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Project:	Traffic Study
	Opal Vale Development
	Salt Valley Road – Toodyay
	Version 2
Client:	Opal Vale Pty Ltd
Author:	Tony Shaw. BSc Dip Eng Surv Grad Dip Bus MIPWEA RABQSA
Signature:	
Date:	03/01/12

1 ST. FLOOR, 908 ALBANY HIGHWAY, EAST VICTORIA PARK WA 6101.

PHONE	**+61 8 9355 1300**
FACSIMILE	**+61 8 9355 1922**
EMAIL	tshaw@shawmac.com.au

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SHAWMAC PTY LTD

ABN 51 828 614 001

PO BOX 937 SOUTH PERTH

WA 6951

T: +61 8 9355 1300 F: +61 8 9355 1922 E: tshaw@shawmac.com.au

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1. Introduction.

1.1. General.

Shawmac Pty Ltd has been engaged to determine and assess the traffic impacts associated with the proposed landfill operations on Lot M2027 Chitty Road, Toodyay.

Access to the site is proposed via the existing road network including Toodyay Road, Fernie Road and Salt Valley Road.

The proposed site is shown in Figure 1.

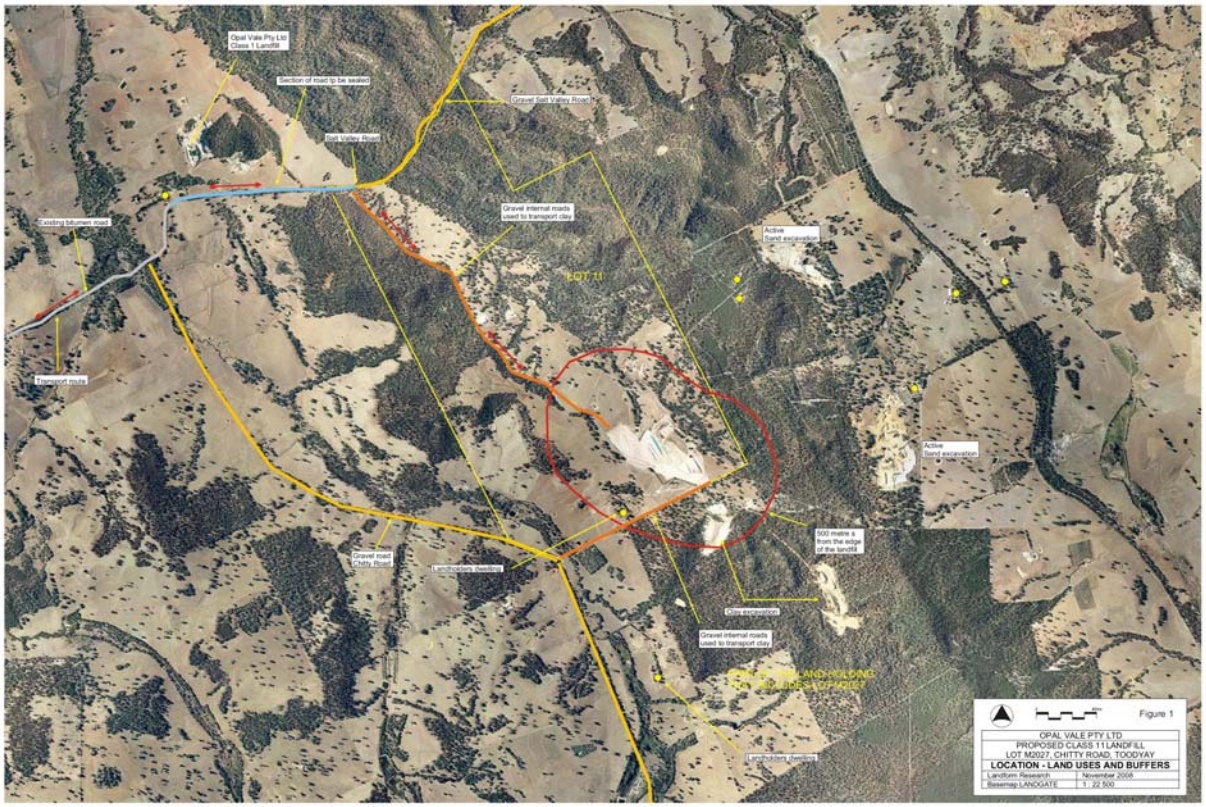


Figure 1. Proposed Site Layout

1.2. Traffic Study Objective.

The Traffic Study outlines the likely impact of the proposed development on network traffic flows. As part of the assessment, traffic volumes generated by the proposed development were estimated, together with their impact on current Salt Valley Road and Toodyay Road flows and total predicted flows from a fully developed traffic catchment.

