EMERGENCY RESPONSE PLAN


Development of a Biodiesel Plant at
Tseung Kwan O Industrial Estate

Version 1: 30 December 2013

22 Chun Wang Street, Tseung Kwan O Industrial Estate, New Territories, Hong Kong
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>CONTENT</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>PROCESS DESCRIPTIONS</td>
<td>2</td>
</tr>
<tr>
<td>2.1</td>
<td>BIODIESEL PRODUCTION</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2</td>
<td>GREASE TRAP WASTE AND WASTEWATER TREATMENT</td>
<td>2-3</td>
</tr>
<tr>
<td>3</td>
<td>EMERGENCY RESPONSE PLAN</td>
<td>3</td>
</tr>
<tr>
<td>3.1</td>
<td>OVERALL OPERATIONAL CONTROL OF THE BIODIESEL PLANT – PROCESS CONTROL SYSTEM</td>
<td>3-1</td>
</tr>
<tr>
<td>3.2</td>
<td>LOADING/UNLOADING OPERATIONS</td>
<td>3-3</td>
</tr>
<tr>
<td>3.3</td>
<td>TRANSFER OPERATION</td>
<td>3-4</td>
</tr>
<tr>
<td>3.4</td>
<td>TANK FARMS</td>
<td>3-4</td>
</tr>
<tr>
<td>3.5</td>
<td>PROCESSING OPERATIONS</td>
<td>3-5</td>
</tr>
<tr>
<td>4</td>
<td>CONTACT INFORMATION</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>TRAINING, TESTING AND REVISION OF THE PLAN</td>
<td>5</td>
</tr>
<tr>
<td>5.1</td>
<td>TRAINING &amp; TESTING</td>
<td>5-1</td>
</tr>
<tr>
<td>5.2</td>
<td>REVISION</td>
<td>5-1</td>
</tr>
</tbody>
</table>
APPENDICS

A  Biodiesel Production Process
B  Wastewater Treatment Process
C  Master Layout Plan and Section
   Tank Farms Layout Plan, Tank List and Bund Area Calculations
D  Foul Drainage System
E  Storm Water Drainage System
F  Trouble Shooting for Anaerobic Treatment
G  Trouble Shooting for Aerobic Treatment
H  Possible Events of the Grease Trap Waste Treatment and the Wastewater Treatment Processes
<table>
<thead>
<tr>
<th>Table/Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2-1</td>
<td>Block flow diagram of Grease Trap Waste (GTW) Pre-treatment Process</td>
<td>2-3</td>
</tr>
<tr>
<td>Table 2-2</td>
<td>Summary of Process Waste/Product of the Biodiesel Production and GTW and Wastewater Treatment</td>
<td>2-6</td>
</tr>
<tr>
<td>Table 3-1</td>
<td>Summary of the volume of the tanks and bund storage capacities</td>
<td>3-4</td>
</tr>
</tbody>
</table>
SECTION 1 INTRODUCTION

This plan stipulates the actions to be taken covering incidents during loading/unloading operation, transfer operations, storage farm operations and processing operations. The plan applies to all the staff in the biodiesel plant at the Tseung Kwan O Industrial Estate (TKOIE) where chemical and materials are transported, purchased, stored, handled, or used, including vehicles of visitors or suppliers who bring the chemicals and raw materials into the biodiesel plant that are potentially hazardous.

The biodiesel plant will be constituted by two major processes – (1) biodiesel production and (2) the grease trap waste (GTW) and wastewater treatment. When the biodiesel plant is in operation, there will be several types of products and by-products being generated and required to be disposed of at designated facilities e.g. landfills. However, it is unlikely but possible that the processes of the biodiesel production, the GTW and the wastewater treatment might be interrupted by the incidents such as power interruption will adversely affect and upset these processes.

This plan summarizes possible disposal outlet for wastes generated from the biodiesel production, the GTW and wastewater treatment depending on the quality and quantity of the waste. Also, it summarizes the operational procedures for the possible incidents interrupting the operations of the biodiesel plant.
SECTION 2  PROCESS DESCRIPTIONS

The biodiesel plant consists of 2 parts of the operation: 1) biodiesel production & 2) grease trap waste and wastewater treatment.

2.1 BIODIESEL PRODUCTION

The process can be divided in two main parts:
1. Esterification and transesterification of the raw material to biodiesel
2. By-product preparation

The following sections describe the process steps of the biodiesel production. (See Appendix A)

Detail description

The feedstock for biodiesel production will be used cooking oil (UCO), grease trap oil (GTO), palm oil fatty acid distillate (PFAD) and tallow.

Raw materials with high content of free fatty acids (palm oil fatty acids, grease trap oil) can be directly transferred into methyl ester by esterification using high-pressure, high-temperature reaction conditions without catalyst. The so-formed methyl ester has a certain content of free fatty acids, which can be processed in the following esterification step.

The raw materials with a certain content of free fatty acids as well as fatty acids recycled from the by-product acidification and the oil phase from the high pressure esterification are transferred to the esterification stage. Fatty acids are esterified with methanol under acidic conditions and ambient pressure in a batch process. The catalyst – a mixture of potassium hydroxide (KOH) and methanol – is prepared in a separate mixing station (solid potassium hydroxide is dissolved in methanol with a certain ratio).

The transesterification process is a two-step process. After dosing methanol and the catalyst the triglycerides are transformed to biodiesel and glycerine. Due to the density difference the glycerine together with the catalyst and the excessive methanol separates from the biodiesel phase and can be discharged to the by-product preparation line. The biodiesel phase of the first reaction step remains in the transesterification vessel and again methanol and the catalyst are dosed to the
vessel. With this technology a sufficiently high degree of transesterification is achieved. The glycerine phase is again discharged to the by-product preparation line.

The methyl ester phase contains certain amounts of methanol, catalyst (mainly in form of soaps) and water. The catalyst is removed from the methyl ester phase by several washing steps (the aqueous phase is discharged to the by-product preparation line). The methyl ester phase after the last washing step contains low volatile high boiling contaminants as well as volatile substances such as water and methanol. The volatile substances are removed in the flash column (degasser), the low volatile high boiling substances are removed in the distillation unit. The distillate represents the high quality methyl ester and is transferred to the biodiesel quality tank, and later, to the biodiesel storage tanks.

