

Construction Methodology for Band 2 Marine Licence

Contractor's Methodology

Project Title: Dovey Junction Viaduct Phase 2B

Client: Network Rail Infrastructure Ltd

Site: DJP 79m 16ch.

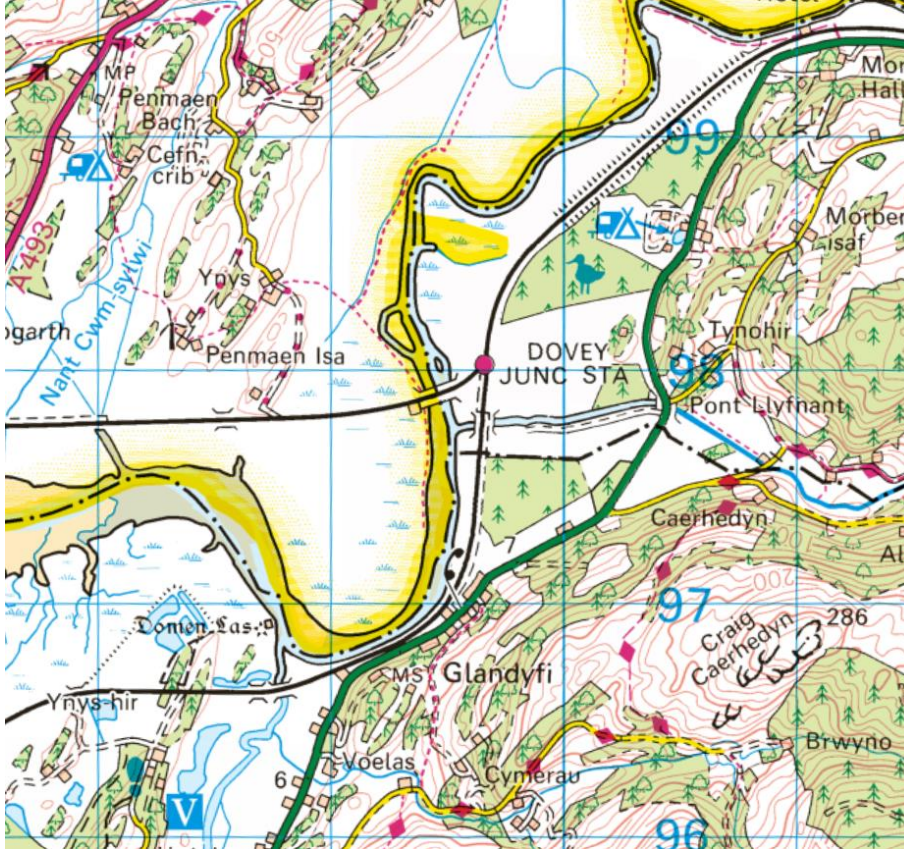


1.0 Scope of Work

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Dovey Junction Viaduct is located on the Dovey Junction to Pwllheli line (DJP) over the River Dovey approximately 5 miles south-west of Machynlleth.

OSGR: SN 69469 97893



The single-track structure comprises of

- 17no. timber spans
- 17no. timber trestles
- 4no. steel spans
- 5no. cast-iron trestles;

Replacement of Structural Elements Design

Based on the Network Rail produced Option Selection Report and CRT the requirements for this project are described below:

- ▶ Timber replacement to 15 main spans (including corbels and edge beams)
- ▶ Reconfiguration of deck plank arrangement and installation of GRP walkway.
- ▶ Re-positioning of span 1 new track
- ▶ 2 No Cross head timbers replaced
- ▶ Trestle 2 Pile 2
- ▶ Trestle 5 Pile 3
- ▶ Trestle 12 Pile 3 & Pile 4
- ▶ Trestle 22 Pile 2 & Pile 3

Temporary Works

Our Temporary Works Coordinator has been nominated to coordinate the management of temporary works in accordance with the AmcoGiffen's procedure PR29 (Managing Design on Site). No designs will be changed without the written approval of the Temporary Works Designer.

