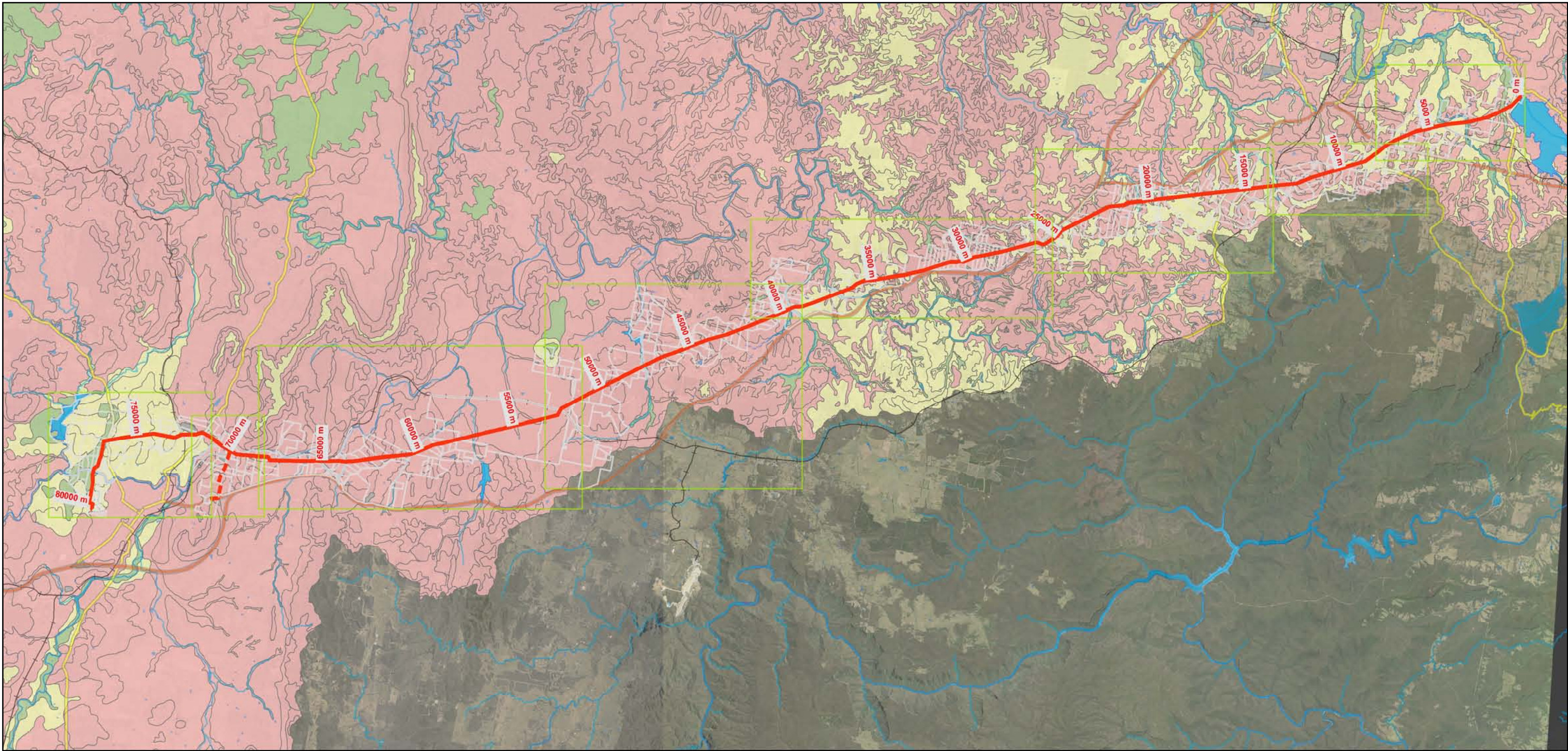




1:200,000 (at A3)

0 2 4 6 8 10

Kilometers

N

Legend

Proposed Pipeline Alignment	Primary Road	Sheet Erosion	
(Raw Water)	Arterial Road		Widespread
(Treated Water)	Railway		Localised
Sector boundary	Lakes, Dams		Not Observed
	Rivers, Creeks		Disturbed Terrain
		Waterbody	

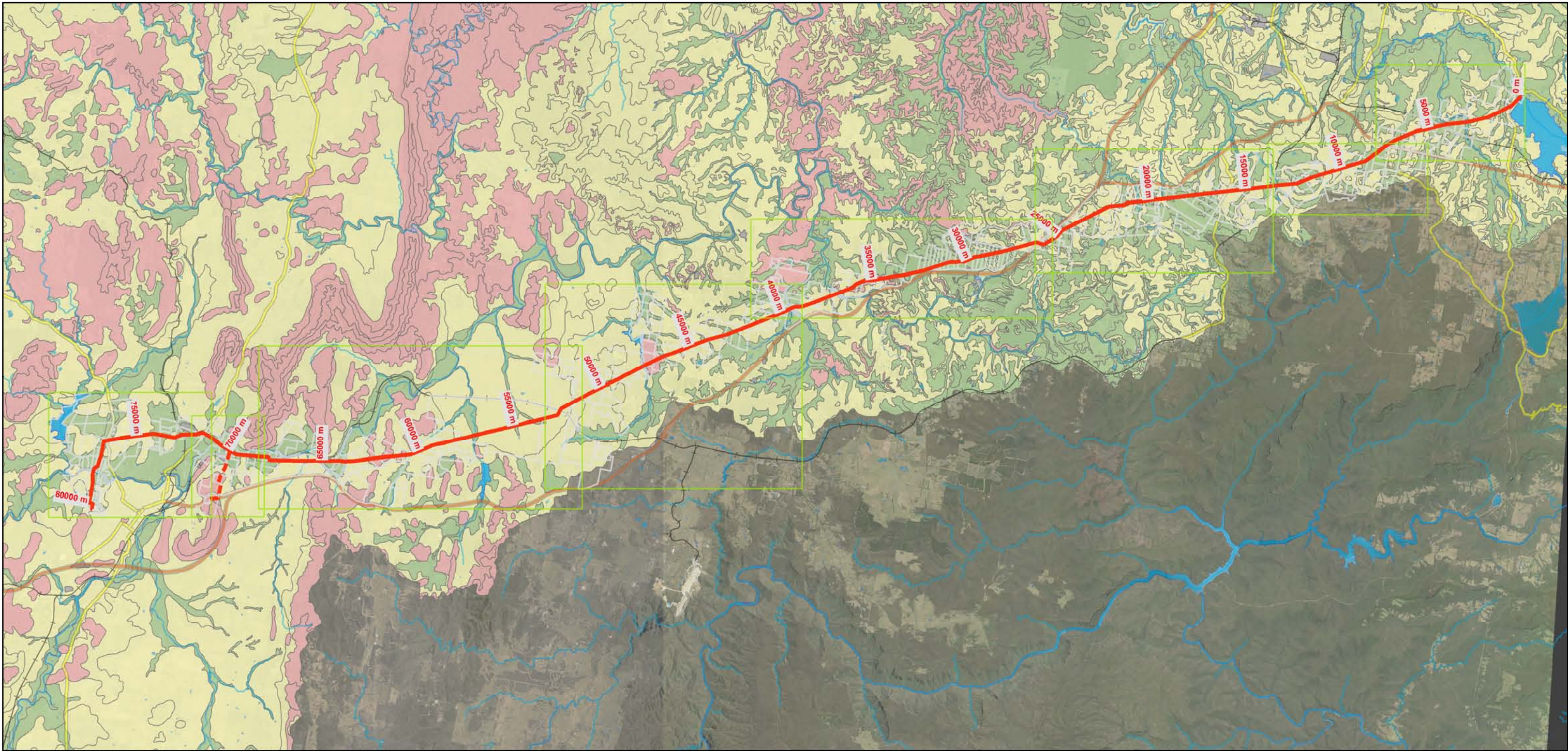
CLIENTS | PEOPLE | PERFORMANCE

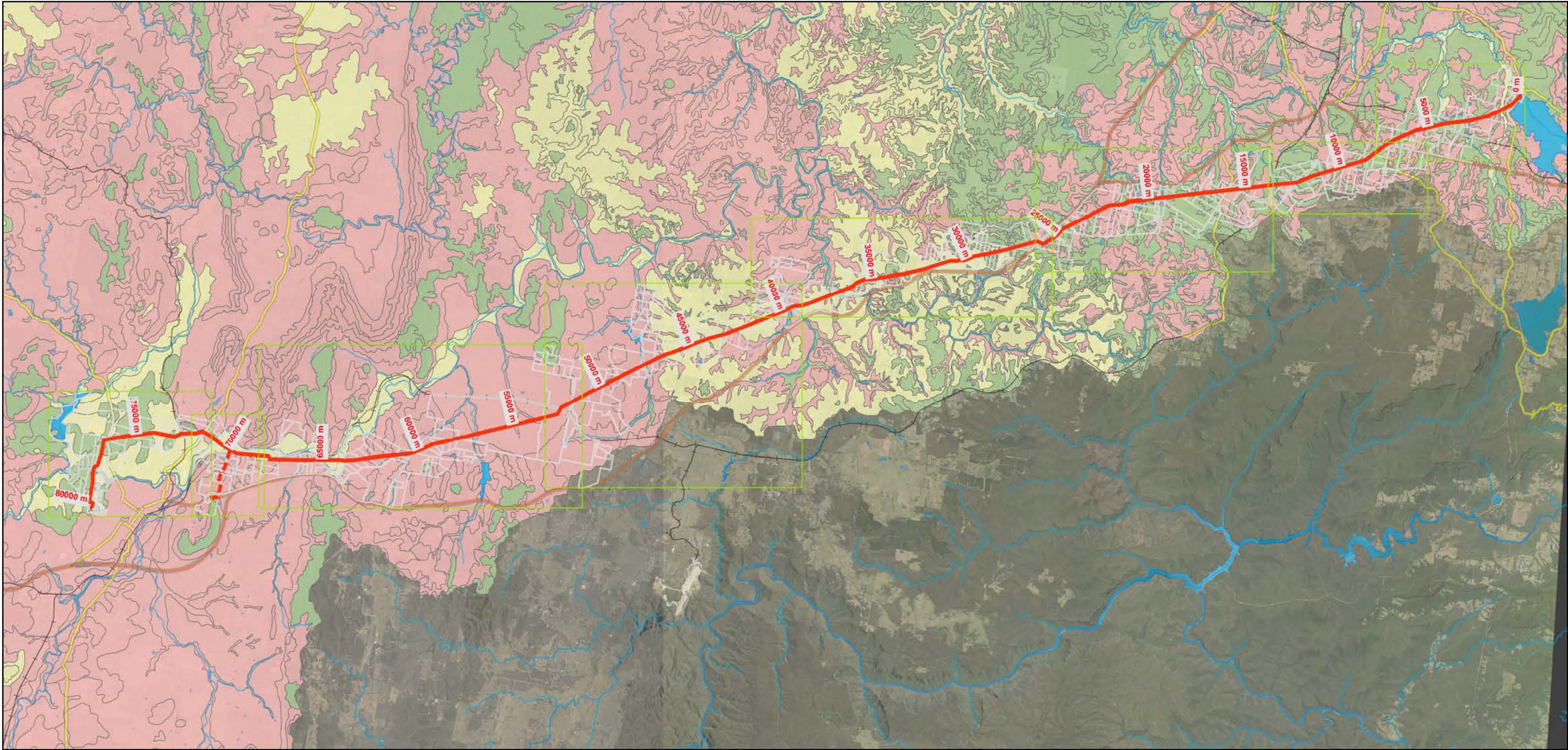
Goulburn Mulwaree Council
Highlands Source Project

Job Number 23-13312-15
Revision 0
Date 14 JAN 2010

Sheet Erosion Hazard

Figure C3





1:200,000 (at A3)

0

2

4

6

8

10

Kilometers

N

Proposed Pipeline Alignment

(Raw Water)

(Treated Water)

Sector boundary

PrimaryRoad

ArterialRoad

Railway

Lakes, Dams

Rivers, Creeks

Sodicity

Widespread

Localised

Not Observed

Disturbed Terrain

Waterbody

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Goulburn Mulwaree Council
Highlands Source Project

