ASHDOWN SITE INVESTIGATION LIMITED

GEOTECHNICAL
AND
ENVIRONMENTAL
ENGINEERS

[redacted]

SUMMERLEY CORNER
SUMMERLEY LANE
BOGNOR REGIS
WEST SUSSEX

REMEDIATION STRATEGY AND VERIFICATION PLAN

Report No. LW23303/rs December 2012

Report prepared for the benefit of:

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INVESTOR IN PEOPLE

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1. INTRODUCTION

This report presents a Remediation Strategy and Verification Plan for the proposed development at Summerley Corner, Summerley Lane, Bognor Regis, West Sussex. The development will comprise the demolition of the existing cottage and the provision of 12 apartments with car parking and communal amenity lawn. No privately owned domestic gardens are proposed. Figure 2 outlines the development proposals.

Ashdown Site Investigation Limited was commissioned to prepare the remediation strategy by Mrs Jacqui Shilton of:

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The Remediation Strategy and Verification Plan follows guidance presented in Annex 2 of Planning Policy Statement 23, Chapters 3 and 4 of the Environment Agency Contaminated Land Report 11: Model Procedures for Management of Land Contamination, and the Environment Agency Report "Verification of remediation of land contamination" (Ref: SC030114/R1).

The remediation proposals are based upon the risk assessments carried out by Ashdown Site Investigation Limited. reported in LW23175, dated August 2012 and LW23303/tk dated 18th December 2012. This remediation strategy should be read in conjunction with the previous reports and risk assessments produced for the site.

It is advised that under the terms of the Contaminated Land (England) Regulations 2000 the local authority have ultimate jurisdiction over the assessment of the contamination status of land within their area. It is therefore essential for them to be involved in discussions relating to the scope of the proposed remediation works and the procedures to be followed in order to conclude the works appropriately.

It is noted that this report has been prepared specifically for the Client's project and the recommendations given may not be appropriate to alternative schemes. The copyright for the report and licence for use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned, or where the exploratory hole records and test results contained therein are interpreted by anyone other than the Company.

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2. SUMMARY OF PREVIOUS WORKS

2.1 Phases of Ground Investigation

The following reports concerning previous phases of investigation have been produced for the site by Ashdown Site Investigation Ltd.

- Geotechnical and Contamination (Phase 1 and 2) Assessment Report, Report Ref: LW23175, Dated August 2012.

The phase 1 contamination assessment identified potential risks to the site from metal and PAH contaminated made ground, petroleum hydrocarbons from an underground fuel tank and ground gases from historical ground workings.

The phase 2 contamination assessment confirmed the presence of elevated concentrations of PAH compounds within existing topsoil at the site.

At the time of the investigation it was not possible to identify the location of the underground fuel tank as it lay beneath a garage building. The report recommended that further sampling and testing should be undertaken around the tank once the building had been demolished and the concrete lifted.

- Supplementary Assessment Report on the Underground Tank. Report Ref: LW23303/tk, dated 18th December 2012

Following demolition of the domestic garage four trial pits were excavated to depth of 2.0m on each site of the suspected tank. The trial pits recorded the presence of what appeared to be a concrete cradle to a depth of 1.8m.

No visual or olfactory evidence of petroleum hydrocarbons was recording during the trial pitting and testing of the soils encountered did not recorded any elevated concentrations of petroleum hydrocarbons.

2.2 Site Location and Description

The site comprises a roughly rectangular shaped plot of land located on the south eastern corner of Summerley Lane and Southview Road, Bognor Regis and is centred on the approximate Ordnance Survey national grid reference SZ 9577 9979. A site location plan is presented as Figure 1.

2.3 Ground Conditions

The intrusive investigation confirmed the presence of between 0.20m and 0.60m of made ground below surfacing of tarmac, hardcore or topsoil. Beneath the made ground, boreholes encountered undisturbed firm to stiff and stiff sandy clay or sand/ clay deposits to depths of between 1.1m and 2.0m below ground level.

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Beneath these soils the investigation confirmed the presence of clayey sand that continued to the to the full depth of the investigation (3m)

These soils are considered to represent the River Terrace Deposits soils indicated on the published geological map.

3. REMEDIATION STRATEGY

CLR11 - Model Procedures for the Management of Contaminated Land recommends that remedial action proposed for the site should be justified. It is considered that the need for remedial action has been justified due to the significant pollutant linkages identified within the contamination risk assessment report (Ref: LW23175, dated August 2012 and LW23303/tk dated 18th December 2012). Also as discussed in CLR11, the remediation options have been developed to meet the technical objectives for the development with the major drivers behind the recommendations being:

- To achieve successful remediation within a particular timescale and budget;
- Familiarity with the methodology by the developer/ground worker;
- Confidence that the remediation can be carried out by good technical practices; and
- Likely success of the style of remediation.

