



# Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam

for

Contract No. DC/2018/03  
EXPANSION OF SHA TAU KOK SEWAGE  
TREATMENT WORKS PHASE 1 AND VILLAGE  
SEWERAGE IN TONG TO  
Rev. 5

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## 1. INTRODUCTION

The purpose of Contract DC/2018/03 is to increase the treatment capacity of the existing Sha Tau Kok Sewage Treatment Works (STKSTW) to cope with the forecast increase of sewage flow in Sha Tau Kok district.


Currently, the effluent from STKSTW is discharged via the existing 250mm diameter submarine outfall, which is insufficient to cope with the increase sewage flow in the future. Therefore, the construction of a new submarine outfall with a larger diameter pipe (i.e. 560mm diameter pipe) is necessary to provide sufficient treatment capacity for discharging the increase effluent to the Starling Inlet near Ah Kung Au.

The submarine outfall will be constructed below the seabed of Starling Inlet by trenchless method, i.e., Horizontal Directional Drilling (HDD), so that the seabed will not be disturbed during the course of construction.

This method statement will include detailed description of the construction for the submarine outfall in Starling Inlet by trenchless method such as Horizontal Directional Drilling, a package of necessary mitigation measures by deploying silt curtain as stated in the Environmental Review Report (ERR) – Change of Horizontal Directional Drilling Method for application of variation of Environmental Permit (VEP) (Application No. VEP-567/2019), having regard to the expected impacts, and a review of the environmental monitoring and audit requirement during the construction of the submarine outfall as per the Environmental Permit (No. EP-517/2017/A) Condition 2.11(i). The silt curtain deployment plan and construction programme are enclosed in **Appendix E and Appendix H** respectively.

As described in the Environmental Review Report (ERR) – Change of Horizontal Directional Drilling Method for application of Variation of Environmental Permit (VEP) (Application No. VEP-567/2019), a marine cofferdam, as a mitigation measure for diffuser installation as assumed in the EIA for this Contract would be installed after completion of the submarine outfall construction. Sediment removal and diffuser installation would then proceed within the cofferdam.

The construction methodology, mitigation measures and environmental monitoring and audit requirements recommended in the approved Method Statement shall be fully implemented during construction of the submarine outfall.

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## 2. SCOPE OF WORKS & STANDARD SPECIFICATION

### 2.1 Scope of Works


The scope of works for submarine outfall construction includes: -

- Site setup of the entry pit and the receiving pit, at land side and sea side respectively;
- DN813mm casing installation;
- DN355mm conductor casing installation inside the DN813mm casing;
- Pilot hole drilling inside DN355mm casing;
- Down hole survey operation and assistant sea surface D.C. Coil (beacon) deployment;
- Borehole reaming (including pre-reaming works and final reaming operations);
- Borehole gauging;
- Borehole smoothing;
- Ground treatment (i.e. grouting) of weak zones in the bedrock (as contingency plan when required);
- Fishing tools and measures to be used to rescue any jammed or broken drilling tools from down hole (as contingency plan when required);
- The installation of a HDPE submarine outfall pipe through the HDD borehole; and
- Testing of the installed submarine outfall pipe
- Sheetpile cofferdam installation at the receiving pit of the diffuser

### 2.2 Standard Specifications

In order to achieve all aspects of the design and construction of submarine outfall in accordance with contract requirements, the Codes and Standards below should follow:-

- a) American Society for Testing and Materials Standards
  - ASTM: F1962-2011 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings
- b) Plastics Pipe Institute

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- Handbook of PE Pipe, Chapter 12, Horizontal Directional Drilling
- c) American Petroleum Institute (API)
  - API SPEC 5DP Specification for Drill Pipe
  - API SPEC 5CTM Specification for Casing and Tubing (Metric Units)
  - API RP 5A5 Field Inspection of New Casing, Tubing, and Plain End Drill Pipe
  - API RP 5C1 Recommended Practice for Care and Use of Casing and Tubing
  - API RP 7G Recommended Practice for Drill Stem Design and Operating Limits
  - API RP 52 Land Drilling Practices for Protection of the Environment
  - API TR 5C3 Technical Report on Equations and Calculations for Casing, Tubing, and Line Pipe Used as Casing or Tubing; and Performance Properties Tables for Casing and Tubing
- d) Other Standards
  - Standard DS-1 Fourth Edition (Volumes 1 to 4).
  - WIS-4-32-08 and ASTM F2620-11 as the PE pipe butt-fusion standards. and
  - API RP 13B-1 Recommended Practice: Standard Procedure for Field Testing Drilling Fluids.

### **3. SEQUENCES OF CONSTRUCTION**

#### **3.1 General Working Sequence Description**

According to the available geological information (GI), the outfall alignment is designed to pass through the backfill layer, sedimentary layer, alluvium (including gravel layer), and highly, moderately and lightly weathered TUFF.

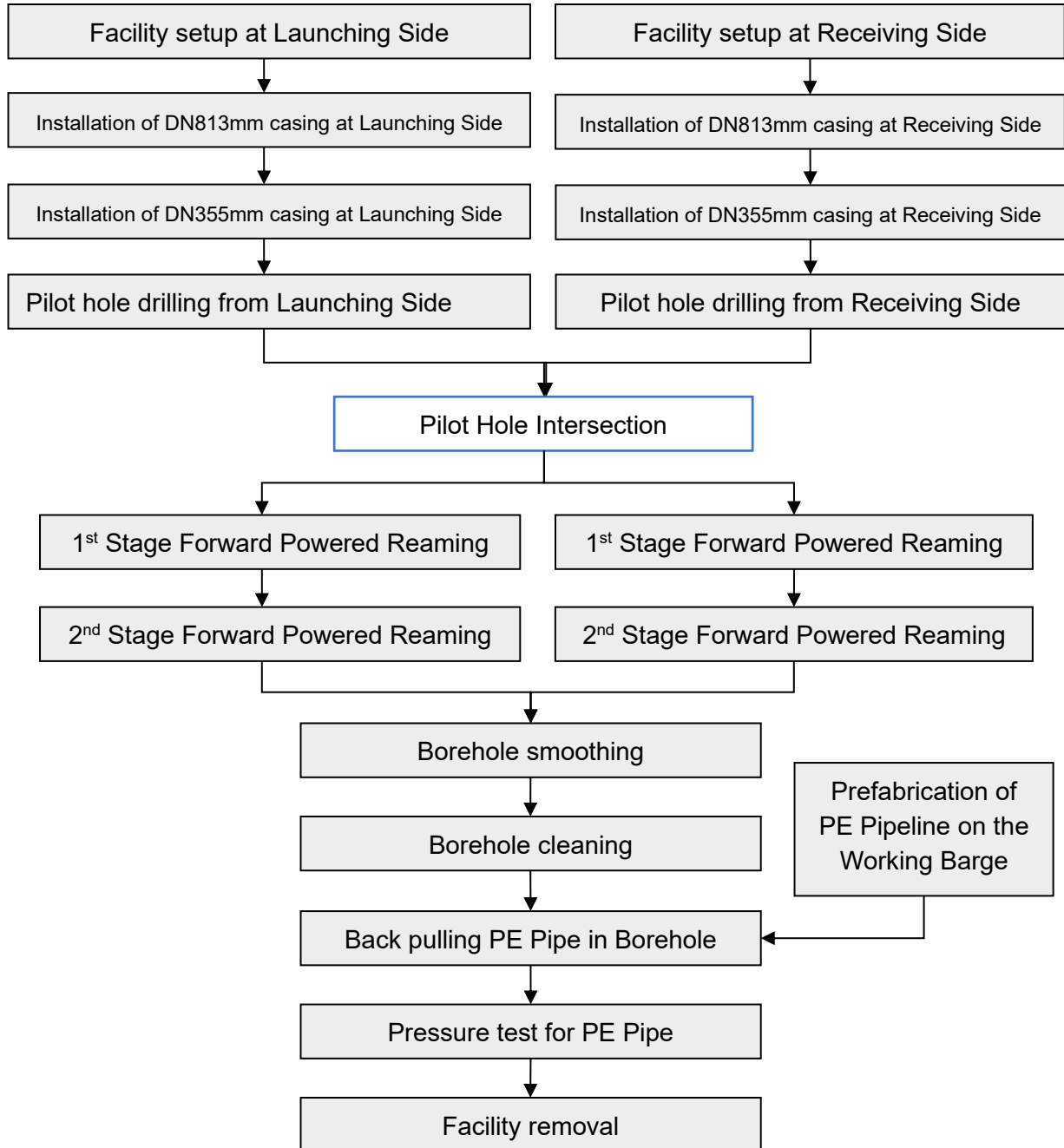
The drill holes MGH6 & MGH7 nearby the receiving pit suggests that there is the coarse gravel and cobble-sized rock fragments with thickness of about 4-7 meters in sandy matrix, the borehole in this cobble layer is not easy to be formed. Furthermore, during the drilling process, the drilling angle of the drill pipe which passes through the pebble layer is difficult to control, and the drill pipe is possibly broken due to the occasion of excessive deviating angle of the drill pipe. Therefore, it is necessary to install a casing to isolate the pebble layer and support the borehole formed in it, with the pebbles excavated through inside the installed casing. HDD construction will be subsequently carried out.

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Based on the conditions of the stratum, in order to ensure the smooth progress of HDD construction, it is proposed to install a 600-ton and a 200-ton combined drilling rig at the land side and sea side respectively. Each equips with corresponding mud systems. The casings are to be installed to deal with the difficulties of drilling through the backfill layer and the soft layer at the entry pit (or launching site) on the land of STKSTW, and isolate the pebble layer in the receiving pit. After that, the pilot hole will be drilled from the two ends simultaneously to intersect at the midway and complete the pilot hole drilling, then to complete reaming construction.

The sequences of HDD construction are shown below:



The handover of the receiving pit is about 2.5 months after commencement of works at land side. When the pilot hole at land side is drilled around 1600m, if the construction progress on the sea side has not yet reached the pilot hole drilling stage, it is planned to start the reaming from the land side. When the drilling tools is pulled back from the land side, the hole opener will be replaced by the drill bit, and then the first stage of




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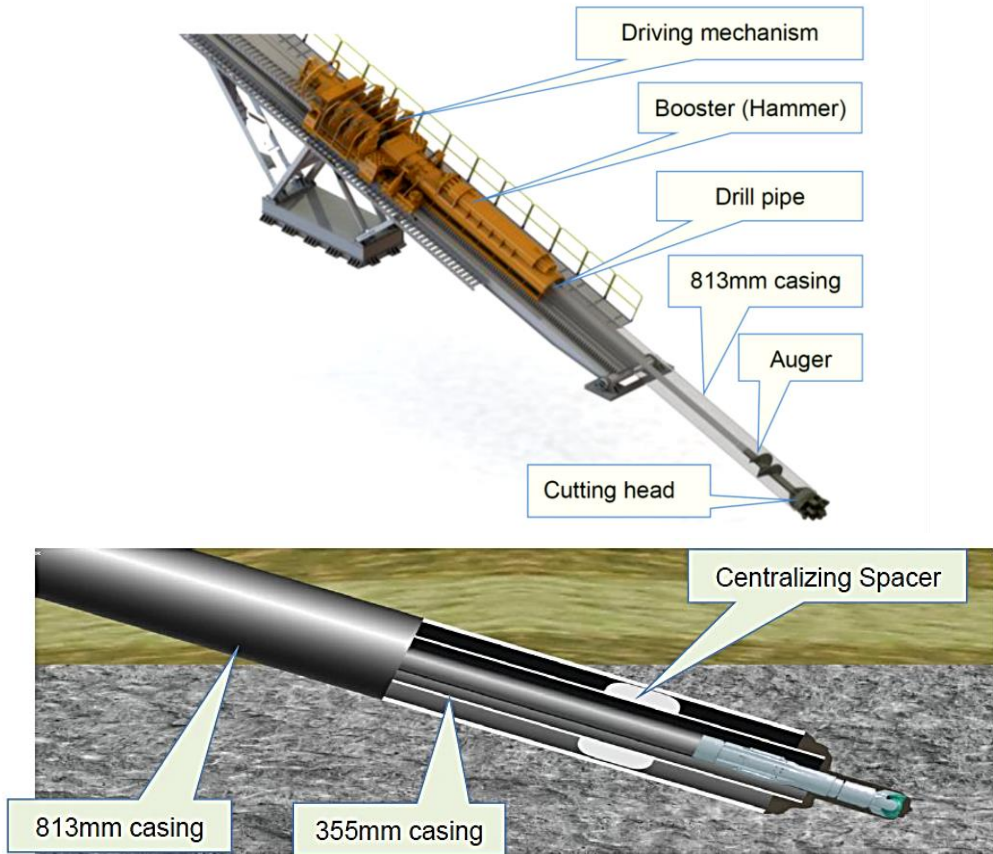
the reaming will be conducted by using the forward powered reaming technique. After the installation of the casing on the sea side is completed, the pilot hole drilling will commence from that side with the intersecting drill bit attached in the front of the drill string, until the pilot holes from the both sides intersect at a position of about 1600m away from the land side.

### **3.2 Work at Launching Site (Land Side)**

Site Setup Plan refer to **Appendix A**.

- 3.2.1 Erect a temporary working platform to facilitate the HDD construction at landside;
- 3.2.2 Mobilize all HDD construction equipment at launching side, including the combined drilling rig, mud tanks, mud pumps, mud separation systems, generators, and on-site offices. An electric mud pump with relatively small dimension is to be used and placed under the rig's girder (beam).
- 3.2.3 Construct a mud pit at the launching site with size of 4.3m x 3m x 5m (LxWxD). The construction of the mud pit will be formed by interlocking sheetpiles and cast the blinding layer at the bottom of the pit.
- 3.2.4 Install a slurry pump at the bottom of the mud pit, for pumping the mud back to the mud processing system for recycling use, and for drainage and re-use of overflowing rains.
- 3.2.5 Erect railing around the mud pit for safety consideration;
- 3.2.6 Install temporary steel casing (DN813mm) adopting by the multifunctional drill rig (model no.: HDD-6000ZH) from the ground and along the designed trajectory by three main operations (hammering, jacking and auger excavating) repeatedly in order to prevent ground settlement, borehole collapse and frac-out of drilling fluid during the HDD installation works in the soft and cobble layers. The guiding sensor mounted at the drill stems to guide the direction of steel casing;
- 3.2.7 Install DN355 centralization casing inside the temporary steel casing to continuous drilling can concentrate thrust force to increase drill efficiency.

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After installing centralization casing

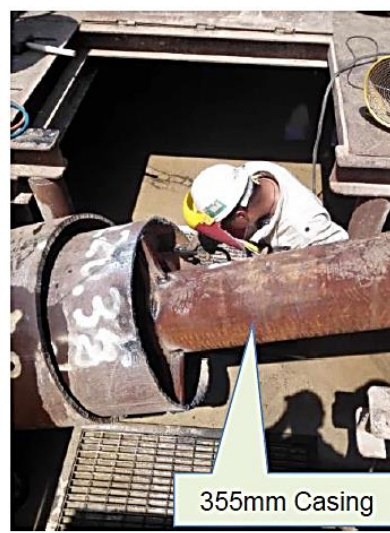
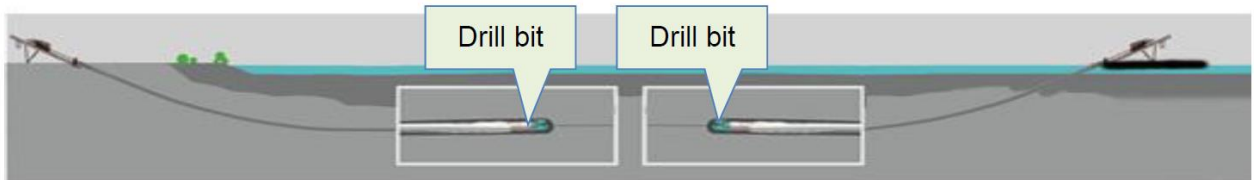


Photo of DN355mm casing installation

### 3.2.8 Pilot Hole Drilling (Land Side)

- i. After completion of casing installation, pilot hole drilling can be commenced, strictly along the designed alignment and profile as approval. The trajectory of the pilot hole should be controlled within 2m radius of the designed center line of the borehole;




- ii. Bottom hole assembly (hereafter abbreviated as BHA)
- iii. HY-6000ZH Drill Rig → 7-5/8” Drill Stem → φ230mm Non-Magnetic Drill Collar → Non-Magnetic Sub (with down hole surveying detector mounted inside) → φ244mm Mud Motor → φ311mm Drill Bit
- iv. Collect all of the data and parameters shown on the control panel and the down hole mud pressure precisely;
- v. Deploy surveying barge along the drilling path on the sea to trace the position of the drill bit to ensure the preciseness and accurate of the drilling trajectory.

### 3.2.9 Powered Reaming (Land Side)

- i. The following table shows the estimated borehole reaming level and differential between the levels. During construction, there is subject to adjust based on actual drilling conditions and hardness of ground layer.

Reaming stage	Borehole diameter(mm)	Borehole level differential(mm)
First stage of reaming	510	200
Second stage of reaming	710	200

- ii. First level reaming: drill rig → 7 5/8 drill pipe → 244mm drill mud motor → 510mm powered reamer
- iii. Second level reaming: drill rig → 7 5/8 drill pipe → centralizer → 286mm mud motor → 710mm powered reamer
- iv. When the hole opener reaches the destined servicing time down in the borehole, or when necessary, the reaming tools should be tripped out for changing. The used hole opener should be scrutinized for any

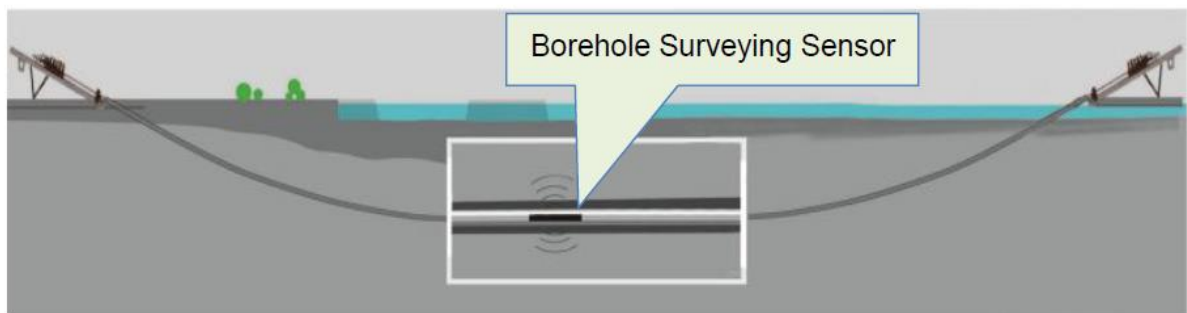
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wearing of the cutters, Tungsten Carbide Inset (TCI) teeth and the gauge protecting layer of the reamer, which shall be improved and enhanced accordingly to increase the actual longevity of the hole opener and to increase the drilling efficacy.

- v. Frequency of changing the hole opener: It is expected that the hole opener should be changed every time after roughly 250m length of reaming.


### 3.2.10 Borehole Surveying (Land Side)

- i. After the borehole reaming completes, during the borehole cleaning activities, the surveying (or gauge testing) of the borehole will be conducted simultaneously, when the surveying sensor mounted inside the drill collar will survey the whole length of the completed borehole. The information and data such as the geometry and curvature of the borehole obtained, can be used as references for the later borehole smoothing.
- ii. Surveying sensor can record the gauging data automatically. After completing the surveying, the sensor connected with computer can output what was recorded for data analysis and data process, which is especially helpful for crossing rock layers with fault zone to find and dispose possible discontinuous geometry of the drilled hole.



### 3.2.11 Borehole forward smoothing (Land Side)

- i. Based on the references of the surveyed data, whichever portion of the borehole does not satisfy the requirement of the curvature of the alignment will be rectified and smoothed.
- ii. The borehole smoothing tool has a sufficient length of rigid, stiff pipe body and an orthogonal cutting head which is driven by high pressurized mud. When this borehole smoothing tool is introduced into the borehole, wherever the borehole curvature complies with requirement, the borehole correction component can pass through smoothly; however,

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wherever the borehole curvature is less than what minimally required, the orthogonal cutting head will, with the length of the rigid stiff pipe body pressed against the hole-wall, be pressed to cut the hole-wall to make the curvature comply with the requirement. The borehole smoothing is to correct the borehole angle and geometry to ensure the hole is smooth enough for back-pulling of the pipeline.

- iii. HY-6000ZH Rig → 7 5/8 Drill Stem → Rigid Stiff Pipe Body (with mud motor mounted inside to connect with drill stem) → orthogonal cutting head.
- iv. The length of the rigid stiff pipe body of the borehole smoothing tool should be not less than 28m, so that it can be sufficient to deal with this borehole with this ultimate diameter to accommodate the outfall PE pipe at a designated curvature.


### **3.3 Work at Receiving Site (Sea Side)**

Setup Plan for Exit Site (Sea Side) refer to **Appendix B**

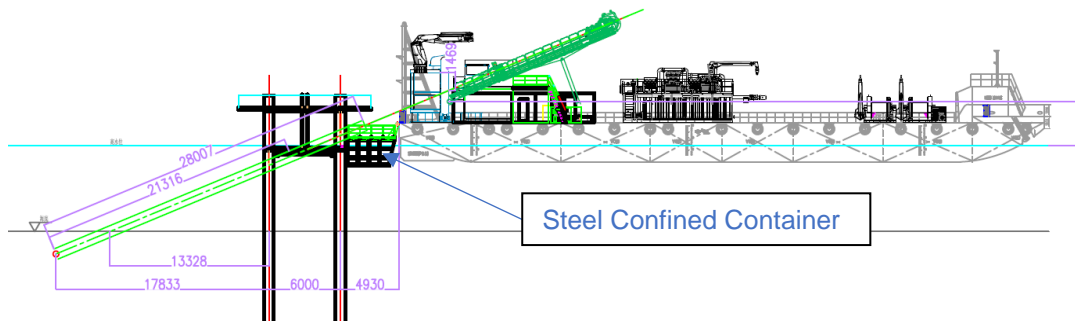
#### **3.3.1 Temporary Scaffold Installation at Receiving Site**

- i. Mobilize derrick lighter with vibrating hammer and set up at receiving site;
- ii. Install floating single silt curtain as a mitigation measure around the derrick lighter and enclose the working area for carrying out pipe piling installation;
- iii. Install 8 nos. of temporary pipe piles with 610mm diameter gradually about 21m below the seabed level. The design can refer to the **Appendix D(i)**;
- iv. Install temporary frame / steel scaffold to be supported by pipe piles and interconnected by structural steel beam and bracings, bolting or welding works;
- v. Temporarily remove floating single silt curtain after insertion of pipe piles and steel casing.

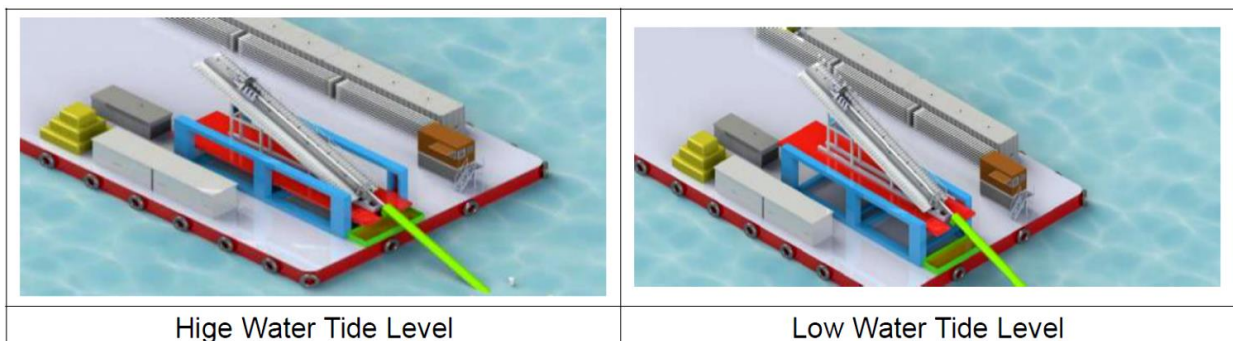
As described in the Environmental Review Report (ERR) – Change of Horizontal Directional Drilling Method for application of Variation of Environmental Permit (VEP) (Application No. VEP-567/2019). Floating single silt curtain will be deployed to fully enclose the works area at sea side prior to marine piling for the installation of temporary scaffold as well as the steel casing insertion. The silt curtain deployment plan with the design and installation of silt curtain refer to **Appendix E**

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- 3.3.2 Deploy a flat top barge as marine working platform where all HDD equipment, plant and materials can be placed. The working barge will be properly anchored so as to align with the extension line of the orientation of HDD exit;
- 3.3.3 Measure and set out the area of the mud pit at the exit site, using the measuring apparatus calibrated by accredited laboratory;
- 3.3.4 Deploy the working barge equipped with construction machines;
- 3.3.5 Provide power supply and / generator connecting on the barge;
- 3.3.6 Install of the mud pit (a steel confined container) as shown below:-



- 3.3.7 Install of mud processing system, mud tanks, mud pumps and connecting tubes or hoses;
- 3.3.8 Provide auxiliary machines, tools and materials;
- 3.3.9 The steps and procedures above mentioned may be adjusted or rearranged according to the actual site conditions. Considering the impact of tidal variation on the HDD works, an adjustable mechanism of drilling rig will be erected on site in order to keep the axis of drilling rig aligning with the exit line of HDD and stabilization during the drilling works. The schematic diagrams of adjustable mechanism for tidal variation are sketched as below;



- 3.3.10 Install temporary steel casing (DN813mm) by the multifunctional drill rig (model no.: HDD-2000ZH) from the sea and along the designed trajectory by three main operations (hammering, jacking and auger excavating) repeatedly in order to prevent ground settlement, borehole collapse and frac-out of drilling fluid

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during the HDD installation works in the soft and cobble layers. The guiding sensor mounted at the drill stems to guide the direction of steel casing;

3.3.11 Install DN355 centralization casing inside the temporary steel casing for continuously drilling can concentrate thrust force to increase drill efficiency.

3.3.12 Pilot hole drilling from Sea Side


- i. HY-2000ZH Drilling Rig →7 5/8 Drill Pipe→230mm Non-magnetic Drill Collar → Non-magnetic connection (Pilot Detector) →244mm Mud Motor→311mm Tri-Cone Bit
- ii. Collect all of the data and parameters shown on the control panel and the down hole mud pressure precisely;
- iii. Deploy surveying barge along the drilling path on the sea to trace the position of the drill bit to ensure the preciseness and accurate of the drilling trajectory.

3.3.13 Powered Reaming from Sea Side

- i. The following table shows the estimated borehole reaming level and differential between the levels. During construction, there is subject to adjust based on actual drilling condition and hardness of ground layer.

Reaming stage	Borehole diameter(mm)	Borehole level differential(mm)
First stage of reaming	510	200
Second stage of reaming	710	200

- ii. First level reaming: HY-2000ZH Drilling Rig →7 5/8 drill pipe→244mm drill mud motor →510mm powered reamer
- iii. Second level reaming: HY-2000ZH Drilling Rig →7 5/8 drill pipe→centralizer→286mm mud motor→710mm powered reamer
- iv. When the reamer (or hole opener) reaches the destined servicing time down in the borehole, or when necessary, the reaming tools should be tripped out for changing. The used hole opener should be scrutinized for any wearing of the cutters, Tungsten Carbide Inset (TCI) teeth and the gauge protecting layer of the reamer, which shall be improved and

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enhanced accordingly to increase the actual longevity of the hole opener and to increase the drilling efficacy.

### 3.3.14 Borehole from Sea Side

- i. The hole smoothing method is the same as that of the launching side. The borehole smoothing tool has a sufficient length of rigid stiff pipe body and an orthogonal cutting head which is driven by high pressurized mud. When this borehole smoothing tool is introduced into the borehole, wherever the borehole curvature complies with requirement, the borehole correction component can pass through smoothly; however, wherever the borehole curvature is less than what minimally required, the orthogonal cutting head will, with the length of the rigid stiff pipe body pressed against the hole-wall, be driven to cut the hole-wall to make the curvature comply with the requirement. The borehole smoothing is to correct the borehole angle and geometry to ensure the hole is smooth enough for back-pulling of the pipeline;
- ii. HY-2000ZH drill rig → 7 5/8 drill pipe → Φ560mm Rigid Stiff Pipe Body (mounted inside a mud motor which is connected to drill pipe) → cutting head;
- iii. Based on pipe radius, final reaming diameter and design radius, the preliminarily determined length of the rigid stiff pipe body should be 28m.

### 3.4 Drilling Fluid System (with Fluid Pump)

During the drilling process, the return mud is processed and recycled. As shown on the following flow chart: water, bentonite, etc. are mixed in a mixing tank according to a certain ratio to form a water-based mud.

