

2.1**INTRODUCTION**

This chapter describes the features of the proposed Edinburgh Airport Rail Link (EARL), including the track alignment, new structures, accommodation works (road realignments etc), construction compounds and work sites. In addition, the proposed construction methods and programme are reported, and the envisaged operational features of EARL are outlined.

A draft Code of Construction Practice (CoCP) has been developed based on the findings of the EIA. This document is introduced here and is attached in *Annex L*. It should be noted that the CoCP is a live document which will be finalised before the contract stage. **tie** ltd has confirmed that the finalised CoCP will form an integral part of all construction contracts.

A number of design alternatives have been considered by **tie** ltd in the development of the current proposed alignment. These are introduced and summarised in *Section 2.7*. The scheme as described in *Sections 2.4* and *2.5*. This is the scheme that has been assessed in the EIA and reported in this ES. Two potential variations to the scheme still remain. One variation relates to whether the station platform is closed, open or roofed and the second variation related to this, is a potential alteration to the horizontal and vertical position of the southern tunnel portals, the platforms and the station concourse building. Both of these variations are discussed in *Section 3.4.3* and are included in the Bill. In terms of the EIA it is considered that the variation in the portal position will not create any alternative significant impacts and as such the various options have not been assessed separately as part of the EIA (ie the layout as illustrated in *Figure 2.14* and *2.15* was assessed). However, the station platform options would result in changes to the predicted environmental impacts, and these changes have therefore been assessed separately in *Chapter 15*.

2.2**THE SITE**

The site of the proposed new rail link and station lies to the west of Edinburgh, as shown in *Figures 1.1* to *1.4*. This area is Green Belt and mainly farmland, except for the airport itself and the associated commercial development which surrounds it. A number of small residential settlements lie within the vicinity of the proposed route. The main residential settlement areas are Kirkliston, Ratho Station and Winchburgh. Further residential properties are scattered throughout the area. The new Royal Bank of Scotland HQ development is nearing completion; it is situated to the south of the A8.

The site is bound to the south, east and north by the existing Edinburgh to Glasgow, Edinburgh to Fife main lines and the Fife to Glasgow (Dalmeny

Chord) respectively. The A8 Glasgow Road runs east to west across the site, providing road access to the airport. Along with the M8 extension, this is the primary road access to the airport and into and out of Edinburgh from the west.

Generally the area proposed for EARL lies within the shallow river basin of the River Almond, in which the existing Edinburgh Airport lies. The lowest point is the River Almond, with the highest points being the existing main lines (Edinburgh to Glasgow, Edinburgh to Fife and the Dalmeny Chord).

For site description purposes the proposed route can be split into three areas, as outlined below.

2.2.1 *The Area North of the Airport*

The northern area comprises mainly several large land holdings and estates with some scattered residential properties and farmsteads. The majority of the land is arable farmland with a few wooded and vegetated outcrops most notably along the River Almond which runs south west to north east across the area (abutting the northern airport boundary fence) to the Firth of Forth.

The town of Kirkliston lies to the north west of the airport bounded by the M9 motorway with the town of Winchburgh further south of Winchburgh Junction.

The land is generally flat around the river and airport, rising to the north.

A disused railway (Port Edgar branch) runs from the west of the airport northwards dissecting the study area. This is currently used as a dedicated walkway and cycleway (Newbridge to South Queensferry Cycleway) and is heavily wooded and vegetated.

2.2.2 *The Airport Area*

This is the most developed part of the study area, the main features of which are Edinburgh Airport and Turnhouse. The airport's main runway runs south west to north west across the site with the secondary Turnhouse runway adjoining it from the south east.

To the south of the airport lie the terminal buildings and car parks plus several hotels, a golf driving range, an exhibition centre, market and show grounds plus several small holdings and residential properties. These are bound to the south by the A8 road.

To the south west of the airport, to the south of the A8, lies the small town of Ratho Station which includes several residential streets, a school, some shops and a large industrial estate.

A watercourse (the Gogar Burn) runs south to north, to the east of the Edinburgh Airport terminal. This is culverted under the main runway and feeds into the River Almond.

2.2.3 The Area South of the Airport

The area to the south of the airport is rural, similar to the northern area but less undulating.

To the north of the A8 lies Castle Gogar and its associated gardens. To the south of the A8 lies Gogar including Gogar Park, a golf course, residential properties a number of wooded and landscaped areas and the Gogarburn Broiler Farm.

Beyond Gogar lies several scattered residential properties and farmsteads; farmed land is mainly arable.

2.3 PRIVATE BILL - LOD AND LLAU

The documents accompanying the Private Bill submission include, in addition to this ES, the parliamentary plans and sections (plus others). The plans and sections show the centre line of the proposed rail route, the Limits of Deviation (LOD) and the Limits of Land to be Acquired or Used (LLAU).

The LOD sets out the horizontal limits of the permanent land take for the authorised works (ie the main features of EARL) and the LLAU sets out the limits of land to be used or acquired permanently or temporary for associated purposes (eg landscaping areas, temporary construction compounds, areas for utility diversions). The LOD and LLAU are shown in *Figures 2.2 to 2.28*, with *Figure 2.1* providing a key and figure location plan for these figures. The horizontal limits of the LOD are represented by the solid green line and the LLAU is represented by the yellow shading. The solid red lines show the extent of proposed works.

Scott Wilson Halcrow Joint Venutre have developed an outline design for EARL which meets **tie** ltd's operational requirements; this is what the LOD and LLAU are based upon. The Bill does allow for slight variations during the detailed design stage, horizontally and vertically, within the LOD and LLAU. It is the scheme as described below, and shown within *Figure 2.1 to 2.28*, that the EIA has assessed as a reasonable 'worst case' in terms of identifying environmental impacts (see *Section 3.4.3*).

2.4 THE PROPOSED SCHEME

2.4.1 Scheme Overview

As set out in *Chapter 1* and shown in *Figure 1.4* EARL involves the development of new heavy rail lines running to Edinburgh Airport from the

existing Edinburgh to Glasgow, Edinburgh to Fife and Fife to Glasgow (Dalmeny Chord) heavy rail routes. The new lines will offer through services to Fife, Aberdeen, Inverness, Dunblane, Stirling, Glasgow, Edinburgh and the south. The proposed new lines are split into chords as shown in *Figure 1.4*.

2.4.2 The Proposed Operational Features

The operational features of EARL, as proposed and assumed for the purposes of this ES, are summarised below.

- Eight to ten trains will run per hour in both directions.
- Trains will be (or will be similar to) Class 220, Class 185 and Class 170 trains.
- Two train tracks, one in each direction.
- The maximum speed of the new route will be 100 mph on the main line (South, North West and Dalmeny Chords), 75 mph on the non main lines (North East and New East Chords) and 50 mph in the tunnelled section.
- The new track will be for diesel trains. Whilst the potential for future electrification has not been precluded, it is not within the scope of this assessment.
- EARL will be for passenger trains consisting of no more than nine carriages. No freight trains will use the new lines, although existing freight services will continue to operate along the Dalmeny Chord.
- Trains will be diverted from the existing timetable, the first train movement being no earlier than around 0500 hours and no later than around 0100 hours. The proposed service will be as outlined in *Section 1.4*; this sets out a service of 8 trains per hour in each direction; however there is scope for up to 10 trains to operate per hour in each direction although no more than this due to signalling and tunnel constraints.