1.3. Site Location.

The development site is located about 8.5 kilometres west of the Toodyay townsite as shown on Figure 2.

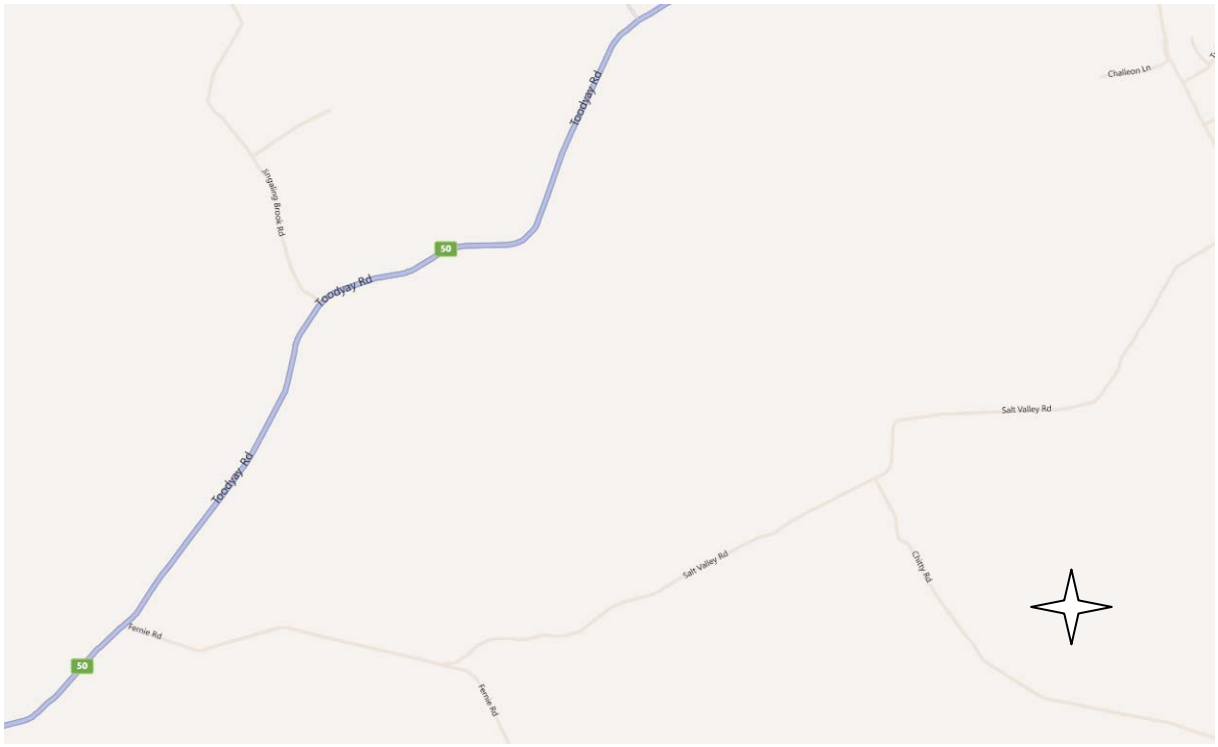


Figure 2. Site Location Map

The development site is zoned Rural under the Shire of Toodyay Local Planning Scheme 4 (LPS 4), as shown on Figure 3.

