**Table A: Soil Analytical Results**
Project Number: 43177
Project Name: Wingham Data Gap Assessment

| | | | TPHs (NEPC 1999) | | | | | | TRHs (NEPC 2013) | | | | | | Polychlorinated Biphenyls | | | | | | | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C6-C9 Fraction | C10-C14 Fraction | C15-C28 Fraction | C29-C36 Fraction | >C10-C36 (Sum of Total) | C10-C36 Fraction (Total) | C6-C10 Fraction | >C10-C16 Fraction | >C16-C34 Fraction | >C34-C40 Fraction | C6 - C10 less BTEX (F1) | >C10 - C16 less Naphthalene (F2) | Aroclor 1016 | Aroclor 1232 | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | PCBs (Total) | Aldrin | alpha-BHC | beta-BHC | delta-BHC | Chlordane | DDD | DDE | DDT | Dieldrin | Endosulfan alpha | Endosulfan beta | Endosulfan Sulphate | Endrin | Endrin aldehyde | Endrin ketone | Heptachlor | Heptachlor Epoxide | Lindane | Methoxychlor | Toxaphene | Total Phenols |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 2 | 50 | 100 | 100 | 250 | | 20 | 50 | 100 | 100 | 20 | 50 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.2 | 1 | 1 |
| NEPC 2013 Soil HIL A | | | | | | | | | | | | | | | | | | | | | 1 | 6 | | | | 50 | | 240 | | 6 | | 270 | | 10 | | | 6 | | | 300 | 20 | |
| NEPC 2013 Soil HSL A and B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | 45 | 110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 Management Limits - Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | 2500 | 10000 | 700 | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | 180 | 120 | 300 | 2800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SQGs (Aged) Urban Residential and Public Open Space | | | | | | | | | | | | | | | | | | | | | | | | | | | | 180 | | | | | | | | | | | | | | | |
| **Field ID** | **Depth** | **Date** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LOT 4** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L246-TH4 | 0.10 | 1/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH5 | 0.10 | 1/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH6 | 0.10 | 1/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH11 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH12 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH13 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH13 | 0.3-0.5 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH14 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| CTP04 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP05 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| **LOT 266** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CS1 | - | 15/10/1999 | <2 | 75 | 441 | 144 | 660 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP04 | 0.30 | 23/02/2001 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP04 | 1.80 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP05 | 0.30 | 23/02/2001 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP06 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP07 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP07 | 2.00 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP08 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP09 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP09 | 0.80 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP10 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp C (S7, S8 and S9) | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| B1 | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| B3 | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CTP06 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP06 | 1.2-1.3 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP09 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| **LOT 267** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CS2 | Sediment | 14/10/1999 | <2 | <50 | <100 | 262 | 262 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP01 | 0.30 | 23/02/2001 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP02 | 0.30 | 23/02/2001 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP03 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP11 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP12 | 0.30 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP12 | 0.60 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp A (S1, S2 and S3) | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| Comp B (S4, S5 and S6) | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| B2 | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| B4 | 0-0.1 | 23/02/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CTP07 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP08 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| WSP1 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| WSP2 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| WSP3 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |

**Table A: Soil Analytical Results**
Project Number: 43177
Project Name: Wingham Data Gap Assessment

| | | | TPHs (NEPC 1999) | | | | | | TRHs (NEPC 2013) | | | | | | Polychlorinated Biphenyls | | | | | | | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C6-C9 Fraction | C10-C14 Fraction | C15-C28 Fraction | C29-C36 Fraction | >C10-C36 (Sum of Total) | >C10-C36 Fraction (Total) | C6-C10 Fraction | >C10-C16 Fraction | >C16-C34 Fraction | >C34-C40 Fraction | C6 - C10 less BTEX (F1) | >C10 - C16 less Naphthalene (F2) | Aroclor 1016 | Aroclor 1232 | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | PCBs (Total) | Aldrin | alpha-BHC | beta-BHC | delta-BHC | Chlordane | DDD | DDE | DDT | Dieldrin | Endosulfan alpha | Endosulfan beta | Endosulfan Sulphate | Endrin | Endrin aldehyde | Endrin ketone | Heptachlor | Heptachlor Epoxide | Lindane | Methoxychlor | Toxaphene | Total Phenols |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 2 | 50 | 100 | 100 | 250 | | 20 | 50 | 100 | 100 | 20 | 50 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.2 | 1 | 1 |
| NEPC 2013 Soil HIL A | | | | | | | | | | | | | | | | | | | | | 1 | 6 | | | | 50 | | 240 | | 6 | | 270 | | 10 | | | 6 | | | 300 | 20 | |
| NEPC 2013 Soil HSL A and B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | 45 | 110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 Management Limits - Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | 2500 | 10000 | 700 | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | 180 | 120 | 300 | 2800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SQGs (Aged) Urban Residential and Public Open Space | | | | | | | | | | | | | | | | | | | | | | | | | | | | 180 | | | | | | | | | | | | | | |
| **LOT 310** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L310-TH1A | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
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| L310-TH9 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10A | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10C | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10E | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10G | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
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| L310-TH12 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
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| L310-TH18 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
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| L310-TH27 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
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## Silja Kuerzinger

**From:** Beatrice Gomez <BGomez@jbsg.com.au>
**Sent:** Monday, 23 March 2015 2:19 PM
**To:** Kylie Lloyd
**Cc:** Matthew Bennett; George Black; Silja Kuerzinger
**Subject:** FW: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham
**Attachments:** log AQ05 and AQ06.jpg; IMG_2886.jpg

Dear Kylie

It was good to catch up with you and Silja last Friday to discuss the queries related to the validation at AQ05 and AQ06.

As discussed, we have noted that the logs from the previous DSI states that the fill material at AQ05 and AQ06 extends to depths of 0.6 and 0.7 mbgs. However, what was observed during the more recent remediation/validation work is that the natural material was shallower than expected and was encountered at approximately 0.3 mbgs. It is considered that the difference in observations may be due to the relatively small sampling areas in the previous DSI and the larger excavation areas during the remediation/validation work. In hindsight, we think that the logs from the previous DSI did not accurately represent the conditions at these locations and that the more recent observations give a more accurate description of the soil profile at these locations. This is based on the following:

- The larger investigation area enabled the field supervisor to observe the soil profile with more accuracy;
- The natural material encountered at AQ05 and AQ06 during the remediation and validation program was similar to the natural material encountered on the northern part of the site and is consistent with the reported sedimentary formations that underlie the site (including diamictite); and
- The depth of the natural material is at AQ05 and AQ06 is consistent with the depths of natural materials encountered at historical test pits immediately to the west and south (i.e. AQ04 (0.3 mbgs), AQ09 (0.2 mbgs), AQ08 (0.2 mbgs) and AQ07 (0.3 mbgs)).

We acknowledge that we have deviated from the approved RAP by excavating AQ05 and AQ06 to a shallower depth. However, as the depth excavated and validated (to 0.3 mgs) at these areas extended to the natural underlying material, it was considered that ACM impacts would not extend past these depths.

To assist with your review of this information, I am attaching the photo of the field notes taken by our field supervisor, George. Please note the creation date of the photo as 19/11/2014 8:38 AM.

In relation to DG1 (north of AQ06), we confirm that the natural material was observed at approximately 0.7 mbgs. From this data, we ascertain the fill material (along a south to north transect) is relatively shallow at AQ04, AQ05 and AQ06, becoming deeper at DG1.

Also, as requested, I am attaching a photograph of the AQ05 and AQ06's general area (IMG_2886.jpg) that shows the state of the area after the site works were completed.

As always, should you have any queries, require more information or prefer to discuss this in more detail, please so not hesitate to let me know.

Thank you.

Best Regards,
Beatrice

**Beatrice Gomez** | Principal Environmental Scientist | JBS&G
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**Contaminated Land | Groundwater Remediation | Auditing and Compliance | Assessments and Approvals | Occupational Hygiene and Monitoring**

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**From:** Kylie Lloyd [mailto:kylie.lloyd@zoic.com.au]
**Sent:** Monday, March 23, 2015 9:13 AM
**To:** Beatrice Gomez; James Belford (belfordj@tpg.com.au)
**Cc:** Silja Kuerzinger; McArthur, Cameron (Cameron.McArthur@boral.com.au)
**Subject:** RE: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Beatrice,
Thanks for the conversation Friday last. I confirm that we will await documentation to support our discussion that the Borehole logs for AQ05 and AQ06 were incorrect in your original Report and in fact finished at 0.3/0.4m below the ground surface and that your remediation reached natural material.

Can you also confirm the depth at DG01 as it is recorded as 0.7m and it would seem odd that AQ05 and AQ06 would be shallow then DG01 is deep again. My recollection of the site surface was the levels of AQ05, AQ06 and DG01 were similar with their connection with the adjacent street, but I didn't pay as close attention to that part of the site's levels as I could have given our current conversation.

James, if this can be appropriately closed and I have no concerns that there is potential fill remaining in the AQ05/AQ06 area that could have ACM, then we will be able to proceed to completion of the audit. If from the documentation it is difficult to get to that conclusion, then I would require some additional proof (borehole/testpit) that the fill is as shallow as indicated and there is no risk of ACM in this area.

Kind regards,

**Kylie**

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**From:** Kylie Lloyd
**Sent:** Tuesday, 17 March 2015 2:23 PM
**To:** Beatrice Gomez (BGomez@jbsg.com.au); James Belford (belfordj@tpg.com.au)
**Cc:** Silja Kuerzinger
**Subject:** FW: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Dear Beatrice

Thank you for your response in regards to remedial works carried out at AQ05 and AQ06 at the Murray Road, Wingham site.

Unfortunately, I still have concerns in regards to potential ACM remaining onsite in these areas. JBS&G did not completed remedial works in accordance with the RAP (12 May 2015) that I have approved and there remains some uncertainty on fill at depth in the locations identified. I note the approved RAP stated:

- Section 5: Summary of Known Contamination: states 'Soils containing bonded ACM above the site-specific criteria were identified at two locations (AQ05 and AQ06), as shown in Figure 4. Based on each location having an area of 100m2 and depth of 1m, the anticipated volume of contaminated material is approximately 200m3.
- Figure 4: the Legend clearly indicates that the remediation extent is from 0 – 1m BGS.

JBS&G has responded that 'natural' soils were encountered in AQ05 and AQ06 at 0.3m (the extent of excavation and remedial works), which despite the photographs, I note that:

- As previously stated, testpit logs from AQ05, AQ06 and DG01 recorded fill ranging from 0.6 to 0.7m, with the testpit logs along the eastern transect recording fill as follows: AQ01 (>1m); AQ02 (>1m); AQ03 (>1m); AQ04 (0.3m); AQ05 (0.7m0; AQ06 (0.6m) and DG01 (0.7m).

- In the response below, JBS&G states 'bonded ACM was reported to be observed within the fill material at AQ05 (0.1-0.2 mbgs) and at AQ06 (0.2-0.3 mbgs)'. These samples were representative of the entire fill profiles, and no underlying fill samples were analysed to provide assurance/validation that deeper fill was not impacted, therefore we cannot assume that deeper fill is not impacted.
- In the response below, JBS&G states 'The log for AQ05 in the ESA report notes that no ACM was observed below 0.3 mbgs'. However, the same was recorded for AQ06 which also did not note ACM in the testpit log description but ACM at this location was identifiable from the sieving associated with sample collection. As with the above dot point, given that no underlying sample was collected, it can only be assumed that the entire fill profile is potentially impacted with ACM.
- The two photograph images attached to the JBS&G do not provide visual assurance that the material at 0.3m is 'natural'. The mix of clay, shale/boulders of various sizes are considered likely to be indicative of fill or redistributed natural – if it was 'natural' shale bedrock, it would have been uniform weathered bedrock.

Overall it is considered that there remains too much uncertainty to allow me to sign-off on the current information. More robust arguments are required if JBS&G are not going to follow the endorsed RAP strategy for AQ05 and AQ06.

If you would like to discuss further, please let me know.

**Kylie**

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**From:** Beatrice Gomez [mailto:BGomez@jbsg.com.au]
**Sent:** Thursday, 12 March 2015 9:58 AM
**To:** Kylie Lloyd
**Cc:** James Belford; 'McArthur, Cameron'; 'Taylor, Phil'; Matthew Bennett; George Black; Silja Kuerzinger
**Subject:** FW: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Hi Kylie

Thank you for sending through your comments.

In relation to your concerns about the validation of AQ05 and AQ06, the following are noted:

- During the previous ESA, bonded ACM was reported to be observed within the fill material at AQ05 (0.1-0.2 mbgs) and at AQ06 (0.2-0.3 mbgs);
- Section 9.1 of the ESA report mentions that bonded ACM impacts at these locations were restricted to surficial soils;
- The log for AQ05 in the ESA report notes that no ACM was observed below 0.3 mbgs;
- Upon test pitting at these locations during the remediation/validation program, natural grey shale was encountered at approximately 0.3 mbgs (please see attached photographs).

Additionally, 10 x 10 metre areas were excavated, centered at each location (i.e. AQ05 and AQ06). This is consistent with the lateral extent requirements as stated in the approved RAP. Figure 4 of the approved RAP presents the remediation areas for AQ05 and AQ06 as directly adjacent to one another. It is noted however, that the shaded areas for AQ05 and AQ06 in Figure 4 of the approved RAP are not illustrated accurately.

During the remediation/validation work, AQ05 and AQ06 were located onsite via a GPS. The 100 m2 area was then centered at each location. The error in the presentation of the remediation areas in the approved RAP has caused the variation in remediated areas shown in Figure 4 of the approved RAP and Figure 4 of the Validation Report. However, the strategy implemented during the actual work is consistent with the strategy described in the text of the approved RAP.

Given that natural material was encountered at 0.3 mbgs at both locations, the lateral extent of each excavated area and the results of the sampling and inspection of the resulting excavation walls and floors, it is considered that validation of the area in the vicinity of AQ05 and AQ06 was achieved.

We would be happy to discuss this with you in more detail, if you prefer. Otherwise, should you find our response acceptable, we can modify the report to more clearly reflect the points as stated above.

Best Regards,
Beatrice

**Beatrice Gomez** | Principal Environmental Scientist | JBS&G
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**From:** Kylie Lloyd [mailto:kylie.lloyd@zoic.com.au]
**Sent:** Tuesday, March 10, 2015 9:46 AM
**To:** James Belford

**Cc:** 'McArthur, Cameron'; 'Taylor, Phil'; Silja Kuerzinger; Beatrice Gomez
**Subject:** RE: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Thanks James,
We have looked through JBS&G's responses regarding our questions. Essentially, JBS&G deviated from the approved RAP in three instances that cause concern. To understand my concerns, I would refer you to Figure 4 in each of the two crucial reports, the approved RAP and the Validation Report.

1. The first was with the Data Gap Sampling. Half of the area was sampled (ie 16 of the proposed 32 locations). Given those 16 returned evidence of no ACM or asbestos fibres and was the closest area to the former buildings, I am willing to accept that deviation.
2. No wall sampling for the asbestos Fibre areas AQ02. Given the slope of the land and the documented work completed, I am also willing to accept this deviation.
3. Remediation of the area encompassing AQ05 and AQ06. This area proposed to be remediated was 200m2, to 1m (volume of 200m3 to be excavated picked and validated as free of asbestos). Instead it has transpired that a total volume of 40m3 was remediated (two separate areas to a maximum depth of 0.3m). As there is no conceptual model why these ACM were found in these locations (other than association with fill) and the logs clearly show deeper fill across this area, I find it difficult to accept this deviation without additional information or evidence.

Silja and I are happy to discuss this with JBS&G and yourself but it makes it difficult to sign off this low risk site with such deviations from the approved RAP.

**Kylie**

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**From:** James Belford [mailto:belfordj@tpg.com.au]
**Sent:** Monday, 9 March 2015 11:31 AM
**To:** Kylie Lloyd
**Cc:** 'McArthur, Cameron'; 'Taylor, Phil'
**Subject:** FW: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Kylie,

Please find attached for your consideration and record corresponding received from JBSG in response to your queries relating to the draft Environmental Report prepared by JBSG for the works at the Boral site at Wingham.

A link is also provided to allow you to download the updated report prepared as a consequence of responding to your queries.

Can you please consider and confirm this now resolves all of your queries and the project can proceed to the finalisation of the Environmental Report and your issue of Site Audit Statement and Site Audit Report.

Any queries please call to discuss.

Regards

James
0407 704 013

BEL GROUP

O James Belford

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*Respecting the Past, Developing the Future*

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**From:** Beatrice Gomez [mailto:BGomez@jbsg.com.au]
**Sent:** Thursday, 5 March 2015 12:11 PM
**To:** James Belford
**Cc:** 'McArthur, Cameron'; 'Taylor, Phil'; Matthew Bennett; George Black
**Subject:** RE: Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Hi James

Please find attached JBS&G's response to the Site Auditor's comments on the draft Validation Report for the Wingham site. The revised report can be downloaded using the link below.

https://jbsg-my.sharepoint.com/personal/bgomez_jbsg_com_au/_layouts/15/guestaccess.aspx?guestaccesstoken=DdK7Pd4c8noFsrs%2fXQkoDVSuNs1ccvxTsaziJA%2b4Fwo%3d&docid=0076cc419185741e49e6d1c82ff37a54f

As always, should you have any queries or if we can assist with anything else, please do not hesitate to contact us.

Best Regards,
Beatrice

**Beatrice Gomez** | Principal Environmental Scientist | JBS&G
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**From:** James Belford [mailto:belfordj@tpg.com.au]
**Sent:** Friday, February 27, 2015 5:03 PM
**To:** Beatrice Gomez
**Cc:** 'McArthur, Cameron'; 'Taylor, Phil'
**Subject:** Boral - Wingham Site Cleanup, FW: Reveiw of Validation Report Wingham

Beatrice,

Can you please consider and address each of the points raised in the attached letter from the auditor including making any amendments to the report and or supporting documents as required all to the satisfaction of the Auditor.

Please provide a timeframe for closing out the points raised. It would be appreciated if they could be closed out on or before 12.00pm Thursday 5th March 2015.

Regards

James
0407 704 013

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**From:** Kylie Lloyd [mailto:kylie.lloyd@zoic.com.au]
**Sent:** Friday, 27 February 2015 4:05 PM
**To:** James Belford (belfordj@tpg.com.au)
**Cc:** Beatrice Gomez (BGomez@jbsg.com.au); Silja Kuerzinger
**Subject:** Reveiw of Validation Report Wingham

Dear James,
Please find attached questions raised from our review of the Validation Report. There are some deviations from the RAP that require a little bit more detail to explain for us to be able to complete the SAR.