2.4.3 Proposed Works

As shown in *Figure 1.4* the proposed scheme comprises five sections of new heavy rail line (one within a tunnel), the upgrading of three existing sections of rail line and the installation of a sub surface station.

The scheme runs from Winchburgh Junction along the Dalmeny Chord to the proposed Kirkliston Junction, a stretch of existing rail line which will be upgraded. From the Kirkliston Junction, the line will follow the proposed North West Chord. From the North West Chord, the route passes under the airport via the proposed Central Chord, where the sub surface station would be situated, to a new junction at Roddinglaw via the South Chord. The additional North East Chord connects the Edinburgh to Fife line to the Central

Chord. To the south of the Central Chord, the New East Chord connects the EARL route back onto the Edinburgh to Fife line at Gogar Junction. A through service is therefore achieved.

In addition to the proposed rail route and station, another major component of the scheme is the provision of accommodation works, namely the re-provision and realignment of roads, accesses and Rights of Way that will be severed by the scheme, and the diversion of some utilities (power, water and communications cables and pipelines).

Figures 2.1 to 2.28 illustrate the works involved and the details of the outline design. *Figure 2.29* illustrates the station concourse building. Please refer to the Glossary for descriptions of terms used in the following sections.

In general, the main physical features of the scheme will be as follows.

- A main line (North West Chord, Central Chord and South Chord) of around 9 km in length with two additional new chords (North East Chord and New East Chord) each of which are around 2.5 km long; new track therefore totals between 14 and 15 km in length. The Central Chord will be tunnelled (partly bored and partly constructed by a cut and cover box method) and a large proportion of the remainder of the route is proposed to be in cutting with some shorter sections of route on embankments.
- Works to upgrade the existing Winchburgh Junction (see *Figure 2.2*) section of track between this and the proposed Kirkliston Junction to 100 mph, where the route ties into the proposed North West Chord (see *Figure 2.8*). This section of existing track is known as the Dalmeny Chord and measures 2.7 km in length.
- A high speed grade separated junction at Roddinglaw where the South Chord joins the existing Edinburgh to Glasgow line with a realignment of the existing line to Edinburgh to accommodate the new junction (see *Figure 2.18*).
- Four further new railway junctions at Kirkliston (see *Figure 2.7*), Gogar (see *Figure 2.28*), Ingliston (see *Figure 2.15*) and the Airport North Junction (adjacent to the oil storage depot) (see *Figure 2.22*).
- Two train tracks (one in each direction) along all chords.
- A new sub surface train station close to the existing airport terminal building, incorporating either a closed, open or roofed platform (see *Figure 2.14*).
- A station concourse building above ground (see *Figure 2.29*).
- Alteration, realignments and re-provision of roads, accesses and Rights of Way, 13 km of new roads in total, and 1.6 km of cycletrack.

- High and medium pressure gas pipelines and other utility diversions (for example high pressure gas pipelines north of Kirkliston, north of the Gogar Roundabout, and south of the proposed Airport Central Junction - see *Figures 2.7 and 2.11 and 2.28* respectively).
- Associated works including emergency access routes, ventilation shafts, signalling work etc and associated railway lineside infrastructure.
- The demolition and replacement of Standingstone Bridge and new bridge works (see *Figure 2.23*) and 18 further bridge structures.
- Demolition of one farm out-building at Myre (see *Figure 2.3*).
- Temporary and permanent river and watercourse diversions and culverting, 3 km of river diversions and new drains in total and 9 new culverts.
- Dewatering and drainage design.
- Around 1.1 million m³ of excavated unbulked earthworks ⁽¹⁾.

The proposed track development details are described below for each chord and Winchburgh Junction.

2.4.4 Winchburgh Junction

The existing Winchburgh Junction layout will be remodelled into a crossover double junction with a 100 mph main line to the airport and a 75 mph turnout to Newbridge, as indicated on *Figure 2.2*.

2.4.5 Dalmeny Chord

Works are proposed to upgrade the Dalmeny Chord (between *Figures 2.2 to 2.7*) in terms of track alignment and possible embankment remedial works to accommodate a linespeed of 100 mph towards the airport. The scope of work would include track upgrades, bridge renewals and slope treatment works.

2.4.6 North West Chord

The North West Chord begins at the proposed Kirkliston Junction where it will integrate with the existing Glasgow to Fife railway line (or Dalmeny Chord) through a proposed crossover double junction to allow a 100 mph main line to the airport (see *Figure 2.8*). From the Kirkliston Junction the route rises on an embankment to a height of 4 m to cross the Queensferry Road (A8000) before returning to ground level. The route continues and enters a

(1) Bulked spoil volumes represent the volumes of spoil after excavation. Unbulked volumes refer to the amount of material when it is in the ground, or in situ.

cutting and passes under Burnshot Road and the Newbridge to South Queensferry Cycleway (see *Figure 2.10*), before entering the proposed tunnelled section via the northern tunnel portals near Wheatlands (see *Figure 2.11*).

2.4.7

Central Chord

The Central Chord lies within the tunnel and begins where the North West and North East Chords merge through a proposed crossover double junction (see *Figure 2.11*). A 50 mph speed limit is proposed through the tunnelled section.

The initial section of the tunnel will be constructed by a cut and cover method which passes under Wheatlands Road and under an area identified as a site for a possible second Edinburgh Airport runway (the potential development of a second runway is therefore not precluded or prejudiced by EARL although the second runway is by no means a committed development). The route here is approximately 8 m below ground level. The River Almond will be diverted temporarily while a cut and cover tunnel box section is installed (see *Figure 2.13*).

The route will pass approximately 12 m underneath the existing runway at Edinburgh Airport in two 550 m long bored tunnels, one for each track (see *Figure 2.13*). The track then returns to a cut and cover tunnel box section for 440 m. The proposed Edinburgh Airport Station will be to the south of the tunnelled section (see *Figure 2.13*). The proposed platform will be a 220 m by 15 m island platform which will be located approximately 6 m below ground level. If either the open or roofed station platform options are progressed (see *Section 2.4.3*), parapet walls will be installed to provide flood protection to the open platforms and tracks.

The station concourse will be raised above ground level to allow flood protection from the Gogar Burn. Entry and exit points will be ramped, and stepped up to the station concourse, again to afford the station protection from flooding (see *Figure 2.29*).

The Gogar Burn will be routed underneath the concourse slab of the station. In order to provide sufficient capacity in flood events, a two-staged channel will be provided (*Chapter 10* may be referred to for additional detail regarding the two staged channel and concourse slabs). These will be formed using sheet piling for the outer walls with the inner pier being formed from a contiguous piled wall. It is currently envisaged that the slab spanning over the Burn will be formed from pre-stressed concrete beams which will enable the span to be made with minimal construction depth.

Three ventilation shafts will be required and will be visible above the station concourse (re above the level of the building (see *Figure 2.29*), and to the north and south of the River Almond. The shafts require to be high enough above the ground to be protected from flooding, and will therefore measure

approximately 10 x 5 x 5 m. Emergency access points will also be required at several points along the tunnelled section.

The remainder of the Central Chord will be in an open box section to the proposed Ingliston Junction (see *Figure 2.15*).

