

O'CONNOR UTILITIES LTD.

Directional Drilling Method Statement

O'Connor Utilities Limited
For
Dŵr Cymru Welsh Water

Installation of Trunk Water Mains:

2 No. Bores x 1 No. 500mm SDR-9 PE100 Blue Barrier Pipe

DEE TUNNEL DIVERSIONS

River Dee – 1 & 2



Produced By:	Ross J Henderson	Title:	HDD Design Manager
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OCU Ref.	3573-RAMS-001	DCWW Ref.	
Issue No.	0	Date:	15/03/21

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I confirm that the contents of this Method Statement have been explained to me and I agree to abide by its content and inform my site supervisor immediately of any changes which may affect the health and safety of me/us or others likely to be affected by the works:

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VISITORS LIST

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1.0 SITE SPECIFIC RISKS (other than Generic)

Item	Working in open public spaces
<i>Hazards</i>	Pollution, Spillages, Movement of Plant & Vehicles, Litter
<i>Persons at risk</i>	General Public, Traffic
<i>Duration</i>	Throughout works, tracking to and from launch/reception pits
<i>Controls</i>	The bores pass beneath National Cycle Route 5 which runs along the south bank of the River Dee, however no works associated with the HDD are planned for this location. Area around machine to be secured with Heras fencing panels & appropriate signs erected. Follow designated access routes, utilise flashing beacons and travel at a reduced speed of 10mph. Plant/Machinery to be checked before, and monitored during, use. Plant/Machinery to be switched off and keys removed when not in use. Plant/Machinery to be moved to site compound at end of shift, where appropriate. Bore Plans 3573-DWG-002 Rev0 to be followed to prevent Settlement and 'Break-Out' of fluid. Hay Bales and Lost Circulation drilling fluid additives to be onsite in case of 'Break-Out'. Gates to be closed after use to prevent unauthorised access. Material Storage areas to be secured inside fenced compound. Fencing panels and signage to be checked before leaving site.
Item	Drilling near Utilities
<i>Hazards</i>	Electrocution, Explosion, Loss of water, sewer and telecoms supply, etc.
<i>Persons at risk</i>	General Public, Operatives
<i>Duration</i>	During drilling & reaming operations
<i>Controls</i>	Permit to Drill to be followed. Location of HV, LV and Water in Dock Road to be identified and verified by OCU. Location of HV and IP Gas parallel to River Road to be identified and verified by OCU. Location of 2 No. IP Gas pipelines between the north bank flood defence and the infilled lagoon to be identified and verified by OCU. Utility prints to be on site and marked out on the ground. Excavate trial holes to reveal critical utility depths. Complete drill in accordance with Bore Plan 3573-DWG-002 Rev0. Trip switch/Strike Alarm to be checked before drilling commences.
Item	Working on 3rd Party Sites
<i>Hazards</i>	Other Contractor's Working, Site Traffic.
<i>Persons at risk</i>	OCU Operatives, Other Contractor's Operatives.
<i>Duration</i>	During drilling & reaming operations
<i>Controls</i>	Abide by Tata Site Rules. Attend Site Induction. Provide Method Statement of Works to enable Tata to co-ordinate site activities and apply any temporary measures to mitigate risks. No motorcycles or Quad Bikes to be used on the Tata site.

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Item	Badgers (<i>Meles meles</i>)
<i>Hazards</i>	Disturbance of Badgers
<i>Persons at risk</i>	Badgers
<i>Duration</i>	Throughout works
<i>Controls</i>	Badger monitoring and licence application to be conducted by DCWW, if required, prior to commencement of works. Badgers are protected under the Protection of Badgers Act 1992. The licensing period for Badgers is 1st July to 30th November inclusive. One disused Badger Sett, currently used as a fox den, lies within the enhancement area on the south bank of the river, (Grid Ref. SJ 30106 69700). This site is to be resurveyed two months prior to the start of works. Two disused Badger setts are located in the HDD Exit field area, (Grid Ref. SJ 30535 69969 and SJ 30537 69927). An active sett was located in the south-east of the Pipe stringing area, (Grid Ref. SJ 31465 70053). A 30m exclusion zone to be established around badger setts. Excavations to be covered at night. All excavations to have ramps as a means of escape included. Ramps to be erected over the welded pipeline to facilitate badger access. Dense vegetation clearance to be supervised by an ecologist. If sighted badgers will not be disturbed. Injured animals will be reported to Natural Resources Wales.
Item	Reptiles (Common Lizard - <i>Lacerta vivipara</i>), Adder (<i>Vipera berus</i>) and Grass Snake (<i>Natrix natrix</i>)
<i>Hazards</i>	Disturbance of Reptiles
<i>Persons at risk</i>	Reptiles, OCU Operatives
<i>Duration</i>	April to September
<i>Controls</i>	Historically, reptiles are known to have been present along the railway line to the south of the Entry Point, but have not been recorded since 1999, and Adder, Grass Snake and Common Lizard have been recorded within the Tata Steel plant. Ecologist to check for reptiles immediately prior to any vegetation clearance. Excavations to be covered at night. All excavations to have ramps as a means of escape included. If sighted reptiles will not be disturbed. Injured reptiles will be reported to NRW.
Item	Otters (<i>Lutra lutra</i>)
<i>Hazards</i>	Disturbance of Otters
<i>Persons at risk</i>	Otters
<i>Duration</i>	Throughout works
<i>Controls</i>	Otters are protected under the Conservation of Habitats and Species Regulations 2010 Reg 41, and the Wildlife and Countryside Act 1981 (as amended) Schedule 9. Historically, Otters are known to forage along the River Dee, but have not been recorded since 1999. Excavations to be covered at night. All excavations to have ramps as a means of escape included. If sighted otters will not be disturbed. Injured animals will be reported to NRW.

Item	Water Vole (Arvicola amphibius)
<i>Hazards</i>	Disturbance of Water Vole
<i>Persons at risk</i>	Water Voles
<i>Duration</i>	Throughout works
<i>Controls</i>	Historically, Water Vole are known to forage along the south bank of the River Dee, but have not been recorded since 2008. Excavations to be covered at night. All excavations to have ramps as a means of escape included. If sighted water voles will not be disturbed. Injured water voles will be reported to NRW.
Item	Bats
<i>Hazards</i>	Disturbance of Bats
<i>Persons at risk</i>	Bats
<i>Duration</i>	Throughout works
<i>Controls</i>	Bats are protected by UK, European and International Law. In the UK, the following legislation applies: - Schedule 5 of the Wildlife and Countryside Act 1981, as amended and the Conservation of Habitats & Species Regulations 2010. Bats are not thought to be present within the working area however may forage in the vicinity of the works. No mature trees need to be removed to facilitate the works. Site lighting will be directed into the compound to minimise impact to bats. Illumination will be minimised at night when no works are underway.
Item	Trees and Scrub
<i>Hazards</i>	Damage to trees
<i>Persons at risk</i>	Trees
<i>Duration</i>	Throughout the Works
<i>Controls</i>	The trees do not have TPO's however are of ecological value and may provide habitat for nesting birds. Any bushes and/or trees requiring trimming or clearance will be removed during February as part of the enabling works. Bore path to be selected to avoid tap roots. Works to be conducted in accordance with BS5837:2005 and NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees.
Item	Ecological Constraints
<i>Hazards</i>	Ecological Constraints
<i>Persons at risk</i>	Ecology
<i>Duration</i>	Throughout the Works
<i>Controls</i>	An Ecological Constraints Report has been produced by APEM, (Document Ref. 219/10/2021), included as Appendix D. The recommendations within this report will be complied with. ECoW to supervise site clearance. ECoW to perform Tool Box talks during Works.

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Item	Contaminated Land
Hazards	Contact with harmful materials
Persons at risk	OCU Operatives, General Public
Duration	Throughout drilling activities
Controls	<u>Historic Landfill at Entry Point, south of Dock Road</u> Gas Monitoring equipment to be used to check excavations at Entry Point where previous use was Landfill. All excavated material to be isolated for testing. Plant & Machinery to be washed down onsite before removal. Good Hygiene practices to be followed. BH01A and BH01B encountered landfill waste to depths of 2.9m and 3.6m bgl respectively. Additional SI with WAC Testing will be conducted through this material. <u>Historic Landfill and Infill north of Dock Road</u> BH02A and BH02C encountered possible “Galligu”, (Arsenic and Heavy Metal contaminated LeBlanc Process waste), at depths between 1.80m and 3.00m bgl. The HDD bores will be at depths of over 11 meters bgl by the time they get into this area of the drill, and be well below the water table, which sits just below surface at a depth of around 0.70m bgl, so are unlikely to be affected by any leachate. The HDD bore will be within the impermeable stiff Clay Glacial Till by the time it is beneath the historic landfill and infill north of Dock Road, and will not therefore encounter DNAPL leachate. <u>Infilled Lagoon North of the River Dee</u> Risks associated with settlement due to vibration consolidation have been expressed regarding the Infilled Lagoon The drilling system will be a Jetting Assembly rather than a percussive system, and no vibration induced settlement will be created. The HDD bore will be within the impermeable stiff Clay Glacial Till beneath the infilled lagoon north of the River Dee, and will not therefore encounter DNAPL leachate. <u>Former Tata Buildings at Exit Point</u> Gas Monitoring equipment to be used to check excavations at Exit Point where previous use was Landfill. All excavated material to be isolated for testing. Plant & Machinery to be washed down onsite before removal. Good Hygiene practices to be followed. BH06 encountered construction waste with a strong hydrocarbon odour to depths of 2.4m bgl, although no free phase product was encountered. Additional SI with WAC Testing will be conducted through this material.
Item	Ground Gas (Methane and Carbon Dioxide)
Hazards	Contact with harmful materials
Persons at risk	OCU Operatives
Duration	During Excavation of Entry and Exit Pits
Controls	Methane (Max 40.5%) and Carbon Dioxide (Max 19.8%) were identified in the landfills south of the Dock Road and in the Tata site. Gas monitors to be used during excavations to prevent exposure to gas risk.

Item	Existing Site Investigation Bore Pathways to Surface
<i>Hazards</i>	Break-Out of Drilling Fluid
<i>Persons at risk</i>	Drilling Programme
<i>Duration</i>	Throughout drilling activities
<i>Controls</i>	The Site Investigation bores drilled by Arcadis have had Gas Monitoring pipes installed leading to a risk that, as the HDD bore approached the SI bores, the Gas pipes will act as pathways for drilling fluid to flow from the HDD annulus to surface. It is recommended that these boreholes are sealed up using bentonite chips prior to the start of HDD drilling activities.
Item	Sub-surface Obstructions
<i>Hazards</i>	Delay to Programme
<i>Persons at risk</i>	OCU Operatives
<i>Duration</i>	Throughout drilling activities
<i>Controls</i>	Potential for obstructions at Exit Point in the Tata site due to former building foundations and railway tracks. Ground Penetrating Radar, (GPR), survey will be conducted to locate potential obstructions prior to confirmation of Exit Point.
Item	Covid-19 Virus
<i>Hazards</i>	Contamination from and Spreading of the Covid-19 virus
<i>Persons at risk</i>	OCU Operatives, Other Contractors Operatives
<i>Duration</i>	Duration of Works
<i>Controls</i>	Comply with OCU Covid Operating Procedures GD017 Rev3, (summarised below). Documentation to be revised in line with Government advice and distributed by OCU SHEQ. Staff should travel alone where possible. Only essential visitors on site. Hands to be washed before and after entering vehicles or offices. Common contact surfaces to be cleaned regularly. Welfare facilities to be sufficient to accommodate social distancing. Hand washing, soap and sanitiser facilities to be maintained. Operators who develop symptoms, (high temperature, persistent cough, loss of taste or smell), should not touch anything, leave work immediately and contact Human Resources to arrange a Covid-19 test. Operators who are instructed by Track & Trace to self -isolate should do so immediately.
Note : No Archaeological Constraints Report has been received for this work. These Site Specific Risk Assessments will be reviewed on receipt.	

