Remediation Statement Appendix E2

Former Albright and Wilson Facility, Whitehaven, Cumbria. Plot C Assessment Actions

17th May 2007
Final

Issue No 2
44320215 / MARP0002_E2

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Report Title:	Former Albright and Wilson Facility, Whitehaven, Cumbria. Plot C Assessment Actions
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Client Company Name:	Rhodia UK Limited
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Approved by	Sophie Bowtell		17th May 2007	Principal Consultant

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1	3rd May 2007	Original issue
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URS Corporation Ltd (URS) was commissioned by Rhodia UK Ltd (Rhodia) to undertake an additional intrusive soil and groundwater investigation at the former Albright & Wilson site in Whitehaven, Cumbria. This work was required based on the concluding assessment actions of the main site investigation in Plot C, conducted in June 2006 and detailed the URS report entitled Plot C Soil and Groundwater Investigation, Former Albright and Wilson Facility, Whitehaven, Cumbria (REF: 44319943/MARP0001, dated 16th October 2006).

The purpose of the additional investigation was to target one specific area within Plot C where uncertainties remained regarding the spatial distribution of arsenic in shallow soil, which had been identified as posing a potential risk to the defined Human Health receptors (based on a public open space end use). Consequently, a trial pitting exercise was undertaken on 6th March 2007 with a total of six trial pits excavated. Following the trial pitting exercise, soil samples were scheduled for arsenic analysis.

These additional results for were then screened against the Stage 3 Human Health criteria used during the main Plot C assessment. Two of the eighteen soil samples exceeded the Human Health screening criteria for arsenic. Consequently, URS recommends remedial works in this area to treat the source zone of contamination. A Best Practical Environmental Option (BPEO) assessment will be required (in conjunction with the potential remedial works across the site) to determine the most cost effective and acheivable method to break the source-pathway-receptor pollutant linkage for this analyte. The extent of this remedial area is likely to be small (approximately 5mx5mx1m deep), although due to restricted accessibility during the site investigation, the northern most extent of the arsenic contamination could not be determined. It is recommended that this should be delineated as part of the remedial works.

1. INTRODUCTION

1.1. General Introduction

URS was commissioned by Rhodia UK Limited on 21st April 2006 to undertake an intrusive soil and groundwater investigation within a parcel of land defined as "Plot C" at the former Albright & Wilson site in Whitehaven, Cumbria as detailed in URS Proposal 130306/SAB/FXW/AJW (dated 13th March 2006). This work was requested by John Moorhouse (Rhodia) at a meeting with Alistair Wyness (URS) on 10th March 2006. This work was conducted during June 2006. The findings of this investigation were presented in a report entitled *Plot C Soil and Groundwater Investigation, Former Albright and Wilson Facility, Whitehaven, Cumbria (REF: 44319943/MARP0001, dated 16th October 2006).*

The report stated that, based on the site data obtained, no risks to Controlled Waters were likely to exist from soils or shallow groundwater within Plot C, and as such, controlled waters are not discussed further in this report. However, the report highlighted that the concentrations of arsenic in soil at a single location within Plot C (Trial pit A111C) may pose a potential risk to Human Health (based on a public open space end use). Additional sampling was required in the vicinity of A111C in order to evaluate the distribution of arsenic, and re-evaluate the potential risk posed by arsenic to Human Health.

This report, which has been incorporated as Appendix E2 of the remediation statement, details this follow up investigation. This additional investigation was incorporated in URS Proposal 1941NG1111 (dated 19th February 2007), which was commissioned by Rhodia on 16th February 2007.

2. SCOPE OF WORKS

The following scope of works was performed in order to determine whether remedial action was necessary.

2.1. Trial Pitting

Trial Pitting was undertaken on 6th March 2007. Prior to excavation, each location was cleared with a Cable Avoidance Tool (CAT Scan). In total 6 trial pits of approximate area 1m x 3.5m (named A118C-A123C) were advanced using a mechanical backhoe excavator to a maximum depth of 1m below ground level. The trial pits were located in the vicinity of A111C (refer to Figures 1 and 2).

The trial pits were backfilled with arisings in the reverse order to their excavation, then compacted using the bucket and tracks of the excavator.

2.2. Soil Inspection and Sampling

The URS field engineer logged the geological sequence observed as the excavation progressed. To assess the potential for contamination, soil samples were taken at regular intervals for headspace analysis (typically every 0.5m). Additional samples were taken for headspace analysis if there was any visual or olfactory evidence of contamination, or where there were pertinent changes in the geology. These samples were screened using a photoionisation detector (PID meter) fitted with a 10.6 eV bulb to assess the potential for chemical impact from volatile hydrocarbons.

