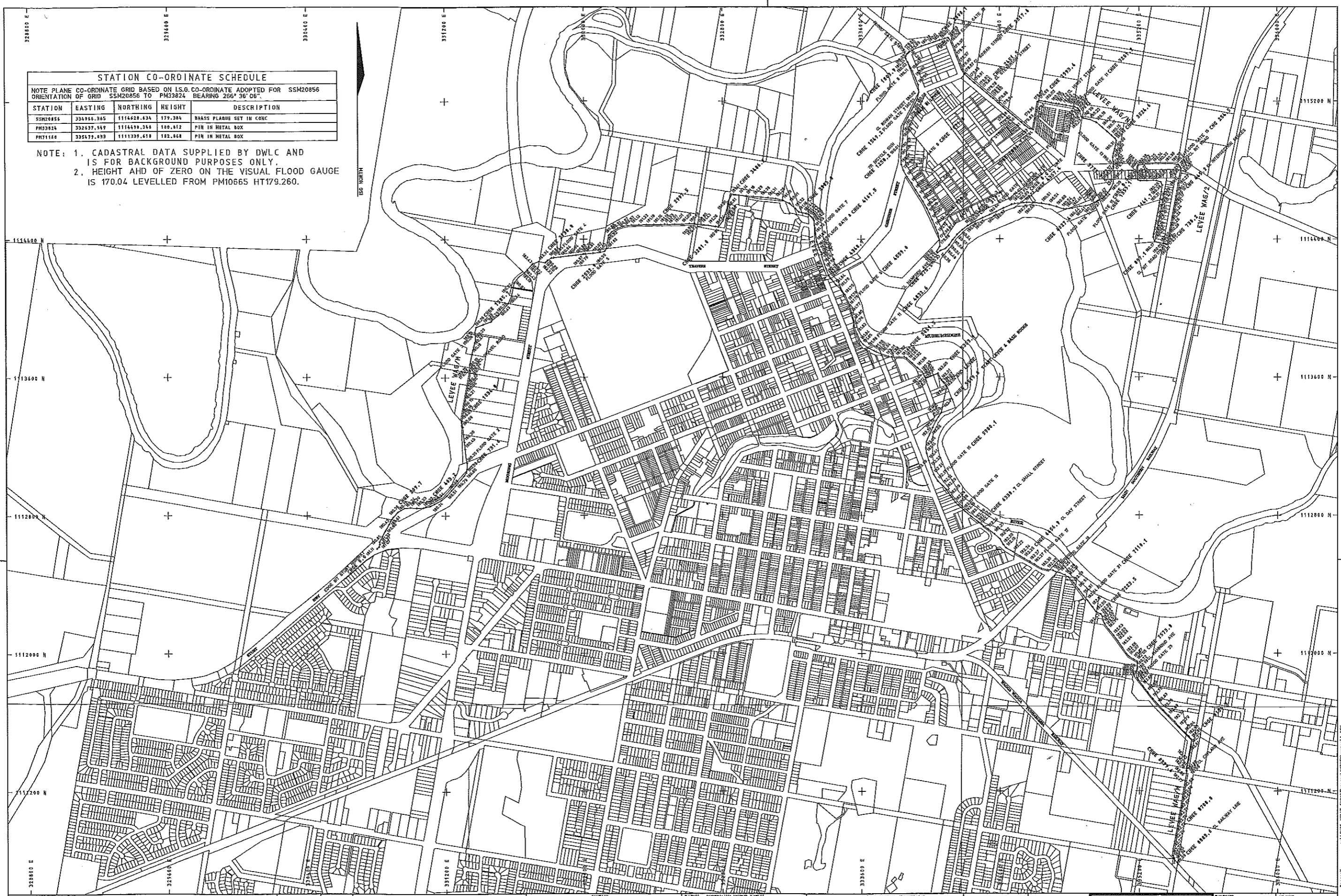


## Attachments

STATION CO-ORDINATE SCHEDULE				
NOTE PLANE CO-ORDINATE GRID BASED ON I.S.G. CO-ORDINATE ADOPTED FOR SSM20856 ORIENTATION OF GRID SSM20856 TO PM33824 BEARING 266° 36' 06"				
STATION	EASTING	NORTHING	HEIGHT	DESCRIPTION
SM20856	334966.365	1114628.634	179.384	BRASS PLAGUE SET IN CONC
PM33824	332437.519	1114619.359	180.412	PIN IN METAL BOX
PM1166	335179.039	1111399.619	182.944	PIN IN METAL BOX

NOTE: 1. CADASTRAL DATA SUPPLIED BY DWLC AND IS FOR BACKGROUND PURPOSES ONLY.  
 2. HEIGHT AHD OF ZERO ON THE VISUAL FLOOD GAUGE IS 170.04 LEVELLED FROM PM10665 HT179.260.



MK	DETAILS OF AMENDMENTS	APPROVED	DATE	<p>CAUTION</p> <p>THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:500 FOR THE PURPOSE OF FLOOD MITIGATION AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE.</p> <p>REDUCTION RATIO 1:500 METRES</p>	<p>DATUM AUSTRALIAN HEIGHT DATUM</p> <p>ORDER OF LEVELS SUNDOWN HORIZONTAL BENCH AND UP ZERO ON THE TOTAL PLAIN SCALE IS ONLY LEVELLED FROM POINT WITHIN 200M</p> <p>AZIMUTH ISB ZONE 55/2</p> <p>FOLDER A2024 LB 3275 FB 3052</p> <p>L.O.A. WALCHA</p> <p>SURVEYOR O. BURNETT</p> <p>SURVEY DATE FEB/2002 FILE