

## **Appendix A5.1: Construction Information**

### **1 Introduction**

- 1.1.1 This appendix provides an overview of a potential construction scenario for the construction of the proposed scheme. This information was prepared based on the DMRB Stage 3 design to provide a set of assumptions for the purposes of assessing potential construction impacts as reported in the ES.
- 1.1.2 It should be noted that the detailed design of the proposed scheme, and the construction programme and methodology, will be determined by the appointed design & build (D&B) Contractor, within the constraints of the contract and the requirements of the ES (i.e. to achieve the stated residual impacts).
- 1.1.3 Information is set out under the following headings:
- General Site Operations;
  - Construction Programme and Phasing;
  - Typical Construction Methods;
  - Land Requirements; and
  - Public Access, Site Access, and Traffic Management.
- 1.1.4 Plant likely to be involved in the construction of the proposed scheme are typical for infrastructure projects of this type, and are likely to include:
- excavators;
  - piling rigs;
  - tracked vehicles, bulldozers and dump trucks;
  - HGVs and concrete wagons;
  - hand-operated machinery including compacting plant;
  - portable generators for temporary lighting, pumps and similar;
  - cranes and other lifting equipment; and
  - motorised graders and pavement (road surface) rollers.

### **2 General Site Operations**

#### **Safety and Security**

- 2.1.1 Throughout the course of the works the Contractor will manage the Health and Safety of the site in accordance with the requirements and principles of all current applicable Health and Safety legislation, including the Construction (Design and Management) Regulations 2015, the Health and Safety at Work etc. Act 1974, the Management of Health and Safety at Work Regulations 1999, and the Workplace (Health, Safety and Welfare) Regulations 1992, and will ensure the safety of the public, site personnel, site operators, and visitors.

#### **Working Hours**

- 2.1.2 Anticipated 'typical' working hours of the contractor will be agreed with Transport Scotland and the Perth & Kinross Council Environmental Health Officer (EHO), but for the purposes of assessment are assumed to be as set out below:
- 07:30 to 18:00 on weekdays (Monday to Friday);
  - 08:00 to 13:00 on Saturdays; and
  - no Sunday working.

- 2.1.3 The above range applies to summer hours, when it is likely to be necessary to maximise the available good weather conditions for carrying out earthworks activities (as poor weather can adversely affect the condition of the material being used and the condition of haul routes). Winter hours will generally be shorter, due to the seasonal restriction on activities that can be carried out efficiently and the length of daylight available.
- 2.1.4 It is anticipated that some work will be required outside the normal working hours for exceptional activities (such as those that can only take place when traffic flows are low), subject to agreement with Transport Scotland and Perth & Kinross Council. These include:
- weekend work to complete critical phases of road construction and surfacing;
  - overnight closures for placing of bridge beams over existing carriageways or railways; and
  - overnight work to facilitate temporary traffic management layouts; and
  - non-disruptive railway possessions to complete structures and blasting.

### **Site Lighting**

- 2.1.5 Temporary site lighting during construction will generally be required as follows:
- at the Contractor's compounds for security and safe movement of staff during winter mornings and evenings;
  - along temporary access roads;
  - at locations where there is currently no lighting, but lighting is required as a safety measure under temporary traffic management (e.g. at carriageway crossovers, contraflows etc); and
  - for night time activities or winter afternoon activities.
- 2.1.6 Maintenance of road lighting at locations where the layout of construction areas is to be changed will be provided by mobile lighting towers or by use of columns in temporary locations.