Soil samples were collected at approximately 0.05m, 0.5m and 1m below ground level from each of the six trial pits, (a total of 18 samples). These were placed directly into containers supplied by the laboratory and dispatched under chain of custody conditions to the URS approved laboratory (Alcontrol Geochem).

2.3. Levelling

A levelling survey of each of the investigation locations relative to Ordnance Datum and the national grid co-ordinates was conducted by a specialist sub-contractor (Survey Systems) between 12th March and 14th March 2007.

2.4. Laboratory Analysis and Data Management

The analytical suite for the March 2007 investigation was based on the findings of the human health risk assessment in the main Plot C report (REF44319943/MARP0001). As such, analysis for arsenic in soils was scheduled. This data is presented in the Tables section at the end of this report.

3. FIELD OBSERVATIONS AND GROUND CONDITIONS ENCOUNTERED

3.1. Introduction

This section reviews the soil conditions observed during the fieldwork and also summarises the field evidence of impact identified as a result of visual/olfactory observations and/or the results of field screening.

3.2. Soil Conditions

The ground conditions underlying the Plot C area are derived from the inspection of the arisings resulting from excavations advanced during the investigation. A summary of the ground conditions encountered is provided in Table 4.1 below. Note that a more complete discussion of the conditions in Plot C is provided in the main Plot C report.

Trial pit logs are presented in Appendix A, and the location of each trial pit is detailed on Figure 2.

Table 3.1 – Summary of Typical Geological Profile Encountered

Unit	Description	Depth Encountered (m)	Maximum Thickness (m)
Made Ground	Red-brown clayey topsoil with rootlets	0 – 0.1	0.1
	Brown / red-brown clayey soil with fine to coarse gravel, and some cobbles and boulders. Varying amounts of building rubble – concrete, brick, piping and rope.	0.05 - 1.0	Not proven

The geological sequence observed is summarised below.

3.2.1. Made Ground

The maximum thickness of the Made Ground was not proven due to the shallow target depth (of 1m bgl) at each location.

The surface layer comprises topsoil with rootlets. Beneath the surface layer the Made Ground typically compromised the following:

- Fill material: Generally brown or red-brown clayey soil with fine-coarse gravel and cobbles, and occasional brick. At A118C the fill also contained concrete, brick, metal, wood, rope, and plastic. This is thought to be associated with the backfilling and levelling operations in Plot C; and

- Reworked drift: Typically brown clay with frequent fine to coarse gravel and boulders, and occasional bricks.

3.2.2. Natural Ground

No Natural Ground was encountered during the excavation of trial pits in Plot C.

3.3. Groundwater Conditions

No groundwater was encountered during the excavation of trial pits in Plot C.

3.4. Field Observations of Contamination

Field observations (visual and olfactory evidence) were recorded to provide information on the location and nature of potential contamination. No visual or olfactory evidence of contamination was observed in any of the trial pits (A118C to A123C).

3.5. Geochemical Results

The analytical schedules and results of chemical analyses are provided in detail in Tables 1 and 2. In addition to arsenic, several other metals were also analysed as part of a standard minimum suite offered by the laboratory.

In table 3.2 below, the concentrations of arsenic in soil samples have been presented for each trial pit.

Table 3.2 – Arsenic concentrations in soils

Trial Pit	Arsenic Concentration in Soil (mg/kg)		
Depth	**0.05m**	**0.5m**	**1.0m**
A118C	96	270	370
A119C	30	42	18
A120C	10	16	15
A121C	13	16	14
A122C	16	10	11
A123C	7	9	8

Based on the analytical results of this site investigation, elevated concentrations of arsenic are located within the shallow Made Ground in A118C. This trial pit is situated within two meters of A111C which returned the elevated arsenic concentration in the June 2006 investigation. It can therefore be concluded that the distribution of arsenic contamination in Plot C is likely to be highly localised.

4. SUMMARY OF RISKS TO HUMAN HEALTH

Each soil concentration obtained during the March 2007 investigation was initially screened against generic Stage 2 values for the protection of Human Health, based on a "public open space" end use (refer to Table 2 at the end of the report). Five exceedances of the Human Health criteria were determined, all of which were from a single analyte, arsenic at Trial Pits A118C and A119C.