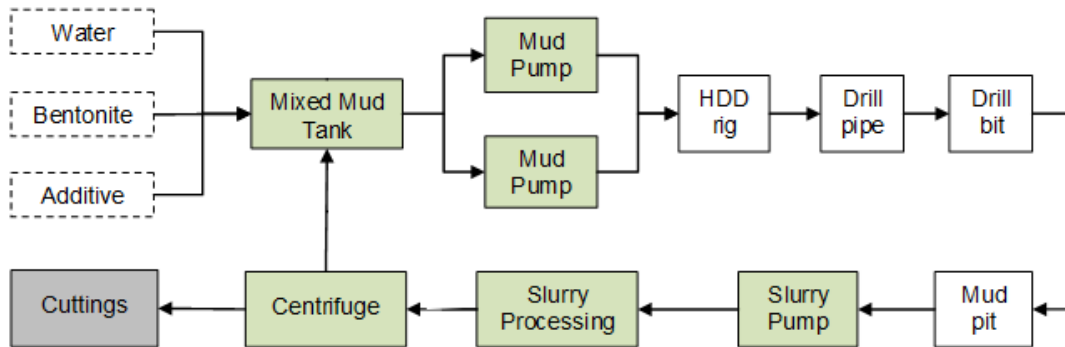
The proposed mix ratios of the MMH (mixed metal hydroxide) system drilling fluid is as follows:

- Bentonite: 60kg/m<sup>3</sup>
- Fresh water: 1m<sup>3</sup>
- MMH: 1kg/m<sup>3</sup>

After testing the performance to meet the requirements of the relevant drilling stages, the mud is pumped through the mud hoses of the rig into the drill pipe; the pressured mud will drive the mud motor to rotate the tri-cone drill bit to cut the rock. Finally the mud will flow back through the borehole back to the mud pit. In the mud pit, where cuttings are also suspended in the mud, will be pumped by the slurry pump to the

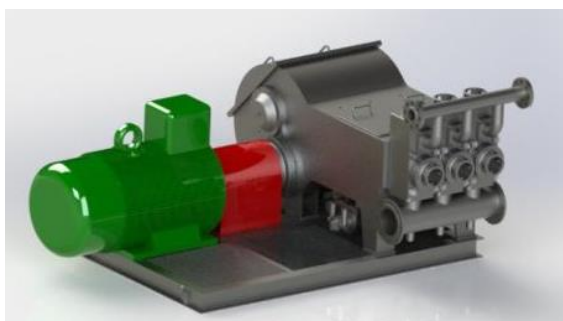



processing system. Through the processing system's vibrating coarse screening, vibrating fine screening, sand removing cyclone, desilting cyclone and centrifuge, the solid and the liquid composed of the drill mud are separated and the solid particles sized as small as up to 5 µm can be separated from the mud. The separated drill cuttings are stored in the cutting storage area. And the mud after the processing will then be transported to the mud mixing tank for further configuring and reusing.



Fluid Pump (Mud Pump): It will deploy NJB-2000/10B type mud pumps with 2000L/min of flow rate (higher flow rate can be achieved by several sets of pumps used simultaneously), 10MPa of rated pressure and 280 kW of power consumption.

	Motor speed(rpm)		
Constant torque	100	1000	
Constant power		1000	2000
Constant transmission ratio (i)	3x3.05=9.15		
Piston stroke (mm)	200		
Piston diameter (mm)	165		
Piston punch (N/min)	10.9	109.3	218.6
Mud flow rate (m <sup>3</sup> /min)	0.14	1.4	2.8
Nominal working pressure (MPa)	10		
Power of motor (kW)	280		



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Drill mud composition includes water, bentonite and additives. During construction, it is necessary to follow the drill mud management plan to monitor the drilling fluid performance.

Major monitoring parameters are as follows:

- Marsh Funnel Viscosity;
- Plastic Viscosity;
- Apparent Viscosity;
- Gel Strength  $G_{10s}/G_{10min}$ ;
- Filter Loss; and
- pH


It is noteworthy that when unexpected fault zone is encountered, the values of the major parameters listed below are susceptible of further configuration.

No.	Item	Value When Drilling Through Granite	Mark
1	Marsh Funnel Viscosity, s	40~60	
2	Plastic Viscosity, mPa*s	15~25	
3	Apparent Viscosity, mPa*s	15~30	
4	Gel Strength $G_{10s}/G_{10min}$ , Pa	2~6/ 5~10	
5	Filter Loss, ml	10~20	
6	pH	9~11	

The API has recommended standard methods of conducting field and laboratory tests for drilling fluids and detailed procedures may be found in the API publication “Recommended Practice: Standard Procedure for Field Testing Drilling Fluids” API RP 13B-1 (ISO 10414 based on it), and supplements.

Rectification actions in response to non-compliance of the desired level of performance of the drilling fluid:

- **Marsh Funnel Viscosity**  
Desired Level 40-60

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When it reaches the trigger points (i.e 60), check MBT values and Gels. If MBT high, dilute with water to get required property. If MBT is within range, check solids control equipment.

➤ **Total Hardness**

Desired Level < 400 mg/l

When it reaches the trigger points (i.e. > 400 mg/l), treat with Soda Ash until < 400 mg/l.

➤ **Sand Content**

Desired Level < 1.5%

When it reaches the trigger points (i.e. > 2%), check solids control systems for breaks in screens. Use centrifuge if available.

➤ **Mud Weight**

Desired Level 1.03-1.10

When it reaches the trigger points (i.e. 1.12), add water to dilute if required.

➤ **Chloride Content**

Desired Level < 2000 mg/l


When it reaches the trigger points (i.e. > 2000 mg/l), perform a flow check to see if water ingress is occurring.

➤ **pH**

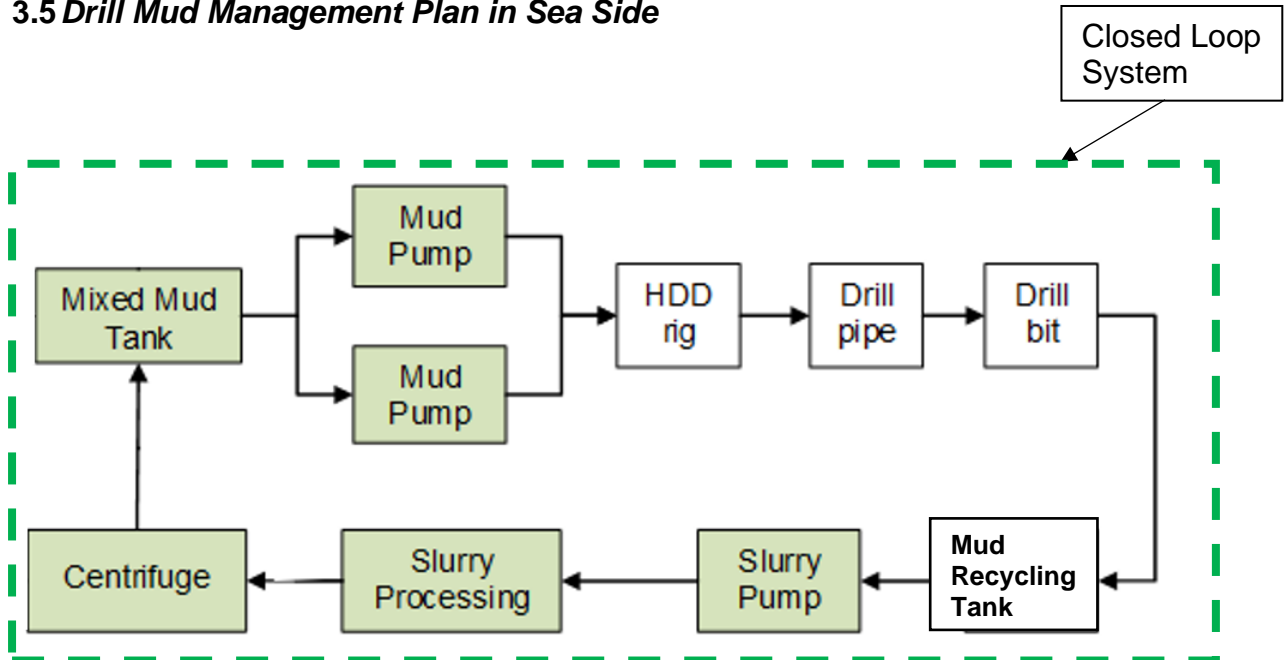
Desired Level 9-11

When it reaches the trigger points (i.e. lower than 9), pH modifier (soda ash) shall be added until pH is in range.

The basic field tests, such as Funnel Viscosity, etc., would be tested every two hours, or according to the actual conditions on site.

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### 3.5 Drill Mud Management Plan in Sea Side




#### 3.5.1 Protective Measure

- i. A mud recycling tank would be installed below the steel casing to collect the drill mud.
- ii. Alert line would be marked on the mud recycling tank to alert operators of the drill mud level is well controlled and prevent accidental overflow.
- iii. Drill mud would be pumped away from the mud recycling tank to the slurry tank on the barge before off-work.

#### 3.5.2 Emergency Preparedness

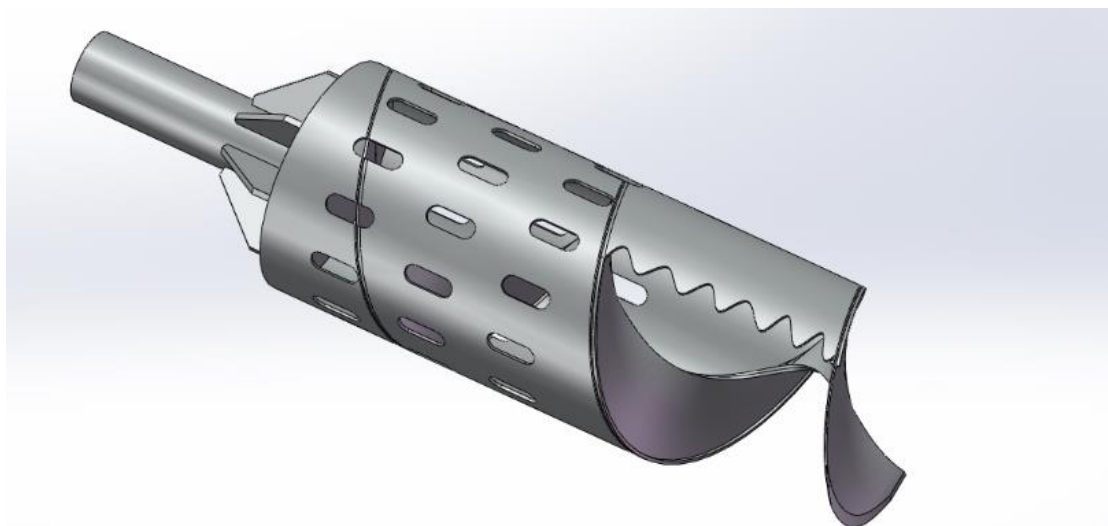
- i. Back up pump would be prepared on barge for emergency situation, e.g., the duty pump broke down, to pump the drill mud away from the mud recycling tank and prevent overflow.
- ii. Drilling works would be stopped immediately when the mud circulation system break down to prevent overflow of drill mud.
- iii. Most of the drill mud circulation is located inside the underground drillhole. If bursting occurs in drill mud pipe on the barge, the drill mud would be retained within the barge which is surrounded by upstand wall with sandbags. The drilling works would be stopped immediately to prevent seepage of drill mud into the sea.

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### **3.6 Method of Cleaning Borehole**

Based on the different stages of HDD construction, two different methods are usually used for borehole cleaning: One is that the recycling of high-performance drilling mud can transport cuttings out of the borehole to the surface. The other is that a kind of special fishing tool introduced into the borehole can bring out the bigger debris which is too large to be transported by the recycling mud. Thus, a clear and clean borehole is created.

During pilot hole drilling and borehole reaming, the performance particulars of the drilling mud should be configured and adjusted, according to the data and parameters of the drilling works (such as torque and mud pressure). The activities of tripping-out and borehole cleaning should be conducted frequently when regarded necessary and compatible, which can clear the cutting bed that may possibly accumulate inside the borehole, so as to avoid the risk of jamming the drilling tools. In addition, during drilling operation, the torque of the rig should be scrutinized to judge if there is any unusual change of the torque which could be affected by cobbles down in the borehole. Cobbles or big debris should be flushed out through the borehole using the fishing barrel as shown in the figure below. Thus, it can prevent damage the PE pipe, when back pulling, from being jammed by cobbles in the borehole.



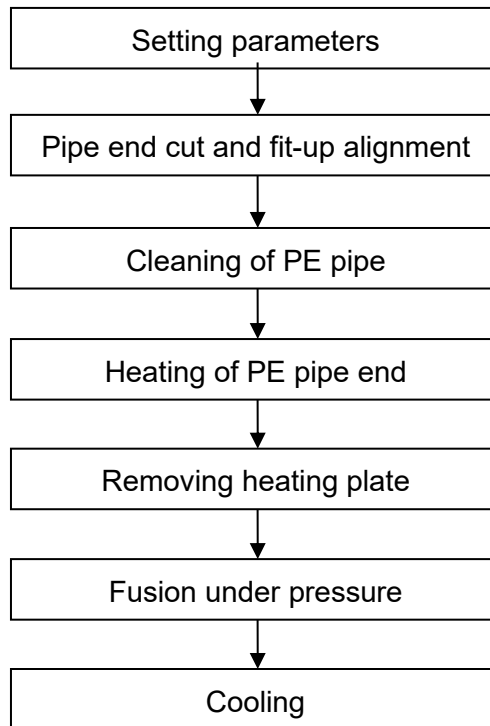
Before pipe pulling, it can be ascertained whether the borehole has been desirably cleaned or not, by observing constituent ratio of cuttings suspended in the returned mud, or by the trial of back pulling of a section of PE pipe through the borehole. If it is assessed that it may still be cuttings or debris accumulation, the recycling of drilling mud and the tripping of fishing tools inside the borehole should be conducted again to achieve the desired cleanliness.

### 3.7 Method of Pipe Connection / Jointing / Pipe Pulling

- i. Pipeline connection method  
The PE pipes will be connected together by using the method of heat butt fusion
- ii. Heat butt fusion of pipe line

The standard which should be complied with during PE pipe butt-fusion should be WIS-4-32-08 and ASTM F2620-11.


The Procedures for PE Pipe Butt Fusion is as below:



- iii. Heating Butt-fusion time estimation




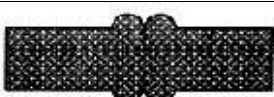

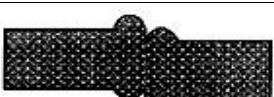
It is estimated that every joint fusion requires 1.6 hours. Specific time is as follows:

Work detail	Specific time (min)
Lifting	10
Pipe End Checking and Correction	10

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Heating of PE Pipe end	3
Remove the heating plate and pressurize the PE end heatedly	11
Cooling while remaining the PE pipe on the butt fusion machine	27
Cooling after removal from the butt fusion machine	30
Visual inspection of the Joint	5
Total	96

iv. Appearance inspection of fusion joint

Appearance	Inspection result	Cause of defect forming
	Acceptable Correct joint	/
	Bead narrow and fall.	Too big pressure
	Small bead	Not enough pressure
	Crack in the center of the welding bead.	Not enough temperature or too long over time
	Different heating temperature	The materials have different heating time
	Misalignment	Tolerances exceeds 10% of pipe wall thickness

### 3.8 Prefabricated pipe

PE pipe sections are connected with each other by butt fusion. Each prefabricated pipes with a desired length of about 60m in order to reduce time consuming at installation, will be prefabricated on a barge (shown in the figure below), and later on be pulled into the borehole after tie-in together on the barge, so as to limit the interference with the seaway of the maritime area.

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According to the PS, in particular, APPENDIX 34.1 of the PS, the WIS 43-2-08 shall be complied with for butt fusion of submarine pipeline and joints sampling frequency.

The proposed sampling frequency for the pipe joints shall be agreed on site and determined by the Project Manager.

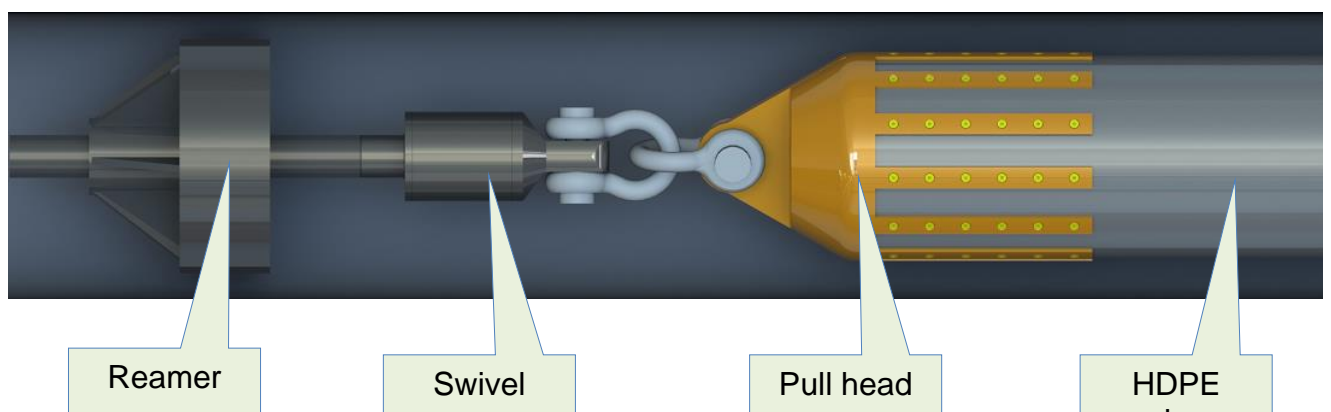
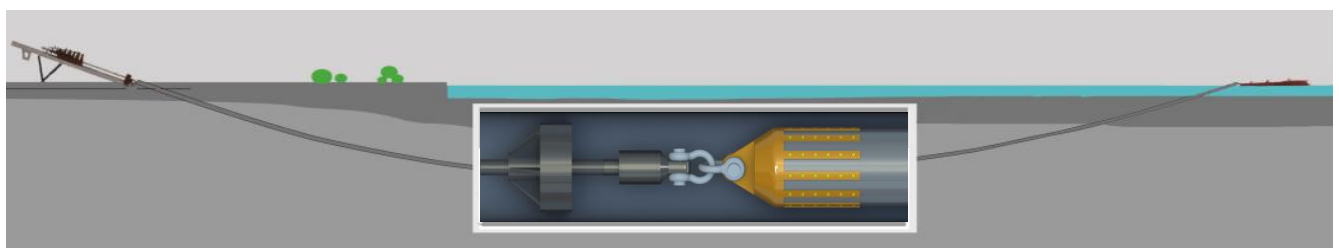
### 3.9 HDPE Pipe Pulling

#### 3.9.1 Procedure of pulling


- i. Lift the 60m length of prefabricated PE pipe section to the position ready for back pulling installation, and pull back it into hole;
- ii. Lift another section of 60m length prefabricated PE pipe for butt fusion with the previous PE pipe which has been installed;
- iii. After cooling for an adequate time, to pull this new section of PE pipe into the borehole;
- iv. Inject water into the installed PE pipe in order to counterbalance the undesirable buoyancy of the mud in the borehole exerted on the pipe, and;
- v. Repeat the procedures above mentioned until all around 1900m length of PE pipeline totally pulled back into the borehole.

#### 3.9.2 BHA when pipeline back pulling

- i. HY-6000ZH drilling rig → 7 5/8 drill pipe →  $\Phi$ 610mm pulling reamer → swivel → pulling pipe head → PE Pipe line

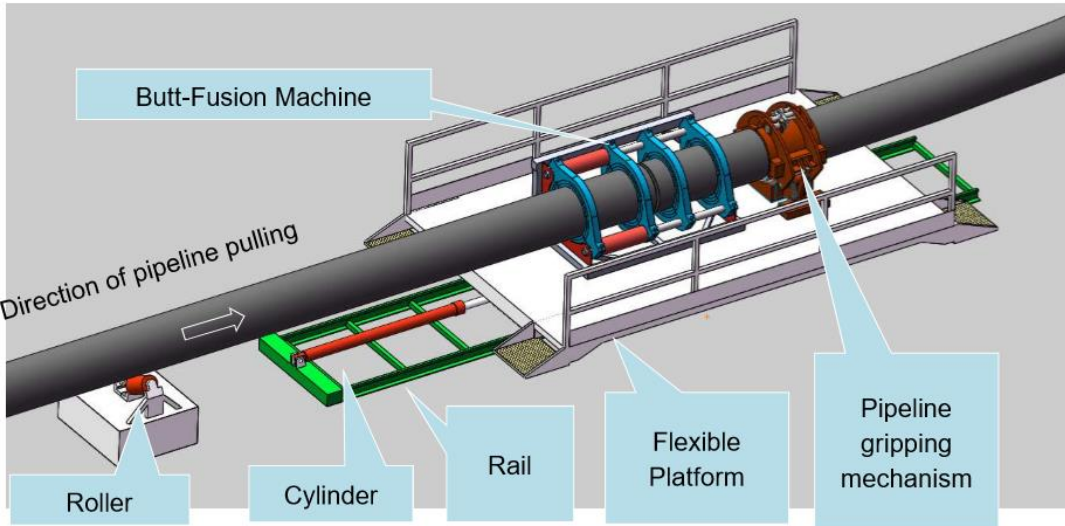
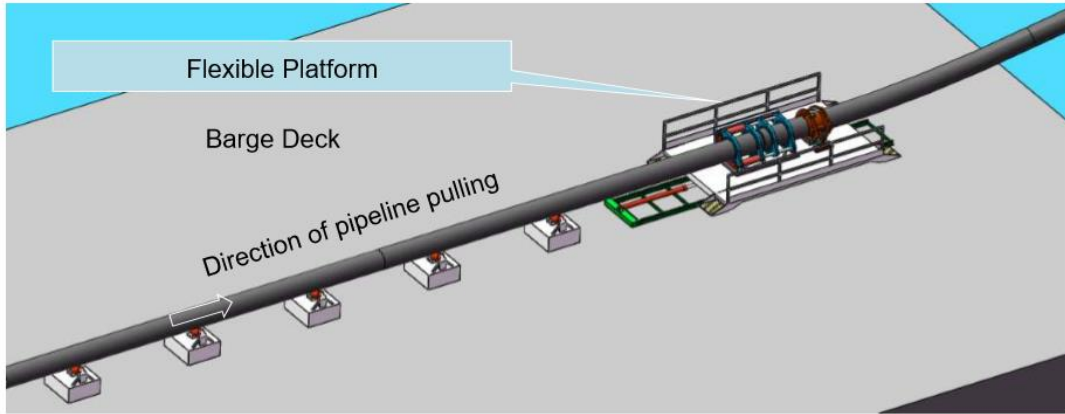





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### 3.9.3 Flexible Pipeline Fusion Device

When PE pipe butt fusion works start on the barge, the gripping mechanism on the flexible platform will hold tightly the upper end of the section of the PE pipeline which has been installed inside the borehole. The automatic tensioning cylinder of the flexible platform can exert a counterbalancing force (roughly 10kN) to offset the movement of the barge, sparing any disturbance to the installed section of the pipeline, i.e., when the barge moves closer towards the direction of the installed pipeline, under the counterbalancing force of the automatic tensioning cylinder, the flexible platform will move oppositely away from the installed pipeline, so that the length of the PE pipeline which relatively extend onto the moving barge will remain on the flexible platform, where the butt fusion machine is mounted for PE pipe welding; conversely, when the barge moves away from the installed pipeline, the flexible platform will move oppositely toward the direction of the installed pipeline, so that the length of the PE pipeline which relatively retract off the moving barge will remain on the flexible platform for butt fusion.




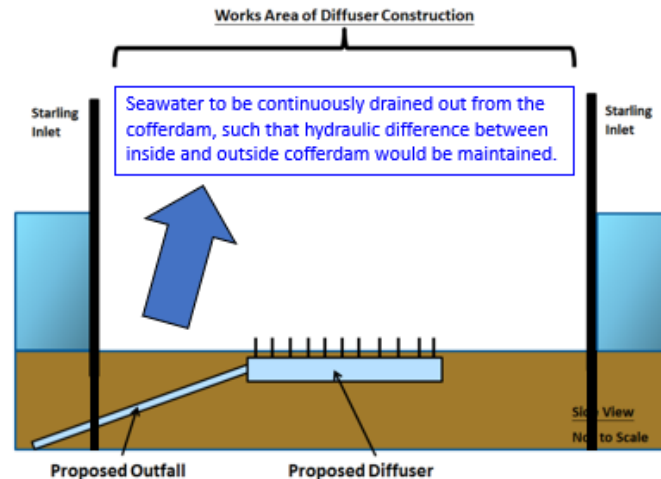
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### **3.10 Sheetpile Cofferdam Installation at Diffuser Site**

The sheetpile cofferdam, with size about 60m (L) x 30m (W), would be deployed after completion of submarine outfall by HDD method and it would enclose the future dredging area of diffuser. Diffuser would be constructed inside the cofferdam in order to prevent sediment release. The sequence of works is listed below:-

- i. Mobilize derrick lighter with vibratory hammer and set up at proposed diffuser site;
- ii. Install floating single silt curtain as a mitigation measure around the derrick lighter to enclose the working area;
- iii. Pre-connect the 24m long sheetpiles on the ground by butt weld joint;
- iv. Apply Interlocking sealant or equivalent (details refer to **Appendix J**) along the interlock area of sheetpiles to ensure no sediment release from the cofferdam during dredging/filling operation. The sheetpiles can be driven into seabed after a curing time of approximately 24 hours.
- v. Drive sheetpiles with interlocking into the seabed with 15m embedment by vibratory hammer. The design can refer to the **Appendix D(i)**. As interlocking sealant which swells over 400% in water is applied to seal up the gaps of the interlocks of sheetpiles, the sediment inside the water tight cofferdam could not pass through the interlocked sheetpiles;
- vi. Remove the temporary scaffold (refer to section 3.3.1) and temporary steel casing (refer to section 3.3.10) inside the cofferdam;
- vii. Drain the seawater continuously from the cofferdam, such that hydraulics difference between inside and outside cofferdam could be maintained, before commencement of sediment dredging. The hydraulic difference could further ensure no flow of sediment to the water body outside the cofferdam;

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- viii. Treat the drained seawater by sedimentation tanks;
- ix. Deploy silt curtain to surround the cofferdam during construction;
- x. Carry out dredging of marine sediment by closed grab according to the design profile without sediment released from the cofferdam;
- xi. Carry out outfall diffuser installation inside the enclosed cofferdam;
- xii. Conduct backfilling works according to design profile;
- xiii. Remove the sheetpiles from the sediment using vibratory hammer;
- xiv. Remove silt curtain after removal of all sheetpiles; and
- xv. Demobilize all marine plants.

Floating single silt curtain will be deployed around the sheetpile cofferdam and sheetpile removal works. The silt curtain deployment plan with the design and installation of silt curtain refer to **Appendix E**.

#### 4. IMPACT MONITORING

##### 4.1 Settlement/Vibration/Tilting/Groundwater Level Monitoring

Monitoring works for ground settlement, existing seawall tilt marker, vibration and ground water level monitoring for the existing treatment plant and temporary sewage treatment plant will be carried out during the submarine outfall HDD construction. The alert level, alarm level and action level for ground settlement is  $\pm 20\text{mm}$ ,  $\pm 22\text{mm}$ ,  $\pm 25\text{mm}$  respectively. The alert level, alarm level and action level for vibration monitoring is  $\pm 10\text{mm}$ ,  $\pm 11\text{mm}$ ,  $\pm 13\text{mm}$  respectively. If the maximum level exceeds, all works must stop and the structure must be examined to determine if it has been

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damaged. The mitigation measures will be proposed by the Contractors and accepted by *Project Manager* to ensure that the levels are reduced to acceptable limits.

#### 4.2 Water Quality Monitoring

According to EM&A Manual Clause 5.2.17, during periods when there are installation, maintenance and removal of pipe piles, steel casing and sheetpiles and sediment removal works for construction of diffuser, impact monitoring should be undertaken at the specified monitoring stations three times a week. Monitoring at each station would be undertaken at both mid-ebb and mid-flood tides on the same day. The tidal range selected for the baseline monitoring will be at least 0.5 m for both flood and ebb tides as far as practicable. The interval between two sets of monitoring would not be less than 36 hours. The monitoring frequency would be increased in the case of exceedances of Action/Limit Levels if considered necessary by Environmental Team. The event and action plan for Water Quality Monitoring is according to EM&A Manual Table 5.5 and enclosed in **Appendix K**. Monitoring frequency and action and limit levels would be maintained as far as practicable and summarized as below:-

<b>Monitoring Parameters, unit</b>	<b>Frequency</b>
<b>In-situ Measurement:</b> <ul style="list-style-type: none"> <li>• Temperature, °C</li> <li>• pH</li> <li>• Salinity, ppt</li> <li>• Dissolved Oxygen (DO), mg/L</li> <li>• Turbidity, NTU</li> </ul> <b>Laboratory Analysis:</b> <ul style="list-style-type: none"> <li>• Suspended Solids (SS), mg/L</li> </ul>	<b>For Marine Water Quality:</b> <ul style="list-style-type: none"> <li>• <i>Construction Phase</i></li> </ul> Both Mid-Ebb and Mid-Flood tides on the same day (the interval between two sets of monitoring should not be less than 36 hours)

The table below is extracted from Table 4.2 of Baseline Environmental Monitoring Report (Water) submitted under EP Condition 3.3

Monitoring Location	Depth Level	DO (mg/L)		Turbidity (NTU)		Total Suspended Solids (mg/L)	
		AL	LL	AL	LL	AL	LL
N1	S & M	5.36	5.34	7.5*	13.1^	5*	8^
	B	5.06	5.05				
N2	S & M	5.95	5.71	4.7*	5.9^	5*	6^
	B	5.56	5.53				
FCZ1B	S & M	5.10#	5.00#	4.5*	5.5^	8*	12^
	B	5.10#	5.00#				
H4A	M	5.94	5.86	4.7*	4.8^	8*	9^
H1A	M	6.01	5.97	6.5*	6.6^	14*	15^
M1A	M	5.63	5.54	5.8*	6.1^	9*	10^
SGA	M	6.00	5.90	6.0*	6.2^	10*	11^
FCZ7@	S & M	5.10#	5.00#	6.0*	6.4^	5*	5^
	B	5.10#	5.00#				
FCZ8	S	5.10#	5.00#	5.2*	9.1^	6*	7^
	B	5.10#	5.00#				

**Remarks:**

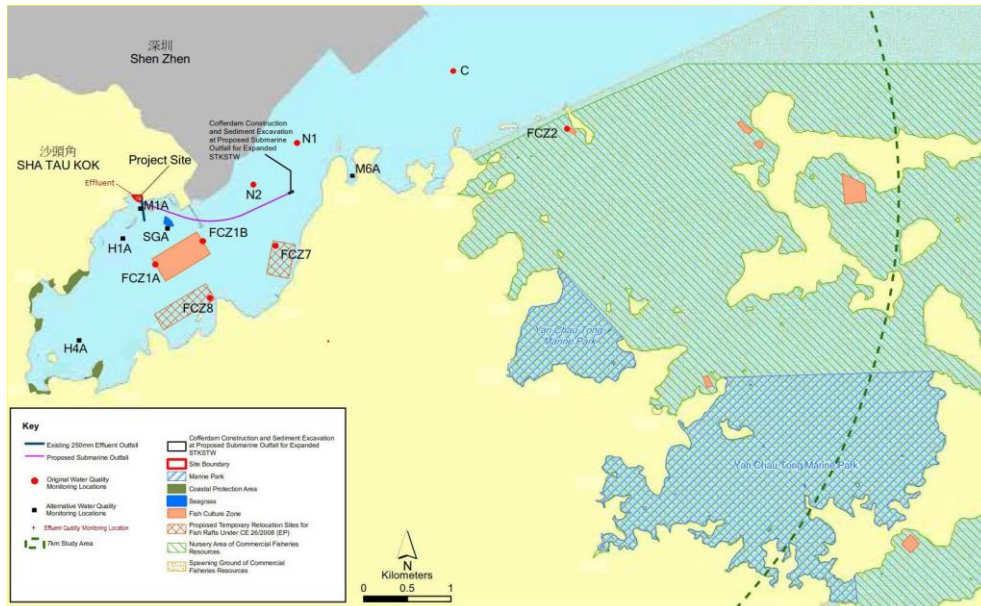
AL: Action Level; LL: Limit Level

# According to the EM&A Manual, for FCZ: AL of DO is 5.1 mg/L or level at control station at same tide of the same day (whichever lower) and LL of DO is 5.0 mg/L or level at control station at same tide of the same day (whichever lower);


\* Or 120% of control station's level at the same tide of the same day;

^ Or 130% of control station's level at the same tide of the same day.

c According to the EM&A Manual, AL of Salinity is Below 91% of baseline level or 9% less than value at any impact station compared with corresponding data from control station and LL of Salinity is Below 90% of baseline level or 10% less than value at any impact station compared with corresponding data from control station



**Location of Marine Water Quality Monitoring Stations**

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## 5. PLANTS AND EQUIPMENT LIST

The plants and equipment list refer to **Appendix F**.

