

BAA – Sustainable Construction at Terminal 5

Company background

BAA is the world's leading airport company, responsible for managing the complex airport environment including:

- Safety and security
- Operation of air bridges, taxiways, aprons, runways and lighting
- Shops and commercial facilities such as catering, car hire, bureaux de change, car parks
- Flight information display systems
- Information desks and help points, and
- Utilities and cleaning.

BAA serves over 133 million passengers at its seven UK airports, including the world's busiest international airport, Heathrow. It also has management contracts or stakes in ten airports outside the UK, plus retail management contracts at two airports in the USA. BAA pioneered airport privatisation and retailing, and is recognised for its responsible and efficient airport operations.

These achievements have been underpinned by BAA's sustained concern for managing the environmental and other impacts of aviation. The company strives to deal with its employees, customers and business partners honestly, fairly and with respect. It measures itself against the most demanding standards of corporate responsibility and regularly wins recognition for its efforts.

Heathrow Terminal 5

In the next 11 years, BAA will invest over £8 billion in its south east UK airports alone including Terminal 5 at Heathrow. The biggest construction site in Europe, building began in September 2002 and the new Terminal is scheduled to open in 2008. It is a £4.2 billion investment that will take 37 million person-hours to complete. Its construction requires the movement of 6.5 million cubic meters of earth (enough to fill the new Wembley Stadium 1.5 times), and 4 times the structural steel of Wembley, whilst the interior space in the main terminal could accommodate 50 football pitches. The enquiry process lasted 46 months – the longest in British history.

Elements of the Terminal 5 project include the main terminal, two satellite terminals, an air traffic control tower, connections to public transport, road works, rails and tunnels. BAA is committed to factoring environmental impacts into its decisions on design, procurement, construction, training and awareness in order to manage risks and maximise opportunities for this complex project.

Risk-based environmental management

BAA's sustainability focus is on understanding risks and planning responses to those. They have strived to create an environment and systems to *actively* manage risk and maximise opportunities for everyone involved. But whilst maintaining a risk-based approach, BAA is not satisfied with 'business as usual'. The company strives to achieve best practice as a minimum, and its ambition is to achieve 'exceptional performance', establishing new environmental standards and solutions.

As a result, an extensive programme of safeguards and mitigation plans has been established to protect the environment and the interests of local people during the construction of Terminal 5. These, as well as planning and legislative requirements, are delivered through BAA's Environmental Management System (EMS) and co-ordinated by a specialist environmental team.

BAA engages internal experts to set environmental targets, objectives and KPIs to manage performance. It also consults external experts to advise and challenge its approach, and conducts meetings with regulators to achieve optimal design and compliance.

At the beginning of any construction project, BAA sets its requirements in a project brief, which details the vision, objectives, targets and KPIs, and explores opportunities for innovation. Next, it develops subject-specific strategies to deliver these. An environmental assessment is then conducted during the design review process. Finally, at the design sign-off stage, all functional criteria and system selection documents and drawings are delivered by the project teams.

In preparation for building, a Construction Team Environment Plan is finalised, which covers planning, legal and design requirements, programme and local community issues, and contingency and mitigation measures. In order to address these, BAA implements:

- Guidance, including control plans, strategies, checklists and templates
- Supplier training, awareness campaigns and environmental leadership initiatives
- Audits and reviews, including weekly inspections, leadership walk-about and risk workshops, and
- Environmental monitoring of such impacts as air quality, dust, waste, surface and ground water, materials and noise.

Inevitably, aspects of the complex, long-term Terminal 5 project have changed as technology and regulation have evolved. Therefore, the procedures described above are regularly reviewed and adapted to arising situations.

Material use

With regard to the use of materials at Terminal 5, BAA's project objectives are to:

- Minimise resource use and improve efficiency by designing to the principles of Standardisation, Prefabrication and Modularisation (SPAM)
- Consider life-cycle impacts in the choice of materials, and
- Minimise the use of non-sustainable materials and toxic materials.

To responsibly manage material risks, a comprehensive Materials Strategy was developed over three years. The Strategy sets out the opportunities for identifying, measuring and managing environmental risks and opportunities associated with material specification, in line with BAA policy and changing environmental agendas.

In addition, the Materials Strategy sets out 'black-listed' and 'red-listed' materials. Black-listed materials are those with a very high environmental or health risk. They are eliminated from the development for the purposes of legislative compliance or

compliance with the British Standards. Red-listed materials those with a high environmental, health or reputational impact, or that are likely to be limited due to forthcoming legislative requirements. These are eliminated from the development where a practicable alternative is available.

Designers and procurers for Terminal 5 are charged with specifying environmentally preferable options where practicable. Innovative materials use is also encouraged within the design teams, including use of recycled, re-usable and sustainable materials and new technologies.

Waste and resource management

Efficient resource use and waste minimisation are high priorities for BAA in all its development activities – and no more so than at Terminal 5 where they have been considered top environmental priorities. On average, over 85% of waste material from the site is recovered and recycled.

Logistics management is one method that BAA has used to curtail waste. A complex and well-organised 'just in time' delivery system requires everyone involved in the project to be efficient about needs and requirements, and prevents over-ordering, reducing waste from both the production and construction processes.

In addition to setting guidelines for materials specification, BAA's Materials Strategy challenges designers and builders to minimise waste through innovative resource use. In response to the Strategy, the Pavement Team delivered significant resource use savings when designing the aircraft pavements and stands for Terminal 5.

