CONSULTING CIVIL & TRAFFIC ENGINEERS, RISK MANAGERS.

Project:	Transport Statement, Lot 7 Toy Road Bindoon.
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CONTENTS.

1. Summary.

Shawmac was commissioned to assess the traffic impacts associated with the generation of traffic from a proposed clay excavation operation at Lot 7 Toy Road Bindoon.

The assessment follows the recommended outline contained in the West Australian Planning Commission draft guideline "Transport Statement Guidelines for Developments". Potential traffic flow from the site was estimated by applying the cubic metre rate by the amount of product to be hauled offsite and the vehicle capacity.

Traffic was assigned to the adjacent existing road network and flows used as a basis for assessing traffic impacts associated with the site. Based on the assessment it was shown that the flows predicted can be accommodated within the existing network without unacceptable adverse impacts.

2. Introduction and Background.

2.1. Proponent.

Shawmac was commissioned to assess the traffic impacts associated with the generation of traffic from the proposed clay extraction operation at Lot 7 Toy Road Bindoon.

2.2. Site Location and Land Use.

The site is located as shown on Figure 1 and is within the Shire of Chittering.

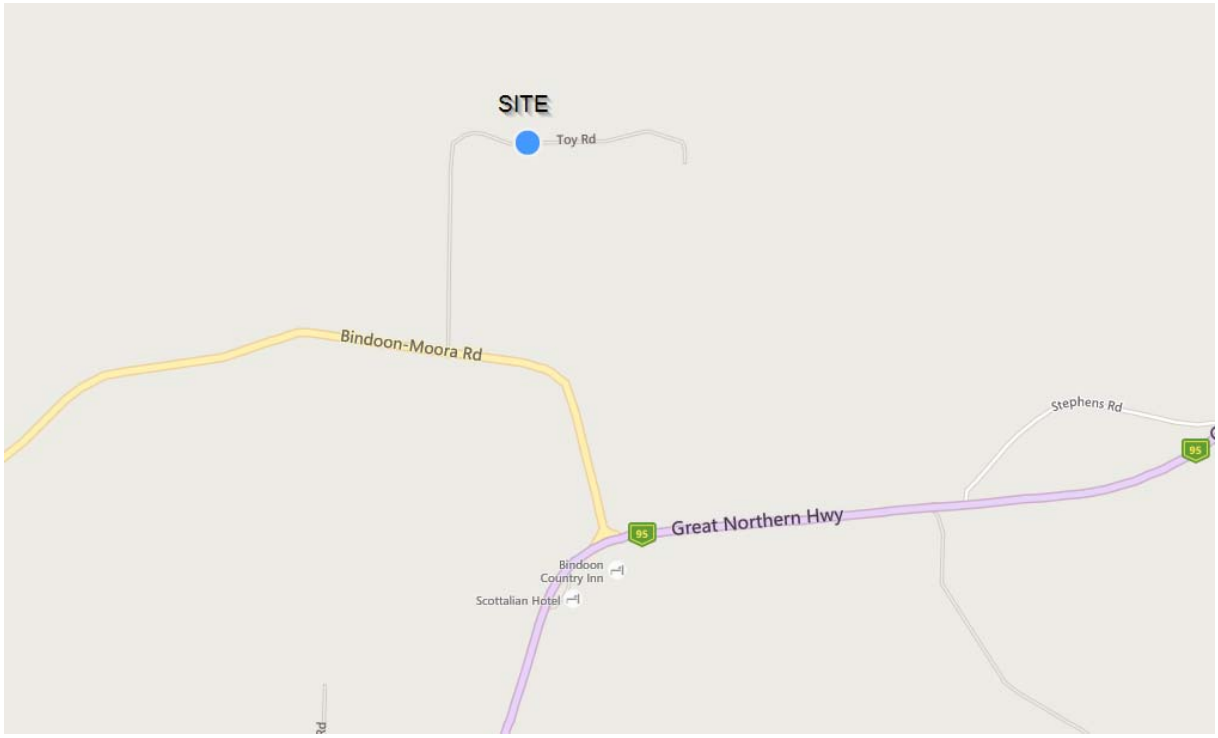

Figure 1. Site Location

The study site was previously used for extensive agriculture and cattle grazing in accordance with the Shire of Chittering town planning scheme. Gravel excavation pits are currently in operation on the eastern part of the site. The existing site together with the surrounding area is shown on the aerial photograph, refer Figure 2.

Figure 2. Site Aerial Photograph

2.3. Referenced Information.

In undertaking the study, the information listed below was referenced.

- Austroads Guide to Road Design Part 4A – Unsignalised and signalised intersections.

3. Site Proposal.

3.1. Regional Context.

The site is located within the Shire of Chittering approximately 10km from the Bindoon Townsite and has direct street frontage to Toy Road which connects to Great Northern Highway via the Bindoon – Moora Road.

3.2. Land Use.

It is proposed to develop the site for extractive industry purposes.

