

Ham Coffey



SCOTTISH EXECUTIVE



# A1 Haddington to Dunbar Expressway

Opened on Wednesday 14th April 2004

by Rt. Hon. Jack McConnell MSP, First Minister, and Nicol Stephen MSP, Minister for Transport



Carl Bro 

**Balfour Beatty**  
Civil Engineering

**Scott  
Wilson**





## Design & Construction

The route commences at the existing Abbotsview Interchange near Haddington, where the addition of slip roads on the east side of the junction completes the diamond interchange. It continues alongside the existing A1 for 6km before deviating to the south at Pencraig Hill and crossing the River Tyne valley on a 217m three-span bridge. The route continues parallel and to the south of the East Coast Main Line before rejoining the existing A1 at a new roundabout at Thistly Cross.

Notable design features of this scheme include:

- the extensive use of "false cuttings" to reduce the visual and noise intrusion of the road on the surrounding environment
- the use of an earthworks bund alongside the railway line
- a rationalised earthworks design aimed at obtaining an on-site cut/fill balance while taking advantage of the available rock and maximising its re-use in the works

- the use of a flexible composite pavement, where the lower base comprises cement bound materials
- the need to maintain a "flowing" vertical alignment which reflects the surrounding landform
- provision of eight detention basins to control the flow of surface water run-off into the adjacent watercourses

There are 12 principal structures:

- River Tyne Bridge; a three-span, post-tensioned concrete box girder bridge, supported on splayed leg piers
- two overbridges; both three-span steel/concrete composite superstructures
- six reinforced concrete box underpasses
- three reinforced concrete segmental arches with reinforced soil headwalls and wingwalls

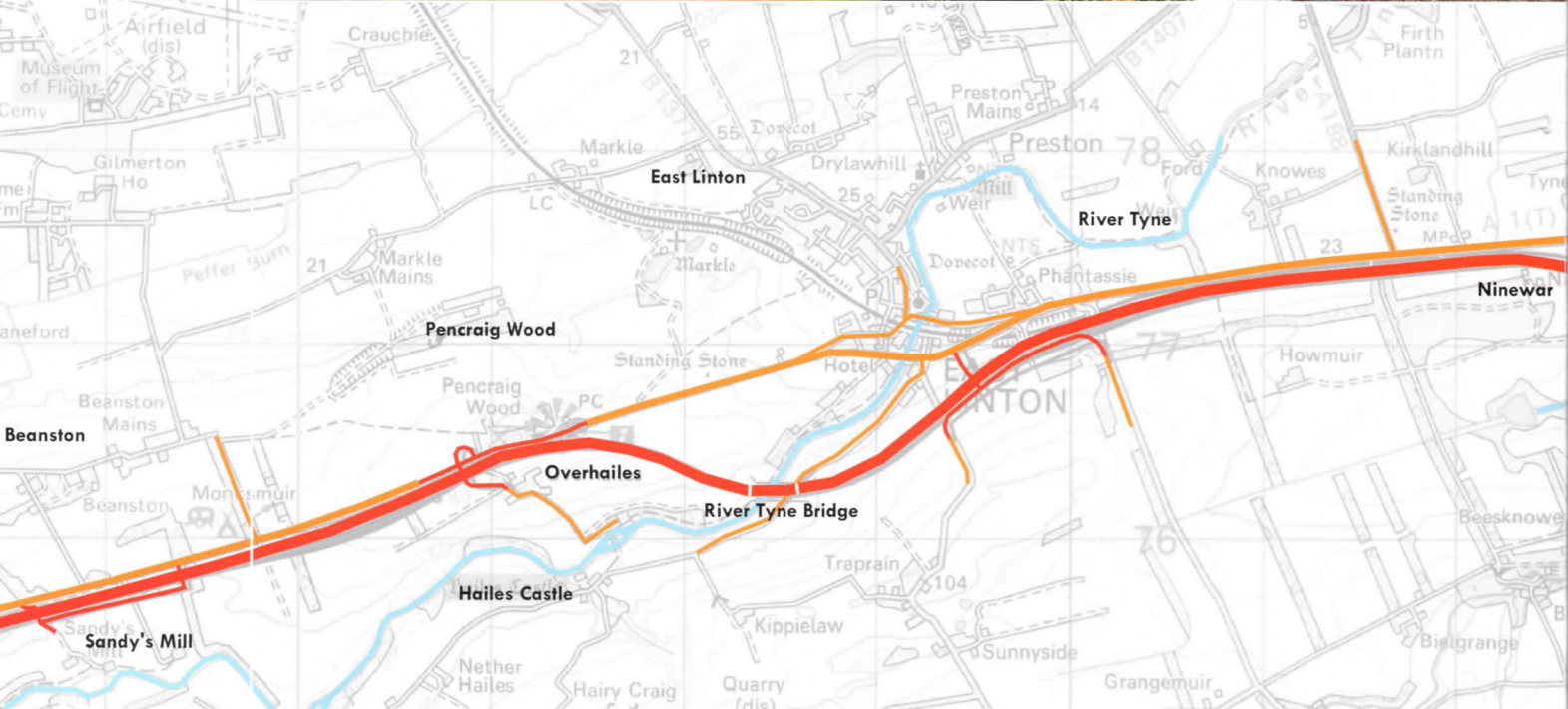
Within each structure type, a consistency of form and finish was adopted to give the appearance of a family of structures.

