

2. Scheme Description

2.1. Introduction

This chapter summarises the main components of the scheme including route alignment, information on the design and appearance of GARL as well as options/alternatives considered prior to selection of the preferred route.

2.2. Scheme Description

2.2.1. Route Alignment

The elements of the route are listed below and the proposed alignment is shown on Figures 4.1 to 4.5. Note that the scheme is described west to east, i.e. from Glasgow Airport to Glasgow Central Station. The proposed scheme will have the following components:

1. A new elevated station at Glasgow Airport located immediately to the south of the existing multi-storey car park (MSCP No. 2). The station will be twin track and ultimately be capable of accommodating two trains of up to four cars in length;
2. An elevated pedestrian link between the eastern end of the new station and the Airport terminal building, crossing Caledonia Way. The link will be fully enclosed and will include a passageway flanked by travelators;
3. A twin track railway viaduct heading westwards from the station;
4. A new bridge structure across the M8, which will be single span and likely to be of tied arch design;
5. A twin track viaduct crossing St James' Park and the Murray Business Area. This viaduct structure will bridge a number of roads including the A726, McFarlane Street and Clark Street. Note that the branch will be fitted with overhead line equipment (OLE) to permit the use of electric trains;
6. The railway will be on a reinforced embankment for the last section between Clark Street and a new junction to be formed with the Paisley to Gourock Main Railway Line. The alignment will require the widening of the deck of the Murray Street Bridge. The surface of Murray Street will be lowered by about 300mm to provide the same headroom to the new deck structure as the existing deck;
7. Existing main lines between Paisley St James' Station and Paisley Gilmour Street Station will then be used, although these sections of the route will not fall within the limits of the scheme;
8. From just to the east of Paisley Gilmour Street Station, Wallneuk Junction and Arkleston Junction will then be extensively remodelled in order to accommodate the increased traffic that GARL will generate. Note that the remodelled junctions will not extend beyond the limits of existing Network Rail (NR) land;
9. Between Arkleston Junction and Shields Junction, a stretch of approximately 6km, a new third track will be built. There is sufficient room to place this new track within the existing rail corridor. The new track will be bi-directional and be placed between the existing Up and Down main lines;
10. Tie-in of the new track to Shields Junction;
11. Widening of the Hillington Bridge over Sandwood Road that will include construction of a new deck and sub-structure;
12. Construction of two new crossovers at Cardonald Junction;
13. Between Shields Junction and Glasgow Central Station, existing rail lines will be used for GARL;
14. At Glasgow Central Station platform 11A will be extended into the train shed. This work will mean construction of new track, the loss of existing short stay car parking spaces within the station as well as the exit ramp from the car park;
15. Extension and electrification of the existing Up loop at Elderslie is required as a replacement for the loss of the Up loop at Wallneuk Junction;
16. All necessary signalling and wiring works;
17. Provision of OLE Structures associated with the proposed new infrastructure and the removal of redundant OLE structures;
18. Decommissioning of the aviation fuel farm at Glasgow Airport, as the proposed branch line alignment passes through the existing facility; and construction of a replacement facility on a site to the west of St Andrew's Crescent. This site is approximately 15 metres east of the Paisley Moss Local Nature Reserve (LNR); and
19. Replacement of 20 league standard football pitches at St James' Park with provision of improved drainage and changing facilities. In addition, a further two new league standard pitches will be provided elsewhere in Paisley (at Ferguslie Park).

The preferred route alignment report was prepared in August 2005¹. Note that whilst the route corridor shown on the plans is fixed, the route alignment within the proposed limits is subject to ongoing consultations and design.

¹ Glasgow Airport Rail Link, Stage 3 Report, Final Scheme Development, August 2005, FaberMaunsell

2.3. GARL Infrastructure

2.3.1. General

SPT recognises that the introduction of a fast heavy rail link between Glasgow Airport and the centre of Glasgow is a significant opportunity to create an effective gateway to the city and to Scotland for visitors arriving at the airport. Therefore the design and branding of GARL will be an important factor in the development of the scheme. The main elements of the design are briefly discussed below.

2.3.2. Airport Station Design

The proposed location for the Airport Station offers an opportunity to create a landmark station that presents a new face for the Airport as viewed from the M8 White Cart Viaduct approach.

The proposed station design is for an elevated terminus station located along the south side of MSCP No. 2, with two 200m long side platforms extending westwards and a 100m long canopy covering the eastern half of the train shed. The platforms and canopy will both culminate in a covered concourse at the eastern (terminating) end of the station where ticketing, staff and public facilities will be situated. The concourse, which will be situated adjacent to the south eastern corner of the MSCP, will be joined to the main airport terminal building by an elevated link. This will convey passengers within an enclosed structure that will bridge Caledonia Way and connect to the airport terminal building and a new vertical circulation core.

The architectural design for Glasgow Airport Station envisages the creation of a canopy with a distinct, curvilinear form extending along the viaduct from the concourse. The structural design has been developed to create a clear span across side platforms and central twin tracks, using a steel frame that can be glazed, to offer views to the south, or clad, to screen views of the MSCP elevation. This will create a space that provides directional emphasis, views to points of external reference and daylighting to aid passenger orientation.

As the Station is to be capable of accommodating both diesel and electric locomotives, the canopy design will incorporate means of passive ventilation and enable fully integrated OLE mountings that fit with the canopy profile and structural design. This will create a co-ordinated approach, which is common to the best examples of station canopy design and minimises the visual disharmony of separate, secondary built elements within the train shed.

2.3.3. Airport Approach Viaduct

The proposed viaduct structure will be approximately 520m long from the north end of the M8 bridge to the airport station. It will comprise a prefabricated steel girder and *in-situ* reinforced concrete deck, supported on reinforced concrete piers with piled foundations. The typical spans will be 25m, but a longer span of 38m is required to cross St Andrew's Drive West due to skew and sight line requirements.

2.3.4. M8 Bridge Design

The proposed structure is a single span tied arch bridge with clear span of approximately 135 metres, supported on reinforced concrete piers with bored pile foundations. The pier foundations will be located away from the Airport feeder roads, which are the outer-most roads at this crossing, to avoid any disruption to Airport operations. The main arch, tie beam and cross girders will be of structural steel with the deck in concrete. It is proposed to assemble the structural elements of the bridge, including the concrete deck, on the adjacent St James' Park site to avoid prolonged motorway closures and to move it into position during a single night-time closure of the M8 motorway and adjacent roads.

2.3.5. St James' Structure

The branch line across St James' Park, approximately 480m long, lends itself to various forms of deck construction and span arrangements. Solutions comprising precast / *in-situ* concrete as well as steel composite decks of varying spans are viable. In general, longer span lengths are more economical for ground conditions where the load bearing stratum is at greater depth, as in this case.

In balancing the requirements of deck articulation and transportable beam length without special dispensation, a span arrangement of 25m continuous spans of steel composite bridge supported on reinforced concrete piers with bored pile foundations is proposed. The height to rail level will be approximately 9m above the existing ground level, with the headroom beneath the viaduct being approximately 7.5m above existing ground level.

Preliminary analysis indicates that a steel composite bridge deck is more economical for this span range than a precast concrete deck. Steelwork composite decks are particularly efficient for continuous spans.