Temporary Works will be carried out and managed in accordance with BS5975 and the general requirements of the CR-T. Anticipated items will include but are not limited to:

- ▶ 001 Heras Fence (Compound Perimeter Fencing)
- ▶ 002 Crosshead propping (programme dependent)
- ▶ 004 Scaffold access during deck works
- ▶ 005 Pontoon Access to structure and across river
- ▶ 006 Lifting plans for RRV
- ▶ 007 Propping to main beams during RRV lifting
- ▶ 008 Main beam ties
- ▶ 008 Pile propping
- ▶ 009 Use of block and tackle to replace piles and wallings
- ▶ 010 RRV assessment for working on structure

The appointed project Temporary Works Co-ordinator (TWC) will manage the design/checking, provision/installation and subsequent removal of all temporary works in accordance with AmcoGiffen internal procedures. Temporary Works Supervisors will be appointed to assist the TWC in discharging responsibilities. Any significant risk Temporary works will be detailed on a Form 002/003 Temporary Works Design in accordance with NR/L2/CIV/003 and submitted to NR for review, comment and acceptance prior to mobilisation on site.

The general temporary works have been successfully used previously by AmcoGiffen on Dovey Junction in 2022, Traeth Mawr and Barmouth Viaduct. These designs will be revisited and updated to reflect the nature of the scope.

2.0 Construction Stage

4. Construction Methodology

The sequence of works can be summarised below:

1. During Abnormal Possession

- Road Rail Vehicles (RRV's) access site to high and low mileage of structure
- Remove track and deck
- With one gang working to the high mileage of the metallic section and one to the low, Cut and remove track and remove for 1 span each side
- Remove all timber and handrail to the crosshead level with RRV. Check level and replace timber
- Replace deck and commence handrail
- Repeat process working away from metal section
- Commence handrail installation
- Change piles where required
- Replace deck and track to new designed level

2. Post Abnormal Possession

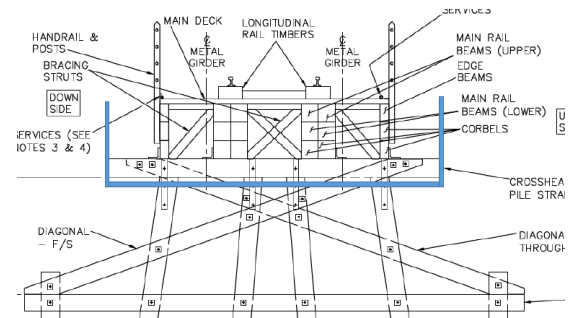
- Remove temporary works
- Carry out any finishing works
- Site demobilization

Access scaffold to the structure

Due to the amount of work at each trestle and span we propose to install an access scaffold to the full structure. This scaffold will be used for access and encapsulation of the steel section as well as access for all other works. In order to install the scaffold during normal working ahead of the blockade, RRV shifts will be utilized to transport the scaffold from the compound to either side of the structure.

Pontoons will be used to access the structure during the scaffold erection with the works sequence generally from the embankments working towards centre.

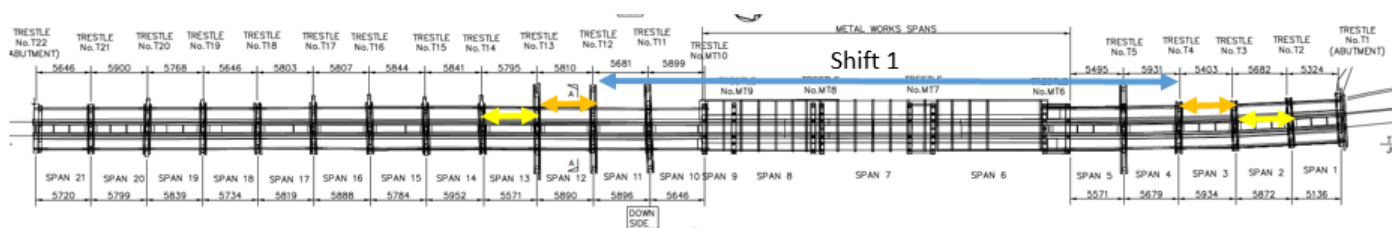
The final level of the scaffold design will be decided at detailed design stage but it will be suitable for works to main beams, crossheads and handrail. It will reduce the amount of work required from towers on pontoons.