It is noted that the risk assessment report has not yet been approved by the local authority. The remediation strategy proposed is provisional based upon their approval of the risk assessment. Additional measures may be required following comment from the local authority.

3.1 Identified Contamination Sources

3.1.1 Existing Sources of Contamination

The risk assessment reports have identified the following sources of contamination at the site:

- Elevated concentrations of PAH compounds with the existing topsoil.

3.2 Treatment of existing contaminant sources

3.2.1 Protection of Human Health

The following works are recommended to address the potential risks identified to the health of end users of the site. Details of how these works will be verified are provided in section 4 of this report.

It is recommended that all the topsoil currently on site should be stripped back and removed from site. An inspection of the stripped formation in all areas of soft landscaping should be made. Verified clean imported topsoil should then be placed in all areas of soft landscaping above a geotextile marker. A sufficient depth of topsoil to provide a suitable growing medium should be placed above the geotextile however no specific cover depth is required.

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The areas of proposed soft landscaping are indicated on Figure 2 of this report.

3.2.2 Groundwater Protection

No significant risk to controlled waters was identified by the risk assessment report and therefore no remediation measures are considered to be necessary..

3.2.3 Protection of Services

The risk of damage to services due to contamination at the site is considered to be negligible. However, it is considered that the service provider's requirements represent the most informed decision when it comes to the protection of their services. It is recommended that service provider's requirements should be fully adhered to and in so doing successfully mitigate any risk posed to services and end users.

Details of any measures required by service providers should be included within the verification report.

3.2.4 Construction Workers

No significant sources of contamination considered likely to pose an acute risk to construction workers have been identified. However, as a minimum and in accordance with industry best practise all ground-workers should be issued with the appropriate PPE and should be instructed in safe working methods. As a precaution instructions should also be given in the recognition of potentially hazardous materials, including oily and odorous soil and water and discoloured or fibrous substances. Any oil-like substances contacting the skin must be washed off immediately using an appropriate cleanser. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food and smoking must be confined to designated clean areas. Suitable welfare (washing) facilities should be provided.

3.3 Watching Brief on Development Works

No specific additional investigation is considered to be necessary at the site. However, as part of the ongoing development works, should any other materials which are suspected of being contaminated be encountered during the works then Ashdown Site Investigation Ltd. should be informed so they can inspect the materials and advise on what actions may be required.

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4. VERIFICATION PLAN

4.1 Inspection of Stripped Formation

Following removal of contaminated topsoil within proposed areas of soft landscaping, the stripped formations will be inspected by engineers from Ashdown Site Investigation Ltd, prior to placement of the geotextile marker and imported cover soils. Sampling of the stripped formation should be carried out in the proposed landscaping areas, with testing of selected samples to ensure they are similar to materials previously recorded.

A plan showing provisional verification sample locations is presented as Figure 3. A photographic record of all stripped formations will be maintained.

It is recommended that the stripped formation level is inspected and sampled following completion of the construction works to prevent vehicle tracking across the proposed soft landscaping areas following the testing.

4.2 Imported materials

Any material from a potentially contaminated (e.g. industrial) site should be rejected. It is recommended that chemical testing results are obtained and supplied for comment prior to accepting the soils on site.

Imported cover materials brought to site should be inspected and sampled by engineers from Ashdown Site Investigation Ltd and verification tests should be carried out to confirm compliance with the recommended screening values – see below.

As a minimum samples of the imported materials taken during the verification inspection should be tested for the presence of arsenic, cadmium, chromium, lead, mercury, nickel, selenium and total polycyclic aromatic hydrocarbons (PAH). The concentrations of PAH should be speciated to provide concentrations of the 16 individual PAH as set out by the USEPA, including benzo(a)pyrene. The material should display no visual or olfactory evidence of petroleum hydrocarbon contamination and contain no significant quantity of putrescible material (incl. wood or paper). The soils should be free from any asbestos containing materials. Screening of samples for the presence of asbestos containing materials may be carried out.

Materials must comply with current CLEA guidance for soils suitable for use within soft landscaping. The table below summarises the soil screening values calculated by Ashdown Site Investigation Ltd. using the CLEA model. Further details of the calculation of these values are provided in the risk assessment report ref: LW23175, dated August 2012.

Topsoil should, when inspected visually, be free from propagules of aggressive weeds, fragments of glass, bricks, concrete, wire or other potentially hazardous

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foreign matter and bulk vegetative growth, in order to ensure negligible risk of subsequent weed problems (introduced in the soil) or traumatic injury.