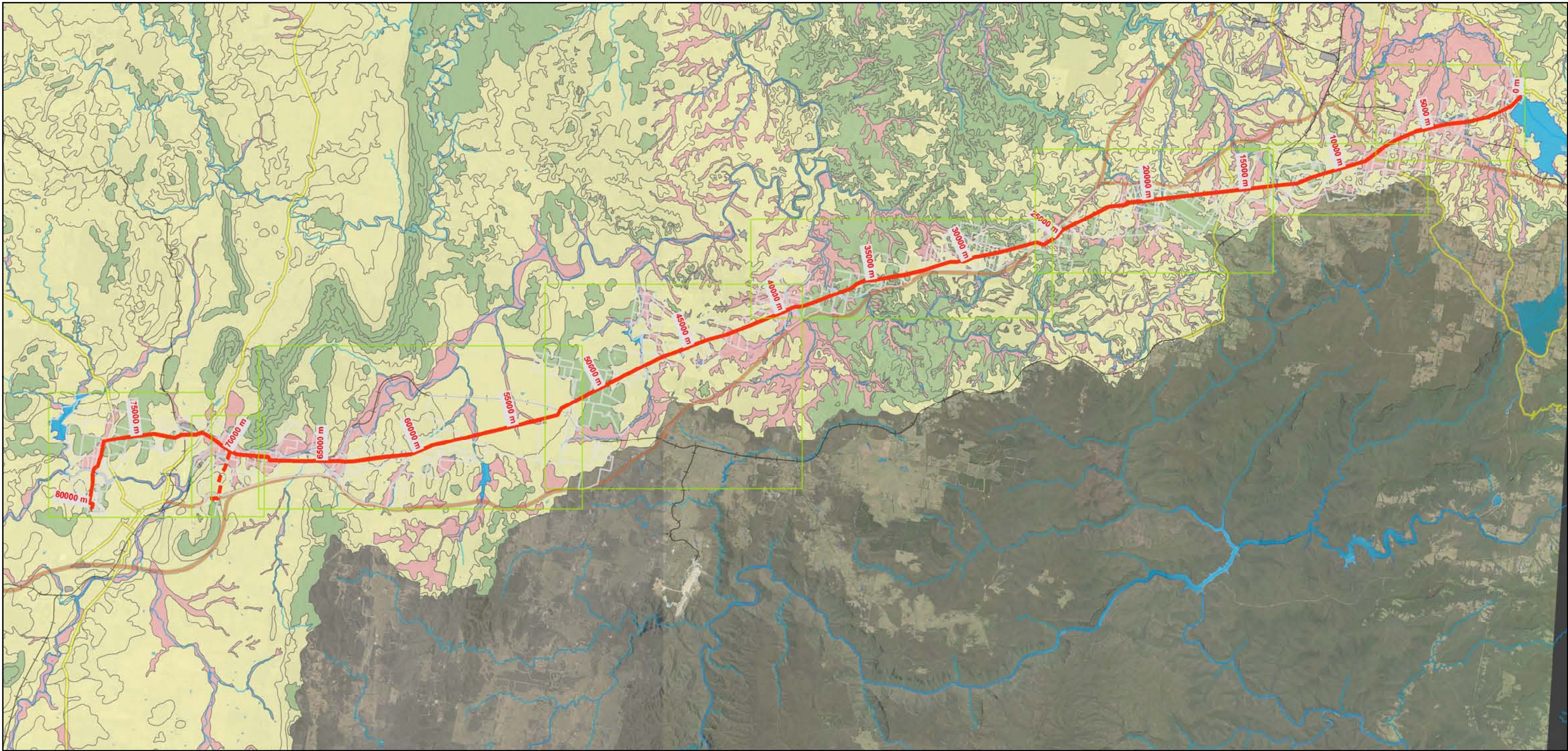
Sodicity

Job Number
Revision
Date

23-13312-15
0
14 JAN 2010

Figure C5

N:\AU\Canberra\Projects\23\13312\GIS\ArcView\Workspace\EA\Figures\Soil_Specialist\23_13312_Sodicity_RevB.mxd
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Data Source: NSW Lands Dept: crownlands,roadsegments,railways,hydroarea,hydroline,logalgovernmentarea,npwreserve,stateforest - 2007. Created by: ccharalambou, trbellwood





Appendix D

Groundwater

Data from DWE's database of groundwater bores
Plans showing borehole locations

TABLE D1: Bores within 2km of proposed pipeline easement**Highlands Source Project Environmental Assessment**

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW011931	1/10/1952	65		Hard	Casing	(Unknown)	-0.1000000000	3.5000000000
GW013306	1/01/1952	48		Poor	Casing	(Unknown)	0.0000000000	0.0000000000
GW013494	1/05/1958	95		(Unknown)	Casing	Threaded Steel	-0.4000000000	11.3000000000
GW013509	1/01/1958	33		(Unknown)	Casing	Withdrawn	0.0000000000	0.0000000000
GW014110	1/10/1958	32		Bad	Casing	Threaded Steel	-0.2000000000	13.8000000000
GW015214	1/01/1957	39		Stock	Casing	(Unknown)	-0.1000000000	6.3000000000
GW015690	1/06/1957	58		1001-3000 ppm	Casing	(Unknown)	-0.3000000000	11.2000000000
GW015941	1/07/1957	61		(Unknown)	Casing	(Unknown)	-0.4000000000	45.3000000000
GW020949	1/09/1954	13		(Unknown)	Casing	Threaded Steel	-0.5000000000	12.8000000000
GW023033	1/02/1966	129		invalid code	Casing	Steel	-0.3000000000	7.6000000000
GW023897	1/11/1965	60		invalid code	Casing	Threaded Steel	0.0000000000	6.0000000000
GW024040	1/11/1965	45		invalid code	Casing	Threaded Steel	0.0000000000	15.2000000000
GW024041	1/11/1965	45		invalid code	Casing	Threaded Steel	-0.3000000000	5.6000000000
GW024339	1/10/1965	144		invalid code	Casing	(Unknown)	0.0000000000	6.4000000000
GW024770	1/11/1973	42		Good	Casing	P.V.C.	-0.2000000000	5.3000000000
GW025808	1/09/1965	128		invalid code	Casing	Threaded Steel	-0.3000000000	17.3000000000
GW025808	1/09/1965	128		invalid code	Casing	Threaded Steel	-0.3000000000	17.3000000000
GW028879	1/10/1968	31		(Unknown)	Casing	Threaded Steel	-0.5000000000	10.4000000000
GW029284	1/02/1968	43		(Unknown)	Casing	P.V.C.	-0.1000000000	2.6000000000
GW031041	1/04/1968	76		0-500 ppm	Casing	P.V.C.	-0.4000000000	5.6000000000
GW031558	1/10/1968	96		invalid code	Casing	Threaded Steel	-0.2000000000	11.9000000000
GW031605	1/04/1969	79		(Unknown)	Casing	Threaded Steel	-0.3000000000	6.2000000000
GW034229	1/12/1971	17		Fresh	Casing	Welded Steel	0.0000000000	16.8000000000
GW034230	1/01/1967	3		(Unknown)	Casing	Concrete Cylinder	-0.7000000000	2.7000000000
GW034245		0		0-500 ppm	Casing	(Unknown)	1.5000000000	3.9000000000
GW034246		0		501-1000 ppm	Casing	Steel	-1.2000000000	-1.2000000000
GW034256	1/01/1950	0		501-1000 ppm	Casing	(Unknown)	0.0000000000	0.0000000000
GW035062	1/03/1973	67		invalid code	Casing	Threaded Steel	-0.4000000000	16.1000000000
GW035156		3		(Unknown)	Casing	Timber	0.0000000000	3.0000000000
GW035166	1/03/1973	65		(Unknown)	Casing	Threaded Steel	-0.2000000000	5.8000000000
GW035423		0		invalid code	Backfill	Backfill	0.0000000000	71.4000000000
GW035423		0		invalid code	Backfill	Backfill	0.0000000000	71.4000000000
GW035429	1/01/1940	0		(Unknown)	Casing	Nil	0.0000000000	0.0000000000
GW035601		0		invalid code	Casing	(Unknown)	-0.4000000000	-0.4000000000
GW035676	1/10/1973	26		Good	Casing	P.V.C.	-0.2000000000	3.2000000000
GW035707	1/09/1973	97		Good	Casing	Steel	-0.2000000000	6.5000000000
GW035742	1/06/1973	38		Good	Casing	P.V.C.	-0.1000000000	2.9000000000

TABLE D1: Bores within 2km of proposed pipeline easement**Highlands Source Project Environmental Assessment**

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW035831	1/07/1973	43		(Unknown)	Casing	P.V.C.	0.0000000000	1.5000000000
GW035911	1/09/1973	49		Good	Casing	P.V.C.	0.2000000000	6.2000000000
GW035919		24		Good	Casing	P.V.C.	-0.2000000000	19.9000000000
GW035924	1/06/1973	76		(Unknown)	Casing	Threaded Steel	-0.3000000000	2.4000000000
GW037960	1/12/1973	95		invalid code	Casing	Pressure Cemented Casing	0.0000000000	12.1000000000
GW037960	1/12/1973	95		invalid code	Casing	Pressure Cemented Casing	0.0000000000	12.1000000000
GW037967	1/11/1973	84		invalid code	Casing	Welded Steel	-0.3000000000	5.7000000000
GW038230	1/05/1974	21		1001-3000 ppm	Casing	P.V.C.	-0.2000000000	11.7000000000
GW038426	1/01/1973	18		Good	Casing	P.V.C.	-0.2000000000	2.9000000000
GW038812	1/12/1973	0		(Unknown)	Casing	Threaded Steel	-0.3000000000	-0.3000000000
GW042926	1/05/1977	117		(Unknown)	Casing	Threaded Steel	-0.3000000000	12.8000000000
GW042926	1/05/1977	117		(Unknown)	Casing	Threaded Steel	-0.3000000000	12.8000000000
GW043362	1/12/1974	76		(Unknown)	Casing	Threaded Steel	-0.2000000000	36.3000000000
GW043366	1/07/1974	21		Salty	Casing	Threaded Steel	-0.1000000000	10.5000000000
GW043473	1/08/1973	18		Good	Casing	P.V.C.	-0.2000000000	2.6000000000
GW043667	1/08/1972	42		501-1000 ppm	Casing	P.V.C.	-0.3000000000	0.6000000000
GW043668		66		Good	Casing	P.V.C.	-0.2000000000	5.6000000000
GW043719	1/03/1975	55		Good	Casing	Threaded Steel	-0.1000000000	6.6000000000
GW043719	1/03/1975	55		Good	Casing	Threaded Steel	-0.1000000000	6.6000000000
GW043719	1/03/1975	55		Good	Casing	Threaded Steel	-0.1000000000	6.6000000000
GW043884	1/08/1974	56		Good	Casing	P.V.C.	-0.1000000000	56.4000000000
GW044058	1/04/1974	9		(Unknown)	Annulus	(Unknown)	0.0000000000	0.0000000000
GW044710	1/01/1976	20		(Unknown)	Casing	Concrete	2.5000000000	4.0000000000
GW045708	1/01/1974	55		(Unknown)	Casing	Threaded Steel	0.0000000000	4.3000000000
GW047076	1/03/1978	90		(Unknown)	Casing	Welded Steel	0.3000000000	5.8000000000
GW047406	1/09/1979	92		Good	Casing	Pressure Cemented Casing	0.0000000000	19.0000000000
GW047443	1/11/1979	67		(Unknown)	Casing	P.V.C.	0.0000000000	24.4000000000
GW049127	1/09/1978	46		Good	Casing	Threaded Steel	-0.3000000000	4.6000000000
GW049788	1/10/1979	53		Good	Casing	Welded Steel	-0.3000000000	8.5000000000
GW049949	1/04/1979	69		Good	Casing	Welded Steel	-0.3000000000	4.3000000000
GW049977	1/06/1979	122		Good	Casing	Welded Steel	-0.3000000000	1.8000000000
GW049978		80		(Unknown)	Casing	Threaded Steel	0.0000000000	0.0000000000
GW050231	1/02/1980	38		Good	Casing	Welded Steel	-0.3000000000	5.8000000000
GW050583	1/07/1980	130		Fair	Casing	Welded Steel	0.0000000000	18.3000000000
GW051450	1/10/1980	54		Good	Casing	Threaded Steel	0.0000000000	6.4000000000
GW051537	1/10/1980	92		Fair	Casing	Welded Steel	0.0000000000	25.7000000000
GW051910	1/10/1980	31		Good	Casing	Welded Steel	0.0000000000	6.4000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW052060	1/10/1980	92		Good	Casing	Withdrawn	0.0000000000	0.0000000000
GW052609	1/03/1981	137		Fair	Casing	Welded Steel	0.0000000000	15.0000000000
GW053019	1/10/1980	76		501-1000 ppm	Casing	P.V.C.	0.0000000000	9.1000000000
GW053019	1/10/1980	76		501-1000 ppm	Casing	P.V.C.	0.0000000000	9.1000000000
GW053062	1/11/1980	107		Fair	Casing	Threaded Steel	0.0000000000	7.0000000000
GW053124	1/02/1981	107		Fair	Casing	Welded Steel	0.0000000000	9.1000000000
GW053272	1/01/1981	96		0-500 ppm	Casing	Welded Steel	-0.3000000000	39.0000000000
GW053272	1/01/1981	96		0-500 ppm	Casing	Welded Steel	-0.3000000000	39.0000000000
GW053272	1/01/1981	96		0-500 ppm	Casing	Welded Steel	-0.3000000000	39.0000000000
GW053995	1/11/1982	31		Good	Casing	Welded Steel	-0.3000000000	1.8000000000
GW053995	1/11/1982	31		Good	Casing	Welded Steel	-0.3000000000	1.8000000000
GW054025	1/11/1981	68		0-500 ppm	Casing	Welded Steel	0.0000000000	11.6000000000
GW054637	1/12/1980	37		501-1000 ppm	Casing	P.V.C.	-0.3000000000	5.4000000000
GW054877	1/10/1981	38		Fair	Casing	P.V.C.	0.0000000000	11.0000000000
GW055436	1/09/1981	76		Good	Casing	Threaded Steel	-0.3000000000	10.7000000000
GW056376	1/01/1982	51		(Unknown)	Casing	P.V.C.	0.0000000000	6.0000000000
GW056854	1/01/1983	122		Good	Casing	Welded Steel	0.0000000000	19.0000000000
GW057287	1/05/1982	68		Good	Casing	Welded Steel	0.0000000000	10.0000000000
GW057369	1/02/1983	84		Good	Casing	Threaded Steel	0.0000000000	24.0000000000
GW057405	1/03/1983	84		Good	Casing	Threaded Steel	0.0000000000	12.5000000000
GW057471	1/03/1983	24	11	Very Good	Casing	Steel	0.0000000000	6.0000000000
GW057572	1/11/1983	32		(Unknown)	Casing	P.V.C.	0.0000000000	12.0000000000
GW057687	1/03/1983	90		Good	Casing	Welded Steel	0.0000000000	23.0000000000
GW057936	1/08/1983	91		Good	Casing	Welded Steel	-0.3000000000	4.2000000000
GW057943	1/03/1983	26		1001-3000 ppm	Casing	Welded Steel	-0.3000000000	25.9000000000
GW057943	1/03/1983	26		1001-3000 ppm	Casing	Welded Steel	-0.3000000000	25.9000000000
GW058042	1/01/1983	68		Fair	Casing	Welded Steel	0.0000000000	12.2000000000
GW058042	1/01/1983	68		Fair	Casing	Welded Steel	0.0000000000	12.2000000000
GW058433	1/08/1983	49		1001-3000 ppm	Casing	P.V.C.	-0.3000000000	26.8000000000
GW059264	1/01/1984	0		1001-3000 ppm	Backfill	Backfill	0.0000000000	36.6000000000
GW059384	1/03/1983	61		Good	Casing	Welded Steel	-0.3000000000	19.5000000000
GW059587	1/05/1984	73		0-500 ppm	Annulus	(Unknown)	71.3000000000	73.2000000000
GW060067	1/02/1983	76		Good	Casing	P.V.C.	0.0000000000	6.0000000000
GW060067	1/02/1983	76		Good	Casing	P.V.C.	0.0000000000	6.0000000000
GW060859	1/02/1985	99		Good	Casing	P.V.C.	0.0000000000	4.6000000000
GW060975	1/04/1985	63		(Unknown)	Casing	Withdrawn	0.0000000000	0.0000000000
GW061161	1/06/1985	46		Good	Casing	Welded Steel	-0.3000000000	16.7000000000