It is considered that the slender steel composite construction is both economical and aesthetically more pleasing than non-standard concrete construction for this section of the branch line, even allowing for routine maintenance costs.

2.3.6. A726 / McFarlane Street

The proposed structure that crosses the A726 and McFarlane Street is a three span steel composite bridge supported on reinforced concrete piers with bored pile foundations.

2.3.7. McFarlane Street Structure – Clark Street

The section of rail link between McFarlane Street and Clark Street is approximately 200m long and up to 9m above existing ground level, with headroom of approximately 7.5m. The proposed structural solution is a viaduct option utilising bored cast-in place piles.

2.3.8. Clark Street

The structural form of the bridge has been refined to minimise the construction depth. This enables the desirable minimum headroom of 5.7m to be achieved, therefore avoiding the need to design the superstructure to resist impact loadings in accordance with the Design Manual for Roads and Bridges (DMRB).

2.3.9. Clark Street-Murray Street Embankment

A piled embankment is proposed for the section of Branch Line between Clark Street and Murray Street, approximately 250m long and up to 6m above existing ground level. The soils encountered in recent site investigations in the vicinity of Clark Street are highly compressible over a thickness exceeding 11m. These soils will compress over a long period of time making it difficult to control the extent of any settlement along the branch line and in particular between the piled bridge structure (which would display very limited settlement), and the unsupported embankment retained by vertical walls.

The embankment would utilise a load transfer platform supported on a grid of piles or stone/grout columns, to carry the imposed loads without exceeding permissible settlement criteria specified in the Railway Group Standards. The use of geo-synthetic reinforcement to achieve a batter slope of 60° would reduce the land take.

2.3.10. Murray Street Bridge

An additional deck will need to be added to the existing Murray Street railway bridge to accommodate the branch line. The proposed structure will be a half-through girder bridge of approximately 20m span, similar to the existing bridge. The existing abutments at both ends will need to be extended to carry the new bridge, and retaining walls provided to reduce the land-take.

It has been established from record drawings that the existing bridge abutments are founded on spread footings. However, site investigations have established that the types of soils present in this region are quite variable. It is probable that settlement at this bridge site has stabilised over the past few decades, but additional loads applied may give rise to further settlement. Therefore, the new abutment extensions and retaining wall returns will be supported on piled foundations.

Based on the surveyed road profile provided by Renfrewshire Council in the vicinity of the new bridge, the surface of the Murray Street will be lowered by 300mm in order to achieve a minimum headroom clearance of 3.9m to match the existing bridge. The new bridge superstructure will be designed to withstand impact loadings as defined in the DMRB, since the headroom is less than the desirable value of 5.7m.

2.3.11. Fuel Farm

As the preferred branch line alignment passes through the existing airport fuel farm, it will be necessary to provide an alternative location for this facility. The new site for the fuel farm was selected by BAA from a number of alternatives, based mainly on planning suitability and best fit with the Airport Masterplan. The selected site is located to the west of St Andrew's Crescent and to the east of the Paisley Moss LNR. The proposed new fuel farm will be a like for like replacement for the existing fuel farm, in terms of capacity and operational parameters. The site, although unoccupied, is zoned in the Local Plan for airport operational use.

The new fuel farm will occupy a rectangular site of approximately 14,700m², split into 'land side' and 'air side' divisions. The new fuel farm is assumed to provide the same capacity as the existing facility and is likely to comprise a number of above ground fuel tanks. The tanks will have a maximum height of 9.0m above ground level with a total capacity of approximately 3,500,000 litres. A possible configuration of the new fuel farm is shown on Figure 2.1.

Tankers used to fill the storage tanks will enter the facility from a new access road. This road will be built between the land side division of the fuel farm and a junction to be formed on the local road that joins St James' Interchange (M8 Junction 29) to St Andrew's Drive West. Airport bowsters/fuellers will fuel from a transfer rig within the air side division of the facility and be able to access the air side of the airport with the added benefit of not having to pass through land side / air side security, as is the case at present.

Measures to control pollution from the fuel farm have been an integral part of the design of the new facility. The design takes cognisance of the Pollution Prevention Guidelines (PPG) published by SEPA and other standards and codes of practice applicable to a facility of this nature. Spillages of fuel from the storage tanks and/or from tankers delivering / transferring fuel are clearly a potential cause of pollution and bunding will be one of the key methods of pollution control.

Primary containment will comprise the fuel tanks themselves, which, with their associated systems, will be of a high specification designed to minimise the risks posed by accidents, fire, flooding, vandalism and likely failure modes.

Secondary containment will control any spillages around the storage tanks, which will comprise an impermeable bund around each of the tanks. This proposed bunding goes beyond the requirements of the applicable guidance, which requires that bunding be designed to have sufficient capacity to provide at least 110% of the largest tank's capacity (to allow for dynamic effects of failure or rainwater within bund, etc.) or 25% of the total tank capacity within the facility.

However, in view of the proximity of the fuel farm to Paisley Moss LNR, it is proposed to provide additional protection by surrounding each tank by its own bund with each bund being sized to accommodate 110% of the tank's capacity. This will limit the extent of any spillage and provide protection against multiple tank failure. In addition, all fuel pipework will be placed above ground and suitably protected from damage from vehicles, etc.

In addition to the local containment of spillages from the tanks and ancillary equipment, further security will be provided to contain any fuel spillages occurring in the areas of hardstanding during delivery or loading of fuel and to contain water/foam that may be used during emergencies when fire fighting equipment is employed. It is therefore proposed to surround the entire fuel farm site with an additional impermeable bund as a further line of defence. This will create a lagoon in which fire fighting run-off or major spillages can be controlled. It is estimated that this bund will have to be 0.5m high and access roads crossing the bund will be designed to ramp down into the site to maintain the integrity of the bund at these locations.

A surface water drainage system will be required to drain access roads, vehicle parking and other areas of hardstanding within the banded fuel farm. The inclusion of oil separators will be necessary to contain spillages of fuel and any other hydrocarbons. The adoption of Sustainable Urban Drainage Systems (SUDS) was considered as a means of discharge but the permeable nature of the ground conditions and the proximity of the fuel farm to Paisley Moss LNR means that the use of soakaways or balancing ponds would not be suitable in this instance.

The discharge of drains into existing surface water drains was therefore considered to be the most appropriate solution. Attenuation of run-off during rainfall events (to supplement the natural attenuation created by the drainage system) is an option if existing sewers do not have sufficient capacity by introduction retention tanks into the drainage design. It is envisaged that these would be located within the fuel farm site if they are found to be required. It is currently proposed to discharge into existing surface water sewers on St Andrew's Crescent.

2.3.12. St James' Park

As discussed in section 2.3.5 above a viaduct will cross St James' Park and, in addition, the eastern half of the park will be used as a compound for construction of the viaduct and the M8 Bridge, as discussed in more detail in section 2.4 below.

Consequently there will be an impact on the 22 football pitches at St James' Park. However, a programme of works will be implemented to ensure that an equivalent 22 league standard pitches will remain available for use in the Paisley area at all times both during and after construction of GARL.

It is intended that during the construction and reinstatement period 11 of these 22 pitches will be maintained on the western side of St James' Park and the remaining 11 will be provided temporarily elsewhere. Four of these temporary pitches will be provided at Ferguslie Park where the 2 existing pitches will be upgraded to league standard and 2 new league standard pitches will be provided.