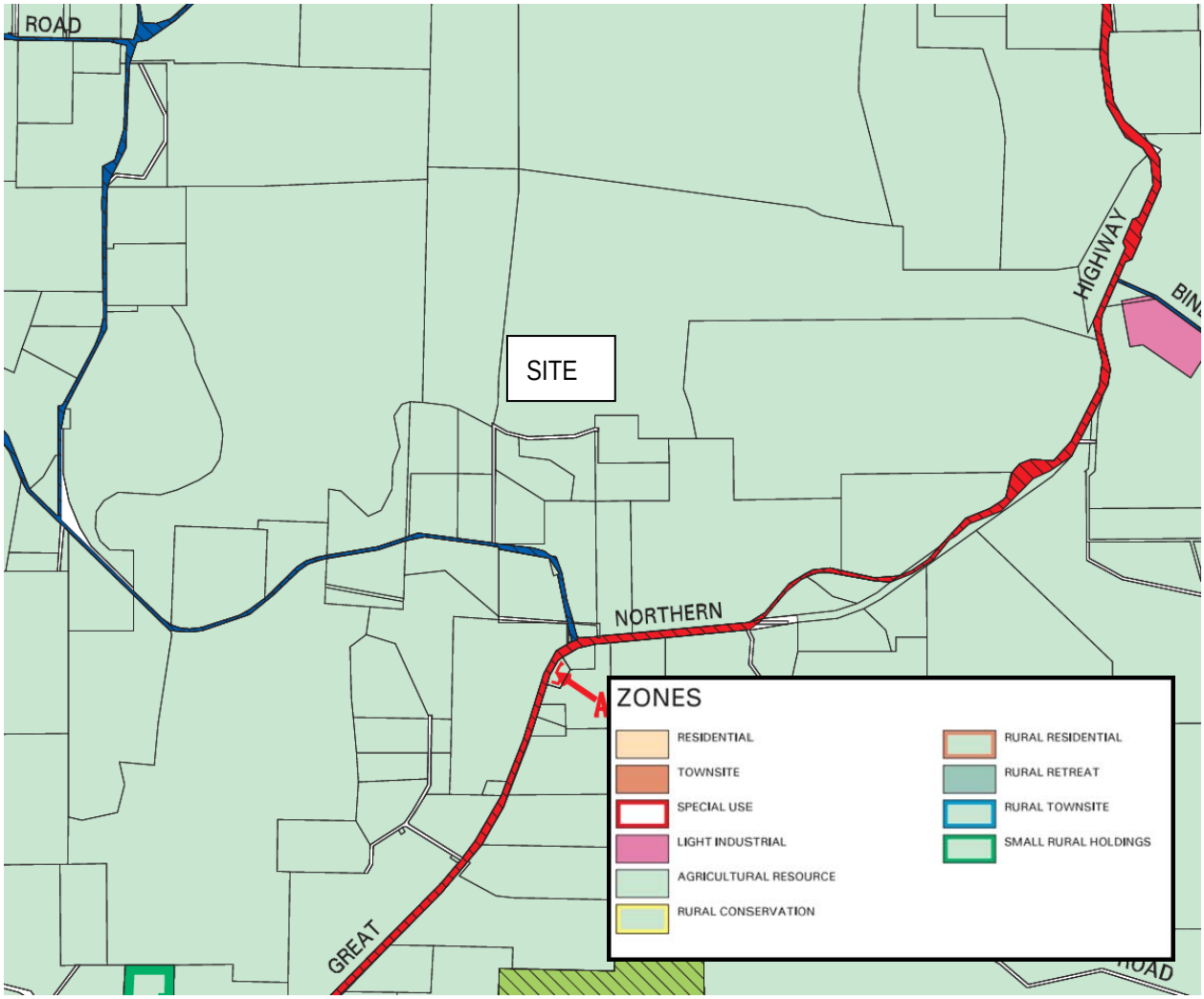

Figure 3. Extract of Shire of Chittering Local Planning Scheme No 6

3.3. Major Attractors and Generators of traffic.

Access to the site is via Toy Road which provides connections to Great Northern Highway via the Bindoon – Moora Road. All movements to and from the site will be to the Perth region to the south.

The site also maintains frontage to Great Northern Highway along its eastern boundary. Great Northern Highway is currently used for access associated with the existing gravel excavation activities on the eastern part of the site. No changes to this operation are proposed as part of this Application.

4. Vehicle movements associated with the proposed clay excavation will only be accessed via Toy Road. Existing Situation.

4.1. Existing Roads.

Toy Road

Toy Road is classified as an access road and is under the care and control of the Shire of Chittering. Toy Road at the site is described as a sealed single carriageway road approximately 7.5m wide with 1m wide gravel shoulders and open roadside drains. Toy Road has an un-posted speed limit.

Traffic count data for Toy Road is not available; however given the traffic catchment it is expected to currently be less than 100 vehicles per day (vpd).

Bindoon – Moora Road

Bindoon - Moora Road is classified as a Primary Distributor Road that has a RAV network 3 status according to the MRWA digital mapping website. It is a State Road under the care and control of Main Roads WA and is described as a sealed single carriageway road approximately 7.0m wide with 1.5m wide gravel shoulders and open roadside drains.

Bindoon - Moora Road has a posted speed limit of 90km/hr.

