

Risk Assessment of Ground Under Existing Centre

Rivermead Leisure Centre New Build, Reading



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AG Geo-Consultants Ltd

Report Title
Risk Assessment of Ground Under Existing Centre

Project	Project No./Report Type
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Client Name
Pellikaan Construction Ltd

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Executive Summary

Client	Pellikaan Construction Ltd
Site and Location	Rivermead Leisure Centre New Build, Reading Approximate postcode = RG1 8EQ
Proposed Development	Demolition of the existing leisure centre followed by construction of a new one nearby. Once the centre is demolished then it will be replaced by (mostly) a carp ark, children's play area (presumably surfaced with rubberised materials) and a landscaping bund. The existing leisure centre footprint will be replaced by: • (mostly) a new car park, • Children's playing area (surfacing undecided at Nov 2020) and • Landscaping/screening mound.
Client Brief	Undertake sufficient assessment to satisfy Condition 8 (risks posed by soils lying beneath the existing centre) and attempt to do so via just a desk-based assessment, rather than also ground investigation. The Local Authority Contaminated Land Officer (CLO) accepted this approach. Given the intended ground use above the existing footprint (above), then gas risk has been ignored.
Previous work	• 1no. desk study and 5no. ground investigation reports have been assessed for this report. • The council CLO supplied the earlier three.
History of Site & Surroundings	The site was used as a landfill from 1970 to 1979. 15 hectares of the site and surrounding LA land is reported to have been filled with biodegradable wastes. Other than the industrial estate to the south that has existed since ~1971, then there appears no other significant information on OS maps, for the surroundings .
Findings of the reports	
Ground Conditions	BGS mapping shows: • Made Ground (MG): historic landfill. • Drift Deposits: Langley Silt Member (sandy clay) (with Kempton Park Gravel (KPG)(sand & gravel) and Alluvium (sand, gravel silt and clay), in the surroundings). • Solid Geology: Seaford and Newhaven Chalk Formation. The made ground has been found to comprise a capping layer over landfill material that contained more non inert materials. Anthropogenic components found included brick, glass, wood/timber, ceramic, plastic, tarmac, paper, metal, glass, nylon, polythene, carbonized material, ash, fabric, plant matter and degraded newspaper.
Hydrogeology & Hydrology	• The River Thames lies nearby. • Groundwater lies at ~1.5-3m depth.
Contamination Considerations	The key point is whether the made ground/landfill material beneath the existing leisure centre is any different to that in the surroundings, and so, whether it poses any greater risks. • 62no. exploratory holes formed, around the 1 hectare existing building & across the other 23 hectares. • 3no. pollution incidents are recorded at the site, relating to minor impacts to land and water from mixed waste/oils/unknown oils & other fuel or oil. The locations & dates of the incidents are unknown • There were no visual indications of contamination, other than ash. • No liquid phase contamination has been reported across the 5no. investigations. • The only olfactory indications of contamination were in the very last (2019) investigation, which recorded hydrocarbon "type" odours in 7no. of 12no. boreholes. They were described at 2x <i>distinct, strong</i>, 3x <i>faint/decomposition</i> or <i>distinct/decomposition</i>, 2x <i>faint</i>, or just <i>odour</i>. • No asbestos has been found in numerous (>48) samples tested. • With respect to a residential without plant uptake end-use, soil test results found elevated heavy metals and PAHs which were considered due to ash/furnace waste-type materials. • The 2015 and 2019/2020 investigations assessed soils results versus a commercial and Public Open Space (POS) end uses and no concentrations were elevated. • Leachable concentrations of metals, phenol, and TPH were found. • Elevated concentrations of Boron, Phenol and PAHs were found in the groundwater.

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	Elevated concentrations of heavy metals and PAHs were found in surface waters. Elevated EPH was found which was considered due to bio-degraded diesel (although none has been observed in any ground investigation to date).	
Conclusions	- The construction of the original leisure centre involved a basement and deep pool, and so such would have removed much or all of the made ground across large areas. - One would expect that any significant unforeseen contamination found during construction would have been removed.	
	Potential Receptors	Risks
	Groundwater	Leaching of total soil concentrations, although much of the footprint will remain hard covered, so preventing leaching. (<u>no free phase</u> contamination has been found)
	Surface Water	Requires contamination of groundwater
	Site end-users	Direct contact, ingestion and inhalation
Across the 24 acre site no risk have been found versus a POS or commercial end use. Some risks have been found versus a residential with plant uptake end-use. The existing building footprint is to be replaced by similar cover # that will prevent pathways via direct contact, inhalation and ingestion. That said, risks to humans from the soils are highly unlikely to be significantly different to the remaining 96% of the landfill site. #: it is assumed that given the presence of the landfill, then the play area will be covered by rubberised material or similar, with no areas of soils or of natural grass planted upon the landfill material at that location). - This report concludes that the ground under the existing leisure centre footprint is unlikely to pose any greater risks than the remaining 96% of the landfill area. We do not consider that undertaking further ground investigation is required to prove any risks. - The planning conditions contain an unforeseen contamination clause and so a watch will be kept during removal of the centre (which includes deep structures such as a basement and swimming pools)		

This is only a summary and should not be read in isolation from the main text.

1 Introduction

1.1 Introduction

AG Geo-Consultants Ltd (AGGC) were commissioned by and on behalf of Pellikaan Construction Ltd (the Client) to undertake work to satisfy planning condition No.8 which relates to a risk assessment for the ground beneath the existing building, at a site known as *Rivermead Leisure Centre New Build*, Reading, RG1 8EQ (the "Site").

1.2 Proposed Development

The proposed development (see plan in Appendix A) comprises demolition of the existing leisure centre and construction of a new centre nearby.

The existing leisure centre footprint will be replaced by:

- (mostly) a new car park,
- Children's playing area (surfacing undecided at Nov 2020) and
- Landscaping/screening mound.

1.3 Brief

The planning permission (Ref 201734) contains the following contaminated land conditions:

- 8: Desk study and ground investigation.
- 9: Unexpected contamination during construction
- 10: Remediation (and risk-reduction) strategy report (RMS) for only land gas risk.
- 11: Implement gas RMS, validate and report the gas remediation.

The client's brief was to:

- Undertake sufficient assessment to satisfy Condition 8 and attempt to do so via just a desk-based assessment, rather than also ground investigation.

The Local Authority Contaminated Land Officer accepted this approach.

Condition 8 reads:

*Following the demolition of the **existing leisure centre** and prior to the installation of the new car park (excluding preparatory works) an assessment of the nature and extent of contamination **with respect to that area of land (the building footprint of the existing leisure centre building)** for its intended use to be submitted to and approved in writing by the Local Planning Authority. This assessment must be undertaken by a competent person, and shall assess any contamination on the site, whether or not it originates on the site. Moreover, it must include:*

- (i) a survey of the extent, scale and nature of contamination;*
- (ii) an assessment of the potential risks to:*

- *human health;*
- *property (existing or proposed) including buildings, crops, livestock, pets, woodland and service lines and pipes;*
- *adjoining land;*
- *groundwaters and surface waters; and*
- *ecological systems.*

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1.4 Limitations

This report is provided for the benefit only of the party to whom it is addressed and we do not accept responsibility to any third party for the whole or any part of the contents and we exercise no duty of care in relation to this report to any third party.

This assessment has been based to a large extent on data acquired from Third Parties. This data has been taken at face value and has not been subjected to any additional validation.

Unless specifically noted to the contrary, it should be assumed that this report has not been submitted to any regulatory authorities for approval.