TABLE D1: Bores within 2km of proposed pipeline easement**Highlands Source Project Environmental Assessment**

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW061330	1/10/1985	114		Good	Casing	P.V.C.	0.0000000000	6.0000000000
GW062006	1/05/1987	128		(Unknown)	Casing	Welded Steel	0.0000000000	7.6000000000
GW062326	1/11/1988	95		Good	Casing	Steel	-0.6000000000	15.2000000000
GW062620	1/04/1986	107		(Unknown)	Casing	Welded Steel	0.0000000000	5.0000000000
GW063634	1/09/1986	0		(Unknown)	Casing	P.V.C.	0.0000000000	7.0000000000
GW064158	1/04/1987	47		Good	Casing	Steel	-0.3000000000	19.5000000000
GW064205	1/05/1987	136		Good	Casing	Steel	0.0000000000	86.0000000000
GW064448	1/05/1987	152		Good	Casing	Steel	0.0000000000	106.0000000000
GW064675	1/02/1988	140		Good	Casing	Steel	0.0000000000	9.0000000000
GW065191	1/04/1988	0			Casing	Steel	0.0000000000	15.2000000000
GW065891	7/03/1989	0		Good	Casing	Steel	0.0000000000	6.0000000000
GW066775		0			Casing	P.V.C.	0.0000000000	6.0000000000
GW066800		0			Annulus	Waterworn/Rounded	45.5000000000	81.0000000000
GW066964		0			Casing	P.V.C.	-0.3000000000	4.0000000000
GW067008		0			Annulus	Crushed Aggregate	5.0000000000	37.5000000000
GW067521	28/01/1992	33		Good	Casing	P.V.C.	0.0000000000	33.0000000000
GW067640	14/02/1989	50			Casing	P.V.C.	-0.5000000000	36.0000000000
GW068276	31/12/1982	0			Casing	Steel	0.0000000000	0.0000000000
GW068481	16/05/1990	0			Casing	(Unknown)	0.0000000000	51.0000000000
GW068819	30/11/1990	22		Good	Casing	(Unknown)	-0.3000000000	11.7000000000
GW068897	27/08/1990	61		Good	Casing	Steel	0.0000000000	2.5000000000
GW069072	4/11/1991	120			Casing	P.V.C.	-0.3000000000	99.0000000000
GW069121	1/03/1991	44		Good	Annulus	Crushed Aggregate	15.0000000000	44.0000000000
GW072132	23/08/1994	24		Good	Casing	P.V.C.	0.0000000000	18.0000000000
GW072179	9/02/1994	111		0-500 ppm	Annulus	Waterworn/Rounded	70.0000000000	111.0000000000
GW072207	15/02/1993	21		501-1000 ppm	Annulus	Waterworn/Rounded	55.0000000000	109.0000000000
GW072320	10/02/1994	109		0-500 ppm	Annulus	Waterworn/Rounded	70.0000000000	109.0000000000
GW072321	12/02/1994	109		0-500 ppm	Annulus	Waterworn/Rounded	70.0000000000	109.0000000000
GW072341	16/05/1990	0			Casing	(Unknown)	0.0000000000	0.0000000000
GW072389	7/10/1994	60		Good	Casing	P.V.C.	0.0000000000	50.0000000000
GW020948	1/10/1954	15		(Unknown)			0.0000000000	0.0000000000
GW025569		46		Salty			0.0000000000	0.0000000000
GW025579		18		1001-3000 ppm			0.0000000000	0.0000000000
GW031606	1/01/1955	0		(Unknown)			0.0000000000	0.0000000000
GW032417	1/01/1966	58		invalid code			0.0000000000	0.0000000000
GW045709	1/01/1973	0		(Unknown)			0.0000000000	0.0000000000
GW057831		46		(Unknown)			0.0000000000	0.0000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