Traffic count data for Bindoon - Moora Road is shown on Figure 4.

Weekly Volume by Hour

Traffic Flow:	**Directional**	Road Name:	**Bindoon Moora Rd (M002)**
Site No:	**15995**	Location Description:	**W of Great Northern Hwy (SLK 0.01)**
Date Range:	**12 Apr 2005 to 22 Apr 2005**	Count Type:	**Classification Counts**

Average Vehicle Volume

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
0000	0	1	1	0	1	3	1	1	2	3	1	1	2	3	1	2	1	2
0100	0	0	0	1	1	1	1	2	1	2	1	3	1	2	1	1	1	2
0200	0	2	0	0	0	0	1	2	0	2	2	1	0	3	0	1	0	1
0300	0	0	1	0	2	1	2	2	2	2	1	0	1	2	1	1	1	1
0400	0	8	2	0	0	2	1	1	1	2	0	1	0	0	1	3	1	2
0500	4	8	5	8	2	6	5	3	3	4	0	3	0	1	4	6	3	5
0600	14	25	14	14	9	22	7	19	7	16	7	10	4	3	10	19	9	16
0700	17	36	14	28	19	21	18	22	18	18	16	26	5	8	17	25	15	23
0800	17	32	27	29	19	28	27	27	24	25	25	29	14	10	23	28	22	26
0900	20	23	23	22	22	29	27	16	34	40	42	36	14	20	25	26	26	27
1000	22	29	32	32	22	18	29	27	30	28	39	31	26	35	27	27	29	29
1100	26	33	16	25	22	22	28	26	33	37	42	37	37	32	25	29	29	30
1200	26	23	19	24	23	26	24	23	28	35	34	29	40	33	24	26	28	28
1300	19	17	26	26	27	25	30	30	30	33	47	26	23	29	26	26	29	27
1400	26	36	24	29	30	24	31	23	38	40	43	38	36	35	30	30	33	32
1500	26	30	39	24	22	28	33	27	55	36	36	19	41	41	35	29	36	29
1600	22	28	31	29	24	25	36	32	36	43	24	32	48	37	30	31	32	32
1700	16	25	22	28	25	22	29	28	28	26	34	24	30	28	24	26	26	26
1800	16	32	16	27	18	20	23	23	30	20	16	15	18	28	21	24	20	24
1900	9	18	17	13	13	10	13	10	29	23	12	16	12	12	16	15	15	15
2000	6	4	6	10	5	8	7	12	10	11	5	6	5	14	7	9	6	9
2100	3	4	4	4	6	6	7	8	2	2	8	4	4	3	4	5	5	4
2200	4	7	4	6	3	5	2	5	3	6	2	6	4	4	3	6	3	6
2300	2	7	4	4	4	8	4	6	3	3	3	5	1	2	3	6	3	5
Total	295	428	347	383	319	360	386	375	447	457	440	398	366	385	358	401	373	401

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
AM	1/4 Hour	1015	0745	1000	1145	0915	0900	0830	1045	1100	1130	1145	1100	1130	1015	1000	1130	1130	1130
	1/4 Hr Vol	11	12	6	10	8	9	10	9	11	13	14	16	12	14	7	8	8	8
	1/2 Hour	1100	0815	1130	1130	0900	0900	0830	1045	1000	1115	1130	1045	1115	1045	1000	1130	1130	1130
	1/2 Hr Vol	16	20	12	16	14	17	19	16	19	23	27	26	23	24	14	16	16	15
	1 Hour	1145	0745	1145	1115	1130	0845	0830	1015	0930	1115	0915	1045	1115	1015	1130	1130	1130	1100
	1 Hr Vol	28	39	19	28	26	32	33	29	35	40	46	44	45	46	25	29	28	29
	1 Hr Fact	.7778	.8125	.5938	.7368	.8125	.8889	.825	.8056	.9211	.8	.8846	.6875	.9375	.8214	.9073	.8938	.8851	.8668
	2 Hour	1115	0645	1130	1115	1130	0800	0815	1030	0830	1115	1130	0915	1115	1015	1130	1115	1130	1115
	2 Hr Vol	54	72	45	55	52	57	61	55	66	73	88	77	79	70	52	56	57	57
PM	1/4 Hour	1545	1845	1545	1815	1445	1500	1530	1615	1545	1630	1445	1415	1630	1230	1545	1630	1545	1630
	1/4 Hr Vol	11	14	12	10	11	10	11	10	20	14	15	16	20	12	10	9	10	9
	1/2 Hour	1545	1500	1530	1815	1430	1500	1515	1615	1530	1630	1300	1230	1445	1615	1530	1615	1530	1615
	1/2 Hr Vol	19	20	23	18	18	17	21	19	34	26	27	23	29	23	20	17	20	17
	1 Hour	1515	1430	1500	1615	1415	1430	1600	1545	1515	1615	1300	1400	1445	1545	1515	1615	1515	1545
	1 Hr Vol	30	37	39	33	30	30	36	32	59	47	47	38	49	45	37	32	37	32
	1 Hr Fact	.6818	.7115	.8125	.9167	.6818	.7895	.9	.8	.7564	.8393	.8393	.5938	.7206	.9375	.8856	.8889	.9004	.8713
	2 Hour	1400	1415	1500	1645	1300	1345	1500	1615	1415	1530	1300	1230	1445	1430	1515	1500	1445	1445
	2 Hr Vol	52	70	70	60	57	53	69	61	96	81	90	72	97	82	67	60	70	61
Peak	12 Hour	0645	0700	0745	0645	0645	0600	0715	0630	0715	0615	0630	0700	0800	0830	0715	0715	0715	0715
	12 Hr Vol	257	344	252	266	270	286	335	303	367	374	398	342	339	348	299	309	311	314

