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4. Comparison of RBSLs and RTC

As an objective of these works was to establish whether the RBSLs were health protective, the RBSLs and RTC have been compared. This comparison is presented in the tables in this section of the report. Within the tables within this section, the lower of the RBSL/RTC has been bolded. Therefore where the RBSL has been bolded, it is protective in comparison to the RTC:

- If the RBSL and the RTC are equal, the RBSL is bolded.
- If the RTC is lower than the RBSL, the RTC is bolded ¹⁶.
- If the RBSL is lower than the RTC, the RBSL is bolded.

Where the RTC are greater than the RBSL or the RTC are equal to the RBSL, the values have been marked as final to illustrate that the RBSL is protective. Where the RTC are lower than the RBSL, further site specific modifications could be considered to establish whether the RTC is unnecessarily conservative and these have been marked as draft.

The RBSL should be used in all cases, except where the RTC is bolded. In this event, the relevant RTC should therefore be adopted.

These further site specific modifications have not been considered at the present stage. However, information provided herein could be used to inform such an evaluation.

4.1 Comparison of residential RBSLs and RTC (shallow soil)

The residential RBSLs and RTC for a shallow soil source are compared in Table 4.1 below.

Table 4.1 – Comparison of residential RBSLs and RTC for shallow soil

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Arsenic	6.40E+01	6.40E+01 a	6.40E+01 a	final
Chromium	1.30E+02	7.80E+01 a	7.80E+01 a	draft
Cadmium	2.60E+00	3.00E+00 b	3.00E+00 b	final
Mercury (inorganic)	1.00E+00	1.00E+00 b	1.00E+00 b	final
Nickel	5.00E+01	7.50E+01 b	7.50E+01 b	final
Selenium	3.00E+00	3.00E+00 b	3.00E+00 b	final
Lead	3.37E+02	3.37E+02 a	3.37E+02 a	final
Vanadium	4.16E+02	1.13E+02	1.15E+02	draft
Copper	4.78E+02	1.43E+02 a	1.43E+02 a	draft
Zinc	2.00E+02	4.78E+02 a	4.78E+02 a	final
Benzo(a)pyrene	9.00E-01	2.11E+00	2.42E+00	final
Benzene	1.20E-01	4.93E-02	1.92E-01	draft
Toluene	3.60E+01	8.69E+01	3.29E+02	final
Ethylbenzene	4.10E+01	3.82E+01	1.93E+02	draft
Xylene	3.20E+01	1.72E+01	1.31E+02	draft

¹⁶ In some cases there may be two RTC, where one RTC is higher and the other lower: one may be bolded and the other not and therefore they remain as draft.

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
TPH aromatic C7-C8	1.25E+02	8.69E+01	3.29E+02	draft
TPH aromatic C8-C10	9.40E+01	1.48E+01	1.03E+02	draft
TPH aromatic C10-C12	1.18E+02	5.73E+01	2.21E+02	draft
TPH aromatic C12-C16	1.31E+02	1.42E+02	4.14E+02	final
TPH aliphatic C6-C8	8.34E+03	6.98E+01	1.69E+04 *	draft
TPH aliphatic C8-C10	1.12E+02	9.76E+00	8.71E+01	draft
TPH aliphatic C10-C12	3.20E+03	1.78E+03 *	4.18E+03 *	draft
TPH aliphatic C12-C16	4.51E+03	5.10E+03 *	5.31E+03 *	final
TPH aromatic C16-C21	8.20E+01	2.72E+02	5.77E+02	final
TPH aromatic C21-C35	1.13E+03	8.88E+02	1.14E+03	draft
TPH aliphatic C16-C21	9.42E+04	1.45E+05	1.45E+05	final
TPH aliphatic C21-C35	9.48E+04			final
Total TPH (Phase 1)	1.72E+03	none (see note 9)		
Total TPH (Process Area)	2.60E+03			
Total TPH (North Tank Farm)	1.10E+03			
Total TPH (South Tank Farm)	1.02E+03			
1,2-Dichloroethane	4.00E-02	1.90E-03	1.02E-02	draft
1,1,1-Trichloroethane	1.54E+02	2.23E+00	1.73E+01	draft
Tetrachloroethene	1.10E+01	4.55E-01	3.62E+00	draft
Trichloroethene	1.00E+00	3.82E-02	3.04E-01	draft
Vinyl chloride	1.00E-02	2.02E-04	8.20E-04	draft
Dichloromethane	5.00E+00	4.58E-01	1.56E+00	draft
Cis-1,2-Dichloroethene	4.00E+00	3.93E-02	2.55E-01	draft
Trans-1,2 Dichloroethene		6.71E-02	4.64E-01	draft
Notes				
1. It is assumed that no visible free product is present within the top 1.0m of soil				
2. Metal RTC derived considering Soil Codes and background data a – based on background soil concentration b – based on Soil Code				
3. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation				
4. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
* 5. The RTC for TPH aliphatic C10-C12 and TPH aliphatic C12-C16 for 1% sand and TPH aliphatic C6-C8, TPH aliphatic C10-C12 and TPH aliphatic C12-C16 for 3% sandy loam are based on a value produced from following the approach outlined in SR4 for substances at saturation				
6. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 4 mg/kg				
7. 'Total' TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
8. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
9. No RTC was produced for total TPH as this will be considered further at validation stage				
10. Asbestos has not been considered here as it is being considered in a separate report				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

4.2 Comparison of residential RBSLs and RTC (deep soil)

The residential RBSLs and RTC for a deep soil source are compared in Table 4.2 below.

Table 4.2 – Comparison of residential RBSLs and RTC for deep soil (1m FFL)

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
Benzo(a)pyrene	none	>sat	>sat	final
Benzene	4.00E-01	4.60E-01	9.87E-01	final
Toluene	5.20E+01	>sat	>sat	final
Ethylbenzene	1.40E+02	2.90E+02	8.12E+02	final
Xylene	5.80E+01	9.14E+01	2.56E+02	final
TPH aromatic C7-C8	1.46E+02	>sat	>sat	final
TPH aromatic C8-C10	2.57E+02	7.10E+01	2.09E+02	draft
TPH aromatic C10-C12	1.39E+03	>sat	>sat	final
TPH aromatic C12-C16	none	>sat	>sat	final
TPH aliphatic C6-C8	none	>sat	>sat	final
TPH aliphatic C8-C10	1.58E+02	4.25E+01	1.25E+02	draft
TPH aliphatic C10-C12	none	>sat	>sat	final
TPH aliphatic C12-C16	none	>sat	>sat	final
TPH aliphatic C16-C21	none	none (see note 3)		
TPH aliphatic C21-C35	none			
TPH aromatic C16-C21	none			
TPH aromatic C21-C35	none			
Total TPH (Phase 1)	9.18E+03	none (see note 9)		
Total TPH (Process Area)	4.10E+03			
Total TPH (North Tank Farm)	3.80E+03			
Total TPH (South Tank Farm)	2.79E+03			
1,2-Dichloroethane	1.00E-01	1.11E-02	1.76E-02	draft
1,1,1-Trichloroethane	1.60E+02	1.08E+01	2.59E+01	draft
Tetrachloroethene	3.40E+01	2.30E+00	6.12E+00	draft
Trichloroethene	2.00E+00	1.88E-01	4.63E-01	draft

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
Vinyl chloride	4.00E-02	9.30E-04	1.29E-03	draft
Dichloromethane	8.40E+01	4.19E+00	6.04E+00	draft
Cis-1,2-Dichloroethene	7.00E+00	2.06E-01	3.92E-01	draft
Trans-1,2 Dichloroethene		3.32E-01	6.89E-01	draft
Notes				
1. Where the lower of the vapour or aqueous saturation limits have been exceeded by the RTC calculated, the hazard quotient is considered to be less than 1 and as such >sat has been presented				
2. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation				
3. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered and therefore no RTC value has been presented here				
4. “none” indicates theoretical RBSL greater than solubility limit				
5. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 7 mg/kg				
6. ‘Total’ TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				
7. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
8. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
9. No RTC was produced for total TPH as this will be considered further at validation stage				
10. Asbestos has not been considered here as it is being considered in a separate report				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

4.3 Comparison of residential RBSLs and RTC (groundwater)

The residential RBSLs and RTC for a groundwater source are compared in Table 4.3 below.