2 Phase 1 Desk Study & Phase 2 Site Investigations

2.1 Introduction

The site is the Rivermead Leisure Centre. The centre is to be demolished after a replacement centre has been constructed nearby. This study relates solely to the risks that are considered to exist beneath the **existing** sports centre and as such does not assess future landfill gas risk at that location.

The site is built upon a landfill and that landfill is said (by Enviros, below) to have been created in order to raise ground levels and so permit the construction of the original leisure centre above the flood plain.

The following reports have been completed for the site owner, Reading Borough Council and they supplied the first three. Most copies provided to us have no diagrams, plans, logs, nor results (i.e. just text):

- **April 2004, Geo-environmental Phase 1 report by WSP.** This report covers a 24 acre area of LA owned land, which includes the leisure centre. It summarises the findings of an earlier site investigation report, namely:
 - **2000, by CL Associates** at the golf driving range.
- **27th May 2004, Geo-environmental investigation letter report undertaken by WSP Environmental.**
- **December 2006, Site investigation of Richfield Avenue, by Enviros Consulting Ltd.**
- **November 2015, Phase II Ground Investigation Report by Soils Ltd.** This is to the north of the existing leisure centre and appears to have been commissioned prior to the construction of the existing demountable pool (which, under current plans, is to remain and doesn't get demolished),
- **August 2019, Main Investigation Report by Soils Ltd** (superseded by the January 2020 update below). This is to the east of the existing leisure, and was produced for the construction of the new leisure centre.
- **28th January 2020** (wrongly dated August 2019), **Main Investigation Report by Soils Ltd** Rivermead Leisure Centre, Richfield Avenue, Reading, Ref 17755/MIR_R27 Rev1.01. It contains gas results up to and including January 2020.

The main findings from these that relate to the area beneath the existing leisure centre, are as summarised below. Executive Summaries (where available) from the reports are given in Appendix B.

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2.2 Significant Points

Table 2.1 2004 Desk Study (plus 2000 site investigation)

The Site	The topic of this report was a site of 24 hectares, of which the leisure centre was a small part (Zone 7). In the absence of the plans and appendices, then such area appears to be that lying between the River Thames and Richfield Avenue. An industrial estate lies south of the leisure centre, south of Richfield Avenue.
Walkover Survey	This found no visual or olfactory indications of contamination at ground level.
Historical Site Use	The site was used as a landfill from 1970 to 1979. Other than the industrial estate to the south that has existed since ~1971, then there appears no other significant information on OS maps, for the surroundings .
Environmental Data	• 3no. substantiated pollution incidents are record on the site relating to minor pollution to land and water by: <i>mixed waste/oils; unknown oils: & other fuel or oil.</i> • 15 hectares of the site was (reportedly) filled with biodegradable wastes (food, sewage sludge, household, garden, etc). • None other significant.
Potential Ground Conditions	<u>BGS Mapping Suggests:</u> • Made Ground (MG): historic landfill. • Drift Deposits: Langley Silt Member (sandy clay) (with Kempton Park Gravel (KPG)(sand & gravel) and Alluvium (sand, gravel silt and clay), in the surroundings). • Solid Geology: Seaford and Newhaven Chalk Formation.
2000 Intrusive investigation Findings	• Sitework scope: 12no. dynamic sample holes formed to a maximum depth of 1.5m. • Landfill capping layer: Anthropogenic components found included brick, glass, wood and ceramic. • Landfill material: Anthropogenic components found included plastic, paper, timber, metal, glass, nylon and polythene. • A landfill gas odour was noted. • No soils were tested for total contaminants concentrations. • Leachable concentrations of metals, phenol, and TPH were found. • No visual or olfactory indications of contamination are mentioned (missing logs prevent a check). • Groundwater is not mentioned (possibly because holes were only 1.5m deep and groundwater lies at 2-3m depth)

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Table 2.2 March/April 2004 Site Investigation

The Site	Mentions the same 24 hectares as the 2000/2004 report, but then says that the ground investigation was “ <i>undertaken in the southern area of the site</i> ”....“ <i>The southern area of the site is occupied by the leisure centre complex and associated car parking, artificial sports pitch, golf driving range and hotel complex</i> ”
2004 Intrusive investigation Findings	• Sitework scope: 7no. dynamic sample holes were formed (in the absence of logs, believed to be up to 3m deep). • Made Ground / landfilled material of sandy gravely silts and clays, with gravels of flint, ash, ceramics, brick and occasional wood fragments and degraded newspaper up to 3m below ground level (mbgl)..... inert waste materials with occasional relatively degraded organic waste (wood and newspaper). • No significant organic odours were noted during the intrusive works. • Limited groundwater was found...at the interface between the landfill material and natural soils, at depths ranging from 1.3m to 2.63mbgl • The main risk was deemed to be ground gas. • Soil test results found elevated heavy metals and PAHs (with respect to a <i>residential without plant uptake</i> end-use) which were considered due to <i>ash/furnace waste-type materials</i>. • Insufficient groundwater could be obtained for testing. • No visual or olfactory indications of contamination are mentioned.

Table 2.3 2005/2006 Site Investigation

The Site	Covers the same 24 hectares as the earlier reports.
2005/2006 Intrusive investigation Findings	• The aim of the work was to check if the land was <i>contaminated land</i> under Part IIa, check gas risks and check risks to water resources. • Sitework scope: 6no. groundwater monitoring wells to 6m depth. 15no. shallow dynamic sampling holes of up to 4m depth. 10no. shallow hand dug pits to 0.3m depth. Samples of soil, groundwater and surface water were taken and tested. • Made Ground / landfilled material of brick, clay, chalk, flint, tarmac, concrete and waste products such as newspapers, plastic and glass. • The only visual indications of contaminations were fragments of ash. • The only odours noted were of degrading waste. • Hazards to humans (ignoring gas risk) were found from heavy metals and PAHs (using <i>residential without plant uptake</i> guidelines). • No asbestos was found in 33no. samples tested. • Elevated concentrations of Phenol and PAHs were found in the groundwater. • Elevated concentrations of heavy metals and PAHs were found in surface waters. Elevated EPH was found which was considered due to bio-degraded diesel (although none has been observed in the soils in any ground investigation to date).

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Table 2.4 November 2015 Site Investigation

The Site	Covers the location of the demountable pool, immediately north of the original leisure centre building.
2015 Intrusive investigation Findings	- The aim of the work was to supply the client and their designers with information regarding ground conditions, to assist in preparing a foundation scheme for development. - Sitework scope: 8no. dynamic sampling holes of 3m to 5m depth. 2no. cable percussion boreholes to 15.45m depth. Installation of 4no. groundwater/gas monitoring wells. Samples of soil and groundwater were taken and tested. Made Ground / landfilled material was <i>Locally organic and with fragments of glass, tiles, slate, carbonized material, brick and tarmacadam. Gravel is fine to coarse sub-angular flint and sandstone. Decomposing material (landfill waste and plant matter) also noted in most locations.</i> - The report and <u>logs</u> show no visual or olfactory indications of contaminations. - None of the soil contaminant concentrations exceeded a commercial end-use. - No asbestos was found in 15no. samples tested. Groundwater was tested for heavy metals, BTEX and BaP and only 3no. boron results exceeded Drinking Water Limits (of those only 1no. exceeded EQS limits).