R2821/00001</p> <p>CADD P. OUYEN</p>	<p>SERVISING &amp; SPATIAL INFORMATION</p> <p>LEVEL 14 VICERIA 881/01/01/01</p> <p>1 - 21 BARRON PLACE, STONEY RIDGE 2040</p> <p>TEL: (02) 9312 3307 FAX: (02) 9312 3322</p> <p>VERIFIED D. BURNETT 25/07/2002</p> <p>VALIDATED G. McH. WARE 29/07/2002</p> <p>APPROVED MANAGER G. McH. WARE 29/07/2002</p>	<p>NSW FLOOD LEVEES</p> <p>WAGGA WAGGA</p> <p>LEVEE CREST SURVEY</p>	<p>PLAN/NO 54XXX</p> <p>SCALE 1:8000</p> <p>DESKED</p> <p>SHAWD</p>	<p>WORKSHEET 2</p> <p>SHEET NO 1</p>

**Wagga Wagga Levee Freeboard Study**  
2010 Revised 27/10/2010

**1.Design Wind Speed**

Wagga Wagga Zone A1

**Wind speed adopted from AS/NZS1170.2**

Vr	Table 3.1 AS/NZS 1170.2		
Md	Table 3.2 AS/NZS 1170.2		
Mz,cat	0.91	<3m with little obstructions, Terrain 2	Section 4
Mh	0.7	D<	Section 4
Ms	1		Section 4

**Design Wind Speed in Meter Per Second**

	N	NE	E	SE	S	SW	W	NW
V1	26	15	13	13	13	14	16	17
V5	32	18	16	16	16	17	19	20
V10	34	19	17	17	17	18	21	22
V20	37	21	19	19	19	20	22	24
V25	37	21	19	19	19	20	22	24
V50	39	22	20	20	20	21	24	25
V100	41	24	21	21	21	22	25	26
V200	43	25	22	22	22	23	26	27
V500	45	26	23	23	23	24	27	29
V1000	46	26	23	23	23	25	28	29
V2000	48	28	24	24	24	26	29	31