Figure 4. Bindoon – Moora Road Count Data

Great Northern Highway (GNH)

GNH is classified as a Primary Distributor and has a RAV network 7 status according to the MRWA digital mapping website. GNH at the site is described as a sealed and marked single carriageway road approximately 7.0m wide with 1.0m wide sealed shoulders and 1.2m wide gravel shoulders and open roadside drains.

GNH has a posted speed limit of 100km/hr.

Traffic count data for GNH is shown on Figure 5.

Weekly Volume by Hour

Traffic Flow:	**Directional**	Road Name:	**Great Northern Hwy (H006)**
Site No:	**15993**	Location Description:	**S of Bindoon Moora Rd (SLK 67.52)**
Date Range:	**12 Apr 2005 to 22 Apr 2005**	Count Type:	**Classification Counts**

Average Vehicle Volume

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
0000	1	3	2	7	5	7	5	6	7	6	9	7	3	5	4	6	5	6
0100	0	3	2	2	4	7	5	6	4	4	6	10	4	3	3	4	4	5
0200	2	0	1	8	1	11	5	6	4	2	6	12	4	2	3	5	3	6
0300	1	3	6	3	4	5	3	3	5	2	0	1	1	2	4	3	3	3
0400	13	0	7	4	8	4	6	4	8	6	10	6	3	1	8	4	8	4
0500	18	10	20	11	16	7	15	11	16	12	15	6	8	6	17	10	15	9
0600	66	15	38	33	47	23	43	17	37	23	30	20	21	8	46	22	40	20
0700	84	35	73	26	62	46	55	48	41	45	59	39	39	18	63	40	59	37
0800	83	44	79	59	70	51	65	78	67	70	80	68	50	39	73	60	71	58
0900	66	54	57	60	63	51	55	71	76	74	97	95	56	53	63	62	67	65
1000	85	52	68	54	73	56	65	63	66	77	87	93	80	67	71	60	75	66
1100	100	62	62	56	67	59	69	64	75	74	102	96	79	88	75	63	79	71
1200	72	60	66	49	65	61	58	69	80	68	80	88	74	92	68	61	71	70
1300	62	43	58	64	48	61	65	66	77	84	83	91	80	70	62	64	68	68
1400	64	52	59	63	66	79	52	80	75	101	87	92	79	107	63	75	69	82
1500	81	73	63	83	56	74	64	89	75	108	62	85	72	122	68	85	68	91
1600	63	67	69	83	58	74	71	94	109	111	67	74	67	95	74	86	72	85
1700	67	61	67	67	56	79	76	82	86	91	57	60	69	83	70	76	68	75
1800	64	51	52	48	50	52	64	54	50	53	36	41	59	52	56	52	54	50
1900	40	30	39	41	34	38	40	41	54	69	41	37	29	26	41	44	40	40
2000	33	22	30	15	38	13	33	27	41	32	16	24	23	12	35	22	31	21
2100	24	8	20	12	29	17	21	23	30	23	13	21	18	15	25	17	22	17
2200	21	12	13	12	12	8	12	14	25	13	19	5	9	10	17	12	16	11
2300	10	11	9	15	14	10	11	13	15	12	7	15	4	6	12	12	10	12
Total	1120	771	960	875	946	893	958	1029	1123	1160	1069	1086	931	982	1021	945	1018	972

