

**BELLOZANNE SEWAGE TREATMENT WORKS  
UPGRADE**

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**Lodged au Greffe on 19th May 1998  
by the Public Services Committee**

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**STATES OF JERSEY**

**STATES GREFFE**

## PROPOSITION

**THE STATES are asked to decide whether they are of opinion -**

- (a) to approve drawing No. 97011-0-321A showing the proposed upgrade of the Bellozanne Treatment Works, St. Helier, as detailed in the report, dated 6th April 1998 of the Public Services Committee, and to authorise the Greffier of the States to sign the said drawing on behalf of the States;
- (b) to authorise the Public Services Committee to enter into a Partnering Agreement, as detailed in the report dated 6th April 1998, of the Public Services Committee, for the construction of the works, with the selected contractors, Degremont UK Limited and M.J. Gleeson Group PLC, on the basis of the Actual Target Cost and Share Mechanism, with the Agreement being 'underpinned' by a formal Contract, and to authorise the Greffier of the States to sign the said Agreement and Contract on behalf of the States.

### PUBLIC SERVICES COMMITTEE

- NOTES:
- 1. The Finance and Economics Committee is advised that all identified risks have been included in the project costings, and that the risk of overspend on this project is very low. The Committee supports the use of project partnering on this project, as set out in the report of the Public Services Committee, and is satisfied that an independent risk assessment has been carried out, in accordance with its requirements that such an assessment be carried out on all future States' projects estimated to cost over £1 million.
  - 2. The Planning and Environment Committee granted development permission on 15th January 1998 - Permit No. 2663/JA.

## REPORT

### Introduction

The Sewage Treatment Works at Bellozanne currently receives a maximum flow of 1,000 litres per second (l/s). On arrival at the Works, the full flow passes through a new Inlet Works that was constructed in 1994, with a capacity to eventually treat 1320 l/s. The Inlet Works includes a screening plant, a grit/grease separator, a grease digester and tanker facilities.

After treatment at the Inlet Works, the full flow of 1000 l/s can be passed through four Primary Settlement Tanks where most of the solid matter settles out as sludge. The sludge is passed to the Digesters for digestion and subsequent disposal. Following settlement in the Primary Settlement Tanks, the effluent flow is divided. Flows up to a maximum of 600 l/s are passed forward to aeration tanks, where a conventional activated sludge process provides secondary treatment to the sewage. This is followed by further settlement in eight final settlement tanks, and then ultra violet (UV) disinfection before discharge to sea.

In times of heavy rainfall, flows above 600 l/s, i.e. the remaining flows up to a maximum of 400 l/s, are spilled after primary settlement, to a dedicated channel that combines with the fully treated flow before receiving UV treatment. Therefore, flows above 600 l/s only receive primary settlement and UV disinfection before being discharged to sea.

### Current problems

Apart from the new Inlet Works and the UV process, much of the Sewage Treatment Works is as it was when originally constructed some 40 years ago. A high proportion of the mechanical and electrical plant and parts of the infrastructure have reached the end of their design life. In addition, although 1000 l/s can currently be received at the Works, only 600 l/s receives full treatment.

In addition to the physical problems at the Works, it also came to the attention of the Public Services Department that a new European Directive was in the process of being introduced, which aimed to reduce nutrient concentrations in discharged effluent, in particular

nitrogen and phosphorus. An excess of nitrates in effluent discharges can lead to the growth of seaweed and algal blooms in the receiving waters, a condition known as eutrophication.

A need was therefore identified to upgrade the existing Works to extend its life, and to increase the capacity of the secondary treatment stage to the full 1000 l/s.

It was also felt that studies should be carried out to determine if eutrophication was a problem in St. Aubin's Bay, since algal blooms have been present in recent years, and if measures to comply with the new Directive would help alleviate the situation, or at least prevent it worsening.

### **Scheme considerations**

Numerous options to achieve these objectives were considered in the preliminary stages of the project.

To use traditional technology, such as further activated sludge lanes, would have meant the hillside adjacent to the Bellozanne works being substantially removed. The cost of effectively doubling the size of the existing Works was considered to be prohibitively expensive. Other options were also considered which utilised relatively new technology. Although these options had a much smaller footprint than conventional treatment options, a considerable amount of new construction was still necessary.

