WWT CONSULTING

Client: Radnor Hills Mineral Water Company

Project: Effluent Processing Solutions

Date: March 2017

Report: Specification for Process Effluent Discharge Arrangement

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Checked by: BS	
Approved by: MS	

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UVDB empowered by Achilles Supplier no 060371

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1. INTRODUCTION

1.1 The following specification sets out the methods, standards and requirements for the installation of a circa. 1.2km effluent discharge pipe and outfall arrangement to carry treated process effluent from the bottled water production facility at Radnor Hills.

1.2 The pipe route covers mainly agricultural land with one road crossing under the A4113. The road crossing is to be undertaken by a separate contractor and is therefore not covered within this specification.

1.3 The final outfall is located adjacent to the property boundary for Turnpike Cottage and discharges directly into the River Teme, upstream of Lingen Bridge.

1.4 The following drawings, provided in Appendix I, should be read in conjunction with this specification:

Table 1 – Drawings to be read in conjunction with this specification

Drawing Number	Title	Description
RAD02-4-100-1-001	Process Effluent Pipe Run General Arrangement Plan	General arrangement plan showing the route and location of the pipe run and final outfall
RAD02-4-100-5-001	Process Effluent Pipe Run Construction Details	Construction details for the pipe trenching, and jointing. Details for the outfall structure and anti-erosion

Table 2 – Document control and revision tracking

Issue	Revision	Notes	Date
1		First issue for planning and consent application	24/03/17

2. SAFETY, HEALTH AND ENVIRONMENT (SHE) INFORMATION

2.1 A 'Line Search Before U Dig' (LSBUD) search indicates the only statutory services likely to be affected are a Western Power Distribution 11kV overhead line across the field adjacent to Turnpike Cottage. However, a full Statutory Services (STATS) search has not been undertaken at this stage and the contractor should complete a full search prior to commencing any works. The contractor should contact Western Power Distribution on 0121 623 9223 to obtain further information regarding notification of works, easements and restrictions around the assets. Information from Western Power Distribution with plans showing the location and route of the powerline, information and guidance letter and guidance documentation is provided in Appendix II.

2.2 The contractor must comply with the requirements of the Health and Safety Executive guidance provided in document GS6 'Avoidance of Danger from Overhead Electric Lines', provided in Appendix III, while undertaking works in the vicinity of the overhead lines.

2.3 There are services local to, and owned by, Radnor Hills within the work area. These consist of buried electrical supplies and water delivery pipe work associated with groundwater extraction bore holes. Further information is available from Radnor Hills, the contractor should contact the site manager directly to determine the exact location, depth and nature of any services within the work area.

2.4 The outfall structure is located at the top of the southern bank of the river Teme, adjacent to the property boundary with Turnpike Cottage. During site survey and investigation, the bank was visually inspected for optimum installation point, ease of access and stability. There are areas of bank collapse and undercut along the bank directly below the garden of Turnpike Cottage. The chosen location for the outfall structure looks to be stable with a 1:1 slope from bank top to river bed, however, a full geotechnical investigation has not been carried out. Excavation for the outfall headwall and installation of the reno anti-erosion mattress should be assessed on site by the contractor to determine the preferred method of access and plant selection. It may be necessary to consult a geotechnical engineer to determine the required set back from the bank top for safe work without the risk of bank collapse. There are several trees, tree stumps and woody debris within the proposed work area that will require protection/removal where appropriate. Photographs 1 and 2, Appendix IV, show the river bank at the proposed location.

2.5 Work around the outfall structure would require safe working practices for deep water, and provision for safety equipment on both banks for the protection of operatives.

2.6 The river Teme and associated water courses should be protected from risk of pollution at all times during construction. High risk areas such as, fuel and chemical storage, refuelling areas, material stockpiles and site compounds should be located a suitable distance away from the river. Fuel, oils and chemicals should be stored on an impervious base with a bund capable of containing at least 110% of the stored volume.

2.7 Work around trees and root protection zones: There are locations where it will be unavoidable to excavate outside the root protection zone of certain trees. In such cases the following must be adhered to, with reference to BS 5837:2012.

2.8 The protected area should be a circle around each tree of radius 4 times the trunk girth, measured at 1.5m above ground level.

2.9 Excavation can be to the contractor's choice, provided minimal disturbance is achieved, it may be necessary to hand dig in some situations.

2.10 Compaction from plant within the root protections zones should be avoided where possible.

2.11 Where roots are cut, it should be a smooth, clean cut with no ragged edges.

2.12 Treatment of roots may not be required during these works, but it should be assessed on a case by case basis.

2.13 Trenches should be backfilled as soon as possible or temporarily lined with polyethylene to reduce evaporation.

2.14 Backfill can be as dug material that is free from waste materials, plastics, non-soil forming materials, oil, fuel, cement or other substances harmful to plant growth, with minimal compaction.

2.15 The contractor is required to submit method statements, construction phase plans and environmental protection practices and waste management plans to the site manager at Radnor Hills prior to the commencement of any works.

3. INSTALLATION OF THE PIPE RUN

3.1 The delivery pipe from the treatment plant to the outfall structure is approximately 1.2km in length. A 90mm OD HDPE (PE100) plastic pipe with compression fittings has been specified, all pipe and fittings should conform to BS EN 12201 'Plastic Piping Systems for Water Supply and Sewerage Under Pressure – Polyethylene (PE)' and Kitemark certified. Pipe products should be to BS EN 12201-2 and compression fittings to BS EN 12001-3. Installation of pipe work in the trench should be in accordance with Water Industry Specification WIS 4-32-08A, 2008 as detailed below. Pipe bedding, where required, should be granular material to Water Industry Specification WIS 4-80-2.

3.2 The crossing of the A4113 is to be undertaken by a separate, approved, contractor. The following specification applies to all works up to, and from, the road crossing.

3.3 In accordance with The Building Regulations 2010 Approved Document H, Table 10, the minimum required cover over the crown of the pipe is 600mm when trenched through the fields in the work area.

3.4 Manholes and inspection chambers are not required for this installation.

3.5 The main pipe run can be bedded on the base of the trench as dug; sections containing joints/fittings should be set on a granular material bedding min. 50mm depth, extending min. 200mm either side of the fitting, as detailed below.

3.6 Excavation of the pipe trench should be in accordance with the following:

3.6.1 Excavated turf, topsoil and sub-soil to be set-aside for re-instatement.

3.6.2 Lower part of the trench to be excavated up to 300mm above the crown of the pipe; vertical sides with a width as small as practically possible. Minimum width, external diameter of the pipe plus 300mm, = 390mm.

3.6.3 Formation for beddings:

3.6.3.1 Timing: excavate to formation level immediately before laying beddings/pipe;

3.6.3.2 Mud, rock, projections, boulders and hard spots: remove and replace with consolidated, site won, bedding material;

3.6.3.3 Local soft spots: Harden by tamping in bedding material; and

3.6.3.4 For sections with joints/fittings, over dig to allow for min. 50mm layer of granular bedding material.

3.6.4 Installation of compression fittings for pipe joints should be completed as soon as possible after the pipe has been laid in the trench. Where joints are to be fitted at a later date, the end of any exposed pipe should be capped to prevent ingress of debris. Joints to be installed as follows:

3.6.4.1 Over dig section by min. 50mm to allow for granular bedding material, min. 200mm extent either side of the joint;

3.6.4.2 Place min. 50mm depth granular bedding material in accordance with WIS 4-08-2 (10mm nominal single-size aggregate: Processed granular materials can include aggregates to BS 882, air-cooled blast furnace slag to BS 1047 and lightweight aggregates to BS 3797);

3.6.4.3 Compression joint to be fitted and tightened in accordance with the manufacturer's guidelines. Care to be taken to avoid grit or other materials entering into the joint that could affect the integrity of the seal; and

3.6.4.4 Section of trench containing the joint to be left open until testing of the pipe run/section is satisfactorily completed.

3.7 Testing of the pipe run or completed sections should be to BS EN 12848-5:

3.7.1 Condition of pipework and equipment prior to testing: Correctly installed, secure and clean;

3.7.2 Pressure testing: Joints, fittings and components must be free from leaks and signs of physical distress when tested for at least one hour as follows:

3.7.2.1 Apply pressure test to 1.5 times the maximum pressure to which the installation or relevant part is designed to be subject to in operation; and

3.7.2.2 The current design load is for a maximum flow rate of 30m^3/hour with a standard working flow rate of 12.4m^3/hour, fed via pump. Therefore the system should be tested for 1.5 times the pressure at 30m^3/hour.

3.7.3 Test results to be submitted to the site manager at Radnor Hills for inspection and sign off prior to any final backfilling.

3.8 Backfilling: Sections of pipe that do not contain any joints/fittings can be backfilled as required to the following:

3.8.1 A protective cushion of site won, as dug, material free from vegetable matter, rubbish, frozen soil and material retained in a 40mm sieve to be backfilled to 150mm above the crown of the pipe. Sections to be compacted by hand in 100mm layers.

3.8.2 Remainder of trench to be backfilled with site won, as dug, material free from vegetable matter, rubbish and frozen soil compacted in 150mm layers. Sufficient surcharge to be used to allow for settlement following works.

3.9 Backfilling: Sections of pipe with compression joints/fittings only to be completed following satisfactory testing and sign off by the site manager at Radnor Hills:

3.9.1 Backfill with granular material in accordance with WIS 4-08-2 (10mm nominal single-size aggregate: Processed granular materials can include aggregates to BS 882, air-cooled blast furnace slag to BS 1047 and lightweight aggregates to BS 3797) to minimum 150mm above crown of pipe. Compacted by hand in 100mm layers.

3.9.2 Remainder of trench to be backfilled with site won, as dug, material free from vegetable matter, rubbish and frozen soil compacted in 150mm layers. Sufficient surcharge to be used to allow for settlement following works.

