

**ECM Night 2023  
17<sup>th</sup> Nov 2023**



**Holistic ECM BMP – An integrated presentation on  
Planning, Implementation, Maintenance, and Innovation**

**by**

**Dr Chew S H, HDB, LTA, Or Kim Peow OKP Contractors,  
and Kay Lim Construction**

*A good and successful ECM is the  
responsibility of all stakeholders –*

*clients, contractors, QECPs, ECMO*

*regulatory agency..*

*and the whole ECM industry.*

Panel Member	Company/Org
Er. Dr Chew Soon Hoe	NUS/IES
Koh Jit Ming/ Lee Ven Chiat	HDB
Loo Hong En/ Chiong Yok Cheng, Darryl Ng	LTA
Chong Tse Yong	Kay Lim Construction
Jong Hua Kwan	Or Kim Peow Contractors

Supported by

Company	Full Name	Position Title
OKP	Or Toh Wat	Group Managing Director
OKP	Daniel Or	Executive Director
OKP	Kance Liong	Senior Project Manager
KayLim	Thomas Voon	General Manager
KayLim	Simon Sng	Project Director
KayLim	Adrian Liew	Project Director

We want to demonstrate the whole process of the ECM -- from planning (designing) to implementation, to maintenance and to removal..

**We want to demonstrate that in this whole process,  
the active participation of various stack-holders,  
active engagement and interaction between parties,  
preprofessional services of QECP and ECMO..  
are vital to the success of this process.**

➔ extra bonus – your active interaction also results in nice and meaningful

**INNOVATION** –

➔ Higher productivity, less chance of failure, and cleaner water!

Stack holders:                      What they want....

- Client – LTA or HDB -- Would like to see a safe and clean project, high productivity
- Contractor -- -- Fast, easy job, simple design
- QECF -- -- clean, and simple design, satisfy PUB requirement

## In the following four stages:

- 1. Re-installation stage or Design stage –**
  - good BMP and PUB submission (including all other agencies permits)
  - Properly ECM design that takes into account the actual construction process
  - ECM material purchased... etc
- 2. Installation Stage –**
  - correct installation at the right time at the right place (especially with multiple phases or multiply stages works, large site.. )
- 3. Maintenance Stage –**
  - Well maintenance over the entire construction periods.
  - Regular maintenance, plus maintenance after heavy storm etc.
  - innovation arising from the effort of the contractor to increase productivity
  - making use of IT.. Digital age now!
- 4. Removal Stage --**
  - Clean job completed!!



# ECMO NIGHT

## Technical Presentation

by



28 Oct 2023

**It is Our Duty to Keep the Water in the Waterways and Reservoirs Clean**



Photo from PUB Website

*Good ECM practices prevent silty runoff and keep our waterways beautiful.*



Photo from PUB Website

*Silty runoff will turn the waterways brown and unsightly.*

How to design and implement ECM practices at construction sites effectively  
to prevent silty discharge into public drains and waterways?



**(1) Before Commencement of Works**

- a) Engages Qualified Erosion Control Professional (QECP) to design and submit ECM plan
- b) Design and submission of ECM plan by QECP
  - Collaboration with Contractor's site team, Consultants and HDB
  - Contractor's input and design parameters
    - ❖ Existing site conditions
    - ❖ Project topography
    - ❖ Site utilization plan, e.g., locations of temporary site facilities, etc.
    - ❖ Underground services plans
    - ❖ Basement or underground structures, if any
    - ❖ Tower cranes layout plan
    - ❖ Phases of construction and schedules for completion
    - ❖ Stages of ECM implementation
    - ❖ etc
- c) Obtain Clearance Certificate from PUB to commence earthworks
- d) Implement QECP's endorsed ECM plan before commencement of works