The volatile substances from the degasser are transferred to the by-product preparation line. The low volatile high boiling substances, namely bioheating oil (BHO), are discharged to a storage tank. They can be further used as heating oil for an oil burner (e.g. thermal oil boiler) and will be used to provide process heat in the plant.

The glycerine phase from the transesterification and the aqueous phases of the methyl ester purification are processed together with the aqueous phase of the esterification in the acidification vessel. In this process step the potassium hydroxide and the potassium soaps are transformed with sulfuric acid to potassium sulfate, glycerine phase and fatty acid phase. The potassium sulfate is a solid phase, the methyl ester forms together with the fatty acids the fatty acid phase, which has a low solubility in the glycerine phase at acidic conditions. This three phase mixture can be separated by the means of a tricanter (continuous operation as well as the acidification). As mentioned above, the fatty acid phase is reused in the esterification unit (increasing the biodiesel output of the process). The generated potassium sulfate is discharged via a screw conveyor to a container as pasty fertilizer. The acidic glycerine phase from the tricanter is neutralized with the basic catalyst in the neutralization tank. The thereby generated potassium sulfate is filtrated off and discharged back to acidification tank. The filtered neutralized glycerine phase is distilled. In the column methanol and water are separated from the glycerine. A second column separates water and methanol.

The recovered methanol and water are recycled and reused in the process. The crude glycerine (80% glycerine) is discharged to the storage tank.
2.2 Grease Trap Waste and Wastewater Treatment

Grease Trap Waste Treatment

Grease trap waste (GTW) treatment process is designed to separate oil, wastewater and sludge mixture in the raw GTW. The following figure shows the block flow diagram of the process:

Figure 2-1 Block flow diagram of Grease Trap Waste (GTW) Pre-treatment Process

The external GTW collectors will deliver and unload the GTW at the Grease Trap Waste Screening Room (GTWSR) where the GTW is screened and removed of grit. In order to reduce the potential problems of clogging of oil at the pipelines, heating coils are equipped.

In the second process, the GTW goes through a process called equalization to provide a buffering volume for overcoming the operational problems caused by variations of flow and characteristics of wastewater. The preliminary treated GTW from the first process is led into and retained in buffer tanks for a period of time where the process of equalization occurs.

Gravity Separation is the most important step in the treatment process, which aims for oil-water separation and solids settling. The tank is designed to separate the three layers in the raw GTW: (i) oil layer at the top, (ii) wastewater at the middle and (iii) sludge at the bottom. Firstly, the GTW from the buffer tank is pumped into the separation tank. Inside the tank, a skimmer is installed to remove the treated GTW at the top layer. The wastewater layer at the middle of the separation tank will be pumped to the wastewater treatment plant. It is estimated that the wastewater capacity is around 450 tons/day. The sludge, which is at the bottom layer, with be
collected using a sludge scraper and is pumped out from the bottom of the tank for sludge treatment.

In the final process of sludge dewatering, centrifuges are installed to dewater the sludge collected at the bottom of separation tank. The dewatered sludge will then be delivered to landfill by trucks.

**WASTEWATER TREATMENT**

Wastewater treatment process comprises I) Pre-treatment, II) Anaerobic Treatment III) Aerobic Treatment IV) Biogas Treatment V) Off Gas Treatment and VI) Sludge Treatment. The process flow diagram is presented in Appendix B

I) Pre-treatment

Wastewater from the production site will be flowing to an influent pit by gravity for collection to remove big solid particles and then will be pumped to an oil-water separator. The oil-water separator is used for free oil removal and the wastewater will flow into the buffer tank by gravity after wastewater undergoes oil removal. The buffer tank is to equalize water quality and flow fluctuation. After the wastewater is equalized in the buffer tank, it will be pumped to the Dissolved Air Floatation Unit (DAF) from buffer tank for further removing total suspended solids (TSS) and oil in wastewater.

II) Anaerobic Treatment

The wastewater will be treated anaerobically in a two stage anaerobic process. In the first stage (Pre Acidification Tank) the wastewater is partly pre-acidified. In the second stage (IC reactor) the organic pollutants of the wastewater are converted into the biogas.

III) Aerobic Treatment

After anaerobic treatment, the wastewater will flow to an activated sludge system for further removal of remained biodegradable chemical oxygen demand (COD). Activated sludge system consists of an aeration tank and a secondary clarifier.

IV) Biogas Treatment

In the IC reactor the by-product, namely the biogas, is produced. The amount of the
biogas produced depends on the COD-load applied to the IC reactors. The higher the COD-load is, the higher the biogas production will be. The biogas will be collected in the degassing tank on top of the IC reactor for gas water separation. The IC reactor and the biogas treatment facilities are closed system.

The biogas is burnt either in the process boiler system or the flare without emission to surroundings.

V) Off Gas Treatment

Odorous components like hydrogen sulphite (H₂S) may be released from the wastewater treatment plant (WWTP). Therefore top of the tanks in pre-treatment units and aeration tank are continuously ventilated. The off gas will be sent to a scrubber for odor removal.

VI) Sludge treatment

Sludge will be collected from the secondary clarifier and the DAF. The sludge discharged from secondary clarifier and the DAF has low dry matter content. To increase the dry matter content of the sludge, the sludge has to be further dewatered by mechanical dewatering equipment.
Table 2-2 Summary of Process Waste/Product of the Biodiesel Production and GTW and Wastewater Treatment

<table>
<thead>
<tr>
<th>Process</th>
<th>Type of Waste/Product</th>
<th>Physical state of Waste/Product</th>
<th>Quantity generated/treated (ton/day)</th>
<th>Fate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel Production</td>
<td>Biodiesel</td>
<td>Liquid</td>
<td>303</td>
<td>Export</td>
</tr>
<tr>
<td>Biodiesel Production</td>
<td>Bioheating Oil</td>
<td>Liquid</td>
<td>27</td>
<td>Export/Internal Use</td>
</tr>
<tr>
<td>Biodiesel Production</td>
<td>Fertilizer Pasty</td>
<td>Solid</td>
<td>7</td>
<td>Selling for chemical, pharmaceutical and other industrial applications</td>
</tr>
<tr>
<td>Biodiesel Production</td>
<td>Glycerine (80%)</td>
<td>Liquid</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>GTWSR</td>
<td>Screened waste</td>
<td>Solid, solid content at least 30%</td>
<td>5.5</td>
<td>Landfill</td>
</tr>
<tr>
<td>Fat Preparation</td>
<td>Screened waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaerobic and Aerobic Treatment</td>
<td>Biogas</td>
<td>Gas</td>
<td>Unknown</td>
<td>Internal Use</td>
</tr>
<tr>
<td>Anaerobic and Aerobic Treatment</td>
<td>Treated effluent</td>
<td>Liquid</td>
<td>515</td>
<td>Government Sewer</td>
</tr>
<tr>
<td>Sludge Dewatering</td>
<td>Dewatered Sludge</td>
<td>Solid, solid content at least 30%</td>
<td>1.3</td>
<td>Landfill</td>
</tr>
</tbody>
</table>
SECTION 3  EMERGENCY RESPONSE PLAN

This section details the plan which will be developed to handle any risk on-site and off-site due to any incident at the facility during the biodiesel production, loading/unloading operations, transfer operations, storage tank farm operations and processing operations.

