

Chapter 3

**CONSIDERATION OF
ALTERNATIVE SITES**

3. CONSIDERATION OF ALTERNATIVE SITES

Introduction

- 3.1. A sizeable works area is required for the treatment of contaminated material based on the outcome of the site investigation and land contamination assessment. The purpose of this chapter is to present the findings of a site search and comparative evaluation of works area options together with a recommendation of the preferred site.
- 3.2. The tight construction programme for the decommissioning of the former Cheoy Lee Shipyard and subsequent theme park development including the Water Recreation Centre dictates that nearly half of the contaminated material generated from the shipyard be treated elsewhere. This is limited to contaminated material requiring either thermal desorption or biopile treatment. In each case the material will also undergo solidification as a second stage of treatment. The remainder of contaminated material will require solidification only and will be treated on site. The size of these works areas for decontamination depend to a large degree on the nature and extent of the contaminated soil, the storage and treatment method, the capacity of relevant treatment plant and other factors such as access arrangement and overall site shape. The location of the works areas for decontamination depends on the required size of the works area, the duration of the treatment period and land availability, the environmental impact arising from the transportation of the soil and the environmental impact arising on any sensitive receivers in the vicinity of the site. The volume of the temporary storage of material is expected to include most of the contaminated material generated because the rate of material excavation from the site over a period of roughly 6 months will significantly exceed the treatment rates with treatment periods lasting between 1 to 3 years.

Broad Criteria for Decontamination Works Area

- 3.3. The broad criteria for the decontamination works area include;
- (i) Environmental acceptability of any impacts including those on sensitive receivers in the vicinity of the site to be affected by the decontamination work.
 - (ii) Proximity to the site at Penny's Bay, e.g. North Lantau to reduce risks of transportation and wider environmental impact.
 - (iii) Accessible by road or by sea. For sea transport the works area would require a 60m long vertical seawall with a minimum depth of water of 4.5m.

(iv) Period of availability:

Processes	Area (ha)	Duration	Period ¹
On Site			
Solidification only	0.4	0.6 years	Nov 02 to May 03
Storage	0.9	0.6 years	Nov 02 to May 03
Material Handling & Circulation	0.8	0.6 years	Nov 02 to May 03
Total On Site Requirement	2.1ha		
Off Site			
Biopile	0.4	2 years	Nov 02 to Nov 04
Thermal Desorption	0.4	2 years	Feb 04 to Feb 06
Solidification	0.4	2 years	Mar 04 to Mar 06
Storage	1.2	3.75 years	Jul 02 to Mar 06
Material Handling & Circulation	2.1	3.75 years	Jul 02 to Mar06
Total Off Site Requirement:	4.5 ha		

Note 1 : The periods given in above table are the best estimates based on the present assessment, refer Programme in Figure 4.17. Actual periods of site occupation may vary according to risks associated with treatment plant procurement and shipping, commissioning and approvals and treatment rates and weather conditions. The above periods do not include establishment or decommissioning.

- 3.4. It is preferable to treat the contaminated material as close to the shipyard site as possible to minimise the impact of material movements and risk of impacts on other areas. Sites with non public road access or marine access are preferred for bulk material transportation to avoid the need for voluminous contaminated material movements on public roads.
- 3.5. The site search has investigated and compared available areas within the Penny's Bay Reclamation area and other areas at North Lantau, refer Figure 3.1

Potential Sites for Decontamination Works

Decontamination Works Areas within the Penny's Bay Development Area

- 3.6. Potential decontamination works areas of the Penny's Bay Development site are very limited. The availability of the site area is dictated by the schedule of handover dates from Penny's Bay Reclamation (Contract CV/99/12) from October 2001 to January 2003, the tight programme of infrastructure works which has been programmed without float, and the timetable for the hand back of areas to key parties such as HKITP, MTRCL and ASD and other Government Departments. In addition, most of the areas within Penny's Bay will be handed over to HKITP for construction of the theme park, hotels and associated supporting facilities right after completion of the reclamation works. Areas not handed over early to other parties will be occupied by the Infrastructure Works which are currently targeted for completion in mid 2005. Thus, these infrastructure works areas are not available for