## 6. SAFETY AND ENVIRONMENTAL CONCERNS

### 6.1 Safety

- Safety Training
  - Safety Induction Training Course  
Workers shall attend the Induction Training Course conducted by the Safety Officer before the commencement of works. The Safety Officer and Site Engineer shall explain the safety requirements and nature of the work to all workers.
  - General Site Safety  
All workers must go through a briefing conducted by the Safety Officer before commencement of any work.
  - Special Skill Training
    - Crane drivers, plant operators and such must be trained and certified. All workers shall be fully trained to use all Personal Protective Equipment, such as safety helmet, eye goggles, ear plugs, safety shoes/boots, safety harness and lifelines, and reflective vest/belts. All workers on land side shall obtain “Green Card”;
    - All workers and personnel on board shall have valid certificate of the “Shipboard Cargo Handling Basic Safety Training Course”.
  - Material Storage  
All workers shall be reminded a potential risk of rolled items (e.g. steel casing) on inclined ground.
- Experienced supervisor(s) and plant operator(s) shall be deployed for the work.
- The works area shall be properly fenced off and warning signs / notice boards / permits shall be displayed at conspicuous positions.
- Protection of Existing Plant Facilities / Equipment
- The Safety Officer, Site Engineer(s) or Site Supervisor(s) shall provide a training / pre-work briefing to all workers to address the protection works of existing plant facilities / equipment.
- Properly fence off the area of existing plant facilities / equipment by well tied plastic barriers to avoid unauthorized person to get in.

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- Warning signs or notice boards shall be well displayed at fenced off area to alert site personnel from operating the plant facilities / equipment without permission.
- Signallers shall be provided on both working vessel and land-side and keep communication with drilling barge operator throughout operation.
- Sufficient buoys and life jackets shall be provided who works adjacent the water;
- No marine work shall be carried out during spells of inclement weather or conditions as listed below:
  - Low visibility (i.e. below 1m nautical mile due to heavy rainstorm or dense fog
  - Any heavy rainstorm warning is hoisted
  - Any tropical cyclone warning signal is in force
- No work shall be carried out on seashore during spells of inclement weather or conditions as listed below:-
  - Any heavy rainstorm warning is hoisted
  - Any tropical cyclone warning signal is in force
  - High tide level which might cause flooding to the seashore working area

## 6.2 Environmental

### Water Quality

- Water quality monitoring conducted by Environment Team shall be carried out in accordance with EM&A manual under this Project during HDD construction. Daily patrol monitoring conducted by the Contractor shall be carried out to monitor and observe if any sediment is floated on the sea during HDD construction.
- During the periods when there are pipe piles installation, impact monitoring should be conducted by Environmental Team and be undertaken at the specified monitoring stations as shown in Figure 5.1 and Table 5.3 of EM&A Manual for this Contract three times a week until the end of submarine outfall construction by two direction drilling method. Monitoring at each station would be undertaken at both mid-ebb and mid-flood tides on the same day.
- Bunding / sandbags should be provided at the edge of the working barges to prevent any potential surface/ mud runoff to the sea.



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#### Air and Dust Emission


- Proper maintenance on mechanical equipment shall be carried out for preventing excessive dust emission.
- Dust emission will be kept to a minimum in any case and as necessary, daily water spraying within the works area shall be conducted to suppress the dust pollution.
- Proper dust control shall be maintained during the grout mixing area.
- C&D materials to be delivered to and from the project site by barges or by trucks should be kept wet or covered to avoid wind-blown dust.

#### Noise

- No site work shall be conducted outside normal working hour (0700-1900 of Monday to Saturday excluding public holiday) unless construction noise permit is obtained from EPD.
- QPME should be adopted as far as applicable.
- Noise barrier shall be provided to minimize noise impact (if necessary).
- Machines and plant that may be in intermittent use to be shut down between work periods or should be throttled down to a minimum; plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from the NSRs.
- NRMM and noise labels should be displayed on the PME.

#### General Site Cleanliness

- The Contractor will at all times maintain a clean and tidy site so that there is no loose debris, packaging or other materials capable of being transported by wind.
- Covering all open stockpiles of construction materials or wastes with tarpaulin or similar fabric during rainstorms.

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### Chemicals and Drill Mud Handling


- Chemical Waste handling of chemical wastes in accordance with the Code of Practice on the Packaging, label and Storage of Chemical Wastes shall be followed, and disposal of chemical wastes at licensed chemical waste recycling/treatment facilities shall be provided.
- Bentonite shall be stockpiled properly and be covered by impervious sheets.
- Suitable containers should be used to hold the chemical/ chemical waste to avoid leakage or spillage during storage, handling and transport.
- Storage of chemicals/waste within the works area should be limited to absolute minimum volume and are to be removed from sites at the earliest opportunity.
- Chemical waste containers should be suitable labelled to notify and warn the personnel who are handling the wastes to avoid accidents.
- The drill mud shall be mixed, transported, stored and processed in a sealing system. Except the recycled and reused drill mud, the rest of drill mud shall be transported by the tank wagons during disposal.
- The drill mud processing system consisted of the drill mud mixer, drill mud pump, centrifuge and filter could separate the used drilling fluid into the drill mud and the drilling cutting, which drill mud could be recycled and reused for the HDD work.
- At the end of the HDD work, the rest of drill mud generated could not be reused anymore, these drill mud shall be disposal of the designated land fill.

## **7. PRECAUTIONARY MEASURES IN WATER QUALITY**

Precautionary measures below should be implemented before and during HDD construction.

### Marine Piling, Casing Installation and Sheetpiling


- All the HDD works including the marine piling and steel casing installation should be applied within the sediment removal area proposed in EIA Report.
- The marine piling, steel casing installation, temporary scaffold installation and cofferdam construction of this Project should not be carried out concurrently.
- The removal of pipe pile, steel casing, temporary scaffold installation and cofferdam should not be carried out concurrently.
- The daily working period for pipe pile insertion or removal should not be greater than 12 hours.

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- Only 1 pipe pile should be installed or removed at any given time and no more than four pipe piles should be installed or removed within a day.
- Insertion or removal of each pipe pile should not be faster than 3 hours.
- Only one steel casing should be installed or removed at any given time;
- The rate of insertion or removal of the first 5.2m of the steel casing should be not faster than 1 hour per 1 meter.
- The diameter of pipe pile should not be greater than 0.61m.
- The diameter of steel casing should not be greater than 1m and its thickness should not be greater than 25mm.
- Silt curtain should be deployed before insertion of pipe piles for construction of temporary steel scaffold and before the installation / removal of sheetpiles of the cofferdam at the diffuser site.

#### HDD Works

- Handling of drilling fluid and removal of steel casing at the seaside should follow the procedures and method described in below: -
  - a) During the drilling operation, in order to isolate the drilling fluid and materials from the seawater, the drilling fluid with drilled materials will be totally enclosed inside the steel casing and then will flow via an enclosed passageway into a steel container that is located underneath the opening of the steel casing for the mud return to mud circulation facilities. The provision of a steel confined container (as shown in Section 3.3.6) serves as a pump sump as well as a temporary attenuation tank for storing and being pumped to the mud circulation facilities for processing. No drilling fluid is discharged to the sea and the potential spillage is prevented. After the mud processing, the final treated mud and rock cuttings that require disposal would be confined in the container on the barge and properly transported to the landside and handled at the landside work site.
  - b) After the HDD works including the pipeline installation area completed, all the drilled mud and rock debris would have been cleansed out of the drilled hole by the drilling fluids. Before the removal of the steel casing, any residual drilling fluids would be pumped out of the steel casing to well below the seabed level. No marine spillage would be expected during the removal of the steel casing and transfer to the steel casing to the barge.
  - c) Good practices is recommended in the EPD's Practice Note "ProPECC PN 1/94", the drilling fluids would be recirculated as far as practicable after suitable treatment or settlement.

Rev.:  5	<b>Build King – Kum Shing Joint Venture</b>	 BUILD KING - KUM SHING JV
Title: <b>Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam</b> Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To		Page #:  <b>Page 33</b>

#### Works inside Cofferdam for Diffuser Construction

- Water resistant sealant (see enclosed in **Appendix J**) would be provided to ensure no release of sediment outside the cofferdam during dredging operation;
- Continuous drain the seawater inside the cofferdam to further ensure no flow to sediment to the water body outside the cofferdam;
- The drained seawater would be treated by sedimentation tank; and
- Silt curtain would be deployed to surround the cofferdam during construction.

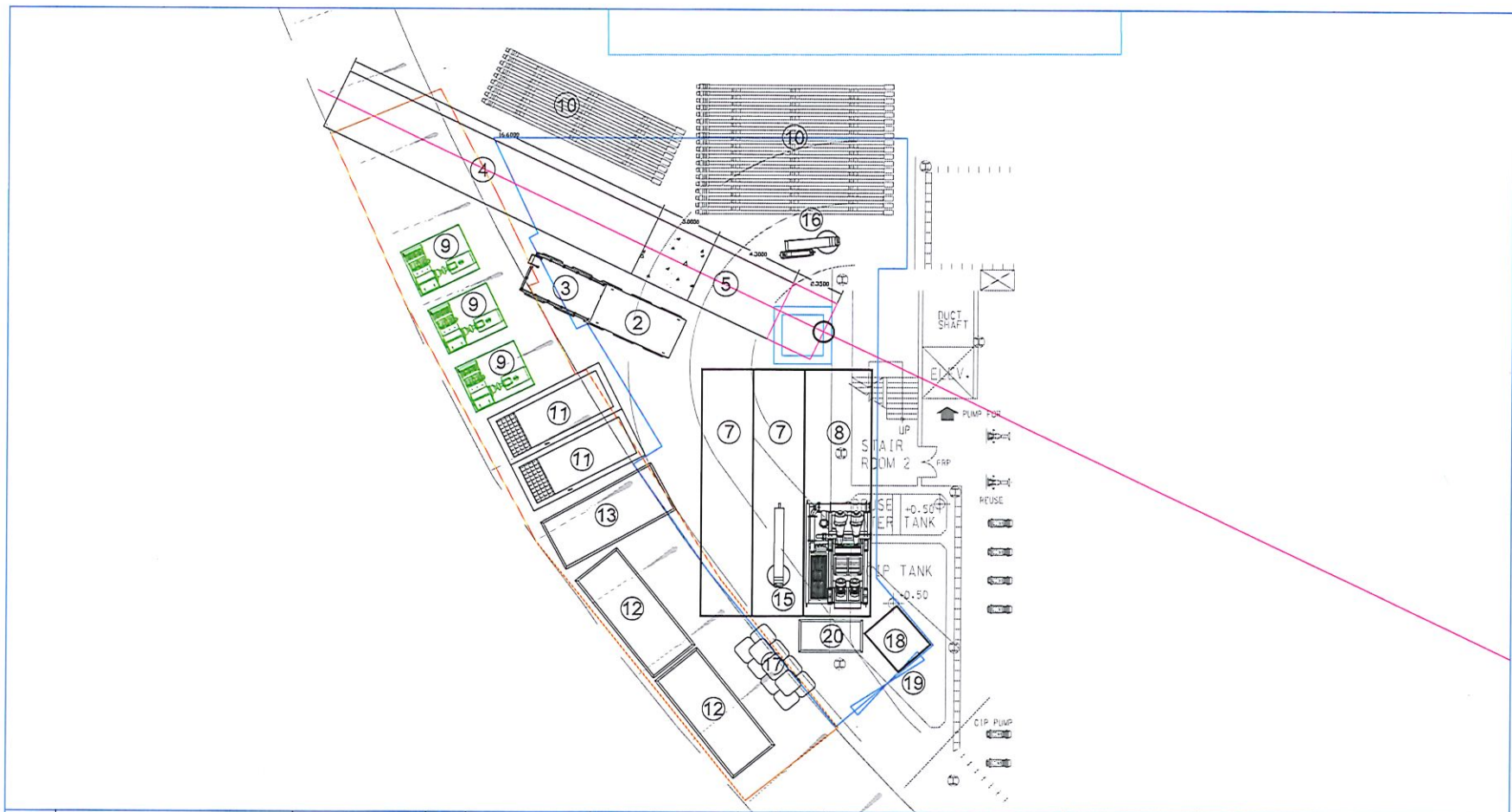
#### Working Vessels

- All vessels should be well maintained and inspected before use to limit any potential discharges to the marine;
- All vessels must have a clean ballast system;
- No discharge of sewage/grey wastewater should be allowed. Wastewater from potentially contaminated area on working vessels should be minimized and collected. These kinds of wastewater should be brought back to port and discharged at appropriate collection and treatment system; and
- No soil waste is allowed to be disposed overboard.

### **8. MITIGATION MEASURES**

Floating single silt curtain shall be deployed to fully enclose the works area at sea side prior to the installation of pipe piles for temporary scaffold at receiving pit and insertion of sheetpile cofferdam at diffuser site. The silt curtain deployment plan with the design and installation of silt curtain refer to **Appendix E**.

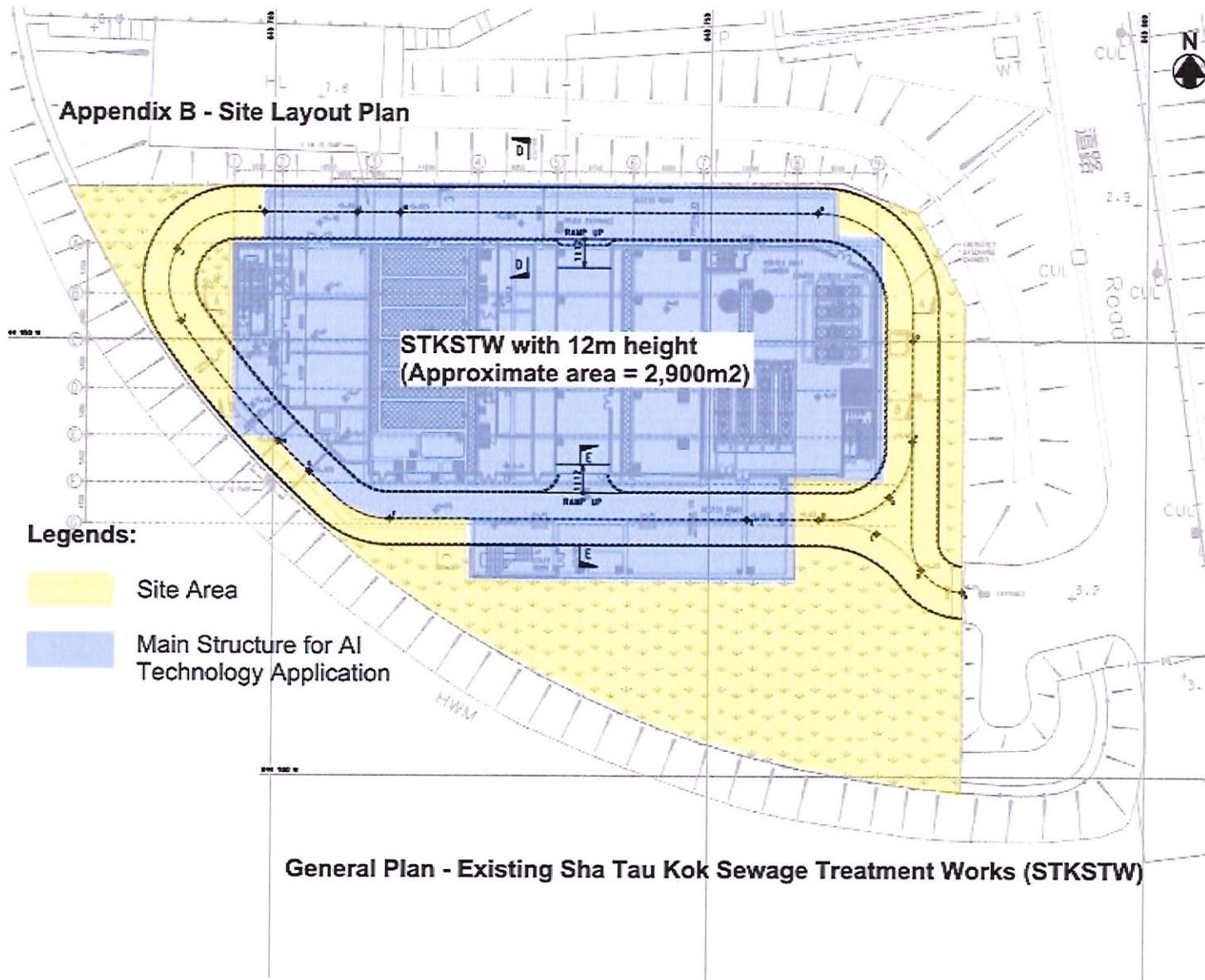
# Appendix A



Item	Facilities	設施	Qty	L×W×H(m)	Remarks	Item	Facilities	設施	Qty	L×W×H(m)	Remarks
①	Hoarding	圍欄	1			⑪	Generator	發電機	2	6×2.5×3	
②	Control room	控制室	1	4×2.4×2.4	Double Deck	⑫	Site Office	辦公室	2	6×2.5×2.4	
③	Hydraulic station	動力站	1	8×2.4×2.3		⑬	Tools Container	工具間	1	6×2.5×2.4	
④	HDD rig	水平定向鑽機	1	18×2.5×9.5		⑭	Sedimentation tank	沉沙缸	1	3×2.5×2.6	
⑤	Mud pit	泥漿坑	1	4.3×3×2		⑮	5t Crane	5t 吊機	1		
⑥	Slurry Pump	渣漿泵	1	1.1×0.7×1.2		⑯	16t Crane	16t 吊機	1		
⑦	Mud mixing tank	泥漿混合罐	2	12×2.5×2.4		⑰	Bentonite	膨潤土	-		
⑧	Mud processor	泥漿處理系統	1	12×3.25×4.3		⑱	Cuttings Storage Area	鉆屑存放區	1		
⑨	Mud Pump	泥漿泵	3	3.2×2.4×1.5		⑲	Gate	場地出入口	1		
⑩	Drilling Tools Area	鑽具存放區	1			⑳	Centrifuge	離心機	1	3×2×1.5	

## **Appendix B**

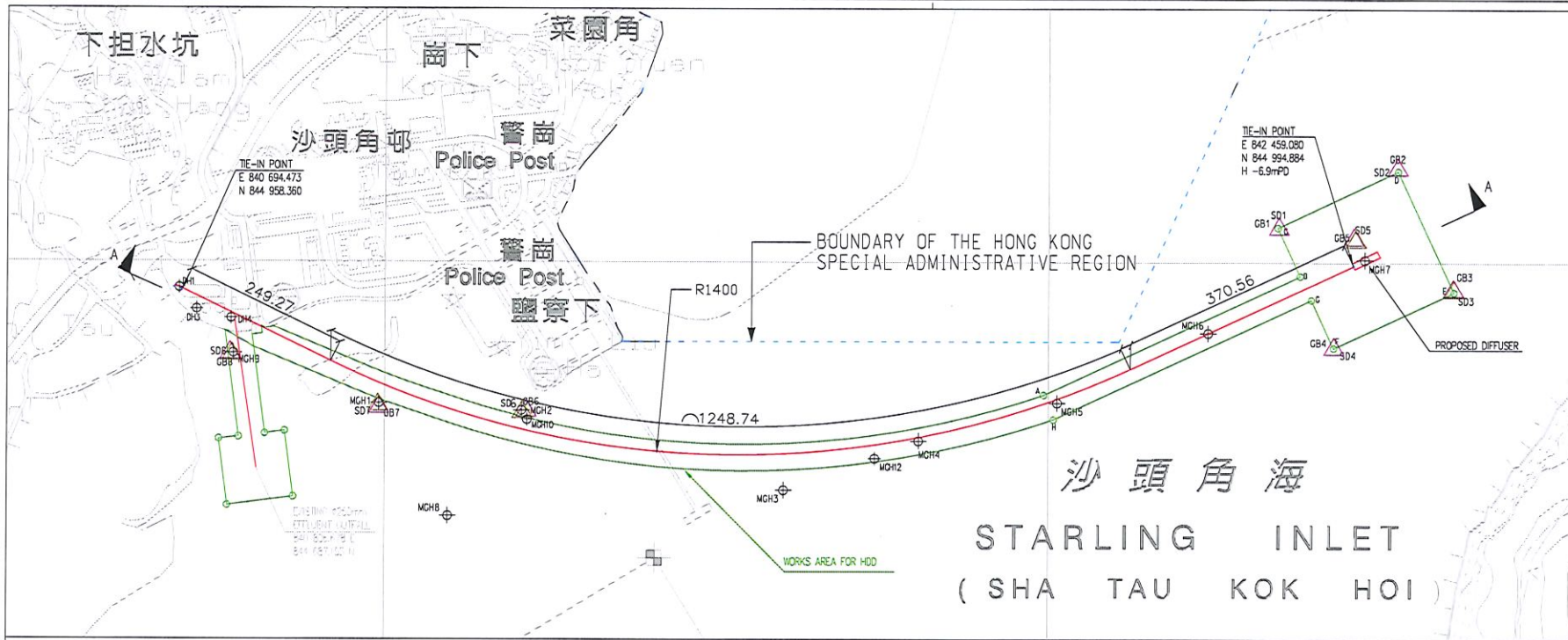
**Appendix B - Site Layout Plan**



**General Plan - Existing Sha Tau Kok Sewage Treatment Works (STKSTW)**



# Appendix C

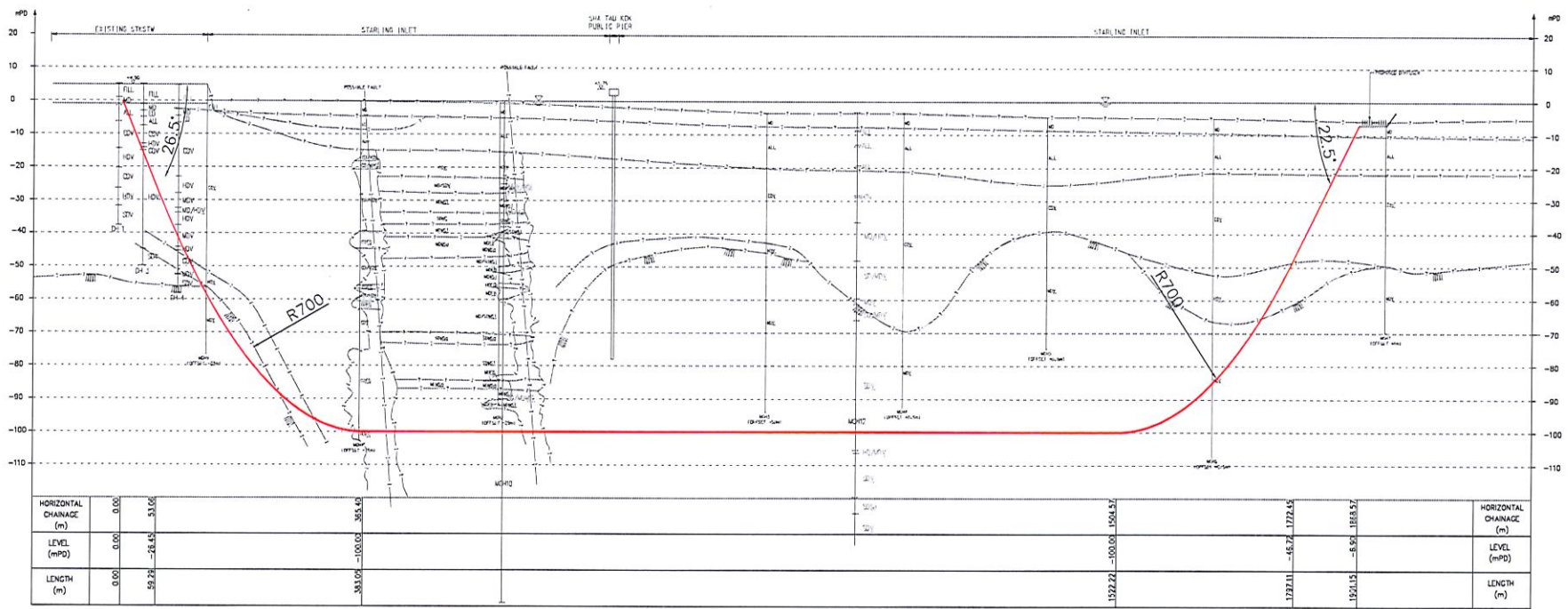


- NOTE:
- 1 The location of section shall be read with drawing no. 180579/BA/0/010.
  - 2 For section of proposed design alignment refer to drawing no. 180579/BA/50/102 and SK-R91-005-01 provided in T03.
  - 3 For section of HDD work area refer to drawing no. 180579/BA/0/101.

