

PCBs in Soil		
Our Reference		367555-43
Your Reference	UNITS	BH112
Depth		0.1-0.2
Date Sampled		26/11/2024
Type of sample		Soil
Date extracted	-	28/11/2024
Date analysed	-	02/12/2024
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate 2-Fluorobiphenyl	%	105

Misc Soil - Inorg						
Our Reference		367555-1	367555-6	367555-11	367555-16	367555-21
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH105
Depth		0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024	29/11/2024	29/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg						
Our Reference		367555-31	367555-36	367555-37	367555-40	367555-42
Your Reference	UNITS	BH107	BH108	BH109	BH110	BH111
Depth		0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	26/11/2024	21/11/2024	21/11/2024	26/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg		
Our Reference		367555-43
Your Reference	UNITS	BH112
Depth		0.1-0.2
Date Sampled		26/11/2024
Type of sample		Soil
Date prepared	-	29/11/2024
Date analysed	-	29/11/2024
Total Phenolics (as Phenol)	mg/kg	<5

Acid Extractable metals in soil						
Our Reference		367555-1	367555-3	367555-4	367555-6	367555-11
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH103
Depth		0.1-0.2	0.9-1	1.4-1.5	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Arsenic	mg/kg	5	5	6	8	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	0.4
Chromium	mg/kg	14	5	4	15	19
Copper	mg/kg	28	6	6	25	28
Lead	mg/kg	51	10	5	110	95
Mercury	mg/kg	0.2	<0.1	<0.1	0.2	0.2
Nickel	mg/kg	13	3	<1	10	12
Zinc	mg/kg	110	36	3	160	200

Acid Extractable metals in soil						
Our Reference		367555-12	367555-16	367555-18	367555-19	367555-21
Your Reference	UNITS	BH103	BH104	BH104	BH104	BH105
Depth		0.4-0.5	0.1-0.2	0.9-1	1.4-1.5	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Arsenic	mg/kg	7	7	9	<4	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	12	15	6	2	19
Copper	mg/kg	14	19	5	2	27
Lead	mg/kg	36	64	12	3	82
Mercury	mg/kg	0.2	0.1	0.1	<0.1	0.2
Nickel	mg/kg	8	9	4	1	11
Zinc	mg/kg	35	100	11	4	160

Acid Extractable metals in soil						
Our Reference		367555-23	367555-26	367555-28	367555-29	367555-31
Your Reference	UNITS	BH105	BH106	BH106	BH106	BH107
Depth		0.9-1	0.1-0.2	0.9-1	1.4-1.5	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Arsenic	mg/kg	13	<4	8	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	12	8	9	3	15
Copper	mg/kg	15	120	10	4	43
Lead	mg/kg	19	40	14	5	20
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	9	7	7	2	55
Zinc	mg/kg	22	73	19	9	56

Acid Extractable metals in soil						
Our Reference		367555-32	367555-34	367555-35	367555-36	367555-37
Your Reference	UNITS	BH107	BH107	BH107	BH108	BH109
Depth		0.4-0.5	1.4-1.5	1.9-2	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	26/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Arsenic	mg/kg	6	5	8	<4	8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	18	5	12	7	8
Copper	mg/kg	22	6	26	34	53
Lead	mg/kg	73	8	28	31	23
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	12	4	14	9	29
Zinc	mg/kg	84	9	56	41	200

Acid Extractable metals in soil						
Our Reference		367555-38	367555-40	367555-41	367555-42	367555-43
Your Reference	UNITS	BH109	BH110	BH110	BH111	BH112
Depth		0.4-0.5	0.1-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	26/11/2024	26/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Arsenic	mg/kg	7	<4	4	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	12	5	13	11	14
Copper	mg/kg	26	9	11	3	18
Lead	mg/kg	26	22	34	15	22
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	19	3	9	7	8
Zinc	mg/kg	93	34	110	31	58

Acid Extractable metals in soil				
Our Reference		367555-44	367555-45	367555-46
Your Reference	UNITS	BH112	BD01/20241121	BD02/20241121
Depth		0.1-0.2	-	-
Date Sampled		26/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	29/11/2024	29/11/2024	29/11/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024
Arsenic	mg/kg	<4	7	7
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	11	19	10
Copper	mg/kg	11	28	14
Lead	mg/kg	24	96	14
Mercury	mg/kg	<0.1	0.2	<0.1
Nickel	mg/kg	4	12	6
Zinc	mg/kg	490	200	33

Moisture						
Our Reference		367555-1	367555-3	367555-4	367555-6	367555-11
Your Reference	UNITS	BH101	BH101	BH101	BH102	BH103
Depth		0.1-0.2	0.9-1	1.4-1.5	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Moisture	%	13	6.2	18	8.9	17

Moisture						
Our Reference		367555-12	367555-16	367555-18	367555-19	367555-21
Your Reference	UNITS	BH103	BH104	BH104	BH104	BH105
Depth		0.4-0.5	0.1-0.2	0.9-1	1.4-1.5	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Moisture	%	12	5.9	1.7	0.4	7.2

Moisture						
Our Reference		367555-23	367555-26	367555-28	367555-29	367555-31
Your Reference	UNITS	BH105	BH106	BH106	BH106	BH107
Depth		0.9-1	0.1-0.2	0.9-1	1.4-1.5	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Moisture	%	12	2.2	2.3	0.9	0.3

Moisture						
Our Reference		367555-32	367555-34	367555-35	367555-36	367555-37
Your Reference	UNITS	BH107	BH107	BH107	BH108	BH109
Depth		0.4-0.5	1.4-1.5	1.9-2	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	26/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Moisture	%	4.6	17	15	11	9.7

Moisture						
Our Reference		367555-38	367555-40	367555-41	367555-42	367555-43
Your Reference	UNITS	BH109	BH110	BH110	BH111	BH112
Depth		0.4-0.5	0.1-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	26/11/2024	26/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024	28/11/2024	28/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024	29/11/2024	29/11/2024
Moisture	%	8.3	3.7	6.7	4.8	11

Moisture				
Our Reference		367555-44	367555-45	367555-46
Your Reference	UNITS	BH112	BD01/20241121	BD02/20241121
Depth		0.1-0.2	-	-
Date Sampled		26/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	28/11/2024	28/11/2024	28/11/2024
Date analysed	-	29/11/2024	29/11/2024	29/11/2024
Moisture	%	12	17	13

Misc Inorg - Soil					
Our Reference		367555-1	367555-4	367555-26	367555-29
Your Reference	UNITS	BH101	BH101	BH106	BH106
Depth		0.1-0.2	1.4-1.5	0.1-0.2	1.4-1.5
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024
pH 1:5 soil:water	pH Units	7.3	6.6	6.3	6.6

CEC					
Our Reference		367555-1	367555-4	367555-26	367555-29
Your Reference	UNITS	BH101	BH101	BH106	BH106
Depth		0.1-0.2	1.4-1.5	0.1-0.2	1.4-1.5
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Date analysed	-	02/12/2024	02/12/2024	02/12/2024	02/12/2024
Exchangeable Ca	meq/100g	26	4.2	4.9	2.5
Exchangeable K	meq/100g	0.6	0.2	0.2	0.1
Exchangeable Mg	meq/100g	1.4	1.5	1.0	0.8
Exchangeable Na	meq/100g	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	meq/100g	28	6.0	6.2	3.4

Asbestos ID - soils NEPM						
Our Reference		367555-1	367555-3	367555-6	367555-7	367555-11
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.1-0.2	0.9-1	0.1-0.2	0.4-0.5	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024
Sample mass tested	g	644.59	738.83	526.81	554.58	482.65
Sample Description	-	Brown coarse-grained soil & rocks				
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected				
Total Asbestos ^{#1}	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected				
ACM >7mm Estimation*	g	-	-	-	-	-
FA and AF Estimation*	g	-	-	-	-	-
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil

Asbestos ID - soils NEPM						
Our Reference		367555-12	367555-13	367555-16	367555-18	367555-21
Your Reference	UNITS	BH103	BH103	BH104	BH104	BH105
Depth		0.4-0.5	0.9-1	0.1-0.2	0.9-1	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024
Sample mass tested	g	615.51	568.97	545.75	666.86	575.22
Sample Description	-	Brown coarse-grained soil & rocks				
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected				
Total Asbestos ^{#1}	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected				
ACM >7mm Estimation*	g	-	-	-	-	-
FA and AF Estimation*	g	-	-	-	-	-
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil

Asbestos ID - soils NEPM						
Our Reference		367555-23	367555-26	367555-28	367555-31	367555-32
Your Reference	UNITS	BH105	BH106	BH106	BH107	BH107
Depth		0.9-1	0.1-0.2	0.9-1	0.1-0.2	0.4-0.5
Date Sampled		21/11/2024	21/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024
Sample mass tested	g	632.41	698.74	439.02	863.1	517.11
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks			
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	Chrysotile asbestos detected Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos ^{#1}	g/kg	<0.1	<0.1	<0.1	<0.1	0.2026
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	Chrysotile			
ACM >7mm Estimation*	g	-	-	-	-	0.1048
FA and AF Estimation*	g	-	-	-	-	-
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos comments	-	Nil	Nil	Nil	Nil	YES

Asbestos ID - soils NEPM						
Our Reference		367555-34	367555-36	367555-37	367555-38	367555-39
Your Reference	UNITS	BH107	BH108	BH109	BH109	BH109
Depth		1.4-1.5	0.1-0.2	0.1-0.2	0.4-0.5	0.9-1
Date Sampled		21/11/2024	26/11/2024	21/11/2024	21/11/2024	21/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024
Sample mass tested	g	551.79	609.22	581.38	488.13	617.75
Sample Description	-	Brown coarse-grained soil & rocks	Brown mulch & soil			
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected				
Total Asbestos ^{#1}	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected				
ACM >7mm Estimation*	g	-	-	-	-	-
FA and AF Estimation*	g	-	-	-	-	-
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil

Asbestos ID - soils NEPM						
Our Reference		367555-40	367555-41	367555-42	367555-43	367555-44
Your Reference	UNITS	BH110	BH110	BH111	BH112	BH112
Depth		0.1-0.2	0.4-0.5	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024	26/11/2024	26/11/2024	26/11/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024
Sample mass tested	g	898.13	862.04	837.35	576.41	641.75
Sample Description	-	Brown coarse-grained soil & rocks				
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected				
Total Asbestos ^{#1}	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected				
ACM >7mm Estimation*	g	-	-	-	-	-
FA and AF Estimation*	g	-	-	-	-	-
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil

Asbestos ID - materials		
Our Reference		367555-49
Your Reference	UNITS	BH108
Depth		0.1-0.2
Date Sampled		26/11/2024
Type of sample		Material
Date analysed	-	29/11/2024
Mass / Dimension of Sample	-	38x33x6mm
Sample Description	-	Beige fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected
Trace Analysis	-	[NT]

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	<p>Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004.</p> <p>Results reported denoted with * are outside our scope of NATA accreditation.</p> <p>NOTE#1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF relative to the sample mass tested)</p> <p>NOTE#2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.</p> <p>Estimation = Estimated asbestos weight</p> <p>Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.</p>
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.
Metals-021	Determination of Mercury by Cold Vapour AAS.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date extracted	-			28/11/2024	1	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			02/12/2024	1	02/12/2024	02/12/2024		02/12/2024	02/12/2024
TRH C ₆ - C ₉	mg/kg	25	Org-023	<25	1	<25	<25	0	119	107
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	<25	1	<25	<25	0	119	107
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	116	101
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	120	106
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	122	112
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	118	108
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	119	110
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	102	1	97	95	2	108	96

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	367555-36
Date extracted	-			[NT]	21	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			[NT]	21	02/12/2024	02/12/2024		02/12/2024	02/12/2024
TRH C ₆ - C ₉	mg/kg	25	Org-023	[NT]	21	<25	<25	0	119	111
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	[NT]	21	<25	<25	0	119	111
Benzene	mg/kg	0.2	Org-023	[NT]	21	<0.2	<0.2	0	117	109
Toluene	mg/kg	0.5	Org-023	[NT]	21	<0.5	<0.5	0	119	112
Ethylbenzene	mg/kg	1	Org-023	[NT]	21	<1	<1	0	122	114
m+p-xylene	mg/kg	2	Org-023	[NT]	21	<2	<2	0	118	110
o-Xylene	mg/kg	1	Org-023	[NT]	21	<1	<1	0	120	112
Naphthalene	mg/kg	1	Org-023	[NT]	21	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	21	95	98	3	106	104

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	28/11/2024	28/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	02/12/2024	02/12/2024		[NT]	[NT]
TRH C ₆ - C ₉	mg/kg	25	Org-023	[NT]	40	<25	<25	0	[NT]	[NT]
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	[NT]	40	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	40	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	40	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	40	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	40	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	40	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	40	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	40	104	103	1	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date extracted	-			28/11/2024	1	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			01/12/2024	1	30/11/2024	01/12/2024		30/11/2024	01/12/2024
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	<50	1	<50	<50	0	92	93
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	<100	1	<100	<100	0	97	125
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	<100	1	<100	<100	0	100	112
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	<50	1	<50	<50	0	92	93
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	<100	1	<100	<100	0	97	125
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	<100	1	<100	<100	0	100	112
Surrogate o-Terphenyl	%		Org-020	91	1	98	99	1	87	91

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	367555-36
Date extracted	-			[NT]	21	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			[NT]	21	30/11/2024	30/11/2024		01/12/2024	01/12/2024
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	[NT]	21	<50	<50	0	100	85
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	[NT]	21	<100	<100	0	106	80
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	[NT]	21	<100	<100	0	114	111
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	[NT]	21	<50	<50	0	100	85
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	[NT]	21	<100	<100	0	106	80
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	[NT]	21	<100	<100	0	114	111
Surrogate o-Terphenyl	%		Org-020	[NT]	21	93	94	1	90	88

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	28/11/2024	28/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	01/12/2024	01/12/2024		[NT]	[NT]
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	[NT]	40	<50	<50	0	[NT]	[NT]
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	[NT]	40	<100	<100	0	[NT]	[NT]
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	[NT]	40	<100	<100	0	[NT]	[NT]
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	[NT]	40	<50	<50	0	[NT]	[NT]
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	[NT]	40	<100	<100	0	[NT]	[NT]
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	[NT]	40	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	40	95	94	1	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: PAHs in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date extracted	-			28/11/2024	1	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			02/12/2024	1	03/12/2024	03/12/2024		02/12/2024	02/12/2024
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	90
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	106
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	92
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.2	67	106	#
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	0.2	0.4	67	106	#
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.2	0.4	67	104	#
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.2	67	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	0.2	0.2	0	92	72
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	0.2	0.4	67	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	0.2	0.2	0	84	81
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	0.2	67	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.2	67	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	124	1	102	103	1	118	101

QUALITY CONTROL: PAHs in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	367555-36
Date extracted	-			[NT]	21	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			[NT]	21	02/12/2024	02/12/2024		02/12/2024	02/12/2024
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	90	96
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	106	110
Fluorene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	92	94
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	21	0.2	0.1	67	87	107
Anthracene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	21	0.4	0.4	0	82	117
Pyrene	mg/kg	0.1	Org-022/025	[NT]	21	0.4	0.4	0	83	112
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	21	0.2	0.2	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	21	0.2	0.2	0	72	96
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	21	0.4	0.4	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	21	0.3	0.3	0	81	135
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	21	0.2	0.2	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	21	0.2	0.2	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	21	108	111	3	101	108

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: PAHs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	28/11/2024	28/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	02/12/2024	02/12/2024		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	40	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	40	0.08	0.07	13	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	40	109	110	1	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Organochlorine Pesticides in soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date extracted	-			28/11/2024	1	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			02/12/2024	1	03/12/2024	03/12/2024		02/12/2024	02/12/2024
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	106	102
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	106	102
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	102	96
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	88
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	112	114
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	102
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	112	108
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	102	110
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	114	112
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	106	104
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	127	1	104	105	1	119	110

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	21	28/11/2024	28/11/2024		28/11/2024	[NT]
Date analysed	-			[NT]	21	02/12/2024	02/12/2024		02/12/2024	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	94	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	98	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	88	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	78	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	104	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	92	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	96	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	102	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	102	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	102	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	21	111	113	2	109	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	28/11/2024	28/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	02/12/2024	02/12/2024		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	40	115	114	1	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Organophosphorus Pesticides in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date extracted	-			28/11/2024	1	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			02/12/2024	1	03/12/2024	03/12/2024		02/12/2024	02/12/2024
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	110
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	98
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	124
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	120
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	100
Fenthion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	116
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	114
Phosalone	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	127	1	104	105	1	119	110

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	21	28/11/2024	28/11/2024		28/11/2024	[NT]
Date analysed	-			[NT]	21	02/12/2024	02/12/2024		02/12/2024	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	104	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	90	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	124	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	116	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	90	[NT]
Fenthion	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	114	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Methodathion	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	103	[NT]
Phosalone	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	21	111	113	2	109	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	28/11/2024	28/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	02/12/2024	02/12/2024		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Methodathion	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	40	115	114	1	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: PCBs in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date extracted	-			28/11/2024	1	28/11/2024	28/11/2024		28/11/2024	28/11/2024
Date analysed	-			02/12/2024	1	03/12/2024	03/12/2024		02/12/2024	02/12/2024
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	111	91
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	120	1	99	101	2	115	105

QUALITY CONTROL: PCBs in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	21	28/11/2024	28/11/2024		28/11/2024	[NT]
Date analysed	-			[NT]	21	02/12/2024	02/12/2024		02/12/2024	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	80	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	21	105	105	0	103	[NT]

QUALITY CONTROL: PCBs in Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	28/11/2024	28/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	02/12/2024	02/12/2024		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	40	108	106	2	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Misc Soil - Inorg				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	367555-6
Date prepared	-			29/11/2024	1	28/11/2024	28/11/2024		29/11/2024	29/11/2024
Date analysed	-			29/11/2024	1	29/11/2024	29/11/2024		29/11/2024	29/11/2024
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	108	110

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	367555-6
Date prepared	-			29/11/2024	1	29/11/2024	29/11/2024		29/11/2024	29/11/2024
Date analysed	-			02/12/2024	1	02/12/2024	02/12/2024		02/12/2024	02/12/2024
Arsenic	mg/kg	4	Metals-020	<4	1	5	5	0	119	104
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	108	92
Chromium	mg/kg	1	Metals-020	<1	1	14	17	19	109	99
Copper	mg/kg	1	Metals-020	<1	1	28	29	4	110	108
Lead	mg/kg	1	Metals-020	<1	1	51	52	2	109	93
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.2	0.3	40	118	130
Nickel	mg/kg	1	Metals-020	<1	1	13	15	14	112	99
Zinc	mg/kg	1	Metals-020	<1	1	110	120	9	114	97

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	367555-36
Date prepared	-			[NT]	21	29/11/2024	29/11/2024		29/11/2024	29/11/2024
Date analysed	-			[NT]	21	02/12/2024	02/12/2024		02/12/2024	02/12/2024
Arsenic	mg/kg	4	Metals-020	[NT]	21	7	7	0	120	108
Cadmium	mg/kg	0.4	Metals-020	[NT]	21	<0.4	0.4	0	109	95
Chromium	mg/kg	1	Metals-020	[NT]	21	19	19	0	111	107
Copper	mg/kg	1	Metals-020	[NT]	21	27	28	4	112	113
Lead	mg/kg	1	Metals-020	[NT]	21	82	86	5	110	107
Mercury	mg/kg	0.1	Metals-021	[NT]	21	0.2	0.2	0	109	115
Nickel	mg/kg	1	Metals-020	[NT]	21	11	11	0	112	109
Zinc	mg/kg	1	Metals-020	[NT]	21	160	170	6	116	111

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	40	29/11/2024	29/11/2024		[NT]	[NT]
Date analysed	-			[NT]	40	02/12/2024	02/12/2024		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	40	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	40	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	40	5	5	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	40	9	11	20	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	40	22	23	4	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	40	3	3	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	40	34	37	8	[NT]	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Misc Inorg - Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			02/12/2024	4	02/12/2024	02/12/2024		02/12/2024	[NT]
Date analysed	-			02/12/2024	4	02/12/2024	02/12/2024		02/12/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	4	6.6	6.4	3	100	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: CEC				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			02/12/2024	[NT]	[NT]	[NT]	[NT]	02/12/2024	[NT]
Date analysed	-			02/12/2024	[NT]	[NT]	[NT]	[NT]	02/12/2024	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PAHs in Soil - # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in sample 367555-6 have caused interference.

MISC_INORG_DRY: pH

Samples were out of the recommended holding time for this analysis.

