

# LARGE-SCALE PILOT FOR TREATMENT AND USE OF CONTAMINATED DREDGED MATERIAL IN THE NETHERLANDS; PRELIMINARY RESULTS AND POLICY

A.K.J. van der Laan<sup>1</sup>, H. van Steeg<sup>2</sup>, M. de Vries<sup>3</sup> and A.L. Hakstege<sup>4</sup>

## ABSTRACT

A yearly quantity of about 30 million cubic meters of dredged material has to be dredged in the Netherlands. Most of these sediments are clean or slightly contaminated and are relocated at sea, placed at riverbanks and, to a smaller extent, used beneficially. A minor part of the dredged material is too contaminated for relocation or reuse and has to be disposed. A number of large-scale sub-aquatic confined disposal facilities (CDF) have been constructed for this purpose. Because of the limited storage capacity of these CDF's and signals from the private sector that treatment of dredged material can be a feasible alternative, the Dutch government started a large-scale pilot in 2003 for the treatment and use of contaminated dredged material. The aim of this pilot is to investigate the financial and technical possibilities for the treatment and use of contaminated dredged material compared to disposal in CDF's. The outcome of the pilot will be input for the future policy on treatment and use of dredged material. Starting point of the pilot is to encourage the industry to treat as much as possible contaminated sediments. The Directorate-General for Public Works and Water Management (in Dutch 'Rijkswaterstaat') assigned various dredging projects from which the contractors can choose contaminated dredged material for treatment. In May 2004, two contracts were awarded to the companies BAG/Van Oord Dredging and Marine Contractors (the Netherlands) and Jan de Nul/ENVISAN (Belgium). In November 2004, BAG/Van Oord Dredging and Marine Contractors started treatment of contaminated dredged material from maintenance of the river Maas near locks between the cities of Roermond and Den Bosch. The dredged material is mainly treated by natural dewatering (ripening) in lagoons and by sand separation. A smaller part of the dredged material, dredged from the floodplains of the river Maas, was treated by chemical immobilization and reused as a capping layer on a disposal site. In 2007, Jan de Nul/Envisan will start treatment (natural dewatering/landfarming, sand separation and mechanical dewatering) on its treatment plant in Gent. This concerns dredged material from maintenance of the Canal Gent-Terneuzen. Based on the preliminary results of the pilot it can already be concluded that treatment and use is not the general solution for the problem of contaminated dredged material in the Netherlands. Only in certain circumstances, treatment and reuse of contaminated dredged material can be an economic viable alternative to disposal in CDF's. These circumstances vary for each dredging project, so in each case the consideration has to be made to determine if treatment is a feasible alternative for disposal in a CDF. The present policy states that treatment is no longer considered as a policy objective, but as a means to arrive at beneficial use. Cost-effectiveness is the most important criterion for decisions on treatment of dredged material, which are taken on a case-by-case basis.

**Keywords:** pilot, contaminated sediments, treatment, beneficial use, building materials

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<sup>1</sup> Ministry of Transport, Public Works and Water Management, Directorate-General for Public Works and Water Management, Aquatic Sediment Expert Centre, P.O. Box 20.000, 3502 LA Utrecht, The Netherlands. Phone: +31 (0)30 – 285 8575, fax: +31 (0)30 – 280 0686, e-mail: [anske.vander.laan@rws.nl](mailto:anske.vander.laan@rws.nl)

<sup>2</sup> Ministry of Transport, Public Works and Water Management, Directorate-General for Public Works and Water Management, P.O. Box 20.000, 3502 LA Utrecht, The Netherlands. Phone: +31 (0)30 – 285 7860, e-mail: [harold.van.steeg@rws.nl](mailto:harold.van.steeg@rws.nl)

<sup>3</sup> Ministry of Transport, Public Works and Water Management, Directorate-General for Public Works and Water Management, Aquatic Sediment Expert Centre, P.O. Box 20.000, 3502 LA Utrecht, The Netherlands. Phone: +31 (0)30 – 285 8038, fax: +31 (0)30 – 280 0686, e-mail: [marinus.de.vries@rws.nl](mailto:marinus.de.vries@rws.nl)