Document Ref. No: RA/OCU2869	Directional Drilling						Date: 19/03/21	
Task / Operation and location:	Directional Drilling							
Persons at Risk:	Site Operatives working adjacent, General Public, Machine Operator							
Hazards	Risk before Controls are implemented			Controls	Risk after Controls are implemented			
	Likelihood	Severity	Risk Level		Likelihood	Severity	Risk Level	
Open excavations	4	5	High	Excavations to be closed as soon as practicable Correct signing lighting and guarding to be in place for all Excavations. Safe access and egress to site for vehicles, plant and persons should be in place. Stop Blocks to be secured for all plant and machinery which need to approach the excavation Supported excavations shall be checked daily before any person enters and a record kept.	1	5	Low	
Overhead Services	4	5	High	Utility prints to be on site. Overhead lines to be protected with ‘Goal-Posts’. Works to be carried out in accordance with HSE GS6 Danger from Overhead Lines Rev4 and OCU CF217 Overhead Lines Safe System of Work. Permit to drill to be used.	1	5	Low	

Underground Services	4	5	High	Legible Utility Plans, less than 3 months old and at suitable scale, must be available on site. Call out utilities as necessary. Mark out location of existing utilities. Prior to any excavation ensure that all the services have been identified and located using a gCAT4+ cable detector and Genny by a trained person. Hand excavate trial holes to ascertain depths of existing services. Use GPR or other methods where Trial Holes not possible. ‘Drill with Risk’ where utilities can not be located only when agreed with Drilling Director. Circumference of bore to be at least 1.0m from known Utility Locations Works to be carried out in accordance with HSG185 Health and Safety in Excavations, HSG47 Avoiding Danger from Underground Services. Permit to Drill (OCU CF29) to be used.	1	5	Low
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Movement / Operation	4	4	High	Only trained, competent and authorized personnel may operate plant and machinery. When machine not is use switch it off and remove keys as this will prevent unauthorised usage. Ensure all round vision is on the machine by the way of three way mirrors one on each side and one at the rear. Use remote control operation where practical. In tight/enclosed areas use the assistance of banksmen to ensure safe access/egress of the machine and that of personnel. Safe working distance during tracking of rig shall be 2.0m	1	4	Low
Prevention of Entanglement in Rotating Parts	4	4	High	Rigs are designed with automatic rod loading systems. Access to rotating parts is prevented by Fixed or Interlocked Guards in line with PUWER Reg11 and EN16228 Part 1 & 3. Rotation and Thrust must be isolated if guard is removed for maintenance. Exposed pipe between vices and entry point must be isolated with barriers or fencing.	1	4	Low
Fall of equipment or materials from height	3	5	High	Operation to be carried out and supervised by trained and competent persons. Loading / Unloading area to be signed and barriered off Operation to be carried out on firm stable ground Lifting equipment and accessories to be checked and test certs on site Lifting equipment to have sufficient capacity to carry out the lift. Hard Hats and Safety Boots to be worn.	1	5	Low

Collision with plant or traffic	4	5	High	Correct signing lighting and guarding to be in place for all roadworks and pathways in accordance with NRSWA and Chapter 8 of the Traffic Signs Manual. Consultation with Local Authority and/or Police where traffic routes are to be obstructed or altered. Safe access and egress to site for vehicles, plant and persons should be in place. Site plant and vehicles to utilise Flashing beacons. Plant Operatives to be trained and competent. Site Operatives and Supervisor to be trained in accordance with Section 67 of NRSWA. Appropriate Hi-Vis PPE to be worn.	1	5	Low
Noise from machinery & vehicular traffic	4	4	High	All site plant, vehicles and equipment to be maintained in good working order. Hearing protection to be worn if working within 8m radius of Drilling Rig during a normal 8hr day. BS5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites is complied with.	1	4	Low
Mixing Drilling Fluid – Dusty Environment	3	3	Medium	Arrange site equipment to provide shelter from dominant wind direction. Maintain Eye Wash station in vicinity of mixing operation. Wear approved Dust Mask and Full Face Goggles during mixing operation. Keep sacks of drilling fluid protected – use hardboard sheets between stacked pallets.	1	3	Low

Transport of Fluids in Bowsers/Tankers	4	4	High	Tanker/Bowser to be full as far as practicable to minimise load shifting. Travel at speeds appropriate to road, ground, load and environmental conditions. Ensure tyre pressures are suitable for road, ground, load and environmental conditions. Visual check on tyre condition to be carried out regularly.	1	4	Low
Transportation (Loose Loads)	3	5	High	Loads to be secured to vehicle by ratchet straps, chains or other appropriate means at secure anchor points in accordance with Department of Transport Guidance. Loads should be checked at regular intervals throughout the journey.	1	5	Low
Drilling near/under structures	3	5	High	Ground conditions to be verified by trial holes or Bore holes. Drilling depth to be agreed with client. Use of Tracking head to monitor head location underground Permit to drill to be used.	1	5	Low
Loss of Load	3	3	Medium	Load to be kept as low as possible to the ground. Care must be taken when working on slopes or areas of gradient. Ensure load is secure before lifting. I.e. Pipe coils to have banding in place. Drill rods to be in baskets. No person to walk or stand under a raised load	1	3	Low
Use of Hand tools	3	3	Medium	Use tools for the job they were intended and in accordance with manufacturer's instructions. Check tools before use to ensure they are in good working order. Broken or damaged tools are not to be used and returned to stores for either disposal or repair. Clean tools after use and return to storage	1	3	Low

Handling of chains & lifting equipment.	4	3	Medium	No one person to lift or move a load greater than 25kg. Protective gloves to worn Good Hygiene practices to be adhered to	1	3	Low
Overturning / Overloading	3	4	Medium	Care must be taken when working on slopes and crossing gradients. Do not lift any items that could over load the machine or lift any items that are unsuitable for the machine to lift. Max lift 725kg when boom fully extended to 6.4m and 1450kg when boom fully retracted to 3.35m	1	4	Low
Vibration	3	3	Medium	Vibration of the rig is below action levels for a normal 8hr day. Vibration is an indication of incorrect operation i.e. advancing too quickly. Work should cease and the method of operation changed. BS5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites is complied with.	1	3	Low
Working Outdoors – Weather	3	3	Medium	Supervisor to assess each day if works should cease due to adverse weather. Appropriate PPE to be issued and worn	1	3	Low
Manual handling of signs and barriers	3	4	Medium	No one person shall lift or move a load greater than 25kg. Materials to be brought to point of use as far as practicable in work vehicle.	1	4	Low
Contact with hazardous materials	3	4	Medium	CoSHH assessment to be available to users on site.	1	4	Low
Falls from Plant	3	3	Medium	Operatives to use manufactures access points only. No persons to ride on Plant unless in the seat provided. Door to be closed when in use, Shutters to be fitted at end of shift.	1	3	Low

Sudden snatching or unexpected movement of tools	3	3	Medium	Only properly trained operatives to use tools Tools to be secured when no in use to prevent unauthorised use	1	3	Low
Failure of hoses or couplings	3	4	Medium	All hoses and coupling to be inspected before use Damaged or faulty equipment should not be used and should be reported to Site Agent who will arrange for them to be replaced and or repaired. Whip arrestors should be utilised Equipment to receive regular maintenance checks	1	4	Low
Manual handling heavy, bulky tools, hoses and power supplies	4	3	Medium	No one person shall lift or move a load greater than 25kg. Materials to be brought to point of use as far as practicable in work vehicle.	1	3	Low
Ejected muds and debris	3	4	Medium	Safe working zone of 8m to be established around rig. Where this is not practicable then hoarding panels should be erected to prevent muds being ejected from the work area in to passing traffic, roads, etc. Two way communication to be established between launch and reception areas. Operatives to wait until tooling has ceased rotation and drilling mud pressure has reduced before approaching tooling. Impact resistant goggles to be worn by operative.	1	4	Low
Exhaust fumes	3	4	Medium	Adequate ventilation to be provided Engines to be switch off when not in use. Exhausts to be vented away from work areas, trenches, etc.	1	4	Low

Hydraulic fluid spillages	3	2	Low	CoSHH assessment to be available on Site detailing appropriate precautions Spillages to be barriered off and cleaned up as soon as practicable. Spill kits and drip trays to be available on site for emergencies.	1	2	Low
Diesel	3	2	Low	CoSHH assessment to be available on site. In England and Northern Ireland oil storage greater than 200 litres will comply with the Control of Pollution (Oil Storage) (England) Regulations 2001. In Scotland oil storage greater than 200 litres will comply with the Control of Pollution (Oil Storage) (Scotland) Regulations 2006. Spillages to be barriered off, bunded and cleared as soon as practicable. Funnels to be used for refuelling. Filters to be checked for compatibility with UK “Red” diesel and Irish “Green” diesel. In strong wind fill with back to the wind, use Full Protection Safety Glasses, use rag to prevent drips being blown about.	1	2	Low
Trips	2	3	Low	Good housekeeping to be practised on the site Tools & materials to be stored and kept clear of walkways	1	3	Low
Weill’s disease	2	3	Low	Good Hygiene techniques to be adopted Site welfare facilities to be provided Information to be provided to operatives on signs & symptoms. PPE to be provided and worn. HSE INDG84 Rev1 to be briefed out to crew and followed.	1	3	Low

Driving at Work	3	5	High	All operatives will comply with the recommendations in the OCU Company Vehicle Drivers Handbook and HSE Driving at Work Guidelines INDG382(Rev1)	1	5	Low
Lifting Operations using Excavators	3	5	High	Lifts using Excavators will be conducted commensurate with CPA Guidance on Lifting Operations in Construction When Using Excavators, (CIG 0801 Rev2). A Lift Plan for the specific excavator will be produced by an Appointed Person. Annually calibrated Rated Capacity Indicator (RCI) must be operational. Acoustic alarm must be operational. Bucket must be removed. Master Link must hang freely and be connected to the designated lifting point. An in-line swivel shackle must be used. Lifting Hooks must be fitted with clips. If load is over 1 tonne, a hose bust lowering control to ISO 8643:97 must be used.	1	5	Low
Attaching Water Standpipes	1	4	Medium	Water will only be abstracted from mains via approved standpipes, and if an abstraction licence has been issued. Aqua Gas Series 19 hydrants, installed between 1996 and 2006, are faulty. The mouthpiece is held to the main body with a pin and is not bolted down. If this retaining mechanism fails, the outlet can rotate and be blown off the hydrant body. Inspect all hydrants before use and if an Aqua Gas Series 19 model is suspected, do not use and inform your supervisor.	1	1	Low
Review: Jan 2022		Assessed by: SR/RH					

2.0 PROCEDURE FOR REGISTERING AMENDMENTS & AUTHORISING OF AMENDMENTS

In accordance with the Health & Safety at Work Act, Section 2 2(a) we have a Statutory Duty to provide 'Safe Systems of Work' that are, so far as is reasonably practicable, safe and without risks to health.

