HS2 Phase 2b (Crewe - Manchester)

Utilities

P9(1)

Why are Utility Works Required?

Utility works are required for:

- New utility services for the construction of HS2
- New utility services for the operation of HS2
- Diversions to remove clashes with HS2 infrastructure
- Diversions to enable ongoing utility maintenance
- Protection works
- Decommissioning of redundant supplies
- Works as a result of realigning existing transport infrastructure

Existing records can be out of date, approximate or missing; therefore, surveys are required to supplement documented utility information to verify condition, location, numbers of assets etc. This is to make sure all utilities are known about, to avoid unplanned disconnections, unplanned diversions and delay.

P9(2)

Utility Assets Affected by Proposed Scheme

60 Major Diversions

- Two 400kV Overhead lines
- Five 132kV Overhead lines
- 10 high-pressure gas pipes
- Five fuel pipelines
- 26 potable water trunk mains
- 12 large diameter sewer diversions

Others

- 10 mobile telecoms mast relocations
- 58 Inovyn private assets
- Manchester Airport Foul Rising Main
- Tata Chemicals Europe private high-pressure gas pipeline

12 Major Connections

- Three power supply connections for Tunnel Boring Machines
- Three water supply connections for Tunnel Boring Machines
- Three waste water connections for Tunnel Boring Machines
- Grid Supply Point (traction power)
- Power supply for Crewe rail depot (traction power)
- Water supply connection for Crewe rail depot
- 284 temporary site connections (power, water/foul, telecoms), including temporary generation, wireless telecoms and tank storage
- 150 permanent site connections (power, water/foul, telecoms), including Rail Systems supply connections

Divert =328	Protection = 2	Removal = 302	Assure* = 298

P9(3) *satisfy the asset owner that the asset can be left in place without further physical protection (e.g. monitoring against settlement).

Major Diversions – Overhead Power Lines

Worksites are mainly in rural locations with access often far from local roads – requiring the construction of temporary access roads.

Outages dictate the construction programme.

Actual diversion of power supply is conditional on outage windows – these are typically through summer seasons to avoid construction programme impacts from poor weather on pre-booked National Grid outages.

The Bill limits reflect the land take required for the construction of the Proposed Scheme, but also the land required for utility works.

HS2 Phase One, works between Birmingham Interchange and Hints (Tamworth)

P9(4)

Major Diversions – Overhead Power Lines

Temporary access may take the form of:

- panels clipped together (pictured)
- stone road laid on geotextile membrane

The temporary road is removed on completion of the works, and the site's previous condition is reinstated.

HS2 Phase One, National Grid Electricity Distribution Featherbed Lane site, near Brackley.

P9(5)

Major Diversions – High Pressure Gas and Fuel Pipelines

HP Gas Main and Fuel pipelines require approximately 50m width for installation, excavated material storage, access and working room.

Additional space is required for an access road if the site is away from the highway.

The pipe is often laid out at ground level for welding and then lowered into the trench.

P9(6)

HS2 Phase One, Cadent HP 21, outside Middleton, near Tamworth

HS2 Phase One, Cadent 11, outside Burton Green, near Coventry

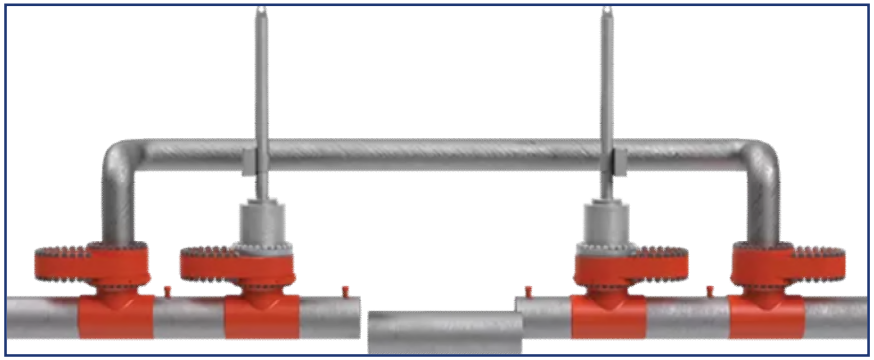
Major Diversions – High Pressure Gas and Fuel Pipelines

High Pressure (HP) Gas diversions are carried out by using a stopple and bypass arrangement, where new valves are installed on live pipes, in order to control flows and cut the pipe.