Table 2.5 2019/2020 Site Investigation

The Site	The location of the new leisure centre.
2019/2020 Intrusive investigation Scope	4no. dynamic sample holes to 1.5-4m depth. 8no. cable percussion boreholes (BH), 4x 12m deep, 2x 15m and 2x 20m deep. - Installation of 3no. gas/groundwater monitoring wells to 15m depth, in BH1-BH3. 12no. gas monitoring visits.
Actual Ground Conditions	0m to 2.2-4.3m depth: Made Ground (MG) containing anthropogenic components of brick, glass, tiles, slate, plastics, metals, wood, paper and fabric. 2.2-4.3m to 8.5-10.5m: Kempton Park Gravel (KPG)(sand & gravel) 8.5-10.5m to >20m: Seaford and Newhaven Chalk Formation. The Langley Silt Member was absent and no alluvium was found.
Indications of Contamination	- Hydrocarbon type odours were noted in trial holes BH2, BH4, BH5, BH6, BH7, WS3 and WS4 (i.e. 7no. of 12no. boreholes). - They were described at 2x <i>distinct, strong</i>, 3x <i>faint/decomposition</i> or <i>distinct/decomposition</i>, 2x <i>faint</i>, or just <i>odour</i>. 23no. soils results were assessed against both <i>Public Open Space (POS)</i> and <i>commercial</i> guidelines and none exceeded the guidelines. - There were no signs of mobile contaminants (liquid phase).
Groundwater	Struck at 0.7-4.5m depth during drilling. Standing at 2.4m to 3.0m depth during monitoring (25 th July 2019 to 3 rd January 2020).

3 Risk Assessment

3.1 Introduction

The risks from the ground beneath the existing leisure centre require assessment in order to satisfy planning condition No.8.

The existing centre is still in use at the time of this report and will be until the new leisure centre is opened.

The wording of condition No.8 suggests that Pellikaan (Reading Borough Council's (RBC) contractor for the new leisure centre) are to await the existing centre (which they also constructed) being vacated and demolished, before they should undertake a ground investigation.

Such has an unacceptable impact on the planned programme for them and for RBC, in terms of getting the new car park built immediately following demolition.

We assume that the new centre cannot open until the car park is complete.

3.2 Risk Assessment

3.2.1 Sources

The source of potential risk is the made ground/landfill material beneath the existing leisure centre and importantly, whether it presents any greater risk than the made ground/landfill material elsewhere on the 24 acre site owned by RBC.

To summarise the risks from that material:

- 3no. **pollution incidents** are recorded at the site, relating to **minor** impacts from mixed *waste/oils/unknown oils and other fuel or oil*. The locations and dates of the incidents is unknown.
- It is reported that 15 hectares of the site was filled with **biodegradable wastes** (food, sewage sludge, household, garden, etc).
- Apart from ash, **no visual indications** of contamination were spotted across 5no. ground investigations and 62no. exploratory holes.
- With respect to a **residential without plant uptake end-use, soil test results** found elevated heavy metals and PAHs which were considered due to ash/furnace waste-type materials.
- The 2015 and 2019/2020 investigations assessed soils results versus a **commercial and POS end uses** and no concentrations were elevated.
- **No asbestos** has been found.
- **Leachable concentrations** of metals, phenol, and TPH were found.
- Elevated concentrations of Boron, Phenol and PAHs were found in the **groundwater**.
- Elevated concentrations of heavy metals and PAHs were found in **surface waters**. Elevated EPH was found which was considered due to bio-degraded diesel (although none has been observed in any ground investigation to date).

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There is a significant risk from **landfill gas**, but gas/odours are not applicable here since the current centre (hard cover) is to be removed and replaced by car parking, a playground and landscape bund, to which gas does not pose a risk.

The construction of the original leisure centre involved a basement and deep pool, and so such would have removed much or all of the made ground across large areas. One would expect that any significant unforeseen contamination found during construction would have been removed.

3.2.2 Receptors

These are:

- Groundwater.
- Surface water.
- Site end-users.

3.2.3 Pathways

The pathways are as follows:

- **Groundwater:** leaching of total soil concentrations (no free phase contamination has been found)
- **Surface water:** migration via groundwater & so requires contamination of groundwater.
- **Site end-users:** direct contact, ingestion and inhalation.

3.2.4 Risks

The existing leisure centre building covers ~1 hectare (~4%) of the wider 24 hectare site that has been assessed by 3no. of the 5no. ground investigations.

We consider the **risks from the soils beneath the existing leisure centre**, to be as follows:

- **Groundwater:** risks to groundwater are highly unlikely to be significantly different to the remaining 96% of the landfill site. Much of the footprint will remain hard covered, so preventing leaching.
- **Surface water:** risks to surface waters are highly unlikely to be significantly different to the remaining 96% of the landfill site.
- **Site end-users:** across the 24 acre site no risk have been found versus a **POS** or **commercial end use**. Some risks have been found versus a **residential with plant uptake end-use**. The existing building footprint is to be replaced by similar cover # that will prevent pathways via direct contact, inhalation and ingestion. That said, risks to humans from the soils are highly unlikely to be significantly different to the remaining 96% of the landfill site.

#: it is assumed that given the presence of the landfill, then the play area will be covered by rubberised material or similar, with no areas of soils or of natural grass planted upon the landfill material at that location).

3.3 Further Work

Prior to this desk based assessment, our feelings were that any further ground investigation for the footprint of the existing leisure centre, was not going to reveal anything that we did not already know about.

Given that this report concludes that the ground under the existing leisure centre footprint is unlikely to pose any significantly greater risks than the remaining 96% of the landfill area, then we do not consider that undertaking further ground investigation is required to prove any risks.

The planning conditions contain an unforeseen contamination clause and so Pellikaan will maintain a watch during removal of the centre (which includes deep structures such as a basement and swimming pools).

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Appendices

- A. Proposed Development Plans
- B. Executive Summary – Phase 1 Desk Study

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Appendix A

PARKLAND NORTH OF DEVELOPMENT

Existing established tree planting belt to the North of the current playground to be extended towards the North West along the proposed mounding to provide enhanced screening of the development from views from the North / Thames Path

Outline proposals as follows:

Mounding Feature

- Interface of proposed spoil mounding to be coordinated with existing spoil mounding
- Severity of the existing soil mounding to be lessened by addition of additional material as cannot currently be mown (angle currently circa 40 degrees +)
- Proposed slopes to not exceed 1:3 to allow for safe mowing and ease of maintenance ongoing

Top Soil + Sub Soil

- Available volumes of both sub soil and topsoil to be confirmed by contractor in order that proposed footprint and height of the mounds can be established
- Topsoil to be tested and confirmed to be BS3882 parameters / suitable for re use prior to re-use
- Topsoil and sub soil to be segregated and appropriately stored prior to forming of mounds in accordance with BS3882
- Site won sub soil to be used to form main body of mounds (Subject to soil report regarding contamination)
- Site won topsoil to be laid to upper 300mm to allow planting / seeding

Planting

- British native tree species proposed standards 10-12cm girth
- Low maintenance amenity seed will be used on the embankments.
- Low maintenance wildflower seed to the top of the mounds.

Grass Seeding

- All mounds features and ground disturbed during construction to receive grass or wildflower seed finish
- Low maintenance amenity seed will be used on the embankments.

Wildflower Seed Low Maintenance

- Low maintenance seed mix could be a species rich lawn type T.B.C

Other Points

- New pathways shown to link with Thames Footpath and earth mounding
- Drainage around the proposed mounds needs to be considered, especially in proximity of the proposed footpaths.
- Recommendations of the Ecology report to be considered
- Footpath construction to be confirmed
- Footpath lighting to be considered

AREA (SOUTH OF DEMOUNTABLE POOL)

Local Authority to confirm details of play area equipment and surfaces before landscaping features can be determined.