- decontamination works. After this time the opening of the Theme Park makes any temporary decontamination works within such areas unacceptable.
- 3.7. The only areas not constrained by the construction of the permanent infrastructure works are the areas to the East of the RD&E area (Area 6B). Immediately following the completion of this area of reclamation under Penny's Bay Reclamation (Contract CV/99/12) the contractor for infrastructure works Contract 1 (Contract No. CV/2000/09) will receive Area 6B by January 2003 for construction of temporary access roads, stockpiles of fill material and works areas until early 2005. A small area (Area 2L) of 0.8ha immediately adjacent to the south east corner of Area 6B, will be handed over to Contract 2 to use for a barging point.
 - 3.8. The completion of thermal desorption treatment is anticipated in early 2006, refer Figure 4.17. The programme however is subject to various risks including those associated with the time required for treatment plant procurement, shipping, commissioning and approvals and treatment rates and weather conditions. The use of a site at Penny's Bay for thermal desorption therefore runs a high risk that the plant will still be operating when the Theme Park is due to open. Given the high number of visitors anticipated at the Theme Park the simultaneous operation of the thermal desorption treatment plant would not be environmentally acceptable or aesthetically desirable. In such case then the thermal desorption plant would need to be relocated to another site if available with the disadvantage of associated additional costs and wider risks and impacts.
 - 3.9. In order to accommodate the intended decontamination plant and stockpiling area, a site of around 5 ha will be required. Early surrender of this sizeable area would inevitably have detrimental effects on the progress of Contract 1 (Contract No. CV/2000/09) and would require negotiation with the Contractor for Contract 1 on financial and cost implications. Of particular concern in such negotiations would be the long lead time required for the negotiation process and the programme impact to Contract 1 and its knock on effects on Theme Park opening. The other concern is the uncertainty on the outcome of such negotiations, which could undermine the planning and tendering of Contract 2, and jeopardise timely opening of the Theme Park. In view of the uncertainties associated with this site and the potential impact to the Project, this site will not be considered further.
 - 3.10. A smaller works area within the former Cheoy Lee Shipyard could be used for the temporary storage and treatment of material requiring solidification only. This represents 55% of all material to be excavated for treatment. The area available is around 2 ha in size located in Area 2 which will ultimately become the Tree Farm within the Water Recreation Centre. The site is required in the first stage of Contract 2 to establish the solidification plant in order to minimize temporary storage requirements of excavated material. The existing formation level is around +5.0mPJD and the site would be available for setting up the solidification plant immediately following excavation and backfilling works in this area. Subsequent filling, formation, landscaping and other works in this area would need to await the completion of solidification treatment and decommissioning in July 2003.
 - 3.11. A further area for biopiling cannot be accommodated within the former Cheoy Lee Shipyard because of the impact on the programme of Contract 2 works. The commencement of biopiling treatment at the former Cheoy Lee Shipyard would need to await completion of a portion of excavation, backfilling and formation in Area 3 by around January 2003 i.e. around 5 months later than the biopiling is proposed to commence off site. On this basis the completion and decommissioning of on-site biopiling would not be expected until the end of

February 2005, after which there would be insufficient time for the construction of the permanent works under Contract 2 in the affected area.

Decontamination Works Areas Outside the Penny's Bay Development Area

- 3.12. A search for potential decontamination works areas on Lantau and Tsing Yi was carried out with the assistance of DLO/Islands and DLO/Kwai Tsing. Three potential areas at North Lantau were identified for further investigation by DLO/Islands concerning land status. These areas include To Kau Wan, Tai Chuen and Siu Ho Wan. The land status of these areas is discussed below. DLO/Kwai Tsing has advised that no suitable sites for decontamination works are available in Kwai Tsing.¹