2.4.8 South Chord

The South Chord continues from the station, via the proposed Ingliston Junction, in a cutting approximately 7 m deep. The proposed junction is a flat diamond double junction with a 100 mph main line and a 75 mph turnout onto the New East Chord. The route rises on an embankment to 3 m to cross the Gogar Burn before returning to ground level and entering a cutting to pass below the proposed tram line route (see *Figure 2.15*). The route continues in a cutting under the A8 Glasgow Road and under the realigned Freeland Road (see *Figure 2.16*), then rises onto an embankment to 4.5 m to cross an unnamed tributary of the Gogar Burn before joining the existing railway via a proposed high speed grade separated junction with a 100 mph main line (see *Figure 2.18*).

2.4.9 North East Chord

The North East Chord will leave the existing Edinburgh to Fife railway line via a crossover double junction and head south towards the airport (see *Figure 2.22*). The track will then cross the Dolphington Burn (see *Figure 2.23*) over an extended bridge structure, and continue south along the existing Newbridge to South Queensferry Cycleway parallel to Standingstone Road. The route will then enter a cutting to pass under a new bridge that will be constructed to replace Standingstone Bridge (see *Figure 2.23*), and pass through Pepper Wood and across a field drain before entering a cutting, and crossing a second field drain. It will then enter the tunnel portal, adjacent to Wheatlands, towards the proposed Airport Central Junction in the tunnel.

2.4.10 New East Chord

The New East Chord will commence at the Ingliston Junction south of the proposed station in a retained cutting 2.5 m deep, as described in *Section 2.4.3*. The railway will then rise to 2.5 m on an embankment to cross the realigned Gogar Burn and continue on an embankment to cross a tributary of the Gogar Burn (see *Figure 2.15*). The route will then enter a cutting, crossing Gogar Mains Road before rising back to ground level. Access to Gogar Mains Road will be provided via a bridge, providing access over EARL (see *Figure 2.26*). The railway will cross the Gogar Burn a second time before entering a cutting (see *Figure 2.27*). The route will interrupt the access to Castle Gogar (the access will be realigned), continuing east across the access road to Meadowfield Farm before joining the Edinburgh to Fife line at Gogar Junction (see *Figure 2.28*), an alternative access is to be provided.

2.4.11 Station Platform Options

As explained in *Section 2.1* there are currently three design options being considered for the sub surface station platform. These are as follows.

- A fully closed sub surface platform.
- A partially open sub surface platform, with a low level canopy providing shelter.
- A roofed sub surface platform, covered by a steel-framed architecturally designed glazed roof structure.

Originally the plans for EARL were developed on the basis of the closed option outlined in the first bullet point above. The purpose of this was to ensure that the scheme did not preclude the possibility of future surface airport expansion directly above the proposed location of the station, as requested by BAA. It has, however, emerged that BAA's longer terms plans have changed, and therefore the option of an open or roofed platform, albeit still sub surface, can now be pursued. The main assessment presented in this ES is based on the closed sub surface platform option. *Chapter 15* sets out the additional information regarding the design of the latter two options, and a full assessment of the change in environmental impacts if either of these were to be implemented.

2.5 ACCOMMODATION WORKS

Alterations to the existing road network will be required to accommodate EARL in some areas. The scale of the specified works will vary from minor road realignments to more major temporary public road diversions. In addition, private accesses will be created to replace existing accesses removed or severed as a result of EARL. *Figures 2.1 to 2.28* show the extent of these realignments. In summary the following roads will be affected or provided.

- Queensferry Road will be vertically realigned, and realigned to the west (see *Figure 2.9*).
- Burnshot Road (at two locations) and the Newbridge to South Queensferry Cycleway will both be realigned to cross the route on bridges (see *Figures 2.24 and 2.25*).
- The existing Wheatlands Road (at two locations – see *Figures 2.11, 2.24 and 2.25*) will be realigned.
- The existing Standingstone Road (at two locations – see *Figure 2.23 and 2.24*) will be realigned to the east of the railway.
- The unnamed road between the A8000 and Standingstone Road (close to Port Elizabeth Yard) will be realigned (see *Figure 2.23*).

- Two new maintenance access tracks to Kirkliston Junction will be provided (see *Figure 2.8*).
- One new maintenance access track to the Airport North Junction will be provided (see *Figure (see Figure 2.22)*).
- Field accesses will be provided to bisected fields in Almondhill (see *Figure 2.8*).
- The existing Freelands Road will be severed and a new route realigned to the west (see *Figure 2.16*).
- The existing Roddinglaw Road will be severed and realigned to the north east of the railway and to the west (see *Figure 2.17*).
- Gogar Mains Road will be realigned (see *Figure 2.26*).
- Castle Gogar drive will be realigned to the east (see *Figure 2.27*).
- The existing A8 will be temporarily diverted twice, once to the north, and then to the south, each for a period of 9 to 12 months to facilitate the excavation of the cutting for EARL and the construction of a new bridge for the road (see *Figure 2.16*).
- Various Rights of Way will be realigned.
- The River Almond footpath will be temporarily suspended during construction before being replaced (see *Figure 2.13*).

2.6 EARL CONSTRUCTION METHODS

2.6.1 Strategy Overview

The construction of EARL is expected to last for around three years (between the years of 2007 and 2011, allowing six months for the setting up of construction contracts and network testing before commissioning) and will involve a number of key activities following a detailed programme of works. Scott Wilson Halcrow have produced an EARL Construction Methodology Report ⁽¹⁾ which sets out in detail the likely construction works required at each area of the EARL route, the construction programme, hours of working and other key construction details and methodologies for the proposed works. This is summarised in the following paragraphs. *Annex I* ⁽²⁾ sets out an indicative programme.

(1) Scott Wilson Halcrow (2004) **EARL Construction Methodology Report**, November 2004.

(2) Supplied by Scott Wilson Halcrow, May 2005.

Major earthworks are required as the majority of the route is either in tunnels or requires cutting. All tunnels are cut and cover except for the 550 m bored tunnel under the airport runway.

The construction strategy firstly enables the bored tunnel section of the route, and station, to be developed. This will involve some facilitation works at either end of the bored section including the plant launch chamber. Following this initial work the scheme will be developed in four areas simultaneously (northern, central, southern and Winchburgh areas) with materials being brought in and removed both to the north and the south. The proposed railway corridors will be developed initially and these will be used as haul roads across the site in order to remove traffic from the local road network. These haul roads will allow access directly to strategic trunk roads, ie the A90 in the north, the A8/M8 in the West and the A720 in the south and east (see *Figure 2.30*).

As the scheme has to run from the existing track level to a point approximately 10.5 m below the River Almond and the airport runway, steep gradients and major cuttings are required with approximately 1.6 million m³ (see *Table 2.2*) of bulked spoil requiring to be removed from the site.

Following site mobilisation and haul road establishment cut off drainage and new outfalls will be installed. This will facilitate the stripping of topsoil to be stored, redistributed or disposed of. Details of the key areas of construction are outlined within *Sections 2.6.2 to 2.6.5* below.

2.6.2

Advance Works

Before main works can commence, certain advance works are usually required. For EARL, typical advance works include:

- site investigation works;
- topographical surveys;
- permanent diversion of two high pressure gas pipelines, one north of Kirkliston (see *Figure 2.7*) and one north of the Gogar Roundabout (see *Figure 2.28*);
- permanent diversion of multiple utility cables and pipelines into Edinburgh Airport from their present route (see *Figure 2.15*);
- permanent re-routing of medium pressure gas pipelines, fibre optics cables and other utilities where EARL passes under the A8 on the South Chord (see *Figure 2.16*);
- the diversion of a minor sewer outfall on the New East Chord (see *Figure 2.26*);
- Tram Line 2 bridge (see *Figure 2.15*);
- adaptations to the M9 Humble Bridge (see *Figure 2.7*);
- Scottish Agricultural Science Agency (SASA) Aphid Trap and Met Office weather station relocation (see *Figure 2.17*);
- archaeological excavation works; and
- ecological checks.