Furthermore, we have a duty to make a suitable and sufficient assessment of the risks to the health and safety of our employees and sub-contractors to which they are exposed whilst they are at work.

This is fundamental to our health & safety management and no person should start an activity under our control without a suitable and sufficient Risk Assessment and Method Statement/Work Instruction to work from.

In addition, all employees and sub-contractors have a duty to comply with our Safe Systems of Work issued to them, and acknowledge that they understand the contents of the applicable Risk Assessment and Method Statement/Work Instruction.



Therefore, as part of our 'putting people to work' process it must be made absolutely clear to employees and sub-contractors that if methods or designs **change** from planned, or additional Risks are identified whilst work is in progress, then the Risk Assessment and Method Statement/Work Instruction will no longer be Suitable and they **must STOP** and seek guidance from the OCU Supervisor and/or Drilling Manager who will discuss the implications with the client. Where applicable, a request to amend the Method Statement should be made to its' Originator. Any revisions will then need to be approved and communicated back to copy holders.

This is key to managing risk and reducing the likelihood that a change will result in an un-managed or un-controlled Risk that was either previously un-foreseen or may have had a lower risk level.

We are open to challenge and want all personnel working on our sites to think about their safety and the safety of others. Therefore, if someone wishes to challenge a Work Instruction or Method of Work, this should be done in a controlled manner as above, discussed with the OCU Supervisor and risks re-assessed before any change takes place.

Failure to abide by Safe Systems of Work will be seen as Gross Misconduct. However, no employee or sub-contractor should feel that they are being pressured in to working either unsafely or in an unsafe environment, and must **STOP** and raise the issue with a Senior Manager or Director.

Our 'Work Safe' policy is backed by the Managing Director and is there to protect employees from harm without fear of any reprisal.

3.0 DESCRIPTION OF WORK

Dŵr Cymru Welsh Water, (DCWW), currently operate twin water mains that cross the River Dee estuary between Connah's Quay and Tata Steel's Shotton Works in a 100 year old tunnel. Surveys of the tunnel have determined that the tunnel lining is in poor condition, and the supply of water is currently reduced to one of the two pipelines owing to leakage on the other.

DCWW propose replacing the existing water mains tunnel, reinforcing the supply to a 15km² area of Cheshire known as Deeside Industrial Park and Garden City, with twin Horizontal Directional Drilled, (HDD), pipelines of 500mm SDR-9 PE100 Blue Barrier Pipe.

Drawing 3573-DWG-0002 Rev1, (Appendix A), provides a more detailed topographical plan and cross section of the proposed Bores.

The ground to the south of the River Dee has been polluted with "Galligu", a waste product from Le Blanc process Soda Ash production comprised of hydrogen chloride and calcium sulphide which produces H₂S, (Hydrogen Sulphide), as it weathers.

The ground to the north of the River Dee is part of Tata Steels Shotton Works, and has been polluted with industrial waste since it's inception as Hawarden Bridge Iron Works in 1895.

The use of "Barrier" pipe, supplied by Ebero Pipeline Systems Limited, incorporating an aluminium layer to prevent contamination of the water supply, will protect the water supply from contamination.

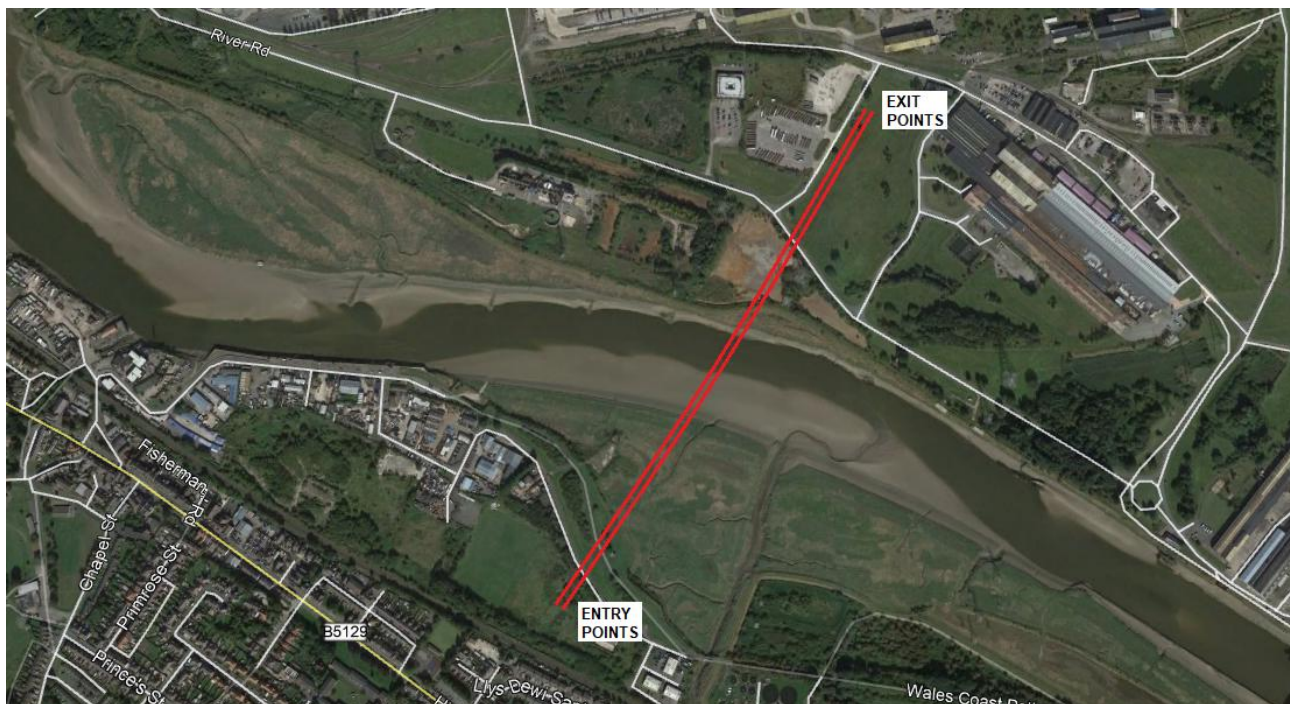


Diagram 1 : River Dee Tunnel Diversion HDD Crossings.

Rig Site Address : Dock Road, Connah's Quay, Flintshire. CH5 4DS.

Pipe Side Address : Tata Steel, Shotton Works, Flintshire. CH5 2NH

The proposed crossing location lies within or adjacent to areas with the following environmental statutory designations:

- The River Dee Site of Special Scientific Interest, (SSSI),
- The River Dee and Bala Lake Special Area of Conservation, (SAC),
- The Dee Estuary Site of Special Scientific Interest, (SSSI),
- The Dee Estuary Wetland of International Importance, (Ramsar),
- The Dee Estuary Special Area of Conservation, (SAC), and
- The Dee Estuary Special Protection Area, (SPA).

In addition, the following non-statutory designation apply to sites within 2km of the working area:

- Two Flintshire local wildlife sites, (LWS),
 - River Dee LWS
 - Shotton Steelworks LWS
- The Dee Estuary RSPB reserve,
- Shotton Lagoons and Reedbeds National Nature Reserve, (NNR),
- NRW Ancient Woodland,
- Dee Estuary NRW Priority Area, (Coastal Saltmarsh),
- Connah's Quay Ponds and Woodland SSSI,
- Deeside and Buckley Newt Sites SAC.



Diagram 2 : Photograph looking down CentreLines from Entry Points.

3.1 HISTORIC PERSPECTIVE

Historically, The South bank of the River Dee, (HDD Entry Point), began to develop earlier than the north bank, the earliest maps of 1870 already showing a substantial Chemical Works at Connah's Quay. The railway line behind Entry Point is also already present.

By 1900 the Wrexham, Mold & Connah's Quay Railway has been built approximately along the current alignment of National Cycle Route 5, (The North Wales Coastal Route). The ground to the north of Dock Road appears to remain at risk of flooding and is undeveloped. The ground between Dock Road and the railway has been assigned for recreational purposes since at least 1966.

The North bank of the River Dee remained marshland and tidal mud flats until ~1895 when the Hawarden Bridge Iron Works make an appearance. The land around the Exit Point is protected by a breakwater but is still listed as liable to flooding.

By 1966, the maps show what has developed into Tata Steels Shotton Works on the site, with railway tracks crossing the bore path between the north bank of the River Dee and Exit Point.

By 1984 the substantial buildings at Exit Point have been partially demolished, and today the area is a flat grassed zone.



**Diagram 3 : Photograph looking north along the HDD CentreLines towards Exit Point.
This site formerly supported buildings and rail tracks associated with the steel works.**

From a drilling perspective, historic foundations could be expected to be present at Exit Point and may require excavation to maintain borehole integrity. At the north bank of the river, the original breakwater appears to have remained in place becoming the levee that provides the present flood protection. This Breakwater may have been constructed with piles, (probably wooden), however as the HDD bores will be over 30m deep at this point they are unlikely to encounter any obstruction.



Diagram 4 : Photograph of the original Breakwater/Levee on the north bank of the River Dee, looking east toward Hawarden Bridge.

THE CONSTRUCTION (DESIGN & MANAGEMENT) REGULATIONS 2015 (CDM)

The CDM Regs 2015 form one of the cornerstones of construction health and safety legislation with the aim of improving the safety and welfare of construction workers.

The regulations define a number of key roles and responsibilities. For further information refer to guidance produced by the Construction Industry Training Board (CITB) at

<http://www.citb.co.uk/health-safety-and-other-topics/health-safety/construction-design-and-management-regulations/cdm-guidance-documents/>

CDM Regs apply to all construction work including new builds, replacements, repairs and maintenance.

For the purposes of the Construction Design & Management Regulations (CDM) 2015 the following designations are assigned:

Client	Dŵr Cymru Welsh Water, (DCWW)
Principal Designer	Waterco Limited, (WaterCo)
Principal Contractor	O'Connor Utilities Limited, (OCU)
HDD Designer	O'Connor Utilities Limited, (OCU)
HDD Contractor	O'Connor Utilities Limited, (OCU)

All parties must cooperate with each other, provide relevant information, and report anything likely to endanger the health and safety of themselves or others. Parties must not accept appointment to roles for which they are not competent.

Client Duties	
• Ensure suitable arrangements are in place to manage the project safely. • Allow/allocate sufficient time and resources to complete the project safely. • Take reasonable steps to satisfy themselves that the people they appoint are competent. • Provide pre-construction information, (including Utility Plans, Ground Conditions, Ecological and Archaeological Constraints). • Provide suitable welfare facilities.	• Ensure that the Contractor or Principal Contractor has developed a Construction Phase Health & Safety Plan. • For projects likely to last more than 30 days and employ more than 20 workers simultaneously, or likely to last more than 500 person days, notify the HSE using an F10 Form. • If more than one contractor working on the site, appoint a Principal Designer and Principal Contractor.
The Client may employ others to perform these duties, but they remain responsible for ensuring they are undertaken.	

Where there only one contractor is working on the site, the Designer and Contractor roles are likely to be applied. Where there is more than one contractor working on the site, the Client must appoint a Principal Designer and Principal Contractor to coordinate and supervise the work of other designers or contractors.