Note: Assuming 1 year ARI Design wind speed

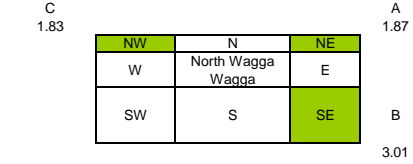
**Design Wind Speed in Miles Per Hour**

	N	NE	E	SE	S	SW	W	NW
V1	33.3	29.6	29.6	29.6	31.5	35.2	37.0	35.2
V5	41.0	36.5	36.5	36.5	38.8	43.3	45.6	43.3
V10	43.6	38.8	38.8	38.8	41.2	46.0	48.4	46.0
V20	47.5	42.2	42.2	42.2	44.8	50.1	52.7	50.1
V25	47.5	42.2	42.2	42.2	44.8	50.1	52.7	50.1
V50	50.0	44.5	44.5	44.5	47.2	52.8	55.6	52.8
V100	52.6	46.7	46.7	46.7	49.7	55.5	58.4	55.5
V200	55.1	49.0	49.0	49.0	52.1	58.2	61.3	58.2
V500	57.7	51.3	51.3	51.3	54.5	60.9	64.1	60.9
V1000	59.0	52.4	52.4	52.4	55.7	62.3	65.5	62.3
V2000	61.6	54.7	54.7	54.7	58.1	65.0	68.4	65.0

**2.North Wagga Wagga - Fetch Distance (km)**

**Wave Height Calculation**

Using 1 yr ARI Wind



Wind Direction	Fetch Distance (Km)	Fetch Distance (miles)	Fetch ft	U miles h	Hs, feet (from notes)	10% of High Wave, 1.27Hs	Wave Height (m)	Fetch	Checking Water Depth				Shallow Reservoir		
									Wave period (T) sec	L = 1.56T <sup>2</sup> (feet)	Water Depth	Ht ft	1.27 Hs	wave height (m)	
N	0.0					0	0.00								
NE	1.87	1.2	6135.171	29.6	1.3	1.56	0.48	A	2.3	2.5	1.26	1.10	1.40	0.43	
E	0.0					0	0.00								
SE	3.01	1.9	9875.328	29.6	1.6	1.92	0.59	B	2.5	3.0	1.49	1.10	1.40	0.43	
S	0.0					0	0.00								
SW	0.0					0	0.00								
W	0.0					0	0.00								
NW	1.83	1.1	6003.937	35.2	1.45	1.74	0.53	C	2.48	2.9	1.46	1.25	1.59	0.48	

Refer to 20 Yr ARI Inundation Plan for the localities of the Wind fetch

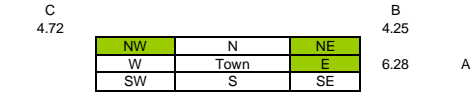
**Notes:**  
Hs obtained from Robin Fells, "Geotechnical engineering of embankment dams"  
For normal freeboard computation, the runup should be calculated using average of the highest 10% of waves, which is 1.27 Hs  
Shallow water wave assumed constant depth of 5 feet

Deep reservoir when water depth D > 0.5L  
North Wagga Levee is considered as "Deep Reservoir"

**3.Wagga Wagga Main Town - Fetch Distance (km)**

**Wave Height Calculation**

Using 1 yr ARI Wind



Wind Direction	Fetch Distance (Km)	Fetch Distance (miles)	Fetch ft	U miles h	Hs, feet (from notes)	10% of High Wave, 1.27Hs	Wave Height (m)	Fetch	Checking Water Depth				Shallow Reservoir		
									Wave period (T) sec	L = 1.56T <sup>2</sup> (feet)	Water Depth	Ht ft	1.27 Hs	wave height (m)	
N	0.0					0	0.00								
NE	4.25	2.6	13943.57	29.6	2	2.4	0.73	B	2.85	3.9	1.93	1.25	1.59	0.48	
E	6.28	3.9	20603.67	29.6	2.4	2.88	0.88	A	3.2	4.9	2.43	1.45	1.84	0.56	
SE	0.0					0	0.00								
S	0.0					0	0.00								
SW	0.0					0	0.00								
W	0.0					0	0.00								
NW	4.72	2.9	15485.56	35.2	2.5	3	0.91	C	3.2	4.9	2.43	1.50	1.91	0.58	