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
AM	1/4 Hour	1015	0900	1045	1000	1015	1015	0815	0845	0945	1015	0915	1045	1045	1115	1015	1000	1115	1000
	1/4 Hr Vol	35	18	22	20	21	21	20	24	27	23	36	33	27	25	19	17	20	18
	1/2 Hour	0745	1045	1045	0945	0800	1015	1045	0830	0930	1000	0915	0945	1030	1145	1100	1000	1115	1130
	1/2 Hr Vol	57	32	37	37	37	35	36	45	44	42	58	60	50	48	37	33	39	35
	1 Hour	1100	1100	1045	0915	1015	1130	1045	0815	1145	0830	0845	0915	1045	1115	1045	0930	1045	1100
	1 Hr Vol	100	62	72	67	73	65	69	83	82	79	109	105	91	94	72	64	77	68
	1 Hr Fact	.8621	.8611	.8372	.859	.8902	.9286	.9583	.883	.8723	.9405	.7569	.8468	.8426	.94	.931	.9412	.9496	.9397
	2 Hour	1000	1100	1030	0900	1000	1130	1000	0815	1045	0830	0815	1045	1015	1115	1000	0830	1045	1115
	2 Hr Vol	185	122	133	114	139	127	134	158	155	157	197	205	167	185	141	126	147	136
PM	1/4 Hour	1500	1500	1700	1530	1230	1445	1715	1515	1630	1530	1230	1230	1300	1445	1630	1530	1630	1530
	1/4 Hr Vol	28	22	22	25	19	29	24	32	33	36	33	31	24	46	20	25	20	25
	1/2 Hour	1500	1500	1645	1530	1230	1445	1700	1515	1630	1515	1400	1300	1245	1445	1630	1515	1630	1515
	1/2 Hr Vol	55	38	40	49	37	48	44	57	61	59	49	52	43	86	40	47	39	48
	1 Hour	1430	1500	1615	1530	1415	1445	1645	1615	1615	1515	1330	1230	1215	1445	1630	1530	1630	1445
	1 Hr Vol	85	73	77	91	70	86	83	96	111	114	92	95	85	143	78	89	76	93
	1 Hr Fact	.7589	.8295	.8953	.91	.9459	.7544	.8646	.8276	.8538	.8028	.8519	.7661	.8854	.7772	.9696	.8783	.9372	.9167
	2 Hour	1415	1445	1545	1530	1415	1445	1545	1515	1545	1445	1230	1230	1215	1445	1545	1445	1545	1445
	2 Hr Vol	151	140	142	170	126	163	149	189	199	219	174	184	159	239	147	175	144	181
Peak	12 Hour	0615	0700	0730	0745	0630	0730	0715	0730	0715	0715	0615	0730	0730	0800	0645	0730	0700	0730
	12 Hr Vol	904	654	697	699	734	744	759	864	879	954	897	929	807	894	778	794	791	815

Figure 5. GNH Count Data

4.2. Intersections

Bindoon - Moora Road and Great Northern Highway (North)

The intersection of Bindoon - Moora Road and Great Northern Highway consists of a fully channelised T intersection with left and right turn auxiliary lanes as shown on Figure 6 below.

Figure 6. Intersection of GNH and Bindoon - Moora Road

Bindoon - Moora Road and Toy Road

The intersection of Bindoon - Moora Road and Toy Road consists of an unchannelised T intersection as shown on Figure 7 below.

Figure 7. Intersection of Bindoon – Moora Road and Toy Road

4.3. Road Hierarchy and status.

Figure 4 shows the Road Hierarchy and Restricted Access Vehicle categories for the road network adjacent to and around the site. Table 1 below shows the permitted Prime Mover and trailer combinations for the majority of the haul route.

Road Name	Prime Mover and Trailer Combinations	Length	Max permitted mass
Bindoon – Moora Road	(A) PRIME MOVER, SEMI TRAILER TOWING A DOG TRAILER 	≤27.5	84
GNH	(A) PRIME MOVER, TOWING SEMI TRAILER AND B DOUBLE  (B) B-DOUBLE TOWING A DOG TRAILER 	>27.5,≤36.5 >27.5,≤36.5	107.5 107.5

Table 1. Prime Mover and Trailer Combinations

Figure 8. Road Hierarchy

4.4. Road Hierarchy vs Actual Flows

Table 2 details the comparison of flows against the maximum desirable flows under the MRWA Functional Hierarchy criteria.

Location and date of count.		Classification	Desirable Max Traffic Volume (vpd)	Actual Daily Traffic Flows (vpd)
GNH	South of Bindoon - Moora Road	Primary Distributor	35,000 vpd.	1,966 vpd
Bindoon – Moora Road	West of GNH (2006)	Primary Distributor	7,000[1] vpd.	759 vpd
Toy Road	North of Bindoon – Moora Road (Estimated)	Access Road	3,000 vpd.	100 vpd

Table 2. Desirable Maximum Flows vs Actual Flows

The table above indicates that all roads are operating in accordance within their capacity.

5. Changes to Surrounding Transport Networks

There are no known changes to the adjacent network that has the potential to affect the assessment.

[1] Although classed as a Primary Distributor the road functions more as a Local Distributor.

6. Assessment Years

The development is assessed on current network conditions.

7. Time Periods for Assessment

Assessment is based on both daily traffic and peak hour periods.

8. Development Generation and Distribution.

Potential traffic flows from the site were calculated based on the extraction rate and cartage details as advised by Brikmakers and summarised below:

Annual extraction: approx. 75,000 tonnes.

Transport Metrics: 50 tonne loads out (ie two 25 tonne trailer combo).

Number of days operating: approx. 25 days a year.

This equates to about 60 trips per day or 120 vehicle movements.

The distribution of traffic is expected to be exclusively from the south and the impact on adjacent roads is summarised on Table 3.