The pavements are concreted areas where the planes manoeuvre prior to, and after, take-off. The stands are where they park ready for boarding/disembarking. Refinements to the pavement construction and design resulted in savings of 14,000m³ of lime and 33,000m³ of cement, and an estimated indirect savings of 100,000 tonnes of CO₂ through the reduction of lime and cement use.

Whilst reducing the amount of concrete used in the pavements and parking stands, their strength was increased in order to cope with new generation aircraft. The team achieved this by developing an improved mix, which involves reducing the water content by a third, replacing 30% of the virgin cement with Pulverised Fuel Ash (PFA) and reducing the thickness by up to 200mm, leading to a 25% reduction in the bulk materials used. This has had a significant impact, with some 27,000 less deliveries to the site, resulting in less noise and pollution, and reduced transport emissions.

It is estimated that approximately 60,000 tonnes of CO₂ will be saved from the cement production process alone. This pavement model has now been applied across the BAA group and is driving further reductions in concrete use.

Water supply

BAA set itself a challenge to reduce consumption of potable water at Terminal 5 by 70% compared with 'business as usual'. This was achieved by matching quality of supply to quality of need. Even though only 30% of water consumed in building construction requires high-quality potable water, conventional systems use 100% potable water. At Terminal 5, a system has been developed to substitute 70% of the potable water supply with non-potable water, to be used for jobs that do not demand water of the highest quality.

Two boreholes have been introduced on the site which collect rainwater and yield a totally of 35 litres/second of non-potable water with minimal treatment.

Twin Rivers diversion

One of the most critical sub-projects of the Terminal 5 construction programme was the diversion of two rivers from their original alignment through the middle of the development site. Construction could not progress until the Duke of Northumberland River and the Longford River were diverted around the western perimeter of the airport.

The Twin Rivers diversion was a complex 18-month scheme which involved not only the rerouting of two rivers, but also the realignment of a live carriageway. The challenge was compounded by strict time constraints and the works' close proximity to local residents. Further restrictions to site activities resulted from the overhead flight path of the world's busiest international airport.

To maximise their environmental value, 95% of the diverted rivers have been placed in two open man-made channels 6km in length, compared with only 50% for the original rivers which were conveyed beneath the runways in culverts. To accelerate construction and minimise the environmental impact of the works, 75% of the river walls (over 5km) were pre-cast off-site.

Pre-planted coir rolls and hazel hurdles provide habitat for small mammals along the naturalised banks. In-channel enhancements maximise the ecological value of the vertical sided channels, creating a meandering flow pattern that further boosts river biodiversity. Recycled trees offer habitat for fish and macro-invertebrates whilst gravel enhancements create a medium for over 84,000 native river plants. A programme for translocating water voles, plants, fish, freshwater mussels and riverbed silts from the original rivers assisted regeneration of the aquatic environment within the new channels.

A major programme of landscape enhancement has been implemented within the western corridor of the airport. This has been achieved by planting over 450 semi-mature trees, 2,000 semi-mature native shrubs and 100,000 evergreen groundcover shrubs.

The future of the Twin Rivers diversion has been safeguarded by the formation of the Twin Rivers Management Committee, a bespoke management body responsible for the operation and maintenance of the diverted rivers. The committee is made up of equal representation from the Environment Agency, the Royal Parks Agency and Heathrow Airport Limited.

The Twin Rivers diversion scheme has won a Civil Engineering Environmental Quality (CEEQUAL) Award for its ability to complete the project to budget and schedule while maintaining high environmental standards and quality. The key to the success of this project was the partnership between client, designer and contractor to create an integrated team.

Supplier engagement

Suppliers are crucial to BAA's success, and the company has a thorough environmental procurement system in place to manage risks and maximise 'win-wins'

with its suppliers. Its specialist environmental team not only monitors and controls potential environmental impacts, but works closely with contractors to assess the best way of mitigating these prior to any work starting.

The company sends a summary of its Materials Strategy with supplier tender packs to serve as a statement of BAA's requirements. If any red-listed materials are used by a prospective supplier, this information is used as a 'risk highlighter' during the acquisition process to assist in scoring supplier qualifications. Of course, sustainability is just one of the procurement risks that need to be managed, and expectations depend on the product that BAA is purchasing.

Suppliers are appointed under a 'T5 Agreement' which defines an integrated approach to partnering and management of risk. Once a contract is in place, BAA issues requirement packs which detail suppliers'/contractors' health, safety and environmental obligations on-site. Because technology and regulation are continually evolving, expectation of change is part of the Agreement. BAA regularly reviews performance and conducts on-site audits of its suppliers, including some 2nd and 3rd tier suppliers.

BAA strives to actively educate and coach its suppliers. Environment training and awareness campaigns are delivered and sustainability forums have been set in place to allow BAA and its suppliers to share learning and best practice with each other. BAA also runs awards and recognition schemes to reward environmental best practice. In general, suppliers respond positively to the commitment to sustainability outlined in BAA's various policy statements.

Although BAA's role as a client will undoubtedly influence UK construction as a whole, the role of its suppliers and stakeholders at Terminal 5 will be equally important in the future. Their experience of working within the groundbreaking T5 Agreement provides a new model of working which will certainly be repeated. BAA's pioneering decision to accept all risk has been integral in the development of a unique Terminal 5 culture. Those working on Terminal 5 do so innovatively and positively in integrated team with shared values. Best practice is expected as a minimum as part of the T5 Agreement. Such a standard, and the learning that comes with it, will enable the project's partners to make a major contribution to the UK construction industry in the years ahead.