## **3 Construction Programme and Phasing**

### **Construction Programme**

- 3.1.1 Construction of the proposed scheme is anticipated to commence in April 2019 at the earliest with the works expected to take approximately 3 to 3.5 years.
- 3.1.2 The indicative construction programme is broken down into three phases to reduce the impact on road users and neighbouring communities. The anticipated phasing of the construction works is as follows:
- Phase 1 – Set-up initial traffic management and construction of the sections of new carriageway that can be completed adjacent to the existing A9, including the construction of the northbound mainline (south tie-in to ch4780, ch5610 to ch5840, ch5960 to ch13240 and ch14890 to ch18870) and southbound mainline (ch5000 to 5515, ch11240 to ch11765, ch13400 to ch14760 and ch19085 to the end of the proposed scheme);
  - Phase 2 – Reconfiguration of traffic management and construction of the sections of new carriageway that can be completed adjacent to the existing A9, including the construction of the northbound mainline (ch4780 to ch5610, ch5840 to ch5955, ch13240 to ch14890, ch18870 to ch21935 and ch22045 to the end of the proposed scheme) and southbound mainline (south tie-in to ch4670, ch6185 to ch11240, ch11765 to ch13140, ch15005 to ch18745); and
  - Phase 3 – Central reserve work and construction of remaining sections of the mainline, including solely southbound sections (ch4670 to ch5000, ch 5515 to 6185, ch13140 to ch13400, ch14755 to ch15005, ch18745 to ch19085). Phase 3 will also include completion of all structures including overbridges.

## **4 Typical Construction Methods**

### **Establishment of Construction Compounds**

- 4.1.1 Preliminary activities include the setting up of the site compounds and offices. This also includes cabins, stores, welfare facilities and car parking. The Contractor will determine the location of the main site compounds and seek all necessary approvals for its design and construction. Due to the length of the proposed scheme, other smaller offices including welfare facilities and compounds are likely to be established along the route.
- 4.1.2 Preparatory works for the temporary site establishments will involve some site clearance work, minor earthworks operations to level the site, drainage and pavement works for the car park and services installation (e.g. electrical, communications, water and sewerage). The site compounds will be erected, maintained and subsequently removed in a manner that will aim to avoid or reduce impacts on the locality.
- 4.1.3 The initial actions will involve the construction of site access and egress points. Wherever practicable, haul routes will also be established to ensure that construction traffic is contained within the confines of the CPO, as far as possible. However, since the route intersects main roads, local roads and other obstructions, the limited use of other public roads is likely to be required and approval for this will be sought by the Contractor with the relevant authorities.

### **Temporary and Permanent Fencing**

- 4.1.4 The land area to be occupied by the construction works will be identified accurately on the ground, by surveying and installing appropriate pegs and posts, prior to the works commencing. The area defined will be the land acquired for the permanent works and any other areas that the Contractor has acquired by agreement to facilitate construction of the works.
- 4.1.5 Any permanent fencing required to denote the permanent highway boundary will generally be a timber post and wire fence. There may however be sections of fencing designed to a higher specification for the exclusion of otters (see paragraph below) and other wildlife where required.
- 4.1.6 Temporary fencing will only be required where necessary to secure the working area.
- 4.1.7 Other specific fencing that may be required temporarily will include higher security fences at compounds or where additional security of the works is required. Environmental fencing (e.g. otter fencing) extends below ground level and therefore requires an element of excavation which will be undertaken using a small excavator or by hand digging.

### **Site Clearance and Demolition**

- 4.1.8 Site clearance and demolition works typically include the following:
- general clearance;
  - demolition of walls and bridges;
  - removal of pipelines, public and privately owned services or supplies; and
  - tree felling and removal of stumps, removal of fencing, hedges, bushes and undergrowth.
- 4.1.9 Any material to be reused in the permanent works will be stockpiled or taken to store. Surplus and unsuitable materials arising from the site clearance operations will be recycled, or, if they cannot be recycled, disposed of at an appropriate, approved disposal facility in the area. Burning of materials on site will not be permitted, except when specifically required for which approvals will be required.
- 4.1.10 Materials for off-site recycling or disposal will be transported in appropriate wagons along prescribed main road routes, which are likely to include the A85, A9, A90 and M90. Prescribed routes will be included in the main construction contract documents. The Contractor will be required to seek approval from the relevant authority should he wish to use any other routes.

- 4.1.11 The Contractor will be responsible for the timing of demolition and site clearance activities and will be required to take account of seasonal restrictions, such as bird breeding seasons and relocation of any species in the works programme. The detailed timetable for ecological constraints will comply with any requirements of the ES and the Report to Inform an Appropriate Assessment for the River Tay SAC.

#### **Contaminated Materials**

- 4.1.12 The treatment of any hazardous materials encountered in site clearance will comply with specific contract requirements and will require an assessment in accordance with current health and safety regulations including the Control of Substances Hazardous to Health Regulations (COSHH) Regulations. Contaminated materials may have to be disposed of at licensed sites.