CAR PARK AREAS - SOFT LANDSCAPING

Expanse of hard landscaping to large car park to be softened

Outline proposals as follows:

- Suitable 'standard form trees' 16-18cm girth planted to locations shown
- Single species hedges to car park perimeter: 10ltr stock, 60-80cm high, with protective line wire support system
- Low level ornamental ground cover planting: 3ltr stock at high density of 6no. plants per m2
- Ornamental bark mulch finish to all planting areas
- Lawn margin to areas as shown

SOFT LANDSCAPING AREA

Expanse of soft landscaping to boundary of car park

- To be grass seeded
- To have a section of species rich grass for ecology benefits
- To have seasonal bulbs for additional interest

EXISTING TREES - GENERALLY

Impact of the development on the existing trees

- BS5837:2012 Tree Survey + Arboricultural Impact assessment Haydens Arboricultural Consultants Project 8458 (19.11.2020)
- New trees to be planted for every 1no. lost as part of the development.
- 18no. number of trees lost to development with an additional 3no. suggested to remove.

OTHER CONSTRAINTS - GENERALLY

- Drainage needs to be considered
- impact of underground services needs to be considered

ECOLOGICAL CONSIDERATIONS

As described in John Wenman Ecological Appraisal August 2019, allowances given to:

- Use British Native woody tree species
- Dismiss use of invasive Snowberry
- Incorporate bird nesting boxes (type TBC)
- Incorporate bat roosting boxes (type TBC)
- Ecologist to confirm possible location of fox / badger set to position mound North of Demountable Pool
- Landscape proposals need to be approved by suitably qualified ecologist

PROPOSED SUB STATION AREA - SOUTH EAST OF DEMOUNTABLE POOL

Proposed new play area with new cafe to have seating and landscaping to suit play specialists' proposals

- The play area boundaries will consist of low growing shrubs and multistem specimens to provide some screening of the bin store & sub-station, but not restrict views of the proposed play area.

PEDESTRIAN AREA TO SOUTH EAST OF PROPOSED PLAY AREA

Planting & Fencing to be Installed to provide restrictions on access from vehicles and pedestrians.

Outline proposals as follows:

- To have steel de-mountable bollards to prevent vehicle access and provide vehicle access for maintenance vehicles.
- Planting beds to soften and obscure bin store area.
- Timber knee rail to guide pedestrian to pathway entrances and prevent vehicle access.

PEDESTRIAN AREA TO WEST OF PROPOSED BUILDING

Planting Proposals to soften appearance of building and hard landscaped areas

Outline proposals as follows:

Trees In Paved Areas

- Double avenue of trees
- Trees with upright fastigate form proposed
- Individual tree pits in paving
- 1.2m square teal tree grilles + frames
- Tree pit volume dependant on species chosen.

Planting to Either Side of Paved Area

- Low level ornamental ground cover planting: 5ltr stock at high density of 4no. plants per m2
- Larger specimen plants at intervals: 10ltr 60-80cm height
- Compact multi stem trees to planting beds 2-2.5m height

POSITION OF RAISED BUND, FORMER PLAY AREA LOCATION

Landscaping will reflect the same as the Northern boundary and provide some screening for this boundary in future years.

POSITION OF RAISED SHRUB PLANTERS WITH SEATING FOR PLAZA WALKWAY

Outline Proposals as follows:

- Proposed large planters with incorporated seating to be positioned to the front entrance. To soften the approach to the building and provide gathering and seating to pedestrians who are waiting at the pickup and drop off point.
- Proposed linear planters with seating incorporated to provide a physical barrier for the adjacent car park and rest locations for pedestrians walking to and from the Northern facilities.
- The linear planters will have low maintenance shrubs 5ltr stock at high density of 4no. plants per m2 with spot planted 10L specimens
- The larger planters to have 5ltr stock at high density of 6no. plants per m2 with large 2-2.5m multistem specimens.

JAPANESE KNOTWEED

- See CR Landscapes Japanese Knotweed Survey Report 11.09.18
- JK shown in 3no. locations in vicinity of the development (+1no. location to the West of the External Pitch)

EXISTING WATERCOURSE TO RICHFIELD AVENUE

Watercourse beyond development boundary to be improved as impacts the presentation of the proposed development.

Outline proposals as follows:

Japanese Knotweed

- Ongoing maintenance / treatment regime to be commissioned
- Location to be confirmed by specialist contractor
- Known areas to be fenced off and appropriate signage erected
- Ongoing maintenance / treatment regime to be commissioned
- The above are to be undertaken prior to any vegetation clearance works in the watercourse