<sup>4</sup> Ministry of Transport, Public Works and Water Management, Directorate-General for Public Works and Water Management, Aquatic Sediment Expert Centre, P.O. Box 20.000, 3502 LA Utrecht, The Netherlands. Phone: +31(0)30 – 285 8784, e-mail: [pol.hakstege@rws.nl](mailto:pol.hakstege@rws.nl)

## INTRODUCTION

A yearly quantity of about 30 million cubic meters of dredged material has to be dredged in the Netherlands, mainly for navigation. Other reasons for dredging are: remediation, flood control and capital works. Most of these sediments are clean or slightly contaminated and are relocated at sea, placed at riverbanks and, to a smaller extent, used beneficially. A minor part of the dredged material is too contaminated for relocation or reuse and has to be disposed. A number of large-scale sub-aquatic confined disposal facilities (CDF) such as the Slufter and the IJsseloog have been constructed for this purpose.



**Figure 1. CDF IJsseloog**

Disposal capacity is scarce and due to lack of space and the NIMBY syndrome, it is increasingly difficult to find locations for new disposal sites. Because of these limited storage capacity of the CDF's and signals from the private sector that treatment of dredged material can be a feasible alternative, the Dutch government started a large scale pilot in 2004 for the treatment and use of contaminated dredged material. The aim of this pilot is to investigate the financial and technical possibilities for the treatment of contaminated dredged material compared to disposal in CDF's. The dredged material has to be treated in building materials and applied as building materials in either a work or similar applications. The outcome of the pilot will be input for the future policy on treatment and use of dredged material.

## **LARGE-SCALE PILOT**

### **Aims of the pilot**

After a period of spending much time and effort on research and development of various treatment techniques, the treatment sector in the Netherlands has stated that treatment has passed the R&D stage. The sector is ready to demonstrate their treatment capacities on large volumes of dredged material. The large-scale pilot offers the opportunity for this purpose. The pilot project would be considered successful when the treatment sector has demonstrated the possibilities and impossibilities of large-scale treatment of contaminated dredged material into building materials, including the options available at the different price levels. The outcome of the pilot is important for political decision-making in the Netherlands on large-scale treatment of dredged material in the future.

### **Set up of pilot**

Rijkswaterstaat, a Directorate-General of the Ministry of Transport, Public Works and Water Management, is responsible for the maintenance of waterways, motorways, flood protection and water quality. Rijkswaterstaat is composed of 7 regional services and 4 special services. The dredging and treatment/disposal expertise on the field of contaminated sediments is combined in the Aquatic Sediment Expert Centre (AKWA).

Starting point of the pilot is to encourage the industry to treat as much as possible contaminated sediments, but at least half a million cubic meters. At least 50% of these 500,000 cubic meters should be treated into building materials, the rest can be disposed in CDF's. Rijkswaterstaat assigned various dredging projects from which contaminated dredged material can be chosen for treatment by the contractors. The treatment sector itself is responsible for the application of the treated materials in the market; there are no guarantees given by Rijkswaterstaat to use the treated products.

### **Starting Points**

There are a number of starting points for this pilot:

- The contractor can choose between several dredging projects with different types of dredged material carried out on behalf of Rijkswaterstaat. Dredged material is contaminated to such a degree that disposal in a CDF is foreseen, if the project is not chosen for this pilot;
- Contracts for dredging and treatment of contaminated material are awarded separately. This way, all parties interested in treatment of contaminated dredged material, also those parties that have no capability to dredge, can participate;
- Rijkswaterstaat does not prescribe the method or location or treatment. The aim is that the contractor treats this material into building materials to the greatest possible extent and applies the products as building materials in a work and;
- Dredged material not suitable for treatment can be disposed in CDF's of Rijkswaterstaat.