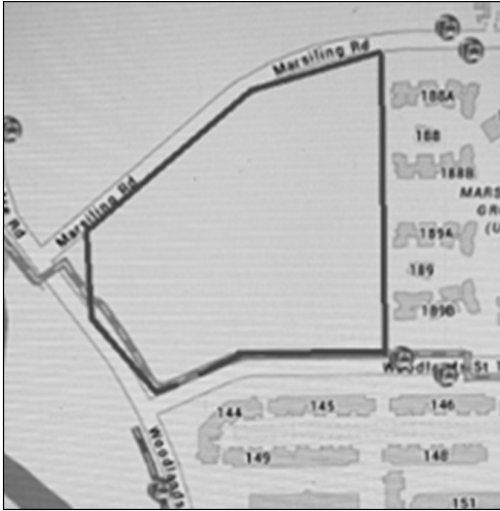
**2) During Construction Stage**

- a) Inspection, Monitoring and Maintenance
  - i. ECMO
    - Attained Certificate of Competency in ECM for Construction Site Personnel Course
    - Inspect, Monitor and maintain ECM
    - Inspect ECM daily to ensure compliances and effectiveness
    - Submit monthly ECM reports to QECP
  - ii. QECP
    - Visit and inspect ECM on site monthly to ensure compliances and effectiveness
- b) ECMO/QECP review and revise (if required) ECM Plan in tandem with Progress of Works at the following construction stages
  - i. Completion of piling and substructure works
  - ii. When building blocks reach super-structure stage
  - iii. External (service road) and landscaping (turfing and tree planting) stage

**3) Before Completion**

- Before ECM removal,
- a) Ensure that all works completed
  - b) Provide finishing surfaces (turfing, road surfaces, etc)
  - c) Obtain QECP's approval

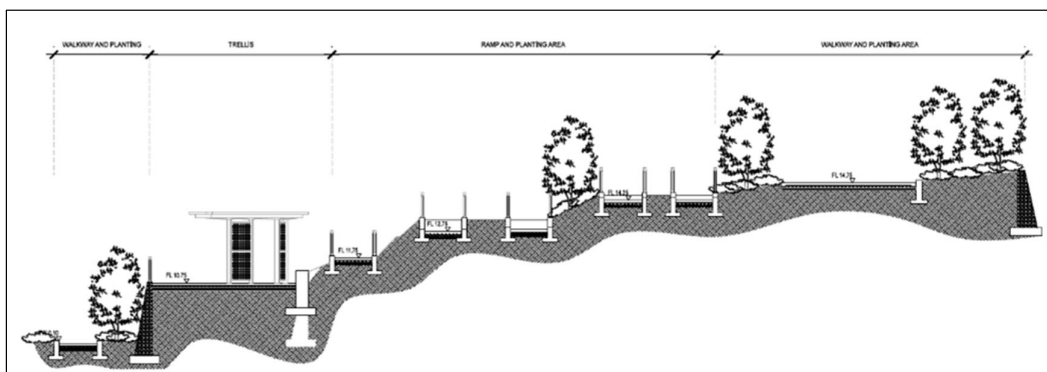
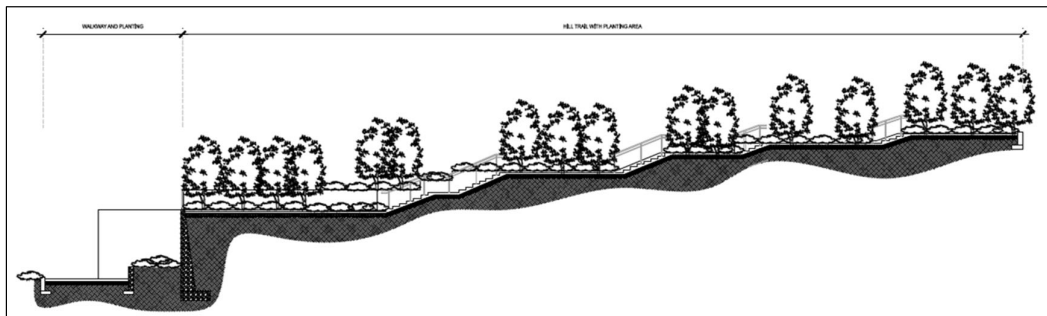
## Case Study: ECM At HDB BTO Project at Woodlands N1C23 & C24



### Site Information

- Sloping and undulating ground
  - The highest point is 9m above existing pedestrian footpath (lowest point)
- Site with various platforms (+9m, +6m, +3m)
- Next to existing residential flats
- Heavy human traffic at the surrounding footpath