Table 4.3 – Comparison of residential RBSLs and RTC for groundwater (1m FFL)

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
Benzo(a)pyrene	none	>sat	final
Benzene	7.00E-01	8.88E-02	draft
Toluene	4.70E+01	9.64E+01	final
Ethylbenzene	1.02E+02	1.34E+01	draft
Xylene	4.30E+01	4.10E+00	draft
TPH aromatic C7-C8	2.00E+01	9.64E+01	final
TPH aromatic C8-C10	2.20E+01	9.85E-01	draft
TPH aromatic C10-C12	none	3.87E+00	draft
TPH aromatic C12-C16	none	>sat	final
TPH aromatic C16-C21	none	none (see note 6)	final
TPH aromatic C21-C35	none		final
TPH aliphatic C6-C8	none	1.40E+00	draft

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
TPH aliphatic C8-C10	none	2.96E-02	draft
TPH aliphatic C10-C12	none	2.28E-02	draft
TPH aliphatic C12-C16	none	>sat	final
TPH aliphatic C16-C21	none	none (see note 6)	final
TPH aliphatic C21-C35	none		final
1,2-Dichloroethane	2.00E-01	3.73E-02	draft
1,1,1-Trichloroethane	1.93E+02	1.31E+01	draft
Tetrachloroethene	2.20E+01	1.66E+00	draft
Trichloroethene	2.60E+00	2.22E-01	draft
Vinyl chloride	6.00E-02	2.48E-03	draft
Dichloromethane	1.50E+02	1.30E+01	draft
Cis-1,2 Dichloroethene	1.50E+01	5.47E-01	draft
Trans-1,2 Dichloroethene	1.50E+01	6.75E-01	draft
Notes			
1. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation			
2. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins			
3. "none" indicates theoretical RBSL greater than solubility limit			
4. In the S106 (Ref. 1), only one value was presented for 1,2-Dichloroethene of 15 mg/l.			
5. Where indoor and outdoor values were presented by RBCA, these have been integrated in line with SNIFFER (2003). Where both indoor and outdoor values derived by RBCA were greater than the saturation limit, >sat has been presented. Where indoor values were presented by RBCA, and the outdoor values were >sat, only the indoor values have been presented. Therefore >sat indicates that the theoretical RTC is greater than solubility limit.			
6. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered			
7. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report			

4.4 Comparison of recreational RBSLs and parks RTC (shallow soil)

The residential RBSLs and RTC for a shallow soil source are compared in Table 4.4 below.

Table 4.4 – Comparison of recreational RBSLs and RTC for shallow soil

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Arsenic	6.40E+01	6.40E+01 a	6.40E+01 a	final
Chromium	2.00E+02	7.80E+01 a	7.80E+01 a	draft
Cadmium	2.60E+00	3.00E+00 b	3.00E+00 b	final
Mercury (inorganic)	1.00E+00	1.00E+00 b	1.00E+00 b	final
Nickel	7.50E+01	7.50E+01 b	7.50E+01 b	final

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Selenium	3.00E+00	3.00E+00 b	3.00E+00 b	final
Lead	3.37E+02	3.37E+02 a	3.37E+02 a	final
Vanadium	6.40E+02	3.51E+02	3.51E+02	draft
Copper	4.78E+02	1.43E+02 a	1.43E+02 a	draft
Zinc	2.00E+02	4.78E+02 a	4.78E+02 a	final
Benzo(a)pyrene	9.00E-01	2.14E+00	2.14E+00	final
Benzene	1.30E+01	2.62E+01	2.75E+01	final
Toluene	8.11E+03	2.16E+04 *	2.14E+04 *	final
Ethylbenzene	4.74E+03	9.67E+03 *	9.45E+03 *	final
Xylene	7.94E+03	1.72E+04 *	1.50E+04 *	final
TPH aromatic C7-C8	2.13E+04	2.16E+04	2.14E+04	final
TPH aromatic C8-C10	4.03E+03	2.23E+03	2.31E+03	draft
TPH aromatic C10-C12	4.59E+03	2.30E+03	2.34E+03	draft
TPH aromatic C12-C16	4.80E+03	2.33E+03	2.35E+03	draft
TPH aliphatic C6-C8	6.06E+05	2.94E+05 *	2.94E+05 *	draft
TPH aliphatic C8-C10	1.21E+04	5.88E+03 *	5.74E+03 *	draft
TPH aliphatic C10-C12	1.21E+04	5.70E+03	5.83E+03	draft
TPH aliphatic C12-C16	1.21E+04	5.80E+03	5.86E+03	draft
TPH aromatic C16-C21	3.64E+03	1.45E+03	1.45E+03	draft
TPH aromatic C21-C35	3.64E+03	1.45E+03	1.45E+03	draft
TPH aliphatic C16-C35	2.43E+05	1.59E+05	1.59E+05	draft
TPH aliphatic C21-C35	2.43E+05			draft
Total TPH (Phase 1)	9.06E+03	none (see note 10)		
Total TPH (Process Area)	1.08E+04			
Total TPH (North Tank Farm)	9.42E+03			
Total TPH (South Tank Farm)	6.35E+03			
1,2-Dichloroethane	4.50E+00	9.52E+00	1.07E+01	final
1,1,1-Trichloroethane	2.79E+04	5.80E+04 *	5.80E+04 *	final
Tetrachloroethene	6.41E+02	1.29E+03 *	1.29E+03 *	final
Trichloroethene	1.93E+02	3.79E+02	4.55E+02	final
Vinyl chloride	7.00E-01	1.29E+00	1.33E+00	final
Dichloromethane	2.41E+02	5.07E+02	5.12E+02	final
Cis-1,2-Dichloroethene	6.32E+02	3.92E+02	4.68E+02	draft
Trans-1,2 Dichloroethene	6.32E+02	1.11E+03	1.40E+03	final
Notes				
1. It is assumed that no visible free product is present within the top 1.0m of soil				

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
2. Metal RTC derived considering Soil Codes and background data a – based on background soil concentration b – based on Soil Code				
3. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation				
4. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
* 5. The RTC for toluene, ethylbenzene, xylene, TPH aliphatic C6-C8, TPH aliphatic C8-C10, 1,1,1-trichloroethane and tetrachloroethene are based on a value produced from following the approach outlined in SR4 for substances at saturation				
6. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered				
7. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 632 mg/kg				
8. 'Total' TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				
9. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
10. No RTC was produced for total TPH as this will be considered further at validation stage				
11. Asbestos has not been considered here as it is being considered in a separate report				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

4.5 Comparison of recreational RBSLs and parks RTC (deep soil)

The residential RBSLs and RTC for a deep soil source are compared in Table 4.5 below.

Table 4.5 – Comparison of recreational RBSLs and RTC for deep soil (1m FFL)

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Benzo(a)pyrene	none	>sat	>sat	final
Benzene	4.80E+01	4.32E+02	9.28E+02	final
Toluene	none	>sat	>sat	final
Ethylbenzene	none	>sat	>sat	final
Xylene	none	4.78E+02	1.33E+03	draft
TPH aromatic C7-C8	none	>sat	>sat	final
TPH aromatic C8-C10	none	>sat	>sat	final
TPH aromatic C10-C12	none	>sat	>sat	final
TPH aromatic C12-C16	none	>sat	>sat	final
TPH aliphatic C6-C8	none	>sat	>sat	final
TPH aliphatic C8-C10	none	>sat	>sat	final
TPH aliphatic C10-C12	none	>sat	>sat	final

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
TPH aliphatic C12-C16	none	>sat	>sat	final
TPH aromatic C16-C21	none	none (see note 4)		
TPH aromatic C21-C35	none			
TPH aliphatic C16-C21	none			
TPH aliphatic C21-C35	none			
Total TPH (Phase 1)	none	none (see note 8)		
Total TPH (Process Area)	none			
Total TPH (North Tank Farm)	none			
Total TPH (South Tank Farm)	none			
1,2-Dichloroethane	6.00E+00	1.04E+02	1.66E+02	final
1,1,1-Trichloroethane	none	>sat	>sat	final
Tetrachloroethene	1.78E+03	>sat	>sat	final
Trichloroethene	2.69E+02	>sat	>sat	final
Vinyl chloride	1.60E+01	8.21E+00	1.14E+01	draft
Dichloromethane	6.22E+03	>sat	>sat	final
Cis-1,2-Dichloroethene	8.81E+02	1.92E+03	3.66E+03	final
Trans-1,2 Dichloroethene		3.10E+03	6.42E+03	final
Notes				
1. Where the lower of the vapour or aqueous saturation limits has been exceeded by the RTC calculated, the hazard quotient is considered to be less than 1 and as such >sat has been presented				
2. Xylene - Users must consider total exposure from all xylene isomers and not consider them in isolation. It should be noted that the value presented is the lowest of the aqueous or vapour saturation limits. The lowest saturation limit of the three isomers has been presented.				
3. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
4. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered and therefore no value has been presented here				
5. “none” indicates theoretical RBSL greater than solubility limit				
6. ‘Total’ TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				
7. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
8. No RTC was produced for total TPH as this will be considered further at validation stage				
9. Asbestos has not been considered here as it is being considered in a separate report				
10. In the S106, only one value was presented for 1,2-dichloroethene of 881 mg/kg				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

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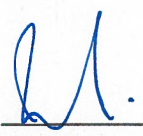
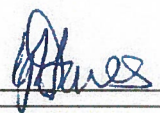
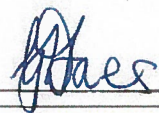
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Scope

This Redevelopment Remediation Works Completion Certificate (RRWCC) has been prepared with reference to the following agreements:

- Section 106 Agreement dated 8 February 2008 between Neath Port Talbot Borough Council (NPTCBC), St Modwen Developments Limited (SMD), St Modwen Properties Plc (SMP), BP Oil Llandarcy Refinery Limited (BPLR) and Coed Darcy Limited (CDL); and
- Remediation and Maintenance Agreement dated 23 May 2008 (RMA) between SMD, SMP and CDL.

