Defra's Water Availability and Quality Evidence Programme

Comparative Costings for Surface Water Sewers and SuDS

Railfreight Terminal, Telford, Shropshire.

Technical Report

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1. Location and Background

1.1 The development is located on the northern edge of Telford, Shropshire, within Telford & Wrekin Borough (a unitary authority). The site is adjacent to Hortonwood, a large, modern industrial estate and the equally large MOD Donnington logistics and maintenance depot. Telford still has a high percentage of jobs in manufacturing and many of these are in companies which are dependent upon transport links to ports. Many of these companies are international ones and potentially footloose and there is a clear need to provide such companies with sound reasons to remain in Telford. The town is a regional growth point and has a young population. It therefore has a need to continue to generate a large number of new jobs each year.

1.2 The Railfreight Terminal was promoted by Telford & Wrekin Borough Council to support the existing employment base within the Borough and help to maintain conditions for continued inward investment. It also provides a rail facility for MOD Donnington which previously was the MOD's largest depot that did not have direct access to a railhead.

1.3 Although economic, employment and development aspects were important, environmental issues were also seen as a driver for the project. Rail transport produces fewer emissions of greenhouse gases and the Terminal facility was seen as a contribution that the Borough could make in terms of sustainable development and also enable local users to 'green' their supply chains; an area of likely future focus for businesses. With this as background, it was a logic step to take the sustainability theme into the details of the development itself. This aspect has included:

- Minimising the amount of surplus and contaminated excavated material to be disposed of off-site.
- Re-using features such as a concrete tank test track as a roadway.
- Incorporating 'passive design' into the office building. This has included: aspect and design details to reduce the need for heating and cooling, very high insulation levels and solar thermal water heating.
- Ensuring good access for employees who travel to work otherwise than by car.
- Replacing trees which had to be removed with new ones in a good landscaping scheme which reinforced habitats and green network.

In this context, sustainable drainage of surface water was also seen as an important issue.

1.4 The Terminal was promoted as an open access facility serving Telford and a large surrounding area to the west of the Birmingham conurbation. It was envisaged as handling all types of freight from bulk materials (such as aggregates), palletised materials and containers. The core activity within the Terminal would be the transfer of freight between rail and road modes; an activity which could involve risk if containers or pallets were dropped and contents escaped. For efficient handling of freight, especially containers, it is necessary to create large surfaced areas of very robust construction as these are used by loaded HGVs and by container handing equipment which has extremely high wheel loads. These conditions mean that the surfacing needs to be either reinforced concrete or dense macadam surfacing; both being impermeable.

1.5 Finding a site for a railfreight terminal is very challenging as they need good connectivity both to the rail network and the principal highway network as well as large areas of land (yet are seen as low value uses in themselves). After a comprehensive study of a large number of sites, this site was selected because of factors that included:

- It was brownfield and avoided incursion into greenbelt or into land otherwise zoned for higher value uses of housing or commercial development.
- It was well located in respect of the highway network and reasonably so in respect of the rail network.
- It was adjacent to a major industrial area and MOD base and therefore had potential for local ('doorstep') customers.
- It was identified in the Local Plan as a potential transport corridor.
- It was a derelict site that needed to be brought into beneficial use.

However, the site had some challenges in that:

- The western part of the site abutted residential development built in the 1960s. (This factor was a key one in configuring the Terminal, so that the most intensive cargo handling activities would be located in the eastern part of the site.)
- The site was not immediately adjacent to the rail network and the costs of reinstating a 4 km. rail link were considerable.
- The site was contaminated to varying degrees and the removal of contaminated material off site could significantly increase costs.
- The site had become naturally regenerated and in addition to its status as a transport corridor in the Local Plan, was also identified as green network.
- Surface water management would have to be carefully planned in terms of quantity and quality. The development required the creation of extensive surfaced areas where drainage had previously simply soaked into the ground or passed into land drains which flowed to the watercourses or sewer. The combined sewer was already over committed and it would not be sensible to consider this as a means of draining additional surface water. There was an underlying aquifer that was used for water supply that presented a risk which would need to be managed generally in terms of surface water run-off and also in respect of the potential for accidents with cargoes in the Terminal.
- It was very close to the lower limit in terms of site area and the internal configuration could not afford to allocate much space away from productive freight uses.

