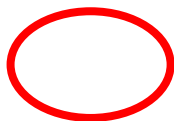
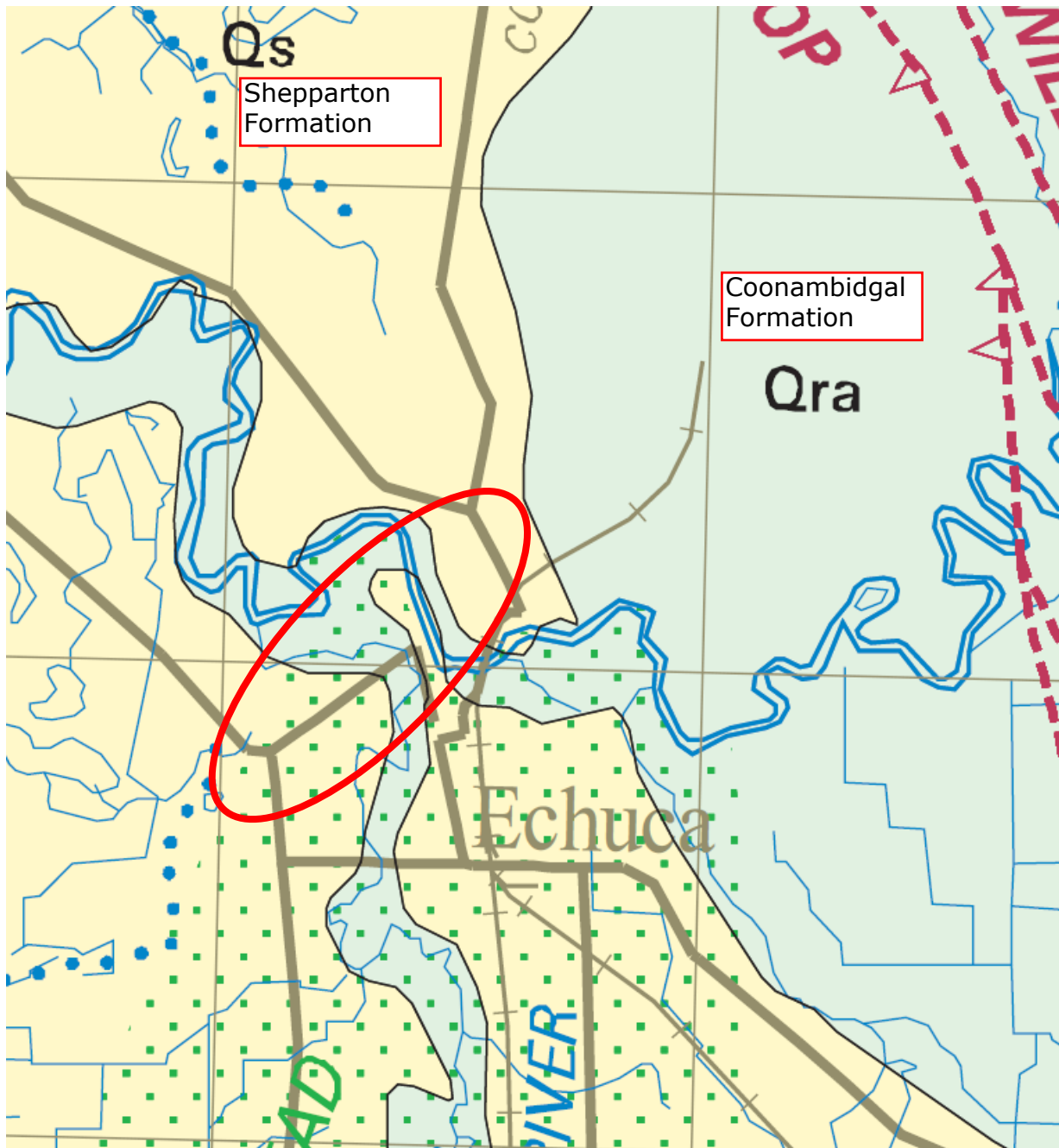


APPENDIX A

Geological Map

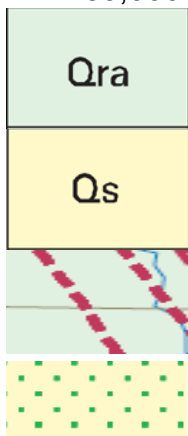
Geological Map



LOCATION OF SITE



1:250,000 Geological Map: Bendigo Map Sheet SJ55-1 Zone 55 by Geological Survey of Victoria