Table 1. Calculated soil screening values for imported soils

Contaminant	Screening Value (mg/kg)	Contaminant	Screening Value (mg/kg)
Arsenic	35	Fluorene*	1850
Cadmium	80	Phenanthrene*	830
Chromium	627	Anthracene*	19000
Lead	246	Fluoranthene*	970
Mercury	268	Pyrene*	2300
Nickel	130	Benz(a)anthracene*	3.7
Copper	6200	Chrysene*	8.8
Zinc	40300	Benzo(b)fluoranthene*	7.0
Selenium	595	Benzo(k)fluoranthene*	10.1
Boron	10300	Benzo(a)pyrene*	1.0
Chromium VI	4.3	Indeno(123-cd)pyrene*	4.2
Naphthalene*	1.6	Dibenz(ah)anthracene*	0.9
Acenaphthylene*	1950	Benzo(ghi)perylene*	46.6
Acenaphthene*	2000		

*Calculated using a soil organic content of 1%

In the event of a soil verification failure, initially additional sampling will be undertaken in the affected area followed by statistical analysis of the testing results to assess the significance of that failure. Liaison with regulators will be undertaken in the event that materials not complying with the assessment criteria are to be considered for retention in situ. Where testing and analysis identify a significant failure and mitigation measures cannot be implemented the imported soils will be removed and replaced with suitable soils.

4.3 Verification Report

Details of the remediation works carried out should be incorporated within a final verification report. The Report should include:

- Photographic records of the stripped formation.
- Copies of supplier soil certification (if provided)
- Copies of verification laboratory testing of imported materials.
- Details of any specific service provider requirements.
- A copy of the as built drawing for the development clearly indicating exactly where all remediation works have been carried out.

The report should include a statement that the remediation works have been carried out in accordance with the agreed remediation strategy. Any alterations from the agreed strategy should be clearly documented along with confirmation that these changes have been agreed with the relevant statutory bodies.

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The documentation can, if appropriate, be incorporated into the site Health and Safety File compiled at the completion of the development by the CDM co-ordinator, in accordance with the CDM Regulations, 2007. A copy of the final remediation verification report should be forwarded to the local authority and any other interested parties, such as the NHBC.

5. POST REMEDIATION RISK ASSESSMENT

The remedial strategy presented in this report has been designed to remove or break all significant pollutant linkages identified by the quantitative risk assessment for the site. A post remediation conceptual model is presented in the following table. A diagrammatic representation of this is included as Figure 3.

Table 2. Post Remediation Conceptual Model

Contaminant Source	Mitigation	Potential Pathway(s)	Assessment of Risk to Human Health
Elevated concentrations of PAH compounds with the existing topsoil.	Removal of PAH impacted topsoil and replacement with verified clean topsoil.	Pathways severed by mitigation (source removal)	No significant pollutant linkage

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6. DESIGN PRINCIPLES FOR POST DEVELOPMENT WORKS

It is noted that the proposed remediation scheme is specific to the proposed development. The proposals are not designed to completely remove all sources of contamination. Any changes to the proposed end use may require a revised risk assessment and/or additional remedial measures.

The following principles are suggested for consideration in any future development at the site:

1. Potential risks to possible receptors (including site users, site maintenance and construction personnel, buried services, building fabric and introduced vegetation) from any residual contamination must be identified by a new risk assessment at that time. Any redevelopment or modifications to the site (e.g. proposal to remove decking or convert communal gardens to individual domestic gardens) shall be managed in accordance with regulatory requirements.

2. Aesthetic considerations such as visibility, taste and odour will need to be taken into account in the design of protective measures for new works, including consideration of the effects from residual contamination on new buried services and building fabric (for example where new water supply pipes are fitted). Service providers should be consulted and their agreement obtained prior to works taking place.

3. Any further treatment of contamination, changes to final ground conditions and any resultant ongoing maintenance obligations must be documented.

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7. SUMMARY

The following is a summary of the main findings of the investigation works, risk asessments undertaken and remediation/verification works proposed at the site. However, no reliance should be placed on any point of this summary until the whole of the report has been read as other sections of the report may put into context the information contained herein.