2.6.3

Construction Compounds

During the construction of EARL, temporary worksites will be required for the storage of plant and materials and to accommodate the site offices. In general, it is envisaged that each worksite will have a secure compound to accommodate the general site office, amenity areas and storage for plant and other equipment. Additionally, the central compound (see *Figures 2.12* and *2.13*) will have a batching plant for the construction of the cut and cover tunnel box section, as will the airport car park compound for the construction of the station (see *Figure 2.14*).

A number of compound areas are required strategically across the area especially where major engineering is required, for example near the tunnel and station, the A8 diversion, the grade separated junction and the Newbridge to South Queensferry Cycleway. These are all shown in *Figures 2.1* to *2.18* and amount to approximately 54 ha, most of which is agricultural land. There will be a worksite located at each of the following:

- Wheatlands (storage area and batching plant), 35 ha – see *Figure 2.12* and *2.13*;
- Airport Car Park (storage area and batching plant), 5 ha – see *Figure 2.14*;
- Winchburgh Junction, 6 ha – see *Figure 2.3*;
- Gogarstone, 2.8 ha – see *Figure 2.16*;
- Burnshot Road, 2.1 ha – see *Figure 2.10*;
- Roddinglaw, 1.0 ha – see *Figure 2.17*;
- Gogar Mains Road, 0.7 ha – see *Figure 2.26*; and
- Gogar Junction (see *Figure 2.28*), 0.7 ha

2.6.4

Temporary Work Sites

In addition to the compound areas a number of temporary work sites are required. These are shown in *Figures 2.1* to *2.28* and are necessary for the laying out and installation of equipment and materials.

2.6.5

Principal Construction Activities

Overview

Although the final detailed design for the construction of EARL has not been developed at this stage, construction will involve a number of key activities. The site would be split into four key areas (as outlined within *Section 2.6.1*) which would be developed simultaneously but independently. The following describes the main construction features and processes.

Construction Plant

Table 2.1 provides a summary of the main construction plant that will be utilised in the construction of EARL. Further details will be developed at the detailed design and construction methodology stage.

Table 2.1 **Summary of Main Construction Plant**

-
- earth moving plant;
 - earth compaction plant;
 - earth / rock cutting plant;
 - JCBs;
 - 360° excavators;
 - boring plant (tunnel boring plant and supply train);
 - vibratory rollers;
 - sheet and bored pile drivers;
 - mobile cranes;
 - delivery lorries (HGVs);
 - concrete batching plant;
 - asphalt batching plant;
 - pumps;
 - track laying equipment;
 - compressors;
 - generators;
 - pneumatic drills; and
 - hand held power tools.
-

Earthworks and Material Delivery

As outlined in *Section 2.4* the construction of EARL will involve the removal of a vast quantity of spoil. Due to this large quantity a waste management strategy has been developed for EARL based on the principals of the waste hierarchy (reduce, reuse, recycle, energy recovery, disposal). Around 1,156,269 m³ of unbulked (about 1,561,532 m³ bulked equalling approximately 2,811,000 tonnes) inert spoil will be produced during the construction of EARL over the 3 year construction period, with the potential for a limited volume of potentially hazardous wastes from any areas of contaminated land encountered, and contamination through controlled plant species such as Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Fallopia japonica*).

The waste cannot physically be reduced due to engineering constraints. Opportunities for reuse are limited due to the nature of the material (mainly inert boulder clay and alluvial till (see *Chapter 9* for details)). Recycling options will be considered at the time of construction (eg by using it elsewhere on site or seeking opportunities to sell it) but these are also likely to be limited. A reasonable worst-case scenario is to assume that the majority of the waste will have to be disposed of off-site at licensed waste disposal sites. The following section outlines the proposed methods of waste movement from the site and indicates the existence of licensed final disposal sites. SEPA has provided a schedule of existing licensed waste sites in Scotland which has been used to demonstrate that such capacity exists.

The nature of the excavated spoil is indicated in *Table 2.2*.

Table 2.2 Soil Excavation Volumes

Excavated Material	Unbulked / m³	Bulked / m³
Rock	19,241	30,788
Made Ground	9,302	12,558
Glacial Till	830,430	1,162,602
Fine Grained Alluvium	136,955	178,040
Coarse Grained Alluvium	136,955	150,650
Glacial Sands/Gravels	23,386	26,894
TOTAL	1,156,269	1,561,532

NB It is assumed that this waste will be sent entirely to landfill and transported by road.

As already noted, the site is divided into four separate areas for the purposes of construction with three separate haul roads within the site and four exit points from which waste will be exported and materials and equipment imported. The haul roads will be created along the proposed rail corridors. An initial period of three months will be required to develop these haul roads and set up the construction compound areas. During this time there will be a requirement to access the site via the local road network. No heavy earthwork movements will, however, occur during this period.

When removing material from site, trips will be scheduled during off-peak times (between 1000 hours and 1530 hours). This will minimise the impacts on traffic flows in the area. Waste will be stored on site within the LLAU for removal between these times. In the event of a 'back log' of waste, night-time movements will be considered.

The four construction areas proposed for EARL are set out in *Table 2.3* below with an indication of the site exit points, the nearest trunk roads, the truck movements likely over the 3 year construction period, the nearest suitable waste sites and the approximate distance of these sites from the project (see also *Figures 2.30* and *2.31*).

Table 2.3 Transport Routes and Possible Waste Disposal Sites

Area	Point of Exit	Nearest Trunk Road	Total Truck Movements (20 tonne trucks)	Nearest Suitable Waste Sites*	Total Annual Capacity (tonnes)	Approx. Distance from EARL
1 North of Airport	Along North West Chord via a new junction onto Queensferry Road (A8000)	A8000 (or proposed M9 Spur road) then either M9, M8, or M90 via Forth Road Bridge	59,150 over 3 year period	3	=75,000	16km
			(total	121	=75,000	20km
			1,183,000	137	<5,000	23km
			tonnes,	2	=75,000	28km
			394,000 per year)	88	<5,000	33km
	21	=75,000	16km			
	131	=150,000	35km			
2 South of Airport/ North of A8	Along New East Chord via a new junction onto A720 at Gogar Roundabout	A720 (Edinburgh Bypass) then / or M8 or M9	32,450 over 3 year period	23	=150,000	12km
			(total 649,000 tonnes, 216,000 tonnes per year)	145	=75,000	19km

Area	Point of Exit	Nearest Trunk Road	Total Truck Movements (20 tonne trucks)	Nearest Suitable Waste Sites*	Total Annual Capacity (tonnes)	Approx. Distance from EARL
3 South of Airport/ South of A8	Along South Chord via a new junction onto Gogar Stone Road at Gogar Mount	A8, then M8 or M9	38,950 over 3 year period (total 779,000 tonnes, 260,000 tonnes per year)	26 22	=150,000 =150,000	15km 37km
4 Winchburgh	Onto A8020	A8020 then M9	10,000 over 3 year period (total 200,000 tonnes, 67,000 tonnes per year)	118 27 63	<25,000 <25,000 <25,000	30km 33km 13km

*Refer to *Figure 2.31* which plots the waste sites and their reference numbers. NB The sites identified in this table are indicative only, final arrangements for the disposal of waste will be determined by the appointed contractor at the time of construction.