Qra

Fluvial: alluvium, flood plain deposits; gravel, sand, silt, clay

Qs

Qs

Fluvial: prior stream, valley-backfill and floodplain deposits; clay, sand, silt, gravel

Corop and Mount Willam Fault

Campaspe Deep Lead

APPENDIX B

Aerial photo records

2013 Aerial photos



2008 Aerial photos

ECHUCA



Run 2
15-21



15.2.2008



271 8041

152.37

0019



ECHUCA



Run 2
15-21



15.2.2008



0018



ECHUCA



Run 2
15-21



15.2.2008



152.32

0017



ECHUCA



Run 3
22-31



15-2-2008



0026



ECHUCA



Run 3
22-31



15-2-2008



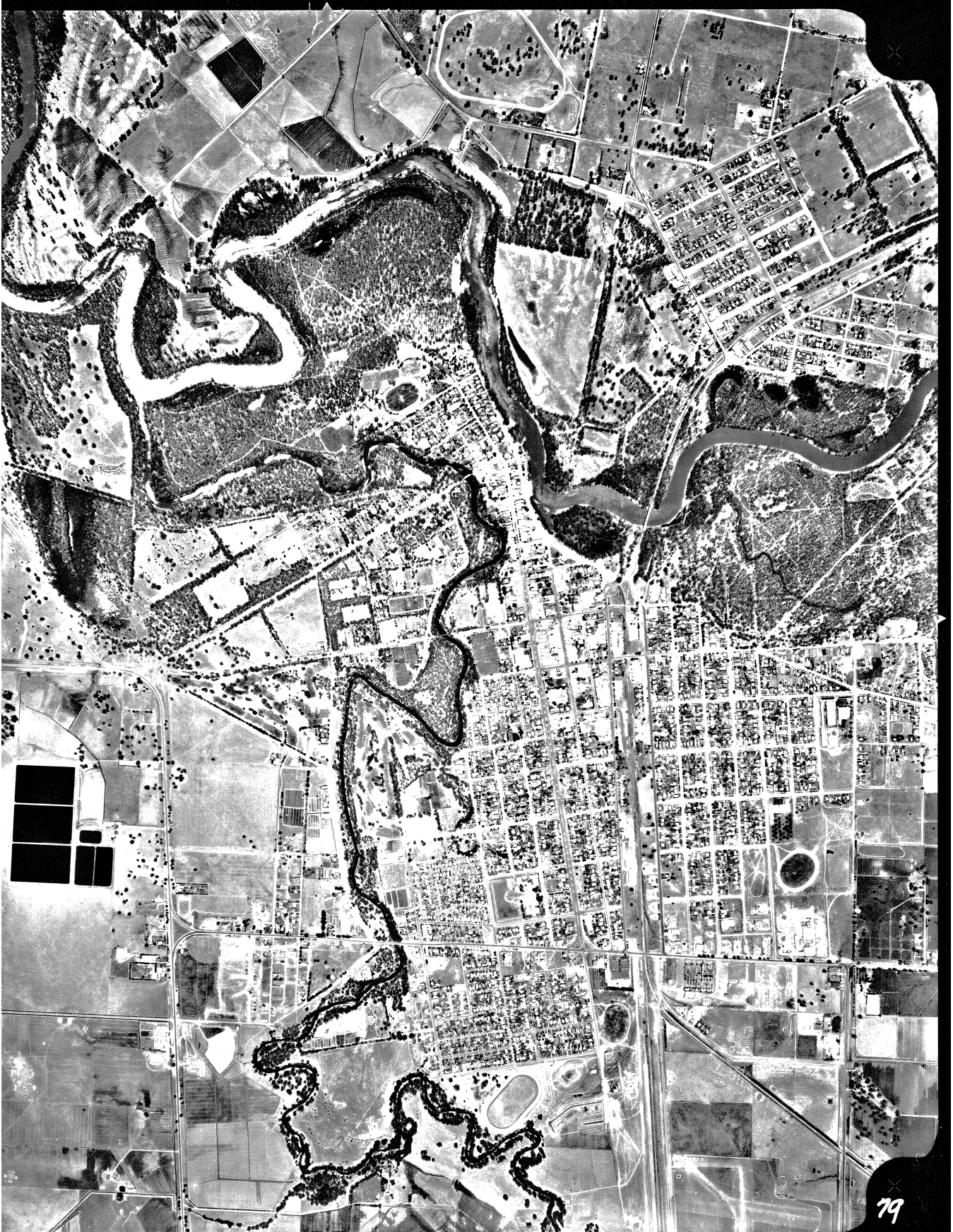
07100047

15231

0027



1971 Aerial photos



79



80



ECHUCA MAPSHEET

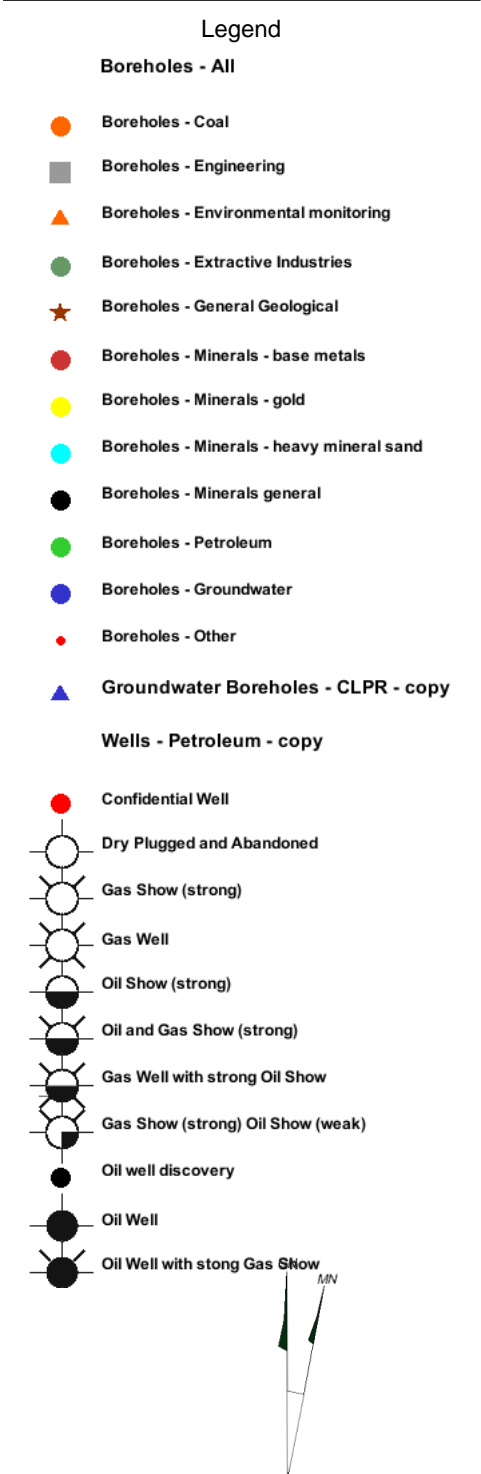
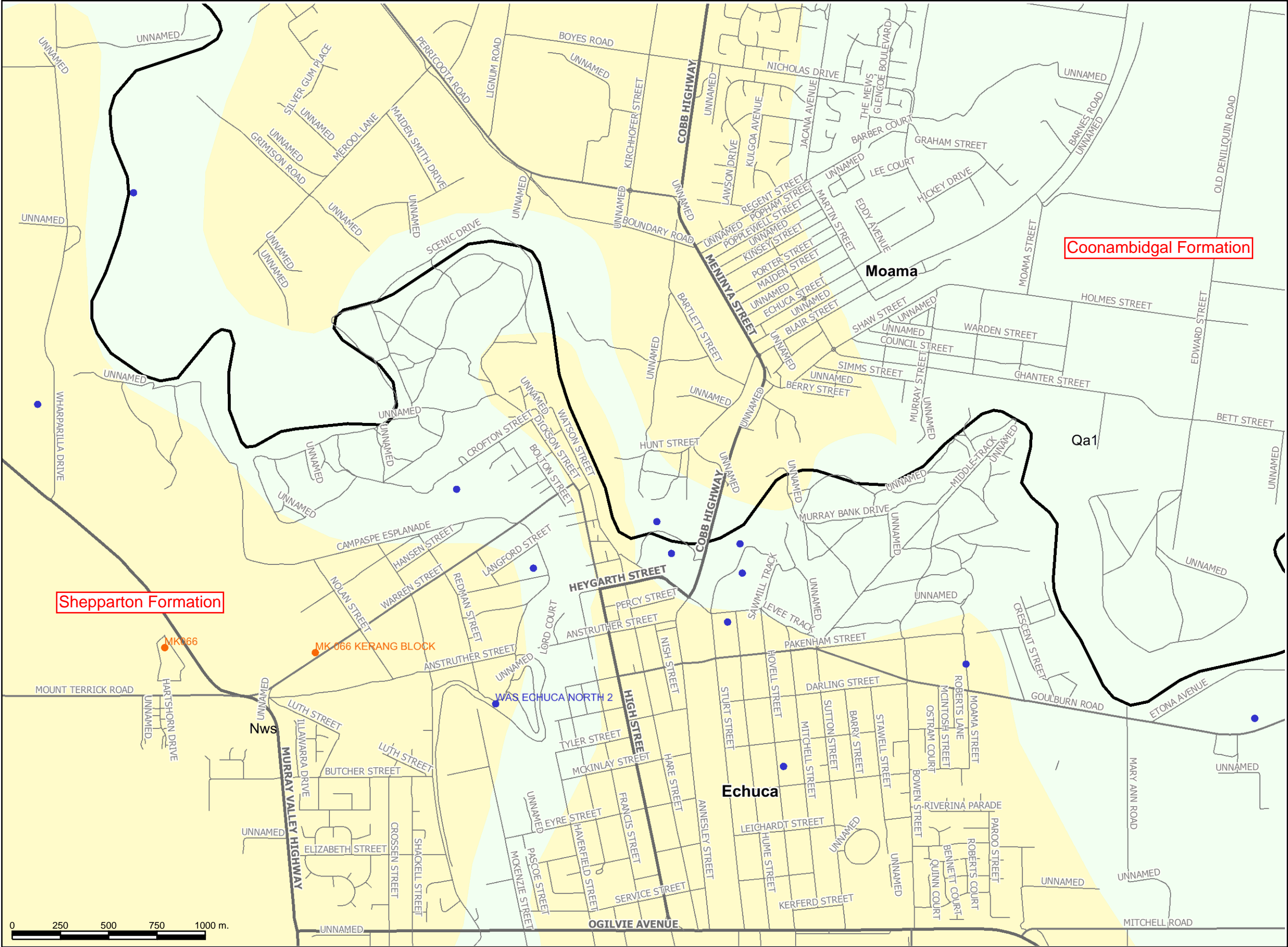
RUN 4