Kind Regards,
Kylie

**Kylie Lloyd**
Managing Director

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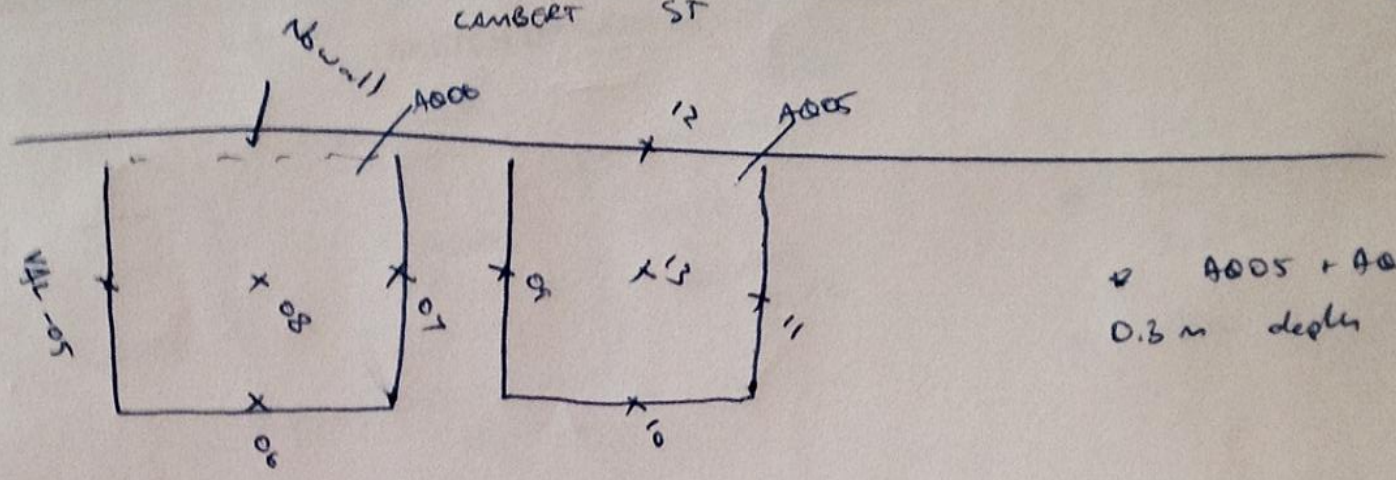
# Field Screening of Soils

JBS&G

| | | | |
|---|---|---|---|
| **PROJECT NAME:** | WINGHAM | **PROJECT NO:** | 43534 |
| **FIELDWORK DATES:** | 12/11/14 | **SAMPLERS:** | G. BLACK |
| **TYPE OF INVESTIGATION (GME/ESA etc):** | VAC | **PROJECT MANAGER:** | B. GOMEZ |

## SKETCH OF SAMPLE LOCATIONS




Dimensions | Weight of ACM(s)

| SAMPLE ID | DATE | DEPTH (m) | PID/~~XRF~~ (ppm) | | SOIL DESCRIPTION AND FATE |
|---|---|---|---|---|---|
| VAL05 | 12/11/14 | 0 - 0.3 | 20L | 0 | Fill Sandy gravel, brown, [illegible] |
| VAL06 | | | | | As above |
| VAL07 | | | | | |
| VAL08 | | 0.3 | | | NAT shale, brown, [illegible] coarse. |
| ~~VAL09~~ | | ~~0.3~~ | | | |
| VAL-09 | | 0-0.3 | 20L | 0 | Fill ~~Silty~~ Sandy gravel, grey, [illegible] course, dense, [illegible] grade |
| VAL-10 | | | | | As above |
| VAL-11 | | | | | |
| VAL-12 | | | | | |
| VAL-13 | | 0.3 | | | NAT shale, grey, [illegible] coarse, |

**ADDITIONAL NOTES:**

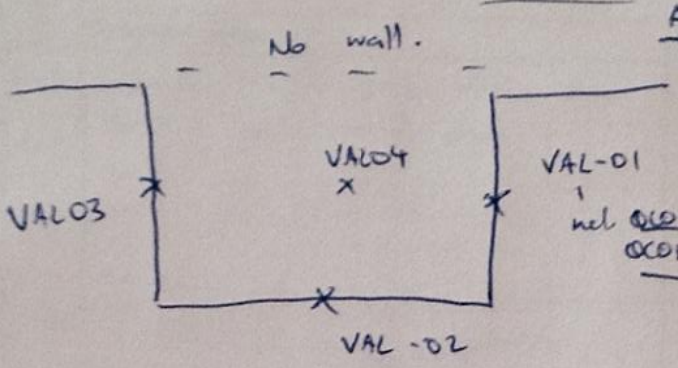
| | Colour | Structure | Moisture | Cohesive Soils | | Sand & Gravel | | | Secondary |
|---|---|---|---|---|---|---|---|---|---|
| FILL | red | homogenous | dry | very soft | non-plastic | very loose | boulders | poorly sorted | and (35-50%) |
| CLAY | yellow | heterogeneous | damp | soft | low plasticity | loose | cobbles | (well graded) | some (20-35%) |
| SILT | black | stratified | moist | firm | mod plasticity | medium dense | coarse gravel | well sorted | little (10-20%) |
| SAND | brown | laminated | wet | stiff | high plasticity | dense | fine gravel | (poorly | trace (0-10%) |
| | grey | lens | saturated | very stiff | | very dense | coarse sand | graded) | |

# Field Screening of Soils

JBS&G

| | |
|---|---|
| **PROJECT NAME:** WINGHAN. | **PROJECT NO:** 48534 |
| **FIELDWORK DATES:** 18/11/14 | **SAMPLERS:** G. BLACK |
| **TYPE OF INVESTIGATION (GME/ESA etc):** VAC LAMBERT ST | **PROJECT MANAGER:** B. GOMEZ |

**SKETCH OF SAMPLE LOCATIONS**




* 1m excavation Depths
* 10 x 10m

Dimensions Observed

| SAMPLE ID | DATE | ~~DEPTH (m)~~ | ~~PID/XRF (ppm)~~ | SOIL DESCRIPTION AND FATE |
|---|---|---|---|---|
| VAL-01 | 18/11/14 | 20L | No obs from 0.0 | FILL: Gravelly sand, grey-brown, fine, dry dense mod stable ground. |
| VAL-02 | ↓ | ↓ | ↓ 0.0 | As above |
| VAL-03 | ↓ | ↓ | 0.0 | As above terracotta. |
| VAL04 | ↓ | ↓ | 0.0 | VAF from CP silty gravelly clay, grey-brown, fine, dry mod organic odour. |

**ADDITIONAL NOTES:**

QC01 & QC01/A @ VAL-01

| Description | | Colour | Structure | Moisture | Cohesive Soils | | Sand & Gravel | | | Secondary |
|---|---|---|---|---|---|---|---|---|---|---|
| FILL | clayey | red | homogenious | dry | very soft | non-plastic | very loose | boulders | poorly sorted (well graded) | and (35-50%) |
| CLAY | silty | yellow | heterogeneious | damp | soft | low plasticity | loose | cobbles | well sorted (poorly graded) | some (20-35%) |
| SILT | sandy | black | stratified | moist | firm | mod plasticity | medium dense | coarse gravel | | little (10-20%) |
| SAND | gravelly | brown | laminated | wet | stiff | high plasticity | dense | fine gravel | | trace (0-10%) |
| | organic | grey | lens | saturated | very stiff | | very dense | coarse sand | | |

# Appendix C – Analytical Result Summary Tables

**Table A: Soil Analytical Results**
Project Number: 43177
Project Name: Wingham Data Gap Assessment

| | | | Metals & Metalloids | | | | | | | | | Polycyclic Aromatic Hydrocarbons | | | | | | | | | | | | | | | | | Phenoxy Acids | | | BTEX | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic (Total) | Boron | Cadmium | Chromium (Total) | Copper | Lead | Mercury (Inorganic) | Nickel | Zinc | Acenaphthene | Acenaphthylene | Anthracene | Benz(a)anthracene | Benzo(a)pyrene | Benzo(b,j)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Fluorene | Indeno(1,2,3-c,d)pyrene | Naphthalene | Phenanthrene | Pyrene | PAHs (Total) | 2,4,5-Trichlorophenoxy-acetic acid | 2,4-Dichlorophenoxy-acetic acid | 2-Methyl-4-chlorophenoxy-acetic acid | Benzene | Ethylbenzene | Toluene | Xylene (m & p) | Xylene (o) | Xylene (Total) |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 2 | 10 | 0.4 | 5 | 5 | 5 | 0.05 | 5 | 5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.3 |
| NEPC 2013 Soil HIL A | | | 100 | 4500 | 20 | 100 | 6000 | 300 | 40 | 400 | 7400 | | | | | | | | | | | | | | | | | 300 | | | | | | | | | |
| NEPC 2013 Soil HSL A and B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | | | | | 0.5 | 55 | 160 | | | 40 |
| NEPC 2013 Management Limits - Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | | | | | | 0.7 | | | | | | | | | | | | | | | | 50 | 70 | 85 | | | 105 |
| SQGs (Aged) Urban Residential and Public Open Space | | | 100 | | | 400 | 210 | 1100 | | 270 | 700 | | | | | | | | | | | | | | 170 | | | | | | | | | | | | |
| **Field ID** | **Depth** | **Date** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LOT 4** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L246-TH4 | 0.10 | 1/09/1998 | 8 | - | <0.4 | 20 | 1 | 21 | <0.05 | - | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH5 | 0.10 | 1/09/1998 | 8 | - | <0.4 | 28 | 2 | 19 | <0.05 | - | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH6 | 0.10 | 1/09/1998 | 24 | - | <0.4 | 13 | 16 | 18 | <0.05 | - | 78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH11 | 0-0.15 | 15/10/1999 | 29 | 435 | <0.4 | 54 | 81 | 65 | <0.05 | - | 481 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH12 | 0-0.15 | 15/10/1999 | 6 | 189 | <0.4 | 25 | 8 | 25 | <0.05 | - | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH13 | 0-0.15 | 15/10/1999 | 5 | 187 | <0.4 | 19 | 4 | 23 | <0.05 | - | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH13 | 0.3-0.5 | 15/10/1999 | 3 | 132 | <0.4 | 14 | 2 | 16 | <0.05 | - | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH14 | 0-0.15 | 15/10/1999 | 14 | <10 | <0.4 | 27 | 21 | 7 | <0.05 | - | 34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CTP04 | 0.1-0.2 | 5/02/2014 | 8.4 | <10 | <0.4 | 23 | <5 | 30 | <0.05 | 5.5 | 46 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| CTP05 | 0.1-0.2 | 5/02/2014 | 5 | - | <0.4 | 22 | <5 | 37 | <0.05 | 6.2 | 29 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| **LOT 266** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CS1 | - | 15/10/1999 | <4 | 140 | <0.4 | <2 | 1 | 1 | 0.2 | - | 104 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | 3 | - | - | <0.2 |
| TP04 | 0.30 | 23/02/2011 | 13 | <20 | <1 | 10 | 7 | 22 | <0.1 | - | 61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| TP04 | 1.80 | 23/02/2011 | 2 | <20 | <1 | 4 | 3 | 8 | <0.1 | - | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP05 | 0.30 | 23/02/2011 | 1 | <20 | <1 | 7 | <1 | 10 | <0.1 | - | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| TP06 | 0.30 | 23/02/2011 | 2 | <20 | <1 | 9 | 5 | 9 | <0.1 | - | 31 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP07 | 0.30 | 23/02/2011 | 3 | <20 | <1 | 10 | 8 | 21 | <0.1 | - | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP07 | 2.00 | 23/02/2011 | 2 | <20 | <1 | 14 | 8 | 6 | <0.1 | - | 27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP08 | 0.30 | 23/02/2011 | 2 | <20 | <1 | 7 | 2 | 7 | <0.1 | - | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP09 | 0.30 | 23/02/2011 | 1 | <20 | <1 | 6 | 2 | 7 | <0.1 | - | 20 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP09 | 0.80 | 23/02/2011 | <1 | <20 | <1 | 5 | 2 | 4 | <0.1 | - | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP10 | 0.30 | 23/02/2011 | 1 | <20 | <1 | 5 | 1 | 6 | <0.1 | - | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp C (S7, S8 and S9) | 0-0.1 | 23/02/2011 | 4 | <20 | <1 | 9 | 2 | 14 | <0.1 | - | 11 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| B1 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - |
| B3 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - |
| CTP06 | 0.1-0.2 | 5/02/2014 | 13 | - | <0.4 | 31 | 21 | 49 | <0.05 | 9.9 | 120 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| CTP06 | 1.2-1.3 | 5/02/2014 | <2 | - | <0.4 | 9.7 | <5 | 10 | <0.05 | 5.6 | 27 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| CTP09 | 0-0.1 | 5/02/2014 | 13 | - | 1.3 | 24 | <5 | 24 | 0.06 | <5 | 12 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| **LOT 267** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CS2 | Sediment | 14/10/1999 | 34 | 154 | <0.4 | 23 | 31 | 53 | <0.05 | - | 293 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| TP01 | 0.30 | 23/02/2011 | 1 | 40 | <1 | 5 | 1 | 6 | <0.1 | - | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| TP02 | 0.30 | 23/02/2011 | 4 | <20 | <1 | 8 | 7 | 17 | <0.1 | - | 39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| TP03 | 0.30 | 23/02/2011 | 4 | <20 | <1 | 11 | 3 | 17 | <0.1 | - | 12 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP11 | 0.30 | 23/02/2011 | 2 | <20 | <1 | 12 | 2 | 11 | <0.1 | - | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP12 | 0.30 | 23/02/2011 | 3 | <20 | <1 | 13 | 5 | 16 | <0.1 | - | 26 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP12 | 0.60 | 23/02/2011 | 3 | <20 | <21 | 13 | 5 | 16 | <0.1 | - | 27 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp A (S1, S2 and S3) | 0-0.1 | 23/02/2011 | 1 | <20 | <1 | 4 | 1 | 8 | <0.1 | - | 9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp B (S4, S5 and S6) | 0-0.1 | 23/02/2011 | 2 | <20 | <1 | 7 | 1 | 11 | <0.1 | | 7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| B2 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - |
| B4 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | - | - | - | - | - |
| CTP07 | 0.1-0.2 | 5/02/2014 | 30 | - | <0.4 | 27 | 14 | 43 | <0.05 | 5.8 | 77 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| CTP08 | 0.1-0.2 | 5/02/2014 | 8.7 | - | <0.4 | 18 | 9.4 | 25 | <0.05 | 5.7 | 95 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| WSP1 | 0-0.1 | 5/02/2014 | 4.1 | <10 | 0.8 | 13 | 9.4 | 15 | <0.05 | 6.3 | 44 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| WSP2 | 0-0.1 | 5/02/2014 | 5.5 | <10 | 0.6 | 20 | <5 | 21 | <0.05 | 5.9 | 19 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| WSP3 | 0-0.1 | 5/02/2014 | 47 | <10 | 0.8 | 34 | 14 | 38 | <0.05 | 7.9 | 66 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |

**Table A: Soil Analytical Results**
Project Number: 43177
Project Name: Wingham Data Gap Assessment

| | | | Metals & Metalloids | | | | | | | | | Polycyclic Aromatic Hydrocarbons | | | | | | | | | | | | | | | | | Phenoxy Acids | | | BTEX | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic (Total) | Boron | Cadmium | Chromium (Total) | Copper | Lead | Mercury (Inorganic) | Nickel | Zinc | Acenaphthene | Acenaphthylene | Anthracene | Benz(a)anthracene | Benzo(a)pyrene | Benzo(b,j)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Fluorene | Indeno(1,2,3-c,d)pyrene | Naphthalene | Phenanthrene | Pyrene | PAHs (Total) | 2,4,5-Trichlorophenoxy-acetic acid | 2,4-Dichlorophenoxy-acetic acid | 2-Methyl-4-chlorophenoxy-acetic acid | Benzene | Ethylbenzene | Toluene | Xylene (m & p) | Xylene (o) | Xylene (Total) |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 2 | 10 | 0.4 | 5 | 5 | 5 | 0.05 | 5 | 5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.3 |
| NEPC 2013 Soil HIL A | | | 100 | 4500 | 20 | 100 | 6000 | 300 | 40 | 400 | 7400 | | | | | | | | | | | | | | | | | 300 | | | | | | | | | |
| NEPC 2013 Soil HSL A and B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | | | | | 0.5 | 55 | 160 | | | 40 |
| NEPC 2013 Management Limits - Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | | | | | | 0.7 | | | | | | | | | | | | | | | | 50 | 70 | 85 | | | 105 |
| SQGs (Aged) Urban Residential and Public Open Space | | | 100 | | | 400 | 210 | 1100 | | 270 | 700 | | | | | | | | | | | | | | 170 | | | | | | | | | | | | |
| **LOT 310** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L310-TH1A | 0.10 | 2/09/1998 | - | 90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH3 | 0.10 | 2/09/1998 | - | 70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH4 | 0.10 | 2/09/1998 | - | <10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH5 | 0.10 | 2/09/1998 | - | 100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH6 | 0.10 | 2/09/1998 | 7 | - | <0.4 | 12 | 3 | 19 | <0.05 | - | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH7 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH8 | 0.10 | 2/09/1998 | 4 | - | <0.4 | 10 | 9 | 28 | <0.05 | - | 49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH9 | 0.10 | 2/09/1998 | 6 | - | <0.4 | 13 | 4 | 19 | <0.05 | - | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10 | 0.10 | 2/09/1998 | 138 | - | <0.4 | 10 | 1 | 25 | <0.05 | - | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10A | 0.10 | 13/01/1999 | 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10C | 0.10 | 13/01/1999 | 17 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10E | 0.10 | 13/01/1999 | 14 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10G | 0.10 | 13/01/1999 | 32 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH11 | 0.10 | 2/09/1998 | 2 | 8 | <0.4 | 8 | 1 | 19 | <0.05 | - | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH12 | 0.10 | 2/09/1998 | 8 | - | <0.4 | 13 | 10 | 18 | <0.05 | - | 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH13 | 0.10 | 2/09/1998 | 8 | - | <0.4 | 12 | 13 | 18 | 0.10 | - | 106 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH14 | 0.10 | 2/09/1998 | 4 | - | <0.4 | 9 | 14 | 4 | <0.05 | - | 90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH15 | 0.10 | 2/09/1998 | 27 | - | <0.4 | 14 | 4 | 20 | <0.05 | - | 20 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH16 | 0.10 | 2/09/1998 | 20 | - | <0.4 | 18 | 11 | 23 | <0.05 | - | 51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH17 | 0.10 | 2/09/1998 | 4 | - | <0.4 | 27 | 8 | 11 | <0.05 | - | 54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH18 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH18 | 0-0.15 | 15/10/1999 | 6 | 130 | <0.4 | 13 | 10 | 16 | <0.05 | | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH19 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH19 | 0-0.15 | 15/10/1999 | 16 | 196 | <0.4 | 24.00 | 12.00 | 45.00 | <0.05 | | 62.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH20 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH20 | 0-0.15 | 15/10/1999 | 5 | 86 | <0.4 | 11 | 9 | 16 | <0.05 | | 76 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH20 | 0.3-0.5 | 15/10/1999 | 5 | 113 | <0.4 | 11 | 9 | 20 | <0.05 | | 93 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH21 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 |
| L310-TH22 | 0-0.15 | 15/10/1999 | 4 | - | <0.4 | 27 | 8 | 11 | <0.05 | | 54 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - | - | <0.2 |
| L310-TH23. | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH23 | 0.3-0.5 | 15/10/1999 | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH24 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH24 | 0.3-0.5 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| L310-TH25 | 0-0.15 | 15/10/1999 | 2 | 47 | <0.4 | 11 | 9 | 8 | 0.1 | | 50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH26 | 0-0.15 | 15/10/1999 | - | - | - | - | - | 7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH27 | 0-0.15 | 15/10/1999 | - | - | - | - | - | 24 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SUMP 1 | Sediment | 14/10/1999 | 9 | 166 | <0.4 | 15 | 16 | 26 | <0.05 | | 89 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| LF1 | Landfarm Material | IT 1999b | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| LF2 | Landfarm Material | IT 1999b | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.2 | <0.2 | <0.2 | - | - | <0.2 |
| CTP01 | 0.5-0.6 | 5/02/2014 | 7.3 | - | <0.4 | 14 | 12 | 11 | <0.05 | 11 | 72 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| CTP02 | 0-0.1 | 5/02/2014 | 3.8 | - | <0.4 | 13 | 7.9 | 7.4 | <0.05 | 7.7 | 61 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| CTP03 | 0-0.1 | 5/02/2014 | 7.8 | - | <0.4 | 15 | 9.1 | 17 | <0.05 | 7.9 | 65 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 |
| V10 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V12 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V13 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V14 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V15 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V16 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V17 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V18 | Validation | 2/27/2001 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table A: Soil Analytical Results**
Project Number: 43177
Project Name: Wingham Data Gap Assessment