Following completion of construction, 9 pitches will be reinstated on the eastern side of the park making a total of 20 league standard pitches that will be available at St James' Park. The shortfall of 2 will be accommodated by the retention of the 2 permanent replacement league standard pitches at Ferguslie Park.

A key aspect in reinstating pitches at St James' Park has been to ensure that the number of league standard pitches is maximised. Furthermore, Renfrewshire Council's concerns regarding the playability of some of the pitches due to potential shadowing effects caused by the new viaduct have been taken into account. It is therefore proposed that the existing pavilion be demolished and a replacement pavilion be relocated within the park in order to maximise the available area for laying out the replacement pitches and also to minimise any shadowing effects from the new viaduct on the re-laid pitches.

The exact configuration and marking of pitches would be subject to detailed design and agreement with Renfrewshire Council. However, the arrangement shown on Figure 7.5 shows one possible configuration that demonstrates that 20 pitches can be accommodated at St James' Park.

2.3.13. Main Line: Permanent Way

2.3.13.1 Airport Junction

The junction will consist of a facing crossover on the main line with two turnouts onto the airport branch line all designed for a speed of 25mph. This line speed on the branch line is 45mph.

2.3.13.2 Wallneuk – Arkleston Junctions

Capacity through the study area is primarily constrained by the flat junction configuration in the Paisley Gilmour Street area (Wallneuk Junction). The new track configuration accommodates the airport service, all existing services and provides some further growth potential as well as mitigating the current problems.

The proposed configuration for Wallneuk Junction moves it away from the end of Paisley Gilmour Street Station to the area adjacent to Paisley Signal Centre. This will improve the junction layout from being non-compliant with current Network Rail Group Standards to conformance with current Standards. Therefore the new layout, although necessary for the GARL project, will also provide a substantial benefit to Network Rail. The configuration of this junction can be summarised as follows:

- Wallneuk Junction will consist of three crossovers with a turnout speed of 25mph. Overall length of layout will be approximately 200m;
- The existing Up Engineers Siding will be retained in its existing position with the addition of OLE for the siding. It will be extended by 50m and a new lead will be constructed to connect into the new Up Main Line and a set of trap points;
- The Down Goods loop will be retained, as per existing length, with new leads at either end to accommodate revised alignment of Down Main Line;
- The existing Down sidings will be retained (Gallowhill sidings); and
- Arkleston Junction - the existing layout of one turnout and one crossover will be replaced with a high-speed junction consisting of five crossovers. These will provide a turnout speed of 50mph. Overall length of layout will be approximately 550m. The proposed layout will substantially increase flexibility for the routing of trains between tracks not only for the new GARL service but also for other passenger and freight services.

2.3.13.3 Three Track Arkleston to Shields Junction

Capacity constraints here are due to the mixture of stopping and fast passenger services and freight trains. The addition of a further 4 trains per hour each way for GARL has determined the requirement for an additional reversible line, which will be located between the existing Up and Down Main lines. As a result, intermediate crossovers will be provided at Cardonald Junction to maintain access into the Deanside Branch and provide operational flexibility for switching to/from the Relief line.

2.3.13.4 Gower Street Junction (Shields Junction)

Three new crossovers will be required in the Shields Junction area. All are in the vicinity of Gower Street Junction.

2.3.13.5 Elderslie Loop

Modifications to Elderslie loop are required to provide a similar operational functionality to the Arkleston Goods loop, which will be lost as it becomes a main line as part of the Arkleston Junction remodelling.

2.3.14. Main Line: Structures, etc.

2.3.14.1 Paisley Viaduct

The scheme will generate clearance restrictions within the Paisley Viaduct area. However, to avoid works on this listed structure, which crosses the White Cart Water, discussions concerning a derogation of the Standards for a reduced 10 foot dimension have been undertaken with Network Rail and HMRI, which indicated that this was an acceptable solution to the problem.

2.3.14.2 Hillington Bridge

This bridge crosses Sandwood Road at Hillington. The existing structure comprises two separate decks supported on abutments and a central pier. The proposed structure will be located between the two existing decks and comprise a single track to support GARL. Two options currently exist regarding the span arrangement; these being a single span clear of the existing abutments and central pier or a two span structure utilising the existing central pier. Where new abutments are required they will be constructed behind the existing abutments using reinforced concrete. Piled foundations will be utilised where appropriate. Due consideration will be given to maintaining the integrity of the existing rail structures and to this end it is assumed any piles will be bored cast in place concrete and not driven.

2.3.14.3 Signalling, Wiring and OLE

Where required, signalling and wiring infrastructure will be replaced and upgraded. OLE will be mounted on portal frames throughout the branch line and the section of the main line from Arkleston to Shields Junction. Between Wallneuk and Arkleston use may be made of existing portals depending on suitability.

2.3.15. Central Station

At Glasgow Central platform 11A will be created within the station shed, modifying an underused platform. This work will mean the loss of existing short stay car parking spaces within the station. In addition, the platform will block the existing down ramp to the car park within the station undercroft. Work will require construction of a new platform and placement of track; however, there will be no changes to the listed station building itself.

2.3.16. Vehicle Design

At this time no final decision has been made on the appearance of the trains that will operate on GARL. However, it is likely that the trains will be of standard type but possibly with some specifically designed elements related to the expected passenger profile, such as additional space for luggage.

2.4. The Construction Phase

2.4.1. Construction Programme and General Activities

Construction of GARL is planned to take place between 2007 and 2009 and will include the following typical construction operations and their likely timescales:

- Statutory utility diversions (month 19 and months 26 to 32);
- Site clearance and earthworks (month 18 and 27 to 29);
- Piling and ground stabilisation works (month 18 to 46);
- Construction of new bridges and structures (month 18 to 50);
- Construction of the Airport Station (month 35 to 47);
- Construction of drainage systems (month 18 to 46);
- Track formation and installation of new track (month 19 to 47);
- Installation of OLE masts and wire (month 19 to 48);
- Installation of signalling equipment (month 19 to 50);
- Installation of telecommunication systems (month 19 to 50); and
- Landscaping works (month 13 to 25 and 45 to 56).

Note that the construction period will be 33 months. However, it has been assumed that Parliamentary process, etc., will take 18 months to complete and therefore the month numbering identified above takes this into account.

Some works, particularly landscaping, comprising primarily relining of football pitches in St James' Park, and upgrading of temporary replacement football pitches elsewhere, etc., will commence before the 33-month construction period. Other landscaping works may be required to continue after the 33 month period. A detailed description of the proposed construction works is included in the Appendix to Chapter 2 in Volume 4 of the ES. This includes a proposed work programme and the possession strategy for railway works.

2.4.2. Code of Construction Practice

During construction the contractor will be required to operate under a Code of Construction Practice that will include an Environmental Management System (EMS). It will set out a variety of control measures for managing the environmental effects of construction works including, for example, adherence to published guidance including Pollution Prevention Guidance (PPG), restrictions on working hours, limits on noise and dust, pest control, and, if required, temporary protection for properties closest to working areas.

A procedure will also be proposed for establishing a Community Liaison Group (CLG). The contractor will be required to participate in consultations prior to and during works and inform the public prior to activities that may cause disturbance.