Unless advised otherwise, definitions used in this RRWCC can be found in the Section 106 Agreement and/or the RMA.

This RRWCC has been prepared for Phase 32 in response to the receipt of a written request from SMD pursuant to clause 4.3 of the RMA. The phase boundary and intended use on which this RRWCC is based have been notified to the Monitor by letter, a copy of which is provided in **Appendix A**.

The intended use for Phase 32 has been declared as residential. The phase boundary is the land edged red on drawing 5041216-REM-DWG-1943, a copy of which is provided in **Appendix A**. The approximate location of Phase 32 in relation to the Development Boundary is shown in **Figure** below. Phase 32 covers an area of approximately 19,000m².

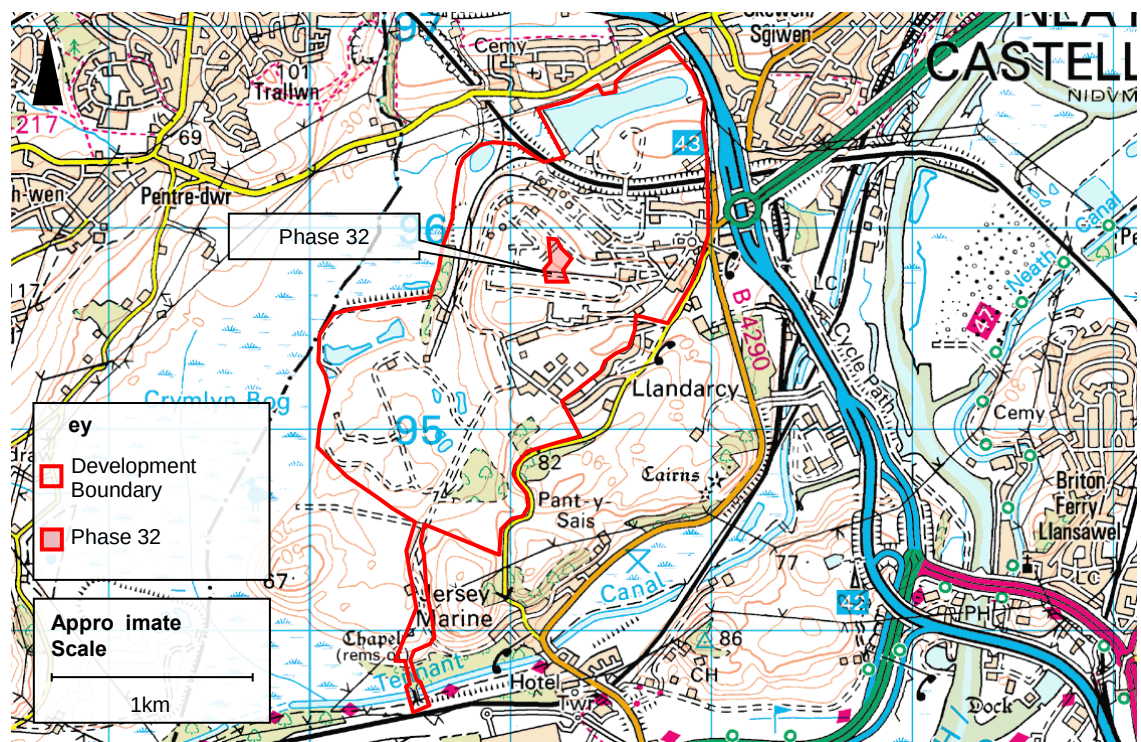


Figure Location plan

A development layout is yet to be confirmed for Phase 32, however an outline layout is shown on the current masterplan drawing reference 1332/400/MP/SK/TERT Revision H, a copy of which is provided in **Appendix A**. A more detailed layout drawing covering part of Phase 32

has been prepared by Roberts Limbrick Architects. A copy of this drawing, ref. 7389/SK007A, is also provided in **Appendi A**.

In accordance with the requirements of the Monitor's Deed of Appointment, this RRWCC shall:

- Describe the remedial action which in the Monitor's professional opinion has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 32; and
- Certify that in the Monitor's professional opinion the Redevelopment Remediation Works have been satisfactorily completed for Phase 32 in accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the intended use.

A copy of Schedule 8 of the Section 106 Agreement is provided in **Appendi B**.

Bac ground

Objectives of the Redevelopment Remediation Works

Part One of Schedule 8 of the Section 106 Agreement outlines the purpose and objectives of the Redevelopment Remediation Works as follows:

- The purpose and objectives of the Redevelopment Remediation Works are the carrying out of all such remedial action over and above that actually carried out as part of the RAP Works that is necessary in order to make each part of the Property suitable for its Intended Use. A part of the property will only be suitable for its Intended Use if and when the Phase Works Completion Date (PWCD) is declared in respect of that part of the Property.
- This objective will be deemed to be met for the purposes of the Section 106 Agreement and the RMA on the date specified in a notice from CDL declaring the PWCD for the Phase. The PWCD will be declared once CDL is satisfied that the remediation necessary for the specified Intended Use for the Phase has been completed.

Part Two of Schedule 8 of the Section 106 Agreement places a number of obligations on SMD as the Developer. The main obligations pertinent to this Phase are as follows:

- The Developer shall carry out or procure the carrying out of all Remedial Action necessary in order to achieve the purpose and objective as outlined in Part 1 of Schedule 8 of the Section 106 Agreement. The design and specification of any remediation shall take account of the principles and objectives and the design assumptions for the RAP Works and shall not prejudice the achievement and future sustainability of these principles and objectives.
- In order to determine the need for Remedial Action in the first place it is necessary to undertake an appropriate site assessment. This assessment needs to take account of the site history, potential and/or actual measured extent of contamination and the associated implied risk. Only by developing a thorough understanding of both potential and actual contamination will it be possible to confirm that all necessary Remedial Action likely to have been completed. This obligation should be satisfied through completion of an appropriate desk study and intrusive investigation.
- The RBSLs set out in Tables 1 and 2 [in Schedule 8 of the Section 106 Agreement] and the aesthetic criteria, remediation quality and scope (including the depth below Final Finished Level (FFL) to which quality standards are achieved), as the same may be varied in accordance with this Schedule 8, shall be achieved for each part of the Property at the minimum validation frequencies set out in Clause 8 of Part 3 (as applicable depending

upon whether such part of the Property is intended for use as residential, commercial or recreational land) as a minimum base level standard.

It should be noted that SMD has procured the services of Atkins Ltd. to assist in discharging the above obligations.

Tables 1, 2, 3 and 4 from Schedule 8 of the Section 106 Agreement are reproduced below for reference.

Table Summary of Soil RBSLs

<i>Contaminant</i>	<i>Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg)¹</i>			<i>Land-Use Specific RBSL Soil below 1m depth (mg/kg)</i>		
	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>
<u>METALS & METALLOIDS</u>						
Arsenic	64	500	64	-	-	-
Cadmium	2.6	1400	2.6	-	-	-
Chromium	130	5000	200	-	-	-
Mercury	1	480	1	-	-	-
Nickel	50	5000	75	-	-	-
Selenium	3	8000	3	-	-	-
Lead	337	750	337	-	-	-
Vanadium	416	16000	640	-	-	-
Copper	200	-	200	-	-	-
Zinc	478	-	478	-	-	-
<u>ORGANIC SPECIES</u>						
Benzene	0.12	5	13	0.4	5	48
Benzo(a)pyrene ²	0.9	29	0.9	none	none	none
Toluene	36	1160	8110	52	389	none
Ethylbenzene	41	122000	4740	140	none	none
Xylenes	32	121000	7940	58	none	none
1,2-Dichloroethane	0.04	2	4.5	0.1	0.65	6
Dichloromethane	5	1650	241	84	665	6220
Tetrachloroethene	11	1050	641	34	368	1780

Contaminant	Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg)¹			Land-Use Specific RBSL Soil below 1m depth (mg/kg)		
	Residential	Commercial	Recreational	Residential	Commercial	Recreational
Trichloroethene	1	84	193	2	28	269
Vinyl Chloride	0.01	4	0.7	0.04	1.6	16
1,2 Dichloroethene	4	273	632	7	91	881
1,1,1-Trichloroethane	154	577000	27900	160	3250	none
TPH Aromatic EC>C7-C8	125	1840	21337	146	617	none
TPH Aromatic EC>C8-C10	94	913	4025	257	547	none
TPH Aromatic EC>C10-C12	118	26515	4589	1394	none	none
TPH Aromatic EC>C12-C16	131	64875	4799	none	none	none
TPH Aromatic EC>C16-C21	82	51449	3639	none	none	none
TPH Aromatic EC>C21-C35	1130	51449	3639	none	none	none
TPH Aliphatic EC>C6-C8	8335	8517587	606191	none	none	none
TPH Aliphatic EC>C8-C10	112	158890	12075	158	none	none
TPH Aliphatic EC>C10-C12	3204	163360	12094	none	none	none
TPH Aliphatic EC>C12-C16	4513	169032	12117	none	none	none
TPH Aliphatic EC>C16-C21	94174	3429944	242573	none	none	none
TPH Aliphatic EC>C21-C35	94820	3429944	242573	none	none	none
Total TPH (Phase 1) ³	1717	81413	9061	9182	81956	None
Total TPH (Process Area) ³	2601	44344	10830	4098	35014	None
Total TPH (North Tank Farm) ³	1104	25875	9419	3802	13974	None
Total TPH (South Tank Farm) ²	1015	37230	6349	2792	34797	None
ASBESTOS						
Sum of all Types of ACM	200	300	200	200 ⁴	-	-