| | | | TPHs (NEPC 1999) | | | | | | TRHs (NEPC 2013) | | | | | | Polychlorinated Biphenyls | | | | | | | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C6-C9 Fraction | C10-C14 Fraction | C15-C28 Fraction | C29-C36 Fraction | >C10-C36 (Sum of Total) | C10-C36 Fraction (Total) | C6-C10 Fraction | >C10-C16 Fraction | >C16-C34 Fraction | >C34-C40 Fraction | C6 - C10 less BTEX (F1) | >C10 - C16 less Naphthalene (F2) | Aroclor 1016 | Aroclor 1232 | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | PCBs (Total) | Aldrin | alpha-BHC | beta-BHC | delta-BHC | Chlordane | DDD | DDE | DDT | Dieldrin | Endosulfan alpha | Endosulfan beta | Endosulfan Sulphate | Endrin | Endrin aldehyde | Endrin ketone | Heptachlor | Heptachlor Epoxide | Lindane | Methoxychlor | Toxaphene | Total Phenols |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 2 | 50 | 100 | 100 | 250 | | 20 | 50 | 100 | 100 | 20 | 50 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.2 | 1 | 1 |
| NEPC 2013 Soil HIL A | | | | | | | | | | | | | | | | | | | | | 1 | 6 | | | | 50 | | 240 | | 6 | | 270 | | 10 | | | 6 | | | 300 | 20 | |
| NEPC 2013 Soil HSL A and B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | 45 | 110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 Management Limits - Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | 2500 | 10000 | 700 | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | 180 | 120 | 300 | 2800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SQGs (Aged) Urban Residential and Public Open Space | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 180 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Field ID** | **Depth** | **Date** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LOT 4** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L246-TH4 | 0.10 | 1/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH5 | 0.10 | 1/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH6 | 0.10 | 1/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L246-TH11 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH12 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH13 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH13 | 0.3-0.5 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| L246-TH14 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | <1 |
| CTP04 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP05 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| **LOT 266** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CS1 | -- | 15/10/1999 | <2 | 75 | 441 | 144 | 660 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP04 | 0.30 | 23/02/2011 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP04 | 1.80 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP05 | 0.30 | 23/02/2011 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP06 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP07 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP07 | 2.00 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP08 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP09 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP09 | 0.80 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP10 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp C (S7, S8 and S9) | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| B1 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| B3 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CTP06 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP06 | 1.2-1.3 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP09 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| **LOT 267** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CS2 | Sediment | 14/10/1999 | <2 | <50 | <100 | 262 | 262 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP01 | 0.30 | 23/02/2011 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP02 | 0.30 | 23/02/2011 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP03 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP11 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP12 | 0.30 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP12 | 0.60 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp A (S1, S2 and S3) | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| Comp B (S4, S5 and S6) | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| B2 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| B4 | 0-0.1 | 23/02/2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CTP07 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP08 | 0.1-0.2 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| WSP1 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| WSP2 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| WSP3 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |

**Table A: Soil Analytical Results**
Project Number: 43177
Project Name: Wingham Data Gap Assessment

| | | | TPHs (NEPC 1999) | | | | | | TRHs (NEPC 2013) | | | | | | Polychlorinated Biphenyls | | | | | | | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C6-C9 Fraction | C10-C14 Fraction | C15-C28 Fraction | C29-C36 Fraction | >C10-C36 (Sum of Total) | >C10-C36 Fraction (Total) | C6-C10 Fraction | >C10-C16 Fraction | >C16-C34 Fraction | >C34-C40 Fraction | C6 - C10 less BTEX (F1) | >C10 - C16 less Naphthalene (F2) | Aroclor 1016 | Aroclor 1232 | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | PCBs (Total) | Aldrin | alpha-BHC | beta-BHC | delta-BHC | Chlordane | DDD | DDE | DDT | Dieldrin | Endosulfan alpha | Endosulfan beta | Endosulfan Sulphate | Endrin | Endrin aldehyde | Endrin ketone | Heptachlor | Heptachlor Epoxide | Lindane | Methoxychlor | Toxaphene | Total Phenols |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 2 | 50 | 100 | 100 | 250 | | 20 | 50 | 100 | 100 | 20 | 50 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.2 | 1 | 1 |
| NEPC 2013 Soil HIL A | | | | | | | | | | | | | | | | | | | | | 1 | 6 | | | | 50 | | 240 | | 6 | | 270 | | 10 | | | 6 | | | 300 | 20 | |
| NEPC 2013 Soil HSL A and B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | 45 | 110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 Management Limits - Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | 2500 | 10000 | 700 | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPC 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | 180 | 120 | 300 | 2800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SQGs (Aged) Urban Residential and Public Open Space | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 180 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LOT 310 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L310-TH1A | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH3 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH4 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH5 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH6 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH7 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| L310-TH8 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH9 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10A | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10C | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10E | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH10G | 0.10 | 13/01/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH11 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | |
| L310-TH12 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH13 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH14 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| L310-TH15 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH16 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH17 | 0.10 | 2/09/1998 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| L310-TH18 | 0.10 | 2/09/1998 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH18 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH19 | 0.10 | 2/09/1998 | <2 | <50 | <100 | 232 | 1830 | 2062 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH19 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH20 | 0.10 | 2/09/1998 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH20 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH20 | 0.3-0.5 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH21 | 0-0.15 | 15/10/1999 | <2 | <50 | <100 | <100 | <250 | <250 | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH22 | 0-0.15 | 15/10/1999 | <2 | <50 | <100 | <100 | <250 | <250 | - | - | - | - | - | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH23. | 0-0.15 | 15/10/1999 | <2 | <50 | <100 | <100 | <250 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| L310-TH23 | 0.3-0.5 | 15/10/1999 | <2 | <50 | <100 | <100 | 321 | 321 | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| L310-TH24 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH24 | 0.3-0.5 | 15/10/1999 | <2 | <50 | <100 | <100 | 115 | 115 | - | - | - | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <0.1 | - |
| L310-TH25 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| L310-TH26 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| L310-TH27 | 0-0.15 | 15/10/1999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SUMP 1 | Sediment | 14/10/1999 | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <1 |
| LF1 | Landfarm Material | IT 1999b | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| LF2 | Landfarm Material | IT 1999b | <2 | <50 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CTP01 | 0.5-0.6 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP02 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| CTP03 | 0-0.1 | 5/02/2014 | - | - | - | - | - | - | <20 | <50 | <100 | <100 | <20 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | - |
| V10 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | 120 | 120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V12 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V13 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V14 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V15 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V16 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V17 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| V18 | Validation | 2/27/2001 | <2 | <50 | <100 | <100 | <100 | <250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table B - Asbestos Results**
Job Number: 43177
Project: Wingham Data Gap Assessment

Note 1: ACM concentration (%w/w) = Mass ACM (g) / (Mass Soil (g) x 100). Soil density based on 1.63 g/cm$^3$

| Sample Location | Sample Depth | Date | Lab Report Number | Volume of Soil (L) | Soil Mass (g) | Mass ACM (g) | Mass Asbestos in ACM (g) | [Asbestos] (%w/w) | Asbestos ID and Trace Analysis Results |
|---|---|---|---|---|---|---|---|---|---|
| AQ01 | 0.2-0.3 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ02 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 311.0000 | 46.6500 | **0.286196319** | **Chrysotile asbestos (AF/FA) embedded in several fragments of fibre cement (total wieght 2.7002 g). Respirable fibres not detected** |
| | | | | - | 1104.00 | 2.7002 | 0.8101 | **0.073378623** | |
| AQ03 | 0.3-0.4 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ04 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ05 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 235.0000 | 35.2500 | **0.216257669** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ06 | 0.2-0.3 | 5 & 6 February 2014 | 101632 | 10.00 | 16300.00 | 24.0000 | 3.6000 | **0.02208589** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ07 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ08 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ09 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ10 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ11 | 0.2-0.3 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ12 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ13 | 0.3-0.4 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ14 | 0.3-0.4 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ15 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ16 | 0.3-0.4 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ17 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ18 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ19 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ20 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ21 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ22 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ23 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ24 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ25 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ26 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ27 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ28 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ29 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ30 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |

**Table B - Asbestos Results**
Job Number: 43177
Project: Wingham Data Gap Assessment

Note 1: ACM concentration (%w/w) = Mass ACM (g) / (Mass Soil (g) x 100). Soil density based on 1.63 g/cm$^3$

| Sample Location | Sample Depth | Date | Lab Report Number | Volume of Soil (L) | Soil Mass (g) | Mass ACM (g) | Mass Asbestos in ACM (g) | [Asbestos] (%w/w) | Asbestos ID and Trace Analysis Results |
|---|---|---|---|---|---|---|---|---|---|
| AQ31 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ32 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ33 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ34 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| AQ35 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| CTP04 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| CTP05 | 0.1-0.2 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |
| WSP1 | 0.0-0.1 | 5 & 6 February 2014 | 104728 | 10.00 | 16300.00 | 0.0000 | 0.0000 | **0.0000** | No asbestos found at reporting limit of 0.1g/kg Respirable fibres not detected |

| Landuse | Soil Asbestos Criteria | Exceedance |
|---|---|---|
| HIL-A (residential with accessable soils) | 0.01% w/w | **Number** |
| FA/AF in soils (all landuse) | 0.001% w/w | **Number** |
| Respirable asbestos fibres (all landuse) | NIL | **Number** |

Project No. 43534
Wingham Asbestos Remediation
Table A - Asbestos Quantification Results

Residential A | Site Criteria (%W/W) 0.0100

total samples = 16 (excluding duplicates)

| Test Pit ID | Sample Depth (m) | Volume (cu. m) | Mass Spoil (kg) | ACM (g) | [ACM] (%w/w) | Fill Description | Asbestos in Soil (Lab) | QA/QC | Date Sampled | Lab Batch | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DG-01 | 0-0.7 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | Yes QC02/QC02/A | 18/11/2014 | 439219 | |
| DG-02 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-03 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-04 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Sandy Gravel | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-05 | 0-0.6 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-06 | 0-0.4 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-07 | 0-0.5 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-08 | 0-0.2 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-09 | 0-0.2 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-10 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-11 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | QC01/QC01/A | 18/11/2014 | 439219 | |
| DG-12 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-13 | 0-0.2 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-14 | 0-0.2 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-15 | 0-0.4 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |
| DG-16 | 0-0.4 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 18/11/2014 | 439219 | |

Job No. 43534
Wingham Asbestos Remediation
Table B - Validation of Asbestos Remedial Areas

bold Exceeds adopted criteria

| Soil Validation Sample ID | Sampling Date | Remedial Area | Sample Depth (m) | Volume (cu. m) | Mass Spoil (kg) | ACM (g) | [ACM] (%w/w) | Fill Description | Asbestos in Soil (Lab) | QA/QC | Lab Batch | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VAL-01 | 18-Nov-14 | Remedial excavation AQ02 | 0-1 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | Yes QC01/QC01/A | 439219 | |
| VAL-02 | 18-Nov-14 | Remedial excavation AQ02 | 0-1 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-03 | 18-Nov-14 | Remedial excavation AQ02 | 0-1 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-04 | 18-Nov-14 | Remedial excavation AQ02 | 1 | 0.02 | 33 | 0 | 0.0000 | FILL: Sandy Gravel | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-05 | 18-Nov-14 | Remedial excavation AQ06 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-06 | 18-Nov-14 | Remedial excavation AQ06 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-07 | 18-Nov-14 | Remedial excavation AQ06 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-08 | 18-Nov-14 | Remedial excavation AQ06 | 0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-09 | 18-Nov-14 | Remedial excavation AQ05 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-10 | 18-Nov-14 | Remedial excavation AQ05 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | Chrsotile asbestos detected in the form of |
| VAL-11 | 18-Nov-14 | Remedial excavation AQ05 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-12 | 18-Nov-14 | Remedial excavation AQ05 | 0-0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |
| VAL-13 | 18-Nov-14 | Remedial excavation AQ05 | 0.3 | 0.02 | 33 | 0 | 0.0000 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439219 | |

Job No. 43534
Wingham Asbestos Remediation
Table C - Validation of Asbestos Remedial Areas

**bold** Exceeds adopted criteria
Criteria included below

| Soil Validation Sample ID | Sampling Date | Remedial Area | Sample Depth (m) | Volume (cu. m) | Mass Spoil (kg) | ACM (g) | [ACM] (%w/w) | Fill Description | Asbestos in Soil (Lab) | QA/QC | Lab Batch | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PAD01 | 19-Nov-14 | Material Sourced from AQ05 and AQ06 | 0-0.1 | 10.80 | 17604 | 42 | 0.0002 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | Yes QC03/QC03/A | 439407 | Validated |
| PAD02 | 19-Nov-14 | Material Sourced from AQ05 and AQ06 | 0-0.1 | 10.80 | 17604 | 49 | 0.0003 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439407 | Validated |
| PAD03 | 19-Nov-14 | Material Sourced from AQ05 and AQ06 | 0-0.1 | 10.80 | 17604 | 65 | 0.0004 | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439407 | Validated |
| PAD04 | 19-Nov-14 | Material Sourced from AQ05 and AQ06 | 0-0.1 | 10.80 | 17604 | 120 | 0.0007 | FILL: Sandy Gravel | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439407 | Validated |
| FP01 | 19-Nov-14 | Footprint of AQ05, AQ06 Stockpile | 0-0.05 | Surface inspected | 1630 | No visable ACM observed. | - | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439407 | Validated |
| FP02 | 19-Nov-14 | Footprint of AQ05, AQ06 Stockpile | 0-0.05 | Surface inspected | 1630 | No visable ACM observed. | - | FILL: Gravelly Sand | No asbestos detected at the reporting limit of 0.1 g/kg. No Respirable Fibre detected. | No | 439407 | Validated |

| | Soil Asbestos Criteria |
|---|---|
| HIL-A (residential with accessable soils) | 0.01% w/w |
| FA/AF in soils | 0.001% w/w |
| Respirable asbestos fibres | NIL |

Project No. 43534
Wingham Asbestos Remediation
Table D - Unexpected Finds

| Soil Sample ID | Sampling Date | Sample Depth (m) | Remedial Area | Visual Inspection | Laboratory results |
|---|---|---|---|---|---|
| UF01 | 18-Nov-14 | - | Wood Stockpile | No visual ACM identified | No Asbestos detected. |
| UF03 | 27-Nov-14 | - | Beneath Rubble stockpile in Lot 310 | No visual ACM identified | No Asbestos detected. |

Project No. 43534
Wingham Asbestos Remediation
Table E - Asbestos RPDs

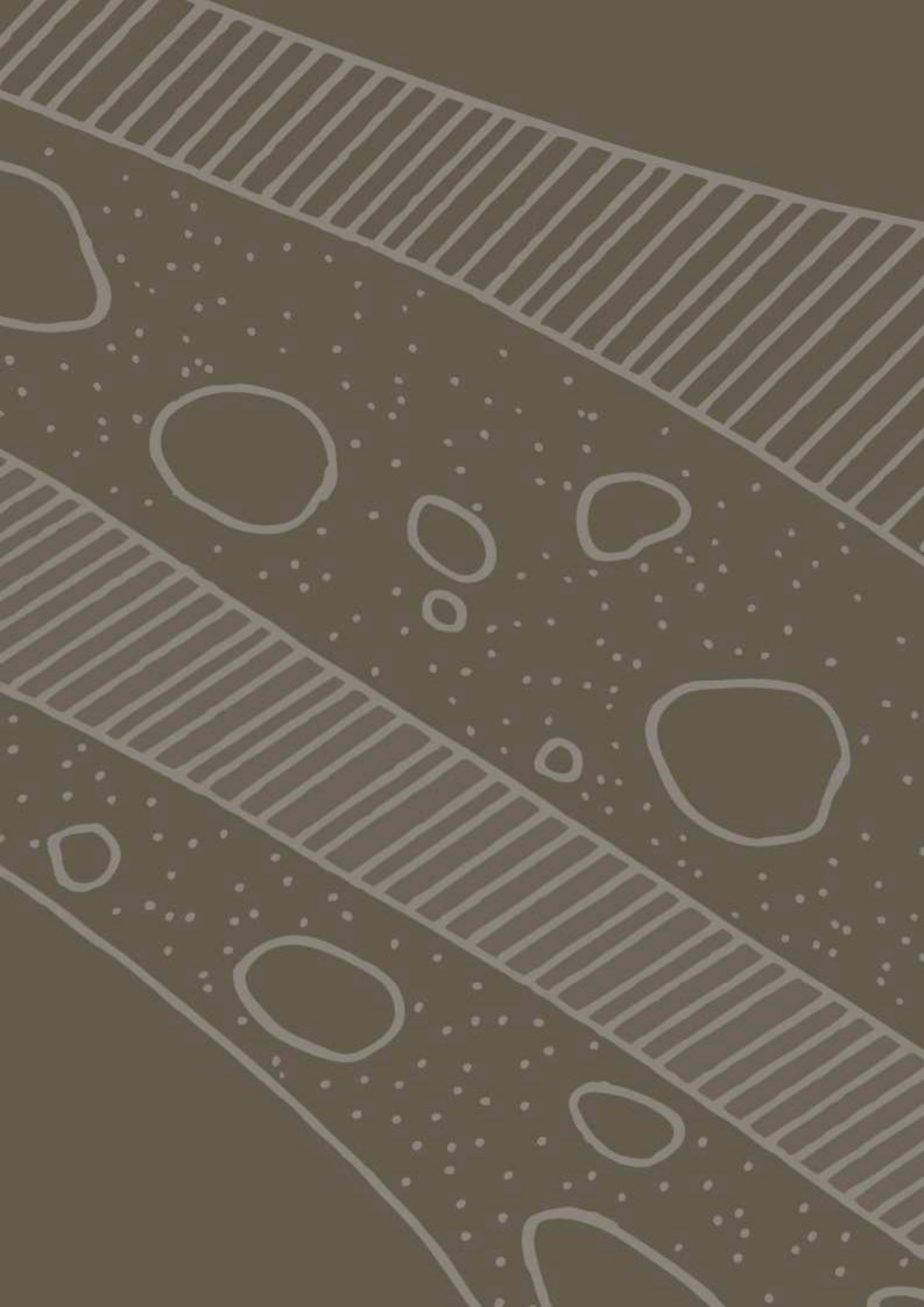
| Sample ID | Date | Asbestos |
|---|---|---|
| VAL-01 (0-1) | 18-Nov-14 | NIL |
| QC01 | 18-Nov-14 | NIL |
| QC01/A | 18-Nov-14 | NIL |
| RPD (%) | | 0 |

| Sample ID | | Asbestos |
|---|---|---|
| DG-01 (0-0.7) | 18-Nov-14 | NIL |
| QC02 | 18-Nov-14 | NIL |
| QC02/A | 18-Nov-14 | NIL |
| RPD (%) | | 0 |

| | | |
|---|---|---|
| PAD01 | 19-Nov-14 | NIL |
| QC03 | 19-Nov-14 | NIL |
| QC03/A | 19-Nov-14 | - |
| RPD (%) | | 0 |