3.1 OVERALL OPERATIONAL CONTROL OF THE BIODIESEL PRODUCTION – PROCESS CONTROL SYSTEM

The Process Control System (PCS) is used for monitoring and controlling the whole biodiesel production process (incl. utility plants and tank farm) by an abstract graphical representation of the plant itself. This graphic representation is made by process pictures which are showing all controllable equipment of the biodiesel plant. All important process conditions are checked permanently and are visualized on a computer screen so that the operator can watch and adjust the process parameters.

PCS is a hot standby system of following hardware:
- PCS server chapters with Raid 0 hard drive redundancy located in the switch room in a computer cabinet
- clients with LCD monitor in the control room
- printer
- data storage
- remote maintenance system (by modem or internet)

The main functions of PCS are:
- process pictures (abstract graphic representation of the biodiesel plant)
- automatic logic program
- controlling the process
- safety interlocks
- adaptive control constraint
- alarm routines
- trending
- alarm logging

Generally there are two modes for the control of the Biodiesel process:

**Manual mode**
This mode allows starting and stopping of all individual plant components. It is possible without major restrictions in the manual operating mode. This mode is normally locked by a password and only can be access by authorized personnel.
Automatic mode
The automatic mode controls the biodiesel production process automatically according to the control program and process parameters. All process parameters can be monitored on process display at control room. Manual intervention is only necessary for start-up or shut-down procedures of process units.

Alarm System
The deviations from normal operation condition are reported by process alarm system. There are two different alarm levels:

- **Low priority alarm** indicates minor deviation and close monitoring of the process unit is required. Process corrective action will be taken if necessary.

- **High priority alarm** indicates the deviation of safety relevant process parameters. Shutdown procedures are started automatically.

Plant Emergency Off
Plant emergency shut off can be activated by “emergency switches” which are located in process control room, process building and tank farm areas. The relevant process plant equipment will be shut off by interrupting its power supply and the essential utility system will remain in function.

Protective Shut Down
Protective shut down is controlled by PCS to activate the shut-down procedures of process units. It is activated automatically by either one of the following situations:

- Instrument air supply interruption
- Ventilation system malfunction
- Nitrogen supply interruption
- Temperature high in vent gas
- Fire alarm
3.2 Loading/Unloading Operations

The following areas involve loading/unloading operation in our plant:

a. Transportation of chemicals, raw materials and product between Tank Farm and Jetty by marine vessels;

b. Transportation of chemicals, raw materials and products between Tank Farm and loading/unloading stations by trucks;

c. Chemicals filling into the chemical tanks at the chemical rooms of the wastewater treatment plant (WWTP) by trucks;

d. GTW reception at loading/unloading stations by trucks

The spillage risks control during loading/unloading operations can be address as follow:

(a) Jetty area
If spillage happens during loading/unloading operation at Jetty area, the floatable oil boom will be laid to surround the affected area. The spilled material will be skimmed back to the GTWSR and reused for biodiesel production.

(b) Loading and Unloading Stations
When chemical unloading at Zone 4C including sulphuric acid, phosphorus acid, diesel and methanol, spillage can be detected by a level sensor which located at the surface drain of the parking slot. The signal will be feedback to control room and terminate operation immediately. The spills are contained in the surface channel which will be cleared and reused to the biodiesel production.

When product loading at Zone 4B including biodiesel, glycerine and BHO, overfill protection system is equipped which interlock with the loading pumps to prevent overfill. Furthermore, the parking slot will be bound by sand bags to prevent any spills to the surface drain. In addition, there is an oil interceptor to trap the oil in case any spills to the surface drain accidentally. The oil interceptor will be regularly cleared and the trapped oil will be reused to biodiesel production via the GTWSR.

(c) Filling the chemical tanks
The storage tanks of ferric chloride and sodium hydroxide are located at the foul drain system which can be diverted to the wastewater treatment plant such that the water quality will not be deteriorated by the spill.

(d) GTW Reception
During the GTW reception, the spill may occur when improper hose connection or the hose breaking. To prevent the GTW spill into the surface drain, sand bags will
be placed to block the drain channel. As mentioned in above item (b), oil interceptor system is equipped to trap the oil in case any spills to the surface drain accidentally. The oil interceptor will be regularly cleared and the trapped oil will be reused to biodiesel production via the GTWSR.

**3.3 Transfer Operation**

Watertight design has been adapted for the tailor-made container to store (i) dewatered sludge from the WWTP, (ii) screened waste from the GTWSR, (iii) screened waste from fat preparation, and (iv) fertilizer pasty from the biodiesel production to prevent any leakage during transportation.

The dewatered sludge and screened waste will be stored in the container and disposed of to the designated landfill by licensed contractor. When there is any incident or accident during road transportation, the licensed contractor will inform ASB immediately so that corresponding corrective action can be carried out.

**3.4 Tank Farms**

The floors of tank farms are coated with oil- and waterproof, anti-static and acid-resistant coating to minimize leakage out of the farm area. Each tank farm is built with bund wall to surround the tank(s) and to retain potential leakage from the tanks inside the bunds and there are 5 tank farms, namely from tank farms 2A to 2E. (See appendix C). The details are summarized in table 3.