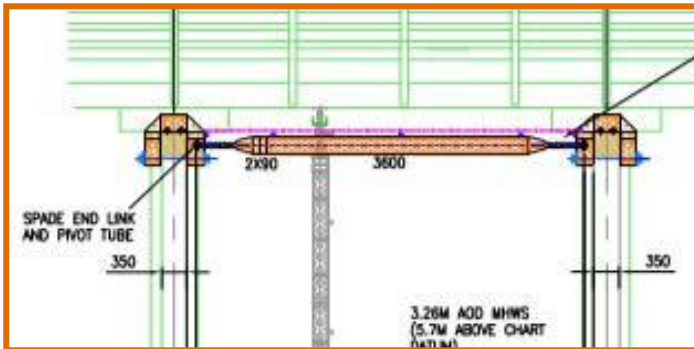
Track Removal and main beam replacement, including crosshead

The sequencing of the track removal is vital for the works as we need to keep elements of the track in place for the RRVs to carry out timber replacement. With this in mind our basic removal sequence is highlighted below with the track and rail timber to the steel sections removed first

Once this section is clear of track we will have teams to the high and low mileage sides of the bridge removing deck timbers and handrail



When the deck section is stripped out we will need to insert temporary lateral restraints. These are in place to maintain the trestle position when the beams are removed. The diagram and picture below demonstrate where this was successfully used previously on Barmouth viaduct.



When the temporary works are in place and signed off, the removal of the spanning timbers can commence. The timbers will be supported by the RRV lifting straps. The steel straps to the structure will be removed. The timbers will be lifted to the RRV trailer.



Where the crosshead is being replaced, the new timber will be lifted from the trailer onto the piles. The contact area to the piles will be checked with gauges. Where the contact area is not as required we will again look to utilise resin to this area. Once the crosshead is set the new straps will be installed to secure.

The levels from the crosshead up is critical to the new track alignment. We aim to get this level correct by adjustments to the corbels. Engineering

controls will be established across the deck to ensure that line and level of the timbers is in accordance with the proposed P-way alignment and all tolerances are met.

The RRVs will lift new corbels into place and the level will be checked by the engineer. When satisfied that the reduced level is correct, temporary brackets will be fitted either side to hold in place until straps are fitted. The spanning edge and main beams will be lifted from the RRV trailer. They will be lined up to the corbel and line and level checked.



Once satisfied that the timbers are at the desired level, the new straps will be secured. The designed torque will be applied and the appropriate QA document signed off for the timber and steel on the bay.

The GRP deck support brackets will be put in place and the GRP grating installed. The scaffold deck will be used for access to undertake this task.

Works will take place from low and high mileage of the steel section, working towards the abutments. We will have 2 bays open at a time so when the infill to one is complete, the "3rd" bay will be stripped so we have full access to change all trestle timber at the centre and the spanning beams.

Handrails

The GRP handrail installation will follow on from the deck bays. The GRP brackets are drilled through the edge beam timber, accessed from the scaffold. The brackets bolt through the timber with locking nuts in place.

Each post will be measured up from the deck level to ensure that we have 1.25m minimum post height. When a series of posts are in place, the horizontal rails are fed through the pre-drilled holes with joints screwed in and finally the kicker board is secured as a section is complete.



Pile Replacement under Live Load

It will be possible to carry out pile replacement works to piles 1, 2 5 and 6 ahead of the abnormal possession. In order to do this we will use a temporary works support to transfer the load from the crosshead to the wailings. This has been successfully used on Traeth Mawr Viaduct.