- LEGEND:
- - - - - INFERRED GEOLOGICAL BOUNDARY
  - /// /// INTERPRETED TOP OF BEDROCK

- GEOLOGICAL KEY:
- MD MARINE DEPOSIT
  - ED ESTUARINE DEPOSIT
  - ALL ALLUVIUM
  - CDV COMPLETELY DECOMPOSED TUFF
  - HDV HIGHLY DECOMPOSED TUFF
  - MOV MODERATELY DECOMPOSED TUFF
  - SDV SLIGHTLY DECOMPOSED TUFF
  - FC FAULT GUDGE
  - FB FAULT BRECCIA
  - MC METACONGLOMERATE
  - MSI META SILTSTONE
  - MGS META SANDSTONE

- △ SD1 AS-BUILT SITE SPECIFIC SEDIMENT SAMPLING DRILLHOLE
- ⊕ MGH1 AS-BUILT SITE SPECIFIC DRILLHOLE
- △ GB1 AS-BUILT SITE SPECIFIC SEDIMENT GRABBING



Rev.	Date	Description	Checked	Drawn

D:\17\????\????????\????\??-2.jpg

TENDER DOCUMENTS FOR  
 SUB-CONTRACT NO. 1828/6012  
 HORIZONTAL DIRECTIONAL DRILLING WORKS

C:\Users\Administrator\Desktop\17\171111.jpg

Drawing title  
 HORIZONTAL DIRECTIONAL DRILLING DESIGN PROFILE

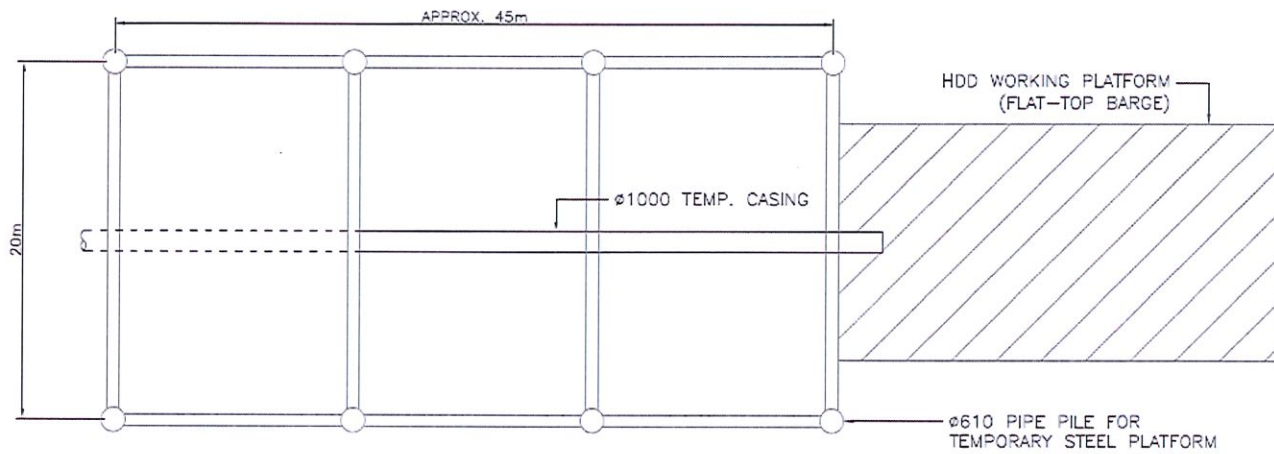
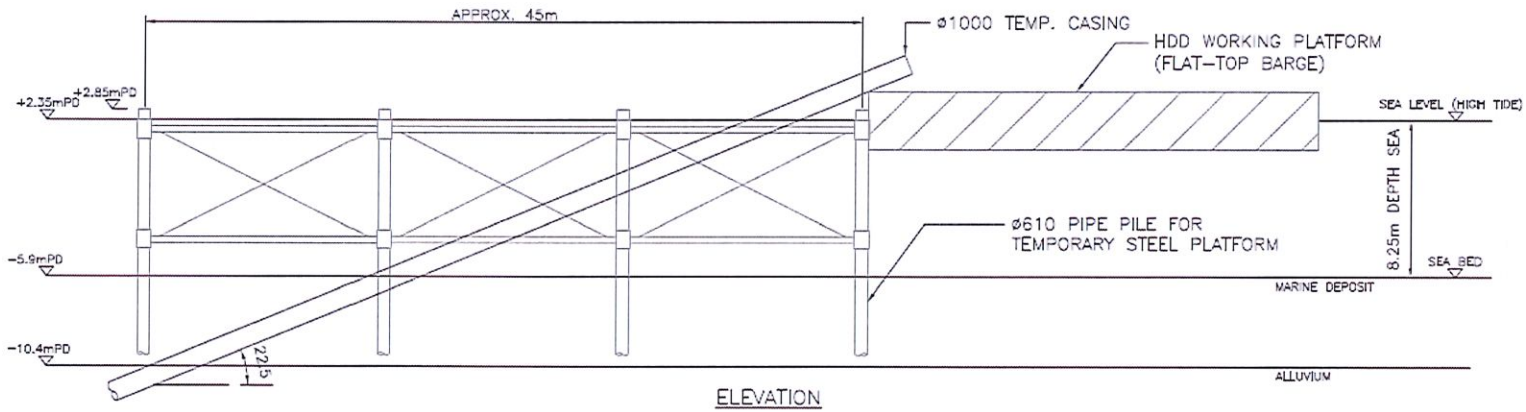
Sketch no.  
 HYID/STK0001

Revision  
 -

Scale

ISO A3 (420.00 x 297.00 MM)

## Appendix D



No.	Date	Description	Checked	Drawn

EXPANSION OF SHA TAU KOK  
SEWAGE TREATMENT WORKS  
PHASE 1 AND  
VILLAGE SEWERAGE IN TONG TO



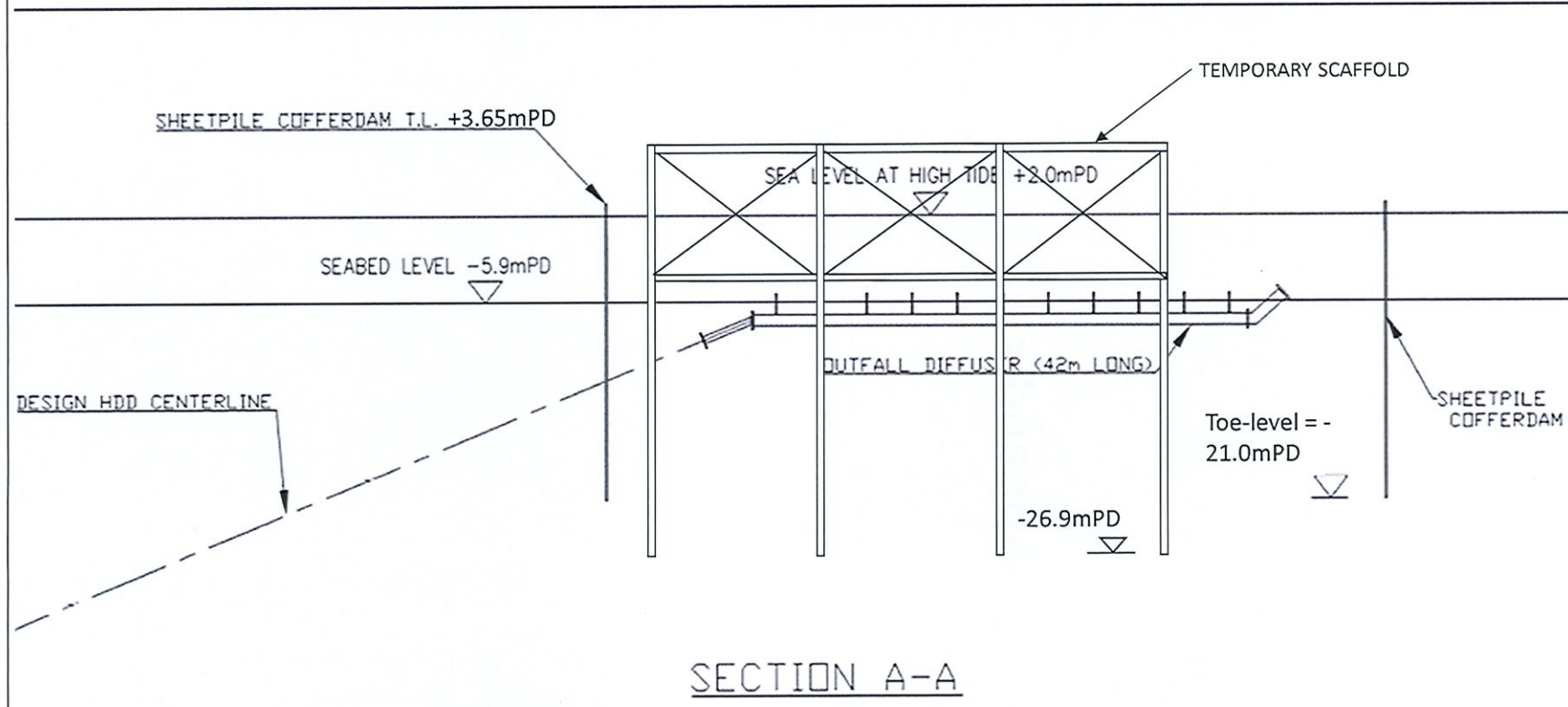
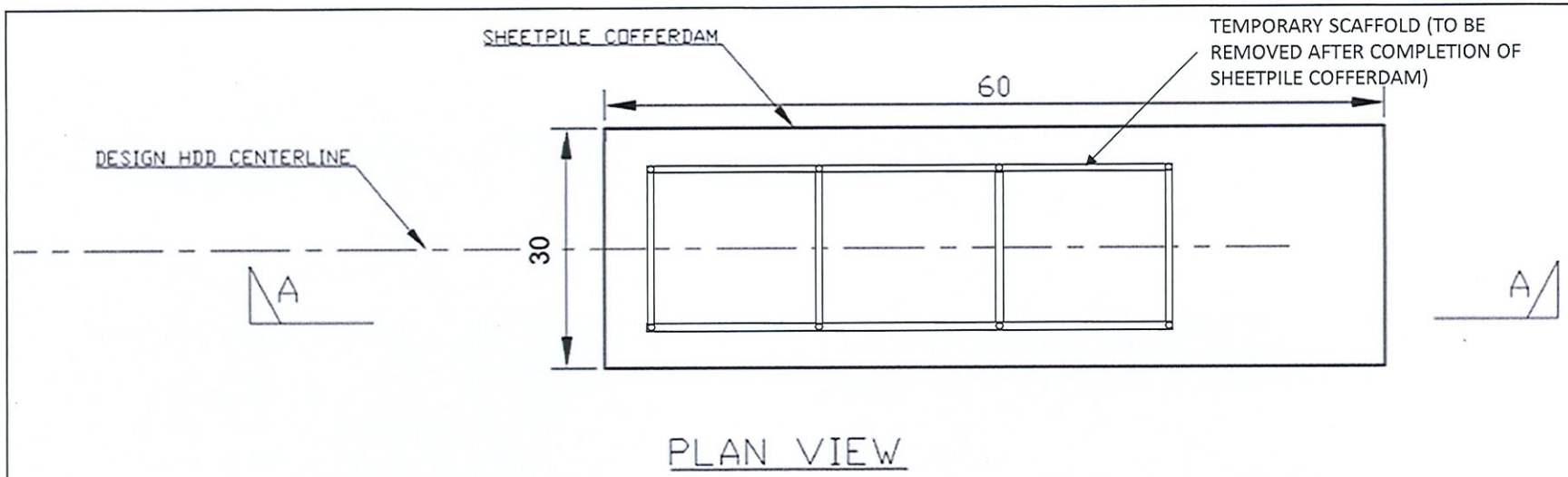
Drawing title

Design of Temporary  
Steel Scaffold at  
Diffuser Location

Sheet No.	Revision
SK-1	-

Scale  
AT 1:100 AS 1:200

100 meters AT (61120 x 81120 MM)



Note:  
 1. All dimension is stated as meters;  
 2. Design of temporary scaffold is indicated only. The design refers to SK-1.

No.	Date	Description	Checked	Drawn

EXPANSION OF SHA TAU KOK SEWAGE TREATMENT WORKS PHASE 1 AND VILLAGE SEWERAGE IN TONG TO



Design of Sheetpile Cofferdam at Diffuser Site

Sheet No.	SK-2	Revision	-
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Scale: A1 1:100 A3 1:200

150 - 1000 A1 (611.00 x 841.00 mm)

## Appendix E



Contract No. DC/2018/03  
EXPANSION OF SHA TAU KOK SEWAGE  
TREATMENT WORKS PHASE 1 AND VILLAGE  
SEWERAGE IN TONG TO

**Silt Curtain Deployment Plan**  
**for Two Directional HDD**  
**Works and Cofferdam at**  
**Diffuser Site**

Rev. B

**CONTENT**

1. INTRODUCTION.....	2
2. CONSTRUCTION PLANTS .....	4
3. SILT CURTAIN DESIGN .....	4
4. SILT CURTAIN DEPLOYMENT PLAN.....	5
5. SILT CURTAIN MAINTENANCE.....	5
6. SILT CURTAIN REMOVAL / REPOSITIONING.....	5

**APPENDIX**

Annex A	-	BKJV-SK0095 Rev.1 Silt Curtain Deployment Layout at Diffuser Location (2 Stages)
Annex B	-	Typical Section of Proposed Silt Curtain
Annex C	-	Product Catalogue of Geotextile for Silt Curtain
Annex D	-	Silt Curtain Inspection Checklist



## 1. INTRODUCTION

Contract DC/2018/03 of Expansion of Sha Tau Kok Sewage Treatment Works (STKSTW) Phase 1 and Village Sewerage in Tong To, is to increase the capacity of STKSTW to cope with the forecast increase in sewage flow.

Presently, the effluent from STKSTW is discharged via the existing 250mm diameter submarine outfall, which is inadequate to cope with the increased sewage flow in the future. Therefore, construction of a new submarine outfall with larger capacity is necessary to provide enough capacity for discharging the increased sewage flow to the sea. The discharge point of the proposed new submarine outfall (OD 560mm PE pipe) will be located in the water of Starling Inlet near Ah Kung Au. The submarine outfall will be constructed under the seabed of Starling Inlet by trench-less method, i.e., two directional horizontal directional drilling, such that the seabed will not be disturbed.

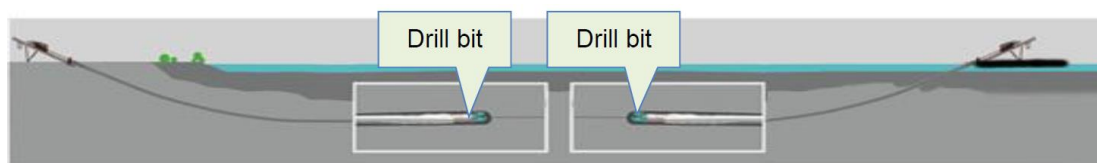


Figure 1. Diagram for two directional horizontal directional drilling

The two-directional horizontal directional drilling (HDD) is proposed to shorten the construction program and reduce the implication to the sea side. Before commencement of marine construction, silt curtain would be deployed and enclose the concerned works area to minimize the water quality impact during construction. Pipe piles would then be inserted into the seabed before erection of temporary steel scaffold. Temporary steel casing, which is circular and its diameter of 1m, would be inclined inserted into the seabed to hard rock level for drilling operation of submarine outfall construction by HDD method. The sequences of HDD construction refer to Section 3 of the method statement of submarine outfall construction by trenchless method. As the drilling operation of HDD construction is carried out inside the temporary steel casing, silt curtain would be temporarily removed to facilitate HDD construction. Upon completion of whole HDD construction, silt curtain would be reinstated at the concerned works area before commencement of removal works for temporary steel scaffold, temporary steel casing and pipe piles respectively to avoid any potential impact of water quality, fisheries and marine ecology.

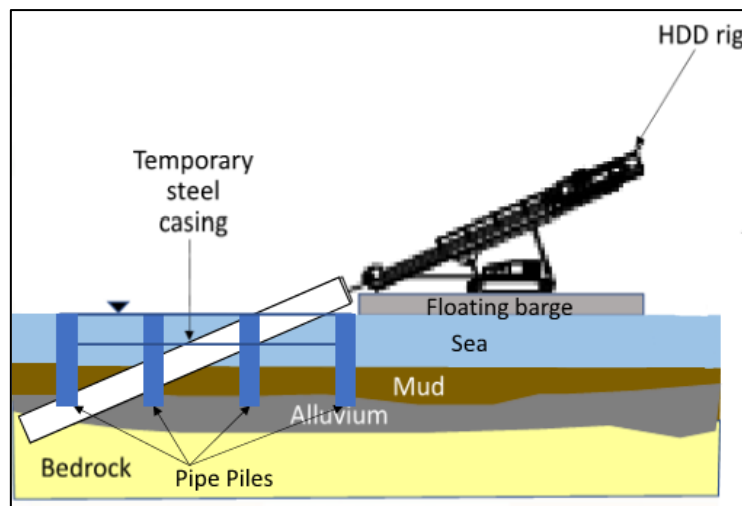


Figure 2. Typical Arrangement of Steel Casing

After the completion of the submarine outfall construction the sheetpile cofferdam would be installed to enclose the sediment removal and backfilling works. Beforehand, the silt curtain would be deployed back and enclose the concerned works area to minimize the water quality impact during cofferdam installation and removal works.

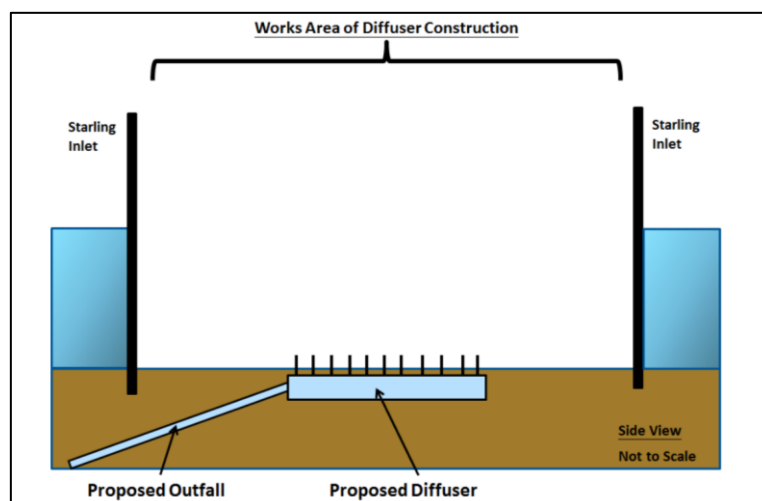


Figure 3. Typical Arrangement of Diffuser Cofferdam

This plan includes the design, operation, maintenance, regular patrol and monitoring of the silt curtain to be deployed in two stages:

Stage 1: Silt curtain should be deployed around pipe piling at the diffuser site; and

Stage 2: Silt curtain should be deployed around the sheetpile cofferdam installation / removal works.

## 2. CONSTRUCTION PLANTS

Plant and equipment to be used for the proposed silt curtain deployment include, but not limited to, the followings:

- Derrick barge
- Generator

## 3. SILT CURTAIN DESIGN

In general, floating single silt curtain will be deployed to fully enclose the works area into two stages. For stage 1, floating single silt curtain will be deployed to fully enclose the works area at sea side prior to the installation of pipe piles for erection of temporary scaffold and installation of temporary steel casing for construction of submarine outfall by trenchless method. Upon installation of temporary steel casing, silt curtain will be temporarily removed to facilitate the HDD construction. For stage 2, upon completion of HDD works, the floating single silt curtain will be deployed back once again to fully enclosed the works area of sheetpile cofferdam. The silt curtain will be temporarily removed and deployed again before the removal of the sheetpile cofferdam. The location of silt curtain is attached in **Annex A**.

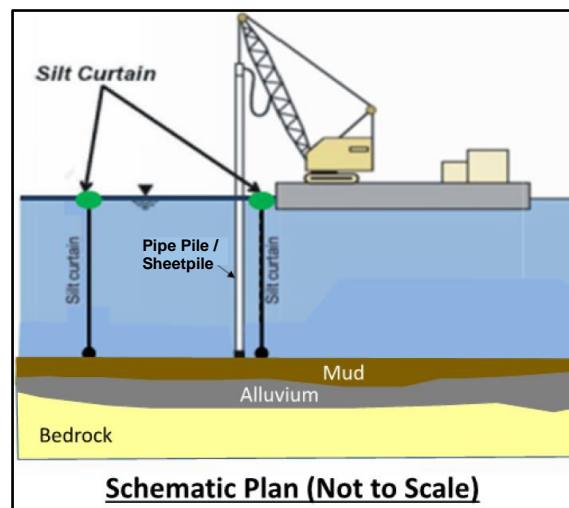


Figure 3. Typical Arrangement of Silt Curtain

The floating silt curtain will typically consist of a layer of geotextile tied on 300mm diameter buoys and extended to the seabed level secured by steel chain ballast. The buoys will be further positioned by nylon ropes tied on nearby existing structures / concrete blocks with the size of 1m x 1m x 1m and spacing of 10m, subject to the seawater current on site. Sufficient length of geotextile shall be allowed such that the silt curtain can be extended from the water surface to the seabed during high tide condition. The length of geotextile is approximate 8.25m. When low tide condition occurs, the length shall be adjusted by rolling up the geotextile to ensure it would be slightly contacted to the seabed. The typical section of the proposed silt curtain is attached in **Annex B**.

Specification of the proposed geotextile (model: GEONIA Silt Protector) for the silt curtain is attached in **Annex C**.

#### **4. SILT CURTAIN DEPLOYMENT PLAN**

- a. Link up 300mm buoys together by a net.
- b. Tie the top end of the geotextile to the buoys net and the bottom end with steel chain ballast before transportation.
- c. Transport the silt curtain to the location for fixing via a marine pontoon.
- d. Put the buoys to the water and then slowly put out the geotextile with the steel chain ballast into sea.
- e. Setup an enclosure shape of silt curtain and deploy to ensure fully enclosed the marine works area.
- f. In order to maintain the position of the silt curtain especially at location with strong current, place concrete sinkers to the seabed if required and tie the silt curtain to the sinkers with nylon strings by divers.

Silt curtain should be deployed around pipe piling and steel casing insertion as well as sheetpiling and removal works, at the diffuser site.

#### **5. SILT CURTAIN DAILY CHECKING AND MAINTENANCE**

On-board supervisors will be assigned to check the condition of the silt curtain before commencement of works every day. A visual inspection checklist will be prepared and filled in by the site supervisors. All checklists will be kept on site for record purpose. A sample of silt curtain inspection checklist is attached in **Annex D** for reference.

In addition to the visual inspection conducted by the site supervisors, dive checking by licensed diver will be arranged to check the condition of silt curtain during the deployment of silt curtain once per every three months.

For the tentative arrangement of silt curtain under adverse weather, the silt curtain will not be temporary removed during adverse weather (e.g. Red or Black Rainstorm, Typhoon Signal No.3 or above etc). However, related works will be suspended immediately if silt curtain is found any damaged. Prior to removal of silt curtain, all marine works for which the silt curtains area deployed shall be suspended and visual inspection of the water quality with the area protected by silt curtains shall be conducted to confirm no sediment plume remaining within the works area before commencing silt curtain lift-up.

Lift up the silt curtain from the water by grab dredger / derrick barge. A new piece of geotextile to the existing geotextile to cover the damage area, with sufficient overlapping length (300mm). Nearby marine works will resume after repairing of the damaged silt curtains. Sufficient spare geotextile will be kept on site for replacing of damaged silt curtains. The spare geotextile shall be kept in place to avoid direct contact with water and sunlight.

#### **6. SILT CURTAIN REMOVAL / REPOSITIONING**

After the removal of pipe piles at outfall diffuser location, floating silt curtains shall be removed by detaching the chain connecting the silt curtain to the anchors. Care should be taken to protect the silt curtain from damage as it is dragged from the water. The

remaining anchors shall be carefully lifted off the seabed for recovery onto the barge to minimize the disturbance to the seabed.

Tentatively, there will not be any plan for repositioning of silt curtain. The actions upon re-deployment will be submitted separately if necessary.

# **Annex A**

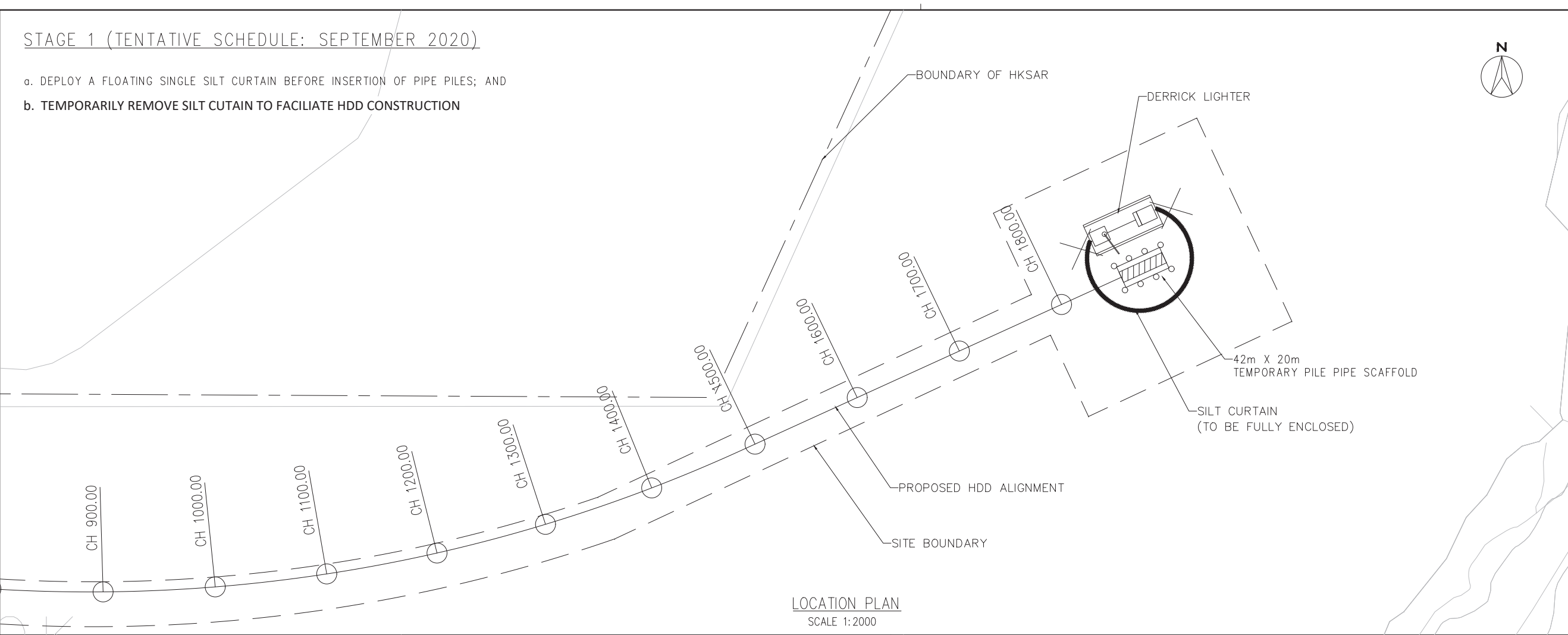
BKJV\_SU\_A3.ctb

02/06/2020

C:\Users\cm.no\Documents\Sha Tau Kok Sewage Treatment Works Phase 1 And Village Sewerage In Tong To Site Sketch\BKJV\_SK0092\_1.dwg

**STAGE 1 (TENTATIVE SCHEDULE: SEPTEMBER 2020)**

- a. DEPLOY A FLOATING SINGLE SILT CURTAIN BEFORE INSERTION OF PIPE PILES; AND
- b. TEMPORARILY REMOVE SILT CURTAIN TO FACILITATE HDD CONSTRUCTION

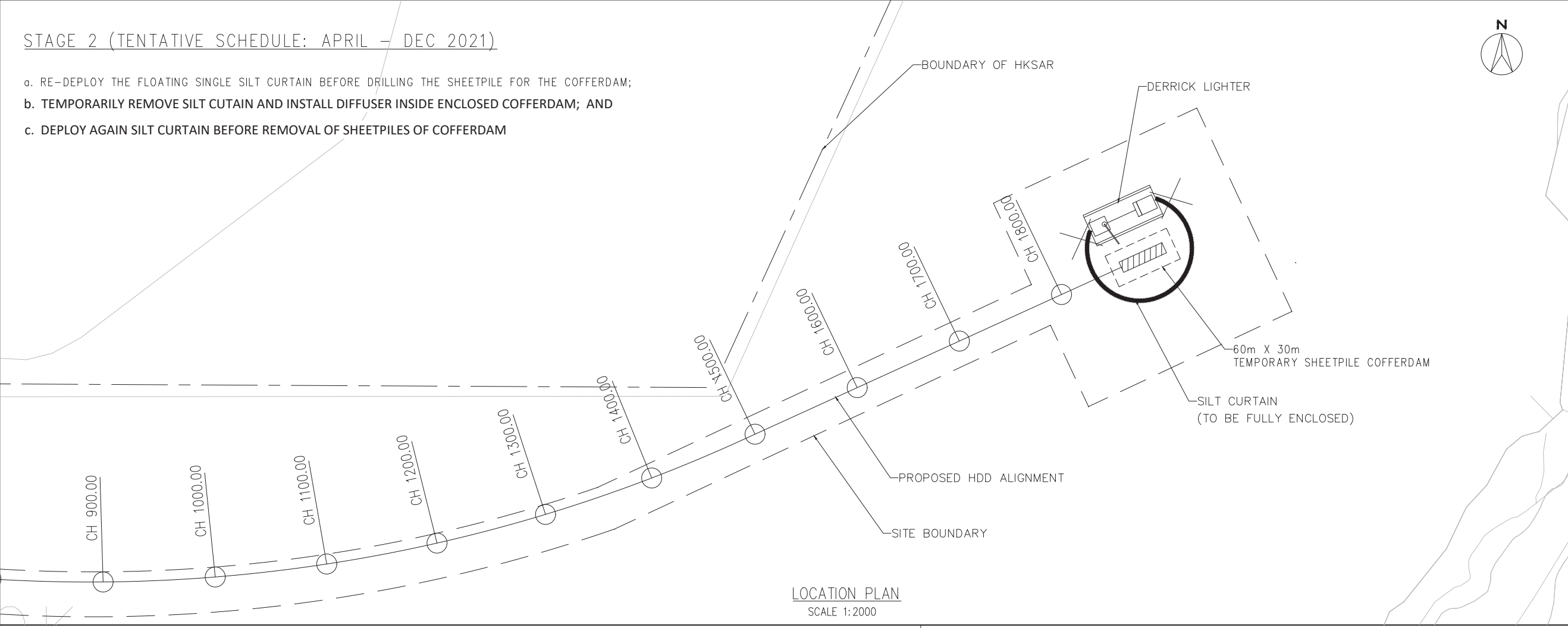


LOCATION PLAN  
SCALE 1:2000

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
  2. SILT CURTAIN SHALL BE FULLY ENCLOSED
- PROPOSED HDD ALIGNMENT
  - SILT CURTAIN
  - BOUNDARY OF HKSAR
  - SITE BOUNDARY
  - DIFFUSER LOCATION
  - TEMPORARY PILE PIPE SCAFFOLD
  - TEMPORARY SHEETPILE COFFERDAM

**STAGE 2 (TENTATIVE SCHEDULE: APRIL - DEC 2021)**

- a. RE-DEPLOY THE FLOATING SINGLE SILT CURTAIN BEFORE DRILLING THE SHEETPILE FOR THE COFFERDAM;
- b. TEMPORARILY REMOVE SILT CURTAIN AND INSTALL DIFFUSER INSIDE ENCLOSED COFFERDAM; AND
- c. DEPLOY AGAIN SILT CURTAIN BEFORE REMOVAL OF SHEETPILES OF COFFERDAM



LOCATION PLAN  
SCALE 1:2000

Rev.	Date	Description	Checked	Drawn
1	6JUN2020	ADD STAGE 1 & 2	SPN	CMH
0	7FEB2020	FIRST ISSUE	SPN	CMH

EXPANSION OF SHA TAU KOK SEWAGE TREATMENT WORKS PHASE 1 AND VILLAGE SEWERAGE IN TONG TO



Drawing title  
SILT CURTAIN DEPLOYMENT PLAN AT DIFFUSER LOCATION (2 STAGES)

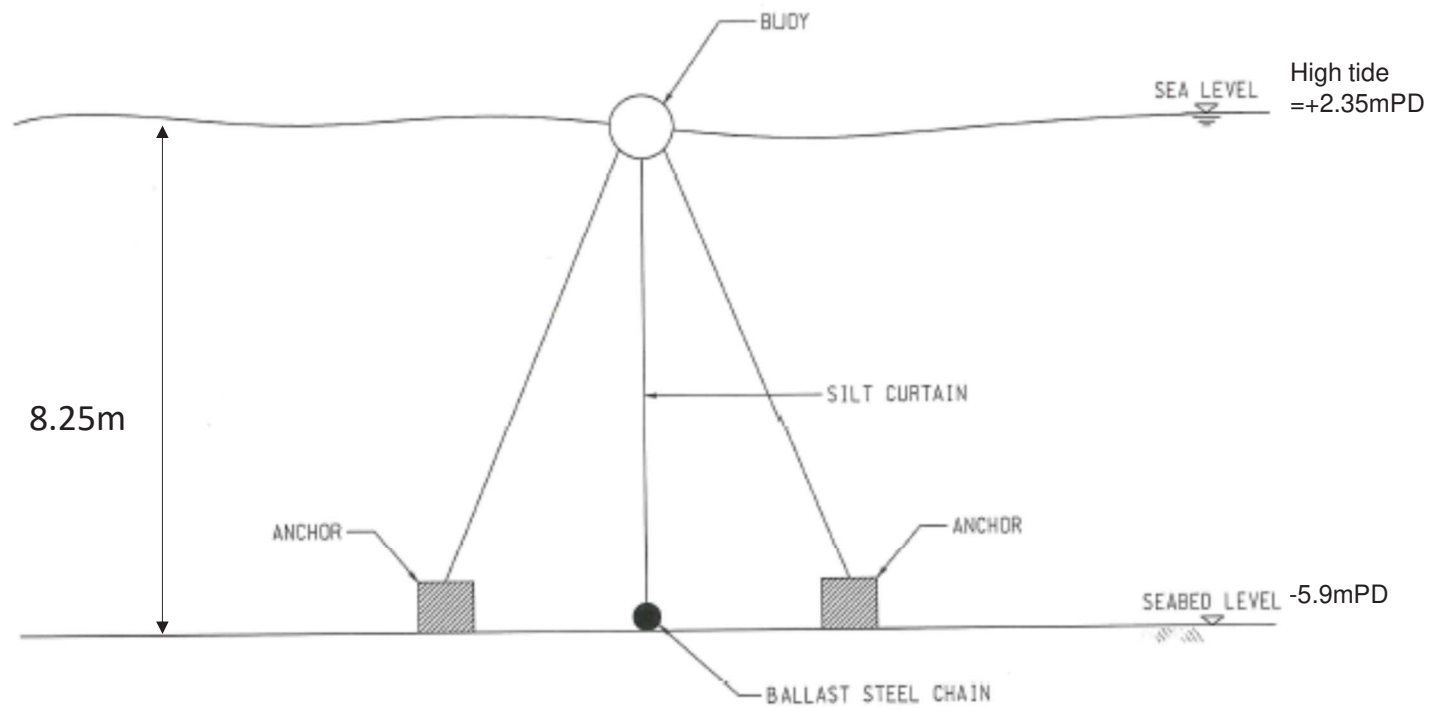
Sketch no.	Revision
BKJV/SK0092	1

Scale  
A1 1:2500 A3 1:5000

ISO A3 (420.00 x 297.00 MM)

# **Annex B**





TYPICAL DETAILS OF PROPOSED SILT CURTAIN

No.	Date	Description	Checked	Drawn

EXPANSION OF SHA TAU KOK  
SEWAGE TREATMENT WORKS  
PHASE 1 AND  
VILLAGE SEWERAGE IN TONG TO



Creating Site

Typical Details of  
Proposed Silt  
Curtain

Sheet No.	Revision
SK-1	-

Scale: A1 1:100 A3 1:200

ISO response #1 (841.00 x 594.00 mm)

# **Annex C**



**Daeyoun Geotech  
GEONIA Silt Protector**

Product Catalogue of Daeyoun Geotech GEONIA  
Silt Protector

Geonia<sup>®</sup> is a registered trademark of DAEYOUN GEOTECH.

www.DYGEOTECH.com



# GEONIA<sup>®</sup>

## Silt Protector

We develop geosynthetics, under the mission of protecting environment as well as human, and supplying highly efficient and cost-effective solutions to global clients.