HP Gas diversions are typically planned between April and September due to weather risk – a stopple and bypass arrangement can avoid the outage requirement.

Working area for HP Gas Stopple Connection – typically 70m x 40m per connection, subject to pipe size (can increase up to 200 x 100m e.g. for 48 inch pipes).

Oil/Fuel pipeline diversions are carried-out by draining the pipeline and inserting a tee/connection.



Stopple and bypass arrangement
(stopples coloured in red)

P9(7)

Phase One, SGN Calvert site, near Bicester

Major Diversions – High Pressure Gas and Fuel Pipelines

In addition to the working area required for the installation of the physical asset itself, additional areas will be required for:

- Working area for pipework
- Storage (this can be significant)
- Access roads

HS2 Phase 2a, National Grid works near Kings Bromley

P9(8)

Major Diversions – Trunk Water Mains

Trunk water mains can be large in diameter (1.2m diameter for ring mains).

Larger pipes (approximately 600mm diameter and above) are usually in steel.

Forces generated by the flow of water under pressure can be large, which require concrete thrust blocks to mitigate.

Secondary diversion of small water, gas, telecoms and power utilities are often also required in urban areas.

Concrete thrust block under construction

Installation of the 42 inch water main at Euston

P9(9)

Major Diversions – Sewers

Sewers can be large diameter (3m diameter).

Some major sewers can date from the Victorian era and are brick built (Travis Street Sewer in Manchester).

Most sewers require a fall to work under gravity, otherwise a pump with a higher grade of pipe (air tight) is required.

Some sewers are constructed with small Tunnel Boring Machines (TBM) known as Micro Tunnel Boring Machines (MTBM).

HS2 Phase One, 1800mm Sewer from the Erskine St Scheme in Birmingham under construction, with MTBM supply lines visible.

P9(10)

Major Connections – Temporary Supplies for Proposed Scheme

Tunnel Boring Machines (TBM) require power supply via a dedicated sub-station, as they are responsible for some of the largest demand for power supply in the UK. Old Oak Common TBM has the largest temporary power supply in London.

TBMs also require large water supply.

Main compounds and temporary railheads will require power, telecoms, water and sewer connections.

Satellite compounds and worksites will require power as a minimum, but this could be supplied via a generator (if network availability is challenging).

HS2 Phase One, temporary power supply for Old Oak Common TBM

P9(11)

Major Connections – Operational Rail Supplies

Traction Power requires large permanent dedicated power supplies.

Stations, Rolling Stock Depots and Infrastructure Maintenance Bases require:

- Power
- Telecoms
- Water
- Sewer connections

Traction Power Supply

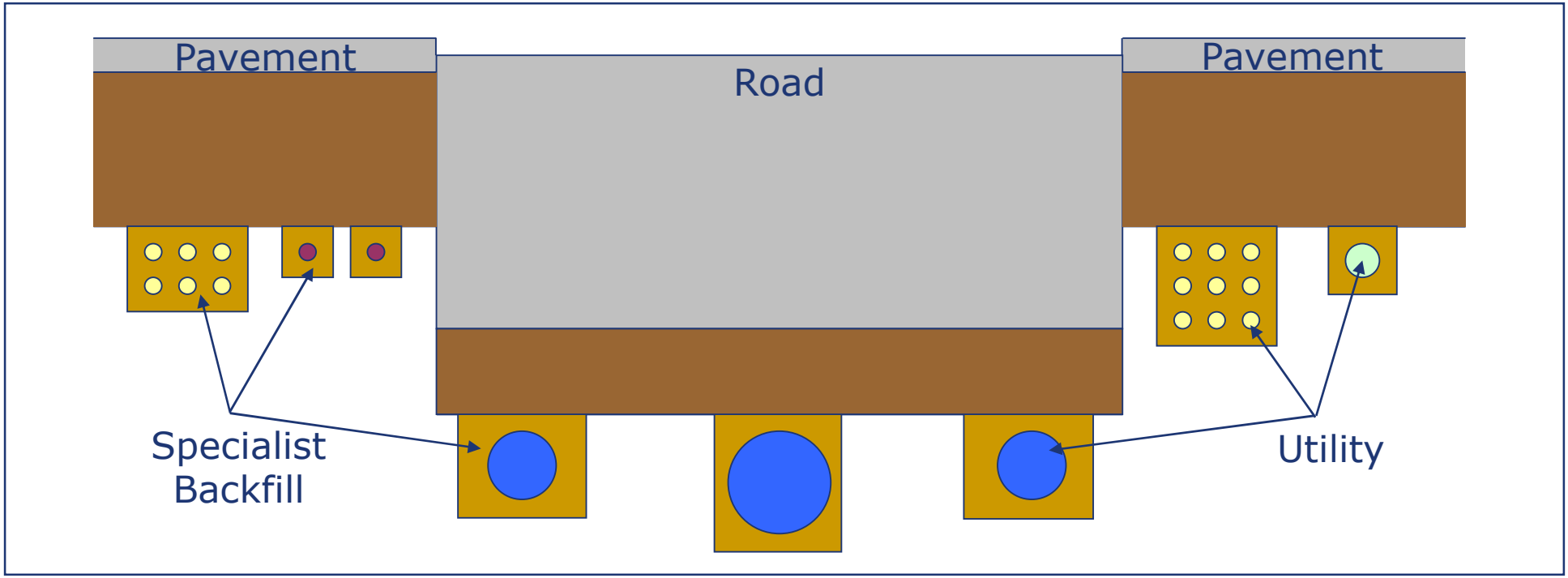
P9(12)

Minor Utility Diversions and Connections

Most minor utility diversions and connections will be carried out in the public highway.

Power, telecoms, water, gas and sewer are all found in the public highway.

Spacing of utilities in the public highway is based on guidance from the National Joint Utilities Group.