The size of timber will be checked and cut in the yard. All metalwork will be changed in advance.

Scaffold will be in place at the top of the pile level to allow access to steelwork.

Specialist dive teams will carry out the pile works. The pile timber will be connected to block and tackle on the crosshead. Any connection to wailings will be removed along with any old splice clamps.

This pile cut line will be agreed with the designers.

A specialist chain saw is then used to cut off the existing pile at the top of the proposed splice. The old pile will be lowered onto pontoons with block and tackle.

The splice detail will be cut into the existing timber. This notched detail then used as a template to cut the splice into the new.

The new timber will be lifted from the pontoon and into place using the block and tackle. It will be offered up and straps applied. Hardwood wedges are then used to push it home.

The top connection will be checked.

If for any reason, a temporary boot solution has been designed. This consists of a steel frame that sits over the top of the existing pile then steel beams that project to the crosshead. This would allow the track to re-open without the timber pile in place.

Resin infill by Trac Structural will be used where we cannot get the required connection at the top of the pile.

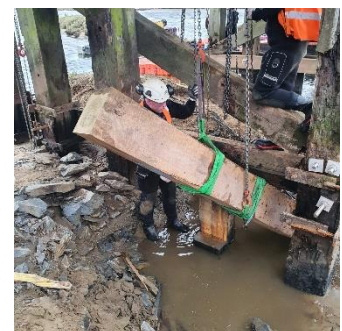
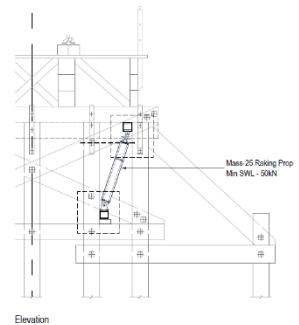
Pile Replacement within Abnormal Possession

The piles identified within the CRT for replacement under the rail bearers will need to be undertaken in the possession with no live load. The programme will show that these piles are replaced once the areas above are complete so there will be no RRVs passing above.

The process for the replacement will be as previous but without the need for temporary propping. The wailings will be removed from one side of the trestle. Block and tackle will be attached to the crosshead to take the weight of the pile and the pile strap removed.

The new pile will be pre-spliced. The existing pile will be cut square and removed on the pontoon. The splice cut into the existing pile will be carried out underwater. The measurement to the crosshead will be checked and new timber cut to suit. The angle of the top of the existing pile will be checked measured and replicated in the new pile.

The new pile will be lifted into place with the block and tackle. The splice brackets will be put in place and hardwood wedges hammered in to push the pile to the home. Again, resin can be used if the contact area is not sufficient.



Permanent Way Installation:

Survey, design and engineering management.

In order to develop the multi-disciplined coordination of the scheme a full check of the survey control and proposed design will be undertaken using primary survey control information. Key dimensional checks will be established to include existing running edge and rail height positions, rail wear at the tie on points, rail joint positions and material conformance checks. This data will be used to facilitate the production of the Form A/B P-Way submission.

The final rail level will be used to determine the construction depths of the final longitudinal timber and timber rail bearing beams and supporting corbel and cross head depths (to be confirmed with structural engineering).

Preparation Works.

On approval of the Form B submission the AFC the materials specification the project team will place the orders for the approved materials.

Once ordered these will be inspected at the supplier's premises to ensure compliance with the AFC and the NWR standards. This will be particularly pertinent to timber elements of the scheme (way beam sizes, quality and condition).

The site technical team will review all proposed setting out data and prove the critical dimensions on site (Horizontal and Vertical alignment) including proposed temporary alignments and construction details (junction / lift fishplates). Any validation surveys highlighting differences to design alignments dimensions will be highlighted to the project team and the designers for review / resolution,

Once the worksite has been established the RRV cranes complete with support trailers will access the line at the RRAP.