Asbestos-ID in soil: NEPM

This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Factual description of asbestos identified in the soil samples: NEPM

Sample 367555-32; Chrysotile asbestos identified in 0.6985g of fibre cement material >7mm

CERTIFICATE OF ANALYSIS 367555-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Michael Le
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>231248.01, Rangihou Reserve Parramatta</u>
Number of Samples	Additional analysis
Date samples received	27/11/2024
Date completed instructions received	05/12/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
 Samples were analysed as received from the client. Results relate specifically to the samples as received.
 Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	12/12/2024
Date of Issue	12/12/2024
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Dragana Tomas, Senior Chemist
 Giovanni Agosti, Group Technical Manager

Authorised By

Nancy Zhang, Laboratory Manager

PAHs in TCLP (USEPA 1311)		
Our Reference		367555-A-6
Your Reference	UNITS	BH102
Depth		0.1-0.2
Date Sampled		21/11/2024
Type of sample		Soil
Date extracted	-	11/12/2024
Date analysed	-	11/12/2024
Naphthalene in TCLP	mg/L	<0.0001
Acenaphthylene in TCLP	mg/L	<0.0001
Acenaphthene in TCLP	mg/L	<0.0001
Fluorene in TCLP	mg/L	<0.0001
Phenanthrene in TCLP	mg/L	<0.0001
Anthracene in TCLP	mg/L	<0.0001
Fluoranthene in TCLP	mg/L	<0.0001
Pyrene in TCLP	mg/L	<0.0001
Benzo(a)anthracene in TCLP	mg/L	<0.0001
Chrysene in TCLP	mg/L	<0.0001
Benzo(b)fluoranthene in TCLP	mg/L	<0.0002
Benzo(a)pyrene in TCLP	mg/L	<0.0001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.0001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.0001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.0001
Total +ve PAH's	mg/L	NIL (+)VE
Surrogate <i>p</i> -Terphenyl-d14	%	97

Metals from Leaching Fluid pH 2.9 or 5			
Our Reference		367555-A-6	367555-A-31
Your Reference	UNITS	BH102	BH107
Depth		0.1-0.2	0.1-0.2
Date Sampled		21/11/2024	21/11/2024
Type of sample		Soil	Soil
Date extracted	-	11/12/2024	11/12/2024
Date analysed	-	11/12/2024	11/12/2024
pH of soil for fluid# determ.	pH units	7.8	8.0
pH of soil TCLP (after HCl)	pH units	1.6	1.7
Extraction fluid used		1	1
pH of final Leachate	pH units	4.9	5.0
Lead	mg/L	<0.03	[NA]
Nickel	mg/L	[NA]	0.05

Method ID	Methodology Summary
Inorg-004	<p>Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439.</p> <p>Please note that the mass used may be scaled down from default based on sample mass available.</p> <p>Samples are stored at 2-6oC before and after leachate preparation.</p>
Metals-020	<p>Determination of various metals by ICP-AES following buffer determination as per USEPA 1311 and hence AS 4439.3. Extraction Fluid 1 refers to the pH 5.0 buffer and Extraction Fluid 2 is the pH 2.9 buffer.</p>
Org-022/025	<p>Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.</p>

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			11/12/2024	[NT]	[NT]	[NT]	[NT]	11/12/2024	[NT]
Date analysed	-			11/12/2024	[NT]	[NT]	[NT]	[NT]	11/12/2024	[NT]
Naphthalene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	92	[NT]
Fluorene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	109	[NT]
Phenanthrene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	97	[NT]
Anthracene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	88	[NT]
Pyrene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	97	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	80	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.0002	Org-022/025	<0.0002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	81	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	101	[NT]	[NT]	[NT]	[NT]	96	[NT]

Client Reference: 231248.01, Rangihou Reserve Parramatta

QUALITY CONTROL: Metals from Leaching Fluid pH 2.9 or 5					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			11/12/2024	[NT]	[NT]	[NT]	[NT]	11/12/2024	[NT]
Date analysed	-			11/12/2024	[NT]	[NT]	[NT]	[NT]	11/12/2024	[NT]
Lead	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	92	[NT]
Nickel	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	95	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Appendix J

Data Quality Assurance and Quality Control

1. Field and laboratory data quality assurance and quality control

The field and laboratory data quality assurance and quality control (QA / QC) procedures and results are summarised in the following Table 1. Reference should be made to the field work methodology and the laboratory results / certificates of analysis for further details. The relative percentage difference (RPD) results, along with the other field QC samples are included in at the end of this appendix.

Table 1: Field and laboratory quality control

Item	Evaluation / acceptance criteria	Compliance
Analytical laboratories used	NATA accreditation	C
Holding times	Various based on type of analysis	PC
Intra-laboratory replicates (Table QA1)	10% of primary samples; <30% RPD	PC
Trip Spikes (Table QA2)	1 per sampling event; 60-140% recovery	C
Trip Blanks (Table QA3)	1 per sampling event; <PQL	C
Laboratory / Reagent Blanks	1 per batch; <PQL	C
Laboratory Duplicate	1 per lab batch; As laboratory certificate	C
Matrix Spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Surrogate Spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Control Samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	PC
Standard Operating Procedures (SOP)	Adopting SOP for all aspects of the sampling field work	C

Notes:

C = compliance; PC = partial compliance; NC = non-compliance

The RPD results were all within the acceptable range, with the exception of those indicated in Table QA1 (results in bold). The exceedances are not, however, considered to be of concern given that:

- The actual differences in the concentrations of the replicate pairs where RPD exceedances occurred were typically low;
- The replicate pairs were collected from fill soils which by its nature are heterogeneous;

- Replicates, rather than homogenised duplicates, were used to minimise risk of volatile loss, hence greater analytical variability between replicate pairs can be expected;
- Most of the recorded concentrations were relatively close to the PQL;
- The majority of RPD results from a replicate pair were within the acceptable limits; and
- All other QA / QC parameters met the data quality indicators.

It is noted that spike recovery was not conducted for phenanthrene, fluoranthene and pyrene as the matrix spike was not possible due to the high concentration of analytes in the sample cause interference. However, it is noted that the laboratory RPD for duplicate results was accepted due to the non-homogenous nature of the sample. This is consistent with Douglas' assessment of the fill as heterogenous.

In summary, the QC data is determined to be of sufficient quality to be considered acceptable for the assessment.

2. Data quality indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQI) as outlined in NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013):

- Completeness: a measure of the amount of usable data from a data collection activity;
- Comparability: the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness: the confidence (qualitative) of data representativeness of media present on-site;
- Precision: a measure of variability or reproducibility of data; and
- Accuracy: a measure of closeness of the data to the 'true' value.

Table 2: Data quality indicators

Data quality indicator	Method(s) of achievement
Completeness	Systematic target locations sampled. Sample numbers and spacing compliant with the NSW EPA (2022) sampling guidelines.
	Preparation of borehole logs, sample location plan and chain of custody records.
	Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody.
	Samples analysed for contaminants of potential concern (COPC) identified in the conceptual site model (CSM).
	Completion of chain of custody (COC) documentation.
	NATA accredited laboratory results certificates provided by the laboratory.

Data quality indicator	Method(s) of achievement
	Satisfactory frequency and results for field and laboratory quality control (QC) samples as discussed in Section 1.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project.
	Experienced sampler(s) used.
	Use of NATA registered laboratories, with test methods the same or similar between laboratories.
	Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled.
	Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQO.
	Samples were extracted and analysed within holding times.
	Samples were analysed in accordance with the COC.
Precision	Field staff followed standard operating procedures.
	Acceptable RPD between original samples and replicates.
	Satisfactory results for all other field and laboratory QC samples.
Accuracy	Field staff followed standard operating procedures.
	Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQI have been generally complied with.

3. Conclusion

Based on the results of the field QA and field and laboratory QC, and evaluation against the DQI it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Table QA1: Relative Percentage Difference Results – Soil Sampling

Lab Report No	Sample ID	Depth	Sample Date	Sample Type	Units	Priority metals								Priority PAH			
						Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene ^b	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH
367555	BH101	1.4 - 1.5 m	21/11/24	Soil	mg/kg	6	<0.4	4	6	5	<0.1	<1	3	<1	<0.05	<0.5	<0.05
367555	BD01/20241121	0 m	21/11/24	Soil	mg/kg	7	<0.4	19	28	96	0.2	12	200	<1	0.2	<0.5	2.3
			Difference		mg/kg	1	0	15	22	91	0.1	11	197	0	0.15	0	2.25
			RPD		%	15%	0%	130%	129%	180%	67%	169%	194%	0%	120%	0%	191%
367555	BH107	1.9 - 2 m	21/11/24	Soil	mg/kg	8	<0.4	12	26	28	<0.1	14	56	<1	<0.05	<0.5	0.1
367555	BD02/20241121	0 m	21/11/24	Soil	mg/kg	7	<0.4	10	14	14	<0.1	6	33	<1	<0.05	<0.5	<0.05
			Difference		mg/kg	1	0	2	12	14	0	8	23	0	0	0	0.05
			RPD		%	13%	0%	18%	60%	67%	0%	80%	52%	0%	0%	0%	67%



Table QA2: Trip Blank Results - Soil Sampling

Sample ID	Sample Date	Media Being Sampled	Sample Type	Units	Priority PAH	Priority TRH		TRH	BTEX				Lab Report No
					Naphthalene ^b	TRH C6 - C10	F1 ((C6-C10)-BTEX)	TRH C6 - C9	Benzene	Toluene	Ethylbenzene	Total Xylenes	
TB1	21/11/24	Soil	Soil	mg/kg	<1	<25	<25	<25	<0.2	<0.5	<1	<1	367555



Table QA3: Trip Spike Results – Soil Sampling (% Recovery)

Sample ID	Sample Date	Media Being Sampled	Sample Type	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Lab Report No
TS1	21/11/24	Soil	Soil	97	97	95	96	95	367555



Remediation Action Plan

CBD Cycleway Project: Rangihou Reserve, Parramatta

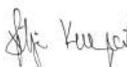
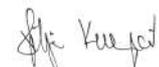
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P37382.011 | Version A | June 2025

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Executive Summary

Progressive Risk Management (PRM) were engaged by City of Parramatta Council (Council or 'the client') to prepare a Remediation Action Plan (RAP) to address known and potential asbestos impacted soils identified within portions of Rangihou Reserve, Parramatta that are associated with the proposed CBD Cycleway Project (the site).

The site is limited to portions of the broader Reserve which are currently being considered for upgrade works as part of the CBD Cycleway project.

The site locality and site layout are provided in **Figure 1** and **Figure 2** respectively and then details of each remediation area (identified as Area A, Area B and Area C) are shown in **Figure 3a, 3b** and **3c**.

PRM understand that as part of the CBD Cycleway Project, Council intends to upgrade the current concrete walking path to a larger multi-use walk and cycling track as well as undertaking various improvements and upgrades to existing infrastructure along the path.

As such, various small-scale earthworks are required to be undertaken into known or suspected asbestos contaminated soils along the length of the upgrade works.

The preferred remedial strategy for the asbestos impacted soils is partial excavation and disposal of contaminated material, and capping of remaining asbestos impacted fill to be managed under a long-term Environmental Management Plan (EMP).

This RAP has been prepared in accordance with current regulatory guidelines made or approved by the NSW Environment Protection Authority (EPA). The objectives of the remediation are to ensure that the areas of soil contamination that are to be impacted during the planned works, are remediated to make the site suitable for continued public open space land use and ensure the site does not pose an unacceptable risk (in regard to contamination) to site users or the surrounding environment.

In order to fulfil the project objectives, the remediation scope of works includes:

- Review of relevant previous investigations and identify areas that require remediation.
- Evaluation of potential remediation options and establish remediation goals and validation acceptance criteria.
- Detail the validation inspections, reporting and quality requirements to be implemented to support the final validation of the site.
- Development of contingency plans to respond to unexpected finds or site incidents associated with the remediation, which may pose risk to human health/environment.

It is considered that following full implementation of this RAP the site will be suitable for the ongoing open space land use.

This Executive Summary should be read in conjunction with the report from which it originated in its entirety.

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Council Technical Specifications

Definitions and Abbreviations

AAM	Asbestos Fibre Air Monitoring
ACC	Asbestos Clearance Certificate
ACM	Asbestos Containing Material
AF/FA	Asbestos Fines/Friable Asbestos
ARCP	Asbestos Removal Control Plan
CoP	City of Parramatta Council
CoPC	Contaminant(s) of Potential Concern
CLM	Contaminated Land Management
CSM	Conceptual Site Model
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ENM	Excavated Natural Material
ESL	Ecological Screening Level
HIL	Health Investigation Level
HSL	Health Screening Level
LAA	Licensed Asbestos Assessor
mBGL	Metres Below Ground Level
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NSW	New South Wales
PRM	Progressive Risk Management
QAQC	Quality Assurance and Quality Control
SAC	Site Assessment Criteria
SEPP	State Environmental Planning Policy
SPR	Source-Pathway-Receptor
WHS	Work Health and Safety
VENM	Virgin Excavated Natural Material

1. Introduction

Progressive Risk Management (PRM) were engaged by City of Parramatta Council (Council or 'the client') to prepare a Remediation Action Plan (RAP) to address known and potential asbestos impacted soils identified within portions of Rangihou Reserve, Parramatta that are associated with the proposed CBD Cycleway Project (the site). The site as defined by this RAP is limited to portions of the broader Reserve which are currently being considered for upgrade works as part of the CBD Cycleway project.

The site locality and site layout are provided in **Figure 1** and **Figure 2** respectively and then details of each remediation area shown in **Figure 3a, 3b** and **3c**.

1.1. Project Background

PRM understand that as part of the CBD Cycleway Project, Council intends to upgrade the current concrete walking path to a larger multi-use walk and cycling track as well as undertaking various improvements and upgrades to existing infrastructure along the path. As such, various earthworks are required to be undertaken into known or suspected contaminated soils along the length of the upgrade works.

1.2. Objectives

The overall objective for the remedial works is to ensure that the site is made suitable (specifically in regard to contamination) to complete the planned upgrade works to the cycleway, and for its continued use as public recreational land. The RAP objectives are to:

- Set remediation goals and identify remediation strategies that will ensure the site is suitable for the upgrade works and for the continued use as public recreational land.
- Documenting the controls required to manage risks to human health during works.
- Demonstrate that the proposed remediation strategy is acceptable and properly addresses site environmental management and contingency planning.
- Provide a sequence of remedial works to inform the nominated contractor of the scope/extent of works required to successfully deliver the remedial works package.
- Detail the requirements for the validation of the remedial works.
- Present a framework for the reporting on the remedial works and validation program.

This RAP is structured to present a clear and concise approach to the effective environmental management and overall environmental improvement works for the site.

1.3. Scope of Works

In order to fulfil the project objectives, the remediation scope of works includes:

- Review relevant previous investigations and identify areas that require remediation.
- Evaluation of potential remediation options and establish remediation goals and validation acceptance criteria.
- Detail the validation inspections, reporting and quality requirements to be implemented to support the final validation of the site.
- Development of contingency plans to respond to unexpected finds or site incidents associated with the remediation, which may pose risk to human health/environment.

1.4. Limitations

This RAP has been prepared to address only those areas of Rangihou Reserve that are to be impacted during the planned upgrade works as part of the CBD Cycleway Project. Groundwater sampling has not been, however, due to the low contaminant concentrations in soils and the generally shallow nature of the planned upgrade works, no further investigation into groundwater or surface water was considered necessary.

2. Regulatory Framework

2.1. Relevant Guidance

Specific legislative requirements, guidelines, industry approved standards and Codes of Practice that were considered in the preparation of this RAP are listed below:

State Legislation and Environmental Planning:

- NSW Contaminated Land Management Act (CLM Act) 1997.
- Protection of the Environment Operations Act (POEO Act) 1997.
- NSW Environmental Planning and Assessment Act (the EP&A Act 1979).
- Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021.

Site Contamination Guidelines:

- NSW EPA Guidelines for Consultants Reporting on Contaminated Land, 2020.
- NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017.
- NSW EPA Guidelines for Consultants Reporting on Contaminated Land, 2020.
- NSW EPA Sampling Design Part 1 Application, 2022.
- National Environment Protection Council (1999, Revised 2013) National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 – Schedule B1 Guideline on Investigation levels for Soil and Groundwater (NEPC, 2013).
- WA Department of Health (DoH) (2021) Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia.

Waste:

- Protection of the Environment Operations (Waste) Regulations (POEO Waste) 2014.
- Waste Avoidance and Resource Recovery Act 2001.
- NSW EPA Waste Classification Guidelines, Part 1 Classifying Waste, 2014.

Asbestos Related:

- NSW Work Health and Safety Act, 2011 (WHS Act 2011).
- NSW Work Health and Safety Regulations, 2017 (WHS Reg 2017), Chapter 8 Asbestos, 2017 (NSW WHS Reg 2017).
- NSW EPA Managing Asbestos in or on Soil, 2014 (NSW EPA 2014).
- SafeWork Australia Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC: 3003(2005)]
- SafeWork Australia – How to Safely Remove Asbestos, August 2019.

Council Planning:

- Parramatta Local Environmental Plan 2023.

2.2. State Environmental Planning Policy

Under the State Environmental Planning Policy (Resilience and Hazards) 2021, the remediation works are considered to be Category 2 (not requiring consent) as:

- The development is not Designated Development, State Significant Infrastructure; or State Significant Development under the EP&A regulation.
- The remediation is not proposed on land identified as critical habitat under the Threatened Species Conservation Act 1995.
- Remediation works is not likely to have a significant effect on threatened species, populations, ecological communities or their habitats.
- The site appears to be in proximity of Category 2 Regulated Land. Council to confirm that the land is confirmed Category 1.
- The remediation does not require consent under another SEPP or a regional environmental plan.

2.3. Compliance Requirements

Disturbance (including removal) of any materials containing asbestos and disposal of any asbestos from the site will need to be completed under an Asbestos Removal Control Plan (ARCP) prepared by a suitably qualified Class A asbestos removal contractor. Where greater than 10m² of non-friable asbestos or any quantity of friable asbestos is to be removed, notification to SafeWork NSW will be required at least 5 days prior to removal.

- Works must be undertaken with the Workplace Health and Safety/Regulation as well as the SafeWork NSW guidance listed previously.
- Soil disposed from the site must be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines.
- Notification to SafeWork NSW will be required five days prior to removal, and a Class A licensed asbestos contractor engaged to prepare Asbestos Removal Control Plan (ARCP).
- During all asbestos disturbance works, Asbestos Air Monitoring (AAM) must be completed by an Environmental Consultant and Licensed Asbestos Assessor (LAA), in accordance with NOHSC:3003 (2005).

2.4. Guidance Framework for Remediation

The preferred hierarchy of options for site remediation and/or management is set out in s.6(16) *Assessment of Site Contamination Policy Framework of Schedules A and B* of the NEPM (2013); this hierarchy is followed in New South Wales.

NEPM (2013) broadly summarises the remediation and management of contaminated sites under the headings of: Prevention; Management; and Implementation.

Prevention of contamination includes application of the precautionary principle for decommissioning and redevelopment of potentially contaminated sites.

Management of contamination includes the development of strategies to protect all segments of the environment with the fundamental goal of remediation being to render a site acceptable and safe for long-term continuation of its existing use or proposed use where a change of land use is part of the remediation strategy.

The preferred hierarchy for site soil remediation / management is broadly summarised as:

- Onsite treatment of the contamination so that it is destroyed, or the associated risk is reduced to an acceptable level.
- Offsite treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to site.

If the above are not practicable, then:

- Consolidation / isolation of soil on site by containment with a properly designed barrier.
- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material.
- A less sensitive land use to minimise the need for remediation works, which may include partial remediation.
- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

Implementation strategies including: the need to report contaminated sites to the relevant authorities; public notification of known contamination; and in the case of in-situ management strategies, development of legally enforceable long-term management plans.

When deciding which option to choose, the sustainability (environmental, economic, and social) of each option should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the option. For example, to the extent practical, the requirement for offsite disposal should be minimised. In cases where no readily available or economically feasible method is available for remediation, it may be possible to adopt appropriate regulatory controls or develop other forms of remediation.

3. Site Information and History

3.1. Site Details

A summary of site details is provided in **Table 1**.

Table 1: Site Details	
Site Details:	Proposed CBD Cycleway upgrade area of Rangihou Reserve. Portion of park between ~50m east of Macarthur Street to Alfred Street bridge
Lot Parcel Number:	Part Lot 50 DP1308168; part Lot 1 DP587055; part Lot 3 DP1215559
Site Area:	Area of works: ~2,150 m ²
Local Council:	City of Parramatta Council
Current Zoning:	RE1 Public Recreation
Site Use:	The broader Rangihou Reserve is a grassed and vegetated parkland adjacent the Parramatta River. The area of works is the recreational walkway / concrete path and immediately surrounding areas that are to be upgraded to a larger path / cycle way, raised boardwalk, swale drain and sandstone block retaining wall.
Surrounding Land Use:	The site is a narrow band of land running east/west and is generally bordered by residential land use to the north and the Parramatta River to the south.

3.2. Site History Summary

According to previous investigations on the site detailed below, the site history is summarised as prior to 1943 the site may have been agricultural land.

A large warehouse / industrial facility was present directly to the north of the central portion of the site and was demolished in the 1980s.

Various investigations undertaken within the area of works and the immediately surrounding area have identified asbestos in soil contamination present.

3.3. Previous Environmental Investigation

The following previous investigations are relevant to the site (with key details summarised in the following sections):

- Douglas Partners (January 2025) Report on Detailed Site Investigation, Proposed Pedestrian and Cycleway Rangihou Reserve, Parramatta NSW (Ref: t 231248.01). Prepared for Council.
- PRM (June 2025) Contamination Assessment (Ref: P37382.009). Prepared for Council.
- PRM (June 2025) Acid Sulfate Soil Assessment (Ref: P37382.010). Prepared for Council.

3.3.1. Douglas Partners DSI

Douglas Partners (DP) completed a Detailed Site Investigation (DSI) on Rangihou Reserve (dated 16 January 2025, project reference 231248.01) on the areas likely to be impacted as part of the cycleway upgrade works. This DSI included a comprehensive site history review as well as a review of all available previous contaminated land assessment works considered relevant to the project. In addition to the review, the DSI included the following scope:

- Drilling of 12 boreholes which were augered to a target depth of 2.0m. These boreholes were identified as BH101 to BH112 from west to east.
- Analysis of collected samples for contaminants of potential concern.
- Preparation of the DSI report.



Image 1: Extract from DP DSI showing sample locations.

The key findings of the DP DSI have been summarised as follows:

- A comparable profile was observed in the western boreholes (BH101 to BH106) and concentrations of contaminants in soil did not exceed the site assessment criteria.
- BH107 and BH108 (both noted to be within Area B) had asbestos contamination as follows:
 - BH107: Fill material to 1.7mbgl with asbestos (AF/FA) identified in analysis from sample collected from 0.4-0.5m depth.
 - BH108: Fill material to 0.2 mbgl and borehole terminated at this depth due to visible asbestos contamination.
- BH109 to BH112 (noted to be within Area C) displayed evidence of a marker layer / capping ranging between 0.2 and 1.0m within and concentrations in soil above the marker layer below the adopted site assessment criteria.

3.3.2. PRM Contamination Assessment

The PRM Contamination Assessment (Ref: P37382.009 dated June 2025) was focused on assessing the potential asbestos contamination in a portion of Area A known as the bush regeneration area. No asbestos contamination was observed or detected in analysis, and as such this area was included in Area A moving forward.