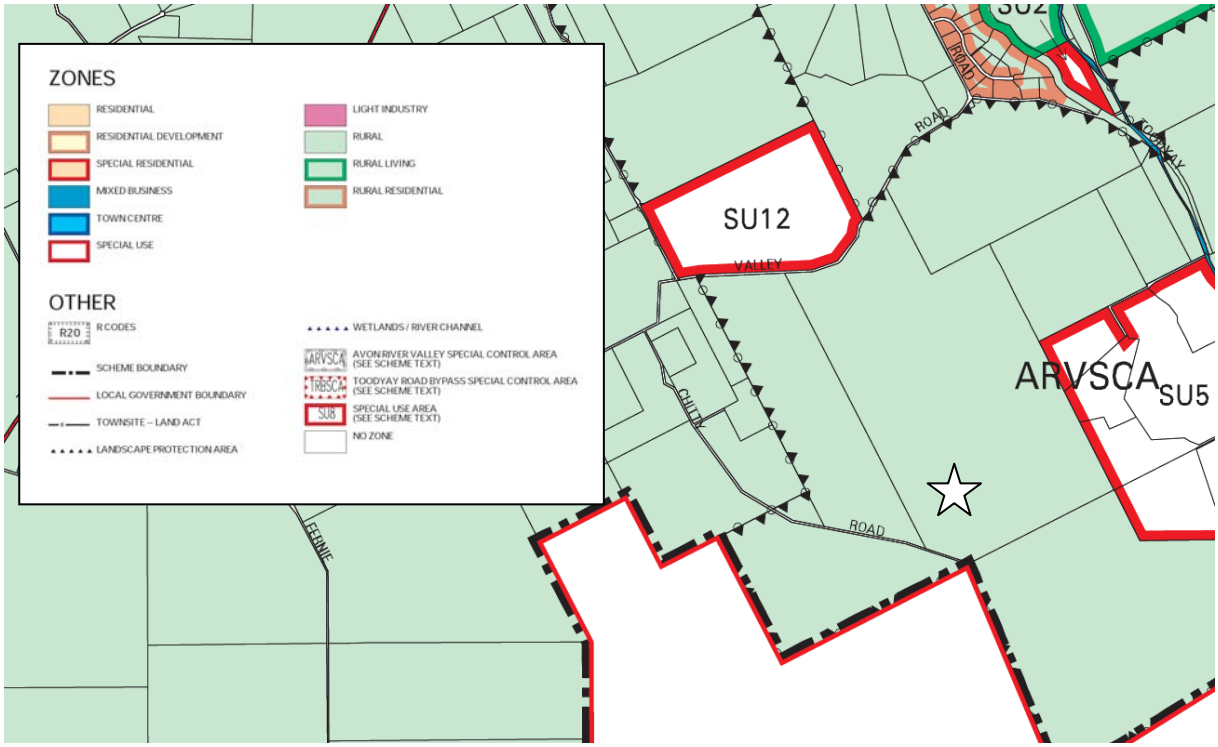


Figure 3. Current Zoning

2. Existing Traffic Environment

2.1. Road Hierarchy

The classification for roads surrounding the proposed development site as sourced from the Main Roads WA website is shown in Table 1 below.

Road Category.	Road Name.	Desirable Max. Traffic Volume[1]. (vpd)
State Road / Primary Distributor	Toodyay Road	Up to 20,000 vpd
Local Distributor	Salt Valley Road	Up to 3000 vpd
Local Distributor	Fernie Road	Up to 3000 vpd

Table 1. Road Classification and Indicative Maximum Traffic Volumes

[1] From Austroads Rural Road Design Guidelines

2.2. Vehicle Volumes and Flows

2.2.1. Toodyay Road

Toodyay Road is classified as a State Road and has a primary function of carrying large volumes of high speed traffic (private, commercial, heavy and oversize) between regional centres. The carriageway consists of 2 x 3.5 m wide traffic lanes, 0.6 m wide sealed shoulders and 1.5m wide unsealed shoulders. The cross section provides adequate trafficable width to allow through traffic to pass stopped right turning traffic at low volume side road intersections.

Traffic count data sourced from MRWA (collected in October 2009) indicates that west of Salt Valley Road, Toodyay Road carried in the order of 1,960 vehicles per day (vpd) of which 8.2% were classified as heavy haulage.

A recent (2011) count taken north of Bailup Road indicated a daily flow of 2,800 vpd distributed throughout the day as shown on Figure 4.

Weekly Volume by Hour

Count:	DIRECTIONAL	Road Name:	Toodyay Rd
Site No:	5533	Location Description:	N of Bailup Rd
Date Range:	11/05/2011 to 16/05/2011	Count Type:	Classification Counts