Notes

“-” value not applicable to scenario

“none” RSBL value exceeds soil saturation limits and free phase assessment appropriate

1 Lower value of human health RBSL or Soil Code value if higher than background LCL value (applicable to metals & metalloids only)

- 2 Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach
- 3 'Total' TPH RBSL derived for an area of development, based on individual RBSLs provided and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach
- 4 Refer to Section 106 Agreement for specification of relevant depth ranges

Table Summary of RBSLs for groundwater

<i>Contaminant</i>	<i>Land-Use Specific RBSL (mg/l)</i>		
	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>
TPH Aliphatic EC>C6-C8	none	none	none
TPH Aliphatic EC>C8-C10	none	none	none
TPH Aliphatic EC>C10-C12	none	none	none
TPH Aliphatic EC>C12-C16	none	none	none
TPH Aliphatic EC>C16-C21	none	none	none
TPH Aliphatic EC>C21-C35	none	none	none
TPH Aromatic EC>C7-C8	20	97	none
TPH Aromatic EC>C8-C10	22	none	none
TPH Aromatic EC>C10-C12	none	none	none
TPH Aromatic EC>C12-C16	none	none	none
TPH Aromatic EC>C16-C21	none	none	none
TPH Aromatic EC>C21-C35	none	none	none
Benzene	0.7	6	198
Benzo(a)pyrene	none	none	none
Toluene	47	229	none
Ethylbenzene	102	506	none
Xylenes	43	607	none
1,2-Dichloroethane	0.2	0.82	45
Dichloromethane	150	624	none
Tetrachloroethene	22	115	none
Trichloroethene	2.6	13	813
Vinyl Chloride	0.06	0.3	18
1,2-Dichloroethene	15	68	none
1,1,1-Trichloroethane	193	989	none

otes

“none” theoretical RBSL greater than solubility limit

Table Scale of Aesthetic Criteria

<i>Class</i>	<i>Visual</i>	<i>Olfactory</i>
0	No visible staining of soil, no visible suspect ACM	No detectable odour on soil
1	Occasional staining of soil, no visible suspect ACM	Faint odour on soil
2	Frequent staining of soil	Distinct but not strong odour on soil
3	Occasional heavy staining of soil	Strong odour on soil
4	Heavy staining of soil	Strong odour discernable in ambient air
5	Visible hydrocarbon product	Overwhelming Odour

otes

Visible suspect ACM refers to asbestos containing material visible to the naked eye which a reasonable and prudent person used to managing asbestos may suspect to be asbestos containing.

Table Minimum Validation Testing Frequencies

<i>Testing for the Validation Suite at the following frequency:</i>	<i>Shallow Soils (Residential <1m FFL)</i>	<i>Deeper Soils (Residential >1m below FFL)</i>	<i>Soils (Commercial all relevant depths)</i>
Imported quarried material	1 per 500m ³ ex situ, composite of 5 regular sub-samples	1 per 1000m ³ ex situ, composite of 5 regular sub-samples	1 per 1000m ³ ex situ, composite of 5 regular sub-samples
Imported soil from verified greenfield site	1 per 250m ³ ex situ, composite of 5 regular sub-samples	1 per 500m ³ ex situ, composite of 5 regular sub-samples	1 per 500m ³ ex situ, composite of 5 regular sub-samples
Imported soil from characterised brownfield site ¹	1 per 25m ³ ex situ, composite of 5 sub-samples	1 per 50m ³ ex situ, composite of 5 sub-samples	1 per 100m ³ ex situ, composite of 5 sub-samples
0.5-1m below FFL in-situ	Regular grid of 1 per 50m ² , sample over 0.5m depth	n/a	Regular grid of 1 per 400m ² , sample over 0.5m depth
>1m below FFL in-situ	n/a	Regular grid of 1 per 100m ² , sample over 1m depth	Regular grid of 1 per 400m ² , sample over 0.5m depth
Stockpiled excavated site materials for re-use	1 per 50m ³ ex situ, composite of 5 sub-samples	1 per 100m ³ ex situ, composite of 5 sub-samples	1 per 400m ³ ex situ, composite of 5 sub-samples

Testing for the Validation Suite at the following frequency:	Shallow Soils (Residential <1m FFL)	Deeper Soils (Residential >1m below FFL)	Soils (Commercial all relevant depths)
Face of remedial excavations <1m deep	1 per 10m, minimum of 1 per face, worst case VO sample	n/a	1 per 15m, minimum of 1 per face, worst case VO sample
Face of remedial excavations >1m deep	n/a	1 per 10m ² , minimum of 1 per face, worst case VO sample	1 per 15m ² , minimum of 1 per face, worst case VO sample
Along redundant service excavations	1 per 20m of trench, worst case VO sample	1 per 20m of trench, worst case VO sample	1 per 20m of trench, worst case VO sample
Soil treated ex-situ and homogenised	1 per 200m ³ , composite of 5 regular sub-samples	1 per 200m ³ , composite of 5 regular sub-samples	1 per 500m ³ , composite of 5 regular sub-samples

otes

"1"	Validation suite to reflect prior use of the originating brownfield site and the design and purpose of the relevant area of Coed Darcy.
"VO"	Visual/olfactory (i.e. aesthetic) observation

Remediation Action Plan (RAP) Works

In addition to meeting the requirements of the Redevelopment Remediation Works, the Developer must also complete a series of statutory remedial works which are referred to as the RAP Works. The requirements for the RAP Works are outlined in Schedule 7 of the Section 106 Agreement.

It is intended that this report, which is the RRWCC, will be complemented by a RAP Works Completion Statement (RAPWCS) in order to provide the information required by CDL to enable the PWCD to be declared.

Details of the scope of works and associated validation completed to satisfy the RAP requirements pertinent to this Phase are reported separately in RAPWCS ref. 49310747/BRRP00076/Cert 32a.

Information Sources

A summary of the information sources that the Monitor has been provided with in relation to Phase 32 is provided in **Table 1**. Unless otherwise stated, the Monitor has relied solely on these information sources as the basis for issuing this RRWCC. Upon a review of the information sources, in the Monitor's reasonable professional opinion, such information and the manner in which it was obtained appears sufficiently up to date, reliable and robust to justify such reliance. No verification of the data has been completed by the Monitor unless noted in the following sections.

Electronic copies of the information sources are provided in **Appendix C**.

Table Information Sources

<i>Ref.</i>	<i>Document Reference</i>	<i>Format</i>	<i>Title</i>	<i>Author</i>	<i>Date Received</i>
1	39991-044-785-FR1287	Report	Whole Site Investigation BP Llandarcy Refinery	URS	August 2005
2	44382742/BRRP0001	Report	BP Llandarcy Refinery Desk Study	URS	July 2007
3	5041216-REM-RPT-000216	Report	Derivation of Remediation Target Criteria (Revision 3)	Atkins	January 2010
4	5041216-REM-RPT-000373	Report	Central Processing Area East Controlled Waters Risk Assessment	Atkins	January 2012
5	-	Technical Note	Residential Phase 2 – Notes for Monitor Agreement	Atkins	July 2013
6	-	Technical Note	Residential Phase 2 – Engineer's Brief Reclamation/Remediation Works	Atkins	July 2013
7	5041216-PLOTS-RPT-000992	Report	Geo-Environmental Assessment and Outline Remediation Strategy – Proposed Residential Phase 2	Atkins	July 2013
8	7389/SK007A	Drawing	Phase 2A Development Layout	Roberts Limbrick Architects	September 2013
9	5041216-PH2D-TN-1090	Technical Note	Response to Monitor Comments RFI119	Atkins	October 2013
10	5041216-OSW-TN-0001483	Technical Note	Response to Monitor Comments RFI153	Atkins	October 2015
11	5041216-REM-RPT-0001408	Report	St. Modwen Homes (Monitor Phase 32) Validation Report Revision 1	Atkins	October 2015

Requests for Information RFIs Issued by the Monitor

The Monitor has raised two RFIs in relation to Phase 32, as summarised in **Table 1**. Copies of the RFIs are provided in **Appendix B**. Copies of the responses received are included in the information sources provided in **Appendix C**.