Location	Daily Traffic (Existing / Predicted)	AM Peak (Existing / Predicted)	PM Peak (Existing / Predicted)
GNH South of Bindoon Moora Road (NB)	1,021 / 1,081 vpd	72 / 78 vph	78 / 84 vph
GNH South of Bindoon Moora Road (SB)	945 / 1,005 vpd	64 / 70 vph	89 / 95 vph
Bindoon – Moora Road east of Toy Road (EB)	358 / 418 vpd	25 / 31 vph	37 / 43 vph
Bindoon – Moora Road east of Toy Road (WB)	401 / 461 vpd	29 / 35 vph	32 / 38 vph
Toy Road north of Bindoon – Moora Road (NB)	100 / 160 vpd	10 / 16 vph	10 / 16 vph
Toy Road north of Bindoon – Moora Road (SB)	100 / 160 vpd	10 / 16 vph	10 / 16 vph

Table 3. Midblock Traffic Prediction Adjacent Network

8.1.1. Impact on Intersections

Turning movements were predicted for both the AM peak and the PM peak periods for the intersection of Bindoon – Moora Road and Toy Road and for Bindoon – Moora Road and Great Northern Highway and are shown on Figures 9 and 10.

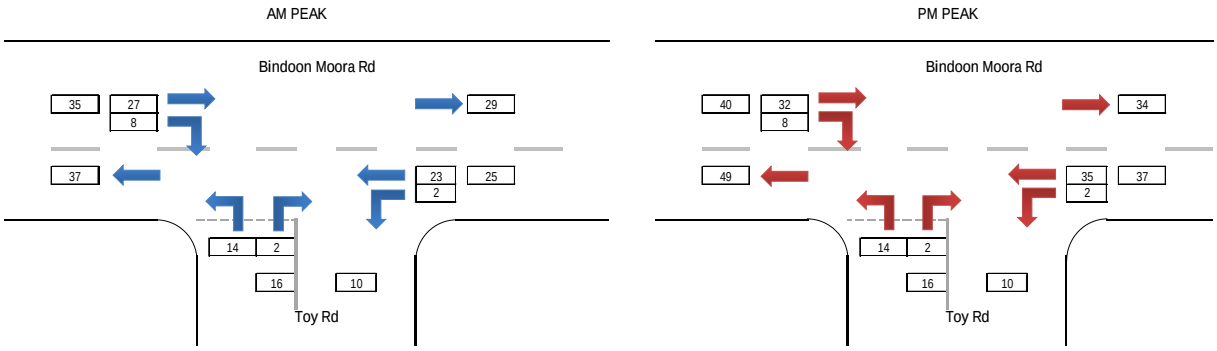

Figure 9. Turning Movements – Toy Road – Bindoon – Moora Road

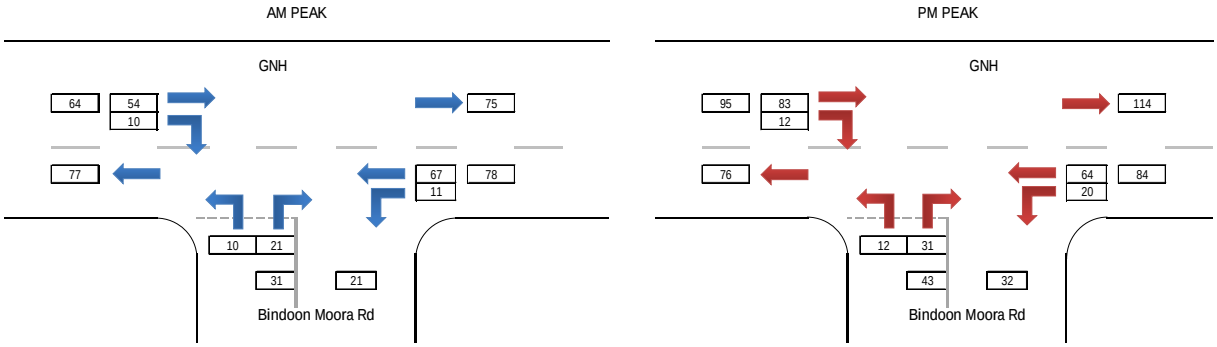

Figure 10. Turning Movements – GNH – Bindoon – Moora Road

The capacity of an intersection is generally evaluated using SIDRA intersection software and warrants for analysis for unsignalised intersections with minor roads are shown in Table 4 which is in an extract of Table 6.1 of *Austroads Guide to Traffic Management Part 3, Traffic Studies and Analysis*. In this instance the warrants are not met for detailed assessment.

Type of Road	Light Cross turning volumes maximum design hour volumes per hour (two way)		
Two- lane major road Cross Road	400 250	500 200	650 100
Four-lane major road Cross road	1000 100	1500 50	2000 25
GNH / Bindoon - Moora Road	180 40		
Toy Road / Bindoon - Moora Road	80 16		

Table 4. Intersection volumes below which capacity analysis is unnecessary

8.2. Access Movements

Access to and from the site will be via a crossover located on Toy Road located approximately 150 metres east of the Toy Road bend as shown on Figure 11.

Figure 11. Propsed Access onto Toy Road

No details are provided for the crossover other than the location and design will be undertaken to ensure that the geometry provides for the intended design vehicle. Given the proximity of the 90 degree bend to the west and the nature of the road to the east of the access point, vehicle speeds along this section of Toy Road are expected to be less than 50 km/h. A desktop review of the crossover location indicates that there is approximately 120m of sight distance to the east and west of the access point. Austroads Part 4A Table 3.2 provides guidance as to Safe Intersection Sight Distance which for a 2 second observation time and a speed of 50 km/hr is 97m.