As the construction strategy proposes to utilise haul roads within the site, it minimises the potential impacts by removing the need for vehicles to use local roads, other than in exceptional circumstances. In addition, the strategy enables waste to exit the site onto trunk roads in the most efficient manner.

The impacts of these movements in terms of traffic disturbance, noise and air quality are discussed in the respective chapters (*Chapters 6, 7 and 8*). *Chapter 9* discusses the issue of waste in more detail.

As well as spoil removal, material deliveries to site are required. Approximately 10,000 20T truck trips are required to deliver bulk items such as fill materials, concrete materials, reinforcement, sleepers, rails, blanketing sand etc. All deliveries will access the sites via Kirkliston, the Gogar Roundabout and Gogarstone Road, at which points they will transfer materials to site locations via the haul roads. Over 1,500 20T truck trips will also be required to deliver the ballast for the northern works. These totals exclude the ancillary and special items such as plant, structural steelwork, junction and track components, signalling and mechanical and electrical equipment. Infrequent specialised and oversized loads may require to use the local road network to gain direct site access.

Demolition Works

EARL will involve the demolition of one building. This is an outbuilding located at Myre (see *Figure 2.3*), directly adjacent to the Dalmeny Chord east of Winchburgh Junction. The demolition is required to accommodate the track realignment. Two bridges will also require demolition. The existing Standingstone Bridge will be demolished and a new bridge constructed over the railway (see *Figure 2.23*), and a bridge which serves a Right of Way will be infilled at Winchburgh Junction (as the track underneath becomes redundant) with a new bridge provided over the new track (see *Figure 2.3*).

Structures

New bridges will be required to support the route as it crosses Queensferry Road, Dolphington Burn and Gogar Burn. Further new bridges will be required to carry the route underneath the A8 Glasgow Road and Burnshot Road. A footbridge will be constructed to maintain the existing cycle track. All bridges will be constructed using spread footing with the exception of the A8 overbridge, which will be piled. *Table 2.4* summarises the structures required overall.

Table 2.4 EARL Structures

Structure Description	See Figure
Kirkliston : Airport Line / Queensferry Road underbridge	2.8
Kirkliston : Airport Line / Access road underbridge	2.8
Carlowrie : Airport Line / Burnshot Road overbridge	2.10
Carlowrie : Airport Line / Cycleway overbridge	2.10
Kirkliston : Dalmeny Chord / Queensferry Road underbridge	2.28
Winchburgh: replacement bridge to Union Canal	2.3
Dalmeny : Bridge Extension over Dolphington Burn underbridge	2.23
Standingstone : New Standingstone overbridge	2.23
New NE line / Burnshot Road overbridge	2.24
Box culvert (under diverted Burnshot Road)	2.25
Box culvert (watercourse diverted at Pepperwood)	2.24
Retaining walls at Standingstone cutting	2.23
Castle Gogar : Airport Line / Gogar Castle Road overbridge	2.27
Gogar Burn : Airport Line / Gogar Burn underbridge	2.27
Gogar Farm ; Airport Line / Gogar Farm Road overbridge	2.26
Ingliston : Airport Line / Gogar Burn underbridge (1)	2.15
Box culvert (under realigned Edinburgh to Glasgow Up Line)	2.18
Box culvert (under Airport Line (1))	2.18
Box culvert (under Airport Line (2))	2.16
Freelands : Airport Line / Freelands Road overbridge	2.16
A8 : Airport Line / A8 overbridge	2.16
Tram Line 2 : Airport line / TL2 overbridge	2.15
Ingliston : Airport Line / Gogar Burn underbridge (2)	2.15
Roddinglaw : Airport line / Edinburgh to Glasgow Up Line flyover overbridge	2.17
Box Culvert : under realigned Roddinglaw Road	2.16
Roddinglaw: access track with overbridge	2.17
Roddinglaw: access track with overbridge	2.17

Drainage and Ducting

The drainage works can be classed in two main types; permanent and temporary. As a general rule, temporary and permanent drainage works will be implemented from the start of the construction programme to protect the site and surrounding land from significant water ingress.

The main drainage works comprise realigned watercourses, flood protection, cut-off drains, track drainage, pumped drainage of the tunnel and road drainage. Included within the watercourse diversion is the requirement to divert approximately 600 m of the Gogar Burn (in three separate sections – see *Figures 2.14, 2.15 and 2.26*), permanently, and a 50 m to 100 m section of the

River Almond, temporarily (see *Figure 2.13*). *Chapter 10* describes this in more detail.

On completion of excavation works, track drainage will be installed. The type of drainage required will vary depending on the position and foundation of the track but over the majority of the scheme filter drains will be installed to encourage natural infiltration and the attenuation of any sediments or other pollutants (see *Chapter 10* for additional detail).

Tunnel Construction

The tunnel construction is confined to the central area of the scheme. This area is divided into two sections of work, those advancing from the north and those advancing from the south.

The northern section includes the following works:

- cut and cover tunnel under the River Almond (see *Figure 2.13*); and
- two bored tunnels beneath the airfield (includes the existing runway and parallel taxiway – see *Figures 2.13* and *2.14*).

The southern section involves:

- a sub surface station with island platform (see *Figure 2.14*);
- two cut and cover tunnels linking the station to the two bored tunnels (see *Figure 2.14*); and
- a retained cutting from the station to Ingliston Junction (see *Figure 2.15*).

Track and Junction Construction

The railway infrastructure works will be undertaken after the heavy civil engineering works are complete. The infrastructure works comprise track laying, junction installation, signalling and telecommunication alterations and new works, track signage and track accesses. The heavy civil engineering works will deliver a railway corridor with drainage installed. The railway works can be broken down into two distinct areas, works which are 'greenfield' and those which require access to the operational railway. All physical works with the exception of the junction tie-in's and associated works are 'greenfield'.

The greenfield works are straightforward in terms of content. However, there are varying implementation methodologies that an experienced railway contractor would apply. In terms of the operational railway works, a basic form of track construction is assumed. Essentially, for the double track arrangement, a line is constructed with conventional construction plant and then the second line is built off this first laid line with on-track plant. The operational works as part of EARL comprise two main works activities. These are the physical permanent way junction positions and the supporting works

to the alterations to the railway infrastructure (primarily alterations and new works to the signalling and telecommunications).

As a consequence of the physical size and scope of the junction installation works at the four locations on the existing network, a significant amount of track access is required to install the junctions in a staged manner.

As outlined above, the four junction tie-in points are located at Kirkliston, Dalmeny, Gogar and Roddinglaw. Roddinglaw involves a larger scope of work as one of the existing Edinburgh to Glasgow lines (the upline) will be realigned both horizontally and vertically by 30 m and 4 m respectively, to provide a 'flyover' junction arrangement.

All of the track will be conventional ballasted track with the exception of the tunnelled areas, which will be slab track. The type of slab track is yet to be defined.

It is important that temporary open ditch drainage (where the drainage trenches will be located) is installed before the installation of sub-ballast to mitigate any risk of water ingress and deformation of the stiff clay layer.