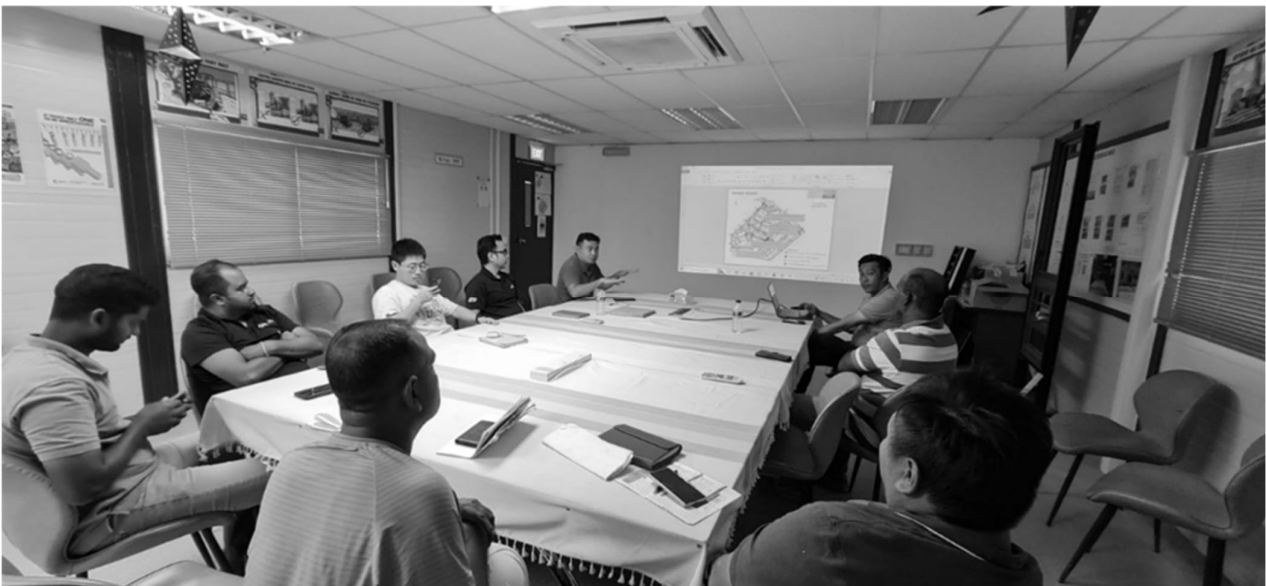
## Case Study: ECM At HDB BTO Project at Woodlands N1C23 & C24



Site with sloping and undulating ground – Challenging to design effective ECM

Question 1- With such a complex project at complex terrain, how would you make sure that QECP (who is the external party) can design and ECM plan that take into account your proposed construction method/sequence..  
... at various stages of works?

**Design of ECM plan – Close Collaboration Between QECP / Contractor**



Close collaboration between QECP, Contractor, Consultant and HDB

- QECP meet site staff (Project Manager, ECMO, Site Manager, etc.) to gather information and discuss ECM design and implementation methods