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Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW058792	1/10/1981	0		(Unknown)			0.0000000000	0.0000000000
GW065885	28/01/1989	0	10	Good			0.0000000000	0.0000000000
GW067463	3/11/1988	0					0.0000000000	0.0000000000
GW072439	2/10/1994	85		0-500 ppm	Annulus	(Unknown)	61.0000000000	79.0000000000
GW072579	3/03/1994	55		501-1000 ppm	Annulus	Waterworn/Rounded	27.0000000000	35.0000000000
GW072580	3/03/1994	15			Annulus	(Unknown)	3.0000000000	14.5000000000
GW072894	20/12/1994	30		Good	Casing	P.V.C.	0.0000000000	27.0000000000
GW072921	12/02/1995	27		Good	Casing	P.V.C.	-0.3000000000	27.4000000000
GW073143	29/10/1992	61	15	Good	Casing	PVC Class 9	0.0000000000	22.5000000000
GW075036	15/11/1998	100	43.56		Annulus	Waterworn/Rounded	0.0000000000	85.0000000000
GW100033	2/08/1994	156			Casing	P.V.C.	0.0000000000	126.0000000000
GW100150	5/07/1991	50		Good	Casing	P.V.C.	0.0000000000	50.0000000000
GW100812	7/12/1995	237			Casing	Steel	-0.5000000000	140.0000000000
GW101439	3/03/1997	95	54.8		Casing	(Unknown)	-0.3000000000	79.2000000000
GW101485	2/03/1998	61			Annulus	Waterworn/Rounded	40.0000000000	60.0000000000
GW101502	1/07/1980	130		Fair	Casing	Steel	0.0000000000	18.3000000000
GW101524	1/01/1944	0	4.27		Casing	Steel	0.0000000000	13.4000000000
GW101583	14/12/1994	30	7.6		Annulus	(Unknown)	0.0000000000	30.0000000000
GW101583	14/12/1994	30	7.6		Annulus	(Unknown)	0.0000000000	30.0000000000
GW101829	16/01/1996	20	9.7		Annulus	Waterworn/Rounded	6.0000000000	20.0000000000
GW101829	16/01/1996	20	9.7		Annulus	Waterworn/Rounded	6.0000000000	20.0000000000
GW102066	14/12/1994	34	7.1		Annulus	(Unknown)	0.0000000000	32.8000000000
GW102259	16/02/1999	43	24		Casing	PVC Class 9	0.0000000000	43.0000000000
GW102309	1/01/1987	0	45		Casing	P.V.C.	0.0000000000	0.0000000000
GW102447	1/01/1979	0	24.38		Casing	Steel	0.0000000000	0.0000000000
GW102448	1/01/1976	259			Casing	Steel	0.0000000000	0.0000000000
GW102448	1/01/1976	259			Casing	Steel	0.0000000000	0.0000000000
GW102516	31/07/1989	91			Casing	P.V.C.	0.0000000000	14.0000000000
GW102573	5/10/1999	52		Good	Annulus	Waterworn/Rounded	40.0000000000	50.0000000000
GW102694	1/09/1999	169			Casing	Steel	-0.5000000000	96.0000000000
GW102716	11/10/1999	103			Casing	Steel	0.0000000000	81.0000000000
GW102718	5/01/2000	133			Casing	PVC Class 9	-0.5000000000	90.0000000000
GW102736	16/04/1998	40			Annulus	(Unknown)	23.0000000000	40.0000000000
GW102757	5/05/1999	210			Annulus	Waterworn/Rounded	2.0000000000	210.0000000000
GW102777	16/12/1999	103			Casing	Steel	-0.5000000000	59.0000000000
GW103106	13/08/2000	37			Annulus	Waterworn/Rounded	0.0000000000	37.0000000000
GW104065	1/01/1996	0			Casing	Steel	0.0000000000	0.0000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW104065	1/01/1996	0			Casing	Steel	0.0000000000	0.0000000000
GW104119	1/10/2001	26		Good	Annulus	Waterworn/Rounded	2.0000000000	26.0000000000
GW104193	13/02/2002	30			Annulus	Waterworn/Rounded	2.0000000000	30.0000000000
GW104213	8/03/2002	144	34	Salty	Casing	Steel	-0.5000000000	84.0000000000
GW104228	2/04/2002	123			Casing	PVC Class 9	-0.5000000000	111.0000000000
GW104295	14/05/2002	50	23.8		Annulus	Waterworn/Rounded	2.0000000000	50.0000000000
GW104317	24/02/2001	182	52.1	Fresh	Casing	Steel	-0.5000000000	80.0000000000
GW104317	24/02/2001	182	52.1	Fresh	Casing	Steel	-0.5000000000	80.0000000000
GW104413	1/07/2002	62	19.6		Annulus	Waterworn/Rounded	0.0000000000	62.0000000000
GW104416	1/08/2002	44			Casing	PVC Class 9	0.0000000000	43.0000000000
GW104472	4/11/2002	72	8		Casing	PVC Class 9	0.0000000000	72.0000000000
GW104476	6/11/2002	96	13		Annulus	Waterworn/Rounded	2.0000000000	96.0000000000
GW104489	24/10/2002	97	23		Casing	PVC Class 9	0.0000000000	25.0000000000
GW104492	28/10/2002	97	11		Annulus	Waterworn/Rounded	2.0000000000	68.0000000000
GW104493	20/03/2002	26	14		Casing	PVC Class 9	0.0000000000	26.0000000000
GW104500	22/11/2000	30	9.5		Hole	Hole	0.0000000000	30.0000000000
GW104506	19/03/2002	104	24		Casing	PVC Class 9	0.0000000000	50.0000000000
GW104521	5/11/2002	96	23		Casing	PVC Class 9	0.0000000000	96.0000000000
GW104523	21/11/2002	91	42		Annulus	Waterworn/Rounded	5.0000000000	7.0000000000
GW104526	14/11/2002	61	33		Casing	PVC Class 9	0.0000000000	61.0000000000
GW104534	13/04/2002	66	22		Annulus	Waterworn/Rounded	0.0000000000	66.0000000000
GW104582	25/06/2001	3			Hole	Hole	0.0000000000	2.5000000000
GW104583	25/06/2001	11			Hole	Hole	0.0000000000	10.8000000000
GW104584	26/06/2001	19			Hole	Hole	0.0000000000	19.0000000000
GW104585	26/06/2001	7			Hole	Hole	0.0000000000	6.6000000000
GW104617	18/02/2003	90	33		Annulus	Waterworn/Rounded	0.0000000000	90.0000000000
GW104650	3/02/2003	145	74		Casing	Steel	0.0000000000	1.5000000000
GW104651	4/02/2003	43	8		Annulus	Waterworn/Rounded	2.0000000000	43.0000000000
GW104674	3/01/2003	48	5		Casing	PVC Class 9	0.0000000000	9.0000000000
GW104684	27/01/2003	156	57	Good	Casing	PVC Class 9	0.3000000000	66.0000000000
GW104727	25/03/2003	175	101		Annulus	Waterworn/Rounded	3.0000000000	5.0000000000
GW104736	1/07/2003	49	4.6		Annulus	Waterworn/Rounded	2.0000000000	49.0000000000
GW104736	1/07/2003	49	4.6		Annulus	Waterworn/Rounded	2.0000000000	49.0000000000
GW104765	8/05/2003	108	41.6		Annulus	Waterworn/Rounded	0.0000000000	72.0000000000
GW104765	8/05/2003	108	41.6		Annulus	Waterworn/Rounded	0.0000000000	72.0000000000
GW104824	17/02/2002	36	15		Annulus	Waterworn/Rounded	2.5000000000	3.5000000000
GW104855	16/02/2003	48	31		Hole	Hole	0.0000000000	48.0000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW104917	28/11/2002	156	65		Casing	Steel	0.0000000000	101.0000000000
GW104987	13/01/2002	70			Casing	PVC Class 9	0.5000000000	26.5000000000
GW105009	4/03/2003	84	7		Hole	Hole	0.0000000000	84.0000000000
GW105017	26/03/2003	61			Annulus	Waterworn/Rounded	16.0000000000	18.0000000000
GW105017	26/03/2003	61			Annulus	Waterworn/Rounded	16.0000000000	18.0000000000
GW105020	4/12/2001	9	3.5		Annulus	(Unknown)	0.0000000000	0.0000000000
GW105024	16/04/2003	84	26		Casing	PVC Class 9	-0.5000000000	54.0000000000
GW105041	3/03/2003	42	3.2		Annulus	Waterworn/Rounded	2.0000000000	3.0000000000
GW105059	6/01/2003	73	16		Casing	PVC Class 9	0.0000000000	73.0000000000
GW105061	7/01/2003	55	14		Casing	PVC Class 9	0.0000000000	55.0000000000
GW105068	4/05/1995	91	40		Casing	PVC Class 9	0.0000000000	91.0000000000
GW105069	23/05/2003	150	94	Good	Annulus	Waterworn/Rounded	2.5000000000	3.5000000000
GW105070	1/01/1980	0			Casing	Steel	0.0000000000	0.0000000000
GW105082	22/09/2003	102	38		Casing	Steel	-0.5000000000	30.0000000000
GW105092	11/11/2003	108	54		Casing	PVC Class 9	-0.5000000000	60.0000000000
GW105102	1/03/2003	120	52.1		Casing	Steel	0.0000000000	97.0000000000
GW105102	1/03/2003	120	52.1		Casing	Steel	0.0000000000	97.0000000000
GW105105	14/02/1996	28	13		Casing	PVC Class 9	0.0000000000	12.0000000000
GW105229	6/03/2003	61	15		Casing	PVC Class 9	-0.3000000000	12.0000000000
GW105240	9/05/2003	42	13.7		Casing	PVC Class 9	0.0000000000	14.0000000000
GW105264	30/03/2003	37	13		Annulus	Waterworn/Rounded	5.0000000000	7.0000000000
GW105308	1/03/2002	170	83		Casing	Steel	0.0000000000	90.0000000000
GW105308	1/03/2002	170	83		Casing	Steel	0.0000000000	90.0000000000
GW105318	25/03/2003	0	15		Casing	PVC Class 9	-0.5000000000	6.0000000000
GW105323	14/04/2003	30			Casing	P.V.C.	-0.2000000000	30.0000000000
GW105327	15/04/2003	42			Casing	P.V.C.	-0.3000000000	27.0000000000
GW105333	28/05/2003	24			Casing	P.V.C.	-0.4000000000	24.0000000000
GW105338	19/05/2003	30		Good	Casing	P.V.C.	0.0000000000	30.0000000000
GW105340	1/05/2003	204		Good	Casing	P.V.C.	-0.4000000000	18.0000000000
GW105348	30/01/2003	54		Good	Casing	P.V.C.	-0.3000000000	30.0000000000
GW105369	18/03/2003	60	30		Annulus	Waterworn/Rounded	0.0000000000	60.0000000000
GW105372	20/02/2003	54	18	Fair	Annulus	Waterworn/Rounded	0.0000000000	54.0000000000
GW105392	7/05/2003	32			Annulus	Waterworn/Rounded	5.0000000000	7.0000000000
GW105396	12/09/2003	96	60		Casing	Steel	0.0000000000	79.0000000000
GW105518	7/11/2003	38			Casing	PVC Class 9	-0.3000000000	17.0000000000
GW105564	7/11/2003	108	16		Annulus	Waterworn/Rounded	8.0000000000	108.0000000000
GW105950	1/01/2004	168	72		Casing	Steel	0.0000000000	79.5000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW106202	1/01/2002	0			Hole	Hole	0.0000000000	75.0000000000
GW106235	4/03/2003	209	95		Casing	Steel	-0.5000000000	150.0000000000
GW106235	4/03/2003	209	95		Casing	Steel	-0.5000000000	150.0000000000
GW106311	1/09/2004	91	34		Annulus	Waterworn/Rounded	5.0000000000	7.0000000000
GW106311	1/09/2004	91	34		Annulus	Waterworn/Rounded	5.0000000000	7.0000000000
GW106342	19/03/2004	151	67		Annulus	Waterworn/Rounded	5.0000000000	8.0000000000
GW106342	19/03/2004	151	67		Annulus	Waterworn/Rounded	5.0000000000	8.0000000000
GW106517	1/06/2004	144	56		Casing	Steel	-0.4000000000	88.0000000000
GW106517	1/06/2004	144	56		Casing	Steel	-0.4000000000	88.0000000000
GW106784	14/07/2004	240	91.7		Casing	Steel	-0.5000000000	12.0000000000
GW106784	14/07/2004	240	91.7		Casing	Steel	-0.5000000000	12.0000000000
GW107006	29/10/2004	175	64		Casing	Steel	-0.3000000000	90.0000000000
GW107006	29/10/2004	175	64		Casing	Steel	-0.3000000000	90.0000000000
GW107082	24/12/2004	170	101	Fresh	Casing	PVC Class 9	-0.5000000000	170.0000000000
GW107082	24/12/2004	170	101	Fresh	Casing	PVC Class 9	-0.5000000000	170.0000000000
GW072790	24/02/1995	36					0.0000000000	0.0000000000
GW105614	11/03/2005	0					0.0000000000	0.0000000000
GW105720	13/04/2005	0					0.0000000000	0.0000000000
GW105738	19/04/2005	0					0.0000000000	0.0000000000
GW105744	19/04/2005	0					0.0000000000	0.0000000000
GW105764	20/04/2005	0					0.0000000000	0.0000000000
GW105781	21/04/2005	0					0.0000000000	0.0000000000
GW105815	26/04/2005	0					0.0000000000	0.0000000000
GW105816	26/04/2005	0					0.0000000000	0.0000000000
GW105842	29/04/2005	0					0.0000000000	0.0000000000
GW105843	29/04/2005	0					0.0000000000	0.0000000000
GW105968	24/05/2005	0					0.0000000000	0.0000000000
GW105981	25/05/2005	0					0.0000000000	0.0000000000
GW106002	27/05/2005	0					0.0000000000	0.0000000000
GW106033	2/06/2005	0					0.0000000000	0.0000000000
GW106103	15/06/2005	0					0.0000000000	0.0000000000
GW106114	17/06/2005	0					0.0000000000	0.0000000000
GW106139	23/06/2005	0					0.0000000000	0.0000000000
GW106245	18/07/2005	0					0.0000000000	0.0000000000
GW106246	18/07/2005	0					0.0000000000	0.0000000000
GW106417	1/09/2005	0					0.0000000000	0.0000000000
GW106577	24/10/2005	0					0.0000000000	0.0000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW106580	24/10/2005	0					0.0000000000	0.0000000000
GW106741	1/02/2006	0					0.0000000000	0.0000000000
GW106788	13/02/2006	0					0.0000000000	0.0000000000
GW106855	7/03/2006	0					0.0000000000	0.0000000000
GW106914	21/03/2006	0					0.0000000000	0.0000000000
GW107012	28/04/2006	0					0.0000000000	0.0000000000
GW107520	7/08/2006	15	12.5		Annulus	Waterworn/Rounded	10.5000000000	15.0000000000
GW107521	8/08/2006	35	16.5		Annulus	Waterworn/Rounded	26.5000000000	35.0000000000
GW107522	9/08/2006	42	30.4		Annulus	Waterworn/Rounded	25.0000000000	42.0000000000
GW108146	17/05/2007	0			Casing	Steel	0.0000000000	0.0000000000
GW108160	1/07/2001	0	6		Casing	ABS	-0.4000000000	57.2500000000
GW108161	1/05/2007	102	22		Hole	Hole	0.0000000000	102.0000000000
GW108196	1/03/2005	66	6		Casing	PVC Class 9	0.0000000000	66.0000000000
GW108196	1/03/2005	66	6		Casing	PVC Class 9	0.0000000000	66.0000000000
GW108198	1/05/2006	78	11		Annulus	Waterworn/Rounded	0.0000000000	0.0000000000
GW108198	1/05/2006	78	11		Annulus	Waterworn/Rounded	0.0000000000	0.0000000000
GW108199	1/02/2006	102	17		Annulus	Waterworn/Rounded	0.0000000000	0.0000000000
GW108199	1/02/2006	102	17		Annulus	Waterworn/Rounded	0.0000000000	0.0000000000
GW108200	1/02/2006	102	11		Annulus	Waterworn/Rounded	0.0000000000	0.0000000000
GW108200	1/02/2006	102	11		Annulus	Waterworn/Rounded	0.0000000000	0.0000000000
GW108240	29/06/2007	90	42		Casing	PVC Class 9	0.0000000000	90.0000000000
GW108243	2/07/2007	31	5		Casing	PVC Class 9	0.0000000000	31.0000000000
GW107084	12/05/2006	0					0.0000000000	0.0000000000
GW107120	25/05/2006	0					0.0000000000	0.0000000000
GW107152	30/05/2006	0					0.0000000000	0.0000000000
GW107165	31/05/2006	0					0.0000000000	0.0000000000
GW107167	31/05/2006	0					0.0000000000	0.0000000000
GW107189	9/06/2006	0					0.0000000000	0.0000000000
GW107193	9/06/2006	0					0.0000000000	0.0000000000
GW107202	14/06/2006	0					0.0000000000	0.0000000000
GW107224	20/06/2006	0					0.0000000000	0.0000000000
GW107225	20/06/2006	0					0.0000000000	0.0000000000
GW107419	11/08/2006	0					0.0000000000	0.0000000000
GW107427	11/08/2006	0					0.0000000000	0.0000000000
GW107435	14/08/2006	0					0.0000000000	0.0000000000
GW107556	24/10/2006	0					0.0000000000	0.0000000000
GW107588	30/10/2006	0					0.0000000000	0.0000000000

TABLE D1: Bores within 2km of proposed pipeline easement

Highlands Source Project Environmental Assessment

Database of Groundwater bores in NSW (DWE, 2004)

Bore ID	COMPLETED	DEEP	STANDING_W	SALINITY_D	COMPONENT	TYPE	FROM_DEPTH	TO_DEPTH
GW107592	30/10/2006	0					0.00000000000	0.00000000000
GW107677	12/12/2006	0					0.00000000000	0.00000000000
GW107705	29/12/2006	0					0.00000000000	0.00000000000
GW107707	2/01/2007	0					0.00000000000	0.00000000000
GW107794	31/01/2007	0					0.00000000000	0.00000000000
GW107893	27/02/2007	0					0.00000000000	0.00000000000
GW108021	20/04/2007	0					0.00000000000	0.00000000000
GW108053	27/04/2007	0					0.00000000000	0.00000000000
GW108058	2/05/2007	0					0.00000000000	0.00000000000
GW108064	3/05/2007	0					0.00000000000	0.00000000000
GW108080	7/05/2007	0					0.00000000000	0.00000000000
GW108108	10/05/2007	0					0.00000000000	0.00000000000
GW108138	17/05/2007	0					0.00000000000	0.00000000000
GW108305	30/07/2007	0					0.00000000000	0.00000000000
GW108348	30/08/2007	0					0.00000000000	0.00000000000

TABLE D2: Groundwater bores within 1 km of road and railway line crossings**Highlands Source Project Environmental Assessment**

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
Highways				
Road 6 – Robertson Road/Illawarra Highway	GW015941	300	61	No data
	GW100033	650	156	No data
	GW032417	800	58	No data
	GW059264	700	0	No data
	GW025579	900	18	No data
	GW104476	600	96	13
Road 22 and 23 – Hume Highway	GW051537	500	92	No data
	GW035924	400	76	No data
	GW108058	350	0	No data
	GW057687	500	90	No data
	GW104765	850	108	41.6
Named roads				
Road 3 – Sheepwash Road	GW108160	800	0	6
	GW057831	500	46	No data
	GW069121	350	44	No data
	GW057405	1000	84	No data
	GW029284	1000	43	No data
Road 5 – Iona Park Road	GW028879	1000	31	No data
	GW034256	1000	0	No data
	GW053062	1000	107	No data
	GW102716	1000	103	No data
	GW104472	900	72	8
	GW060859	900	99	No data
	GW053124	800	107	No data
	GW104521	450	96	23
	GW073143	200	61	15
	GW072439	550	85	No data
	GW066964	900	0	No data
Road 8 – Yarrawa Road	GW024040	1000	45	No data
	GW023897	1000	60	No data
	GW106784	300	240	91.7