1.6 The most challenging feature of the project was that of cost and funding. The direct, balance sheet economics of rail terminals are such that few, if any, generate enough income to cover their capital costs within a reasonable pay-back period. The 'return' on the capital investment, particularly for the one at Telford, is seen as being largely in terms of wider economic and community well-being benefits. When the Terminal came to be built, the potential for partial funding from the Department for Transport had completely gone and the sources remaining comprised: the Council (borrowings), the Regional Development Agency, the Homes and Communities Agency and EU funds. Even though the Terminal is an extremely cheap one in national terms, capital funding was a very serious issue. There was therefore a stringent approach in respect of all 'non-essential' (avoidable) costs within the project i.e. those costs that did not directly contribute to useable freight handing assets. This pressure on cost was worked through in conjunction with the sustainability theme in respect of the details of the Terminal. It was found that there were generally not significant conflicts between these two. Within the areas of 'non-essential' costs the focus particularly came on matters such as:

- Surface water drainage.
- Highway construction standards and detailing.
- Disposal of surplus excavated material from site.

1.7 The development received its core planning permission through a Transport & Works Act Order (T&WAO). This process requires a thorough environmental impact assessment and provides the arena for the full range of issues and objections to be tabled. The Council as promoter had been actively managing these issues prior to the submission of the application for the Order. This work included very extensive discussions with the Environment Agency over surface water management and remediation of contaminated land. As a result of this work, the T&WAO did not need to go to a public inquiry and the small number of objections remaining were handled by the Department for Transport through written representations. The Order was made on April 2004. At this point in time, the promoter was still working hard on the costs of the project and on a funding package. Ultimately, costs had been brought down to a level that matched available funding sources and work on the construction of the Terminal started in 2008 and it was opened in April 2009.

1.8 The project was designed and managed by a team within Telford & Wrekin Council. This team undertook all liaison and negotiations with those parts of the Council which have regulatory responsibilities (e.g. planning, highways and environmental health), with utilities, the Environment Agency, Network Rail and other bodies such as the Department for Transport and the Office of Rail Regulation.

1.9 The National Grid Reference of the site is: SJ 692132.

2. Site Characteristics

2.1 This is a 20ha site which is situated in an area with relatively flat topography. Adjacent to the site are two large plots which are allocated for warehouse development within an overall logistics park concept. The Terminal site is linear in form and was formerly on the railway route between Shrewsbury and Stafford and included a large railway siding area owned by the MOD together with other former MOD land. The railway was closed as a through route in the 1960's, but the sidings continued to receive traffic until 1990 when all of the tracks were lifted. Thereafter the site was used for storing military equipment and a tank test track was built on part of it. The site was therefore brownfield. However, the previous uses had not created impermeable areas of any significant extent and the site was therefore essentially greenfield in terms of surface water run-off. In the 1970s, as part of the development of Telford New Town, a new main road (New Trench Road, A518) had been built along an alignment broadly parallel to the site. In the west, this road is situated along the northern boundary of the site and rises up on an embankment to cross over the site on a bridge, and onto the south side, about halfway along its length. This bridge forms a natural division between the two parts of the Terminal in terms of functions and drainage.

2.2 The site slopes gently from south to north and is crossed by two culverted minor watercourses, one to the west of the A518 bridge and one to the east of it. The site is also crossed by a major trunk combined sewer to the west of the bridge. The combined sewer carries heavy flows and often operates in a surcharged condition with flow levels rising to within a metre of surface levels in the site. To the north of the site, there is a combined sewer overflow which diverts excess flows from the sewer to the watercourse system. Whilst this overflow operates within its consent standards, it is a significant source of pollution, with very visible impacts upon the water quality and in terms of bankside sewage debris.

2.3 The sub-soil conditions in the wider area are mixed glacial deposits: clays, sands and gravels. This particular site is underlain by silty sands and has some permeability. The site is underlain by an aquifer within sandstone at shallow depth. This aquifer is used for potable water supply, with a number of extraction points immediately adjacent to the northern boundary of the site to the east of the road bridge.

2.4 The brownfield nature of much of the site meant that there was contamination of various types and at different levels. In considering the remediation and development of the site, detailed consideration was given to *source - pathway - target*. This was especially the case in relation to the types of sustainable drainage that could be used.

3. The Highways and Surfaced Areas

3.1 The site has a single highway access from the existing highway network. This is in the western part of the site, immediately west of the bridge. The access road drops steeply down a ramp into the Terminal to a ‘T’ junction with an internal roadway running west-east. This roadway links to:

- The container handing area in the east.
- The vehicle fuelling point.
- The office and car park.
- The western freight transfer area.
- An 8ha site for a high bay warehouse in the eastern part of the site.
- A 1.25ha warehousing site in the western part of the site.