For small projects where OCU are the only contractor on site, both the Designer and Contractor roles may be filled by OCU. On sites where additional contractors are employed, the Principal roles must be applied.

One Contractor on Site
Designer Duties
• Ensure Client is aware of their Duties. • Eliminate, reduce or control risk to construction workers in their design. • Provide information about residual risks to the Client, Designers and Contractors.
Contractor Duties
• Ensure Client is aware of their Duties. • Plan, Manage and Monitor the Safety of the site and their own construction work. • Develop a Construction Phase Health & Safety Plan. • Provide a Site Induction and take reasonable steps to prevent unauthorised access to site. • Ensure adequate welfare facilities are in place.

Multiple Contractors on Site
Principal Designer Duties
• Must be a Designer or Project Manager who appoints Designers, with control over the design stage of the project. Will usually be the Clients Project Manager, or the Lead Designer. May be a corporate entity or individual. • Duties as per a Designer, plus: • Coordinate consideration of Health & Safety by the design team during the pre-construction phase. • Ensure all designers comply with their CDM duties, so far as is reasonably practical. • Assist Client in production of Pre-Construction information. • Responsible for producing a Health & Safety File.
Principal Contractor Duties
• Duties as per a Contractor, plus: • Plan, Manage and Monitor construction site safety. • Develop the Construction Phase Health & Safety Plan. • Provide a Site Induction. • Take reasonable steps to prevent unauthorised access.

4.0 METHOD OF WORK

An area approximately 50m x 50m for the parking of the rig and support vehicles will be required at the Entry Point of the drill. This area need not be square but can be flexible and accommodated within a space that causes least impact to the environment.

If possible water will be abstracted from local surface sources, pulling from the upper levels of the water body and using a strainer. An inline filter is included in the fluids mixing system. Abstraction from the mains requires licencing, is restricted to very low flow rates and increases our carbon footprint and environmental impact by using treated water. Also, the introduction of treated water to the natural environment often causes the ground to react adversely. Use of native groundwater does not usually cause the ground to react.

Water will be sourced from the Wepre Gutter, adjacent to the site, at around 8m³ per day.

This abstraction rate falls below the 20m³ per day trigger values for a temporary abstraction licence from Natural Resources Wales, (Water Resources (Transitional Provisions) Regulations 2017 and the Water Resources (Exemptions) Regulations 2017).



Diagram 5 : Wepre Gutter potential water source.

A working area approximately 20m x 20m wide will be required at the Exit Point for pipe handling and drilling fluid transfer. This area will be within a grass field in the Tata Steel Shotton Works site.

Plant will be transported to site by conventional haulage low loader with On & Off loading of the rig carried out on firm stable ground with assistance provided as necessary to give all round visibility.

All existing underground ducts and services within the vicinity of the site compound, launch/reception pits and bore path will be located, marked out and their position detailed to the drilling team by OCU.

Where it is not reasonably practicable to dig trial holes then alternative means of identifying depth and location shall be used. i.e. Ground Probing Radar. If location and depth are still indeterminate then the Drilling Manager/Foreman must report to the Drilling Director for a decision to be made whether to 'Drill with Risk' or 'Abandon the Drill'.

A launch pit approximately 2.0m wide x 2.0m long x 1.2m deep will be required inside the launch site compound for each bore. A reception trench 2.0m x 2.0m x 1.2m deep will be required at Exit Point for each bore. All excavations to be assessed and suitable trench support provided where appropriate. All excavations to be secured within a fenced compound using Heras Fencing as a minimum.

The Barrier Pipe will be delivered to the site in 12 metre lengths with the ends pre-prepared at the factory by the supplier. Fabrication of the Butt-Fusion Welding, Aluminium layer and protective Shrink Wrap Sleeves will be undertaken on site by OCU

A Mud Tight tow head will be provided by OCU.

Each installation will consist of a 12-1/4" pilot hole and 18", 24" and 28" Hole Opening Passes before the pipeline is pulled back into the bore.

GROUND CONDITIONS

The Regional Geological Memoir from the British Geological Survey reports the local geology at Entry Point being Holocene Tidal Flat deposits over Carboniferous Period, Pennine Lower Coal Measures. As the HDD bore progresses north-east beneath the River Dee, the bedrock gets progressively older passing through Namurian stage Bowland Shale Mudstones and finally Westphalian Stage Millstone Grit, Gwespys Sandstones. Areas of Made Ground are reported in the vicinity.

Some Historic boreholes from the British Geological Survey exist south -east of Entry Point, on the west bank of the Wepre Gutter, reporting Made Ground over silty Clays and fine Sands, typical of the Tidal Flats expected.

A number of site investigation boreholes were sunk by Geotechnics along the HDD route, and some Geological Reports have been produced during the development phase of this project, included in Appendix E:

Arcadis	Dee Crossing Tunnel Diversion Geo-environmental and Geotechnical Interpretative Report. (April 2018) Report No. : 2780-W-201-HYD-XX-TU-RP-GX-10140 Rev 01.
Arcadis	Dee Crossing Tunnel Diversion Geo-Environmental and Geotechnical Memo for Horizontal Directional Drilling (March 2018). Document reference : 2780-W-201-HYD-XX-TU-ME-GX-10143

The underlying solid geology is Upper Carboniferous sedimentary sequences of Mudstones, Siltstones, Sandstones, Coals and Seat Earths however as bedrock is not encountered by the HDD bore(s) the solid geology will not be discussed further.

The drift deposits comprise Holocene Tidal Flat deposits of Clay, overlain by silty Sand and Made Ground at surface.

At Entry Point the Made Ground is between 2.90m and 3.60m thick and contains landfill waste. Trench Boxes may be required to stabilize the loose landfill material in the Entry Pit.

Below the Made Ground is a ~12.5m thick sequence of silty fine to medium Sand before the top of the Clay is encountered at between 15.70m and 15.90m bgl.

The Clay is stiff to very stiff, slightly sandy and slightly gravelly.

At Exit the bore will drill back up through the silty gravelly Sand before encountering Made Ground including cobbles and boulders of concrete and brick from a depth of ~2.4m bgl. This material is likely to be construction rubble from the demolition of the former steel works buildings and may require excavation or Trench Box support to provide a stable Entry Pit.

All the site investigation boreholes encountered a similar sequence of lithologies giving confidence in the developed geological model. The Top of Clay layer has been extrapolated between the boreholes and is relatively consistent across the length of the HDD bore(s), (Drawings Appendix A). The HDD bore(s) should penetrate the top of the clay before drilling under the historic landfill site to the north of the Dock Road, and remain within the clay while drilling under the River Dee and the leachate lagoon on the north bank of the river.

“Blowing Sands” were encountered in BH03A between depths of 15.00m and 16.00m bgl however the cohesionless material appears to have been controlled by maintaining a positive head of pressure in the annulus.

The HDD bores will drill beneath the landfilled Galligu on the Entry curve however will be at a depth of over 13m bgl where the Galligu in BH02A lies at a maximum depth of 3.00m bgl. Leached pollutants cannot be discounted.

Similarly, the leachate filled lagoon on the north bank (Chainage 500m to 600m) has been determined at ~4.23m deep. The HDD bores will be at a minimum of 29.4m bgl under the lagoon so should not encounter any contaminated waste however the presence of leached pollutants cannot be discounted.



Diagram 6 : Tata Steel Leachate Lagoon, looking south along the bore paths towards the River Dee.

No issues with groundwater were experienced during the drilling of the site investigation bores and no artesian conditions were experienced. The groundwater may well be tidal and could contain elevated chloride levels.

EXISTING SERVICES

The following existing buried services are crossed:

	Chainage	Invert Level	Drill Axis	Depth of Cover
	m	m (bgl)	m (bgl)	Ground Level to CL m
HV in Dock Road	~35	TBC	~10.0	TBC
LV in Dock Road	~35	TBC	~10.0	TBC
Water in Dock Road	~37	2.7	~10.0	TBC
BT north of Dock Road	~114	TBC	~30.0	TBC
BT North Bank of River Dee	~472	TBC	~30.0	TBC
Water south of Infilled Lagoon	~492	TBC	~30.0	TBC
IP Gas south of Infilled Lagoon	~499	TBC	~30.0	TBC
IP Gas in Infilled Lagoon	~512	TBC	~29.5	TBC
Sewer south of River Road	~607	TBC	~32.0	TBC
BT south of River Road	~607	TBC	~32.0	TBC
IP Gas north of River Road	~633	1.3	~32.5	TBC
HV north of River Road	~634	TBC	~32.5	TBC
LV south of Exit Point	~841	TBC	~6.0	TBC

The Existing buried services have yet to be traced and verified with regards to location and depth. Those in the Tata field at Exit Point have been located during the GPR Survey undertaken on the 2nd March 2021 and will be updated once the data has been processed. The rest of the services will be traced remotely, and trial holed where necessary.

Only the LV cable close to Exit Point is critical with respect to the HDD bore path.

All the Gas Pipelines are crossed when the HDD bores are at a depth of ~30m bgl. Settlement Calculations for the gas pipelines will be undertaken once the depth of the pipelines has been verified. The gas pipeline stakeholders will provide guidance as to any additional depths of cover or protection measures required.

Settlement Calculations will also be undertaken for the overhead power line pylon foundations.

HDD BORE DESIGN

HDD Bore profiles have been included in Appendix A.

Twin 500mm SDR-9 PE100 Barrier Pipes have been specified for installation by Waterco.

The HDD bore lengths are 872.60m Along Hole from the waste ground adjacent to the football pitches at Connah's Quay on the south bank of the River Dee to the grassed area on River Road within the Tata Steel Shotton Works on the north bank of the River Dee. These areas were provided to O'Connor Utilities as potential launch and reception points by DCWW.

A pull force calculation has been undertaken using the HDD Bore Profiles in Appendix A, showing that if the 500mm pipelines are dragged off pipeline rollers and ballasted as they are pulled below the water table, they will require a pull-back force of 67,453 lbs, (or 30.5 tonnes), to install.

Applied Loading:			Earth pressure = 4.6 psi. Water pressure = 44.1 psi. Mud pressure = 68.2 psi.						
HDPE-PE4710		OPERATIONAL			INSTALLATION				
IPS Nom. OD	IPS DR	Deflection	Critical Collapse - Full - 50 yr (pressure pipe)	Critical Collapse - 1 hr	Critical Collapse - 10 hr	Pull Back Force	Allowable Pullback	Status	
inches		% OD	psi	psi	psi	lbs	lbs		
No Rollers & No Ballast	20	7.3	0.4	262	498	415	140,234	193,129	PASS
	20	9	0.7	128	229	191	148,579	161,346	PASS
	20	11	1.5	66	107	89	156,021	135,011	FAIL
With Rollers & No Ballast	20	7.3	0.4	262	504	420	136,225	193,129	PASS
	20	9	0.7	128	230	192	145,761	161,346	PASS
	20	11	1.5	66	107	89	153,662	135,011	FAIL
With Rollers & Ballast	20	7.3	0.4	262	556	463	67,991	193,129	PASS
	20	9	0.7	128	267	222	67,453	161,346	PASS
	20	11	1.5	66	134	112	67,008	135,011	PASS

Diagram 7 : Pull Force Calculation for 872m of 500mm SDR-9 Pipelines

Considering Launch and Reception points, the only area capable of fabricating 872m of pipeline, (plus stick up at either end of each bore), in a single length for testing prior to pullback is around the Tata Steel site on the north bank of the River Dee. It is proposed therefore to drill the bores from the south bank of the River Dee.