To Kau Wan

- 3.13. An area of Government land at To Kau Wan was identified in April 2001 as a potential site for decontamination works, refer Figure 3.2. The area of the site is 6.08 hectares which will be sufficient for the proposed works. This area of reclamation is formed to a relatively uniform level varying between +5.1 mPD and +6.2 mPD. The site has an existing pier and more importantly a vertical seawall of over 200m length which will facilitate the establishment of the treatment plant on site and possibly the loading of treated materials for disposal off site. The vertical seawall has a minimum water depth alongside of 5m, which will cater for the drafts of barges envisaged. The only existing road access to the site is via a restricted road under the control of TMCA currently accessible only from the Tsing Ma Toll Plaza of NLH. A temporary access road to this area is to be constructed under MTRCL's PBRL tunneling contract and CED's Infrastructure Contract 1. This site access road will avoid the need to use NLH for bulk movements of contaminated material. The alignment of the temporary access road to To Kau Wan is shown on Figure 6.3. The site is wholly outside the MTRC railway protection boundary.
- 3.14. The area is not currently assigned for any use and has therefore been reserved for use by this project. CED are however in discussion with HyD concerning the possible shared use of this site by HyD for loading/unloading of construction materials for Route 10 (Tsing Lung Bridge) project. This EIA considers the adjacent temporary uses associated with Route 10 construction project.
- 3.15. A part of the site (0.75ha) has been used by Infrastructure Works Contract 1 for trial berm works for this project (TGLA No. TIS 419 Land for Soil Compaction Trial at To Kau Wan North Lantau, CED expiring February 2002). This work however has now been completed and is available for use for the proposed decontamination works.
- 3.16. The possible works area at To Kau Wan is adjacent to an existing shipyard and the NLH Lantau Toll Plaza Administration Building both of which would be considered sensitive receivers. To Kau Wan is also close to the Route 10 (NLYLH) construction works site at North Lantau. The works are tentatively scheduled to commence in mid 2003. In addition, to the NE along the adjacent coast, several little egrets have been observed roosting in small

¹ Sites outside North Lantau have been considered but were considered not acceptable in view of the wider environmental impacts. One site considered was a Tsing Yi lot next to Tsing Ma Tourist Centre. This site was not considered environmentally acceptable. This is because of the potential adverse visual and air quality impacts from the decontamination plant on the tourists using the Tsing Ma Viewing Point and the bridge users.

patches of secondary woodland. This area could potentially serve as a nesting area for Ardeids.

- 3.17. The To Kau Wan site is designated "Undetermined" on the North-East Lantau OZP No. S/I-NEL/8. Temporary uses expected to be less than five years, as in the case for the proposed decontamination works, are always permitted as long as they comply with the requirements of other government departments.

Tai Chuen

- 3.18. The site at Tai Chuen is 1.65 hectares of reclamation adjacent to and north of the south west abutment of the Kap Shui Mun Bridge, refer Figure 3.1. The site is formed to between +5.4 mPD and +9.4 mPD and features a 130m long vertical seawall with landing steps. There is no existing road access to the site. The site is wholly outside the MTRC railway protection boundary.
- 3.19. The Tai Chuen site is designated "Green Belt" on the North-East Lantau OZP No. S/I-NEL/8. Temporary uses expected to be less than five years, as in the case for the proposed decontamination works, are always permitted as long as they comply with the requirements of other government departments.
- 3.20. As indicated on the land status plan an area at the south edge of the site (0.2ha) is occupied by CLP Power Hong Kong Ltd under a Short Term Tenancy due to expire on 1st June 2002. A similar size area (0.2 ha) at the west corner of the site is currently used by Highways Department for the storage of rock cores under TGLA No. TIS 368 Storage Rock Core at Tai Chuen, Lantau Island due to expire on 31st January 2003.
- 3.21. The Tai Chuen site is 9.6km by sea (via Ma Wan Fairway, North of Ma Wan then via Kap Shui Mun Fairway) from the temporary works area (Area 2L) at Penny's Bay.
- 3.22. The site is constrained to by the proximity of the Kap Shui Mun Bridge. In addition a few existing dwellings have been noted to exist adjacent to the North edge of the site. These will constrain the location and arrangement of treatment plant and operations. This site is considered not favourable on environmental grounds due to the potential visual and air quality impacts.