Table 3-1 Summary of the volume of the tanks and bund storage capacities

<table>
<thead>
<tr>
<th>Tank Farm</th>
<th>No. of tank(s) in tank farm</th>
<th>Volume of largest tank / m³</th>
<th>110% Volume of the largest tank / m³</th>
<th>Total volume of the tanks / m³</th>
<th>20% Total volume of the tanks* / m³</th>
<th>Volume of bund storage capacity / m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td>14</td>
<td>2561</td>
<td>2817.1</td>
<td>13935</td>
<td>2787</td>
<td>5188.7</td>
</tr>
<tr>
<td>2B</td>
<td>1</td>
<td>518</td>
<td>569.8</td>
<td>518</td>
<td>103.6</td>
<td>588.0</td>
</tr>
<tr>
<td>2C</td>
<td>2</td>
<td>160</td>
<td>176</td>
<td>320</td>
<td>64</td>
<td>226.1</td>
</tr>
<tr>
<td>2D</td>
<td>1</td>
<td>105</td>
<td>115.5</td>
<td>105</td>
<td>21</td>
<td>116.5</td>
</tr>
<tr>
<td>2E</td>
<td>2</td>
<td>54</td>
<td>59.4</td>
<td>80</td>
<td>16</td>
<td>72.3</td>
</tr>
</tbody>
</table>

*Refers to “Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes” issued by EPD.
The bunds are built to retain the potential leakage from the tanks and fulfill the requirement of both 110% of the volume of the largest tank and 20% of total volume of the tanks.

Furthermore, leakage detection system is equipped in each of the tank farms which consist of valve pit and level sensor. In normal operation, the valve at valve pit is in close position to avoid any spillage from tank farm(s) to storm water drainage system. In addition, the level sensor detects the spillage which connects to PCS. The signal will be shown and monitored by ASB staff in the Control Room so corresponding corrective action can be carried out. In case of spillage, the spill will be contained at the tank farm. The spilled material will be cleared and returned to the biodiesel production for reuse.

3.5 PROCESSING OPERATIONS

In the processing operations, the emergency response has been taken for the following incident.

3.5.1 Chemical Spillage

Various chemicals are used in the biodiesel plant e.g. polymers for the DAF and dewatering, and acids for the biodiesel production.

In case of chemical spillage, the procedures stipulated in an Emergency Contingency Plan for chemical and material spillage (ECP) will be strictly followed (See also section 3.5.11). Material Safety Data Sheet (MSDS) of the chemicals will be referred prior to handle the chemical spillage. Moreover, relevant training will be given to ASB staff and regular drills of chemical and material spillage handling will be conducted. Furthermore, spent chemical absorbents will be handled in accordance with the Code of Practice on the Package, Labeling and Storage of Chemical Wastes issued by the Environmental Protection Department of the HKSAR Government (EPD).

3.5.2 Sludge Spillage

In case of any sludge or biomass spillage, response team shall wear personal protection equipment to prevent from contact with it.

For spillage of activated sludge from the aeration tank, the spilled sludge must be cleared immediately to avoid to flow to the surface drain which is leading to the government storm water manhole.
In case of spillage of biomass from the IC reactor, the spilled biomass will be surrounded by sand bags and pumped back to the recirculation tank and transferred back to the anaerobic process for treatment.

### 3.5.3 Pipe Damage and Leakage

The raw materials and chemicals used in biodiesel plant are transferred via pipeline system either in pipe bridges or pipe trench, for which there are numerous pipe works indoor and outdoor.

In case of the damage of the pipeline (e.g. bit by foreign object during typhoon), leakage of liquid or gases will be happened. In this case, the transfer pump will be stopped immediately to ease the leakage situation. Both the closest valves of up- and down-stream have to be closed and isolate the system. The damaged pipes will be fixed or will be replaced if necessary. Depending on the nature and conditions, the spilled materials will be either returned to the biodiesel production process or disposed of by the licenced facility.

### 3.5.4 Overflow

All the tank farms are surrounded by the bund. Any potential overflow from the tanks will be retained in the bund which is guarded by the isolation valve and level sensor. Under the normal operation, the isolation valves are close to retain any overflow from the tanks within the bund area. In rainy day, the ASB staff will check the tank farms to ensure that there is no spillage from the tanks before the isolation valves will be opened to allow the rainwater flowing to the surface water channels which is leading to sewer discharging to sea. (See appendices D and E)

In case of overflowing from the tanks within the tank farm, the ASB staff will ensure that all the valves shall be closed immediately to prevent any spilled liquid entering surface water channels. Spilled liquid will be cleared by tanker and unloaded back to the appropriate tank depending its nature, quantity and characteristic.

### 3.5.5 Power Failure

The biodiesel plant is equipped with two emergency fuel powered generators to supply power in the event of a failure of the mains supply.
2 set of emergency generators (250 KVA and 2250 KVA) supply the essential power to the fire services installation only for protection and life safety purposes. Neither the biodiesel production nor the GTW and wastewater treatment can be maintained.

The generators will be fitted with auto-switches which will be automatically activated when power failure. The generator start-up will be complete in less than 1 minute from the power failure occurring.

### 3.5.6 Blockage of Biodiesel Plant Access Road

ASB will be responsible for the notification of the GTW collection companies. ASB will coordinate in the case of blockage of the biodiesel plant access road by a traffic accident or vehicle breakdown with the Hong Kong Police for traffic direction in this situation.

ASB will continue such notification and coordination until the obstructing vehicles are removed and will immediately notify all mentioned organisations when the blockage to the access road is cleared.

ASB will immediately notify the GTW collection companies when the blockage has been removed.

ASB will agree with the organisations a predetermined arrangement for the temporary diversion of GTW collection companies directly to the designated or alternative disposal facility during an access road blockage.

### 3.5.7 Fire

A comprehensive fire protection system has been designed in ASB biodiesel plant which is approved by the Fire Service Department (FSD). The whole system includes:

- Automatic Fire Detection and Fire Alarm Systems;
- Sprinkler systems;
- Fire Hydrants and Hoses Reels;
- Seawater Fire Pump System;
- Gas Detection/Extraction System;
- Fixed Foam System;
- Mechanical Ventilation Control System; and
- Portable hand-operated Approved Appliances.
At emergency power failure situation, the fire protection and lighting equipment will still be maintained and emergency team will be trained to manage and coordinate during emergency situation.

All mobile equipment in the biodiesel plant, e.g. forklift, will have a fire extinguisher installed in the cab or at another appropriate position for immediate use by the driver or other staff if the plant catches fire, or if operator is first on the scene of a fire which is safe to tackle with the extinguisher.