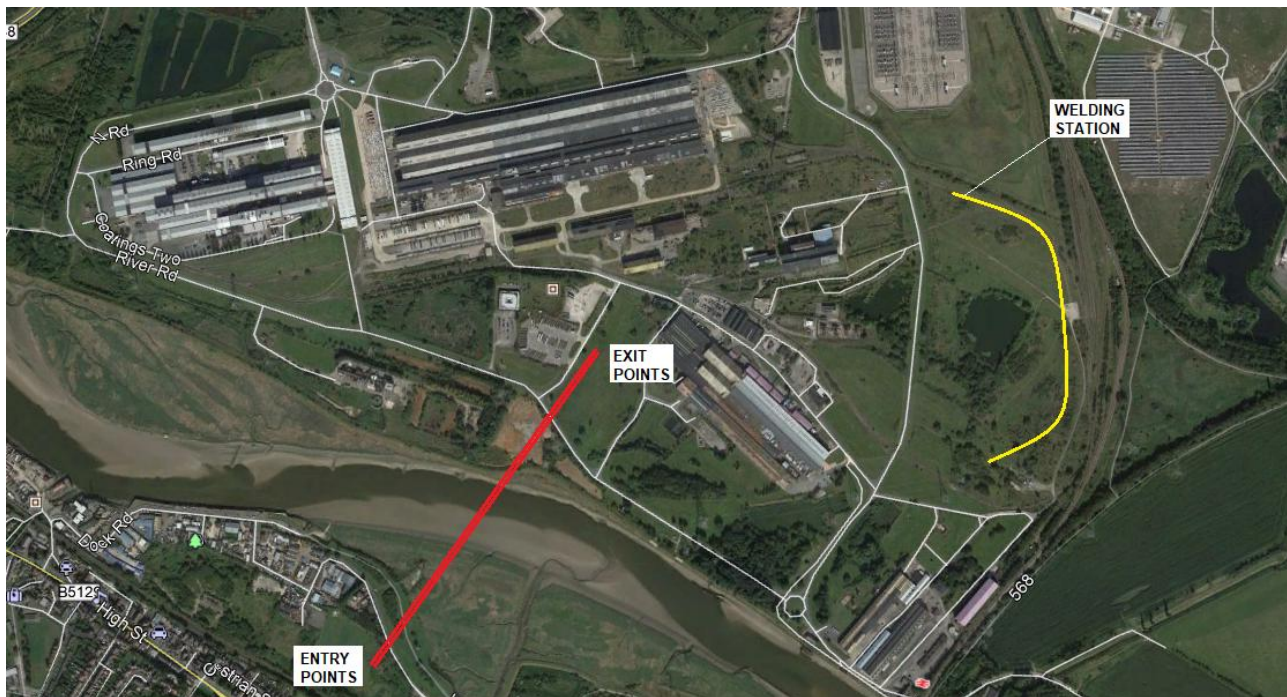


Diagram 8 : Aerial Photograph showing the HDD Bore Path and Pipeline Fabrication Area

	HDD-1	HDD-2
Entry Elevation	7.01m	7.01m
Entry angle	15.00°	15.00°
Vertical Build radius – Entry	300m	300m
True vertical depth	32.01m	32.01m
Horizontal section	550.18m	546.53m
Horizontal Build Radius	5,000m	5,000m
Vertical Build Radius – Exit	300m	300m
Exit Angle	15.00°	15.00°
Exit Elevation	7.09m	7.09m
Horizontal Distance	864.74m	864.74m
Total Along Hole Bore Length	872.60m	872.60m

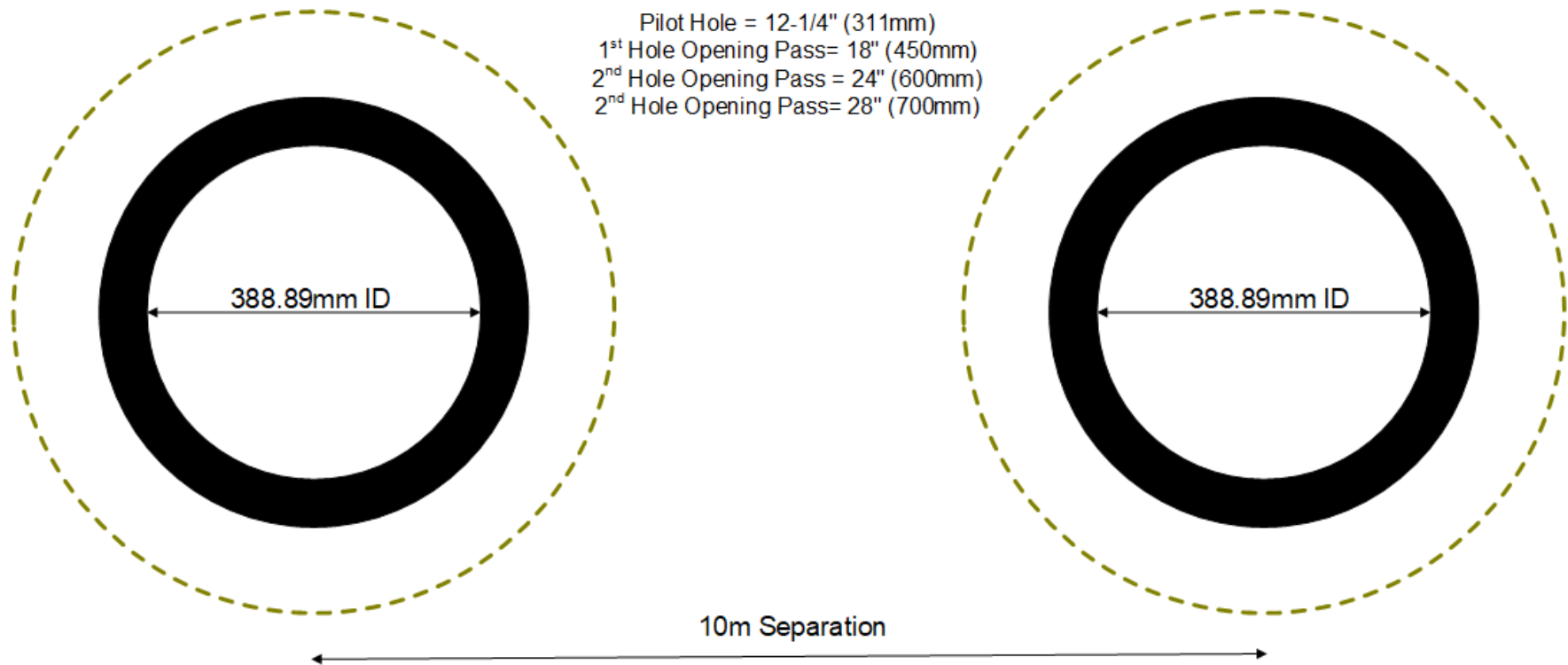
HDD Bore Profiles

The total Away Distance (Chainage) of the bores will be 864.74m, and the Along Hole distance will be 872.60m.

The 500mm pipeline bore will be drilled in four stages, initially a 12-1/4” pilot hole will be excavated, followed by an 18” ream, a 24” ream and finally a 28” ream.

DEPTH OF COVER LIMITATIONS

Guidance issued by the Environment Agency Wales requires trenchless crossings of watercourses to be installed at a minimum depth of cover of 1m from crown of pipe to hard bed level, extending for at least 5m beyond the top of the banks. This crossing of the River Dee obviously meets these requirements, however there may be additional restrictions imposed by the Environment Agency or Marine Licence consents.



O'CONNOR UTILITIES LTD.	TITLE River Dee Tunnel Diversion River Dee – 1 & 2		REVISIONS		Duct Configuration									
			NO.	DATE	DESCRIPTION	1	No.	500	mm	SDR-9	PE100	55.56 mm WT	388.89 mm ID	
			01	10/03/21	Based on Welsh Water Email 15/02/21	1	No.	500	mm	SDR-9	PE100	55.56 mm WT	388.89 mm ID	
							No.		mm	SDR-11	PE100	0.00 mm WT	0.00 mm ID	
					No.		mm	SDR-11	PE100	0.00 mm WT	0.00 mm ID			
	DATE ORIGINAL		SCALE											
	10 th March 2021		Not to Scale											
	LATEST REVISION		JOB NO.		CHECKED		DRAWN							
	01		3573-DUCT-01		Mike McNulty		Ross Henderson							
500 mm Bundle Diameter = 19.69 inches														
at 30% Overcut = 25.59 inches Bore ID														
at 40% Overcut = 27.56 inches Bore ID														
at 50% Overcut = 29.53 inches Bore ID														

Diagram 9 : Pipeline Arrangement

RIG ANCHORING

The PD400/150 drilling rig weighs 49.6 tonnes, which is greater than the 30.5 tonnes pull force required to install the pipeline when ballasted and pulled off rollers, (refer to Diagram xx). The rig is designed with an integral Footplate which will be pinned to the ground using steel 'I' Beams driven to refusal. If the ground is too hard to drive beams, or the landfill waste prevents sufficient depth being achieved, a concrete deadman will be poured into which the 'I' Beams will be set.

DRILLING OPERATIONS

The drills will be carried out in accordance with the proposed bore plan 3573-DWG-0002.

The drilling operation will begin by drilling a pilot hole using a 12-1/4" drill head and the pressure injection of drilling fluid. The drilling will be carried out continuously in intervals of 9.50 metres, equivalent to one length of drill pipe until the head exits the ground.



Diagram 10 : Jetting Assembly

As the drilling is undertaken, we will be able to monitor the exact location of the bore as it proceeds along its path and provide real-time information as to its location and depth. As these bores will be drilled at over 30m deep, to tight tolerances including changes in azimuth, with critical separation between the twin pipeline options and depths of cover below existing utilities; real-time optical ring laser gyroscopic guidance systems will be utilised. Gyroscope tools are unaffected by changes in magnetic field strength incurred when changing azimuth during the bore, and will not be affected by magnetic interference caused by the overhead power lines or cathodic protection on the IP Gas Mains.

The guidance data is transmitted to the surveyor in real-time via a wireline installed in the drillpipe. As such, no personnel will be required to work near or over The River Dee to track the drill head.

The Gyroscopes are accurate to 0.01° in inclination and 0.04° in azimuth, therefore at a maximum drilled depth of 872.6m, the theoretical target will be an ellipse of uncertainty 1.22m wide by 1.18m long. In real terms the errors plot on a Bell Curve so actual location is likely to be significantly better than this. Clients must be aware however that although we may know where we are, and where we intend to be, to very tight tolerances, ground conditions may preclude us from drilling with such accuracies.

If there is a major difference between the actual and planned location of the drill bit, the operator is able to correct the actual profile by pulling back to a correct position on the planned profile and re-drilling.