3.3.3. PRM Acid Sulfate Soil Assessment

Preliminary review of analysis results has not identified ASS to the depth the works are to be undertaken as part of this project. Summary of this report will be included once completed.

3.4. Environmental Setting

Based upon a review of previous reporting and site conditions, the site environmental setting is summarised in **Table 2**.

Table 2: Environmental Setting
Soil Landscape:
Reference to Sydney 1:100 000 soil mapping indicates that the site is within Lucas Heights residual soils described as gently undulating crest and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). Local relief to 30 m, slopes <10%. Rock outcrop is absent. Extensively or completely cleared, dry sclerophyll low forest and woodland.
Acid Sulfate Soils:
NSW acid sulfate soils (ASS) mapping indicates that the site is located in an area with high probability of occurrence at or near ground surface from the east to the central portion of the site. The northwest portion of the site is located in an area with high probability of occurrence within 1 m of the ground surface. The ASS Map of Parramatta Local Environmental Plan (LEP) 2023 indicates that the site is classified as Class 2 where development consent is required for works below the natural ground surface or works by which the water table is likely to be lowered. The following areas were identified adjacent to the site: <ul style="list-style-type: none"> • Class 1 land to the south whereby consent condition is required for any works. • Class 5 land to the north where development consent is required for works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres AHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land. Refer to Section 3.3.3 for site-specific ASS investigation works.
Geology:
Reference to Sydney 1:100 000 Series Seamless Geology Sheet indicates that the site is underlain by alluvial floodplain deposits which is described as silt, very fine to medium grained lithic to quartz rich sand clay. The site is located adjacent to estuarine channel deposits to the south described as fine – to medium grind lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell, grave and Ashfield Shale to the which is described as black to light grey shale and laminate.
Hydrogeology:
A search of the groundwater bore database maintained by the Department of Primary Industry was undertaken by others on 4 December 2024 which indicated that there is one groundwater well within a 500 m radius of the site is located on the other side of Parramatta River and is considered to be cross gradient. Based upon the topography and low-lying nature of the site, groundwater flow is expected to the south towards Parramatta River.
Topography / Drainage:
The site is near flat with a gentle slope towards Parramatta River, which borders the site to the south. Rainfall at the site is likely to infiltrate into unpaved ground or runoff into the nearby Parramatta River system. There is also a drainage culvert within the planned works area, which will drain to Parramatta River.
Sensitive Receptors:
Sensitive receptors are considered to include: <ul style="list-style-type: none"> • Parramatta River to the south. • Mature trees located on or adjacent the work area. • Site workers during continued upgrade works. • Site users, including children. • Surrounding residents. Given asbestos in soil is the only contaminant of concern, no further assessment of ecologically sensitive receptors was completed.

4. Conceptual Site Model

The following Conceptual Site Model (CSM) describes the known and potential complete contamination source-pathway-receptor (SPR) linkages based on the previous assessments completed at the site.

Table 3: Conceptual Site Model				
Contamination Type	Transport Mechanisms	Exposure Pathway	Receptors	SPR Linkage
AEC: Former Council Depot (BH107 / BH108 Area B)				
Friable Asbestos Containing Material <i>Fragments of friable ACM associated with fill material from the former industrial land</i>	<ul style="list-style-type: none"> Breakdown of ACM over time releasing fibres. Release of fibres from plant movement construction activities. 	<ul style="list-style-type: none"> Inhalation of fibres. 	Onsite: <ul style="list-style-type: none"> Current and future site users. Onsite personnel, including contractors for the upgrade works. Offsite: <ul style="list-style-type: none"> Neighbouring residents. 	The SPR linkages have the potential to become complete.
AEC: Former Remediation / Capped Area (BH109 - BH112, Area C)				
Suspected Asbestos Containing Material <i>Potential asbestos contamination located under capping / marker layer</i>	<ul style="list-style-type: none"> Breakdown of ACM over time releasing fibres. Release of fibres from intrusive works through the capping layer. 	<ul style="list-style-type: none"> Inhalation of fibres. 	Onsite: <ul style="list-style-type: none"> Current and future site users. Contractors for the upgrade works. 	The SPR linkages have the potential to become complete.

4.1. Data Gaps

The data gaps for the site are as follows:

- Groundwater sampling was not undertaken as part of the works completed by DP nor by PRM. However, due to the low contaminant concentrations in soils and the generally shallow nature of the planned upgrade works, no further investigation into groundwater or surface water was considered necessary.
- Any unexpected finds will be managed in accordance with the Unexpected Finds Protocol in **Section 6.5**.

5. Remediation Design

5.1. Remediation Goals

The overall goal of the remediation works is to render the site suitable for the proposed upgrade works to occur as well as the ongoing recreation land use of the site following works. As such, the remediation goals include:

- Removal, to the extent practicable, unacceptable risks to human health and the environment from the identified asbestos impacted soils.
- Preventing to the extent practicable, the potential contamination of the surrounding environment.
- Addressing unexpected finds that may be present during site works.
- Demonstrate that the site is suitable for the proposed recreational land use activities associated with the upgrades on site.

5.2. Remediation Extent

The site has been delineated into the following areas of similar contamination status and remediation areas. This information has also been captured in Council tender documentation for the works which are appended to this RAP.

- Area A (No contamination identified): Area A is located from approximately the middle of the upgrade area and extends from Area B to the western end of the upgrade area (refer to **Figure 3a**).
- Area B (Asbestos contaminated): Area B is located in the central portion of the site and is bound by Area A to the west and Area C to the east (refer to **Figure 3b**).
- Area C (Previously capped for likely asbestos contamination – however details are not known): Area C is located to east of Area B and extends to the eastern end of the upgrade area and has a surveyed geofabric marker layer where asbestos–impacted soils have previously been capped (refer to **Figure 3c**).

5.3. Remediation Option Assessment

A summary of the remediation option assessment undertaken for the contamination identified is included in **Table 4**.

Table 4: Remediation Option Assessment	
Strategy	Discussion
Defer Remediation	This approach was considered inappropriate as the asbestos contaminated soils pose a risk to workers associated with the upgrade works and present a potential long-term hazard to human receptors if not managed or remediated.
Onsite Treatment	Rejected – not an option for the contamination encountered.
Offsite Treatment	Rejected – not an option for the contamination encountered.
Onsite Containment	Selected: Remaining or residual contamination that is not impacted as part of the upgrade works are to remain insitu and be managed under an EMP. This option reduces the amount of material required to be disposed to landfill.
Excavation/Disposal	Selected: Where contaminated soils are excavated as part of works, these are to be disposed off-site and no contaminated soils that are excavated are proposed to be placed into onsite contamination.

Based upon the above, the preferred remediation approach is a combination of off excavation/disposal of material impacted by the works, and onsite containment and capping of all residual soils in Area B and Area C that remain insitu. The contaminated material remaining insitu below a capping layer to be managed under an EMP.

5.4. Capping Design

A summary of the proposed capping design and relevant considerations across the site are outlined in the following table. Note that all works are to be completed in accordance with the technical specification provided by council and contained in **Appendix A**.

Table 5: Capping Element and Design	
Capping Design	Long Term Management
Area A (no contamination identified)	
No proposed geofabric marker layer or capping thickness requirements, as no contamination has been identified. In the event that unexpected contamination is identified, this will require capping specifications as per Area B. Currently not proposed to be managed under EMP.	
Area B hardstand areas (bicycle paths / footpaths/ Bike Racks)	
Installation of surveyed geofabric demarcation layer beneath all hardstand areas. Minimum 125mm reinforced concrete hardstands. Refer to landscape details provided in Appendix A.	The EMP will be prepared with measures and contingencies in place for any works that breach the hardstands.
Area B Turfed areas	
Where sensitive tree root zone is present, then soil within drip-zone is to not be touched. Outside of drip-zone and in areas with no trees, then surveyed geofabric marker layer over site derived contaminated fill material, minimum 200mm of topsoil / growing medium and Kikuyu turf to be placed. Refer to spec landscape details provided in Appendix A.	The EMP will be prepared with measures and contingencies in place for any works that breach the geofabric marker layer.
Area B Tree Pit	
Excavate 1,500 mm wide by 600 mm deep to accommodate the rootball of the tree. Surveyed geofabric marker layer over site derived contaminated fill material; backfill outside of rootball with imported topsoil material and then mulch ring at surface. Refer to spec landscape details provided in Appendix A.	The EMP will be prepared with measures and contingencies in place for any works that breach the geofabric marker layer.
Area B Planting Swale / Retailing Wall	
In summary, contaminated soil is to be cut to requirement and the vertical face lined with geofabric marker layer and the sandstone block wall installed. Then adjacent, the planting swale is to be excavated with 200mm of topsoil and surface dressing utilised. Works to be completed in accordance with the landscape details provided in Appendix A.	The EMP will be prepared with measures and contingencies in place for any works that breach the geofabric marker layer.
Area B Shallow Planting	
Locations for shallow planting are to be excavated 200mm and install surveyed geofabric marker layer over site derived contaminated fill and cover with 200mm of topsoil and shallow tubestock plants. The area is then to be covered with 100mm native leaf litter mulch. Refer to spec landscape details provided in Appendix A.	The EMP will be prepared with measures and contingencies in place for any works that breach the geofabric marker layer.
Area B Timber Post and Rail Fence	
Excavation of fence post holes to 400mm as well as a 100mm strip directly under the fence and then install surveyed geofabric marker layer over residual soil. Fence post holes backfilled with fence post and concrete and shallow strip backfilled with mulch. Refer to spec landscape details provided in Appendix A.	The EMP will be prepared with measures and contingencies in place for any works that breach the geofabric marker layer.
Area C: Where excavation extend past capping layer	
When excavations extend through the marker layer into the assumed contaminated material below, then excavations are to continue to depth required, new surveyed geofabric marker layer placed and then reinstate according to specific methodology detailed for Area B.	The EMP will be prepared with measures and contingencies in place for any works that breach the geofabric marker layer.
Service Trenches and service pits installed beneath the geofabric marker layer	
If required, lined with geofabric marker layer and backfilled with clean imparted certified materials.	To be included in EMP if relevant.

5.5. Validation Criteria

The validation criteria have been selected based on ongoing open space land use and are summarised below.

Table 6: Validation Criteria
Asbestos impacted soils beneath geofabric marker layer (Area B and Area C):
Site derived soils could contain asbestos above the following will be managed under the long-term EMP and are assumed to be impacted with the following exceedances: <ul style="list-style-type: none"> • Bonded ACM – 0.02 %w/w. • Friable Asbestos (FA) and Asbestos Fines (AF): 0.001 %w/w.
Aesthetics:
Assessment of the site aesthetics includes discolouration (staining), a malodorous nature (odours) and abnormal consistency (anthropogenic inclusions).
Imported Capping Topsoil Materials:
Imported topsoils to be used as the capping layer: <ul style="list-style-type: none"> • Virgin Excavated Natural Materials (VENM) as defined under PoEO Act 1997. • Materials that meet the Excavated Natural Material Exemption and Order 2014 (ENM Order). • Imported materials unable to be classified as VENM or ENM (such as blended landscaping/topsoils) must meet the following: <ul style="list-style-type: none"> • Human health criteria taken from NEPM 2013 criteria HSL/HIL C. • Asbestos taken from NEPM 2013 and WA DoH: No asbestos in surface soils. • Ecological criteria EIL /ESL adopted from NEPM 2013 with the exception of 'low reliability' BaP. • Ecological BaP ESL adopted from CRC Care Technical Report No. 39 where CRC 'high reliability' BaP ESC have been presented in Table 11 from CRC Care and CCME (2010).
Offsite Disposal:
<ul style="list-style-type: none"> • NSW Protection of the Environment Operations Act (POEO Act) 1997. • NSW Protection of the Environment Operations (Waste) Regulations 2014. • NSW EPA – Waste Classification Guidelines, Part 1 Classifying Waste, 2014.

5.6. Remediation Summary

All works to be undertaken in strict accordance with the Council technical specifications appended to this RAP. Specific details relating to the upgrade works and remediation considerations for Area A/B/C are summarised in the following sections.

5.6.1. Area A: No contamination identified

Area A is shown in Figure 3a. No contamination has been identified in Area A to date. All works to be undertaken in strict accordance with the Council technical specifications appended to this RAP. Excavation works that occur in this area are not considered to be asbestos removal works, but should be undertaken in accordance with the Unexpected Finds Protocol in **Section 6.5**.

Proposed Works: Various upgrade elements across Area A include:

- Removal of turf, excavation to subgrade level and construction of concrete path.
- Installation of a timber post and rail fence along the northern side of the path.
- Excavation of tree pit and installation of mature tree.

5.6.2. Area B: Asbestos contaminated

Area B is shown in Figure 3b. Friable and bonded asbestos have been identified in fill material in Area B.

Proposed Works: Various upgrade elements across Area B include:

- Installation of a sandstone block retaining wall.
- Installation of a planted swale drain.
- Installation of a timber post and rail fence along the northern side of the path atop a new retaining wall and adjacent the old Council depot.
- Excavation of tree pits and installation of mature tree.
- Removal of turf, excavation to subgrade level and construction of concrete path.

Remediation Requirements: The remediation approach for Area B is as follows:

- All works to be undertaken in strict accordance with the Council technical specifications appended to this RAP. If ambiguity exists between the RAP and the Council technical specification, then the Council technical specification should be followed.
- Where excavation works into the asbestos contaminated soils are required, then the various depths detailed per task in the Council technical specification must be followed.
- As required, soil is to be excavated under Class A asbestos removal conditions. Soil is to be stockpiled in a designated area, a waste classification is to be completed and the soil is to be disposed of offsite. Refer Figure 3b for details of stockpile location.
- Once contaminated material is excavated to the required depth, the walls and floor of the excavation are to be emu-picked of visible ACM.
- The walls and floor of the excavation are then to be lined with geotextile fabric to serve as a physical barrier and warning layer between the contaminated material remaining insitu, and the capping materials.
- The lateral and vertical extents of the geofabric marker layer are to be surveyed.
- Following geotextile placement, a visual clearance will be given by a Licenced Asbestos Assessor (LAA) as defined by SafeWork NSW. Council should be notified at this stage and an inspection should be completed by Council and their representative.
- Proposed capping design and reinstatement process varies across each upgrade element and is shown in the Council technical specification and the capping thickness detailed in **Table 5**.
- All materials removed from site are to be appropriately classified as per the NSW EPA Waste Classification Guidelines (2014), with all disposal dockets provided to the appointed environmental consultant.
- Any material required to be imported to site to be confirmed as ENM/VENM and asbestos free and suitable for the task required. Details of this are to be recorded by the environmental consultant and detailed within the Validation Report.
- Once all capping has been completed (hardstand pavements, topsoils etc) the area is to be surveyed to allow for confirmation of capping thicknesses.
- Following the completion of works, a Validation Report will be provided to the client. The capped materials will require long term management under an EMP, which must be legally enforced for the lifetime of the contained material.

5.6.3. Area C: Previously Capped Area

Proposed Works: Various upgrade elements are occurring in this area including:

- Removal of turf, excavation to subgrade level and construction of concrete path.
- Reshaping and re-turfing of specific areas.
- Installation of new lighting.
- Excavation of tree pits and installation of mature tree.

Remediation Requirements The remediation approach for Area C is as follows:

- All works to be undertaken in strict accordance with the Council technical specifications appended to this RAP. If ambiguity exists between the RAP and the Council technical specification, then the Council technical specification should be followed.
- Where excavation works into the existing soil profile is required, then the various depths detailed per task in the Council technical specification should be followed.
- Previous reporting has indicated that the eastern portion of the site has the potential to have been remediated with a cap and contain method at some stage in the past. As such, the majority of works are assumed to be in the assumed clean capping material above the marker layer.
- Excavation works above the marker layer in the capping material in this area are not considered to be asbestos removal works, but should be undertaken in accordance with the Unexpected Finds Protocol in **Section 6.5**. Spoil generated from these works should be stockpiled in a designated area and assessed for contamination:
 - If found to comply with remediation criteria, then this spoil can be beneficially reused on site.
 - If found to be contaminated, then this spoil should undergo a waste classification and the soil is to be disposed of offsite
- Excavation works that are undertaken through the marker layer and into the potentially contaminated soil below should be undertaken as follows:
 - The marker layer is to be removed and the soil is to be excavated under Class A asbestos removal conditions. Soil is to be stockpiled in a designated area, a waste classification is to be completed and the soil is to be disposed of offsite.
 - Once contaminated material is excavated to the required depth, the walls and floor of the excavation are to be emu-picked of visible ACM.
 - The walls and floor of the excavation should then be lined with geotextile fabric to serve as a physical barrier and warning layer between the contaminated material remaining insitu, and the capping materials.
 - Following geotextile placement, a visual clearance will be given by a LAA as defined by SafeWork NSW. Council should be notified at this stage and an inspection should be completed by Council and their representative.
 - Proposed capping design and reinstatement process varies across each upgrade element and is shown in the Council technical specification and the capping thickness detailed in **Table 5**.
 - All materials removed from site should be appropriately classified, with all disposal docket provided to the appointed environmental consultant.
 - Any material required to be imported to site should be confirmed as asbestos free and suitable for the task required.
 - Following the completion of works, a Validation Report will be provided to the client. The capped materials will require long term management under an EMP, which must be legally enforced for the lifetime of the contained material.

5.6.4. Stockpile Management

In areas where stockpiles are generated (either for reuse on site or offsite disposal), then appropriate stockpile management is required:

- Stockpile area is to be established at the commencement of works – suggested area is presented in Figure 2.
- Bunding and erosion control is to be in place before soil is received.
- A durable plastic layer is to be pinned in place prior to soil being received.
- A clear delineation between contaminated and potentially uncontaminated soil areas is to be established.
- Once soil is received to the area and stockpiled, it is to be assessed by environmental consultant.
- Once assessed, the stockpile is to be secured and wrapped – awaiting further movement.

If minor amounts of soil are expected, or works are to be spread over a longer period, then skip bins for contaminated soil may also be an acceptable option.

6. Remediation Preliminaries

6.1. Overview and Scope

As outlined above, the preferred remediation option is to remove contaminated material that is excavated as part of works, and then contain the remaining asbestos contamination onsite. This is the most ideal option as it reduces the amount of material required for offsite disposal and allows the site to remain suitable for the proposed upgrade works and the ongoing open space land use.

6.2. Regulatory Approvals and Notifications

Notification to start works will be required of SafeWork NSW due to the work proposed relating to the contamination of friable asbestos at the site. The notification is to be undertaken by the Principal Contractor (PC) or nominated Class A asbestos contractor. Where required, the client is responsible for notifying residents of the commencement (and completion) of the proposed remediation works, including scope and estimated program.

6.2.1. Asbestos Contractor

The asbestos contamination at the site was deemed as 'friable' asbestos due to findings of the DP DSI as well as the unknown status of the potential contamination that is currently capped in Area C. Based on these lines of evidence, PRM are of the opinion that the removal must be undertaken by a Class A licenced removal contractor.

6.3. Planning and Site Establishment

The following sections will act as a basic checklist to ensure all elements have been addressed prior to remedial works commencing.

6.3.1. Project Safety and Environmental Management Plan

Prior to the commencement of site works, the PC shall prepare a Project Safety and Environmental Management Plan (PSEMP). This plan will include specific details and work method statements describing all environmental and work health and safety (WH&S) controls to be implemented and followed during the remediation works. The PSEMP will include contact details of appropriate personnel associated with the remediation works.

The PSEMP is to specify requirements for all site personnel and procedures to minimise disturbance and impacts to surrounding areas.

The following critical elements are required to be included in the PSEMP:

- Measures and procedures to minimise impacts to any sensitive ecological communities to ensure the works do not negatively impact on potential environmental receptors and comply with applicable environmental legislation.
- Measures and procedures to minimise the potential for site personnel and workers to be exposed to contamination during the works.
- Material tracking and imported material protocols.

All site staff, contractors and sub-contractors are to complete all relevant contractor inductions and site-specific safety inductions and made aware of the contamination type expected through the remediation. The key environmental and WHS considerations (related to remedial works) that are required to be included in the Plan and some control measures to manage hazards, are detailed later in this RAP.

6.3.2. Asbestos Removal Control Plan

The nominated Class A asbestos removal contractor is to prepare an Asbestos Removal Control Plan (ARCP) for the remediation works prior to commencement.

An ARCP is prepared to ensure workers and other persons are not at risk of inhalation of asbestos fibres during the asbestos removal or soil disturbance/excavation (if required) and capping process.

The ARCP must include details of how the asbestos removal will be carried out including method, tools, equipment and PPE and details of the asbestos to be consolidated and capped, location, type, and condition of the asbestos.

6.3.3. Site Establishment

Site establishment tasks shall include, but may not be limited to:

- Mobilisation of plant and equipment, and installation of health and safety, and environmental controls outlined in the PSEMP.
- Erect temporary fencing to demarcate the remediation area. The remediation work area should be delineated with physical barriers and warning signs. The following risk assessment factors should be taken into consideration when establishing the remediation area: proximity to workers or the public outside the removal work area, the method of asbestos removal and controls in place, any existing barriers (walls, site constraints) and the type of physical barrier to be used (i.e., ATF, hoarding).
- Asbestos decontamination facilities for personnel and plant should be implemented within the remediation work area, which should include a mobile personal decontamination unit and the establishment of a geofabric lined pad for the washing of plant and trucks (as a minimum).
- Preparation and establishment of stormwater diversions and sedimentation controls.
- Installation of air monitoring equipment by an LAA or suitably experienced person during all asbestos works.
- Preparation/provision of waste classification documentation for any offsite disposal of asbestos-impacted material if required.
- Provision of dust suppression equipment, as necessary.

The contractor shall endeavour to protect property and infrastructure at the site and mitigate impacts to the surrounding environment to the extent practicable during works.

6.4. Contingency Plan

Potential events that may arise during the remediation and actions that will be undertaken if such unexpected conditions occur are summarised in **Table 7**.