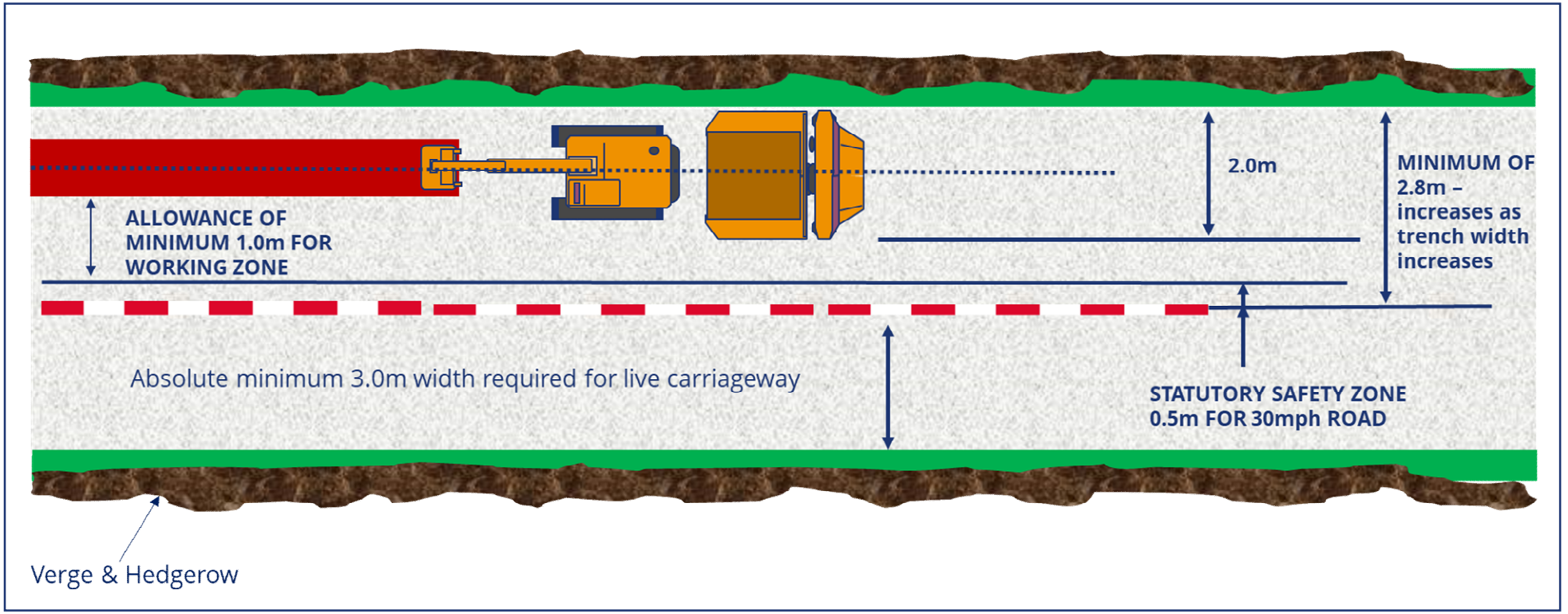


Typical road cross-section

Minor Utility Diversions and Connections

Full separation of worksite and live traffic to protect both public and workforce.

Work will progress in sections with road re-instated before next work section is started.



Typical plan view of highway utility work – single lane running, controlled with traffic lights

Minor Utility Diversions and Connections

Unknown utilities are often found during works and need to be managed.

Managing unknown utilities is achieved through:

- Identification
- Removal (if redundant)
- Protection
- Diversion

HS2 Phase One, works at Euston

P9(15)

Minor Utility Diversions and Connections

Urban worksites often have restricted working room.

Excavation support is required to minimise excavation and protect neighbouring assets.

Excavation support often comprises of steel sheet with timber/steel horizontal spreaders and propping between them.

Other safety controls include:

- Fixed ladder access
- Insulated tools
- Gas detection
- Means of local lifting

HS2 Phase One, works at Euston

P9(16)

Trenchless Technology – Micro Tunnel Boring Machines

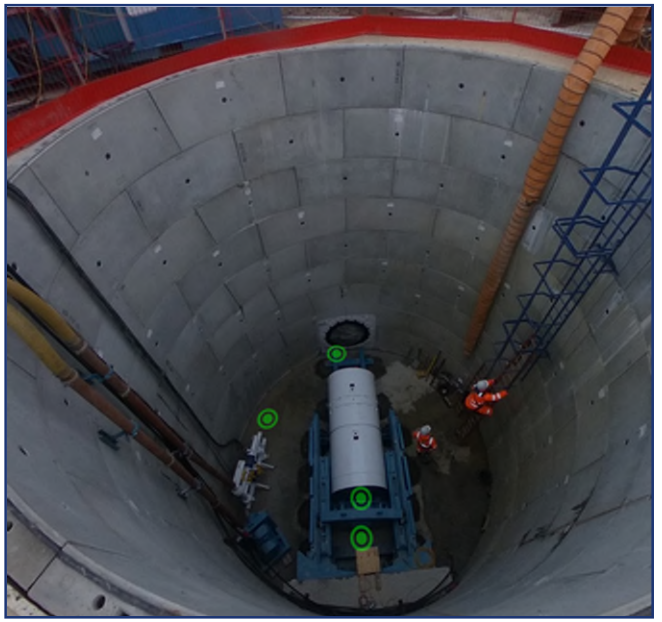
Micro Tunnel Boring Machines (MTBM) are often used for the construction of new tunnels with a diameter of 3m or less. This technique is known as ‘pipe-jacking’.

MTBMs can be used for sewers, power routes and telecom routes, where appropriate.

MTBMs can be used for distances of up to 1km, depending on ground conditions and size of pipe.

Cutterheads can be controlled from the surface and gentle radii are possible.

SSW/Cadent/TW Project



SSW/Cadent/TW Project

P9(17)

Trenchless Technology – Micro Tunnel Boring Machines

Micro Tunnel Boring Machines (MTBM) and Tunnel Boring Machines (TBM) both use cutterheads.

TBMs use segments for the tunnel lining, whereas MTBMs use complete pipes.

TBMs push off completed tunnel rings, whereas MTBMs pushes completed pipe sections forward.

An access shaft for a TBM drive under construction at HS2 Phase 1 Thames Water Greenway site (West Ruislip), with precast rings jacked downwards, along with its dedicated crane and lifting platform.