TABLE D2: Groundwater bores within 1 km of road and railway line crossings**Highlands Source Project Environmental Assessment**

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
Road 11 Bibbys Lane	GW104650	700	145	74
	GW104651	900	43	8
	GW107084	800	0	No data
	GW059587	900	73	No data
	GW105041	600	42	3.2
	GW035156	400	3	No data
Road 12 – Mount Broughton Road	GW105041	200	42	3.2
	GW035156	400	3	No data
	GW107084	900	0	No data
	GW059587	200	73	No data
	GW072389	400	60	No data
	GW105069	900	150	94
Road 15 – Exeter Road	GW069072	200	120	No data
	GW075036	950	100	43.56
	GW105744	800	0	No data
	GW102777	750	103	No data
	GW067521	900	33	No data
	GW060067	400	76	No data
	GW107006	200	175	64
Road 18 - Old Argyle Road	GW105396	900	96	60
	GW062326	600	95	No data
	GW025808	600	128	No data
	GW104684	900	156	57
	GW105082	1000	102	38
	GW108108	1000	No data	No data
Road 19 – Sallys Corner Road	GW045708	1000	55	No data
	GW045709	1000	0	No data
	GW106311	500	91	34
	GW051537	1000	92	No data
	GW035062	700	67	No data
	GW105092	850	108	54
Road 20 – Middle Road	GW106311	400	91	34

TABLE D2: Groundwater bores within 1 km of road and railway line crossings**Highlands Source Project Environmental Assessment**

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
	GW035062	800	67	No data
	GW105092	900	108	54
Road 40 – Inverary Road	No groundwater bores	No groundwater bores	No data	No data
Road 45 – Wollumbi Road	No groundwater bores	No groundwater bores	No data	No data
Road 47 – Red Hills Road	GW106033	850	0	No data
Road 51 – Red Hills Road	GW108348	800	0	No data
Road 54 – Brayton Road	GW056376	400	51	No data
Road 59 – Carrick Road	GW104413	1000	62	19.6
	GW072921	1000	27	No data
Road 62 – Towrang Road	GW061161	1000	46	No data
Road 64 – Murrays Flat Road	GW049978	200	80	No data
	GW100150	800	50	No data
Road 68 – Taralga Road	GW104583	450	11	No data
	GW104582	450	3	No data
	GW104585	600	7	No data
	GW104584	450	19	No data
	GW106788	400	0	No data
	GW107193	800	0	No data
	GW107893	800	0	No data
Road 70 – Middle Arm Road	GW049949	600	69	No data
	GW101524	150	0	4.27
	GW020948	900	15	No data
	GW105264	700	37	13
	GW107152	500	0	No data
	GW107224	750	0	No data
Road 71 – Crookwell Road	GW049127	1000	46	No data
	GW043667	800	42	No data
	GW050231	700	38	No data
	GW049788	450	53	No data
Road 72 – Chinamans Lane	GW049788	600	53	No data

TABLE D2: Groundwater bores within 1 km of road and railway line crossings

Highlands Source Project Environmental Assessment

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
	GW063634	300	0	No data
	GW107167	400	0	No data
	GW043473	1000	18	No data
	GW106139	400	0	No data
	GW105981	350	0	No data
	GW065885	400	0	10
	GW105738	800	0	No data
	GW105323	800	30	No data
	GW105518	900	38	No data
	GW104500	900	30	9.5
	GW105764	1000	0	No data
Road 73 – Clinton Street	GW104617	600	90	33
	GW104492	400	97	11
	GW059384	700	61	No data
	GW106114	600	0	No data
	GW105369	700	60	30
	GW108064	200	0	No data
	GW104855	400	48	31
	GW105372	400	54	18
	GW106002	500	0	No data
	GW105229	600	61	15
	GW035831	800	43	No data
	GW105338	300	30	No data
	GW064158	400	47	No data
	GW104534	500	66	22
	GW105816	600	0	No data
	GW105327	700	42	No data
	GW104493	700	26	14
	GW104506	800	104	24
	GW104489	850	97	23
Water 1 – Kellys Creek	GW031558	700	96	No data
	GW015690	800	58	No data

TABLE D2: Groundwater bores within 1 km of road and railway line crossings**Highlands Source Project Environmental Assessment**

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
Water 2 – Medway Rivulet	GW062620	900	107	No data
	GW023033	750	129	No data
	GW105069	850	150	94
	GW072389	650	60	No data
	GW059587	750	73	No data
	GW105041	900	42	3.2
Water 3 – Wells Creek	GW108108	900	No data	No data
	GW104727	1000	101	No data
	GW105396	900	96	60
	GW062326	600	95	No data
	GW025808	600	128	No data
	GW104684	900	156	57
	GW105082	1000	102	38
Water 4 – Black Bobs Creek	GW105082	400	102	38
	GW025808	1000	128	No data
	GW104684	650	156	57
	GW104526	800	61	33
	GW047443	900	67	No data
	GW107677	700	0	No data
Water 5 – Long Swamp Creek	GW035062	200	67	No data
	GW105092	400	108	54
	GW045708	750	55	No data
	GW045709	800	0	No data
	GW106311	800	91	34
Water 6 – Paddys River	No groundwater bores	No groundwater bores	No data	No data
Water 7 – Uringalla Creek	GW104824	900	36	15
Water 8 – Jaorimin Creek	No groundwater bores	No groundwater bores	No data	No data
Water 9 – Lockyersleigh Creek	No groundwater bores	No groundwater bores	No data	No data

TABLE D2: Groundwater bores within 1 km of road and railway line crossings**Highlands Source Project Environmental Assessment**

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
Water 10 – Narambulla Creek	No groundwater bores	No groundwater bores	No data	No data
Water 11 – Osborns Creek	No groundwater bores	No groundwater bores	No data	No data
Water 12 – Wollondilly River	GW105061	500	55	14
	GW061161	1000	46	No data
	GW105059	1000	73	16
Water 13 – Wollondilly River	GW108243	700	31	5
Water 14 – Boxers Creek	GW108243	350	31	5
Water 15 – Wollondilly River	GW104584	750	19	No data
	GW104585	800	7	No data
	GW104582	850	3	No data
	GW104583	850	11	No data
Water 16 – Kenmore Creek	GW104584	800	19	No data
	GW104585	850	7	No data
	GW104582	900	3	No data
	GW104583	900	11	No data
	GW106788	950	0	No data
Water 17 – Kenmore Creek	GW104584	500	19	No data
	GW104585	600	7	No data
	GW104582	500	3	No data
	GW104583	500	11	No data
	GW106788	400	0	No data
	GW107193	800	0	No data
	GW107893	800	0	No data
Water 18 – Kenmore Creek	GW104584	600	19	No data
	GW104585	700	7	No data
	GW104582	600	3	No data
	GW104583	600	11	No data
	GW106788	300	0	No data
	GW107193	700	0	No data
	GW107893	700	0	No data

TABLE D2: Groundwater bores within 1 km of road and railway line crossings

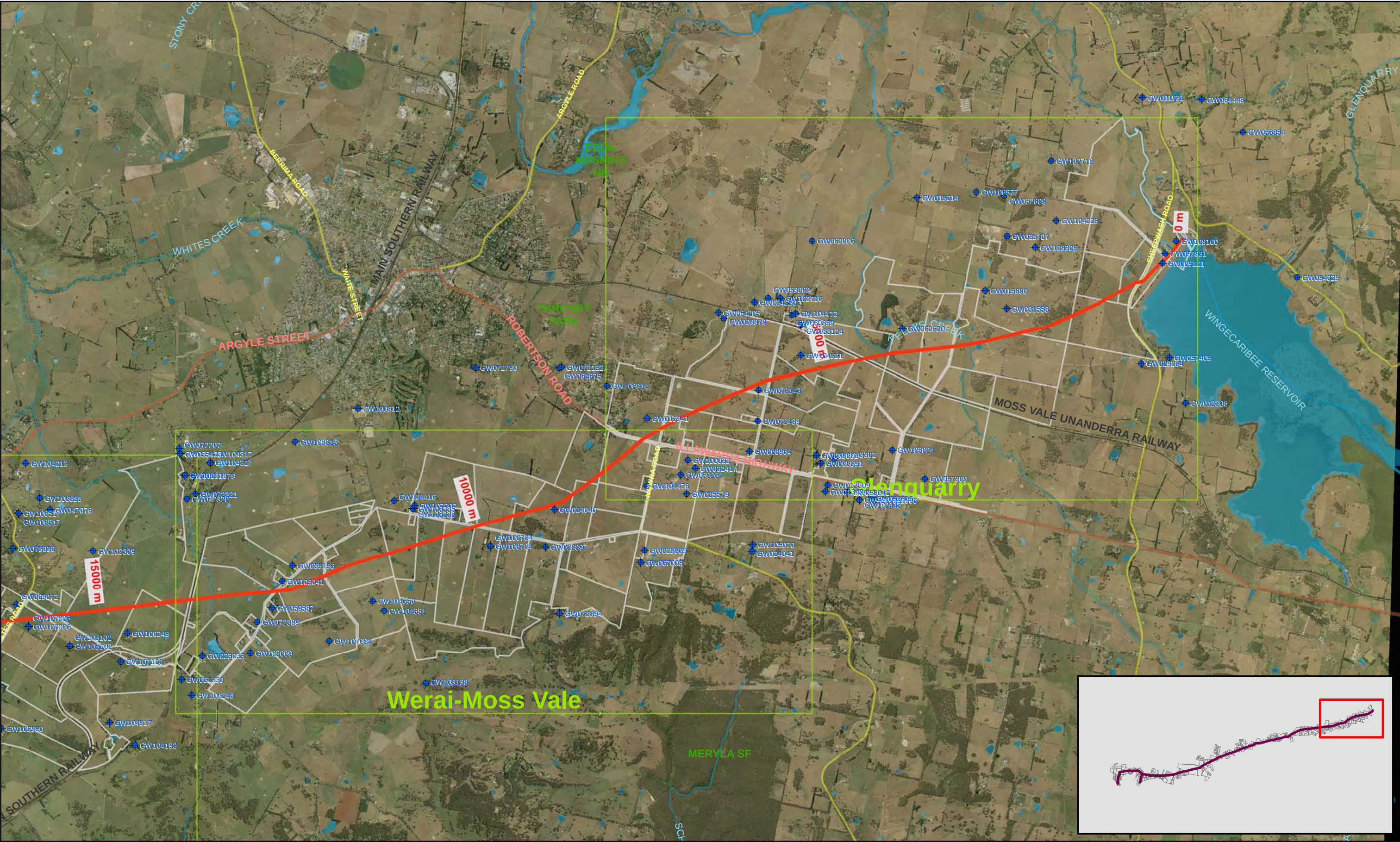
Highlands Source Project Environmental Assessment

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
Water 19 – Kenmore Creek	GW104584	700	19	No data
	GW104585	800	7	No data
	GW104582	700	3	No data
	GW104583	700	11	No data
	GW106788	200	0	No data
	GW107193	600	0	No data
	GW107893	600	0	No data
Water 20 – Wollondilly River	GW063634	1000	0	No data
	GW107167	900	0	No data
	GW106139	800	0	No data
	GW105981	400	0	No data
	GW065885	400	0	10
	GW105738	800	0	No data
	GW105323	750	30	No data
	GW105518	800	38	No data
	GW104500	900	30	9.5
	GW105764	800	0	No data
	GW105843	800	0	No data
	GW105842	800	0	No data
	GW105333	800	24	No data
	GW105020	900	9	3.5
	GW054637	500	37	No data
	GW057936	600	91	No data
	GW104489	800	91	23
	GW104506	850	104	24

	Bore ID	Distance from crossing (approximate, metres)	Depth of Bore (metres from the surface)	Standing Water Level (metres from the surface)
Rail 1 – Moss Vale Unanderra Railway	GW062620	650	107	No data
	GW104521	800	96	23

TABLE D2: Groundwater bores within 1 km of road and railway line crossings**Highlands Source Project Environmental Assessment**

Crossing	Bore ID	Approximate distance from crossing (metres)	Depth of Bore (metres below ground level)	Standing Water Level (metres below ground level)
	GW053124	900	107	No data
Rail 2 – Main Southern Railway	GW106245	900	0	No data
	GW023033	700	129	No data
	GW105069	1000	150	94
	GW072389	900	60	No data
	GW059587	1000	73	No data
Rail 3 – Main Southern Railway	No groundwater bores	No groundwater bores	No data	No data
Rail 4 – Main Southern Railway	GW049978	200	80	No data
	GW100150	700	50	No data
Rail 5 – Golburn Crookwell Railway	GW049949	700	69	No data
	GW107193	400	0	No data
	GW107893	450	0	No data
	GW106788	800	0	No data



