ST. HELIER SURFACE WATER LINK AND STORAGE TANK CONTRACT ("THE CAVERN"): REPORT - VOLUME 1

Presented to the States on 17th April 2002
by the Public Services Committee

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PUBLIC SERVICES COMMITTEE

REPORT ON THE WEIGHBRIDGE TO TOWN CENTRE, ST. HELIER, SURFACE WATER LINK AND STORAGE TANK

Contents

1.0 PREFACE

The St. Helier Surface Water Link and Storage Tank Contract, commonly referred to as the "Cavern", has received much public comment and criticism. Much of this was in a vacuum of information on the final cost of the scheme and on its operational performance.

The final cost of the Project was settled at the end of 2001. This Report to the States aims to present a comprehensive and full history of the Project, from the initial identification of the problems to be solved, through all subsequent stages of the Project to the final settlement of the cost. The Report also presents information on the operational performance of the scheme compared with the original objectives.

The Report has been produced by the Public Services Department and is a factual account of the project based on previous Reports presented to the various Public Services Committees that have been in place during the life of the Project, to other States Committees and to the States itself. Where available in the records, the reasons given at the time of various decisions being taken are included in this Report. However, no attempts to defend or criticise these decisions are included in the main body of the Report as that could be seen as a matter of opinion and could lessen the independence of the Report. Nevertheless, the final Chapter of the Report, "Lessons Learned" does identify issues that contributed to the excessive costs and duration of the Project, and also identifies where measures have already been taken by the States to avoid, or lessen, such problems with capital schemes now and in the future.

The Report has been produced by the Public Services Department under the overall supervision of the Chief Officer, Dr. Clive Swinnerton, who joined the Department in late 1997 after the Balfour Beatty Civil Engineering Contract work had been completed. A copy of the draft Report was made available to the States' Audit Commission - whose own review of the project was halted on legal advice due to the arbitration process - for comment prior to this final Report being published. The Audit Commission commented upon the draft Report, and this final Report takes account of those comments where considered appropriate, but the Commission has not had the opportunity to comment on this final version. It is accepted that all concerns relating to the Cavern must be fully examined so that there is no perception that any aspects have been excluded from this examination. Therefore, the Public Services Committee and Department accept fully that some States members may consider it necessary for a totally independent review, or Committee of Inquiry, to be undertaken. Hopefully, that will not be the case, but if it is, the Committee and Department will co-operate fully in such a review or Inquiry.

Volume I of the Report is the main text and has been sent to all States' members and to the media. Volume II presents Appendices of the Public Services Committee membership during the life of the Cavern, the Finance and Economics Committee membership, relevant Acts from various States' Committees and relevant Questions to the President of the Public Services Committee. Three copies of Volume II have been placed in the States Bookshop for reference, but copies can be obtained upon request.

2.0 DESCRIPTION OF INITIAL PROBLEMS TO BE SOLVED

Background

The Public Services Committee's policy on the disposal of liquid waste is stated as follows -

(i) that all foul sewage from properties which are connected to the foul sewer system should be conveyed to the Bellozanne Sewage Treatment Works for treatment, before the treated effluent is discharged to sea (although recently an exception to this policy has been made with the installation of a Packaged Treatment Plant at Bonne Nuit).

(ii) that work which was commenced by the former Sewerage Board and Resources Recovery Board will continue on the reconstruction and upgrading of the sewer system, to enable it to cope with the increased loadings from development in the Island. In general terms this involves the separation of surface water flows from foul sewage, and the elimination, as far as is practicable, of discharges of foul sewage to sea.

(iii) that work will continue on the extension of the foul sewer system to as many areas of the Island as can practicably be connected.

All of the above works are subject to the availability of funds.

In order to appreciate the Public Services Committee's Policy, as stated above, it is necessary to explain the events leading up to the present situation.

The original system of public sewers in St. Helier was constructed in the latter part of the 19th century, and not without opposition, due to the cost of the work involved. The sewers were built of brickwork, and carried both foul sewage and surface water. (This is termed a combined system, as opposed to a separate system of two sewers, one for foul sewage and one for surface water). The sewers discharged straight to the sea, as in those days it was a vast improvement to simply remove the foul sewage from the populated areas for health reasons.

These combined sewer systems discharged their contents to sea, through outfalls at the Weighbridge, Le Dicq, First Tower, and Beaumont.

This method of disposal continued until after the Second World War, when, with tourism becoming a major factor in the Island's economy and the increasing use of the foreshore for recreational purposes, the Health Authorities became concerned about the risk of infection from sewage on the beaches and in the sea.

Recommendations were put before the States in 1950 to re-design and reconstruct the existing sewer system to modern standards. This involved the construction of a Sewage Treatment Works in Bellozanne Valley, and a large pumping station at First Tower. Intercepting sewers were constructed to cut off the outfalls in St. Aubin's Bay and other bays, and to convey the collected sewage to the First Tower Pumping Station to be pumped to Bellozanne for treatment.

The Sewage Treatment Works was commissioned in 1959, and was designed to provide full treatment to produce an effluent to Royal Commission standards for a population of 57,000.

It was recognised that a large amount of surface water was entering the St. Helier combined sewers from the brooks at Vallée des Vaux and Grands Vaux. In 1956, a large surface water sewer (1.8 metre diameter) was constructed from Town Mills to the Weighbridge, to collect the surface water from the two valleys. This sewer had to be constructed in a tunnel under Val Plaisant, New Street and Conway Street, and discharged the surface water to sea through the old granite outfall at the Albert Pier.

Over the years, the foul sewer system has been extended to many parts of the Island, requiring the construction of many pumping stations. A large proportion of the foul sewage from these areas has to pass through St. Helier on its way to First Tower. Flows from areas north-east of St. Helier are pumped to Five Oaks. Flows from east of St. Helier arrive at Le Dicq and are pumped to the Weighbridge. The increased development and the extension of the sewer system obviously increased the loading on the St. Helier sewers.

From 1950 to 1980, various new sewers were constructed in St. Helier to attempt to rationalise the sewer system, by adopting a policy of separation of surface water flows from foul sewage. In some areas, new foul sewers were laid, with the intention of later using some of the old brick sewers to carry the surface water. In other areas, total reconstruction was carried out, by replacing the brick sewers with new twin pipe systems in order to separate flows.

Separation of flows

It is important to explain the reasoning behind the separation of flows.

The flows of foul sewage alone do not cause the sewers to be overloaded. It is the quantities of surface water gaining entry to the foul sewers, especially during periods of heavy rainfall, which cause overloading and occasionally flooding.

To attempt to put this into perspective, it is necessary to quote some flow figures. The flow rates in sewers are quoted in litres per second. (There are 4.54 litres in one gallon.)

At times of dry weather, the average rate of flow of foul sewage to the Sewage Treatment Works is around 315 litres per second, although the rate of flow varies somewhat throughout the day.

It has been calculated that the flows of foul sewage and surface water which can arrive at the Weighbridge in the combined sewer system, during heavy rain storms, can reach as high as 4,700 litres per second. Therefore, it can be seen readily that the major part of the problem is created by the surface water.

These quantities of flow are far too large to be conveyed in parts of the combined sewer system, hence the resulting flooding. It was necessary, therefore, to allow some of the flows to overflow to the sea, in times of heavy rainfall. (The foul sewage is diluted by surface water during times of storm, but it is nevertheless contaminated.) These flows are also far too large to be treated at the Sewage Treatment Works, which is capable of giving full treatment to a maximum flow of 600 litres per second and giving partial treatment to a further flow of 400 litres per second.

To attempt to upgrade the system to deal with flows of this magnitude would involve constructing very large sewers in most of the streets in the central area of St. Helier. It would also mean replacing the main trunk sewer from the Weighbridge to First Tower with a very much larger pipe, reconstructing First Tower Pumping Station to a very much larger size, and replacing the pumping mains from First Tower to Bellozanne with very much larger pipes. The Sewage Treatment Works would have to be increased in capacity to approximately five times its present size.

The practicalities and the costs involved in this would be enormous; furthermore it does not make sense to be treating surface water, which can be discharged to sea, if it is separated from the sewage.

Therefore, the policy which was adopted in the past, and which continues to be followed, is to construct a separate system of surface water sewers, where this is practicable, in order to reduce the overloading in the foul (or combined) sewers, thereby reducing the incidence of overflows of contaminated water to sea and also to reduce flooding. It will also reduce the loading on the Sewage Treatment Works, which will improve the efficiency of treatment.

To achieve the policy of separation, it is necessary to avoid, wherever possible, surface water entering the combined and foul sewers. Having achieved that separation, it is necessary to provide an adequate system of sewers and outfalls to convey the surface water directly to the sea. The primary requirement in St. Helier is to provide an adequate system of main surface water sewers and outfalls which will form the spines for further areas to connect to. The surface water that has to pass through St. Helier is from a catchment that stretches from West Park, West Mount, Old St. John's Road and Queen's Road on the western side, to Five Oaks and Mont Millais on the eastern side. It also includes the two large catchments of Vallée des Vaux and Grands Vaux. The only surface water outfall serving this area, prior to 1980, was the Val Plaisant surface water sewer (see Figure 1), which discharged to the old Weighbridge culvert and to sea at the Albert Pier.

The new surface water sewers will immediately pick up flows of surface water from the roads, from parts of the existing older properties, which are still on a combined system, and from the whole of properties that already have separate systems. All new properties and redevelopments are required to totally separate their surface water, and, as redevelopment proceeds, there are already significant areas of St. Helier that have the potential to be separated.

However, in the short term, there are areas that will still be subject to overloading and at risk of flooding, particularly in St. Helier. Serious flooding occurred in the central area of St. Helier, at Beresford Street, Halkett Place, King Street, Bath Street, Broad Street, Queen Street and Library Place, in 1981 and 1982, during two severe rainstorms.

History of improvements to the Surface Water System during the 1980s and 1990s

Some major improvements have been made to the Island's surface water sewers in recent years.

In 1981, a new large (1.5 metre diameter) surface water sewer was constructed in tunnel in Gloucester Street, as the first phase of a separation scheme for the western part of St. Helier. The second phase of this scheme was completed in 1984, with the construction of a surface water sewer (900 millimetres diameter) in Rouge Bouillon from Great Union Road to Queen's Road. (The sewers in Queen's Road had already been reconstructed in 1979 with the provision of greater surface water capacity.) The third phase was the construction of a large (1.5 metre diameter) surface water sewer in tunnel from Gloucester Street to Rouge Bouillon in 1985, which linked the two previous phases. This completed the spine of the surface water system for the western area of St. Helier, and a further surface water sewer from Cheapside and New St. John's Road was linked to this in 1986. (This sewer system is shown in Figure 1.)