Given the low number of vehicles using Toy Road and the likely speed at which through traffic would be travelling along Toy Road, the movement of trucks to and from the site is not expected to result in unacceptable levels of risk.

A review of turning movements at the intersection of Toy Road and Bindoon – Moora Road indicates that based on hourly volumes and the application of warrants as described in Austroads "*Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections*" a Basic intersection configuration is warranted; refer Figure 12.

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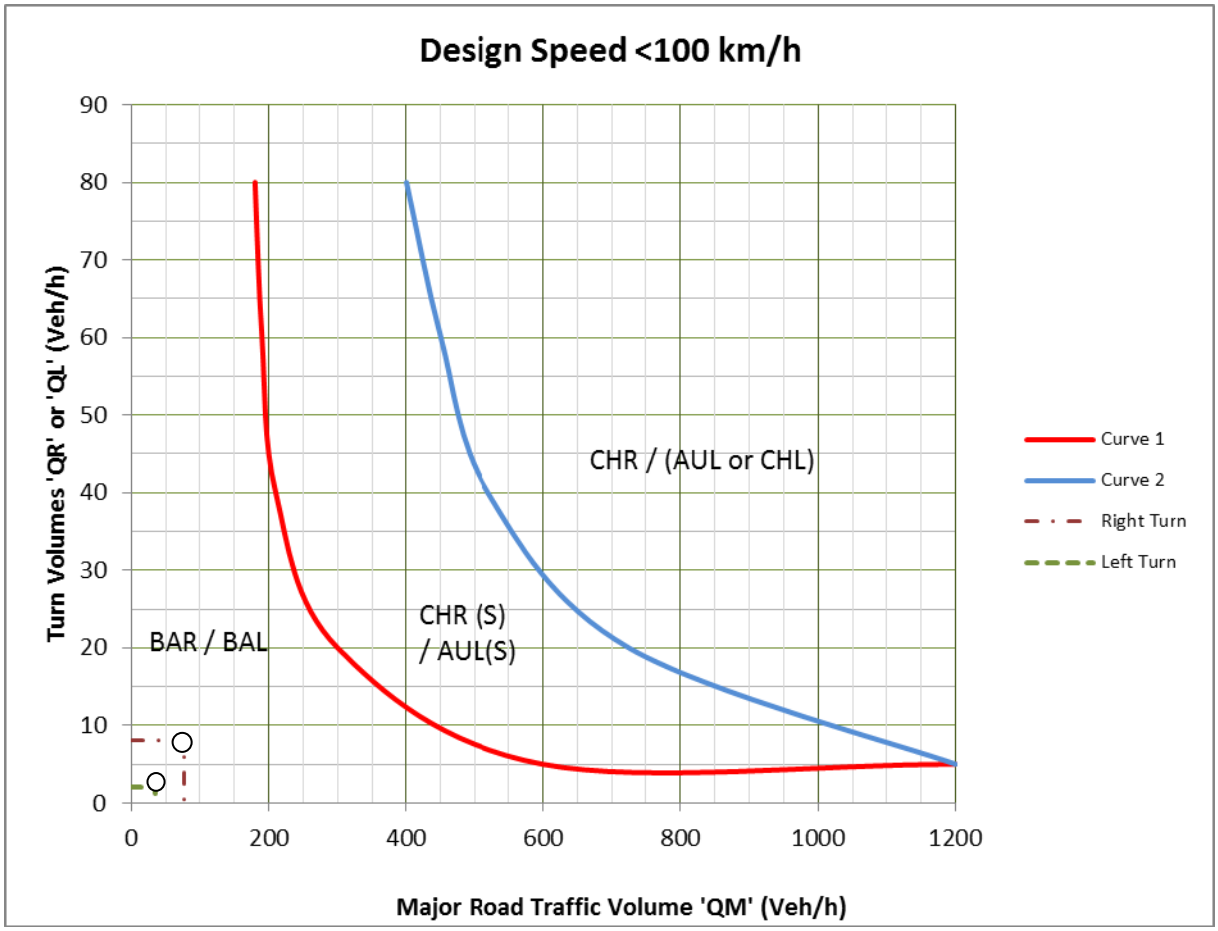

Figure 12. Intersection Warrants

As Toy Road is not a designated RAV route, application will need to be made to the Shire of Chittering in order to have the route designated based on the type of vehicle proposed to be used. This will require consideration of the RAV assessment guidelines. Given the short haul distance, the limited amount of traffic using Toy Road and the width of the current seal, the use by permit vehicles over a short time frame each year (25 days) is considered to be acceptable. Apart from additional signage and modification of the intersection, no upgrade works are considered to be necessary or warranted.

With respect to the intersection, upgrading will be required to provide sufficient width on the Bindoon – Moora Road westbound carriageway to allow for through traffic to safely pass right turning traffic into Toy Road, to accommodate all turns into and out of the intersection lane correct and to accommodate slow moving vehicles turning left onto Bindoon – Moora Road. A conceptual layout of the improvements is shown over on Figure 13.