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**VIETNAM SALES OFFICE (HOCHIMINH)** 41 le trung Nghia P12 Tan Binh district Hochiminh Vietnam  
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Tel.: +81-3-3507-9595 Fax: +81-3-5532-8624



Printed in June 2015

**DAEYOUN  
GEOTECH**



# SILT PROTECTOR

## PRODUCT

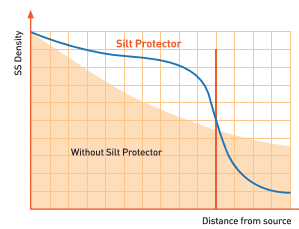
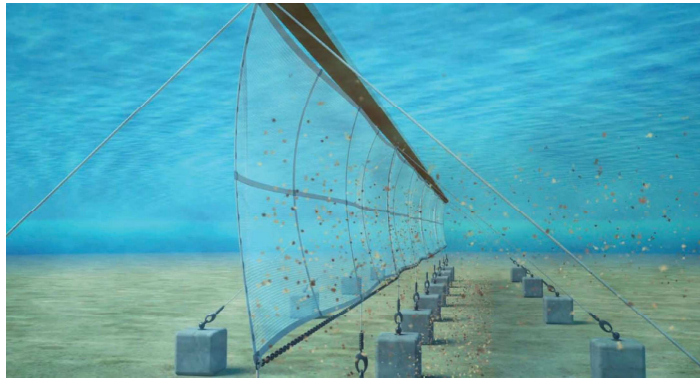
### GEONIA® Silt Protector

GEONIA® Silt Protector is a silt fence installed in water for preventing spread of environmental contaminants induced by coastal and riverside construction. Leakage of silt from marine and sewage constructions has a serious influence on marine resources and natural environment of surrounding regions.

GEONIA® Silt Protector is used to preserve the natural environment and protect marine resources. By blocking a specific water zone with a special membrane composed of high strength synthetic fiber, soil particles that occur in the area are filtered and precipitated to prevent leakage and spread of silt water.

### Application

- Protection of sea farming and swimming beach from nearby coastal construction
- Reclamation Protection
- Protection of revetment contamination
- Revetment of contaminant

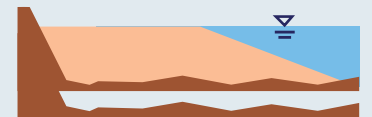


### Function

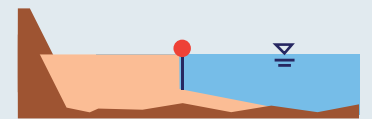
The main function of the GEONIA® Silt Protector is to enclose turbidity and to minimize the influences on outside sensitive areas. Enclosed by Silt Protector, current velocity inside is much lower than outside velocity. This means the GEONIA® Silt Protector is accelerating sedimentation of silt by reducing the flow of velocity.

- The acceleration of the settlement of silt by interference of particles – The installation of GEONIA® Silt Protector suppresses the diffusion of the pollution and make the soil particles interfere with each other to accelerate their settlement.
- The reduction of distance required to settle the silt – As shown, the installation of GEONIA® Silt Protectors narrows the settlement range, resulting in minimizing the diffusion of pollution after the unit.

### Without GEONIA® Silt Protector



### With GEONIA® Silt Protector

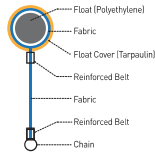
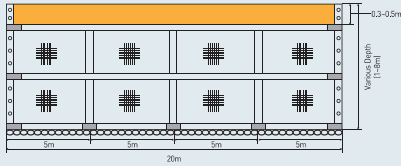


# GEONIA® SILT PROTECTOR

## TYPES

### Tube Type

High external force of tide, wave and wind.



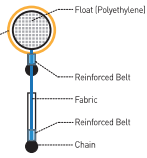
### Durable Tube Type

High external force of tide, wave and wind + long resistance from the sunlight



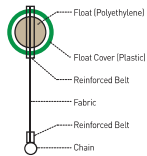
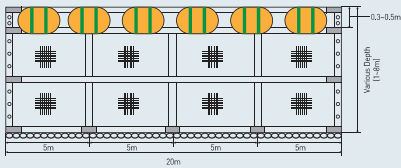
A broken PVC coated fabric in a part of the float  
A durable fabric for the float using high tenacity colored yarn

Durable Tube Type GEONIA® Silt Protector applies a durable fabric for the float device by using high tenacity colored yarn, which was improved to solve the problem of fault construction, poor visibility caused by a damaged PVC coated fabric, and marine pollution of a broken PVC coated fabric.



### Covering Head Type

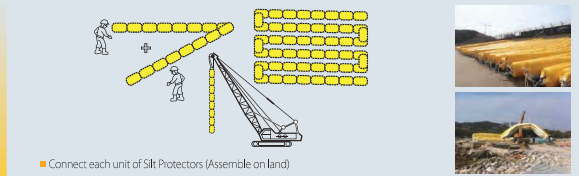
Less external force than tube type / easy to install



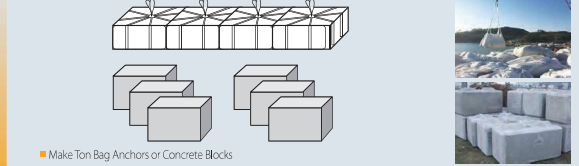
## INSTALLATION

### Installation of Tube Type GEONIA® Silt Protector

#### Assembly



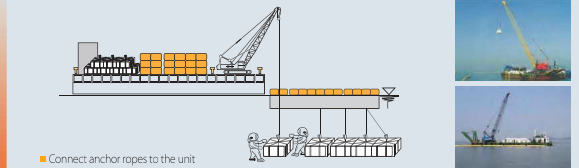
#### Production of Anchors



#### Transportation



#### Installation





**Daeyoun Geotech**  
**GEONIA Silt Protector**

Product Specification of GEONIA Silt Protector

**GEONIA® Silt Protector DSP Technical Data Sheet**
[www.egeonia.com](http://www.egeonia.com)

High Performance Silt Protector (Floating Curtain)

## DSP15 (150/150)

Mechanical Properties	Test Method	Unit	Value
<b>Physical Properties</b>			
Tensile Strength	MD ASTM D4595	kN/m	≥ 150
Tensile Strength	CD ASTM D4595	kN/m	≥ 150
Elongation	MD ASTM D4595	%	≤ 15
Elongation	CD ASTM D4595	%	≤ 15
Rate of Contraction	ISO 7771	%	± 0.2
<b>Hydraulic Properties</b>			
Water flow rate (h:50mm)	ASTM D4491	l/m <sup>2</sup> /sec (mm/sec)	≥ 1.0
Water Permittivity (h:50mm)	ASTM D4491	sec <sup>-1</sup>	≥ 0.02
Apparent Opening Size(O <sub>95</sub> )	ASTM D4751	mm	≤ 0.075

Above data sheet is our standard properties for the reference usage. DAEYOUN GEOTECH will not be responsible caused by any discrepancy with above data sheet. Please contact us if you need specified data sheet.

GEONIA® is a registered trademark of DAEYOUN GEOTECH.  
MADE IN KOREA


**DAEYOUN  
GEOTECH**

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Tel: +82-2-539-9700 Fax: +82-2-539-9710  
www.dygeotech.com E-mail: overseas@egeonia.com



## DSP METALIC PARTS METARIAL AND COATING

2014-12-24

ITEM	METARIAL	COATING
EYELET	STEEL (S20C)	PAINTING (oil based paint)
STEEL PLATE	STEEL (S20C)	GALVANIZED (50~80μm)
REINFORCED STEEL PLATE	STEEL (S20C)	HOT DIP GALVANIZE (over 80μm)
BOLT&NUT	STEEL (S20C)	GALVANIZED (50~80μm)
CHAIN	STEEL (S20C)	COAL TAR PAINTING

\* Above materials and coating methods can be changed according to manufacturer's decision.

\* Any kind of change will be noticed to buyer in advance when it occurred.



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**Daeyoun Geotech**  
**GEONIA Silt Protector**

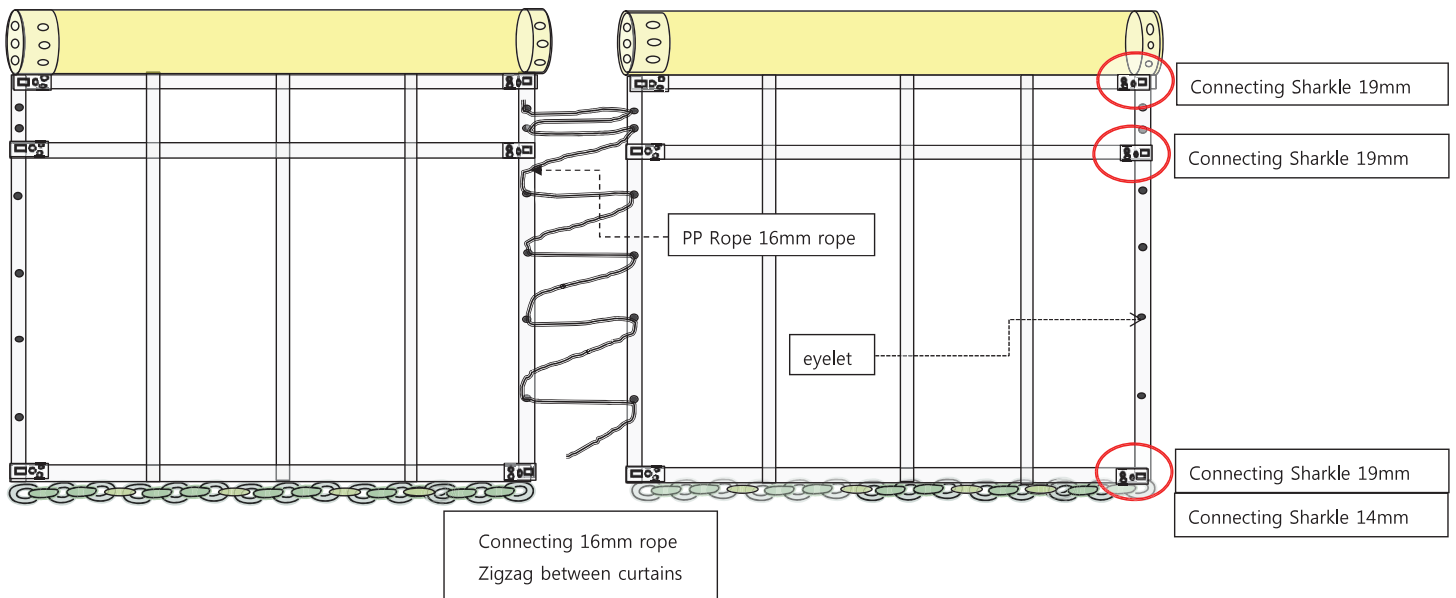
Installation, Caution & Maintenance Guideline



**Silt Protector**

**Installation**  
**Caution**  
**Maintenance**

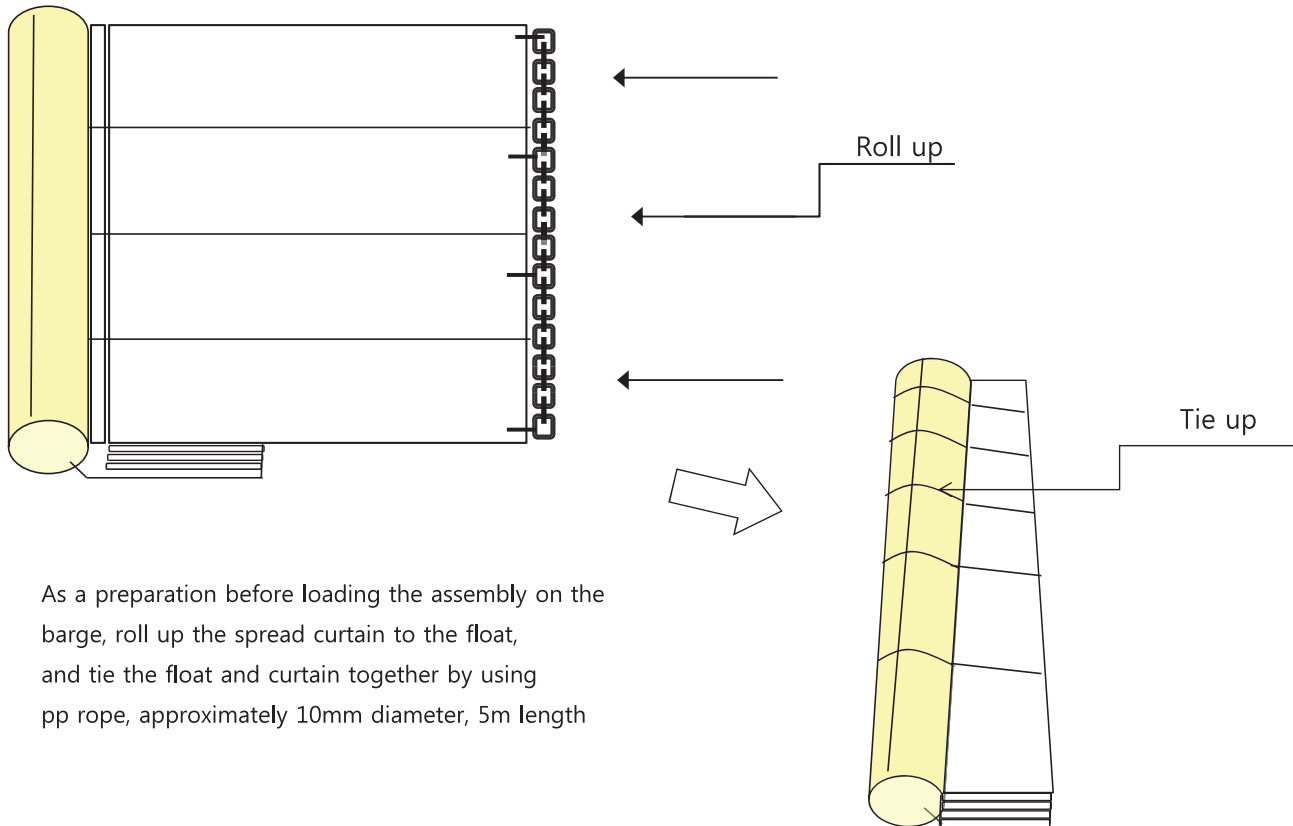
## Installation Guide (Connecting curtain and curtain)



\* Number of connections (between curtain and curtain)

	19mm shackle	No. of eyelet
2m height of curtain	3	6
3m height of curtain	4	9
4m height of curtain	4	12
5m height of curtain	5	15
6m height of curtain	5	18

## Installation Guide (Temporary tying curtains)



As a preparation before loading the assembly on the barge, roll up the spread curtain to the float, and tie the float and curtain together by using pp rope, approximately 10mm diameter, 5m length



## Caution

### Caution

Designate a person who is in charge of management of the Silt Protector.

If an environment that exceeds the design conditions is estimated, remove the Silt Protector immediately, or the unit may be damaged.

If the Silt Protector requires a repair, take necessary actions soon. If it is left without being repaired, the function of the unit may be affected adversely or the damage may expand so that it cannot be repaired.

In case the Silt Protector has been dislocated from the proper position or the layout has been deformed, restore it to original position or formation immediately. Otherwise, serious accident may be caused.

Be careful not to damage the float and curtain when removing sea shells and plants from these components.

The float is made of Styrofoam which is inflammable . Keep fire away from this component.

### Preconditions for maintenance

Check the Silt Protector periodically, and any component that have been deteriorated due to aging must be repaired or replaced with new component.

## Maintenance 1

### Maintenance

#### Daily inspection

The Silt Protector should be visually monitored by patrol during the period it is placed in the water. The patrol is performed on the boat for the purpose of preventing ships from running against the unit and of finding abnormality in earlier phase. (once per day)

**Caution:** In case the Silt Protector has a serious trouble, failure to do the daily check may cause serious trouble in addition to the loss of its normal pollution protection performance.

#### Periodic inspection

In addition to visual inspection on the boat, periodically dive to check the unit thoroughly. (Once per every three months)

**Caution:** In case the Silt Protector has been damaged, failure to do the periodical check may cause the loss of its normal pollution protection performance and a damage that cannot be repaired to occur.

#### Extra inspection

After typhoon or other abnormal weather, check the unit for the purpose of finding possible damages or troubles earlier. This check is performed basically on the boat, but dive to check the unit if necessary.

**Caution:** In case the Silt Protector has been seriously damaged, failure to do the extra check may cause the loss of its normal pollution protection performance and a damage that cannot be repaired to occur.

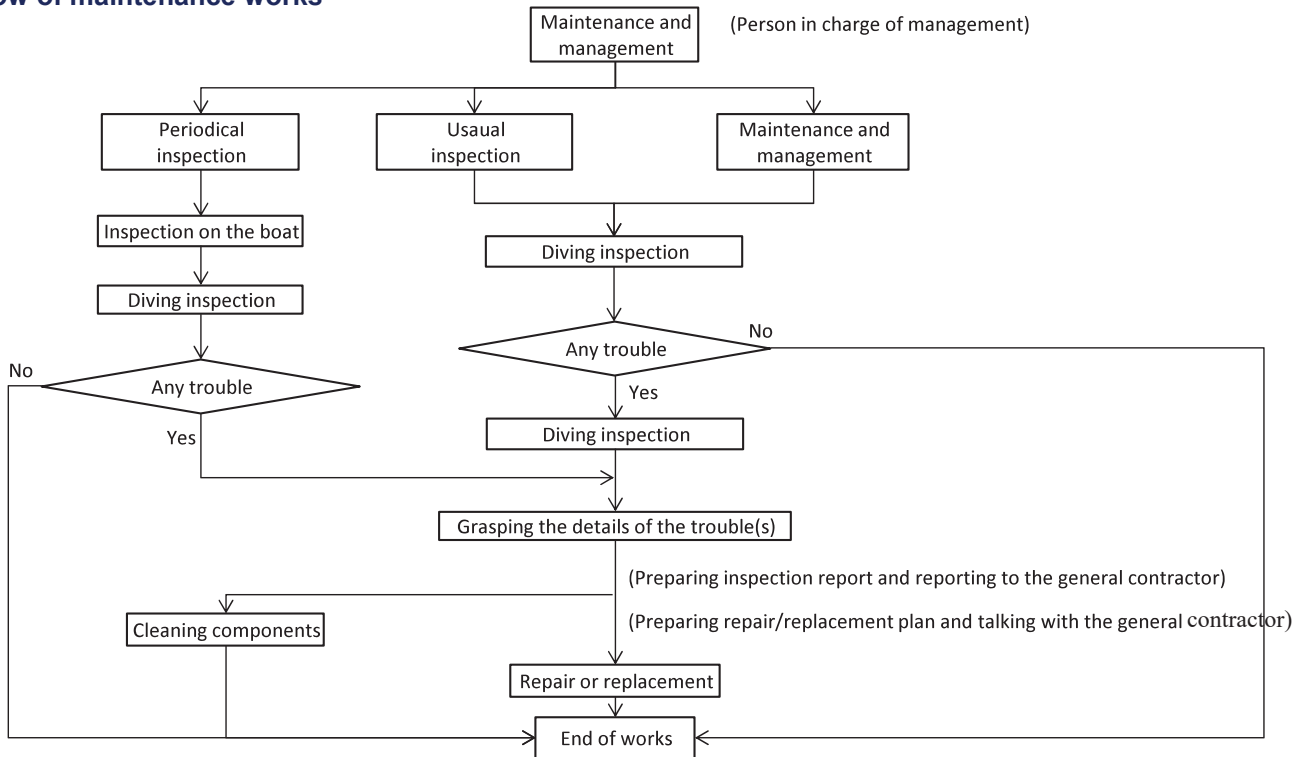
#### Sea shell removal

If it is found that the freeboard of the float is less than 1/2 of its diameter due to increase of the total weight with the growth of sea shells and plants on the float and curtain, dive to clean these components. It is recommended to monitor the change of the freeboard of the float. Check it at the periodical inspection, and record the growth of the sea organisms. (perform these works as necessary.)

**Caution:** Failure to do the cleaning may increase the weight of the Silt Protector resulting in sinking it to cause loss of the function. Be careful not to damage the Silt Protector when cleaning the unit.

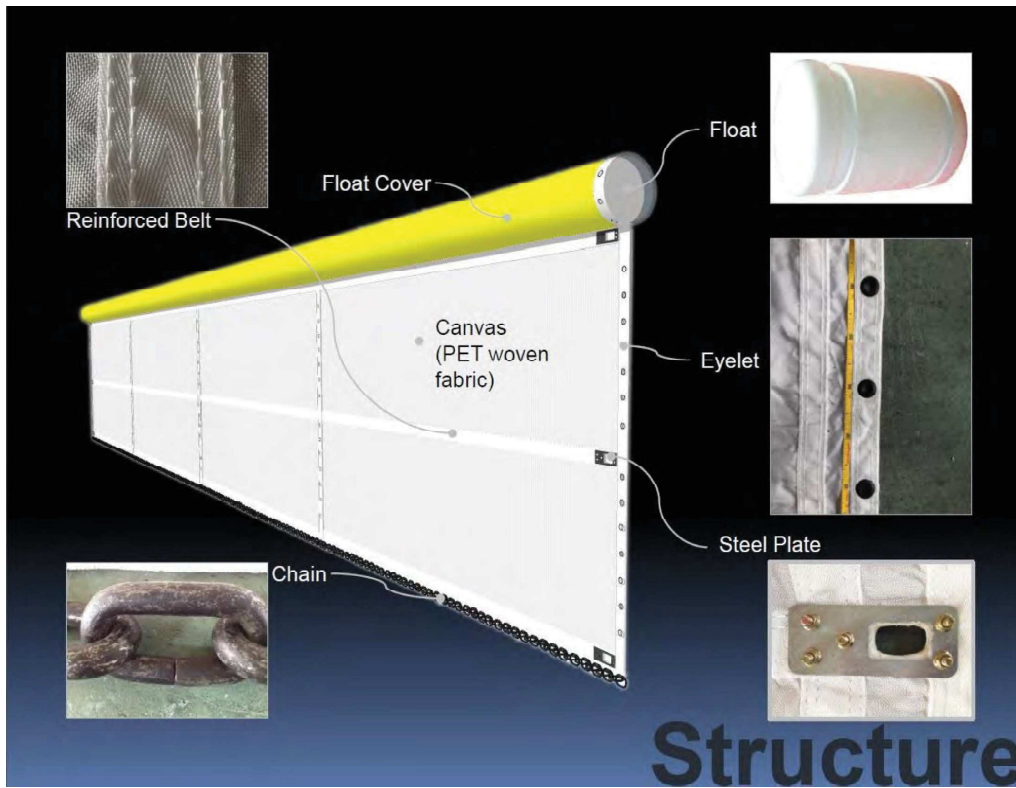
## Maintenance 2

### Flow of maintenance works





Parts



## Project list of Silt Protector

We, Daeyoun Geotech, hereby certify that the following are our main project list in **Vietnam**.

Name of Project	Contract Amount (USD)	Month/Year	Span
NSRP Project	300,000	Sep. 2013	150 spans
Lach Huyen Project	100,000	Sep. 2013	100 spans
Total	400,000	-	250 spans

We, Daeyoun Geotech, hereby certify that the following are our main project list in **Korea**.