The existing Val Plaisant surface water sewer discharged into a section of the original brick and granite culvert at the Weighbridge, adjacent to the Harbour Office. This old culvert was formerly the original sea outfall serving the Town's combined sewers, and extended from the Weighbridge to a point just to the west of the Albert Pier, where it discharged to sea, via a long granite culvert laid on the beach. It was converted to a surface water outfall when the new foul sewer, which conveys foul sewage from the Weighbridge to First Tower Pumping Station and on to Bellozanne Sewage Works for treatment, was constructed in 1956. The entire length of this original outfall was of inadequate capacity, and was unable to handle the peak flows from the Val Plaisant surface water sewer. This reduced the efficiency of the Val Plaisant sewer considerably.

In 1990 and 1991 a new outfall culvert was constructed across the reclamation site West of the Albert Pier, prior to landfill operations, between the position of the (then proposed) underpass roundabout and the sea wall, adjacent to the (proposed) Elizabeth Harbour. During 1992 and 1993 this new culvert was extended, as part of the underpass project construction, and linked to the Val Plaisant surface water sewer (see Figure 1). The space created behind the new wall at the existing Marina enabled the large culvert (2.4 metres x 2.4 metres inside size) to be constructed, whereas construction of such a large culvert in the existing road would have been extremely difficult and disruptive. The new outfall culvert removed the restriction in the surface water system and it was designed to accept the flows from both the existing Val Plaisant surface water sewer and the proposed central surface water sewer at the Weighbridge. It also had the capacity to store a large volume of surface water, when flow to sea was prevented by high tides.

In 1996, this surface water culvert was extended through the area of the new Marina (west of Albert), and the outlet was located adjacent to the entrance to the Marina (see Figure 1). It had also been identified some years earlier that a large capacity pumping station was required, in order to be able to pump the surface water to sea, when severe rainstorms coincided with high tides and caused the outflow from the surface water culvert to be prevented. The request for the funds for both of these projects had been entered in the Committee's capital programme for upgrading the surface water sewerage system, and the culvert extension and the pumping station were constructed as part of the Marina project. This pumping station is dealing with very large flows of surface water, and its capacity is sixteen times the capacity of the First Tower pumping station.

All of these schemes make an important contribution to the overall policy of separation of surface water and reducing the rate of flow to Bellozanne.

Central Area Surface Water Sewer (from Weighbridge to Town Centre)

The central area of St. Helier, bounded by Val Plaisant/New Street to the west, St Saviour's Road to the east, and Springfield Road to the north, was served by a system of combined sewers that conveyed both foul sewage and surface water to the Weighbridge and on to Bellozanne for treatment. Surface water from outside this area, including Five Oaks, St. Saviour's Hill, Patier Road, St. Saviour's Brook in the grounds of Government House, and Wellington Road, was also discharged to the combined system via the Town Brooks (the Grand Douet and the Faux Bie).

The majority of these sewers were constructed many years ago, when, as was the normal practice, the combined sewer carried both foul sewage and surface water flows that were ultimately discharged untreated to sea. As a result, all flow from this area was being conveyed to Bellozanne for treatment, prior to disposal to sea.

Even after all the above improvements, the existing system in the area still gave rise to three major problems -

(a) Continued development over the years had led to much of the older system being severely overloaded in times of storm. This was highlighted in 1981 and 1982 when businesses, properties and roads in Beresford Street, Halkett Place, King Street, Bath Street, Broad Street, Queen Street and Library Place were flooded with foul sewage during two severe rainstorms.

(b) It was clear that no further large-scale development within the catchment, for example in the Springfield or Patier Road/St. Saviour's Hill areas, could be allowed until the sewer system had been improved to provide the necessary capacity to deal with the additional foul and surface water flows that such development would generate.

(c) Both foul sewage and surface water was conveyed by the combined sewers to Bellozanne for treatment. This was a most inefficient and uneconomic use of the facilities at Bellozanne, which should only treat the foul sewage, while surface water should be discharged directly into the sea.

3.0 DESCRIPTION OF OPTIONS CONSIDERED

There were two main arterial surface water outfalls from Gloucester Street and Val Plaisant (see Figure 1). The Gloucester Street surface water sewer served the area to the west of Val Plaisant, and the Val Plaisant surface water sewer served the two valleys to the north of St. Helier and the area adjacent to Val Plaisant. These two sewers also provided emergency outfalls into which the overloaded combined sewers might discharge in times of storm, thus significantly reducing the risk of surface flooding. In the years following the construction of these new outfalls, a continuing programme of separating surface water and foul flows in the areas was pursued. This involved the reconstruction of the existing combined sewers to provide separate foul and surface water pipes. Foul sewage could thus be conveyed via the foul sewer network to the Sewage Works for treatment, and surface water could be discharged directly to sea via the new arterial surface water sewers. Reducing the quantity of surface water flow remaining in the foul sewers resulted in a reduction in the volume of flow requiring treatment at the Sewage Works. It also reduced the number of times the capacity of the foul system as a whole was exceeded, which resulted in overflow of foul sewage to sea during times of rainfall.

It had been clear for several years that a similar arterial surface water system, and subsequent separation of the foul and surface water flows, was required to serve the central part of St. Helier. The possibility of linking to the Val Plaisant surface water sewer had been investigated, but it did not have any spare capacity and, therefore, it was decided that a separate arterial surface water sewer was required to serve this area.

The surface water culvert, constructed in 1993, which terminated at the northeast corner of the St. Helier Marina, was designed to accept the flows from both the existing Val Plaisant surface water sewer and the proposed central area surface water sewer at the Weighbridge.

Drainage Engineers in the Public Services Department had investigated the problems in the sewer system in considerable detail, using the then latest computer modelling techniques to analyse the hydraulic performance of the sewer network. Various options were considered, and it was concluded that a relief sewer was required to take surface water from the Gasworks area to the Weighbridge, and that overflows of foul sewage would have to be picked up from the Bath Street sewer system and at the Weighbridge, from the overflow. The possible routes and construction methods available were assessed, bearing in mind that ultimately the surface water sewer would be extended in a northerly direction to the Springfield Road area, and that it needed to be able to accept surface water flows from the Town Brooks in the vicinity of Oxford Road and the Gasworks.

Numerous routes were considered and three possible options, which met the hydraulic requirements, were identified (see Figure 2). Preliminary investigations were undertaken to determine the ground conditions along the routes.

From these investigations, various routes were considered, but most were eliminated by the major disruption that would have arisen from any open-cut excavations and from the working shafts that would have been required for tunnelling on these routes. It was concluded that the selected route was the preferred alignment, as all of the main tunnelling operations could be undertaken from the main working shaft in Snow Hill car park, thus minimising surface disruption.

Initially it had been intended to construct the tunnel as a gravity sewer, falling from Philips Street to the Weighbridge. This meant that the tunnel in Bath Street would have been constructed through the soft ground above rock level but still at a depth of at least ten metres below the ground surface. However, a detailed site investigation revealed that the ground conditions in Bath Street were such that extensive ground consolidation works would have to be carried out, in order to stabilise the ground prior to the tunnel being driven. These ground consolidation works would have resulted in major surface disruption all along Bath Street. It was therefore decided that the tunnel would be constructed at a much greater depth, entirely in the rock strata, thus avoiding the difficult soft ground conditions in Bath Street.

At this greater depth, the sewer would have to operate as an inverted syphon, with the attendant disadvantage of higher maintenance. (An inverted syphon is a pipeline that has the middle lower than the ends, but the higher water level at the upstream end pushes the water through.) However, this scheme had the following distinct advantages -

(a) The northern tunnel could be extended to Oxford Road, avoiding the major surface disruption that would result in Bath Street and Gas Place.

(b) Both tunnels could be constructed from a single major working shaft at Snow Hill car park. Minor shafts would be required in Bath Street at West Centre, at the Weighbridge, and at Oxford Road, to enable connections to the existing network to be made.

(c) Disruption to residents, businesses, motorists and pedestrians would be kept to the absolute minimum, with all major works confined to the Snow Hill car park. Obviously the car park would have to be closed, but this would be the only source of major disruption.

(d) The entire 1,100 metre length of the three-metre diameter tunnel from the Weighbridge to Oxford Road would be constructed in rock, at least ten metres below the top of the rock and a minimum of 20 metres below ground. This would ensure that there would be no significant effect on buildings and structures along the route. This was a prime concern of the scheme, as there was a high water table, with the foundations of the older buildings being in the soft ground. It was essential to have a tunnelling method that did not cause dewatering of the ground and settlement of the buildings.

The selected route (Route C on Figure 2) would start from a new shaft (S1) at the Weighbridge, linking to the existin surface water culvert at the head of the Marina. The route would pass under the northern end of Fort Regent, to a new shaft (S2) in the car park at Snow Hill. From there, the sewer route would be under Bath Street, until Peter Street, where it would curve slightly eastwards, passing under the properties between Peter Street and Tunnel Street. The northern end of the route would be a shaft (S4) in the north-east corner of the Gasworks car park. This shaft would provide the connection point for the Gasworks Brook and for a planned surface water sewer from Oxford Road to Springfield. A shaft (S3) was planned at Bath Street, adjacent to Wests Centre, to pick up separated surface water from the central area and to pick up the overflow from the overloaded foul (combined) sewer system in Bath Street. A further shaft (S5) was to be constructed in the corner of the planned Liberation Square, adjacent to the existing underground overflow chamber, to pick up the overflowed sewage and to link by a short tunnel to the shaft at the Marina (S1).

Foul Water Storage Tank

Bellozanne Sewage Treatment Works is capable of providing full treatment of foul sewage flow up to a maximum of 600 litres per second and primary treatment of flows in excess of 600 but not exceeding 1,000 litres per second.

Normal flows of foul sewage can be accommodated in the sewer system leading to Bellozanne, and therefore receive either full, or at least partial, treatment before discharging to sea.

Flows generated in the sewer system during times of even moderate rainfall are considerably in excess of 1,000 litres pe second, and hence it would be necessary to either store the excess flow for subsequent treatment, once the flows in the sewers had subsided, or to allow the excess flow to continue to be discharged to sea.

In 1987, following an appraisal of the existing Sewage Treatment Works at Bellozanne, it became clear that it would be necessary to modernise the whole plant, and that a rolling programme of improvement works should be implemented. In 1992, funds were voted for the construction of the new Inlet Works which, in line with the policy of the Public Services Committee to eliminate, as far as was practicable, discharges of untreated foul sewage to sea, included the provision of storm overflow storage (that is, combined flow of foul sewage and surface water during times of heavy rainfall). Consideration was given as to the best location for this storage facility. The volume of storage required was 5.5 million gallons (25,000 cubi metres).