No amendments or modifications to the intersection of Bindoon – Moora Road and GNH are required.

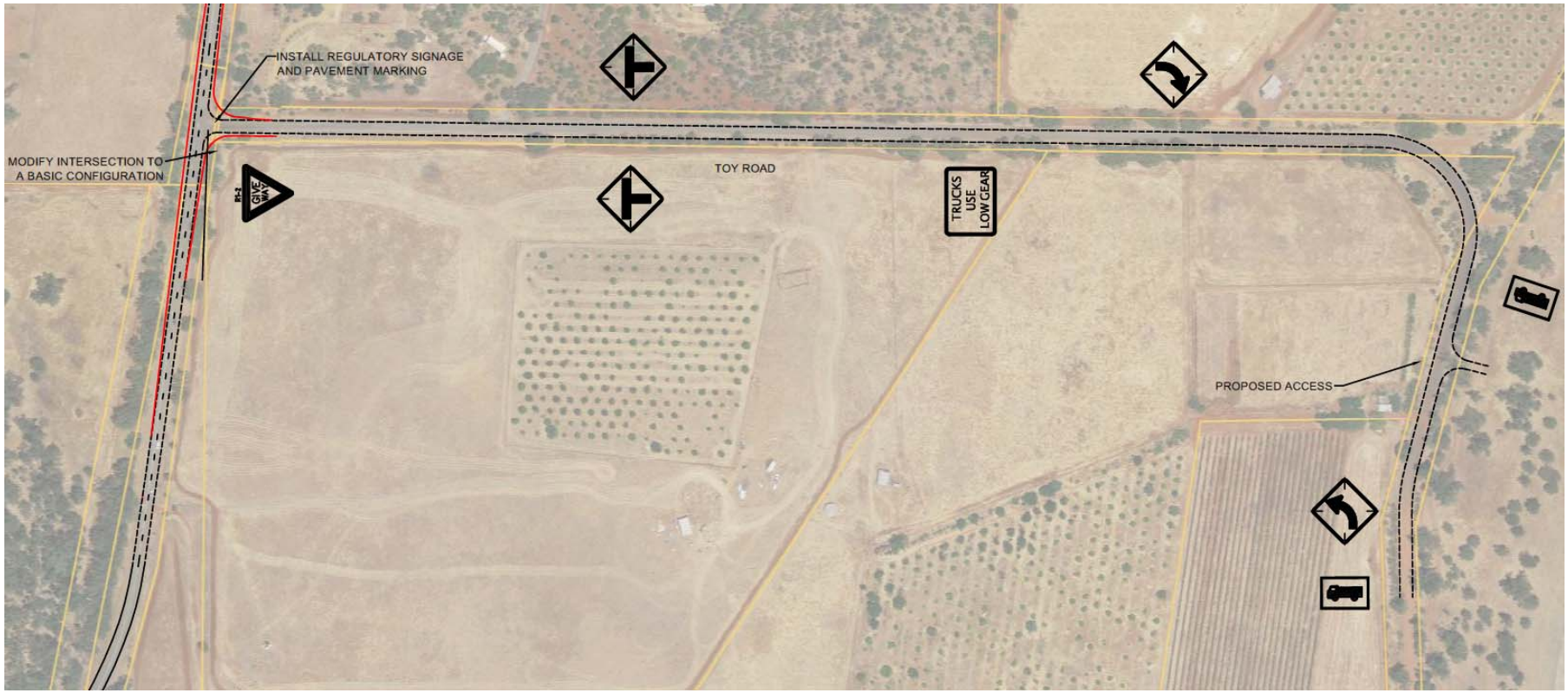

Figure 13. Toy Road Improvements

9. Conclusions

A review of the traffic impacts associated with the extraction and carting of clay from Lot 7 Toy Road Bindoon indicated the following:

- Under the development scenario, the predicted generation from the site is 60 vehicles per day, based on an extraction rate of 75,000 tonnes per year carted over a 25 day period by heavy haulage vehicles having a 50 tonne payload.
- The carting will result in an additional 120 trips per day which will travel between the site and the Perth region via Toy Road, Bindoon – Moora Road and Great Northern Highway.
- Expected increase in traffic using these roads is predicted to be in the order of 12 movements per hour; 6 of which will be to the site and 6 from the site. This will only occur on 25 days a year.
- The location of the access and egress point on Toy Road is considered to be satisfactory and given the low vehicle numbers on Toy Road and the low speed of traffic using Toy Road, sight distance to and from the access is likely to be adequate. As such, no unacceptable reduction in safety to road users is envisaged.
- The section of Toy Road proposed to be used for haulage is not a RAV classified route; however given the existing seal width, short haul distance to Bindoon – Moora Road and infrequent haulage period accommodation of permit vehicles on the road is considered to be acceptable.
- The intersection of Bindoon – Moora Road and Great Northern Highway is capable of accommodating the additional traffic without requiring upgrading. The intersection of Bindoon – Moora Road and Toy Road requires modification to accommodate the additional heavy haulage traffic.