Station Construction and Associated Gogar Burn Realignment

It is envisaged that the method of construction for the station will follow a bottom-up sequence incorporating temporary steel cross-propping for the walls during bulk excavation. The underground structure will incorporate bored piles and in-situ base and roof slabs. The internal columns, walls and the lining walls to the contiguous piled walls of the station will also be formed from in-situ concrete to provide a watertight structure with a uniform standard of finish. The platforms may be built using either pre-cast or in-situ concrete.

The slab for the station concourse will be cast in-situ over the platform and also north-eastwards towards the airport terminal. Bored pile foundations will support the concourse slab. The Gogar Burn will be diverted into a two-staged channel under the slab. The ultimate outer walls will be formed using sheet piling. Noise and vibration from piling works will require to be monitored and the method revised if required. The centre pier of the two channels will be formed from a contiguously piled wall.

The span of the concourse slab over the burn will incorporate pre-cast, pre-stressed concrete beams, infilled with concrete to form the slab. These will be supported on piled foundations at each end and on the centre pier. On completion of the new channel section the Gogar Burn will be diverted. The land through which the burn flowed will then be backfilled in layers with suitable engineering fill. The north-eastern extent of the concourse slab and the ramps and stairs towards the terminal will then be constructed.

The station concourse will probably be enclosed by a steel framed building. This will be erected on completion of the floor slab using mobile cranes. It is likely that these will need to be positioned on the concourse slab over the platform as deliveries will be made from the main access road on the eastern side of the site.

At the northern end of the station the ventilation shafts and staircases will probably be formed from in-situ concrete. Other plant rooms and accommodation will be constructed from brick and blockwork.

Further details of the methodologies to be employed during the diversions and the protection of water quality, ecology and opportunities for ecological enhancement of the area are discussed within *Chapters 10 and 11* of this ES.

River Almond Diversion

Construction of the cut and cover tunnel under the River Almond will be carried out during a temporary diversion of the river. The construction work will also involve a permanent change to the position of the Gogar Burn outfall channel between the culvert and the river.

The diversion of the River Almond will be carried out using temporary contiguous sheet piling around the tunnel position and the airport boundary, and a temporary earth bund to the north side of the river will be installed. The sheet piling will need to penetrate several metres into the glacial clay at this point and will require cross bracing for stability during bulk excavation. Prior to the bulk excavation bored piling for the walls from a temporary piling platform will be carried out. The level of the top of the sheet piling and the earth bund will be high enough to prevent flooding from the river. The sheet piling may be installed using traditional driving techniques.

Following boring works, piling and bulk excavation, the base and roof slabs for the tunnel will be cast in-situ and material will be reinstated to form the base of the river. Sheet piling will then be removed and the northern bank of the river returned to the original shape. The remainder of the cut and cover tunnels will then be constructed to join up with the sub-river sections.

Further details regarding the methodology for the diversion and the reinstatement of the river section on completion of the works are referred to within *Chapter 10* of this ES

Fencing and Security

Discussions are ongoing with BAA, the Police and Network Rail in relation to the requirement for fencing and security measures. The works will be protected in accordance with their requirements and advice, and resulting measures and commitments will be incorporated into the Code of Construction Practice (CoCP) (see *Section 2.6.7*) to ensure public safety is protected and maintained at all times.

Post Construction Works

The final area of work to be undertaken will be the planting out of vegetation and landscaping. The detailed landscaping will be designed in accordance with the findings of this ES and the landscape and visual mitigation measures proposed. These are discussed in *Chapter 13*.

2.6.6 Construction Programme

It is anticipated that the heavy civil engineering works will last for approximately the first two years of the construction programme. The remaining year will be the 'fitting-out' and installation of the railway.

One key aspect of this programme is the assumption that procurement will be Design and Build and the contract would be let on the first working day of 2007. *Annex I* includes the Construction Programme for EARL ⁽¹⁾.

2.6.7 Code of Construction Practice

In order to minimise the potential temporary adverse effects during construction, a draft Code of Construction Practice (CoCP) has been developed for EARL. The CoCP addresses the environmental and safety aspects of the scheme affecting the interests of local residents, businesses, the general public and the surrounding environment in the immediate vicinity of the construction works. The draft CoCP has been prepared in addition to the statutory regulations, and represents the level of construction mitigation to which **tie** Ltd is committed. The construction mitigation set out throughout this ES is included in the draft CoCP which is presented in *Annex L; Section 3.6.2* sets out how this mitigation will be delivered.

The CoCP is very much a draft document which will be developed through full consultation with local authorities, consultees, agencies and utilities companies. The CoCP will require to be formally signed off at the construction stage, when it is finally approved following discussions with the contractor. The contractor will be legally obliged to comply fully with the provisions of the CoCP under the terms of the construction contract. The following are assumptions upon which the draft CoCP is based.

2.6.8 Working Hours

Normal working hours during the construction period will be 0800 hrs to 1800 hrs Monday to Friday and the same on Saturday. Quiet work, for example plant maintenance, may take place outside these core hours. Waste will be scheduled to be removed from site by truck between the hours of 1000 and 1530.

(1) Supplied by Scott Wilson Halcrow, May 2005.

Certain other works may also be required outside of normal working hours, for example:

- 24hr tunnel boring operations;
- night-time railway track work (including under possession ie while train movements are restricted or suspended);
- airport possession work (ie while plane movements are restricted or suspended);
- night-time road closure work, setting up contra-flows etc;
- utility diversions, in periods of low demand;
- spoil removal from site (possibly at night);
- special plant deliveries eg the tunnel boring shield; and / or
- some material deliveries.

Significant possessions are required, and a number of these may be at night, weekends or on public holidays.

Works may also be required outside the normal hours to ensure that the programme is met, eg spoil may be stored for transportation at off-peak times. Occasions where construction operations may take place outside of normal working hours will be subject to prior agreement with the relevant local authorities.

In general, the hours of working will be controlled through the CoCP, and by agreement with the local authorities.

2.6.9 Construction Workforce

Based on the capital cost of the project, it is estimated in *Chapter 14* that the total full time equivalent jobs created by the construction of EARL will be 644 throughout the duration of construction. It is envisaged that the maximum workforce on site at any one time (during peak construction periods) will be 300 to 350 full-time equivalents. The split in labour across the site is:

- two-thirds required for works north of the airport; and
- one-third to the south of the airport.

Assumptions regarding construction personnel traffic movements are reported within *Chapter 6*.

2.7 ASSESSMENT OF ALTERNATIVES

2.7.1 Introduction

Existing public transport links to Edinburgh Airport have been recognised as being unsatisfactory to support its projected expansion, and substantial growth in air passengers. Improved access and transport links are therefore essential to facilitate sustained growth. In 2002, the Scottish Executive commissioned Sinclair Knight Merz (SKM) to undertake various studies to

examine the options for establishing direct rail links to Edinburgh Airport; the results were published in 2003 ⁽¹⁾.

Following publication of these reports, a light rail scheme, in the form of Tram Line 2, was taken forward. It was acknowledged that there was still a case for heavy rail links to Edinburgh Airport, and in October 2003 a Scottish Ministerial decision was taken to develop the runway tunnel option presented by SKM, and now known as EARL. Whilst this option was considered to have the highest capital cost, it provided the most in terms of overall public benefits.

The sections below provide additional detail with regard to the options that have been assessed and the decisions that have led to EARL being developed in its current form. The options assessed included:

- a 'do-nothing option';
- options for light rail; and
- options for heavy rail.