3.5.8 Weighbridge Breakdown

The weighbridge system is designed to provide sufficient flexibility that the temporary breakdown of either an IN- or OUT-weighbridge can be adequately handled without any significant adverse impacts on the operation of the biodiesel plant.

In the event of a weighbridge breakdown, traffic will be re-routed to use one of the other weighbridges of the facility. In addition, the following temporary provisions may be implemented to improve traffic flows through the biodiesel plant if problems are experienced with traffic queuing as a result of a weighbridge breakdown:

- for example the GTW collection tanker of known tare weight, may be monitored and manually recorded in sufficient detail to permit subsequent identification and payload calculations to be made at a later time;
- Non-routine deliveries of privately collected waste, e.g. contracted refuse collector, may be charged at a rate computed from the vehicle type and volume using agreed conversion factors; and
- GTW collection tanker may be rejected by ASB until the weighbridge is operational.

3.5.9 Vehicle Breakdown

The design of the biodiesel plant provides two lanes for traffic flows wherever practicable. Hence, the potential for the GTW collection tanker or other vehicle breakdown on-site to completely block and disrupt operations is minimised. Normally, only one lane of a roadway will be blocked allowing use of the other lane to continue. In the event of a blockage, ASB will immediately implement emergency manual traffic control at the scene to manage the traffic circulation with minimal disruption to the transfer operations. Members of staff will be trained to
act as emergency traffic controllers and to handle such situations using standard practices and signaling systems, for example hand signals for traffic management.

If a vehicle breaks down on-site, it will be towed away to a designated area within 30 minutes so as not to impair traffic flow. Removal will occur as soon as it is apparent that repair of the vehicle within a reasonable time span is impossible.

Designated areas will be allocated at the biodiesel plant for vehicles which have broken down and been towed away. It will be the responsibility of the owner to remove any vehicle from the designated areas within 24 hours, after which time impoundment and disposal procedures by ASB may be brought into action, with the owner required to pay the costs.

3.5.10 Uninterruptible Power Supply for Weighbridge Computers

An Uninterruptible Power Supply (UPS) system will be provided to maintain the no-break operation of both our PCS in control room and the weighbridge computers for the period between mains failure and before the stand-by generator taking over the load. The UPS batteries will be rated for 30 minutes continuous operation.

3.5.11 Spillage from GTW collection tanker

Any spillage from the GTW collection tanker anywhere within the biodiesel plant, and particularly at the compactor/tanker interface or in the vicinity of the unloading bays, will be removed as soon as is practical. In addition, any areas which waste can collect or temporarily store will be cleaned at least at the end of every working day.

All staff will be trained in spillage control and good housekeeping measures and to appreciate the importance of these aspects to the efficient and environmentally-acceptable operation of the facility.

As far as is practicable, emergency situations involving the spillage of the GTW, or other materials will be avoided by the following provisions:

- Control of vehicles entering the biodiesel plant;
- Careful inspection of the GTW collection tanker prior to, and during, discharge; and
- Staff Training.
However, procedures will be developed to deal with any spillage of materials of concern with respect to the operation of the facility and the potential risk to health and safety.

ASB will develop an Emergency Contingency Plan (ECP) for chemical and material spillage as part of the emergency response plans for the biodiesel plant. The ECP will identify the following:

- A list of materials of concern which are used in the biodiesel production, GTW and wastewater treatment;
- Guidance on spill response actions, including demarcation, control, clean up and evacuation procedures and lines of reporting;
- Guidance on personal protection measures;
- A list of resources provided for the control and cleanup of spillage with details of their location; and
- A description of required staff training in the response procedures.

Guidance on the ECP will include a step-by-step approach listing appropriate instructions covering:

- Immediate provisions required for supervision of the spill area and for the initial control and minimisation of risks, including rescue of any injured person(s) and determination of the presence of fire, smoke or fumes;
- Notification of supervisory staff and other senior staff;
- Evaluation of the nature of the spill to determine the appropriate response, including the need to wear protective clothing, prevention of further spillage, containment of the spill, notification of FSD or other emergency services, evacuation procedures and cleaning up and remediation of the spill and any contaminated materials;
- Identification of the spilled substance by container labels, shipping papers or vehicle placards;
- Identification of the means necessary to prevent any spilled material from entering the sewer, site drainage system or escaping from the site; and
- Disposal of any contaminated soils and/or absorbent materials.

An incident report will be prepared to record the nature of the spill, any injuries to staff or other persons and the details of the resultant remediation.

All employees will be required to be familiar with the contents of the ECP and will be trained in the manner in which the area of a spill must be secured. In addition, employees who are designated as responsible for containment or for cleaning up
spills will be required to have a minimum of 24 hours of training in safe working procedures for these activities.
3.5.12 Operation during Typhoon Signal No. 3

ASB will continue the normal operation of the facility during the hoisting of the No. 3 typhoon signal. The following actions will be undertaken:

- The emergency procedure for the suspension of marine transportation will be employed;
- All storm and surface water drains, ditches and outfalls will be checked and if necessary cleared of debris, silt and litter; and
- The GTW collection companies delivering the GTW to the biodiesel plant will be informed of any significant changes in the operations of the biodiesel plant.

3.5.13 Operation during Typhoon Signal No. 8

ASB will continue the normal operation of the facility during the hoisting of the No. 8 typhoon signal. The following actions will be undertaken:

- The transfer of containerised waste from the biodiesel plant to the designated or alternative landfill will be eased;
- The transfer of waste to the designated or alternative landfill will resume within 2 hours of the lowering of the No. 8 typhoon signal; and

3.5.14 Operation during Typhoon Signal No. 9 or 10

ASB will notify the GTW collection companies and stop receiving the GTW. The biodiesel production and the GTW and wastewater treatment will be kept in operation.

3.5.15 Plant Closure

If the biodiesel plant has to cease operations during normal operational hours, contingency plans will be made with regards to the diversion of incoming wastes to other facilities. In such an eventuality, the following people and groups will be notified immediately:

- The designated or alternative facility contractor; and
- The GTW collection companies.
3.5.16 Reopening Notification

The people and groups listed above will be notified immediately upon the re-opening of the biodiesel plant.

3.5.17 Emergency Calls

ASB will provide an emergency telephone list located in a prominent position in the office. The list will update the persons of contact and their telephone numbers as appropriate.

3.5.18 Contaminated Water

All contaminated water generated at the Site will be treated at the wastewater treatment plant.