The P-Way team will remove the existing fishbolts using Bance petrol driven impact wrench and disc cut the rails where required in bays. The running rails will then be removed and set on the trailers, initially trestles 4-12 then one bay at a time, as works progress. Once the requisite length of rail is removed the existing way beam transoms and holding down brackets will be unfastened and removed. The Way beams will then be lifted and stored on the trailers exposing the rail bearing beams below.

The now redundant Permanent way equipment will be transported to the access point for stacking and collective removal by NWR's scrap clearance contractor.

The structural elements of the bridge will then be removed as required.

The track technical officer will support the structures team with engineering and setting out of new structural elements of the bridge paying attention to timber heights and levels (a constant comparison with the design rail level to the relative structure elements will be made to ensure that):

- a) The resultant track level is not too high
- b) The timber way beam is not set too low resulting in too many packing shims used between the way beam and the underside of the LGN / LN baseplates).

Once the top rail bearing beam has been installed the Way beam will be lifted into place using the RRV. The site technical officer will control the alignment and level. Care will be taken to ensure the way beam is set to a level +0 and a maximum of – 30mm (target – 15mm) to control the packing shims used.

The way beams will be aligned then fixed with M30 stainless steel tie bars and galvanized transoms installed and fixed (all fixings to be stainless steel, including coach screws, washers and lock nuts).

Once the timber way beams have been installed and fixed the Pan LN & LGN baseplates will be distributed and the RRV will then lift on the running rails. One leg will have the base plates fitted, the technical officer will align the rail and then track staff will drill and fix the baseplates (650mm maximum centres). Care will be taken to ensure the baseplates are fixed in accordance with the minimum dimensional tolerances for coach screw positions relative to timer ends.

As the structures team progress with their work the site team will work behind, outside critical path activities installing the rail.

Once the first rail is pinned down the adjacent rail will be installed and gauged from rail no1. The track staff will then drill and fix the running rails into position. Note, Pan LN and PGN baseplates to be fixed 1x LGN, 2 X LN, 1 LGN, 2 LN etc.

Once the running rail is installed the team will move forward and progress the removal of the next section of rail / timber / structural elements.

Note: All fishbolt holes will be CBX'ed either in the factory or any holes drilled on site will be CBX'ed prior to running traffic.

On completion of the structures works and the way beam / rail renewal, the interface with the existing track on structure UB41 will be attended to.

On completion of the planned works a detailed as-built survey will be completed and the works inspected by an experienced track hand back engineer and the CRE track construction. A form TEF 3203 V6.0 will be completed on the final inspection of the works.

Any snags will be attended to and the structure handed back to rail traffic.



Note; a combined track monitoring and CRT plan will be agreed prior to the works and the monitoring arrangement set up and effected as agreed. This will include JCT recording and monitoring.

Follow Up Works:

All fixings will be checked after 1 week's traffic and any loose bolts / nuts replaced.

Handback

The handback engineer will check the track alignment, F005 will be completed and track handed back.

Our CRE, managed by the CEM, will be responsible for the production and collation of all their respective as-built and Inspection and Test Plan (ITP) documentation. All of this information has to be centrally collated and provided as evidence for to support the Entry into Service (EIS).

A tracker will be developed by the CEM and agreed with the DPE, it will be updated on a weekly basis to allow the management of the process. This will demonstrate that the works have been constructed in accordance with the design, that all construction works required for EIS are completed, and that a full action plan of snagging issues has been completed.

We have a process, PR21 - Manage Commissioning & Handover, to successfully hand back the asset and obtain a certificate of practical completion.

Our quality manager will be responsible for ensuring that the process is followed, and that all information required for the commissioning and handback is captured and reviewed accordingly.

Following blockade

Any outstanding works such as handrails, shrouds, steel repairs and brackets can be completed following the abnormal possession. It is anticipated that this will be minimal.

The works to the pile shrouds involves removing the existing with breakers. Once removed, the GRP shroud will be set at the correct level. This may involve the temporary removal of the fixings to the horizontal wailing.

Once the shroud is secured, the grout can be mixed and poured to design.

Test cubes will be taken and allowed to cure as close to the bridge as practical before being crushed

The areas where the Reno mattress has been removed will be identified and the mattress replaced in line with manufacture guidance.