Siu Ho Wan

- 3.23. During the site search exercise, Siu Ho Wan was targeted as a potential area for the decontamination works. However, the site searching exercise revealed that most areas in Siu Ho Wan have been allocated permanently for infrastructure works and the remaining areas have already been reserved for other uses.
- 3.24. The Site search at Siu Ho Wan identified one potential area for decontamination works however this area is constrained by a current land allocation. The area which measures 2.4ha is accessible by road and was adjacent to the existing Siu Ho Wan Water Treatment Works and Siu Ho Wan Police Vehicle Pound. The site is too small to meet the decontamination works area requirement (4.5ha) and is reserved under GLA-TIS 10/1/21 Proposed Grease Trap Waste Treatment Facilities (Fall Back Option). This site is also

adjacent to the Siu Ho Wan Water Treatment Works raising the risk of potential contamination of the water supply. Accordingly this site will not be considered further.

- 3.25. Another nearby area is adjacent to and West of the Siu Ho Wan Sewerage Treatment Works but is allocated to DSD under GLA-IS 424 Sewage Treatment Works Upgrading at Siu Ho Wan and GLA-TIS 406 Temporary Works Area. Both these area allocations were handed over in July 2001 by DSD to the relevant contractors for the construction of the Outlying Islands Sewerage Stage 1 Phase 1 C - Sewage Treatment Works Upgrading, Contracts DC/99/10 and Contract DE/99/12 for construction works until November 2006.

Comparison of Decontamination Works Areas Outside the Penny's Bay Development Area

- 3.26. A comparison of the available sites for decontamination works areas has been prepared taking into account of the key factors and constraints of each. The characteristics of particular importance are the size and availability of the site over the duration of the decontamination treatment period, the implications of any delays in the completion of the treatment affecting the infrastructure development, the distance from the shipyard and means of access, the suitability of existing facilities for access, the site constraints such as the presence of any sensitive receivers and the potential environmental effects from storage and treatment.

Site Area

- 3.27. The area required for storage and treatment of contaminated material is about 5ha. At To Kau Wan the available site area of 6.1ha will be sufficient to cater for the proposed decontamination works. The 1.65 ha site at Tai Chuen will not be adequate for all the decontamination works and would therefore involve the use of an additional site of at least a further 3.4ha. As the treatment processes are interrelated, the use of multiple sites is less efficient and requires double handling of materials causing wider environmental impact. Thus, the use of multiple sites for off site treatment is not preferred. It would also involve a larger land take because of the duplication of treatment and handling areas and a wider extent of risk associated with the transport of material. On this basis the site at To Kau Wan is preferred from a site area view point because this is the only site with confirmed availability of adequate site area for all the decontamination works.

Availability

- 3.28. The availability of the To Kau Wan site is confirmed with land allocation procedures in an advanced stage for the envisaged time span of the decontamination works. The site at Tai Chuen is also currently unallocated and would therefore be available for use over the expected duration of the decontamination works. However, Tai Chuen site is too small to accommodate the decontamination works.

Site Access

- 3.29. A temporary road access will be constructed between Road P2 at Yam O along the south side of the LAR to To Kau Wan for the transportation of contaminated material to To Kau Wan. This road will not be open to the public and will not therefore pose any significant risks or have any effect on traffic on public roads. The To Kau Wan site also has adequate marine access via an existing vertical seawall and pier. Marine access may be used for the establishment of decontamination plant and for the shipment of treated material off site. The site at Tai Chuen has no means of road access but has adequate marine access via an existing vertical seawall. All movements of material to and from this site would need to be via the sea. Both sites therefore have adequate access provisions.

Transport Distance

- 3.30. The distance to the To Kau Wan works area is 3.6km via the temporary access road between Yam O and To Kau Wan (refer Figure 6.3) whereas the transshipment distance to the Tai Chuen works area by sea via Ma Wan Fairway, North of Ma Wan then via Kap Shiu Mun Fairway would be 9.6km. The movements of contaminated material to Tai Chuen would also require land transport via the interim access road at Penny's Bay over a distance of 3km from CLS to the temporary barging point. The total distance travelled by land and sea to Tai Chuen is 12.6km. To Kau Wan is therefore preferred on the basis of transport distance.