The principle of storage of storm overflow sewage, until it can be dealt with by the sewage treatment system, is a widely recognised principle in the sewage treatment industry, and has been used in many other jurisdictions in the United Kingdom and Europe. It is recognised that it is not feasible to completely reconstruct existing sewer systems in congested urban areas, and therefore it is more appropriate to provide storage for the excess flows. Some examples of similar schemes are -

- *Brighton Interceptor Sewer - 1998.* A six-metre diameter tunnel, 5.5 kilometres long, with storage capacity o 33 million gallons (150,000 cubic metres), constructed under the beach, at a cost of £40 million.

- *Blackpool Storm Water Storage Tanks - 1999.* Two 36-metre diameter, 40-metre deep tanks, with storage capacity of 13.2 million gallons (60,000 cubic metres). The cost of this project was £10 million, and was par of a £500 million scheme to clean up the coastline.

- *Isle of Man.* This scheme has the same principle, by providing storage tanks, but to a much smaller scale, due to the smaller size of developed area and population involved.

- *Hastings Interceptor/Storage Sewer - 1998.* A 6.5 metre diameter tunnel, 1.6 kilometres long, at depths of 2 to 60 metres under the town centre, with storage capacity of 11.6 million gallons (53,000 cubic metres). Th cost of this tunnel is not known, but it was part of a £100 million scheme to improve the quality of the bathin water along the Hastings coastline and to alleviate flooding in the town centre.

The first option considered for the storage tank was to construct it in the car parking areas along Victoria Avenue. This option had several disadvantages -

(a) The tank would have been approximately six metres deep by eight metres wide and approximately 520 metres in length. The tank would thus have occupied over half the length of Victoria Avenue between Firs Tower and West Park Café.

(b) The works would have been carried out from the surface and would have occupied the full width of the promenade between the sea wall and Victoria Avenue. This would have caused major disruption to pedestrians, cyclists and motorists.

(c) Extensive service diversions would have been required to re-locate the existing underground services in the area in order to make space for the tank, and this would have caused further disruption.

(d) The works would have taken in excess of 12 months to complete, but would have had to be phased ove several winter periods to keep the area open for tourists, particularly the Battle of Flowers, during the summer. This stop-go construction, and the fact that the works would have had to be constructed in winter in poor ground conditions, would have been an expensive and inefficient way of constructing the works.

(e) The majority of excess flow that needed to be stored was generated in the Town area, and had to be taken out of the system at the Weighbridge, due to the inadequate capacity of the existing sewer between the Weighbridge and First Tower. It would thus have been necessary to construct a new feeder sewer of some 1.5 metres diameter between the Weighbridge and the head of the proposed storage tank in Victoria Avenue The construction of this sewer in open-cut would have caused major surface disruption in one of the most heavily trafficked areas of the Island, and the alternative of construction in tunnel would have been difficult and expensive, in view of the poor ground conditions in this area.

The second option considered was to construct a large underground storage tunnel running beneath the Esplanade and Victoria Avenue. Whilst this option reduced the magnitude of the surface disruption, it too had several disadvantages -

(a) Using the entire length between the Weighbridge and First Tower, some two kilometres long, the storage tunnel would still have had to be some four metres in diameter.

(b) Major working shafts would have been required along the length of the tunnel, causing major localised problems of surface disruption, which would have been difficult to overcome.

(c) The tunnel storage would have had to be constructed at a considerable depth, to obtain reasonable ground conditions, i.e. rock, and to avoid the multitude of services in this area. The stored sewage would thus have had to be pumped back into the sewer system, and a new very deep pumping station would have been required near First Tower.

4.0 SELECTION OF PREFERRED OPTION - "THE CAVERN"

The decision to construct the Weighbridge to Oxford Road surface water tunnel at low level provided a third option for the location of the storage facility, as it enabled foul sewage overflow from the existing system at the Weighbridge to be conveyed in a separate pipe within the tunnel, falling back to the low point in the tunnel beneath Snow Hill car park, and thence to a storage tank, under Snow Hill and Fort Regent. The overflow from the existing sewers in Bath Street would also be conveyed in a similar manner to Snow Hill.

The holding tank could therefore be constructed in the Snow Hill area, below the level of the proposed surface water tunnel, i.e. some 25 metres below Snow Hill car park level and 60 metres below Fort Regent. This option had several advantages, i particular -

(a) All the construction work could be undertaken from the Snow Hill car park, via an access portal in the rock face.

(b) Surface disruption would be restricted to Snow Hill car park, and not spread along the Esplanade or Victoria Avenue. This obviously would minimise the environmental impact on St. Helier and disturbance to members of the Public.

(c) The granite in which the holding tank was to be constructed was potentially an ideal construction medium, enabling a large storage volume to be excavated at a relatively economical cost. It was intended that the excavated rock be used in the proposed land reclamation schemes.

(d) All permanent works would be housed underground, and access would be gained, to the control room and pump room, via portal doors in the rock face at Snow Hill at the car park level.

(e) Foul sewage from both the Bath Street overflow and the Weighbridge overflow could be conveyed easily to this point through separate pipes inside the surface water tunnel.

(f) This option was considerably less expensive than options one and two, as all of the options required the tunnel from the Gasworks to the Weighbridge to be constructed as a common feature, in addition to the other parts of the individual schemes.

When the three options were investigated in 1993, their costs were estimated and the relative differences could be seen. There was one part of the proposed solutions that was common to all three options, and this was the tunnel from the Gasworks to the Weighbridge. (There were some differences in the engineering required for the different options, but this did not change the cost significantly.) This tunnel was required to convey the surface water from the Gasworks to the Weighbridge, and would also act as the conduit for the pipes to carry the foul sewage from the two overflow points to the Weighbridge.

The first option, with the storage tank in the car parks on Victoria Avenue, was estimated at £12.3 million. The second option, with the storage tunnel under the Esplanade and Victoria Avenue, was estimated at £15.25 million.

The third, and preferred option, with the storage tank at Snow Hill (the Cavern), was estimated at £9.1 million.

Project Group

The Project was managed in-house by the Public Services Department, but, in view of the technical complexity of the works, a Project Group was set up which included representatives from several specialist consultancy practices.

The Project Group comprised -

1. Design Engineers from the Department’s Drainage Section - responsible for hydraulic design, hydraulic and drainage specification, and overall Project Co-ordination.

2. Donaldson Associates Ltd, Uttoxeter - specialist design and specification for tunnelling techniques, shaft construction, and management of site investigation contract.

3. Geo-Engineering, Jersey - specialist design and specification for excavations in rock and rock support requirements.

4. Bennett Associates Ltd, Rotherham - specialist design and specification for mechanical, electrical and ventilation requirements.

5. Rock Environmental, Derby - specialist advice on the use of explosives and control of noise during construction.

Combined Scheme for Surface Water Sewer and Foul Sewage Storage Tank

It was considered that, by combining the construction of the Weighbridge to Oxford Road low level surface water sewer with the construction of the foul sewage storage tank at Snow Hill, the best possible solution to the two individual problems would be achieved.

The surface water tunnel provided the necessary outfall to enable future separation of surface water from foul sewage to proceed, thus significantly reducing the risk of flooding previously experienced in King Street, Queen Street, Bath Street, Halkett Place, Broad Street, Library Place and Beresford Street areas. Foul sewage overflow would be conveyed, by separate pipes laid within the surface water tunnel, to the low point at Snow Hill, which provided the ideal location for the holding tank, and enabled as much of the foul overflow as possible to be stored for later treatment at Bellozanne, thus minimising the amount of untreated sewage being discharged to the marine environment.

The joint scheme enabled disruption at Snow Hill car park to be limited to the minimum period of time. The construction of the storage facility anywhere else in, or around, St. Helier could not have been achieved without considerably greater disruption to a large number of people and businesses.

This scheme for St. Helier was a very important part of the overall strategy of separation of flows, and has made a large contribution to the overall objectives. It also made provision for further proposed developments in, and leading to, this area of St. Helier.

A number of projects had already been identified, such as the reconstruction of sewers at St. Saviour's Hill, in order to remove the restrictions on further development in this area. There were localised problems of inadequate capacity in the existing sewer system, and it was recognised that the effect of permitting further development would be to add further flows to the already overloaded system. It was also known that the solution to the localised problems, by upgrading the local sewer system, would exacerbate the problems further down the system, in the central area of St. Helier, by allowing more flow to reach there more quickly.

There were, and still are, numerous parts of St. Helier where further work is required, and separation of surface water would proceed outwards from the main spine sewers. The construction of the new surface water link has already enabled this being done from Oxford Road to Springfield and from the Gasworks to Mont Millais, allowing further parts of the sewer system to be separated.

The Public Services Committee is pursuing a policy, started by the former Sewerage Board and continued by the Resources

Recovery Board, of reconstructing the existing sewer system, particularly in St. Helier, in order to separate surface water from foul sewage. The reasons for this have been stated earlier in the Report.

This long-term policy involves works in many areas of St. Helier, and elsewhere around the Island. As mentioned elsewhere in this report, a considerable number of schemes have already been constructed, which have made improvements to the functioning of the different parts of the system, both at the Sewage Treatment Works and to the sewer system. However, there remains considerable work to be done, and numerous schemes have been identified. It will take time for the full benefits of this policy to be attained, but, as work progresses, the risks of flooding will reduce as will the risk of overflows of foul sewage to sea.

The proposed improvements to the sewer system are not only to contain the effects of the development that has already taken place, but also to provide for further proposed developments. Without these improvements, the addition of further development will increase the overloading of the system, the risk of flooding, and incidences of overflow to the sea. Already, there are identified areas for major developments in St. Helier, and elsewhere.

The States have continued to recognise the strategic importance of reconstructing this part of the infrastructure, by giving sewerage projects a high priority in the requests for capital funds.

With the higher levels of environmental standards that have to be attained, the development of shellfish farming, and the increasing use of the sea and shore for leisure pursuits, the Committee intends to continue to pursue this policy, subject to the availability of funds from the States. It is considered that the public of Jersey would not expect anything less.

The Public Services Committee had considered the proposals for this project at various meetings from late 1992, and gave its approval, in March 1993, to the scheme with the storage tank at Snow Hill proceeding.

The project was presented to the States on 11th May 1993, as part of the Report on the Committee’s Policy for the Disposal of Liquid Waste. The States approved the policy, including the surface water link part of the project, but did not approve the storage tank, and requested further information to justify the need for it.