4. INSTALLATION OF OUTFALL STRUCTURE

4.1 The proposed outfall structure consists of a pre-cast concrete headwall and anti-erosion reno mattress, with flows discharging directly to the river Teme. The following specifications are based on The Building Regulations Approved Document H, Highways Agency Design Manual for Roads and Bridges 107/4 – Outfall and Culvert Details, the Water Industry guidelines WIS-04-08-02 and the Reference Guide for Designing of River and Coastal Gabion Protection Works, produced by Enviromesh. Photographs 1 and 2, Appendix IV, show the area of the river bank that is proposed as the outfall point.

4.2 The potential peak discharge velocity from the outfall pipe could be greater than 1m/s therefore some degree of energy dissipation would be required in the design. Given the distance between the outfall and the river, the anti-erosion reno mattress would provide adequate energy dissipation and protect the river bank from erosion.

4.3 The headwall has been specified as a precast concrete unit; the suggested product is the Althon H3C standard precast headwall. This unit has a back wall width of 400mm, a front wall width of 1300mm, a depth of 900mm and a height of 1000mm. When ordering a headwall, it should be specified that a pipe opening suitable for a 90mm OD HDPE pipe is formed.

4.4 Installation should be to the following method (advice on the foundation has been taken from the manufacturer and general Environment Agency guidance suggesting that the use of poured concrete for foundations adjacent to water courses should be avoided):

4.4.1 Excavate bank to a firm undisturbed soil, free from vegetation, work around trees should be carried out in accordance to paragraph 2.7 above. The bank behind the headwall should be excavated to a safe batter during the installation process.

4.4.2 The area of the toe should be excavated locally to 50mm below the required depth of the main headwall.

4.4.3 The base of the excavation and toe area should be lined with a non-woven geotextile of the contractor's choice suitable to the ground conditions.

4.4.4 A layer of minimum 150mm thickness granular fill to WIS 4-08-2 (10mm nominal single-size aggregate: Processed granular materials can include aggregates to BS 882, air-cooled blast furnace slag to BS 1047 and lightweight aggregates to BS 3797) should be placed over the geotextile. Allowance to be made for the 50mm depth in the area of the toe. Granular fill should be well consolidated and compacted to form a sound foundation for the headwall.

4.4.5 The granular foundation should have a 50mm depth blinding layer of sand placed across the whole foundation.

4.4.6 The headwall should be lifted into position, using appropriate lifting clutches, and placed level or with a slight fall towards the toe. Once in positon, granular fill should be placed around the toe and well compacted.

4.4.7 The outfall pipe should be located centrally through the pipe opening and levels checked. The pipe should protrude a minimum of 50mm beyond the rear wall of the headwall into the structure. The pipe opening should be appropriately sealed using a flexible sealant suitable for the HDPE pipe. It

may be necessary to backfill the rear of the headwall with ST4/GEN3 site mixed concrete depending on the quality of the seal that can be achieved.

4.4.8 Following installation of the pipe, the headwall can be backfilled, starting with the pipe section then backfilling around the main headwall structure and graded to the surrounding ground. Backfill material can be site won, as dug, material free from vegetable matter, rubbish, frozen soil and material retained in a 40mm sieve, compacted in 100mm layers.

4.5 Reno/gabion mattress anti-erosion should conform to the following specifications:

4.5.1 Mattress manufactured from double twist hexagonal woven wire mesh to BS EN 10223-3:1998.

4.5.2 Diaphragms to be at nominal 500mm centres on the unit length, as the slope batter is circa. 1:1.

4.5.3 Mattress depth should be 300mm, length and width can be to suit site conditions and slope batter.

4.5.4 Mesh openings should be hexagonal with a nominal dimension of 60mm x 80mm.

4.5.5 Mesh wire should adhere to the following:

4.5.5.1 Wire in the body of the mattress to be 2.0mm diameter;

4.5.5.2 Edge selvedge wire to be 2.70mm diameter;

4.5.5.3 All wire to be in accordance with BS EN 10218-2:1997;

4.5.5.4 Tensile strength of all wire to fall in the range of 350 to 575 N/mm^2;

4.5.5.5 For corrosion protection all wire should be zinc coated to BS EN 10244-2:2001; and

4.5.5.6 If desired, an additional extruded u-PVC coating of nominal 0.5mm radial thickness could be applied over the galvanised wire.

4.5.6 The mattress should have a minimum width across the slope of 2.00m and should extend a minimum of 3.00m into the river bed.

4.5.7 The area for the mattress should be excavated to minimum 300mm below existing ground level. The excavation should be lined with a non-woven geotextile.

4.5.8 Mesh cages to be placed in the excavation over the geotextile, method of installation can be of the contractor's choice to suit site conditions. As the slope batter is 1:1, anchor pins should be used at a density of 2 pins per 2.0m unit width.

4.5.9 On site jointing should be with continuous lacing wire or pneumatically closed stainless steel 'C' rings. Lacing wire should be of nominal 2.2mm diameter and with corrosion protection as specified above.

4.5.10 Rock fill should be placed from the toe of the batter up slope towards the joint with the head wall. It should not be placed from the top of the slope down due to the risk of slippage and unit failure.

4.5.11 Rock fill should be with a hard, durable and non-frost susceptible rock with a minimum dimension of not less than the mesh opening (60mm x 80mm) and a maximum dimension of 200mm.

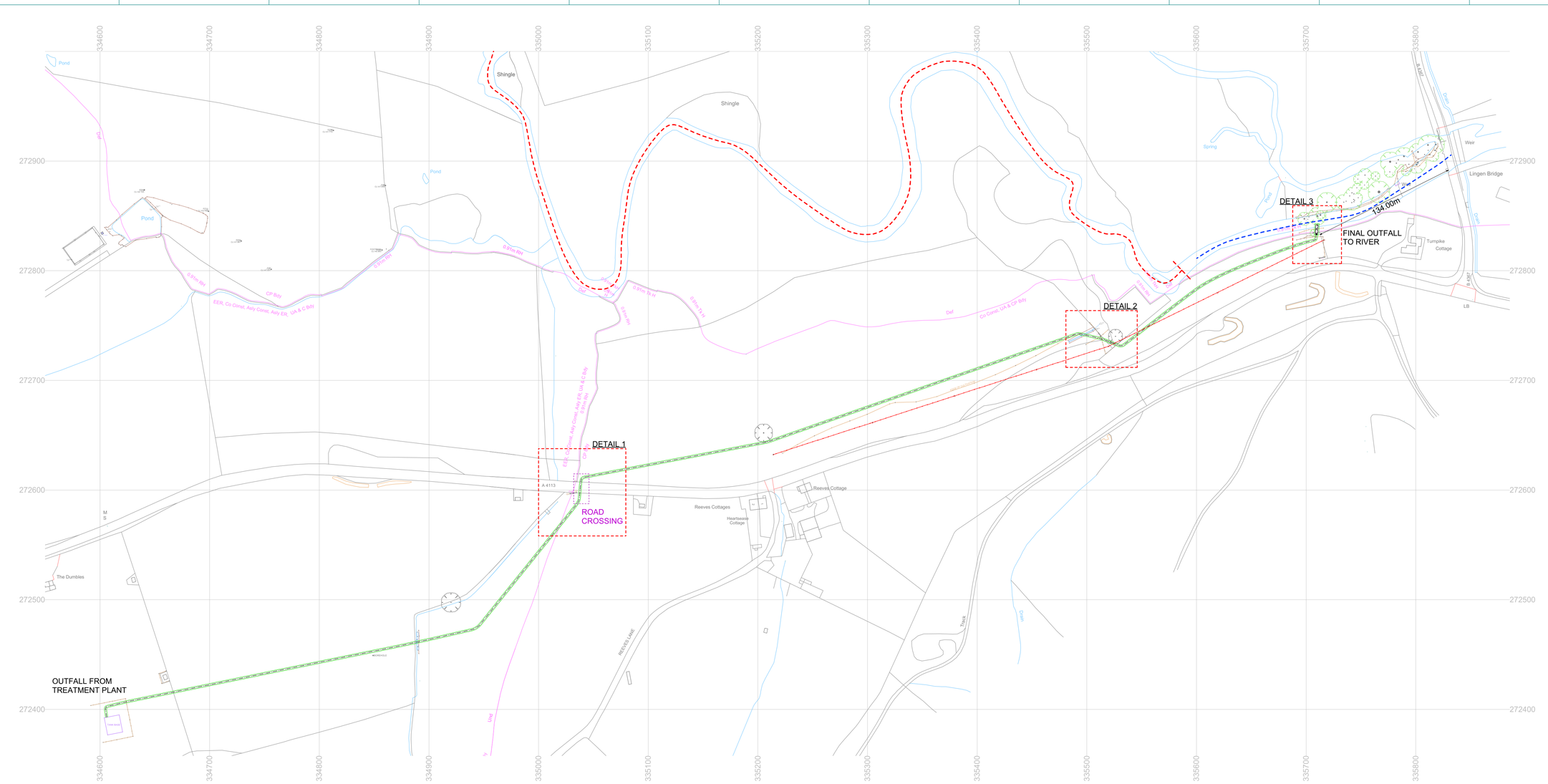
4.5.12 Rock fill should be packed tightly to minimise voids and the risk of rock slippage within the mattress. The units should be filled to an extent such that the mesh lid bears down onto the rock fill. The lid should be attached through continuous lacing wire or 'C' rings as specified above.

4.5.13 Adjacent units should be jointed with a continuous lacing wire or 'C' rings as specified above. If 'C' rings are used, they should be at a spacing of one every other mesh opening.

4.5.14 The interface between the edge of the mesh gabion and the headwall may need jointing and sealing to prevent effluent flows from passing between the headwall and gabion, causing undermining. The joint should be formed using ST4/GEN3 site mixed concrete, floated to a smooth finish. A formation with a slight dip towards the centre line would ensure that flows are directed to the gabion mattress and not deflected off the side of the mattress.