Name of Project	Contract Amount (USD)	Month/Year	Span
Gamcheon Port (International Fish Market) Construction	160,000	Nov. 2013	267 spans
Boryeong-Taeon 2 Sector	210,000	Oct. 2013	350 spans
Heaundae Beach	432,000	May. 2013	720 spans
Dangjin Thermal Power Plant Construction	450,000	Aug. 2013	750 spans
Incheon Port International Passenger Wharf Construction	10,000	Sep. 2012	17 spans
Pusan New Port Second (2-5 Step)	10,000	Sep. 2012	17 spans
Galsa Bay Shipbuilding Industry Construction	100,000	Aug. 2012	167 spans
Mokpo South-Port Government Ships Pier Construction	50,000	Aug. 2012	83 spans
Aewol Port Step 2	10,000	Jul. 2012	17 spans
Port Mooring Facilities Construction	15,000	Mar. 2012	25 spans
Gogyunsan 3 Sector	10,000	Jan. 2012	17 spans
Gwangyang Drainage Construction	15,000	Jan. 2012	25 spans
Sinma Port Construction	25,000	Jul. 2011	42 spans
Ulsan New Port Construction	12,000	Jul. 2011	20 spans
Gwangyang Plant Expansion Construction	20,000	May. 2011	33 spans
Yeosu Oil Tank Construction	10,000	Apr. 2011	17 spans
Samcheong Green Power Construction	13,000	Feb. 2011	22 spans
Pusan Port Coast Guard Pier Construction	10,000	Feb. 2011	17 spans
Jeongoghang Aquarium Relocation	10,000	Feb. 2011	17 spans
Dangjin Thermal Power Plant Construction	15,000	Feb. 2011	25 spans
Kyungin-Ara Waterway Construction	12,000	Feb. 2011	20 spans
Seogmun 5 Sector	10,000	Jan. 2010	17 spans
Daewoo Tongyeong LNG Construction	20,000	Sep. 2009	33 spans
Total	1,629,000	-	2715 spans

## SILT PROTECTOR PROJECT LIST (OVERSEAS)

We, Daeyoun Geotech, hereby certify that the following are our main overseas project list in overseas

Name of Project	Nation	Contract (USD)	Month/Year
Pinang Island Reclamation Project	Malaysia	11,585	MAR. 2016
Tsuen Wan West Station, TW-6 Property Development	HongKong	898	AUG. 2015
Replacement and rehaulitaion of water mains at Peng Chau	HongKong	3,016	MAR. 2015
Deep vemet Mixing Trial Works	HongKong	10,186	MAR. 2015
Dual 2-lane carriageway between HZMB BCF and North Lantsu Highway	HongKong	20,306	APR. 2014
Catbi airport	VIETNAM	300,000	DEC. 2013
Congio Island development	VIETNAM	100,000	DEC. 2013
Congio Island development	VIETNAM	100,000	DEC. 2013
Pomosa Posco	VIETNAM	300,000	DEC. 2013
Hanoi~Haiphong pkg7 GS	VIETNAM	500,000	DEC. 2013
Pomosa Hathin Steel	VIETNAM	200,000	DEC. 2013
Camau Road & etc	VIETNAM	1,500,000	DEC. 2013
The Sothern Coastal Corridor-Minh Luong project	VIETNAM	730,000	DEC. 2012
Siltprotect(NSRP Project)	VIETNAM	300,000	SEP. 2013
Siltprotect(Lach Huyen Project)	VIETNAM	100,000	SEP. 2013
The Sothern Coastal Corridor-Kenh 14 Bridge	VIETNAM	100,000	NOV. 2012
Rach Gia Giang Bypass Project	VIETNAM	250,000	NOV. 2012
Hanoi-Haiphong Express Way 5 Sector	VIETNAM	500,000	AUG. 2012
Hanoi-Haiphong Express Way 4 Sector	VIETNAM	1,000,000	MAR. 2012
Hanoi-Haiphong Express Way 6 Sector	VIETNAM	520,000	MAR. 2012
Hanoi-Haiphong Express Way 2 Sector	VIETNAM	520,000	OCT. 2011
Hanoi-Haiphong Express Way 10 Sector	VIETNAM	520,000	SEP. 2011
Hanoi-Haiphong Express Way 3 Sector	VIETNAM	600,000	SEP. 2011
Hanoi-Haiphong Express Way 8 Sector	VIETNAM	600,000	SEP. 2011
Hanoi-Haiphong Express Way 7 Sector	VIETNAM	615,000	APR. 2011
Hochiminh TBO Project	VIETNAM	50,000	APR. 2011
Posco port for steel process factory in Phu My	VIETNAM	150,000	APR. 2010
National way Hochiminh~Trung Luong project	VIETNAM	200,000	FEB. 2010
Caimep Industrial Park	VIETNAM	200,000	JUN. 2010
National way No. 61B project	VIETNAM	200,000	JUN. 2010
National way No.51 project	VIETNAM	300,000	JUN. 2009
Hanoi~Hochiminh Express Way Caugie-Ninh binh project	VIETNAM	400,000	JAN. 2008
Hanoi Than Tri Bridge	VIETNAM	300,000	JAN. 2008



**Daeyoun Geotech**  
**GEONIA Silt Protector**

Project Reference



## Daeyoun Geotextile Silt Protector

Date	Project	Client	Consultant	Model	Size (W x Lm)	No. of Span
Jul-03	CV/2002/04 Penny's Bay Reclamation Stage 2	Gammon Construction Ltd	Scott Wilson Ltd		5 x 20m 5 x 10m	86 256
May-13	DC/2011/01 Drainage Maintenance and Construction in Mainland South Districts (2011-2015)	World Diamond Engineering Ltd	Drainage Services Department	GSP 15	5x20m 3x5m 3x2m 3x13m	1 10 1 4
Apr-14	HY/2012/07 Dual 2-lane carriageway between HZMB BCF and North Lantau Highway	Gammon Construction Ltd	AECOM Asia Co Ltd	DSP15	6 x 20 7 x 20 9 x 20	24 10 10
Mar-15	16/WSD/11 Replacement and rehabilitation of water mains at Peng Chau, Sunshine Island and Hei Ling Chau	Pipe Tech Ltd MIRDTEC HK Ltd	AECOM Asia Co Ltd	DSP 15 DSP 15 DSP 15	0.6 x 20 1.2 x 20 1.5 x 20	1 22 6
Mar-15	P552 Deep Cement Mixing Trial Works	Penta Ocean Construction Co	Atkins	DSP30 DSP30	8 x 20 8 x 25	2 6
Aug-15	Tsuen Wan West Station, TW-6 Property Development	Hip Hing Construction Co Ltd	Mannars Chan & Associates	DSP15	4 x 20	1
Dec-15	HK/2012/08 Wan Chai Development Phase II - Central Wan Chai Bypass at Wan Chai West	China State - Leader JV	AECOM Asia Co. Ltd	DSP30 DSP30 DSP15 DSP15 DSP15	10 x 20 5 x 10 10 x 20 9 x 20 8 x 20	6 6 5 5 5
Mar-16	Asia Pacific Gateway (APG) - Tseung Kwan O (Cape Collinson)	Maritime Mechanic Ltd	Environmental Resources Management	DSP15	14 x 12	20
Nov-16	Dredging works at Marina Cove	Fung Kau Kee Contractors Ltd		DSP15	5 x 20	2
Nov-16	HY/2012/08 Tuen Mun - Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section	Crown Asia Engineering Ltd Dragages - Bouygues JV	AECOM Asia Co. Ltd	DSP15	8 x 20 9 x 20 10 x 20	5 5 5
				Marker Buoy	Dia: 520mm	12 nos.
Dec-16	C3203 3rd Runway System Project DCM Ground Improvement Works (Package 3)	Sambo E & C Co Ltd	Airport Authority	DSP 30 Barge Type	4 x 10 2 x 10 4 x 9 1.6 x 9 2.8 x 9 1.8 x 9 2 x 9	46 2 246 4 2 2 2
Dec-16	C3204 3rd Runway System Project DCM Ground Improvement Works (Package 4)	CRBC-Sambo JV	Airport Authority	DSP30	6 x 5.3 6 x 11.3 6 x 12.3 6 x 12.8 6 x 13.8 6 x 6	2 2 20 4 4 30
Jan-17	C3201 3rd Runway System Project DCM Ground Improvement Works (Package 1)	Penta Ocean-China State- Dong Ah JV	Airport Authority	DSP 30	6 x 8	134
Feb-17	P560 Aviation Fuel Pipeline Diversion Works	Kat Yue Construction Engineering Ltd	Airport Authority	DSP15	1.5 x 20	8
Apr-17	HKHA20120023 Public rental housing, Shek Mun Estate	Hin Sum Engineering Co Ltd	Housing Authority	DSP / SG110	3 x 20	2
Jun-17	C3204 3rd Runway System Project DCM Ground Improvement Works (Package 4)	CRBC - Sambo JV	Airport Authority	DSP30	6 x 6	50
Jul-17	Refuse Boom at Tai O by World Wide Fund	G and E Co Ltd		DSP15	0.5 x 20	3
Aug-17	Lyric Theater Complex and Extended Basement Project for the WKCD Authority	Gammon Construction Ltd	AECOM Asia Co. Ltd / Mott Macdonald HK	DSP15	8 x 20	6



## G AND E COMPANY LIMITED

14/F Kiu Yin Commercial Building  
361 - 363 Lockhart Road,  
Wanchai, Hong Kong  
Tel: 852-2570 0103 Fax: 852-2570 0089  
website: www.g-and-e.com



<b>Date</b>	March 2016
<b>Project</b>	Asia Pacific Gateway (APG) - Tseung Kwan O
<b>Client</b>	China Mobile International Limited
<b>Consultant</b>	Environmental Resources Management
<b>Main Contractor</b>	Maritime Mechanic Ltd
<b>Works</b>	Fiber Optic Laying Turbidity Control
<b>Material</b>	DSP15 Silt Curtain



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website: [www.g-and-e.com](http://www.g-and-e.com)



<b>Date</b>	May 2014
<b>Project</b>	HY/2012/07 Tuen Mun - Chek Lap Kok Link- Sothern Connection Viaduct Section
<b>Client</b>	Highway Department
<b>Consultant</b>	AECOM Asia Co. Ltd
<b>Main Contractor</b>	Gammon Construction Ltd
<b>Material</b>	DSP 15 Silt Curtain
<b>Quantity</b>	6m x 20m 24 spans 7m x 20m 10 spans 9m x 20m 10 spans



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361 - 363 Lockhart Road,  
Wanchai, Hong Kong  
Tel: 852-2570 0103 Fax: 852-2570 0089  
website: www.g-and-e.com



<b>Date</b>	April 2015
<b>Project</b>	Contract No. 16/WSD/11 Replacement and rehabilitation of water mains, stage 4 phase 2
<b>Client</b>	Water Service Department
<b>Consultant</b>	AECOM Asia Company Limited
<b>Main Contractor</b>	Pipe Tech Ltd
<b>Material</b>	Daeyoun Geotech DSP 15 Silt Curtain
<b>Quantity</b>	1.2 x 20m 2 spans 1.5 x 20m 4 spans



# **Annex D**

隔泥幕檢查表  
 Silt Curtain Inspection Checklist







隔泥幕名稱： \_\_\_\_\_  
 地點： \_\_\_\_\_  
 檢查日期及時間： \_\_\_\_\_





項目	描述	情況		需要立即採取行動?*		預計修補日期	備註
		是	否	要	不要		
1.	No any floating debris / refuse within silt curtain? 隔泥幕內沒有任何垃圾?						
2.	Buoys in good condition? 浮泡情況良好?						
3.	Tying rope in good condition? 繫上的繩索情況良好?						
4.	Geotextile intact and in good condition? 土工布完整無缺?						
5.	Sinkers in good condition? 下墜物情況良好?						
6.	No any obstruction to water flow between geotextile? 土工布之間沒有任何阻礙水的流動?						
7.	Silt curtain frame in good condition? 隔泥幕鐵架狀況良好?						



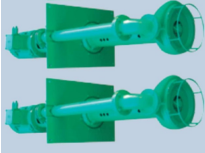
檢查人： \_\_\_\_\_  
 Build King - Kum Shing Joint Venture

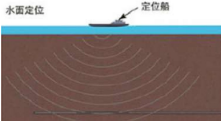


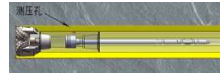
\*Note: For silt curtain with defects which need to be rectified immediately, related marine work has to be stopped until rectification work completed to the satisfaction of the Engineer.  
 \* 指引：對於已損壞的隔泥幕，需要立刻給予修補，而相關的海事工作必須停止，直到工程師認可修補工作完成。

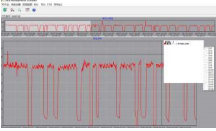





## **Appendix F**

No.	Equipment	Model/Type	Qty.	Specifications/Description	Manufacturer	Past projects on which the equipment has been used	Picture
<b>i Drill rig and control system</b>							
1	Drill rig and control system	HDD-6000ZH	1	Pull /push force: 600T Max torque: 367kNm Power: 1140kW	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
2	Drill rig and control system	HDD-2000ZH	1	Pull /push force: 200T Max torque: 285kNm Power: 315kW	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport	
<b>ii Drill pipe</b>							
1	Drill pipe	7 5/8"	420	DS-1 Standard: Premium or better Φ193.68mm×12.7mm Grade: S135 Tensile Strength: 670t Torsional Strength: 263kNm	Jiangsu Shuguang Group Zhongyuan Special Steel Co.,Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
<b>iii Reamers, drill bits and ancillary tooling, i.e. crossover subs, non-magnetic pipe, downhole motors, stabilisers, etc.</b>							
1	Forward reamer	20"	8	Carbide insert block reamer suitable for hard rock of 100MPa or more Different shapes of the Carbide inserts can be changed to deal with different terrain or formation.	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
2	Forward reamer	28"	8	Carbide insert block reamer suitable for hard rock of 100MPa or more Different shapes of the Carbide inserts can be changed to deal with different terrain or formation.	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
3	Drill bit	Tri-cone bit 12 1/4LR637G	9	Which is suitable for medium-hard formations(>100MPa) Rotary speed: 40-90rpm Weight on bit: 218-373kN	Tianjin Lilin Group	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	

4	Drill bit	Tri-cone bit 12 1/4LR317	2	Which is for soft formation Rotary speed: 45-100rpm Weight on bit: 218-404kN	Tianjin Lilin Group	Zhengzhou-Tangyin Yellow River HDD Pipeline Project HDD Crossing of Minjiang River for the 2nd Phase of Haixi Gas Pipeline Network	
5	Crossover sub	HYDS70-7 5/8REG	4	For the connection between the drill bit and other BHA	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
6	Non-magnetic drill collar	9"	2	Φ230mm Length: 9.5m, including Non-magnetic sub	Zhongyuan Special Steel Co.,Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
7	Steerable downhole motor	7LZ244×7.0-1.5 -5	2	Which is for pilot hole drilling Flow: 2270-4500L/min, Rotary speed: 68-135 rpm Pressure: 4MPa Torque: 24.0kNm	Tianjin Lilin Group	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
8	Reaming downhole motor	7LZ244×7.0--5	2	Which is for 1 <sup>st</sup> stage reaming Flow: 2270-4500L/min, Rotary speed: 68-135 rpm Pressure: 4MPa Torque: 24.0kNm	Tianjin Lilin Group	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
9	Reaming downhole motor	7LZ286×7.0-4.6	2	Which is for 2 <sup>nd</sup> stage reaming Flow: 3875-6800L/min, Rotary speed: 86-154 rpm Pressure: 3.68MPa Torque: 29.3kNm	Tianjin Lilin Group	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
10	Stabiliser	20"	2	20"	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	







<b>iv Drilling fluid pumps and mud system</b>							
1	Drilling fluid Pump	NJB-2000/10B	6	Flow rate: 2000L/min Pressure: 10MPa Power: 280kW	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
2	Mud Processor	GNMS-1500G	2	Capacity: 360m³/h Size:12.2mx2.44mx2.44m	Hebei GN Solids Control Co.,Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
3	Mud-mixing Tank	HYMMT-45	2	Mixing rate: 272m³/h Volume: 45m³ Size:12.2mx2.44 xm2.44m	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
4	Slurry storage tank	HYMST-60	2	Size:12.2mx2.44mx2.44m Volume: 60m³	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
5	Slurry pump	GN150Y250A-40A	4	Flow rate:270m³/h Lift: 30m Outlet diameter: 6 inch	Hebei GN Solids Control Co.,Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
6	Decanter centrifuge	GNLW452	1	Capacity: 57m³/h Power: 45kW	Hebei GN Solids Control Co.,Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	

v Horizontal directional drilling monitoring equipment for pilot hole survey and guidance system including the Pressure-While-Drilling(PWD) or the like device							
1	Monitoring equipment	CB-III	1	Surface wire tracking system consists of a magnetic field signal transmitting device (on land or on board), power supply, GPS and corresponding software. It can assist the positioning of HYMGS's guiding detector. The maximum positioning depth is 200m and the positioning accuracy is less than 1m.	Beijing Huayuan North Technology Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
2	Guiding System	HYMGS	2	A damping system designed specifically for hard rock is designed in the guide detector. At the same time, the signal transmission distance is not limited by the length of the wire, and the data can be transmitted normally even if the wire is partially worn.	Beijing Huayuan North Technology Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
3	Guiding System for Pilot hole intersection drilling	DJ-I	1 set	This DJ-1 Guiding System is used for guiding the drill bits to achieve a handshake for the intersection of pilot hole drillings, especially in soft terrain.	Beijing Huayuan North Technology Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport; Luoyang-Zhumadian Yellow River HDD Pipeline Project; Zhengzhou-Tangyin Yellow River HDD Pipeline Project;	
4	Pressure-While-Drilling (PWD)	HYMGS	2	The PWD is integrated in the guiding system and installed in the non-magnetic shoring together with the guiding detector. The pressure in the hole can be monitored at any time. The maximum withstand voltage of the system is 5MPa.	Beijing Huayuan North Technology Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	

<b>vi General drilling data logging equipment</b>							
1	Drilling data logging equipment	HY-DMS	2	The data management system can record the push/pull speed & force, rotary speed & force, drilling fluid flow & pressure during HDD rig operation. Other recording parameters can be customized according to user requirements. System record minimum interval 1s	Beijing Huayuan North Technology Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
<b>vii Hole grouting equipment (the mud pump NJB-2000/10B and the mud mixing tank HYMMT-45 listed below are also used as part of the drilling fluid system)</b>							
1	Mud pump	NJB-2000/10B	1	For injection of bentonite cement grout Flow rate: 2000L/min Pressure: 10MPa Power: 280kW	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
2	Mud pump	BW-320	1	For injection of Sodium metasilicate Maximum flow: 320L/min Maximum Pressure: 8MPa Power: 30kW	Hengyang zhongdi Equipment Prospecting Engineering Machinery Co.,LTD	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport HDD Crossing of Yudongxia Reservoir at Guiyang City for the Product Oil Pipeline from Guiyang city - Tongzi County	
3	Mud-mixing Tank	HYMMT-45	1	Used for bentonite cement grout Mixing rate: 272m³/h Volume: 45m³ Size:12.2mx2.44 xm2.44m	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
4	Mixing tank	HYMMT-5	1	For mixing of Sodium metasilicate Volume: 5m³ Power: 2.2kW Size:2mx2.2m x1.5m	Huayuan Heavy Machinery Co., Ltd.	P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project	
<b>viii Pull head</b>							
1	Bolt-On pull head	560mm	1	Inside the Pull head, there are two sets of sealing rings, which can prevent mud from entering the PE pipe. Endurable pulling force: Not less than 100 tons	Huayuan Heavy Machinery Co., Ltd.	HDD Crossing Works at Xiancaotan Pond, Daishan County, for the Zhoushan-Daishan-Xiaochangtu Subsea Water Conveyance Pipeline Construction Project	



Additional Specialized Plant, Equipment, Workshops, etc

<b>vi General drilling data logging equipment</b>						
1	Pipe hammer	CB-1200	1	Can speed up the installation of the casing and ensure the quality of the casing installation	Huayuan Heavy Machinery Co., Ltd.	<p>P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport HDD Crossing of Jiuzhoujiang River at Zhanjiang City for the Product Oil Pipeline from Zhanjiang city - Beihai County</p> 
3	Borehole smoothing device	HY-XKQ	1 set	After the hole is reamed, the hole is repaired by the borehole smoothing device to ensure the smooth inner wall of the hole and ensure the overall smoothness of the hole.	Huayuan Heavy Machinery Co., Ltd.	<p>P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project</p> 
3	Borehole gravity evaluation unit	HY-CKQ	2 sets	It can evaluate the quality of the borehole after reaming, and provide guarantee for the smooth return of the pipeline.	Beijing Huayuan North Technology Co., Ltd.	<p>P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project</p> 
4	Salvage male cone	Φ194	1	Salvage the drill in the borehole big end diameter of the thread: 174.8mm small end diameter of the thread: 144.8mm	Xinbeifang Petroleum Drilling Tool Co., Ltd.	<p>YACHENG13-1 Subsea Pipeline Shore Approach EPC Project HDD Crossing of Minjiang River for the 2nd Phase of Haixi Gas Pipeline Network</p> 
5	Salvage female cone	Φ194	1	Salvage the drill in the borehole big end diameter of the thread: 204mm small end diameter of the thread: 178mm	Xinbeifang Petroleum Drilling Tool Co., Ltd.	<p>YACHENG13-1 Subsea Pipeline Shore Approach EPC Project HDD Crossing of Minjiang River for the 2nd Phase of Haixi Gas Pipeline Network</p> 
6	Magnetic overshot	Φ510 Φ710	1 set	Suitable for hole retraction and gravel salvage in the reaming stage, built-in strong magnetic steel to ensure effective salvage of ferromagnetic objects Adjusting the size of the opening of the bucket body can control the size of the gravel	Huayuan Heavy Machinery Co., Ltd.	<p>P560(R)-Aviation Fuel Pipeline Diversion Works for Hong Kong International Airport YACHENG13-1 Subsea Pipeline Shore Approach EPC Project</p> 

## **Appendix G**

# Build King – Kum Shing Joint Venture

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DSD CONTRACT NO. DC/2018/03  
 EXPANSION OF SHA TAU KOK SEWAGE TREATMENT WORKS PHASE 1 AND  
 VILLAGE SEWERAGE IN TONG TO



<b>Risk Assessment</b>	<b>Prepared By :</b>	Kan Poon (Safety Officer)		Date : 27-02-2021
		Ping Ngan (Senior Site Engineer)		Date : 27-02-2021
<b>Subject :</b>	Submarine Outfall HDD Construction by HDD Method			
<b>Ref. No. :</b>	<b>Approved By :</b>	Ron Hung (Site Agent)		Date : 27-02-2021

## 1. Introduction:

- 1.1 This risk assessment is to identify the captioned work, which may contribute to an accident/incident result. Hazards mitigating controls will be identified to eliminate / reduce or safely manage the risks as appropriate. The controls will attempt to embrace the as low as reasonably practicable principle.
- 1.2 The supervisor / foreman shall be delegated with the responsibility of ensuring the overall safety and health of the entire employee, including sub-contractors on site, and the public. The supervisor / foreman also appoint appropriate qualified person to examine the related works, equipment and plant regularly. The supervisor / foreman should monitor the site safety condition in execution of workers in order to assure the operation is in compliance either the contractual or statutory requirements.

# Build King – Kum Shing Joint Venture

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### 2. Risk Assessment Methodology:

#### Hazard Ranking System

2.1	In order to quantify the hazards identified, a ranking system combining the unmitigated frequency and severity of a particular hazard was used. The ranking system is adopted from the Australia / New Zealand Standard – AS/NZS 4360: 1995 Risk Management. The purpose of this ranking system is to prioritize the hazard so that appropriate mitigation measures and actions are carried out.		
2.2	The ranking system is based on two parameters, which determine the overall risk of each hazard identified: the severity and frequency. Each of these parameters are given a ranking as follows ( 2.3 – 2.5 ):		
2.3	<b>FREQUENCY:</b> The likelihood of the event will happen.		
	<b>Ranking</b>	<b>FREQUENCY</b>	<b>Description</b>
	F1	Rare	The event may occur only in exceptional circumstances
	F2	Unlikely	The event could occur at some time
	F3	Moderate	The event should occur at some time
	F4	Likely	The event will probably occur in most circumstances
	F5	Almost Certain	The event is expected to occur in most circumstances
2.4	<b>SEVERITY:</b> The seriousness of the event when it happens.		
	<b>Ranking</b>	<b>SEVERITY</b>	<b>Description</b>
	S1	Insignificant	No injuries, low financial loss
	S2	Minor	First aid treatment, medium financial loss
	S3	Moderate	Medical treatment required, high financial loss
	S4	Major	Extensive injuries, major financial loss
	S5	Catastrophic	Death, huge financial loss

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Hazard Ranking System						
2.5	<b>Risk Ranking Matrix</b>					
	Ranking	S1	S2	S3	S4	S5
	F5 (Almost Certain)	S	S	H	H	H
	F4 (Likely)	M	S	S	H	H
	F3 (Moderate)	L	M	S	H	H
	F2 (Unlikely)	L	L	M	S	H
	F1 (Rare)	L	L	M	S	S
L --- Low Risk: manage by routine procedures (Acceptable grading)			S --- Significant Risk: senior management attention needed (Acceptable grading)			
M --- Moderate Risk: management responsibility must be specified (Acceptable grading)			H --- High Risk: detailed research / review and management planning required at senior levels (Unacceptable grading and improvement measures are req'd)			

3. Work Sequence:				
Item	Activities	Affected person(s)	Associated Risk Items	Remark
3.1	General work	Workers/Foreman / Site Supervisor/ Engineer/ Operator/ Banksman/ Rigger	5.1, 5.2	
3.2	Lifting Operation on Marine	Workers/Foreman / Site Supervisor/ Engineer/Crane Operator/ Banksman/ Rigger	5.3	
3.3	Welding	Workers/Foreman / Site Supervisor/ Engineer	5.4	
3.4	Working on Marine	Skilled Workers/ Foreman / Site Supervisor	5.5	
3.5	Stacking and De-stacking of Large Tubes	Skilled Workers/ Foreman / Site Supervisor/Crane Operator/ Banksman/ Rigger	5.6	
3.6	Pilot Drill & Reaming	Skilled Workers/ Foreman / Site Supervisor/Crane Operator/ Banksman/ Rigger	5.7	
3.7	Butt-Fusion Jointing	Skilled Workers/ Foreman / Site Supervisor/Crane Operator/ Banksman/ Rigger	5.8	
3.8	Product Pipe Pulling	Workers/ Foreman / Site Supervisor	5.9	

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## 4. Plant and Equipment

Item	Plant and Equipment	Operator certification	Statutory certification	Associated Risk Items	Remark
4.1	Lifting Operation	Yes	Form 1,3,4	5.3	
4.2	Welding Machine	NA	NA	5.4	
4.3	Horizontal Directional Drill	Authorized person	NA	5.7	
4.4	Singla Pressure Butt Fusion Welding Machine	Experienced person	NA	5.8	

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5. Risk Assessment												
Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom	
				F	S	R/R		F	S	R/R		
5.1.1	General – Working on Site Area	Slipping or Tripping or Slipping on steps or staircase	<ol style="list-style-type: none"> <li>Workers shall always wear proper PPE while working on the slope.</li> <li>Stick poking of grass and bush.</li> <li>Workers shall always wear safety harness with adequate provision of lifeline for their securely connection.</li> <li>Workers shall always wear non-slippery safety shoes while working on the slope.</li> </ol>	2	2	L	<ol style="list-style-type: none"> <li>Provide proper tool box talk to workers.</li> <li>Shallow slopes are only allowed for working.</li> <li>Fall prevention measures should be provided while working in steep slopes.</li> <li>Provide proper safety access and egress for workmen to adopt.</li> </ol>	1	2	L	Workers/Foreman / Site Supervisor/ Engineer	
5.1.2		Head injury caused by falling objects	<ol style="list-style-type: none"> <li>All tools should be securely fixed</li> <li>All personnel should wear safety helmets with Y-strap and safety boots</li> <li>Provide suitable vessel for place the tools</li> <li>The tools / materials should be handled with care</li> <li>Work area should be fenced off</li> </ol>	1	2	L	Hand String should be provided for hand tools	1	2	L	Workers/Foreman / Site Supervisor/ Engineer	
5.1.3		Special smell cause illness	<ol style="list-style-type: none"> <li>Ensure the air ventilation is sufficient</li> <li>Open all window, door, etc.</li> <li>Stop works and leave work area for rest immediately if worker feels sickness and consult the medical treatment if necessary</li> </ol>	1	2	L	Take a rest or consult medical treatment immediately if worker suffers from sickness	1	2	L	Workers/Foreman / Site Supervisor/ Engineer	
5.1.4		Bad Weather (Rainstorm, Thunderstorm, etc.)	<ol style="list-style-type: none"> <li>Nil as working area is inside the existing pumping station and will not be affected by weather condition</li> <li>The appointed safety supervisor</li> </ol>	1	1	L		1	1	L	Worker/Foreman/SS/ Engineer/Stand By Person	

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VILLAGE SEWERAGE IN TONG TO



### 5. Risk Assessment

Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom
				F	S	R/R		F	S	R/R	
			should monitor and assess the adverse impact caused by the weather condition								
5.1.5		Heat Stroke	1. Physical check and require worker to report their health status before working when' very hot weather warning is hoisted; 2. Avoid workers work under direct sunshine during hot time or provide shelter to prevent direct sunshine. 3. Provided adequate drinking water 4. Provide shelter for workers to take break	3	3	S	1. Worker to wear loose and light color clothing 2. Arrangement of rest time let works to take break after reasonable interval of working	2	2	L	Worker/Foreman/SS/ Engineer/
5.1.6		Injury by Hand Tools	1. Cover the sharp edge of hand tools properly 2. Maintain the hand tools in good condition 3. Wear protective gloves	4	2	S	Wear Protective gloves	2	2	L	Workers/Foreman / Site Supervisor/ Engineer/
5.1.7		Mosquito bites	1. Wear light long sleeves clothes and trousers. 2. Use mosquito-repellent 3. Reduce the standing period	5	2	S	1. Wear light long sleeved clothes 2. Use Mosquito repellent	3	2	M	Workers/Foreman / Site Supervisor/ Engineer/
5.1.8		Fall of person	1. Fence off the floor opening with barriers. 2. Wear safety harness with yard connected to secure anchor point.	1	4	S	Provide working platform with proper guardrail for working over 2 meters.	1	3	M	Worker/Foreman/SS/ Engineer/Stand By Person



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5. Risk Assessment												
Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom	
				F	S	R/R		F	S	R/R		
5.2.1	Manual Handling	Hand Injury	<ol style="list-style-type: none"> <li>All sharp edges should be removed before work carried out;</li> <li>Use suitable and adequate protective gloves when work is carried out.</li> </ol>	3	3	S	<ol style="list-style-type: none"> <li>Provide proper Tool Box Talk training</li> </ol>	1	3	M	Workers/Foreman / Site Supervisor/ Engineer/	
5.2.2		Low back injury, muscular strain, twist during manual handling equipment.	<ol style="list-style-type: none"> <li>Workers should have slight exercise before works.</li> <li>Arrange sufficient manpower with adequate physical strength.</li> <li>Using correct method for manual handling the equipment.</li> <li>Maintain the access path free from obstruction &amp; tripping hazard.</li> <li>Give instruction &amp; monitor the correct posture to the workmen.</li> <li>Maintain good communication via walkie talkie or mobile phone.</li> <li>Wear safety shoes to avoid falling objects hitting against the foot, slipping floor and kicking hazard.</li> <li>Workers wear non-slippery safety shoes prior to work.</li> </ol>	2	3	M	<ol style="list-style-type: none"> <li>Provide manual handling training for the related workers.</li> <li>Close supervision by foreman and engineer for manual handling.</li> <li>Regular inspection to workmen should be conducted.</li> <li>Arrange workmen to take regular short rest.</li> <li>Workers should adopt proper posture during manual handling / lifting.</li> </ol>	1	2	L	Safety personnel /Engineer. /Foreman	
5.3	Lifting Operation on Marine	- Collapse of crane - Falling objects - Failure of lifting gears	<ol style="list-style-type: none"> <li>Inspect all lifting gears prior to use.</li> <li>Check if the lifting gear were appropriate for the works.</li> <li>Check weight of load to be lifted against allowable SWL.</li> <li>Fence-off the working / storage area when handling / storing removed unit.</li> <li>The lifting operator must have valid training certificate.</li> </ol>	3	4	H	<ol style="list-style-type: none"> <li>Ensure loading and unloading works free from obstacles /obstructions.</li> <li>Banksman shall be provided to give signal/instruction to operator.</li> <li>Ensure loads are tied down securely before transportation</li> <li>Stay clear of load and crane</li> </ol>	2	3	M	- Engineer - Foreman - Safety Supervisor - Workers - Plant Operator -Banksman	

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5. Risk Assessment											
Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom (once a week)
				F	S	R/R		F	S	R/R	
			6. The lifting appliance (LA) and lifting gear (LG) must be certified by registered professional engineer before use and must possess valid certificate (Form 1 3, 4 and 5 for lifting appliance, and Form 6 and 7 for lifting gear, for Labour Depart). 7. If the LA and LG are used on marine work, they must possess valid certificate of Form 2, 3 and 4 for LA and Form 5,6 for LG. 8. Part 1, 2 and 3 of Form 1 in the Register of LALG specified by Marine Department shall be examined and signed by competent person at least once for every year. 9. Periodic inspection in part 3 and 4 of Form 1 of Register shall be examined and signed by competent person at least once for every 3 months. 10. If wire has broken in such rope, it shall be inspected once at least in every month.				5. Lift to low height whenever possible. 6. The distance of the lifting hole of the member to the edge shall be checked by Engineer to prevent falling of the member.				
5.4.1	Electric arc welding	Electric Hazard	1. Only licensed person should be allowed to carry out arc-welding work. 2. Permit to work system, e.g Hot work permit. 3. Live parts of welding equipment must be provided with appropriate	3	4	H	1. Electric cables should be properly hanged up. 2. Transformer should be equipped with voltage regulator to step down the voltage. 3. Regular inspection should be conducted.	2	3	M	Workers/Skilled Workers/ Foreman / Site Supervisor