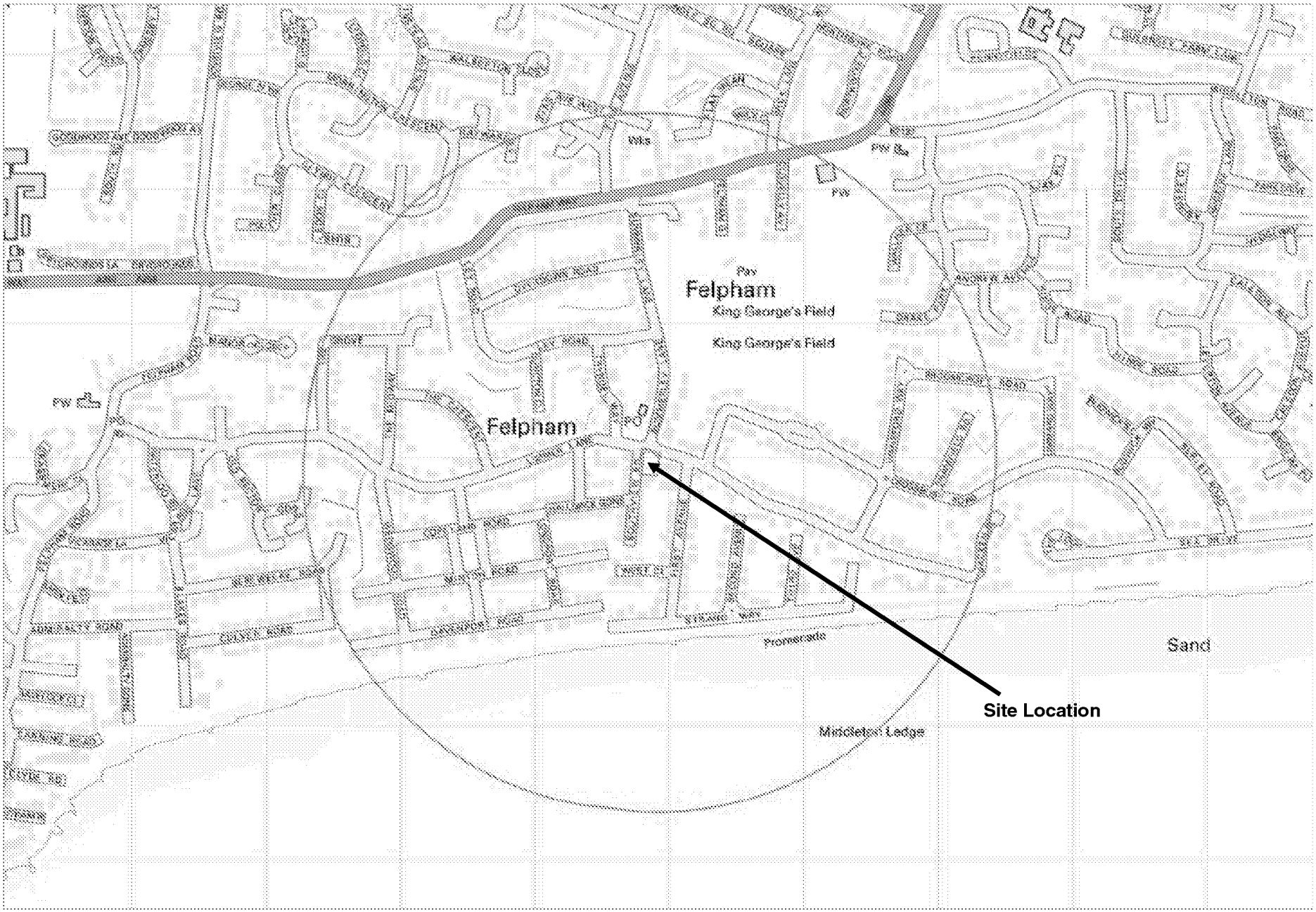
- The contamination risk assessment identified elevated concentrations of PAH compounds within the existing topsoil at the site.
- Remedial measures to deal with the contamination are judged to be needed for the future safe development of the site for residential end use. The following remedial measures are proposed:
    - All existing topsoil should be removed from proposed areas of soft landscaping.
    - An inspection and sampling of the stripped formation should be carried out once existing soils are removed.
    - Verified clean cover soils should be placed above a geotextile marker.
    - The topsoil will be subject to contamination testing to confirm it complies with the screening values presented in Table 1 of this report.
- Inspection and sampling of the stripped formation of soft landscaped areas across the site should be undertaken by Engineers from Ashdown Site Investigation Ltd, to ensure that the materials remaining are similar to those previously encountered and free from any evidence of gross contamination.
- Upon completion of the remediation works, records of the works undertaken should be presented in a remediation verification report which may, if appropriate be included in the Health and Safety File for the site. A copy of the report should be provided to the appropriate bodies (e.g. local authority, Environment Agency and NHBC) as confirmation that the works have been carried out appropriately.