1:45,000 (at A3)

0 500 1,000 1,500 2,000

Metres

N

Legend

- Borehole
- Proposed Pipeline Alignment
 - (Raw Water)
 - (Treated Water)
- Sector boundary
- Primary Road
- Arterial Road
- Railway
- Lakes, Dams
- Rivers, Creeks

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council

Goulburn Mulwaree Council
Highlands Source Project

Job Number 23-13312-15
Revision 0
Date 14 JAN 2010

Groundwater Bores
Sector: Werai - Glenquarry

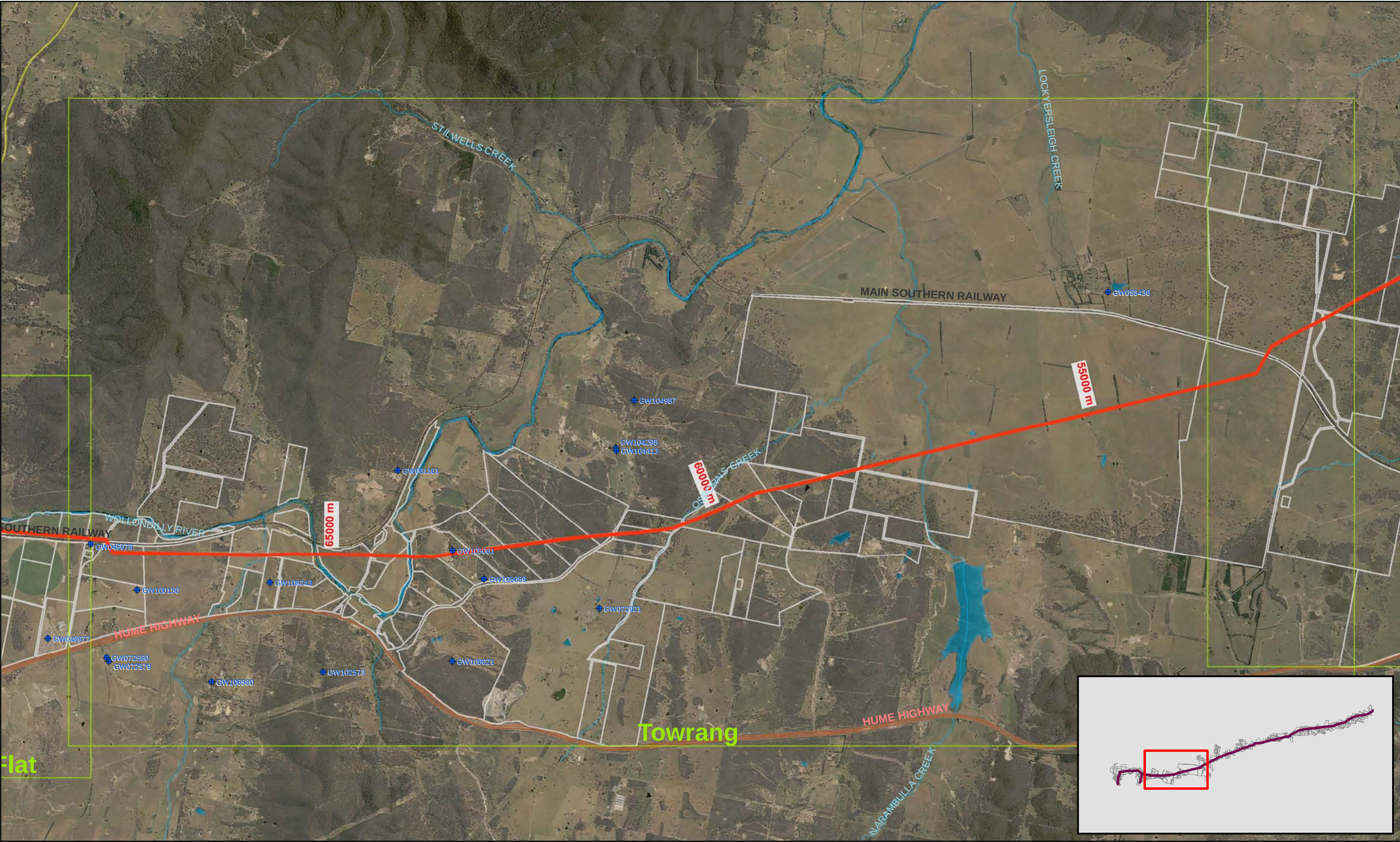
Figure D1(a)

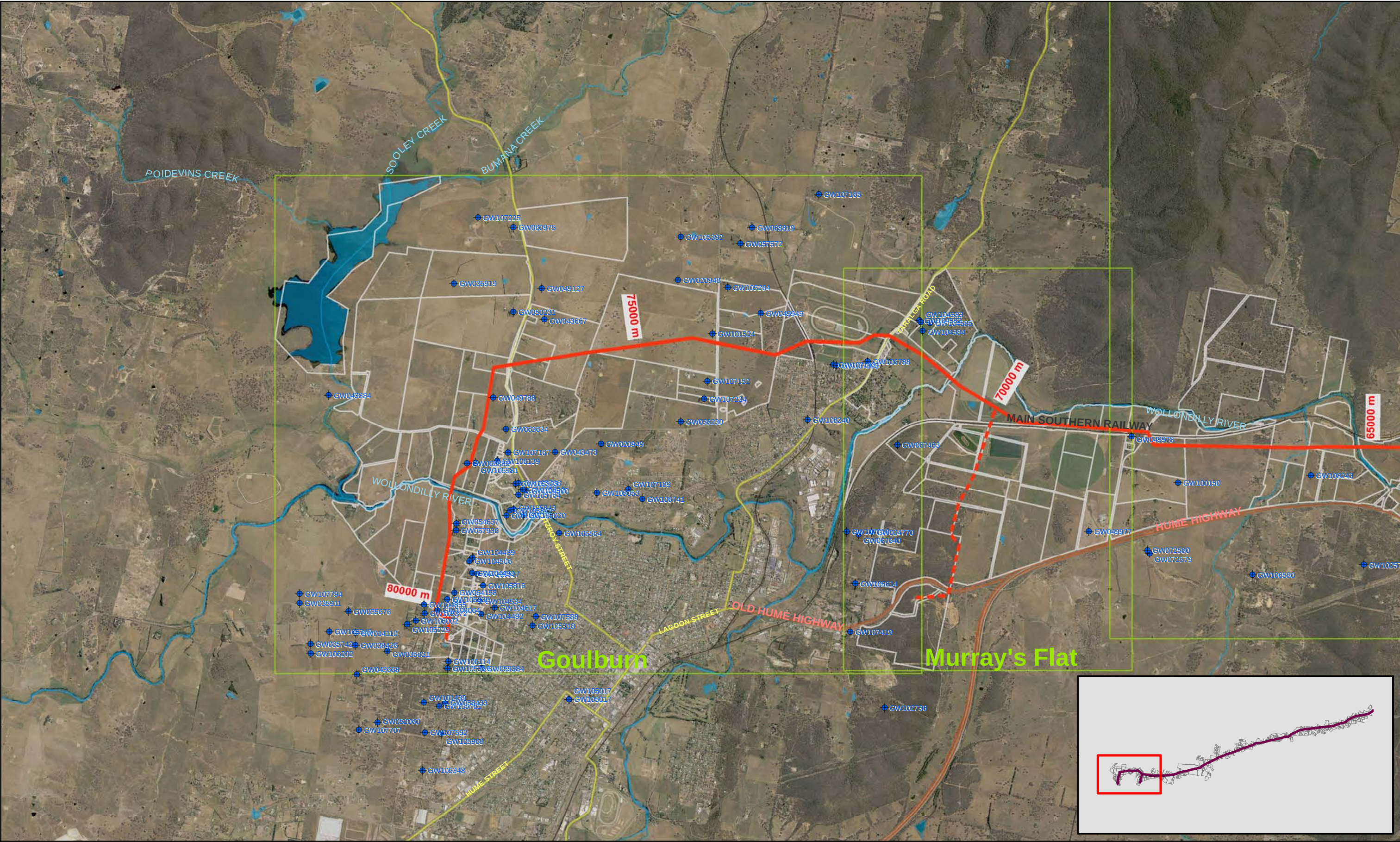
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Data Source: NSW Lands Dept: crownlands,roadsegments,railways,hydroarea,hydroline,logalgovernmentarea,npwreserve,stateforest - 2007. Created by: ccharalambou, trbellwood

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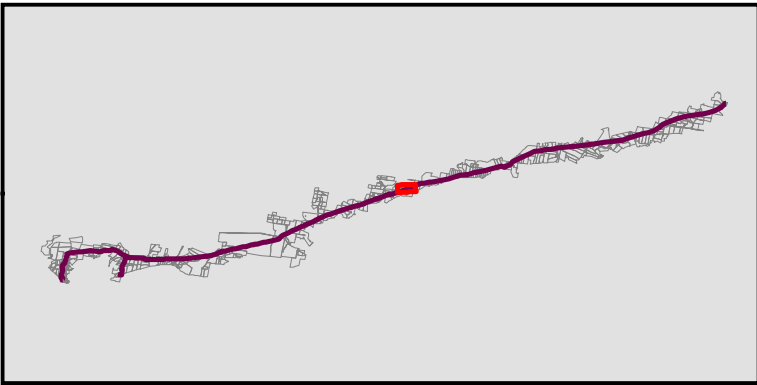


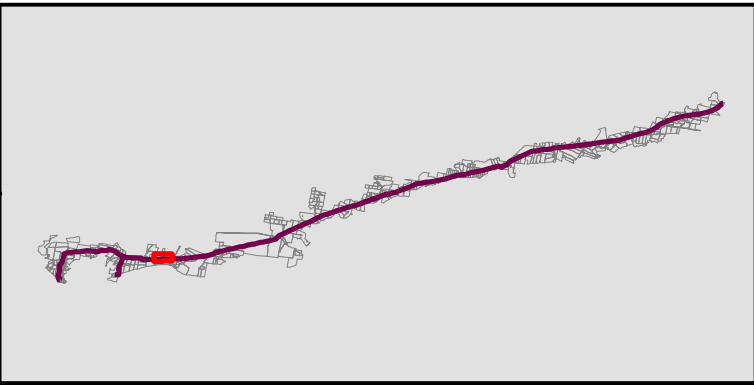
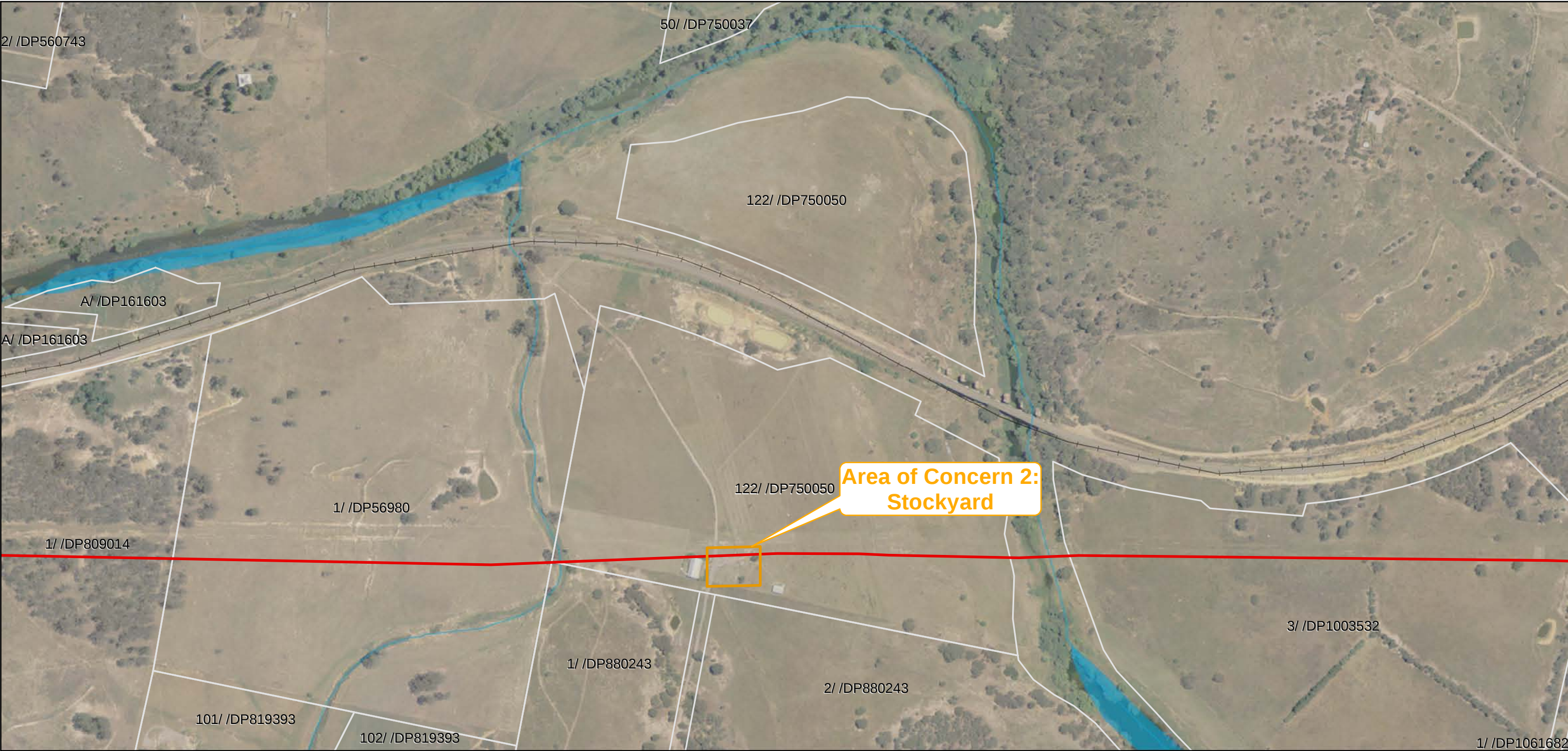
Appendix E