The maximum allowable dog leg severity (DLS) is 2.15° per rod



**Diagram 11 : Photograph of River Dee Crossing,
HDD Bore CentreLines looking towards river from Dock Road**

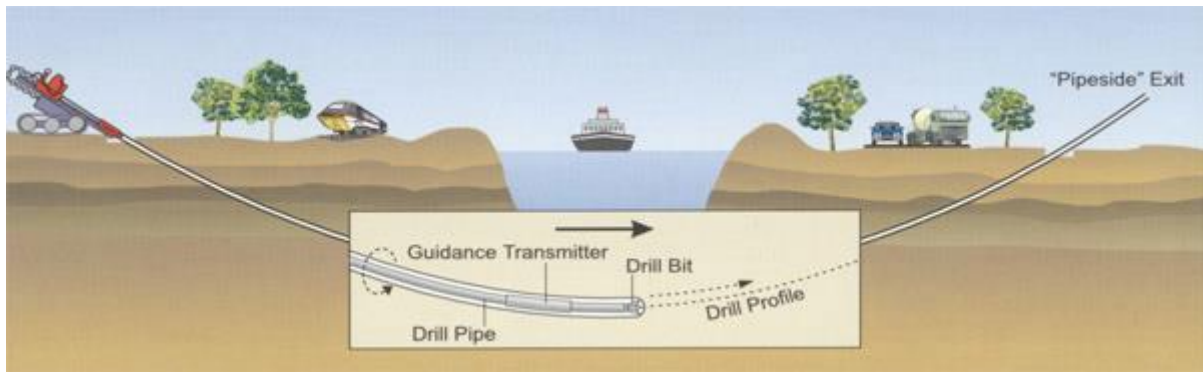


Diagram 12 : Pilot Hole Schematic

Once the drill bit exits the other end of the drill hole, the drill head is removed and an 18" reamer is attached to the drill string. Depending on the ground conditions several reamings may be necessary. During the reaming process, drilling fluid is pumped under pressure through the drill string to the reamer. As the drill rig pulls the reamer back towards it, drill pipe is attached continuously behind the reamer for subsequent reaming and pipe pulling operations.



Diagram 13 : HDD Reamers

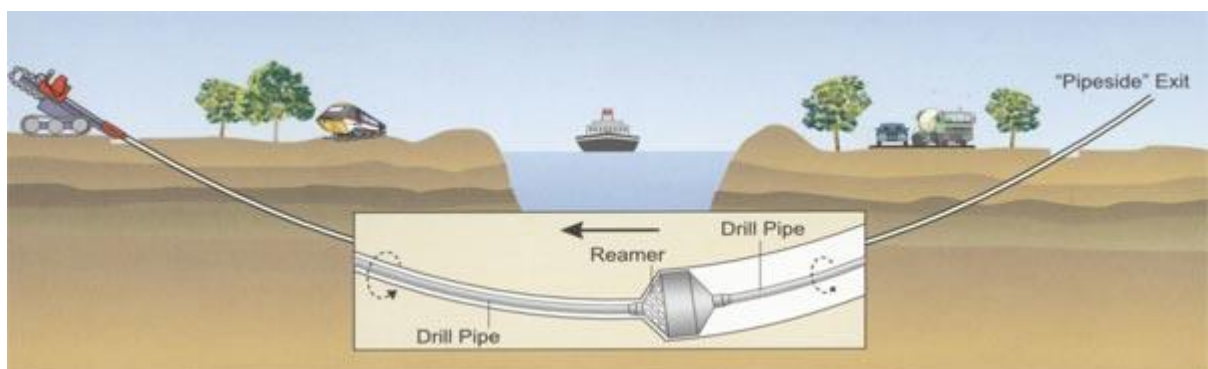


Diagram 14 : HDD Reaming Phase Schematic

When the bore hole has been reamed out to the correct diameter the reamer is sent back down the bore one or two more times to ensure that the hole is clear of any large objects and that the slurry in the hole is well mixed.

This prepares the hole for the Pipeline to be pulled in. Once the driller is satisfied that the hole is clear and ready for the pipe, the tow head is connected to the drill string via a swivel. The swivel prevents the pipe from rotating during the pullback.

The length of the Pipeline is to be equivalent or greater than the length of the drilled hole.

The Pipeline is then pulled back towards the entry area by the drill rig.

The maximum allowable pull load on 500mm SDR-9 PE100 pipe is 161,346 lbs, (73.1 tonnes).

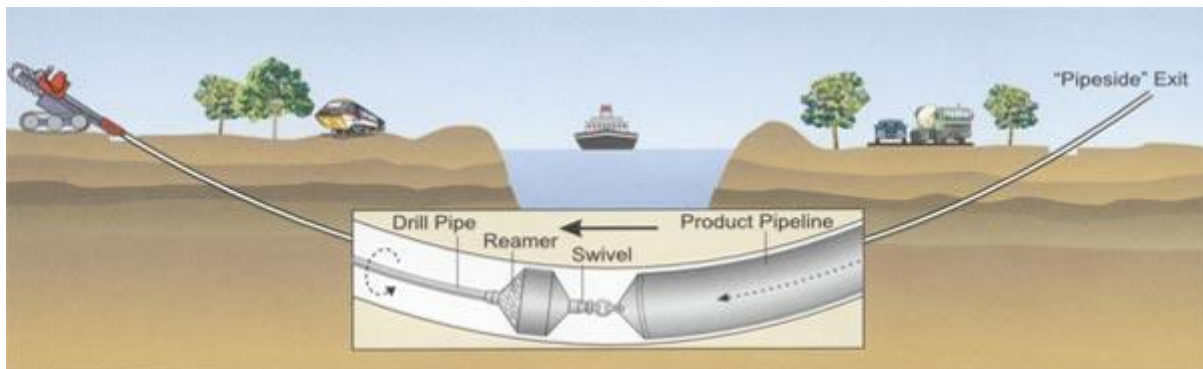


Diagram 15 : HDD Pull-Back Schematic

Once the duct is installed it will be proved by the pull through of a brush 10% larger than the duct Internal Diameter (ID), (427mm), and then a mandrel 10% smaller than the duct ID, (349mm).

The Brushing and Mandrelling of the ducts will be witnessed by a DCWW Representative and signed off on an ITP QA sheet.

A pressure testing proposal will be issued by Waterco.

Upon completion of the HDD crossings, OCU will produce an As-Built drawing using CAD, which will be presented to the Client.

DRILLING FLUIDS-General

Enviro Formfill or similar should be on hand to deal with any major Break-Out.

During drilling of the hole, the drilling fluid lubricates the drill string, removes solids from the borehole, and cools the drilling bit and downhole instruments.

The drilling fluid system design will be based on expected ground conditions and adjusted as required throughout the drilling operations.

The drilling mud has very good sealing properties and is often used in construction of dams, where the water table is close to ground level.

One of the primary functions of drilling mud in Horizontal Directional Drilling, is that it provides a very good 'filter cake'. This means that, due to the flat clay platelets and the minute size of the particles, the mud soaks into permeable and porous drilled hole walls, and provides a seal.

Mud viscosity will be varied according to the prevailing conditions and monitoring will be an ongoing operation. It is envisaged that a viscosity of 45-55 sec/qt will be maintained. Mud pump volumes and pressures will vary according to conditions and the nozzle sizes used in the tools, the mud pump output details are included in the HDD equipment section.

DRILLING FLUIDS – Cleaning, Spoil Separation and Disposal

During the drilling of the holes, cuttings will be produced. The cuttings will be carried back along the drilled path by the drilling fluids to the mud pit. The mud pit is a pit that is excavated close to the HDD entry point. The sidewalls of the mud pit are built up to form a bund around the mud pit.

The level of drilling fluid in the mud pit is monitored at all times during drilling operations. The driller will be able to monitor the level of the drilling fluid in the mud pit and keep the circulating drilling fluid system in balance, controlling the rate of pumping from the mud pit to the drilling fluid recycling tanker.

Drilled cuttings will be collected in a skip, or similar, so that actual volumes removed from the bore can be compared and recorded by the Fluids Technician with theoretical volumes for the size of pilot hole and ream. Any variations between the actual and theoretical volumes must be related to the Drilling Supervisor.

Waste drilling fluid remaining at the completion of all HDD operations will be removed from site and disposed of by Stubwood (UK) Limited to the nearest appropriate landfill site. The drilling fluids used in O'Connor Utilities operations are classified as Non-Hazardous Waste, reference 01-05-04, in the European Waste Catalogue, and are suitable for disposal to landfill.

Cuttings will remain on site for use in reinstatement or landscaping. The drilled cuttings circulated from the bore are classified as Non-Hazardous Waste, reference 17-05-04, in the European Waste Catalogue, and are suitable for disposal to landfill.

Supasorb may be used to absorb the water and solidify the remaining sludge which can then be excavated and removed by conventional grab wagon.

DRILLING FLUIDS – Loss of Circulation

Should mud circulation be partially lost as drilling progresses, operations will cease. An inspection of the drill line will be undertaken to determine if the fluid loss is to the surface, or being lost downhole into the surrounding formation. Should the fluid loss be to the surface, then the mud will be contained with sandbags and if possible pumped back to the rig entry pit. To reduce or halt the mud fracture, the drilling string will be withdrawn from the hole to a position where mud returns are regained to the rig site.

Loss of fluid to the surface in accessible areas remains a priority. This will be contained and controlled immediately.

The running back in of the drill string will not only recondition the drilled hole but will also have allowed time for the surface fracture to self seal.

Once the hole has been reconditioned, new cuttings generated by further drilling can flow into the fracture and eventually seal it off.

Should fluid loss be to the surrounding formation and not to surface, attempts as outlined above to recover circulation will be implemented. Should circulation continue to be lost to the formation, and drilled cuttings are also being carried out of the borehole into voids, drilling of the pilot hole can continue as normal.

Maintaining 100% mud returns in crossings where formations are predominantly sand and silts cannot be guaranteed. The loss of the drilling fluid to the surrounding formation requires closer attention to drilling parameters downhole, such as drill string torque and push/pull characteristics.

DRILLING FLUIDS – Management

Once the Pilot Hole punches out of the ground within the Tata Steel site on the north bank of the River Dee, subsequent drilling fluid annular flow during Reaming operations will be via the larger diameter bore to Exit Side in preference to Rig Side.

Rather than transfer the drilling fluid to Rig Site for recycling and re-use, the drilling fluid will be recycled at Exit Side and pumped back into the drill string via a mud swivel. A series of one-way Check Valves will be used either side of the Reamer to ensure drilling fluid flows into the annulus and back to surface, cleaning and stabilising the bore.

Certificate of Registration under the Waste (England and Wales) Regulations 2011

Regulation authority

Name



Address

National Customer Service Centre
99 Parkway Avenue
Sheffield
S9 4WF

Telephone number

03708 506506

The Environment Agency certify that the following information is entered in the register which they maintain under regulation 28 of the Waste (England and Wales) Regulations 2011.

Carriers details

Name of registered carrier

O'CONNOR UTILITIES LTD

Registered as

an upper tier waste carrier, broker and dealer

Registration number

CBDU105380

Address of place of business

O'CONNOR UTILITIES LTD
SANDFOLD LANE
MANCHESTER
M19 3BJ

Telephone number

0161 248 9922

Date of registration

Thursday 25th April 2019

Expiry date of registration (unless revoked)

Thursday 12th May 2022

Making changes to your registration

Your registration will last 3 years and will need to be renewed after this period. If any of your details change, you must notify us within 28 days of the change.

Diagram 16 : OCU Waste Transfer Licence

Certificate of Registration under the Waste (England and Wales) Regulations 2011

Regulation authority

Name



Address

National Customer Service Centre
99 Parkway Avenue
Sheffield
S9 4WF

Telephone number

03708 506506

The Environment Agency certify that the following information is entered in the register which they maintain under regulation 28 of the Waste (England and Wales) Regulations 2011.