The contractor and SPT will work with the CLG to agree mitigation proposals at agreed locations, if required. The EMS will also include procedures dealing with complaints, ensuring that they are logged and that prompt action is taken where necessary.

2.4.3. Construction Compounds

Construction of GARL is planned due to take place in 2009. As the work will take place over an extended period the Contractor will need various secure places to store plant, equipment and material and to assemble engineering components. Suitable locations for these construction compounds have been identified and the following, relating to which section of the scheme being worked on, are proposed:

Branch Line Construction Compounds:

- Area of car park immediately to the east of MSCP No. 2;
- Area surrounding site of existing airport fuel farm;
- Southern half of the playing fields to the west of St Andrew's Crescent (with a temporary access from this road) and also area to the south of the proposed fuel farm site;
- Eastern half of St James' Park (with a temporary access from the A726);
- Car parking area south of Clark Street in Murray Business Area; and
- Site north of Murray Street in the Murray Business Area.

To improve access to the St James' Park Construction Compound and to avoid using the entrance on Greenock Road, a new temporary entrance will be constructed at the south-eastern corner of the park, opposite the entrance to McFarlane Road. A temporary signalised junction will be provided at this point.

Main Railway Line (west to east) Construction Compound:

- Area of land immediately to the south of the Paisley viaduct between Renfrew Road and East Buchanan Street owned by NR (with access from East Buchanan Street);
- Area at the junction of the dismantled Arkleston Branch to the north of the main line but within the NR boundary;
- Area of land owned by NR to the south of Arkleston Road bridge next to Barshaw Golf Course (with access from Arkleston Road);
- Area to the south of Fifty Pitches Road immediately to the north of Cardonald Junction (with temporary access from Fifty Pitches Road);
- Area of land owned by SPT to the east of the Transco Gas Holder north of the railway (with access from Broomloan Road near the junction with Paisley Road West);
- Area of land on the site of a demolished works adjacent to the railway at Shields Junction (with access from Cornwall Street South); and
- Area of Central Station undercroft to the south of Midland Street (using an existing access from this street).

The locations of the proposed construction compounds are shown on Figures 4.1 to 4.5.

2.4.4. Haul Routes

Defined haul routes will be used for transporting men and materials to the construction compounds. For the branch line compounds these routes will all be by road, predominantly via the M8. North of the motorway, compounds will be accessed via the local road north of the M8 heading east from Junction 29 (St James' Interchange) and the airport roads, returning to the M8 via Junction 28 and/or 29.

For compounds south of the M8, vehicles will exit the M8 at Junction 29 southwards onto the A726. From this point vehicles will either turn left at the temporary signalised junction into the compound at St James' Park or right, into McFarlane Road. From McFarlane Road, vehicles will use North Greenhill Road to access Clark Street and Murray Street (via McKean Street).

Occasionally, however, where Clark Street and Murray Street are temporary closed, access to the Murray Business Area may be required via Greenock Road and/or Greenhill Road, respectively. Haul routes for the branch line works are shown on Figure 2.2.

For works on the main railway line, the majority of materials will be transported to each construction compound by rail, as these are all adjacent to the railway. However, road access will be required for personnel to enter these sites and the local road network will be utilised in each case.

Approximate numbers of vehicle movements relating to each access road / haul route are included in the Appendix to Chapter 2.

2.5. Operation

It is intended that GARL will be operating by 2009. Service frequency will generally comprise a train every 15 minutes between Glasgow Central and Glasgow Airport stopping only at Paisley Gilmour Street. Trains will initially be 3 or 4 cars long with the capacity to extend to 6 or 8 car trains. Current timetabling has trains operating from 0539 to 2345 from Platform 11A at Central Station and the journey time will be approximately 16 minutes.

2.6. Alternatives Considered

The development of the scheme has had a relatively long gestation period and a range of alternatives has been considered over the years. The following sets out the alternatives considered. These include:

- Strategic Alternatives;
- Glasgow Airport Station location;
- Branch Line alignment and configuration;
- Main line options; and
- Relocation of the Fuel Farm.

2.6.1. Strategic Alternatives

Since the late 1980s, a number of studies have been commissioned into the feasibility of building a rail link to Glasgow Airport. The two main studies are summarised below.

2.6.1.1 MVA Glasgow Airport Links and Cross-City Links (1998)

Transportation consultants MVA was commissioned in April 1998 to evaluate various options for providing an enhanced public passenger transport link to Glasgow Airport in combination, where appropriate, with alternative Cross City Rail options. Airport options considered included Paisley St James; Arkleston Heavy Rail; Renfrew / Braehead Heavy Rail; Cross Clyde connection with Yoker North Electrics; a fixed track link from the Airport to Paisley Gilmour Street; and more frequent bus services between Glasgow City Centre and the Airport. The options were assessed on the basis of

- Demand and revenue forecasts;
- Assessment of operational issues, including the impact on the existing rail network
- Estimates of capital and operating costs;
- Assessment of environmental issues; and,
- Impact on land use and development proposals.

At the end of the initial stage of the study the options were narrowed down to the following:

- Paisley St James – four trains an hour between the airport and Glasgow Central Station;
- Paisley St James via St Johns Link – four trains an hour between the airport and Queen Street Station; and
- The people mover link between the airport and Paisley Gilmour Street.

A more detailed appraisal was then carried out combining both the forecast airport passenger and airport employee forecasts with other non-airport travellers within the Glasgow area. Further work was undertaken refining the operational aspects of the options. From this it was found that estimates of the operating costs of the people mover were substantially increased based on the experience of the People Mover used at Stansted Airport. Overall, the best performing option was the Paisley St James to Glasgow Central option.

2.6.1.2 SKM Rail Links to Glasgow and Edinburgh Airports (March 2002 to February 2003)

Introduction

The Scottish Executive commissioned Sinclair Knight Merz (SKM) to undertake an assessment of Rail Links to Glasgow and Edinburgh Airports. The study was conducted in four phases culminating in the Final Report published in February 2003 (*Rail Links to Glasgow and Edinburgh Airports*, SKM, 2003).

Methods

In Phase 1 a wide range of infrastructure options were identified and appraised using a simplified STAG methodology, which includes an environmental component. In Phase 2 a shortlist of the Phase 1 options were developed to a series of service options. The methodology of Phase 2 was to:

- Develop preliminary engineering designs and to derive capital costs;
- Calculate operating costs;
- Prepare demand forecasts (single year);
- Examine rail capacity issues and other operational constraints;

- Present information in STAG Part 1 Appraisal Summary Tables (AST);
- Undertake discussions with stakeholders; and
- Develop a shortlist of options to take forward to Phase 3.

The objectives of Phase 3 were to:

- Undertake a detailed appraisal of the short listed options using STAG methodology;
- Assess robustness of core appraisals; and
- Prepare advice on funding and procurement options.

Phase 4 comprised the reporting stage of the project.

Glasgow Airport Options

Infrastructure options for Glasgow Airport and Glasgow City Centre were appraised in Phase 1 as shown in the following tables.