The aim of Rijkswaterstaat is to generate market conditions in this pilot, which allows a good comparison between treatment and disposal. This leads to the following allocation of risks. Rijkswaterstaat is responsible to deliver the quantity of dredged material in time, but not for deviations in quality. The contractor receives all the available information on the quality of dredged material and can do further investigations depending on the intended treatment techniques. The contractor is responsible for treatment and use of the treated materials. Rijkswaterstaat will not give guarantees to use these materials. On the other hand, Rijkswaterstaat will encourage application of treatment products in government infrastructure projects. The risks associated with large-scale application of dredged material in the infrastructure will be analyzed during the pilot.

The following functional requirements apply to the pilot:

- The contractor must process at least 50% of the total quantity of the contaminated dredged material from the selected dredging projects into building materials;
- In the framework of the pilot, at least 500,000 in-situ m<sup>3</sup> of contaminated dredged material has to be treated into building materials;
- The contract sum, including tax, may not exceed a predetermined maximum sum;
- The building materials will have to comply with the Construction Products Decree (in Dutch: Bouwstoffenbesluit) and specific engineering requirements depending on the application.

Given the starting point that no specific treatment technique is prescribed, the only requirement for applying a treatment technique is the availability of the relevant permits (such as in relation to the Environmental Protection Act) on time during the pilot.

### TENDER PROCEDURE

In late 2003/ early 2004, the Ministry of Transport, Public Works and Water Management in the Netherlands tendered a contract for the treatment and use of contaminated dredged material. The tender procedure made use of a several lots in order to offer relatively small, specialized and/or regional companies the opportunity of submitting competitive tenders. The dredging projects that are part of the pilot are scheduled for the next five years for either maintaining the depth of waterways or remediation of contaminated sediments. Therefore, they are representative of the availability of contaminated dredged material in the Netherlands. The projects vary in size (5,000 – 400,000 in situ m<sup>3</sup>), location (throughout the Netherlands), timing (2004 – 2008), composition (sand and silt content). Given the total amount of dredged material on offer totaling over 2,5 million in-situ m<sup>3</sup> on the one hand, and the minimum treatment requirement of 500,000 m<sup>3</sup> on the other hand, contractors have the opportunity to choose those projects best suited for their situation (i.e. treatment technique, location, capacity, etc.).

In May 2004, two contracts were awarded to the companies BAG/Van Oord Dredging and Marine Contractors and Jan de Nul/ENVISAN. The contract with BAG/Van Oord Dredging and Marine Contractors concerns the treatment of dredged from maintenance of the river Maas and a smaller part of the dredged material from the floodplains of this river (see figure 2). The contract with Jan de Nul/ENVISAN concerns the treatment of dredged material from maintenance of the Canal Gent-Terneuzen (see figure 2).



Figure 2. Dredging projects from which contaminated dredged material will be treated in the pilot.



## TREATMENT CONTRACTS

### Contract BAG/Van Oord Dredging and Marine Contractors

BAG/Van Oord Dredging and Marine Contractors is a Dutch company, situated in the south of the Netherlands, specialized in treating waste materials in building materials. The contract with BAG concerns of three types of treatment:

- Natural dewatering (ripening);
- Sand separation and;
- Chemical immobilization.

Especially for the natural dewatering (ripening) and sand separation of the contaminated sediments within the framework of the large-scale pilot, BAG/Van Oord Dredging and marine Contractors used a former fly ash basin nearby an old power station.



Figure 3. Treatment plant BAG/Van Oord Dredging and Marine Contractors

### *Natural dewatering/ripening/sand separation*

In November 2004, BAG/Van Oord Dredging and Marine Contractors started treatment of contaminated dredged material from maintenance of the river Maas nears locks between the cities of Roermond and Den Bosch. The dredged material was transported in large barges and unloaded by a crane. Trucks transported the dredged material to the former fly ash basins where the process of natural dewatering (ripening) and sand separation started. The dredged material consists mostly of very fine sediments with a high zinc content. Due to this high zinc content, most of the dredged materials were cleaned first by separation of fines by a washing process. In October 2006 the last dredged material was transported to the treatment site of BAG/Van Oord Dredging and Marine Contractors. In total approximately 220,000 cubic meters were treated.

