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for information

Review of the Public Filling Strategy and Programme

This paper intends to inform Members of the Advisory Council on the Environment (ACE) on the current status of the Civil Engineering Department's consultancy study entitled "Review of the Public Filling Strategy and Programme". As the Final Report for this study has not yet been issued to or endorsed by the Government, it should be noted that the conclusions and recommendations are those of the Consultant.

Introduction

2. The continuing successful development and redevelopment of the Hong Kong SAR has led to an increase in Construction and Demolition (C&D) material which is generated by construction, demolition, renovation and earthworks projects - in 1996 over six million cubic metres of this material was generated within the SAR. C&D material comprises a small proportion of C&D waste and a larger proportion of inert public fill. C&D waste comprises solid and putrescible wastes, plastics and vegetation arising from site operations whereas the inert public fill comprises rock and stone, broken masonry and concrete, soil and small quantities of timber.

3. Ideally, public fill material should be delivered to Public Filling Areas (PFAs), formally known as public dumps, for re-use as reclamation material and C&D waste should be delivered to sanitary landfill for safe disposal. In practice, however, large amounts of inert public fill have, until recently, been disposed of at landfill sites, occupying valuable and expensive void space, and significantly reducing the overall lifespan of the landfill.

4. With the development of the strategic landfills, and stricter enforcement of material acceptability by EPD, the amounts of public fill disposed of at these sites has fallen from 76.2% of the total in 1991 to 21.8% of the total in 1996. This has contributed to prolonging the lifespan of the strategic landfills for the proper disposal of potentially more environmentally damaging municipal solid wastes. However, by diverting more public fill to the PFAs, the available void space at these sites has been used more quickly than planned which has resulted in a predicted shortage of space for public fill.

5. CED anticipate that there will be a shortfall of public filling capacity at PFAs towards the end of 1999 and so have commissioned this study to formulate a long term public filling strategy and implementation programme covering 1997 to 2011 to ensure that this material is used in a beneficial, efficient and environmentally friendly way.

Planning Model

6. In order to determine the likely quantities of C&D material arising in the future, the Public Fill Planning Model (PFPM) was developed to assist CED in their future planning for the use of public fill. The model uses two sub models which combine to produce an overall forecast. The first model was originally developed by the Hong Kong Polytechnic University and may be used to predict C&D material arisings given either the Gross Floor Area (GFA) of buildings scheduled for demolition or construction, or the contract sum. It also includes data from the Fill Management Committee (FMC) for surpluses of material from major projects. This model is accurate for the short term (next 2 to 3 years) only. The second model was developed by the Consultant and uses regression techniques to predict C&D material arisings from past data compiled by CED, FMC and EPD, and is more accurate in the longer term (next 4 to 10 years).

Field Surveys

7. In order to provide additional information for the PFPM, and the study in general, field surveys were undertaken at existing Public Filling Barging Points (PFPBs) and PFAs to determine such parameters as average turnaround for trucks depositing material, composition and geographical location of C&D material arisings.

Alternative Uses and Disposal of Public Fill

8. One of the options examined by the Consultant was uses of public fill other than as fill material in marine reclamation projects. This option focussed upon the production of recycled aggregates from public fill material and their potential use in concrete, using examples from the USA, Europe and Japan. It was concluded that whilst this was technically feasible, it is likely that introduction of mandatory use of recycled aggregated would be resisted by the industry. The Consultant recommended that "demonstration" projects be set up by government to introduce and educate the industry about the potential of recycled aggregate, and that unduly stringent specifications for low grade concrete, such as those for below ground structures, be relaxed to allow the use of recycled aggregates.

9. The Consultant also noted that in order to produce recycled aggregates from public fill, C&D Material Sorting Facilities (C&DMSFs) would be required in order to reclaim the useful material.

10. On land, it is possible to use public fill instead of general fill material at construction sites or land raise schemes although there may be engineering difficulties where only a shallow thickness of fill material is required.

11. At marine sites, such as borrow pits or contaminated mud pits, it is possible to use public fill to form underwater bunds and as cover material, but this is not recommended since the risks of pollution from floating debris in the public fill is very great. While it is government policy to backfill used pits, the preferred fill material is dredged mud which is difficult to dispose of anywhere else.