13-1-71
13,000' A S L

81

APPENDIX C

Summary of records
in DELWP groundwater
database



[illegible]

Digitized by Google

LABORATORY CHEMISTRY

Bore ID	Reading date	Interval from (m)	Interval to (m)	Collection method	Parameter name	Parameter value	Unit of measure
102821	6/06/1966			FLOWING	Calcium, as Ca	45	mg/L
102821	6/06/1966			FLOWING	Chloride, as Cl	980	mg/L
102821	6/06/1966			FLOWING	Hardness, as CaCO3 (calc.)	584	mg/L
102821	6/06/1966			FLOWING	Bicarbonate, as HCO3	85	mg/L
102821	6/06/1966			FLOWING	Sulphate, as SO4	726	mg/L
102821	6/06/1966			FLOWING	DME Silicate, as SIO3	11	mg/L
102821	6/06/1966			FLOWING	Magnesium, as Mg	114	mg/L
102821	6/06/1966			FLOWING	Total Soluble Salts (Conductiv	2090	mg/L
102821	1/07/1966			FLOWING	Calcium, as Ca	5	mg/L
102821	1/07/1966			FLOWING	Chloride, as Cl	187	mg/L
102821	1/07/1966			FLOWING	Carbonate, as CO3	12	mg/L
102821	1/07/1966			FLOWING	Hardness, as CaCO3 (calc.)	39	mg/L
102821	1/07/1966			FLOWING	Bicarbonate, as HCO3	133	mg/L
102821	1/07/1966			FLOWING	Sulphate, as SO4	70	mg/L
102821	1/07/1966			FLOWING	DME Silicate, as SIO3	5	mg/L
102821	1/07/1966			FLOWING	Magnesium, as Mg	7	mg/L
102821	1/07/1966			FLOWING	Total Soluble Salts (Conductiv	670	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Calcium, as Ca	22	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Chloride, as Cl	1105	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Carbonate, as CO3	15	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Hardness, as CaCO3 (calc.)	258	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Bicarbonate, as HCO3	442	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Sulphate, as SO4	834	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Magnesium, as Mg	49	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Total Dissolved Solids, 105C	3467	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Calcium, as Ca	6	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Chloride, as Cl	322	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Carbonate, as CO3	18	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Hardness, as CaCO3 (calc.)	69	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Bicarbonate, as HCO3	409	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Sulphate, as SO4	237	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Magnesium, as Mg	13	mg/L
61931	7/10/1963	162.15	170.99	AIR LIFTED	Total Dissolved Solids, 105C	1275	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Calcium, as Ca	23	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Chloride, as Cl	983	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Carbonate, as CO3	12	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Hardness, as CaCO3 (calc.)	290	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Bicarbonate, as HCO3	213	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Magnesium, as Mg	56	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Total Dissolved Solids, 105C	2224	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Calcium, as Ca	27	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Chloride, as Cl	789	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Carbonate, as CO3	9	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Hardness, as CaCO3 (calc.)	146	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Bicarbonate, as HCO3	195	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Sulphate, as SO4	210	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Magnesium, as Mg	19	mg/L
61931	7/10/1963	162.15	170.99	FLOWING	Total Dissolved Solids, 105C	1761	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Calcium, as Ca	106	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Chloride, as Cl	3248	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Hardness, as CaCO3 (calc.)	1265	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Bicarbonate, as HCO3	143	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Sulphate, as SO4	451	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	DME Silicate, as SIO3	4	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Magnesium, as Mg	243	mg/L
61931	7/11/1963	162.15	170.99	FLOWING	Total Dissolved Solids, 105C	6077	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Calcium, as Ca	7	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Chloride, as Cl	242	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Carbonate, as CO3	13	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Hardness, as CaCO3 (calc.)	59	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Bicarbonate, as HCO3	175	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Sulphate, as SO4	85	mg/L
61931	16/02/1964	162.15	170.99	BAILED	DME Silicate, as SIO3	15	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Iron, total as Fe	1.2	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Magnesium, as Mg	10	mg/L
61931	16/02/1964	162.15	170.99	BAILED	Total Dissolved Solids, 105C	712	mg/L
61933	4/03/1964			FLOWING	Chloride, as Cl	71	mg/L
61933	4/03/1964			FLOWING	Bicarbonate, as HCO3	6	mg/L
61933	4/03/1964			FLOWING	Total Dissolved Solids, 105C	204	mg/L
61934	6/03/1964			FLOWING	Chloride, as Cl	13	mg/L
61934	6/03/1964			FLOWING	Bicarbonate, as HCO3	54	mg/L
61934	6/03/1964			FLOWING	Total Dissolved Solids, 105C	82	mg/L
61935	12/03/1964			FLOWING	Chloride, as Cl	10	mg/L
61935	12/03/1964			FLOWING	Carbonate, as CO3	7	mg/L
61935	12/03/1964			FLOWING	Bicarbonate, as HCO3	92	mg/L
61935	12/03/1964			FLOWING	Total Dissolved Solids, 105C	152	mg/L
61936	13/03/1964			FLOWING	Chloride, as Cl	628	mg/L
61936	13/03/1964			FLOWING	Bicarbonate, as HCO3	789	mg/L