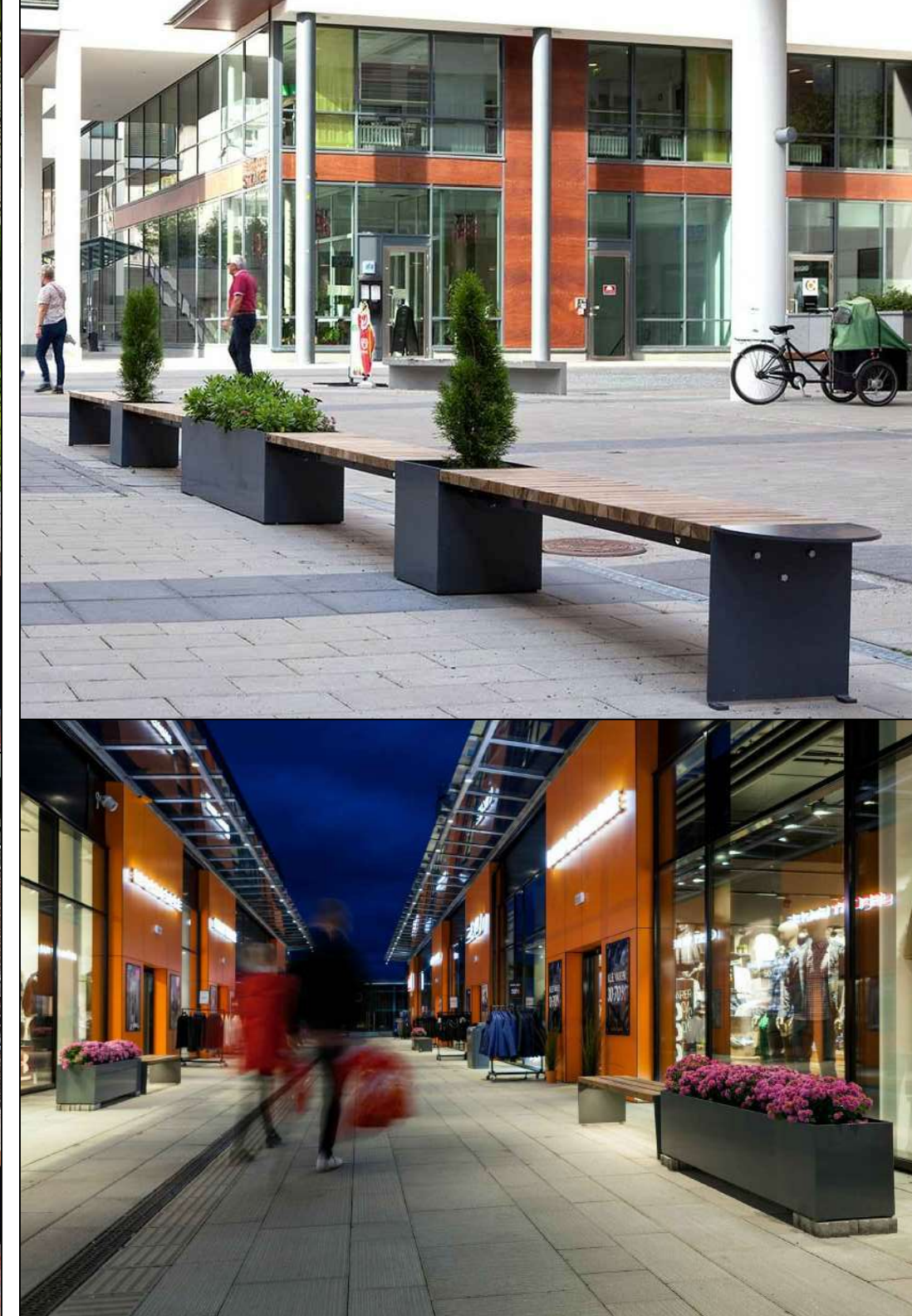
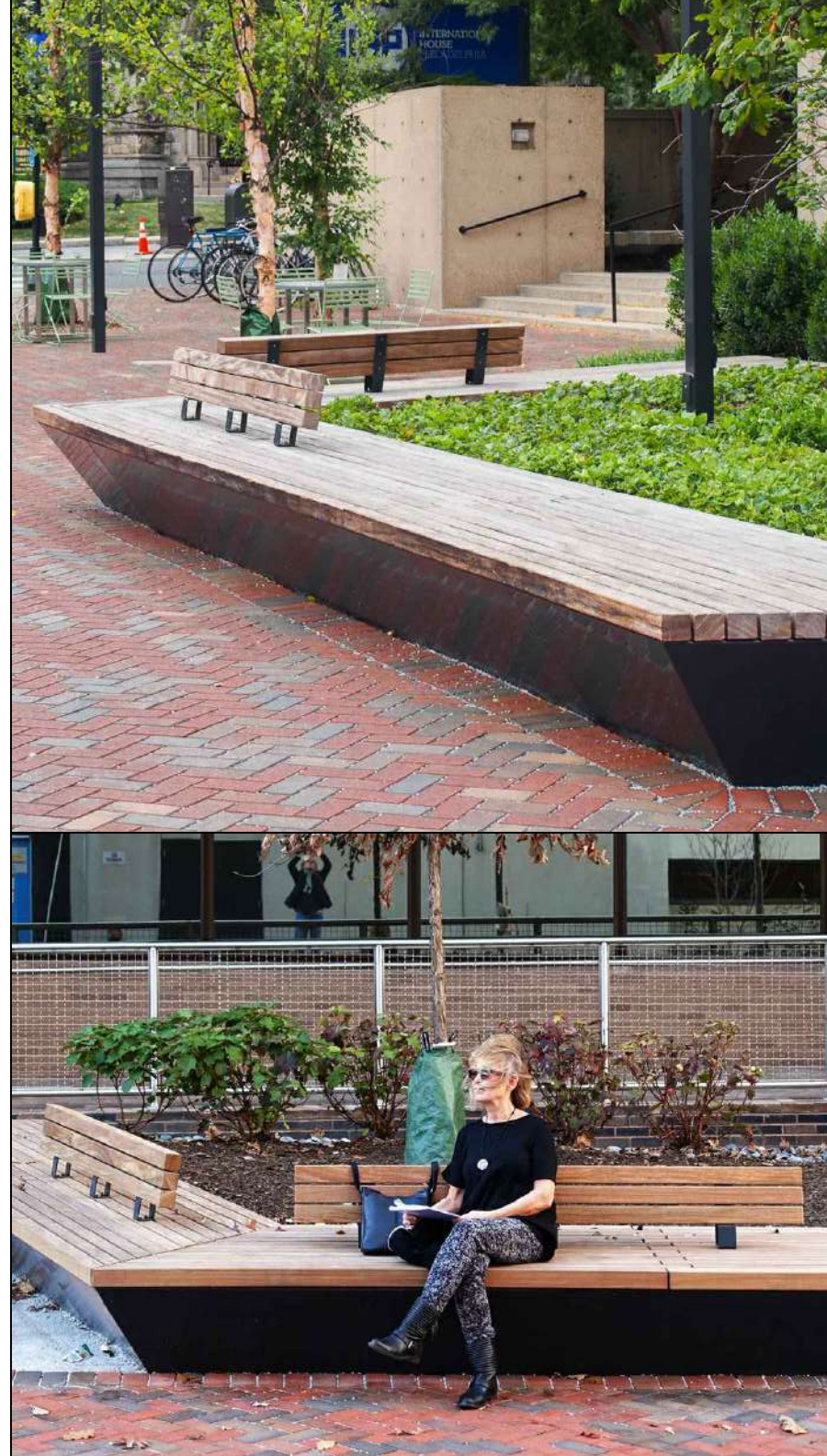
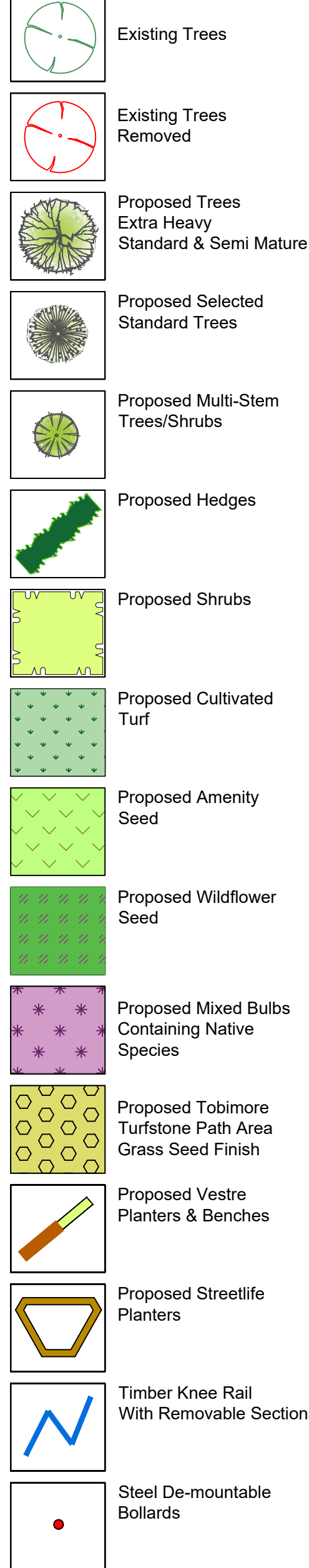
Initial Vegetation Maintenance

- Trees scheduled for retention to be identified
- Overgrown sloped embankments to be mown and arisings removed initially
- Sloped to be mown annually ongoing

Existing London Planes

- Not shown on the RBC Tree Survey
- Shall be part of GLL development boundary but within GLL demise
- Trees to be protected and retained as requested by LPA

KEY



Rev.	Comments:	Date:
E	Changed as per clients comments	30.11.20
D	Changed as per architects comments	23.11.20
C	Changed as per architects latest layout	18.11.20
B	Changed as per architects latest layout	13.11.20
A	Changed as per latest architects drawing	15.10.20

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Landscape Design, Management & Consultancy

Title: Outline Landscaping Proposal

Client: Pelikaan Construction

Project: Rivermead Leisure Centre

DRAFT INFORMATION ONLY

Status:	Concept	Date:	24.09.2020
Drawn:	JG	Revision:	E
Checked:	JK	Scale:	1:500 @ A0

The Knoll, Leicester Road, Earl Shilton, Leicester, LE9 7JT
Tel: (01455) 850250
email: jon.king@eastmidlandslanscaping.co.uk

Pedestrian Gate For Pellikaan employees, sub-contractors and & site visitors. With direction sinage from the contractor parking zone.

