



Photograph No 43

19 February 2013



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28 February 2013



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25 March 2013



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Photograph No 49

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17 April 2013



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10 July 2013



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Photograph No 59

11 December 2013



Photograph No 60

11 December 2013



Photograph No 61

23 July 2014



Photograph No 62

4 August 2014



Photograph No 63

4 August 2014



Photograph No 64

13 August 2014

*A E I CO ARISO OF RBSL
A RTC T RES OL S*

Contaminant	RTC (mg/l)
TPH aliphatic C10-C12	>sat
TPH aliphatic C12-C16	>sat
1,2-Dichloroethane	4.80E+00
1,1,1-Trichloroethane	>sat
Tetrachloroethene	>sat
Trichloroethene	2.85E+01
Vinyl chloride	3.38E-01
Dichloromethane	1.98E+03
Cis-1,2 Dichloroethene	7.40E+01
Trans-1,2 Dichloroethene	8.91E+01
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 - 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 aromatic C7-C8 is considered to comprise toluene only by Atkins 4. The potential presence of free product should be assessed in accordance with information in the S106 (Ref. 1).	

4. Comparison of RBSLs and RTC

As an objective of these works was to establish whether the RBSLs were health protective, the commercial RBSLs and RTC have been compared. This comparison is presented in the tables in this section of the report. As per the approach adopted for the residential and recreational RTC, 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 bolded⁹.
- 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. Further site specific modifications have not been considered at the present stage.

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

The background soil concentration and Soil Code have not been considered within the metals RTC presented and therefore the values presented for metals may not be protective of phytotoxic

⁹ In some cases there may be two RTC, where one RTC is higher than the RBSL and the other lower: one may be bolded and the other not and therefore they remain as draft.

effects. The soft landscaping areas should therefore be suitably designed at the remediation design stage, once such areas are defined.

4.1 Comparison of commercial RBSLs and RTC (shallow soil)

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

Table 4.1 – Comparison of commercial RBSLs and RTC for shallow soil (0.65m below FFL)

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Arsenic	5.00E+02	6.35E+02	6.35E+02	final
Chromium	5.00E+03	3.65E+02	3.65E+02	draft
Cadmium	1.40E+03	2.43E+02	2.43E+02	draft
Mercury (inorganic)	4.80E+02	3.71E+03	3.71E+03	final
Nickel	5.00E+03	1.99E+03	1.99E+03	draft
Selenium	8.00E+03	1.30E+04	1.30E+04	final
Lead	7.50E+02	5.45E+03	5.45E+03	final
Vanadium	1.60E+04	7.59E+03	7.59E+03	draft
Copper	-	1.15E+05	1.15E+05	draft
Zinc	-	9.18E+05	9.18E+05	draft
Benzo(a)pyrene	2.90E+01	2.47E+01	2.48E+01	draft
Benzene	5.00E+00	1.78E+01	9.98E+01	final
Toluene	1.16E+03	4.18E+05 a	4.22E+05 a	final
Ethylbenzene	1.22E+05	1.83E+05 a	1.87E+05 a	final
Xylene	1.21E+05	2.93E+05 a	3.27E+05 a	final
TPH aromatic C7-C8	1.84E+03	4.18E+05 a	4.22E+05 a	final
TPH aromatic C8-C10	9.13E+02	6.21E+04 a	6.62E+04 a	final
TPH aromatic C10-C12	2.65E+04	6.83E+04 a	6.84E+04 a	final
TPH aromatic C12-C16	6.49E+04	6.84E+04 a	6.57E+04	final
TPH aliphatic C6-C8	>1.00E+06	≤1.00E+06 a	≤1.00E+06 a	draft
TPH aliphatic C8-C10	1.59E+05	1.69E+05 a	1.70E+05 a	final
TPH aliphatic C10-C12	1.63E+05	1.71E+05 a	1.71E+05 a	final
TPH aliphatic C12-C16	1.69E+05	1.71E+05 a	1.71E+05 a	final
TPH aromatic C16-C21	5.14E+04	2.85E+04	2.85E+04	draft
TPH aromatic C21-C35	5.14E+04	2.85E+04	2.85E+04	draft
TPH aliphatic C16-C21	>1.00E+06	≤1.00E+06	≤1.00E+06	draft
TPH aliphatic C21-C35	>1.00E+06			draft
Total TPH (Phase 1)	8.14E+04	Not calculated (see note 8)		
Total TPH (Process Area)	4.43E+04			
Total TPH (North Tank Farm)	2.59E+04			

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Total TPH (South Tank Farm)	3.72E+04			
1,2-Dichloroethane	2.00E+00	4.01E-01	2.15E+00	draft
1,1,1-Trichloroethane	5.77E+05	4.43E+02	3.14E+03	draft
Tetrachloroethene	1.05E+03	1.03E+02	7.88E+02	draft
Trichloroethene	8.40E+01	7.48E+00	5.49E+01	draft
Vinyl chloride	4.00E+00	4.50E-02	1.74E-01	draft
Dichloromethane	1.65E+03	1.58E+02	7.34E+02	draft
Cis-1,2-Dichloroethene	2.73E+02	8.70E+00	5.30E+01	draft
Trans-1,2 Dichloroethene		1.38E+01	8.77E+01	draft
Notes				
a) based on a value produced from following the approach outlined in SR4 for substances at saturation				
1. It is assumed that no visible free product is present within the top 1.0m of soil The presence of free product should be assessed in accordance with information in the S106 (Ref. 1).				
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 aromatic C7-C8 is considered to comprise toluene only by Atkins				
4. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 273 mg/kg				
5. '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.				
6. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
7. No RTC was produced for total TPH as this will be considered further at validation stage				
8. Asbestos has not been considered here as it is being considered in a separate report				
9. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				
10. In the S106 (Ref. 1), “-“ was presented for the RBSLs for copper and zinc for a commercial land use				
11. The values for metals may not be protective of phytotoxic effects				

4.2 Comparison of commercial RBSLs and RTC (deep soil)

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

Table 4.2 – Comparison of commercial RBSLs and RTC for deep soil (1m below 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	5.00E+00	7.10E+01	1.52E+02	final
Toluene	3.89E+02	>sat	>sat	final
Ethylbenzene	None	>sat	>sat	final
Xylene	None	>sat	>sat	final

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
TPH aromatic C7-C8	6.17E+02	>sat	>sat	final
TPH aromatic C8-C10	5.47E+02	>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
TPH aliphatic C12-C16	None	>sat	>sat	final
TPH aliphatic C16-C21	None	Not calculated (see note 3)		
TPH aliphatic C21-C35	None			
TPH aromatic C16-C21	None			
TPH aromatic C21-C35	None			
Total TPH (Phase 1)	8.20E+04	Not calculated (see note 9)		
Total TPH (Process Area)	3.50E+04			
Total TPH (North Tank Farm)	1.40E+04			
Total TPH (South Tank Farm)	3.48E+04			
1,2-Dichloroethane	6.50E-01	1.73E+00	2.75E+00	final
1,1,1-Trichloroethane	3.25E+03	>sat	>sat	final
Tetrachloroethene	3.68E+02	3.98E+02	1.06E+03	final
Trichloroethene	2.80E+01	2.88E+01	7.07E+01	final
Vinyl chloride	1.60E+00	1.54E-01	2.14E-01	draft
Dichloromethane	6.65E+02	6.77E+02	9.76E+02	final
Cis-1,2-Dichloroethene	9.10E+01	3.51E+01	6.70E+01	draft
Trans-1,2 Dichloroethene		5.34E+01	1.11E+02	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 the Total Petroleum Hydrocarbon Criteria Working Group (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 91 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				

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
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				
12. The potential presence of free product should be assessed in accordance with information in the S106 (Ref. 1).				

4.3 Comparison of commercial RBSLs and RTC (groundwater)

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

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

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
Benzo(a)pyrene	None	>sat	final
Benzene	6.00E+00	1.15E+01	final
Toluene	2.29E+02	>sat	final
Ethylbenzene	5.06E+02	>sat	final
Xylene	6.07E+02	>sat	final
TPH aromatic C7-C8	9.70E+01	>sat	final
TPH aromatic C8-C10	None	>sat	final
TPH aromatic C10-C12	None	>sat	final
TPH aromatic C12-C16	None	>sat	final
TPH aromatic C16-C21	None	Not calculated (see note 6)	final
TPH aromatic C21-C35	None		final
TPH aliphatic C6-C8	None	>sat	final
TPH aliphatic C8-C10	None	>sat	final
TPH aliphatic C10-C12	None	>sat	final
TPH aliphatic C12-C16	None	>sat	final
TPH aliphatic C16-C21	None	Not calculated (see note 6)	final
TPH aliphatic C21-C35	None		final
1,2-Dichloroethane	8.20E-01	4.80E+00	final
1,1,1-Trichloroethane	9.89E+02	>sat	final
Tetrachloroethene	1.15E+02	>sat	final
Trichloroethene	1.30E+01	2.85E+01	final
Vinyl chloride	3.00E-01	3.38E-01	final
Dichloromethane	6.24E+02	1.98E+03	final

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
Cis-1,2 Dichloroethene	6.80E+01	7.40E+01	final
Trans-1,2 Dichloroethene	6.80E+01	8.91E+01	final
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 68 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. The potential presence of free product should be assessed in accordance with information in the S106 (Ref. 1).			

5. Conclusions and Recommendations

5.1 Commercial RTC

5.1.1 Conclusions

RTC have been derived for a shallow and deep soil source for a commercial land use. As can be seen in Section 4, some RTC were higher than the RBSL and thus the RBSLs would be protective and suitable for use.

In other cases, the RTC were lower than the RBSL and therefore may not be protective of human health based on the assumptions underpinning the RTC. In such cases the RTC have been marked as draft and may require further assessment.