| | Metals | | | | | | | | | BTEX | | | | | | | nated B | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | PAH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Arsenic | Boron | Cadmium | Chromium (III+VI) | Copper | Lead | Mercury | Nickel | Zinc | Benzene | Ethylbenzene | Toluene | Xylene (m & p) | Xylene (o) | Xylene Total | C6-C10 less BTEX (F1) | Hexachlorobenzene | 4,4-DDE | a-BHC | Aldrin | b-BHC | chlordane | Chlordane (cis) | Chlordane (trans) | g-BHC | DDD | DDT | Dieldrin | Endosulfan I | Endosulfan II | Endosulfan sulphate | Endrin | Endrin aldehyde | Endrin ketone | g-BHC (Lindane) | Heptachlor | Heptachlor epoxide | Methoxychlor | Toxaphene | Benzo[b+j]fluoranthene | Acenaphthene | Acenaphthylene |
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | 2 | 10 | 0.4 | 1 | 1 | 1 | 0.05 | 1 | 1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.3 | 20 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.1 | 1 | 0.5 | 0.1 | 0.1 |
| **NEPC 2013 Soil HIL A** | **100** | **4500** | **20** | **100** | **6000** | **300** | **40** | **400** | **7400** | | | | | | | | **10** | | | | | **50** | | | | | | | | | | **10** | | | | **6** | | **300** | **20** | | | |
| **Field_ID** | **Sample_Depth_Range** | **Sampled_Date-Time** | **Matrix_Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF01_0.3-0.5 | 0.3-0.5 | 18/11/2014 | FILL: Gravelly Clay | 31 | - | <0.4 | 33 | 20 | 31 | 0.06 | 13 | 100 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |
| BF01_0-0.1 | 0-0.1 | 18/11/2014 | FILL: Gravelly Clay | 26 | - | <0.4 | 16 | 13 | 26 | 0.06 | 14 | 110 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |
| BF02_0.4-0.6 | 0.4-0.6 | 18/11/2014 | FILL: Gravelly Clay | 3.2 | <10 | <0.4 | 23 | 10 | 11 | <0.05 | 16 | 67 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |
| BF03_1.0-1.2 | 1-1.2 | 18/11/2014 | FILL: Gravelly Clay | 4.8 | <10 | <0.4 | 19 | <5 | 13 | <0.05 | <5 | 28 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |
| BF03_2.0-2.2 | 2-2.2 | 18/11/2014 | FILL: Gravelly Clay | 2.5 | <10 | <0.4 | 15 | 7.1 | <5 | 0.06 | 6.6 | 45 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |
| BFQC01 | | 18/11/2014 | FILL: Gravelly Clay | 37 | - | <0.4 | 22 | 16 | 29 | 0.05 | 17 | 120 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |
| BFQC01/A | | 18/11/2014 | FILL: Gravelly Clay | 9 | - | <0.4 | 17 | 14 | 19 | <0.1 | 12 | 63 | <0.2 | <1 | <0.5 | <2 | <1 | - | <25 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | - | - | <0.1 | <0.1 |
| LF01 | | 18/11/2014 | FILL: Gravelly Clay | 4.9 | <10 | <0.4 | 12 | 6.1 | 13 | <0.05 | 5.9 | 62 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.3 | <20 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | - | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.2 | <1 | <0.5 | <0.5 | <0.5 |

| | PAH/Phenols | | | | | | | | | | | | | | | Polychlorinated Biphenyls | | | | | | | | TPH | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Anthracene | Benz(a)anthracene | Benzo(a) pyrene | Benzo(b)&(k)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Fluorene | Indeno(1,2,3-c,d)pyrene | Naphthalene | PAHs (Sum of total) | Phenanthrene | Pyrene | Arochlor 1016 | Arochlor 1221 | Arochlor 1232 | Arochlor 1242 | Arochlor 1248 | Arochlor 1254 | Arochlor 1260 | PCBs (Sum of total) | C6 - C9 | C10 - C14 | C15 - C28 | C29-C36 | >C10 - C36 (Sum of total) | C6-C10 |
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | 0.1 | 0.1 | 0.05 | | 0.1 | 0.5 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 | 0.1 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 | 20 | 20 | 50 | 50 | 50 | 20 |
| **NEPC 2013 Soil HIL A** | | | | | | | | | | | | | **300** | | | | | | | | | | **1** | | | | | | |
| **Field_ID** | **Sample_Depth_Range** | **Sampled_Date-Time** | **Matrix_Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF01_0.3-0.5 | 0.3-0.5 | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |
| BF01_0-0.1 | 0-0.1 | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |
| BF02_0.4-0.6 | 0.4-0.6 | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |
| BF03_1.0-1.2 | 1-1.2 | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |
| BF03_2.0-2.2 | 2-2.2 | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |
| BFQC01 | | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |
| BFQC01/A | | 18/11/2014 | FILL: Gravelly Clay | <0.1 | <0.1 | <0.05 | <0.2 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <25 | <50 | <100 | <100 | - | <25 |
| LF01 | | 18/11/2014 | FILL: Gravelly Clay | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <20 | <20 | <50 | <50 | <50 | <20 |



APPENDIX F – Purfleet/Taree LALC Response (12 December 2013)

## Terrance Stafford

**From:** Glen Rennie <grennie@ptlalc.com.au>
**Sent:** Thursday, 12 December 2013 3:21 PM
**To:** Terrance Stafford
**Subject:** RE: 5219 Boral - Planning Proposal, Rural to Residential, Various Lots surrounded by Lambert, Mortimer & Richardson Streets & Murray Road, Wingham

Hi Terrance

Please consider this a letter of response regarding Boral's application for change of zoning.

PTLALC has considered your proposal and as explained on the telephone we are concerned with the integrity of the burial grounds and the subsequent maintenance of the site. PTLALC has no objection to the proposed rezoning to residential from rural; PTLALC would like it noted that the development of the site and allotment of residential blocks would require further consultation. It is important that the development impact does not impose or provide opportunity for damage to the lands known as "burial ground".

If I can be of further assistance please don't hesitate to contact me.

Regards

Glen Rennie
Chief Executive Officer
Purfleet Taree Local Aboriginal Lands Council
Ph. 02 65524106
Mob. 0408654537

**From:** Terrance Stafford [mailto:terrances@kingcampbell.com.au]
**Sent:** Thursday, 12 December 2013 2:14 PM
**To:** Glen Rennie
**Cc:** kate.jackson@boral.com.au
**Subject:** FW: 5219 Boral - Planning Proposal, Rural to Residential, Various Lots surrounded by Lambert, Mortimer & Richardson Streets & Murray Road, Wingham

I just wanted to follow up on the below email and our conversation of 27 November regarding this matter. Have you been able to undertake a review of the proposed rezoning? I note that we are intending to lodge the application with Council before Christmas.

If you have any questions please call.

Regards,

Terrance Stafford
Town Planner

King & Campbell Pty Ltd
T: 02 6586 2510
F: 02 6583 4064

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APPENDIX G – Ecological Impact Assessment (Flora Fauna Consulting)

# Ecological Assessment
# EA-2013-1810

**In relation to:**

**Proposed Land Rezoning**

**Lot 246, Lots 265-270 & Lot 310 in DP 754454 and Lot 4 in DP 114687, Wingham**

**December 2013**

**Prepared for: Boral Pty Ltd**

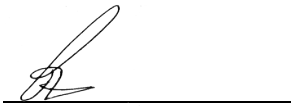
**FloraFauna Consulting**
PO Box 3212
West Kempsey NSW 2440
Mobile: 0429 727 010
Email: mail@florafauna.com.au
Web: www.florafauna.com.au

| | |
|---|---|
| **Report Title:** | **Ecological Assessment** |
| **Project:** | Ecological Assessment – Lot 246, Lots 265-270 & Lot 310 DP 754454 and Lot 4 DP 114687, Wingham |
| **Client:** | Boral Pty Ltd |
| **Report No.:** | EA-2013-1810 |
| **Draft/Final:** | Final – 8 January 2013 |

*The preparation of this report has been undertaken in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.*

*All information contained within this report are prepared for the exclusive use of the client and with respect to the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes other than those stated herein.*

**Prepared By:** **Steve Britt**
BSc. (Botany)
Grad. Dip. DBPA
M. Wld. Mgt. (Habitat)

**Signed:** 

**Date:** 8 January 2014

# Table of Contents

# 1. Executive Summary

This report describes the ecological assessment undertaken during November – December 2013 in relation to the proposed rezoning of land situated at the corner of Murray Road and Lambert Street Wingham. The subject site is identified as Lot 246, Lots 265-269 & Lot 310 in DP 754454 and Lot 4 in DP 114687. The combined area of these allotments is approximately 7.6 ha. With the exception of Lot 270, which contains the Wingham Baptist Church the land within the subject site is vacant.

The objectives of the assessment were to describe the ecological characteristics of the survey area within the subject site; identify the impacts of the proposed activity on flora and fauna species, populations, ecological communities and critical habitat; assess the nature, extent, frequency, duration and timing of impacts; assess the extent of threatening processes; assess the significance of the impact on species, ecological communities and populations listed under the *Threatened Species Conservation Act 1995* (TPC Act), *Fisheries Management Act 1994* FM Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act); and propose environmental management measures to minimise mitigate and if necessary offset impacts.

The survey area encompasses the subject site located at Wingham, which is bounded by Mortimer Street to the north, Lambert Street to the east, Murray Road to the south and Richardson Street to the west. During the field survey two terrestrial plant communities were recorded within the survey area. These included a Spotted Gum - Grey Ironbark dry open forest community as described under the NSW Vegetation Information System (VIS) classification and a derived riparian community that could not be assigned a formal VIS classification due to the extent of modification and degradation of the plant community.

There are a number of potential impacts on biodiversity that are described in Section 5 of this report, which may occur as a consequence of the land within the subject site being rezoned. These include removal of vegetation associated with future development of the site, loss of habitat, interruption to ecosystem processes, and other impacts associated with increased human activities including changes in animal behaviour and artificial lighting. Proposed measures to mitigate the potential impacts are detailed in Section 6 of the report. As previously discussed the subject site is heavily infested with invasive weeds.

From the habitat assessment and database/literature review, it was considered that 8 threatened species as listed under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* could potentially utilise the habitat within the survey area.

The Section 5A Assessments appended to this report as Appendix C concluded that the proposal has the potential to impact on some threatened species and populations. Generally however, the impacts can be mitigated by the measures outlined in Section 6 of this report.

# 2. Introduction

## 2.1 Background

FloraFauna Consulting has been engaged by Boral Pty Ltd (the client) to prepare an ecological assessment report to assess the potential impacts in relation to the proposed rezoning of land situated at the corner of Murray Road and Lambert Street Wingham.

## 2.2 Subject Site

The subject site is located at Wingham and comprises nine allotments of land bounded by Mortimer Street to the north, Lambert Street to the east, Murray Road to the south and Richardson Street to the west. The allotments that form the subject site are identified as:

- Lot 246 in DP 744454
- Lots 265-269 in DP 754454;
- Lot 310 in DP 754454; and
- Lot 4 in DP 114687.

The combined area of these allotments is approximately 7.6 ha.

The majority of the land within the subject site is zoned RU1 – Primary Production under the *Greater Taree Local Environmental Plan 2010* (LEP). Part of Lot 269 situated in the north-eastern corner of the subject site is zoned B1 – Neighbourhood Centre.

The larger proportion of the subject site has been cleared of native vegetation and is maintained to a parkland cleared condition through regular slashing. However, a relatively small part of the land adjacent to a small watercourse that dissects the centre of the site contains more substantial areas of native and exotic vegetation.

The subject site is situated within the urban environment of Wingham. The surrounding landscape in which the subject site is situated has undergone significant modification with much of the land having been cleared of native vegetation.

Existing residential development adjoins the subject site to the north, east and west. Beyond the residential areas in these directions are large expanses of cleared agricultural land with some remnant vegetation that is mostly confined to land within road reserves and adjacent to watercourses. To the south of the subject site adjacent to Murray Road is a small commercial precinct that is zoned B6 – Enterprise Corridor that adjoins a relatively large area of cleared agricultural land zoned RU1 – Primary Production through which the north coast railway corridor is situated.

The relative position of the subject site and the general nature of the surrounding landscape are shown in Figure 2.1.


**Figure 2.1: Aerial image of the subject site and surrounding landscape**

## 2.3 Proposed Development

It is proposed to rezone the land within the subject site from the current zoning of RU1 – Primary Production and B1 – Neighbourhood Centre to R1 – General Residential and RE1 – Public Recreation.

## 2.4 Survey Area Description

The survey area encompasses all of the land within the subject site as described under Section 2.2. The extent of the survey area is shown in Figure 2.2.


**Figure 2.2: Survey area**

## 2.5 Legislative Context

In NSW the *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for the assessment of development activities. Clause 5A of the Act requires that the significance of the impact of a proposal on threatened species, populations and endangered ecological communities is assessed by preparing a seven-part test in accordance with Clause 5A(2) of the Act.

Other State legislation relevant to the ecological assessment includes the following:

- *Threatened Species Conservation Act 1995* (TSC Act);
- *National Parks and Wildlife Act 1974* NPW Act);
- *Noxious Weeds Act 1993* (NW Act);
- *Fisheries Management Act 1994* (FM Act);
- State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14);
- State Environmental Planning Policy No. 26 – Littoral Rainforests (SEPP 26);
- State Environmental Planning Policy No.44 – Koala Habitat (SEPP 44).

Commonwealth legislation relevant to the ecological assessment is the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the Act as matters of national environmental significance. Matters of national environmental significance relevant to biodiversity are:

- Wetlands of international importance;
- Nationally threatened species and ecological communities;
- Migratory species; and
- Commonwealth marine areas.

Significance of impacts is determined in accordance with the *Significance impact guidelines 1.1 – matters of national environmental significance* (Department of Environment, Water, Heritage and the Arts, 2006). Where a proposal is likely to have a significant impact on a matter of national environmental significance, the proposal is referred to the Federal Environment Minister. The referral process involves a decision on whether or not the proposal is a 'controlled action'. When a proposal is declared a controlled action, approval from the Minister is required.

## 2.6 Objectives of the Report

The objectives of the ecological assessment are to:

- Describe the ecological characteristics of the subject site including identifying protected and threatened flora and fauna species, populations and ecological communities and their habitats;
- Identify the direct and indirect impacts of the proposed activity on flora and fauna species, populations, ecological communities and critical habitat;
- Assess the nature, extent, frequency, duration and timing of impacts;
- Assess the extent to which the proposed activity contributes to processes threatening the survival of biota on the site;

- Assess the significance of the impact of the proposed activities on species, ecological communities and populations listed under the TSC Act, FM Act and EPBC Act; and
- Propose management measures to minimise or mitigate and if necessary offset impacts.

# 3. Survey Methodology

## 3.1 Licencing

All work in relation to this ecological assessment was undertaken with appropriate licences and authorisations including:

- A Scientific Licence for the purpose of ecological survey and consulting issued subject to the provisions of Section 132C of the NPW Act and regulations; and
- An Animal Research Authority issued by the Department of Industries and Investment (formerly the Department of Primary Industries) Director-General's Animal Care and Ethics Committee for the purpose of biodiversity survey and habitat assessment.

## 3.2 Nomenclature

The names of plants used in this document follow the *Flora of New South Wales* (Harden, 2000) with updates from the PlantNet website (Royal Botanic Gardens Sydney, 2012).

The description of plant communities used in this document follow the NSW Plant Community Type (PCT) classification from the NSW Vegetation Information System (VIS) classification database (NSW Department of Environment and Heritage). For clarity a description based on observations recorded during the field survey has also been provided.

The names of vertebrate animals used in this document follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of the Environment and Heritage (2004).

## 3.3 Literature Review and Database Searches

The following literature was reviewed in relation to this ecological assessment:

- Site inspection report dated 23 November 2009, prepared by King and Campbell Pty Ltd;
- Report to ordinary meeting of Greater Taree City Council, dated 16 February 2011, prepared by Kieran Metcalfe (Strategic Planner);
- *Greater Taree Local Environmental Plan 2010* (LEP); and
- Greater Taree Council online land zoning map.

Database searches as summarised in Table 3.1 were undertaken on 27 November 2013.

| Database | Source |
|---|---|
| Atlas of NSW Wildlife (10 km x 10 km search area) | NSW Government Office of Environment and Heritage |
| PlantNet: ROTAP/Threatened Species Spatial Search (10 km radius) | Sydney Royal Botanic Gardens |
| EPBC Act Protected Matters Search Tool (10 km buffer) | Department of Sustainability, Environment, Water, Population and Communities |

**Table 3.1: Database Searches**

## 3.4 Field Survey

An investigation of the subject site was undertaken on Thursday, 28 November 2013 for the purpose of conducting an assessment of the flora and fauna, a survey of trees within the canopy of the plant community and habitat assessment as detailed below.

### 3.4.1 Flora Assessment

An assessment of the flora was conducted during the field investigation using a modified random meander method after Cropper (1993) and the following information was collected:

- The plant communities, species and populations present (NB: An inventory of the species present was made but cannot be regarded as comprehensive due to the disturbed nature of the site);
- Tree survey;
- Spatial distribution of the vegetation in the survey area;
- Condition of the vegetation; and
- Conservation significance of the vegetation;

### 3.4.2 Tree Survey

Trees were surveyed to quantify the species composition of the canopy within the plant communities. The purpose of quantifying the species within the canopy was to assist with:

- Determining the plant communities present within the survey area;
- Collection of information for the habitat assessment such as presence of tree hollows; and
- Determining the approximate percentage of Koala feed tree species present as part of the Koala habitat assessment.

For the purposes of this ecological assessment a tree is defined as a perennial plant having a trunk diameter at breast height (DBH) of not less than 100 mm where DBH is the measurement of the trunk at 1.3 m above ground level.

### 3.4.3 Fauna Assessment

The fauna assessment conducted was restricted to a visual daytime survey. Trapping or other survey techniques such as spotlighting and the like for fauna species was not conducted, nor was a comprehensive species list gathered. During the fauna survey the following information was collected:

- An inventory of bird species present within the site and adjacent land using the "standardised search" method after Watson (2007); and
- Other species of fauna recorded opportunistically during the field survey.

### 3.4.4 Habitat Assessment

The habitat assessment focused on the potential for species to occur within the survey area based on the type, suitability and condition of the habitat, and the habitat features present. Although recording threatened species during field survey can confirm their presence in an area, the lack of threatened species records does not necessarily indicate that threatened species are absent. Threatened species tend to be rare and in many cases are cryptic by nature, consequently they are often difficult to detect. Suitable habitat is, therefore, a useful indicator and an important matter for consideration when determining the potential for the presence of threatened species. During the field survey the following information was collected:

- Habitat type;
- Habitat features;
- Threatened species and populations likely to be present based on the type of habitat and the habitat features present; and
- Habitat connectivity; and conservation significance (individuals, species, populations and communities).

### 3.4.5 Koala Habitat Assessment

#### (a) SEPP 44

*State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) "aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline." SEPP 44 Koala Habitat Assessment was undertaken and involved the following points of consideration:

- Determining whether the subject site occurs within a Local Government Area (LGA) listed under Schedule 1 of SEPP 44;
- Determination of *Potential Koala Habitat*; and
- Determination of *Core Koala Habitat*.

#### (b) EPBC Act

Koala (*Phascolarctos cinereus*) populations in Queensland (QLD), New South Wales (NSW) and the Australian Capital Territory (ACT) have been listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This listing came into legal effect on 2 May 2012.