#### **Temporary Construction Drainage / SuDS**

- 4.1.13 Temporary drainage measures, including temporary Sustainable Drainage Systems (SuDS), will be employed to control, treat and dispose of surface water runoff during construction works. The development of the construction drainage strategy will be the responsibility of the appointed Contractor; however, the typical drainage methods are discussed below. It is intended that the temporary construction SuDS will be separate from the proposed operational SuDS to reflect natural drainage patterns at the outset of construction and the likely requirement to treat significantly higher volumes of suspended sediment.
- 4.1.14 Clean or greenfield surface water runoff that has not passed over disturbed construction ground will be separated from construction drainage through the installation of upslope pre-earthwork drains. Temporary interception ditches will convey the potentially contaminated runoff from the construction area to the natural catchment low points. Treatment will be provided by silt traps during conveyance, and settlement ponds or soakaways prior to discharge.
- 4.1.15 Unlike operational pre-earthwork drains and SuDS, temporary pre-earthworks drains and construction SuDS will not discharge directly to watercourses as a vegetated filter strip (10m where practicable) would be provided between the outfall and any watercourse. This is intended to provide a final level treatment to remove any remaining suspended sediment prior to discharge. Erosion within cut-off and interception ditches will be avoided by minimising the gradient of these ditches, installing regular check dams/silt traps, and using geotextile membrane liners.
- 4.1.16 Temporary SuDS measures, as described above, will be constructed prior to any significant site stripping activities. Construction of the temporary SuDS will involve earthworks operations including excavation, placement of fill and compaction. Temporary SuDS measures will likely have to be modified and adapted as the work progresses, with drainage patterns likely to be altered by earthworks and operational SuDS becoming available. Maintenance of temporary SuDS will be required to remove accumulated sediment and ensure that they operate as intended.
- 4.1.17 The land requirements for temporary construction SuDS are discussed in Section 5 (Land Requirements).

#### **Service Diversions**

- 4.1.18 It is possible that some service diversions will be undertaken in advance of the main construction works. However, other diversions are only likely to be possible once construction has reached a certain stage.
- 4.1.19 Existing services may require temporary diversions as a result of disruption to apparatus during the construction of the works. These temporary diversions will be in place to minimise any disruption to the services being affected by the proposed scheme.
- 4.1.20 Services are either located above or below ground. For works above ground, posts, towers or pylons will have to be delivered to the site and constructed. This will involve transport of materials and some excavation and concrete works for foundations or footings.

**Topsoil Stripping and Storage**

- 4.1.21 Topsoil will be stripped off areas occupied by the roads, cuttings, embankments and associated structures to depths defined for each particular location in phases as required by the Construction Programme. The areas of topsoil strip will be undertaken in phases to limit areas of exposed soil. The topsoil will be removed if surplus to requirements or stockpiled outwith working areas, until such time as it is required for reuse. SuDS measures will be constructed prior to any significant site stripping activities. In addition, measures such as cut-off ditches and silt fencing will be required around stockpiles to prevent erosion and allow conveyance of any contaminated runoff to temporary SuDS ponds.
- 4.1.22 The plant potentially used for topsoil stripping includes rubber-tyred motorised scrapers, excavators etc. though more controlled procedures may be required in environmentally sensitive zones using smaller plant. Limits will be imposed on the maximum distance from the zone of excavation to the point of deposition of the topsoil to control invasive plant species and ensure that topsoil is reused close to the location it was stripped.

**Pre-Earthworks Drainage**

- 4.1.23 Pre-earthworks drainage generally comprises excavation of unlined ditches, or filter drains constructed at the top of cutting slopes or toe of embankments where required by the design. They are excavated prior to construction of the cutting or the embankment to prevent surface or ground water entering the works. Existing pre-earthworks ditches are known to exist at the top of existing cuttings and these will be cleared of any excess vegetation or other identified blockages as part of the site clearance works to ensure that they prevent run-off entering the construction works below. When placed at the top of cuttings, surface water carried by the pre-earthworks drainage can be transferred directly to watercourses unless the rate of discharge has to be controlled. When placed at the toe of embankments, surface water carried by the pre-earthworks drainage may contain sediment from runoff from the embankments being constructed and will be required to discharge water to temporary settlement ponds or enlarged cut-off ditches prior to it being discharged to a watercourse.
- 4.1.24 The material arising from the excavation of the pre-earthwork drainage will be transported for reuse within the works or off-site, or ultimately disposal off-site. It should be noted that some ditches will have to be lined depending on the nature of the subsoil to prevent erosion of the ditch. Other options in this instance would include use of filter drains.