5.1.2 Recommendations

The lower of the RTC/RBSL is recommended for use in order to be protective for the receptor at the site. It is also recommended that the land use assumptions used to develop the CSM are compared to the development plans to establish whether the RTC are suitable for use. For instance, a less permeable soil type than the sand/sandy loam used within the RTC modelling, may result in a higher RTC and less remediation being required. Information regarding the application of the RTC/RBSL is understood to be presented within the remedial strategy and validation plans (as appropriate).

Should exceedances of the RTC/RBSL be reported, it is recommended that the guidelines outlined in the validation plan (in preparation) are followed.

A number of approaches could be considered for those contaminants where the RTC is lower than the RBSL. The recommended approaches include:

- consideration of building development plans on plot specific basis (e.g. areas of hard standing) versus exceedances of RTC/RBSL;

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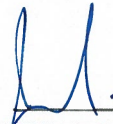
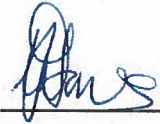
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***PREPARED FOR:
Coed Darcy Limited***

***PREPARED BY:
AECOM Infrastructure &
Environment UK Limited***

FINAL

REV	DATE	REVISION DETAILS	PREPARED BY	CHECKED BY	APPROVED BY
1	12 May 2015	Original issue	Joanne Foy	Rhys Mander	Geoff Jones
			Associate Environmental Scientist	Principal Engineer	Technical Director
			Signed:	Signed:	Signed:
					

AECOM Infrastructure & Environment UK Limited
Longcross Court
47 Newport Road
Cardiff
CF24 0AD
United Kingdom

Telephone: +44(0)29 2046 5960
Fax: +44(0)29 2046 5961

www.aecom.com

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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 29 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 were notified to the Monitor by letter, a copy of which is provided in **Appendix A**.

The Phase Boundary for Phase 29 is the land edged in green on drawing 5041216-REM-DRG-1563 Rev A, a copy of which is provided in **Appendix A**. The approximate location of Phase 29 in relation to the Development Boundary is shown in **Figure** below. The area of Phase 29 is approximately 2,436m².

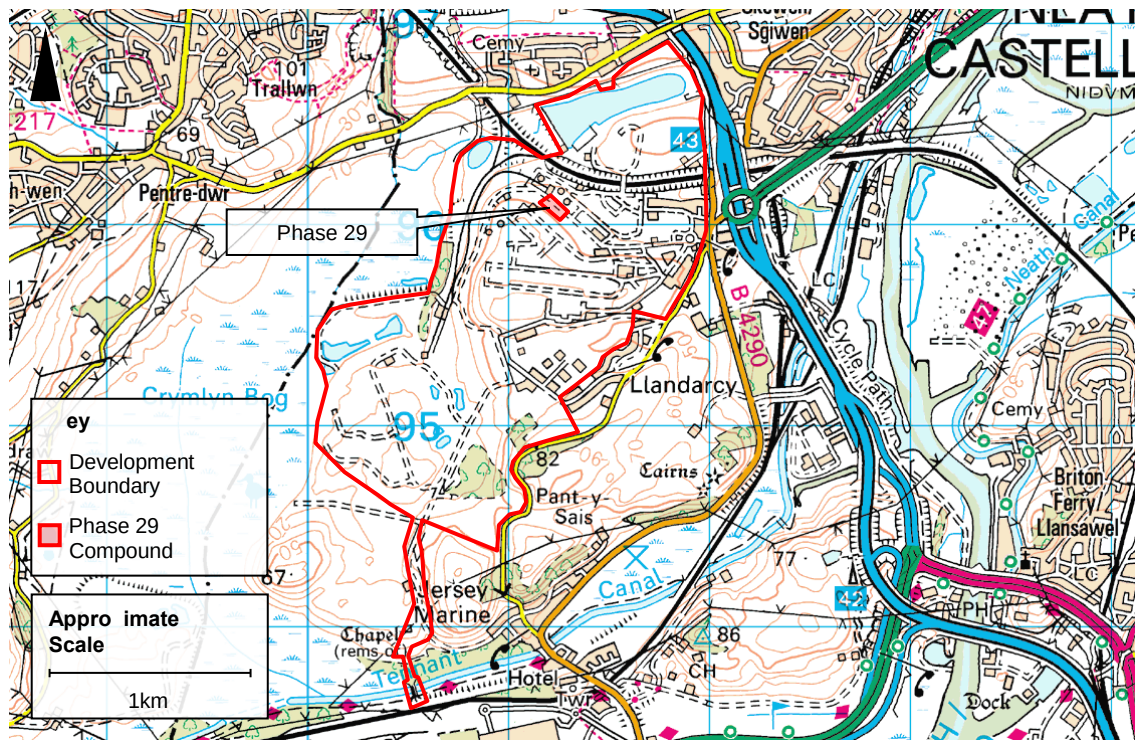


Figure Location plan

The Intended Use has been declared as 'residential' however in the short term the phase will be used as a contractor's compound. With reference to the definitions provided in the Section 106 Agreement, this is considered to comprise a residential phase.

Although a development layout is yet to be confirmed, an outline layout is shown on the current masterplan drawing reference 1332/400/MP/SK/TERT Revision H, a copy of which 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 29; and
- Certify that in the Monitor's professional opinion the Redevelopment Remediation Works have been satisfactorily completed for Phase 29 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 Phase 29. 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

<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>
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
<u>ASBESTOS</u>						
Sum of all Types of ACM	200	300	200	200 ⁴	-	-

otes

“-” 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

<i>Contaminant</i>	<i>Land-Use Specific RBSL (mg/l)</i>		
	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>
Vinyl Chloride	0.06	0.3	18
1,2-Dichloroethene	15	68	none
1,1,1-Trichloroethane	193	989	none

Notes

“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

Notes

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

<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>
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
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

Notes

“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

1.2.2 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 that has been completed to satisfy the RAP requirements pertinent to this Phase are reported separately in RAPWCS ref. 49310747/BRRP00070/Cert 29a.

1.3 Information Sources

A summary of the information sources that the Monitor has been provided with in relation to Phase 29 is provided below in **Table 5**. 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	44382742 / BRRP0001	Report	BP Llandarcy Refinery Desk Study	URS	July 2007
2	5041216-PLOTS-RPT-000992	Report	Geo-Environmental Assessment and Outline Remediation Strategy – Proposed Residential Phase 2	Atkins	July 2013
3	5041216-PLOTS-TN-1245	Technical Note	Coed Darcy - Monitor Phase 29. Response to Monitor Comments RFI0122	Atkins	September 2014
4	5041216-PH2D-RPT-0001139 Revision 1	Report	New Compound Area (Monitor Phase 29) Validation Report	Atkins	November 2014

Requests for Information RFIs Issued by the Monitor

The Monitor has raised one RFI in relation to Phase 29, as summarised in **Table** below. A copy of the RFI is provided in **Appendix** . A copy of the response received is 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>
122	Review of Atkins' New Compound Area (Monitor Phase 29) Validation Report 5041216-PH2D-RPT-0001139 dated May 2014	5041216-PH2D-RPT-0001139	30/07/14	Yes	Response received (Information Source 3 above) with revised report also received (Information Source 4 above)

DESCRIPTION OF REMEDIAL ACTION

The following section provides a description of the remedial action which has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 29. This section of the report is structured as follows:

1. Site Assessment

2. Remediation Strategy
3. Redevelopment Remediation Works
4. Validation

2.1 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.

2.1.1 Desk Study

With reference to Atkins' validation report (Information Source 4) it is evident that Atkins has reviewed a range of information from previous site investigations and desk studies to develop an understanding of both potential and actual contamination.

With reference to the historical maps provide in **Appendix E**, Phase 29 is situated between two former processing units and it is evident that a number of small tanks were present within the area. Atkins assumes that contamination, if present, will be similar in nature to the that found across the Central Processing Area with the potential for inorganic metals, metalloids, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH) and asbestos. The Monitor considers this assessment to be appropriate.

2.1.2 Intrusive Investigations

Based on data from ground investigations within and immediately adjacent to Phase 29, Atkins reports that Phase 29 is underlain by Glacial Drift which overlies Carboniferous Upper Pennant Measures, with solid strata dipping to the north. Pre-remediation ground conditions comprised made ground and glacial soils overlying sandstone bedrock. The made ground is reported to have been soft to firm silty or gravelly clays, with some brick and clinker fragments. Natural soils are reported to have comprised firm brown to orange gravelly clays, locally silts and sands. Atkins also noted strong hydrocarbon odours and sheens in the made ground and natural soils up to a visual/olfactory rating of 4/5 as defined by the aesthetic criteria listed in **Table 3**. However the location of these odours and sheens is not specified. The logs from ground investigations within the Phase (WSTP024, WSTP177 and WSMN013) indicate maximum visual/olfactory ratings of 4/4 in both natural and made ground.

Whilst not detailed in the Atkins report, the Monitor notes that asbestos was previously detected in samples collected from two locations within Phase 29. Asbestos contamination could therefore be expected.

Groundwater across Phase 29 is reported to be situated within the underlying bedrock, although perched water in shallow soils has also been observed. Historical groundwater monitoring indicated that no free-phase product was present.

Other than the historic site investigations discussed above, no further phase-specific site investigations were undertaken. Despite this, the Monitor is satisfied that sufficient information was available for Atkins to develop an understanding of the site conditions prior to remediation.

Remediation Strategy

Schedule 8 of the Section 106 Agreement sets out the minimum remedial action required depending on the groundwater regime. As discussed above, groundwater in Phase 29 is primarily in rock i.e. there is little or no soil material over the bedrock and the water table is normally first encountered in bedrock. This has since been confirmed by Atkins during the remedial works. Given that the Intended Use has been declared as residential, the minimum remedial action required for residential end-use where groundwater is primarily in rock has been applied, as defined in the Section 106 Agreement as follows:

- 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.