Carriers details

Name of registered carrier

STUBWOOD (UK) LTD

Registered as

an upper tier waste carrier, broker and dealer

Registration number

CBDU46572

Address of place of business

PEAR TREE FARM
JARDINES LANE
STUBWOOD
UTTOXETER
ST14 5GA

Telephone number

07971090878

Date of registration

Thursday 11th October 2018

Expiry date of

registration (unless
revoked)

Tuesday 14th December 2021

Making changes to your registration

Your registration will last 3 years and will need to be renewed after this period. If any of your details change, you must notify us within 28 days of the change.

You can do this by calling the Environment Agency and providing your access code. Your access code is: **AEOLMU**.

Diagram 17 : Stubwood (UK) Limited Waste Transfer Licence

PIPELINE FABRICATION

The layered construction of the 500mm SDR-9 PE100 Barrier Pipe means that it will require a three stage fabrication process.

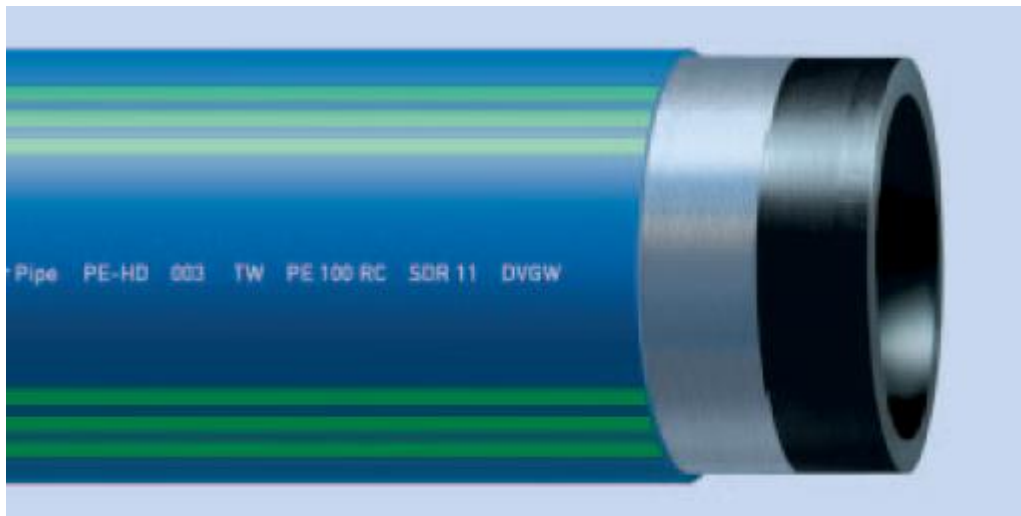


Diagram 18 : Barrier Pipe Cut-Away showing SDR-9 PE100 inner core, (Black), Aluminium Barrier layer (Silver), and PE100 Protective Coating, (Blue with Green Stripes).

Pipeline Fabrication - Stage 1

The pipe joints will be delivered to site in 12 metre lengths with the ends pre-prepared by the factory as shown in Diagram xx.

Fabrication Stage 1 will be to Butt Fusion Weld the SDR-9 PE100 black inner cores together to WIS 4-32-08 standards.



Each joint will be numbered for Quality Control purposes. An automatic welding system will be used and the computer printout of the welding parameters will be numbered and retained. Internal and External Weld Beads will be removed and twist tested on site.

Diagram 19 : Butt Fusion Welding Shelter

The Joint will be CCTV inspected before it is accepted for State 2 of the Fabrication process.

Diagram 20 : CCTV of Butt Fusion Joint



Dummy Welds and random joints can be cut-out for destructive testing if required.

Pipeline Fabrication - Stage 2

The accepted Butt Fusion Welded Joint will be pulled 12m to the Stage 2 process, allowing the Butt Fusion Welding station to prepare and weld the next joint.

The Stage 2 Fabrication process involves the wrapping of an Aluminium tape around the Butt Fusion Welded Joint.



Diagram 21 : Pipeline Fabrication Stage 2 – Aluminium Wrapping

Pipeline Fabrication – Stage 3

The Aluminium Wrapped Joint will be pulled 12m to the Stage 3 process, allowing the Butt Fusion Welding Station and the Aluminium Wrapping Station to prepare, weld and wrap the next joints.

The Stage 3 Fabrication process involves the covering of the Aluminium Wrapped joint with a PE100 Heat Shrink protective sleeve.



Diagram 22 : Pipeline Fabrication Stage 3 – Heat Shrink Protection

PIPELINE STAGING

The fabricated and tested pipeline will require moving from the fabrication area to the HDD Exit Point for pull-back.

This Pipeline Staging will be undertaken in two Parts; initially, the day before pull-back, the pipeline will be moved across the New Road and over scrub land to a point just north of the railway line. A traffic diversion will be implemented to direct vehicles around the New Road closure. The pipeline will be manoeuvred over an existing overground Steam Pipeline using pre-positioned pipe rollers, (Refer to Diagram xx).

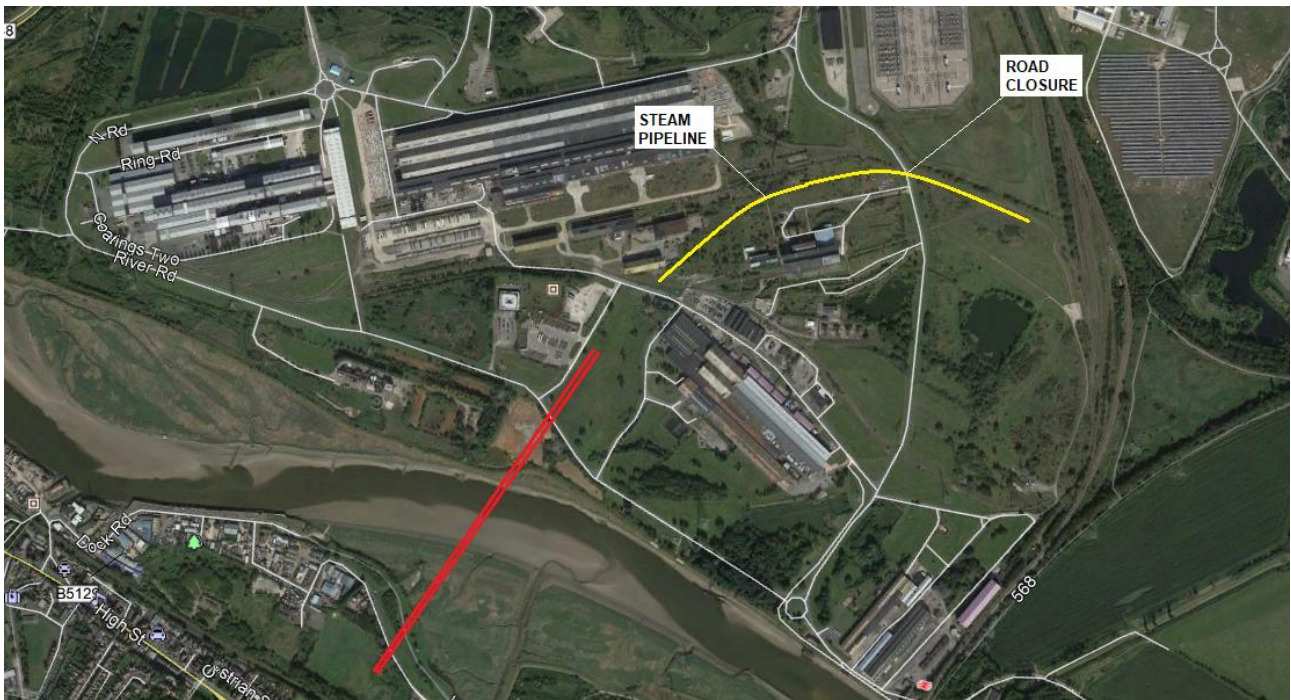


Diagram 23 : Pipeline Staging Part 1



Diagram 24 : New Road Crossing on Pipeline Staging Part 1
The Pipe Fabrication Stations will be set up on the far side of the road, to the left of the rail tracks.



Diagram 25 : Overground Steam Pipeline on Pipeline Staging Part 1

Part 2 of the Pipeline Staging process will be undertaken on the morning of the Pull-Back, towing the pipeline across the railway, across the road and over the overground Fire Main pipeline before it is hooked up to the HDD Pull-Back assembly and pulled into the bore.



Diagram 26 : Pipeline Staging Part 2 – The Fire Main, Road and Rail Track

The timing of the pipeline Pull-Back will need to be agreed to suit railway operations. A traffic diversion will be implemented to direct vehicles around the road closure. The pipeline will be manoeuvred over the overground Fire Main using pre-positioned pipe rollers, (Refer to Diagram xx).

The New Road closure will be opened up as soon as the tail of the pipeline is clear of the carriageway.

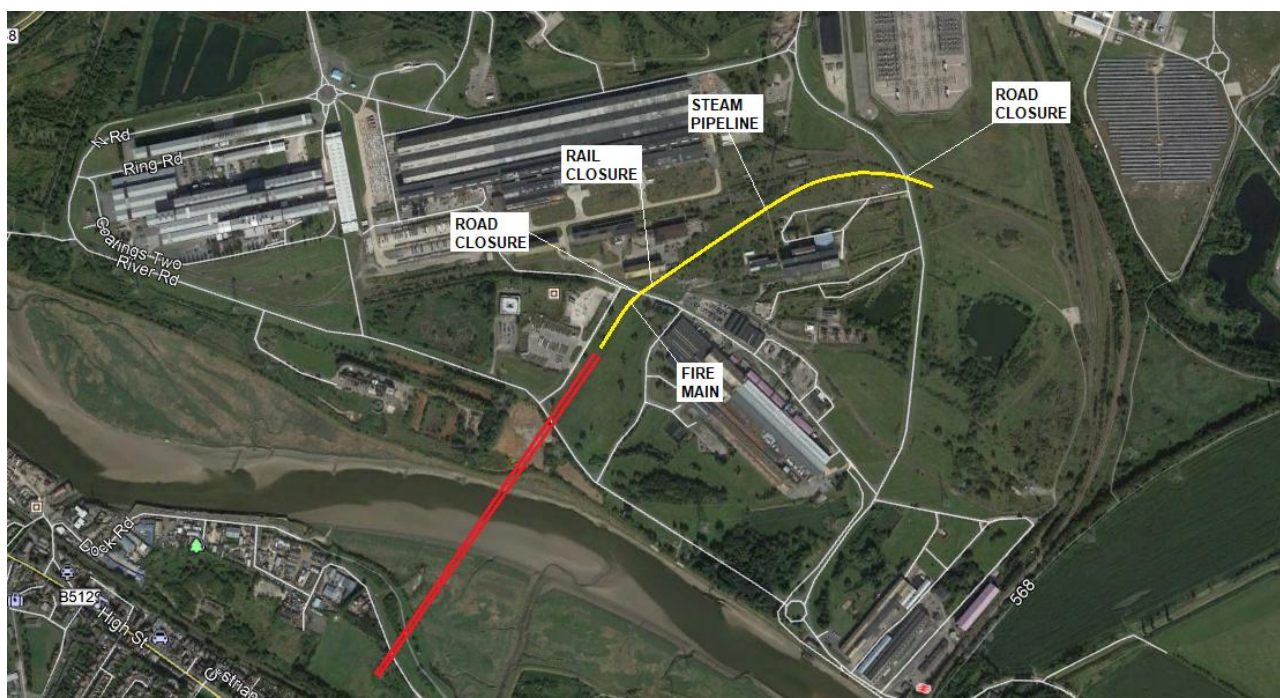


Diagram 27 : Pipeline Staging Part 2

5.0 QUALITY PLAN / ITP

The following information will be recorded for inclusion in the Project Safety File and submitted for each bore:

Permit to Drill Form (CF29 Issue 3)
 Drill Completion/Handover Form (CF107 Issue 1)
 Daily Drilling Report
 Daily Drilling Fluids Report
 Pilot Hole Survey File
 AutoCAD As-Built Plan and Profile

Signed by Client
 Signed by Client

HDD Pipeline Installed
 HDD Pipeline Capped

Photo Entry & Exit
 Photo Entry & Exit

Duct testing

Brush (427mm) & Mandrel (349mm)

Witness Statement

QA Information

Duct Material and Dimensions
 Drilling Fluid

OD/ SDR/PE/Colour/Source/Production run number
 Specification/Source/COSHH/MSDS

SWMP

Liquid Waste
 Drilled Arisings
 General Construction Waste

Certified Carriers Licence and Waste Management Dockets
 Certified Carriers Licence and Waste Management Dockets
 Certified Carriers Licence and Waste Management Dockets

De-Mobilisation

HDD Ducts Buried or Left Sticking Up
 Pits Back Filled or Left Open

Photo Entry & Exit
 Photo Entry & Exit

6.0 PROGRAMME

It is anticipated that the works will take a total of 17 Weeks.
Start date to be 25th April 2022.