Impacts from Transport

- 3.31. The impact from the transportation of contaminated material by road is considered to be acceptable given the precautions taken for the various types of contaminated material. In particular the proposed containerisation of material contaminated by dioxin will ensure that the impact of any road transport accident will be small. In addition the use of escort vehicles which will travel ahead of the trucks carrying dioxin contaminated material will greatly minimise any risk of accidents on route to To Kau Wan. The route to To Kau Wan is entirely on site access road other than the short section (390m) of Road P2 at Yam O (currently used only for construction and franchised buses for construction workers) and the 112 m of restricted road at To Kau Wan under the control of TMCA. The Infrastructure Contract 2 contractor will also be required to have in place a rescue plan and a contingency plan to ensure a rapid clearance and cleanup in the event of any accidents. In the same way for marine transport of material to Tai Chuen, the containerisation of contaminated material, would minimise risks to the environment during transshipment. In particular the risk of significant marine incident involving potential cargo losses over the course of the project has been estimated to be very low. The consequent risk of loss in dioxin contaminated material and impact to the environment is also very low due to precautions such as the use of rubber seals on containers doors and a tie down system for the containers on the vessel. Overall the risks of impacts for various modes of transportation of dioxin contaminated material are therefore considered acceptable.
- 3.32. For material with other types of contamination requiring biopiling and subsequent solidification, bulk transportation by road (truck) to To Kau Wan is proposed in line with HK practice. The use of a temporary access road has the benefit of avoiding large number of truck movements on public roads. The use of a temporary access road and the very limited section of Road P2 at Yam O (currently used only for construction and franchised

buses for construction workers) will reduce the risks of incidents and any significant impacts. The material carried by the dump trucks would be covered with impermeable liners to protect the material from wind and rain and avoid any losses during transportation. The rescue and contingency plans put in place under Infrastructure Contract 2 will also ensure a rapid clearance and cleanup in the event of accident. The risk of environmental impacts from marine transport to Tai Chuen is considered higher for marine transport for bulk material because of the higher risk of material losses in the event of a serious accident, however unlikely. It must be noted however that based on historic records on marine incidents the risks of significant marine accidents for vessels transporting material with contamination other than dioxin in bulk would be expected to be insignificantly low due to the use of self-propelled barges and restricting such shipments to daylight hours. The consequence of road accidents during transportation leading to waste implication between Penny's Bay and off-site treatment area is presented in Section 6.

- 3.33. The overall risk of impacts from transportation would increase with the distance travelled and on this basis transportation impacts associated with the To Kau Wan are considered less than Tai Chuen. The transportation risks to these sites are however considered to be very low and acceptable.

Impacts from Storage

- 3.34. The potential impacts of storage are considered to be acceptable given that the precautions recommended are appropriate to the types of contamination involved. The use of an enclosed building for dioxin contaminated material will ensure that the stored material will be unaffected by environmental effects such as wind, rain etc. The enclosed building will minimise any potential impacts to the surrounding air quality particularly during periods of material storage or extraction.

Environmental Impact

- 3.35. The potential environmental impacts associated with the decontamination works are considered acceptable and can be mitigated for the To Kau Wan site. Potential impacts to Ardeids (which may use woodland to the Northeast of the site for roosting and possibly nesting) are expected to be low, as the sighting of egrets was probably an occasional one and there would be no direct impact on the egrets (refer to section 8 for details). In addition, To Kau Wan is further away from Ma Wan Fish Culture Zone than Tai Chuen. As a result, To Kau Wan is more favourable on environmental grounds.