Furthermore, Schedule 10 of the Section 106 Agreement sets out additional generic remedial requirements, the following of which are relevant to Phase 29:

- 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.
- 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 Final Finished Level 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.
- 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 Final Finished Level will comprise such imported material in all circumstances of residential and commercial end-use.

Based on the above requirements and the findings of the site assessment discussed in Section 2.1 of this report, Atkins' Remediation Strategy recommended the following scope of redevelopment remediation works for Phase 29 and the wider area:

- Removal of all oil saturated soils and/or free phase product;
- Removal of visible ash and clinker where located <1m below FFL;
- Removal of all soils with a visual/olfactory rating exceeding Class 2;
- Further investigation and removal of all identified asbestos contaminated materials;
- Removal of identified 'hotspots' of increased contamination as identified during the investigation to date.

In addition a range of other works was proposed in order to facilitate the subsequent redevelopment of the Phase, including:

- Removal of all remaining structural remnants, including concrete, brickwork and other identified obstructions;
- Removal of remaining live services, including drainage;
- Re-profiling of the final surface to achieve a stable, free-draining surface.

The Monitor is satisfied that the above remediation strategy is generally consistent with the requirements of the Section 106 Agreement.

Redevelopment Remediation works

The redevelopment remediation works that have been completed for Phase 29 are described in Atkins' Validation Report (Information Source 4) and can be summarised as follows:

- Initial phase of demolition and removal of above ground structures and hardstanding (December 2008 to February 2009);
- Reclamation and remediation, including the removal of below ground structural remnants and unsuitable soils (August to September 2013);
- Validation site investigation (October 2013 to January 2014);
- Outstanding hotspot removal (November 2013 and March 2014); and
- Additional validation sampling (October 2014).

The Monitor is satisfied that the works that have been carried out are in accordance with the remediation strategy outlined above and satisfy the requirements of the Section 106 Agreement.

Monitor's Observations During the Redevelopment Remediation Works

A summary of the observations made by the Monitor during the Redevelopment Remediation Works is provided below in **Table 1**.

Table onitor s Observations uring the Redevelopment Remediation or s

DATE	OBSERVATIONS
24-Jul-2013	Works had started on the remediation of the second residential phase, which includes the contractor's compound at Phase 29. Soils were being excavated down to bedrock and segregated based on a visual/olfactory assessment. Buried structures and redundant pipework was being removed. Some evidence of contamination was noted such as stained soils, oily seepages, sheens and ochreous seepages.
08-Aug-2013	The proposed contractor's compound had been excavated almost to bedrock. Generally the soils contained a shallow band of unacceptable contaminated granular material that was underlain by natural soils which appeared to be acceptable in terms of a visual/olfactory assessment. The excavation measured approximately 150m long by 15m wide and approximately 4m deep. Three trial pits had been excavated at the base of the excavation to confirm the presence of bedrock. The Monitor also inspected the stockpiled material which was proposed as backfill. The soils comprised a clayey gravel. No visual or olfactory evidence of contamination was noted.
15-Aug-2013	The excavation for the compound area remained open and it was noted that the base of the excavation was generally dry indicating that groundwater was situated within the bedrock.
28-Aug-2013	Backfill of the compound area had started.
15-Oct-2013	Backfill of the compound area had been completed to FFL minus 0.5m and validation trial pits were being excavated. One trial pit was observed, which appeared to be generally acceptable in terms of a visual/olfactory assessment. The trial pits were being excavated to a depth of approximately 5.3m, which was the deepest depth that the excavator could reach. Perched groundwater was encountered at shallow depth.
21-Nov-2013	Phase 29 had been occupied by the contractor as a compound area.

A selection of photographs are provided in **Appendi F**.

In summary, the Monitor is satisfied that the works appear to have been carried out in accordance with the Remediation Strategy and the requirements of the Section 106 Agreement.

alidation

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 of the Section 106 Agreement have been achieved. It should be noted that in the absence of a detailed development layout and confirmed FFLs, it has been assumed that the ground level following the completion of the redevelopment remediation works represents FFL minus 0.5m.

Removal of Oil Saturated Soils

The Section 106 Agreement requires the removal of all oil saturated soils and/or free phase product.

Atkins reports that all soils within Phase 29 were excavated to expose bedrock, which involved the excavation of approximately 10,000m³ of soil. These soils were segregated at source based on a visual/olfactory assessment in accordance with the criteria specified in **Table 3**. Based on this assessment, Atkins considered 3,000m³ of material to be unacceptable, due to a visual/olfactory scoring greater than 2.

Based on this assessment, the Monitor is satisfied that all oil saturated soils appear to have been removed from Phase 29.

2.4.2 Soil Chemical Quality and Testing Frequencies

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.

It should be noted that in addition to the RBSLs defined in the Section 106 Agreement, Atkins has also developed Remediation Target Concentrations (RTCs) in order to assess the significance of any reported contaminant concentrations. The RTCs are intended to be health protective for a low density residential end-use. It has been agreed previously with NPTCBC's Environmental Health Department that where the RTCs are numerically lower than the RBSLs, the RTCs shall be used. A summary of the RBSLs and RTCs is presented in **Appendix G**.

As discussed above all soils within Phase 29 were excavated to expose bedrock and the excavated soils were segregated at source based on a visual/olfactory assessment.

Atkins also validated the base of the remediation excavation. However, as it was not possible to collect meaningful samples due to the presence of bedrock, the validation relied on a visual/olfactory assessment. The Monitor considers this to be an appropriate approach.

A total of 24 visual/olfactory observations were made on the bedrock which indicated a maximum rating of 1 in accordance with the criteria specified in **Table 3** which is considered acceptable in accordance with the requirements specified in the Section 106 Agreement.

Given that Atkins reports the removal of approximately 3,000m³ of unacceptable soils, the unacceptable soils observed during the historic site investigations, as discussed in Section 2.1.2 above, are no longer considered relevant with regards to soil chemical quality validation. Therefore the soils required to meet the specified chemical quality thresholds will be those placed within Phase 29 to create the finished profile.

Atkins reports that the backfill material comprised approximately 7,000m³ of the excavated soils from within Phase 29 which were considered suitable for re-use, plus approximately 3,700m³ of site won material from other areas of the Coed Darcy site, reported to have been from the adjacent phase.

With reference to the minimum testing frequencies specified in the Section 106 Agreement, as defined in **Table 4** in this report, Atkins considers that the scenario 'soil treated ex-situ and homogenised' is appropriate for the 3,700m³ of site won material. The Monitor considers this to be appropriate. This scenario requires a minimum validation testing frequency of 1 sample per 200m³ of fill material for both shallow and deep soils for a residential end-use.

Atkins reports that a total of 25 samples were taken from the material prior to placement which represents a testing frequency of 1 sample per 148m³ and therefore meets the requirements specified in the Section 106 Agreement.

Atkins reports that a number of samples exceeded the RBSLs/RTCs for shallow soils within 1m below FFL, as follows:

- Copper – 2 exceedences up to 197 mg/kg;
- Mercury – 5 exceedences up to 4.63 mg/kg;

- Zinc – 1 exceedence at 660 mg/kg;
- Benzo(a)pyrene – 5 exceedences up to 2.3 mg/kg; and
- TPH Aromatic C16-C21 – 3 exceedences up to 165 mg/kg.

However, despite the above exceedences in relation to shallow soils, the materials are acceptable for deep soils below 1m below FFL in residential areas. Atkins reports that these materials were therefore placed at depths greater than 1m below FFL. Whilst it may be difficult to verify this, it should be noted that further validation trial pitting was completed following the placement of the materials, which is discussed further below.

Following the completion of the placement of backfill material within Phase 29, a number of in-situ samples were collected from a series of trial pits. Atkins reports that the trial pits comprised 23 deep trial pits to a maximum depth of 5.3m and 22 shallow trial pits.

With reference to the minimum testing frequencies specified in the Section 106 Agreement, as defined in **Table** in this report, Atkins considers that the 7,000m³ of excavated soils from within Phase 29 that were considered suitable for re-use, should be tested in accordance with the minimum testing frequency for stockpiled excavated site materials for re-use. The Monitor considers this to be appropriate. This scenario requires a minimum validation testing frequency of 1 sample per 50m³ of fill material for shallow soils and 1 sample per 100m³ of fill material for deep soils.

Given that the surface area of Phase 29 is approximately 2,436m² and the finished ground profile is reported to be FFL minus 0.5m, it can be assumed that 1,218m³ of material has been placed at shallow depth. Therefore, given that 10,700m³ of material is reported to have been placed within Phase 29, the volume of material placed at depths greater than 1m below FFL can be assumed to be approximately 9,482m³.

Atkins reports that a total of 46 samples were collected from less than 1m below FFL and 112 samples were collected from greater than 1m below FFL.

This therefore equates to a testing frequency of 1 sample per 26m³ of material for shallow soils and 1 sample per 85m³ of material for deep soils. The Monitor is therefore satisfied that the number of samples collected meets the minimum testing frequencies specified in the Section 106 Agreement. It should be noted that these testing frequencies do not take into account the additional testing undertaken on the 3,700m³ of site won material prior to placement which further increases the testing frequency.

The results of the chemical analysis are presented in Atkins' Validation Report (Information Source 4). The reported results are summarised below:

- Visual/olfactory assessments were undertaken which indicated evidence of contamination up to class 2 in 13 of the trial pits. All of these observations of contamination were recorded at depths greater than 1m below FFL and are therefore considered acceptable in accordance with the requirements of the Section 106 Agreement.
- Water ingress was noted in some of the trial pits but this was not considered to be representative of groundwater on the basis of the lack of water ingress during the previous excavation works. It was also noted that these trial pits were excavated following a period of wet weather and this was considered likely to be the cause of the water ingress. No sheens were reported to have been observed on the water.
- A number of RBSL/RTC exceedences were reported within the 46 samples collected at shallow depth, as summarised below:
 - Mercury – 1 exceedence at a concentration of 6.24mg/kg;

- TPH C6-7 Aromatic – 1 exceedence at a concentration of 0.105mg/kg;
 - TPH C16-21 Aromatic – 5 exceedences at concentrations up to 207mg/kg;
 - Benzo(a)pyrene – 6 exceedences at concentrations up to 2.3mg/kg;
 - Asbestos – 2 exceedences at concentrations up to 1.2%.
- No RBSL/RTC exceedences were reported within the 112 deep samples.