The Protected Matters Search Tool (PMST) indicates that the Koala or its habitat could occur within the area. Therefore, it is a requirement under the provisions of the EPBC Act that adequate information on the characteristics of any koala populations and the quality of potential habitat within the survey area is collected.

As the PMST indicates that the Koala may be present, it was necessary to conduct a habitat assessment. Since there is a limited amount of information on Koala populations and habitat in the area available, a Koala survey was also undertaken for the purposes of this ecological assessment.

### I. Koala Habitat Assessment

The habitat assessment considered features of the survey area including:

- The canopy tree species composition;
- The percentage of the canopy cover of each of the above species;
- The vegetative ground cover (% of the ground area);
- The leaf litter cover (% of the ground area);
- The bare ground (% of the ground area);
- The area of surface water (% of the ground area);
- The distance to surface water (m) (in drought years, survival of a population may be dependent on the presence of vegetation near permanent waterways; Gordon et al, 1988); and
- Evidence of dogs in the area (the potential threat of mortality from dog-attacks will influence impact assessment and impact- mitigation measures required).

### II. Koala Survey

As per the *Interim Koala Referral Advice for Proponents* (Department of Sustainability, Environment, Water, Population and Communities, 2012) the Koala survey was undertaken in accordance with the survey techniques outlined in Policy 4 of the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016* (Queensland Government Environment Protection Agency 2006). As the survey area was relatively small and contained limited potential habitat it was possible to undertake a search of the entire potential habitat within the survey area. Surveys of actual animal sightings were undertaken; however more indirect methods including a search for scats and other indicators such as scratch markings on trees were also utilised.

For the purposes of the EPBC Act, where the Koala is identified as occurring in a study area, it is recommended that the Spot Assessment Technique (SAT) (Phillips and Callaghan, 2011) to provide an indication of how much or frequently the area of habitat is being used by the Koala be undertaken.

## 3.5 Significance Assessments

Significance assessments were carried out for threatened species, populations and ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Threatened Species Conservation Act 1995* (TSC Act).

In the case of the EPBC Act, the significance assessments were undertaken in accordance with the *Significance Impact Guidelines 1.1 – Matters of National Environmental* (Department of Environment, Water, Heritage and the Arts, 2009). In the case of the TSC Act, the significance assessments were undertaken in accordance with the *Threatened Species Assessment Guidelines – The Assessment of Significance* (Department of Environment and Climate Change, 2007).

The conclusions drawn in this report are based upon information obtained from the review of literature and database searches, and from the ecological assessment undertaken of the survey area at the time of the field investigation. These results are not exhaustive but rather are indicative of the environmental conditions, including the presence or otherwise of threatened species, populations and ecological communities. It should also be recognised that environmental conditions are dynamic and will change over the course of time.

Habitat assessments were completed for all threatened species and populations identified in the database searches (Table 3.1) to determine whether or not suitable habitat exists within the subject site. This is a conservative approach that is more likely to include cryptic species as well those that are otherwise difficult to detect.

## 3.6 Aboriginal Heritage

Aboriginal objects are physical evidence of the use of an area by Aboriginal people. These objects can also be referred to as 'Aboriginal sites', 'relics' or 'cultural material'. Aboriginal objects include:

- Physical objects, such as stone tools, Aboriginal-built fences and stockyards, scarred trees and the remains of fringe camps;
- Material deposited on the land, such as middens; and
- The ancestral remains of Aboriginal people.

Known Aboriginal objects and sites are recorded on the Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS). The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW sets out the process which must be followed in order to satisfy due diligence requirements. The first step in this process is checking for Aboriginal sites on AHIMS by conducting an AHIMS Basic Search in the area of your proposed activity.

If the results of the initial AHIMS Basic Search indicate that AHIMS contains information about an Aboriginal site in the area of the proposed activity an Extensive Search must be undertaken. For the purposes of due diligence the AHIMS Basic Search results may be relied upon for 12 months.

# 4. Results

## 4.1 Flora

Based on the floristic assemblage and canopy composition data collected during the flora assessment of the survey area it was determined that two plant communities were present, as described below.

### 4.1.1 Plant Community Description – NSW Vegetation Information System (VIS) classification

#### (a) Plant Community 1:

*Plant Community Type ID*: 1213 *Biometric Vegetation Type ID*: HU630

*Vegetation Type*:

i. **Common Community Name:** Spotted Gum - Grey Ironbark dry open forest of the lower foothills of the Barrington Tops, North Coast.

ii. **Scientific Community Name:** *Eucalyptus acmenoides, Eucalyptus crebra, Eucalyptus fibrosa, Eucalyptus moluccana / Acacia falcata, Acacia implexa, Allocasuarina torulosa, Breynia oblongfolia, Aristida vagans, Cheilanthus sieberi* subsp. *Sieberi, Cymbopogon refractus, Dianella caerulea*.

iii. **Dominant Canopy Species:** *Corymbia maculata* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus creba* (Narrow-leaved Ironbark), *Eucalyptus punctata* (Grey Gum), *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum).

iv. **Mid Stratum Species:** *Allocasuarina torulosa* (Forest Oak), *Acacia falcata*, *Acacia implexa* (Hickory Wattle), *Leucopogon juniperinus* (Prickly Beard-heath), *Breynia oblongifolia* (Coffee Bush), *Persoonia linearis* (Narrow-leaved Geebung), *Glycine clandestina* (Twining Glycine), *Hardenbergia violacea* (False Sarsaparilla).

v. **Ground Stratum Species:** *Aristida vagans* (Threeawn Speargrass), *Cymbopogon refractus* (Barbed-wire Grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Lomandra multiflora* subsp. *Multiflora* (Many-flowered Mat-rush, *Cheilanthes sieberi* subsp. *Sieberi* (Rock Fern), *Vernonia cinerea* var. *cinerea*, *Dianella caerulea* (Blue Flax-lily)**.**

*Vegetation Formation (CMA)*: Dry Sclerophyll Forests (Shrub/grass subformation)

*Vegetation Class*: Hunter-Macleay Dry Sclerophyll Forests

*Landscape Position:* Occurs on foothills and undulating terrain mainly below 400m.

Images of the remnant Spotted Gum - Grey Ironbark dry open forest community that occurs within the subject site is shown in Figure 4.1 and Figure 4.2 below.

**Figure 4.1: Remnant Spotted Gum - Grey Ironbark dry open forest in the northern parts of the survey area**

**Figure 4.2: View of the remnant Spotted Gum - Grey Ironbark dry open forest adjacent to the ephemeral stream in the centre of the site**

### (b) Plant Community 2

This is a derived plant community with little affinity to any natural plant community as classified under the Vegetation Information System. The community name and description is based entirely on observations made during the field survey.

i. **Community Name:** Derived Riparian Community;

ii. **Scientific Community Name:** None;

iii. **Dominant Canopy Species:** *Senna septemtrionalis* (Arsenic Bush), *Ligustrum sinense* (Small-leaf Privet), *Solanum mauritianum* (Tobacco Bush), *Cinnamomum camphora* (Camphor Laurel), *Melaleuca linariifolia* (Flax-leaved Paperbark), *Hakea salicifolia* subsp. *salicifolia* (Willow-leaved Hakea);

iv. **Mid Strata Species:** *Ageratina adenophora* (Crofton Weed), *Alocasia sp.* (Elephant Ear), *Lantana camara* (Lantana), *Nephrolepis cordifolia* (Fishbone Fern), *Pteridium esculentum* (Bracken), *Rumex crispus* (Curled Dock);

v. **Ground Strata Species:** *Tradescantia fluminensis* (Wandering Jew), *Commelina cyanea* (Native Wandering Jew), *Pollia crispata* (Pollia) and *Ranunculus plebeius* (Forest Buttercup).

**Note: This plant community is highly degraded and some assumptions have been made regarding its identification. Details regarding the degradation and the reasoning behind this interpretation are provided in the discussion under Section 4.1.2 – Field Observations.**

An image of the derived riparian community within the survey area is shown in Figure 4.3 and Figure 4.4.

**Figure 4.3: Arsenic bush and Crofton weed within the derived riparian community**

**Figure 4.4: Derived riparian community dominated by exotic/weed species**

### 4.1.2 Field Observations

#### (a) Spotted Gum - Grey Ironbark dry open forest community

Observations made during the flora assessment indicated that a highly modified and disturbed Spotted Gum - Grey Ironbark dry open forest community occurred across the majority of the subject site. The principle species in the canopy included *Eucalyptus tereticornis* (Forest Red Gum), *Corymbia maculata* (Spotted Gum), *Eucalyptus moluccana* (Grey Box), *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus acmenoides* (White Mahogany). Generally, the canopy has been significantly reduced so that the community tends to resemble a grassy woodland rather than open forest. In some parts of the site, particularly in the southern and central-northern parts the vegetation has been reduced to managed grassland.

The land within the majority of the subject site is managed. With the exception of the areas adjacent to the watercourse the vegetation within the site is maintained through slashing. This slashing regime appears to have been in place for a considerable period of time so that the understorey is almost absent and the groundcover is maintained to a height of less than 300 mm. In the slashed areas of the site where obstructions such as clumps of trees or old fence lines preclude access to the slashing machinery, remnant understorey vegetation remains. During the field survey it was noted that in these areas the remnant understorey is dominated by exotic species, some of which are serious environmental weeds. The most common species recorded in the understorey was *Ligustrum sinense* (Small-leaf Privet), which is a serious environmental weed. Other common species of the understorey included *Lantana camara* (Lantana) a weed of national significance, and *Asparagus aethiopicus* (Asparagus Fern) a declared noxious weed. Other understorey species recorded included *Lycium ferocissimum* (African Boxthorn), which is listed as a Weed of National Significance as well as juvenile trees such as

*Cinnamomum camphora* (Camphor Laurel) and *Corymbia torelliana* (Cadaga); a native to far northern Queensland but regarded as a potentially serious weed in NSW. Of the few native species recorded in the understorey of the slashed areas the most common species were juvenile trees from the canopy species as well as *Pittosporum undulatum* (Sweet Pittosporum) and *Acacia implexa* (Hickory Wattle). An image of the remnant understorey within the slashed areas of the site is shown in Figure 4.5.

**Figure 4.5: Understorey vegetation at the base of a canopy tree within the slashed area of the site**

In the slashed areas of the site the groundcover also tended to be dominated by exotic/weed species. The more common exotic/weed grass species included *Paspalum urvillei* (Vasey Grass), *Setaria sphacelota* (South African Pigeon Grass), *Andropogon virginicus* (Whisky Grass), *Cynodon dactylon* (Common Couch), *Briza maxima* (Quaking Grass), *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Festuca pratensis* (Meadow Fescue) and *Vulpia bromoides* (Squirreltail Fescue). Other widespread exotic/weed species included *Taraxacum officinale* (Dandelion), *Plantago lanceolata* (Lambs Tongue), *Senecio madagascariensis* (Fireweed), *Verbena incompta* (Purpletop), *Bidens pilosa* (Cobbler's Pegs), *Centaurium erythraea* (Common Centaury) and *Trifolium pratense* (Red Clover). Native species were far less common within the groundcover. Those recorded included *Pratia purpurascens* (Whiteroot), *Dianella caerulea var. caerulea* (Blue Flax-lily) and *Centella asiatica* (Indian Pennywort). An image of the groundcover typical of the slashed areas of the site is shown in Figure 4.6.

**Figure 4.6: Groundcover typical of the slashed areas of the subject site**

There was also a small drainage depression located in the northern part of the subject site that contained several species that were not recorded elsewhere within the Spotted Gum - Grey Ironbark dry open forest community. These included the exotic/weed species; *Paspalum mandiocanum* (Broadleaf Paspalum), *Cyperus eragrastis* (Umbrella Sedge) and the native species *Ranunculus plebeius* (Forest Buttercup), which was also recorded within a section of the derived riparian community. An image of the groundcover that occurred within the small drainage depression is shown in Figure 4.7.

**Figure 4.7: Groundcover within the small drainage depression**

In the areas of the site adjacent to the watercourse that are not subject to slashing there was a higher representation of native species recorded within the groundcover. This could most likely be attributed to reduced light associated with a more intact canopy, which would exclude a significant number of the exotic/weed species and provide more favourable conditions for some native species including *Themeda triandra* (Kangaroo Grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern).

Despite a greater canopy cover in the areas adjacent to the watercourse, shade-tolerant exotic/weed species remained a significant component of the floral assemblage including *Ligustrum sinense* (Small-leaf Privet), *Lantana camara* (Lantana) and *Asparagus aethiopicus* (Asparagus Fern), which were widespread.

### (b) Derived Riparian Community

Observations made during the flora assessment indicated that the riparian zone associated with the ephemeral stream that dissects the subject site contains a derived plant community that is largely composed of an assemblage of exotic species. Canopy species associated with the adjacent Spotted Gum - Grey Ironbark dry open forest community were recorded up to the edge of the riparian zone.

Within the riparian zone the dominant species of the canopy along the entire length of the watercourse comprised three invasive weed species; *Senna septemtrionalis* (Arsenic Bush), *Ligustrum sinense* (Small-leaf Privet) and *Solanum mauritianum* (Tobacco Bush). At the western (upstream) end of the watercourse a relatively large area has been colonised by *Alocasia sp.* (Elephant Ear) with another relatively large area nearby that has been colonised by *Nephrolepis cordifolia* (Fishbone Fern). Both of these species are regarded as invasive weeds. However, the most significant weed within the watercourse in terms of the extent of its range appears to be *Ageratina adenophora* (Crofton Weed).

During the field survey a small number of native species were recorded within the watercourse. However, some of these species tended to be uncommon, such as *Melaleuca linariifolia* (Flax-leaved Paperbark) with three individuals recorded and *Hakea salicifolia* subsp. *salicifolia* (Willow-leaved Hakea) with two individuals recorded. Other native species were recorded as common associates of the community but often restricted in their range. For instance, *Commelina cyanea* (Native Wandering Jew) was a common associate species of the groundcover but was recoded only in the western part of the watercourse, while *Pollia crispata* (Pollia) and *Ranunculus plebeius* (Forest Buttercup) were common associate species of the groundcover but were only recorded in the eastern part of the watercourse adjacent to the site boundary.

The species of flora recorded within the subject site during the field survey is provided in Appendix A of this report. During the field survey no threatened species or populations of flora or any Endangered Ecological Community were recorded within the survey area.

### 4.1.3 Tree Survey

During the flora assessment trees within the subject site were surveyed. As previously discussed, the plant communities within the subject site are highly modified and only a small portion of the canopy remains. The growth stage of trees within the subject site ranged from saplings and poles (regrowth) to early-mature and mature (mature) after Woodgate et al (1994). This is indicative of a site that has been cleared it the past and has undergone regeneration, although this has been restricted by an ongoing management regime. It was noted that recruitment of juveniles was confined to areas where slashing had not occurred.

All trees across the subject site were inspected for visible hollows. One tree in the late-mature growth stage in which hollows become more common from the greater number of crown breaks and larger branches breaking was recorded. This individual of *Corymbia maculata* (Spotted Gum) was located in the north-western corner of the site and although it displayed the characteristic signs of senescence associated with the late-mature growth stage no visible hollows were observed. The visible hollow search concluded that there were no hollow-bearing trees present within the subject site.

The tree survey also looked at the species composition of the canopy within the survey. Species composition data was not quantified in detail other than to confirm the identification of species composition and their relative abundance. The results of this aspect of the tree survey indicate that *Eucalyptus tereticornis* (Forest Red Gum), *Corymbia maculata* (Spotted Gum) and *Eucalyptus moluccana* (Grey Box), were the principal species present with *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus globoidea* (White Mahogany) being common associates but less abundant. It was noted during the tree survey that the larger proportion of the subject site lacks a canopy and is maintained as grassland.

## 4.2 Habitat

The principal components of the habitat within the survey area comprised the Spotted Gum - Grey Ironbark dry open forest community and the derived riparian community. Both communities are highly modified with the Spotted Gum - Grey Ironbark dry open forest community resembling managed parkland and the riparian community being almost completely dominated by exotic/weed species.

As previously discussed in Section 4.1.3 the majority of the Spotted Gum - Grey Ironbark dry open forest community has a reduced canopy, an understorey that has largely been removed and groundcover of mostly managed exotic grasses except in the areas immediately adjacent to the watercourse and around clumps of trees where access to slashing equipment is impeded. As a consequence there is a general absence of habitat features within this community and utilisation of the habitat is likely to be restricted to foraging purposes by a limited number of fauna species.

With respect to the derived riparian community, the aquatic and riparian habitats associated with the ephemeral stream are likely to provide potential habitat for a number of species. Despite the large assemblage and dominance of exotic/weed

within the community the extent of this vegetation cover would afford shelter as well as foraging habitat for a variety of fauna species.

## 4.3 Fauna

Based upon information gathered during the field survey in relation to the plant communities and the habitat features observed, and notwithstanding the past disturbance and modification that have occurred as detailed above, it was determined that the land within the survey area provides limited potential habitat for some species of fauna. Given presence of some habitat features such as limited food resources in the canopy of the Spotted Gum - Grey Ironbark dry open forest community as well as foraging and shelter habitat available within the derived riparian community there is potential for the habitat within the subject site to be utilised by a number of species including several that are threatened.

Although a comprehensive fauna survey was not undertaken during the field survey a number of species were recorded. These included one reptile and 11 birds. The species of fauna recorded within the subject site during the field survey are appended to this report under Appendix B. During the field survey no threatened species or populations of fauna were recorded within the survey area.

## 4.4 Protected Matters

Under the provisions of the EPBC Act approval is required for any action that may have a significant impact on matters of National Environmental Significance (NES) or on Commonwealth land. A search of the Department of Sustainability, Environment, Water, Population and Communities web site employing the Protected matters Search Tool with a 10km buffer was undertaken to identify the matters of NES that may occur in, or may relate to the site.

### 4.4.1 Matters of NES (within 10km radius of the site)

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Significance: | None |
| Great Barrier Marine Parks | None |
| Commonwealth Marine Areas: | None |
| Threatened Ecological Communities: | 1 |
| Threatened Species: | 45 |
| Migratory Species: | 34 |

The threatened ecological community returned in the Protected Matters Search Tool was the critically endangered *Lowland Rainforest of Subtropical Australia*. This plant community was not observed within the survey area during the field survey.

The threatened species returned in the Protected Matters Search Tool have been considered under the Assessment of Significance in Appendix C of this report.

Of the 34 migratory species returned in the Protected Matters Search Tool only two are considered to have potential to utilise the habitat within the subject site. These include:

- *Hirundapus caudacutus* (White-throated Needletail); and
- *Ardea ibis* (Cattle Egret).

Neither of these species is listed as a threatened species. The Cattle Egret was introduced into Australia in the 1930s but the large numbers across northern Australia suggests that the species may have self-introduced from Asia.