Contaminated land

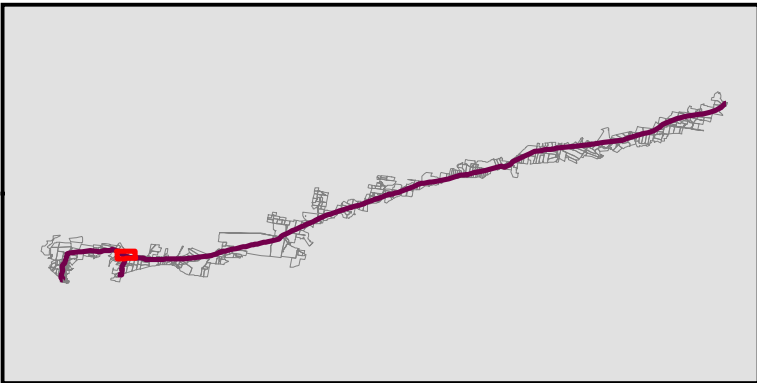
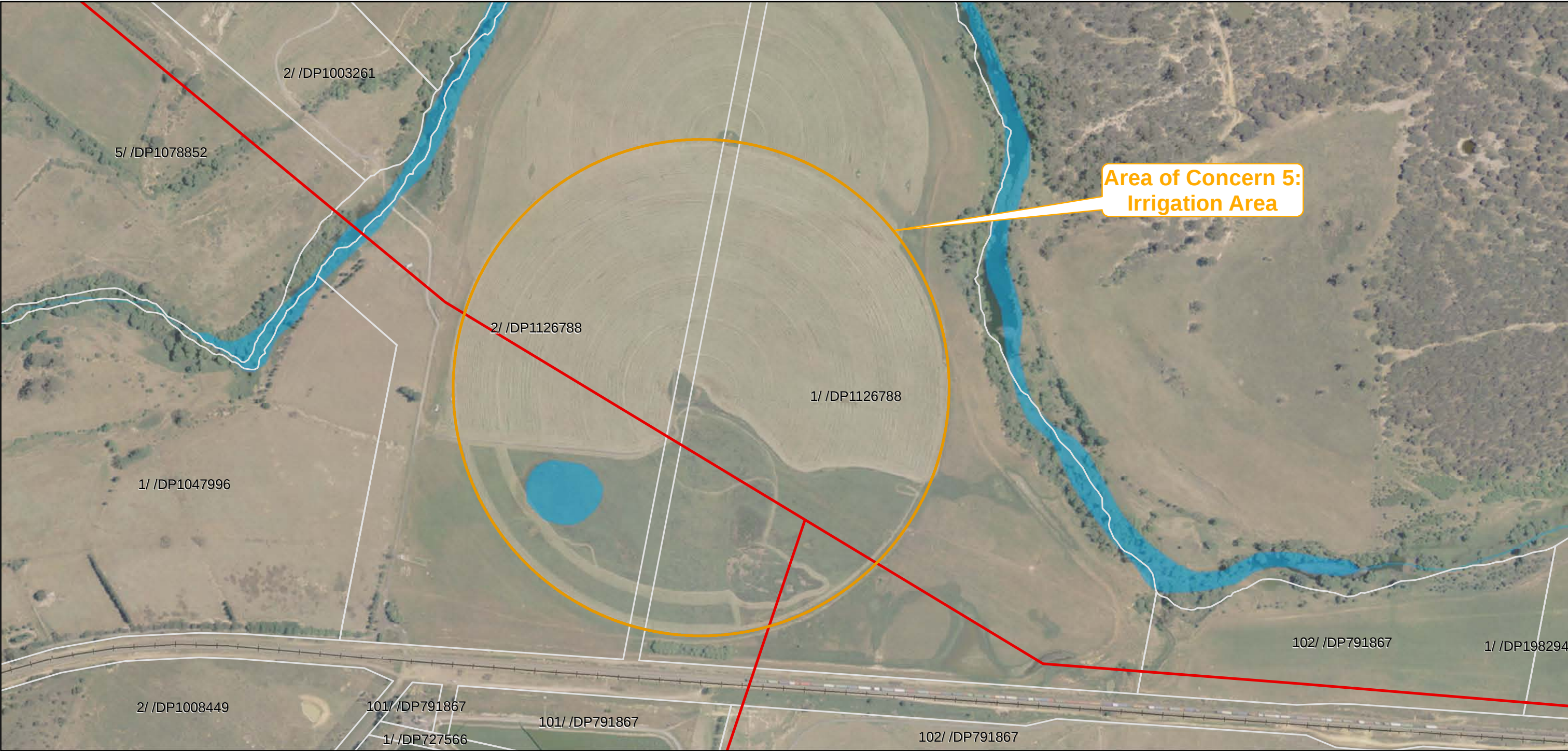
Areas of potential concern

Search results Notices under Part 3 of CLM Act











Search results

Your search for: LGA: Goulburn Mulwaree Council

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the [planning process](#).

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... [more search tips](#)

More information about particular sites may be available from:

- The [POEO public register](#)
- The appropriate planning authority: for example, on a planning certificate issued by the local council under [section 149 of the Environmental Planning and Assessment Act](#).

See [What's in the record and What's not in the record](#).

24 November 2009



Print



Close page

Search results

Your search for: LGA: Wingecarribee Shire Council

Matched 11 notices relating to 3 sites.

Suburb	Address	Site Name	Notices related to this site
Joadja	Joadja Creek	Shale Oil Refinery	1 current
Mittagong	Lot 1 Alfred Street	Former Shale Oil Plant	9 former
Moss Vale	Bowman/Berrima Road	Moss Vale North Depot	1 current

Page 1 of 1

24 November 2009



Appendix F

Environmental risk and impact assessment

Environmental Risk Assessment Tables

Impact Assessment Risk Register

Consequence Table

Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Soil (stability)	Negligible loss of soil through erosion	Minor localised soil loss through erosion. No localised land degradation.	Local soil erosion leading to some localised land degradation	Extensive local soil erosion and land degradation	Wide spread soil erosion resulting in significant land degradation
Soil (contamination of adjoining areas due to disturbance of existing soil contamination)	Insignificant increase in lateral and / or vertical extent of contaminated area	Minor increase in lateral and / or vertical extent of contaminated area. Does not require remediation and does not restrict intended use of land within construction corridor.	Increase in lateral and / or vertical extent of contaminated area. Require minor remediation and does not restrict intended use of land within construction corridor.	Significant increase in lateral and or vertical extend of contaminated area requiring remediation to ensure contamination spread does not restrict intended land use within construction corridor	Significant increase in lateral and or vertical extend of contaminated area rendering adjoining land unusable for intended purpose without significant and costly remediation within construction corridor
Groundwater (depth and availability)	Negligible change to groundwater depth and groundwater availability,	Minor localised and short term (weeks) changes to groundwater depth and / or groundwater availability.	Localised temporary (months) changes to groundwater depth, groundwater availability, with minor implications to receptors.	Groundwater depth, groundwater availability significantly changed for a significant time period (years)	Permanent widespread groundwater resource depletion and subsidence
Groundwater (quality)	Negligible change to groundwater quality	Minor localised and short term (weeks) changes to groundwater quality. No impact on beneficial use	Localised temporary changes to groundwater quality Minimal risk of detrimental impact to beneficial use	Groundwater quality significantly changed impacting beneficial use for a significant time period (years)	Permanent and significant change to groundwater quality causing detrimental impact to the beneficial use

Likelihood Table

Likelihood	Description
Almost Certain	The event is expected to occur in most circumstances
Likely	The event will probably occur in most circumstances
Possible	The event could occur
Unlikely	The event could occur but not expected
Rare	The event occurs only in exceptional circumstances

Risk Matrix

Likelihood Level	Consequence Level				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Negligible	Low	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	High
Rare	Negligible	Negligible	Low	Medium	Medium

Soil, Groundwater and contamination impact assessment
Highlands Source Project
Environmental Risk Register

Specialist Field	Risk Pathway	Consequence (IMPACT)	Project Controls	Consequence	Likelihood	Relative Risk	Additional Controls	Consequence	Likelihood	Treated Risk
Construction activities at Wingecarribee Water Treatment Plant site										
Groundwater and soils	Flooding of the pump station area (raw water option) during construction of the elevated building pad exposes pad (soil) to stormwater erosion.	Loss of soil Sedimentation of surface water which flows to Wingecarribee the River.	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction.	Insignificant	Unlikely	Negligible	None	-	-	-
Groundwater and soils	Earthworks at the Wingecarribee Water Treatment Plant site disturb soils. Soils become exposed to stormwater erosion.	Loss of soil particularly topsoil via stormwater erosion	Minimisation of area of disturbance. Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction.	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Earthworks at the Wingecarribee Water Treatment Plant site disturb soils. Soils become exposed to stormwater. Sediment laded surface water generated.	Degradation of water quality in Wingecarribee River	Minimisation of area of disturbance. Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction.	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Spillages of storaged of fuels and chemicals during construction work at the Wingecarribee Water Treatment Plant site.	Generation of contaminated soil	Minimal quantities of fuels and chemicals to be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards. Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with <i>Waste Classification Guidelines</i> (DECCW 2008)	Insignificant	Unlikely	Negligible	None	-	-	-
Groundwater and soils	Spillages of storaged of fuels and chemicals during construction work at the Wingecarribee Water Treatment Plant site results in contaminated soil. Surface water runoff over contaminated soil becomes contaminated.	Degradation of water quality in Wingecarribee River	Minimal quantities of fuels and chemicals would be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards. Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with <i>Waste Classification Guidelines</i> (DECCW 2008) Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction.	Insignificant	Unlikely	Negligible	None	-	-	-
Trenching (Dryland)										
Groundwater and soils	Trench construction activities disturb soil within the construction corridor and exposes soil to stormwater runoff.	Sheet erosion causing significant land degradation. Difficulty in re-establishing vegetation post construction, possibly resulting in further land degradation beyond the construction corridor	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Trench construction activities through shallow, sodic, saline, highly erosive soils, and / or steep slopes; exposes soils to stormwater and wind.	Soil erosion and land degradation Temporary degradation of surface water quality in watercourse Temporary degradation of aquatic habitat health	Seperate stockpiling of sodic and saline soils. Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Trench construction activities disturb soil within the construction corridor and exposes soil to stormwater runoff. Sediment laden stormwater generated and drains to nearby watercourse.	Temporary degradation of surface water quality in watercourse Temporary degradation of aquatic habitat health	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Insignificant	Unlikely	Negligible	None	-	-	-
Groundwater and soils	Trench construction activities intercept shallow groundwater. Sediment laden water or spills of fuels and chemicals contaminates groundwater. Groundwater flows to watercourse.	Degradation of shallow groundwater (shallow groundwater likely to be greater than 3m bgl) Temporary degradation of surface water quality in watercourse Temporary degradation of aquatic habitat health	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Insignificant	Rare	Negligible	None	-	-	-