Hour	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg M-F		Avg M-S	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
00:00 - 01:00					7	0	4	0	6	0	11	3	6	2	6	0	7	3
01:00 - 02:00					2	2	3	1	1	1	2	1	5	5	2	1	3	2
02:00 - 03:00					1	1	1	0	0	2	5	2	1	4	1	2	2	2
03:00 - 04:00					4	6	2	6	5	4	2	1	3	3	4	5	3	4
04:00 - 05:00					5	19	5	19	3	20	1	7	4	3	4	19	4	14
05:00 - 06:00					35	69	22	76	23	71	2	23	4	12	27	72	17	50
06:00 - 07:00					52	115	40	109	41	104	22	33	5	17	44	109	32	76
07:00 - 08:00					65	209	47	191	43	171	41	67	42	37	52	190	48	135
08:00 - 09:00					78	152	65	144	53	136	60	115	81	71	65	144	67	124
09:00 - 10:00					71	102	63	91	65	106	69	103	90	104	66	100	72	101
10:00 - 11:00					69	106	82	93	78	96	145	127	137	138	76	98	102	112
11:00 - 12:00					65	78	59	96	62	99	140	106	145	124	62	91	94	101
12:00 - 13:00					83	92	76	65	73	91	106	80	105	125	77	83	89	91
13:00 - 14:00					83	82	68	76	100	78	132	99	94	124	84	79	95	92
14:00 - 15:00					89	96	90	82	101	120	125	75	94	168	93	99	100	108
15:00 - 16:00					134	83	117	91	136	100	101	76	65	138	129	91	111	98
16:00 - 17:00					137	73	164	91	156	80	153	93	92	134	152	81	140	94
17:00 - 18:00					186	68	188	57	216	74	126	106	92	91	197	66	162	79
18:00 - 19:00					92	48	117	40	113	46	65	56	70	48	107	45	91	48
19:00 - 20:00					53	16	43	21	66	24	52	30	53	34	54	20	53	25
20:00 - 21:00					34	9	34	6	35	20	44	21	20	15	34	12	33	14
21:00 - 22:00					15	5	32	6	31	7	34	39	13	8	26	6	25	13
22:00 - 23:00					21	5	25	7	26	10	29	10	14	2	24	7	23	7
23:00 - 00:00					6	1	12	2	16	5	19	6	5	3	11	3	12	3
AM Peak 1/4 Vol					26	60	29	55	26	58	54	42	54	41	23	52	31	36
AM 1/4 Hour					1115	0715	1015	0730	1030	0715	1030	0845	1045	1000	1030	0715	1030	0745
AM 1/2 Vol					43	110	50	103	47	93	86	71	88	73	43	97	58	70
AM 1/2 Hour					0815	0700	1015	0730	1030	0715	1015	0845	1030	1000	1015	0715	1030	0730
AM 1hr Vol					82	209	82	191	84	171	152	127	157	138	76	190	105	135
AM 1hr Hour					0815	0700	1000	0700	1030	0700	1030	1000	1045	1000	1000	0700	1030	0700
AM 1hr Fact					0.891	0.871	0.707	0.868	0.808	0.737	0.704	0.962	0.727	0.842	0.838	0.919	0.841	0.932
AM 2hr Vol					162	361	147	335	155	307	285	243	287	265	154	334	196	259
AM 2hr Hour					1145	0700	1015	0700	1145	0700	1000	0845	1030	0915	1145	0700	1000	0700
PM Peak 1/4 Vol					63	33	49	32	57	37	46	42	32	50	56	28	44	29
PM 1/4 Hour					1715	1200	1715	1615	1715	1400	1645	1700	1300	1515	1715	1200	1715	1515
PM 1/2 Vol					115	54	98	57	111	65	91	69	58	88	107	52	84	56
PM 1/2 Hour					1715	1400	1715	1600	1700	1400	1630	1700	1245	1400	1715	1400	1700	1400
PM 1hr Vol					186	99	188	100	216	121	162	114	110	168	197	100	162	108
PM 1hr Hour					1645	1345	1700	1530	1700	1345	1615	1630	1215	1400	1700	1345	1700	1400
PM 1hr Fact					0.738	0.917	0.959	0.781	0.947	0.818	0.880	0.679	0.859	0.955	0.874	0.926	0.925	0.951
PM 2hr Vol					334	184	352	194	372	220	284	201	199	310	349	191	302	206
PM 2hr Hour					1545	1330	1600	1430	1600	1400	1530	1545	1200	1330	1600	1400	1600	1400
Peak 12hr Vol					1153	1269	1136	1214	1219	1265	1274	1108	1126	1312	1166	1247	1179	1210
Peak 12hr					0715	0515	0700	0515	0800	0530	0800	0645	0745	0730	0745	0530	0745	0600
24hr Total					1387	1437	1359	1370	1449	1465	1486	1279	1240	1410	1397	1423	1385	1396

Figure 4. Toodyay Road Flows

2.2.2. Salt Valley Road / Fernie Road.

Adjacent to the proposed development site Salt Valley Road is sealed to a width of 6.0 to 6.2 metres with 1.0 to 1.5 metre wide unsealed shoulders. It is classified as a Local Distributor (rural access road) and has a primary function of providing vehicular access to rural residential properties and connection to higher order roads. Austroads Rural Roads guidelines indicate that a road of similar construction is suitable for flows of up to 3,000 vehicles per day.