4.5.15 Once installation is complete, the surrounding ground should be re-instated and graded into the mattress.

APPENDIX I. Project Drawings



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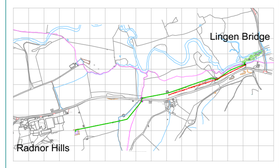


Key

- Proposed Pipe Route
- Pipe run and outfall boundary
- Road crossing section (undertaken by others)
- Target reach for treated discharges to surface water*
- Reaches prone to drying up*

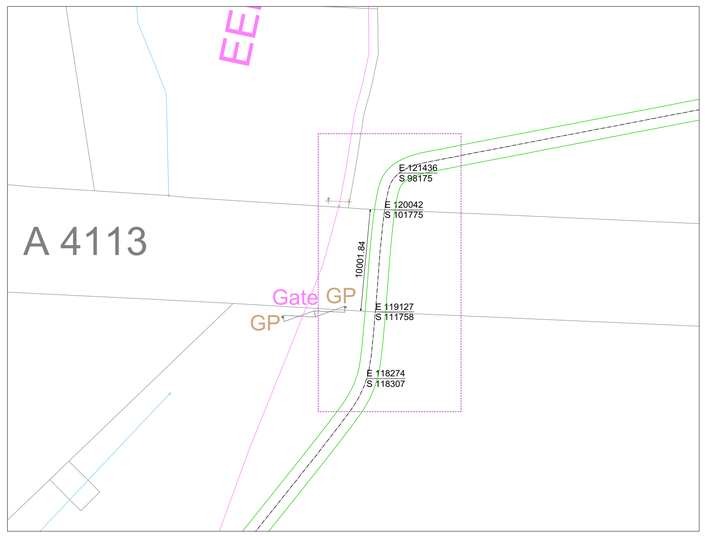
*Taken for RUKHydro Report

General Notes

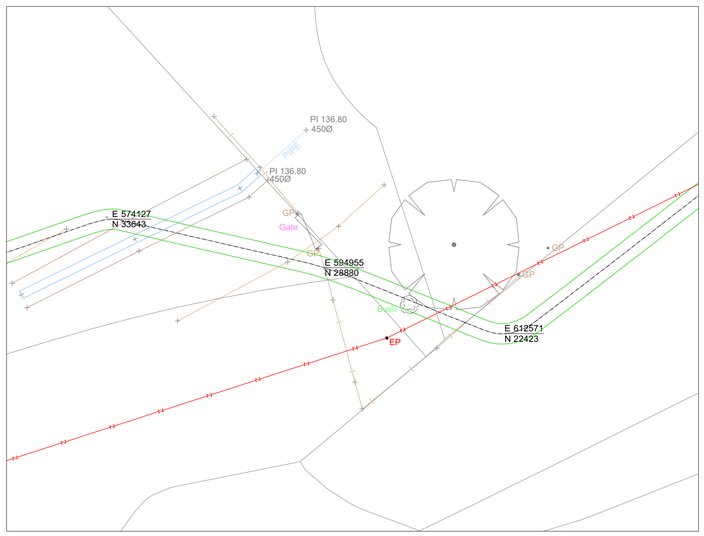
1. Do not scale drawings. Dimensions govern.
2. All dimensions shall be verified on site before proceeding with the work.
3. WWT Consulting is to be notified in writing of any discrepancies.
4. Drawings to be read in conjunction with the relevant specification documents.
5. To be read in conjunction with the following drawings:

RAD02-4-100-5-001 Process Effluent Pipe Run Construction Details

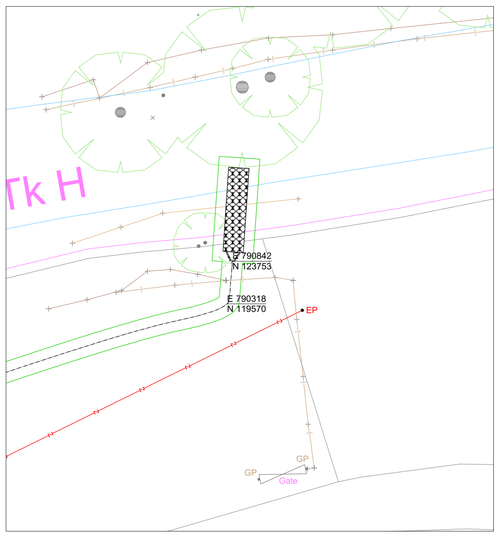
DETAIL 1 - ROAD CROSSING



DETAIL 2 - UPHILL SECTION



DETAIL 3 - OUTFALL INTO RIVER TEME



Revision	Date	Description

Consultant
WILDFOWL & WETLANDS TRUST
SLIMBRIDGE
GLOUCESTERSHIRE GL2 7BT
www.wwtconsulting.co.uk

Client
RADNOR HILLS MINERAL WATER COMPANY Ltd
HEARTSEASE
KNIGHTON
POWYS

Sustainability Consultant SUSTAINABLE DIRECTION Ltd

sustainable direction
thinking of the future

Hydrology Consultant RUKHYDRO LIMITED

6 Claremont Buildings
Claremont Bank
Shrewsbury

Survey Engineer
INVAR MAPPING SURVEYS

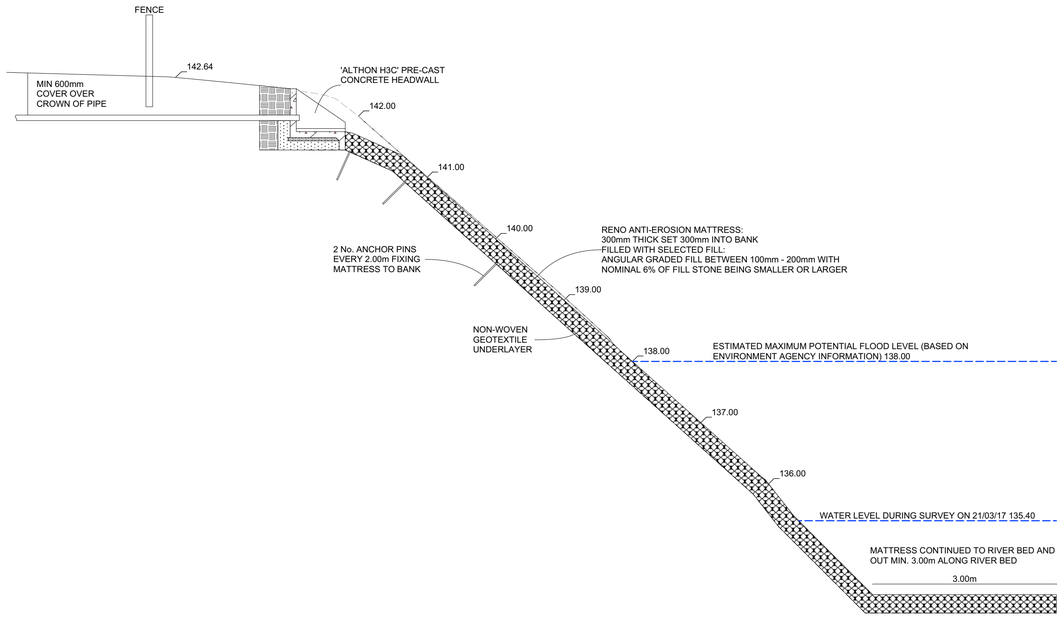
1 STIPERSTONES,
MINSTERLEY, SHREWSBURY,
SHROPSHIRE, SY5 0LZ

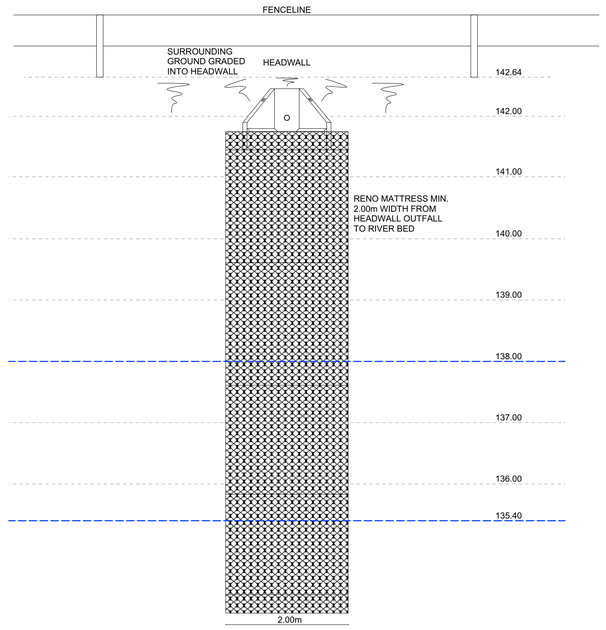
Project Title
EFFLUENT PROCESSING SOLUTIONS

Drawing Title
PROCESS EFFLUENT PIPE RUN GENERAL ARRANGEMENT PLAN

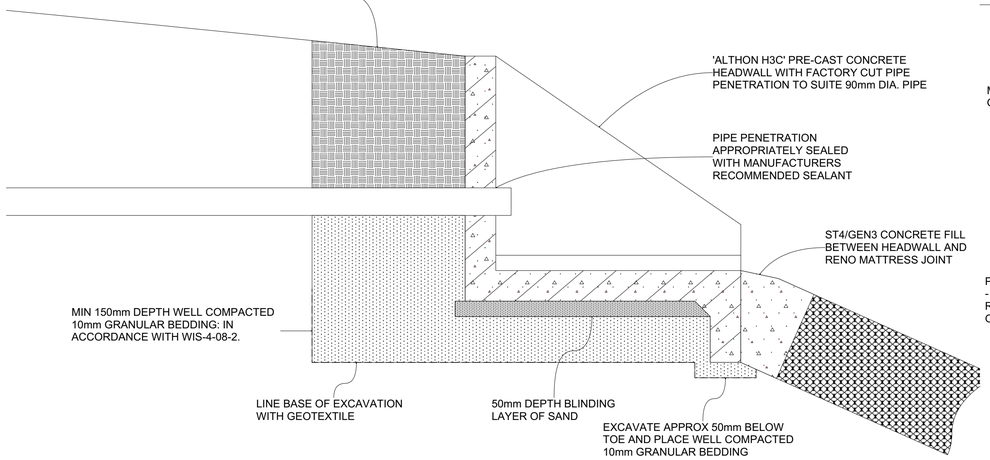
Date	Drawn	Checked	Scale
23/03/17	DN	MS	1:2000 @ A1
Project ref. RAD02	Stage [4] TECHNICAL DESIGN		Scale 1:4000 @ A3
Drawing No. RAD02-4-100-1-001			Revision