3.2 The highways and all tarmac areas within the site are not adopted and are built to a minimum width of 8.5m. They have a 1.5m strip to one side which is demarcated by a white line as a walking and cycling route and a 300mm strip on the opposite side as a shoulder. Very few of the highway and surfaced areas have kerbs. The use of these margins and the omission of kerbs were part of the means of reducing costs and were also integral to the SuDS concept. All of the highways are however constructed to a very high engineered standard in respect of the thicknesses of sub-base and surface layers. In this respect the standard equates to that used for trunk roads and heavily traffic industrial sites. These areas do not have porous surfacing.

3.3 The surfaced areas within a railfreight terminal are not just used for access; they form one of the key operational assets. Most terminals are designed to be operational 24 hours per day and seven days per week. The loading and unloading of trains is an extremely time-critical operation as the trains have to run within tightly defined ‘paths’ within the main rail network. A minor delay in the loading and despatch of a train can have substantial repercussions in terms of delays and consequential costs.

3.4 Containers are loaded and unloaded by large, wheeled reach stacker trucks which need well drained surfaces on which to operate. These reach stackers with their very high wheel loads are extremely punishing for the surfaces and in particular any gullies and manhole covers located within the surfaced areas. Evidence from other terminals investigated prior to the construction of this one showed that most had surface defects and that these almost always emanated from gullies, manhole covers and similar features. The evidence also showed that these defects proved to be very difficult to rectify in a permanent manner. Clearly any remedial works to the surfacing are costly, not just in terms of direct costs but particularly in terms of ‘down time’ for the terminal. A decision was taken with this Terminal to avoid the positioning of any gullies and manholes within the surfaced areas used by the reach stackers. The use of SuDS facilitated the implementation of this decision.

3.5 Containers and pallets may be placed directly on the surface. If there were to be any ponding of water on these surfaces, such as may occur around a defective or blocked gulley, then there could be damage to cargoes. The design of the container and freight handling surfaces to match the SuDS drainage features eliminates this risk.

3.6 With the exception of two areas, surfaced areas are not drained to gullies and pipes, but are instead drained directly to SuDS features. The two areas that utilise gullies are:

- The container handling area: Because of the narrow width of the site at this point and a wish to maximise the working area of the container handling slab, surface water run-off is taken to the northern edge where there is a kerb and gullies. These drain to a pipe which has been kept at the shallowest possible depth. This flows westwards and, as soon as it is clear of the container slab, discharges into the head of a linear basin. This arrangement is described in more detail within the SuDS concept below in the surface water system as built (Section 4).
- The vehicle fuelling point: Here, a very small surfaced area immediately adjacent to the fuelling point has been profiled to fall away from the adjacent swales and instead drains to two gullies which flow to an interceptor which discharges to the combined sewer.

4. The Surface Water Drainage System as Built

4.1 Surface water drainage is a SuDS system. This operates mainly through storage and attenuation although in the western part of the site, infiltration is not excluded. In view of the intensity of heavy axle loadings on the roadway areas, it was felt that porous surfacing would not be practical and therefore the SuDS strategy was to take water from surfaces by the shortest possible routes into adjacent storage and slow conveyance features. The SuDS system therefore does not have source control components (with the exception of the roof water disconnection from the buildings) and relies on effective local control elements.

4.2 There was a requirement from the Environment Agency to limit the discharge rate to greenfield runoff. The SuDS system is designed to accommodate a 1 in 30 year event

4.3 All of the highways and other impermeable areas (with the exception of the container handling slab and the fuelling point) drain to one side where the water leaves the surfaced area as sheet flow into a closely adjacent linear SuDS feature.

4.4 In the west of the site, these features are for the most part swales which drain to a pond immediately to the west of the office building. This pond was formed by considerably enlarging a smaller one that had formed where the culverted watercourse which passes beneath the site briefly emerged as an open section before entering another culvert under the main road. This small water body had originally been formed by debris which built up on the grating over the entrance to the downstream culvert which cause local ponding on the surface. The new pond has two outlets. One is to the downstream culverted watercourse to the north where the grating has been removed and replaced by a small weir (used for base flows). The other (for higher flows) is to a large ditch to the west which ultimately connects to another minor watercourse off-site. The car park drains northwards to the pond via a grass margin and roof water from the office and other buildings drains over the surface to swales via short lengths of concrete channel. Ground contamination in this area was generally not severe and for the most part comprised oils, largely bound within the surface layers of old railway ballast. The risks of contamination of surface water from activities in this part of the Terminal were assessed as being similar to those on highways and all of the SuDS features in this area were therefore unlined to facilitate water loss by infiltration. As all of the SuDS features are on the surface, any pollution will be readily visible during day to day work in the Terminal and immediate action can be implemented.