Clear site and Demobilise

Following completion of works, all site fencing will be reinstated to meet the existing specification of boundary lines. All site welfare, compounds and access will be demobilised and all fields reinstated to their original state.

Resources

Resource levels are assessed to ensure optimum efficiencies are achieved, particularly during critical period's e.g. abnormal possessions where successful completion of works is critical to the overall programme and safety of the public and NR personnel.

In the preparation of these works, AmcoGiffen have engaged with their supply chain to source specialist, experienced and competent contractors.

Key Risks, Mitigation and Contingencies

The key risks together with corresponding mitigation/contingency measures that may be adopted are tabulated below.

This list is not exhaustive and the Project Hazard/Risk Log will be incorporated into the Construction Phase Plan. This document will be updated throughout the duration of the project.

Risk	Mitigation / Contingency
Working on or near the line	Valid Safe System of Work (SSOW) to be in place Persons to have valid PTS card or Track Visitors Permit and must be in possession of these at all times if working on track Employees to sign in and out of the Sentinel app

	Works to be planned in line with NR Standard – NR/L2/OHS/019 – Safety of people on or near the line Only use approved POS provider No access on to the track until COSS has given their briefing, acceptance by those involved in the works and given authorisation to access
Working at Height	Suitable access point to working are must be used at all times. Provide built for purpose scaffold to undertake the works. Only trained competent persons to erect scaffold Task brief, permit to work, TBTs, Whiteboard WaH assessments in place
Working in and over Water	Pontoons and rescue boats in area. Check river flows ahead of works. Correct PPE including dry suits and life jackets. Life lines and rigs at bridge. Fully qualified divers for underwater works
Injury from lifting activities	Lift operations to be part of a lift plan and permit to lift issued Lifting equipment to be marked with its safe working load and not to be used to move loads heavier than SWL Only trained people to use lifting equipment Exclusion zone to be established and controlled throughout the lift journey Any authorised persons within the exclusion zone never to stand under a suspended load Ensure landing destination is prepared and ready prior to the lift being commenced Lifting equipment and accessories to be inspected and certified prior to use with any defective equipment/accessory to be quarantined until repaired or replaced Ensure outriggers are used where fitted Effective communication to be in place at all times between the operator and slinger/signaller
Injury from Hand Arm Vibration	Assessment to be carried out on equipment to use lowest HAV's tool available & establish activity duration Equipment to be checked before each shift with any faults notified to the supervisor and quarantined until repaired or replaced. Equipment to be regularly serviced and cleaned in line with manufacturer's recommendations Operatives to be rotated on operations HAVS trigger time recorded and recorded in site files. Monitoring/management of trigger times in accordance with HSE guidelines.
Cutting and drilling of tropical hardwood	Secure area on pontoon to be established for all cutting and drilling operations. Competent persons to carry out the task wearing the appropriate PPE. Use of hand held grinders-ensure correct tool selected, ensure working platform is at correct height and stable. Use fixed scaffold where possible Use of Pontoons-Operatives to be briefed and practical demonstration on use of pontoons and how they react whilst carrying out different activities from them. Supervisor to check tide levels that could change during an activity introducing new risks
Risk of people & objects falling from open and unprotected edges	Fall prevention PPE to be worn at all times when a risk from falling from height exists when collective measures not in place ie. Inertia reels, harnesses and restraints. Rescue plan in place if full suspension rope access is used Permit to work at height issued Use designated walkways/access No access on to incomplete fixed or mobile scaffold unless trained to do so and wearing correct PPE Scaffold to side of bridge for handrail works Exclusion zones to be erected below / around scaffolding
Striking Services	Refer to buried service information provided by the client and Network Rail Hazard Directory. Copies to be readily available on site. CAT scan of area by competent person for signs of known or unknown services. Mark up on site using a line marker or reference point. Any unknown services to be updated on service drawings and NR notified. Excavate hand trial holes using insulated spades & shovels to locate known or unknown services. Do not use picks, pins or forks