61936	13/03/1964			FLOWING	Total Dissolved Solids, 105C	2549	mg/L
61937	17/03/1964			FLOWING	Chloride, as Cl	541	mg/L
61937	17/03/1964			FLOWING	Bicarbonate, as HCO3	97	mg/L
61937	17/03/1964			FLOWING	Total Soluble Salts (Conductiv	1180	mg/L
61939	6/12/2007			PUMPED	Acidity/Alkalinity (pH)	6.08	pH units
61939	9/01/2008			PUMPED	Acidity/Alkalinity (pH)	6.12	pH units
61940	25/03/1964			FLOWING	Chloride, as Cl	42	mg/L
61940	25/03/1964			FLOWING	Bicarbonate, as HCO3	42	mg/L
61940	25/03/1964			FLOWING	Total Dissolved Solids, 105C	128	mg/L
61941	2/04/1964			FLOWING	Chloride, as Cl	3	mg/L
61941	2/04/1964			FLOWING	Carbonate, as CO3	13	mg/L
61941	2/04/1964			FLOWING	Bicarbonate, as HCO3	90	mg/L
61941	2/04/1964			FLOWING	Total Dissolved Solids, 105C	127	mg/L
61941	2/04/1964			FLOWING	Chloride, as Cl	32	mg/L
61941	2/04/1964			FLOWING	Bicarbonate, as HCO3	26	mg/L
61941	2/04/1964			FLOWING	Total Dissolved Solids, 105C	126	mg/L
61948	11/05/1964			FLOWING	Calcium, as Ca	2	mg/L
61948	11/05/1964			FLOWING	Chloride, as Cl	5	mg/L
61948	11/05/1964			FLOWING	Hardness, as CaCO3 (calc.)	11	mg/L
61948	11/05/1964			FLOWING	Bicarbonate, as HCO3	119	mg/L
61948	11/05/1964			FLOWING	Magnesium, as Mg	2	mg/L
61948	11/05/1964			FLOWING	Total Dissolved Solids, 105C	154	mg/L
61949	19/05/1964			AIR LIFTED	Calcium, as Ca	2	mg/L
61949	19/05/1964			AIR LIFTED	Chloride, as Cl	6	mg/L
61949	19/05/1964			AIR LIFTED	Carbonate, as CO3	8	mg/L
61949	19/05/1964			AIR LIFTED	Hardness, as CaCO3 (calc.)	24	mg/L
61949	19/05/1964			AIR LIFTED	Bicarbonate, as HCO3	99	mg/L
61949	19/05/1964			AIR LIFTED	Sulphate, as SO4	3	mg/L
61949	19/05/1964			AIR LIFTED	DME Silicate, as SIO3	1	mg/L
61949	19/05/1964			AIR LIFTED	Magnesium, as Mg	5	mg/L
61949	19/05/1964			AIR LIFTED	Total Soluble Salts (Conductiv	150	mg/L
61950	26/05/1964			AIR LIFTED	Calcium, as Ca	2	mg/L
61950	26/05/1964			AIR LIFTED	Chloride, as Cl	5	mg/L
61950	26/05/1964			AIR LIFTED	Carbonate, as CO3	7	mg/L
61950	26/05/1964			AIR LIFTED	Hardness, as CaCO3 (calc.)	17	mg/L
61950	26/05/1964			AIR LIFTED	Bicarbonate, as HCO3	84	mg/L
61950	26/05/1964			AIR LIFTED	Sulphate, as SO4	5	mg/L
61950	26/05/1964			AIR LIFTED	Magnesium, as Mg	3	mg/L
61950	26/05/1964			AIR LIFTED	Total Dissolved Solids, 105C	94	mg/L
61951	28/05/1964			AIR LIFTED	Calcium, as Ca	2	mg/L
61951	28/05/1964			AIR LIFTED	Chloride, as Cl	10	mg/L
61951	28/05/1964			AIR LIFTED	Carbonate, as CO3	6	mg/L
61951	28/05/1964			AIR LIFTED	Hardness, as CaCO3 (calc.)	19	mg/L
61951	28/05/1964			AIR LIFTED	Bicarbonate, as HCO3	117	mg/L
61951	28/05/1964			AIR LIFTED	Sulphate, as SO4	9	mg/L
61951	28/05/1964			AIR LIFTED	Magnesium, as Mg	3	mg/L
61951	28/05/1964			AIR LIFTED	Total Dissolved Solids, 105C	141	mg/L

FIELD CHEMISTRY

Bore ID	Date	Time	Interval from	Interval to	Collection method	pH	Temperature (C)	EC (uS/cm)
102821	6/06/1966	0:00:00			FLOWING	7.2		
102821	1/07/1966	0:00:00			FLOWING	8.5		
61931	7/10/1963	0:00:00	162.15	170.99	FLOWING	8.4		
61931	7/10/1963	1:00:00	162.15	170.99	AIR LIFTED	8.5		
61931	7/10/1963	2:00:00	162.15	170.99	FLOWING	8.4		
61931	7/10/1963	3:00:00	162.15	170.99	FLOWING	8.4		
61931	7/11/1963	0:00:00	162.15	170.99	FLOWING	7.7		
61931	16/02/1964	0:00:00	162.15	170.99	BAILED	8.5		
61933	4/03/1964	0:00:00			FLOWING	4.5		
61934	6/03/1964	0:00:00			FLOWING	7.8		
61935	12/03/1964	0:00:00			FLOWING	8.2		
61936	13/03/1964	0:00:00			FLOWING	7.8		
61937	17/03/1964	0:00:00			FLOWING	7		
61939	6/12/2007	0:00:00			PUMPED		28.4	4380
61939	9/01/2008	0:00:00			PUMPED		28.3	4380
61940	25/03/1964	0:00:00			FLOWING	7		
61941	2/04/1964	0:00:00			FLOWING	8.3		
61941	2/04/1964	1:00:00			FLOWING	7.4		
61948	11/05/1964	0:00:00			FLOWING	7		
61949	19/05/1964	0:00:00			AIR LIFTED	8.2		
61950	26/05/1964	0:00:00			AIR LIFTED	8.1		
61951	28/05/1964	0:00:00			AIR LIFTED	8.3		