**Earthworks**

- 4.1.25 The principal earthworks process involves layered excavations of soils in cuttings and transportation of the excavated soil to neighbouring zones where embankments are required. Deposition in the fill areas will be built up by depositing the material and using bulldozers to place it in layers which are then compacted by rollers. This process is repeated until embankments are built to the road formation level.
- 4.1.26 Generally, it is preferred to achieve a cut/fill balance and have short haul distances to minimise transport of earthworks materials along the site between cuttings where they are excavated and embankments where they are placed. Indicative lorry loads are shown in Table 1. This is based on preliminary ground investigations indicating that material is likely to have 90% suitability for reuse.

**Table 1: Indicative Lorry Loads – Earthworks**

Potential Earthwork Requirements	
Potential import (m <sup>3</sup> )	188,000
Potential export(m <sup>3</sup> )	314,600
Potential Total Lorry Loads	65,000
Potential length of main earthworks activities (months)	36 months
Estimated weekly average lorry loads during main earthworks activities	450

- 4.1.27 The undulating topography of the site and alignment standards to be provided complicate achievement of an earthworks quantities balance and long hauls of material may be required. Excavations in cutting will include the removal of the top layers of material which are likely to be unacceptable for use in the main road embankments and transport of this material to stock piles to be reused as landscaping earthworks mitigation at a later date. The lower layers of the cuttings are likely to comprise material that is more acceptable for use in the main road embankments and this will be transported and compacted as described above.
- 4.1.28 Some excavations will encounter rock and this is harder to excavate. In some instances, rock may be ripped using a bulldozer with a blade attached to the rear. Another option where ripping of rock material is not feasible includes using a hydraulic breaker (also known as a rock hammer or pecker). Alternatively, fragmentation blasting and/or pre-split blasting may also be required for areas of rock excavations.

#### **Drainage, Service Ducts and Chambers**

- 4.1.29 Construction of carriageway drainage will involve laying filter drains, carrier drains, drainage channels and outfalls to transport surface water runoff from side slopes, carriageways and other paved areas. Drainage products will include pipes, gully pots, cover gratings, graded gravel for pipe bedding, gravel filter material, and other stone pieces for balancing ponds and open channels. Manholes and chambers will be built with in-situ concrete bases, precast concrete ring or brickwork walls and iron cover on precast concrete caps.
- 4.1.30 Construction of carriageway drainage will involve excavation of the drain, with material being deposited adjacent to the drain in the road verge or transported for reuse or disposal. Gravel bedding and filter material (crushed rock) is delivered to the works from either a local quarry or a source on site if extracted rock quality is suitable. The bedding material is placed at the bottom of the excavated trench and the drainage pipes are placed on top before being covered with the filter material. Some filter drains also have a geotextile surround to prevent sediment ingress into the filter material, and if the drainage pipe crosses the road carriageway, it will have a concrete surround which will be transported to the site and placed around the pipe in the trench.
- 4.1.31 The construction of SuDS features will require earthworks in a similar manner to the temporary construction drainage described above in paragraph 4.1.13-4.1.17. An outflow pipe or ditch will transfer runoff from the carriageway drainage network to the permanent ponds, and to the receiving watercourse following treatment/attenuation. If a piped outfall is proposed, a headwall will be required at the point it discharges to the receiving watercourse. Headwalls are likely to be in situ concrete although they may have a stone facing or other finish applied. Headwall construction may require temporary diversion or damming of the watercourse during construction works.
- 4.1.32 Service ducts and chambers are constructed in a similar manner as carriageway drainage and catchpits/manholes. However, service chambers may be brick built involving transport of materials and on site manufacture and use of mortar.