No recent traffic counts are available for Salt Valley Road; however 2009 counts taken by the Shire of Toodyay near the BGC Quarry are available and are shown on Figure 5. The counts represent a snapshot of the traffic environment and are understood not to include the current clay carting traffic.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.1	0.1
0100-0200	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.1
0200-0300	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.0	0.1
0300-0400	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
0400-0500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0500-0600	0.7	1.3	0.7	1.0	0.0	0.0	0.3	0.7	0.6
0600-0700	2.7	3.7	3.3	3.3	2.0	0.7	1.0	3.0	2.4
0700-0800	2.3	5.0	**8.0<**	4.7	**6.0<**	3.0	2.3	**5.2<**	4.5
0800-0900	2.7	3.0	4.0	1.3	5.3	4.3	1.7	3.3	3.2
0900-1000	3.7	**7.3<**	4.0	4.3	4.7	**5.7<**	3.3	4.8	**4.7<**
1000-1100	4.3	3.0	5.7	**5.0<**	3.7	3.7	**4.3<**	4.3	4.2
1100-1200	**4.3<**	5.7	5.0	3.0	2.3	4.0	2.3	4.0	3.8
1200-1300	3.7	3.3	1.5	2.0	3.0	**7.0<**	5.0	2.8	3.8
1300-1400	2.7	2.0	3.0	3.0	4.7	3.7	**6.3<**	3.1	3.6
1400-1500	3.0	6.3	2.3	**5.7<**	4.7	3.3	3.7	4.4	4.1
1500-1600	4.0	3.0	3.0	5.3	4.7	3.7	4.7	4.0	4.0
1600-1700	**4.7<**	4.7	**7.3<**	2.3	4.0	4.0	4.7	4.6	**4.5<**
1700-1800	4.0	**7.7<**	4.7	5.0	2.3	1.7	3.0	**4.7<**	4.0
1800-1900	2.0	3.0	3.0	1.7	**4.7<**	2.0	2.7	2.9	2.7
1900-2000	0.7	1.3	2.0	2.3	1.3	1.0	0.7	1.5	1.3
2000-2100	0.7	0.3	1.0	0.0	0.0	0.7	0.7	0.4	0.5
2100-2200	1.7	1.7	2.3	1.0	0.3	1.7	0.7	1.4	1.3
2200-2300	0.7	0.0	0.0	0.0	1.3	1.3	0.3	0.4	0.5
2300-2400	0.0	0.0	0.0	0.0	0.7	0.7	0.3	0.1	0.2
Totals									
0700-1900	41.3	54.0	51.5	43.3	50.0	46.0	44.0	48.1	47.2
0600-2200	47.0	61.0	60.2	50.0	53.7	50.0	47.0	54.4	52.7
0600-0000	47.7	61.0	60.2	50.0	55.7	52.0	47.7	54.9	53.5
0000-0000	48.3	62.3	60.8	51.0	56.0	52.7	50.0	55.7	54.5
AM Peak	1100	0900	0700	1000	0700	0900	1000		
	4.3	7.3	8.0	5.0	6.0	5.7	4.3		
PM Peak	1600	1700	1600	1400	1800	1200	1300		
	4.7	7.7	7.3	5.7	4.7	7.0	6.3		

Figure 5. Salt Valley Road Traffic Flows

Salt Valley Road connects with Fernie Road to the west and ultimately to Toodyay Road.

Based on the existing number of properties serviced by Salt Valley Road and Fernie Road between Toodyay Road and Hoddy Well Road and applying a generation rate of 9 vehicle trips per day, it would be expected that up to an additional 120 trips per day would be generated at current development levels over and above the existing volume of 55 vehicles a day recorded on Salt Valley Road east of Fernie Road. Peak hour flows would be expected to currently be in the order of 15 to 20 vehicles per hour (combined flow). These flows do not include clay carting traffic.

2.2.3. Road Hierarchy vs. Flows

Austroads Rural Road Design Guidelines recommendations for rural road cross sections are tied to the level of traffic carried by the road and are shown on Table 2 below.

Element	Design AADT				
	1-150	150-500	500-1,000	1,000-3,000	>3,000
Traffic Lanes	3.5 (1 x 3.5)	6.2 (2 x 3.1)	6.2-7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Total Shoulder	2.0	1.5	1.5	2.0	2.5
Shoulder Seal	0.5	0.5	0.5	1.0	1.5

Table 2. Road Cross Section Capacity

Table 3 indicates that Toodyay Road and Salt Valley Road are operating within theoretical capacities.

Road Category	Location		Desirable Max Traffic Volume (vpd) at current cross section	Estimated Daily Traffic Flows (vpd)
State Road	Toodyay Road	West of Salt Valley Road	20,000	2,800
Rural Access Road	Salt Valley Road / Fernie Road	East of Toodyay Road	3,000	175*

Table 3. Existing Daily Traffic Flows Vs Capacity (* calculated flow)

2.3. Crash History

The crash history for the five (5) year period to December 2010 for the intersection of Toodyay Road and Fernie Road was reviewed via the Main Roads WA website. The website indicates that there have been no recorded crash events at the intersection.

3. Future Transport Considerations

3.1. Development Trip Generation

The anticipated peak period and daily traffic flows generated by the development site have been determined from advice received from the Proponent and are shown on Tables 4, 5, 6 and 7.

Flows are based on predicted landfill traffic volumes and the current maximum carting rates of clay from the BGC and Austral pits.