These values were then taken onto a Stage 3 assessment (refer to Table 3). The Stage 3 site-specific value for arsenic used during the main Plot C investigation *(REF: 44319943/MARP0001, dated 16th October 2006)* was used for the screening; the soil screening value was 104mg/kg. Two soil concentrations (from samples taken from A118C at 0.5m and 1.0m) were greater than this value, and therefore deemed to continue to present a theoretical risk to Human Health at Stage 3.

Therefore a total of three samples taken from this area (which includes a sample taken from TPA111C in the June 2006 investigation) present a theoretical risk to Human Health.

On this basis, Section 5 re-evaluates the pollutant linkages determined in the main report, based on the additional (March 2007) data.

5. RE-EVALUATION OF POTENTIAL POLLUTANT LINKAGES

The potential pollutant linkage assessment for Plot C is presented in Section 8 of the main Plot C report (REF: 44319943/MARP0001, dated 16th October 2006). Based on the additional site investigation detailed in this report, the following update has been generated:

Pollutant Linkage Identifier	Pollutant	Source location	Pathway	Main Receptor	Subsequent Receptors	Description of Harm/Pollution of Controlled Waters	Does the linkage still exist, and is it still significant based on the recent site investigation and risk assessment? (Y/N)
C19	arsenic	A111C A118C	HH1, HH2, HH3	Public users	n/a	Potential exposure to arsenic of future users of the site	YES – Remedial action required see Remedial Actions Section below.

6. REMEDIAL ACTIONS

Based on the data obtained by URS during the site investigations to date, it is thought that remedial action is required to treat the soils that pose a potential risk to Human Health which are located to the south west of the former diesel above ground storage tank, in the vicinity of TPA118C. It is thought an area of approximately 5m long x5m wide x 1m deep should be scheduled for remedial works. A Best Practical Environmental Option (BPEO) assessment will be required to determine the most cost effective and acheivable method to break the source-pathway-receptor pollutant linkage for this analyte. Given the restricted access to sampling due to the soil storage area, the northern most extent of the remedial zone is not known, this may have implications on the width of the remedial area. It is proposed that during the remediation, this area is accessed and soil samples are taken from the top 1m of soil, and are scheduled for analysis. Validation sampling from each of the remediation trench walls will also be required.

The remedial area is presented on Figure 2.

TABLES

FIGURES

Figure 1- Site Plan

Figure 2- Proposed Remediation Zone

Appendix A - Borehole & Trial Pit Logs

Appendix B - Laboratory Certificates

Appendix C - Plates

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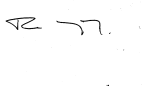
Checked by	Frank Wigley		17th May 2007	Senior Consultant
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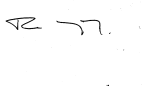
Checked by	Frank Wigley		17th May 2007	Senior Consultant
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EXECUTIVE SUMMARY

URS Corporation Ltd (URS) was commissioned by Rhodia UK Ltd (Rhodia) to undertake an additional intrusive soil and groundwater investigation at the former Albright & Wilson site in Whitehaven, Cumbria. This work was required based on the concluding assessment actions of the main site investigation in Plot C, conducted in June 2006 and detailed the URS report entitled Plot C Soil and Groundwater Investigation, Former Albright and Wilson Facility, Whitehaven, Cumbria (REF: 44319943/MARP0001, dated 16th October 2006).

The purpose of the additional investigation was to target one specific area within Plot C where uncertainties remained regarding the spatial distribution of arsenic in shallow soil, which had been identified as posing a potential risk to the defined Human Health receptors (based on a public open space end use). Consequently, a trial pitting exercise was undertaken on 6th March 2007 with a total of six trial pits excavated. Following the trial pitting exercise, soil samples were scheduled for arsenic analysis.

These additional results for were then screened against the Stage 3 Human Health criteria used during the main Plot C assessment. Two of the eighteen soil samples exceeded the Human Health screening criteria for arsenic. Consequently, URS recommends remedial works in this area to treat the source zone of contamination. A Best Practical Environmental Option (BPEO) assessment will be required (in conjunction with the potential remedial works across the site) to determine the most cost effective and acheivable method to break the source-pathway-receptor pollutant linkage for this analyte. The extent of this remedial area is likely to be small (approximately 5mx5mx1m deep), although due to restricted accessibility during the site investigation, the northern most extent of the arsenic contamination could not be determined. It is recommended that this should be delineated as part of the remedial works.