#### **Topsoiling and Seeding**

- 4.1.33 Topsoiling and seeding will be undertaken as soon as possible after earthworks construction is completed. This will enable the subsoil to be sealed preventing sediment runoff. As described previously, topsoil will have been stripped and stored adjacent to the works. The topsoil will be transported from the topsoil storage locations to the works and will be placed by a tracked excavator. Grass seeding may be by hand or by machine spreading, undertaken in the relevant areas specified in the landscape design.

#### **Pavement Construction**

- 4.1.34 Pavement construction involves building the pavement up in layers. The bottom layer (sub-base) is a crushed rock aggregate which will be delivered to the site from local quarries or crushed and graded on site from excavated rock, as described previously. Indicative lorry loads required for pavement construction are shown in Table 2. The material is deposited and then pushed into place and compacted.



- 4.1.35 The upper pavement layers will be specified in accordance with the requirements of the contract and will involve transport of material to the site either from local sources or from a batching plant on site.

**Table 2: Pavement Construction**

Parameter	Estimate
Estimated total lorry loads	24,090
Potential length of pavement construction activities (months)	24 months
Estimated weekly average lorry loads during pavement construction	250

### **Roadworks Finishes**

- 4.1.36 Following pavement construction, safety barriers will be installed. Posts and barriers are delivered to the site and safety barrier installation then involves driving steel posts into the ground or excavating small footings and placing concrete into which the posts are set. The barriers are bolted to the posts and fixed to small concrete anchorages.
- 4.1.37 Sign installation will involve excavation for the concrete foundations, and setting the posts. The sign faces are then fixed to the sign posts. Some signs may be lit and will require cabling to be passed through the service ducts installed as described previously.
- 4.1.38 Variable message signs (VMS) and CCTV camera installation will involve excavation for the concrete foundations and these concrete foundations will extend above ground level in the case of the VMS. The supporting column is then fixed to the concrete foundation and the VMS display box is then attached to the supporting column. The CCTV cameras are typically mounted on a lattice support which is connected to the foundation. Associated cabinets and hard standing areas will be constructed at ground level at each location.
- 4.1.39 Road markings will be applied to the road surface using specialist lorry-mounted equipment.

### **Accommodation Works**

- 4.1.40 Accommodation works will include access roads, fences and walls or other ancillary items agreed with landowners. Construction methods will be similar to those described for these items in this outline methodology.

### **Structures**

- 4.1.41 Typical construction methods for bridges and retaining walls are described below and apply to most bridges and retaining walls to be constructed as part of the proposed scheme.

#### Retaining Walls

- 4.1.42 The DMRB Stage 3 design incorporates a number of retaining walls. These retaining walls are required to support soil where differences in ground levels are needed.
- 4.1.43 Retaining walls may be constructed by excavating to the required level whilst temporarily supporting the material to be retained. The retaining walls may comprise pre-cast or cast in-situ concrete panel walls supporting reinforced earth walls. Alternatively, contiguous piles may be installed to form the retaining wall before excavation to the required level.

#### Underbridges

- 4.1.44 Underbridges accommodate roads or watercourses which pass below the mainline. These can be open structures (similar in appearance to overbridges), or underpasses which are more box-shaped. Both underbridges and underpasses require foundation construction; abutment, pier and wall construction; deck construction; and finishes.