Summary

- 3.36. This assessment has considered various potential sites for the proposed decontamination works. On site treatment is possible for 48,000m³ of material requiring solidification only. This represents 55% of all material requiring treatment and occupies 2ha of the former Cheoy Lee Shipyard. Treatment of the remaining contaminated material such as that requiring thermal desorption or biopiling would take between 2 to 3 years and cannot be accommodated within the programme for Contract 2 on site works. Various other sites have therefore been examined. A summary of the review of these sites is given on Table 3.1. The site at Penny's Bay is not acceptable for treatment of other material because of the uncertainty of any negotiations to secure the area from the Contractor for Contract 1 (Contract No. CV/2000/09) which could undermine the planning and tendering of Contract

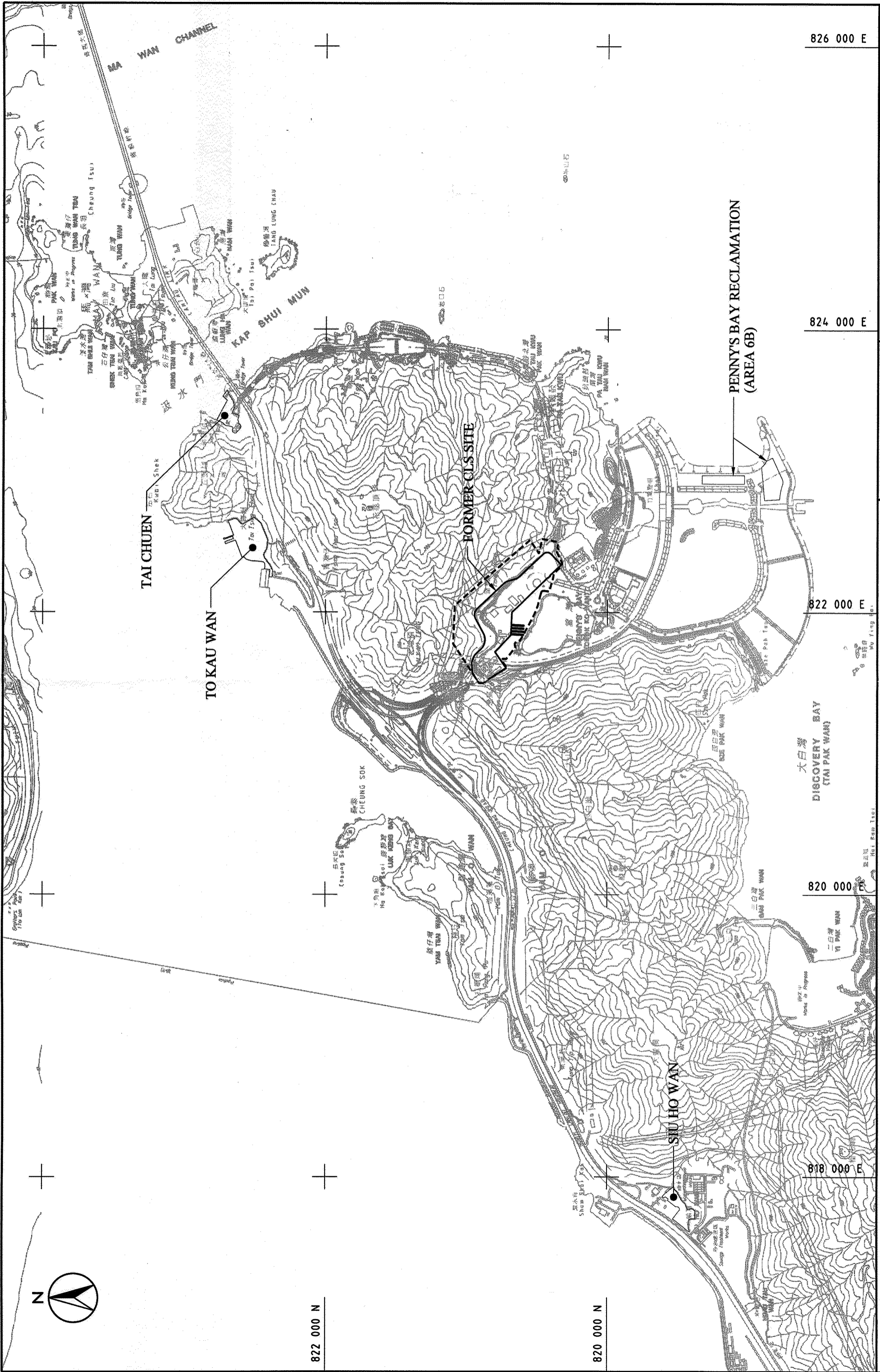
2 and jeopardize timely opening of the Theme Park. There is also the likelihood that the thermal desorption plant at Penny's Bay would still be operating in early 2006. If the thermal desorption plant was operated at Penny's Bay it would therefore need to be relocated to another site, if available, prior to the opening of the Theme park to avoid unacceptable risks to Theme Park visitors. The site at Tai Chuen is not acceptable because it is not large enough for all the decontamination works requiring the use of multiple treatment sites with wider risk and impact from transportation and duplication of treatment. The only site at Siu Ho Wan identified is inadequate in size and is also adjacent to the Siu Ho Wan Water Treatment Works and is therefore not considered environmentally acceptable.