Specialist Field	Risk Pathway	Consequence (IMPACT)	Project Controls	Consequence	Likelihood	Relative Risk	Additional Controls	Consequence	Likelihood	Treated Risk
Groundwater and soils	Trench construction activities intercept shallow groundwater. Sediment laden water or spills of fuels and chemicals infiltrates to groundwater.	Groundwater quality degraded making it temporarily unusable by downgradient receptors (stock watering, agriculture, garden irrigation, domestic use) which typically source water from aquifers at depths of at least 18m bgl.	Progressive backfilling on trench and rehabilitation of areas following pipe installation. Limit trench excavation depths (max. 2m bgl) Minimal quantities of fuels and chemicals would be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards. Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with Waste Classification Guidelines (DECCW 2008)	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Trench construction activities disturb soil within the construction corridor which results in dust generation	Construction workers exposed to dust inhalation	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be undertaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Insignificant	Possible	Negligible	None	-	-	-
Groundwater and soils	Trench construction activities disturb contaminated soils. Disturbed contaminated soil subject to stormwater erosion	Contaminated soil mobilises and contaminates adjoining areas. Surface water runoff over contaminated soil becomes contaminated. Water quality in nearby watercourses is degraded due to contaminated surface water inflows Temporary degradation of aquatic habitat health	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be undertaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Stormwater causes tunnel erosion within pipeline trench	Ground subsidence causes hazards to livestock and vehicle movement	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Use of seepage collars or bulk heads Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Backfilled trench results in localised ground subsidence	Ground subsidence causes hazards to livestock and vehicle movement	Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Construction excavations in colluvial soils causes instability	Damage to pipeline	Geotechnical intrusive investigations would be undertaken advise as part of detailed design. Mass movement hazards would be considered in design.	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Construction excavations on steep slopes cause mass movement of soil	Damage to pipeline	Geotechnical intrusive investigations would be undertaken advise as part of detailed design. Mass movement hazards would be considered in design.	Moderate	Rare	Low	None	-	-	-
Trenching (Watercourses: drainage lines, gullies, ephemeral streams, creeks)										
Groundwater and soils	Trench construction activities disturb soil within riparian zone. Exposes soil to stormwater runoff.	Loss of soil from disturbed areas and land degradation. Difficulty in re-establishing vegetation post construction, resulting in further land degradation beyond the construction corridor	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Possible	Low	None	-	-	-
Groundwater and soils	Trench construction activities in riparian zone through shallow, sodic, saline, highly erosive soils, and / or steep slopes; exposes soils to stormwater and wind.	Soil erosion and land degradation Temporary degradation of surface water quality in watercourse	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Possible	Low	None	-	-	-
Groundwater and soils	Trench construction activities intercept shallow groundwater. Sediment laden water or spills of fuels and chemicals contaminates groundwater. Groundwater flows to watercourse.	Degradation of shallow groundwater (shallow groundwater likely to be greater than 3m bgl)	Progressive backfilling on trench and rehabilitation of areas following pipe installation. Limit trench excavation depths (max. 2m bgl) Minimal quantities of fuels and chemicals would be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards. Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with Waste Classification Guidelines (DECCW 2008)	Minor	Possible	Low	None	-	-	-
Groundwater and soils	Trench construction activities disturb soil within the construction corridor which results in dust generation	Construction workers exposed to dust inhalation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Insignificant	Likely	Low	None	-	-	-

Specialist Field	Risk Pathway	Consequence (IMPACT)	Project Controls	Consequence	Likelihood	Relative Risk	Additional Controls	Consequence	Likelihood	Treated Risk
Groundwater and soils	Trench construction activities disturb contaminated soils. Disturbed contaminated soil subject to stormwater erosion	Contaminated soil mobilises and contaminates adjoining areas. Surface water runoff over contaminated soil becomes contaminated. Water quality in nearby watercourses is degraded due to contaminated surface water inflows	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during construction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be undertaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Stormwater causes tunnel erosion within pipeline trench	Ground subsidence causes erosion of watercourse bed	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Use of seepage collars or bulk heads Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Possible	Low	None	-	-	-
	Backfilled trench results in localised ground subsidence	Ground subsidence causes erosion of watercourse bed	Rehabilitation of watercourse bed using appropriate materials in accordance with geomorphology study recommendations Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Possible	Low	None	-	-	-
	Construction excavations in colluvial soils causes instability	Damage to pipeline	Geotechnical intrusive investigations would be undertaken advise as part of detailed design. Instability hazards would be considered in design.	Minor	Rare	Negligible	None	-	-	-
Thrust boring										
Groundwater and soils	Excavation of launch and/or receiver pits disturb soil within the construction corridor and exposes soil to stormwater runoff	Sheet erosion causing significant land degradation. Difficulty in re-establishing vegetation post construction, resulting in further land degradation beyond the construction corridor	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Possible	Low	None	-	-	-
Groundwater and soils	Thrust boring construction activities disturb soil within the construction corridor and exposes soil to stormwater runoff. Sediment laden stormwater flows to nearby watercourse	Temporary degradation of surface water quality in watercourse Temporary degradation of aquatic habitat health	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Excavation launch and receiver pits exposes soils to wind resulting in dust generation	Construction workers exposed to dust inhalation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Insignificant	Likely	Low	None	-	-	-
Groundwater and soils	Drilling slurry, fuel or chemical spills in pits infiltrates to shallow groundwater or groundwater seepage into pits becomes contaminated with sediment, drilling fluids, fuels or chemicals.	Local degradation of groundwater quality Groundwater quality degraded making it temporarily unusable by downgradient receptors (stock watering, agriculture, garden irrigation, domestic use) which typically source water from aquifers at depths of at least 18m bgl.	Groundwater seepages would be pumped out of pits prior to commencement of thrust boring and prior to backfilling and remediation of pits. Remove all drilling slurry from pits before backfilling. Minimal quantities of fuels and chemicals would be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with Waste Classification Guidelines (DECCW 2008)	Minor	Possible	Low	None	-	-	-
Groundwater and soils	Drilling slurry, fuel or chemical spills in pits infiltrates to deeper groundwater resource	Quality of groundwater resource degraded making it temporarily unusable by downgradient receptors (stock watering, agriculture, garden irrigation, domestic use) which typically source water from aquifers at depths of at least 18m bgl.	Groundwater seepages would be pumped out of pits prior to commencement of thrust boring and prior to backfilling and remediation of pits.	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Launch pit and /or receiver pit walls excavated in unstable ground	Collapse of excavation walls OHS risk to site workers	Work would be undertaken in accordance with NSW WorkCover Codes of Practice for construction works / excavations. Excavation walls would be supported where required	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Backfilling of (thrust bore) launch and receiver pits causes ground subsidence	Ground subsidence causes hazards to livestock and vehicle movement	Ongoing maintenance until agreed property rehabilitation objectives are achieved	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Waterlogged soils encountered at thrust boring locations	Instability of thrust block foundation	Trenching or underboring would be undertaken at locations if soil and geological conditions are not conducive to thrust boring	Minor	Unlikely	Low	None	-	-	-
Underboring										
Groundwater and soils	Excavation of launch and/or receiver pits disturb soil within the construction corridor and exposes soil to stormwater runoff	Sheet erosion causing significant land degradation. Difficulty in re-establishing vegetation post construction, resulting in further land degradation beyond the construction corridor	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Thrust boring construction activities disturb soil within the construction corridor and exposes soil to stormwater runoff.	Sediment laden stormwater flows to nearby watercourse	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Minor	Unlikely	Low	None	-	-	-

Specialist Field	Risk Pathway	Consequence (IMPACT)	Project Controls	Consequence	Likelihood	Relative Risk	Additional Controls	Consequence	Likelihood	Treated Risk
Groundwater and soils	Excavation of launch and/or receiver pits exposes soils to wind resulting in dust generation	Construction workers exposed to dust inhalation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Insignificant	Likely	Low	None	-	-	-
Groundwater and soils	Drilling slurry, fuel or chemical spills in pits infiltrates to shallow groundwater or groundwater seepage into pits becomes contaminated with sediment, drilling fluids, fuels or chemicals.	Local degradation of groundwater quality	Groundwater removed from pits and trench will either be pump out into a tank for off site disposal or pumped out and released onto vegetated land or passed through a sediment trap. Remove all drilling slurry from pits before backfilling. Minimal quantities of fuels and chemicals would be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards. Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with Waste Classification Guidelines (DECCW 2008)	Minor	Possible	Low	None	-	-	-
Groundwater and soils	Frac out occurs during underboring	Degradation of surface water in water course	Groundwater seepages would be pumped out of pits prior to commencement of thrust boring and prior to backfilling and remediation of pits.	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Drilling slurry, fuel or chemical spills in pits infiltrates to deeper groundwater resource	Quality of groundwater resource degraded making it temporarily unusable by downgradient receptors (stock watering, agriculture, garden irrigation, domestic use) which typically source water from aquifers at depths of at least 18m bgl.	Groundwater removed from pits and trench will either be pump out into a tank for off site disposal or pumped out and released onto vegetated land or passed through a sediment trap. Remove all drilling slurry from pits before backfilling. Minimal quantities of fuels and chemicals would be stored on construction areas. Any fuels and chemicals requiring storage on construction areas would be stored in accordance with relevant Australian Standards. Any spills of fuels or chemicals would be immediately cleaned up. Contaminated soil would be disposed of offsite in accordance with Waste Classification Guidelines (DECCW 2008)	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Launch pit and /or receiver pit walls excavated in unstable ground	Collapse of excavation walls OHS risk to site workers	Work would be undertaken in accordance with NSW WorkCover Codes of Practice for construction works / excavations. Excavation walls would be supported where required	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Backfilling of (thrust bore) launch and receiver pits causes ground subsidence	Ground subsidence causes hazards to livestock and vehicle movement	Ongoing maintenance until agreed property rehabilitation objectives are achieved	Moderate	Rare	Low	None	-	-	-
Soil management										
Groundwater and soils	Stockpiling of topsoil and subsoils generates dust	Loss of soils from wind erosion	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Stockpiling of topsoil and subsoils generates dust	Construction workers exposed to dust inhalation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Insignificant	Possible	Negligible	None	-	-	-
Groundwater and soils	Stockpiling of topsoil and subsoil exposes soil to rain and stormwater runoff	Loss of soils from stormwater erosion	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Construction would be staged to minimise the duration that materials are stockpiled	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Stockpiling of topsoil and subsoils exposes soil to rain and stormwater runoff	Soil erosion and land degradation Temporary degradation of surface water quality in watercourse	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2A Installation of services (DECC 2008) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Unlikely	Low	None	-	-	-
Construction corridor access										
Groundwater and soils	Construction traffic movements disturb soil at access points and along construction corridor exposing soil to stormwater runoff	Soil erosion (gully or sheet erosion) at access points. Difficulty in re-establishing vegetation post construction, resulting in further land degradation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2C Unsealed Roads (DECC 2008a) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Construction traffic movements disturb soil (particularly saline and waterlogged soils, shallow soils, sodic soils) and along construction corridor exposing soil to stormwater runoff	Soil erosion (gully or sheet erosion). Difficulty in re-establishing vegetation post construction, resulting in further land degradation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2C Unsealed Roads (DECC 2008a) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Minor	Unlikely	Low	None	-	-	-

Specialist Field	Risk Pathway	Consequence (IMPACT)	Project Controls	Consequence	Likelihood	Relative Risk	Additional Controls	Consequence	Likelihood	Treated Risk
Groundwater and soils	Significant storm event causes sever damage to rehabilitated areas	Loss of initial rehabilitated areas. Soil erosion. Difficulty in re-establishing vegetation post construction, resulting in further land degradation	Erosion controls implemented in accordance with Soils and Construction: Managing Urban Stormwater Vol 1 (Landcom, 2004) and Soils and Construction: Managing Urban Stormwater Vol 2C Unsealed Roads (DECC 2008a) prior to commencement of construction. Progressive rehabilitation of areas following pipe installation Ongoing maintenance until agreed property rehabilitation objectives are achieved	Moderate	Rare	Low	Undertaken program of re-establishment of rehabilitated areas	Minor	Rare	Negligible
General contaminated soil management										
Groundwater and soils	Disturbance of contaminated soils. Disturbed contaminated soil subject to stormwater erosion	Contamination of adjacent (clean) soil	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be underetaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Trench / thrust boring / underboring activities disturb contaminated soils. Disturbed contaminated soil subject to stormwater erosion	Groundwater quality degraded making it unusable to sensitive receptors (stock watering, agriculture, garden irrigation)	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be underetaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Trench / thrust boring / underboring activities disturb contaminated soils. Disturbed contaminated soil subject to stormwater erosion	Groundwater quality degraded making it unusable for human use	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be underetaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Moderate	Rare	Low	None	-	-	-
Groundwater and soils	Disturbance of contaminated soils. Disturbed contaminated soil subject to stormwater erosion	Workers and Residents exposed to contaminants by ingestion, inhalation or dermal contact.	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be underetaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Minor	Rare	Negligible	None	-	-	-
Groundwater and soils	Disturbance of contaminated soils in effluent irrigated areas	Workers exposed to contaminants by ingestion, inhalation or dermal contact. Contaminants exposed to stormwater and become mobile	Erosion controls established prior to commencement of construction. If potentially contaminated soils are encountered during constuction works, the work would cease and the area investigated by a person qualified and experience in soil contamination investigations. Appropriate remediation actions would be underetaken if soil was found to be contaminated. Contaminated soil managed in accordance with the EPA guidelines.	Moderate	Possible	Medium	Investigate soil contamination in effluent irrigated areas prior to construction of trenching in that area. Adopt appropriate soil mananagment techniques based on the outcomes of the investigation Cease irrigating land when construction activities are occuring	Minor	Rare	Negligible
Maintenance activities										
Groundwater and soils	Scour water is discharged into ground with shallow soils, saline soils, sodic soils or on steep slopes	Discharges cause soil (sheet and or gully) erosion	Scour water would not be discharged onto bare ground but into well vegetated areas.	Minor	Unlikely	Low	None	-	-	-
Groundwater and soils	Dirty' scour water is discharge onto ground and infiltrates to the groundwater	Groundwater quality degraded making it unusable to sensitive receptors (stock watering, agriculture, garden irrigation)	None	Moderate	Rare	Low	None	-	-	-