Table 2.1 SKM Glasgow Airport Options

Reference	Description
GA1	Heavy rail link from Paisley St James Station
GA2	Heavy rail link along the former Arkleston Branch
GA3	Heavy rail link from Cardonald via Braehead and Renfrew
GA4	Heavy rail link from Jordanhill via a Tunnel under the Clyde
GA6	Tunnelled heavy rail link via Braehead, Renfrew and Paisley St James
GA7	Tunnelled heavy rail link from Paisley St James
GA8	Heavy rail link from Jordanhill via a Tunnel under the Clyde, combined with St James Link in tunnel. North of the Clyde, services to run via Anniesland and Maryhill to Queen Street High Level

Table 2.2 SKM Glasgow City Centre Options

Reference	Description
GC1	Central Station
GC2	St John's Link (Crossrail) to Queen Street Station
GC3	Glasgow International Link to New Cowlairs International Station
GC4	City Centre Tunnel with one and two station variants
GC5	St John's Link (Crossrail) and Strathbungo Link
GC6	Barnhill Link to Cumbernauld Line
GC7	Glasgow Central – Shotts – Edinburgh Service
GC8	Glasgow Queen St High Level via Cowlairs Chord

Results

For the Glasgow Airport options Phase 1 it was concluded that, if the amenity and environmental impacts on St James Park were considered to be unacceptable, then option GA1 should be ruled out. In addition, it was considered unclear as to whether surplus revenues would be sufficient to cover the cost of the additional tunnelling that would be required under the park for Option GA7. Nevertheless, both of these options were considered preferable to the other options proposed at this stage.

In terms of the City Centre options the following infrastructure options were taken forward to Phase 2:

- GC1: Central Station;
- GC2: St John's Link;
- GC5: Strathbungo Link; and
- GC3/6/8: Various service options, either alone or in combination with GC1 or GC2.

The study found that the high capital costs associated with the tunnelled option (GC4) could not be justified by the additional demand and revenues resulting. In Phase 2 these short listed infrastructure options were developed into service options as described in the next table.

Table 2.3 Phase 2 Options

Reference	Description	Phase 1 Infrastructure Components
Glasgow 1	Glasgow Airport via Paisley Gilmour Street to Glasgow Central	GA1/GA7 and GC1
Glasgow 2	Glasgow Airport via Paisley Gilmour Street and Queen Street Low Level and to Charing Cross	GA1/GA7 and GC2
Glasgow 3	Glasgow Airport via Paisley Gilmour Street to Glasgow Central, plus Glasgow Airport via Paisley Gilmour Street and Cowlairs Chord to Queen Street High Level and continuation to Aberdeen and Stirling	GA1/GA7 and GC1 plus GC8

Reference	Description	Phase 1 Infrastructure Components
Glasgow 4	Glasgow Airport via Paisley Gilmour Street to Glasgow Central, plus Glasgow Airport via Paisley Gilmour Street and Cowlares Chord to Queen Street High Level and continuation to Edinburgh	GA1/GA7 and GC1 plus GC8
Glasgow 5	Glasgow Airport via Paisley Gilmour Street to Glasgow Central, plus Glasgow Airport via Paisley Gilmour Street and minimal new infrastructure to allow continuation to Cumbernauld, Falkirk Grahamston and Edinburgh	GA1/GA7 and GC1 plus minimal new infrastructure
Glasgow 6	Glasgow Airport via Paisley Gilmour Street to Glasgow Central, plus Glasgow Airport via Paisley Gilmour Street, West Street Station, Cowlares Link, Croy and Falkirk High to Edinburgh.	GA1/GA7 plus GC1 and GC3

It was initially concluded that Option Glasgow 1 (four trains per hour (tph) to Glasgow Central) was the only option where revenues would come near to covering operating cost. It would also have the lowest capital costs and therefore this option was the only one taken forward to Phase 3. However, following further work it was decided to take forward the following options to the next phase:

Table 2.4 Phase 3 Options

Name	Description
Glasgow Central	4 tph to Glasgow Central, using infrastructure options GA1 and GC1
Queen Street	4 tph to Queen Street Low Level using infrastructure options GA1 and GC2
Glasgow Central Plus	4 tph to Glasgow Central, using infrastructure options GA1 and GC1, plus 2tph longer distance services to Edinburgh either via Carmyle or Cowlares
Queen Street Plus	4 tph to Queen Street Low Level using infrastructure options GA1 and GC2, plus 2tph longer distance services to Edinburgh either via Carmyle or Cowlares

In Phase 3 these four short listed options were further appraised on the basis of consultation with Railtrack, planning and land use issues, major risk factors and environmental issues. In terms of environment it was concluded that for the Shields Road Junction to Glasgow Airport section:

- Properties close to the St James' Link branch line could be subject to temporary air pollution from dust, with 50 properties within 100m, during construction;
- Rock cutting at Arkleston during construction could generate air pollutants and dust. There are 25 properties within 100m of the works;
- The bridge over the M8 may affect the flight path of Whooper Swans;
- The St James' Link would be overlooked by residents of Greenhill Road, McFarlane Street and Greenock Road. In Greenock Road 3 properties would have clear views of the Link and 14 properties on Greenock Road would experience visual intrusion;
- There would be substantial adverse impacts on recreational users of St James' Park due to loss of football pitches;
- Impacts on residents of Greenock Road would be substantially adverse;
- The Four Square tobacco factory on the corner of Greenhill Road and Clark St is listed and could be partially demolished (Category B listed);
- Views from the Park to the towers and spires of Paisley could be affected;
- There would be potential severance of St James' Park depending on the character of viaduct structure.

In addition, service patterns into Glasgow favoured the Glasgow Central option, as it was the option where revenues came closest to operating costs. However, service patterns via St John's link were retained, as capacity at Glasgow Central was not yet established. The report did not identify any environmental issues associated with Glasgow Central.

2.6.2. The Ministerial Decision

The SKM work and ASTs produced formed a STAG submission on which the scheme was approved. Following the conclusion of the SKM work, the Minister for Transport and Telecommunications at the Scottish Executive announced in March 2003 that financial provision would be made for a heavy rail link to Glasgow Airport. His backing was for a preferred scheme from the Airport, via St James, to Glasgow Central Station, operating every 15 minutes. SPT was awarded immediate funding to undertake design and engineering work and preparation for the necessary Parliamentary Powers.

2.6.3. Faber Maunsell 2004/2005

In providing Preliminary Design and Parliamentary Submission services for GARL Faber Maunsell has considered various alternatives for the location of the airport station, the alignment and configuration of the

high level crossing of St James' Park and the configuration of main line works. These alternatives are discussed below and the options selection process described.