APPENDIX D

Site Photographs



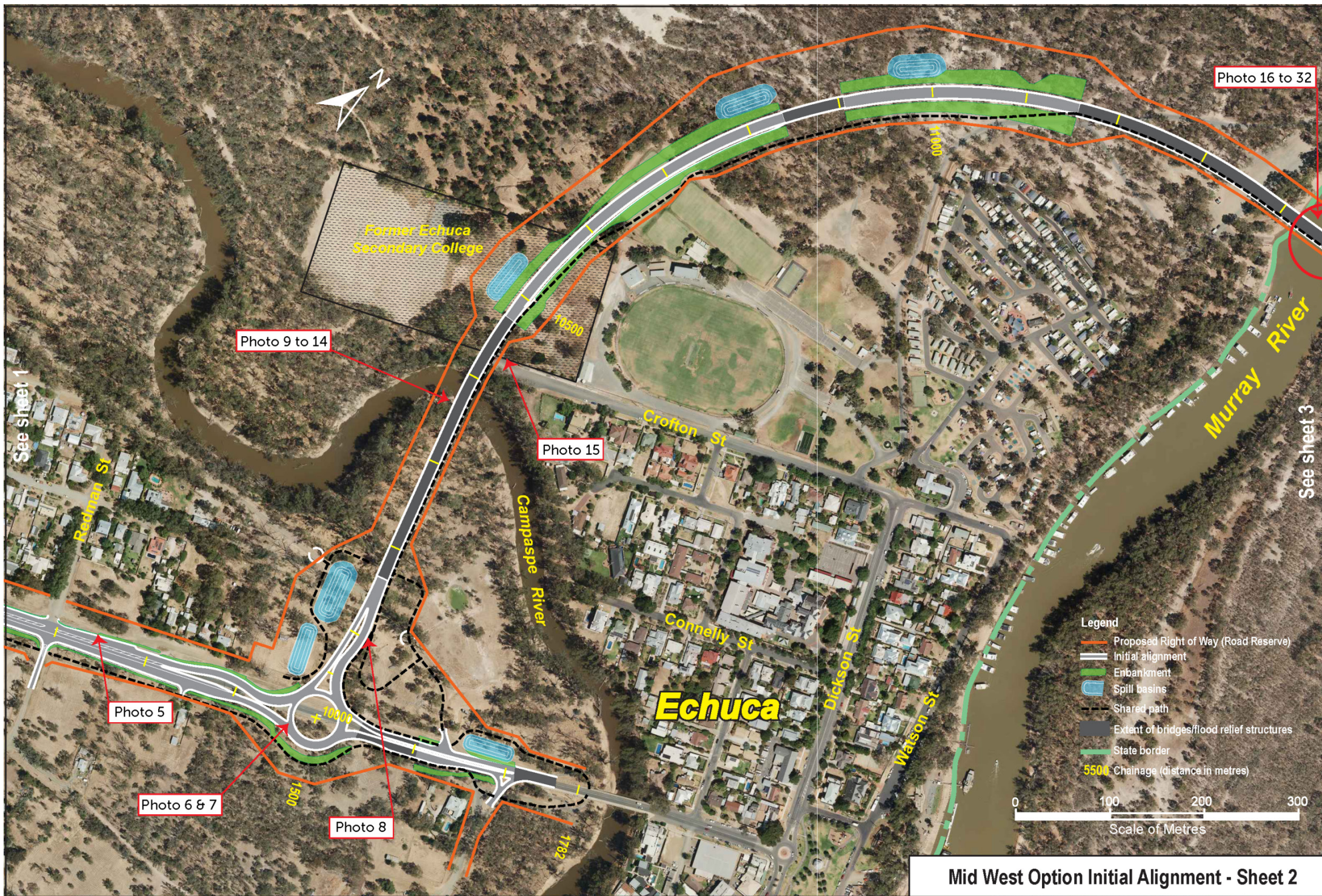






Photo 1 - View North along Warren St from MVH intersection (2011)



Photo 2 - View North of private property North from MVH intersection & West of Warren St (2011)



Photo 3 - View of private property from fence line North of MVH (2011)



Photo 4 - Intersection of Homan and Warren St (2014)



Photo 5 - Warren St – Approximate mid point between Redman and Payne Street (2014)



Photo 6 – Existing structure on Warren (2014)



Photo 7 – Existing structure on Warren St (2014)



Photo 8 View from Warren St towards Campaspe River (2014)



Photo 9 – Approximate crossing at Campaspe River (2014)



Photo 10 – Approximate crossing at Campaspe River (2014)



Photo 11 – Approximate crossing at Campaspe River (2014)



Photo 12 – Approximate crossing at Campaspe River (2014)



Photo 13 – Approximate crossing at Campaspe River (2014)



Photo 14 – Approximate crossing at Campaspe River (2014)