Table RFIs

<i>RFI Ref.</i>	<i>Title</i>	<i>Associated Atkins Document</i>	<i>Date Raised</i>	<i>Complete</i>	<i>Comments</i>
-----------------	--------------	-----------------------------------	--------------------	-----------------	-----------------

RFI Ref.	Title	Associated Atkins Document	Date Raised	Complete	Comments
119	Review of Atkins' Notes for Monitor Agreement, Engineer's Brief and Remediation Strategy	Notes for Monitor Agreement, Engineer's Brief and Remediation Strategy	August 2013	Yes	-
153	Review of Atkins' Validation Report for Monitor Phase 32	St. Modwen Homes (Monitor Phase 32) Validation Report	August 2015	Yes	Updated validation report (Rev 1) received October 2015

DESCRIPTION OF REMEDIAL ACTION

The following section provides a description of the remedial action that has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 32. This section of the report is structured as follows:

1. Site Assessment
2. Remediation Strategy
3. Redevelopment Remediation Works
4. Validation

Site Assessment

As discussed above, the Section 106 Agreement requires the Developer to undertake an appropriate site assessment which needs to take account of the site history, potential and/or actual measured extent of contamination and the associated implied risk. The Section 106 Agreement also states that only by developing a thorough understanding of both potential and actual contamination will it be possible to confirm that all necessary Remedial Action is likely to have been completed. This obligation should be satisfied through completion of an appropriate desk study and intrusive investigation.

Desk Study

From the information presented in Atkins' validation report (Information Source 11) it is evident that Atkins has reviewed the findings of previous site investigations and desk studies to develop an understanding of both potential and actual contamination with Phase 32. The following is of note:

Phase 32 is located within the former operations and processing area, towards the western area of the middle terrace of the former refinery. With reference to the historical maps provided in **Appendix E** it can be seen that various refinery infrastructure was situated within Phase 32, as follows:

- Electrical substation no. 10 was located at the northern end of Phase 32;
- A catalytic cracking plant was located within the centre of Phase 32;
- A deodoriser was situated to the east of the catalytic cracking plant;

- The east-west pipe route crossed the southern part of Phase 32;
- Part of no. 4 vac unit was situated in the southwest corner of Phase 32;
- Electrical substation no. 9 was located at the southern end of Phase 32;
- A propane de-asphalting Plant was situated in the southeast corner of Phase 32.

Furthermore, both no. 1 and no. 2 cat reformers were located to the west and northwest of Phase 32. The north-south pipe route was situated to the east of the Phase.

With regards geology, Atkins reports that the British Geological Survey Sheet for Swansea (Sheet 247) Drift Edition indicates that this part of the refinery is underlain Till (Diamicton) heterogeneous glacial deposits overlying the Hughes Member, south Wales Upper Coal Measures Formation (Pennant Sandstones).

With regards hydrology, groundwater within Phase 32 is generally situated within the underlying bedrock and flow is considered to be towards the northwest. The underlying sandstones are classified as a Secondary A Aquifer, which are defined by the Environment Agency as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers'. The closest surface water feature to Phase 32 is Crymlyn Bog, which lies approximately 370m to the west. The South Site Reservoir is located approximately 375m to the northwest of Phase 32.

Intrusive Investigations

URS carried out a number of historic site investigations on behalf of the operator of the former refinery, as reported in URS' site investigation report FR1287 (Information Source 1). These investigations included 24 exploratory holes within Phase 32.

In 2011 Atkins also undertook a site investigation which included the excavation of a further 6 trial pits within the central part of Phase 32. Details of these site investigations are presented in Atkins' remediation strategy (Information Source 7) and Atkins' validation report (Information Source 11).

Ground conditions were shown to be consistent with the reported geology discussed above and generally the soils comprised made ground, underlain with glacial soils over sandstone bedrock. The bedrock was generally shallow, ranging from depths of 0.1m to 1.8m bgl.

Land contamination is reported to have been evident within the soils in the form of staining, odours and localised free product. Laboratory analysis identified TPH and naphthalene in excess of the RBSL thresholds for a residential end use. Trace concentrations of asbestos were also reported to have been encountered at one location.

Atkins reports that groundwater monitoring information from the boreholes situated within Phase 32 indicated the presence of free product. RBSL exceedances were also noted for TPHs within the historical wells.

Groundwater across Phase 32 was encountered between 0.9m and 2.75m bgl however this was considered to represent localised perched groundwater rather than true groundwater which is assumed to be situated in the deeper bedrock.

Remediation Strategy

Schedule 8 of the Section 106 Agreement sets out the minimum remedial action required depending on the intended use and the groundwater regime. As noted above, the intended use for Phase 32 has been declared as residential and groundwater is primarily in rock i.e. there is limited soil material over bedrock, little perched groundwater is present in that soil and

the water table is normally first encountered in bedrock. Therefore, the following minimum remedial action was considered necessary for Phase 32 in accordance with the requirements listed in the Section 106 Agreement:

- All oil saturated soil should be removed.
- All soils must be remediated so as to meet the RBSLs for TPH, BTEX and PAHs at the relevant depth relative to FFL and the aesthetic criteria Class 2 or better at greater than 1m below FFL.
- The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.
- Soils where there is visible ash and clinker, or metal concentrations above RBSLs, are to be removed so that none is retained within the first metre below FFL in garden areas.
- Where it is not practicable to address groundwater contamination within bedrock this must be controlled, e.g. where seeps, sheens and iron staining discharge from the bedrock. Acceptable methodologies for remediation may include, but are not limited to, the use of land drainage via interceptors. Control measures should result in no visible discharge at surface and little or no odour observable.
- All soil potentially containing dispersed asbestos fibres or visible ACM must be removed or remediated to meet in bulk, considering both dispersed fibres and pieces of ACM, the appropriate ACM RBSL, or to meet the requirements of relevant Environmental Authorities, whichever is the more conservative.

In addition to the minimum remedial action requirements outlined above, Schedule 10 of the Section 106 Agreement states that:

- All buried services shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity.
- Wherever there is a risk that following construction of the Urban Village groundwater or organic phase liquid may contaminate soils within the top one metre below FFL such that any of the relevant RBSLs and/or aesthetic criteria specified in Schedule 8 of the Section 106 Agreement may be exceeded, the Developer shall ensure that all necessary steps are taken to mitigate these risks. Suitable measures may include, but not be limited to, the installation of land drains and/or the raising of the site ground levels such that groundwater will not be able to influence shallow soil quality.
- The final 0.5m of materials shall comprise quality controlled imported fill materials suitable for the use to which they are to be put and of better quality than all RBSLs for the relevant end-use and meeting aesthetic type 0 for residential use and type 1 or better for commercial use as specified in **Table** of this report.

Based on the above requirements and the findings of the site investigations, Atkins prepared a remediation strategy (Information Source 7) which can be summarised as follows:

- Removal of oil saturated soils and/or free product;
- Removal of visible ash and clinker;
- Removal of soils with a visual/olfactory rating exceeding Class 2 as defined in **Table** of this report;

- Removal of remaining structural remnants such as brickwork, concrete and other obstructions, through a general turnover of soils down to bedrock, enabling a visual inspection of all soils and the surface of bedrock;
- Removal of contamination hotspots;
- Removal of asbestos contaminated materials;
- Removal of redundant services;
- Backfilling to FFL minus 1m; and
- Validation of in-situ soils via the collection of soil samples from trial pits.

The Monitor considered the above approach to be appropriate in accordance with the requirements of the Section 106 Agreement.

Redevelopment Remediation works

The redevelopment remediation works that have been completed for Phase 32 are described in Atkins' validation report (Information Source 11) and can be summarised as follows:

- Excavation of all in-situ soils to expose the underlying bedrock across the entire phase;
- Segregation of excavated soils based on a visual/olfactory assessment to identify soils suitable for retention;
- Removal of unsuitable soils for bioremediation elsewhere on site;
- Visual inspection of the exposed bedrock and removal of areas of suspected contamination;
- Backfilling to FFL minus 1m using stockpiled soils deemed suitable for re-use; and
- Validation of the backfill (either via samples collected from the stockpiles prior to placement or otherwise via in-situ samples collected from validation trial pits).

The Monitor attended site during the works and was generally satisfied that the works were being carried out appropriately and that the requirements of the Section 106 Agreement were likely to be achieved.

Validation

With reference to the remediation requirements discussed in Section 2.2 of this report, the following sections aim to demonstrate whether or not the requirements specified in the Section 106 Agreement have been achieved.

It should be noted that in the absence of a detailed layout for the proposed development and confirmed FFLs, it has been assumed that the ground levels following the completion of the redevelopment remediation works represents FFL minus 1m. A topographical record of the ground levels upon which this certificate is based are shown on drawing 5041216-ATK-DR-C-REM-DWG-2106 Rev P1 a copy of which is provided in **Appendix F**.

Aesthetic Criteria

The Section 106 Agreement requires that all soils within the top 1m below FFL must be remediated such that the aesthetic quality, as defined in **Table 1** of this report, is Class 1 or better and that all soils at depths greater than 1m below FFL must be Class 2 or better.

Given that the ground levels upon which this certificate is based represent FFL minus 1m, it is necessary that all soils above bedrock must be Class 2 or better.