Refer to 100 Yr ARI Inundation Plan for the localities of the Wind fetch

**Notes:**  
Hs obtained from Robin Fells, "Geotechnical engineering of embankment dams"  
For normal freeboard computation, the runup should be calculated using average of the highest 10% of waves, which is 1.27 Hs

Main Wagga Levee is considered as "Deep Reservoir"

**Fetch Distance Calculation**

Location	Angle	X (km)	Cos (a)	Xi Cos (a)	Sum Xi cos (a)	Sum cos (a)	Effective Fetch (km)
A	45	3.6	2.15	0.707107	1.519752	14.725	7.890
	33.75	3.9	2.328	0.831	1.936		
	22.25	3.7	2.209	0.926	2.044		
	11.25	3.3	1.970	0.981	1.932		
	0	2.5	1.493	1.000	1.493		
	11.25	2.8	1.672	0.981	1.640		
	22.25	3	1.791	0.926	1.658		
	33.75	3	1.791	0.831	1.489		
	45	2.4	1.433	0.707	1.013		
B	45	6.1	3.642	0.707	2.575	23.744	7.890
	33.75	4	2.388	0.831	1.986		
	22.25	3.1	1.851	0.926	1.713		
	11.25	7.2	4.299	0.981	4.216		
	0	6.6	3.940	1.000	3.940		
	11.25	7.4	4.418	0.981	4.333		
	22.25	4	2.388	0.926	2.210		
	33.75	3.2	1.910	0.831	1.588		
	45	2.8	1.672	0.707	1.182		
C	45	3.6	2.149	0.707	1.520	14.433	7.890
	33.75	3.1	1.851	0.831	1.539		
	22.25	3	1.791	0.926	1.658		
	11.25	3	1.791	0.981	1.757		
	0	3.1	1.851	1.000	1.851		
	11.25	3	1.791	0.981	1.757		
	22.25	2.8	1.672	0.926	1.547		
	33.75	3.1	1.851	0.831	1.539		
	45	3	1.791	0.707	1.266		

**Fetch Distance Calculation**

Location	Angle	X (km)	Cos (a)	Xi Cos (a)	Sum Xi cos (a)	Sum cos (a)	Effective Fetch (km)
A	45	5.6	3.343	0.707	2.364	49.563	7.890
	33.75	5.3	3.164	0.831	2.631		
	22.25	5.6	3.343	0.926	3.094		
	11.25	11.6	6.925	0.981	6.792		
	0	15.4	9.194	1.000	9.194		
	11.25	17.7	10.567	0.981	10.364		
	22.25	11.6	6.925	0.926	6.410		
	33.75	11.6	6.925	0.831	5.758		
	45	7	4.179	0.707	2.955		
B	45	5	2.985	0.707	2.111	33.501	7.890
	33.75	5.9	3.522	0.831	2.929		
	22.25	5.3	3.164	0.926	2.929		
	11.25	4.8	2.866	0.981	2.811		
	0	5	2.985	1.000	2.985		
	11.25	4.2	2.507	0.981	2.459		
	22.25	4.2	2.507	0.926	2.321		
	33.75	16.1	9.612	0.831	7.992		
	45	16.5	9.851	0.707	6.966		
C	45	6	3.582	0.707	2.533	37.215	7.890
	33.75	7	4.179	0.831	3.475		
	22.25	9.8	5.851	0.926	5.415		
	11.25	12	7.164	0.981	7.027		
	0	11.5	6.866	1.000	6.866		
	11.25	7.1	4.239	0.981	4.157		
	22.25	6.2	3.701	0.926	3.426		
	33.75	4.7	2.806	0.831	2.333		
	45	4.7	2.806	0.707	1.984		