Initial Anticipated Traffic Volumes	
Annual Waste Tonnage to Landfill:	75,000
Instant Waste Tonnage	*60,000*
Truck and Dog Vehicles Tonnage (80%)	48,000
Tonnage per Vehicle	42
Number of Vehicles per Year	1,143
Number of Truck and Dog Vehicles per Day	4.4
Semi Trailer Tonnage (20%)	12,000
Tonnage per Vehicle	24
Number of Vehicles per Year	500
Number of Semi Trailer Vehicles per Day	1.9
Total Number of Instant Waste Vehicles per Day	6.3
Other Commercial Waste Tonnage	*15,000*
Tonnage per Vehicle (mix of 6 or 8 wheeler or semi trailer)	8
Number of Vehicles per Year	1,875
Number of Other Commercial Vehicles per Day	7.2
Landfill Operations Vehicles per Day (utes and cars)	*5.0*
Total Number of Vehicles to the Landfill per Day	**18.5**

Table 4. Opal Vale Landfill Operations Initial Traffic

Ultimate Anticipated Traffic Volumes	
Annual Waste Tonnage to Landfill:	150,000
Instant Waste Tonnage	*100,000*
Truck and Dog Vehicles Tonnage (80%)	80,000
Tonnage per Vehicle	42
Number of Vehicles per Year	1,905
Number of Truck and Dog Vehicles per Day	7.3
Semi Trailer Tonnage (20%)	20,000
Tonnage per Vehicle	24
Number of Vehicles per Year	833
Number of Semi Trailer Vehicles per Day	3.2
Total Number of Instant Waste Vehicles per Day	10.5
Other Commercial Waste Tonnage	*50,000*
Tonnage per Vehicle (mix of 6 or 8 wheeler or semi trailer)	8
Number of Vehicles per Year	6,250
Number of Other Commercial Vehicles per Day	24.0
Landfill Operations Vehicles per Day (utes and cars)	*7.0*
Total Number of Vehicles to the Landfill per Day	**41.6**

Table 5. Opal Vale Landfill Operations Ultimate Traffic

Clay Extraction Operations (Existing)

BGC Clay Extraction Operations	
Annual Clay Extraction Tonnage	100,000
Tonnage per Vehicle (truck and dog)	40
Daily Clay Tonnage Removal (minimum)	2,000
Number of Vehicles per Day (minimum)	50
Daily Clay Tonnage Removal (maximum)	3,500
Number of Vehicles per Day (maximum)	88
1) Clay extraction occurs for one week per month all year round.	
2) 20 year clay resource available.	
Austral Bricks Clay Extraction Operations (Existing)	
Annual Clay Extraction Tonnage	47,000
Tonnage per Vehicle (truck and dog)	41.5
Total Vehicle Numbers	1,133
Summer Haulage Vehicle Numbers (90%)	1,019
Vehicles per 2 Week Haulage Campaign (3 per summer)	340
Vehicles per Day	34
1) Clay extraction occurs for 2 weeks per 8 week period.	
2) 90% of the extraction occurs during summer.	
3) 20 year clay resource available.	

Table 6. Clay Operations Existing Traffic.

Landfill (Initial period)	18.5
BGC Clay (Maximum)	87.5
Austral Bricks (Maximum)	34.0
Total Vehicles (Maximum if all clay is being hauled – predicted maximum operation)	**140.0**
Landfill (Ultimate Anticipated)	41.6
BGC Clay (Maximum)	87.5
Austral Bricks (Maximum)	34.0
Total Vehicles (Maximum if all clay is being hauled – predicted maximum operation)	**163.0**

Table 7. Summary - Number of Vehicles per Day

Maximum flows will occur when the operation is at its ultimate level of development and both BGC Clay and Austral Bricks are both carting clay. Under this scenario it is expected that traffic generated from the sites would be in the order of 325 vehicles per day (vpd) which together with the current estimated volume of 175 vpd would result in a total flow on Fernie Road east of Toodyay Road in the order of 500 vpd. However it is unlikely that this traffic generation would be a common event and under normal operating conditions without clay carting, daily traffic flows of about 210 vpd would be expected. Given that clay carting times are more likely to be staggered daily flows of about 350 vpd would be expected.

A range of possible scenarios exist and are summarised on Table 8.