As discussed in Section 2.3 of this report, the remediation works involved the excavation of all soils to expose the underlying bedrock across the entire phase. The excavated soils were then segregated based on a visual/olfactory assessment carried out in accordance with the aesthetic criteria defined in **Table** of this report. This assessment identified soils that were deemed to be suitable for retention, i.e. Class 2 or better, and these were stockpiled for re-use, whereas unsuitable soils, for example hydrocarbon impacted soils, were removed for bioremediation elsewhere on site.

Atkins also undertook a visual/olfactory assessment of the exposed bedrock across Phase 32. Some hydrocarbon impacted sandstone was identified and further excavations were carried out in these areas to remove the impacted bedrock.

Atkins reports that the phase was then backfilled to FFL minus 1m using stockpiled soils that had been deemed suitable for re-use via a visual/olfactory assessment as well as chemical testing which is discussed later in this report.

These soils were also monitored during placement, again to ensure an aesthetic rating of Class 2 or better. Lastly, validation trial pits were excavated across part of the phase and the soils were again verified in accordance with the specified aesthetic criteria.

The Monitor is therefore satisfied that the soils within Phase 32 meet the necessary aesthetic criteria as specified in the Section 106 Agreement.

Removal of Oil Saturated Soils

The Section 106 Agreement requires that all oil saturated soil should be removed.

As discussed above, all soils were excavated across the entire phase to expose the underlying bedrock and the soils used as backfill were subjected to a visual/olfactory inspection to ensure that they were Class 2 or better (frequent staining of soil and/or distinct but not strong odour on soil) i.e. free from oil saturated soils.

In summary, the Monitor is satisfied that oil saturated soils have been removed from Phase 32 in accordance with the requirements of the Section 106 Agreement.

Soil Chemical Quality

The Section 106 Agreement requires that all soils must be remediated to meet the RBSLs for TPH, BTEX and PAHs at the relevant depth relative to FFL.

Given that Phase 32 represents a residential phase where groundwater is primarily in rock, the relevant depth to FFL, as defined in the Section 106 Agreement, is the level at which bedrock is encountered. This effectively means that all soils from bedrock to FFL must meet the specified RBSL thresholds.

In addition to the RBSLs, in order to assess the significance of any reported contaminant concentrations, validation results have also been screened against Remediation Target Concentrations (RTCs) which have been developed by Atkins. The RTCs are intended to be health protective for a low density residential end-use. It has been agreed previously with NPTCBC that where the RTCs are numerically lower, i.e. more conservative, than the RBSLs, then the RTCs shall be used. A summary of the relevant RBSLs and RTCs is presented in **Appendi**

It should be noted that the RBSL/RTC thresholds are depth dependant. Given that the ground levels upon which this certificate is based represent FFL minus 1m, the following section only considers deep soils (those soils greater than 1m below FFL). It should be noted that if the

development layout and proposed FFLs differ significantly from the assumed FFLs then further remediation works may be required.

As described in Section 2.3 of this report, all soils within Phase 32 were excavated to expose the underlying bedrock. Unacceptable soils were removed and replaced with suitable site-won fill materials. These materials either comprised excavated soils from Phase 32 that had been deemed suitable for re-use based on a visual/olfactory assessment or excavated soils from elsewhere on site that had been treated ex-situ via bioremediation and homogenised.

Chemical testing of these fill materials, to ensure compliance with the specified RBSL/RTCs, comprised either the testing of samples collected from the stockpiles prior to placement or otherwise via the testing of samples collected from validation trial pits after the materials had been placed.

Atkins reports that no chemical exceedances were identified against the relevant RBSL/RTC thresholds.

In summary the Monitor is satisfied that the deep soils within Phase 32 meet the necessary chemical quality as specified in the Section 106 Agreement.

With regards the validation of shallow soils from FFL to FFL minus 1m, the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued, so it has therefore been agreed with the NPTCBC that the quality of these soils will be regulated via planning control when the works take place.

Testing Frequencies

The Section 106 Agreement requires that the quality of all material placed as fill and/or remaining in-situ post-construction must as a minimum meet the relevant RBSLs and aesthetic standards at the testing frequencies set out in Table 4 of Schedule 8 of the Section 106 Agreement i.e. the sampling of soils shall be undertaken to the minimum frequencies defined.

Given that the remediation works comprised the removal of all soils to expose the underlying bedrock and then backfilling with soils from various sources, the following minimum testing frequency is considered to be applicable to Phase 32, as defined in **Table** of this report:

- Deep residential soils comprising stockpiled excavated site materials for re-use at a minimum testing frequency of 1 per 100m³

Atkins reports that approximately 28,557m³ of material was placed within Phase 32. This comprised the following:

- 4,919m³ of site-won rock validated by means of a visual/olfactory assessment prior to placement;
- 15,217m³ of site-won soils validated by the collection of 167 samples from stockpiles prior to placement (i.e. a testing frequency of 1 per 91m³);
- 3,500m³ of site-won 6F2 comprising crushed concrete validated by means of a visual/olfactory assessment prior to placement; and
- 4,926m³ of site-won soils validated by the collection of 84 soil samples from 52 validation trial pits following placement (i.e. a testing frequency of 1 per 95m³).

It should be noted that these volumes have not been verified by the Monitor, however the Monitor is satisfied that the reported volumes appear to be consistent with the isopachyte volumes calculated by comparing the topographical surveys of the base of excavation and FFL minus 1m, as reported in Atkins' validation report (Information Source 11). It is also noted

that there is a minor discrepancy between the individual volumes listed against each source of material and total volume.

It can be seen that the site-won soils have been validated at frequencies of 1 per 91m³ and 1 per 95m³ which complies with the minimum specified testing frequency of 1 per 100m³ specified in the Section 106 Agreement.

The Monitor is satisfied that it would not be appropriate to collect rock samples or samples of 6F2 for chemical testing and that the visual/olfactory assessment undertaken is appropriate.

The Monitor is therefore satisfied that an appropriate number of validation samples have been collected in order to demonstrate compliance with the testing requirements specified in the Section 106 Agreement.

Top 0.5m of Quality Controlled Imported Fill

The Section 106 Agreement requires that a minimum thickness of suitable garden soils are to be provided in residential areas, soils for landscaping in public and commercial areas and sub-base for hardsurfaced areas which shall comprise a minimum of 0.5m of quality controlled imported fill materials suitable for the use to which they are to be put and of better quality than all RBSLs for the relevant end-use and meeting aesthetic type 0 for residential use and type 1 or better for commercial use.

Given that the ground levels upon which this certificate is based represent FFL minus 1m, it is not yet possible to demonstrate that this requirement has been met. As discussed in section 2.4.3 of this report it has been agreed with NPTCBC that the quality of imported soils within the top 1m will be controlled via planning conditions given that the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued.

It should be noted that if there is any significant change in the development proposals or the proposed FFLs then reconsideration of the information contained within this certificate may be necessary. Notwithstanding this, it is understood that the redevelopment remediation works that have been completed are aimed at being conservative to allow for minor alterations to FFLs.

Removal of Ash, Clinker and Metals

The Section 106 Agreement requires that visible ash and clinker and metal concentrations above RBSLs are to be removed from soils so that none is retained within the first 1m below FFL in garden areas.

Given that the ground levels upon which this certificate is based represent FFL minus 1m, it is not yet possible to demonstrate that this requirement has been met. As above, the import of soils within the top 1m will therefore be controlled via planning conditions given that the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued.

It should be noted that if there is any significant change in the development proposals or the proposed FFLs then reconsideration of the information contained within this certificate may be necessary. Notwithstanding this, it is understood that the redevelopment remediation works that have been completed are aimed at being conservative to allow for minor alterations to FFLs.

Asbestos

The Section 106 Agreement requires that all soils potentially containing dispersed asbestos fibres or visible ACM must be removed or remediated to meet in bulk, considering both dispersed fibres and pieces of ACM, the appropriate ACM RBSL, or to meet the requirements of relevant Environmental Authorities, whichever is the more conservative. In this instance,

the Environmental Authorities have not declared any more stringent requirements and therefore the RBSLs/RTCs shall apply.

It should be noted that under the scenario for residential phases where groundwater is in rock, as specified in Schedule 8 of the Section 106 Agreement, there is no minimum depth to which the above requirements must be met. However, under the scenario for residential phases where groundwater is in soil it is stated that the asbestos requirements must be achieved to minimum depth of 2m below FFL. On previous residential phases where groundwater is in rock it has been agreed that it is appropriate for this minimum depth of 2m below FFL to also apply.

Given that the ground profile upon which this certificate is based represents FFL minus 1m, the asbestos requirements are therefore only relevant to the top 1m of soils remaining in situ.

Atkins' validation report (Information Source 11) states that there was no visible asbestos containing material observed in the soils during the ground investigation.

Of the four sources of fill material listed in Section 2.4.4 of this report, Atkins reports that two of the sources were not tested for asbestos. These two sources were the 4,919m³ of site-won rock and 3,500m³ of site-won 6F2 crushed concrete, which were validated by means of a visual assessment.