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Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom (once a week)
				F	S	R/R		F	S	R/R	
			insulation. 4. Welding equipment shall be connected to the earth. 5. Do not operate in a wet environment. 6. Welding equipment shall be checked by registered electrical worker.				4. Visual inspection should be performed prior to adopt. 5. Specific training should be delivered to the workmen.				
5.4.2		Eye injury by strong light.	1. Full face shield and with suitable protective glass should be used by the welder.	3	3	S	Erect protective screen to fence of the strong light affecting others.	2	2	L	Workers/Skilled Workers/ Foreman / Site Supervisor
5.5.1	Working on marine	- Drown Tripping	1. All persons on vessel must possess a valid Shipboard Cargo Handling Basic Safety Training Course (Blue Card). 2. Proper lifejacket shall be worn all the time. 3. Do not over extent any part of body from the vessel. 4. Do not walk, stand up and change seats on the boat during operating. 5. Do not overload the loading limit of the speed boat. 6. Provision of rope and lifebuoy. 7. The function of all lifejackets shall be checked before use. Access should be free from obstruction.	3	4	H	1. Provision of tool box talk. 2. Monitor the passengers keep wearing lifejacket all the time. 3. Banksman would be provided to monitor condition of works. 4. Maintain good housekeeping.	3	3	S	Workers/Skilled Workers/ Foreman / Site Supervisor

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Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom (once a week)	
				F	S	R/R		F	S	R/R		
5.5.2		Falling into water	<ol style="list-style-type: none"> <li>All workers hold the certificate of shipboard cargo handling basic safety training course issued by authorized organization before working on the sea deck.</li> <li>Safety access should be provided for embarking or disembarking Prohibit working outside of guardrail.</li> </ol>	2	3	M	<ol style="list-style-type: none"> <li>Workers shall wear safety life jacket during whole operations.</li> <li>Provide rescue equipment including life buoys with at least 30 meters long of buoyant ropes along sea sides and stretcher.</li> <li>Wear safety harness and hook on anchorage point during working at weight.</li> </ol>	1	3	M	Workers/Skilled Workers/ Foreman / Site Supervisor	
5.5.3		Missing of workers after daily work	<ol style="list-style-type: none"> <li>Implement “Blue Card System” for workers on barges:-</li> <li>A watch man for controlling person on board a marine vessel or working over/nearby water;</li> <li>Workers must give the Blue Card to the watch man for recording;</li> <li>While completion of work, workers must take the Blue Card from the watch man;</li> <li>The watch man must check the PPE such as life jacket while receiving the blue card.</li> </ol>	3	4	H	<ol style="list-style-type: none"> <li>Workers shall wear safety life jacket during whole operations.</li> <li>Provide rescue equipment including life buoys with at least 30 meters long of buoyant ropes along sea sides and stretcher.</li> </ol>	2	3	M	Workers/Skilled Workers/ Foreman / Site Supervisor	
5.5.4		Fall on same level due to slip/trip	<ol style="list-style-type: none"> <li>The floor should be maintained in a clean condition. Mud and any spillage of oil, fuel oil, grease and etc must be immediately cleaned up.</li> <li>Do not leave tools on the floor, or in any location where they can easily dislodge.</li> </ol>	2	2	M	<ol style="list-style-type: none"> <li>Provide and maintain proper drainage and means of sewage disposal on deck.</li> <li>Provide proper storage such as toolboxes or containers for tools and equipment.</li> </ol>	1	1	L	<ul style="list-style-type: none"> <li>- Foreman</li> <li>- Safety officer</li> <li>- Safety supervisor</li> <li>- Workers</li> <li>- Plant operator</li> </ul>	

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## 5. Risk Assessment

Item	CAUSE / INITIAL EVENT	Hazards and Consequence	Existing Mitigating Controls	Risk Ranking			Additional Mitigating Controls Required	(A.L.A.R.P.) Risk Ranking			By Whom (once a week)
				F	S	R/R		F	S	R/R	
5.6	Collapse of material stockpiles when stacking or de-stacking of material	Falling object	<ol style="list-style-type: none"> <li>Material should not be stacked over 2 meters.</li> <li>Round pipes or tubes shall be stacked with wedge or chocks against rolling.</li> <li>If any, the tiers of round objects should be rested on battens or planks against moving with wedges secured to the battens or planks.</li> <li>When de-stacking of materials, it should be taken down tier by tier.</li> </ol>	3	3	S	<ol style="list-style-type: none"> <li>All stacking must be rested on level ground and kept away from falling edges.</li> <li>All vehicular reverse movement adjacent to stackings must be directed by a banksman.</li> <li>Avoid walking on round pipes</li> </ol>	2	3	M	<ul style="list-style-type: none"> <li>- Foreman</li> <li>- Safety officer</li> <li>- Safety supervisor</li> <li>- Workers</li> <li>- Plant operator</li> </ul>
5.7	Pilot Drill & Reaming  Handling of Drilling Rods	-Finger injury  -Noise	<ol style="list-style-type: none"> <li>Only trained personnel shall be allowed to handle the connection of drill rods</li> <li>Guarding should be installed at the rotating parts</li> </ol>	4	3	S	<ol style="list-style-type: none"> <li>Provision of induction training and use of suitable of PPE</li> <li>Wear ear plug or protector with Waitaki for communication.</li> </ol>	3	2	M	Skilled Foreman / Workers/ Site Supervisor
5.8	Butt-Fusion Jointing	- Hands scald  - Pinch injury  -Electric hazard	<ol style="list-style-type: none"> <li>Fence off the working area</li> <li>Maintain well ventilation to the workplace</li> <li>The operator should be well trained before use the butt fusion jointing machine</li> <li>The electrical equipment shall be checked and registered by Electrician</li> </ol>	2	3	M	<ol style="list-style-type: none"> <li>Suitable gloves should be used to operate the machine</li> <li>All electrical wire shall be hung up.</li> </ol>	2	2	L	Skilled Foreman / Workers/ Site Supervisor
5.9	Product pipe pulling	- Trip or clip	<ol style="list-style-type: none"> <li>Keep access or workplace tidy, non-slippery and without obstruction.</li> <li>Proper stacking of materials and equipment.</li> </ol>	3	2	M	<ol style="list-style-type: none"> <li>Provide adequate lighting at access or workplace.</li> </ol>	2	2	L	Workers/ Foreman / Site Supervisor

# Appendix H

Contract No. DC/2018/03  
 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To  
 Construction Programme (Rev.9)

Updated on :

29/11/2021

Activity	Calendar Duration (Day)	Period		2020												2021												2022										
		Start	Finish	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov						
<i>Activity 2: Submarine Outfall (HDD Works)</i>																																						
2.1 Casing Installation (Land)	20	20-Jul-2020	8-Aug-2020	█	█	█	█	█	█																													
2.2 Pilot Hole Drilling (Land)	114	10-Aug-2020	1-Dec-2020	█	█	█	█	█	█	█																												
2.3 Reaming (Land)	190	22-Sep-2020	30-Mar-2021		█	█	█	█	█	█	█	█	█	█	█																							
2.4 Casing Installation (Sea)	45	20-Jan-2021	6-Mar-2021							█	█	█	█																									
2.5 Pilot Hole Drilling (Sea)	32	7-Mar-2021	8-Apr-2021								█	█	█	█																								
2.6 Reaming (Sea)	301	9-Apr-2021	4-Feb-2022									█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█		
2.7 Pipe Connection & Pulling	24	5-Feb-2022	1-Mar-2022																																			
2.8 Cleaning & Testing	7	2-Mar-2022	9-Mar-2022																																			
2.9 Demobilization	14	10-Mar-2022	24-Mar-2022																																			
<i>Activity 3: Cofferdam Construction &amp; Diffuser Installation</i>																																						
3.1 Preparation & Mobilization of Working Barge	14	25-Mar-2022	8-Apr-2022																																			
3.2 Construction of cofferdam at the location of diffuser and Removal of DN814 steel casing	84	9-Apr-2022	2-Jul-2022																																			
3.3 Dredging Works for diffuser and Removal of dummy HDPE pipe	28	3-Jul-2022	31-Jul-2022																																			
3.4 Hydrographic Survey of Diffuser Formation Profile and Approval	7	1-Aug-2022	8-Aug-2022																																			
3.5 Backfilling Works (up to Invert of Diffuser)	21	9-Aug-2022	30-Aug-2022																																			
3.6 Installation of Diffuser	10	31-Aug-2022	10-Sep-2022																																			
3.7 Backfilling Works (up to Existing Seabed Level) and Installation of Protective Cap	21	11-Sep-2022	2-Oct-2022																																			
4. Removal of Cofferdam	30	3-Oct-2022	2-Nov-2022																																			

Notes:-  
 1. Red narrow represents critical path.  
 2. The programme is based on the subcontractor's latest programme and latest accepted Contractor's programme.

# Appendix I



## Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam

Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

### Implementation Schedule

(Environmental Permit (EP) No. EP-517/2017/A Condition 2.11 – Method Statement for Construction of Submarine Outfall)

The Permit Holder and any person constructing and operating the Project shall fully implement all mitigation measures in this Plan. Key measures are included in the Implementation Schedule (IS) below for focusing on key issues and easier checking. However, all measures in this Plan, whether included in the IS or not, shall be fully carried out.

Expected Impact	Recommended Mitigation Measures (What Measures)	Objective of the Measures (What Requirements)	Who to Implement / Maintain the Measures? (Who)	Location of the Measures (Where)	When to Implement the Measures? (When)	Reference to paragraph(s) in this Method Statement
Water quality impact during construction of submarine outfall	<p><b>Construction by trenchless method</b></p> <p>The submarine outfall in Starling Inlet shall be constructed by trenchless method such as Horizontal Directional Drilling or equivalent such that seabed (except at the diffuser location) will not be disturbed.</p>	N/A	The <i>Contractor</i> of the Contract and HDD Specialist	Along the alignment of submarine outfall in Sha Tau Kok Hoi	Aug 2020 – Jun 2021	Section 3.1 to Section 3.9
Water quality impact during sediment dredging	<p><b>Water-tight Cofferdam and Single Floating Silt Curtain</b></p> <p>Sheetpiling cofferdam with interlocking (about 15m depth below seabed level) shall be adopted for the excavation of sediment to ensure no sediment release from the cofferdam. In addition, the floating single silt curtain would also be installed during the dredging operation.</p>	<p>.EIA S5.9.2</p> <p>Seawater to be continuously drained out from the cofferdam, such that water level difference between inside and outside cofferdam would be maintained. The hydraulic difference could further ensure no flow of sediment to water body outside the cofferdam.</p>	The <i>Contractor</i> of the Contract and Subcontractors	At the end of alignment of submarine outfall in Sha Tau Kok Hoi	Jun 2021 to Dec 2021	Section 3.10
Water quality impact during installation of temporary scaffolding,	<p><b>Deployment of silt curtain shall be carefully planned and implemented</b></p>	Environmental Review Report – Change of Horizontal Directional Drilling Method S4.11	The <i>Contractor</i> of the Contract	At the end of alignment of submarine	Before Installation of Temporary Scaffold and	

## Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam

Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

steel casing and diffuser cofferdam	To deploy the silt curtain in accordance with the Silt Curtain Deployment Plan.	Silt curtain should be deployed around pipe piling and pipe pile removal works at the diffuser site	and Subcontractors	outfall in Sha Tau Kok Hoi	Temporary Steel Casing: Nov 2020 & Before Installation of Diffuser Cofferdam: Jun 2021	
	<p><b>Operation and Maintenance of Silt Curtain</b></p> <p>Before operation of silt curtain, a Silt Curtain Daily Inspection (SCDI) Checklist was prepared. The specific location of the silt curtains deployed, inspection date &amp; time and the conditions of such silt curtain shall be provided in the Checklist for auditing.</p>	<p>1. Daily visual inspection by Site Supervisor</p> <p>2. Dive checking by licensed diver</p>	The <i>Contractor</i> of the Contract and Subcontractor	At the end of alignment of submarine outfall in Sha Tau Kok Hoi	<p>During Installation of Pipe piles, Temporary Scaffold and Steel Casing: Nov 2020 – Jan 2021 &amp; During Installation of Diffuser Cofferdam: Jun 2021 – Sep 2021 &amp; During Removal of Diffuser Cofferdam Dec 2021 – Feb 2022</p>	
Water quality impact during removal of temporary scaffolding and diffuser cofferdam	<p><b>Removal of Silt Curtain</b></p> <p>Prior to removal of silt curtains, all marine works for which the silt curtains are deployed shall be stopped and visual inspection of the water quality within the area protected by silt curtains shall be conducted.</p>	N/A	The <i>Contractor</i> of the Contract and Subcontractor	At the end of alignment of submarine outfall in Sha Tau Kok Hoi	<p>Completion of Temporary Scaffold and Temporary Steel Casing: Jan 2021 &amp; Completion of Installation of Diffuser Cofferdam Sep 2021 &amp;</p>	

## Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam

Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

					Completion of Removal of Diffuser Cofferdam Feb 2022	
	<p><b>Standard Measures and Good Site Practices</b></p> <ul style="list-style-type: none"> <li>All vessels should be well maintained and inspected before use to limit any potential discharges to the marine</li> <li>All vessels must have a clean ballast system;</li> <li>No discharge of sewage/grey wastewater should be allowed. Wastewater from potentially contaminated area on working vessels should be minimized and collected. These kinds of wastewater should be brought back to port and discharged at appropriate collection and treatment system; and</li> <li>No soil waster is allowed to be disposed overboard</li> </ul>	<p>EIA S5.9.3</p> <p>ETWB TCW No. 34/2002: Dumping at Sea Ordinance (DASO)</p> <p>Wastewater Treatment System shall be setup during marine dredging</p>	<p>The <i>Contractor</i> of the Contract and Subcontractor</p>	<p>At the end of alignment of submarine outfall in Sha Tau Kok Hoi</p>	<p>Aug 2020 – Feb 2022</p>	<p>Section 7 of Method Statement</p> <p>ETWB TCW No. 34/2002: Dumping at Sea Ordinance (DASO)</p>
<p>Water quality impact during insertion or removal of pipe piles, steel casing, temporary scaffold installation and cofferdam construction</p>	<p><b>Measures on Insertion or Removal of Pipe Piles, Steel Casing, Temporary Scaffold Installation and Cofferdam Construction</b></p> <ul style="list-style-type: none"> <li>Pipe piles, steel casing installation, temporary scaffold installation and cofferdam</li> </ul>	<p>Environmental Review Report – Change of Horizontal Directional Drilling Method S4.11</p> <ul style="list-style-type: none"> <li>Daily working period for pipe pile insertion or removal should not be greater than 12 hours.</li> <li>Insertion or removal of each pipe pile should</li> </ul>	<p>The <i>Contractor</i> of the Contract and Subcontractor</p>	<p>At the end of alignment of submarine outfall in Sha Tau Kok Hoi</p>	<p>During Installation of Pipe piles, Temporary Scaffold and Steel Casing: Nov 2020 – Jan 2021 &amp; During Installation of Diffuser Cofferdam: Jun 2021 – Sep 2021</p>	<p>Section 7 of Method Statement</p>

**Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam**

Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

	<p>construction should not be carried out concurrently.</p> <ul style="list-style-type: none"> <li>• Removal of pipe piles, steel casing, temporary scaffold installation and cofferdam should not be carried out concurrently.</li> <li>• Only 1 pipe pile should be installed or removed at any given time and no more than four pipe pile should be installed or removed within a day.</li> <li>• Only one steel casing should be installed or removed at any given time;</li> <li>• Diameter of pipe pile should not be greater than 0.61m.</li> <li>• Diameter of steel casing should not be greater than 1m and its thickness should be greater than 25mm.</li> <li>• Control rate of sediment loss</li> </ul>	<p>not be faster than 3 hours.</p> <ul style="list-style-type: none"> <li>• Rate of insertion or removal of the first 5.2m of the steel casing should be not faster than 1 hour per meter</li> </ul>			<p>&amp; During Removal of Diffuser Cofferdam Dec 2021 – Feb 2022</p>	
Water quality impact due to Drilling Fluid	<p><b>Handling of Drilling Fluid</b></p> <ul style="list-style-type: none"> <li>• Provision of a steel confined container underneath the opening of steel casing.</li> <li>• During the drilling process, the drilling fluid including the drilled materials would be transferred through or fully enclosed with</li> </ul>	<p>Environmental Review Report – Change of Horizontal Directional Drilling Method S4.9</p> <p>No marine spillage would be expected during the removal of the steel casing and transfer to the steel casing to the barge.</p>	The Contractor of the Contract and Subcontractor	Along alignment of submarine outfall in Sha Tau Kok Hoi	Nov 2020 – June 2021	Section 7 of Method Statement

**Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam**

Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

	<p>the steel casing and isolated from the seawater. The final effluent requiring disposal would be confined in the container on the barge and transported to the landside and handled at the landside work site.</p> <ul style="list-style-type: none"> <li>• After the HDD works including the pipeline installation area completed, all the drilled mud and rock debris would have been cleansed out of the drilled hole by the drilling fluids.</li> <li>• Before the removal of the steel casing, any residual drilling fluids would be pumped out of the steel casing to well below the seabed level</li> </ul>					
<p>Water quality impact during diffuser cofferdam</p>	<p><b>Measures During Diffuser Cofferdam</b></p> <ul style="list-style-type: none"> <li>• Control rate of sediment loss by interlock sealant applying along the interlock area of sheet pile</li> <li>• Continuously drain the seawater from the cofferdam to prevent overflow or release of sediment outside the cofferdam during dredging operation.</li> </ul>	<p>N/A</p>	<p>The <i>Contractor</i> of the Contract and Subcontractor</p>	<p>At the proposed diffuser site</p>	<p>June 2021 to Jan 2022</p>	<p>Section 7 of Method Statement</p>

## Method Statement for Construction of Submarine Outfall and Diffuser Cofferdam

Contract No. DC/2018/03 Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

	<ul style="list-style-type: none"> <li>The drained seawater would be treated.</li> <li>Silt curtain will be deployed to surround the cofferdam during sheetpiling works dredging/filling operation.</li> </ul>					
Marine Water Quality Monitoring	<p><b>Marine Water Quality Monitoring (WQM)</b></p> <p>WQM at selected WSRs would be conducted during the marine works including temporary scaffold installation, temporary casing installation, installation, maintenance and removal of sheetpile and sediment removal works.</p>	<p>EIA S5.12.1</p> <p>Three times a week at the selected WSRs by Environmental Team</p>	The <i>Contractor</i> of the Contract and Subcontractor	Along alignment of submarine outfall in Sha Tau Kok Hoi	<p>During Installation of Temporary Scaffold and Temporary Steel Casing: Nov 2020 – Jan 2021 &amp; During Installation of Diffuser Cofferdam: Jun 2021 – Sep 2021 &amp; During Removal of Diffuser Cofferdam Jan 2022 – Feb 2022</p>	Figure 5.1 and Table 5.3 of EM&A Manual
Water quality impact for dredging disposal	<p><b>Marine Dumping</b></p> <p>Dredging of marine sediment by closed grab and delivery to the designated dumping location at South Cheung Chau Open Sea Sediment Disposal Area.</p>	<p>EIA S6.6.20</p> <p>ETWB TCW No.34/2002 Dumping at Sea Ordinance</p>	The <i>Contractor</i> of the Contract and Subcontractor	At the proposed diffuser site	At the end of alignment of submarine outfall in Sha Tau Kok Hoi	ETWB TCW No.34/2002

## **Appendix J**



# HYPER SEAL DPS-500

## ONE COMPONENT PU SEALANT FOR SHEET PILES

### Description

DPS-500 is hydrophilic polyurethane waterstop of liquid for sheet pile interlocks.

### Use

Because of its high expansion coefficient (5 times) and its quick expansion in the presence of moisture, DPS-500 is ideally suited for use as a water-stop on sheet piles.

### Installation

Clean dirt and debris from the interlock area of the pile DPS-500 is poured into the interlock area of sheet pile to a depth of 5mm. The sheet piles can be driven after a curing time of approximately 24 hrs.

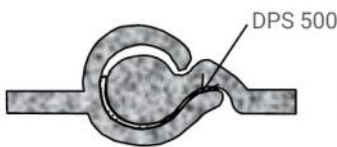
Treated sheet-piles should be protected from moisture before they are driven. If long term storage is anticipated it would be best to invert the sheet pile and cover to protect from moisture.

After approximately 24 hrs of curing time the sheet piles can be driven. The DPS-500 will cure enough on the surface in that time to hold it in place. The driving procedure will break the cured surface and allow the DPS-500 to fill the voids in the interlock area. Contact with moisture will cause expansion and form a complete waterstop.

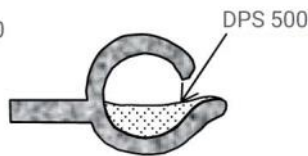
### Installation Description

#### INDIVIDUAL SHEET (Z type sheet pile)

#### MIDDLE JOINT

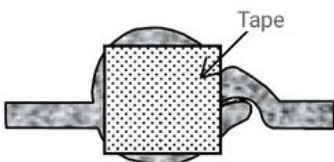


#### SIDE

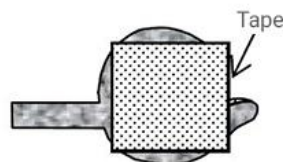


Place a piece of tape over each end of the interlock to prevent the DPS-500 from flowing out of the interlock. Fill the middle joint with DPS-500. If the material overflows it will not be a problem. The side joint should be filled to a depth of approximately 5mm.

#### MIDDLE JOINT



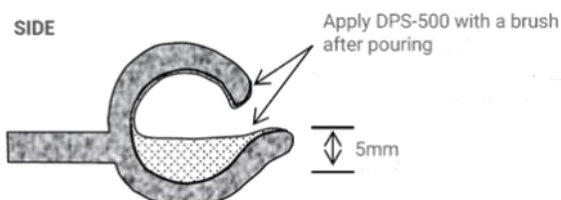
#### SIDE



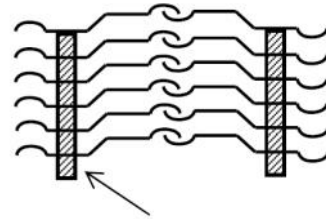
#### TAPE ON EACH END

Brushing the DPS-500 to the sides of the interlock area after pouring the DPS-500 to a depth of 5mm is recommended as shown,

#### SIDE



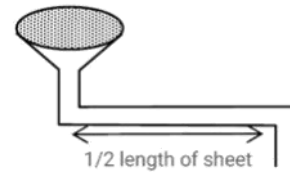
Place blocks between each sheet to allow access for the application of DPS-500 if the DPS-500 is to be applied when the sheet piles are in a stacked position.



wooden block between sheet

If the sheet files are in a stacked configuration, Use the following application procedure to fill the middle joint. Stack the sheet piles as level as possible. Fill the middle joint on the top sheet pile from the sides and measure the amount of DPS-500 and the time necessary to fill the joint. The DPS-500 will level itself into the interlock area. With the amount and time measurement it is possible to fill the remaining sheet piles without the ability to visually check the result.

To fill the middle joint on sheet piles that is stacked. Use a funnel with pipe attached as shown to reach in below the top set of sheet piles.

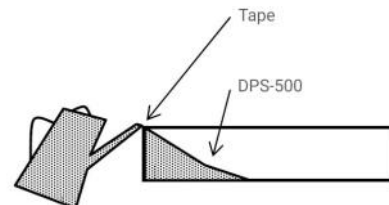


1/2 length of sheet

An ordinary steel or copper pipe can be used if the above apparatus is not available. The primary purpose is to place the DPS-500 near the center of the sheet pile and allow the DPS-500 to flow to each side. If may be necessary to fill from both ends or from the center.

The method of filling the center joint id dependant on how the sheet piles are

#### SIDE VIEW OF MIDDLE JOINT SECTION



### Information

Contact with water will induce cured DPS-500 to expand five times by volume and effectively prevent water intrusion in the interlock areas of sheet piles. In it's cured state DPS-500 can withstand a hydrostatic head of approximately 50m. It adheres well to the sheet pile and does not tear off during the driving process.

DPS-500 cures into a rubber like state. It does not contain any toxic solvents and is safe to handle. The performance of DPS-500 will not







# HYPER SEAL DPS-500

## ONE COMPONENT PU SEALANT FOR SHEET PILES

degrade under continuous water contact. It is a flame-resistant, environmentally safe product. Heat build up during the driving process will not affect the DPS-500.

Cured DPS-500 can be removed from the sheet piles by applying water to the retrieved sheet piles. Apply water to the interlock area and peel the DPS-500 from the interlock.

DPS-500 performs in aggressive ground water substances and has good resistance to a number of chemical contaminants. Some chemical in higher concentrations may affect the performance of DPS-500.

### Properties of DPS-500

Appearance	Light-Yellow transference liquid
Viscosity	5,000±2,000cPS at 25°C
Solid Content (%)	85±2%
Solvent Composition	Xylene

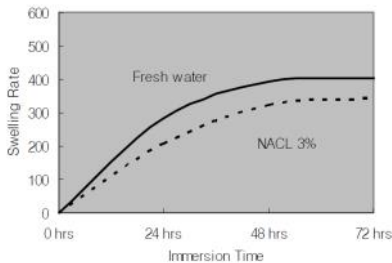
### Properties of DPS-500

Appearance	Semi transference and soft film
Physical Properties	Tensile Strength(kgf/cm <sup>2</sup> ): over 10 Elongation(%): over 450%
Curing Time	Inner 24hrs(RT, 75%RH)
Swelling Rate	Over 400%(2 days in water at RT)

### Handling & Storage

Hyper Seal DPS-500 can be stored for 6 months at below 25°C. Please avoid exposure to humidity or temperature above 50°C for long time. Please avoid contamination of water or alcohol. The product is very sensitive to air, therefore you must use all the product after open the container. Packing: 20kg pail can

### Expansion Graph



Cleaning the interlock part of sheet pile with brush or air blow



Attach a piece tape over each end of the interlock to prevent the DPS-500 from out of the interlock.



The piles may be driven after the DPS-500 has fully cured or after the DPS-500 has cured to at least "Gel" state. Curing time is approximately 24 hrs.



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**Project references of plastic sealant applying the interlock area of sheet piles**

Project: Bascule Highway Cofferdam  
Location: Adelaide, Australia  
Description: Cofferdam for the construction of bridge piers



Completely dry excavation was able to be carried out due to grouted clutches



The plastic sealant application allowed the construction to be carried out unobstructed and in the dry condition

Project: One Cofferdam Project in Singapore  
Location: Singapore



The plastic sealant application allowed the dewatering purpose inside the cofferdam

Project: 13/WSD/17 Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant in Hong Kong  
Location: Hong Kong





The plastic sealant application allowed the dewatering purpose inside the cofferdam



# WADIT

The Proven Sheet Pile Interlock Sealant

**WADIT**

**The Proven Sheet Pile Interlock Sealant**





# WADIT = Watertight

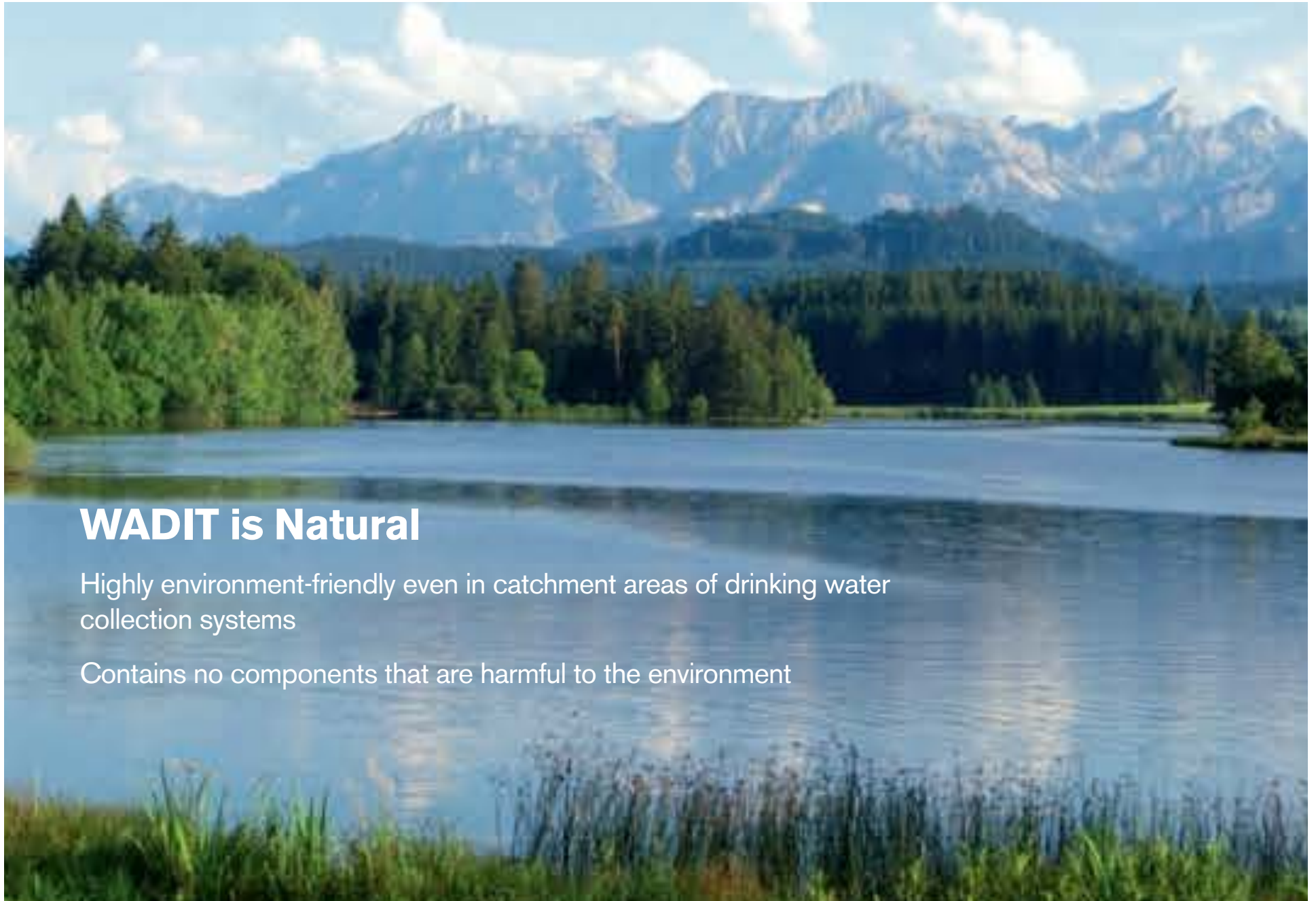


WADIT® is a steel sheet pile interlock sealant based on sustainable natural raw materials which provides a reliable water seal for sheet pile walls.