2.6.3.1 Glasgow Airport Station

Initially 10 potential locations for a new station at Glasgow Airport were identified. These were options A to F plus G1 to G4. These options are shown in Figure 2.3 below:

Figure 2.3 Glasgow Airport Station Location Options

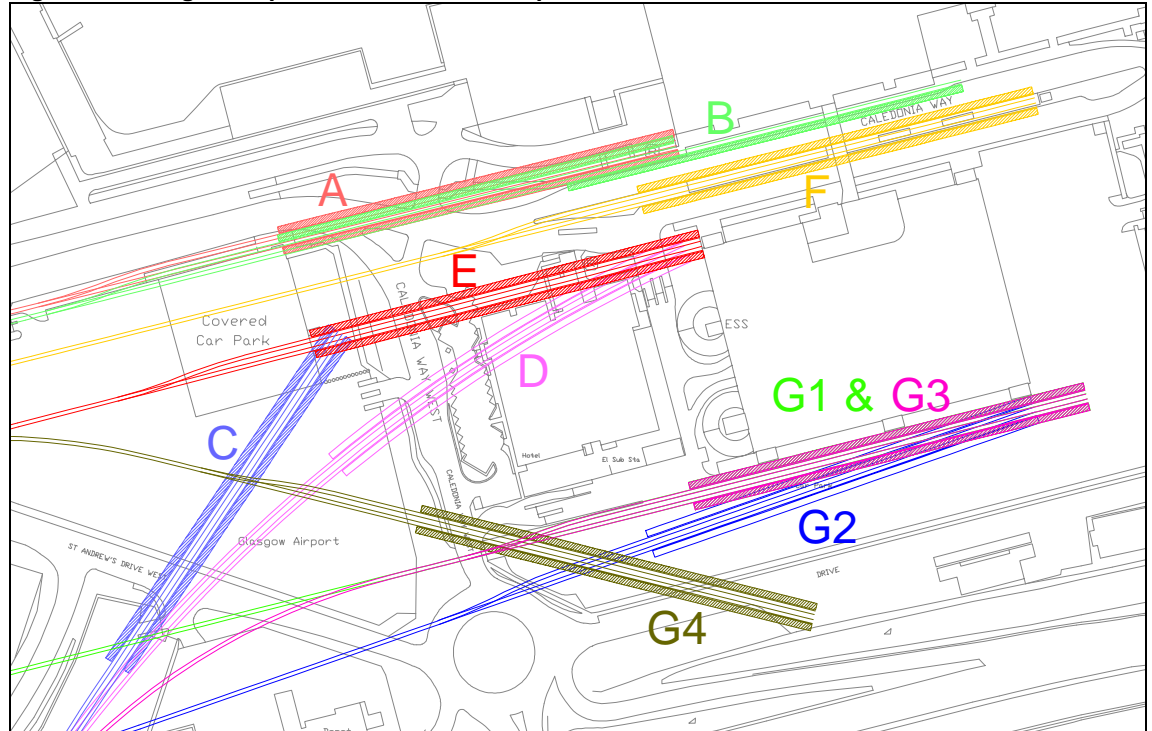


Table 2.5 shows the initial option selection appraisal for each of the station locations.

Table 2.5 Airport Station Location: Option Selection

Option	Comments
A	Would preclude westerly expansion of airport terminal, easterly extension of railway and extension of station platforms.
B	Would preclude westerly expansion of airport terminal, full easterly extension of railway and extension of station platforms.
C	Would require demolition of residential properties on Greenock Road, and precluded full easterly extension of railway and extension of station platforms.
D	Would require demolition of residential properties on Greenock Road, and precluded full easterly extension of railway (unless Multi-storey Car Park (MSCP) No2 was demolished). Station platforms located on a curve.
E	Would require Holiday Inn Hotel to be demolished and relocated. Would preclude full easterly extension of railway, (unless MSCP No2 demolished).
F	Would allow easterly extension of railway and station platforms to be extended. Would constrain southerly expansion of airport terminal and modifications to Caledonia Way.
G1	Would allow easterly extension of railway and allow station platforms to be extended. New elevated walkway with travelators required. Removal of fuel farm required.
G2	Would allow easterly extension of railway and would allow station platforms to be extended. Elevated walkway with travelators required.
G3	Would require demolition of residential properties on Greenock Road. Would allow easterly extension of railway and allow station platforms to be extended. Elevated walkway with travelators required.
G4	Would make easterly extension of railway very difficult. However, would avoid impact on fuel farm (benefit over G1).

It was concluded that:

- Options A, B and E should be dropped because they precluded expansion of the airport terminal and/or the railway. Option E would also require the Holiday Inn to be demolished,
- Options C, D and G3 would require demolition of residential properties as well as precluding expansion of the railway (apart from G3)

Options F, G1, G2 and G4 were therefore taken forward to the next stage. Subsequently option F was sub-divided into two variants, F1 and F2 (where F1 was the original Option F revised to terminate at the existing link bridge between MSCP No. 2 and the airport terminal building and F2 was option F shortened so that it terminated as far to the west as practicable). Further appraisal rejected options G2 and G4:

- G2 was rejected because, although its alignment avoided the existing fuel farm, the required crossings of the M8 and airport access roads were not considered to be viable; and
- G4 was rejected because, although its alignment avoided the existing fuel farm, it was the longest route and therefore the most expensive to construct, as well as being the option that placed the station furthest from the airport terminal

Thus the options were narrowed down to F1, F2 and G1 and these were assessed in more detail. This assessment concluded that:

- Option F2 offered a shorter branch line route than Option F1, and by stopping short of the airport forecourt avoided many of the construction problems, high costs and safety risks associated with building and operating a facility in that area. It posed a lesser risk to the terminal building in terms of security, but increased walking distances for passengers compared to F1. However, both options would have limited the future expansion of the airport terminal, piers and aircraft stands proposed in the Airport Masterplan.
- Option G1 significantly reduced the security threat to the airport, although it increased the walking distances and visibility between the station and the key arrivals and departure points within the airport terminal, thus potentially impacting on patronage.

As part of this assessment an environmental appraisal of the short-listed options was undertaken.

It was considered that option G1, although occupying land of low landscape quality (i.e. car parks) and with the only sensitive receptor being the Hotel (which would have oblique and aerial views), would appear visually disconnected from the airport building, potentially resulting in additional pedestrian connections and associated clutter. Therefore, in visual terms this option would be more likely to appear as a disharmonious and discordant development than options F1 and F2.

Station locations F1 and F2 were considered to bear a more direct and immediate relationship to the terminal building and would, if well designed, appear in scale and harmonious with the current airport landscape at this point. Of these, the landscape and visual preference, assuming appropriate and attractive architectural design, was for option F1 as it came slightly closer to the existing buildings than option F2. Therefore, in landscape and visual terms, option F1 was preferred.

In terms of noise and vibration, it was thought likely that the options would have similar impacts in terms of their operations, although option G1 would be likely to have a lesser impact than options F1 and F2, as these latter two options were located closer to the airport terminal, whilst G1 was shielded from the terminal by other buildings such as car parks.

However, it was noted that option G1 would necessitate demolition of the existing fuel farm with attendant risks from ground contamination that may impact on the water environment arising from release of hydrocarbons, etc., during demolition, or if discovered during ground works. In addition, the proposed new location of the replacement fuel farm close to the Paisley Moss LNR, although within operational airport land, might have impacts on this designated ecological site and associated water resource receptors.

In terms of Land Use and Amenity it was concluded that there are no significant differences between options for these parameters. For Air Quality all options were likely to have a similar impact, although there may be localised air quality issues in the relatively enclosed public space that would be created beneath the station structure (depending on design) for options F1 and F2, particularly if motor vehicles continued to use this space.

Finally, no listed buildings or known archaeological sites at the airport would be affected by any of the options and therefore impacts for Archaeology and Cultural Heritage for all options were likely to be negligible.