RIVER BANK OUTFALL GENERAL ARRANGEMENT

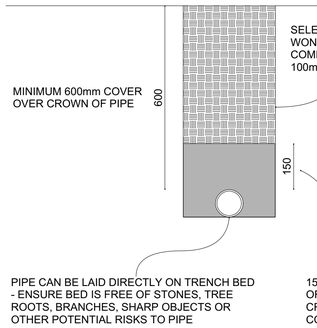




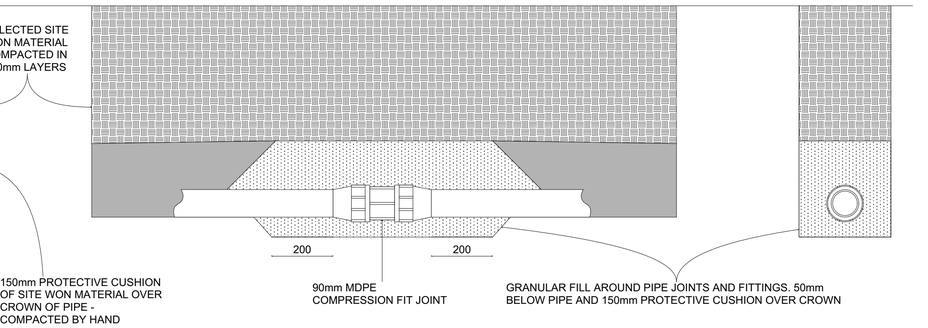
HEADWALL CONSTRUCTION DETAIL



GENERAL IN-FIELD PIPE TRENCH DETAIL



PIPE JOINT TRENCH DETAIL



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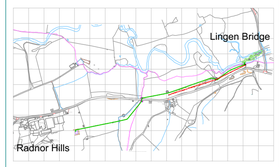

General Notes

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2. All dimensions shall be verified on site before proceeding with the work.
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4. Drawings to be read in conjunction with the relevant specification documents.
5. To be read in conjunction with the following drawings:

RAD02-4-100-1-001 Process Effluent Pipe Run General Arrangement Plan

Revision	Date	Description

Consultant
WILDFOWL & WETLANDS TRUST
SLIMBRIDGE
GLOUCESTERSHIRE GL2 7BT
www.wwtconsulting.co.uk

Client
RADNOR HILLS MINERAL WATER COMPANY Ltd
HEARTSEASE
KNIGHTON
POWYS

Sustainability Consultant SUSTAINABLE DIRECTION Ltd
sustainable direction
thinking of the future

Hydrology Consultant RUKHYDRO LIMITED
6 Claremont Buildings
Claremont Bank
Shrewsbury

Survey Engineer
INVAR MAPPING SURVEYS
1 STIPERSTONES,
MINSTERLEY, SHREWSBURY,
SHROPSHIRE, SY5 0LZ

Project Title
EFFLUENT PROCESSING SOLUTIONS

Drawing Title
PROCESS EFFLUENT PIPE RUN
CONSTRUCTION DETAILS

Date	Drawn	Checked	Scale
23/03/17	DN	MS	VAR @ A1

Project ref.	Stage	Scale
RAD02	[4] TECHNICAL DESIGN	VAR @ A3

Drawing No.	Revision
RAD02-4-100-5-001	

APPENDIX II. Western Power Distribution Asset Information

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Our Ref: 10123049 Your Ref: RAD02-100

Friday, 24 March 2017

David Naismith
WWT Slimbridge Bowditch
Dursley
Gloucestershire
GL27BT

Western Power Distribution,
Mapping Centre
Toll End Road
Tipton
West Midlands
United Kingdom
DY4 0HH
www.westernpower.co.uk

Map Response
T 0121 623 9780
F 0121 623 9223
WPDMapResponse
@westernpower.co.uk

LinesearchbeforeUdig
Help Desk 0845 437 7365

Dear David Naismith

Thank you for your enquiry dated Friday, 24 March 2017

I now enclose a copy of our plan showing existing Western Power Distribution (WPD) Electricity / WPD Surf Telecom apparatus in the vicinity of your proposed works. This information is given as a general guide only and its accuracy cannot be guaranteed. Please note that all WPD equipment on site should be assumed to be LIVE until WPD prove otherwise and provide you with confirmation to this effect in writing. Recent additions to our network, or service connections between the main cable and a building or street lamp may not be shown.

Damage to underground cables and contact with overhead lines can cause severe injury or may prove fatal. If you are excavating on site in the vicinity of either WPD Electrical apparatus or WPD Surf Telecom apparatus you must comply with the requirements of the following:-

Health & Safety Executive guidance HS(G)47, Avoiding Danger from underground services.

Work taking place in the vicinity of our plant is also regulated under the:-

Electricity at Work Regulations 1989, Health and Safety Act 1974, CDM Regulations 2015.

Safe working procedures should be defined and practiced

Please ensure that the use of mechanical excavators in the vicinity of our plant is kept to a minimum. WPD Surf Telecom ducts contain fibre cables, which are expensive to repair. Therefore, extreme care must be taken whilst working in the vicinity of these ducts, hand digging methods being used to determine their precise position.

If there are overhead lines crossing your site and your proposal involves building works which may infringe the clearance to our overhead system then you should call the relevant general enquiries number (see page 2 of this letter) for advice. Where overhead lines cross your site you must comply with the requirements of Health & Safety Executive guidance as laid down in GS6, Avoidance of Danger from Overhead Electric Lines.

Where diversions to WPD apparatus are needed to allow change to occur on site, the cost of these alterations may be charged to the persons responsible for the works.

If you require advice in connection with your proposals please contact the relevant general enquiries number (see page 2 of this letter)

Following consultation the local Western Power Distribution team will where necessary prepare detailed proposals and provide a quotation for any necessary alterations and/or development of our equipment on the site.

Yours sincerely
WPD Map Response Team

Western Power Distribution PLC
South West - 02366894
South Wales - 02366985
East Midlands - 02366923
West Midlands - 03600574

Registered in
England and Wales

Registered Office:
Avonbank
Feeder Road
Bristol
BS2 0TB

Contact Us

Emergency or Power Supply issues
In an emergency call 0800 6783 105, 24 hours a day.

Mapping Enquiries
If you have an enquiry relating to this letter or the attached map plan, please contact us using the following information:

Telephone	0121 623 9780
Fax	0121 623 9223
Email	WPDMapResponse@westernpower.co.uk

General Enquiries
If you have a general enquiry, please call us on the following telephone number:

All areas	0800 096 3080

LinesearchbeforeUdig
If you have an enquiry relating to the use of the LinesearchbeforeUdig website please contact LinesearchbeforeUdig using the following information:

Telephone	0845 437 7365
Email	enquiries@linesearchbeforeudig.co.uk
Website	www.linesearchbeforeudig.co.uk

Steps to help keep you safe

- **If you are working within 10 metres of our 33kV, 66kV, 132kV underground electricity cables or within 10 metres of an overhead electricity line you should call the relevant General Enquiries for free safety advice.**

  Safety Documents – please download our informative safety documents to help ensure that you, your staff and the public are kept safe whilst working in the vicinity of electricity.
  http://www.westernpower.co.uk/Health-and-Safety/Public-Safety

- **Make sure you have up to date plans** - remember that recent additions to our network or service connections between the main cable and a building or street lamp may not be shown.

- **Look for signs of service cables -** an electricity meter box or nearby streetlamp may give you an indication that service cables are present in your area of work.

- **Non WPD Network -** electricity cables, lines and equipment owned by others may also be present in addition to WPD network. They are unlikely to be shown on our plans.

- **Use a cable locator** - trace electricity cables and mark the position of them using paint or other waterproof marking on the ground.

- **Hand dig trial holes** - to confirm the position of cables in close proximity to your area of your work and use spades and shovels rather than picks, pins or forks.

- **Have an emergency plan** - so that everyone working on site understands what to do in the event of an underground electricity cable being damaged or contact being made with an overhead electricity line.

- **If you are working within 10 metres** of an overhead electricity line then it may be necessary for you to erect warning signs and markers, or height restriction goal posts. Ensure that you comply with the requirements of Health & Safety Executive guidance laid down in GS6, Avoidance of Danger from Overhead Electric Lines.

- **If you are erecting a structure** that could allow anyone standing on it, or its access device (ladder, scaffold, MEWP), to come within 3m of any overhead electric line then **you must inform us**. This is your duty and a legal requirement under the Electricity Safety, Quality & Continuity Regulations 2002.

- **If you cannot work safely** around the underground electricity cable or overhead electricity line, then you may need to get it moved to allow your works to go ahead. Call the general enquiry numbers above for guidance.

- **It is possible that cables or pipes may be embedded in concrete** - electricity cables embedded in concrete MUST be made 'dead' by Western Power Distribution or the cable owner before the concrete is broken out. Alternatively, another safe way of working should be agreed.

Cables are sometimes covered by tiles or a marker tape - these can be concrete, polythene or earthenware and are a useful early warning of the presence of cables; you should avoid disturbing any tiles or tape to expose the cable. Not all cables have these warning indicators.