12. One other potential use of public fill, especially oversized blocks and boulders, is the creation of artificial reefs at designated marine sites - the Artificial Reef Deployment Study (ARDS) is now being undertaken by Environmental Resources Management (ERM) Hong Kong and will recommend suitable sites. Although this may be viewed as a use for oversized public fill, it should be stressed that environmental and ecological objectives of reef construction must take precedence over re-use or disposal objectives for public fill.

C&D Material Sorting Facilities

13. As mentioned above, C&DMSFs would be required to produce aggregates from public fill if this was required by government, however, C&DMSFs would also be needed even if recycled aggregate production is not to be promoted. The strategic landfills have strict criteria for the acceptance of waste - only materials containing less than 20% of inert material may be disposed of. Materials with 20% or above inert materials should go to PFAs, however, PFAs also have acceptance criteria with regard to household and industrial wastes and so it is possible that some materials are not acceptable at either facility. It is this C&D material, comprising both inert and non-inert fractions, that requires separation at C&DMSFs into public fill and C&D waste components.

14. This C&D material arises at present because of inadequate separation of inert and non-inert materials at the construction and demolition sites throughout Hong Kong. There are many reasons why this does not occur but most are related to the small size of the urban sites which do not allow separate stockpiling of different materials, and to the lack of awareness by both designers and site managers as to the benefits of source separation. Also, the operation of sorting plant would not be environmentally or socially acceptable in heavily populated urban areas.

15. At the SouthEast New Territories (SENT) strategic landfill a C&DMSF has been operating for almost three years and has been providing recycled aggregates for use in landfill site operations as well as recycling material from disused haul roads and temporary drainage works. This releases valuable void space for non-inert waste and also reduces the need to quarry virgin materials for use in the landfill.

16. The Consultant has assessed the operation of this facility and conceptual design for C&DMSF which would be required as part of the overall public filling strategy. This design incorporates state of the art mitigation measures to improve energy efficiency, while reducing the inherent noise and dust generation.

Site Searches

17. The location of C&DMSFs and disposal sites was a major aspect of this study and one of the most contentious - Hong Kong has little suitable land for siting C&DMSFs, and even less surviving natural environment to lose to development of disposal sites. New sites for PFAs were not included in this site search since PFAs are usually part of planned reclamations and are therefore dependent upon associated project demands and schedules.

18. The Consultant therefore needed to recommend sites which would not only be available during the implementation of the public filling strategy, but would also be acceptable on environmental as well as engineering, planning, logistical and social grounds. These sites also needed to be close to the main areas generating C&D material in order to reduce transport impacts. The Consultant looked at potential sites throughout the Hong Kong SAR.

19. For the siting of C&DMSFs, the Consultant identified suitable areas of previously used land in or near the three strategic landfills in the New Territories, and also at a quarry site in Kowloon. Although it is envisaged that there will be contractual difficulties to be overcome should these sites be used, there will be a much greater need for C&DMSFs in the future soon after landfill charging is introduced.

20. For the disposal of public fill, the Consultant identified a number of land reclamations at some of the smaller Outlying Islands, but without a proposed after use, and considering the huge environmental impact which would be involved, these sites were not recommended unless potential land use issues and development plans could be identified in further studies. This left only terrestrial sites, and a number of these were identified.

21. The Consultant recommended two adjacent ex-quarries in the New Territories which have no current or planned use. Adjacent to one of the Country Parks and in greenbelt zoning, it was recommended that after further study, one of these sites should be used as a public fill disposal site should this need arise. Volume calculations for void space were made and the overall recommendation was that using pubic fill, the site should be filled, recontoured to blend with surrounding landforms and then revegetated with indigenous species. The overall aim of this process would be not only to provide disposal space for public fill, but also to enhance the natural environment in an area of degraded landscape with the hope that eventually, the rehabilitated site could be included within the Country Park for public enjoyment and environmental protection and conservation.