A presentation was given to States members, by Public Services Department Engineers, on 19th May 1993, explaining the purposes of the project and the need for the storage tank. It was explained that there were recorded instances of about 100 discharges a year of foul sewage to sea, from the Weighbridge overflow.

A further Report was presented to the States, explaining the reasons for the need for the storage tank, and this was approved by the States on 22nd June 1993.

The Reports to the States and the presentation to States members covered the objectives of the project, in order to obtain the approval of the States to the scheme. They did not cover specifically the aspects of the construction, nor the risks associated with it, other than to state that specialist external designers had been employed, due to the technical complexity of the works. There was reference to complex ground conditions and the measures proposed to avoid risks of damage to properties, by constructing the tunnels at greater depth.

5.0 TYPE OF CONTRACT AND REASONS FOR CHOOSING

There are always risks involved in Civil Engineering construction projects, particularly those associated with underground construction. The type of contract used in this case, the Institution of Civil Engineers Conditions of Contract for Works of Civil Engineering Construction, 5th Edition (commonly known as the ICE Conditions of Contract), has been in use for many years, both in the United Kingdom and throughout many countries, and is well tried and tested.

It is essential to have conditions of contract that are tried and tested, as disputes over them will then have had established precedent in law. The ICE Conditions of Contract had (some years earlier) been reviewed by legal experts, in order to modify them to take into account Jersey law and practices.

This form of contract is also an ad measurement contract, that is the tender price is based on the Contractor’s rates for quantities of work that are provided by the Employer’s designer. The work executed is subject to re-measurement of quantities at the rates in the tender, whether the quantity is higher or lower. Therefore, the final price can differ from the tender price, depending on the actual measure of the work carried out.

There are other forms of contract that could be used, for example lump sum fixed price, where the Contractor is required to include in its price for all work required, and for some, or all, of the risks that could be foreseen. The Contractor is, therefore, expected to complete the work for the fixed price, unless the Employer introduces any changes (variations). This means that the Contractor has to be sure that it is covering all foreseeable risks in its price, and the price will, therefore, reflect the degree of risk. If the Contractor does not encounter any of these risks, it will still have to be paid the full amount of the tender price.

The result of a lump sum fixed price contract is that the Contractor's price will be higher, possibly considerably higher, than with an ad measurement contract. However, it is still possible to have claims arising from a fixed price type of contract, if the Contractor encounters conditions that could not reasonably have been foreseen, at the time of submitting the price. This depends on the amount of risk that the Contractor is required to accept, under the Contract. In some circumstances, with certain types of construction projects, the Contractor may be prepared to accept liability for absolutely all risks, and will price even higher accordingly.

In this case, it was considered that the ICE Conditions of Contract would be the most appropriate, for the following reasons -

- It was considered that the Contractor would not be prepared to accept all of the risks, in a project that involved total underground working.

- The ICE Conditions of Contract was a tried and tested form of contract for this type of work, and had been legally reviewed for Jersey conditions.

- The site investigation that had been carried out to determine the design of the project had been extensive.

On this last point, it has been suggested that the site investigation was at fault. This was not the case, in the Engineer's opinion, and it was not proven by the Contractor that the site investigation was faulty. There were a few areas, where unforeseen conditions were encountered, but it must be noted that it is impossible to cover every part of the route of a project, especially when the route passes under properties.

It is important to understand the position of the Engineer to the Contract and the importance of his opinion. The Engineer is a key figure, nominated in the Contract, and is authorised to make the final decisions on contractual matters. In carrying out his duties under the Contract, the Engineer must do so with impartiality, and must be seen to be fair to the Contractor and to the Employer. It is common practice for the Engineer to be a direct employee of the Employer (in this case the Committee), and this is the case with many Water Authorities and Government bodies in the United Kingdom. Provided the Engineer demonstrates that he exercises his professional judgement in an unbiased manner, he will be seen to fulfil his role under the Contract.

6.0 TENDERING PROCEDURE

Submissions were invited in September 1993 from a selected list of Civil Engineering contractors that had relevant experience of tunnelling in hard rock using tunnelling machines and using blasting, sinking deep shafts in soft ground and in rock, excavation of large underground structures in rock using blasting and rock support, and shotcreting (sprayed on concrete). Fourteen contractors were considered, and six of these were chosen for their previous experience of this specialised work.

Two sets of tendering documents were issued to these contractors in September 1993. These documents included conditions of contract, specifications, design drawings, and site investigation information with test results. The two sets of documents were for two separate contracts, the first one being for only the tunnels and shafts, and the second being for the tunnels, shafts, and the storage tank. The reason for this was in case the costs for the complete scheme were too high and in excess of the funds available. In this event, the Committee would have been able to proceed with the tunnels, without the storage tank. It was considered that the surface water link was the most important part of the project, to accomplish the relief of the overloaded sewer system in the central area of St. Helier. The Committee would then have had to seek further funds for the storage tank.

The tenders were returned at the end of November 1993, and were opened by the President of Public Services. The tenders received were as follows -

Contractor	**Tunnels and shafts only** **£**	**Complete Scheme** **£**
Balfour Beatty Civil Engineering Limited, England	5,315,668.00	8,114,374.00
Trafalgar House Construction (Tunnelling), England	7,187,019.66	10,781,034.80
M.B.M. Tunnelling, England	8,633,291.97	14,134,781.02

Amec Civil Engineering Limited, England	9,058,698.60	15,976,611.12
Hochtief A.G., Germany	13,645,438.47	23,022,009.66
Ed Zublin A.G., Germany	Withdrew during tender period	

This information was reported to the Committee on 6th December 1993. It was reported that the tenders received were generally higher and the spread much greater than anticipated, possibly reflecting the demanding nature of the work, as well as market conditions in the United Kingdom and on the Continent. The tenders had all been examined, and the two lowest were being carefully scrutinised at that time.

It was noted that the lowest tender, submitted by Balfour Beatty, might not comply with the requirements of the specification, that further clarification was being sought from the contractor, and that its price might increase to meet the specification. Further information was also being sought from Trafalgar House, regarding its tender. The Committee was mindful of the urgent need for the scheme to be completed, and agreed that it was imperative that the successful tender was technically correct.

7.0 SELECTION OF PREFERRED CONTRACTOR

Discussions and correspondence with Balfour Beatty and Trafalgar House resulted in a significant addition to Balfour Beatty's tender, for changes to the tunnelling construction between Snow Hill and the Gasworks. There were still some issues to be resolved regarding this tender. A slight increase was also necessary to the Trafalgar House tender, as it had programmed certain operations to be carried out on the night-shift; a method of working that was clearly prohibited in the specification. (The specified permitted working hours were 7.15 a.m. to 7.00 p.m. Monday to Friday, 8.00 a.m. to 5.00 p.m. Saturday, a no work on Sundays.)

The rules on tendering procedures state that, under normal circumstances, tenderers should not be allowed to make additions or alterations to their tenders after they have been opened. However, if it is sufficiently in the interest of the Employer, then this can be allowed, with the sanction of the Employer. In this case, the difference between the first and second tenders was large, and the second tender also required alteration. The alternative would have been to ask for re-submission of tenders, and start again, with the delay that this would have required. Therefore, the Committee authorised further discussions with the two lowest tenderers, in order to complete the evaluation and to be satisfied that the tenders complied fully with the specification.

Further discussions were held with Balfour Beatty, along with the Committee's technical advisers, in order to ensure that all aspects of the Contract specification had been fully complied with. This required further submissions of details from the Contractor, explaining how it proposed to carry out the work in compliance with the Contract. Eventually, in March 1994, a position was reached where it was considered that Balfour Beatty had provided sufficient detail to show that its tender was acceptable. The final tenders from Balfour Beatty and Trafalgar House were £8,795,374 and £10,861,034 respectively.

The risks associated with a construction project involving tunnelling and deep excavations were addressed by having a very detailed and extensive site investigation carried out. The Committee was made aware that as much investigation as practicable had been carried out to investigate the ground conditions, and specialist designers had been employed to prepare the design and the specification for the work. Contractors with large resources and the relevant experience had been selected, based on their previous performance. The lowest contractor's tender had been investigated in detail, to ensure that its proposed construction methodology would deal with the anticipated difficult ground conditions and the requirements of the specification. There were contingency sums of about five per cent in the tender (£420,000).

The progress of the discussions had been regularly reported to the Committee, which then approved the acceptance of Balfour Beatty's tender, subject to the agreement of the Finance and Economics Committee to the transfer of funds from the Committee's Capital Votes for sewer works. The overall cost of the project was estimated at £10.3 million.

The funds for this scheme had originally been voted in three parts, as follows -

1. In 1992, £2.5 million was voted for Phase I of the Surface Water Sewer from Weighbridge to Town Centre, thi being the section from the Weighbridge to Bath Street (Capital Vote C0453 - Surface Water Improvements).

2. In 1992, funds were voted for the construction of improvements to the Bellozanne Sewage Treatment Works. In

addition to a new Inlet Works, these funds included for the provision of storm overflow storage, to the amount of £4.8 million (Capital Vote C0480 - Liquid Waste Treatment).

3. In 1993, £1.6 million was voted for Phase 2 of the Surface Water Sewer from Weighbridge to Town Centre, this being the section from Bath Street to Oxford Road, and including the reconstruction of the sewers in Bath Street (Capital Vote C0418 - Reconstruction of Sewers).

By amalgamating the allocated funds from these three existing votes, funds of £8.9 million were available to fund this scheme.

Further to a report to the Committee on 24th January 1994, regarding the tenders, the Committee agreed to seek the approval of the Finance and Economics Committee to the amalgamation of funds from the following capital votes -

		£
Vote C0480 -	Liquid Waste Treatment	4,800,000
Vote C0418 -	Reconstruction and Replacement of Sewers	2,350,000
Vote C0453 -	Surface Water Improvements	3,150,000
	Giving Total Funds of:	**10,300,000**

The additional funding was made available by deferring other planned sewer works in the Committee's Capital Votes for Sewer Reconstruction (£750,000) and Surface Water Improvements (£650,000), to provide the total funding of £10,300,000. Some of these works had been planned to proceed after the Surface Water Link had been completed. (It should be noted that no funds were taken from the Foul Sewer Extensions Capital Vote - C0452, as the Public Services Committee considered it to be sacrosanct.)

A detailed report was given to the Finance and Economics Committee regarding the transfers of funds, and it approved these transfers of funds to a separate vote for the project, in February 1994.