## River Tyne Bridge

The River Tyne Bridge is the largest structure on the project and is one of the largest and most complex bridges procured by the Scottish Executive. The bridge is set in the Tyne Valley, which is one of the most valued landscapes in East Lothian and is officially designated as an Area of Great Landscape Value, a Nature Conservation Area and a Scottish Wildlife Trust Wildlife Area. In addition there is a public right of way on the river walkway from East Linton to Hailes Castle. In response to the sensitive setting the Carl Bro bridge design team and the Scottish Executive produced a design for a landmark structure which reflected the asymmetric valley form and provided a bold expression of function whilst minimising impact on the valley.

Extensive consultations were held with interested parties including the Royal Fine Art Commission and East Lothian Council. As a result the design concept for the bridge in terms of configuration, span arrangement and proportions, and much of the details and complex geometry, were fixed by the Carl Bro design team and embodied in the contractual requirement. This presented the Balfour Beatty and Scott Wilson team with a significant planning, design and construction challenge. The complex geometry of the structure (curved highway alignment and sloping deck sides), combined with the inclined piers and access constraints within the river valley, meant that the temporary works required to support the bridge were complex and extensive. A 3D computer model of the structure was developed to aid construction.





The bridge was constructed on scaffolding placed across the whole valley, partly supported on a temporary bridge over the River Tyne (the largest scaffolding used in Scotland to date). The design takes advantage of the decision to adopt scaffolding and uses slender webs to minimise the self weight and cross section to be stressed. The deck is stressed by post-tensioned tendons (16 in the main span and 20 in each of the side spans). Each tendon consists of highly stressed steel strands weighing approximately 10t. Stressing was carried out in multiple stages interleaved with complex staged lowering of the falsework.

The arrangement of piers and main span of the bridge results in high stresses in both the deck and pier legs, resulting in the use of high strength concrete and substantial reinforcement. The east pier is founded directly onto rock, while at the west pier rock is at a depth of some 15m and a grid of 60 small diameter piles (both vertical and inclined) was installed beneath each leg.

The completed bridge solution is a bold enhancement to the River Tyne Valley and has successfully delivered all the objectives identified at the consultation stage and is a testament to the combined skills and teamwork of all parties.

## Landscaping / Environment

As a matter of policy, the Scottish Executive seeks to minimise the landscape impact of road schemes by integrating the road with its surroundings.