### ***Chemical immobilization***

Dredged material, approximately 13,000 cubic meters, excavated from the floodplain of the river, is treated by mixing with cement to immobilize contaminants (chemical immobilization). This product is used as cover material on a landfill.



**Figure 4. Chemical treatment site BAG/Van Oord Dredging and Marine Contractors**

### **Contract Jan de Nul/ENVISAN**

In July 2007, Jan de Nul/ENVISAN will start treatment (natural dewatering/landfarming, sand separation and mechanical dewatering) on its treatment plant in Gent (Belgium). This concerns dredged material from maintenance of the Canal Gent-Terneuzen. Actually the dredging contract is in full preparation.

### **PRELIMINARY RESULTS**

Although the treatment of the contaminated sediments is still in progress (contract BAG/Van Oord Dredging and Marine Contractors) and the second contract did not start yet (Jan de Nul/ENVISAN), the following preliminary conclusions can be drawn:

- Only simple treatment methods were offered by the market during the tender including sand separation, natural dewatering/landfarming and chemical immobilisation. More complex techniques such as thermal treatment were not included in the offers, because these techniques are not operational and can not compete with simple techniques;
- The treatment sector only selected maintenance projects and not remediation projects, obviously because dredged material from maintenance is more suitable for simple treatment techniques (higher sand content, less contamination);
- The costs for treatment and use offered during the tender shows a range of which the top boundary is about twice the costs for disposal, and a lower boundary near to the disposal costs.

In order to achieve an optimal treatment process it's necessary that frequent coordination takes place with the dredging contractor. If not, then problems may occur concerning (daily) planning, unloading capacity, etc.

Based on the preliminary results of the pilot and experiences so far, it appears that treatment (and reuse) of contaminated sediments is not the general solution for the dredged material issue in the Netherlands. Only in certain circumstances, treatment and reuse of contaminated dredged material can be an economic viable alternative to disposal in CDF's e.g. where the disposal site is at a large distance. These circumstances refer to:

- The type of dredged material (focus during tender on material with high sand content);
- Cost of transport (dredging location in relation to both location of disposal and alternative location of treatment);
- Market conditions of treated material and;
- Costs of treatment and disposal.

Given the fact that these circumstances will differ for each dredging project, the possibilities for treatment and use of the contaminated dredged material will have to be judged for each case. In the pilot it is rather difficult to find suitable locations for use of the treated dredged material. The reasons are the following:

- Treated dredged materials have to compete with primary resources and other secondary resources that are available at low costs;
- The reluctance of project-managers and contractors to use contaminated dredged material because perceived environmental risks also on the long term;
- The attitude of regulators to consider treated products as a waste, with all the necessary regulations and monitoring.

#### **TODAYS POLICY**

It is important to take notice of a policy note on dredged material by the government in 2005, which is partly based on the preliminary outcome of the pilot. The present policy states that treatment is no longer considered as a policy objective, but as a means to arrive at beneficial use. Cost-effectiveness is the most important criterion for decisions on treatment of dredged material, which are taken on a case-by-case basis.

Actually, a study is being carried out about the possibilities for privatization of some CDF's and the opportunities for treatment and use.

New legislation will come into force in the second half of 2007, about the application of contaminated dredged material. The new legislation offers the opportunity that less dredged material has to be disposed in CDF's or treated, but more can be used directly.

#### **REFERENCES**

- Graaf, W. de (2004). "Large-scale pilot for treatment of contaminated dredged material". *Proceedings Reused 2<sup>nd</sup> European Conference on dredged sludge remediation*, Amsterdam, the Netherlands.
- Graaf, W. de, Hakstege, A.L., and Steeg, H. van (2004). "Large-scale pilot project for the treatment of contaminated dredged material in the Netherlands". *Proceedings Wodcon XVII*. Hamburg, Germany.
- Hakstege, A.L. (2005). "Latest developments in Sediment Management in the Netherlands.", *Proceedings 14. Chemisches Kolloquium 'Die Bedeutung von Baggergutrichtlinien für das Sedimentmanagement in Flussgebieten und für den Meeresschutz'*. Federal Institute of Hydrology, Koblenz, Germany, 26-32.