Table 7: Contingency Items	
Event	Application
Acid sulfate soils are identified	Although assessment has indicated that ASS is not expected in the depth of works, if it is identified, then consideration should be given the preparation of an ASS Management Plan for implementation and management of the ASS.
Land use plans changed	Review the applicability of this RAP to the revised site use.
Contamination is found laterally outside of the identified areas.	Review of the remediation strategy will be undertaken. Possible responses could include: <ul style="list-style-type: none"> • Further excavation • Risk assessment • Further delineation sampling/monitoring • Onsite containment of a portion of the soil etc.

Table 7: Contingency Items

Event	Application
Soil classified as hazardous waste is identified	<p>For soil that is required to be disposed of offsite, a waste classification will need to be undertaken. If the material returns as hazardous soil, it will need to be treated prior to being disposed to landfill.</p> <p>Such pre-treatment could either occur onsite or could occur at a suitably licensed offsite treatment facility. In the event hazardous waste was encountered and onsite pre-treatment was proposed then an addendum to this RAP would be prepared.</p>
Contamination is found to have migrated offsite	<p>In the event that contamination was encountered extending beyond the site boundary initially the extent and significance would be assessed along with the need for further remediation / management through monitoring and potentially fate and transport assessment / risk assessment.</p>

6.5. Unexpected Finds Protocol

If during remediation works, material is encountered which appears to be potentially contaminated or appears to be different from the contamination described in this RAP, or known areas of contamination appear to extend beyond their defined boundary, the following procedures should apply:

- Any suspicious material/soil which has been excavated should be stockpiled on bunded, strong, impermeable plastic sheeting, covered and protected from erosion and all seepage retained.
- Excavation works at that part of the site where the suspicious material (soil) was encountered should cease until inspection is carried out and documented by the environmental consultant.
- If it appears the known contamination area extends beyond the defined boundary, the consultant shall inform Council and determine a procedure to delineate the contaminated area.
- Based on visual inspection, the consultant should provide interim advice on construction health and safety, soil storage and soil disposal to allow works to proceed if possible.
- Based on sampling and analysis of the material, the consultant should provide final advice, based on comparison of the laboratory test results to suitable criteria relating to human health, potential environmental impacts and waste disposal.

“Suspicious” material may include stained soil, odorous material, fibrous material, brightly coloured material, tarry or ashy material, or chemical containers etc.

Any unexpected events which may affect the outcome of the remediation should be notified to the consultant. The consultant shall then contact Council to report the finding. At that time potential actions to address the unexpected event will be assessed and presented in consultation with Council.

7. Validation Program

A validation program will be undertaken following the completion of the remediation works to demonstrate that the remediation works have met the nominated remediation goals.

7.1. Validation Strategy

The validation strategy to be adopted includes:

- Visual inspection and clearance by an LAA or competent person following excavation of impacted fill material and following placement/installation of geotextile marker layer to ensure no ACM remain.
- Collect field measurements or review data to ensure required capping thicknesses as per Council technical specification has been met.
- Review of imported material certificates and inspection upon delivery to ensure compliance regulatory guidance for imported material.
- Final inspection of the site at the completion of all works.

7.2. Data Quality Objectives

A Data Quality Objectives (DQOs) process is used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site.

The consultant, with inputs as required from the PC, shall implement the validation program in accordance with the DQO process. In the validation report the consultant shall demonstrate how the validation program was guided by the DQOs to evaluate the success of the works in achieving the remediation goals.

Table 8: Data Quality Objectives
Stage 1: State the Problem
Previous assessment works identified friable ACM associated with uncontrolled fill material present within Area B as well as potentially capped contaminated material in Area C.
Step 2: Identify the Decision of the Study
The following specific decisions will be made, as required: <ul style="list-style-type: none"> • Were all necessary approvals gained prior to remediation works commencing? • Was asbestos air monitoring undertaken during the works, as required? • Was asbestos material handled as per appropriate SafeWork procedures? • Where required, were remediated areas validated (visual inspection) once the asbestos impacted fill material had been removed? • Are there any unacceptable risks remaining to onsite or offsite receptors from the asbestos material? • If offsite disposal occurred, were relevant materials excavated and disposed of appropriately to facilities licensed to accept the material? • Is any further management of the identified areas required?
Step 3: Identify Information Input
The primary inputs required are: <ul style="list-style-type: none"> • Existing environmental data. • Physical observations during site activities. • Results of clearance inspections and air monitoring. • Results of the survey data. • Material removal and disposal documentation (if required). • Assessment of the suitability of that data for the purpose of environmental assessment through application of data quality indicators (DQI), namely precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters.

Table 8: Data Quality Objectives

Step 4: Define the Study Boundary
<p>The extent of the study boundary is as follows:</p> <ul style="list-style-type: none"> • Lateral: the soils across the site in all areas of works. • Vertical: the extent of asbestos contaminated material (depth not known – but limited to the depth of proposed works) and capping material. • Temporal: the outcomes of inspections throughout the course of the remediation works.
Step 5: Develop an Analytical Approach/Decision Rule
<p>The area can be confirmed remediated if the LAA deems the remediation works to have been completed in accordance with this RAP (and any addendum). A decision on the acceptance of the analytical data will be made based on the DQI in the context of the PARCC parameters as follows:</p> <ul style="list-style-type: none"> • Precision: a quantitative measure of the variability (reproducibility) of data. • Accuracy: a quantitative measure of the closeness of reported data to the “true” value. • Representativeness: the confidence (expressed qualitatively) that data may be equivalent for each media present onsite. • Completeness: a measure of the amount of useable data from a data collection activity. • Comparability: the confidence (expressed qualitatively) that data may be equivalent for each sampling and analytical event. <p>The quantitative and qualitative measures/criteria employed to enable application of these parameters are described in Steps 6 and 7.</p>
Step 6: Specify the Performance/Acceptable Criteria
<p>Specific limits for this project are in accordance with the appropriate guidance made or endorsed by the NSW EPA and SafeWork NSW, appropriate indicators of data quality, and standard procedures for field sampling and handling.</p>
Step 7: Optimise the Design for Obtaining Data
<p>This remediation program presented is aimed at obtaining the necessary data to allow the identified decisions in Step 2 to be made.</p>

7.3. Validation Methodology

To confirm that remediation works have been completed in accordance with this RAP, the following will be undertaken:

- Visual inspection by the LAA following the installation of the marker layer.
- AAM during asbestos removal/disturbance.
- An ACC will be prepared by the LAA following the emu-pick and placement of the marker layer
- Field measurements or survey data reviewed by the consultant to denote the exact depth of the capping and ensure that capping thickness has been achieved.
- Approval of imported material to be free of asbestos and meet site criteria (Section 5.4).
- Material tracking information will be reviewed to ensure compliance with this RAP, including landfill disposal dockets for asbestos materials and miscellaneous waste items, import dockets and waste classification certificates.
- Inspection of the site at the completion of all works.
- Validation reporting.

7.4. Asbestos Air Monitoring

Due to the identified the asbestos contamination as being “friable”, as well as the proximity of the asbestos contamination to the public, asbestos fibre air monitoring (AAM) is considered necessary for all works undertaken where disturbance / removal of asbestos is undertaken. All AAM must be undertaken by a NSW LAA.

The results of the asbestos air monitoring should be provided to the PC each workday to confirm that control measures are adequate prior to works commencing the next day.

The results of air monitoring will also be included within the Validation Report.

7.4.1. Exposure Trigger Levels

Air monitoring results should be obtained within 24 hours of sample collection. While this precludes “real time” monitoring, inspections will be made during excavation, loading works and if there are any visible dusts, light water sprays will be used to wet the work areas and prevent the release of airborne asbestos fibres.

The Code of Practice – How to Safely Remove Asbestos in the Workplace, contains trigger levels for airborne asbestos fibres which have been adopted and air summarised below.

Action Level	Control	Action
<0.01 fibres/mL	No new control measures are necessary.	Continue with current control measures.
≥0.01 fibres/mL but ≤0.02 fibres/mL	1. Review	Review control measures.
	2. Investigate	Investigate the cause.
	3. Implement	Implement controls to eliminate or minimise exposure and prevent further release.
>0.02 fibres/mL	1. Stop removal work.	Stop removal work.
	2. Notify regulator (SafeWork NSW)	Notify the relevant regulator by phone followed by email or written statement that work has ceased and the result of the air monitoring.
	3. Investigate the cause.	Conduct a thorough visual inspection of the isolated/barricaded area and associated equipment in consultation with all workers involved with the removal work.
	4. Implement controls to eliminate or minimise exposure and prevent further release.	Extend the isolated/barricaded area around the removal area/enclosure as far as reasonably practicable (until fibre levels are at or below 0.01 fibres/mL), wet wipe and vacuum the surrounding area, seal any identified leads (e.g., with expandable foam or tape) and smoke test the enclosure until it is satisfactorily sealed.
	5. Suspend removal works until further air monitoring is conducted.	Do not recommence until fibre levels are at or below 0.01 fibres/mL.

7.5. QA/QC Plan - Field

All field and laboratory procedures are to be assessed for SQIs in accordance with the NSW EPA (2017) *Contaminated Site: Guidelines for the NSW Site Auditor Scheme*. The QA/QC protocols to be adopted during remediation and validation are summarised below.

Table 10: Field QA/QC Procedures

Field Procedure	QA Procedure Description
Sampling Team	Environmental consultant must be professionally qualified environmental scientists, engineers trained in conducting site contamination projects. All AAM, clearance inspections and ACCs are to be completed by NSW LAA.
Equipment Calibrations	All equipment will be calibrated as specified within the relevant operator manuals.

As no soil sampling is to be undertaken as part of the validation for the site, no QA/QC procedures have been included.

7.6. Reporting

The following reports will be required to be prepared by a suitably qualified environmental consultant in accordance with relevant guidelines made or approved by NSW EPA under s105 of the Contaminated Land Management Act 1997:

7.6.1. Validation Report

The Validation Report and will contain at the minimum:

- Details of the remediation works conducted, including detailed photographic log.
- Information demonstrating that the objectives of the RAP have been achieved, including the review of survey data.
- Information demonstrating compliance with appropriate regulations and guidelines, including AAM reports, ACCs, etc.
- Information detailing material tracking undertaken during works, including material disposed of offsite (if required).
- Any variations to the strategy noted during the implementation of the remediation.

7.6.2. Environmental Management Plan

An Environmental Management Plan (EMP) prepared in accordance with NSW EPA guidelines will include the following at a minimum:

- Roles and responsibilities for the managing the capped area.
- Dimensions of the capping based on a survey of the site conducted at the completion of remediation works.
- Legal enforceability and public notification requirements.
- Requirements for breaches of the capping.
- Management/inspection for ensuring that the capping remains appropriate to manage the ACM impacted soils.
- Ensuring that any contractors are aware of the requirements of the EMP.
- Ensuring that the EMP is periodically reviewed to be in line with current regulatory approaches.

8. Site Management

8.1. Responsibilities

The implementation of the controls outlined in this RAP is the responsibility of the PC engaged to undertake the works. Onsite works should only be conducted by contractors / individuals who have read and acknowledged their understanding of this RAP.

The roles and responsibilities for the implementation and management of this RAP is provided below. These responsibilities do not replace any other regulatory responsibilities of the parties in relation to works within the works area.

Table 11: Role Definition

Principal Contractor
<ul style="list-style-type: none"> • Comply with the RAP for all site works including relevant legislation and guidance (including the WHS Act 2011 and Regulation 2017 or relevant legislation current at the time of works). • Hold at a minimum, a Class A Asbestos Licence or engage a Class A licenced supervisor to direct the works. • Prepare and follow ARCP. • To ensure that all licences, clearances, permits, and approvals are in place in the appropriate manner. • Inform the consultant if conditions change significantly from those documented in the RAP. • Onsite implementation of the RAP. • Day to day management of the requirements of the RAP and ensuring that the checking, monitoring and inspection of appropriate mitigation measures for contract and sub-contract personnel is undertaken. • Preparations and implementation of the PSEMP and associated WHS documentation and controls. • Notification to client and the consultant and the appropriate external bodies (such as emergency services, regulatory authorities etc.) in the event of an environmental incident. • Temporary suspension of site work if the environment or WHS of personnel or the community is at risk. • Suspension of individuals from the site where disregard for the RAP has been identified. • Material tracking including detailed reconciliation ('cradle to grave') of imported materials and materials disposed of offsite if required.
Site Supervisor (as appointed by client)
<ul style="list-style-type: none"> • Ensure nearby residents are notified as required. • Evaluate site conditions and complete a Site Hazard Assessment at the commencement of works. • Ensure all workers have undertaken any appropriate site inductions and induct all personnel onto site specific WHS before any site works commence. • Inform all contractors of identified hazards/risks that have the potential to affect their health and safety. • Maintain site security for the duration of the project and ensure communications are maintained. • Comply with the RAP for all site works including relevant legislation and guidance (including WHS Act 2011 and Regulation 2017 or relevant legislation current at the time of works). • Conduct daily Toolbox Talk with all workers at the commencement of each day. • Monitor the works to ensure compliance with this RAP and stop works if work practices deviate from the approved RAP or conditions are considered unsafe.
Environmental Consultant / LAA (as appointed by the client)
<ul style="list-style-type: none"> • Provide the RAP to any worker or contractor (who is under the control of the PC). • Ensure all parties clearly understand the RAP requirements and ensure that compliance with the RAP is a condition of any works undertaken by any contractor/site worker contracted by the PC. • Provide remediation supervision to ensure that works are being completed in accordance with all statutory requirements, best practice guidelines and the requirements of the RAP. • Document the stages of the validation works. • Undertake AAM during asbestos works. • Undertake clearance inspections following removal of asbestos impacted areas and following placement of geotextile fabric marker layer. • Undertake waste classification of material if required. • Update the RAP if they become aware that the site conditions have changed and inform any other parties (contractors/site workers etc.) of the changes. • Preparation of the Validation Report.

8.2. Hours of Operation

The PC shall be responsible for ensuring all works are conducted during the hours prescribed by Council. Generally, the prescribed hours permitted are:

Monday-Friday:	07:00 – 17:00
Saturday, Sunday, and Public Holidays:	Determined by PC in consultation with the client

If emergency works are required, these works are permitted to be completed outside of these hours.

8.3. Contact Details

The PC shall be responsible for the posting of contact details for key personnel associated with the remediation. As a minimum the following contact details should be noted:

Table 12: Contact Details			
Role	Company	Name	Number
Client Project Manager	City of Parramatta Council	TBC	-
Site Supervisor	TBD	TBD	-
Environmental Consultant / LAA	TBD	TBD	-

Note: The above table should be displayed on site and updated as contractor appointments are finalised and/or if site personnel are replaced.

8.4. Site Security

No person shall enter the site or works area without expressed permission of the PC. Contractors and visitors must be inducted onto the site prior to the start of any planned works. During remediation works. Signage at the site entrances and, where appropriate, safety fencing will be maintained to restrict access to the works area. Only authorised persons will be able to enter the works area.

8.5. Exclusion Zone and Traffic / Pedestrian Control

An exclusion zone and an alternative route for pedestrians is required as there is unlikely to be the space to enable the public a safe walking path around the works area where contaminated soil is to be excavated.

Given the location and accessibility of the site, traffic control is not required.

The PC shall assess how goods and materials are delivered to site.

8.6. Protection of Services

The PC shall be responsible for any damage caused to existing services and shall notify owners of utility services that are damaged by work activities.

8.7. Environmental Management

The environmental management strategy consists of the requirements outlines in this RAP as well as those specified in a series of environmental management sub-plans developed specifically for the proposed works. The PC is responsible for preparing the environmental management sub-plans in accordance with relevant standards and guidelines.

The environmental management sub-plans provided by the PC must comprise (as a minimum):

- Materials management sub-plan.
- Erosion, sediment, and surface water management sub-plan.
- Dust, noise, and emissions management sub-plan.
- Traffic management sub-plan.

8.7.1. Erosion, Sediment and Surface Water Management

An important part of the remediation works will be the management of erosion, sediment, and surface water particularly when wetting down asbestos contaminated equipment, plant, PPE and soil. The strategy to be adopted would aim to:

- Reduce land degradation.
- Reduce pollution to downstream areas and receiving waters.
- Facilitate the implementation of the remediation works program.

The strategy would involve the installation and operation of several environmental control measures that will be progressively implemented as work proceeds across the site. The design approach adopted will satisfy the following principles:

- Minimise the area of disturbed soil exposure wherever possible by staging the works.
- Control water flow through the works, bunding areas if required to reduce run off.

All works must comply with the requirements of the 'Blue Book' Managing Urban Stormwater: Soils and Construction, Landcom 2004, including the development of an Erosion and Sediment Control Plan (ESCP) by the Principal Contractor. The ESCP should contain a drawing clearly showing the:

- Site layout with the approximate grades and indicators of fall.
- Location of the trees and other vegetation to be retained.
- Location of site access.
- Proposed roads and parking facilities.
- Proposed and existing drainage patterns.

The PC is to undertake regular maintenance of all erosion, sedimentation, and pollution control devices to ensure their continuing effective and efficient operation.

9. Work Health and Safety

9.1. Site Induction

The PC must ensure all personnel working on the remediation project attend a site induction undertaken prior to entering the site for the first time. The site induction should include a brief outline of the remediation project, details on general site hazards (e.g., vehicle movements, heavy machinery, contamination etc.) and details on the specific hazards associated with the remediation works including but not limited to:

- Nature of the materials being handled (i.e., asbestos).
- Personal protective equipment to be utilised onsite.
- Necessary decontamination procedures to be undertaken whilst onsite.

9.2. Protection of Services

The PC shall identify and mark out all services at the site and shall obtain utility plans from relevant authorities and Before You Dig (BYD) service and any relevant information as to the presence of services at the site. It is the PC’s responsibility to gain accurate information as to the depth, size and alignment of services. These may include overhead power cables, underground power, telecommunications, drains, sewers and water mains.

The PC shall:

- Take special care to ensure that services are protected in accordance with the conditions specified by the controlling authority.
- Arrange for a representative from the controlling authority to be present, unless the authority directs otherwise, when the remediation contractor is:
 - Proving the locations of services.
 - Excavating within 1 m of the service.
 - Arrange with the appropriate authority for the closure and subsequent restoration of any service that must be shut down while the works are in progress.
 - Adopt a method for uncovering and protecting the service from damage if the service must be uncovered and left exposed, to the satisfaction of the controlling Authority.
 - Immediately inform the owner or controlling authority of any damage or interference to any service, structure or property.
 - Carry out any temporary bypass and restoration of the services to the satisfaction of the respective authorities and owners.

9.3. Site Safety Signage

The below signs are representative of some Work Health Safety signs which should be utilised on site boundaries:



9.4. Personal Protective Equipment

The following table outlines the general PPE requirements onsite, which should be readily available for ALL personnel including contractors and visitors:

Table 13: Job Specific PPE Requirements			
Type	Description	Required Yes/No	Required Activities
Head Protection	Hard Hat	Y	All site activities
Eye Protection	Safety glasses with side shields	Y	All site activities
	Goggles	-	-
	Face shield	-	-
Hand Protection	Disposable latex gloves	-	-
	Disposable nitrile gloves	Y	Soil sampling activities
	Cut resistant gloves	Y	Manual handling activities
	Rubber gloves	-	-
	Gauntlets	-	-
Respiratory Protection	Respirator (nominate type and cartridge) Respiratory Protective Equipment (RPE) compliant to AS/NZS 1716:2009.	Y	When asbestos works are undertaken utilised at least a half face mask fitted with P3 filters or a P2 fitted respirator mask.
Body Protection	Disposable coverall Type 5, Category 3 (prEN ISO 13982-1) or equivalent.	Y	During asbestos works.
	Sunhat, sunscreen, repellent	Y	If working in sun
Environmental Protection	Cold weather gear	Y	Where required
	Wet weather gear	Y	Where required

9.5. Decontamination Procedures

9.5.1. Personal Hygiene and Decontamination

For personal decontamination this involves the removal of all visible asbestos dust/residue from PPE and RPE. Personal decontamination must be undertaken each time a worker leaves a designated asbestos works area. Personal decontamination should be done via a portable decontamination unit within the asbestos works area.

Asbestos contaminated PPE must not be transported outside the asbestos works area except for disposal purposes. Before work clothes and footwear worn during asbestos removal work are removed from the asbestos removal work area, they should be thoroughly wet wiped to remove any potential asbestos fibres. Disposable coveralls should always be worn over the top of any clothing worn whilst inside the remediation work area.

RPE must remain on until all contaminated disposable coveralls and clothing have been cleaned and/or removed and bagged for disposal and personal decontamination has been completed. Any PPE used while carrying out asbestos removal work must not be taken home by a worker. Personal hygiene and careful washing are essential. Particular attention should be paid to the hands, fingernails, face, and head. The following hygiene requirements are to be followed by all site personnel:

- No eating, smoking, or drinking to be conducted in the remediation area.
- Staff to wash hands and face prior to eating, smoking, or drinking.

9.5.2. Equipment Decontamination

Equipment (tools, non-disposable PPE etc.) should be washed or otherwise cleaned to ensure that contaminated soil, water, or dust is removed before it leaves the designated asbestos works area.

9.5.3. Plant Decontamination

A decontamination area must be established within the asbestos works area. All plant should be thoroughly cleaned of soil and sediment before moving out of the designated asbestos works area. The specific plant decontamination arrangements are to be determined by the PC in consultation with the environmental consultant.

Following decontamination, an equipment clearance certificate should be completed by the appointed LAA or suitably qualified person.

9.6. Environment Work Health & Safety

An Environment and Works Health & Safety (EWS) Management Plan must be prepared by the PC prior to commencement of remediation works. The objectives of the Plan will be to:

- Protect the health of workers and the general public during the remediation works and comply with applicable health and safety legislation; and
- Ensure the works do not negatively impact on potential environmental receptors and comply with applicable environmental legislation.