There were two pressing reasons for the work having to proceed. The first was that the location of one of the shafts (S5) was in the corner of the new Liberation Square, and this had to be completed prior to the new Square opening in May 1995, and also that there was another shaft (S1) adjacent to the head of the Town Marina. The second was that the new Marina, west of the Albert Pier, was due to open in early 1998, and the end of the outfall, which discharged the overflowed foul sewage, was located adjacent to the entrance to the new Marina. The reason for this was that the original outfall had been located in the south-eastern corner of the first reclamation site (west of Albert), as this was, at that time, the open sea and it was still discharging foul sewage at times of overflow from the sewer system. It could not, therefore, have been located in the new Elizabeth Harbour. When the decision was taken to construct the new Marina in this location, the outfall had to be extended through the area of the new Marina, and the discharge of foul sewage had to be stopped before the new Marina opened for use.

Therefore, the tender from Balfour Beatty was accepted on 31st March 1994.

8.0 COMMENT ON THE OVERALL PERFORMANCE OF THE CIVIL ENGINEERING CONTRACTOR

The Civil Engineering (CE) Contract was for the construction of the tunnels, the shafts, the storage tank, and the control and pump rooms at the car park level. The fitting of the operational equipment was a separate contract, to be carried out by a Mechanical and Electrical (M&E) Contractor, following the completion of the CE Contract.

The Contractor for the CE Contract was Balfour Beatty Civil Engineering Limited. The Employer was the Public Services Committee. The original Engineer to the Contract (who was the Engineer to all civil engineering contracts issued by PSD at that time) was the former Director of Engineering, PSD, who retired in 1996. He was succeeded by Mr. C.J. Mulready, the Chief Executive Officer of PSD, in 1996. (This will be explained in more detail, later in the Report.)

The CE Contract started at Snow Hill on 25th April 1994, and was programmed to be completed in 82 weeks, that is on 18th November 1995.

The storage tank and associated works were actually completed on 15th February 1997. The tunnels and shafts were substantially completed in Week 173, that is on 15th August 1997. Reinstatement of Snow Hill Car Park was completed, and the site vacated on 17th August 1997. Some minor finishing works in the shaft at the Gasworks car park continued until early September 1997, when this site was also vacated.

By July 1994, work had fallen behind programme in a number of areas. This was taken up with Balfour Beatty's senior management, in order to minimise delays and to make up to the programme. As delays increased, regular discussions were held with the Contractor's senior management. One option requested by the Contractor to retrieve the lost time was to be allowed to implement 24-hour working for six days of the week. This is the normal preferred way of working on tunnel construction, but it had been made very clear to the Contractor at the tender stage that this could not be allowed in this case, due to the proximity of residential properties.

It was reported to the Committee that the Engineer's opinion was that the Contractor was disorganised and that its progress was unsatisfactory. The Contractor's opinion was that unforeseen problems had caused the delays.

By the end of 1994, work was proceeding at a number of locations - the main working shaft at Snow Hill, the main access tunnel to the storage tank at Snow Hill, two shafts at the Weighbridge, and the shaft at the Gasworks - and the Contractor had fallen seriously behind programme. The Contractor had also given notification of a number of claims for delays due to unforeseen conditions.

The tunnel boring machine (TBM) for the tunnel from Snow Hill to the Gasworks (S2-S4) started tunnelling in January 1995, some 14 weeks later than planned. Within a distance of less than one metre, it suffered a major breakdown that required removing it completely from the tunnel and returning it to England for repair. This caused a major delay in this tunnel construction of over nine months, as it was not returned to site until August 1995 and did not start tunnelling again until October 1995. The TBM suffered numerous minor breakdowns and two further serious breakdowns, before reaching the Gasworks shaft (S4) in February 1997, some 19 months behind programme.

The tunnel from Snow Hill to the Weighbridge (S2-S1) also suffered delays, due to breakdowns of the tunnelling equipment. It had originally been planned to construct this tunnel by drill and blast techniques, but there was considerable concern expressed to the Contractor about controlling the blasts in the launch chamber of the other tunnel and the level of the vibrations that were being caused. The Contractor then proposed a different method of constructing this tunnel, without blasting, called horizontal raise boring. After examination by the Employer's designers, it was agreed by the Committee to accept this alternative method at an additional cost of £66,000, as it would remove the need for blasting along this route. The programme was to complete this tunnel by May 1995, but delays to progress and breakdowns of the equipment resulted in the tunnelling not being completed until November 1996.

Considerable delays occurred in the sinking of the deep shaft at the Gasworks (S4). Work started in October 1994 and the sinking of the shaft was programmed to be completed in four months, then to await the arrival of the TBM tunnel from Snow Hill. A problem was encountered in sinking the shaft through the interface between the soft ground and the rock, with a high water table present in the soft ground. This resulted in a very long delay, while the Contractor attempted to inject grout into and around the interface. After negotiating the interface, further delays occurred in sinking the shaft through the hard rock, and this was not completed until October 1996.

Excavation of the main access tunnel and the cavern started in July 1994 and was programmed to be completed in March 1995. Some slight delays were caused by unexpected rock conditions in a few areas, but the overall progress was much slower than programmed. The excavation phase was completed in December 1995. The concrete lining and finishing work was programmed to take five months, but actually took nearly ten months, with work on the cavern being substantially completed in February 1997, instead of the programmed date of November 1995.

The surface water link was commissioned in January 1998, after some of the M&E equipment had been installed.

Mechanical and Electrical Contract

The Mechanical and Electrical (M&E) Contractor was Staveley Industries Plc., WHS Division, and was appointed on 26th February 1997. The Employer was the Public Services Committee. The Engineer to this Contract was the Principal Engineer, Information Services Group, PSD. Installation of the equipment for pumping sewage, washing down walls, ventilation and air purification, control and monitoring started on site on 18th August 1997, was programmed to be completed in mid-March 1998, and was completed on 12th May 1998, when the cavern was commissioned.

9.0 DESCRIPTION OF CLAIMS AND WHICH WERE RESOLVED DURING THE CONTRACT

Civil Engineering Contract with Balfour Beatty

The Tender sum was £8,795,374 and the approximate division of the costs between the two main parts of the CE Contract was as follows -

- Surface Water Tunnel and Shafts £5.0 million
- Storage Tank, or Cavern, £3.8 million

This illustrates that the majority of the cost was in the tunnels and shafts and not the storage tank (the Cavern).

The Contractor started submitting notifications of claims, under the provisions of the Contract, in 1994. By the end of the construction period, 39 specific claims and eight general claims had been notified. These claims were predominantly related to ground conditions allegedly being different from what could have been foreseen at the time of tendering. The claims ranged in size from £2,000 to £3.5 million for the specific claims, and to£2.5 million for the general claims.

30 of the claims, to the value of £12.5 million, were for the tunnels and shafts, and nine were for the cavern, to the value of £800,000. Therefore, it should be noted that approximately 94 per cent of the claims submitted related to the tunnels and shafts, and not to the cavern.

Efforts were made to resolve these claims close to the time of submission. A few of the claims were accepted in principle, and the Contractor was requested to provide detailed substantiation of the costs incurred, so that agreement of the due entitlement to the Contractor for the extra work could be made. The Contractor, however, only submitted estimated costs of the additional work, and so a detailed evaluation could not be made at that stage. Nevertheless, it was necessary to make an on-account payment towards the Contractor's costs, where the claim had been accepted in principle. This was because the Contractor would be due some payment and, if not paid until later, would be entitled to claim interest on the costs. Therefore, a conservatively low percentage of the costs claimed was made on these claims, as it is common for the final agreed costs to be lower than the claimed costs.

The Contractor was notified of the claims that were not accepted in principle, but it did not accept that these claims were not accepted by the Engineer and continued to submit requests for payment.

The claims that were agreed in principle, and for which on-account payments were made, are listed below. (The on-account payments are described in the next section.)

(a) *Tunnel from Snow Hill to Weighbridge (S2-S1).* Unforeseen ground conditions - a geological sill was encountered under the position of the JMT Bus Garage, and this caused a breakdown of the tunnelling equipment and delay.

(b) *Tunnel from Snow Hill to Gasworks (S2-S4).* Unforeseen ground conditions - a band of clay was encountered in the rock between Charles Street and Phillips Street, and this caused clogging of the TBM and delay. Also an increased length (over what was shown in the Contract) of high strength rock caused delay.

(c) *Shaft at Snow Hill (S2).* Unforeseen ground conditions - highly fractured nature of rock affected blasting procedures and caused delay.

(d) *Shaft at Bath Street/Wests Centre (S3).* Loss of profit, due to this overflow shaft and the connecting sewers being withdrawn from the Contract.

(e) *Shaft at the Gasworks (S4).* Unforeseen ground conditions - higher than foreseen magnitude of groundwater inflow at soft ground/rock interface and through fractures in rock, increased hardness of rock, and additional specialised grouting of rock.

(f) *Shaft at Liberation Square (S5).* Large boulders obstructing sinking of shaft through soft ground.

(g) *Connecting Tunnel from Weighbridge Shaft (S1) to Existing Surface Water Culvert.* Unforeseen obstructions caused additional work and delay.

(h) *Cavern Ventilation Shaft at Fort Regent.* Unforeseen obstructions, buried granite wall.

(i) *Overall Delay and Disruption.* As a result of all of the foregoing claims, the Contractor was entitled to an Extension of Time for the additional work, and to an entitlement to overhead costs and profit for this period.

The Contractor was paid the sum of £14,378,132 for all work to the end of the construction period, which included Variation Orders, increases in measured works and expenditure of provisional items, and £4,091,094 on-account towards claims agreed in principle and prolongation costs.

10.0 SUMMARY OF AGREED PAYMENTS AND OUTSTANDING CLAIMS

Claims

Although discussions on claims continued throughout the period of construction, no detailed formal submissions of claims were received until November 1996. Over the period up to August 1997, the remainder of the detailed claims submissions were received from the Contractor. As mentioned previously, the Engineer's role is very important in the Contract. It is the Engineer who decides on whether the Contractor's claims for additional payment are accepted or rejected, and, if accepted, decides on the payment that the Contractor is entitled to. However, the Engineer could not be expected to be an expert in every specialist area, and had a Team of Advisers to analyse and evaluate the issues involved in the claims. Many of these were in specialist technical areas and also in legal areas.

The claims involved extensive documentation, and the Engineer and his Team of Advisers analysed and responded to these claims up to September 1997. In brief, the Engineer's responses were that, with the exception of the few claims that had already been agreed in principle, the Contractor's submissions did not contain information to convince him of the Contractor's claim to further entitlement.

Various attempts had been made to persuade the Contractor that its claims could possibly be settled, if it was prepared to concede the claims that had not been agreed, but the Contractor was not prepared to concede any claims.