3.5.19 Closure of Designated Landfill

In the event of the closure of the designated Landfill, the transfer operation could be switched to the NENT or SENT Landfill after notification from EPD.

3.5.20 Floods

Contaminated flood water held in bunded areas of the site in excess of the capacity of the WWTP will be pumped and transported by road to a suitable alternative treatment centre for treatment and disposal.

3.5.21 Equipment and Process Unit Failure

In case of the equipment failure in the biodiesel production process, the corresponding equipment will be replaces immediately as the maintenance staff will be 24-hour on-site standby.

In case of the process unit failure, the biodiesel production will be ceased if such unit is the sole unit, e.g. boiler. The raw material can be received up to maximum capacity and then the plant will be closed (see 3.5.15) until the process unit is resumed normal.

For the grease trap waste and wastewater treatment processes, the troubleshooting and scenario are summarized in appendices F, G and H.
## SECTION 4  CONTACT INFORMATION

The person(s) below shall be contacted in case of any incidents happened related to:

(I) Biodiesel, GTW and Wastewater Treatment Operation

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Tel no</th>
<th>Mobile no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddie WONG</td>
<td>Plant Manager</td>
<td>3183 4228</td>
<td>9091 1567</td>
</tr>
<tr>
<td>Martin HUI</td>
<td>Production Manager</td>
<td>9866 6333</td>
<td></td>
</tr>
<tr>
<td>Stanley KO</td>
<td>Shift Production Supervisor</td>
<td>6013 4562</td>
<td></td>
</tr>
<tr>
<td>H. TAKEUCHI</td>
<td>Shift Production Supervisor</td>
<td>9028 0689</td>
<td></td>
</tr>
<tr>
<td>Victor WANG</td>
<td>Shift Production Supervisor</td>
<td>9653 3721</td>
<td></td>
</tr>
</tbody>
</table>

(II) Sampling and Analysis

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Tel no</th>
<th>Mobile no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebecca LAU</td>
<td>Laboratory Manager</td>
<td>3183 4207</td>
<td>9272 0795</td>
</tr>
<tr>
<td>Jay LEUNG</td>
<td>Chemist</td>
<td>3183 4211</td>
<td>6199 0296</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3183 4212</td>
<td></td>
</tr>
</tbody>
</table>

(III) Equipment Maintenance/Failure

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Tel no</th>
<th>Mobile no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sylvia HAR</td>
<td>Engineering Manager</td>
<td>3183 4206</td>
<td>9479 0949</td>
</tr>
<tr>
<td>Albert Kwan</td>
<td>Maintenance Manager</td>
<td>3183 4209</td>
<td>9313 6012</td>
</tr>
</tbody>
</table>

(IV) Environmental, Health and Safety

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Tel no</th>
<th>Mobile no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew TSE</td>
<td>EHS Officer</td>
<td>3183 4205</td>
<td>9409 0630</td>
</tr>
</tbody>
</table>
Government Authorities/Organizations

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency</td>
<td>999</td>
</tr>
<tr>
<td>Hong Kong Police, Tseung Kwan O Station</td>
<td>2623 9041</td>
</tr>
<tr>
<td>Marine Police Harbour Division</td>
<td>2884 9242</td>
</tr>
<tr>
<td>Fire Services Department, Tai Chik Sha Fire Station</td>
<td>2723 8787</td>
</tr>
<tr>
<td>Drainage Services Department</td>
<td>2877 0660</td>
</tr>
<tr>
<td>Electrical and Mechanical Services Department</td>
<td>2333 3762</td>
</tr>
<tr>
<td>Environmental Protection Department</td>
<td>2838 3111</td>
</tr>
<tr>
<td>Tseung Kwan O Hospital</td>
<td>2208 0111</td>
</tr>
<tr>
<td>Ecospace Limited (Chemical Waste Treatment Facility)</td>
<td>2434 6490</td>
</tr>
</tbody>
</table>
SECTION 5  TRAINING, TESTING AND REVISION OF THE PLAN

5.1 TRAINING & TESTING

All the responsible staff must be trained and should demonstrate the ability of performing the task stated in this plan.

Exercise and drill shall be undertaken in a regular frequency to test the adequacy and effectiveness of this plan in controlled conditions if necessary, and allow the responsible staff to familiarize this plan.

5.2 REVISION

ASB will update this plan if necessary after consultation with the Engineering Department, the Maintenance Department, the Production Department or Senior Management of the Company. Also, the advices from or problems encountered from these departments will be taken into consideration and updated in this plan.
Appendix A

Biodiesel Production Process
Appendix B

Wastewater Treatment Process
WASTEWATER TREATMENT PLANT (WWTP)
Appendix C

Master Layout Plan and Section

Tank Farms Layout Plan, Tank List and Bund Area Calculations
Appendix D

Foul Drainage System
Appendix E

Storm Water Drainage System
"Statement II: The works shown on these plans are Type II works (External Drainage) in respect of which consent is applied for the purpose of Fast Track consent application under regulation 33 of the Building (Admission of) Regulations."
Appendix F

Trouble Shooting for Anaerobic Treatment
## Trouble Shooting for Anaerobic Treatment

<table>
<thead>
<tr>
<th>Item</th>
<th>Problem</th>
<th>Result</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COD Overloading (More than design limit 6000kgCOD/d to IC reactor)</td>
<td><strong>Short term:</strong>&lt;br&gt;• Volatile Fatty Acid (VFA) cannot be biodegraded by methanogenic bacteria.&lt;br&gt;• When more VFA accumulated in IC reactor, pH drops. If VFA is more than 10 meq/l and/or pH lower than 6.5 which both harmful to methanogenic bacteria.&lt;br&gt;• Gas production decrease, high COD in the IC effluent;&lt;br&gt;<strong>Long term:</strong>&lt;br&gt;• Granular sludge washes out.</td>
<td>• Find out the reason of overloading: High COD concentration in influent or low COD removal in pre-treatment, etc.&lt;br&gt;• Temporarily increase the pH by dosing sodium hydroxide to recirculation tank.</td>
</tr>
<tr>
<td>2</td>
<td>pH out of range - influent</td>
<td>• If the influent pH is too high or too low, feed pump will stop automatically.&lt;br&gt;• If influent pH is out of range, slow down the performance of anaerobic system.</td>
<td>• Check the chemical dosing pumps.&lt;br&gt;• Calibrate the pH meter.&lt;br&gt;• Reduce COD loading.</td>
</tr>
<tr>
<td>3</td>
<td>High fat/oil concentration in influent</td>
<td>• Granular sludge cannot attach together and so sludge will wash out easily.&lt;br&gt;• The remaining sludge cannot be capable to treat the influent effectively.</td>
<td>• Find out the reason of high fat/oil: High fat/oil concentration in influent or low removal efficiency in pre-treatment (DAF);&lt;br&gt;• Restart the anaerobic system only if the fat/oil concentration is no more than 50mg/l;</td>
</tr>
</tbody>
</table>
## Trouble Shooting for Anaerobic Treatment (cont’)