The following table lists key environmental and WHS considerations (related to remedial works) that are required to be included in the Plan and some control measures to manage hazards. It is noted that the information is a guide only. The PC is required to undertake their own EWS hazard identification risk assessment as part of preparing the Plan.

Table 14: Key Environmental and Health & Safety Hazards	
Hazard	Control Measure
Air quality: Odours generated from excavation	If odours are detected the site is to be inspected the consultant and recommended control measures are to be implemented throughout the remediation process.
Air quality: Dust	If required, dust management measures may include: <ul style="list-style-type: none"> • Erection of dust screens around the perimeter of the site excavation areas. • Securely covering all loads entering and exiting the site. • Use of water sprays carts on exposed soil. • Cessation of operations that may generate dust during periods of high winds. • Covering of stockpiles of contaminated soil when not in use and minimising periods of stockpiling. • Keeping excavation surfaces moist; and dust monitoring.
Air quality: Emissions from vehicles and plant	Plant and vehicles involved in the remediation will be properly maintained to ensure their emissions comply with applicable guidelines. Vehicles and plant will be turned off when not in use.
Stockpiles	Stockpiles must be tracked from the point of excavation to their final containment or their disposal at a suitably licenced landfill (this includes any onsite handling).
Transport of soils	When material is disposed of offsite, it must be classified prior to disposal in accordance with NSW EPA (2014) Waste Classification Guidelines. Disposal of contaminated soil must meet the following requirements: <ul style="list-style-type: none"> • Contaminated soil is to be trucked in accordance with NSW EPA requirements. Trucks used to transport contaminated fill shall meet the NSW EPA licensing requirements for the waste transported. • Trucks used to transport contaminated fill must have a suitable load covering. • The wheels/exterior of the vehicle must be cleaned down prior to leaving site. • Truck movements shall be along designated transport corridors. • A copy of every landfill weigh-bridge docket for each load delivered will be forwarded to the consultant to reconcile volume. • A register of truck licence plates entering/leaving the site must be maintained. • Driver's code of conduct to be developed and signed by all truck drivers.

Table 14: Key Environmental and Health & Safety Hazards

Hazard	Control Measure
Designation, delineation and control of access to various work zones	The asbestos works area is to be adequately delineated with temporary fencing and signage, with the only entry/exit point into the asbestos works area through the decontamination unit/ area. The requirements for the asbestos works area are to be outlined in the ARCP. The site should be adequately fenced with appropriate signage to ensure the public does not have access to the site during remedial works.
Hazardous materials (including fuel and chemical management)	Any hazardous materials should be stored in accordance with appropriate environmental and health and safety regulations. Refuel plant and equipment using mobile tanker in a designated area with appropriate controls / bunding. Make available "spill kits" onsite and clean up spillage quickly using spill kits.
Waste management	Waste disposal bins will be established as part of site mobilisation, which shall be maintained onsite for the duration of the remedial works. The waste disposal bins shall be emptied as necessary to avoid overflowing, and the contents disposed of to a waste disposal facility approved for the relevant waste type. Recycling will be undertaken where possible. All materials removed from site must be appropriately disposed of at a licenced landfill facility in accordance with the POEO Act and NSW EPA (2014) Waste Classification Guidelines.
Monitoring requirements	Monitoring requirements at the site are likely to include: <ul style="list-style-type: none"> Regular visual monitoring to check environmental and safety controls are in place and effective. Visual monitoring for dust generation. Observations of odours during the works.
Work health and safety	A project specific Job Hazard Analysis (JHA) shall be prepared prior to the commencement of works in accordance with the relevant legislation. This will outline the controls, exposure, hazards, job hazard analysis, and the tasks assigned to all employees.

9.7. Emergency Procedures and Response

In the event of an emergency, the safety of people shall always be the FIRST priority. Provided no other risks to human life are present, attend to any injured personnel in so far as is required to prevent further injury. ALL personnel within the works area shall be alerted to emergencies by verbal command and directed to a designated muster or assembly point.

If a spill has occurred, provided the safety of those on or off-site has been determined and emergency services have been notified, take all practical steps to prevent the spill from reaching all environmental receptors both on and off site. Incidents, injuries and near misses must be reported into the PC and client immediately. Environmental incidents need to be reported immediately to the client representative and the responsible authorities.

Table 15: Summary of Potential Emergencies

Emergency	Action
Medical Emergencies	Prior to arrival on-site: <ul style="list-style-type: none"> Ensure First Aid kits are up to date and contain First Aid supplies relevant to the nature of the work done on site. Ensure appropriate first aid equipment is carried at all times. Ensure at least one field person has a Senior First Aid Certificate. In the event of an Injury: <ul style="list-style-type: none"> Apply First Aid, provided you do not place yourself or others at risk. For serious injuries including hit by vehicle / accident, bitten by a snake or spider etc. <ul style="list-style-type: none"> Call 000 for an Ambulance.
Fire or Explosion	Call the fire brigade on 000. Evacuate the area and assemble at assembly point. Warn third parties that may be impacted by the event. Ensure fire brigade is met at the site.

Table 15: Summary of Potential Emergencies

Emergency	Action
Loss of Contaminant	Stop work. Use temporary bunding material to limit the extent of the spill and block storm water drains.
Utility Strike	Stop work. Assess if the area needs to be evacuated. Inform the relevant utility company.
Meteorological Event	<ul style="list-style-type: none"> • Check Bureau of Meteorology website before travel to site. • Listen to local radio stations for any weather alerts. • Regularly check the local weather forecast. • Drive with due care in adverse weather conditions. • Pull over and stop if road conditions are unsafe. • Cancel field work if necessary.
Vehicle Collision	<p>Prior to arrival on-site:</p> <ul style="list-style-type: none"> • Ensure driver is appropriately licensed and that Pre-Start Checklist has been completed. <p>In the event of a Vehicle Accident:</p> <ul style="list-style-type: none"> • Assess self for injuries. • If uninjured, and it is safe to do so, drive vehicle to side of road and turn on hazard lights. • If uninjured, and safe to do so, assess injuries of other occupants. • If necessary, apply first aid to self or others' injuries. • Call the emergency services on 000 if anyone is injured.
Biological (snake, spider, bee etc.)	<ul style="list-style-type: none"> • Ensure at least one field person has a Senior First Aid Certificate. • Ensure first aid kit has set press bandages. • Appropriate PPE. • Ensure all staff know how to administer EpiPen if relevant.
Heat or Cold Stress	<ul style="list-style-type: none"> • Check the local weather forecast. • Increase hot/cold fluid intake. • Appropriate PPE. • Ensure First Aid Kit has emergency space blanket/ice-packs. • Stop and rest as necessary in extreme conditions.

9.8. Emergency Muster Point

In the event of an incident or emergency, all personnel shall stop all works, shut down all equipment (where practical and safe to do so) and relocate to the muster point/s.

Table 16: Emergency Muster Point

Emergency	Action
Location of muster point.	To be confirmed by Principal Contractor
Fire, Ambulance or Police	000 (Australia)
Closest Hospital	Westmead Hospital (02) 8890 5555

10. Conclusions

Based on the previously identified contamination and the successful implementation of the measures described in this RAP, it is concluded that the site can be made suitable for the proposed ongoing open space land use, and that the risks associated with the identified contamination can be managed to ensure there is no risk to human health or the environment (from a contamination perspective).

These conclusions are made within the following limitations.

10.1. Limitations

This report is confidential and has been prepared by Progressive Risk Management (PRM) for the client detailed above. This report may only be used and relied upon by the client and must not be copied to, used by or relied upon by any person other than the client.

All results, conclusions and recommendations presented should be reviewed by a competent person before being used for any other purpose. PRM accepts no liability for use of, interpretation of or reliance upon this report by any person or body other than the client. Third parties must make their own independent inquiries.

This report should not be altered amended or abbreviated, issued in part or issued incomplete without prior checking and approval by PRM. PRM accepts no liability that may arise from the alteration, amendment, abbreviation or part-issue or incomplete issue of this report. To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by PRM and this report are expressly excluded (save as agreed otherwise with the client).

PRM shall bear no liability in relation to any change to site conditions after the date of this report. This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope and limitations defined herein (Scope of Works). Should information become available regarding conditions at the site including previously unknown sources of contamination, PRM reserves the right to review the report in the context of the additional information.

Figures

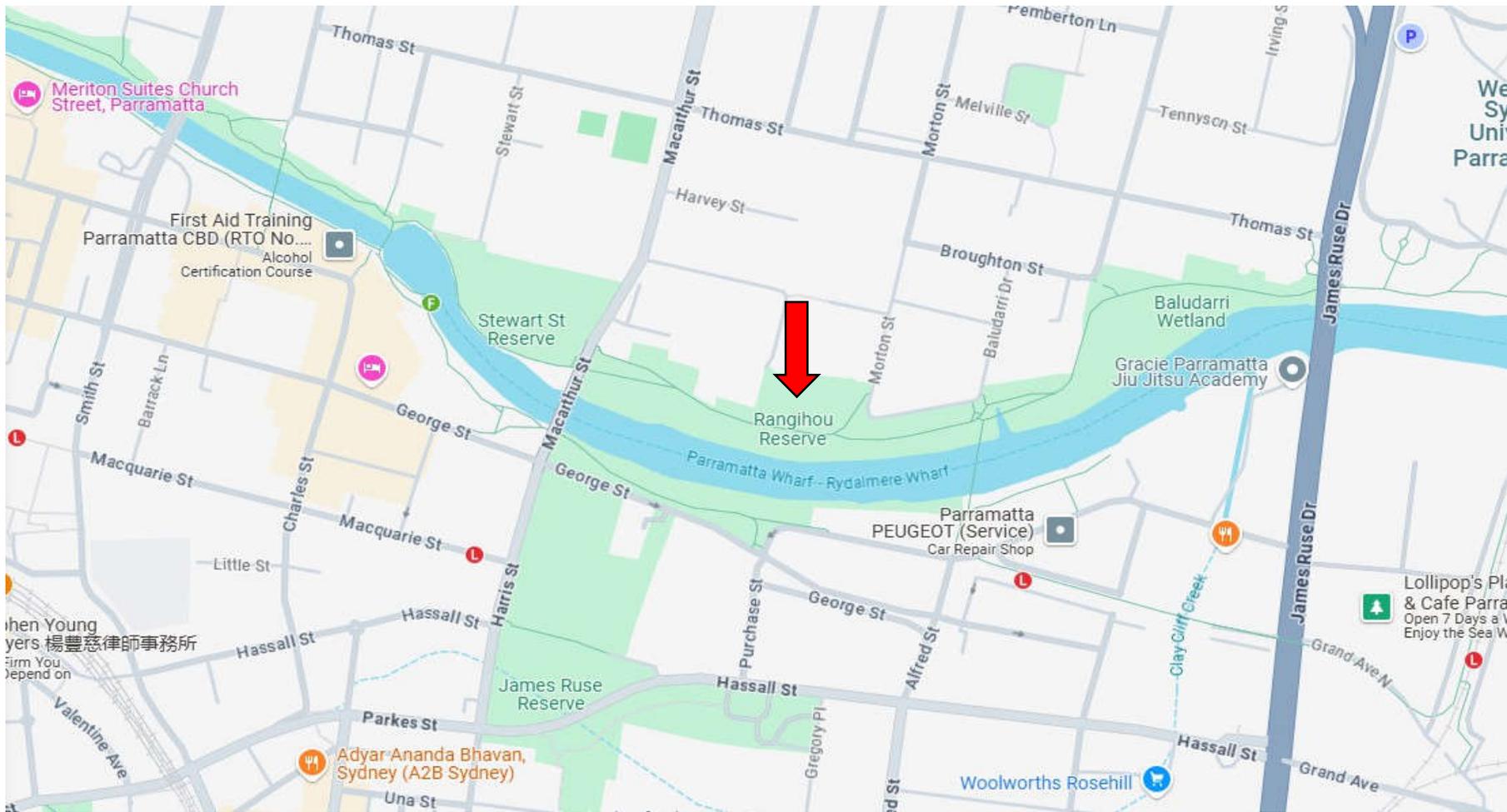
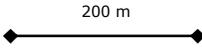


Image courtesy of www.google.com.au/maps, 2025



LEGEND		Report Name:	Remediation Action Plan
	Approximate site location	Site Details:	CBD Cycleway Project: Rangihou Reserve - Baludarri Drive, Parramatta NSW
		Client Name:	City of Parramatta Council
		PRM Reference:	P037382.011 / C0018
		Figure Number:	1
		Figure Name:	Site Locality Map



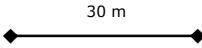
Area A: Contamination not identified

Area B: Contaminated

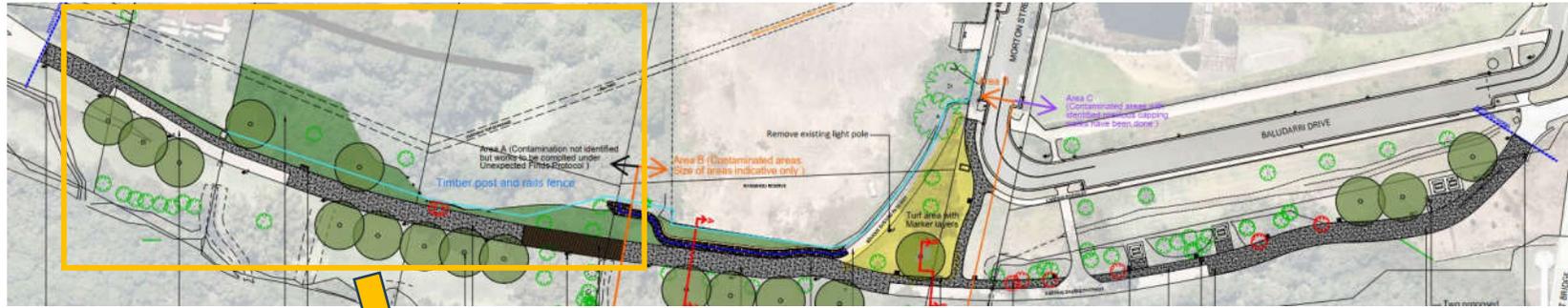
Area C: Contamination below historical capping



Image courtesy of www.google.com.au/maps, 2025



LEGEND		Report Name:	Remediation Action Plan
	Approximate area of works	Site Details:	CBD Cycleway Project: Rangihou Reserve - Baludarri Drive, Parramatta NSW
	Approximate extent of areas (Refer Fig 3a, 3b, 3c)	Client Name:	City of Parramatta Council
		PRM Reference:	P037382.011 / C0018
		Figure Number:	2
		Figure Name:	Site Layout Map



LEGEND

Report Name: Remediation Action Plan

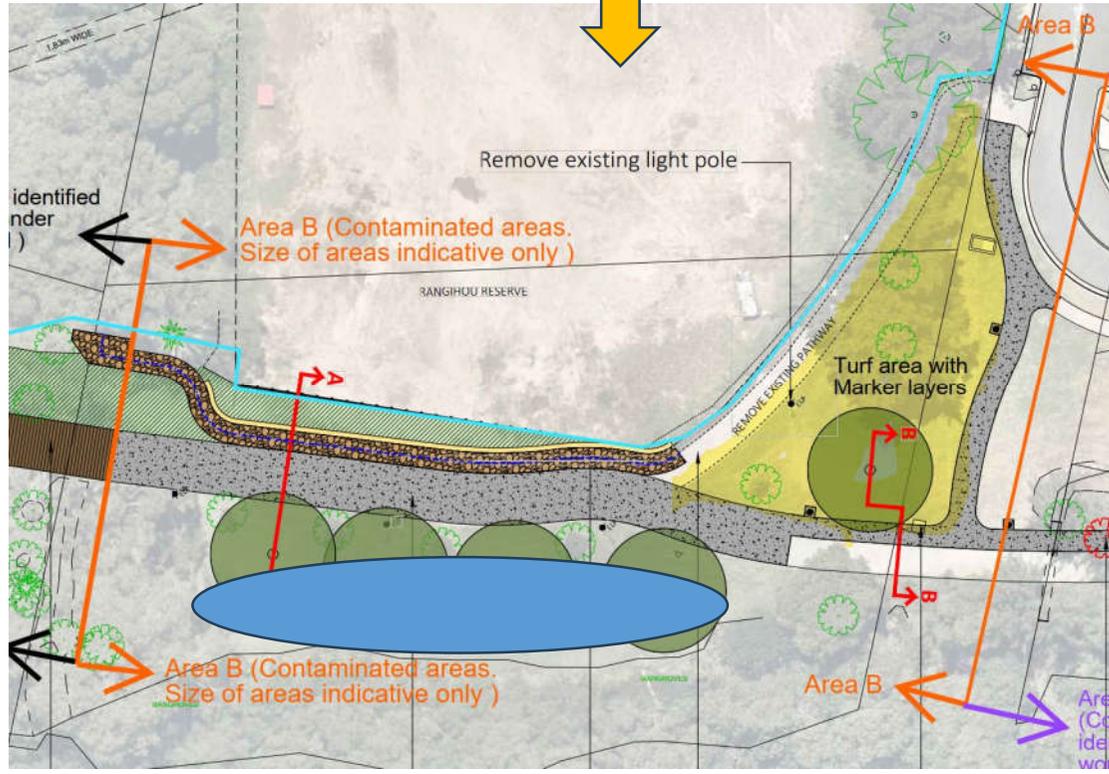
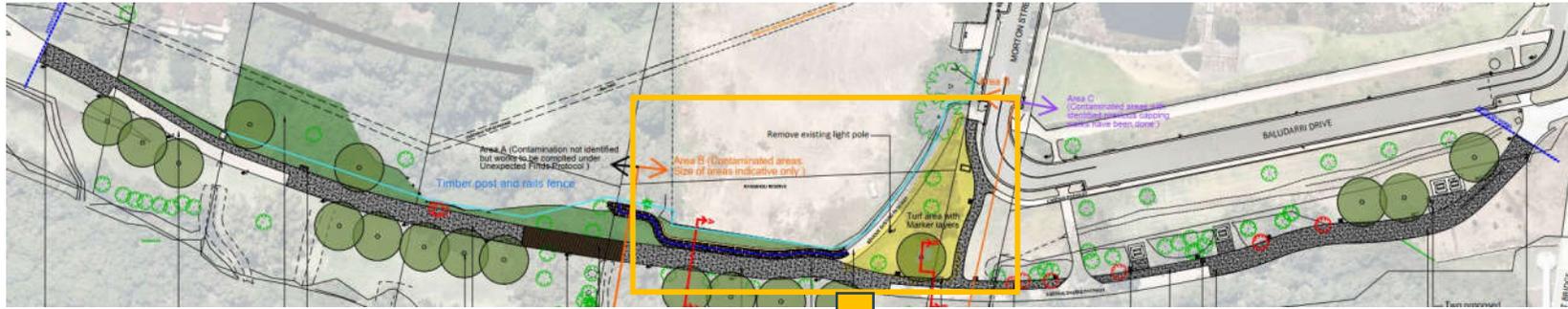
Site Details: CBD Cycleway Project: Rangihou Reserve - Baludarri Drive, Parramatta NSW

Client Name: City of Parramatta Council

PRM Reference: P037382.011 / C0018

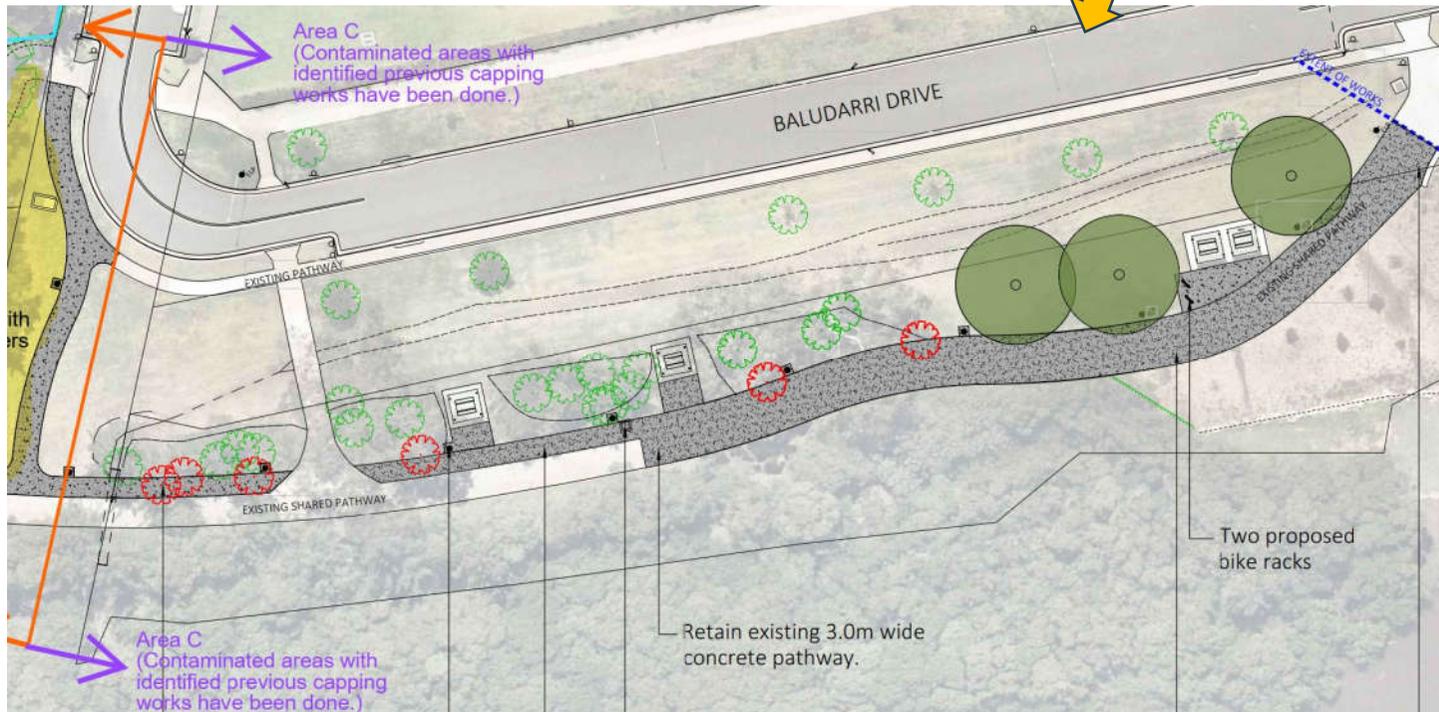
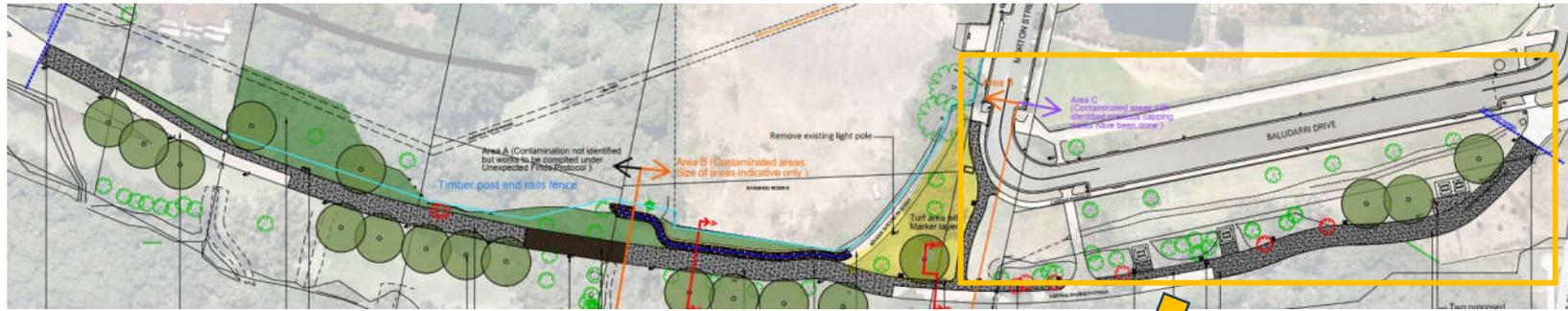
Figure Number: 3a: Area A