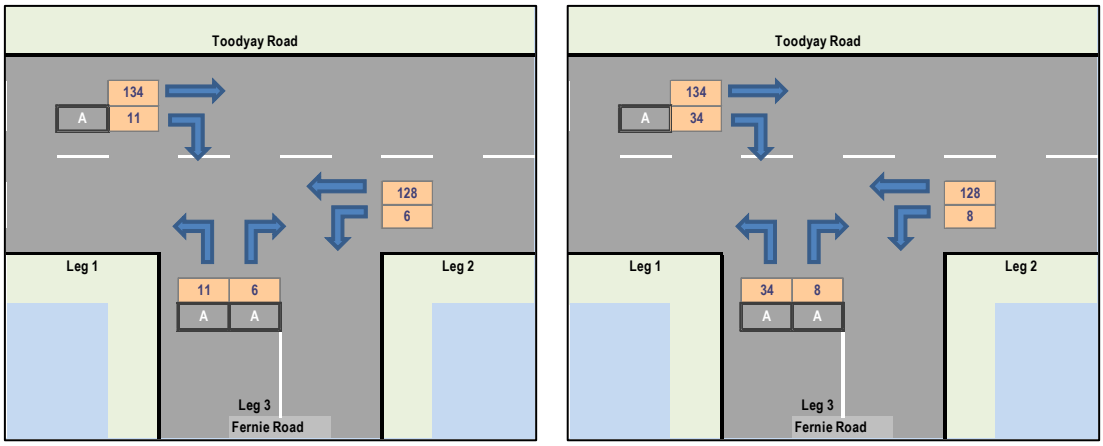
Scenario	Daily Traffic	Peak Hour Traffic
Existing flows – no clay carting	175	17
Existing flows – concurrent clay carting from both pits	417	42
Predicted flows – no clay carting	263	26
Predicted flows – concurrent clay carting from both pits	505	50

Table 8. Summary - Number of Vehicles per Day

3.1.1. Traffic distribution.

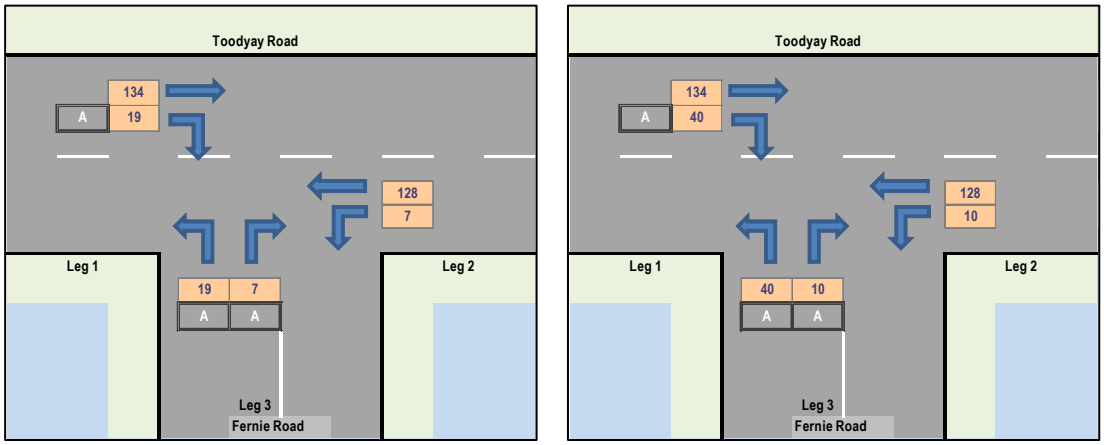
Traffic generated from the landfill site and the extraction sites is expected to move to and from the west.

Assuming 50% entering and 50% leaving, the predicted typical peak flows can be assigned to the Toodyay Road – Fernie Road intersection as shown on Figures 6 and 7.



Existing - no clay carting Existing – Concurrent clay carting

Figure 6. Existing typical peak hour movements.



Predicted – no clay carting Predicted – Concurrent clay carting

Figure 7. Predicted typical peak hour movements.

3.2. Intersection Impacts

The existing intersection configuration of the Toodyay Road – Fernie Road intersection is shown on Figure 8 below. The intersection consists of a Basic (BA) type intersection with an unsealed widened gravel shoulder adjacent to the northbound lane to provide passing opportunities for following traffic to pass traffic turning right into Salt Valley Road.

Figure 8. Existing Toodyay Road – Fernie Road intersection.

Based on daily flows, the appropriate intersection configuration can be ascertained by reference to the Institute of Highway and Transport in United Kingdom Matrix shown in Figure 9. This indicates that at predicted flows a priority controlled intersection is expected to operate at a Level of Service of A.