Photo 15 – Crofton St looking towards school (2014)



Photo 16 - Boat ramp edge of corridor for Murray River crossing (2011)



Photo 17 – Edge of Boat ramp looking North along edge of Murray River crossing corridor (2011)



Photo 18 - Adjacent to boat ramp existing wooden retaining walls for scour protection (2011)



Photo 19 - View North along back of proposed crossing (2011)



Photo 20 - From bank to bank @ centre of proposed crossing (2011)



Photo 21 – Looking South from south edge of study corridor (2011)



Photo 22 - Existing scour at proposed Murray River crossing (2011)



Photo 23 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 24 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 25 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 26 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 27 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 28 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 29 – Recent scour protection works at proposed Murray River crossing (2014)



Photo 30 – NSW side at proposed Murray River crossing (2014)



Photo 31 – NSW side at proposed Murray River crossing (2014)



Photo 32 – NSW side at proposed Murray River crossing (2014)



Photo 33 - View from Percotta Rd looking East to Cobbs Hwy intersection (2011)



Photo 34 View from intersection of Percotta Rd & Cobbs Hwy looking North along Cobbs Hwy (2011)



Photo 35 - View from intersection of Percotta Rd & Cobbs Hwy looking South along Cobbs Hwy (2011)



Photo 36 - View from Lion park (looking towards Cobbs Hwy (2011)



Photo 37 - View from lion park (looking towards Boundary Road) (2011)



Photo 38 - Along proposed corridor south of Boundary Rd (2011)



Photo 39 - Along corridor approximately 150m south of Boundary Rd (2011)

APPENDIX E

Possible Ground Improvement Options

Possible Ground Improvement Options

Ground improvement methods	Brief Details	Disadvantage/ Associated risks
Controlled Modulus Column (CMC)	Controlled Modulus Columns (CMC) are installed as rigid inclusions in the soil for the purpose of enhancing the global modulus of otherwise incompetent soil. CMC are formed by rotary techniques using an auger designed to displace the soil laterally during installation. CMC are installed in a 2.0 m grid pattern (average) to a depth of 7.0 m below ground level. A layer of crushed rock, geotextile and geogrid as working platform is required.	<ul style="list-style-type: none"> CMC piles may not attain sufficient capacity to prevent settlement of the embankment.
Wick drain	Wick drains are closely-spaced artificial vertical drainage paths to which the pore water can flow, thus decreasing the consolidation time. Wick drains are installed with specialized equipment consisting of a vertical mast housing a special installation mandrel. The mandrel, containing the wick drain, is hydraulically pushed or vibrated into the ground to the desired treatment depth, typically to the bottom of the soft-soil stratum. The wick drains to be installed in 1.2 m spacing in a triangular pattern to a depth of 7.0 m below ground level. A surcharge layer of 4.0 m thick will be required for a period ranging from 6 to 8 months. A working platform consisting of a layer of crushed rock, geotextile and geogrid is required.	<ul style="list-style-type: none"> Time consuming, surcharging time may be longer than expected
Stone Columns (Geopier)	Stone Columns are constructed by densely compacting successive thin lifts of high quality crushed rock in a 400 to 800mm cavity of varying depth using patented ramming equipment. The vertical ramming action increases the lateral stress and improves the soils surrounding the cavity, which results in foundation settlement control and greater bearing pressures for design. The stone columns to be installed in 2.0m spacing (average) in a grid pattern to a depth of 7.0 m below ground level. A working platform consisting of a layer of crushed rock, geotextile and geogrid is required.	<ul style="list-style-type: none"> Stone columns may not attain sufficient capacity to prevent settlement of the embankment. vibration generated from driving of the stone column may affect properties and bridges nearby. Vibrations from driving of stone columns may damage existing services (overhead power and optic fibre cable etc.)
Injected piles or Continuous Flight Auger (CFA)	A pile driving rig is used to auger into insitu materials at depths of up to 7 m below the ground level. Lime, cement or grout is injected and mixed with the soil as the auger is extracted. The CFA pile is approximately 450 mm in diameter. A working platform consisting of a layer of crushed rock, geotextile and geogrid is required.	<ul style="list-style-type: none"> Injected piles may not attain sufficient capacity to prevent settlement of the pavement. Longer time will be required for piles to achieve their ultimate strength if the groundwater is present.
EPS Fill	Use lightweight expanded polystyrene (EPS) as fill for embankment construction.	<ul style="list-style-type: none"> EPS should be anchored to avoid floatation. Damage to EPS posed by hydro-carbon spills