After the Engineer had responded to these claim submissions, an attempt was made in October 1997, with the approval of the Public Services Committee and the Finance and Economics Committee, to bring the matters to a close by offering a negotiated settlement with the Contractor. The offer of a negotiated settlement was ex-contractual and, therefore, the Engineer did not have a formal role in these discussions. The two parties to these discussions were the representatives of the Employer and the Contractor.

At that time, the Contractor's claim for total payment was in excess of £28 million. Due to the lack of useful detail in the claims submissions, it was still not possible for the Engineer's Team to fully evaluate the Contractor's entitlement. However, an estimate had to be made of the Employer's position and the possible liability to the Employer that could arise from arbitration. Therefore, an offer was made to the Contractor of a settlement of £15.5 million. The Contractor flatly refused to consider an offer in that region and insisted that it would be able to obtain considerably more by going to arbitration. The Contractor's expectations were in excess of £26 million and it stated that it would have the claims prepared again by world expert claims consultants and technical specialists in all areas. The claims would be prepared such that, if they were not accepted, then the Contractor would proceed straight to arbitration.

Against this background, the Committee had to ensure that the level of expertise available to advise the Engineer, and to protect the Committee's liability under the Contract, would be sufficient to address all of the issues. Various eminent technical specialists therefore had to be employed to analyse and respond to the new claims submissions that were received from the Contractor from July 1998 to April 1999. The claims submissions were very extensive, comprising over 200 volumes (of lever-arch file size), and covered many specialist technical areas. The numerous specific claims had been grouped together into areas of work, for example all of the issues involved in the tunnel from Snow Hill to the Gasworks. This resulted in a smaller number of larger claims.

The claims also covered a number of legal/contractual issues that could only be dealt with by lawyers. An example of this was that the Contractor had claimed, more than half way through the construction of the Snow Hill to Gasworks tunnel, that the TBM was the responsibility of the Employer and that the Employer was liable for all costs arising from the breakdowns and delays. The value submitted for this claim was £7.2 million. The total value of the Contractor's submissions for claims and measured works was £35.1 million.

The Engineer's Team prepared very comprehensive responses to the second claims submissions, as it was anticipated that these matters could end in arbitration. This obviously took time and involved very considerable costs to the Committee for the Advisers.

The advice of the Committee's Legal Advisers was that the Engineer's Team should complete the procedure of evaluating and responding in detail to the claims. In this way, it was intended to reduce the Contractor's expectations of the outcome of the claims, and the responses would also be fit for submission to arbitration. By demonstrating to the Contractor that its claims had been addressed comprehensively and professionally, the amount in dispute would be reduced, and the possibility of either a resolution or a settlement could become more likely. However, the extent of over-valuation in the Contractor's claims had resulted in the amount in dispute still being very large, and this made the possibility of a negotiated settlement unlikely.

The Engineer’s Responses to the Claims

The Engineer’s Team prepared detailed responses, dealing with all of the principles and technical evidence submitted by the Contractor. Detailed financial evaluations also had to be made of the matters that were accepted in principle, so that the Engineer could arrive at his own Valuation of the issues. These responses comprised extensive documentation that would be suitable for submission to arbitration, and were reviewed by the Legal Advisers.

A. - Tunnels and Shafts

The Engineer’s response to the first main claim, for all issues involved in the construction of the tunnel from Weighbridge to Snow Hill (S1-S2), was issued to the Contractor on 25th September 1999. A further submission was received from the Contractor, on 20th November 2000, replying to the Engineer’s response. This was examined, and it did not affect the Engineer’s opinion. The claimed amount was £3,131,661. The Engineer’s valuation was £573,701, and a sum of £615,000 had already been paid on account. (Some of the issues that had originally been submitted as part of the claims were resolved as part of the Measured Works.) The agreed payment was mainly for the delays associated with the geological feature under the location of the JMT Bus Garage. There were some complex legal/ contractual issues in this claim.

The Engineer’s response to the Bath Street Shaft (S3) claim (for loss of profit) was issued to the Contractor on 14th October 1999, and no reply was received from the Contractor. The claimed amount was £100,376. The Engineer’s valuation was £17,994, of which £17,400 had already been paid on account.

The Engineer’s response to the second main claim, for the TBM tunnel from Snow Hill to the Gasworks (S2-S4 claim) was issued to the Contractor on 25th May 2000. The response was delayed by information missing from the Contractor’s claim submission, which had to be further obtained from the Contractor. The claimed amount was £7,277,010, but was reduced by the Contractor in December 1999 to £5.8 million, apparently due to inaccuracies in the first submission. The Engineer's valuation was £51,724, which had already been paid on account for the band of clay and extra length of high strength rock. There were, however, some very important and complex legal issues involved in this claim. A further submission was received from the Contractor, on 20th November 2000, replying to the Engineer’s response. This was examined, but it did not affect the Engineer’s opinion.

The Engineer’s response to the Gasworks Shaft (S4) claim was issued to the Contractor on 24th November 2000. The claimed amount was £1,782,325. The Engineer’s valuation was £813,955, and a sum of £1,201,074 had been paid on account at an earlier stage in the Contract. The reason for the on-account payment exceeding the Engineer’s final valuation was that it was only possible to make a preliminary evaluation, at the time of the work being carried out. It was necessary to make some payment towards the Contractor’s costs, on a claim where the principle had been agreed, or the Employer would have been liable for interest on costs not paid until later. It was only after a very detailed examination of the Contractor’s claim and its costs that the real costs to the Contractor were determined, and the scale of over-valuation of the claims became apparent. The payment was for additional work and delays caused by high groundwater inflow, increased hardness of rock and specialist grouting of rock.

Total of Engineer’s Valuation of Tunnels and Shafts Claims: £1,490,770.

B. - Cavern and Ancillaries

The Engineer’s response to the claim for the Main Access Tunnel (leading to the Cavern) was issued to the Contractor on 11th September 2000. The claimed amount was £411,142. The Engineer’s valuation was £48,539 for additional rock support to unstable areas.

The Engineer’s response to the claim for the Main Holding Tank (the Cavern) was issued to the Contractor on 21st October 2000. The claimed amount was £452,869. The Engineer’s valuation was £85,379, mainly for additional rock support to unstable areas and unforeseen obstructions in the Ventilation Shaft construction.

Total of Engineer’s Valuation of Cavern Claims £133,918.

C. - General Claims

The Engineer’s response to the Delay and Disruption claim was issued to the Contractor on 5th December 2000. The claimed amount was £8,273,722. The Engineer’s valuation was £1,545,115, and a sum of £1,500,000 had previously been paid on account. The payment was for overall delay and disruption to the Contractor’s working arrangements, additional overhead costs and profit.

This brought the total of the Engineer's Valuation of the Claims to £3,169,803 (compared with the claimed value of £19,677,008).

Measured Works

The agreement of the final account for the Measured Works was very protracted, due to the Contractor not providing the relevant information, and not being prepared to agree to the resolution of disputed items. Ideally, this should have been completed within six months of the completion of the construction, but the Contractor was not prepared to provide the resources required to address these matters. Eventually the resources were provided, and the finalisation of the Measured Works was taken as far as it could be agreed. The Contractor's submitted account for the Measured Works was £15,431,267, and the account was agreed (as far as it could be) in 2001 at £10,401,785, with £1.1 million of non-agreed items listed separately (i.e. a Scott Schedule) for resolution to be decided otherwise. (Some items that had been submitted as claims initially were resolved as measured works items.)

The Engineer's Valuation of the Claims added to the Valuation of the Measured Works made the Final Valuation of the Contract £13,571,588.

The Engineer was required to complete the determination of the final Extension of Time due to the Contractor as a result of delays from additional work, claims, etc. This then enabled the value of the Liquidated Damages to be determined.

The Engineer issued his Final Certificate, confirming his Final Valuation of the Contract, on 20th July 2001. After doing so, he could only change the value of the Final Certificate by either the Contractor or the Employer asking for a formal Decision under the Contract (a Clause 66 Decision). If the Contractor had then been dissatisfied with the Engineer's Decision on the issue (or issues), its only recourse, under the Contract, would have been to ask for arbitration.

As mentioned previously, arbitration had always been considered as a last resort, due to the costs involved and the unpredictability of the outcome. Throughout the claims process, parallel discussions had continued with the Contractor to find a way of resolving the dispute, possibly by a negotiated settlement.

11.0 SUMMARY OF NEGOTIATIONS LEADING TO FINAL SETTLEMENT

The continuing costs to the Committee for Advisors dealing with the claims had been considerable, as the concentrated work on the analysis of the claims had taken over a year to produce the Engineer's valuations of, and responses to, the claims. It can be seen, from the comparison of the claimed amounts and the Engineer's valuations, that the work of analysing the claims in detail was a necessary and worthwhile investment. Without this detailed work, it would have been impossible to refute the Contractor's claims with any confidence. Also, this work had put the Employer in a much stronger position, should the matters end up in arbitration.

To summarise the claims situation, the Contractor had submitted 8 main claims to the value of £19,677,008. The Engineer had completed his detailed evaluation of these, and his Valuation was £3,169,803.

It must be pointed out that, even at that stage, this was not the final outcome. The Contractor could have challenged these valuations, by a process that would probably have led to arbitration.

A great deal of work had also been carried out on the Measured Works account, and this had resulted in the Engineer's Valuation of £10,401,785, compared to the Contractor's submitted account of £15,431,267.

The summarised position was that the Engineer had produced his Valuation of £13,571,588 for the entitlement due to the Contractor, but the Contractor was maintaining that it was due an entitlement in excess of £30 million. The Contractor expressed its dissatisfaction at the Engineer's Valuation and maintained that the Engineer had been unfair, and biased towards the Employer. This was refuted by the Engineer, who said that it could be demonstrated that his evaluation of the claims had been unbiased and had been subjected to independent review.

The importance of the Engineer's role has already been stated. The Engineer is a key figure in the Contract and is authorised to make the final decisions on contractual matters, and on issues of dispute between the Employer and the Contractor. In carrying out his duties under the Contract, the Engineer must do so with impartiality, and must be seen to be fair to the Contractor and to the Employer. In any arbitration, it would be necessary for the Engineer to demonstrate that he had been impartial; otherwise this could be challenged by the Contractor.

As mentioned previously, discussions had continued with the Contractor's senior management to try to find a way of reaching a resolution, without going to arbitration. The Contractor had stated that it would be prepared to take a reasonable loss on the Contract, in exchange for what it considered to be a reasonable commercial settlement. However, the settlement figure the Contractor eventually revealed that it had in mind, at that time, was in excess of £21 million. It was made clear to the Contractor that the Employer could not consider a figure of that magnitude, when the advice of the Engineer and his Team was that the Contractor's entitlement was considerably less.