Figure Name: Site Layout Map



LEGEND	
	Proposed stockpile area for contaminated material

Report Name:	Remediation Action Plan
Site Details:	CBD Cycleway Project: Rangihou Reserve - Baludarra Drive, Parramatta NSW
Client Name:	City of Parramatta Council
PRM Reference:	P037382.011 / C0018
Figure Number:	3b: Area B
Figure Name:	Site Layout Map



LEGEND

Report Name: Remediation Action Plan

Site Details: CBD Cycleway Project: Rangihou Reserve - Baludarri Drive, Parramatta NSW

Client Name: City of Parramatta Council

PRM Reference: P037382.011 / C0018

Figure Number: 3c: Area C

Figure Name: Site Layout Map



Appendix A: Council Technical Specifications

TO BE INCLUDED ONCE COMPLETED

<p>The following have been identified as significant environmental aspects for the site: These aspects shall be managed with the environmental protection measures outlined on this plan.</p>		<p>Major Construction Management Plan (1) – Site Setout and Construction Protection Measures Project Name: Construction Management Plan - WICR322-Eastern Parramatta River & CBD Precinct Cycleway Date and Revision:</p>	
<p>Management</p>		<p>Approved Drainage Plan Here</p>	
<p>1. Responsibilities: Emergency Contact 1: Name – Mobile – Email Emergency Contact 2: Name – Mobile – Email</p>	<p>5. Staging of Works: Approximate Months of Construction</p>	<p>Legend: Ex Fence — Temp Fence — Gate Waste ■ Toilet ●</p>	
<p>2. Communication of CMP Requirements: A Copy of the CMP to be kept onsite at all times & made available to all contractors. Site inspections will be undertaken weekly & after rain event/s to ensure adherence to all items in the CMP.</p>	<p>6. Informing Residents and Businesses: Nearby residents shall be informed at least two days prior to any construction works via letter drop and door knock.</p>	<p>Site Shed ■ Sediment Trap □ TPZ Area ☁ Contractor Parking</p>	
<p>3. Inspections and Maintenance:</p>	<p>7. Associated Documents:</p>		
<p>4. Traffic Management The Principal Contractor is to define control measures in a Construction Traffic Management Plan prepared in accordance with Councils and TfNSW requirements. This shall appropriately manage internal site traffic, including pedestrian and cycle movements to ensure the safety of workers and public as well as outline required signage and fencing to assist with ensuring safety for all. Signs advising of the proposed works and changes to traffic conditions, as well as areas under construction, should be visibly placed around the area of works. The Construction Traffic Management Plan is to be approved by the CoP before works commence.</p>			
<p>Noise Risk: Significant / Med / Low</p>			
<p>Requirement: EPA NSW and Council requirements must be adhered to in relation to the level of noise and working hours, to ensure that residents and other applicable neighbours to the site are not disturbed unreasonably. The generation of noise must be minimized.</p>			
<p>7. Working Hours: 7 am to 6pm Monday - Friday 8 am to 5pm Saturday 24-hour contact details of site manager: Council's superintendent: Peter Kazanzidis (0477 760 228) Community consultation and complaints handling; Council's project managers Hans Smit (8839 4014) Arusha Bhowmik (8839 3379)</p>	<p>8. Noise Minimization Methods:</p>	<p>9. Other:</p>	
<p>Dust Risk: Significant / Med / Low</p>			
<p>Requirement: Dust generation must be minimized to ensure there is no health risk or loss of amenity and prevented on dry, windy days.</p>			
<p>10. Minimizing Dust Generation: Works on hot, dry, windy days to be minimized to prevent dust. Restrict vehicle movements onsite.</p>	<p>12. Contingencies:</p>		
<p>11. Dust Suppression: Dust suppression will be controlled by means of water, using sprinkler/s or handheld hose/s with a trigger nozzle.</p>	<p>13. Other: Any debris deposited by vehicles on roads is to be minimized when vehicles are leaving the site and council roads/footpaths are to be kept clean and maintained to the satisfaction of council officers.</p>		
<p>Erosion and Sediment Risk: Significant / Med / Low</p>			
<p>Requirement: Erosion and sediment control plans are to be established by the Principal Contractor and approved by the CoP prior to commencement of works. The controls must be maintained in place until the works are complete and all exposed erodible materials are stabilised. All sediment control measures must be checked regularly and repaired or re-installed (if required) if heavy rainfall is forecast. Erosion and sediment must be managed in accordance with current best practice environmental management practices, to prevent sediment-laden water from entering any drainage system or natural waterway. Mud must not be transported on to nearby roads.</p>			
<p>14. Drainage Management: Debris deposited by vehicles on the road is to be minimized when vehicles are leaving the site and kept clean and maintained to the satisfaction of Council Officers.</p>		<p>17. Sediment Traps: Sediment traps to be placed on All Internal Drainage Pit/s & Council Pit/s</p>	
		<p>18. Dewatering:</p>	

<p>15. Soil Stabilization: During Construction:</p> <p>Post Works:</p>				
<p>16. Stockpile Protection:</p>	<p>19. Vehicle and Road Management.</p> <p>Roads - must be kept clean, to satisfaction of Council, at all times. Use only nominated access points.</p> <p>Site Access - Vehicle movements to & from the site & deliveries will only occur during the approved working hours.</p> <p>Cleaning - Vehicles are to be inspected & cleaned of debris by scraping with a shovel & broom before leaving the site.</p> <p>Cleaning - Streets any material deposited on roadway to be swept up by means of shovel & broom or use of a street sweeper. Or as directed by an Authorized Council Officer. Using Street Sweeper as required and as directed by Authorized officer, any urgent cleaning may be undertaken by Council's contractor and the cost of this will be subtracted from the bond.</p>			
	<p>20. Other:</p>			
<p>Waste Risk: Significant / Med / Low</p>				
<p>21. Detail Construction Waste Management Plan (CWMP) - A detailed Construction Waste Management Plan (CWMP) is to be prepared by the Principal Contractor specifying the likely waste generation and how the waste generated will be disposed of. Waste material taken off site will be appropriately classified and managed in accordance with the Waste Classification Guidelines (EPA November 2014). The CWMP is to be approved by the CoP before works commence. Demolition work plans - to be provided along with final landscape drawings</p>				
<p>Requirement: Litter and waste must be contained on site, before disposal in a responsible manner. Skip bins must have hinged lids and be kept closed each night and on wind affected days.</p>				
<p>21. Movement of Soil: Of-site / On Site / N/A Contaminant Status:</p>	<p>Waste Storage and Disposal: All rubbish bin/s and skip bin/s will have lids or be covered to contain airborne material/s.</p> <p>All timber and metalworks to be recycled where possible.</p>			
<p>22. Waste Minimization Methods:</p>	<p>24. Other:</p>			
<p>Chemicals Risk: Significant / Med / Low</p>				
<p>Requirement: Storage and spill management practices must be implemented to ensure that no environmental damage can result from the escape or spillage of chemicals or fuels.</p>				
<p>25. Storage:</p>	<p>27. Refueling Procedure:</p>	<p>Flora and Fauna Risk: Significant / Med / Low</p> <p>Requirement: All significant flora and fauna on and adjacent to the site must be protected in accordance with AS4970-2009</p>	<p>Archaeological/Heritage Risk: Significant / Med / Low</p> <p>Requirement: Places, sites and objects of archaeological or heritage significance must be protected.</p>	<p>Blank 1 Risk: Significant / Med / Low</p> <p>31.</p>
<p>26. Spill Management:</p>	<p>28. Other:</p>	<p>29. Yes / No. Details: Prior to the commencement of any building works appropriate tree protection fencing must be erected in accordance with Australian Standard AS47902009 & remain in place until completion of works.</p>	<p>30. Yes / No. Details:</p>	

RISK ASSESSMENT CHECKLIST		Major Construction Management Plan (2) - Risk Assessment and Designs of Environmental Protection Measures		
☑ Noise		Project Name: Construction Management Plan - WICR322-Eastern Parramatta River & CBD Precinct Cycleway Date and Revision:		
Issues: <ul style="list-style-type: none"> Nature of Noise Generating Works: Potential Noise Receptors: Proximity of Works to Noise Receptors: 	<u>Likelihood</u>			
	<u>Consequence</u>			
	<u>Overall Risk</u>			
☑ Dust			Environmental protection measures shall be constructed in accordance with the following designs.	
Issues: <ul style="list-style-type: none"> Dust Sources: Potential Dust Receptors: Proximity of Works to Dust Receptors: Extent of Exposed Earth and Duration of Time Exposed: Wind Conditions: 	<u>Likelihood</u>			
	<u>Consequence</u>			
	<u>Overall Risk</u>			
☑ Erosion and Sediment				Environmental protection measures shall be constructed in accordance with the following designs.
Issues: <ul style="list-style-type: none"> Erosion and Sediment Sources: Potential Erosion and Sediment Receptors: Proximity of Works to Erosion and Sediment Receptors: Extent of Exposed Earth and Duration of Time Exposed: Soil Type and Erosivity: Slope: Site Drainage Regime: Rainfall: Vehicle Movements on and Off Site: 	<u>Likelihood</u>			
	<u>Consequence</u>			
	<u>Overall Risk</u>			
☑ Waste		Environmental protection measures shall be constructed in accordance with the following designs.		
Issues: <ul style="list-style-type: none"> Nature of Waste to be Generated: Presence of Waste on Site Prior to Work Commencement: Quantity of Waste Anticipated: Potential Waste Receptors: Proximity to Potential Waste Receptors: 	<u>Likelihood</u>			
	<u>Consequence</u>			
	<u>Overall Risk</u>			
☑ Chemicals			Environmental protection measures shall be constructed in accordance with the following designs.	
Issues: <ul style="list-style-type: none"> Types of Chemicals and Fuels Used and/or Stored on Site: Quantities of Chemicals and Fuels Used and/or Stored on Site: Potential Chemical Receptors: Proximity to Potential Chemical Receptors: 	<u>Likelihood</u>			
	<u>Consequence</u>			
	<u>Overall Risk</u>			
☑ Significant Flora/ Fauna				Environmental protection measures shall be constructed in accordance with the following designs.
Issues: <ul style="list-style-type: none"> Types of Flora/ Fauna: Vulnerability of Flora / Fauna: Proximity of Flora/Fauna to Works: Work Activities Which May Threaten Flora / Fauna: Potential Impacts on Flora / Fauna: 	<u>Likelihood</u>			
	<u>Consequence</u>			
	<u>Overall Risk</u>			

△ Archaeological/ Heritage						
Issues: <ul style="list-style-type: none"> Traditional Land Owners Consulted? Yes/ No Survey or Assessment Conducted? Yes/ No / Not Required Probability of Encountering Archaeological/ Heritage Items During Works: Types of Archaeological/ Heritage Items on Site: Proximity of Archaeological/ Heritage Items to Works on Site: Work Activities Which May Threaten Archaeological/ Heritage Items: Potential Impacts on Archaeological/ Heritage Items: 	<u>Likelihood</u>	†Blank 1		†Blank 2		
	<u>Consequence</u>	Issues: <ul style="list-style-type: none"> 	<u>Likelihood</u>	Issues: <ul style="list-style-type: none"> 	<u>Likelihood</u>	
			<u>Consequence</u>		<u>Consequence</u>	<u>Consequence</u>
	<u>Overall Risk</u>		<u>Overall Risk</u>		<u>Overall Risk</u>	<u>Overall Risk</u>

I have read this Construction Management Plan and agree to undertake works and ensure sub-contractors undertake works in accordance with this plan.

Developer: _____ Date: _____

Consultant: _____ Date: _____

Contractor: _____ Date: _____



planning consultants

Statement of Heritage Impact

Construction of Pedestrian and Cyclist Pathways

Rangihou Reserve, Parramatta



Prepared for: City of Parramatta
January 2025

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1 Introduction

1.1 Commission

DFP has been commissioned by the City of Parramatta (Council) to prepare a Statement of Heritage Impact (SoHI) for the proposed works to Rangihou Reserve, located on the northern side of the Parramatta foreshore.

This SoHI report assesses the potential environmental impacts which could arise from the 'Proposal' which include:

- Construction of a 5m wide concrete shared path. Where possible, the existing path is proposed to be extended;
- Installation of pathway lighting;
- Relocation of fencing and installation of a sandstone block retaining wall;
- Landscaping and tree removal;
- Construction of sandstone block retaining walls;
- Construction of a raised composite boardwalk; and
- Associated drainage restoration works.

1.2 Methodology and Structure

The methodology used in the preparation of this SoHI is in accordance with the principles and definitions as set out in the guidelines to *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance October 2013*) and the latest version of the Statement of Heritage Impact Guidelines (2002), produced by the Heritage NSW, Department of Premier and Cabinet (DPC), accessed October 2015.

This SoHI reviews the relevant statutory heritage controls, assesses the impact of the proposal on the subject property and makes recommendations as to the level of impact. The proposed works have been assessed in relation to the relevant controls and provisions contained within the *Parramatta Local Environmental Plan 2023* (LEP) and the Parramatta Development Control Plan 2023 (DCP).

1.3 Site Identification

1.3.1 Location and Legal Description

The site is located approximately 500m to the east of the Parramatta CBD and is within the City of Parramatta Local Government Area (LGA).

The site subject to the proposed works is Rangihou Reserve, Parramatta and is located within the following property addresses:

- Lot 1 in DP 587055;
- Lot 2 in DP 1089537;
- Lot 15 in DP 1141023;
- Lot 155 in DP 128846;
- Lot C in DP 162815; and
- Lot 3 in DP 1215559.

A Survey of the site is included at **Appendix 1** of this REF.

The site of the proposed works is irregularly shaped with a frontage to Baludarri Road to the north and Parramatta River to the south.

Figure 1 below is a locality plan showing the site outlined in red line.

1 Introduction



Figure 1 Site Location

Figure 2 is an aerial photograph of the site and its surrounds.

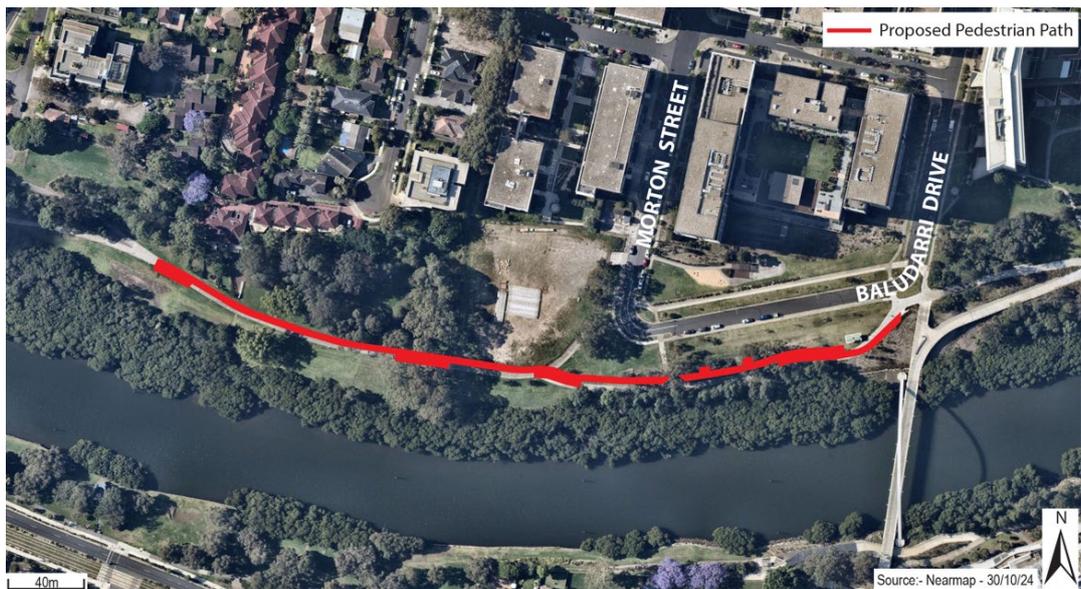


Figure 2 Aerial Photograph

1.4 Report Limitations

The proposed works are in the vicinity of heritage Item no. I011, Parramatta River Wetlands and no. I632 Stone Wall in *Parramatta Local Environmental Plan 2023*. This report is limited to assessment of the potential physical and visual impacts on the significance of the item. Due to the natural characteristics of the heritage item documentary and historical research is not warranted.

Archaeological assessment of the subject site is outside the scope of this report. The report does include recommendations in the event of archaeological evidence being encountered.

This report only addresses the relevant heritage planning provisions and does not address general planning or environmental management considerations.

1 Introduction

1.5 Abbreviations and Definitions

SoHI	Statement of Heritage Impact
ICOMOS	International Council on Monuments and Sites
Burra Charter	refers to 'The Burra Charter' prepared by Australia ICOMOS October 2013

The conservation terms used throughout this report are based on the terms and definitions adopted by *The Burra Charter*, *The Australia ICOMOS Charter for places of cultural significance* (Australia ICOMOS October 2013). *The Burra Charter* forms the basis for cultural conservation within Australia and is acknowledged by government heritage agencies around Australia. Terms used in this plan are defined below:

Place, means site, area, land, landscape, building or other work, group of buildings or other works, and may include components, contents, spaces and views.

Cultural Significance, means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.

Fabric means all the physical material of the place including fixtures, contents and objects.

Conservation means all the processes of looking after a place so as to retain its cultural significance, as listed in the History Section of this report.

Maintenance means the continuous protective care of the fabric, and setting of a place, and is to be distinguished from repair. Repair involves restoration or reconstruction.

Integrity (not a Burra Charter definition) means the degree to which a place or component of a place retains the form and completeness of its physical fabric, historical associations, use or social attachments that give the place its cultural significance.

Preservation means maintaining the fabric of a place in its existing state and retarding deterioration.

Restoration means returning the existing fabric of a place to a known earlier state by removing accretions or by reassembling existing components without the introduction of new material.

Reconstruction means returning a place to a known earlier state and is distinguished from restoration by the introduction of new material into the fabric.

Adaptation means modifying a place to suit the existing use or a proposed use. [Article 7.2 states regarding use that: *a place will have a compatible use*]

Compatible use means a use, which respects the cultural significance of a place. Such a use involves no, or minimal impact on cultural significance.

Interpretation means all the ways of presenting the cultural significance of a place.

2 Physical Description

2.1.1 Physical Description

Existing facilities on the site include a number of interconnected shared paths that extends between both eastern and western ends of Rangihou Reserve. The land consists of existing trees, grass covers and low-lying shrubs. Also located on the site are existing light posts, community amenities such as picnic tables and shelters and small playgrounds located towards the eastern and northern sides of the site.

Figures 3 to Figure 8 are photographs of the site.