APPENDIX III. HSE G6 Guidance Document Avoidance of Danger from Overhead Electric Lines

Avoidance of Danger from Electricity Overhead Lines and Underground Cables

WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

Avoidance of Danger from Electricity Overhead Lines and Underground Cables

Introduction

In the UK on average, 20 people are killed and 400 people are injured as a result of coming into contact (or close proximity) with electricity overhead lines and underground cables.

Although electric shock is the first thing that people associate with coming into contact with our network, those who have witnessed the effects of damage to our system are shocked by the amounts of heat, light and noise that are the result of an electrical flashover.

In the Midlands, South West and South Wales, Western Power Distribution (WPD) have had to attend to incidents where people have accidentally made contact with one of our live electricity overhead lines or damaged an underground cable and become seriously injured.

A significant number of these accidents occurred whilst people were working in the vicinity of overhead and underground electrical apparatus and this booklet has been produced to provide general guidance on how you and your employees can avoid becoming one of these statistics.

Our Operational Area

PLANNING YOUR WORK.

It makes sense to consider your safety while in the vicinity of our equipment as early in your planning process as possible.

One of the first things you should do whenever you are planning your work is to check whether there is any of our equipment in the immediate vicinity. You should do this whether your work is taking place on public (e.g. highways and footpaths) or on private land.

For instance, take a good look around your site to see if there are any visible overhead lines. You should also bear in mind that we have a very extensive network of underground cables, and we are always happy to supply a plan from our Map Response Team who can be contacted via the following;

Tel: 0121 623 9780
Fax: 0121 623 9223

WPDMapResponse@westernpower.co.uk

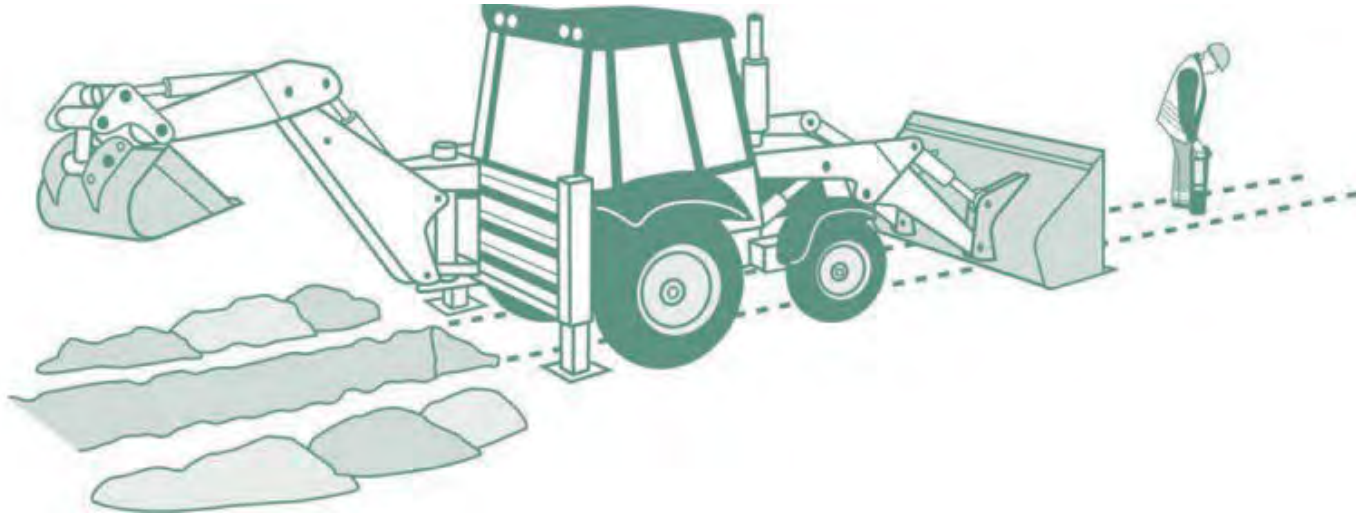
An online mapping service is available at
www.westernpower.co.uk/locationplans

It is always safer to assume that there are underground cables present in the ground until you have proven otherwise.

WORKING IN THE VICINITY OF UNDERGROUND CABLES

Having obtained copies of our network maps, it is important to recognise that in most cases there will be no surface indication of the presence of our underground cables. We therefore advise that you take the following actions:

- Make sure that you have up-to-date copies of our cable record plans ON SITE - not back in the office.
- Don’t assume that these plans are to scale if they have been faxed or copied.
- Make sure that a competent person using a Cable Avoidance Tool (CAT) locates all of the cables shown on these plans.
- Mark the locations of cables on the ground surface with waterproof road paint or other permanent marker.
- Always assume that our cables are live unless we have informed you, in writing, otherwise.



- By hand, dig trial holes to locate the exact position of all cables. Always use a spade or shovel – never use a pick, fork or power tool – push the spade or shovel into the ground applying foot pressure.

- Look out for ducts, marker tape or tiles but do not rely on these. Even if a cable route was originally laid in a duct or with a marker tape, these may have been removed during other excavations at a later date along all or part of the cable route.
- Brief all people working in the vicinity of the presence and location of all underground cables.

UNDER NO CIRCUMSTANCES SHOULD YOU ATTEMPT TO WORK ON, OR INTERFERE WITH, ANY OF OUR UNDERGROUND CABLES.

The only people qualified to work on this equipment are our operatives; who have been specifically trained and are authorised in writing to do so.

Please also be aware that:

- Cable record plans are not guaranteed to be completely accurate. Kerb lines, roads and buildings may have been moved or altered since the cables were laid.
- Cables should ordinarily be at least 450mm deep but don't assume this to be the case where you are working – ground levels could have changed.
- Not all service cables are shown on record plans, so look for cables running down poles and bear in mind that all buildings, street lights and street furniture are likely to have cables running to them. Cables feeding street furniture may be relatively shallow near to the furniture.
- Cables do not run in straight lines. They often "snake" through the ground avoiding surface and buried obstacles that may not be visible to you.
- Cables are flexible and can change direction and depth abruptly – for this reason never use mechanical excavators within 0.5m of any underground electricity cable even if you have located it with trial holes.

- **No attempt should be made to break out concrete surrounding a cable. Please contact us immediately on our general enquiries number and we will discuss the options for safe working which may include making the cable dead or you moving your work site if possible. If we need to make the cable dead we may need to provide our customers with two weeks notice of the power interruption.**
- Our cables and joints are not designed to act as steps or to be left unsupported. If you remove support from any cable, you will need to support it using temporary hangers at not more than 0.5m intervals.
- When backfilling, please consolidate the ground under the cables, cover the cable with soil free of stones or with stone dust and replace any cable marker tiles, ducts and tape.

IF YOU DAMAGE AN UNDERGROUND CABLE

you must immediately clear the area of personnel, because the cable could still be live, or become live again.

If a machine is still in contact with the cable, instruct the driver to JUMP clear. Do not touch any part of the machine.

Please contact us on our emergency number immediately and tell us what has happened. Please be ready to provide us with a contact telephone number and an accurate location or set of directions – this will help us in getting our staff to site quickly to minimise any danger and lessen the disruption to your work.

Please report any damage to a cable, however superficial it might seem. The cable may not fail at the time of damage, but it could fail later, causing danger to our staff and other contractors, disruption to our customers' supplies, and also – if we trace the damage back to you – a very much larger repair bill.

WORKING IN THE VICINITY OF OVERHEAD LINES

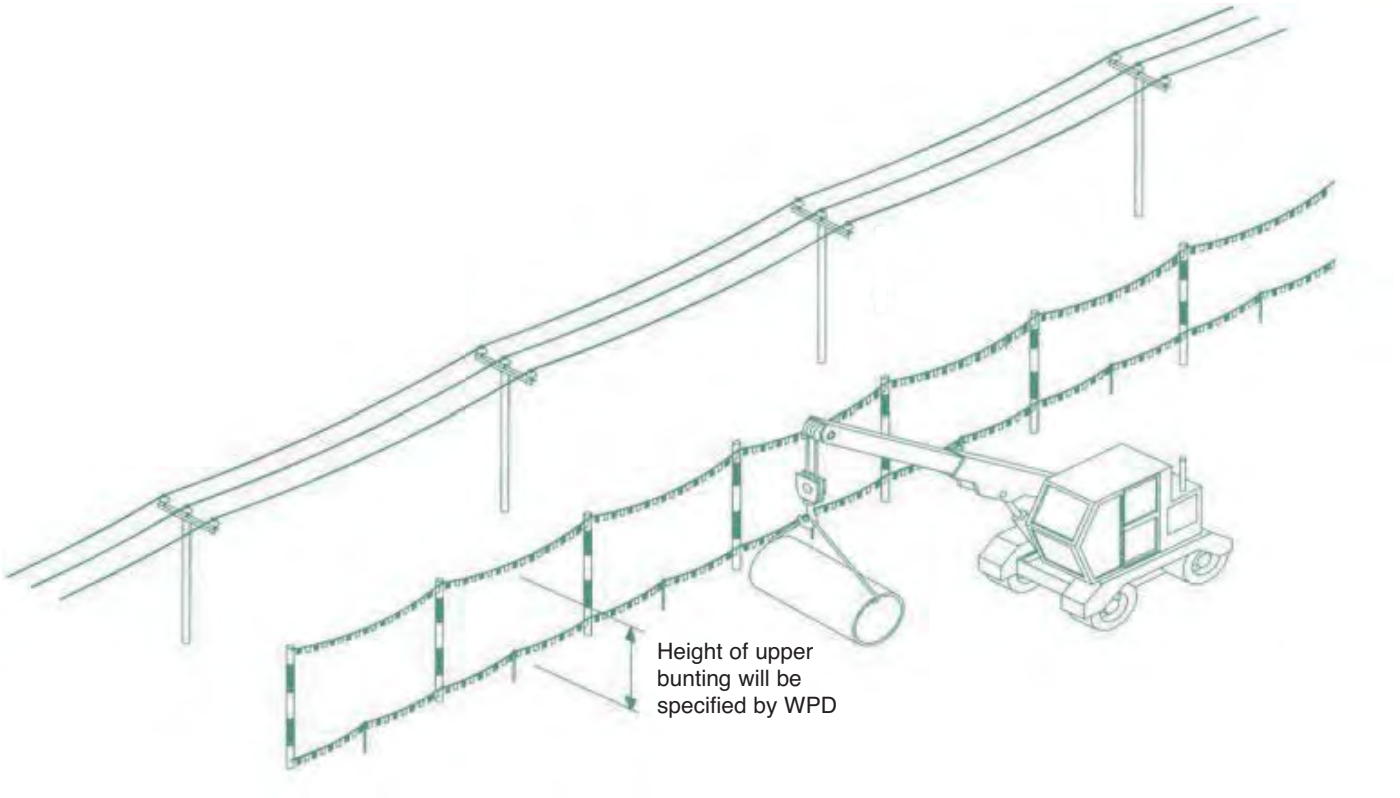
UNDER NO CIRCUMSTANCES SHOULD YOU ATTEMPT TO WORK ON, OR INTERFERE WITH ANY OF OUR OVERHEAD LINE EQUIPMENT OR SERVICE WIRES.