## Design of ECM plan – Contractor's Input

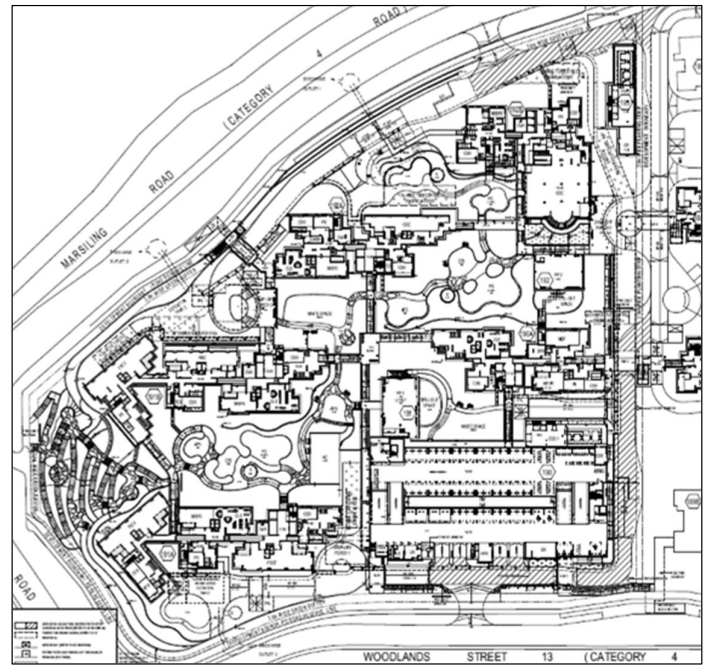


Existing Site Conditions

## Design of ECM plan – Contractor's Input

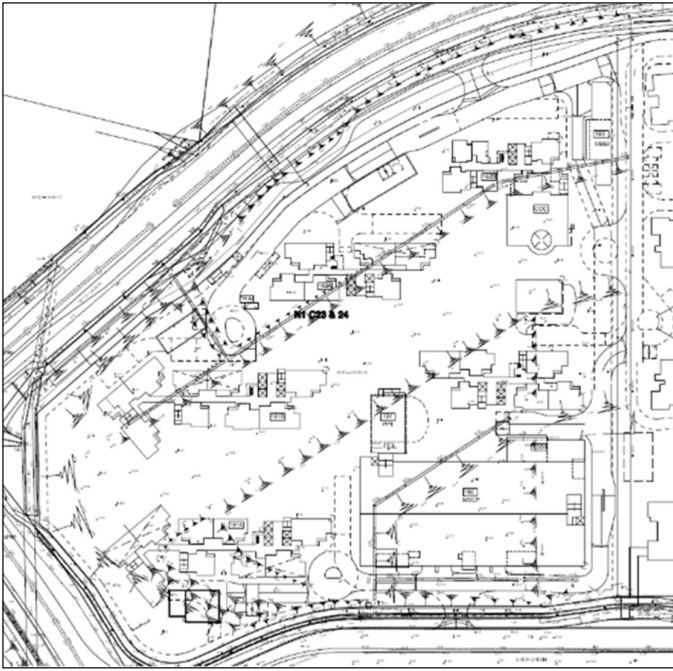


Site Topography

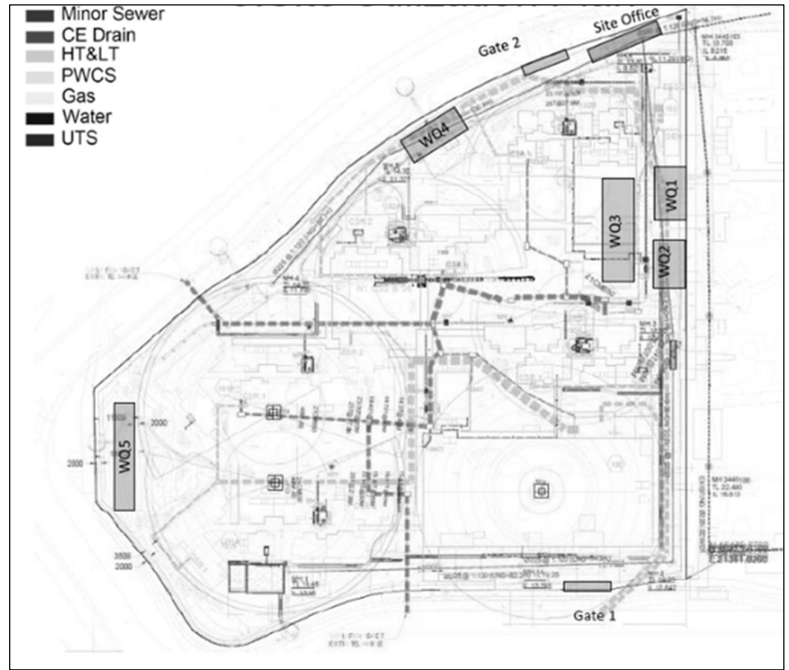


Site Layout Plan

## Design of ECM plan – Contractor's Input

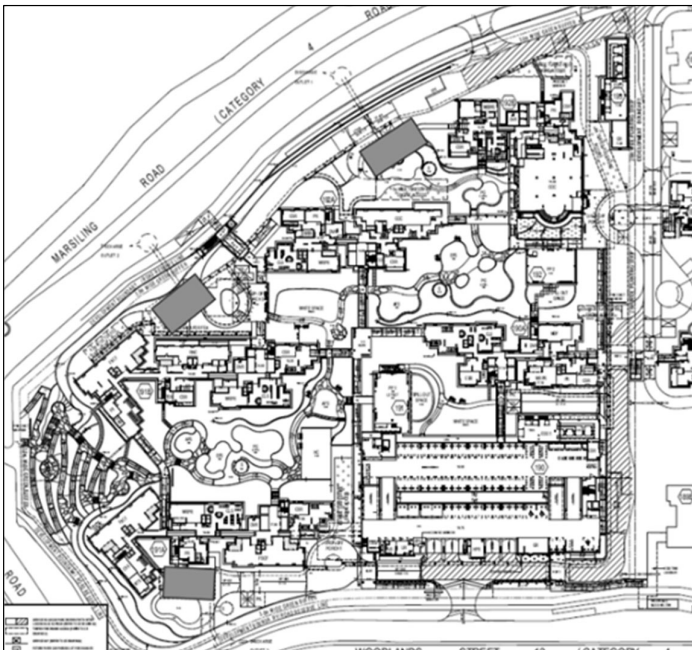


Superimposed Site Topo / Building Blocks

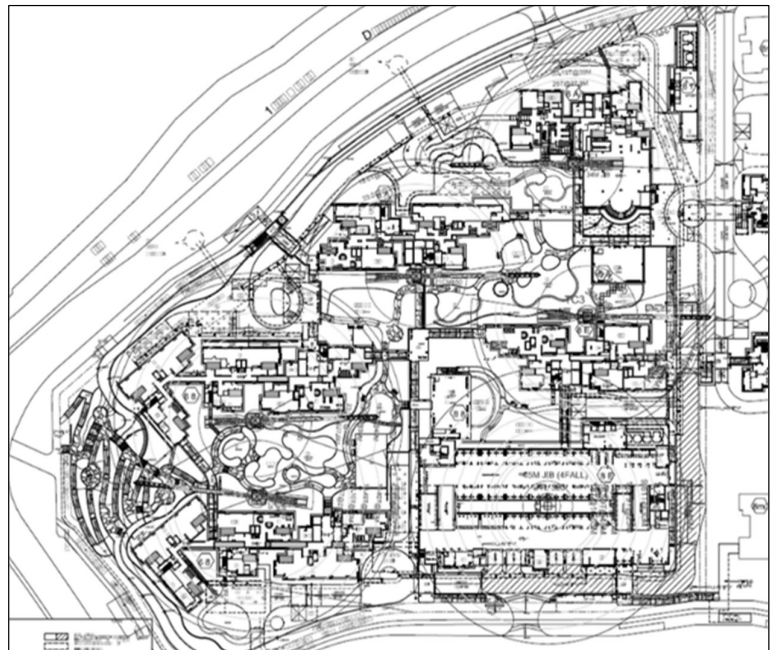


Underground Services Plan and Site Facilities