<table>
<thead>
<tr>
<th>Item</th>
<th>Problem</th>
<th>Result</th>
<th>Action</th>
</tr>
</thead>
</table>
| 4    | Excessive solids in influent     | • Reduce the VSS/TSS ratio in sludge bed and so the remaining sludge cannot capable to treat the influent effectively. (VSS=Volatile Suspended Solids)  
• Sludge washes out; | • Find out the reason of excess solid: High solid concentration in influent or low removal efficiency in pre-treatment (DAF);  
• Solids in influent (after pre-treatment) shall will control lower than 600mg/l  
• In the worst case temporarily stop pump to recirculation tank. |
| 5    | Temperature of influent out of range | • Too low temperature (say less than 30°C) or too high temperature (say higher than 40°C ) will decrease the sludge activity and the performance of anaerobic system. | • Check temperature control in pre-treatment system;  
• Once the temperature is over the range, the anaerobic system should be shut down;  
• In the worst case, hot/cold water should be added temporary; |
| 6    | Sulphide toxicity                | • Higher VFA concentration in the effluent;  
• Low biogas production because methanogenic activities was decreased. | Increase the pH of the influent by adding sodium hydroxide to prevent the toxicity of undissociated H₂S to methanogenic bacteria. |
<table>
<thead>
<tr>
<th>Item</th>
<th>Problem</th>
<th>Result</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>Too high inorganic content of the granules</td>
<td>Only a small fraction of the sludge is active organic material. The capacity of the sludge (in kg COD/kg TSS) will be lower. The mixing of the sludge bed will be poor and there is a change of scaling of the sludge bed.</td>
<td>Decrease the pH of the influent keeping in mind the possible problems with sulphide toxicity. Remove a part of the heavy sludge from the bottom section of the reactor.</td>
</tr>
<tr>
<td>8</td>
<td>Foam/high level alarm</td>
<td>Foam/high level alarm (on the computer). If this alarm is active it might indicate that the downer is clogged and the recirculation water may flow into the gas line. Visible foam in the gas/water separator on top of the reactor</td>
<td>The pump to the reactor should be stopped automatic. To unclog the downer it must be flushed with nitrogen. By opening the valve on top of the reactor the sprinkler is started and the foam will be destroyed.</td>
</tr>
</tbody>
</table>
Appendix G

Trouble Shooting for Aerobic Treatment
<table>
<thead>
<tr>
<th>Item</th>
<th>Problem(s)</th>
<th>Possible Cause(s)</th>
<th>Corrective Action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Boiling action/violent turbulence is observed on the water surface of the aeration tank.</td>
<td>Failure of dissolved oxygen (D.O.) sensor caused over-aeration resulting in high D.O. and/or floc shearing.</td>
<td>Check the D.O. sensor. Replace if necessary. Reduce the air flow rate and maintain the D.O. level at 2mg/L.</td>
</tr>
</tbody>
</table>
| 2    | Uneven water aeration pattern is observed.                                | (I) The diffuser(s) was/were partially plugged;  

(II) The diffuser(s) was/were damaged. | (I) Increase the airflow vigorously to clear the sludge. If it does not work, isolate and clear the aeration tank to clean or replace the diffuser(s).  

(II) Repair or replace the diffuser(s). |
| 3    | Sour and/or septic odours is smelled and results in low D.O.              | (I) Failure of D.O. sensor;  

(II) Air leaked from the pipes to the surroundings instead of pumping into the wastewater;  

(III) The program of the PLC was wrongly set;  

(IV) Malfunction of the valves of the air pipes resulted that the valves could not be opened pneumatically. | (I) Check and calibrate the sensor. Replace if necessary;  

(II) Check the pipes, joint connection and valves by listening for air leakage or by soap test flanges to see any bubble caused by air leaking. Replace the leaked section of the pipe if necessary;  

(III) Resume the default setting until the aerobic process approaches normal;  

(IV) Check the function of valves. Repair or replace if necessary. |
<table>
<thead>
<tr>
<th>Item</th>
<th>Problem(s)</th>
<th>Possible Cause(s)</th>
<th>Corrective Action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Extra air flow rates are used but have no apparent change in organic loading and it is difficult to maintain adequate D.O. level.</td>
<td>(I) Air leaked from the pipe(s) to the surroundings; &lt;br&gt; &lt;br&gt; (II) Persistent high organic loadings (BOD, COD, Suspended matter, Oil &amp; Grease) from the upstream anaerobic process depleted the oxygen level rapidly.</td>
<td>(I) Check the pipes, joint connection and valves by listening for air leakage or by soap test flanges to see any bubble caused by air leaking. Repair or replace the pipes if necessary. &lt;br&gt; (IIa) If the loadings are greater than 20%, add chemical e.g. ferric chloride (FeCl₃) to precipitate the organic matter and increase the rate of sludge wasting. &lt;br&gt; (IIb) Increase the MLSS in the aeration tank by transferring the activated sludge from other transfer station.</td>
</tr>
<tr>
<td>5</td>
<td>Blower does not work</td>
<td>(I) The temperature of the motor was too high that the protection circuit was tripped; &lt;br&gt; &lt;br&gt; (II) Fuse was blown; &lt;br&gt; &lt;br&gt; (III) The power supply to the blower was failed that the main switch was tripped. &lt;br&gt; &lt;br&gt; (IV) The belt driving the blower was broken.</td>
<td>(I) Push reset button. &lt;br&gt; &lt;br&gt; (II) Replace the fuse. &lt;br&gt; &lt;br&gt; (III) Request the Electrician to check the power supply and rest the main switch. &lt;br&gt; &lt;br&gt; (IV) Replace the belt.</td>
</tr>
<tr>
<td>6</td>
<td>Foaming  &lt;br&gt; (I) White, thick, billowing or sudsy foam on aeration tank surface.</td>
<td>(I) Excessive sludge wasting caused low mixed liquor suspended solids (MLSS).</td>
<td>(I) Reduce rate of activated sludge wasting by not more than 10% per day until the process approaches normal.</td>
</tr>
<tr>
<td>Item</td>
<td>Problem(s)</td>
<td>Possible Cause(s)</td>
<td>Corrective Action(s)</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>-------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>6</td>
<td>Foaming</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(II) Shiny, dark-tan foam on aeration tank surface.</td>
<td>(II) The sludge wasting was insufficient that the amount of aged sludge retained in the aeration tank.</td>
<td>(II) Increase rate of activated sludge wasting by not more than 10% per day until the process approaches normal.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(III) Thick, scummy dark-tan foam on aeration tank surface.</td>
<td>(III) MLSS of aeration tank was too high that was verified by the internal laboratory testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(IV) Dark-brown, almost blackish sudsy foam on aeration tank surface. Mixed liquor colour is very dark-brown to almost black. Septic or sour odour from aeration tank is smelled.</td>
<td>(IV) Anaerobic conditions occurred in aeration tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(IV) Clear the aeration tank by tankers and restart up the process.</td>
</tr>
<tr>
<td>7</td>
<td>Sludge clumps rising to and dispersing on the surface of the final clarifier</td>
<td>Malfunction of scraper of final clarifier resulted that the sludge could retain in the final clarifier for prolonged period and finally led to denitrification that air bubbles were produced and caused the sludge rising.</td>
<td>Check the motor of the scraper. Repair or replace the motor if necessary. Increase sludge wasting rate by not more than 10% per day to reduce or eliminate level of denitrification.</td>
</tr>
</tbody>
</table>
Appendix H