The conclusion of the Engineer's Valuations of the claims in 2001 had reduced the Contractor's expectations to some extent, and it stated at a meeting in March 2001 that it would be prepared to consider a settlement of around £19 million. At that time, the Employer (the Committee) was prepared to consider a settlement figure of £15 million, as it had already paid £14.37 million, and was anxious to conclude the long-running dispute and avoid further on-going costs or the risk of arbitration.

At a meeting in September 2001, the Contractor stated that it would be prepared to settle for £18 million, provided the payment was made within one month. During subsequent correspondence, the Employer's formal offer of a settlement of £15 million was made to the Contractor.

The Public Services Committee had reported these negotiations to the Finance and Economics Committee, in order to obtain its approval for the funding. The Committee's Legal Adviser had attended the Finance and Economics Committee to report on the situation and, while being concerned at the overall expenditure on this project, the Finance and Economics Committee understood the difficulty of the situation and the need to find a resolution. Therefore, it had given its support to the approach being adopted, in order to draw the dispute to a close.

The Contractor was still not prepared to accept the offer of £15 million, stating that it was still prepared to go to arbitration to obtain a higher sum. A series of correspondence followed, which culminated with a meeting on 21st December 2001, when the Committee's final offer of £15.75 million was made to the Contractor. After considering this, on 24th December 2001 the Contractor stated its acceptance of the settlement of £15.75 million, provided the final payment was made as soon as possible, and this was confirmed by exchange of faxes.

The final payment was made to the Contractor by 31st December 2001, and this concluded the dispute.

12.0 INFORMATION ON EXPERTS AND CONSULTANTS EMPLOYED, WITH PAYMENTS MADE

It has been explained previously that the Committee had to employ specialist advisers on legal, technical and contractual matters, to be able to respond to the claims made by the Contractor. As the magnitude of the dispute increased, the level of involvement of the advisers increased accordingly.

Although the items in dispute were of considerable magnitude, discussions were carried out in a professional and reasonably amicable manner.

The dispute with Balfour Beatty on claims and contractual issues extended from 1995 until the settlement was reached on December 24th 2001. The total cost of all of the advisers over this period was £3,213,708. In addition to this, it was necessary to retain a few key members of the site staff (gradually reducing to one), who had supervised the construction on behalf of the Committee, for their specialist knowledge of the construction and to co-ordinate the work on the claims. These site staff had been employed only from the beginning of the construction phase of the project. The additional cost of this was £495,941, giving a total cost of analysing and countering the claims of £3,709,649.

The continuing costs of dealing with the claims caused great concern to the various Public Services Committees over this period. These matters were regularly reported to the Finance and Economics Committee, and requests had to be made for the additional funding. The Finance and Economics Committee was also greatly concerned at the continuing costs, but accepted that this process had to be completed, in order to protect the States' liability, and therefore provided the funding.

As described previously, the Engineer's role is very important in the Contract. At the beginning of the Contract, the Engineer was the former Director of Engineering, PSD. When he retired in early May 1996, a successor had to be appointed by the Employer, as provided for in the Contract. It was decided that, as the Contract had already entered a state of contractual dispute, the person appointed as the Engineer should be a senior member of the PSD, who had experience of large contractual disputes. The Chief Executive Officer, Mr. J. Mulready, had considerable experience of dealing with large contracts and with contractual disputes, and therefore he was appointed as the Engineer in early May 1996. It is fairly common for the Engineer to be a Chief Officer or a senior officer of a Water Authority or Government department. (This has been the policy of the Resources Recovery Board, the Public Buildings and Works Department, and the PSD.) This is seen as being essential, as the Engineer must have considerable experience of contractual matters, and must be of sufficient status to deal with senior management personnel of contractors.

It was anticipated, at that time, that the Contract would be completed in October 1996. When the decision was made that Mr. Mulready would retire in October 1996, the situation was reviewed in August 1996. At that time, it was anticipated that the Contract work would be completed in April 1997. The Committee's Legal Advisers recommended that, as there had already been one change of Engineer and the Contract was moving further into dispute, it would not be in the Committee's interest to have another change. It would be better, from the point of view of any possible arbitration, to maintain continuity by keeping the same person as the Engineer. Therefore, as Mr. Mulready was taking up a Professorship with the University of Leeds Innovations Centre (a consultancy), a contract would be made with University of Leeds to provide the services of the Engineer for the remaining period. At that time, it was not foreseen that the dispute would last for a long time.

The list of the 19 organisations and consultants involved in the claims process, the area in which they specialised, the time involved, and the payments made to them are as follows -

	£
• Merricks, legal advisers, from 1995 to 1999	432,054
• Hammond Suddards Edge, legal advisers, took over in 2000 (but the same individual)	379,040
• CRC Consultants, contractual and commercial consultants, from 1996	960,401
• Geo-Engineering, geotechnical consultants, from 1995	293,093
• Donaldson Associates, tunnelling consultants, from 1995	492,066
• University of Leeds Innovations Limited, provision of services of the Engineer, Professor C.J. Mulready, from late 1996	214,709
• Dr. O.T. Blindheim, geotechnical and tunnelling consultant, from 1996	115,206
• Dr. W. Weber, tunnelling machinery consultant, from 1996	26,044
• Dr. N. Barton, rock stabilisation consultant, from 1997	1,800
• Dr. T. Mellors, geotechnical consultant, from 1999	45,838
• Golders Associates, hydrogeological and geotechnical consultants, from 1998 to 1999	99,763
• Insitu Solutions, hydrogeological and geotechnical consultants, took over from Golders in 2000 (but the same individual)	40,269
• National Radiological Protection Board, radon advisers, from 1997	2,475
• Vibrock, blasting and vibration advisers, from 1996	52,599
• Soil Mechanics Limited, geotechnical and site investigation advisers, from 2000	26,892
• J. Bowcock, mediation adviser, from 1996	1,775
• Tillyard, quantity surveyors, from 1995	4,805
• K. Pickavance, programme and contractual adviser, from 1999	2,814
• Sintef/NTNU, laboratory testing	9,674
• Administrative and secretarial, from 1997	12,391
TOTAL	3,213,708

This information on the cost of employing experts and consultants, etc., was presented to the States on 12th February 2002.

13.0 FINAL DETAILED COST INFORMATION

The breakdown of the final costs is shown in Schedule 1.

The costs of Site Staff were higher than the original estimate, due to the extended time of construction. At the end of the construction period, the cost of Site Staff was £1,422,332.

Loss of revenue from car parking was higher than the original estimate, due to the extended time of construction, and this ceased from the completion date of the M&E Contract.

The cost of the M&E Contract was higher than the original estimate, partly due to inflation, partly due to the delay in the completion of the CE Contract, and partly to the costs being higher than the estimates made by the consultants.

Costs for Retained Site Staff and Advisers on technical, contractual and legal issues were considerable, in order to safeguard the Committee’s liability under the Contract.

The final agreed cost of the CE Contract was £15.75 million, and the estimated split of this cost was surface water link £10,145,000 and storage tank £5,605,000.

The estimated cost of the full scheme in late 1993, this being the time of the tender from Balfour Beatty, was £10.3 million, with the Balfour Beatty contract being £8.8 million. Allowing for inflation on the funds, the equivalent cost was of the order of £13 million. The final cost of the whole scheme was slightly under £22.4 million. The increase at the relevant prices was, therefore, £9.4 million. The payment to Balfour Beatty, over the Engineer's valuation of the work, was £2.25 million in order to obtain a settlement. The cost of advisers, etc. required as a result of the claims not being settled at the Engineer’s valuation figure was £3.7 million. Therefore, the total costs associated with the disputed claims were £5.95 million, and, without these, the overall cost would have been about £16.4 million.

The total funds voted (Capital Vote C0494) were as follows -

At the start of the project - £10,300,000.

An inflationary increase was granted on 22nd July 1996 of £2,653,100, taking the total funds for the project to £12,953,100.

An amount towards agreed claims and Advisers costs was obtained at the October 1996 Supply Day - £2,074,400.
Funds for the M&E Contract were granted on 24th February 1997 - £1,060,800.
Funds were granted at 31st December 1997 to meet additional costs - £1,880,000.
Funds were transferred from PSC Vote C0418 - Reconstruction of Sewers, on 26th January 1998 for the construction of the Shaft at Phillips Street - £895,000. However, these funds had to be used for continuing costs.
Additional funds were granted on 19th April 1999 for continuing costs of Retained Site Staff and Advisers - £800,000.
Additional funds of £122,700 for Advisers were granted on 1st November 1999.
Additional funds of £560,000 for Retained Site Staff and Advisers in 2000 were granted on 26th June 2000.
Additional funds of £700,000 for Retained Site Staff and Advisers in 2001 were granted on 6th February 2002.
Additional funds of £1,371,868 were granted on 6th February 2002 for the final payment to Balfour Beatty.

Total funds voted £22,417,868.

The final cost of the project was £22,396,757.

14.0 OPERATIONAL PERFORMANCE INFORMATION

Original design

The original design was that -

(a) The surface water link would remove a large amount of the surface water that was having to pass through the foul sewer system. This would reduce the overloading of the foul sewers, thereby reducing the risk of flooding, and would also reduce the amount of surface water needlessly going to Bellozanne for treatment. However, it is very difficult to quantify this overall amount, as it depends on the amount of rainfall. The surface water link has achieved the reduction of surface water in the foul sewers, and some further parts of the sewer system have since had surface water separated.

(b) The surface water link also provides the conduit for the pipes to carry the overflowed foul sewage.

(c) The storage tank was designed to store overflowed foul sewage, to prevent this discharging to sea. It was designed to have the capacity to store up to the quantity that would arise from a rainstorm that would occur once every 10 years. The major part of the quantity of overflow, about 70 per cent, would be from the Weighbridge overflow.

(d) An overflow shaft was to be provided, to relieve the overloaded foul sewers in the central area of St. Helier to reduce the risk of flooding. As will be explained below, this shaft has yet to be constructed.

The question has been asked as to how efficiently the scheme will work, without the central area overflow shaft. As described above, the surface water link has already removed a large quantity of surface water from the foul sewers, reducing the overloading. The overflow at the Weighbridge will relieve the overloaded foul sewers, and constitutes 70 per cent of the flow to the storage tank. The existence of the storage tank also helps to reduce the likelihood of flooding, by the overflow at the Weighbridge helping to lower the levels of the flow in the foul sewers. This overflow previously discharged to the surface water culvert, which would also have high levels in it at times of heavy rainfall and especially at times of high tide. The overflow will operate more efficiently, now that it is discharging directly to the storage tank, as it will have a “free” discharge. It is difficult to be precise, but it is estimated that the scheme will be about 80 per cent efficient without the central overflow shaft.