7.0 OPERATIVES

It is envisaged that site operatives will need to be in possession of a CSCS card as a minimum to work on the DCWW site.

Name	Job
	Project Manager
	SHEQ Representative
	ECoW
	Rig Supervisor
	Driller
	Surveyor
	Drill Fluids Technician
	Rig Side Floor Hand
	Rig Side Floor Hand
	Exit Side Floor Hand
	Exit Side Floor Hand
	Welding Supervisor
	Butt Fusion Welding Operative
	Aluminium Wrap Operative
	Shrink Sleeve Operative

8.0 TRAFFIC MANAGEMENT PLAN

Transport of the drilling rig and associated equipment will be by conventional Low Loader and Truck & Trailer

Any wayleave agreements will need to be detailed to the drilling team prior to the commencement of works.

The access route to Rig Site will be via the Dock Road railway bridge with a height restriction of 3.8m. The drilling rig will need to be unloaded, tracked beneath the bridge and re-loaded to enable access.



Diagram 28 : Dock Road Railway Bridge

Access to the Tata Steel site will need to be arranged with the site security and inductions will need to be undertaken by all operatives and visitors.

9.0 CONSTRUCTION LOGISTICS PLAN

Prime Drilling PD400/150 RP-C Drill Rig with 18", 24" and 28" Reamers
 Hydraulic Power Pack
 Site Tec M2002E Mud Mixing Plant
 Site Tec R2000E Mud Recycling Plant
 Site Tec ST2000E Active Tank
 HT-400 Mud Pump
 Workshop/Tool Store
 Drill Cab
 Welfare Unit
 Site Office
 500 kVA Generator
 Gyro Guidance System
 12-1/4" Railhead Drill Bit
 Exit Side Site Tec R2000E Mud Recycling Plant
 Exit Side Site Tec ST2000E Active Tank
 Exit Side HT-400 Mud Pump
 Exit Side Welfare
 Exit Side Generator
 TongHand
 2 No. Mud Swivel
 2 No. 6-5/8" FH Check Valves
 Tractor and Vacuum Tanker
 Slurry pump for Entry Pit
 Slurry pump for Exit Pit
 2" Honda Pump for water supply and fire hose
 500mm Tow Head

Subject to ongoing commercial and technical review of available fuels, OCU intend utilising hydrogenated vegetable oils on site.

Subject to ongoing commercial and technical review of available systems, OCU intend utilising renewable energy power supplies on site, (e.g. Nixon Solar Pods).



Diagram 29 : Photograph of Nixon Solar Pod

10.0 FIRST AID & WELFARE ARRANGEMENTS

Welfare facilities commensurate with CDM Regulations will be provided by OCU.

All OCU gangs carry a 10 person First Aid Kit and relevant PPE which are issued freely, regularly checked and maintained by OCU site supervisor from stocks available in OCU Head Office Stores.

All OCU vehicles carry first aid kits.

Automated External Defibrillator (AED) Locations

Connah's Quay

**Ysgol Bryn Deva
Linden Avenue, Connah's Quay, CH5 4SN**

On Hook outside Head Teachers Office
Monday to Friday 07:30 to 17:30 Term Time Only

11.0 PPE

O'Connor Utilities PPE complies with PPE Regulation (EU) 2016/425 Guidelines, 1st Edition, April 2018.

PPE will be utilised alongside existing or devised control measures to further reduce the level of risk as per the Risk and CoSHH assessments.

Minimum mandatory PPE requirements are head protection, foot protection with ankle support, high visibility vest, hand protection and eye protection.



Head Protection to EN397:2012

Foot Protection to EN ISO 20345

Safety footwear must provide support to the ankle, include mid-sole protection, have a covered steel toe cap and must be FULLY LACED as intended.

Rigger Boots are not permitted on site, however wellington boots and waders may be used for specialist tasks or where wet ground conditions dictate. Wellington boots used on site must include the mid-sole protection and covered steel toe caps.

High Visibility Clothing to EN471:2003 Class 2

Hand Protection to EN388:2016

Different Gloves are available for different tasks.

Ensure that appropriate gloves in terms of Abrasion resistance, Cut resistance, Tearing Strength, Puncture resistance and Chemical protection are being worn for each task.

Eye Protection to EN166, "F" Rating for lenses and frames

The use of Eye Protection in fully screened mobile plant is not mandatory.

Clothing Flame Retardant Coveralls to EN5631 or BS EN ISO 11612:2007 Class 2

Minimum dress code of trousers and sleeved T-Shirts.

No shorts or Vests are to be worn

Hearing Protection will be worn where appropriate



Respiratory Protective Equipment (RPE)

Dust Masks will be used for tasks associated with particulates such as mixing drilling fluid.

RPE Assigned Protection Factor (APF) will be APF20 with FFP3 Particulate Filter.

DCWW site rules will apply in regards to the wearing of PPE on their sites.

12.0 ENVIRONMENTAL MANAGEMENT PLAN

Transmission & Reception Pits to be of sufficient size to hold excess amount of Water/Drilling Fluid to prevent run off. A vacuum tanker will be used to transport fluids from the reception to the launch area. Final quantity of waste is dependant on ground conditions and therefore the Drilling Foreman or Manager will need to inform the client of the requirements as soon as this is known. It is proposed to transport any remaining fluid waste with the services of Stubwood (UK) Limited to transport the waste to local Landfill site, or similar, which will accept the fluid.

Any remaining sludge may be treated with Supasorb to solidfy the waste and enable it to be excavated and disposed of at a landfill site.

Plant and equipment will be checked for drips and leaks before entering the site and drip trays and spill kits will be available to prevent any subsequent fuel & oil leaks polluting water courses.

Only designated routes are to be used to access the work area.

Formfill or similar to be available on site as an additive to the drilling fluid to seal any fractures in case of Break out.

General litter to be disposed of accordingly.

DCWW will propose that biodiversity enhancement measures, such as replanting, are implemented to provide a positive biodiversity change following completion of the works.

Arup Report – “Deeside Crossing Directional Drilling – Waste Assessment” dated 29th March 2021 has been reviewed.

The report Section 3.2 Discussion and recommendations for disposal options per area makes the following recommendations:

- 1) That all landfill waste at Entry Point is excavated, segregated, managed, stored and disposed to prevent cross contamination during drilling.
- 2) That the landfill liner / barrier system at Entry Point is evaluated prior to excavation of waste material such that leachate or landfill gas pathways are not developed by the construction process.
- 3) That UXO measures are incorporated into any intrusive works associated with items 1) and 2).
- 4) That Made Ground at Exit Point is excavated, segregated, managed, stored and disposed to prevent cross contamination during drilling.
- 5) That separation is maintained of hazardous, non-hazardous and inert materials.
- 6) That drilled cuttings are tested, analysed and risk assessed for controlled waters and human health suitability to determine disposal or re-use options.

13.0 PRECAUTIONS & LIMITATIONS

Access & Egress to be restricted and limited to only those necessary to carry out the works.

Permit to drill to be followed and all reasonably practicable steps to be used to locate any underground services in accordance with HS(G)47 and avoid overhead services in accordance with GS6.

Access to site by designated access points only.

No person shall enter an unsupported excavation without prior assessment by a competent person.

Drill shall only proceed when permissions have been granted by DCWW.

14.0 EMERGENCY RESPONSE PLAN

Site Operatives to be inducted during which details of the OCU Emergency Arrangements will be detailed.

Any incidents on site which affect the Health, Safety, Quality of the Service and Welfare of employees, visitors, sub-contractors or members of the public should be reported immediately to O'Connor Utilities Head Office (0161 248 9922) and to the Drilling Manager who will inform the Client and in turn inform any relevant parties and instigate the Clients Emergency Procedures.

O'Connor Utilities Positive Intervention "App" will be used to report near misses and incidents. In the event of any emergency, the following procedure will need to be followed:

ALARM :

Muster Point with Access and Egress Routes

All operations to cease immediately and shut down all plant so as to present no further risk to persons present.

If first aid is required, a person trained in first aid should carry this out. First Aider

Firefighting equipment location

When calling Emergency Services 999

Provide details of Service required with:

Location, Incident type, Numbers Injured (if any), Extent of any Injuries, Details of any existing Hazards

Utilities:

It is anticipated that Gas, Water, Sewers, Electric and Telecoms are present.

All Statutory Undertakers Plant drawings will be provided by OCU and copies will be held with contact details on site.

Local Authority & Agencies:

HSE		0845 345 0055
Natural Resources Wales (Pollution Hotline)		0300 065 3000
Natural Resources Wales (Flood Line)		0345 955 1188
National Grid Power Emergency	Power	0800-404 090
National Gas Emergency	Gas	0800 111 999
SPEN (Merseyside & North Wales)	Power	0800 001 5400
Welsh Water	Water & Sewers	0800 052 0130
British Telecom	Comms	0800 023 2023

Virgin Media
NHS Direct

Comms
Medical Advice

0870 8883113
0845 4647

Nearest A&E Hospital:

Wrexham Maelor Hospital
Croesnewydd Road, Wrexham, LL13 7TD
Tel: 01978 291100

All spillages shall be dealt with in accordance with the Pollution prevention Procedure and follow the steps; Stop, Contain, Divert, Contact and Disposal

Abandoned Bores / Plant:

In the event that a drill shot is unsuccessful then the client shall be informed and all equipment shall be withdrawn from the bore as far as is reasonably practicable and then the void will be filled with a mud slurry and allowed to solidify.

Where plant becomes stuck underground work shall cease and a method for its recovery devised. Where it is found to be irretrievable due to its location under the canal then equipment will be abandoned in the ground, the remaining bore filled with mud slurry and its location noted on the as-built drawings.

15.0 METHOD OF COMMUNICATION

Primary source of Communication is by Mobile Phone:

Mike McNulty HDD Director 07717 894606