Possible Events of the Grease Trap Waste Treatment and the Wastewater Treatment Processes
# Procedures for Possible Events of the Grease Trap Waste Treatment (GTWT) and the Wastewater Treatment (Anaerobic & Aerobic) Processes

<table>
<thead>
<tr>
<th>Process</th>
<th>GTWT</th>
<th>Anaerobic</th>
<th>Aerobic</th>
<th>Action</th>
</tr>
</thead>
</table>
| Normal operation | Normal operation | Process Failure | - Control the volume of the wastewater portion from the GTW to Anaerobic process;  
- Clear the Aeration Tank by tankers;  
- Start up the Aerobic process either by:  
  i. Feed a mixture of wastewater from the Anaerobic process and the wastewater portion from the GTW to incubate activated sludge in the Aeration Tank for 1-2 weeks; or  
  ii. Bring in activated sludge from other wastewater treatment facility for immediate start-up.  
| Process Failure | Normal operation | Normal operation | - Accept raw GTW until all the GTW storage tanks are full;  
- Inform the company(ies) of GTW collection tankers that ASB will not receive the GTW;  
- GTWT process will cease until the Anaerobic process is resumed;  
- Wastewater portion from the GTWT will be diverted to the Aerobic process directly for treatment before discharging into the final manhole.  
- Anaerobic process will be initiated by purchasing or sourcing new biomass for the treatment as like the process commissioning of the WWTP. |
| Process Failure | Normal operation | Normal operation | - Accept raw GTW until all the GTW storage tanks are full;  
- Inform the company(ies) of GTW collection tankers that ASB will not receive the GTW;  
- Fix the problems as soon as possible; |
## Procedures for Possible Events of the GTWT and the Wastewater Treatment (Anaerobic & Aerobic) Processes (cont’)

<table>
<thead>
<tr>
<th>Process Failure</th>
<th>GTWT</th>
<th>Anaerobic</th>
<th>Aerobic</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal operation</td>
<td></td>
<td>- Accept raw GTW until all the GTW storage tanks are full;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Inform the company(ies) of GTW collection tankers that ASB will not receive the GTW;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Fix the problems as soon as possible;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Anaerobic process will be initiated by purchasing or sourcing new biomass for the treatment as like the process commissioning of the WWTP.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Wastewater portion from the GTW will be diverted to the Aerobic process directly for treatment before discharging into the final manhole.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Failure</th>
<th>GTWT</th>
<th>Normal operation</th>
<th>Process Failure</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Process Failure</td>
<td></td>
<td>- Accept raw GTW until all the GTW storage tanks are full;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Inform the GTW collection company(ies) of GTW collection tankers that ASB will not receive the GTW;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Clear the Aeration Tank by tankers;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Start up the Aerobic process either by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>i. Feed a mixture of wastewater from the Anaerobic process and wastewater portion from the GTW to incubate activated sludge in the Aeration Tank for 1-2 weeks; or</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ii. Bring in activated sludge from other wastewater treatment facilities for immediate start-up.</td>
</tr>
<tr>
<td>Process Failure</td>
<td>Action</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GTWT</strong></td>
<td><strong>Anaerobic</strong></td>
<td><strong>Aerobic</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Normal operation | Process Failure | Process Failure | - Accept raw GTW until all the GTW storage tanks are full;  
- Inform the GTW collection company(ies) of GTW collection tankers that ASB will not receive the GTW;  
- Anaerobic process will be initiated by purchasing or sourcing new biomass for the treatment as like the process commissioning of the WWTP;  
- Clear the Aeration Tank by tankers;  
- Start up the Aerobic process either by:  
  i. Feed a mixture of wastewater from the Anaerobic process and wastewater portion from the GTW to incubate activated sludge in the Aeration Tank for 1-2 weeks; or  
  ii. Bring in activated sludge from other wastewater treatment facilities for immediate start-up. |
| Process Failure | Process Failure | Process Failure | - Accept raw GTW until all the GTW storage tanks are full;  
- Inform the GTW collection company(ies) of GTW collection tankers that ASB will not receive the GTW;  
- Fix the problems as soon as possible;  
- Anaerobic process will be initiated by purchasing or sourcing new biomass for the treatment as like the process commissioning of the WWTP;  
- Clear the Aeration Tank by tankers;  
- Start up the Aerobic process either by:  
  i. Feed a mixture of wastewater from the Anaerobic process and wastewater portion from the GTW to incubate activated sludge in the Aeration Tank for 1-2 weeks; or  
  ii. Bring in activated sludge from other wastewater treatment facilities for immediate start-up. |