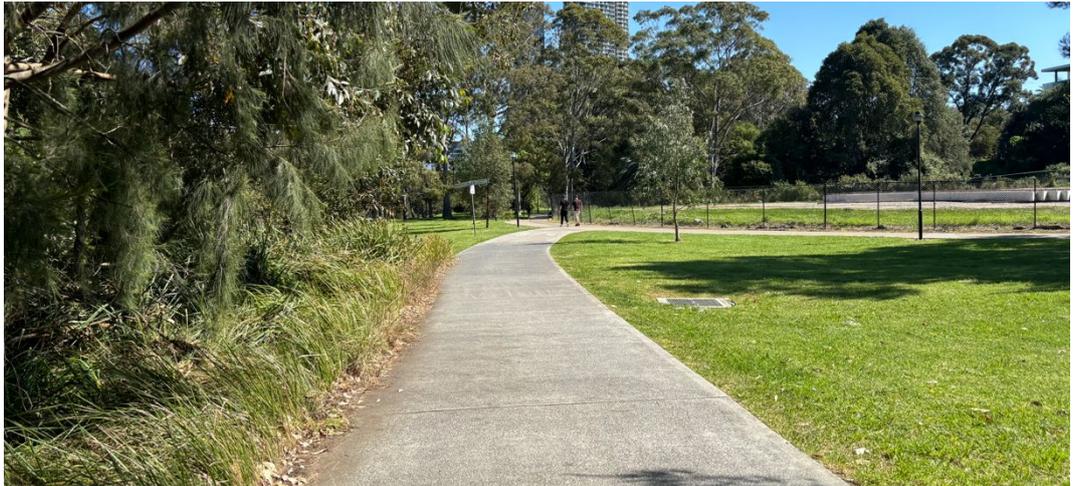


Figure 3 Photograph of existing path looking west



Figure 4 Photograph of existing vegetation looking towards Parramatta River

2 Physical Description



Figure 5 Photograph of existing path looking west



Figure 6 Photograph of existing path and vegetation

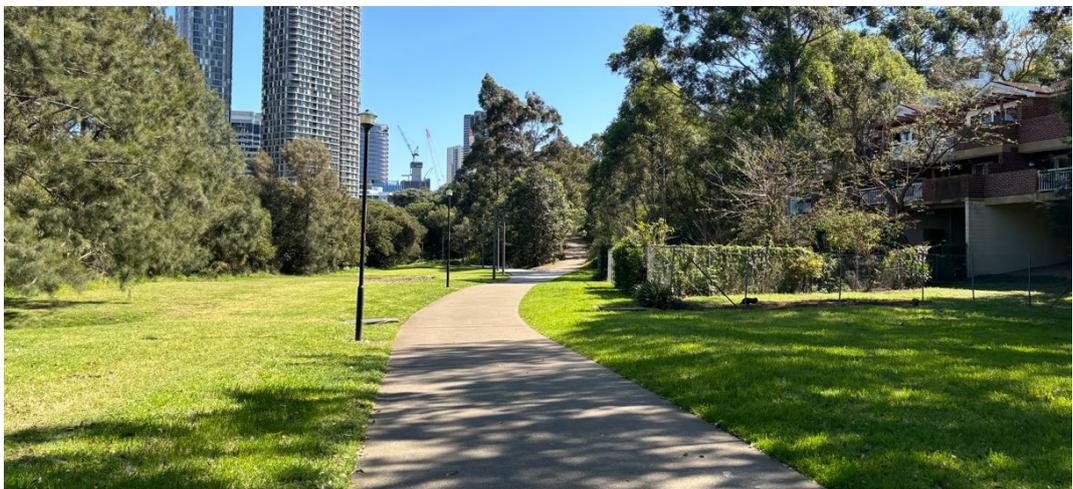


Figure 7 Photograph of existing path with Parramatta CBD in the background

2 Physical Description



Figure 8 Photograph of connecting path (right) that links to Macarthur Street

2.1.2 Vegetation

There is a variety of trees and shrubs across the full extent of the Rangihou Reserve site.

The site is located within a proximity area to coastal wetlands that are along the foreshore of Parramatta River. Much of the land south of the proposed works is mapped as comprising biodiversity values.

2.2 Surrounding Development

To the north of the site is Baludarri Drive. Also located to the north of the site are a range of residential developments, mostly consisting of mid and high-density residential developments and some mixed-use developments.

To the east of the site are the Baludarri Wetlands. Also located to the east of the site is the Alfred Street Bridge, which was constructed in 2023. The bridge is a pedestrian bridge that connects the northern and southern sides of the Parramatta foreshore.

To the south of the site is Parramatta River.

To the west of the site is Stewart Street Reserve. Further to the west is the Parramatta Central Business District (CBD).

3 Heritage Significance

3.1 Significance Assessment

Heritage item I011 and I632 are depicted in the extract from *Parramatta Local Environmental Plan 2023* Heritage Map in **Section 5.2** of this report.

3.1.1 Parramatta River Wetlands

The following statement of heritage significance is extracted from the NSW Heritage Inventory Sheet for the Parramatta River Wetlands heritage item No. I011 in the LEP:

The wetlands along Parramatta River are of significance for Parramatta area as remnant representative areas of mangroves and salt marshes which once extensively lined the foreshores and tidal water flats of the region.

A photograph of the wetlands along the Parramatta River foreshore is provided at **Figure 9** below.



Figure 9 Photograph of wetlands along the Parramatta River Foreshore

3.1.2 Stone Wall

A review of a City of Parramatta Heritage Study has described the stone wall in Rangihou Reserve as being located along the banks of Parramatta River on both sides and part of construction associated with Queens Wharf on the south side of the river.

The historical details associated with the stone wall are quoted below:

Stone wall shown on south side of Parramatta River in this location on plan of gas works of March 1890, which shows stone wall holding back reclamation fill. A rubble stone wall is shown on the north side of the river in this location on the Water Board Survey of November 1926.

A photograph of the rubble stone wall on the northern side of the river is provided at **Figure 10** below.

3 Heritage Significance



Figure 10 Photograph of rubble stone wall within Rangihou Reserve

5 Assessment of Heritage Impact

5.1 Introduction

The subject site borders heritage item I011 Parramatta River Wetlands, and Item I632 a stone wall under *Parramatta Local Environmental Plan 2023*, which extends along the northern shoreline of the Parramatta River.

An extract of the heritage map from the LEP is provided at **Figure 11** below.

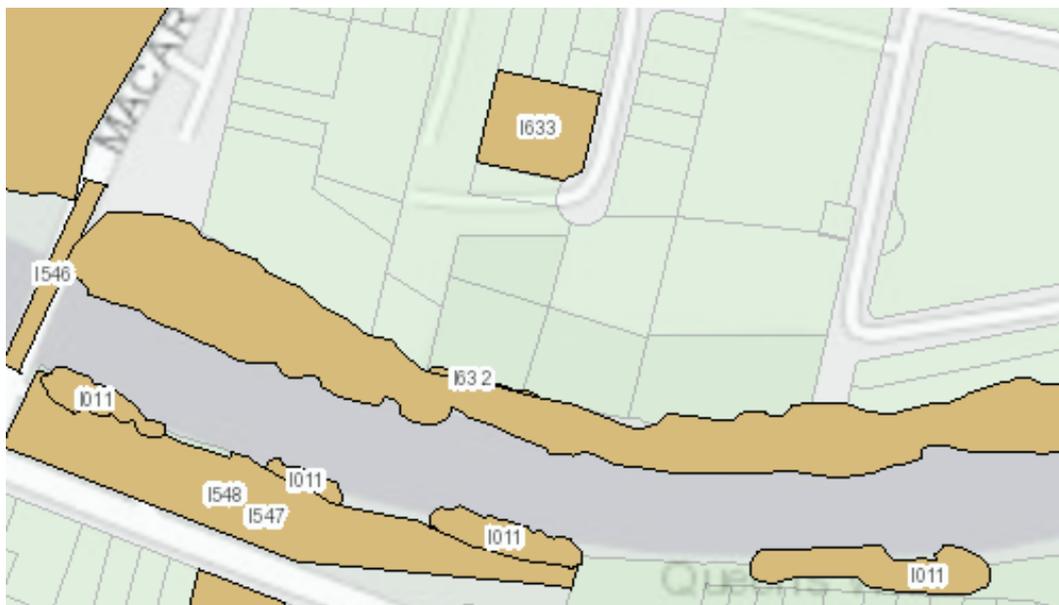


Figure 12 Extract from Heritage Map Parramatta LEP 2023

The proposed scope of works has been assessed against the following impact assessment criteria:

- The New South Wales Heritage Council Guidelines and Statements of Heritage Impact

The accepted practice in assessing the levels of impact on items, places or fabric of heritage significance is to adopt the following grading¹:

<i>Impact Grading</i>	<i>Built Heritage or Historic Landscape Attributes</i>
No Change	No change to Fabric or setting.
Negligible	Slight changes to historic building elements or setting that hardly affect it and have no impact upon significance.
Minor	Change to key historic building elements, such that the asset is slightly altered.
Moderate	Changes to many key historic building elements, such that the resource is moderately altered.
Major	Change to key historic building elements that contribute to the listing such that the resource is totally altered. Comprehensive changes to setting.

5.2 Statutory Controls

The provisions of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (SEPP T1) allow the proposed works to be carried out as development without consent under Part 5 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The works are subject to a Review of Environmental Factors under section 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation). This assessment considers the relevant provisions of Section 171(2) of the EP&A Regulation, specifically the following environmental factor as it relates to heritage.

¹ ICOMOS – Guidance on Heritage Impact Assessment for Cultural World Heritage Properties, A publication of the International Council on Monuments and Sites, January 2011, downloaded 23/2/2015.

5 Assessment of Heritage Impact

(e) *the effects on any locality, place or building that has-*

- (i) *aesthetic, anthropological, archaeological, cultural, historical, scientific or social significance, or*
- (ii) *other special value for present and future generations.*

Section 2.11 of SEPP TI addresses consultation with councils – development with impacts on local heritage. The relevant provisions of subclause (1) state:

- (1) *This section applies to development carried out by or on behalf of a public authority if the development—*
 - (a) *is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item, in a way that is more than minor or inconsequential, and*
 - (b) *is development that this Chapter provides may be carried out without consent.*
- (2) *A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies unless the authority or the person has—*
 - (a) *had an assessment of the impact prepared.*

This SoHI satisfies the requirements of Section 171(2) of the EP&A Regulation as set out in this SoHI.

Notwithstanding the above, Section 2.17 of SEPP TI sets out exceptions whereby Sections 2.10 – 2.15 do not apply. Subclause (c) provides that consultation in accordance with Section 2.10 – 2.15 is not required to be given to Council or a public authority that is carrying out the development. In this instance, Council is carrying out the proposed development.

Additionally, the proposed development is not likely to affect the heritage items in the vicinity. Being adjacent to and not within the items and augmenting works already in existence, physical impacts will be avoided, and visual impacts will be negligible and, in these circumstances, consultation is not required.

This assessment also takes into account the relevant environmental criteria at subsection 171(2)(e) of the EP&A Regulation:

(e) *the effects on any locality, place or building that has—*

- (i) *aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or*
- (ii) *other special value for present or future generations,*

These criteria are very broad and are captured suitably by the provisions of Clause 5.10 of LEP.

Table 1 Review against relevant clauses of Parramatta LEP 2023

LEP Clause	Discussion
<p>5.10 Heritage conservation</p> <p>(1) Objectives The objectives of this clause are as follows:</p> <ul style="list-style-type: none"> (a) to conserve the environmental heritage of the City of Parramatta; (b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views, (c) to conserve archaeological sites, (d) to conserve Aboriginal objects and Aboriginal places of heritage significance. 	<p>The pathway, landscaping and associated works for the existing pathway in Rangihou Reserve are minor in scale and are located adjacent to the wetlands.</p> <p>The proposed works are consistent with the objectives of the Clause 5.10 LEP</p> <p>The works will cause negligible physical and visual impacts on the wetlands vegetation, environment and ecology.</p>

5 Assessment of Heritage Impact

Table 1 Review against relevant clauses of Parramatta LEP 2023

<p>(2) Requirement for consent Development consent is required for any of the following: (a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance): (i) a heritage item, (ii) an Aboriginal object, (iii) a building, work, relic or tree within a heritage conservation area, (e) erecting a building on land: (i) on which a heritage item is located or that is within a heritage conservation area, or (ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance</p>	<p>Consent is not strictly required under sub clause (2) as the proposed activity is not located on or within a heritage item. The proposed activity will also not demolish, or alter the exterior of any of the detail, fabric, finish or appearance of any of the heritage items within the vicinity.</p> <p>An AHIMS Search (Appendix 13) was undertaken on 3 October 2024 which identified six (6) known Aboriginal Sites or Places within a 200m radius of the site.</p> <p>Notwithstanding, all of these items are located on the southern side of Parramatta River and are considerably setback from the location of the proposed works</p> <p>Consequently, there are no known indigenous or cultural heritage items, objects or relics within the site and the proposed works are within the footprint of existing disturbed parts of the site.</p> <p>Notwithstanding, if during the construction works, Aboriginal objects are relics are uncovered, a Mitigation Measure has been included to cease works immediately and contact the relevant authority.</p>
<p>(4) Effect of proposed development on heritage significance The consent authority must, before granting consent under this clause in respect of a heritage item or heritage conservation area, consider the effect of the proposed development on the heritage significance of the item or area concerned. This subclause applies regardless of whether a heritage management document is prepared under subclause (5) or a heritage conservation management plan is submitted under subclause (6).</p>	<p>This Statement of Heritage Impact provides the necessary information to make an assessment under sub clause (4).</p> <p>This Statement of Heritage Impact is a heritage management document.</p>
<p>(5) Heritage assessment The consent authority may, before granting consent to any development: (a) on land on which a heritage item is located, or (b) on land that is within a heritage conservation area, or (c) on land that is within the vicinity of land referred to in paragraph (a) or (b), require a heritage management document to be prepared that assesses the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area concerned.</p>	<p>This Statement of Heritage Impact is a heritage management document</p>
<p>(6) Heritage conservation management plans The consent authority may require, after considering the heritage significance of a heritage item and the extent of change proposed to it, the submission of a heritage conservation management plan before granting consent under this clause.</p>	<p>A Heritage Conservation Management plan is not warranted in these circumstances.</p>

The assessment of heritage impacts is summarised below:

5 Assessment of Heritage Impact

ITEM	IMPACT
Construction of a 5m wide concrete shared path. Where possible, the existing path is proposed to be extended;	Visual: Minor Physical: Negligible
Installation of pathway lighting	Visual: None Physical: None
Relocation of fencing and installation of a sandstone block retaining wall	Visual: Minor Physical: None
Landscaping and tree removal;	Visual: None Physical: None
Construction of sandstone block retaining walls;	Visual: Minor Physical: None
Construction of a raised composite boardwalk; and	Visual: Minor Physical: Potentially minor
Associated drainage restoration works	Visual: None Physical: Potentially minor

5.2.1 Parramatta Development Control Plan 2023

Table 2 provides an assessment against the DCP. Part 7 of the DCP entitled 'Heritage and Archaeology' provides general objectives for development on and in the vicinity of heritage and archaeology. The proposed works are consistent with the general objectives of Part 7 insofar as potential impacts on the setting of the heritage items in the vicinity of the proposed activity:

- O.01 Ensure the appropriate management of heritage in the City.*
- O.02 Retention and reinforcement of the attributes that contribute to the heritage significance of items, areas and their settings.*
- O.03 Ensure development is compatible with the significance and character of the area so that the new work does not detract from the historic buildings and their amenity to/or from the streetscape.*

Part 5.3.2 of Parramatta Development Control Plan 2023 addresses development associated with Waterways and The Riparian Zone. For an assessment of the impact on the values of the heritage item objective O.01 is relevant.

- O.01 Ensure development contributes to the protection and rehabilitation of waterways in order to:*
 - *improve waterway health, and*
 - *develop and maintain ecologically sustainable waterways.*

In this regard the proposed provision of pathway widening and retaining wall, being contained primarily to the northern side the route of the existing pathway, is consistent with the controls of Part 5.2.3 and will have no impact on the heritage listed wetlands.

6 Conclusion

6.1 Conclusions

This Statement of Heritage Impacts has been prepared by DFP for the City of Parramatta Council, the proponent and determining authority for the proposed minor upgrade works to Rangihou Reserve, Parramatta.

This Statement of Heritage Impact describes the existing site context and provides details of the proposed works which should be read in conjunction with the Review of Environmental Factors prepared by DFP Planning for the proposed upgrade works to Rangihou Reserve.

The proposed works will have a negligible visual impact and potential minor physical impacts on the natural significance of the remnant mangroves and saltmarsh. No impacts are likely to be generated towards the wetlands and the existing stone wall.



Brian McDonald
Principal Urban Designer and Heritage Consultant
DFP Planning

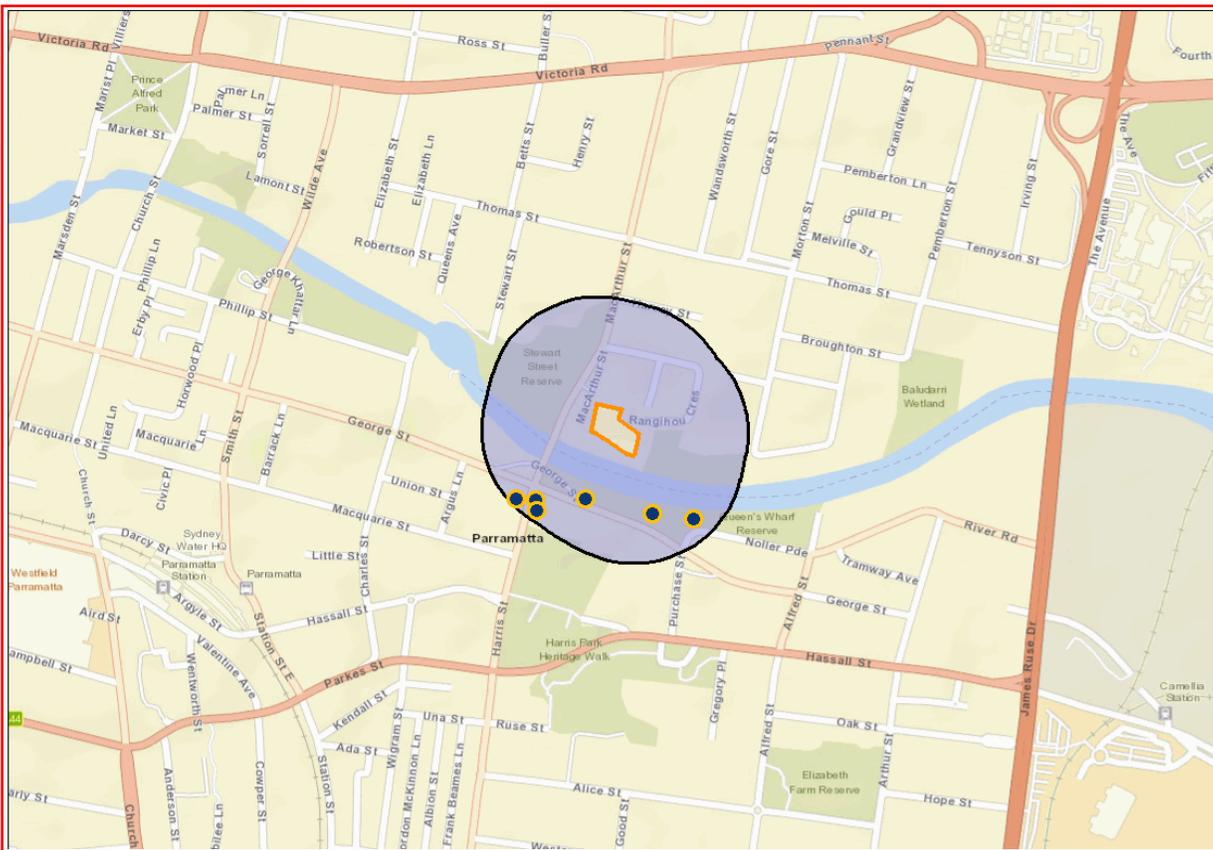
Thomas West
 11 Dartford Road
 Thornleigh New South Wales 2120
 Attention: Thomas West
 Email: twest@dfppanning.com.au

Date: 03 October 2024

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 1, DP:DP587055, Section : - with a Buffer of 200 meters, conducted by Thomas West on 03 October 2024.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

	6 Aboriginal sites are recorded in or near the above location.
	0 Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

23 June 2025

City of Parramatta Council

Attn: Shane Lauger

P37382.006 Version A | Acid Sulfate Soils Assessment Rangihou Reserve

1. Introduction

Progressive Risk Management (PRM) was engaged by City of Parramatta Council (Council – the client) to undertake an Acid Sulfate Soil (ASS) Assessment of a portion of insitu material to be disturbed as part of the CBD Cycleway upgrade project at Rangihou Reserve, Parramatta (the site). The site locality is shown in **Figure 1** and site layout in **Figure 2**.

1.1. Project Background

The site is currently a 3 m wide cycleway and adjoining land within Rangihou Reserve, north of Parramatta River. Upgrades to the area will include widening of the existing cycleway, construction of a raised boardwalk, lighting poles, swale, service trenches, a sandstone retaining wall, planting of trees and shrubs and turf along the cycleway. The maximum depth of works for these upgrades includes up to 1.6 metres below ground level (mbgl) for lights, and up to 1.8 mbgl for installation of boardwalk footings.

A Geotechnical Investigation (GI) previously conducted by Douglas Partners in January 2025 (ref: *Report on Geotechnical Investigation, Proposed Pedestrian and Cycleway Upgrades, Rangihou Reserve* (DP, 2025a)) identified Acid Sulfate Soils (ASS) present within the site material. This investigation found Potential Acid Sulfate Soils (PASS) to be present within natural alluvial sand between 1.9 and 2.0 mbgl at one sampling location, BH103. The GI identified PASS at 1.9 to 2.0 mbgl where the surface of the site is at approximately 1.7m AHD, which is one of the lowest elevations across the site surface. This indicates that PASS is present on the site at approximately -0.3 to -0.4 metres Australian Height Datum (mAHD). Actual Acid Sulfate Soils (AASS) were not identified in any of the samples tested. The GI (DP, 2025a) concluded that an Acid Sulfate Soil Management Plan (ASSMP) would be required where alluvial soils are to be disturbed.

As the elevation of the site surface is typically around 2.0m to 3.0m AHD it is possible that the cycleway upgrade works will not extend to the depth where PASS may be present. PRM was therefore engaged to complete this ASSA to investigate the presence of ASS within the lowest point of the site/deepest disturbance depth (lighting poles and trees).

1.2. Objectives

The purpose of this ASS investigation is to assess if material proposed to be disturbed at the lowest point of the site/deepest excavation depth will encounter material that contains PASS or AASS and determine if an ASSMP is required for the proposed upgrade works.