Whilst the Monitor is satisfied that the presence of asbestos within the rock does not represent a significant risk, the crushed concrete is more likely to have the potential to contain asbestos. However, Atkins states that this crushed concrete has been used to create a temporary compound area, which will be taken up when the development is completed, i.e. this material will not form part of the final development. The Monitor is therefore satisfied that there should be no need for further testing of this material. However, should the material be incorporated into the permanent works then further testing may be appropriate.

Of the remaining soils 4,926m³ was validated in situ through the excavation of trial pits following placement and 15,217m³ was validated by the collection of samples from stockpiles prior to placement. From the information provided by Atkins it appears that all samples were screened for the presence of asbestos and where positive results were identified then the sample was scheduled for quantitative analysis.

Atkins reports that concentrations of asbestos were below the permitted RBSL/RTC of 200ppm (0.02%) in all but one of the 251 soil samples collected. This one exceedance was collected from Stockpile 109a. Atkins reports that this material was placed at depths greater than 2m below FFL, i.e. at which depth the RBSL/RTC is not applicable.

The Monitor is satisfied that the soils within Phase 32 meet the necessary requirements for asbestos as defined in the Section 106 Agreement. However it should be noted that the requirements specified in the Section 106 Agreement only consider the human health implications of the presence of asbestos once the site is occupied, and does not take into consideration the potential risks during construction. These risks will need to be considered by any Contractor undertaking works in this area.

Groundwater

The Section 106 Agreement requires that wherever there is a risk that following construction of the Urban Village groundwater or organic phase liquid may contaminate soils within the top 1m below FFL, such that any of the relevant RBSLs and/or aesthetic criteria specified in Schedule 8 may be exceeded, the Developer shall ensure that all necessary steps are taken to mitigate these risks. Suitable measures may include, but not be limited to, the installation of land drains and/or the raising of the site ground levels such that groundwater will not be able to influence shallow soil quality.

Observations during the remediation works indicated that groundwater is at a significant depth within the underlying bedrock across Phase 32. It is therefore considered unlikely that groundwater would enter the top 1m below FFL. The Monitor is therefore satisfied that there is no significant risk of groundwater re-contaminating soils within the top 1m below FFL and therefore no further measures as listed in the Section 106 Agreement are considered necessary.

Seepages

The Section 106 Agreement requires that where it is not practicable to address groundwater contamination within bedrock then this must be controlled, e.g. where seeps, sheens and iron staining discharge from the bedrock. Acceptable methodologies for remediation may include, but are not limited to, the use of land drainage via interceptors. Control measures should result in no visible discharge at surface and little or no odour observable.

Atkins' validation report (Information Source 11) describes a number of locations where oily residues, hydrocarbon staining, minor product seepages and localised sheens were observed emanating from the bedrock. In some locations impacted rock was broken out and removed. Elsewhere the seepages and sheens were observed over a period of time and were found not to be persistent.

Given that the surface of the bedrock will be at significant depth in relation to FFL, there is not considered to be a significant risk of visible discharge of seepages, sheens or iron stained discharge from the bedrock. The Monitor is therefore satisfied that no further measures are necessary in relation to Phase 32.

Removal of Buried Services

The Section 106 Agreement requires that irrespective of the intended use, all existing buried services shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity. Where backfill to new underground services may become a pathway for residential Pre-Transfer Date Contamination, appropriate control measures such as land drainage or venting measures shall be installed so as to appropriately protect remediated and/or developed areas.

Atkins' validation report (Information Source 11) states that a number of redundant pipelines were encountered during the works and these were removed. It is reported that some of the pipelines were situated within channels that had been excavated into the underlying bedrock and some oily residues, including free product, were observed in some locations. Atkins reports that impacted rock was broken out and contaminated materials were removed.

Given that all soils within Phase 32 were removed down to bedrock, there can be reasonable assurance that all redundant services would have been encountered during the works and subsequently removed.

The Monitor is therefore satisfied that buried services appear to have been removed from Phase 32 in accordance with the requirements of the Section 106 Agreement.

CERTIFICATIO

Redevelopment Remediation or s

The following section aims to confirm whether or not in the Monitor's professional opinion the Redevelopment Remediation Works have been satisfactorily completed in accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the intended use. **Table** provides a list of the minimum remedial action required for a residential phase where groundwater is in rock, as described in Section 2.2 of this report, and summarises whether or not each requirement has been satisfied.

Table Certificate Summary

<i>Requirement</i>	<i>Status</i>	<i>Comments</i>
The RBSLs and the aesthetic criteria, remediation quality and scope (including the depth below FFL to which quality standards are achieved) shall be achieved for each part of the property at the minimum validation frequencies set out in Clause 8 of Part 3 of Schedule 8 of the Section 106 Agreement (as applicable depending upon whether such part of the property is intended for use as residential, commercial or recreational land) as a minimum base level standard.	Complete	Refer to Section 2.4 of this report.
All oil saturated soils shall be removed.	Complete	Refer to Section 2.4.2 of this report.
All soils must meet the RBSL for TPH, BTEX and PAHs at the relevant depth relative to FFL.	Complete	Refer to Section 2.4.3 of this report.
All soils must meet the aesthetic criteria Class 2 or better at greater than 1m below FFL.	Complete	Refer to Section 2.4.1 of this report.
The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.	Not applicable	The top 1m of soils is yet to be placed. Refer to Section 2.4.1 of this report.
Soils where there is visible ash and clinker, or metal concentrations above RBSLs, are to be removed so that none is retained within the first metre below FFL in garden areas	Not applicable	The top 1m of soils is yet to be placed. Refer to Section 2.4.6 of this report.
Where it is not practicable to address groundwater contamination within bedrock this must be controlled, e.g. where seeps, sheens and iron staining discharge from the bedrock. Acceptable methodologies for remediation may include, but are not limited to, the use of land drainage via interceptors. Control measures should result in no visible discharge at surface and little or no odour observable.	Complete	Refer to Section 2.4.9 of this report.
All soil potentially containing dispersed asbestos fibres or visible ACM must be removed or remediated to meet in bulk, considering both dispersed fibres and pieces of ACM, the appropriate ACM RBSL to a minimum depth of 2m below FFL.	Complete	Refer to Section 2.4.7 of this report.

Requirement	Status	Comments
Irrespective of the intended use of each phase or part thereof, all existing buried services at the property shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity. Where backfill to new underground services may become a pathway for residential pre-transfer date contamination, appropriate control measures such as land drainage or venting measures shall be installed so as to appropriately protect remediated and/or developed areas.	Complete	Refer to Section 2.4.10 of this report.
Wherever there is a risk that following construction of the Urban Village groundwater or organic phase liquid may contaminate soils within the top one metre below FFL such that any of the relevant RBSLs and/or aesthetic criteria specified in Schedule 8 may be exceeded, the Developer shall ensure that all necessary steps are taken to mitigate these risks. Suitable measures may include, but not be limited to, the installation of land drains and/or the raising of the site ground levels such that groundwater will not be able to influence shallow soil quality.	Complete	Refer to Section 2.4.8 of this report.
To provide a minimum thickness of suitable garden soils in residential areas, soils for landscaping in public and commercial areas and sub-base for hardsurfaced areas, the Developer shall build up the final elevation after completion of the RAP and redevelopment remediation works with a minimum of 0.5m of quality controlled imported fill materials suitable for the use to which they are to be put and of better quality than all RBSLs for the relevant end-use and meeting aesthetic type 0 for residential use and type 1 or better for commercial use as specified in Schedule 8 of the Section 106 Agreement. For the avoidance of doubt, the minimum remediation standards set out above therefore assume that the first half metre below FFL will comprise such imported material in all circumstances of residential and commercial end-use.	Not applicable	The top 1m of soils is yet to be placed. Refer to Section 2.4.5 of this report.

Preventative Measures

In addition to preparing the RAPWCS and RRWCC, the Monitor is also obliged, if requested by CDL, to review any certificate or other documentation produced to CDL by or on behalf of the Developer purporting to confirm that Preventative Measures have been completed or are not required in relation to any Phase or part thereof providing CDL in writing of its professional opinion as to:

- whether the author is suitably qualified to issue the certificate; and
- whether the certificate contains or reflects any manifest error, omission or bias, etc. and certifies that the land is fit for its purpose.

The Monitor has not received any such documentation or requests in relation to Phase 32.

Ground Gas

The Section 106 Agreement states that a proprietary and appropriate ground gas resistant membrane and appropriate venting system shall be installed in all structures that will be entered by people and any structure where there is a potential for gas accumulation if ground gas is present.

As reported in Atkins' remediation strategy (Information Source 7) Atkins has undertaken an assessment of ground gases which concluded that the risk, as defined in CIRIA C665, is considered to be representative of Characteristic Situation 2 (low risk classification). Atkins therefore recommends the following gas vapour protection measures for enclosed structures:

- Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 2000g DPM and underfloor venting;
- Beam and block or pre-cast concrete and 2000g DPM/reinforced gas membrane and underfloor venting;
- All joints and penetrations to be sealed.