The above RBSL/RTC exceedences within shallow soils were subsequently addressed through hotspot removal as summarised below:

- Excavation to 0.5m at NCA04 (excavation for benzo(a)pyrene and asbestos). Side and base samples were collected and analysed as per the requirements of the Section 106 Agreement with no further exceedences reported.
- Excavation to 1.0m at NCA08 (for asbestos). Side and base samples were collected and analysed as per the requirements of the Section 106 Agreement with no further exceedences reported.
- Excavation to 0.5m at NCA23 (excavation for mercury and benzo(a)pyrene). Side and base samples were collected and analysed as per the requirements of the Section 106 Agreement with no further exceedences reported.
- Excavation to 0.5m encompassing NCA12 to NCA17 (excavation for TPH C6-7 aromatic fraction, TPH C16-21 aromatic fraction, and benzo(a)pyrene). Side and base samples were collected and analysed as per the requirements of the Section 106 Agreement. The following exceedences were noted:
 - One base sample (from NCA14) was noted to exceed the shallow RBSL for arsenic, however given that the depth of the sample was stated as 0.6m it is anticipated that this will be >1m below FFL and therefore the screening against the shallow criteria is conservative and no further action was proposed. The Monitor considers this to be appropriate.
 - Two northern side samples (NCA13N at 0.4m and NCA14N at 0.4m) exceeded the criteria for TPH C16-21 aromatic fraction and benzo(a)pyrene. Atkins reports that the excavation was extended as far as practicable to the north but was restricted by the presence of a road which runs along the northern boundary of this phase. Atkins states that the use of statistical analysis has shown that no further action is necessary as the Upper Confidence Limits for these compounds for the full shallow dataset for Phase 29 is below the RBSL. The Monitor notes however that the use of statistical analysis is only appropriate if it is possible to demonstrate that the dataset used is representative of the material in question, i.e. the material is homogenous. The detection of high concentrations in a defined area along the northern boundary suggests this may not be the case. The requirement therefore to remove this material at a later date should be considered although given the concentrations reported it would appear to be feasible that further risk assessment may provide assurance that the health risk from this material is acceptable.

In summary, the Monitor is satisfied that the soils within Phase 29 meet the necessary chemical quality as specified in the Section 106 Agreement. However, the potentially unacceptable material identified along the northern boundary of Phase 29 should be reinvestigated during the remediation of the adjacent Phase. It should however be noted that given the concentrations reported it may be feasible that further risk assessment could provide assurance that the health risk from this material is acceptable.

Furthermore, it is noted that Phase 29 will temporarily be used as a contractor's compound before it is eventually redeveloped for residential use. Any subsequent land contamination matters that may arise during the use as a contractor's compound should be investigated and verified prior to the redevelopment of the Phase.

2.4.3 *Aesthetic Quality of Soils*

The Section 106 Agreement requires that the aesthetic quality of soils for at least the first metre below FFL shall be Class 1 or better (i.e. no more than a faint odour and occasional staining of soil) and that the aesthetic quality of soils at greater than 1m below FFL shall be Class 2 or better (i.e. no more than a distinct (but not strong) odour and frequent staining of soil).

As noted in Section 2.4.1 above, all soils within Phase 29 were excavated and segregated at source based on a visual/olfactory assessment. Atkins considered 3,000m³ of material to be unacceptable, based on a visual/olfactory scoring greater than 2. This material was therefore removed.

Atkins also monitored the placement of backfill material and recorded a maximum visual/olfactory score of 2 within the backfill material. However, this scoring of 2 was recorded at a depth greater than 1m below FFL, which is considered acceptable in accordance with the requirements of the Section 106 Agreement for deep soils within a residential area.

In summary, the Monitor is satisfied that the soils within Phase 29 meet the necessary aesthetic quality as specified in the Section 106 Agreement.

2.4.4 *Ash, Clinker and Metals*

The Section 106 Agreement requires the removal of soils where there is visible ash and clinker or metal concentrations above RBSLs, so that none is retained within the first metre below FFL in garden areas.

Atkins reports that deposits of ash and clinker were noted during the historic site investigations. However, as discussed above, all in situ soils were removed down to bedrock and segregated based on a visual/olfactory assessment. Ash and clinker, where present, was identified and removed as part of this exercise.

Following the placement of the backfill material, a series of trial pits were excavated and samples were collected for analysis. As noted in Section 2.4.2 above, one RBSL/RTC exceedance for metals was identified within shallow soils. This mercury hotspots was subsequently excavated and the material removed from Phase 29.

The Monitor is therefore satisfied that the soils within Phase 29 meet the necessary requirements for ash, clinker and metals in accordance with the Section 106 Agreement.

2.4.5 *Groundwater*

The Section 106 Agreement requires that where it is not practicable to address groundwater contamination within bedrock this must be controlled, for example where seepages, 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.

Based on the information from historic site investigations, coupled with the observations during the redevelopment remediation works, groundwater appears to lie within the bedrock which is at considerable depth. Therefore, given the placement of materials above bedrock, no seeps, sheens or iron staining is anticipated to discharge from the bedrock at surface.

The Monitor is therefore satisfied that no further control measures are required in relation to groundwater in accordance with the requirements of the Section 106 Agreement.

Asbestos

The Section 106 Agreement requires that all soil potentially containing dispersed asbestos fibres or visible asbestos containing material must be removed or remediated to meet in bulk the appropriate RBSL, or to meet the requirements of relevant Environmental Authorities, whichever is the more conservative.

It should be noted that whereas under the scenario defined in the Section 106 Agreement for a residential phase where groundwater is primarily in rock there is no minimum depth to which this requirement must be achieved, for the scenario where groundwater is in soil, the above requirement must be met to a minimum depth of 2m below FFL. On previous Phases it has been agreed that it is appropriate for this minimum depth to also apply to residential phases where groundwater is in rock.

As noted in Section 2.4.2 above, two RBSL/RTC exceedences were identified for asbestos within shallow soils. Both hotspots were subsequently excavated and the material removed from Phase 29.

The Monitor is therefore satisfied that the soils within Phase 29 meet the necessary requirements for asbestos in accordance with the Section 106 Agreement.

Buried Services

The Section 106 Agreement requires the removal of all existing buried services. Given that all soils were removed down to bedrock, the Monitor is satisfied that all existing services have been removed from within Phase 29.

Recontamination of Soils from Groundwater

The Section 106 Agreement requires that wherever there is a risk that 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 may be exceeded, all necessary steps shall be taken to mitigate these risks.

As noted above, based on the information from historic site investigations, coupled with the observations during the redevelopment remediation works, groundwater appears to lie within the bedrock which is at considerable depth. Therefore it is considered unlikely that groundwater could contaminate soils within the top one metre below FFL.

Soils Within the Top Half Metre

The Section 106 Agreement requires a minimum thickness of suitable garden soils to be provided in residential 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.

As noted above, the finished ground profile following the completion of the remediation works is reported to be FFL minus 0.5m, which assumes that a minimum of 0.5m of clean cover will be placed as required in the Section 106 Agreement. The as-built ground levels following completion of the remediation works are shown on Atkins drawing 5041216/300SD/DWG/1684 a copy of which is provided in **Appendix C** (Information Source 4).

It should be noted that any subsequent import of material and/or removal of material from the development Phase following certification will need to be controlled by the Local Planning Authority as the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued.

It should also 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 report may be necessary.

CERTIFICATION

Redevelopment Remediation Works

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.

With reference to the minimum remedial action required, as discussed in Section 2.2 of this report, **Table** provides a summary of whether or not in the Monitor's professional opinion these objectives have been satisfied.

Table Certificate Summary

REQUIREMENT	STATUS	COMMENTS
All oil saturated soil should be removed.	Complete	Refer to Section 2.4.1
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.	Complete (refer to comments)	Refer to Section 2.4.2 The potentially unacceptable material identified along the northern boundary of Phase 29 should be reinvestigated during the remediation of the adjacent Phase. It should however be noted that given the concentrations reported it may be feasible that further risk assessment could provide assurance that the health risk from this material is acceptable. Furthermore, it is noted that Phase 29 will temporarily be used as a contractor's compound before it is eventually redeveloped for residential use. Any subsequent land contamination matters that may arise during use as a contractor's compound should be investigated and verified prior to the redevelopment of the Phase.
The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.	Complete	Refer to Section 2.4.3
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.	Complete	Refer to Section 2.4.4

REQUIREMENT	STATUS	COMMENTS
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 2.4.5
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.	Complete	Refer to Section 2.4.6
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.	Complete	Refer to Section 2.4.7
Wherever there is a risk that 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 may be exceeded, all necessary steps shall be taken to mitigate these risks.	Complete	Refer to Section 2.4.8
A minimum thickness of suitable garden soils shall be provided in residential areas, soils for landscaping in public and commercial areas and sub-base for hard surfaced areas. The Developer shall build up the final elevation 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.	Not complete	Refer to Section 2.4.9 Placement of the final 0.5m of clean cover is yet to be completed. The placement of this material will be controlled by the Local Planning Authority.

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 29.

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.

Atkins has not undertaken a ground gas assessment for Phase 29. Atkins proposes that the exact details of the gas protection systems shall be agreed with the relevant regulatory authorities prior to installation. As discussed above, the Monitor shall, if requested by CDL, review any certificate or other documentation purporting to confirm that Preventative Measures have been completed or are not required.