- 3.37. The review has determined that a suitable site at To Kau Wan is available for the expected duration of the proposed decontamination works. The site at To Kau Wan is 6.1ha and is adequate to accommodate all the thermal desorption and biopile treatment works on one site. The site is reasonably close to Penny's Bay and is to have temporary road access for the transfer of contaminated material by truck. The site has also adequate marine access with an existing vertical seawall and pier for the establishment of treatment facilities and subsequent shipments of treated material off site. Transportation and storage impacts are estimated to be acceptably low. Potential environmental impacts associated with the decontamination works are acceptable and can be mitigated (the evaluation of environmental impacts and proposed environmental mitigation measures are discussed in the relevant sections of this report). Accordingly it is recommended that the site at To Kau Wan be used as the decontamination works site.

Table 3.1 : Summary of Review of Potential Decontamination Sites

Decontamination Works Area	Site Area	Site Availability	Road Access	Marine Access	Existing Vertical Seawall (Berth)	Transportation Distance (km)		Programme	Environmental Impact	Remark
						Land	Sea			
Area 6B Penny's Bay	Potential Area of 4ha subject to surrender by Infrastructure Contractor 1 contractor	Site is not available and will be under control of Infrastructure Contractor 1 Contractor from 1/03 to 4/05 (27 months). Requires negotiation to effect a surrender of this works area.	Yes	Yes	No	2.9	N/A	Plant to be relocated to another site if treatment not complete by early 2005. Long lead time negotiation for surrender of works area from Infrastructure Contractor 1 contractor poses risk to Contract 2 tender programme and project completion and Theme Park opening. Surrender of 5ha works area by Infrastructure Contractor 1 may delay completion of Contract 1 works and Theme Park opening.	Potential impact on Site Workers	Not Recommended.
To Kau Wan	6.1 ha Adequate	Availability confirmed for minimum 36 months. (1.7.02 till 30.6.05) ¹	Yes	Yes	Yes	3.6	N/A	Allows for possible delays in decontamination treatment without relocation	Minimal Impacts. Acceptable impact on Toll Plaza Administration Building.	Recommended.
Tai Chuen	1.65 ha Inadequate	Currently available	No	Yes	Yes	N/A	12.6 (incl. 3.0 over land)	Allows for possible delays in decontamination treatment without relocation.	Potential Visual and Air Quality Impacts. Close to Ma Wan Fish Culture Zone.	Not Recommended.
Sui Ho Wan	2.61 ha Inadequate	Currently reserved for another project	Yes Requires use of public road.	No	No	(i) 7.0	N/A	N/A	Close to Siu Ho Wan Water Treatment Works. Potential Contamination of water supply.	Not Recommended.

Note : 1. Prolonged use of part of site beyond 30.6.05 is believed to be possible. Discussions are underway with DLO/Is.