Ashdown Site Investigation Limited
December 2012

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FIGURES

Figure 1	Site Location Plan
Figure 2	Site Plan Indicating areas of Proposed Soft Landscaping
Figure 3	Site Plan Indicating Proposed Stripped Formation Sample Locations
Figure 4	Post Remediation Conceptual Model



ASHDOWN SITE INVESTIGATION LIMITED	SITE: Summerley Corner South Site, Summerley Lane, Bognor Regis, West Sussex	Site Location Plan Not To Scale	Figure 1 LW23175/rs

SOUTHVIEW ROAD

main entrance

4.

pedestrian access

flower beds and shrubs

2

3

4.

5.

6.

7.

8.

9.

10.

block paved parking area

13.

14.

15.

lawn

2.

2.

new footpath

existing footpath

existing grass

Areas where all topsoil should be removed and stripped formations inspected

AERLEY
RN
TEL

LINE OF ADJOINING FLATS

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ASHDOWN SITE INVESTIGATION LIMITED

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DRAWN BY:	DATE:	SCALE (at A3):
TSH	DEC 2012	NTS

SITE:
Summerley Corner, Summerley Lane, Bognor Regis, West Sussex

REPORT REF.:	FIGURE NO.:
LW23303/rs	2

DRAWING TITLE:
Areas of Proposed Soft Landscaping

SOUTHVIEW ROAD

main entrance

4.

pedestrian access

2

3

4.

5.

6.

7.

8.

9.

10.

flower beds and shrubs

AERLEY
RN
TEL

block paved parking area

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lawn

2.

2.

new footpath

Propsosed verification sample locations

existing footpath

existing grass

LINE OF ADJOINING FLATS

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ASHDOWN SITE INVESTIGATION LIMITED

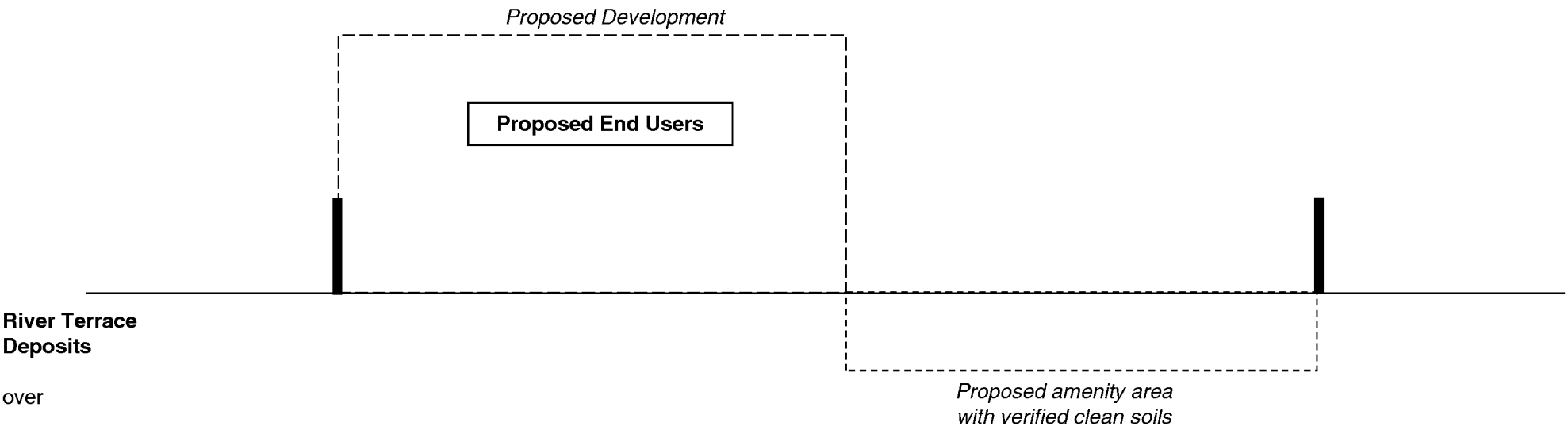
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SITE:
Summerley Corner, Summerley Lane, Bognor Regis, West Sussex

REPORT REF.:	FIGURE NO.:
LW23303/rs	3

DRAWING TITLE:
Site Remediation and Verification Plan



Key

Confirmed Sources	Mitigation	Pathways
1. Elevated concentrations of PAHs within existing topsoil.	Complete removal of PAH impacted topsoil and replacement with verified clean soils	Pathways Severed by Remediation Works

No Significant Pollutant Linkage Identified

ASHDOWN SITE INVESTIGATION LIMITED	SITE: Summerley Corner South Site, Summerley Lane, Bognor Regis, West Sussex	Post Remediation Conceptual Model. Not To Scale	Figure 4 LW23303/rs