4.5 In the east of the site there was more contaminated ground and the nature of contamination varied, including incinerator ash and debris tipped from salvage activities. This was dealt with by a carefully developed strategy which enabled some material to be left in situ and capped. The area was underlain by the water supply aquifer, with nearby abstraction boreholes. As indicated, the nature of the activities within this part of the Terminal meant that there was also a higher risk of surfaces being contaminated by spillage form cargoes. All of these factors pointed toward an open, but sealed SuDS system. This comprises the long, linear basin (previously referred to) alongside the roadway. This basin receives the runoff from the roadway as sheet flow and also receives the flow from the container handling slab at its eastern end. The linear basin is clay lined and has a small diameter (restricted) outlet in a new chamber built where the culverted watercourse passes beneath the basin. This restricted outlet mobilises the storage capacity of the basin. There is a penstock on this outlet which can be closed in the event of an incident. This enables any pollution to be retained within the basin and removed by tanker operating from the adjacent roadway. The capacity of the basin is supplemented by a large pond that was built in a corner of the site which was not useable for other purposes. The pond is connected to the basin by a shallow section of pipe which passes beneath a railway track. If the capacity of the basin and pond are exceeded, there is a high level overflow weir at the outlet chamber on the basin. As in the western part of the site, all of the SuDS components are surface features. They are readily visible during normal working operations at the Terminal and if, for example, there was a pollution incident or the outlet pipe from the basin became blocked, then these events would be quickly discovered and remedial action easily taken. The SuDS system contains no confined spaces or other features that would require the use of special equipment. All inspection and operational maintenance can be safely carried out by the personnel on the Terminal.

4.6 To cover the eventuality of extreme flood events, the two SuDS systems are linked at the bridge by a shallow pipe and a surface flood route so that excess water from one system may pass over into the other.

4.7 The 1 in 100 year event from both parts of the site would be managed by overland flow along assessed and defined routes, broadly along the routes of watercourses. In practice the on-site SuDS arrangements will be capable of handling more than the 1 in 30 year event. To the west of the bridge, the culvert downstream of the pond forms a major restriction for a 1 in 100 year flow. This flow would be therefore directed westwards along the ditch line along the south side of the A518 road to a plot of grazing land which is reserved from any development. This area could accommodate some shallow flooding before flows then are passed northwards along a further watercourse route. Potentially, the 8ha warehousing site sits within the flood route for the eastern part of the Terminal. An outline SuDS concept has been developed for this site which will create a safe flood route adjacent to the site perimeter. This will form part of the development brief and planning conditioning for this site when it is sold.

4.7 All of the SuDS features, together with a substantial earth embankment which forms an acoustic barrier, form the main elements of the landscaping of the site and also have some biodiversity value. These features enable the site to continue to serve as green network. The unlined swales in the western part of the site are planted with trees and grass will be cut only a few times per year. The ponds west and east of the bridge form pleasant features. That to the west enhances the setting of the office building, whilst the operator of the Terminal has placed some picnic tables on the grass alongside the eastern pond. Here, lorry drivers may take a break if they are waiting for their vehicle to be loaded. The SuDS features contribute to the image of the facility which is now branded as a Telford Railfreight Park.

4.8 Despite the SuDS features being substantial, they serve only the Railfreight site and would therefore have the status as private drainage and not be adopted by the SAB. As indicated, none of the features have complexity beyond that of general landscaping. Maintenance is therefore well within the scope of the staff at the Terminal and the external landscape maintenance contractors they employ. As with other aspects of the facility, a manual has been provided showing how the SuDS system works and indicating inspection and maintenance aspects.

5. The Sewered/Piped Drainage Concept

5.1 This concept comprises conventional gullies and kerbing to collect surface water and pipe systems designed to cater for a 1 in 30 year event to convey the water to the culverted watercourses. The concept is configured in a similar manner to the SuDS system i.e. one system serving the western part and another serving the eastern part. Both systems incorporate long lengths of sewer with relatively slack gradients as there is little available fall from the surface levels at the furthermost remote points to the watercourses, taking account of cover to the pipes. Both systems incorporate oversized and multiple pipes to provide storage to meet the discharge criteria. The storage would be mobilised by two ‘hydro brake’ type flow control devices situated within the outlet manholes.

5.2 The sewer system in the eastern part of the site incorporates an open topped concrete box structure. This performs the same function as the linear basin: to allow the runoff from the container slab to be monitored. In the event of a pollution incident, a penstock at the downstream end of this structure could be closed and the polluted matter removed from the chamber by a tanker standing on the adjacent roadway. This chamber is open topped so as to permit monitoring from the surface and to avoid it becoming an enclosed space and requiring trained personnel to enter it. With the exception of this open box structure, the design of the pipe system is in accordance with Sewers for Adoption. All of the pipe infrastructure would however remain private as it serves only the Terminal.