- 4.1.45 Appendix A11.8 (Watercourse Crossings Report), provides more information on the design approach for underbridge structures for watercourses while Figures A11.8.1-A11.8.68, part of Appendix A11.8 (Volume 2 of the ES), provides indicative general arrangement drawings of each of these structures.
- 4.1.46 There are four underbridges as part of the proposed scheme that cross the River Tay SAC including; Essangal Underbridge, Pitaldonich Underbridge, Allt Girnaig Underbridge and Allt Bhaic Underbridge. The HRA for the proposed scheme therefore provides more detail on the general arrangement and construction methods for these structures which is summarised below.
- 4.1.47 The design of Essangal Underbridge retains the existing A9 crossing of the River Garry at Essangal (ch4300) as the southbound carriageway and a new structure would mirror the existing structure downstream of the existing structure. The new structure will require the construction of three structural piers in-line with those of the existing structure, to support steel beams, forming the deck of the structure. Two piers would require scour protection comprising rock armour over a geotextile membrane to a depth of 1.9m. Overlaying this would be natural riverbed deposits to a depth of approximately 0.9m. The protection would also extend up to 14m from each pier and include part of the eastern river bank. The scour protection would require to be placed around the existing bridge piers necessitating the removal of the existing gabion baskets which have become partly exposed. Steel sheet piling will be put in place to create a dry area (a coffer-dam) within which the foundation for the pier within the river channel, and the pier itself which will be made from reinforced concrete. The de-watered area is then flooded at the end of the pier construction process and the steel sheet piling will be removed down to the riverbed level using cutting techniques suitable for underwater use.
- 4.1.48 To enable in-channel working to take place out with sensitive periods the programme is divided into phases for the construction of piers and scour protection (Table 3). Each pier will take approximately 16 weeks to construct. Pier 1 is fully in the terrestrial zone and would require no in-channel works. Pier 2 lies within the high-flow area and access would be via a bund placed on geotextile or similar material. Pier 3 will require construction within the river channel. For Pier 3, an access jetty/platform will be created requiring piling into the river for the supports to avoid damming at this location.
- 4.1.49 Alternative construction programmes could be developed provided that the sensitive periods for Atlantic salmon lifecycles are taken into consideration.

**Table 3: Indicative construction programme for the Essangal Underbridge**

Phase	Description	Timescale
1	Pier 2 construction	Year 1: August to November
2	Pier 1 construction	Year 1: September to November
3	Scour protection Left Bank to Pier 1	Year 1-2: December to January
4	Pier 3 construction	Year 1-2: December to April
5	Scour protection Pier 3 to Right Bank	Year 2: February to April
6	Scour protection Pier 3 to Left Bank	Year 3: January to February

- 4.1.50 The Pitaldonich Underbridge comprises a new structure (River Garry Underbridge) to the west (upstream) of the existing crossing which will be retained as the southbound merge. The new structure would clear span over the watercourse. To construct the abutments, the abutment footprint will be excavated to the required level, with appropriate benching or temporary supports to the sides of the excavation. Thereafter, construction will follow conventional reinforced concrete construction methods (erect temporary formwork, fix reinforcement, place concrete, strip formwork and repeat sequence as required depending upon the phasing of the abutment construction). The structure will be constructed by placing the concrete beams between the abutments and avoiding the need for any in-channel working. The existing structure has scour protection in the form of gabion baskets. It is proposed to extend these to a point approximately 7.5m upstream. None of the scour protection would fall within the watercourse during normal flows.
- 4.1.51 The Allt Girnaig watercourse runs through a small steep sided valley. A new structure would be constructed on the downstream side of the existing bridge and form the northbound carriageway. The new structure would be a mirror image of the existing bridge and its piers would therefore be set back from the water's edge on the valley sides, with the deck approximately 25m above the Allt Girnaig.



- 4.1.52 The current structure over the Allt Bhaic comprises a single span simply supported in situ reinforced concrete deck slab which clear spans the watercourse. The new structure would be approximately 5.5m above the Allt Bhaic riverbed, and approximately 2.0m above the height of the existing structure, necessitating the demolition of the existing structure. Scour protection would also be required extending to 7.5m upstream and downstream of the new structure which will require in channel working. The scour protection will comprise rip-rap approximately 2m deep across the width of the channel with 30cm of bed substrate placed on top.
- 4.1.53 The new structure for the Allt Bhaic would be constructed in two phases. The section to the upstream side of the existing bridge would be constructed first (Phase 1). After constructing the first phase, traffic would be switched to the new structure and the existing bridge demolished. The remaining section of the new structure would then be constructed in the cleared area of the existing bridge (Phase 2). To assist the assessment process, a precautionary construction timescale has been developed. Therefore, a total construction period of 28 months spread over two periods has been allowed for construction of the Allt Bhaic Underbridge. Phase 1 would comprise 8 months and Phase 2 a further 19 months (Table 4). The start date that has been designed to ensure that demolition of the existing structure does not begin prior to the start of the non-sensitive period for Atlantic salmon (July to mid-October inclusive).
- 4.1.54 Demolition of the existing bridge (as indicated above) and the installation of scour protection would be undertaken whilst the channel was dewatered. The scour protection would be installed during construction of the bridge abutments and wingwalls and would take approximately 4-6 weeks. The indicative programme therefore enables the dewatering and scour protection installation, as well as bridge demolition, to take place during the non-sensitive period for Atlantic salmon. Immediately after the scour protection is installed, the Allt Bhaic would be rewatered.