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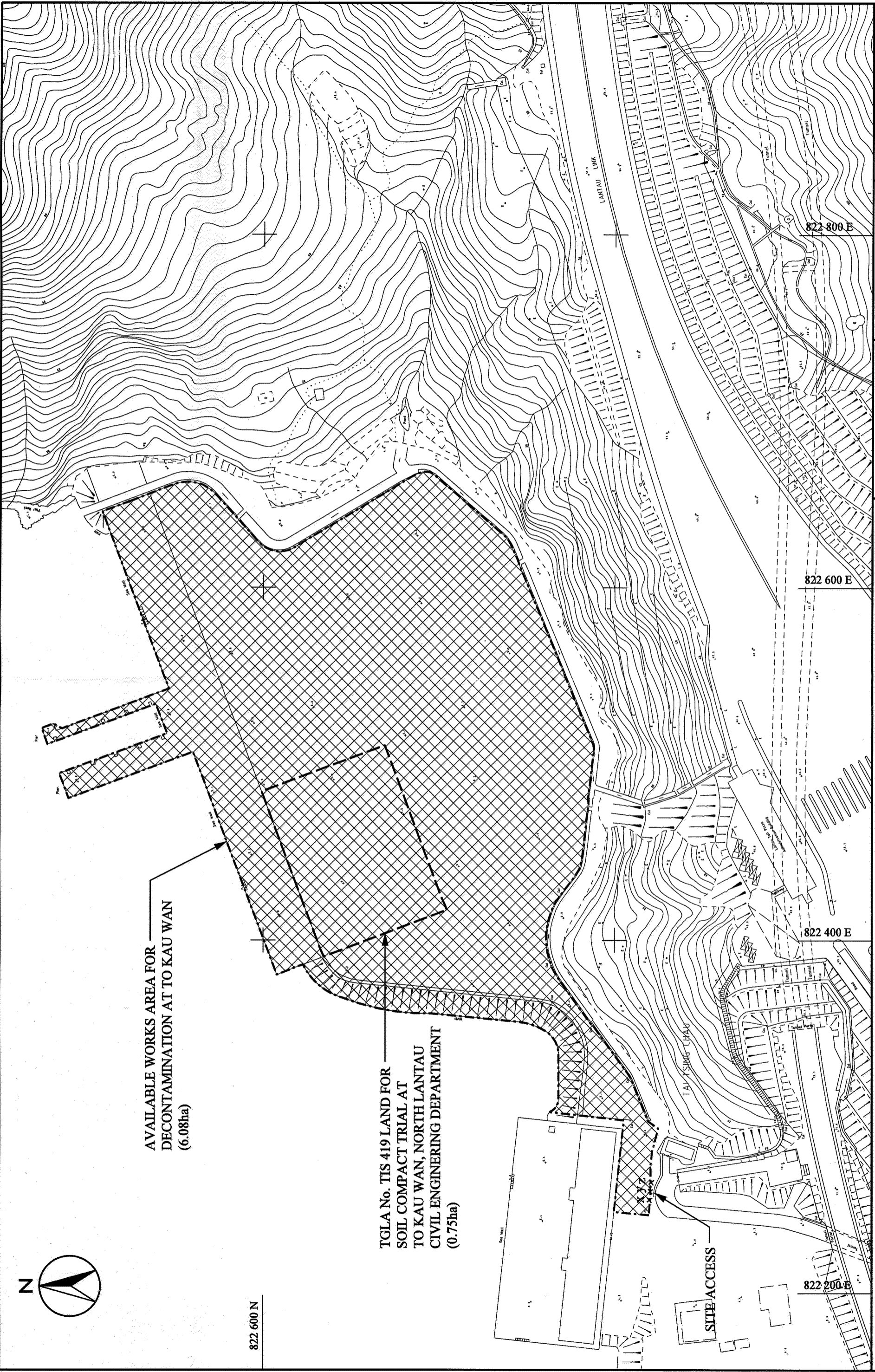
Projects No.	R06100
Figure No.	3.1

Scale	1:2500
Date	Feb. 2002

Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction
 Decommissioning of Cheoy Lee Shipyards

POTENTIAL DECONTAMINATION WORKS AREAS

Title



Title		Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard	
Scale		1:2000	
Projects No.		R06100	
Date		Feb. 2002	
Figure No.		3.2	

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LAND STATUS PLAN : TO KAU WAN