The only people qualified to work on this equipment are our operatives; who have been specifically trained and are authorised in writing to do so.

Overhead lines have the advantage that, unlike underground cables, they can easily be seen.

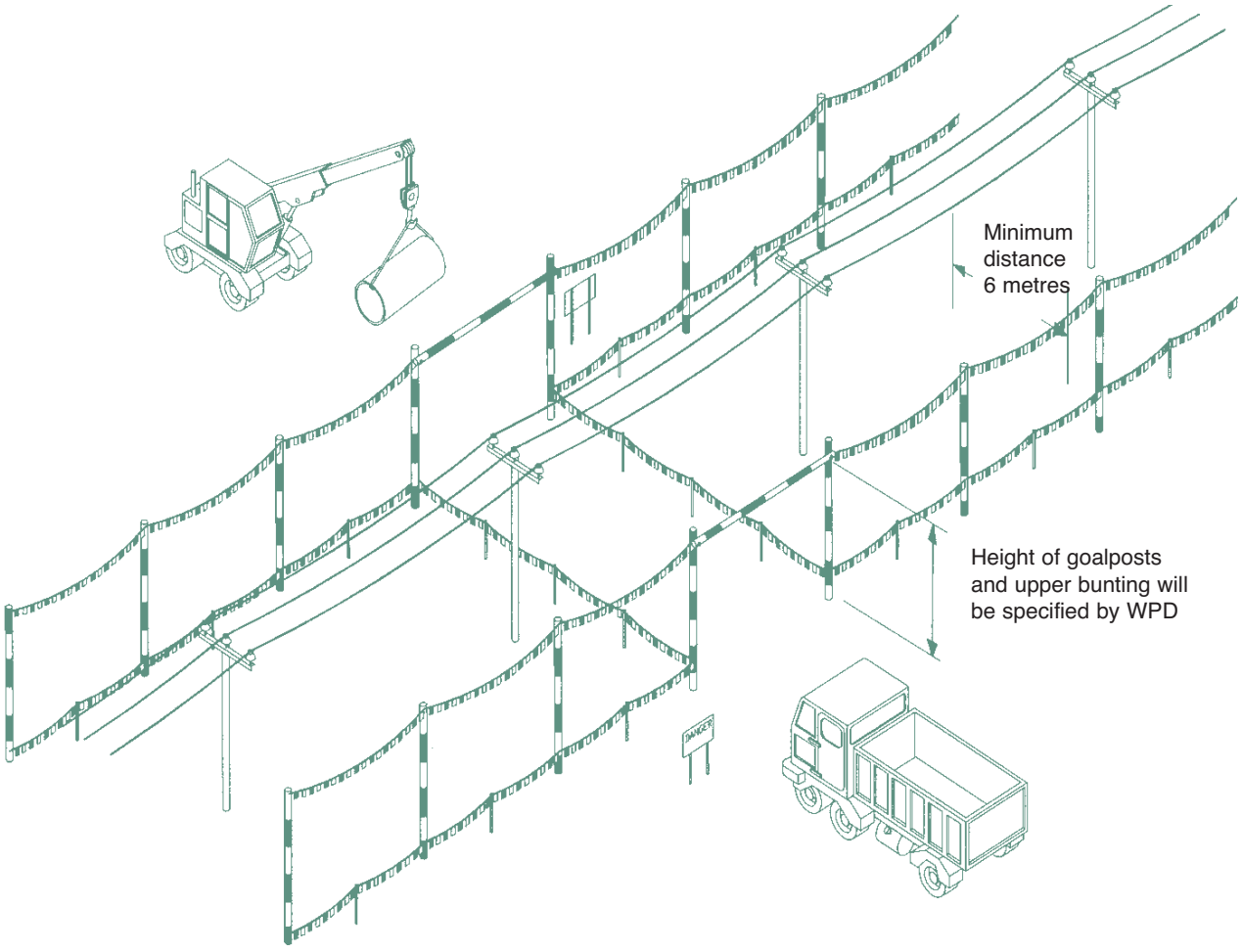
- Always assume that our overhead lines are live unless we have informed you otherwise in writing.
- We will be able to advise you about the type and voltage of the overhead lines in question and provide you with information about the clearances that you must adhere to during your work. Please ring our regional general enquiries number for further advice.
- If you are in any doubt about whether the overhead lines in question are power or telephone (this is a very common mistake) – please ask us.
- In some circumstances, we may be able to temporarily shroud low voltage overhead lines and services running to buildings if you need to work in the vicinity e.g. for scaffolding erection, fascia repairs and painting work on domestic properties. We don't normally charge for the shrouding of overhead lines, but please give us as much notice as possible.
- If you think that you will be working close to our overhead lines and they need shrouding – please don't start work until we have agreed what needs to be done and all safety precautions are in place.
- Please note that it is not technically possible to shroud high voltage lines, so if you cannot avoid working near to our high voltage lines, contact us and we will be happy to meet with you to discuss safe alternatives.

- If it is decided that work can go ahead in the vicinity of our overhead lines but there is a risk of you infringing the safety clearances from the overhead lines, you have a responsibility to erect safety barriers to segregate your works from the area around the overhead lines. The detailed requirements for these barriers are provided in the HSE document GS6 ‘Avoidance of Danger from Overhead Lines’. As a summary they should consist of:
  - Red and white coloured posts erected at 6m intervals, with coloured bunting stretched between their tops, supplemented by low level bunting erected at 1m above ground level, supported at 3m intervals on red and white coloured posts. This is shown below.



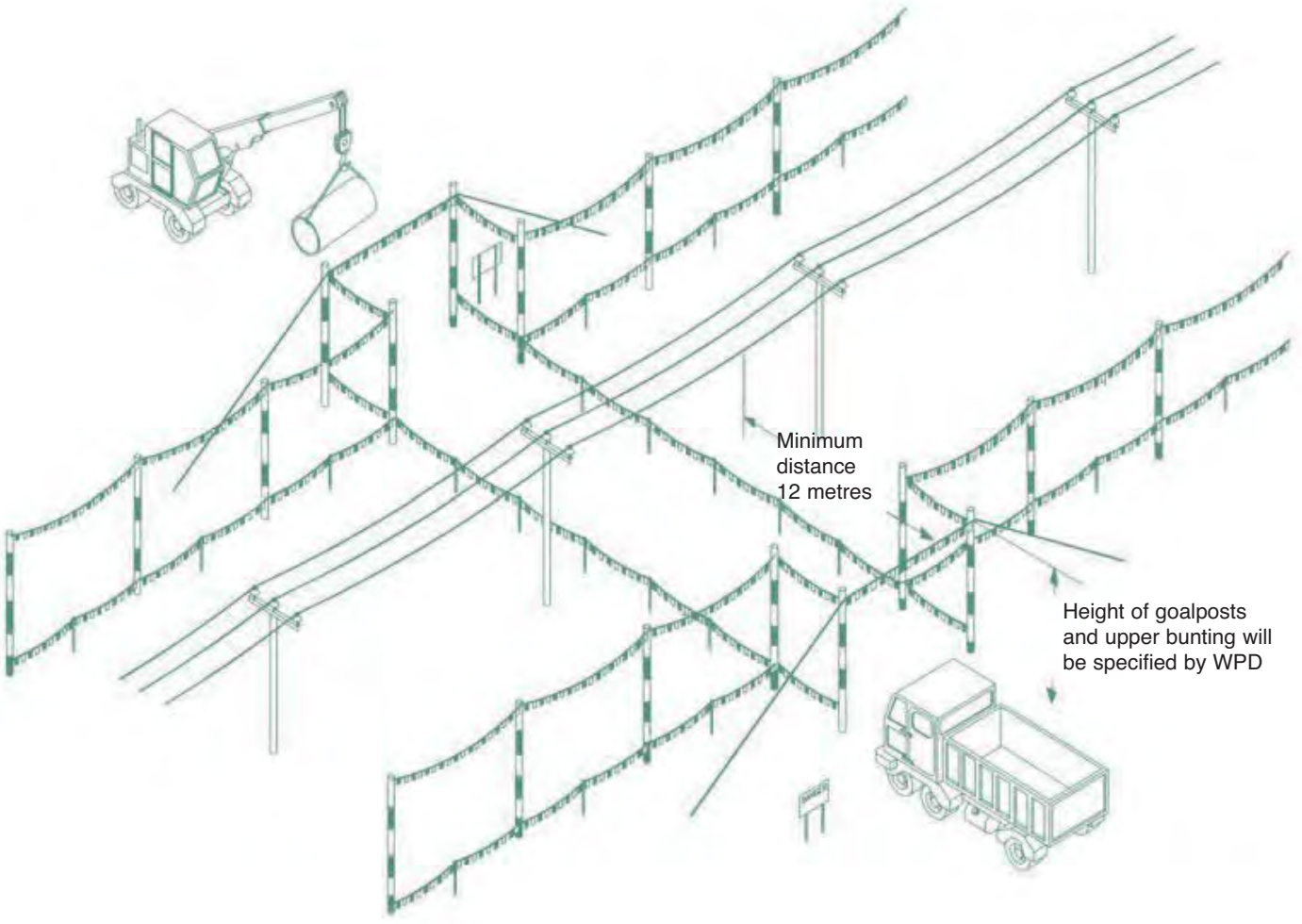
  - We are able to advise you on the height of the barriers and any additional clearances necessary if you are using large plant on your site.
  - Any bunting, ropes and lanyards used should be made from an insulating material.
  - These barriers should be erected parallel to the overhead line at a minimum distance of 6m horizontally from the outermost conductor of the overhead line.