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RR CC

This RRWCC confirms that in the Monitor's professional opinion, and on the basis of the information provided within the Information Sources and observations made by the Monitor during the remediation works, the Monitor is satisfied that the Phase 29 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 once CDL is satisfied that the remediation necessary for the specified Intended Use 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

Sir Stanley Clarke House, 7 Ridgeway, Quinton Business Park, Birmingham, B32 1AF

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

1st July 2014

Our ref:

Coed Darcy Limited
Dumfries House
Dumfries Place
Cardiff
CF10 3ZF

Dear Sirs

**Coed Darcy
Phase 29 - New Compound Area
Request for Phase Works Completion Date**

We hereby give our written request seeking the declaration of the Phase Works Completion Date for Phase 29 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 29 boundary is shown on the attached Drawing No. 5041216-REM-DWG-1563 Revision A.

The "Intended Use" for Phase 29 is confirmed as that of a temporary compound in the short term and subsequently residential housing with gardens and associated infrastructure within the final development.

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

Yours faithfully

A handwritten signature in black ink, appearing to read "Neil Williams".

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

Key
Monitor Phase Boundary

A BOUNDARY REVISED MJ AP 25/03/14

REVISIONS Drawn By Checked By Date

PURPOSE OF ISSUE Rev. Authorised for Issue Date

Atkins Limited

Telford Office
Coneslone House
Stafford Park 13
Telford TF3 3AZ
Tel 01952 201234
Fax 01952 200981

Birmingham Office
The Axis, 19 Holliday Street
Birmingham
West Midlands B1 1TF
Tel 0121 483 5000
Fax 0121 483 5252

THIS DRAWING IS NOT TO BE SCALED

CLIENT

ST.MODWEN

PROJECT
COED DARCY

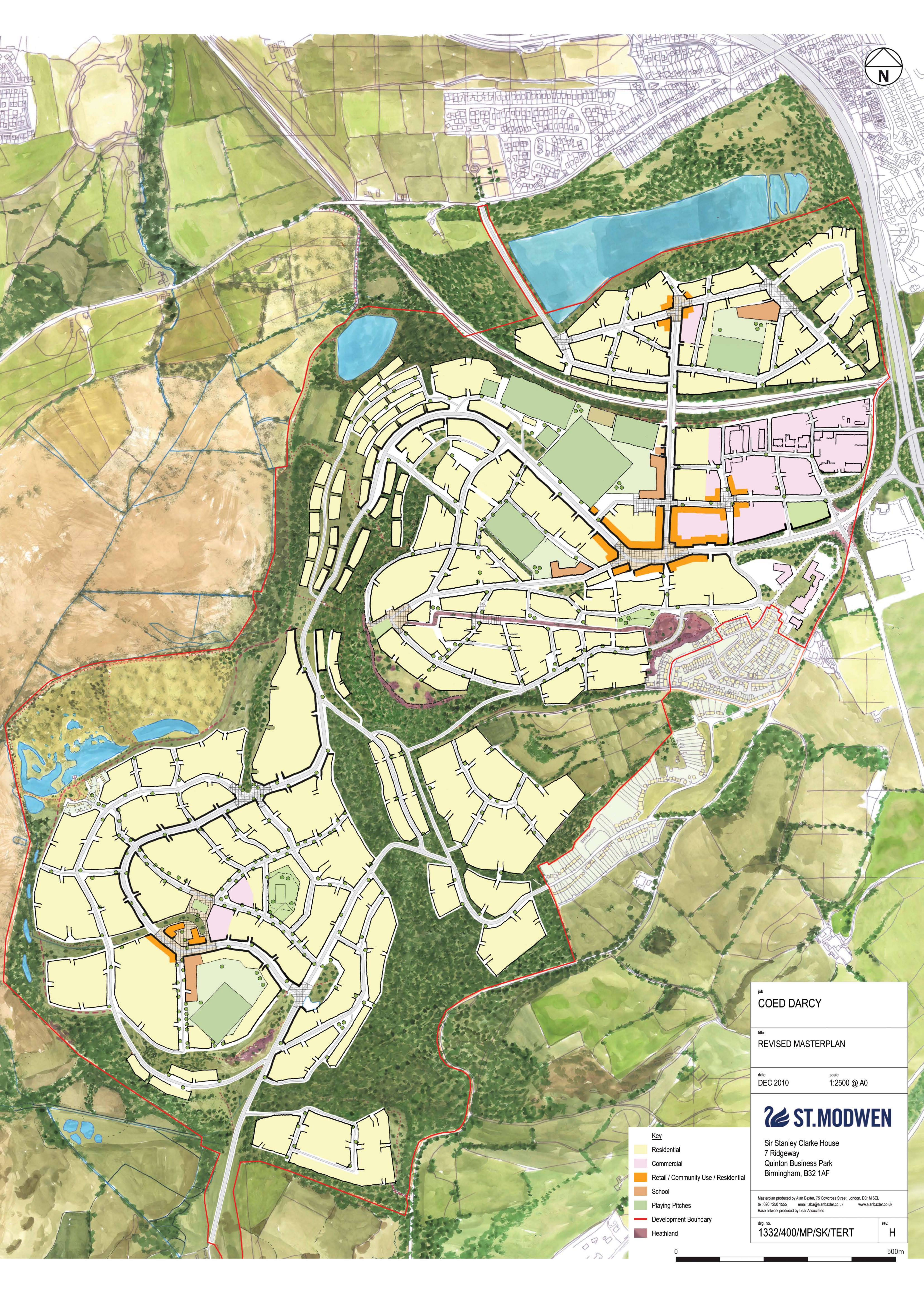
DRAWING TITLE
PROPOSED PHASE BOUNDARY
MONITOR PHASE 23

SCALES 1:1250 DRAWN MJ CHECKED ML CO-ORD CHECK

DATE 22.07.13 DATE 22.07.13 DATE

0 1 2 3 4 5 6 7 8 9 10 SHEET A3 PLOT DATE 28.03.14

DRAWING NO 5041216-REM-DRG-1563 REV A



- 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
 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



*A E I B SC E LE OF T E
SECTION
A REE E T*

SCHEDULE 8

Redevelopment Remediation Works

Purpose, objectives and requirements of the Redevelopment Remediation Works

Part 1

1. Purpose and objectives of the Redevelopment Remediation Works

- 1.1 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 within the meaning of paragraph 1.2 below for its Intended Use or such other use as may be determined from time to time.
- 1.2 A part of the Property will only be suitable for its Intended Use or such other use as may be determined from time to time if and when the Phase Works Completion Date is declared in respect of that part of the Property.

Part 2

2. Developer's obligations regarding Redevelopment Remediation Works

- 2.1 The Developer shall carry out or procure the carrying out of all Remedial Action necessary in order to achieve the purpose and objectives set out in Part 1 of this Schedule.
- 2.2 The design and specification of the Redevelopment Remediation Works shall take appropriate account of the principles and objectives (as set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Schedule 7 hereto) and the design assumptions of the RAP Works and shall not prejudice the achievement and future sustainability of these principles and objectives of the RAP Works or the RAP Works themselves.
- 2.3 The Redevelopment Remediation Works may reduce the reliance on the RAP Works to achieve the principles and objectives of the RAP Works set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Schedule 7 hereto but must not increase that reliance.
- 2.4 The RBSLs set out in Tables 1 and 2 below and the aesthetic criteria, remediation quality and scope (including the depth below Final Finished Level to which quality standards are achieved) as also set out in Part 3 below, 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.
- 2.5 Without prejudice to the requirement to achieve the RBSLs set out in Tables 1 and 2 as a minimum base level standard, the Developer shall ensure that all necessary remediation targets are developed and used to determine the extent and quality of remediation appropriate to the development design and purpose of the Urban Village and the Pre-Transfer Date Contamination.
- 2.6 The Developer shall promptly notify CDL and the Monitor if at any time it or any person acting on its behalf identifies a substance present at, in, on or under the

Property, or has reasonable cause to suspect such presence, for which no RBSL is specified in Tables 1 or 2 of Part 3 below in which case the following procedure shall apply:

- 2.6.1 As soon as reasonably practicable after serving a notice under paragraph 2.6 above, the Developer shall prepare proposals for soil and groundwater RBSLs for the substance identified that are consistent with the purpose and objectives of the Redevelopment Remediation Works as set out in Part 1 of this Schedule and the standards of prevailing Environmental Law and shall provide a copy of such proposals to CDL the Monitor and the Authority. Any such proposal shall contain a detailed statement of the health risk assessment and general methodology from which the proposed RBSLs have been derived.
 - 2.6.2 Not earlier than 10 Working Days after submitting its proposals to CDL the Monitor and the Authority in accordance with sub-paragraph 2.6.1 above, the Developer shall submit a written request to the appropriate Environmental Authorities, copied at the same time to CDL the Monitor and the Authority, for approval of the use of the proposed RBSLs. The Developer shall provide to the appropriate Environmental Authorities with its request copies of the health risk assessment and general methodology referred to in sub-paragraph 2.6.1 above and a copy of this Agreement clearly drawing attention to the purpose, objectives and requirements of the Redevelopment Remediation Works set out therein and the proposed changes thereto.
 - 2.6.3 Each of the Developer, CDL and the Monitor shall be free at any time to make such submissions to the appropriate Environmental Authorities in relation to the Developer's proposals as they see fit, provided such submissions are made in writing and copied to each other and the Authority at the same time.
 - 2.6.4 The Developer shall ensure that the Redevelopment Remediation Works achieve compliance with any RBSLs approved in writing by the appropriate Environmental Authorities pursuant to this paragraph 2.6, as if they were also set out in Tables 1 and 2 of Part 3 of this Schedule.
- 2.7 The Developer may at any time propose variations to the requirements of clauses 3 to 8 inclusive of this Schedule 8 below to the appropriate Environmental Authorities and to the Authority pursuant and to the extent required to comply with the Planning Permission to take account of changes of circumstances since the date of this Agreement, provided no variation shall be proposed that is in any way prejudicial to the achievement of the purpose and objectives of the Redevelopment Remediation Works as set out in Part 1 above and, in particular, the achievement of the RBSLs set out in Tables 1 and 2 above (as previously amended in accordance with paragraph 2.6 above if applicable) and provided further that
- 2.7.1 Any such proposals shall be submitted in writing to CDL the Monitor and the Authority at least 10 Working Days before they are submitted to any Environmental Authority;
 - 2.7.2 Any such proposal submitted to any Environmental Authority shall be copied to CDL the Monitor and the Authority at the same time;
 - 2.7.3 The Developer shall enclose a copy of this Agreement with any such proposal made to any Environmental Authority clearly drawing attention to the

purpose, objectives and requirements of the Redevelopment Remediation Works set out therein and the proposed changes thereto;