	Issue and brief Permit to dig – NO PERMIT NO DIG No mechanical excavation within 1.2m of any service unless authorised by Regional managing Director Protect existing services on deck
Working with plant and equipment	All works to be carried out in line with 019 standards. All plant to be accompanied by a MC/Banksman at all times. Exclusion zones to be erected around all plant while working. Detcom radios to be used between all banksmen & MCs. Install and use of designated walkways Slinger/signallers to be used for all plant/crane movements where required, if possible exclude banksman/vehicle marshal they will be in control of an area of working plant and will not allow any persons to enter the exclusion zone until the plant has stabled and isolated. Only certified operators to operate plant. Suitable signage to be erected prior to works commencing. PPE to be worn at all times. Lifting of materials to be done when slew radius is clear from workforce. No personnel to be positioned below lifts at any time. Designated vehicle access to be established for site access. Briefings on controls to be undertaken during induction. Exclusion zones to be established around working area, Personnel to be briefed in safe systems of works and working boundaries prior to accessing site, plant/pedestrian segregation using physical barriers when working adjacent to machines, Adequate lighting provided at work site, PPE to be worn at all times, acknowledgment by operatives/operators to be briefed and enforced throughout scheme, designated pedestrian walkways established prior to work start.
Working on scaffold	Scaffold approved, inspected and fit for purpose. Appropriate hoarding and segregation in place Form005 completed by the CRE construction or nominated person once the scaffold is complete and inspected Temporary Works Coordinator to be formerly appointed Temporary works Supervisor to be formerly appointed Scaffold to be installed as per approved design and using recommended/approved materials Scaffold only to be installed, altered and dismantled by trained and competent persons No access, except for scaffolders until signed off and permit to load issued Weekly check by competent scaffolder Form005 completed by the CRE construction or nominated person once the scaffold is complete and inspected
Accident or Incident to people and or property from an unplanned change or circumstance	Agree a plan to control the activity Compile a "Point of Work Risk Assessment" with everybody's input (POWRA) Contact line manager for confirmation Brief the control measures to those concerned On completion of new work return to original documentation and SSOW 1. Notice it 2. Stop Works 3. Determine the effects it might have 4. Deal with the change to achieve the right outcome
Work exposing workers to the risk of drowning	Works to be undertaken from a safe pontoon system qualified dive personnel and safety boat attendance to be in attendance during all diving operations. Monitoring of river levels to be undertaken to be aware of any risk of flooding. Permit to work on water to be in place prior to commencement of works. Compressor filters to be checked before each dive, if necessary the filters should be changed. Make sure all intakes are well away and up wind of exhaust. Regular air checks are to be completed and a certificate of air purity issued before diving commences.

	If radio communications have been lost, revert to hand signals until the diver has left the water (SWP1, 1:2). Dive operations not to commence, until radio communications have been re-established. Diver's umbilical to be tended by experienced linesman only and the umbilical held tight but not to impede the divers work. Keep the number of lines/ropes from the surface to a minimum. Diver to wear the correct protective equipment, gloves etc., limit dive times to the prevailing conditions and or when the diver complains he is cold. Standby diver situated in sheltered area. Warm drinks supplied – divers in water time restricted. The seabed may have small debris the diver is to be made aware and briefed of sharp edges, needle stick injuries etc. Report any such injury to the supervisor. Emergency Medical Care to be provided and emergency services informed if needed.
Moving vessels during dive operations	Flag to be flown during diving operations. Work will be carried out using a permit to work issued to by the appropriate harbour authority. When diving operations are in progress Radio contact to be maintained and monitored on working channels
Spreading of COVID 19	Follow Government guidelines do not attend work if you get any symptoms and self-isolate for 7days. If you live or have been in close contact with anyone who has had symptoms do not come to work and self-isolate for 14days. Follow social distancing measures where possible to reduce your contact with other people and reduce the risk of spreading the disease to save lives