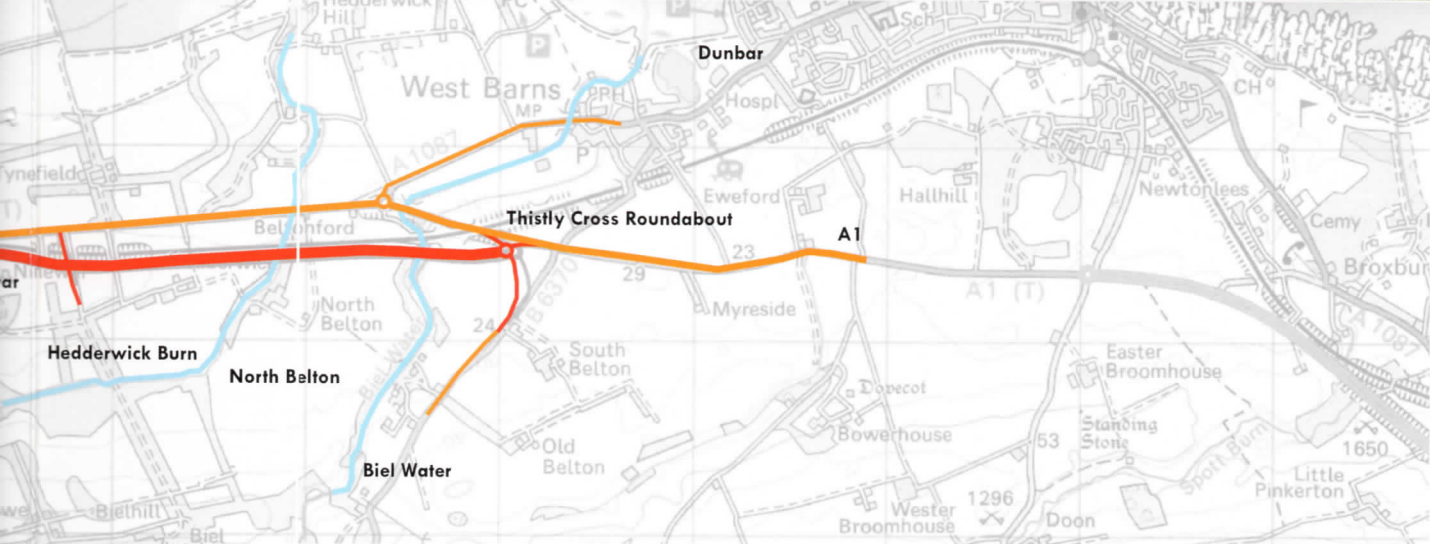
Landscape considerations have been an integral part of the design and implementation of the scheme. 450,000 new trees and shrubs have been planted and 150,000 square metres have been sown with wild flower seeds.

Ironside Farrar, landscape consultant to the Scottish Executive, helped develop a route that balanced landscape, environmental and engineering considerations.

They carried out an Environmental Assessment through which the Scottish Executive committed to specific measures to reduce the impact of the road, such as creating new landforms to screen neighbouring properties and extensive planting to integrate the road into the landscape.



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Balfour Beatty employed Gillespies as landscape consultant to develop the design for implementation. Hedges and hedgerow trees have been planted along many of the boundary fences. Landforms and belts of screen planting have been introduced to screen neighbouring properties such as at Abbotsview, Sandy's Mill and Overhailes. Broad belts of new woodland planting have been introduced to reflect the pattern of the existing woodland and shelterbelts, particularly between the new A1 and the old road.

The landform around the new River Tyne Bridge has been carefully shaped to help integrate the bridge into the river valley and extensive planting was carried out to extend the existing riverside woodland up to the road.

To enhance biodiversity and maintain a natural appearance, all the trees and shrub species, with a few exceptions, are Scottish native, and almost all have been grown from seed collected in Scotland.

#### Wildlife & Habitats

Extensive measures have been undertaken to reduce the impact of the road on wildlife and habitats.

During the development of the scheme extensive surveys were undertaken for protected species such as badgers, otters and bats, and for mapping of plants and habitats. Information from the surveys was used to design measures to protect badgers and otters and to protect or create diverse habitats.

Measures taken during construction included the relocation of badgers from setts directly affected by the route and the careful checking of trees and hedges for bats and birds prior to felling and site clearance.

Long-term measures include a number of mammal tunnels allowing badgers and other small mammals to pass beneath the road along former routes that have been severed by the construction. Extensive lengths of specially designed fencing will be used to prevent the mammals crossing on the road and to guide them to the pipes.

As well as integrating the road into the landscape, the planting and seeding proposals are designed to replace lost habitat and augment existing habitats. Planting includes native woodland, hedges, native scrub and wild flower grasslands. It is anticipated that this will greatly enhance biodiversity in the local area.



## The Project

Following the Routes South of Edinburgh Study in 1990 the decision was taken by the Scottish Executive to upgrade the A1 to near motorway standard as far as Dunbar. The Scottish Executive appointed Carl Bro as consultant to prepare proposals to upgrade the A1 from Tranent to Haddington and from Haddington to Dunbar.

A preferred route for Haddington to Dunbar was published in 1992. Following a period of further consultation and scheme development a Public Local Inquiry was held into the proposals in 1997.

During 1997-98 the junctions at Monksmuir and Phantassie were deleted from the scheme in order to reduce the environmental impact and the cost of the scheme. The concept of the "A1 Expressway" emerged at this stage. In 1999 the Strategic Roads Review carried out by the Scottish Executive confirmed the Expressway as the preferred scheme. In 2001 the statutory processes were complete and Carl Bro continued the development of the scheme in sufficient detail to allow a competition to take place for the Design, Construction and Maintenance of the A1 Expressway. The opening of the A1 Expressway represents one of the last components of the commitment made in 1990 and will provide considerable benefits for road users and local communities.