22. All suggested sites were assessed using Preliminary Environmental Impact Assessments (EIAs), Road Traffic Impact Assessments (TIAs) and Marine Traffic Impact Assessments (MIAs) as appropriate. Detailed EIAs, TIAs and MIAs will be undertaken in accordance with statutory procedures for those suggested sites which are selected for further study.

Public Filling Barging Points

23. One of the key strategic requirements of this study was to provide a suitable design and locate acceptable sites for Public Filling Barging Points (PFBPs) at strategic locations throughout the SAR. Again, this was a contentious issue as both the public and local district officials have the perception that operations at PFBPs are dirty and noisy.

24. At PFBPs, C&D material is brought directly by truck from construction and demolition sites in the surrounding area and then loaded onto large barges which are then transported to marine reclamation sites where the material is used as fill. At existing PFBPs such as Aldrich Bay, the incoming material is inspected by supervisory staff prior to being tipped which helps reduce amount of floating material which ends up in the sea.

25. The Consultant recommended that three PFBPs should be provided on Hong Kong Island in order to reduce road traffic loading through the cross harbour tunnels and also because barge transportation is more efficient than road transport for this type of bulky material. Other sites were also recommended in Kowloon, the New Territories and on Lantau Island.

26. The Consultant also provided a conceptual design for a new generation of PFBPs which would incorporate multiple site use (such as office development above the PFBP) as well as stringent environmental mitigation measures to control dust, noise and visual impact. For example, the use of flexible plastic sheeting with water sprays to cover the chute from the tipping platform to the barge to reduce dust, the provision of baffle walls around the site perimeter to reduce noise and the provision of a full canopy over the tipping area to reduce visual impact.

The Strategy and Programme

27. The Consultant recommended that Hong Kong adopt the reduce/avoid, re-use, recycle and dispose waste management hierarchy but tailor it to Hong Kong circumstances. Public education and government demonstration, backed up by policy decisions, would be required to reduce C&D material at source. This would also help to promote the re-use of materials on site. The production of recycled aggregates and artificial reefs would only constitute a small percentage of the total predicted arisings of C&D material and so other recommendations were needed.

28. The amount of public fill used in ongoing and proposed reclamations is not 100% of the fill requirement and there is considerable scope for increasing the void space allocated to public fill in reclamation projects without affecting engineering requirements - the only limiting factor was seen to be the supply of public fill to match the required programme. Reclamations generally require large quantities of material in a relatively short period of time while public fill is generated at a lower but constant rate. The Consultant recommended the use of Buffer Storage Areas (BSAs) at PFAs or C&DMSFs to provide a stockpile of public fill which could be delivered on demand to reclamation projects.

29. Although it is likely that existing and planned reclamations together with the reduction, re-use and recycling of C&D material could absorb the predicted arisings, any slippage of the major reclamations could result in a shortage of void space as predicted by CED. For this reason, the Consultant also recommended a contingency option in addition to the waste management hierarchy - based on the rehabilitation of a New Territories quarry, this option appears acceptable from all aspects but, of course, would only be implemented after detailed EIAs and TIAs had been completed.

30. The Consultant suggested areas for further study, predominantly with regard to the contentious issue of locating C&DMSFs, BSAs, disposal sites and PFBPs but also including alternative uses. The Consultant concluded the Study stating that if recommendations were followed, it would be possible to deal with the forecast arisings of C&D material within Hong Kong in an environmentally acceptable way which would provide material for new land formation as well as saving valuable void space in the strategic landfills.

Public Education and Consultation

31. As part of this study, the Consultant is also preparing an information video for CED which will form part of the education campaign recommended in the strategy. This video will be aimed at all branches of the construction industry as well as at government departments. It will aim to enlighten as well as convince the target audience as to the need for the public filling strategy and its associated components - PFAs, C&DMSFs, BSAs and PFBPs - and that the operations can and will be undertaken in an environmentally friendly way in order to achieve greater benefit for everyone in Hong Kong without causing undue disruption.

32. Public Consultation with regard to this study is under the direction of CED and so far has included this ACE meeting and also meetings with the Hong Kong Truck Drivers' Association.

Civil Engineering Department
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