5.3 Consideration has been given to a hybrid scheme whereby piped drainage might have been used in conjunction with surface storage features. It is not felt that this would be feasible owing the depth of the sewers at the points where storage would be best located.

5.6 The 1 in 100 year event would be managed in a similar manner to that of the SuDS, although there may be some challenges in ensuring that excess flows could exit the system at more than one location so as to reduce damage that might arise from concentrated flow.

5.7 If this concept had been implemented, landscaping would have also been provided, probably taking the form of grass verges with some trees. There would probably have been no open water features. Maintenance would also have been covered with a manual, but this work would most require the use of specialist contractors and occasional need for them to enter confined spaces. Gullies would require de-silting by tanker. Silt may also tend to be deposited within the pipes used for flow storage which would require periodic pressure jetting and de-silting. The two flow control devices would require periodic inspection and maintenance.

6. The Estimates

6.1 These are shown in Appendix 3. The approach taken with the estimates has been to design a piped drainage system for comparison with the SuDS system as built. The changes are principally in connection with the drainage infrastructure itself (e.g. pipes instead of swales and basins) together with aspects of the roadway drainage (i.e. introducing kerbs and gullies). The estimates do not include costs for the surfaced areas (as these do not change between the concepts) and do not therefore represent the full infrastructure costs of the development. Even though strenuous efforts were made to re-use and disposal of surplus materials on-site, there was still a quantity to be disposed of off-site. The material from the SuDS excavations went straight into the fill for the acoustic bund. A significant item in respect of the piped solution is there disposal of the additional material that would have been generated from the trenching works.

6.2 The rates used are local ones from Telford & Wrekin Council's annually tendered minor works contract. These were felt to be locally more appropriate than using Spons. The rates have been used consistently for all of the estimating for both the SuDS and the pipe drainage options in order to have a sound basis for comparison.

6.3 There is little doubt that a bespoke, tendered contract for each of the concepts would have secured lower rates and lower out-turn costs for both the SuDS scheme utilised and the piped scheme. The out-turn costs for the SuDS scheme were in practice substantially reduced as much of the excavation work for them took place as part of the construction of the general site excavation work and the creation of the acoustic bund. This is what happened in practice and could be expected to happen on the vast majority of sites. The economies deriving from this would not have been available to sewer works constructed within trenches excavated and backfilled at a slower pace that the general site earthworks.

6.4 The total estimated cost for the sewer features is £372,259.
The total estimated cost for the SuDS features is £51,088.
This represents an overall total saving of the order of £321,171 with the SuDS concept.
If one examines the basic works costs excluding preliminaries and design and supervision and removes the effects of the disposal of surplus material, the saving is still of the order of £253,000.

7. Opportunities for SuDS and piped drainage if the site layout had been modified

7.1 This development was planned in a holistic way, taking account of the needs of SuDS. These needs were very easily accommodated within the overall site concept and detailed layout. There is therefore no need to consider any further opportunities for SuDS in connection with potential changes to the site concept or layout.

7.2 It has been considered whether any cost reductions could have been secured for the piped drainage concept if the site layout had been arranged differently. In view of the needs of the Terminal and the linear nature of the site, it is clear that there would have been no opportunities to reduce the amount of pipework necessary to drain the site.

8. Benefits

8.1 A significant benefit of the use of SuDS in this case is the substantial reduction in costs of surface water drainage. This has helped to secure the overall viability of the project and enabled significantly more investment to be placed in features that directly contribute to the functioning of the facility. For example the cost saving represents the cost of approximately half of the reinforced concrete container handling area or the cost of two full length sidings with point work.

8.2 The SuDS have been accommodated within areas that would have been used for landscaping and have enhanced the attractiveness of the Terminal. An interesting initiative is that taken by the operator to provide picnic tables by one of the ponds where visiting lorry drivers can take a break in attractive surroundings. The SuDS features have also provided enhanced habitats and helped to secure a more continuous green network through the site with positive effects on biodiversity.

8.3 The slow conveyance and attenuation of flows have the effect of removing pollutants and reducing the diffuse pollution load which would otherwise have been carried by the surface water sewer system into the watercourses.

8.3 As most of the SuDS features are visible within the site, they are subject to daily oversight by the staff. Any pollution and malfunctioning of the system will be immediately apparent and can be acted on quickly. With a piped system, pollution or malfunction may take time to spot and then usually at a point some distance downstream. Experience shows that subsequent diagnosis and location of the source of pollution in pipe networks can be very time consuming and expensive.