The consideration of alternatives to EARL has included the appraisal of environmental issues at every stage, alongside a number of other factors, including socio-economic, modal shift and technical feasibility. All of these components have influenced the conclusions of the assessment of alternatives.

2.7.2

Assessment of Alternatives

Do-Nothing

As outlined in detail in *Chapter 1*, one of the primary strategic objectives of EARL is that it should support the Scottish economy. This is consistent with the provisions of national and local planning and transport policy (refer to *Chapter 4*).

Without the development of improved public transport links to Edinburgh Airport these economic benefits would not be realised. Therefore the option of 'do nothing' was rejected.

Light Rail

A study undertaken by SKM in 2002 to investigate the potential for Light Rail links to Edinburgh Airport ⁽²⁾ found that such a link would be viable if considered as an 'add-on' to an existing light rail network or line. At this time, the basis for a light rail network in Edinburgh had already been defined, and it was therefore assumed that there would be a tram link between the city centre and Gogarburn from where a line could continue to the airport.

(1) Scottish Executive (Sinclair Knight Merz). (2003) **Rail Links to Glasgow and Edinburgh Airports, Final Report**, February.

(2) Scottish Executive (2003) **Rail Links to Glasgow and Edinburgh - Light Rail Study**, April.

Four broad options were identified to provide a Light Rail link between Gogarburn and Edinburgh Airport, and as a result an alignment for the proposed Edinburgh Tram Line 2 was developed and is being progressed. The tram is not specifically dedicated to the airport although a stop is proposed. The aim of the tram is primarily to provide facilities for travel for those living in the western fringes of Edinburgh, with the advantages that it will reduce congestion and support the growing local economy.

Heavy Rail

The SKM report entitled '*Rail Links to Glasgow and Edinburgh Airports*'⁽¹⁾ represents a Scottish Transport Appraisal Guidance (STAG) study looking at a number of alternative means of providing for surface heavy rail access to Edinburgh Airport. This section briefly outlines each of the options considered in the study in relation to Edinburgh Airport.

Preliminary appraisals of three main groups of scheme were examined:

- a spur into the airport either from the Edinburgh to Glasgow Line or the Fife to Edinburgh Line;
- a diversion of the Edinburgh to Glasgow Line through the airport; and
- a diversion of both the Edinburgh to Glasgow and Edinburgh to Fife lines through the airport.

In accordance with STAG Part 1, appraisals were undertaken on eight potential infrastructure options; seven were then taken through Phase 2 which focussed on service options. As a result of this, four options were selected. These are summarised in more detail below; an additional fifth option, the '*Surface Diversion*', was also subsequently included.

The Fife Spur Option

The Fife Spur option would have provided a shuttle service of four trains per hour between the Airport and Edinburgh Waverley. This was seen as a relatively low cost option and revenues would comfortably exceed the projected operating costs. However, the full scale of the costs of providing the extra capacity at Waverley Station to accommodate this airport shuttle only became apparent later in the study⁽²⁾.

The study recognised that this option would require additional train paths into, and platform space at, Waverley Station if it were to be pursued. In considering the EARL proposals it was appreciated that improved facilities at Waverley could not be expected within any known timeframe. Accordingly, this option was not considered to be viable.

(1) Scottish Executive (2003) **Rail Links to Glasgow and Edinburgh Airports**, February.

(2) Scottish Executive (Sinclair Knight Merz). (2003) **Rail Links to Glasgow and Edinburgh Airports**, February.

The Edinburgh and Glasgow Spur Option

The Edinburgh and Glasgow Spur option would also provide a shuttle service of four trains per hour between the airport and Waverley Station. This option, however, was seen as a first phase of a route under the airport, and it was therefore assumed that the airport station would be underground. As a result, it would cost more than the Fife Spur option. Revenues were again shown to exceed operating costs comfortably and the full scale of the costs of providing the extra capacity at Waverley to accommodate this airport shuttle only became apparent later in the study ⁽¹⁾.

The study also recognised the need for additional train paths into, and platform space at, Waverley Station if this option were to be pursued. As with the Fife Spur option, this option was therefore not considered to be viable.

The Runway Tunnel Option

The Runway Tunnel option would enable all services between Edinburgh and places to the south (Newcastle) and places to the west and north (Glasgow, Stirling, Fife, Inverness and Aberdeen) to be routed through an airport station via a tunnel under the runway. Although it was recognised that the capital costs would be high, it was calculated that minor additional operating costs would be incurred as no new services would be required. This option also had the important advantage of not requiring any extra platform or track capacity at Waverley Station. Additional revenues were forecast to be the highest of all the Edinburgh options and it therefore appeared to be the most robust option in financial terms ⁽¹⁾.

With this option, advice was sought from Her Majesty's Railway Inspectorate (HMRI) as to the health and safety requirements of such an option. This identified additional significant costs associated with evacuation and ventilation requirements, which were added to the option costs.

This is the option upon which EARL is assessed in this ES, was based.

The Edinburgh and Glasgow Diversion Option

The Edinburgh and Glasgow Diversion option was taken forward as a fall-back through-running option in the event that the Runway Tunnel option either proved infeasible or too costly. It would allow the four trains per hour between Edinburgh and Glasgow, and the two trains per hour between Edinburgh and Fife, to be diverted via the Airport. This option would cost substantially less than the Runway Tunnel option. However, while avoiding the risks associated with tunnelling under the airport, it would impact significantly on the Royal Highland Showground (RHS). The option would involve the construction of a viaduct for the new line which would pass

through the showground. SKM reported that it was ‘...difficult to imagine how the Showground could continue to operate in an economic and effective manner’ ⁽¹⁾.

Again it had the important advantage of not requiring any extra capacity at Waverley. As no new services would be involved, it would incur very small additional operating costs which would be comfortably exceeded by the additional revenues ⁽¹⁾.

Due to the potential impacts of this option on the economic viability of the RHS, allowance was made within the costs for relocation of the showground. There was, however, the risk that the parties might not agree to the relocation proposals. In addition, discussions with BAA at the time indicated that the station would have to be approximately 700 m from the terminal entrance due to restrictions imposed by their current development plans for the airport. It was therefore considered that any advantages of this option were outweighed by disadvantages.

The Surface Diversion Option

In order to ensure that a full range of alternatives were considered, the SKM consultant team chose to develop a fifth option entitled the “Surface Diversion Option”. This option would require a number of components of new infrastructure, including:

- a spur off the Edinburgh to Fife line (as in the Fife Spur option);
- a surface level station at the airport (as in the Fife Spur option but not underground as in the Edinburgh to Glasgow Spur option);
- a link between the airport station and the Edinburgh to Glasgow Spur line facing west; and
- a chord connecting the Edinburgh to Glasgow Line to the Winchburgh Chord (as in the Edinburgh to Glasgow Diversion option) ⁽¹⁾.

Under this option “...the main Edinburgh to Glasgow Line would remain open and the Edinburgh-Glasgow services would operate as at present without calling at the Airport. The Fife Line would also remain open and some services would continue to operate as at present without calling at the Airport.” ⁽²⁾ However, the new infrastructure would allow four trains per hour from any of a number of places to the north-west and north of the airport to be diverted through the airport, thereby providing services for air passengers and employees. The infrastructure element of this option would avoid the complexities associated with the tunnel and station under the airport and would not impact on the Royal Highland Showground. Because no new services would be involved, there would be no need for extra track capacity into, or platform capacity at, Waverley Station. The option would, however, result in an increase in journey times of around 10 minutes for those travelling west and 15 minutes for those

(1) Scottish Executive (Sinclair Knight Merz). (2003) **Rail Links to Glasgow and Edinburgh Airports, Final Report**, February, page 69.