**Table 4: Indicative construction programme for the Allt Bhaic Underbridge**

Phase*	Description	Timescale
1	Construction of bridge on the upstream side of existing structure	8 months (June Yx to March Yx+1)
1a	Temporary piling	2 months
1b	Abutment construction	3.5 months
1c	Installation of wingwalls and beams	2.25 months
1d	Installation of concrete deck	1.75 months
1f	Finishing	2 months
2	Demolition of existing structure and remaining construction	19 months (July Yx+1 to March Yx+3)
2a	Demolish existing structure	3 months
2b	Temporary piling	2 months
2c	Abutment construction	3 months
2d	Installation of wingwalls and beams	2.25 months
2e	Installation of concrete deck	1.75 months
2f	Finishes	1.25 months

\*Activities are not necessarily consecutive and may overlap

### Bridge Foundations

- 4.1.55 Foundations are required to support the abutments and piers. Foundations can be either concrete pad or piled with a pile cap.
- 4.1.56 Pad footings require excavation to a suitable founding soil strata, and then laying a concrete layer reinforced with steel rods/caging. Once abutments or piers have been cast, excavations are backfilled with acceptable material.
- 4.1.57 Piled foundations require preliminary excavations at foundation locations, and then installing foundation piles to a suitable load bearing soil strata - this can either be by driving precast concrete/steel piles to the required depth with a pile driver, or by using a boring machine to create the void for the pile. Piles are then trimmed to required level and a reinforced concrete pile cap is constructed to provide a base for piers or abutments.

### Bridge Piers and Abutments

- 4.1.58 Bridge piers and abutments will be constructed of reinforced concrete, and are usually pre-cast and then transported to their installation location. Exposed surfaces are treated and a waterproof membrane applied.

## **5 Land Requirements**

### **Land Required During Construction**

- 5.1.1 Land required during construction may be in addition to that required for the permanent footprint of the proposed scheme. The main requirements are described below.

#### Site Compounds for the Contractor and Others

- 5.1.2 Where possible these would be located close to the proposed works where there is suitable access. They would be used to accommodate offices for the contractor as well as workshops, stores, welfare facilities, etc. and parking for cars and plant.

#### Additional Works Areas

- 5.1.3 Land may be required to allow the contractor to gain safe access to the permanent works. This is usually where access is very restricted or where the works are adjacent to a live carriageway, such as when carrying out online widening works.

#### Temporary Diversions

- 5.1.4 In order to maintain traffic flows when undertaking works on the existing highway, such as a new bridge or carriageway tie-ins, it may be necessary to provide a temporary diversion.

#### Temporary Drainage/SuDS

- 5.1.5 The temporary drainage/SuDS measures described in paragraphs 4.1.13 to 4.1.17 of this appendix may require additional land take. The land required for temporary construction SuDS has been assessed by reviewing indicative drainage catchments areas, estimating attenuation and treatment volume requirements and providing potential drainage solutions on a catchment-by-catchment basis. The land requirements for construction SuDS have been included within the Compulsory Purchase Orders (CPO) for the proposed scheme.

#### Other Works

- 5.1.6 Other works requiring a licence, off-site planting etc. will require temporary land and will be identified as the detailed design is developed. A review to identify land requirements for the construction has been undertaken to ensure sufficient land is included in the CPO.

### **Clearance of Site on Completion**

- 5.1.7 Clearance of the site on completion of the works will normally involve small dumpers, excavator/loaders and lorries to gather up and dispose of surplus material and generally tidy up.

### **Permanent Land**

- 5.1.8 The main requirements for permanent land are as follows:
- land taken by footprint of the proposed scheme, including earthworks (i.e. land required to build embankments or excavate cuttings);
  - land to allow adequate drainage of the proposed scheme and the area through which it passes. This includes land required for diversion of watercourses, drainage outfalls and SuDS features,

arrangements for maintenance access, and any compensatory storage areas to accommodate potential watercourse flood events;

- land required for other environmental mitigation, such as landscape and ecological planting planting.