- 2.7.4 Each of the Developer, CDL and the Monitor shall be free to make such submissions to the appropriate Environmental Authorities in relation to the Developer's proposals as they see fit, provided such submissions are made in writing and copied to each other and the Authority at the same time.
 - 2.7.5 Subject to paragraph 2.7.6 no such proposed variation shall be implemented unless, it has been approved in writing by the appropriate Environmental Authorities in accordance with the requirements of this clause 2.7.
 - 2.7.6 If the Developer has only oral approval (or non objection) to a proposed variation from the relevant Environmental Authorities, no such proposed variation shall be implemented unless the Developer notifies the relevant Environmental Authorities in writing (copied at the same time to CDL the Monitor and the Authority) that it proposes to proceed with the implementation of the proposed variation to the Redevelopment Remediation Works 10 Business Days after the date of such notice and no written objections of any relevant Environmental Authority are received within such 10 Business Day period in respect of the same.
 - 2.7.7 Any reference in this Agreement to the Redevelopment Remediation Works shall be to the Redevelopment Remediation Works as varied in accordance with this paragraph 2.
- 2.8 The Developer shall, and shall procure that any person acting on its behalf in relation to any aspect of the Redevelopment Remediation Works required by this Schedule 8 shall, at all times comply with the requirements of Schedule 10 (General Remediation Requirements).

Part 3

Table 1 – Summary of Soil RBSLs

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
METALS & METALLOIDS						
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	478	-	478	-	-	-
Zinc	200	-	200	-	-	-
ORGANIC SPECIES						
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
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	-	-

“-“ 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 See text below for specification of relevant depth ranges

Table 2 – Summary of RBSLs for Groundwater

Contaminant	Land-Use Specific RBSL (mg/l)		
	Residential	Commercial	Recreational
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

“none”= theoretical RBSL greater than solubility limit

3. Scale of aesthetic criteria

Table 3 – Scale of aesthetic criteria

Class	Visual	Olfactory
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

3.1 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.

3.2 All references in Table 1 above to depths to which minimum RBSLs are to be achieved are expressed below, relative to FFL following completion of construction of the intended Urban Village.

4. Residential End-Use where Groundwater is Primarily in Rock

4.1 This remediation scenario is intended to refer to residential end-use in areas where 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. Areas of the Property with these characteristics include the more elevated parts of the former process area and of the southern tank farm. The minimum Remedial Action required in this scenario is as follows:

4.2 All oil saturated soil should be removed.

4.3 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.

4.4 The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.

4.5 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.

4.6 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.

4.7 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.

5. Residential End-Use where Groundwater is in soil

- 5.1 This remediation scenario is intended to refer to residential end-use in areas where there is sufficient soil material over bedrock to commonly contain perched groundwater such that the water table is normally first encountered in soil. Areas of the Property with these characteristics include the lower parts of the former process area and of the southern tank farm and the north site tank farm. The minimum Remedial Action required in this scenario is as follows.
- 5.2 All oil saturated soils and free product shall be removed.
- 5.3 Soils must be remediated so as to meet the RBSLs for TPH, BTEX and PAHs to a minimum depth of 0.5m below the likely seasonal minimum groundwater depth following development of the intended Urban Village. This depth is to be established by consideration of all available groundwater level monitoring data relevant for each area. All soil must meet aesthetic criteria Class 2 or better to the same depth.
- 5.4 All soil must meet aesthetic criteria Class 1 or better to at least 1m below FFL.
- 5.5 Soils where there is visible ash and clinker or metal concentrations above RBSLs to be replaced to at least 1m below FFL.
- 5.6 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 the requirements of relevant Environmental Authorities, whichever is the more conservative, to a minimum depth of 2m below FFL.
- 5.7 Where there is a risk of the migration in ground of hazardous gas or vapour or contaminated liquid into remediated areas, the Developer shall take all necessary measures appropriate to prevent this occurring, including monitoring whatever measures are put in place after their installation to continue to demonstrate their effectiveness. Such measures could include the installation of interception trenches and management of discharge from these.
- 5.8 Where necessary, seeps, sheens and iron rich discharges from the bedrock must be permanently controlled such that there is no visible discharge at surface and little or no odour detectable. Acceptable methodologies for remediation may include, but are not limited to the use of land drainage via interceptors.

6. Commercial End-Use where Groundwater is in soil

- 6.1 This remediation scenario is intended to refer to commercial end-use in areas where there is sufficient soil material over bedrock to commonly contain perched groundwater such that the water table is normally first encountered in soil. The area identified for commercial development in the Masterplan is the lower part of the former process area, which in general terms has these characteristics. Based on the Masterplan, no commercial developments are currently envisaged where groundwater is primarily encountered only in rock; in the event such development is proposed, Remedial Action consistent with the standards specified below would be required, adapted as necessary to local conditions.

- 6.2 All oil saturated soils and soil containing free product other than minor sheens shall be removed to a minimum depth of 2 m FFL or 0.5 m below the likely lowest seasonal groundwater elevation following development of the intended Urban Village, whichever is the deeper. This depth is to be established by consideration of all available groundwater level monitoring data.
- 6.3 All soils must meet the RBSL for TPH to at least 1m below FFL.
- 6.4 All soils must meet in bulk, considering both dispersed fibres and pieces of ACM”, the RBSL for ACM to at least 1m below FFL and any visible ACM encountered during construction in the first 1m below FFL is to be removed.
- 6.5 Where there is a risk of the migration in ground of hazardous gas or contaminated liquid into remediated areas, the Developer shall take all appropriate measures to prevent this occurring. Such measures could include the installation of interception trenches and management of discharge from those. The Developer shall monitor whatever measures are put in place after their installation to continue to demonstrate their effectiveness.
- 6.6 Where necessary, seeps, sheens and iron rich discharges from the bedrock must be controlled such that there is no visible discharge at surface and little or no odour. Acceptable methodologies for remediation may include, but are not limited to the use of land drainage via interceptors.

7. Public Open Space

- 7.1 The Developer shall remediate areas of the Property which will not be developed for residential or commercial end-uses based on those areas falling into one of the following three broad categories of land-use:
- 7.1.1 Well managed parks and public gardens;
- 7.1.2 More lightly managed areas where public access is encouraged;
- 7.1.3 Areas to which access is discouraged but occasional access and/or trespassing is possible.
- 7.2 The degree of protection that will need to be afforded to people will be largely dependent upon how the access to these areas is encouraged/discouraged and managed. For guidance only, access may be discouraged by physical barriers such as fencing, or vegetation, or actively managed by the provision of walkways along which controlled access is encouraged. The topography of the site may encourage children to use bikes, potentially causing rutting of the ground surface and exposing soils at depth. Detailed designs in this regard will be prepared by the Developer approved by CDL and agreed with the Environmental Authorities to (i) protect human health considering the reasonably anticipatable use of the land (ii) achieve the relevant RBSLs (recreational RBSLs being provided in Table 1 above) to an appropriate depth and (iii) include an appropriate scheme of validation testing.

8. Validation

- 8.1 As a minimum validation of RBSL's will be required to include:
- 8.1.1 Determining the necessary extent of remedial excavations: this will be the responsibility of the Developer;

- 8.1.2 Quality assurance of imported materials, including testing of imported materials for contamination if it is intended to use reclaimed aggregates, top soil, etc: this will be the responsibility of the Developer, however, CDL may elect to validate such materials in-situ, once they are finally placed for construction;
- 8.1.3 Quality assurance of soils treated on the site for re-use: this will be the responsibility of the Developer, however, CDL will validate such materials in-situ, once they are finally placed for construction, and;
- 8.1.4 Quality assurance of soils for which no remedial works are identified: this will be the responsibility of the Developer, however, CDL will validate such materials.

8.2 As a minimum, sampling at the following frequencies should be undertaken.

Table 4 - Minimum Validation Testing Frequencies.

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)
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
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

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 (ie aesthetic) observation

- 8.3 The quality of all material placed as fill and/or remaining in-situ post-construction of the Urban Village must as a minimum meet the relevant RBSLs and aesthetic standards at the frequencies set out above (in either case as the same may be amended in accordance with this Schedule).
- 8.4 In all circumstances, CDL and/or the Monitor may at its discretion take additional samples if it has reason to suspect that material may not meet the relevant RBSLs and

aesthetic standards (in either case as the same may be amended in accordance with this Schedule).

- 8.5 All validation samples obtained by CDL and/or the Monitor whether according to the above frequencies or on a discretionary basis must on analysis be of the same or better quality than the relevant RBSLs and meet or exceed the relevant aesthetic criteria (in either case as the same may be amended in accordance with this Schedule).