(2) Scottish Executive (Sinclair Knight Merz). (2003) **Rail Links to Glasgow and Edinburgh Airports, Final Report**, February, page 69.

travelling north of the airport. This was considered to be unacceptable, and the option was therefore not considered to be viable.

Final Option Selection

The five short listed options were finally subjected to a detailed appraisal, consisting of the following three appraisal stages.

- Appraisal against the earlier strategic objectives of operating cost neutrality, capital cost covering non-user benefits, and consistency with long term airport strategy.
- Implementation feasibility against criteria including land use, fit with national and local policy, technical feasibility and risk, operational feasibility and public acceptability.
- Appraisal against the Government's objectives⁽¹⁾, as set out in STAG 2 (which includes environmental assessment).

Whilst the aim of Tram Line 2 was primarily to provide choices for travel, reduce congestion and support the growing economy on a local scale, the Runway Tunnel option was considered to satisfy these objectives on a wider geographical scale. Following recommendations from the Stakeholder Group⁽²⁾ the Transport Minister announced the selection of the Runway Tunnel as the preferred airport rail option link in March 2003. This option was subsequently titled the Edinburgh Airport Rail Link (EARL).

2.7.3

Development of the Runway Tunnel Option (EARL)

Introduction

Following the selection of a preferred route option, a consortium entitled the Scott Wilson Halcrow (SWH) was appointed in December 2003 to carry out further design and assessment on the preferred EARL alignment and to facilitate the promotion of the scheme through Statutory Procedures⁽³⁾.

As part of the progression and development of EARL, additional minor studies looked at the assessment of various options. These are summarised below.

(1) These are Economy, Accessibility, Safety, Environment and Integration.

(2) A Steering Group comprising the Scottish Executive, BAA, Strategic Rail Authority, Department for Transport, Scottish Enterprise and Strathclyde Passenger Transport.

(3) tie Ltd (2005) **Edinburgh Airport Rail Link - Design Development STAG appraisal** (Draft), March.

Tunnel Options Report

This study concentrated on three main tunnelling options and their impact on the operation of the airport and its environment. The options considered were:

- twin bored tunnel by tunnel boring machine;
- cut and cover tunnels with jacked box or cellular arch below the runway; and
- a hybrid option (comprising both of the above methods).

The hybrid option was considered the most favourable option in technical terms.

Comparison of Short Bored Tunnel and Jacked Box Options beneath the Runway

This report summarised the advantages and disadvantages of two possible construction methods for the section of tunnel beneath the airport runway. The two methods compared were:

- bored tunnel; and
- jacked box.

On the basis of the investigation, it was demonstrated that the bored tunnel option offers greater advantages and less risk in construction than the jacked box alternative. It was also highlighted that bored tunnels offer greater flexibility and adaptability to manage potential objections during the construction and parliamentary stages of the project as well as greater choice in the procurement of construction. It was therefore recommended that the bored tunnel option be carried forward for detailed development.

Southern End STAG 1 Appraisal of Several Options

This work compared the four-tracking of the Edinburgh to Glasgow line from Roddinglaw to Saughton with the development of a new line from the Fife line to the airport for the southern end of the EARL alignment. The four-tracking of the Edinburgh to Glasgow line was only considered feasible along a proportion of the route with major constraints, including the need to provide a new bridge under the A720. The development of the four-track option was concluded to be complex and with considerable risk. It was likely to result in significant public disruption, and offered poor value for money. These disadvantages led to this option being rejected. The recommendation was to consider in more detail the development of two lines, a heavy rail to the Edinburgh to Fife line and a heavy rail to the Edinburgh to Glasgow line before Roddinglaw.

Northern Option

The object of the study was to determine the civil engineering feasibility of an alternative route running south from the Edinburgh to Fife line from a point south of Dalmeny Junction to join a proposed new west approach line at Dalmeny South Junction, and to determine engineering criteria for use in an operational modelling comparison of different routes.

The issues associated with using the former branch line focused upon the need to deepen and widen the existing cutting. It was recommended that intrusive ground investigation works were carried out as part of the scheduled route-wide investigation should this line form part of the preferred route.

East Line Options

This report was compiled in tabular format highlighting the issues regarding the Northerly Alignment and Southerly Alignment. The evaluation concluded that a southerly alignment was preferable.

Roddinglaw and Winchburgh Junction Option Comparisons

This report compared the aspects of the grade separated junction and a re-aligned flat junction at Winchburgh, and a grade separated junction and a flat junction at Roddinglaw. The report concluded that the junction at Roddinglaw would need to be grade separated, but that this was not required at Winchburgh.

Station Options

Options for the station were considered as follows

- Option 1 - a 10 m deep station and tracks to the west of a relocated Gogar Burn, substantially underground to allow terminal expansion to be incorporated above.
- Option 2 – a 10 m deep station and tracks to the west of a relocated Gogar Burn, located further south independent of the airport expansion as far as possible, and allowing the station box to be partially open.
- Option 3 – a 7 m deep station and tracks to the east of the retained burn, substantially underground to allow terminal expansion to be incorporated above.
- Option 4 – a 7 m deep station and tracks to the east of the retained burn, located further south independent of the airport expansion as far as possible, and allowing the station box to be partially open.
- Tunnelling Options 5 and 6 would have stations the same as for options 4 and 2 respectively.

Following an agreement in principle to proceed with option 5, the station location was considered in more detail in conjunction with the vertical and horizontal rail requirements.

Turnhouse Options STAG 1 Appraisal

During the public consultation process, the option of a new station at Turnhouse, with a link to Edinburgh Airport was identified. A separate report detailing the Turnhouse Station options was produced ⁽¹⁾ and resulted in the identification of four options for a station location around Turnhouse and three possible options for linking the station to the airport terminal including:

- surface level shuttle buses;
- sub surface pedestrian tunnels (with travellers); and
- sub surface driverless shuttles.

For each of the four station location options, it would be necessary to quadruple a proportion of the track from Turnhouse south to Saughton Junction and construct a new rail line from Kirkliston Junction to Turnhouse. The report therefore concluded that whilst there were difficulties to overcome, it would be feasible to construct such a line. They also concluded that all four station locations were feasible, but that each lent itself more readily to supporting one of the ways of linking to the terminal building.

It should be noted that the surface shuttle-bus link was discounted as buses would be required to cross the airport runway, which is not permitted under CAA and BAA safety regulations.

Long journey times, walking distances, safety issues, access and feasibility issues for passengers were all identified in association with the other two link options considered.

In conclusion, the Turnhouse options were predicted to result in low passenger uptake, and were considered to be sub-optimal by some considerable margin in achieving the planning objectives set out for EARL.

2.7.4

Alternatives Summary

In summary, the Runway Tunnel option chosen was assessed as meeting EARL's planning objectives and providing the best benefits, whilst being forecast to produce revenues in exceedence of its costs. The alternatives work has resulted in the scheme proposed as shown in *Figures 2.1 to 2.28*. As outlined in *Section 2.1* two possible variations remain, these will be left as variations in the Bill to be determined at the detailed design stage; *Section 3.4.3* discusses these also.

(1) Scott Wilson Halcrow JV (2005) **Edinburgh Airport Rail Link: Turnhouse Option Report**, January.