Overall, it was considered that option G1 was the least preferred in environmental terms because of the requirement to decommission the existing fuel farm and to relocate the facility to the vicinity of the Paisley Moss LNR. Faber Maunsell therefore initially recommended option F2 to be taken forward, because it provided close connection to the terminal building, without generating the construction issues associated with F1, and did not require the demolition of the existing aviation fuel farm.

Ultimately, however, of the proposed options, G1 was selected mainly on the basis that it did not clash with the BAA Masterplan for Glasgow Airport. In addition, G1 provided a good fit with BAA's commitment to the generation of a new transport hub at the airport.

Contributory factors for selection of G1 were that it did not prevent expansion of the airport terminal, did not cause disruption to Caledonia Road and it was considered a lower security threat. The issue of distance from the current terminal was solved with the introduction of the elevated pedestrian link. However, it was conceded that this option would require the relocation of the existing aviation fuel farm.

2.6.3.2 Branch Line

Four options were proposed for the branch line between the Inverclyde Line and Glasgow Airport. This work was undertaken in parallel with the airport station location study discussed above. The branch line options were:

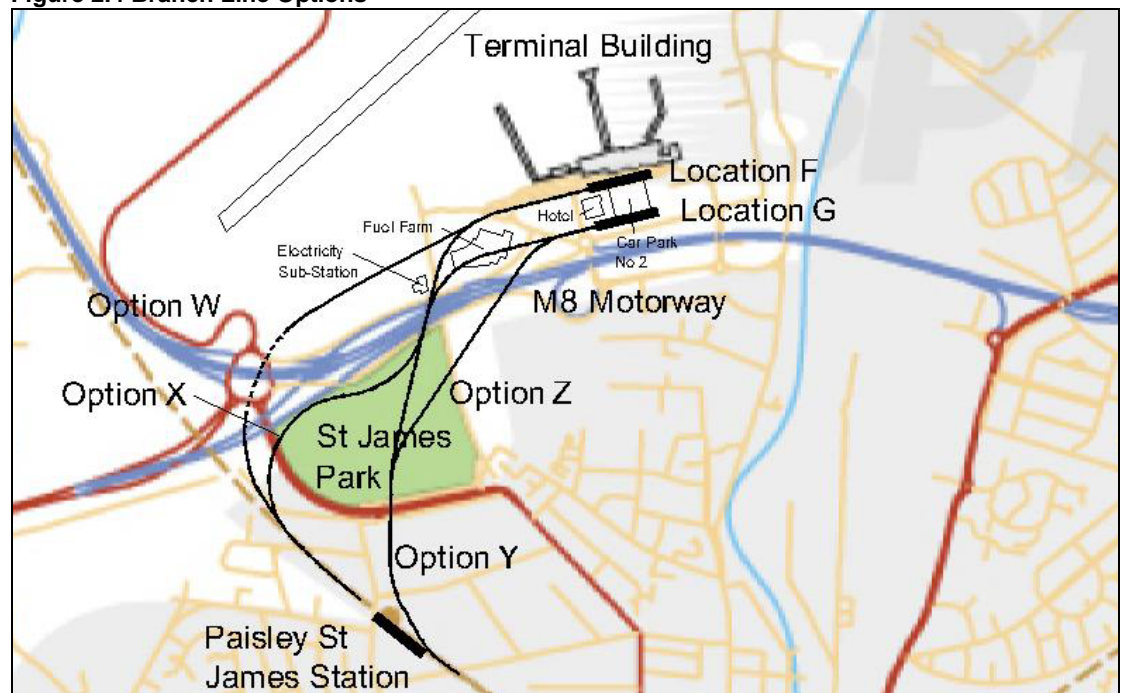
- Option W – which avoids St James' Park by passing through the St James' Interchange (M8 Junction 29);
- Option X – which skirts the northern side of the St James' Park;
- Option Y – which goes through the centre of St James' Park; and
- Option Z – which enters St James' Park then crosses Greenock Road and the M8 before reaching the Airport.

In addition to these four options, a study was undertaken on the merits of constructing an additional branch line from Glasgow Airport to Gourock to permit through running of existing services from the Inverclyde Lines to Glasgow Central via the airport, with a view to eliminating the need for dedicated airport services.

This route would have entailed construction of a branch line from a point west of Paisley St James Station, across either St James' Park or the Paisley Moss LNR. However, an initial assessment suggested that the Gourock branch line did not offer a feasible alternative to a dedicated airport service from Central Station, as it performed poorly in terms of limited patronage, cost and land-use (loss of football pitches and residential properties) and/or environmental impact (direct damage to Paisley Moss LNR). This option was therefore not considered any further.

A diagram (Figure 2.4) showing the options W, X, Y and Z is included below together with the favoured locations for the Airport Station.

Figure 2.4 Branch Line Options



The alignment and environmental appraisal for each route is summarised below.

Option W

This route leaves the main line and follows the existing railway tracks westwards, drops down on a gradient of 2% behind the properties on St James' Avenue and passes underneath St James' Interchange and the M8 in a tunnel. The alignment rises again on a gradient of 2%, and continues upwards on an elevated structure over St Andrew's Crescent at the western end of Glasgow Airport. From there the alignment continues on a viaduct to a proposed elevated station in front of the terminal building or south of MSCP No.2.

It was concluded that vertical clearance issues would impact on the highways in the western areas of Glasgow Airport requiring a redesign of the airport network. The route would impact severely on Paisley

Moss LNR, the residents of St James' Avenue and the Abbotsinch Development, where residential property and gardens would be lost. Above all, the construction of a tunnel underneath St James' Interchange introduced significantly more risk and increased capital costs. The potential for consequential carriageway disruption on the M8 would need to be resolved. Option W was therefore dropped at an early stage of the assessment.

Option X

This route leaves the main line and follows the existing tracks westwards, rising up on a gradient of 2% behind the residential properties on St James' Avenue. The elevated structure then turns eastwards and crosses over the A762 on a new bridge structure. The alignment continues on an elevated structure, skirting around the northern boundary of St James' Park, parallel with the M8 motorway. At the northeast corner of the park the alignment turns northwards and crosses over the M8 on a new bridge and then continues on a viaduct within Glasgow Airport to a proposed elevated station either in front of the terminal building or south of MSCP No. 2.

This route reduces the impact on St James' Park but increases impact on the residents of St James' Avenue, where there may be loss of property. The amount of horizontal curvature on the alignment is less desirable than any of the other routes with a potential impact on ride quality and operational feasibility. Environmental issues associated with this option are as follows:

- This option avoids going through the centre of St James' Park and would entail loss of fewer football pitches than for Option Y and Z.
- This option would pass close to houses at the northern end of St James' Avenue (that currently abut the railway) and would entail loss of part of some gardens, and in the worst case up to 4 residential properties. Options Y or Z would not impact these properties. However, the option would be located considerably further from houses on Greenock Road than Options Y and Z, apart from those situated at the northern end of the Greenock Road, close to the M8, where the route would go no closer to them than Option Y.
- The proximity of the route to the houses on St James' Avenue may introduce noise and vibration to remaining houses in this area, although these houses are already situated close to a busy railway and the St James' interchange of the M8.
- A line and viaduct/ bridge running close to, and against the background of, the existing interchange over-bridges and at a similar level would be unlikely to result in significant adverse landscape or visual impacts. However, localised felling of mature trees to the north and west of St James' Avenue may be required for construction, and there may be localised adverse impacts upon the townscape and visual amenity of St James' Avenue receptors due to the close proximity of the route. However, in landscape and visual impact terms, this option would be favoured over Option Y and Z.
- The route would pass through an area of unused ground at the northern end of St James' Avenue. Initial observations indicate that this area has been subject to natural regeneration and may be of ecological value, particularly as it adjacent to a Renfrewshire Council SINC and close to the Paisley Moss LNR. Although not designated in its own right, sites such as this become important where they link other ecologically important areas. However, it is known that development is scheduled for this area and therefore the ecological value of the area would probably not be significant at the time of construction of the Branch Line.
- As mentioned above the airport station location study was undertaken in parallel with the branch line study. It was noted that if airport station option G1 was selected then this would require alignment X to pass through the existing aviation fuel farm, which would have to be located. Option Z would not require removal of the fuel farm.