A E I C I FOR ATIO SO RCES

A E I RFI

Contract Name: Coed Darcy Monitor RFI No: 0122

Contract Number: GNP/NJR/13773-2 Date Raised: 30 July 2014

Subject: Review of Atkins' New Compound Area (Monitor Phase 29) Validation Report 5041216-PH2D-RPT-001139 dated May 2014

To: Michelle Lee Atkins

Cc: Mike Poland Atkins

From: Rhys Mander/Joanne Foy URS

Response Required Within:	1 Day		3 Days		5 Days		10 Days	✓
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Comments:

The following queries are raised in relation to Atkins' New Compound Area (Monitor Phase 29) Validation Report 5041216-PH2D-RPT-001139 dated May 2014.

- Section 2.4 (Historical Use) states that "Information relating to the historical development of Monitor Phase 29 has been previously presented in Atkins report 5041216/REM/RPT/992". It is noted that Report 992 does not include detail on Phase 29. In the drawings within Report 992 (drawings 5041216-REM-DWG-613 to 616) Phase 29 is shown between the Edeleanu Unit and the LPG unit. It is not clear which of these two, if either, extends to Phase 29. Of these, only the LPG unit is described in detail in that report. The history of this phase is therefore not detailed in Report 992. Please confirm the historical use of Phase 29 and the potential contaminants associated with it.
- Section 2.8 (Pre Remediation Ground Conditions) states a number of findings from historical ground investigation within Phase 29. Please clarify the intrusive locations these statements refer to. Report 992 includes only two logs from this Phase (WSTP024 and WSMW013) neither of which reach bedrock and neither of which use the current visual/olfactory classification system, however the text in this section refers to both of these things along with other geological details. It should also be noted that asbestos was previously detected in samples from two locations within this Phase.
- Section 2.8 (Pre Remediation Ground Conditions) refers to groundwater levels in WSMW013 and WSMW042. It is noted WSMW042 is not located within Phase 29, but it is acknowledged that the data is relevant to this phase due to the proximity of the well.
- Section 3.1 states that this could either be classified as "residential end use where groundwater is in rock" or "residential end use where groundwater is in soil". It is not stated in this section which scenario is considered the more likely, and which scenario has therefore been used in deciding the remediation requirements. It is alluded to in later sections that refer to the requirements of the Section 106 that the groundwater in bedrock scenario has been used. Please confirm this and provide a short explanation as to why this scenario has is considered appropriate.
- The remedial strategy outlined in Section 3.2.1 does not meet the requirements of the Section 106 for either residential scenario (groundwater in bedrock or soils), however it is noted that later sections confirm that the Section 106 requirements have been met, if the soil in bedrock scenario has been selected.
- Please confirm whether the PID readings stated in Section 5.2 were taken from a headspace bag. It is noted that in previous correspondence (5041216-PH2D-TN-1090 dated 28th October 2013) that headspace bags would be used where an initial visual/olfactory/PID screen indicated the presence of contamination. This would apply to these two locations as staining and odours were observed; please confirm it was undertaken.
- The bedrock validation tables in Appendix D do not include RBSLs for metals or hydrocarbons and therefore cannot be verified. Please amend this table to clearly show the screening criteria used.
- From the details in Section 5.3.1 and earlier referenced sections it appears that 10,700 m3 of material was used to backfill this Phase, with 25 samples taken from this volume. Further, a number of results exceeded the RBSLs for shallow (<1m below FFL) soils but passed the RBSLs for deeper soils. This material was then placed at a depth >0.5m (>1m below FFL) and represented approximately 3,700 m3. Is this interpretation correct?
- It is noted that the analysis of 25 samples from 10,700m3 does not meet the Section 106 requirement of 1 sample per 50m3 (214 samples required), however it is noted that this strategy had previously been agreed with the Monitor.

- The report states that twenty-three validation trial pits (NCA4 to 49) were excavated and refers to drawing 5041216-REM-DRG-1688. Forty-seven trial pit locations are shown on that drawing. In addition, logs are provided in Appendix B for twenty-six trial pits (NCA1 to 26) and include the three bedrock trial pits. Please clearly state the number of trial pits and trial pit identifiers used and provide the appropriate full set of trial pit logs.
- The summary text in Section 5.3.1 is incorrect both in terms of the number of samples that fail (copper, mercury and Benzo(a)pyrene) and the maximum concentration of copper. Please amend and re-issue the report. Please also confirm whether the missing failures were noted at the time of backfilling and the fate of the material represented by these samples.
- The summary text in Section 5.3.2 states that 47 shallow samples and 139 deep samples were collected and refer to Appendix D for summary tables. The text in Section 5.4 also refers to these tables and states that samples were taken from the base, sides and fill for each hotspot excavation. The summary tables include the following:
 - A table with 18 samples from the hotspot excavation for metals and hydrocarbons. This table is not screened and does not include a full set (N, S, E, B and Fill) for each hotspot excavation.
 - A table with 25 samples from the hotspot excavation and 41 shallow trial pits for PAH. This table is only partially screened and doesn't include data for some of the failures quoted in the text.
 - A table with 30 deep samples from the trial pits for PAH. It is titled shallow soils but shows data >1m deep and is not screened.
 - A table with 18 deep samples from the trial pits for metals and hydrocarbons. This table is not screened.
- Overall, the text, trial pit logs, drawings, and tables do not match with many factual errors or inconsistencies. It is not possible therefore to verify the information in the text for either the initial trial pits or the hotspot excavations. Please re-issue a full set of tables including all data, correctly screened and correctly showing whether it is shallow or deep from the trial pits or from the hotspot excavations.
- The text in Section 5.3.2 states that 110 samples were screened for asbestos with 59 then scheduled for quantification. The asbestos results table provided in Appendix D includes a total of 142 samples (32 of which were from hotspot excavation) and 53 quantification results (7 of which were from hotspot excavation). Some quantification results are therefore missing from this table. Please re-issue it with a full data set.
- Given that the land immediately up-gradient (i.e. to the south) of Phase 29 has not yet been remediated, please could you discuss whether or not Phase 29 is considered to be at risk of recontamination and if so what measures are being implemented to avoid this.

Signed:


Date: 30th July 2014**Reply:**

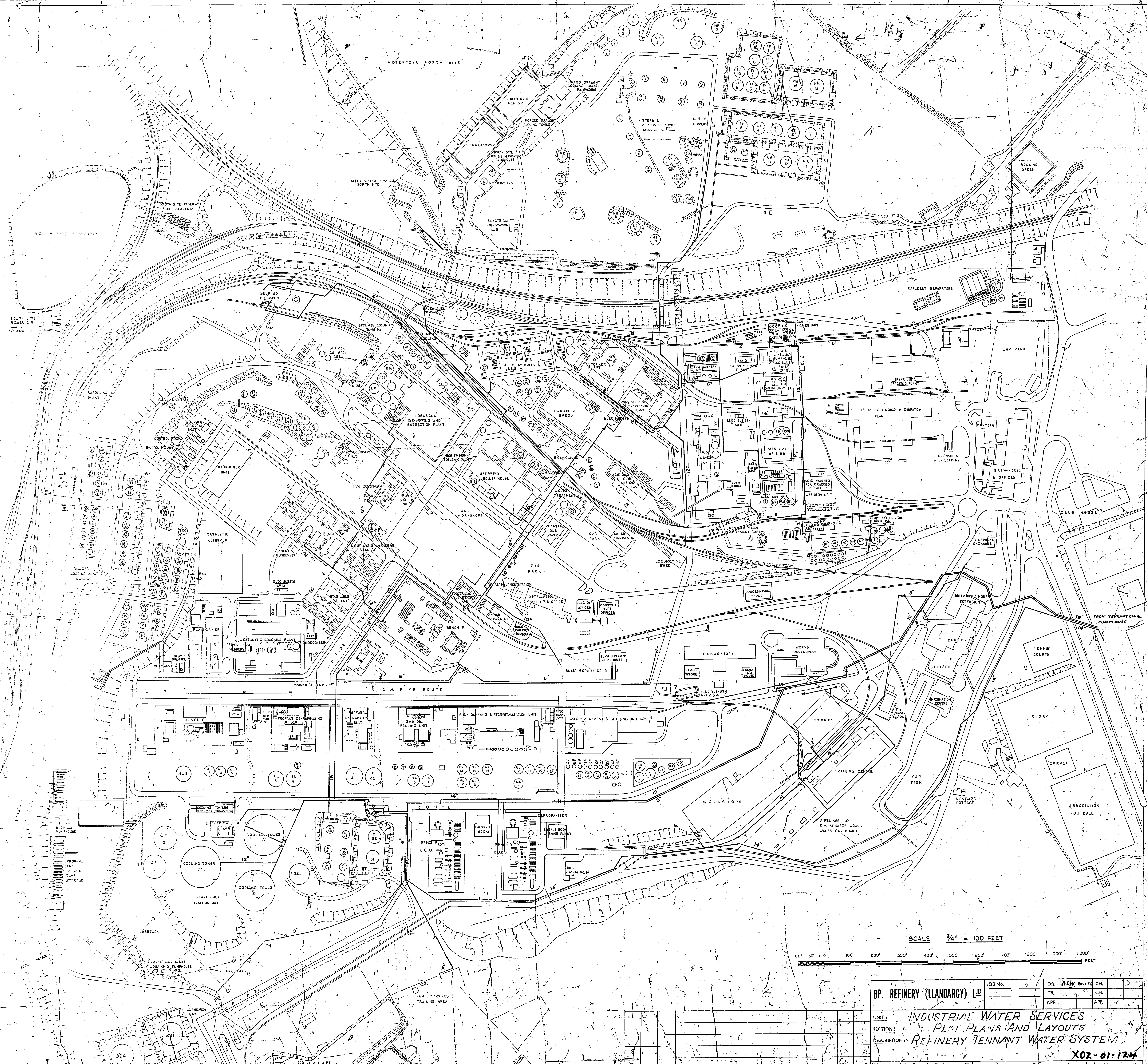
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Date:

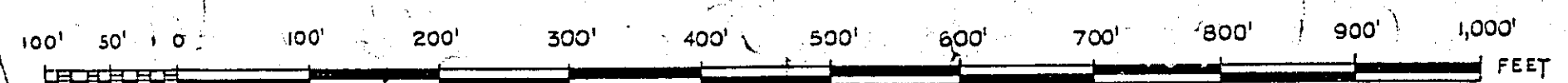
Distribution

To	cc	Name	Company
✓		Mike Poland	Atkins
✓		Michelle Lee	Atkins

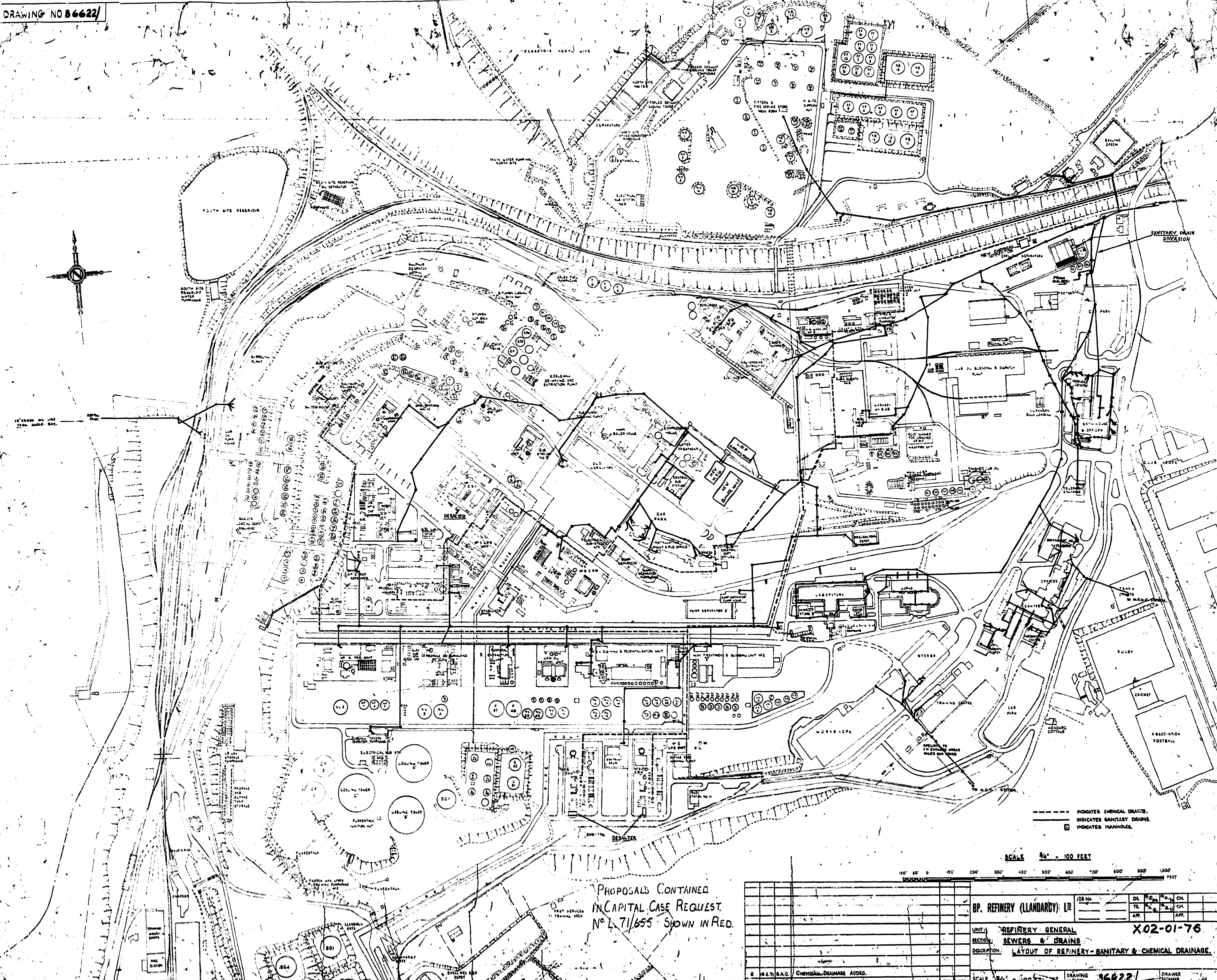
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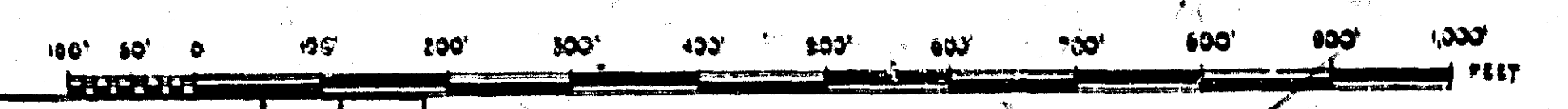


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DESCRIPTION: REFINERY TENNANT WATER SYSTEM				
		X02-01-124		
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				DRAWER NUMBER



INDICATES CHEMICAL DRAINS.
INDICATES SANITARY DRAINS.
INDICATES MANHOLES.

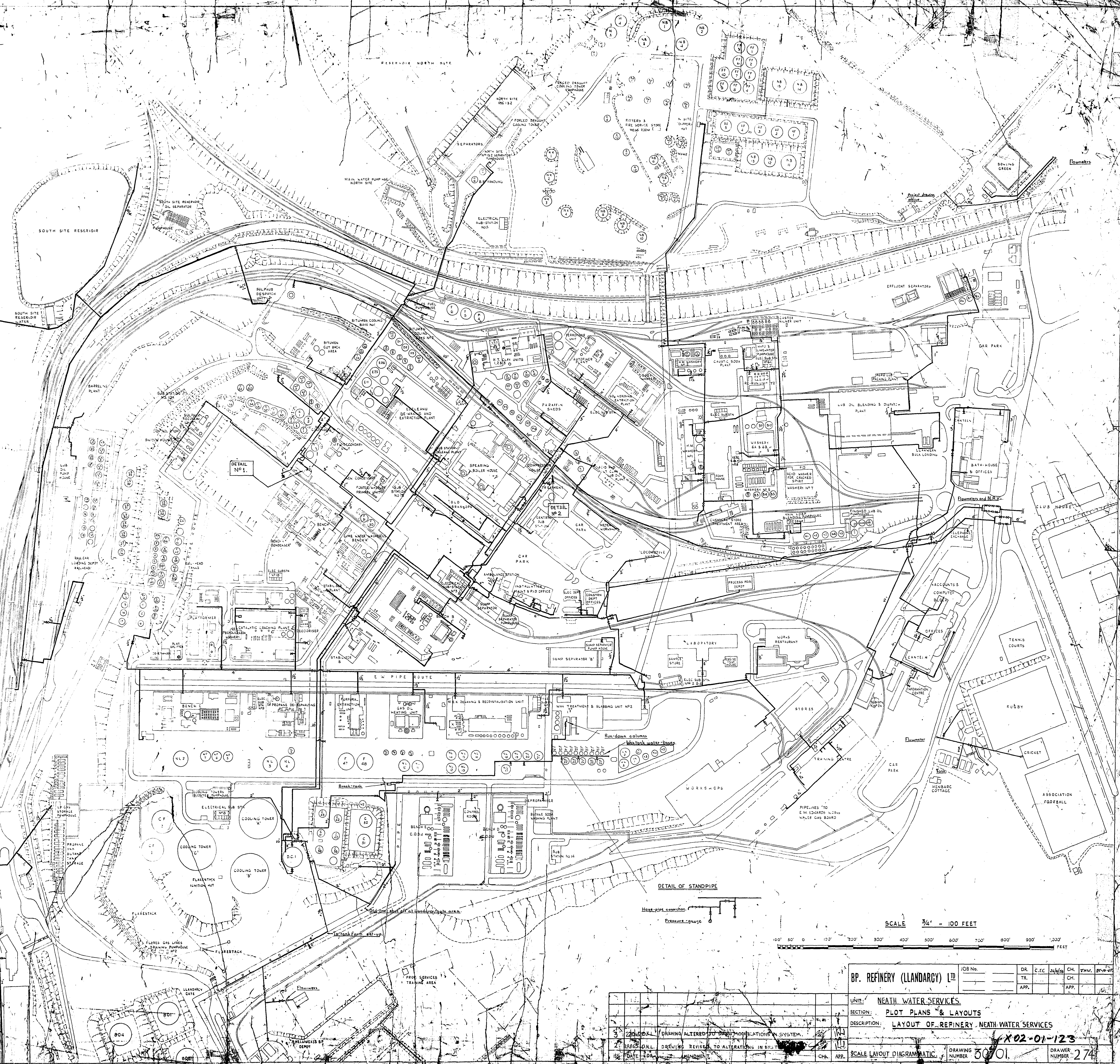
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PROPOSALS CONTAINED
IN CAPITAL CASE REQUEST
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UNIT: REFINERY GENERAL							
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DESCRIPTION: LAYOUT OF REFINERY - SANITARY & CHEMICAL DRAINAGE.							
2 16.7.71 G.A.C. CHEMICAL DRAINAGE ADDED.							
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AMENDMENT							
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SCALE 1/4" = 100 FT.							
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100' 50' 0 100' 200' 300' 400' 500' 600' 700' 800' 900' 1,000' FEET

BP. REFINERY (LLANDARCY) LTD	JOB No.	DR.	C.T.C.	26/10/58	CH.	TNU.	27/10/58
		TR.			CH.		
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UNIT: NEATH WATER SERVICES							
SECTION: PLOT PLANS AND LAYOUTS							
DESCRIPTION: LAYOUT OF REFINERY NEATH WATER SERVICES							
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SCALE LAYOUT DIAGRAMMATIC	DRAWING NUMBER 50701					DRAWER NUMBER 274	