- The supports may be supported by rubble or concrete filled barrels or buried directly in the ground.
- Danger Notices should be fixed to all of your high level supports.
- The ground enclosed within these barriers is best regarded as “dead ground” in which all foot and vehicular traffic is forbidden, in all circumstances, for the duration of your work.
- Where it is necessary for foot and vehicular traffic to pass under the line, you will need to form a marked access way between the barriers as shown below.



- This access way should comprise of bunting erected 1m above ground, supplemented by high level “goal-posts” erected at either end.
- The goal post cross bars should be rigid, made of insulating material and positioned in a location and at a height specified by us.

- The access route should be as narrow as possible and should not normally exceed 10m in width.
- If it is necessary to make the access route wider than this, you may find it impractical to use rigid cross bars, so you may use a tensioned rope and bunting instead. If you use rope and bunting as a cross bar, you should move the entrance to the access route out to a minimum distance of 12m from the outermost conductor of the line. This is to allow for any stretching of the rope if pulled by your plant.



- If you decide to use steel wire rope to support the barrier, this must be effectively connected to earth at both ends.
- You should also install Danger Notices at all probable directions of approach and clearly display the cross bar height.
- If you are working at night, or in conditions or poor visibility, you should ensure the area is well lit and that the overhead lines are clearly visible.
- Whatever measures you take, you should ensure that everyone working in the vicinity of overhead lines is briefed about the risks and what safety measures are in place. Do not permit anyone to carry long objects, especially scaffold poles, ladders and irrigation pipes in the vicinity of overhead lines.
- You should ensure that all shrouding, barriers and signs are regularly inspected and maintained so that they remain effective.
- Overhead lines are not normally insulated and electricity at high voltages may jump, so a dangerous situation can arise just from a close approach.
- Cranes and excavators working near overhead lines are at increased risk because of the possibility of the jib/arm slewing or being raised into the overhead line, or the load swinging into the overhead line. You may therefore also need to fit plant and vehicles with restricting chains etc. to physically restrain their operation – we can advise on this if you wish.
- If you are planning to carry out tree cutting or arboriculture work in the vicinity of our overhead lines, you need to be aware that this is a complex, high risk activity and we recommend that you employ a competent tree surgeon, who complies with all of the requirements of Forestry industry Safety Accord (FISA) publication FISA 804 - Electricity at work: Forestry.

If contact is made with an overhead line

you must immediately clear the area and suspend all work within 50m of the damage because the line could still be live, or become live again.

The operator of a machine that is in contact with an overhead line should:

- **if the machine is still operable and the operator is still in the cab:**

  provided that you do not risk breaking the overhead line or dragging it to the ground, immediately lower the raised parts of the machine USING ONLY THE CONTROLS IN THE CAB and/or drive the vehicle clear of the overhead line.

  contact us immediately on our emergency number so that we can check the overhead lines.

  instruct other people in the vicinity not to approach the vehicle.

- **if the machine is not operable, cannot be driven clear of the overhead line or there is a risk that doing so will break the line or drag it to the ground:**

  stay in the cab.

  contact your site manager or us immediately on our emergency number by radio or mobile phone or as soon as possible by any other method.

  instruct everyone outside the vehicle not to approach it.

  do not exit the cab until given confirmation BY WPD PERSONNEL that it is safe to do so.

- **if the machine is inoperable or cannot be driven free and there is risk of fire or other immediate hazard:**

  JUMP clear of the vehicle, avoiding simultaneous contact with any part of the machine and the ground.

  try to land with your feet as close together as possible.

  where possible, continue to move away from the vehicle using “bunny hops” with your feet together until at least 15m from the vehicle.

  instruct other people in the vicinity not to approach the vehicle.

  contact us immediately on our emergency number.

  do not return to the vehicle until given confirmation by WPD PERSONNEL that it is safe to do so.

Whatever the circumstances please contact us on our emergency number immediately and tell us what has happened. Please be ready to provide us with a contact telephone number and an accurate location or set of directions – this will help us in getting our staff to site quickly to minimise any danger and lessen any disruption to your work.

Please report any damage or contact no matter how minor they may seem to you at the time. The damage may not cause a serious problem at the time of damage, but it could fail later, causing danger to our staff and members of the public, disruption to our customers' supplies, and – if we trace the damage back to you – a large repair bill.

MORE INFORMATION

For your information, we are legally obliged to report all contact with our system to the Health & Safety Executive (HSE), and, if you are an employer, you may be obliged to report incidents involving your staff or contractors to the HSE. Even if no one is hurt, you could be prosecuted for failing to report such an incident.

More detailed general information on this subject is available in the following publications from the HSE:

HSG(47) – Avoiding Danger from Underground Services

GS6 – Avoidance of Danger from Overhead Lines

Along with Forestry Industry Safety Accord (FISA) publication FISA 804 – Electricity at Work: Forestry

If you require more site-specific information relating to our equipment at your location please contact us on our regional general enquiries numbers.

Our general enquiries numbers are;

Midlands General Enquiries	0845 724 0240
South Wales General Enquiries	0845 601 3341
South West General Enquiries	0845 601 2989

FINALLY…

Please, always remember that electricity cables and overhead lines can be very dangerous – the general rule is STAY AWAY and stay safe.

NOTES

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Serving the Midlands, South West and Wales

This booklet is issued by the Safety Team

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2014, 4th issue

Our emergency number is:
0800 6783 105

Calling from a mobile?
East Midlands
0330 123 5009
West Midlands
0330 123 5008
South Wales
0330 123 5002
South West
0330 123 5001

LOOK OUT-

LOOK UP!

A Guide to the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines

WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

The Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines

Introduction

Every year in the UK on average, two people are killed and many more are injured when mechanical plant and machinery comes into contact or close proximity to overhead electricity lines.

This booklet has been produced for anyone who uses mobile plant, (such as Hiabs, MEWPs, Tipper Lorries and Trailers, Grab Lorries, Concrete Conveyors and Excavators) for short duration work and provides general guidance on how to avoid becoming part of these statistics.

1 BEFORE STARTING WORK

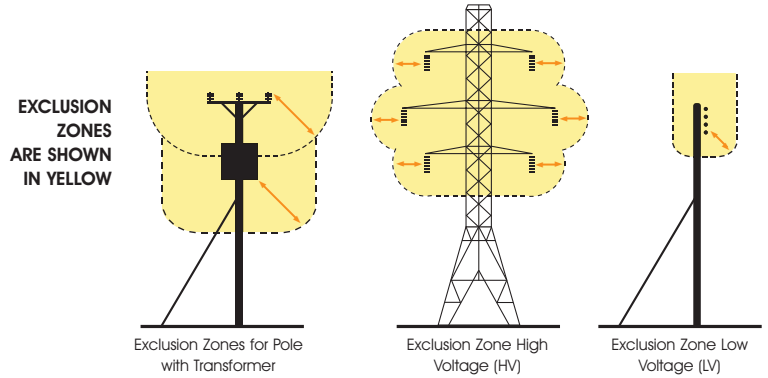
- Overhead lines have the advantage that they can easily be seen, so before you set up your vehicle or plant always:

STOP AND LOOK UP!

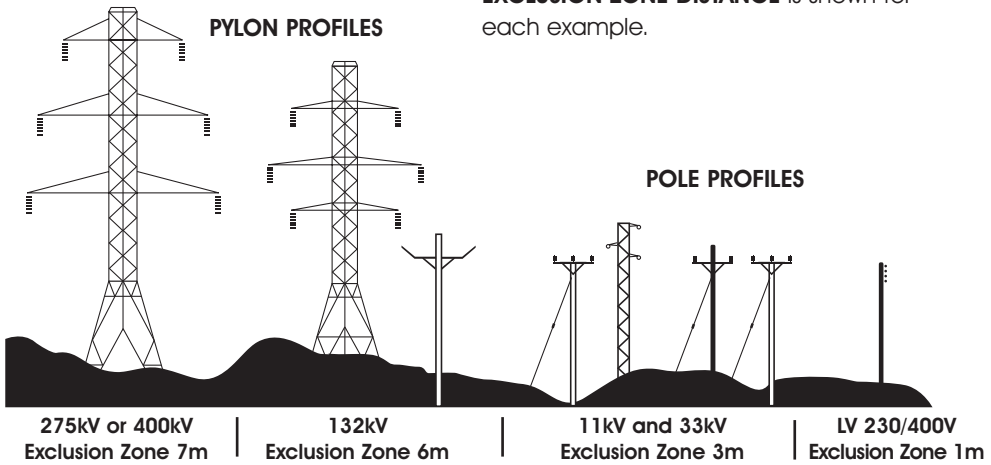
- If you are working at night, or in conditions of poor visibility, you should use spotlights or a torch to carefully check that there are no overhead lines within your vehicle's reach.
- Always assume that our lines are live unless we have informed you otherwise in writing.
- If you are in any doubt about whether the lines in question are power or telephone (this is a very common mistake) – always assume that they are power lines and are live.
- It is not normally practical for electricity companies to shroud high voltage conductors and even when low voltage conductors are shrouded, the shrouding is not designed to protect against contact by mechanical plant – again, always assume the lines are live.