Atkins proposes that the exact details of the gas protection systems shall be agreed with the Monitor and the relevant regulatory authorities prior to installation. The Monitor shall, if requested by CDL, review certificates or other documentation purporting to confirm that Preventative Measures have been completed or are not required. It is also suggested that the findings of the ground gas assessment should be reviewed against the recently published BS 8485:2015.

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This RRWCC confirms that in the Monitor's professional opinion, and on the basis of the information provided within the information sources as well as observations made by the Monitor on site during the remediation works, the Monitor is satisfied that the Phase 32 redevelopment remediation works appear to have been completed in general accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the specified intended uses, and that the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement are likely to continue to be met for the foreseeable future without the need for further remedial action in relation to or affecting the area within the phase boundary.

C

The PWCD will be declared by CDL once CDL is satisfied that the remediation necessary for the specified intended uses for the Phase has been completed. This report, which is the RRWCC, will be complemented by a RAPWCS in order to provide the information required by CDL to enable the PWCD to be declared.

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ST. MODWEN DEVELOPMENTS LIMITED - a ST. MODWEN company

Registration England 892832

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T: 0121 222 9400 **W:** www.stmodwen.co.uk

21st May 2015

Our ref:

Coed Darcy Limited
Dumfries House
Dumfries Place
Cardiff
CF10 3ZF

Dear Sirs

Coed Darcy
Phase 32 - Residential Phase 2, Phase 2
Request for Phase Works Completion Date

We hereby give our written request seeking the declaration of the Phase Works Completion Date for Phase 32 of Coed Darcy as required under Clause 4.6 of the Remediation Agreement made between Coed Darcy Limited, St. Modwen Developments Limited and St. Modwen Properties PLC dated 23rd May 2008.

The Phase 32 boundary is shown on the attached Drawing No. 5041216-REM-DWG-1943.

The "Intended Use" for Phase 32 is confirmed as that of a residential end use, comprising residential housing with gardens and associated infrastructure.

As required by the Remediation Agreement, we have copied this letter to the Monitor.

Yours faithfully

Neil Williams

For and on behalf of St. Modwen Developments Limited

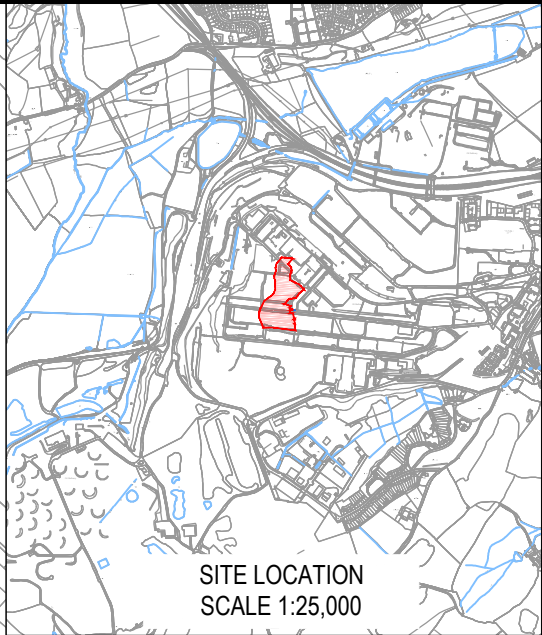
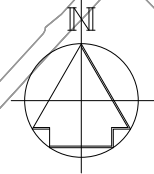
Cc Rhys Mander, Llancoed House, Coed Darcy, Neath, SA11 8AZ

St. Modwen Properties PLC

Head Office & Registered Office: Sir Stanley Clarke House, 7 Ridgeway, Quinton Business Park, Birmingham, B32 1AF

T: [0121] 222 9400 **W:** www.stmodwen.co.uk

Registration: England 349201



SITE LOCATION
SCALE 1:25,000

KEY



MONITOR BOUNDARY PHASE 32

REVISIONS

Drawn By
Checked By
Date

PURPOSE OF ISSUE

Rev.
Authorised for issue
Date

Atkins Limited

Telford Office
Cornerstone House
Stafford Park 13
Telford TF3 3AZ

Birmingham Office
The Axis, 10 Holliday Street
Birmingham
West Midlands B1 1TF

Tel 01952 201234
Fax 01952 200981



Tel 0121 483 5000
Fax 0121 483 5252

THIS DRAWING IS NOT TO BE SCALED

CLIENT



PROJECT

COED DARCY

DRAWING TITLE

MONITOR BOUNDARY PHASE 32

SCALES

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DRAWN

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CO-ORD CHECK

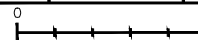
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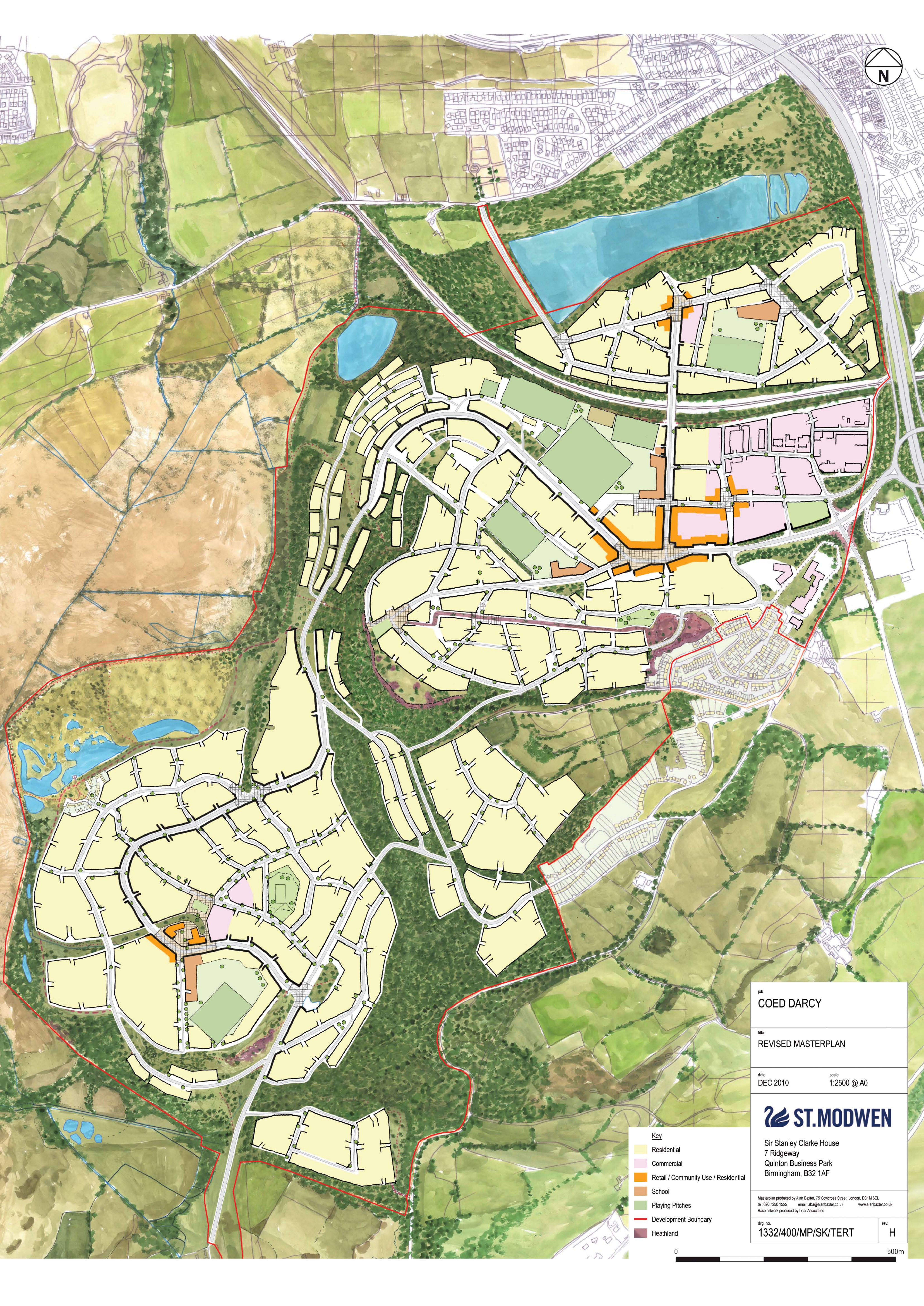
PLOT DATE
26.10.15

DRAWING NO

5041216-REM-DWG-1943

REV

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- Key**
- Residential
 - Commercial
 - Retail / Community Use / Residential
 - School
 - Playing Pitches
 - Development Boundary
 - Heathland

job COED DARCY	
title REVISED MASTERPLAN	
date DEC 2010	scale 1:2500 @ A0
 ST.MODWEN Sir Stanley Clarke House 7 Ridgeway Quinton Business Park Birmingham, B32 1AF	
Masterplan produced by Alan Baxter, 75 Cowcross Street, London, EC1M 6EL tel: 020 7250 1555 email: aba@alanbaxter.co.uk www.alanbaxter.co.uk Base artwork produced by Lear Associates	
drp. no. 1332/400/MP/SK/TERT	rev. H

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