### 4.4.2 Other Matters Protected by the EPBC Act

| | |
|---|---|
| Commonwealth Lands: | 3 |
| Commonwealth Heritage Places: | 1 |
| Listed Marine Species: | 34 |
| Whales and other Cetaceans: | 1 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Commonwealth Reserves Marine: | None |
| Places on the RNE (Indigenous sites): | 3 |
| State and Territory Reserves: | 1 |
| Regional Forest Agreements: | 1 |
| Invasive Species: | 36 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Narine): | None |

With respect to invasive species returned in the Protected Matters Search, four species of bird and seven species of mammal are considered to have potential to occur within or utilise the land within the survey area. The Protected Matters report also lists 15 weed species under Invasive Species, which includes some of the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The weeds and other invasive species that are known or are considered to have potential to occur within the survey area are listed in Table 4.2 below.

| Scientific Name | Common Name |
|---|---|
| **Plantae (Weeds)** | |
| *Anredera cordifolia* | Madeira Vine |
| *Asparagus aethiopicus* | Asparagus Fern * |
| *Dolichandra unguis-cati* | Cat's-claw Creeper |
| *Genista sp. X Genista monspessulana* | Broom |
| *Lantana camara* | Lantana* |
| *Opuntia spp.* | Prickly Pears |
| *Rubus fruticosus aggregate* | Blackberry |
| *Sagittaria platyphylla* | Delta Arrowhead |
| *Senecio madagascariensis* | Fireweed* |
| **Aves** | |
| *Acridotheres tristis* | Indian Myna* |
| *Passer domesticus* | House Sparrow |
| *Streptopelia chinensis* | Spotted Turtle-dove |
| *Sturnus vulgaris* | Common Starling |
| **Mammalia** | |
| *Canis lupus familiaris* | Domestic Dog |
| *Felis catus* | Domestic Cat |
| *Lepus capensis* | Brown Hare |
| *Mus muclus* | House Mouse |
| *Oryctolagus cuniculus* | European Rabbit |
| *Rattus rattus* | Black Rat |
| *Vulpes vulpes* | Red Fox |

**Table 4.2: Invasive species known or likely to occur within the survey area**
***** Indicates species recorded within the survey area during the field survey

Three Weeds of National Significance (WoNS); *Asparagus aethiopicus* (Asparagus Fern), *Lantana camara* (Lantana) and *Senecio madagascariensis* (Fireweed) were recorded within the survey area during the field survey. Furthermore, although not returned in the Protected Matters Search another WoNS; *Lycium ferocissimum* (African Boxthorn) was also recorded during the field survey as a single individual.

## 4.5 Koala Habitat Assessment

### 4.5.1 SEPP 44

The subject site is situated in the Port Macquarie-Hastings LGA, which is listed on Schedule 1 – Local Government Areas of SEPP 44.

As per SEPP 44, *Potential Koala Habitat* is defined as:

"*Areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component.*"

Although a substantial portion of the forest community has previously been removed from within the subject site and much of the land is occupied by treeless grassland there is a portion of the canopy that still remains. Within the remaining canopy the eucalypt species; *Eucalyptus tereticornis* (Forest Red Gum), which is listed on Schedule 2 – Feed Tree Species of SEPP 44 as a Koala feed tree species, was recorded within the Spotted Gum – Grey Ironbark dry open forest community during the field survey. The species constituted more than 15 % of the total number of trees in the upper and lower strata of the tree component. On this basis the Spotted Gum – Grey Ironbark dry open forest community within the subject site satisfies the criteria as potential Koala habitat for the purposes of SEPP 44.

As per SEPP 44, *Core Koala Habitat* is defined as:

"*An area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population).*"

The Atlas of NSW Wildlife database search returned 32 records of the Koala within a 10 km x 10 km search area around the subject site. This indicates that the species has a presence in the area but is not necessarily an indication of a population that is presently on, or utilising the subject site. The locations of the recorded sightings of the Koala within a 10 km x 10 km search area from the Atlas of NSW Wildlife (OEH, 2013) are shown in Figure 4.8 below.

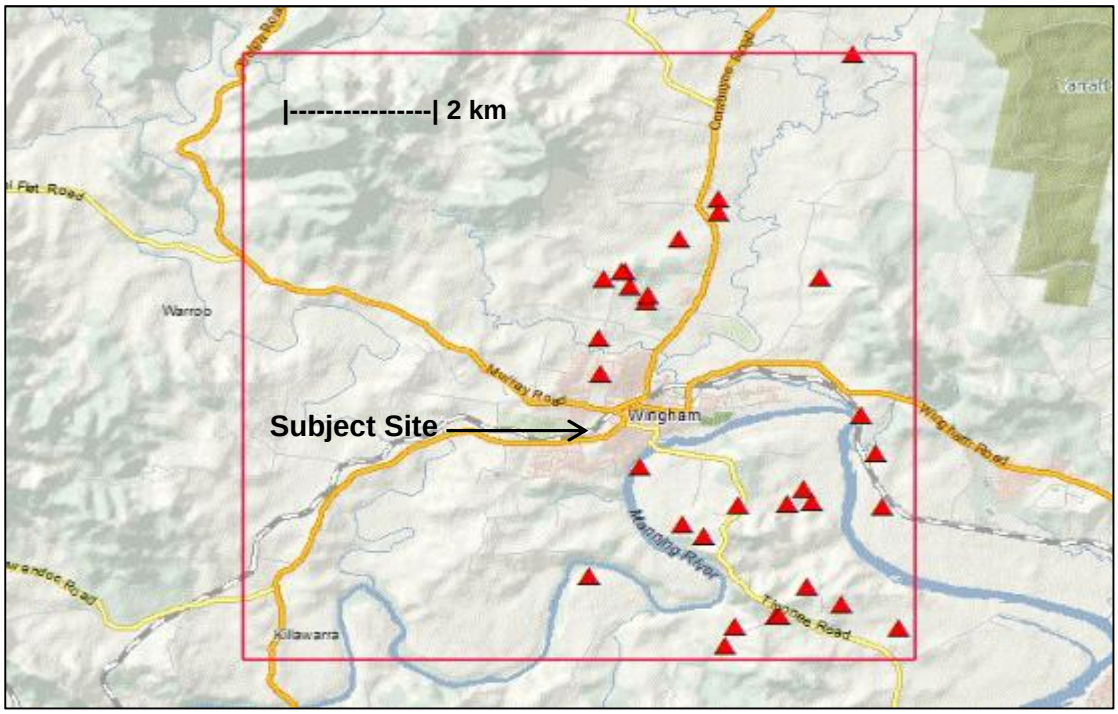



**Figure 4.8: Locations of Koala sightings (red markers) within a 10 km x 10 km search area around the subject site. Source: Atlas of NSW Wildlife (OEH)**

The Atlas records suggest that there is a local Koala population present within the 10 km x 10 km search area. With one exception all the records are located outside the urban environment with concentrations to the north in an area of remnant forest and also to the south in another area of remnant forest beyond the Manning River. The single record within the urban area is in close proximity (approximately 500 m) to the subject site as indicated in Figure 4.4.

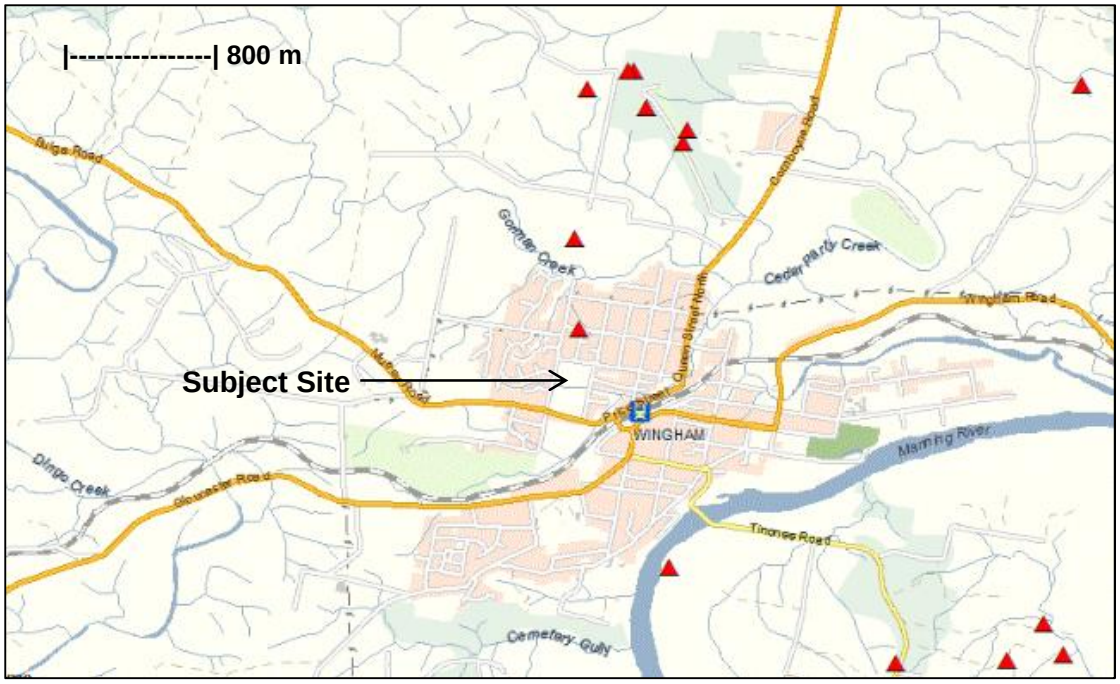



**Figure 4.9: Locations of closest Koala sightings (red markers) around the subject site. Source: Atlas of NSW Wildlife (OEH)**

During the field survey a search of the entire habitat within the subject site was undertaken. This included searching the site for actual Koala sightings as well as a Spot Assessment Technique (SAT) survey (a search for scats) and other indicators such as scratch markings on trees. This survey found no evidence of the Koala being present or utilising the habitat within the survey area.

Despite there being potential habitat as defined under SEPP 44 within the subject site it is unlikely that the habitat could be regarded as core Koala habitat given that there was no evidence of the species utilising the habitat, the extent of urbanisation around the site and the lack of suitable habitat corridors to provide linkages to non-urban vegetated areas. On this basis the habitat within the survey area cannot be regarded as core Koala habitat for the purposes of SEPP 44.

### 4.5.2 EPBC Act

For the purposes of the EPBC Act, habitat critical to the survival of the Koala populations in Queensland, NSW and the Australian Capital Territory are:

- Primary koala food tree species comprise at least 30 % of the over-storey trees;
- Primary koala food tree species comprise less than 30 % of the over-storey trees, but together with secondary food tree species comprise at least 50 % of the over-storey trees;

- Primary food tree species are absent but secondary food tree species alone comprise at least 50 % of the over-storey trees;
- The above qualities may be absent in a forest or woodland but other essential habitat features are present and adjacent to areas exhibiting the above qualities; and
- A relatively high density of koalas is supported, regardless of the presence of food tree species. Koala population densities vary across their range and regional data should be used to judge relative density.

Food trees are those listed under Appendix 2 of the Recovery Plan for the Koala (DECC, 2008). With respect to the subject site, *Eucalyptus tereticornis* (Forest Red Gum); a primary food tree species was recorded in the canopy during the flora assessment. Within the Spotted Gum – Grey Ironbark dry open forest community the primary food tree species comprised greater than 30 % of the over-storey trees. On this basis the habitat within the subject site satisfies the criteria as critical habitat with respect to food resources for the purposes of the EPBC Act.

The following observations of the habitat were made during the field survey with respect to essential habitat features critical to the survival of the Koala populations in Queensland, NSW and the Australian Capital Territory:

- Permanent water is not readily available within or in close proximity to the subject site;
- Dogs are present in the area. There is existing urban development in the immediate vicinity of the survey area in which dogs are kept as domestic pets. Furthermore, there is also rural holdings nearby where it is likely that dogs are also kept as domestic pets and working dogs associated with agricultural activities;
- The habitat within the subject site has been modified through removal of the understorey and significant reduction of the original canopy;
- There is no linkage between the subject site and areas of suitable Koala habitat; and
- The adjacent rural land situated to the south of the subject site has been substantially cleared of native vegetation.

Although the habitat within the subject site satisfies the criteria as critical habitat with respect to food resources, the aforementioned characteristics of the site and the surrounding landscape are impediments to utilisation of the habitat within the subject site by the Koala.

## 4.6 Aboriginal Heritage

The initial AHIMS basic search undertaken on 10 December 2013 indicated that one Aboriginal site is recorded within or near the subject site. Before proceeding further the record was flagged with King and Campbell who advised that they were aware of the Aboriginal site and had undertaken an extensive AHIMS search and other additional research. The extensive search report indicates that the site is identified as the “Wingham Burial Ground” and is located within the subject site. It is understood that measures have been taken to ensure that the burial ground is protected.

# 5. Potential Impacts on Biodiversity

The proposal involves the rezoning of the land within the subject site from the current zoning of RU1 – Primary Production to residential. Initially this is unlikely to have any direct impact on biodiversity. However, it is acknowledged that once rezoned for residential purposes it is likely that any subsequent development within the subject site such as subdivision of the land, provision of infrastructure and construction of buildings could impact on biodiversity. Therefore, consideration of the potential impacts on biodiversity that may occur from future development as result of the proposed rezoning is warranted.

The principle impact on biodiversity associated with the proposed rezoning stems from the likely subdivision of what is effectively a relatively large allotment of vacant land into numerous smaller parcels of land each of which would have some form of development entitlement. Essentially, this would result in loss of habitat, albeit one that is highly disturbed, to facilitate the provision of infrastructure and construction of buildings. In the longer term there would also be an ongoing increased human presence that would also potentially impact on biodiversity in various ways such as interruption of ecosystem processes, introduction of environmental weeds and exotic animals, and increased artificial lighting. However, some of these impacts already occur and would continue to occur irrespective of whether the proposed rezoning and any subsequent development proceed or not.

As detailed in Section 4 of this report, the habitat associated with the plant communities across the majority of the subject site has been previously modified in the past. In the northern part of the site there has been a significant reduction of the canopy and a large proportion of the understorey has been removed. In the southern part of the site the entire canopy and understorey has been removed. Regrowth in these areas of land is controlled by an ongoing slashing regime. The ephemeral stream lies between the northern and southern parts of the site. It is highly degraded and heavily infested with invasive weeds and in fact a large assemblage of exotic/weed species was recorded across the site generally. These modifications appear to have been in place for a considerable period of time.

## 5.1 Vegetation Removal

No vegetation will be removed from within the subject site in relation to the proposed land rezoning. However, once rezoned for residential purposes it is likely that removal of vegetation will be an intrinsic aspect of any future development on the land. It is noted that any removal of vegetation would be restricted to the northern part of the site where remnant forest still remains. Such removal of vegetation, which essentially involves trees from the canopy, in all likelihood would have some impact on biodiversity.

## 5.2 Interruption to Ecosystem Processes

Ecosystems require a suite of processes in order to function. These processes include climatic processes, primary processes (production of biomass), hydrological processes, nutrient cycling, interspecific and intraspecific interactions, movement of

organisms and natural disturbance regimes such as fire and flooding (Gleeson et al, 2012). Ecosystem processes are complex and therefore are difficult to quantify. Most development in natural environments has the potential to interrupt ecosystem processes.

Given the extent of disturbance that exists within the subject site and surrounding landscape it is unlikely that the rezoning proposal and any subsequent development will contribute significantly to further interruption of ecosystem processes.

## 5.3 Weed Invasion

Weed invasion has a negative impact on biodiversity. It is generally accepted that weeds are a significant threat to biodiversity as well as being an economic problem. Depending on the species, weeds can increase shading, compete with native plants for nutrients, smother native plants or chemically suppress their germination or growth through allelopathy. Invasion of native plant communities by exotic perennial grasses and invasion, establishment and spread of Lantana (*Lantana camara*) are listed in NSW as Key Threatening Processes (KTPs).

During the field survey it was noted that invasion of the habitats within the subject site by weeds is well advanced with a large assemblage of weed species recorded and the larger proportion of the habitats being dominated by exotic/weed species. In particular, four weeds of National Significance including *Asparagus aethiopicus* (Asparagus Fern), *Lantana camara* (Lantana), *Senecio madagascariensis* (Fireweed) and *Lycium ferocissimum* (African Boxthorn) are widespread across the subject site.

## 5.4 Other Impacts Associated with Human Activities

### 5.4.1 Changes in Animal Behaviour

Behavioural changes in native animals can occur as a result of the physical presence of a development or due to interaction with people at a development. There are various types of behavioural changes possible such as changes in the choice of foraging and reproductive behaviour. In some cases animals may be drawn to a development by an improved food supply associated with the presence of humans. For example, species such as the Eastern Grey Kangaroo, Brushtail Possum, Magpie, Butcherbird, Kookaburra and Noisy Miner often live in close proximity to humans because of the improved foraging opportunities. Other more secretive or shy species such as the large forest Owls and the Bush Rat are more likely to avoid areas in the vicinity of a development. In other cases modification of the habitat in the vicinity of a development such as removal of the understory to create a parkland-like setting favours particular species that can result in the absence of other species. For example, a parkland cleared site is favoured habitat of the Noisy Miner, an aggressive, cooperative breeder that will exclude many other avian species from an area. It was noted that the Noisy Miner was the most common bird recorded with the subject site during the field survey.

### 5.4.2 Artificial Lighting

Artificial lighting can cause disruption of foraging behaviour, increased potential for collision with structures, and disruption of reproduction and movement. The effects of artificial lighting on most Australian fauna are not fully understood, nor has it been sufficiently studied.

# 6. Managing Potential Impacts

The proposed land rezoning is likely to precede further activities associated with development of the site that could impact on biodiversity as discussed previously in Section 5. However, there are a number of measures that can be undertaken to manage and mitigate the potential impacts.

The recommended mitigation measures are described below in Section 6.1, 6.2, 6.3 and 6.4. Prior to initiating the mitigation measures a Vegetation Management Plan (VMP) should be prepared to define and document the actions required to implement the management of the proposed public recreation land and to detail the measures to be adopted for the restoration, protection and conservation of the public recreation land in the longer-term.

The following objectives for site management have been identified:

- To protect existing remnant native vegetation;
- Encourage regeneration of existing vegetation
- Control invasive weeds;
- To minimise the impact of proposed development on the native vegetation; and
- To perform monitoring and maintenance activities to ensure that implementation of the mitigation measures are adequate and a satisfactory restoration outcome is achieved.

## 6.1 Restoration of the Public Recreation Land Habitat

The proposed public recreation land lies within the upper part of an ephemeral (first order) stream that has the potential to form a vegetated habitat corridor. As it is intended to exclude the proposed public recreation land from development and essentially retain it as in situ habitat, any future mitigation measures such as revegetation and weed management should be focussed on this area. Currently the area of land within the subject site that forms the proposed public recreation land is degraded and heavily infested with weeds.

For the purposes of restoring the habitat within the proposed public recreation land a three-pronged approach should be applied that incorporates:

- Natural regeneration as detailed in Section 6.2;
- Supplementary re-planting to offset trees that are removed from other parts of the site as detailed in Section 6.3; and
- Integrated weed management as detailed in Section 6.4.

## 6.2 Regeneration within the Public Recreation Land

The regeneration of the habitat should be undertaken by promoting natural ecological processes under an assisted natural regeneration regime with the aim being to accelerate, rather than replace, natural successional processes by removing or reducing barriers to natural forest regeneration such as soil degradation, competition with weedy species, and recurring disturbances (e.g., fire, grazing, and timber harvesting). For the purposes of assisted natural regeneration of the habitat within the proposed public recreation land the following measures should be adopted:

- Further unnecessary disturbance of the remnant plant communities within the proposed public recreation land should be avoided;
- Undertake appropriate weed control measures as per methods described in Section 6.4;
- Allow natural regeneration of plants within the regeneration area from all strata including groundcover, understorey and canopy;
- Install temporary or permanent fencing around the proposed drainage to control access during regeneration;
- No mulching is to be carried out within the proposed public recreation land regeneration area;
- Regeneration shall be ongoing in perpetuity; and
- Control weeds and landscape maintenance in perpetuity commencing after practical completion of the primary works.