1.3. Guidance and Regulations

The standards and methodologies that have been used to develop this report include:

- NSW Acid Sulfate Soils Management Committee (ASSMAC), Acid Sulfate Soils Assessment Guidelines (NSW ASSMAC 1998).
- Water Quality Australia, National Acid Sulfate Soils Guidance (NASSG, 2018)

2. Background on Acid Sulfate Soils

Acid sulfate soils (ASS) are naturally occurring sediments containing iron sulfides, most commonly pyrite. When undisturbed or waterlogged, they present a low environmental risk. If ASS are exposed to air through disturbance such as excavation or dewatering, the iron sulfides react with oxygen to produce sulfuric acid which can result in significant environmental damage, particularly if acid is spread through water movement, and damage to infrastructure. ASS can form in coastal areas such as low-lying estuaries, mangroves, lakes, rivers, harbours and floodplains or in inland areas such as creeks, rivers and drought impacted areas. The ASS of most concern were formed after the last major sea level rise, in the Holocene period (last 10,000 years).

There are two categories of ASS:

- Actual Acid Sulfate Soils (AASS) have been exposed to oxygen and as a result contain high acidity from the oxidation of sulfides. Common features include a pH less than 4, yellow jarosite formations and occur overlying PASS.
- Potential Acid Sulfate Soils (PASS) contain iron sulfides that have not been oxidised. In their undisturbed state the pH is commonly greater than 4, are associated with pyrite and are relatively stable. If disturbed they will generate sulfuric acid and become AASS.

3. Site Details

Table 1 provides a summary of the general site details

Table 1: Site Details	
Address:	Rangihou Reserve, Parramatta NSW 2150
Lot Parcel:	Part lot 1 of DP587055
Local Council:	City of Parramatta Council
Zoning:	RE1 – Recreational, based on the Parramatta Local Environmental Plan (2023).
Site Owner:	City of Parramatta Council
Surrounding Land Uses:	<p>North: Material laydown area and vacant land with residential land beyond.</p> <p>South: Open recreational space, Parramatta River with recreational space beyond.</p> <p>East: Open recreational space and residential land.</p> <p>West: Open recreational space and residential land.</p>

3.1. Summary of Previous Investigations

Douglas Partners, 2025a

Douglas partners conducted a Geotechnical Investigation (GI) and provided a report summarising the findings in January 2025. The scope of the GI included 12 boreholes to a maximum depth of 2.0 mbgl or refusal. A total of 20 samples from varying boreholes were screen tested for the presence/absence of ASS via measurement of field pH and observation in reaction rate. Field screening results identified ten of the 20 samples showed strong indication of PASS. Nine samples were further analysed for Chromium Reducible Sulfur (Scr) based off these results and one sample was found to contain PASS (BH103_1.9-2.0) within natural alluvial sand. None of the samples were found to contain AASS.

The GI concluded that ASS were likely present within the natural alluvial sediment below the tidal water table at the site at elevations of approximately -0.3 m AHD. It was concluded that management of ASS would be necessary through an ASSMP if the proposed upgrade works extended to this depth.

[DSI \(Douglas Partners, 2025b\)](#)

Douglas Partners prepared a Detailed Site Investigation (DSI) concurrent to the Geotechnical Investigation (ref: *Report on Detailed Site (Contamination Investigation, Proposed Pedestrian and Cycleway, Rangihou Reserve* (Douglas Partners, 2025b)). The DSI summarised a number of previous investigations including three Acid Sulfate Soil Investigations and an ASSMP associated with other projects for Rangihou Reserve. Limited information was available on the location of these assessments and if they are in fact within the cycleway project footprint.

The DSI identified friable and non-friable asbestos above the adopted land use criteria and will require remediation to be suitable for the project. The DSI summarised the findings of ASS Investigation completed in Douglas Partners, 2025a, although incorrectly identified AASS as being present, with the GI identifying PASS present in natural soils and no AASS.

3.2. Site History

A review of site history was undertaken during the DSI (Douglas Partners, 2025b). Historical imagery indicates the site was agricultural pasture as far back as 1943. Minor disturbance of surface soils occurred around this time likely due to industrial activities and/or vehicle movement. By 1955 there was an increase in vegetation across the site, indicating that the site may have ceased to be agricultural. In the surrounding area a large industrial structure is built to the east of the site. The site remained largely unchanged until 2000 by which time the cycleway was constructed within the site, and extending on to Morton Street to the east. Minor soil disturbance was identified to the immediate west of the site in 2020, however there were no significant changes between 2000 and 2025.

3.3. Soils and Geology

The Department of Industry, Resources and Energy, 1983, 1:100,000 Geological Series Sheet 9130 (Edition 1) indicates that the site comprises of black to dark grey shale and laminate with underlying Winamatta group Ashfield Shale.

Review of eSPADE Sydney 1:100,000 soil mapping (2025) identified the site to be within the Lucas Heights landscape, consisting of gently undulating crests and ridges on plateau surfaces of the Mittagong formation (interbedded shale, laminate and fine to medium grained quartz sandstone).

The geology encountered during the GI (2025a) comprised of mixed fill material containing silty clay, sand and gravelly sand from the surface to 1.1 to 1.5 mbgl, underlain by dark grey silty sand alluvial sediments to 2.0 mbgl (the maximum depth of the investigation). Inclusions of anthropogenic material such as fragments of brick and concrete were identified within the fill material.

The intrusive investigation conducted by PRM for this ASS Investigation was generally consistent with the above findings.

3.4. ASS Soil Risk

The upgrade works are located in an area of Class 2 Acid Sulfate Soil Risk as per Parramatta Local Environment Plan 2023. In a Class 2 Ass risk area, ASS is likely to be found below the natural ground surface.

4. Sampling Plan

4.1. Sampling Rationale

The Rangihou Cycleway project is approximately 400m long. The area subject to this assessment (the lowest point/deepest excavation area) covers approximately 100m with the deepest excavation extending up to 1.6 mbgl. Refer to concept plans in **Attachment A**.

Total disturbance has been estimated as <1000t of natural soil (as indicated by Douglas Partners, 2025a). In accordance with Table 6.1 of the National Acid Sulfate Soil Guidance 2018, two boreholes would be required for minor linear disturbance. However, a higher density of three boreholes has been applied.

Two boreholes along the cycleway were advanced to 1 mbgl and an additional borehole was advanced to 2 mbgl in the central (lowest lying) portion of the site.

4.2. Soil Sampling and Field Screening

The initial field investigation consisted of the following:

- Site walkover and assessment to determine appropriate borehole locations across the site area.
- Construction of 3 boreholes along the cycleway two to 1mbgl and one to 2mbgl.
- Field screening for ASS was conducted at each borehole in 0.5m increments starting at ground level.
- Concurrently, soil samples were collected at each borehole in 0.5m increments starting at ground level. All samples were collected directly into a zip lock bag with excess air removed. Following the examination of field screening results, four samples were selected for laboratory analysis for chromium reducible sulfur.
- All samples were labelled with unique identification, including project number, sample location, and depth. Samples were then placed into a cooled, insulated, and sealed container for transport to a NATA accredited laboratory (Envirolab Services Pty Ltd) for analysis.

4.3. Field Screening Methodology

Field screening to determine pH_F and pH_{FOX} was conducted on all of the collected samples with pH results and effervescence reactions recorded on field sheets. The field screening procedure was conducted as per the following:

- Collection of soil samples (approximately half a teaspoon) taken from each sampling depth and split between two sterile, heat resistant, sealable containers, and labelled with a unique ID.
- Calibration of the pH metre with at least two solutions (pH 4 and pH 7).
- Addition of deionised water (DI) to one of the split samples (pH_F), enough to make a paste, and stir/shake.
- Measurement of pH_F with the pH metre with the stabilised reading recorded on the field sheet.
- Rinse the pH probe with DI between individual samples.
- Add a pH 4.5-5.5 adjusted hydrogen peroxide (30%) to the other split sample container (enough to cover the soil) and stir/shake.
- Wait 10 minutes for reactions to occur before measuring pH.
- Record reactions on the field sheet.
- Measure pH_{FOX} with the pH metre and record a stabilised reading on the field sheet.

Field screening results and field observations to be considered when selecting the samples for further laboratory analysis. Generally, a pH_F less than 4 (with consideration of field observations) may be considered acidic. Significant pH drops between the pH_F and pH_{FOX} measurements were considered for further laboratory analysis to confirm is PASS.

4.4. Sample Analysis

A total of four soil samples were submitted for chromium reducible sulfur (S_{cr}) analysis at a NATA accredited laboratory. The S_{cr} method allows an Acid Base Accounting (ABA) process to be undertaken. The ABA formula has been adopted from the Water Quality Australia, 2018 guidelines. The ABA formula considers the acid producing components of the soil such

as actual acidity, potential acidity and retained acidity against the acid neutralising capacity (ANC) of the material to allow a net acidity to be calculated. The ANC can only be used in the net acidity calculation if its effectiveness has been corroborated by other data that demonstrate acidification of soils is not experienced in field conditions when completely oxidised. As incubation analysis (or similar) is not to be conducted the following equation will apply for this assessment:

$$\text{Net acidity} = S_{cr} + TAA + S_{NAS}$$

Where:

S_{cr} = chromium reducible sulfur potential sulfidic acidity

TAA = Titratable actual acidity

S_{NAS} = retained acidity, net acid soluble sulfur (determined when pH_{KCL} less than 4.5 or jarosite observed)

5. Assessment Criteria

Acid sulfate soil analytical results were compared to the action criteria listed in Table 5.4 of the National acid sulfate soils guidance: National acid sulfate soils sampling and identifications methods manual (Water Quality Australia, 2018) included as **Table 2** below. The adopted criteria are consistent with ASSMAC, 1998.

Blue cell/bold indicates chosen criteria.

Table 2: Action criteria based on texture and volume of material disturbed			
Type of Material		1–1000 tonnes disturbed	> 1000 tonnes disturbed
Texture range	Approx clay content (%)	Sulfur trail % S	Sulfur trail % S
Coarse Texture Sands to loamy sands	≤5	0.03	0.03
Medium Texture Clayey sand to light clays	5 - 40	0.06	0.03
Fine Texture Light/med/heavy clays	≥40	0.1	0.03

The soils investigated for PASS/AASS consisted of low to medium plasticity silty clays and clayey sands with approximate disturbance volume of <1000 tonnes. The adopted site assessment criteria (SAC) is **0.06% S**, for medium textured soils <1000 tonnes disturbance volume. To distinguish between PASS and AASS, the below criteria will be adopted:

- Actual Acid Sulfate Soil (AASS) = $pH < 4$ and $S_{cr} >$ action criteria
- Potential Acid Sulfate Soil (PASS) = $pH > 4$ and $S_{cr} >$ action criteria

The action criteria from NASSG 2018 and ASSMAC 1998 has been adopted to identify if any identified AASS or PASS would require management in accordance with the guidelines.

6. Results and Discussion

6.1. Site Observations

PRM environmental consultants undertook intrusive works on 22 May 2025, the area is shown on **Figure 2**. Observations made during the material inspection are discussed below. Borelogs are included in **Attachment B**.

The site surface was found to be mostly grassed with some hardstand coverage on the existing cycleway. The site surface was found to gently slope southward into the parramatta river and rainwater is expected to both infiltrate the soil and flow into the river. There were no visual indications of contamination on the site surface. All soil encountered was inferred to be natural with no evidence of anthropogenic disturbance. Groundwater was encountered at the base of BH01 at a depth of 2mbgl/0.05mAHD. Photos are included in **Attachment C**.

6.2. Acid Sulfate Field Screening Results

A summary of acid sulfate field screening results are included in **Table 3** below. Only those field screening results associated with samples submitted for laboratory analysis are shown below. A copy of all field screening results is attached in **Attachment D**.

Table 3: Acid Sulfate Field Screening Results				
Sample ID	Screening Results			
	pH _F	pH _{Fox}	Change in pH	Reaction*
BH01 (surface)	5.6	5.4	0.2	2
BH01 (2m)	5.1	4.9	0.2	-
BH02 (surface)	5.2	5.3	0.1	-
BH03 (0.5m)	4.8	4.8	0.0	2

*Reaction ratings

1 = slight or no effervescence | 2 = moderate effervescence | 3 = high effervescence | 4 = vigorous effervescence

As per NASSG (2018), the field indicators of AASS can include:

- Field pH <4,
- Sulfurous 'rotten egg' smell,
- Jarosite horizons or substantial iron oxide mottling on surface encrustations,
- Presence of corroded mollusc shells.

Field indicators of PASS can include:

- pH post-oxidisation (pH_{Fox}) <3, with large unit change from field to oxidation pH together with a volcanic reaction,
- Water-logged soils,
- Soft, sticky, blue-green, greenish-grey mud; silty sands, mid-dark grey or dark grey-black bottom sediments,
- Peat or peaty soils,
- Coffee rock horizons,
- Sulfurous 'rotten egg' smell.

None of the field screening results were indicative of AASS or PASS.

6.3. Laboratory Results

NATA laboratory certificates are presented in **Attachment E**. Results were compared to the relevant guidelines specified in **Section 5**. A summary of the chromium reducible laboratory results that have been issued for acid sulfate soil is presented in **Table 5**.

The chromium reducible laboratory results were compared to the action criteria listed in the *National Acid Sulphate Soils Guidance (NASS, 2018b)* for the disturbance of 1-1,000 t for clayey sand to light clays of 0.06% oxidisable sulfur.

The action criteria are trigger values for the need for further management of ASS during further excavation works.

Table 5: Chromium Reducible Laboratory Results Summary

Sample ID	pH _{KCL}	TAA pH 6.5 (%w/w S)	S _{NAS} (%w/w S)	ANC _{BT} (%w/w S)	S _{CR} (%w/w S)	Net acidity (without ANC) (%w/w S)	ASS
Criteria (NASSG 2018)		≥0.06			≥0.06	≥0.06	
BH01_S	6.0	0.02	-	-	0.01	0.003	-
BH01_2.0	5.6	0.03	-	-	0.008	0.038	-
BH02_S	5.7	0.02	-	-	0.02	0.04	-
BH03_0.5	4.9	0.08	-	-	0.01	0.09	-

A = Acid Soil

Net acidity = S_{CR} + TAA + S_{NAS} - ANC

S_{CR} = chromium reducible sulfur potential sulfidic acidity

TAA = titratable actual acidity

S_{NAS} = retained acidity

ANC = acid neutralising capacity. When pH_{KCL} TAA <6.5 ANC = 0.

Chromium reducible analysis was conducted on four samples. All samples had an acidic pH, less than 6.5 (ranging between 4.9-6.0). As all samples had a pH <6.5, acid neutralising capacity was not calculated. Chromium reducible sulfur was detected in all samples, but at low levels, below the action criteria. The material is not considered to contain PASS or AASS.

7. Discussion

Field screening and laboratory analysis results do not indicate the presence of AASS or PASS. Investigation locations were based on the lowest point of the site (BH02, BH03) with the maximum depth of 0.6mAHD (BH03) and the deepest excavation area (BH01) with a maximum depth of approximately 0.05mAHD. This sample was also collected at the water table where groundwater was encountered at the base of the borehole.

The GI (DP, 2025) identified PASS at one location (BH103_1.9-2.0). This location was at the point of lowest elevation on the site and understood to be beyond the scope of disturbance of the cycleway project. Douglas Partners (2025a) concluded that where material was disturbed below -0.3mAHD, it would require an ASSMP. It is not considered that PASS is likely to be encountered based on the maximum depth of disturbance the client has indicated (0.05mAHD) and therefore no ASSMP required.

8. Conclusions and Recommendations

The findings of the ASS Investigation do not indicate the presence of PASS or AASS expected to be disturbed as part of the cycleway upgrade works. The maximum depth of disturbance is estimated at 0.05mAHD. The GI (DP, 2025a) identified PASS in soils below -0.3 m AHD at one location.

If the works exceed the proposed depth, and material below -0.3 m AHD will be disturbed, it would need to be treated as PASS. This would need to be managed according to an ASSMP prepared specifically for the project.

9. Limitations

This report is confidential and has been prepared by Progressive Risk Management for the Client detailed above. This report is limited to the Scope of Works as outlined within this report. All results, conclusions and recommendations presented should be reviewed by a competent person before being used for any other purpose.

PRM accepts no liability for use or interpretation by any person or body other than the client. This report should not be reproduced without prior approval by the client or amended in any way without prior approval by PRM.

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Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements and site history, not on sampling and analysis of all media at all locations for all potential contaminants. Should information become available regarding conditions at the site including previously unknown sources of contamination, PRM reserves the right to review the report in the context of the additional information.

Ground conditions between sampling locations may vary, and this should be considered when extrapolating between sampling points.

Changes to the subsurface conditions may occur after the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

Unless otherwise stated PRM were not present during excavation, stockpiling and load-out or disposal of this material. As such, PRM make no warranties that the material to be disposed is that material which PRM has classified within this report.

Document Control:

Project Details	
Report Name:	Acid Sulfate Soil Assessment
Client Name:	City of Parramatta Council
Site Details:	Rangihou Reserve, Parramatta NSW
Project Reference:	P37382.006 C0018

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Version Date:	Review Process:			Issued to:	Summary of changes from previous version:
	Prepared:	Reviewed:	Approved:		
VerA 23/06/2025	LTW	FKW	NPA	CoPC	-

Report Review					
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Prepared by:		Technical Review by:		Authorised for Issue by:	
					
Name:	Lyndon Wale	Name:	Fiona Warden	Name:	Nick Passlow
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Date:	23/06/2025	Date:	23/06/2025	Date:	23/06/2024



Attachments

Figures

- Attachment A – Client Concept Plans
- Attachment B – Borelogs
- Attachment C - Photolog
- Attachment D – ASS Field Screening Results
- Attachment E – NATA Laboratory Certificates

Figures

315600 315800 316000 316200 316400 316600

6257000

6256800

6256600

6256400

6256200



315600 315800 316000 316200 316400 316600 316800

Project Reference	P37382.006
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Client	CoPC

**Rangihou Reserve,
Parramatta NSW**

**Site Location
Figure 1**



PROGRESSIVE RISK MANAGEMENT

Scale: 1:7000

Coord. Sys: GDA 1994 MGA Zone56

Legend

 Site Boundary

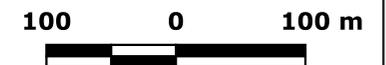
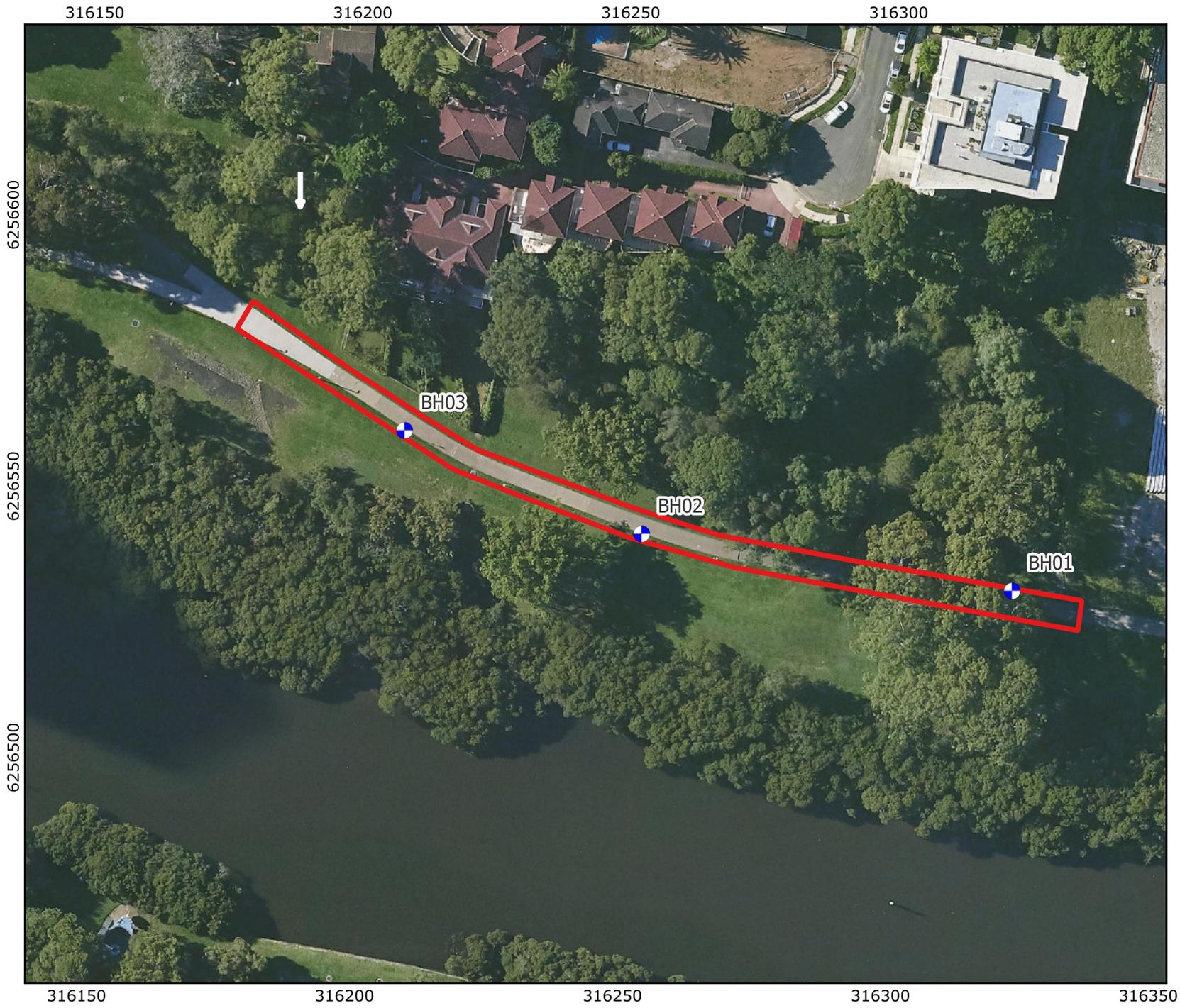


Image Source: Sixmaps (2025)



Project Reference	P37382.006
Report Name	Acid Sulfate Soil Assessment
Client	CoPC

**Rangihou Reserve,
Parramatta NSW**

**Site Layout
Figure 2**



Scale: 1:1200

Coord. Sys: GDA 1994 MGA Zone56

Legend

- Site Boundary
- ⊕ Boreholes

Image Source: Metromap (2025)