1. INTRODUCTION

1.1. General Introduction

URS was commissioned by Rhodia UK Limited on 21st April 2006 to undertake an intrusive soil and groundwater investigation within a parcel of land defined as "Plot C" at the former Albright & Wilson site in Whitehaven, Cumbria as detailed in URS Proposal 130306/SAB/FXW/AJW (dated 13th March 2006). This work was requested by John Moorhouse (Rhodia) at a meeting with Alistair Wyness (URS) on 10th March 2006. This work was conducted during June 2006. The findings of this investigation were presented in a report entitled *Plot C Soil and Groundwater Investigation, Former Albright and Wilson Facility, Whitehaven, Cumbria (REF: 44319943/MARP0001, dated 16th October 2006).*

The report stated that, based on the site data obtained, no risks to Controlled Waters were likely to exist from soils or shallow groundwater within Plot C, and as such, controlled waters are not discussed further in this report. However, the report highlighted that the concentrations of arsenic in soil at a single location within Plot C (Trial pit A111C) may pose a potential risk to Human Health (based on a public open space end use). Additional sampling was required in the vicinity of A111C in order to evaluate the distribution of arsenic, and re-evaluate the potential risk posed by arsenic to Human Health.

This report, which has been incorporated as Appendix E2 of the remediation statement, details this follow up investigation. This additional investigation was incorporated in URS Proposal 1941NG1111 (dated 19th February 2007), which was commissioned by Rhodia on 16th February 2007.

2. SCOPE OF WORKS

The following scope of works was performed in order to determine whether remedial action was necessary.

2.1. Trial Pitting

Trial Pitting was undertaken on 6th March 2007. Prior to excavation, each location was cleared with a Cable Avoidance Tool (CAT Scan). In total 6 trial pits of approximate area 1m x 3.5m (named A118C-A123C) were advanced using a mechanical backhoe excavator to a maximum depth of 1m below ground level. The trial pits were located in the vicinity of A111C (refer to Figures 1 and 2).

The trial pits were backfilled with arisings in the reverse order to their excavation, then compacted using the bucket and tracks of the excavator.

2.2. Soil Inspection and Sampling

The URS field engineer logged the geological sequence observed as the excavation progressed. To assess the potential for contamination, soil samples were taken at regular intervals for headspace analysis (typically every 0.5m). Additional samples were taken for headspace analysis if there was any visual or olfactory evidence of contamination, or where there were pertinent changes in the geology. These samples were screened using a photoionisation detector (PID meter) fitted with a 10.6 eV bulb to assess the potential for chemical impact from volatile hydrocarbons.

Soil samples were collected at approximately 0.05m, 0.5m and 1m below ground level from each of the six trial pits, (a total of 18 samples). These were placed directly into containers supplied by the laboratory and dispatched under chain of custody conditions to the URS approved laboratory (Alcontrol Geochem).

2.3. Levelling

A levelling survey of each of the investigation locations relative to Ordnance Datum and the national grid co-ordinates was conducted by a specialist sub-contractor (Survey Systems) between 12th March and 14th March 2007.

2.4. Laboratory Analysis and Data Management

The analytical suite for the March 2007 investigation was based on the findings of the human health risk assessment in the main Plot C report (REF44319943/MARP0001). As such, analysis for arsenic in soils was scheduled. This data is presented in the Tables section at the end of this report.

3. FIELD OBSERVATIONS AND GROUND CONDITIONS ENCOUNTERED

3.1. Introduction

This section reviews the soil conditions observed during the fieldwork and also summarises the field evidence of impact identified as a result of visual/olfactory observations and/or the results of field screening.

3.2. Soil Conditions

The ground conditions underlying the Plot C area are derived from the inspection of the arisings resulting from excavations advanced during the investigation. A summary of the ground conditions encountered is provided in Table 4.1 below. Note that a more complete discussion of the conditions in Plot C is provided in the main Plot C report.

Trial pit logs are presented in Appendix A, and the location of each trial pit is detailed on Figure 2.

Table 3.1 – Summary of Typical Geological Profile Encountered

Unit	Description	Depth Encountered (m)	Maximum Thickness (m)
Made Ground	Red-brown clayey topsoil with rootlets	0 – 0.1	0.1
	Brown / red-brown clayey soil with fine to coarse gravel, and some cobbles and boulders. Varying amounts of building rubble – concrete, brick, piping and rope.	0.05 - 1.0	Not proven

The geological sequence observed is summarised below.

3.2.1. Made Ground

The maximum thickness of the Made Ground was not proven due to the shallow target depth (of 1m bgl) at each location.