Its load capacity is huge, but WADIT® still has extremely green credentials. It is a sealant which can be applied when hot and has been used successfully throughout the world for more than 10 years.

WADIT® has proved to be stable and produces outstanding results even in extreme climatic conditions such as in the tropics or the Arctic





## **WADIT is Natural**

Highly environment-friendly even in catchment areas of drinking water collection systems

Contains no components that are harmful to the environment

# Flexibility



Conventional materials start to become brittle as temperatures fall to 50°F or less - work in ground water (40 - 46°F) can be a problem

WADIT® remains perfectly flexible even below 20°F

it does not become brittle



## WADIT - Works in extreme heat



Safe and effective at water pressure levels up to 5 bar or 130 ft

Stable and non-deforming in temperatures of up to 125°F

WADIT® can be used for high pressure sealing requirements with long pile lengths and extreme temperature ranges



# Less Friction



WADIT® creates a film of lubricant in the interlocks

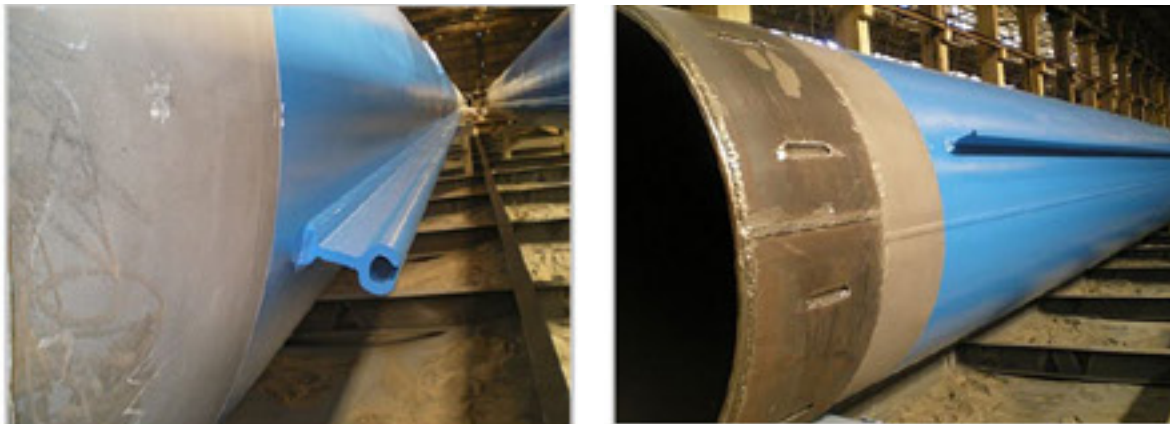
as it is inserted reducing interlock friction

WADIT® is very suitable to the 'in and out' installation method using the press in pilers



# Hazardous Substances Testing

Leak-tightness studies for sheet pile interlocks under chemical influence of Creosote using the sealant Wadit



# Hazardous Substances Testing



Expert Body for Hazardous Substances in Mining

Expert body for the measurement and testing of hazardous substances in terms of their potential risk to the environment and in the workplace.



SERVICES A - Z PRODUCTS DMT - THE COMPANY INFOPOINT PRESS JOBS & CAREER



Search

Testing & Expert Bodies

# Hazardous Substances Testing

Leak-tightness studies for sheet pile interlocks under chemical influence of Creosote using the sealant Wadit



## C. residence time 72 hours below 30°C

The 72 hour sample below 30°C showed during the test with water no leakages.

A structure change of Wadit® could not be found. The flexibility remained.

The contact power of Wadit® is unchanged.



← **72 hours below 28F  
No leakage  
No change in bond  
and flexibility**

## D. residence time 48 hours, direct contact with Creosote

The 48 hour sample showed during the test with water no leakages.

A structure change of Wadit® could not be found. The flexibility remained.

The contact power of Wadit® is unchanged.



← **48 hours room temp  
No leakage  
No change in bond  
and flexibility**



# Chemical Resistance



1 Acetaldehyde	N	36 Calcium acetate	OK	71 Ethyl cellulose	OK	106 Lead nitrate	OK	141 Phenol	OK
2 Acetic acid (10/RT)	N	37 Calcium bissulfite	OK	72 Ethyl chloride	OK	107 Lead sulfamate	OK	142 Phosphoric acid	OK
3 Acetone	N	38 Calcium chloride	OK	73 Ethyl chlorohydrin	OK	108 Linseed oil	OK	143 Potassium chloride	OK
	K	39 Calcium hydroxide	OK	74 Ethylene diamine	OK	109 Liquifide petroleum gas	OK	144 Potassium cyanide	OK
	K	40 Calcium hypochlorite	OK	75 Ethylene glycol	OK	110 Lubricating oil	OK	145 Potassium dichromate (10/RT)	OK
	K	41 Calcium nitrate	OK	76 Ethyl oxalate	OK	111 Magnesium chloride	OK	146 Potassium hydroxide	OK
8 Aluminum chloride	OK	42 Calcium sulfide	OK	77 Ethyl silicate	OK	112 Magnesium hydroxide	OK		
9 Aluminum fluoride	OK	43 Carbon dioxide	OK	78 Fatty acid	OK	113 Magnesium sulfate	OK	147 Potassium permanganate	OK
10 Aluminum nitrate	OK	44 Carbonic acid	N	79 Ferric chloride	OK	114 Maleic acid	OK	148 Potassium sulfate	OK
11 Aluminum sulfate	OK	45 Castor oil	OK	80 Ferric sulfate	OK	115 Malic acid	OK	149 Propane	OK
12 Ammonia gas	OK	46 Cellsolve	N	81 Fluorboric acid	OK	116 Mercuric chloride	OK	150 Propyl alcohol	OK
13 Ammonium carbonate	OK	47 Cellsolve,Acetate	OK	82 Fluosilicic acid	OK	117 Mercury	OK	151 Propylene Glycol	OK
14 Ammonium chloride	OK	48 Cellsolve,Butyl	OK	83 Formaldehyde (40/RT)	OK	118 Methyl alcohol	OK	152 Pyridine	OK
15 Ammonium hydroxide	N	49 Chlorinated solvents	N	84 Formic acid (25/RT)	NO	119 Methyl ethyl ketone	OK	153 Salicylic acid	OK
	N	50 Chromic acid (2/70)	N	85 Fuel oil	OK	120 Mineral oil	OK	154 Salt water	OK
	N	51 Citric acid	OK	86 Gasoline	OK	121 Monoethanolamine	OK	155 Silicon greases	OK
	N	52 Copper chloride	OK	87 Gelatin	OK	122 Motor Oil	OK	156 Silicon oil	OK
	N	53 Copper cyanide	OK	88 Galuber's salt	OK	123 Naptha	OK	157 Silver nitrate	OK
	N	54 Copper sulfate	OK	89 Glycerin	OK	124 Natural gas	OK	158 Soap solutions	OK
16 Aniline	OK	55 Cyanide	OK	90 Hexane	OK	125 Nickel acetate	OK	160 Sodium bicarbonate	OK
20 Aniline dyes	OK	56 Cyclohexanone	OK	91 Hexyl alcohol	N	126 Nickel chloride	OK	161 Sodium bisulfate	OK
21 Lard oil	OK	57 Developing	OK	92 Hydrobromic acid	N	127 Nickel sulfate	OK	162 Sodium bisulfite	OK
22 Arsenic acid	OK	58 Developing solutions(Hypos)	OK	93 Hydrochloric acid 3/RT)	OK	128 Nitric acid (10/RT)	NO	163 Sodium borate	OK
23 Asphalt	OK	59 Dibutyl phthalate	OK	94 Hydrochloric acid	OK	129 Nitroethane	OK	164 Sodium chloride	OK
24 ASTM oil NO.1	OK	60 Diesel Fuel	OK	95 Hydrogen	OK	130 Nitromethane	OK	165 Sodium cyanide	OK
25 ASTM reference fuel	OK	61 Diethylene glycol	OK	96 Hydrogen peroxide	N	131 Nitrogen	OK	166 Sodium hydroxide (10/RT)	N
26 Barium chloride	OK	62 Diisopropyl ketone	OK	97 Hydrogen sulfide	N	132 Octyl alcohol	OK	167 Sodium hydroxide (50/RT)	N
27 Barium hydroxide	OK	63 Dimethyl formamide	OK	98 Hydroquinone	OK	133 Oleic acid	OK	168 Sodium hypochlorite	OK
28 Barium sulfate	OK	64 Dioctyl phthalate	OK	99 Hydrochloric acid	OK	134 Olive oil	OK	169 Sodium metaphosphate	OK
29 Barium sulfide	OK	65 Dioxane	OK	100 Isobutyl alcohol	OK	135 Oxalic acid	OK	170 Sodium nitrate	OK
30 Benzene	N	66 Ethanolamine	OK	101 Isopropyl alcohol	OK	136 Oxygen	OK		
31 Benzine	N	67 Ethyl acetate	N	102 Jet Fuel	OK	137 Ozone	OK		
32 Benzyl alcohol	OK	68 Ethyl aceetoacetate	OK	103 Lacquer	OK	138 Palmitic acid	OK		
33 Boric acid	OK	69 Ethyl alcohol (Ethanol)	OK	104 Lactic acid	OK	139 Petroleum	OK		
34 Butane	OK			105 Lead acetate	OK	140 Phenyl hydrazine	OK		
35 Butyl alcohol	OK								

## Acids

## Alcohols

## Creosols

## TEAs



Seite 5/5  
Datum 04.05.2009

## Conclusions

The sheet pile locker, which were sealed with Wadit®, show no leakages under the above discribed conditions.

← **No leakage**

No Influences on the Wadit® could be detected by diluted (with soil) or by undiluted (without soil, direct contact with the test sample) Creosote.

← **No influence on Wadit diluted or undiluted**

The Wadit® shows no visible changes and alterations regarding the contact power and flexibility.

← **No change in contact power and flexibility**

Kind regards  
DMT GmbH & Co. KG

  
(Kapperhagel)

  
(Grube)



**Fakultät  
Bauwesen**

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Tragkonstruktionen  
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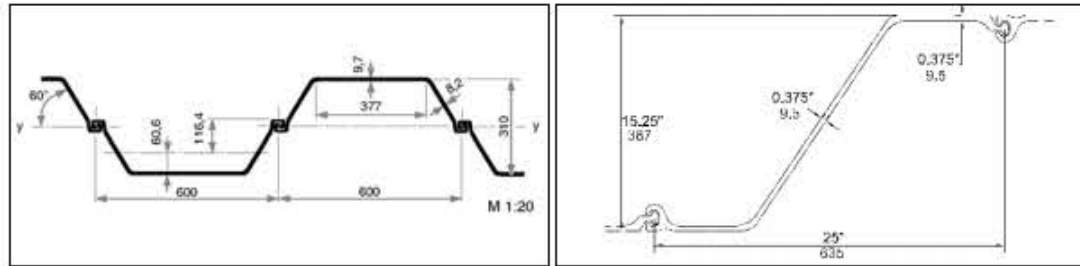
**WADIT-Sealant  
for  
Sheet Piling Walls**

**- Documentation of experiments for water-tightness -**

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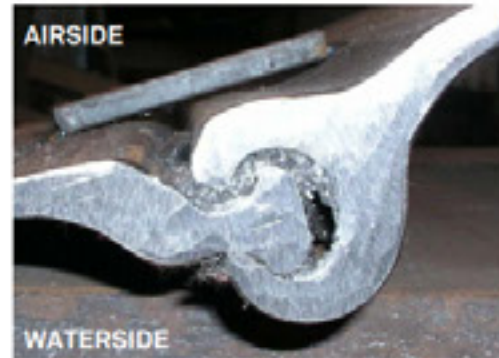
Dipl.-Ing. Th. Topp

February 2008



**Figure 4:**  
LARSEN-Sheet pile (Type 603)

**Figure 5:**  
PZC Sheet pile (Type PZC 18)



# For Water Tightness



Test setup without specimen



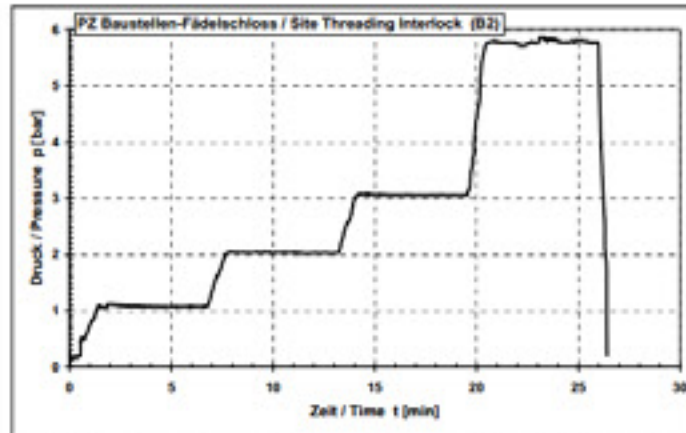
Test setup with specimen



Pressure control with Manometer

Test Flow:

Ball & Socket  
Lock

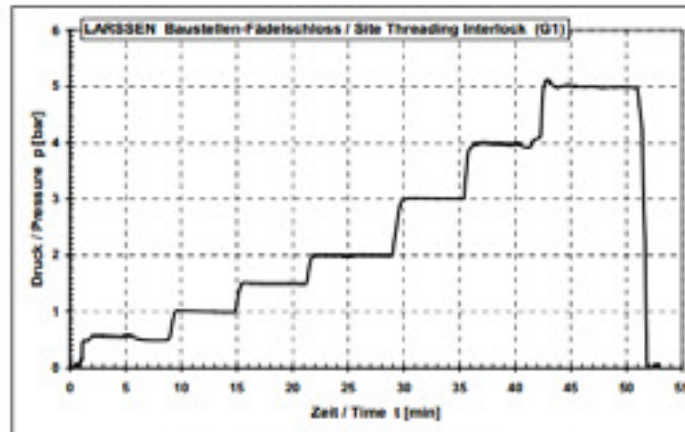


Temperature: 15 °C / 59 °F

Test Result: No water flow

Test Flow:

Larssen  
Lock



Temperature: 16 °C / 61 °F

Test Result: No water flow



**Examining authority:  
State Trade Supervision  
Department for Bavaria  
(LGA)  
Institute for Environmental  
Geology and Contaminated  
Sites**

**“The reports from the LGA come to the conclusion that WADIT® sealing compound can be used as a sealing compound in sheet pile walls for ground and surface water without restriction.”**

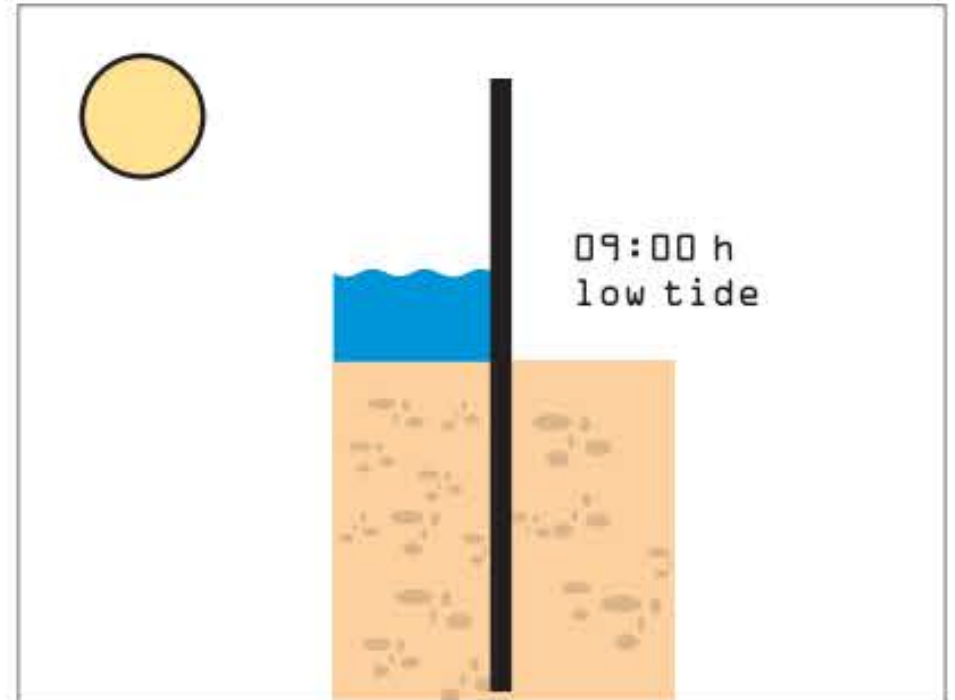
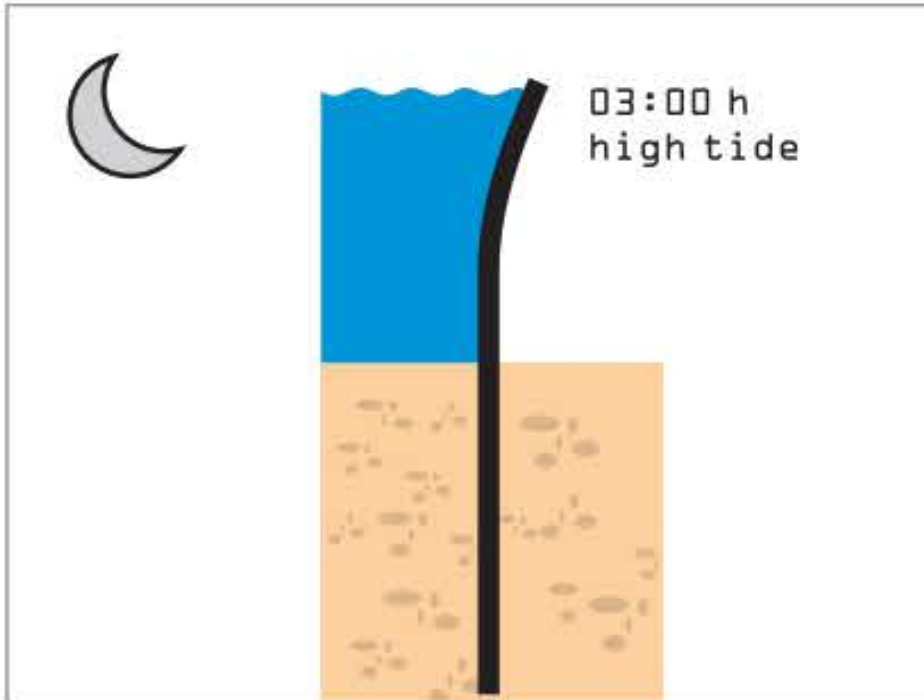
**“there is no concern of harmful effects in the catchment area of drinking water collection systems.”**

“

# Bond = Durability

Wadit® has exceptional bond to the steel

It prevents corrosion in the interlocks and can be used with coatings.





# Filling of Interlocks

Piling can be driven within 30 mins, or let sit for months.

A professional 2-man crew can install up to 5,000 ft per day



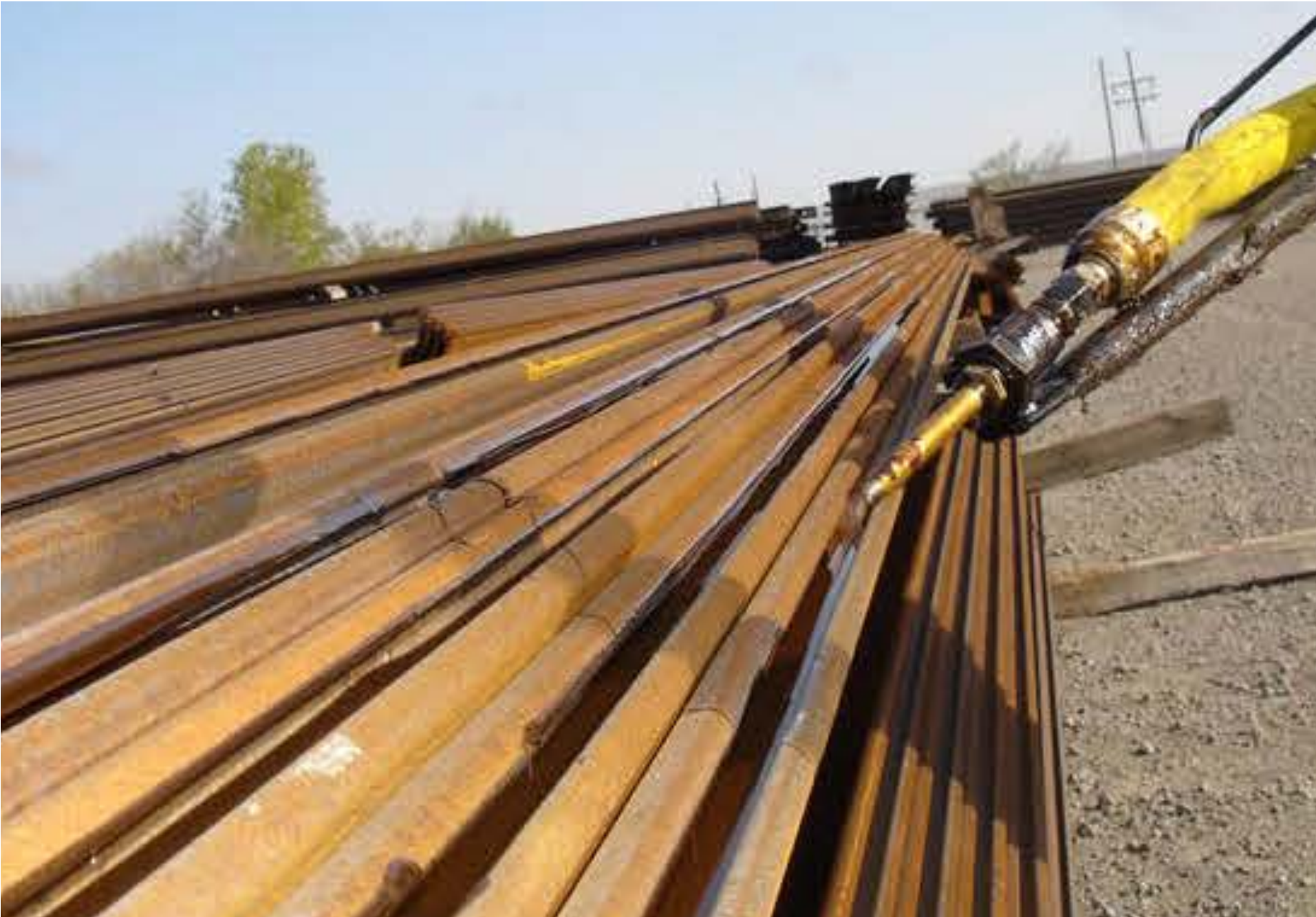
# Application



# Application



# Application



# Application





# Application

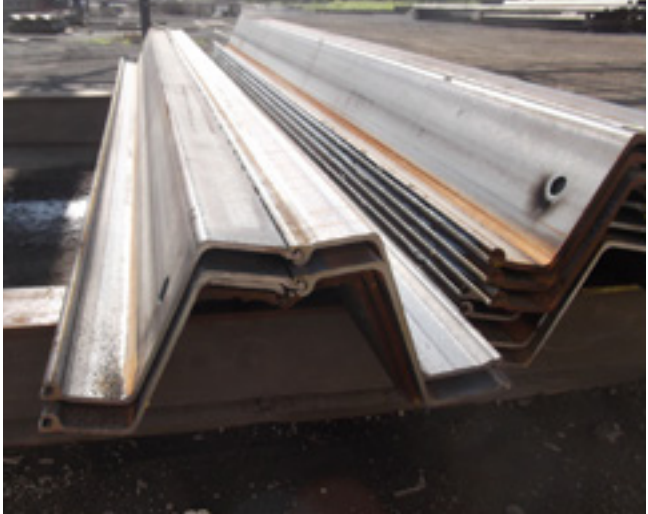


# Application

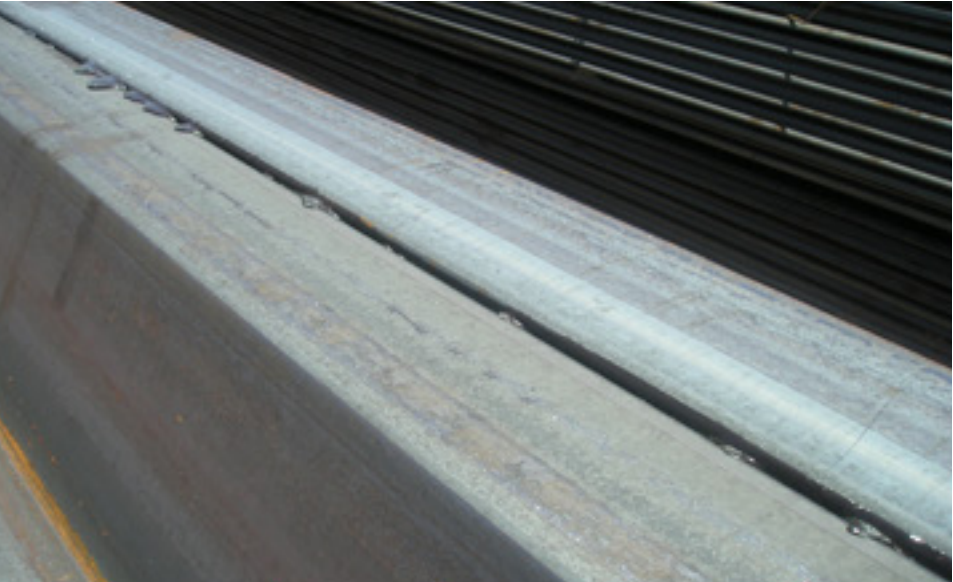




# Application



# Application



## What is it

Ingenious sealant made exclusively for sheet piling

A natural sustainable raw material

## Why it is different

Environmentally friendly – use with drinking water – non toxic

Excellent chemical resistance

Use in extreme hot or cold

Water resistant to 130 ft

Corrosion inhibitor – increases durability

Lubricant to aid driving

Professionally applied at distributor or jobsite

## Why it is different?

1. Ingenious sealant for sheet pile walls
2. Made exclusively for sheet piling
3. Environmentally friendly – use with drinking water – non toxic
4. Unique elasticity – does not harden or become brittle
5. Excellent chemical resistance
6. Use in extreme hot or cold
7. Water resistant to 130 ft
8. Corrosion inhibitor – increases durability
9. Lubricant to aid driving

**WADIT**

**Thank you.**



iSheetPile



PilePro

WADIT



Pile

[PileProGroup.com](http://PileProGroup.com)

Job Reference of Steel Sheet Pile Interlock Sealant 'WADIT' in Hong Kong

Item	Project	Consultant	Client
1	Three Runway System Project – Contract 3801 – APM and BHS Tunnels on Existing Airport Island	China State Construction Engineering (HK) Ltd.	The Airport Authority Hong Kong
2	Three Runway System Project – Contract 3802 – APM and BHS Tunnels and Related Works.	Gammon Engineering & Construction Limited	The Airport Authority Hong Kong

## **Appendix K**



Expansion of Sha Tau Kok Sewage Treatment Works

Table 5.5 Event and Action Plan for Water Quality Monitoring

Event	Action			
	ET	IEC	Contractor(s)	ER
Action Level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>Identify source(s) of impact and record in notification of exceedance;</li> <li>Inform IEC, Contractor(s) and ER.</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>Inform EPD and AFCD.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Check plant and equipment and rectify unacceptable practice</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing.</li> </ol>
Action Level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>Identify source(s) of impact and record in notification of exceedance;</li> <li>Inform IEC, Contractor(s) and ER;</li> <li>Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>Inform EPD and AFCD;</li> <li>Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Check plant and equipment and rectify unacceptable practice;</li> <li>Consider changes of working methods;</li> <li>Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days;</li> <li>Implement the agreed mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented.</li> <li>Ensure additional mitigation measures are properly implemented.</li> </ol>

## Expansion of Sha Tau Kok Sewage Treatment Works

Event	Action				
	ET	IEC	Contractor(s)	ER	
Limit Level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>2. Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>3. Identify source(s) of impact and record in notification of exceedance;</li> <li>4. Inform IEC, Contractor(s) and ER;</li> <li>5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>2. Inform EPD and AFCD;</li> <li>3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Check plant and equipment and rectify unacceptable practice;</li> <li>3. Critically review the need to change working methods;</li> <li>4. Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days;</li> <li>5. Implement the agreed mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented.</li> <li>3. Ensure additional mitigation measures are properly implemented.</li> <li>4. Request Contractor(s) to critically review the working methods.</li> </ol>	
Limit Level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>2. Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>3. Identify source(s) of impact and record in notification of exceedance;</li> <li>4. Inform IEC, Contractor(s) and ER;</li> <li>5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>2. Inform EPD and AFCD;</li> <li>3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Check plant and equipment and rectify unacceptable practice;</li> <li>3. Critically review the need to change working methods;</li> <li>4. Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days;</li> <li>5. Implement the agreed mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented.</li> <li>3. Ensure additional mitigation measures are properly implemented.</li> <li>4. Request Contractor(s) to critically review the working methods.</li> </ol>	

Notes : ET – Environmental Team, IEC – Independent Environmental Checker; ER = Engineering Representatives  
The above actions should be taken within 1 working day after the exceedance is identified during operation phase.