The question has also been asked, whether it would have been better value to construct only the storage tank, to collect the overflow of sewage. To be able to do this, the tunnel from the Weighbridge to the storage tank would still have been necessary, to take the sewage overflow to it. However, without the surface water link, there would still have been very large quantities of surface water getting into the foul sewers. There would still have been overloading and the risk of flooding. In addition, the storage tank would have had to be very much larger, to store the additional quantity of sewage caused by the surface water still in the system, and then all of this would have had to be pumped to Bellozanne for treatment.

There are some parts of St. Helier, where it will be impractical to reconstruct the sewers, so there will never be total separation of surface water. As the further sewer reconstruction schemes that are planned for St. Helier are completed, the quantity of surface water in the foul sewers will be reduced. In this way, the capacity of the storage tank will effectively increase and it will be able to store the overflow from higher intensity storms, resulting in even fewer discharges to sea.

Since the scheme became operational in May 1998, there have been around 225 spills of sewage to the storage tank that would otherwise have gone to sea. The tank has stored around 500 million gallons of sewage, which has been pumped to Bellozanne for treatment. Just to put this into perspective, 500 million gallons is the capacity of over 3,500 swimming pools the size of the one at Fort Regent.

Apart from the period it was out of action, when the foul sewage pipes in the surface water tunnel came loose and had to be repaired by the Contractor (at its cost), there have been three occasions on which it has overflowed to sea. On 6th November 2000, after the second wettest October on record, the tank was unable to empty itself, due to the continuing rain, and about 1.5 million gallons of sewage spilled to sea. In early January 2001, due to the same weather conditions continuing and resulting in the wettest winter on record, about three million gallons spilled to sea. In early February 2001, due to a major electrical fault putting First Tower pumping station out of action, the foul sewer system overflowed totally to the tank, which quickly filled. About six million gallons overflowed to sea, but the tank stored 5.5 million gallons that would also have overflowed to sea. These three occasions were extreme events, and the storage tank cannot deal with all of the flow from absolutely all events. Taking all three events into consideration, the storage tank has stored 98 per cent of the sewage overflows with just two per cent discharging to the sea. Omitting the incident in February 2001, which was due to a fault in the system that the tank was not intended to deal with, then 99 per cent of sewage overflows have been stored.

However, the comparison has to be made with the previously existing situation, where the foul sewers overflowed to sea over 100 times a year, depending on the rainfall.

Central Area Overflow Shaft

An overflow shaft was required in the central area of St. Helier, to allow the foul sewers to overflow at times of overload, in order to alleviate the risk of flooding. Phillips Street was the first choice for the location of this shaft, from a construction point of view, as it was the widest space and there were fewer businesses that would be affected.

When the hydraulic modelling of the flows in the sewers was carried out in 1991, the computer models confirmed that the main overload point in the sewers was at the junction of Bath Street and Peter Street. It was considered at that time that it would still be preferable to construct the shaft at Phillips Street, as it would cause far less disruption. However, the computer models available were not sufficiently sophisticated to be able to simulate reverse flows in the sewers (a situation that is known to occur in practice), and it was not possible to check that the system would work with the shaft at Phillips Street, as this would have required reverse flows.

Therefore, the overflow shaft had to be located close to the junction of Bath Street and Peter Street. The position for the shaft that caused least disruption to traffic and businesses was in Bath Street, adjacent to Wests Centre. Connecting sewers would be constructed, in open-cut, from the shaft to the main sewers at the Bath Street/Peter Street junction.

Wests Centre

The construction of the shaft in Bath Street, adjacent to Wests Centre, required a fairly large working area for the plant and equipment involved. By locating the working area on part of the Wests Centre, the size of the working area in Bath Street would be minimised and the effect on the businesses in Bath Street would be reduced.

As Wests Centre was privately owned, a request was made to the owners to have an agreement to lease the working area for the period of the work (about six months). This led to discussions with all of the tenants and businesses in the area, regarding the proposed work, the effects it would have on businesses and the condition of the Wests Centre. Information from previous discussions regarding the square of Wests Centre had led the Department to believe that only the owners of the square needed to give their consent to the use of a part of the area. It was only after detailed investigations of the tenants' leases were made that it became apparent that the tenants had to give consent as well. The Committee offered to take over the ownership of the Wests Centre and, after completing the work on the shaft, to refurbish and maintain the area, but was unable to reach agreement with all of the owners and tenants.

The negotiations had started in November1993 and in December 1994 it was decided that it would not be possible to obtain the required agreement for work to start in January 1995. Therefore, a variation order was given to the Contractor, withdrawing the shaft and connecting sewers from the Contract.

Investigations had been made into relocating the shaft and working area in Peter Street, although a much smaller area. The Committee agreed that discussions should be held with the Contractor, to re-negotiate this work. However, by this time, delays to the work and contractual disputes had arisen in a number of areas of the Contract, and it was not possible to conclude reasonable negotiations with the Contractor for this work. The decision was taken to have the construction of the overflow shaft carried out by a separate contract, after the completion of the Balfour Beatty Contract. At that time, it was not known that it would take until August 1997 to complete the work.

With the delay that had taken place, it was discovered that new computer modelling techniques had become available, which were much more sophisticated, and made it possible to check that the system would work satisfactorily with the shaft at Phillips Street. This is a much better location to construct such work in this area of Town, and will cause less disruption than at Wests Centre. The shaft will be constructed over the tunnel and a link will be made to the pipes already inside the tunnel. The new computer modelling has also shown that the importance of the overflow shaft is even greater than previously realised, in enabling the successful operation of the various other sewer reconstruction schemes proposed for St. Helier.

The funding for this shaft was discussed at a meeting of the Finance and Economics Committee at the end of 1998, when it was decided that the funding should await the outcome of the negotiations on claims on the CE Contract. As the resolution of the claims had taken much longer than anticipated, the funds for the construction of this shaft were requested in 2000, to be included in the capital programme for Sewer Reconstruction for 2004.

15.0 LESSONS LEARNED- LINKED TO TREASURY CODE OF DIRECTIONS No. 8

The rules of the States, at the time of the Contract, required that the lowest tender should be accepted, unless there were exceptionally good reasons for not accepting it. This is still the case. In other jurisdictions, this is not always the case and can result in better tendering procedures, by discouraging low tenders.

Balfour Beatty's tender was considerably lower than the other tenders, but it is fairly common for large contractors to put in low bids for work, when there is a shortage of work around, in order to maintain their turnover. A detailed examination of Balfour Beatty's tender was carried out, before it was accepted, in order to ensure that all the requirements of the Contract had been allowed for. Despite being assured that this was the case, it is apparent that Balfour Beatty did not resource the work as well as it should have done, and this was the reason for many of the delays.

It would be preferable to not be required to accept the lowest tender, especially where it is much lower than the other tenders. It would have to be accepted that this might involve higher initial costs on contracts, but that it could well be cheaper in the long run.

It is evident that Balfour Beatty's approach to claims and its refusal to reach a reasonable settlement until a long time after the construction was completed led to very considerable costs for the Employer. The employment of all of the Committee's Advisers and the retention of the Site Staff resulted in costs of £3.7 million. Had a settlement been reached at a much earlier stage, say at October 1997, and at a figure around the Engineer's final valuation, then the costs to the Employer could have been reduced by about £6 million. However, there is no method for compelling the Contractor to settle, under present Jersey legislation. Although it may be considered that this is an unusual situation, it is fairly common for large contractors to make claims on projects. This problem has been recognised in the United Kingdom and new legislation has been introduced in recent years, to avoid protracted contractual disputes. The United Kingdom Construction Act forces parties to have some form of mediation within a limited time, and the aim of this is to avoid or reduce the time and cost of litigation.

There has been reference earlier in the report to risks in construction projects, and the question of which party is allocated the responsibility for these risks. At the time that this project started, the procedures of the States left the responsibility for risks to be resolved through the contract, and this could obviously result in arguments or contractual disputes afterwards as to who was responsible for the risks and their consequences. The method of dealing with the financial implications of this was by use of the General Reserve.

New procedures have been put in place in recent years by the States for the overall control of capital projects, and these are detailed in the Treasury Code of Directions No. 8. These require much greater attention to the feasibility stages, at which detailed risk assessments are carried out. This results in the identification of all costs associated with these risks, and these costs have to be allowed for in the overall budget provisions for the project. In this way, the full potential costs of projects should be established, as well as is possible, and provision made for this before embarking on the project. The responsibility for the risks must be decided and made clear at the outset.

SCHEDULE 1: BREAKDOWN OF FINAL COSTS

LIST OF COSTS FOR CAVERN AND SURFACE WATER LINK	ORIGINAL ESTIMATES/ FUNDS	FUNDS WITH INFLATION	FINAL COST AT 14.01.2002	DESCRIPTION
REINSTATEMENT COSTS	60,000.00	75,455.00	NIL	
M&E CONTRACT, PLUS DESIGN AND SUPERVISION	600,000.00	754,550.00	1,228,940.00	
CAR PARKING LOST REVENUE AND MISCELLANEOUS	140,000.00	176,061.00	285,836.00	
SITE STAFF/RETAINED STAFF COSTS	700,000.00	880,308.00	1,918,273.00	
	840,000.00	1,056,369.00	2,204,109.00	
CIVIL ENGINEERING CONTRACT (BALFOUR BEATTY)	8,800,000.00	11,066,726.00	15,750,000.00	Payment 24/12/01 to Balfour Beatty in settlement. Previously paid 14,378,132.00
TECHNICAL, LEGAL AND CONTRACTUAL ADVISERS			3,213,708.00	Advisers' costs
TOTAL:	10,300,000.00	12,953,100.00	22,396,757.00	
INFLATIONARY INCREASE (GRANTED 22/07/96)	2,653,100.00			
OCTOBER 1996 SUPPLY DAY	2,074,400.00			
M&E FUNDS (GRANTED 24/02/97)	1,060,800.00			
ADDITIONAL FUNDS GRANTED 31/12/97	1,880,000.00			
TRANSFERRED FROM PSC VOTE 26/01/98	895,000.00			
ADDITIONAL FUNDS GRANTED 19/04/99	800,000.00			
ADDITIONAL FUNDS GRANTED 01/11/98	122,700.00			
ADDITIONAL FUNDS GRANTED 26/06/00	560,000.00			
ADDITIONAL FUNDS GRANTED 06/02/02	2,071,868.00			
TOTAL FUNDS VOTED AT 06/02/2002	22,417,868.00			