## 6.3 Vegetation Removal and Replanting

To facilitate the construction of infrastructure and buildings associated with future subdivision and residential development of the land within the subject site it is likely that removal of trees will be necessary. It is noted that tree removal would only be necessary in the northern part of the site as no trees have been retained on the land within the site situated on the southern side of the proposed public recreation land (ephemeral stream).

In relation to the vegetation within the subject site for the purposes of future residential development it is recommended that the following measures should be adopted:

- Where possible Koala feed tree species should be retained;
- A 1:1 tree re-planting strategy should be applied for each tree that is removed (see below);
- Each replacement tree shall be of the same species as the tree it is replacing;
- The re-planting should be undertaken in the proposed public recreation land within the subject site;
- If there is insufficient land area within the proposed public recreation land to accommodate all of the re-planting some may also be provided as street trees within the subject site;
- Plantings should be placed irregularly within the proposed public recreation land to simulate a natural plant community;
- Removal of trees within the subject site should be undertaken selectively with preference given to retaining trees of good growth form, Koala feed tree species and trees with potential to form hollows.

Note: For the purposes of the tree replacement strategy, the definition of a tree is: A perennial plant having a trunk diameter at breast height (DBH) of not less than 100 mm where DBH is the measurement of the trunk at 1.3 m above ground level.

## 6.4 Weed Management

As discussed in Section 5 weed invasion has the potential to impact on the local environment. In addition, as detailed in Section 5.3 some invasive or environmental weeds are identified as Key Threatening Processes (KTPs). Weeds are widespread across the subject site and dominate the plant communities therein. In the long term an integrated weed management program could be implemented. This would involve a long term approach that incorporates several weed management techniques including:

- Physical control such as hand removal, mulching, tilling and mowing;
- Chemical control through the use of appropriate herbicides;
- Biological control where available; and
- Cultural control by encouraging the competitiveness of desired species that helps to supress weed growth by reducing access to available sunlight, nutrients and moisture.

# 7. Conclusion

This report has been prepared to assess the ecological impact of the proposed rezoning of land situated at the corner of Murray Road and Lambert Street Wingham.

The survey area encompasses the subject site located at Wingham, which is bounded by Mortimer Street to the north, Lambert Street to the east, Murray Road to the south and Richardson Street to the west. During the field survey two terrestrial plant communities were recorded within the survey area. These included a Spotted Gum - Grey Ironbark dry open forest community as described under the NSW Vegetation Information System (VIS) classification and a derived riparian community that could not be assigned a formal VIS classification due to the extent of modification and degradation of the plant community.

There are a number of potential impacts on biodiversity that are described in Section 5 of this report, which may occur as a consequence of the land within the subject site being rezoned. These include removal of vegetation associated with future development of the site, loss of habitat, interruption to ecosystem processes, and other impacts associated with increased human activities including changes in animal behaviour and artificial lighting. Proposed measures to mitigate the potential impacts are detailed in Section 6 of the report.

As previously discussed, the subject site is degraded and heavily infested with invasive weeds. Overall, it appears that there are no significant impediments to the proposed rezoning. In relation to further development of the subject site, it is considered that additional ecological investigation would not be warranted given the extent of the disturbance and modification to the habitats that exists. The mitigation measures proposed under Section 6 are aimed at providing an appropriate biodiversity offset that does not compromise the development potential of the subject site.

From the habitat assessment and database/literature review, it was considered that 8 threatened species as listed under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* could potentially utilise the habitat within the survey area.

The Section 5A Assessment appended to this report as Appendix C. concluded that the proposal has the potential to impact on some threatened species and populations. Generally however, the impacts can be mitigated by the measures outlined in Section 6 of this report.

# 8. References

Auld, B. A., Medd, R. W., 1992, *Weeds: An Illustrated Botanical Guide to the Weeds of Australia*, Reed International Books Australia, Port Melbourne, Australia

Bibby, C. J., Burgess, N. D., Hill, D. A., 1992, *Bird Census Techniques*, Academic Press, New York

Boland, D. J., Brooker, M. I. H., Chippendale, G. M., Hall, N., Hyland, B. P. M., Johnston, R. D., Kleinig, D. A., Turner, J. D., 1992, *Forest Trees of Australia*, CSIRO Publishing, Collingwood, Victoria, Australia

Cogger, H. G., 1986, *Reptiles and Amphibians of Australia*, Reed Books Pty Ltd, Sydney, Australia

Costermans, L., 2008, *Native Trees and Shrubs of South-Eastern Australia*, New Holland Publishers, Australia

Cropper, S. C., 1993, *Management of Endangered Plants*, CSIRO Publishing, Collingwood, Victoria, Australia

Department of Environment and Climate Change, 2008, *Recovery Plan for the Koala (Phascolarctos cinereus*)

Department of Sustainability, Environment, Water, Population and Communication, 2012, Census of Australian Vertebrates, from;

Department of Sustainability, Environment, Water, Population and Communities, 2012, EPBC Act Protected Matters report, retrieved 27.11.2013, from; http://www.environment.gov.au/epbc/pmst/index.html

Department of Sustainability, Environment, Water, Population and Communities, 2012, *Interim Koala Referral Advice for Proponents*

Gleeson, J., and Gleeson, D., 2012, *Reducing the Impacts of Development On Wildlife*, CSIRO Publishing, Collingwood Victoria, Australia

Floyd, A. G., 2008, *Rainforest Trees of Mainland South-eastern Australia*, Terania Rainforest Publishing, Australia

Greig, D., 1999, *Field Guide to Australian Wildflowers*, New Holland Publishers, Chatswood, Australia

Harden, G. J., McDonald, W. J. F., Williams, J. B., 2007, *Rainforest Climbing Plants: A Field Guide to Their Identification*, Gwen Harden Publishing, Nambucca Heads, Australia

Harden, G. J., McDonald, W. J. F., Williams, J. B., 2006, *Rainforest Trees and Shrub: A Field Guide to their Identification*, Gwen Harden Publishing, Nambucca Heads, Australia

Harden, G. J., Ed, 2000 (revised), *Flora of New South Wales*, University Press, Sydney, Australia

Klaphake, V., 2004, *Key to the Commoner Species of Sedges and Rushes of Sydney and the Blue Mountains*, Byabarra, NSW, Australia

Keith, D., 2004, *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT*, Department of Environment and Conservation, Hurstville, NSW Australia

Lamp, C. A., Forbes, S. J., Cade, J. W., 2001, *Grasses of Temperate Australia A Field Guide*, Bloomings Books, Melbourne, Australia

Lunney, D., Matthews, A., Moon, C., Ferrier, S., 2000, Incorporating habitat mapping into practical koala conservation on private land, *Conservation Biology* 14(3), pp. 669-680

Mackowski, C. M., 1984, The ontogeny of hollows in Blackbutt, *Eucalyptus pilularis* and its relevance to the management of forests for possums, gliders and timber, in *Possums and Gliders*, Eds. Smith, A. P., Hume, I. D., pp. 517-525, Surrey, Beatty and Sons, Sydney

Mallet, K., Orchard, A. E., Eds., 2002, *Flora of Australia Volume 43 Poaceae 1 Introduction and Atlas*, CSIRO Publishing, Collingwood, Australia

Mallet, K., Ed. 2005, *Flora of Australia Volume 44B Poaceae 3*, CSIRO Publishing, Collingwood, Australia

Menkhorst, P., Knight, F., 2004, *A Field Guide to the Mammals of Australia*, Oxford University Press, Melbourne, Australia

National Parks and Wildlife Service, 2003, *The Bioregions of New South Wales Their biodiversity, conservation and history*, National Parks and Wildlife Service (NSW), Hurstville

National Parks and Wildlife Service, 2009, Atlas of NSW Wildlife, retrieved 27.11.2013 from; http://www.bionet.nsw.gov.au

NSW Rural Fire Service, 2006, *Planning for Bushfire Protection 2006*, NSW Rural Fire Service and Department of Planning, Sydney, Australia

Office of Environment and Heritage, 2012, Threatened Species Search Site, retrieved 27.11.2013, from; http://www. environment.nsw.gov.au/threatened species/

Phillips, S., and Callaghan, J., 2011, The Spot Assessment Technique: a tool for determining localised levels of habitat use by koalas *(Phascolarctos cinereus)*, *Australian Zoologist 35*, pp. 774–780.

Richardson, F. J., Richardson, R. G., Shepherd, R. C. H., 2007, *Weeds of the South-East: An Identification Guide for Australia*, Second Edition, R. G. and F. J. Richardson, Victoria, Australia

Robinson, M., 1998, *A Field Guide to Frogs of Australia*, New Holland Publishers, Australia

Rose, H., Rose, C., 2012, *Grasses of coastal NSW*, NSW Department of Primary Industries, Sydney

Royal Botanic Gardens, 2012, PlantNet – FloraOnline Spatial Search, retrieved 27.11.2013, from; http://plantnet.rbgsyd.nsw.gov.au/search/spatial.htm Sydney, NSW, Australia

Schodde, R., Tideman, S. C., 1993, *Complete Book of Australian Birds*, Readers Digest Australia Ltd, Surrey Hills, NSW, Australia

Scott, D., 2003, *Key Habitats and Corridors for Forest Fauna; A landscape Framework for conservation in north-east New South Wales, Occasional Paper No. 32*, NSW National Parks and Wildlife Service, Hurstville

Slater, P., Slater, P., Slater, R., 2003, *The Slater Field Guide to Australian Birds*, New Holland Publishers, Australia

Smith, A. P., Andrews, S., 1997, *Koala Habitat, Abundance and Distribution in the Pine Creek Study Area. A report to State Forests NSW*, Austeco, Environmental Consultants, Armidale

Strahan, R., Ed, 1998, *The Mammals of Australia*, New Holland Publishers, Sydney, Australia

Swan, G., Shea, G., Sadlier, R., 2004, *A Field Guide to Reptiles of New South Wales*

Triggs, B., 1996, *Tracks, Scats and Other Signs- A Field Guide to Australian Mammals*, Oxford University Press, Melbourne, Australia

Watson, D. M., 2003, The ‘standardised search’: An improved way to conduct bird Surveys, *Austral Ecology 28*, pp. 515-525

White, N. A., 1999, Ecology of the koala (*Phascolarctos cinereus*) in rural south-east Queensland, Australia, *Wildlife Research* 26, pp. 731-744

Wilson, A., Ed., 2009, *Flora of Australia Volume 44A Poaceae 2*, CSIRO Publishing, Collingwood, Australia Wilson, S. K., Swan, G., 2005, *A Complete Guide to Reptiles of Australia*, Reed New Holland, Sydney, Australia

Woodgate, P. W., Ritman, K., Coram, J., Brady, A., Rule, A., Banks, J., 1994, A Study of Old-growth Forests of East Gippsland, Conservation and Natural Resources Department, Melbourne

Wormington, K., Lamb, D., 1999, Tree hollow development in wet and dry Sclerophyll eucalypt forest in south-east Qld, Australia, *Australian Forestry 62*, pp. 336-345

# 9. Appendix A: Flora Species List

The species of flora recorded within the survey area during the field survey are detailed in Table A.1 below.

| Family | Scientific Name | Common Name |
|---|---|---|
| Apiaceae | *Centella asiatica* | Indian Pennywort |
| Apocynaceae | *Gomphocarpus fruticosus** | Narrow Leaf Cotton Bush* |
| Araceae | *Alocasia sp.** | Elephant Ear* |
| Araliaceae | *Schefflera actinophylla** | Umbrella Tree* |
| Asparagaceae | *Asparagus aethiopicus** | Asparagus Fern* |
| Asteraceae | *Ageratina adenophora** | Crofton Weed* |
| | *Bidens pilosa** | Cobbler's Pegs* |
| | *Senecio madagascariensis** | Fireweed* |
| | *Sonchus oleraceus** | Milk Thistle* |
| | *Taraxacum officinale** | Dandelion* |
| Bignoniaceae | *Jacaranda mimosifolia** | Jacaranda* |
| Centianaceae | *Centaurium erythraea** | Common Centaury* |
| Commelinaceae | *Commelina cyanea* | Native Wandering Jew |
| | *Pollia crispata* | Pollia |
| | *Tradescantia fluminensis** | Wandering Jew* |
| Crassulaceae | *Bryophyllum delagoense** | Mother-of-Millions* |
| Cyperaceae | *Baumea teretifolia* | |
| | *Carex longebrachiata* | |
| | *Cyperus eragrastis** | Umbrella Sedge* |
| Davalliaceae | *Nephrolepis cordifolia** | Fishbone Fern* |
| Dennstaedtiaceae | *Pteridium esculentum* | Common Bracken |
| Dicksoniaceae | *Calochlaena dubia* | Rainbow Fern |
| Dilleniaceae | *Hibbertia dentata* | Trailing Guinea Flower |
| Fabaceae (Caesalpinioideae) | *Senna pendula* var. *glabrata** | Easter Cassia* |
| | *Senna septemtrionalis** | Arsenic Bush* |
| Fabaceae (Faboideae) | *Trifolium pratense** | Red Clover* |
| Fabaceae (Mimosoideae) | *Acacia implexa* | Hickory Wattle |
| Lauraceae | *Cinnamomum camphora** | Camphor Laurel* |
| Lobeliaceae | *Pratia purpurascens* | Whiteroot |
| Lomandraceae | *Lomandra longifolia* | Spiny-headed Mat-rush |
| Myrtaceae | *Corymbia maculata* | Spotted Gum |
| | *Eucalyptus acmenoides* | White Mahogany |
| | *Eucalyptus moluccana* | Grey Box |
| | *Eucalyptus siderophloia* | Grey Ironbark |
| | *Eucalyptus tereticornis* | Forest Red Gum |
| | *Eucalyptus torelliana** | Cadaga* |

| | | |
|---|---|---|
| | *Melaleuca linariifolia* | Flax-leaved Paperbark |
| Ochnaceae | *Ochna serrulata** | Micky Mouse Plant* |
| Oleaceae | *Ligustrum sinense** | Small-leaf Privet* |
| Phormiaceae | *Dianella caerulea* var. *caerulea* | Blue Flax Lily |
| Phyllanthaceae | *Breynia oblongifolia* | Coffee Bush |
| Pittosporaceae | *Pittosporum undulatum* | Sweet Pittosporum |
| Plantaginaceae | *Plantago lanceolata** | Lamb's Tongue* |
| Poaceae | *Andropogon virginicus** | Whisky Grass* |
| | *Avena fatua** | Wild Oats* |
| | *Briza maxima** | Quaking Grass* |
| | *Chloris gayana** | Rhodes Grass* |
| | *Cynodon dactylon* | Common Couch |
| | *Echinopogon ovatus* | Forest Hedgehog Grass |
| | *Eragrostis brownii* | Brown's Lovegrass |
| | *Festuca pratensis** | Meadow Fescue* |
| | *Imperata cylindrica* | Blady Grass |
| | *Microlaena stipoides* var. *stipoides* | Weeping Grass |
| | *Paspalum mandiocanum** | Broadleaf Paspalum* |
| | *Paspalum urvillei** | Vasey Grass* |
| | *Setaria sphacelota** | South African Pigeon Grass* |
| | *Sporobolus africanus** | Parramatta Grass* |
| | *Themeda australis* | Kangaroo Grass |
| | *Vulpia bromoides** | Squirreltail Fescue* |
| Polygonaceae | *Rumex crispus** | Curled Dock* |
| Primulaceae | *Lysimachia arvensis** | Pimpernel* |
| Proteaceae | *Grevillea robusta* | Silky Oak |
| | *Hakea salicifolia* subsp. *salicifolia* | Willow-leaved Hakea |
| Pteridaceae | *Cheilanthes sieberi* subsp. *sieberi* | Poison Rock Fern |
| Ranunculaceae | *Ranunculus plebeius* | Forest Buttercup |
| Solanaceae | *Lycium ferocissimum** | African Boxthorn* |
| | *Solanum mauritianum** | Tobacco Bush* |
| | *Solanum nigrum** | Black-berry Nightshade* |
| Thymelaeaceae | *Pimelea linifolia* subsp. *Linifolia* | Slender Rice-flower |
| Typhacea | *Typha domingensis* | Narrow-leaved Cumbungi |
| Verbenaceae | *Lantana camara** | Lantana* |
| | *Verbena incompta** | Purpletop* |

**Table A.1: Flora species recorded within the survey area**

* Indicates an introduced species

# 10. Appendix B: Fauna Species List

The species of fauna recorded within the survey area during the field survey are detailed in Table D.1 below.

| Family | Scientific Name | Common Name |
|---|---|---|
| **Reptilia** | | |
| Scincidae | *Lampropholis delicate* | Garden Skink |
| **Aves** | | |
| Acanthizidae | *Acanthiza pusilla* | Brown Thornbill |
| Campephagidae | *Coracina novaehollandiae* | Black-faced Cuckoo-shrike |
| Corvidae | *Corvus orru* | Torresian Crow |
| Cracticidae | *Cracticus tibicen* | Australian Magpie |
| Dicaeidae | *Dicaeum hirundinaceum* | Mistletoebird |
| Halcyonidae | *Dacelo novaeguneae* | Laughing Kookaburra |
| Maluridae | *Malurus cyaneus* | Superb Fairy Wren |
| Meliphagidae | *Lichenostomus chrysops* | Yellow-faced Honeyeater |
| | *Philemon corniculatus* | Noisy Friarbird |
| Pachycephalidae | *Colluricincla harmonica* | Grey Shrike-thrush |
| Pardalotidae | *Pardalotus punctatus* | Spotted Pardalote |
| | *Pardalotus striatus* | Striated Pardalote |
| Psittacidae | *Trichoglossus haematodus* | Rainbow Lorikeet |
| Rhipiduridae | *Rhipidura fuliginosa* | Grey Fantail |
| **Mammalia** | | |
| Peramelidae | *Isoodon/Perameles sp.* | Unidentified Bandicoot |

**Table D.1: Fauna species recorded during the field survey**

# 11. Appendix C: Assessments of Significance

The BioNet Atlas of NSW Wildlife database search returned one threatened species of flora and 10 threatened species of fauna recorded in a 10 km x 10 km search area around the subject site. With the exception of one record of the Koala all records were situated outside the urban areas.

The EPBC Act Protected Matters Report indicated that a total of 45 threatened species or species habitat may occur in the area with a 10 km buffer. However, 27 of these threatened species were disregarded immediately on the basis that they are aquatic or marine species whose habitat is not present within the subject site or adjacent land.