2 EXCLUSION ZONES

- Overhead power lines are not normally insulated and so any contact can result in serious or fatal injuries.
- Electricity at high voltages can also jump gaps with no warning whatsoever, so it is also dangerous to let your plant approach too close to a line.
- The distance that electricity can jump depends on the voltage of the line. The higher the voltage, the further you must stay away from the line and any other equipment that may be fitted to the pole or pylon. This distance is called the **EXCLUSION ZONE.** Examples of this are shown highlighted in the diagram below.



- You must not allow any part of your plant to enter the **EXCLUSION ZONE.**
- The diagram below shows typical types of overhead lines and provides a guide to help you assess the line voltage of lines on wooden poles or steel pylons. The minimum **EXCLUSION ZONE DISTANCE** is shown for each example.

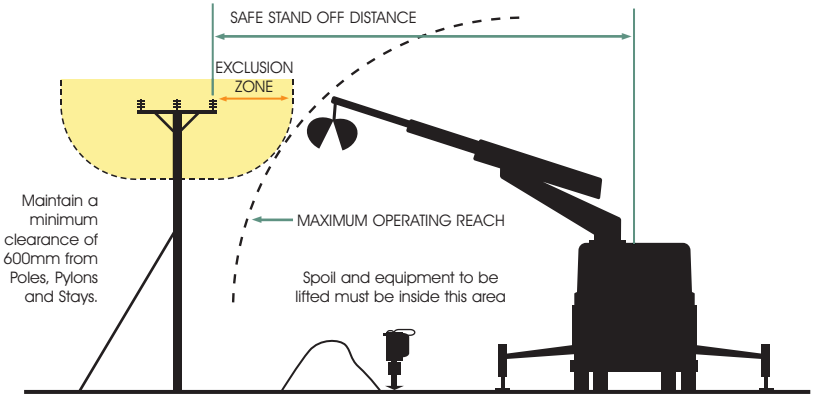


- Please note that these are absolute minimum distances that should under no circumstances be infringed. ***If you do – it could prove fatal.***

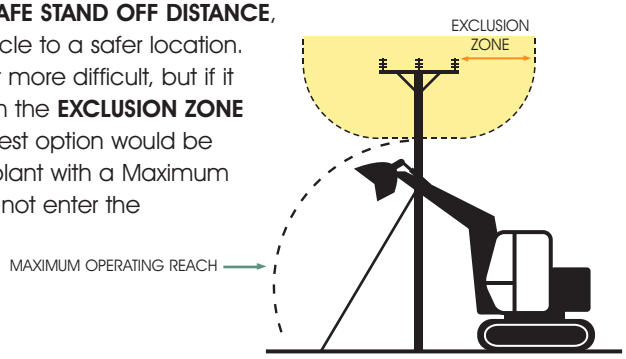
- As well as staying away from the lines or equipment, you should also stay at least 600mm away from any part of poles, pylons and stay wires.
- Please remember that is for guidance only, and if you are in any doubt, please call us for advice before setting up your plant or starting work.

3 STAND OFF DISTANCES

- If there are power lines in the vicinity of your work the best way to make sure you stay out of the **EXCLUSION ZONE** is to position your vehicle at a **SAFE STAND OFF DISTANCE** so that, even when fully extended, no part of it can accidentally reach inside the **EXCLUSION ZONE**.
- This **SAFE STAND OFF DISTANCE** can be calculated by adding the **EXCLUSION ZONE** distance for the appropriate voltage of the line to the Maximum Operating Reach of your vehicle. This is shown in the diagram below.

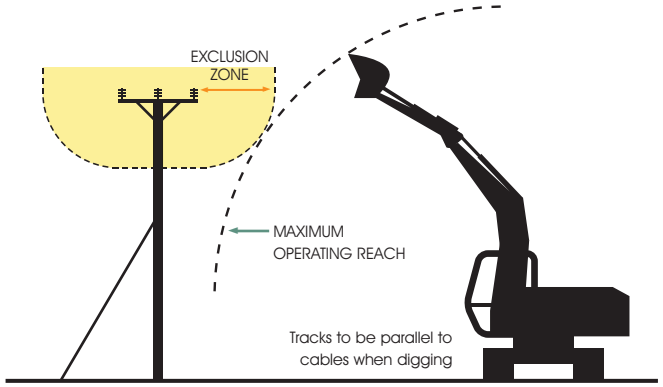


- If you position your vehicle outside of the **SAFE STAND OFF DISTANCE**, there is no risk of accidental contact with the lines and no danger of electricity jumping from the line to your vehicle.
- If you cannot achieve a **SAFE STAND OFF DISTANCE**, consider moving your vehicle to a safer location. It may make your job a bit more difficult, but if it means you stay away from the **EXCLUSION ZONE** - it will be safer. The next best option would be to consider using smaller plant with a Maximum Operating Reach that cannot enter the **EXCLUSION ZONE**.



- You may not be able to achieve either of these options, so, as a last resort, if you cannot avoid operating large items of plant in the vicinity of lines, you **MUST** make sure that the plant is fitted with restraints to ensure that the **EXCLUSION ZONE** cannot be entered. These restraints may be electrical or hydraulic systems fitted to the plant, or mechanical devices such as chains.

  Please seek advice from the plant manufacturer for more information on choices available for your particular item of plant.
- If you are using a mechanical excavator to dig parallel to the line, it is good practice to position the excavator with the tracks or wheels parallel to the line, so as you move along the excavation the **SAFE STAND OFF DISTANCE** is easily maintained.



- Care must also be taken to avoid non-mechanical equipment, (e.g. scaffold poles, ladders and long loads such as lengths of steel or timber) from entering the **EXCLUSION ZONE**.
- Always maintain at least 600mm clearance from your plant to any of our poles, stay wires or pylons. Any contact with these by your plant could cause the line to break and fall to the ground.

4 EMERGENCY PROCEDURES

If contact is made with an overhead line, you must immediately clear the area and suspend all work within 50m of the damage because the line could still be live, or become live again.

The operator of a machine that is in contact with an overhead line should take the following steps:

- **If the machine is still operable:**
  - lower any raised parts that are controlled from the driving position and/or drive the vehicle clear of the line, as long as neither of these actions risk breaking the line or dragging it to the ground.

- **If the machine is not operable or cannot be driven clear of the line:**
  - stay in the cab.
  - contact your site manager or us immediately by radio or mobile phone or as soon as possible by any other method.
  - instruct everyone outside the vehicle not to approach it.
  - do not exit the cab until given confirmation BY WPD PERSONNEL that it is safe to do so.

- **If the machine is inoperable or cannot be driven free and there is risk of fire or other immediate hazard:**
  - jump clear of the vehicle, avoiding simultaneous contact with any part of the machine and the ground.
  - try to land with your feet as close together as possible.
  - where possible, continue to move away from the vehicle using "bunny hops" with your feet together until at least 15m from the vehicle.
  - instruct other people in the vicinity not to approach the vehicle.
  - do not return to the vehicle until given confirmation BY WPD PERSONNEL that it is safe to do so.

Whatever the circumstances please contact us on our emergency number immediately and tell us what has happened.

Please be ready to provide us with a contact telephone number and an accurate location or set of directions – this will help us in getting our staff to site quickly to minimise any danger and to reduce any disruption to your work.

Our emergency number is:

105 or 0800 6783 105

Please report any damage or contact no matter how minor they may seem to you at the time. Whilst the damage may not cause a serious problem at the time of contact it could fail later, causing danger to our staff and members of the public, disruption to our customer's supplies, and – if we trace the damage back to you – a larger repair bill!

5 MORE INFORMATION

- Proximity Warning Systems (such as Wire Watcher – see *wirewatcher.co.uk* for information) may be fitted to your vehicle. Never turn these devices off or disable them in any way.
- Take note of any warnings these proximity warning systems may provide but do not use the presence of such devices as a reason not to follow the advice provided in this leaflet.
- For your information, we are legally obliged to report all contact with our system to the Department of Trade and Industry (DTI), and, if you are an employer, you may be obliged to report incidents involving your staff or contractors to the Health & Safety Executive (HSE). Even if no one is hurt, you could still find yourself being prosecuted for causing a dangerous occurrence.

6 FURTHER READING

For advice related to signing and guarding at longer term work sites please also refer to WPD booklet "Avoidance of Danger from Electricity Overhead Lines and Underground Cables"

More detailed information is also published in the following documents available from the HSE.

GS6 – Avoidance of Danger from Overhead Lines.

HS(G) 47 – Avoiding Danger from Underground Services.

Along with Forestry Industry Safety Accord (FISA) publication **FISA 804 - Electricty at Work: Forestry.**

If you require more site-specific information relating to our equipment at your location please contact us on the relevant **GENERAL ENQUIRIES NUMBER**:

0800 096 3080

FINALLY.... Please, always remember that electricity overhead lines can be very dangerous **– the general rule is *STAY AWAY and STAY SAFE!***

For the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines ALWAYS FOLLOW THESE SIMPLE RULES – THEY COULD SAVE YOUR LIFE!

- Treat all overhead lines as live and dangerous
- Any contact may be fatal or cause very serious injuries
- Electricity can jump gaps
- Before you set up or use plant near to lines – STOP and LOOK UP
- Take special care and use lights in the dark or poor light conditions
- If there are lines in the vicinity of your work – stay well away
- Set up your plant with care to reduce the chance of contact
- If you are unsure or need advice

  - please ask us before starting work

Our emergency number is: **105 or 0800 6783 105**

You can also call 105 if you spot damage to electricity power lines, poles and substations which could put you or someone else in danger.

If there's a serious immediate risk, you should also call the emergency services.

This booklet is issued by the Safety Team: wpdsafetyhelpline@westernpower.co.uk

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Registered Office: Avonbank, Feeder Road, Bristol BS2 0TB

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APPENDIX IV. Photographs

Photograph 1 – River bank at proposed outfall location

Photograph 2 – View of the river bank from the top