5.1.9 Other land not required for the permanent works may also be permanently acquired by the roads authority due to it becoming unusable or impractical to use as a direct result of the works.

## **6 Public Access, Site Access and Traffic Management**

### **Access Routes for Construction Traffic**

6.1.1 The proposed works are generally located on the main road network, so most construction traffic will be able to use the main highway network without restriction. However, the Contractor will be restricted as to the extent and purpose that the Contractor can use other roads for construction purposes. While it is desirable that all construction related access should be via the A9 it will be necessary to provide some access from the side road network. Routes not available to the Contractor will be as agreed with the relevant authority and stipulated in the contract.

### **Traffic Management Requirements**

#### Introduction

6.1.2 During construction, temporary traffic management will be required to undertake the works, whilst minimising disruption to users of the active road network.

6.1.3 Temporary traffic management will be put in place during construction at works close to or on existing roads, and at site access and egress points. Examples of measures include traffic cones, temporary signs and lighting, temporary speed restrictions, temporary diversions and contraflows.

#### Lane Requirements

6.1.4 In general, construction phasing and temporary traffic management proposals have been prepared on the basis of keeping at least one lane in each direction available on the A9 at all times except for very specific short term restrictions. Where considered appropriate, the Contractor will be required to provide a vehicle recovery service to promptly remove any broken down vehicles within the temporary traffic management areas.

6.1.5 For the main routes, it is proposed to keep traffic on the normal carriageways, wherever possible, and if necessary using narrow lanes. It is also proposed to adopt a 40mph temporary speed limit through the main works areas.

6.1.6 It is generally proposed that other routes including slip roads at major junctions be kept open during construction of the proposed works. This will, in some cases require construction of extensive temporary alignments. The proposals in this appendix have been prepared on the basis of keeping all routes and accesses open throughout the works wherever feasible.

#### Working Restrictions

6.1.7 It is generally proposed that the network connection works be constructed within the typical working hours as set out in Section 1.2, with no requirement or intention for prolonged late night or 24 hour working. The only likely exceptions to this would be for activities such as the installation of beams on new bridges which could only be carried out during an overnight closure of the carriageways being spanned, or for critical tie-in works between existing and new carriageways or construction of structures adjacent to the railway requiring railway possessions to complete structures or undertake blasting operations. Alternative diversion routes will be set up during such night time closures, together with advance warning and publicity to help drivers to avoid these locations/dates if possible.

- 6.1.8 Road closures and diversions are likely to require a Temporary Traffic Order and be subject to approval by Transport Scotland, Police Scotland, and the Maintaining Authority.
- 6.1.9 Where night work is required in the vicinity of residential areas, methods of construction should be adopted that keep noise levels to a practicable minimum.

Temporary or Permanent Road Closures or Diversions

- 6.1.10 Temporary road closures and diversions will be arranged through the relevant traffic authority following discussions with Transport Scotland, Perth & Kinross Council, Police Scotland and the Maintaining Agents. A Temporary Traffic Order giving the requisite notice will be prepared and a statutory notice placed in local newspapers.
- 6.1.11 Permanent road closures that occur as a consequence of the phasing for the construction of the proposed scheme, supported by the appropriate legal Orders, will be implemented following discussions with relevant parties and agreement of any temporary traffic arrangements.

Temporary Carriageway

- 6.1.12 Under the traffic management proposals in this appendix, there may be a requirement to construct some sections of temporary carriageway. The need for these will be dependent on the Contractor's detailed design and his construction and traffic management methodology. Appropriate geometric and pavement construction standards for the design of temporary diversions will be set out in the contract.

Approvals

- 6.1.13 The Contractor's detailed proposals for traffic management will only be confirmed after discussions with Transport Scotland, Police Scotland and the Maintaining Agents.
- 6.1.14 The Contractor will be required to appoint a Traffic Safety Officer who be responsible for submitting traffic management layout drawings, method statements, etc. within the requisite notice period for discussion at regular traffic management meetings. The Traffic Safety Officer will be responsible for ensuring that temporary traffic management operations are monitored and maintained.