Fire Escape Access from Demountable pool to be maintained

Managed access to existing leisure centre deliveries through site on existing tarmac road.

Managed vehicle access route for Reading Festival.

Existing Sub Station

Redundant Ready Bike Stands to be removed

Clearance of shrubs for new path

Segregation of path required for Reading Festival.

Footpath from Thames promenade to be extended past the site hoarding, around the adult social care fence. Existing street lighting to be maintained.

Maintain/Retain existing lights along the path

Existing Demountable Pool

Connection points for temporary power water and foul drainage

3+ Readibus Parking

Garden for Adult Social Care

N 174577459
E 470686781

N 174570511
E 470676846

N 174552962
E 470668956

N 174555014
E 470679784

N 174509845
E 470676819

N 174509416
E 470672413

N 174486734
E 470651006

N 174472924
E 470650779

N 174468967
E 470680103

N 174477672
E 470727114

N 174491511
E 470816917

N 174473688
E 470727670

N 174477672
E 470727114

N 174491511
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E 470727114

N 174491511
E 470816917

N 174473688
E 470727670

N 174477672
E 470727114

N 174491511
E 470816917

EXTERNAL PITCH

Existing Leisure Centre

New Leisure Centre

AREA FOR BRIDGE LAYING

Access to Parking/
Garden Centre
Maintained

Directional signage for pedestrians

Traffic Sign Priority over Oncoming Vehicles 615

Traffic Sign Priority to Oncoming Vehicles 615

Traffic Sign Footpath Closed (Next to Bridge) 617

Traffic Sign Footpath Ahead Closed 617

Traffic Sign Footpath Ahead Closed 617

Traffic Sign Footpath Ahead Closed 617

Traffic Sign Footpath Ahead Closed 617

Traffic Sign Footpath Ahead Closed 617

Traffic Sign Footpath Ahead Closed 617

Signage 'Footpath Closed'

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Signage 'Footpath Closed'

- No. Note
- 1 All dimensions to be verified on site by GENERAL CONTRACTOR prior to any work, setting out or shop drawings being prepared.
 - 2 Drawings not to be scaled. Work to figured dimensions only.
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 - 4 This drawing and related specifications are for use only in the stated location.
 - 5 This drawing is to be read in conjunction with all other Consultants drawings and specifications.
 - 6 Drainage has not been surveyed and any/all pipe locations and below ground drainage runs are indicative.
 - 7 It is assumed that all works will be carried out by a competent contractor who will be working, where appropriate, to an approved method statement.

CONSTRUCTION PHASE 1

- A** Site Cabins / welfare facilities & sub-contractor cabins during Phase 1 & 2 with PIR lighting on time switch and external water supply to be used for damping down in dry conditions after H.V. Diversion.
- B** Area for Plant.
- C** Area for materials
- D** Contractor & Visitor Parking
- E** Gateman cabin
- F** Emergency Exit and Access for Pool Chemical Deliveries, Sub Station and Reading Festival
- G** Fire assembly point
- W** Wheel Wash Provision
- Security Hoarding to be maintained (including removal of any graffiti or fly posters).
- Appropriate signage will be placed on hoarding apologising for footpath closures.

- Japanese knotweed
- Pedestrian walkway
- Vehicle Access Route
- Tree Protection Zone

Public access to existing leisure centre:

- P1** Public access to existing leisure centre

General notes:

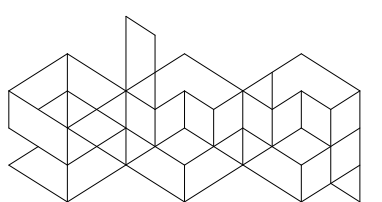
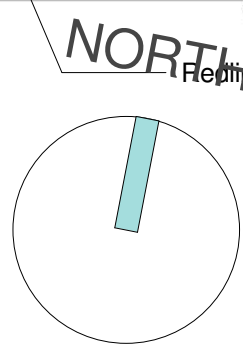
- Buildings to be demolished do not contain drains or have any capping requirements.
- Vermin protection measures currently on site will be maintained.
- A suitably qualified ecologist will be appointed to check the areas to be removed immediately prior to clearance and advise whether nesting birds are present. If active nests are recorded, no vegetation clearance or other works that may disturb active nests shall proceed until all young have fledged the nest.

Site Waste Management:

- Site Waste Limited to 6.5 Tonnes per 100m² of GIFA 80% by Weight.
- Non-Demolition Waste to be Diverted From Landfill.
- Site Lighting - will be deployed as required for the works and turned off when the site is closed.
- Dust Control - Please refer to CEMP for details of control measures, in relation to the emission of dust, dirt and other airborne pollutants.
- Noise Control - Please refer to CEMP for details of noise control measures.
- Pest Control - Please refer to CEMP for details of pest control measures, particularly in regard to demolition and where drains and sewers are to be capped and details of baiting requirements.

- PHASE 1 PARKING:
- TOTAL NUMBER OF CAR PARKING SPACES IN TOTAL = 580
 - NO. OF CAR PARKING SPACES RETAINED FOR EXTG. LEISURE. CTR. = 224
 - NO. OF CAR PARKING SPACES USED FOR CONTRACTOR PARKING = 33
 - NO. OF CAR PARKING SPACES OUT OF ACTION (USED FOR CONTRACTOR'S COMPOUND & ACCESS ROUTE TO S.E. CAR PARK) = 323

Scale 1:500



**Saunders
Boston
Architects**

Eastern Gate House, 119 Newmarket Road,
Cambridge CB5 8HA
T01223 361733
office@saundersboston.co.uk