8.4 All aspects of the inspection and maintenance of the SuDS system are capable of being safely undertaken by the staff of the Terminal or outside landscaping contractors. A piped system would require at least an annual visit by specialist contractors. This may require several days if pipe jetting is required. Potentially unscheduled, reactive visits may be needed as well e.g. to respond to blocked gullies or choked flow control devices.

8.5 A rigorous analysis of the materials used in the piped solution and transport journeys associated with their production and delivery and with the disposal of surplus materials has not been undertaken. However, but the use of SuDS has saved in excess of 100 HGV journeys (probably significantly more) or in excess of 8,000 vehicle miles.

8.6 The absence of manhole covers and gulley gratings within the heavily trafficked surfaced areas through the use of SuDS will contribute significantly to the resilience of these areas and reduce costs and down time associated with their future maintenance.

9. Lessons Learnt

9.1 The chief lesson was that it found to be a relatively simple task to develop a SuDS concept for this site and to produce an engineering design for it. The concept was developed by considering numerous themes in a holistic manner. These included:

- Effective and robust removal of surface water from surface areas. (This is a critical factor in view of the use of these surfaces on this site.)
- Effective management of water volumes and rates of flow.
- Effective management of water quality.
- Cost of the infrastructure.
- Aesthetics within the development.
- Access to features for maintenance.
- Health and Safety.

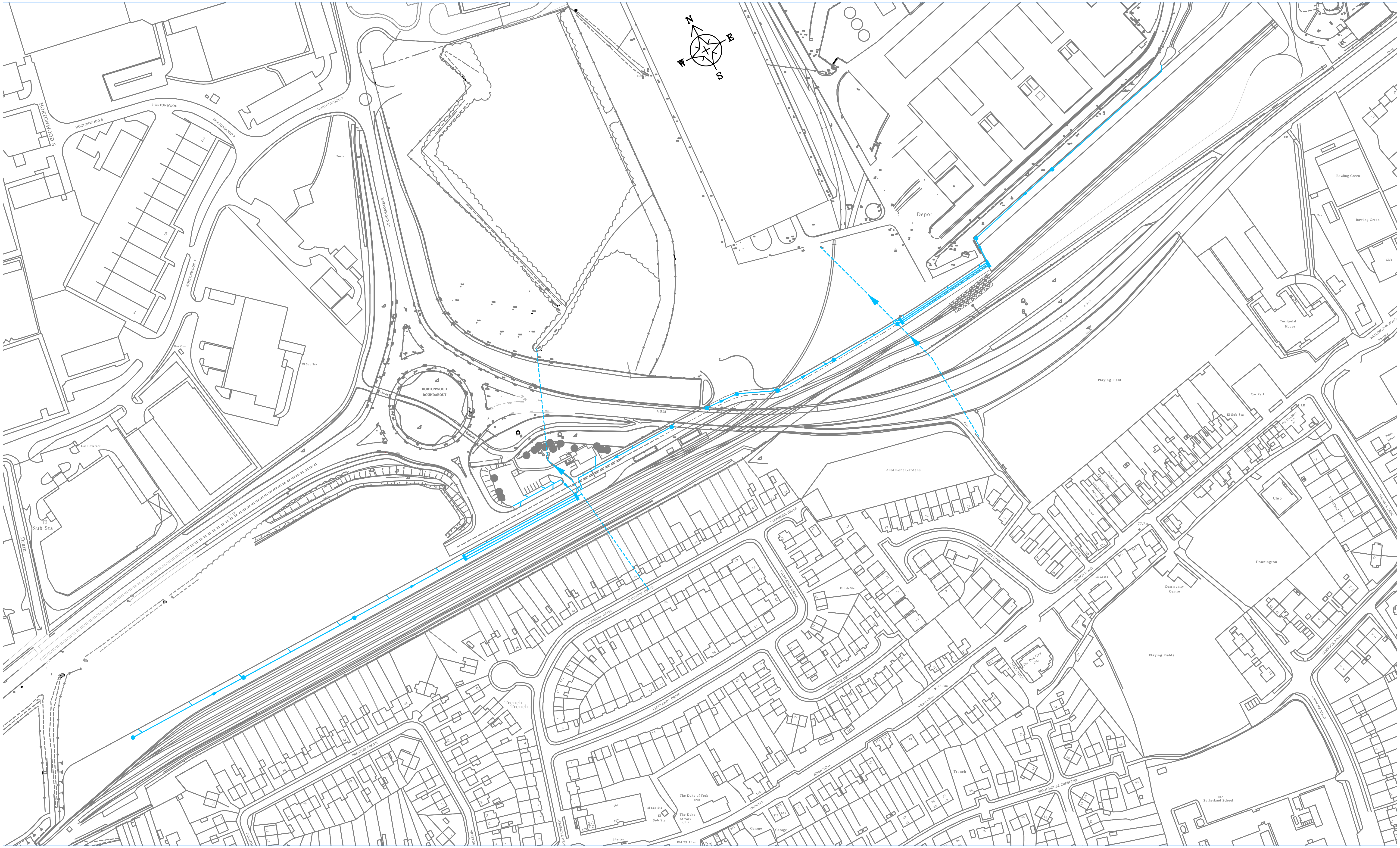
- Using ‘green spaces’ for both landscape/green network and surface water management.
- Ensuring viable flood routes.