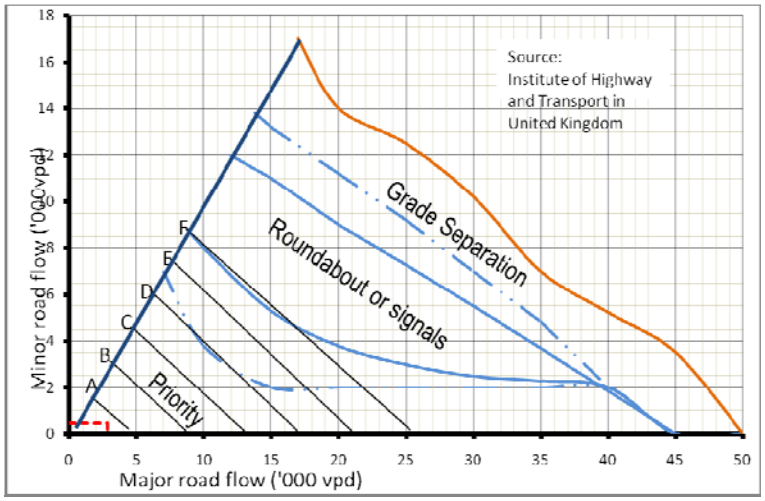
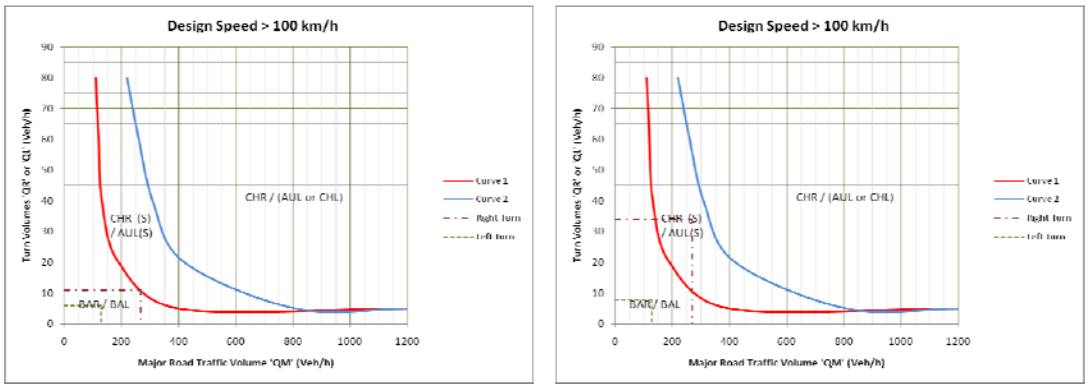


Figure 9. Intersection Type

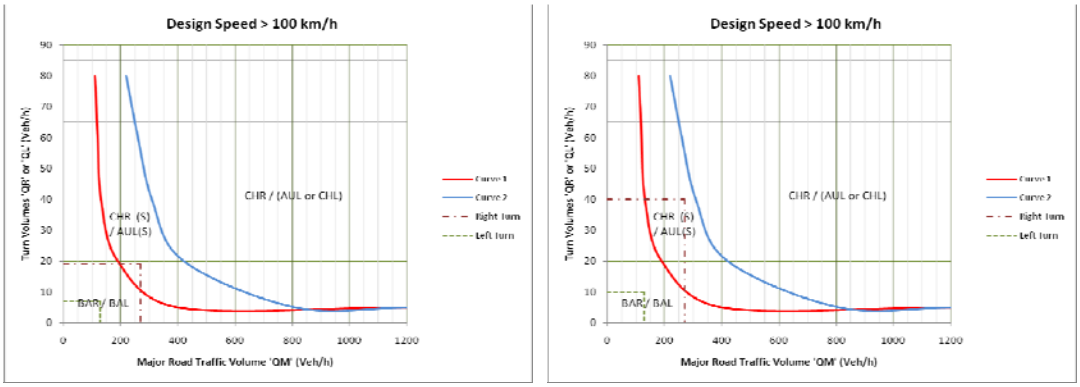
Traffic flows through the intersection have been assessed against Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections, Warrants for Rural Turn Lanes to determine the need for auxiliary lanes at the intersection, refer to Figures 10 and 11.

The assessment indicates that without the development traffic (at existing flow rates), an auxiliary lane to accommodate right turns into Fernie Road is likely to be warranted. Additional flows from the proposed development are not predicted to change the warrants for intersection treatment.



Existing – no clay carting Existing – concurrent clay carting

Figure 10. Austroads Warrants for Turn Lanes Typical Peak (Without landfill development).



Predicted – no clay carting Predicted – concurrent clay carting

Figure 11. Austroads Warrants for Turn Lanes Typical Peak (With landfill development).

4. Conclusion

This Traffic Study has been undertaken to assess the traffic impacts associated with the proposed landfill development accessing Salt Valley Road, Toodyay.

The assessment indicates that traffic generated by the landfill site is estimated at about 40 vpd initially and 160 vpd at ultimate operating levels. Depending on whether clay carting is occurring in conjunction with landfill operations, traffic flows could increase from existing flows during concurrent

clay carting of 417 vehicles per day to 505 vehicles per day with concurrent clay carting and landfill operations.

This should not result in unacceptable adverse impacts on the road environment. The expected additional trips are of a small magnitude and will not impact measurably on the existing road network or affected intersections.