The surface layer comprises topsoil with rootlets. Beneath the surface layer the Made Ground typically compromised the following:

- Fill material: Generally brown or red-brown clayey soil with fine-coarse gravel and cobbles, and occasional brick. At A118C the fill also contained concrete, brick, metal, wood, rope, and plastic. This is thought to be associated with the backfilling and levelling operations in Plot C; and

- Reworked drift: Typically brown clay with frequent fine to coarse gravel and boulders, and occasional bricks.

3.2.2. Natural Ground

No Natural Ground was encountered during the excavation of trial pits in Plot C.

3.3. Groundwater Conditions

No groundwater was encountered during the excavation of trial pits in Plot C.

3.4. Field Observations of Contamination

Field observations (visual and olfactory evidence) were recorded to provide information on the location and nature of potential contamination. No visual or olfactory evidence of contamination was observed in any of the trial pits (A118C to A123C).

3.5. Geochemical Results

The analytical schedules and results of chemical analyses are provided in detail in Tables 1 and 2. In addition to arsenic, several other metals were also analysed as part of a standard minimum suite offered by the laboratory.

In table 3.2 below, the concentrations of arsenic in soil samples have been presented for each trial pit.

Table 3.2 – Arsenic concentrations in soils

Trial Pit	Arsenic Concentration in Soil (mg/kg)		
Depth	**0.05m**	**0.5m**	**1.0m**
A118C	96	270	370
A119C	30	42	18
A120C	10	16	15
A121C	13	16	14
A122C	16	10	11
A123C	7	9	8

Based on the analytical results of this site investigation, elevated concentrations of arsenic are located within the shallow Made Ground in A118C. This trial pit is situated within two meters of A111C which returned the elevated arsenic concentration in the June 2006 investigation. It can therefore be concluded that the distribution of arsenic contamination in Plot C is likely to be highly localised.

4. SUMMARY OF RISKS TO HUMAN HEALTH

Each soil concentration obtained during the March 2007 investigation was initially screened against generic Stage 2 values for the protection of Human Health, based on a "public open space" end use (refer to Table 2 at the end of the report). Five exceedances of the Human Health criteria were determined, all of which were from a single analyte, arsenic at Trial Pits A118C and A119C.

These values were then taken onto a Stage 3 assessment (refer to Table 3). The Stage 3 site-specific value for arsenic used during the main Plot C investigation *(REF: 44319943/MARP0001, dated 16th October 2006)* was used for the screening; the soil screening value was 104mg/kg. Two soil concentrations (from samples taken from A118C at 0.5m and 1.0m) were greater than this value, and therefore deemed to continue to present a theoretical risk to Human Health at Stage 3.

Therefore a total of three samples taken from this area (which includes a sample taken from TPA111C in the June 2006 investigation) present a theoretical risk to Human Health.

On this basis, Section 5 re-evaluates the pollutant linkages determined in the main report, based on the additional (March 2007) data.

5. RE-EVALUATION OF POTENTIAL POLLUTANT LINKAGES

The potential pollutant linkage assessment for Plot C is presented in Section 8 of the main Plot C report (REF: 44319943/MARP0001, dated 16th October 2006). Based on the additional site investigation detailed in this report, the following update has been generated:

Pollutant Linkage Identifier	Pollutant	Source location	Pathway	Main Receptor	Subsequent Receptors	Description of Harm/Pollution of Controlled Waters	Does the linkage still exist, and is it still significant based on the recent site investigation and risk assessment? (Y/N)
C19	arsenic	A111C A118C	HH1, HH2, HH3	Public users	n/a	Potential exposure to arsenic of future users of the site	YES – Remedial action required see Remedial Actions Section below.

6. REMEDIAL ACTIONS

Based on the data obtained by URS during the site investigations to date, it is thought that remedial action is required to treat the soils that pose a potential risk to Human Health which are located to the south west of the former diesel above ground storage tank, in the vicinity of TPA118C. It is thought an area of approximately 5m long x5m wide x 1m deep should be scheduled for remedial works. A Best Practical Environmental Option (BPEO) assessment will be required to determine the most cost effective and acheivable method to break the source-pathway-receptor pollutant linkage for this analyte. Given the restricted access to sampling due to the soil storage area, the northern most extent of the remedial zone is not known, this may have implications on the width of the remedial area. It is proposed that during the remediation, this area is accessed and soil samples are taken from the top 1m of soil, and are scheduled for analysis. Validation sampling from each of the remediation trench walls will also be required.

The remedial area is presented on Figure 2.

TABLES

FIGURES

Figure 1- Site Plan

Figure 2- Proposed Remediation Zone

Appendix A - Borehole & Trial Pit Logs

Appendix B - Laboratory Certificates

Appendix C - Plates