Option Y

This route leaves the main line and rises on an embankment at 2% away from the station and crosses Clark Street on a new structure. Continuing to rise on an elevated structure, the route passes behind the listed Four Square Tobacco factory and crosses McFarlane Street and the A762 on new structures. The route continues on an elevated alignment through the centre of St James' Park towards the northeast corner of the park before crossing the M8 motorway on a new bridge. Within the airport the route continues on a viaduct to a proposed elevated station in front of the terminal building (Option F2) or south of MSCP No. 2. (Option G1).

This route provides the most straightforward alignment and has the least impact on residential properties (with none being directly affected). However, the route crosses the centre of St James' Park, which would increase environmental impacts such as noise, landscape and visual impacts, as well as loss of amenity where the most significant impact would be permanent loss of football pitches.

Environmental issues associated with this option are as follows:

- This option crosses almost directly through the centre of St James' Park, and would entail the loss of more football pitches than the other options considered, resulting in significant loss of amenity. It was noted that it was likely that a greater area would be lost if the route were placed on an embankment rather than a viaduct and/or if two tracks were developed rather than a single track. In land use terms, this option is less favourable than Options X or Z.

- Visual impact is likely to occur through proximity of the route to houses (on Greenock Road) and landscape impact due to fragmentation of open parkland area. However, it was considered that a viaduct, could be a positive landscape element, and would be better than an embankment in this regard.
- The proximity of the route to housing on Greenock Road and its proposed elevation is likely to generate noise impact for these properties. In addition, there would be some noise impact for users of St James' Park. This impact would be greater than for Option X but less than that associated with Option Z.
- Ecological impact is not likely to be significant as this option does not pass through any of the designated sites or sites of potentially ecological interest in the area.
- The option has potential impacts on a listed building (the Four Square Tobacco Building) at the corner of Clark Street and Greenhill Road. Construction of the link may result in a loss of setting.
- It was noted that if airport station option G1 was selected then this would require alignment Y to pass through the existing aviation fuel farm, which would have to be located. Option Z would not require removal of the fuel farm.

Option Z

This route leaves the main line and rises at 2% on an embankment away from the station and crosses Clark Street on a new structure. Continuing to rise on an elevated structure, the route passes behind the listed Four Square Tobacco factory and crosses McFarlane Street and the A762 on new structures. The route continues on an elevated structure and turns eastwards across the south east corner of St James' Park. The route then crosses Greenock Road and continues to rise over the M8 motorway on a new bridge close to the existing Airport junction. The route continues on a viaduct within Airport Station and terminates at a proposed station south of MSCP No. 2.

This option would provide the most direct route to the airport, leading to improved run times and ride quality and has less impact on St James' Park. However, the alignment would have a major impact on Greenock Road residents and would require at least three properties to be purchased. Remaining properties would be severely impacted by visual and noise issues due to the close proximity of the alignment. Environmental issues associated with this option are as follows:

- There would be significant impacts in terms of land use as this option would involve Compulsory Purchase and the demolition of houses on Greenock Road. In addition, some football pitches would be lost resulting in loss of amenity, although fewer pitches would be lost than with Option Y.
- This option would pass closer to the remaining houses of Greenock Road (i.e. to the front of the houses to the south and to the rear of houses to the north) than other options, resulting in increased noise and vibration impacts for these remaining houses.
- In landscape terms this option is the least preferred as it would bring the structure close to the front and rear of houses on Greenock Road and would constitute a significant impact.
- In terms of landscape, visual, noise/vibration and land use, therefore, (including the aforementioned loss of residential buildings) Option Z is likely to be the most environmentally damaging and hence the least preferred from an environmental standpoint.
- It was noted that this option would work with station location G1 and would not require demolition of the fuel farm.

2.6.3.3 Conclusions

The results of the initial assessment demonstrated that Option W was the least attractive of all the routes considered and scored poorly in nearly all of the criteria against which it is assessed. This option was dropped at an early stage.

Although Option X ranked almost equally with Option Z after the initial assessment, the more detailed review of this option confirmed that it would be the most expensive of the three. It also presented a number of concerns, particularly for operation and maintenance resulting from having the least desirable alignment. It was therefore recommended that Option X be discarded.

Option Z offered similar benefits to Option Y but scored poorly on grounds of environmental impact because of the detrimental effect on Greenock Road properties.

On the basis of the findings from both initial and detailed assessment of options, Option Y offered the best overall route for the construction and operation of the branch line. The key benefits of adopting Option Y as the preferred solution were that it:

1. Avoided purchase of residential property on St James' Avenue and Greenock Road.
2. Would be likely to be one of the cheapest to construct (along with option Z)
3. Avoided the construction and maintenance risks associated with option X.
4. Limited noise and vibration impacts on properties surrounding St James' Park.
5. Provided an alignment to an airport station located either to the north or south of MSCP No. 2.

However, it was noted that Option Y would require decommissioning and relocation of the existing aviation fuel farm at Glasgow Airport.

It should be noted that in the material prepared for the Public Consultation, which began on 1st November 2004, Options W, X, Y and Z were re-labelled A, B, D and C.

2.6.4. Main Line Options

Early work on the project established that the addition of the 4-trains per hour Airport Rail Service onto the Main Line between Glasgow Central Station and Paisley St James' would result in severe capacity problems on what is already a very constrained section of route. Different ways of providing additional capacity in the form of adding one or two tracks to the existing two-track network were therefore examined.

The final recommendation was for a three track (in total) layout to be provided between Shields Junction and Arkleston Junction. Improvements for Wallneuk Junction were also proposed. This involved the relocation of the junction eastwards away from Paisley Gilmour Street allowing a higher speed facility with greater capacity. No specific environmental appraisal of main line options was undertaken; however, it was considered that environmental issues would not be the determining factor for the configuration of the main line.

2.6.5. Airport Fuel Farm

Construction of an aviation fuel farm at Glasgow Airport forms part of the GARL scheme, as the existing facility lies within the scheme route alignment within the airport (alignment options Y and station location G1). The new site was selected by BAA from a number of alternatives, based mainly on planning suitability and best fit with the airport Masterplan. This selected site is located to the west of St Andrew's Crescent and to the east of the Paisley Moss LNR. The proposed new fuel farm will be a like for like replacement for the existing fuel farm, in terms of capacity and operational parameters. The site although unoccupied is zoned in the Local Plan for airport operational use.