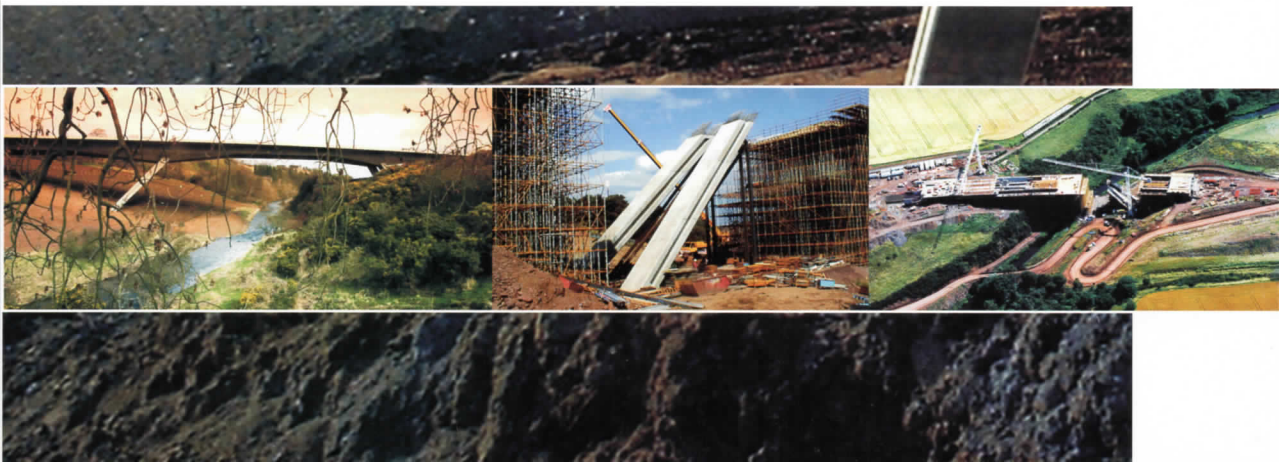


## Procurement

A competition was held for the Design, Construction and Maintenance of the A1 Expressway in 2001. Five tenderers were asked to present their proposals to take forward the scheme developed by Carl Bro and develop specific proposals for Design and Construction in line with the Road Orders, Environmental Statement, the Employer's Requirements and the land made available for the Works.

These constraints allowed the tenderers freedom to develop proposals which suited their own methods of working whilst ensuring that commitments made by the Executive to third parties were respected as embodied in the contract documents. Tenderers were able to submit their own proposals for the time taken to complete the works, subject to a maximum time set by the Executive.

The contract was awarded in March 2002 to Balfour Beatty Civil Engineering with Scott Wilson as their Designer.





## Key Participants in the Project

Employer:  
The Scottish Executive

Pre-contract Scheme Designer:  
Carl Bro

Engineer for the Works:  
Carl Bro

Contractor:  
Balfour Beatty Civil Engineering Ltd

Contractor's Designer:  
Scott Wilson Scotland Ltd

Contractor's Checker:  
Fairhurst

Planning Supervisor:  
Carl Bro

Contractor's Environmental Consultant:  
Gillespies

Employer's Environmental Consultant:  
Ironside Farrar



## Technical Data

### Contract Data

Start Construction: 3rd June 2002  
Maximum Contract Period: 104 Weeks  
Road Open to Traffic: 98 Weeks  
Contract Value: £34.2m

### Geometric Standards

Design Speeds: 120kph  
Traffic Volume: 12,000 Vehicles per Day  
Dual Carriageway: 7.3m Dual with 1m Hardstrip  
Length of Dual Carriageway: 13.7km  
Side/Slip Roads: 6.5km

### Pavement

Surface Course: 30mm  
Binder Course HMB35: 60mm  
Upper Roadbase HMB35: 100mm  
Lower Roadbase CBM4R: 180mm  
Subbase Type 1: 150mm

### Quantities

Earthworks Excavation: 1,151,000m<sup>3</sup>  
Embankment Fill: 620,000m<sup>3</sup>  
Structural Concrete: 17,000m<sup>3</sup>  
Structures: 12 No.  
Surfacing: 315,000m<sup>2</sup>  
Drainage: 76,000 Linear Metres  
Landscaping/Planting: 450,000 No.