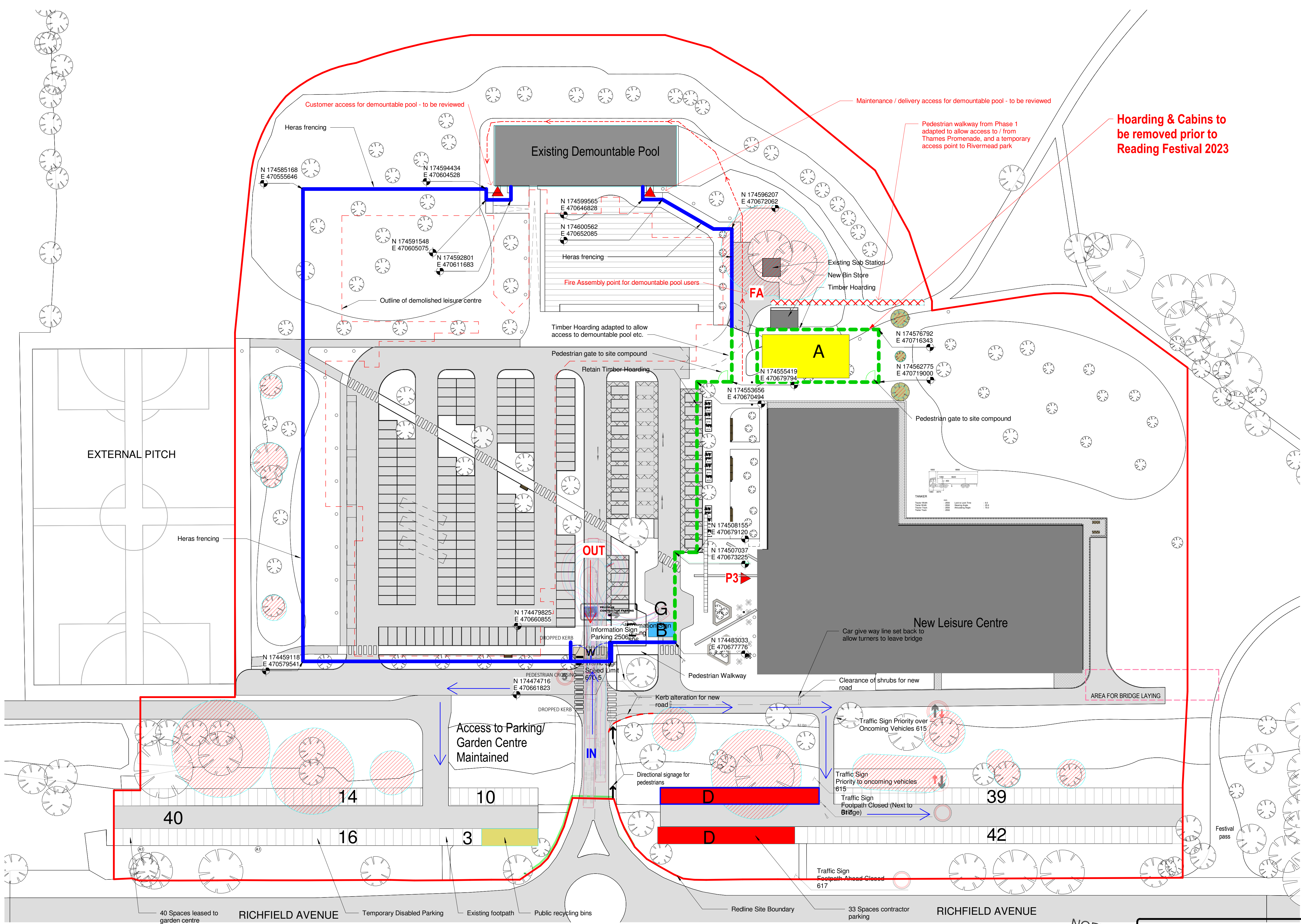
The Generator, The Gallery, King's Wharf
The Quay, Exeter EX2 4AN
T01392 346627
www.saundersboston.co.uk

STAGE 4

SBA Project Code **1790**
Drawn **ES**
Checked **CW**
Date **04/08/21**
Suitability Code **S3**

Scale As indicated @A1
project originator zone level type role number
1790 -SBA-RM-00 -DR-A-5500

Pellican Construction Limited			
Job Rivermead Leisure Centre			
Drawing Construction Method Statement Phase 1			
Client	18/11/21	CW	CB
C6 Pedestrian Access Amendments	09/09/21	CW	CB
C5 Issued For Comment	13/08/21	CW	CB
C4 Issued For Comment	06/08/21	CW	CB
C3 Issues For Comment	04/08/21	CW	CB
C2 Issues For Comment	26/07/21	CW	TZ
C1 Issued for Comments	08/07/21	CW	CB
P2 Amended per client's request	12/04/21	CW	ES
P1 Amended per client's request		CW	ES
No Revision		Chk	Auth



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 - 5 This drawing is to be read in conjunction with all other Consultants drawings and specifications.
 - 6 Drainage has not been surveyed and any/all pipe locations and below ground drainage runs are indicative.
 - 7 It is assumed that all works will be carried out by a competent contractor who will be working, where appropriate, to an approved method statement.

CONSTRUCTION PHASE 2

- A** Site Cabins / welfare facilities & sub-contractor cabins (as per Phase 2)
- B** Area for skips
- D** Car park area for contractor during construction phase 3 (as per Phase 2)
- E** Gatemann cabin
- G** Fire assembly point
- W** Wheel Wash Provision
- Heras Fencing**
- Timber Hoarding**
- Appropriate signage will be placed on hoarding apologising for footpath closures.
- Japanese knotweed
- Pedestrian walkway
- Vehicle Access Route
- Tree Protection Zone

Public access to existing leisure centre:

- P3** Public access to existing leisure centre

- General notes:**
- Buildings to be demolished do not contain drains or have any capping requirements.
 - Vermin protection measures currently on site will be maintained.
 - A suitably qualified ecologist will be appointed to check the areas to be removed immediately prior to clearance and advise whether nesting birds are present. If active nests are recorded, no vegetation clearance or other works that may disturb active nests shall proceed until all young have fledged the nest.

Site Waste Management:

- Site Waste Limited to 6.5 Tonnes per 100m² of GIFA 80% by Weight.
- Non-Demolition Waste to be Diverted From Landfill.
- Site Lighting - will be deployed as required for the works and turned off when the site is closed.
- Dust Control - Please refer to CEMP for details of control measures, in relation to the emission of dust, dirt and other airborne pollutants.
- Noise Control - Please refer to CEMP for details of noise control measures.
- Pest Control - Please refer to CEMP for details of pest control measures, particularly in regard to demolition and where drains and sewers are to be capped and details of baiting requirements.

PHASE 2 PARKING:

- TOTAL NO. OF EXTG CAR PARKING SPACES IN TOTAL = 580
- NO. OF CAR PARKING SPACES RETAINED FOR PROPOSED LEISURE CENTER = 164
- NO. OF CAR PARKING SPACES USED FOR CONTRACTOR PARKING = 33
- NO. OF CAR PARKING SPACES OUT OF ACTION (USED FOR CONTRACTORS COMPOUNDS & RECYCLING BINS & NEW PEDESTRIAN PLAZA) = 383

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Boston
Architects**

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office@saundersboston.co.uk

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The Quay, Exeter EX2 4AN
T01392 346627
www.saundersboston.co.uk

SBA Project Code 1790		Drawn ES	Date 04/09/21	Checked CW	Suitability Code S3	Scale As indicated @A1	Revision C6
project 1790		originator -SBA-RM-00	zone -DR-A	level -5502	type -5502	role -5502	number -5502

Pellican Construction Limited			
Job Rivermead Leisure Centre			
Drawing Construction Diagram Phase 2			
Client	18/11/21	CW	CB
C6	18/11/21	CW	CB
C5	09/09/21	CW	CB
C4	13/08/21	CW	CB
C3	08/08/21	CW	CB
C2	04/08/21	CW	CB
C1	26/07/21	CW	TZ
P1	12/04/21	CW	ES
No.	Revision	Date	Chk. Auth.

AG Geo-Consultants Ltd

Appendix B

MANOR FARM, READING

Geo-Environmental Phase I Report

SUMMARY

Key Findings

The subject site comprises approximately 24 hectares of land, located to the north of Richfield Avenue, Reading. The site currently comprises open ground, a leisure centre complex, golf driving range, artificial sports pitch and hotel complex. The site is bordered to the north by the River Thames, to the west by Greenfield land and to the south and east by commercial developments. Drainage ditches are located in the southern area of the site. The site is located at approximately 40m AOD. The northern area of the site is relatively flat and is raised by approximately 1m compared with the adjacent land to the west. Some areas within the southern section of the site are raised by approximately 2m.

The available historical records indicate that the site was Greenfield, with a number of drainage channels, until the 1970's. During the site 1970's the site was reported to have been utilised for landfilling.

The surrounding area was historically generally Greenfield up until the 1960's/1970's. Potential off site current and historic contaminative sources include a scrap metal yard, foundry, saw mills, timber yards and industrial estate comprising printing works, depots, engineering works, warehouses, electricity sub stations and tanks.