9.2 The decision to implement SuDS on this site was initiated by a stringent need to save capital costs. This decision was vindicated. The site is leased to a very cost conscious operator who is finding that the estimates made for maintaining the landscape features and SuDS have proved to be more generous that the amounts needed in practice.

9.3 Considering that reliable operation of infrastructure in this type of facility is highly important, the use of SuDS has contributed to a very robust outcome.

10. Summary

10.1 The case study has shown that SuDS can work well in a site with a highly demanding industrial use and that they ought to be readily adaptable to other new industrial and office developments. The excavation of the SuDS conveyance and storage features on this site was carried out very effectively as part of the general site excavation and preparation. This approach meant that the real costs of creating the SuDS features was minimal compared with the trenching work needed for piped drainage. The fact that the SuDS features are for the most part on the surface means that are visible and can easily be monitored and maintained without specialist skills and equipment. Integration of the SuDS within the landscaping has enhanced the quality of the landscaping, strengthened the biodiversity aspects and enabled the creation of amenities for the use of workers at the facility.



Key:

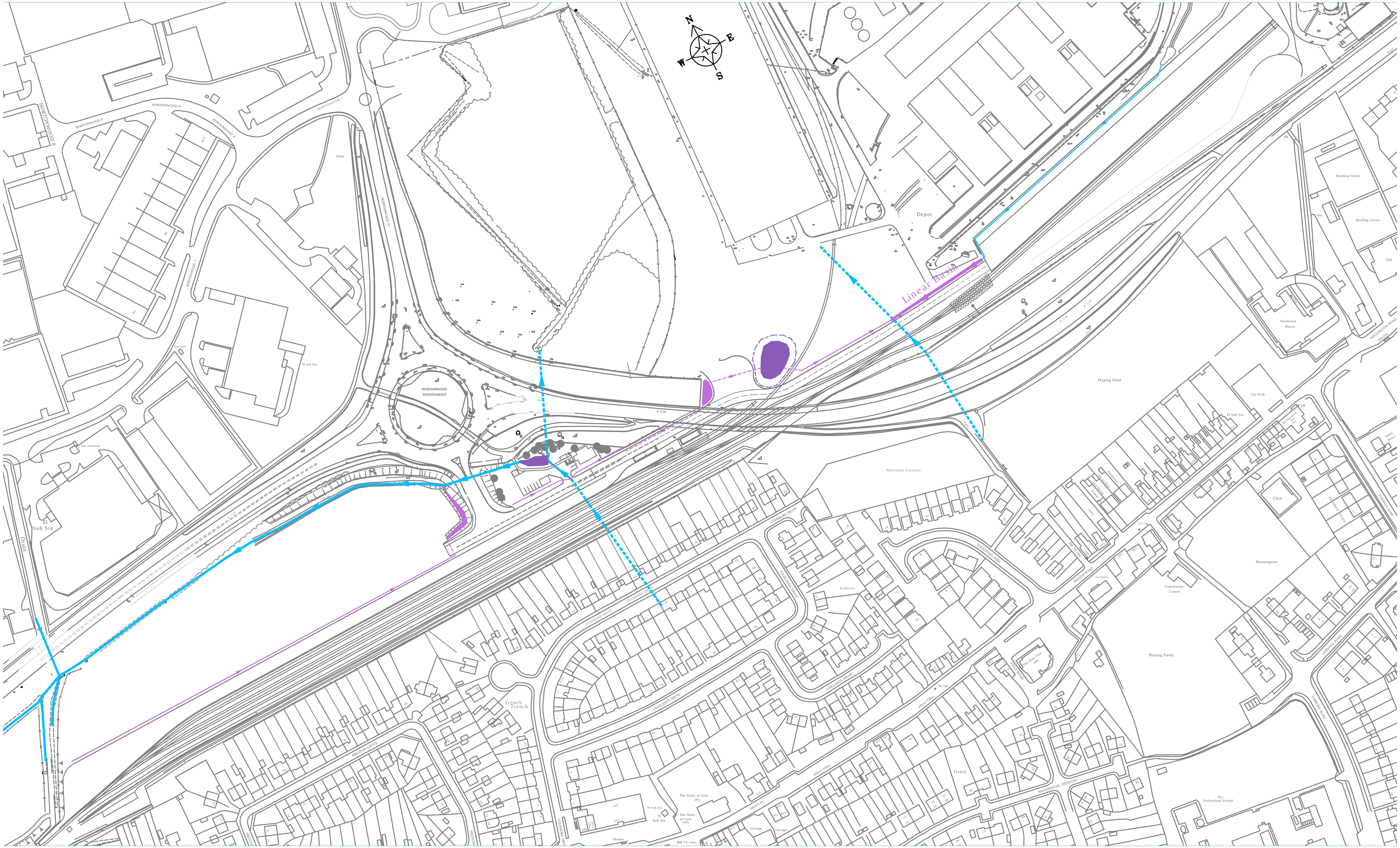
- Surface Water Sewers
- SW Underground Storage Pipes
- Watercourse
- Culverted Watercourse
- Swales
- Pipes
- Basin or Flood Meadow
- Floodable Area
- Pond