In addition, the facility to reduce the concentrations of nutrients in the effluent, particularly nitrogen, would have been an additional cost for all options considered, if it were required. To determine this, a study was carried out by Leeds University to assess the extent of eutrophication in St. Aubin's Bay. The results of these extensive studies, carried out through 1997, indicated that the potential for eutrophication in the main bay existed, but was not currently a serious problem. However, the study identified that there were high concentrations of nitrates near the foreshore, i.e. the main bathing area, which could lead to the growth of algal blooms.

Based on these results, the recommendation to the Committee was that the European Directive should be complied with, particularly with regard to nitrogen removal.

Prior to these findings, an option proposed by the consultants being employed by the Committee to carry out feasibility studies at the Works, Degremont UK Limited, was already under consideration. It had been identified that a new, high efficiency, activated sludge process would enable considerable cost savings to be made, by avoiding the need to construct new tanks. The process, called Pegazur, originated in Japan and has been operating there for seven years. It is an advanced form of the activated sludge process, and involves the utilisation of a media material that allows accelerated biological treatment.

The advantage of the process is that it can be installed in the existing aeration tanks at Bellozanne with only modifications and alterations to internal tank walls required. For the size of existing tanks at Bellozanne, capacity of the secondary treatment can be increased from 600 l/s to 900 l/s, close to the original objective.

An added benefit is that the process also enables nitrogen levels in the effluent to be reduced to within those required by the new European Directive.

The Manager of the Treatment Works at Bellozanne has visited several plants of this type in Japan and has reported favourably. In addition, pilot trials have been run at Bellozanne for several months, using a small-scale version of the process, and these have proved successful.

To cater for the increased flow through the secondary treatment process, the construction of four additional final settlement tanks is also required.

The feasibility study carried out by Degremont UK has also identified the opportunity for increasing the capacity of the whole Works to 1,300 l/s from its present 1,000 l/s, by replacing two of the four primary settlement tanks with new, high rate, primary clarifiers (Densadegs). The upgrading of the primary treatment is part of the continuing development of the site, but will not form part of this proposal due to budget constraints. However, the design of the Densadegs has been

incorporated into this scheme so that future construction will be simplified, and a request for the finance for construction has been made as part of the future Capital Programme.

Construction of the Densadegs would make two of the existing Primary Settlement Tanks redundant, and it has been identified that these could be converted for phosphorus removal in the future, if this was required.

### **Project partnering**

In an attempt to avoid cost and programme overruns, and subsequent confrontation with Contractors that are often a result of using more traditional forms of construction contracts, the Committee is proposing the use of project partnering for this scheme.

Project partnering is a relatively new philosophy, whereby the client, designer, process contractor and civil engineering contractor work together as a team, from the outset of design, with the common goal of producing a successful project, within budget and on time. This philosophy has now been adopted on Sewage Treatment Works projects in the United Kingdom by a number of Water PLCs, including Southern Water, South West Water and Wessex Water.

There are a number of advantages in using project partnering -

Project partnering parties are selected by the client, using pre-qualification submissions and interviews. Prices for elements of work form part of the submission and include supervision, labour, plant and materials, etc.

Parties to the agreement cost the work items on an 'open book' basis, whereby the contractor has to disclose the build-up of his rates. Individual work elements, for example, mechanical/electrical procurement and fabrication, are tendered for by approved manufacturers, in order to ensure that competitive prices are obtained.

An independent project manager/quantity surveyor can be (and has been) employed to monitor the programme and progress of work, and to check that value for money is being obtained. In

this particular instance, the project managers will not be part of the partnering agreement.

A realistic target budget cost is established at an early point within the feasibility/outline design stage.

The risks of extra costs on the project are shared proportionately between the parties, in accordance with a pre-agreed share mechanism, commonly known as pain/gain. Conversely, any cost savings are also shared in accordance with the same agreement.

Project partnering reduces the confrontational elements of traditional contracts, and reduces the risk of unreasonable contractual claims. These in themselves can cost large sums of money to contest, particularly when legal advisers are necessary in order for the client to mitigate the claims.

Project partnering significantly reduces the overall time for the completion of a project. Under a traditional contract, there are separate, distinct phases; design, tendering, tender acceptance, procurement, construction, installation, testing and commissioning. Under a partnering agreement, many of these activities can run concurrently.