Potential on-site sources of contamination relate to the presence of landfilled material. Biodegradable waste, within a sandy clay matrix, is reported to have been deposited on the site. The thickness of waste material was not determined during the intrusive investigation. No engineered capping material was identified to overly the landfilled material. No total contaminant concentrations were determined during the investigation however, a number of contaminants were identified as being leachable in excess of relevant guidance values. Given the information to date it is likely that the landfill has no landfill gas or leachate management incorporated within its original design.

Potential sources of ground gas have been identified within the site area. These include alluvial deposits and landfilled material. Gas spike surveys previously undertaken across the site, to a depth of approximately 1.0m, recorded a maximum methane concentration of 2% and a maximum carbon dioxide concentration of 4% within the landfilled material. No limiting borehole flow rates were recorded during the surveys. Gas protection measures are reported to have been installed within the leisure centre complex. Evidence of ground gas has been reported adjacent to the southern boundary of the site suggesting the potential for either off site gas migration or an alternative source of ground gas in this area.

Compressible ground subsidence hazards have been recorded on site.

Potential contaminant pathways exist on site. These include the potential vertical and lateral migration of contaminants within the landfill material to the underlying groundwater and along current and historic drainage channels which drain to the River Thames, located adjacent to the site. The underlying soil is also classified as having a high leaching potential.

The site is considered to be of high environmental sensitivity due to the underlying major aquifer, the presence of controlled surface water courses located on and adjacent to the site and the presence of

commercial properties located on site. The site is also recorded to be within an indicative fluvial floodplain.

Environmental Liability Based on the information contained in this report, it is the opinion of WSP Environmental Ltd that the site represents a high risk of environmental liability. This largely reflects the unknown nature and extent of potential contamination associated with landfilled material underlying the site, the potential for elevated concentrations and flow rates of ground gas on and adjacent to the site resulting from underlying landfilled materials and alluvial deposits and the presence of potentially sensitive receptors (current site users, potential future site workers, existing properties and controlled waters) on and adjacent to the site.

Recommended Works Given the assessment presented within this report, and the current proposal for the site, further investigative works are considered necessary to further define the major geo-environmental and geotechnical liabilities associated with the purchase of the site.

Following further investigative works, it is recommended that a conceptual model is developed for the site and that a landfill gas risk screening assessment is undertaken to determine whether the site represents, or potentially represents, a significant risk to identified receptors. Should future development be considered on or within 250m of the site, an assessment of the risks from landfill gas will need to be undertaken in accordance with current legislation.

WSP Environmental Ltd

12. CONCLUSIONS

12.1 Risks to Health

The potential risks to site users from contaminants within underlying material are assessed to be moderate/low.

This assessment is based on the investigation data collected to date and Enviro's interpretation of the current regulatory position.

Potential risks to on-site human receptors from contaminants within the shallow Made Ground are considered to be moderate / low. Concentrations of arsenic and PAHs in shallow soils (elevated lead concentration were recorded in deeper Made Ground) were found to be elevated when compared against the SGVs for the CLEA residential without plant uptake scenario. This scenario is certainly overly conservative for the current site landuse however the commercial industrial scenario (for which no exceedances were recorded) is likely not to be sufficiently conservative. The current uncertainty regarding the appropriateness of SGVs needs also to be considered in the assessment of risks posed to human receptors.

The US₉₅ value for arsenic was approximately 0.3 times (30%) greater than the SGV. On this basis the exceedence may be considered as "not significantly greater than" (CLAN 02/05) the screening value (the SGV). It is therefore unlikely to meet the test set out in the Statutory Guidance of presenting a "significant risk of significant harm". In our opinion based on the guidance available to date it is likely that the concentrations of arsenic recorded in shallow soils do not pose a significant risk to site users.

The US₉₅ value of Benzo(a)pyrene (B(a)P) and Dibenzo(ah)anthracene were found to be elevated above ESV for the shallow Made Ground. The Dibenzo(ah)anthracene US₉₅ was only slightly elevated above ESV however the US₉₅ for B(a)P was found to be approximately 10 times (1000%) greater than the ESV. On this basis the exceedence of B(a)P may be considered as "significantly greater than" (CLAN 02/05) the screening value (the ESV). It is believed that the elevated concentrations of B(a)P are related to camp fires which have occurred in the past during WOMAD festivals.

It is understood that at the final meeting of the SGV task force proposals have been put forwards for the modification of the CLEA methodology that are likely to result in an SGV for B(a)P in excess of the US₉₅ value recorded on site. At time of writing these proposals have not been adopted however it appears likely that the regulatory regime is shifting to a position where the concentrations recorded within shallow site soils are unlikely to be defined as causing a "significant risk of significant harm" to humans.

Potential risks to on-site human receptors from landfill gas within the golf driving range and Leisure Centre are considered to be moderate / low. This reflects the installation of both carbon dioxide and methane alarms and changes in access procedures to the basement in the Leisure Centre. The calculated gas regime around the Leisure Centre is characteristic regime 3 which indicates that significant concentrations of gas are present. Details of the golf driving range building have recently come to light and these show that the building has a suspended floor slab that is passively vented and a damp proof membrane (of unknown specification) installed. These measures ensure that the elevated gas concentrations detected in the area (characteristic regime 2) are satisfactorily

mitigated. All other areas of the site were found to have significantly lower gas concentrations and were classified as characteristic gas regime 1.

12.2 Risks to Groundwater

The potential risks to groundwater are assessed as moderate/low. Made Ground /waste materials are present across the site and are underlain by Major Aquifers. Much of the site is covered with softstanding, which will encourage infiltration. No areas of significant potentially mobile contamination were encountered during the investigation. Groundwater monitoring did not detect significant groundwater contamination either up or down hydraulic gradient at the site.

12.3 Risks to Surface Waters

The potential risk to surface water is assessed as low. The River Thames is located adjacent to the site. During the monitoring period groundwater flow was recorded as flowing in a south easterly direction away from the River Thames. No areas of significant potentially mobile contamination encountered during the site investigation or detected in groundwater.

12.4 Risks to Vegetation

The risk to vegetation growing on-site is assessed as very low due to the lack of evidence of any plant dieback and low concentrations of phototoxic metals in the top 0.6m of material.

12.5 Risks to Buildings

Risks to on-site buildings from contacting contaminated ground is assessed as low. Site buildings are likely to be underlain by some Made Ground / waste material. Pipes and building structures may contact Made Ground and waste. Concentrations of contaminants recorded are unlikely to impact buildings and services. No evidence of building stress was observed.

Risks to buildings from soil gas are assessed as low for the golf driving range and the Leisure Centre. This rating reflects the presence of gas protection measures in both buildings.

12.6 Statutory Designation

The site is not currently designated statutory Contaminated Land under Part IIA of the Environmental Protection Act 1990.

In our opinion, the sites current condition would not lead the site to be classified as contaminated land by RBC under the provision of the draft statutory guidance made under Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995). This is due to the absence of a proven pollutant linkage with the potential to cause significant harm to people or the wider environment.

13. RECOMMENDATIONS

- ◆ A bi-annual gas monitoring programme should be initiated to allow continued assessment of the sites soil gas regime to ensure that the protection measures within the golf driving centre and Leisure Centre remain adequate.
- ◆ Following introduction of approved modifications to the CLEAR methodology a brief review of this report should be undertaken to ensure that the assumptions of risks to human receptors are correct and that the concentrations recorded on site are not causing a “significant risk of significant harm” to humans.