Case Study 5

Rail Freight Terminal

SW Sewer Plan

Scale : 1:2500



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Case Study 5

Rail Freight Terminal
Suds Plan
Scale : 1:2500

Case Study 5 (Telford Rail Freight Terminal)
East of A518 Bridge
and
Grand Totals

Item	Standard Drainage		SUDS	
	Qty	£	Qty	£
Pipework	460.0m	80,750.00	35.0m	1,995.00
Pumping	7 Days	700.00		
Manholes	4 nr	9200.00	1	2,300.00
Special Manholes	2nr	17,670.00		
Special Chamber	1	22,420.00		
Gullies incl. connections	13 nr	2,990.00		
Gulley Pipework	75.0m	3,300.00		
MOT Type 1	1120.5m^3	5,378.40		
Disposal	2220.0m^3	-		
Excavation Basins			445.6m^3	3,475.65
Excavation Ponds			400.0m^3	3,120.00
Clay Liner			193.0m^3	6,948.00
Topsoil / Seeding	417.4 m^2	626.00	480.0m^2	720.00
Kerbing	250.0m	5,250.00		
Sub Total		**148,284.40**		**18,558.65**
Prelims 14%		20,759.82		2,598.21
Design Supervision 10% (25% for SuDS)		14,828.44		4,639.66
Total		**183,872.66**		**25,796.52**
GRAND TOTALS				
Total of works East of Bridge		**183,872.66**		**25,796.52**
Total of works West of Bridge		**188,386.63**		**25,291.25**
TOTAL		**372,259.29**		**51,087.77**

* Note: Because of the low cost of the SuDS works, it is felt that a 10% figure for the design and supervision element would be insufficient and it has therefore been increased to 25% which would equate to reasonable time inputs.

Case Study 5 (Telford Rail Freight Terminal) West of A518 Bridge				
Item	**Standard Drainage**		**SUDS**	
	Qty	**£**	**Qty**	**£**
Pipework	600.0m	85,565.22	170.0m	9,480.00
Pumping	7 Days	700.00		
Manholes	5 nr	5,316.67		
	1 nr	2,300.00		
Special Manholes / Chambers	2	12,450.00		
Gullies incl. connections	30 nr	6,900.00		
Gulley Pipework	230.0m	10,120.00		
MOT Type 1	1,310.0m^3	2,515.20		
Disposal of surplus excavated material	1,040.0m^3	10,292.78		
Excavation Large Swale			375.5m^3	3,069.71
Excavation Small Swales			56.5m^3	615.85
Excavation Ponds			50m^3	545.00
Topsoil / Seeding	1875 m^2	4,214.83	1995m^2	4,484.58
Kerbing	550.0m	11,550.00		
Sub Total		**151,924.70**		**18,195.14**
Prelims 14%		21,269.46		2,547.32
Design Supervision 10% (25% for SuDS*)		15,192.47		4,548.79
Total		**188,386.63**		**25,291.25**
Above totals are carried to Grand Total on Section East of Bridge				

* Note: Because of the low cost of the SuDS works, it is felt that a 10% figure for the design and supervision element would be insufficient and it has therefore been increased to 25% which would equate to reasonable time inputs.

Case Study 5, Telford Railfreight Terminal

Photograph. G. Fairhurst

Pond in eastern section of Terminal.

Photograph. G. Fairhurst

Roadside swale also receiving roof water flows.

Photograph. G. Fairhurst

Pond in western section of Terminal receiving flows from car park.

Photograph. G. Fairhurst

Swale in western section of Terminal receiving flows from internal roadway.