The following Assessment of Significance (Seven-Part Test) relies on the ecological assessment provided in Section 4 and 5 of this report. Based on the plant community and habitat assessment, it is considered that the land within the survey area constitutes potential habitat for one threatened species of flora, one threatened species of bird and 3 threatened species of mammal recorded in the BioNet Atlas of NSW Wildlife database and 3 threatened species of flora, one threatened bird species and 4 threatened species of mammal listed on the EPBC Act Protected Matters Report as detailed in Table C.1.

| Family | Scientific Name | Common Name | NSW | Nat |
|---|---|---|---|---|
| **PLANTAE** | | | | |
| Myrtaceae | *Eucalyptus glaucina* | Slaty Red Gum | | V |
| Orchidaceae | *Diuris flavescens* | Pale Yellow Doubletail | E4 | |
| Rubiaceae | *Asperula asthenes* | Trailing Woodruff | | V |
| **AVES** | | | | |
| Cacatuidae | *Lathamus discolor* | Swift Parrot | E1 | E |
| **MAMMALIA** | | | | |
| Dasyuridae | *Dasyurus maculatus* | Spotted-tailed Quoll | V | E |
| Phascolarctidae | *Phascolarctos cinereus* | Koala | V | V* |
| Pteropodidae | *Pteropus polioephalus* | Grey-headed Flying-fox | V | |
| Vespertilionidae | *Chalinolobus dwyeri* | Large-eared Pied Bat | | V |

**Table E.1: Subject species for Section 5A Assessment (see key below for listings)**

## Key to Threatened Species Listings – Table E.1

NSW: TSC Act Listing
Nat: EPBC Act Listing
V: Vulnerable
E: Endangered,
E1: Endangered (Schedule 1 TSC Act),
E2: Endangered (Schedule 2 TSC Act)
E4 Critically endangered (Schedule 1A TSC Act)
V*: Nationally listed Koala species is the Koala populations in Queensland, NSW and the ACT

# Assessment of Significance

***a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable population of the species is likely to be placed at risk of extinction:***

# Plantae

**Slaty Red Gum (*Eucalyptus glaucina*)**

Slaty red Gum is a medium-sized tree to 30 m tall. The bark is smooth and mottled white to slaty grey. Adult leaves are disjunct, lanceolate, 12–18 cm long, 2–3 cm wide, green or grey- green, dull and concolorous, juvenile leaves are elliptic and blue-green with a whitish bloom. The buds are fusiform, glaucous, 8-15 mm long, 5-6 mm diameter, with a scar is present. The calyptra is conical or elongate acute, and longer than and as wide as the hypanthium. The flowers are white, or occasionally pink. Flowering occurs between August and December. The fruit is globose or ovoid, 3-5-locular, 7-10 mm long, 7-10 mm in diameter, the disc is raised and the valves are exerted.

The species is found only on the north coast of NSW and in separate locations. One location occurs near Casino where the species can be locally common. The other location is farther south from Taree to Broke, west of Maitland. Slaty Red Gum grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.

Slaty Red Gum is listed as vulnerable nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. The habitat within the subject site may be suitable for this species. However, there are no records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area. Nor was the species recorded during the field survey undertaken for this ecological assessment. On this basis it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

**Pale Yellow Doubletail (*Diuris flavescens*)**

The Pale Yellow Doubletail is a terrestrial (ground) orchid belonging to the Doubletail, or Donkey Orchid, group. It is a small herb with two linear, conduplicate leaves to 17 cm long arising at the base. In spring the plant produces a 20 cm flowering stem with up to six flowers, which are yellow with dark brown markings on the dorsal sepal and labellum. The flowers have the typical yellow ‘donkey ear’ sepals bent back at the top, and narrow, darker sepals crossed below the flower to form the “doubletail”. An upper sepal projects over the flower like a veranda and has two brown markings, while the lower tongue-like petal has a slight ridged fold down its centre. The Pale Yellow Doubletail Pale flowers from September to October.

The species is known only from the Wingham-Tinonee area where it grows in grassy tall eucalypt forest with Kangaroo Grass and Blady Grass on brown clay soil.

The Pale Yellow Doubletail is listed as critically endangered in NSW under the *Threatened Species Conservation Act 1995*. There are 5 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area. All of these records are located off the Tinonee Road approximately 6 km to the southwest of the subject site. The species was not recorded during the field survey undertaken for this ecological assessment. However, as the Pale Yellow Doubletail was not flowering at that time it is unlikely that the species would have been readily detected.

Parts of the habitat within the subject site, particularly those areas in the vicinity of the proposed public recreation land that have not been subjected to an ongoing slashing regime may be suitable for this species. As this area lies within the proposed public recreation land and is to be retained as in situ habitat it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

### Trailing Woodruff (*Asperula asthenes*)

Trailing Woodruff is a decumbent perennial herb with linear, oblanceolate or narrow-elliptic leaves arranged in whorls of four around a weak stem often trailing to 30 cm long. Small white fragrant flowers arranged in terminal cymes on slender peduncles are produced in spring followed by small two-lobed fruit. The species is readily identifiable all year round despite flowering occurring only in spring.

The species is restricted to NSW where it is rare and is found in scattered locations from Bulahdelah in the south to Taree in the north, with several records from the Great Lakes area. It grows in damp sites, often along river banks.

Trailing Woodruff is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are no records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area. Nor was the species recorded during the field survey undertaken for this ecological assessment.

The moist areas of the habitat adjacent to the ephemeral stream within the subject site may be suitable for this species. As this area lies within the proposed public recreation land and is to be retained as in situ habitat it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

## Aves

### Swift Parrot (*Lathamus discolor*)

The Swift Parrot is a small parrot about 25 cm long. It is bright green with red around the bill and forehead, red with a yellow edge on the throat, a blue crown and bright red patches under the wing. The species most distinguishing feature however, is its dark red, long thin tail. The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter to south-eastern Australia. In NSW it mainly occurs on the coast and south west slopes.

On the mainland the Swift Parrot inhabits areas where eucalypts are flowering profusely or where there are abundant lerp infestations. The favoured feed trees are winter flowering species including local species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum) and *C. gummifera* (Red Bloodwood). Commonly favoured lerp infested tree species include *E. pilularis* (Blackbutt).

The Swift Parrot is listed as endangered in NSW under the *Threatened Species Conservation Act 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are two records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

There is foraging habitat available to this species that contains *Corymbia maculata* (Spotted Gum); a favoured food tree in the canopy of the subject site, some which would be available in perpetuity within the proposed public recreation land. However, outside of the proposed public recreation land much of the native vegetation including trees from the canopy has been remo0ved. On this basis it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

## Mammalia

**Spotted-tailed Quoll (*Dasyurus maculatus)***

The Spotted-tailed Quoll is the largest marsupial carnivore on the Australian mainland. Males are 38-76 cm long with a tail length up to 55 cm, while females are 35-45 cm long with a tail measuring up to 42 cm. The species is a rich rufous brown to dark brown above, with white spots of varying size and pale below.

The Spotted-tailed Quoll is recorded from a wide range of habitats, including rainforest, open forest, woodland, coastal heath and inland riparian forest. It occurs from the coast to the snowline and inland to the western plains. The species usually nocturnal and is an efficient predator taking prey ranging from small wallabies to insects. Den sites include hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. The species was formerly widespread on either side of the Great Dividing Range, but its distribution is disjunct over much of its former range. Loss of habitat through land clearing, poisoning and trapping is implicated in its decline.

The Spotted-tailed Quoll is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and as endangered nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are 6 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

This species forages across a wide range of habitats but requires suitable habitat features such as hollow-bearing trees, fallen logs, small caves and crevices for den sites. As these types of habitat features are not present within the subject site it is

unlikely that the species could utilise the habitat for breeding. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

**Koala (*Phascolarctos cinereus*)**

The Koala is an arboreal marsupial that feeds almost exclusively on the foliage of specific Eucalypts. The species has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW, the species mainly occurs on the central and north coast areas. The Koala inhabitants eucalypt woodland and forest and are known to feed on the foliage of 70 eucalypt and 30 non-eucalypt species, but typically select preferred browse species, which varies from one area to another. The species is inactive during the day, foraging and feeding by night and occupies a variable home range from less than two hectares up to several hundred hectares in size.

The Koala is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and the Koala (Combined populations of Queensland, New South Wales and the Australian Capital Territory) is listed as a vulnerable species nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are 32 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

As discussed in Section 4.5 the subject site satisfies the criteria as potential habitat under SEPP 44 but does not meet all the criteria as critical habitat for the purposes of the EPBC Act. As it is intended to retain Koala food trees wherever possible and mitigate any removal of food trees by compensatory planting it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

**Grey-headed Flying-fox (*Pteropus poliocephalus*)**

The Grey-headed Flying-fox is the largest Australian bat species and is found within 200km of the eastern coast of Australia from Bundaberg in Queensland to Melbourne, Victoria. The species occurs in subtropical and temperate rainforest, tall sclerophyll forest and woodland and individuals travel up to 50km to feed on the nectar and pollen of native trees, particularly eucalypts, Melaleuca spp. and Banksia spp. and the fruits of rainforest trees and vines.

The Grey-headed Flying-fox is listed as endangered in NSW under the *Threatened Species Conservation Act 1995* and as vulnerable nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are 496 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

This species could potentially utilise the habitat within the subject site for foraging purposes. However, the habitat within the site is generally unsuitable for roosting. Consequently, it is unlikely that the species would utilise the habitat within the survey area for roosting or breeding. Therefore, it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

**Large-eared Pied Bat (*Chalinolobus dwyeri*)**

The Large-eared Pied Bat is known from scattered locations from near Rockhampton in central Queensland to Bungonia in southern NSW. It is found in a range of habitats, including dry sclerophyll forest and woodland to the east and west of the Great Dividing Range. Isolated records from subalpine woodland above 1500 metres and at the edge of rainforest and moist eucalypt forest, suggest it may tolerate a greater range of habitats than has so far been recorded. The species daytime roosts include caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins. The combination of a relatively short, broad wing and low weight per unit area of wing is indicative of manoeuvrable flight, suggesting it probably forages for small flying insects below the forest canopy.

The Large-eared Pied Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act 1999*.

This species forages across a wide range of habitats but requires caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins for roosting. As these types of habitat features are not present in the study site it is unlikely that the species could utilise the habitat for nesting or shelter. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

***b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable population of the species is likely to be placed at risk of extinction:***

**The Koala (Combined populations of Queensland, New South Wales and the Australian Capital Territory)**

This population has been listed as vulnerable under the EPBC Act as it has undergone a substantial decline over three generations due to a combination of a number of factors including loss and fragmentation of habitat, vehicle strike, disease and predation by dogs.

For the purposes of the *Interim Koala Referral Advice for Proponents* (Department of Sustainability, Environment, Water, Populations and Communities, June 2012) habitat critical to the survival of the Koala is currently considered to be areas of forest or woodland with the following attributes:

- Primary Koala food tree species comprise at least 30% of the over-storey trees;
- Primary Koala food tree species comprise less than 30% of the over-storey trees, but together with secondary food tree species comprise at least 50% of the over-storey trees;
- Primary food tree species are absent but secondary food tree species alone comprise at least 50% of the over-storey trees;

- The above qualities may be absent in a forest or woodland but other essential habitat features are present and adjacent to areas exhibiting the above qualities; or
- A relatively high density of koalas is supported, regardless of the presence of food tree species. Koala population densities vary across their range and regional data should be used to judge relative density.

NB: For the purposes of the *Interim Koala Referral Advice for Proponents*, Koala food trees are those listed in Appendix 2 of the *Recovery Plan for the Koala (Phascolarctos cinereus*) produced by the NSW Department of Environment and Climate Change, 2008.

The eucalypt species; *Eucalyptus tereticornis* (Forest Red Gum) is listed as a primary food tree species and was recorded within the survey area. Consequently, the habitat within the subject site satisfied the criteria as critical habitat with respect to food resources. However, the habitat did not satisfy the criteria for critical habitat on several points including:

- An absence of permanent water;
- The presence of dogs in the immediate vicinity of the site;
- A highly modified habitat in which the canopy has been reduced and the understorey has largely been removed;
- The surrounding landscape consists of extensive areas of urban development and cleared agricultural land; and
- No linkage to areas of suitable habitat

On this basis the action proposed is unlikely to have an adverse effect on the life cycle of this species (that constitutes an endangered population) such that a viable population of the species is likely to be placed at risk of extinction

***c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; and***

No endangered ecological community was recorded within the subject site during the field survey.

***(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

No endangered ecological community was recorded within the subject site during the field survey.

***d) In relation to the habitat of a threatened species, population or ecological community:***

***(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;***

The habitat within the survey area has been significantly disturbed in the past with part of the assemblage of species within the canopy removed; almost all of the understory removed and the groundcover modified through vegetation management activities. The action proposed may result in removal of some trees from the canopy to facilitate future development. Therefore, in view of the existing modification and disturbance of the habitat the habitat to be removed or modified as a result of the proposed action is not considered to be significant with respect to a threatened species, population or ecological community.

***(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;***

It is considered that the proposed action is unlikely to fragment habitat areas or isolate habitat areas from other areas of habitat.

***(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;***

The habitat within the survey area has been significantly disturbed in the past. However, it does contain some Koala feed trees. It is intended that any Koala feed tree that is removed in the future will be offset by compensatory plantings at a ratio of 4:1. Any non-Koala feed tree removed will be offset by compensatory plantings at a ratio of 1:1 as detailed in Section 6.3 of this report. Therefore, the habitat within the subject site proposed to be removed and/or modified is not considered to be significant to the long-term survival of the aforementioned threatened species.

***e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly):***

Critical habitat was not recorded within the subject site. Therefore, the action proposed is unlikely to have an adverse effect on critical habitat (either directly or indirectly).

***f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan:***

There is no recovery plan or threat abatement plan relevant to the proposed action or the subject site.

***g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process:***

Key threatening processes (KTPs) are listed in Schedule 3 of the TSC Act. Those considered to be applicable to future development of the subject site once it has been rezoned are:

*Clearing of Native Vegetation*

The reduction of native vegetation within the subject site associated with the development of the land could be viewed as contributing to the overall incremental decline of native vegetation within the region. However, the plant communities within the subject site have previously been significantly modified. It is intended to regenerate/revegetate the land within the proposed public recreation land, which will be a considerable improvement on the current situation.. Therefore, it is considered that the proposed action does not contribute significantly to this KTP.

*Anthropogenic Climate Change*

The use of machinery and power tools during any future earthworks or construction activities will contribute to anthropogenic climate change through release of stored carbon from vegetation and greenhouse gas emissions associated with use of fossil fuels. However, the overall impact of the action is considered negligible in the context of other human activities in the region.

*Invasion of native plant communities by exotic perennial grasses*

The subject site is already heavily infested with invasive weeds. The proposed action is likely to improve the situation through the mitigation measures described in Section 6 of this report.

*Invasion, Establishment and Spread of Lantana (Lantana camara)*

The field survey revealed that Lantana is established and is widespread within the subject site. The proposed action in itself is unlikely to significantly contribute to this KTP. Furthermore, measures are recommended in Section 6 of this report to mitigate this KTP.

APPENDIX H – Gateway Determination (18 September 2014)

Mr Ron Posselt
A/General Manager
Greater Taree City Council
PO Box 482
TAREE NSW 2430

Our ref: PP_2014_GTARE_002_00 (14/13833)
Your ref: 671/2010/PP

Att: Michael Griffith

Dear Mr Posselt,

**Planning Proposal to amend Greater Taree Local Environmental Plan 2010**

I write in response to your Council's letter dated 7 August requesting a Gateway determination under section 56 of the Environmental Planning and Assessment Act 1979 ("EP&A Act") in respect of the planning proposal to rezone, from RU1 Primary Production and B1 Neighbourhood Centre to R1 General Residential, various lots at Murray Road, Richardson, Mortimer, and Lambert Streets, Wingham

As delegate of the Minister for Planning, I have now determined that the planning proposal should proceed subject to the conditions in the attached Gateway determination.

I have also agreed the planning proposal's inconsistencies with S117 Directions 1.1 Business and Industrial Zones, 1.2 Rural Zones and 1.5 Rural Lands are of minor significance. No further approval is required in relation to these Directions.

Council may still need to obtain the department's approval to comply with the requirements of relevant S117 Directions. Council should ensure this occurs prior to the plan being made.

The Minister delegated plan making powers to councils in October 2012. It is noted that Council has requested to be issued with delegation for this planning proposal. I have considered the nature of Council's planning proposal and have decided to issue an authorisation for Council to exercise delegation to make this plan.

The amending Local Environmental Plan (LEP) is to be finalised within 12 months of the week following the date of the Gateway determination. As it has been determined this is a minor amendment, Council is to request Parliamentary Counsel's Office commence drafting the instrument as soon as possible. A copy of the request should be forwarded to the Department for administrative purposes.

The State Government is committed to reducing the time taken to complete LEPs by tailoring the steps in the process to the complexity of the proposal, and by providing clear and publicly available justification for each plan at an early stage. In order to meet these commitments, the Minister may take action under section 54(2)(d) of the EP&A Act if the time frames outlined in this determination are not met.

Attached for your assistance is a simplified guide to the plan making process and reporting requirements to ensure that the LEP Tracking System is kept updated.

Should you have any questions regarding this matter, I have arranged for Ken Phelan from the Hunter office to assist you. Mr Phelan can be contacted on (02) 4904 2705.

Yours sincerely,

18 September 2014
**David Rowland**
**General Manager**
**Hunter and Central Coast Region**
**Housing, Growth and Economics**

# Gateway Determination

***Planning Proposal (Department Ref: PP_2014_GTARE_002_00)**: to rezone, from RU1 Primary Production and B1 Neighbourhood Centre to R1 General Residential, various lots at Murray Road, Richardson, Mortimer, and Lambert Streets, Wingham*

I, the General Manager, Hunter and Central Coast Region at the Department of Planning and Environment as delegate of the Minister for Planning, have determined under section 56(2) of the EP&A Act that an amendment to the Greater Taree Local Environmental Plan (LEP) 2010 to purpose of planning proposal should proceed subject to the following conditions:

1. Council is to update the Planning Proposal, prior to exhibition, to reflect the proposal adopted by Council. As part of this Council should update the environmental assessment to identify how the issues raised will be addressed through the residential zoning.

2. Community consultation is required under sections 56(2)(c) and 57 of the Environmental Planning and Assessment Act 1979 ("EP&A Act") as follows:

   (a) the planning proposal is classified as low impact as described in *A Guide to Preparing LEPs (Planning & Infrastructure 2013)* and must be made publicly available for a minimum of **14 days**; and
   (b) the relevant planning authority must comply with the notice requirements for public exhibition of planning proposals and the specifications for material that must be made publicly available along with planning proposals as identified in section 5.5.2 of *A Guide to Preparing LEPs ( Planning & Infrastructure 2013)*.

3. Consultation is required with the following public authorities under section 56(2)(d) of the EP&A Act and/or to comply with the requirements of relevant S117 Directions:

   - The Purfleet-Taree Local Aboriginal Land Council
   - Office of Environment and Heritage (National Parks and Wildlife Service)

   Each public authority is to be provided with a copy of the planning proposal and any relevant supporting material, and given at least 21 days to comment on the proposal. Once the consultation is undertaken with the public authorities, and information is provided, Council is to update its consideration of S117 Directions.

4. A public hearing is not required to be held into the matter by any person or body under section 56(2)(e) of the EP&A Act. This does not discharge Council from any obligation it may otherwise have to conduct a public hearing (for example, in response to a submission or if reclassifying land).

5. The timeframe for completing the LEP is to be **12 months** from the week following the date of the Gateway determination.

Dated 18th day of September 2014.

**David Rowland**
**General Manager**
**Hunter and Central Coast Region**
**Housing, Growth and Economics**
**Department of Planning and Environment**
**Delegate of the Minister for Planning**

**WRITTEN AUTHORISATION TO EXERCISE DELEGATION**

Greater Taree Council is authorised to exercise the functions of the Minister for Planning under section 59 of the *Environmental Planning and Assessment Act 1979* that are delegated to it by instrument of delegation dated 14 October 2012, in relation to the following planning proposal:

| **Number** | **Name** |
|---|---|
| PP_2014_GTARE_002_00 | Planning proposal to rezone various Lots (7.97ha) from RU1 Primary Production and B1 Neighbourhood Centre to R1 General Residential at Lambert, Richardson and Mortimer Streets and Murray Road, Wingham |

In exercising the Minister's functions under section 59, the Council must comply with the Department's "*A guideline for the preparation of local environmental plans"* and "*A guide to preparing planning proposals*".

Dated 18 September 2014

**David Rowland**
**General Manager**
**Hunter and Central Coast Region**
**Housing, Growth and Economics**
**Department of Planning and Environment**