Traditional type contracts (in this case, the Institution of Chemical Engineers Conditions of Contract for Process Plant - for Cost Reimbursable Contracts) are put in place 'beneath' the partnering agreement, so that if the partnering agreement did fail, the project could still be completed by resorting to the contract.

For Phase I of the upgrade of Bellozanne Sewage Treatment Works, which is for the outline design only, the following process engineers/civil engineering contractors/ independent project Managers, have been selected and appointed -

Process Engineers Degremont UK Limited  
Civil Engineering Contractors M.J. Gleeson Group PLC  
Project Managers/Quantity Surveyors E.C. Harris.

It should be noted that project partnering accounts for over 50 per cent of the recent contracts carried out by M.J. Gleeson in the United Kingdom, and they have completed several contracts in partnership with Degremont.

### **The target cost**

Phase I of the scheme, the outline design, is now complete. This has entailed applying value engineering and value management techniques to the design, to identify cost savings wherever possible, as well as carrying out a comprehensive risk analysis to allow for contingencies for identified risks. This has enabled the partners to agree a 'target cost' for the construction of the proposed Works, known as the actual target cost (ATC).

During Phase I, it was discovered that additional space for sludge storage needed to be created. It is currently proposed to temporarily convert one of the existing primary settlement tanks for this purpose, as part of this scheme, until the sludge disposal problems at the Works are resolved. This issue is currently the subject of a separate feasibility study and report, and funds have been requested in the future Capital Programme.

Drawings will be available to illustrate the location and extent of the proposed Works.

Based on the scope of work, and including the Primary Settlement Tank conversion, the ATC is £6,434,815, which is within the funds available for this scheme of £7,427,000 (Capital Vote C2649, Liquid Waste Treatment Phase II). After deduction of the costs already committed for various studies and project management, the funds remaining are £6,897,000.

As part of the risk analysis, it was identified that a contingency sum of £173,000 needed to be included to cover the Committee's risk areas. This leaves a total fund available for construction of £6,724,000, which provides a remaining contingency amount of £289,185.

Planning and Development permission has been received from the Planning and Environment Committee, and Phase II, i.e. construction,



has been programmed to commence on 8th June 1998, with a projected completion date of December 1999.

Once Phase II commences, the actual costs to the contractors of carrying out the Works will be paid in full, including overheads and profit. Throughout this Phase, costs and progress will be monitored, and at the end of Phase II, the actual cost of the project will be totalled, and any saving or overspend will be shared amongst the partners on the basis of the agreed share mechanism.

The share mechanism limits the Public Services Committee's financial liability in the event of an over-spend, and encourages the contractors to work efficiently and look for savings during construction, since they will have a share in those savings.

Under the agreement, the Committee's financial liability, in the event of an over-spend, is limited to 4.5 per cent of the ATC, which would only occur with an over-spend of 15 per cent or more of the ATC. For an ATC of £6,434,815, this equates to £289,567 (for a total over-spend of £965,222) and the contingencies currently available total £462,185.

## **Summary**

It has been identified that much of the Sewage Treatment Works at Bellozanne is nearing the end of its design life and needs urgent upgrading, particularly the secondary treatment process.

Currently, only 600 l/s, of the 1000 l/s that arrives at the Works during heavy rainfall, receives full treatment. The remaining 400 l/s receives only primary settlement and UV disinfection before discharge to St. Aubin's Bay. Any upgrade therefore needs to provide an increase in the volume of flow given full treatment, thereby reducing the proportion of partially treated sewage being discharged to the bay.

Recommendations have been made to reduce the concentrations of nutrients discharged into St. Aubin's Bay from the Sewage Treatment Works, particularly nitrogen.

An innovative activated sludge process, called Pegazur, has been identified which achieves the objectives outlined above, increasing

secondary treatment by 50 per cent, and which is substantially cheaper than more conventional options.

It is proposed to use a partnering agreement for the detailed design and construction of the scheme, in conjunction with a target cost, and a share mechanism for sharing any over-spend or savings.

The partners in the agreement will be the Public Services Committee as the client, Degremont UK Limited as the process designer and mechanical/ electrical contractor, and M.J. Gleeson Group PLC as the civil engineering contractor. E.C. Harris will act as independent project managers/ quantity surveyors and will not be part of the partnering agreement.

A target cost of £6,434,815 has been identified as the cost of constructing the scheme, which is within the available construction budget of £6,724,000.

6th April 1998.