## Design of ECM plan – Contractor's Input

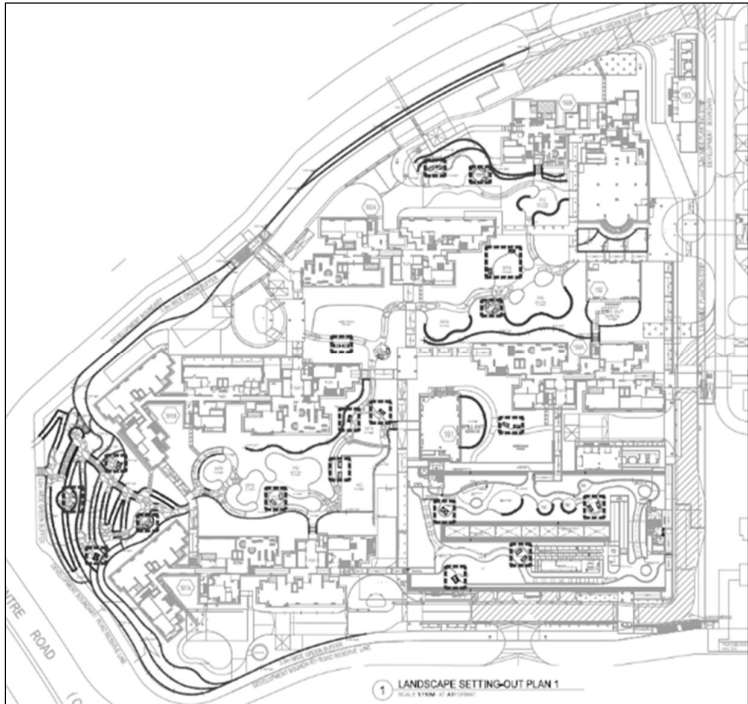


Locations of Detention Tanks

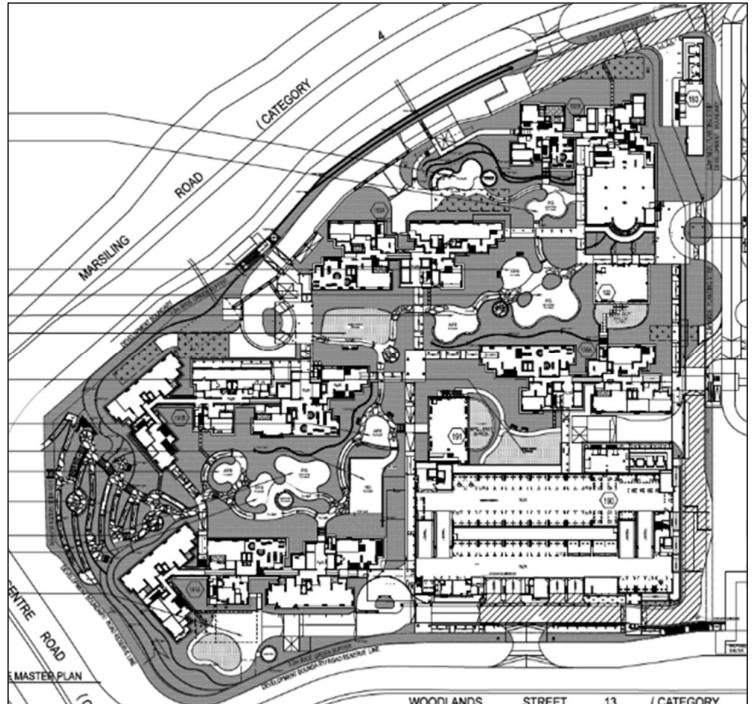


Locations of Tower Cranes

## Design of ECM plan – Contractor's Input



## Locations of Retaining Walls



### Locations of Service Road and Landscaping

### Design of ECM plan – Contractor's Input

[illegible]

## Master Construction Programme



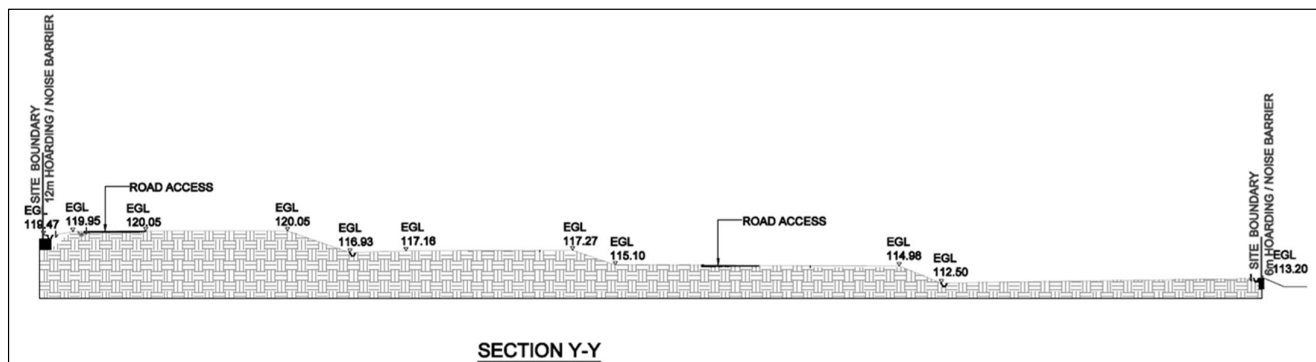


**Figure 10.1 Typical design of a silt trap**

(a) **TYPICAL PLAN OF SILT TRAP**  
Scale 1:50

(b) **SECTION A-A**  
Scale 1:20

(c) **SECTION C-C**  
Scale 1:20



**SECTION D-D**  
Scale 1:50

**SECTION K-K (LONGITUDINAL SECTION)**  
Scale 1:50



## Design of ECM plan – PUB Clearance Certificate

**PUB** SINGAPORE'S NATIONAL WATER AGENCY

Project Ref No. : CWTBFORM-000510  
 Submission No. : 20230201ECM-2402303  
 Cost No. : ECM-640230602402303  
 Date : 23/06/2023

Tel : 67313464  
 Email : aw\_kwong\_yew@pub.gov.sg

KAY LIM CONSTRUCTION AND TRADING PTE LTD  
 21 SENOKO SOUTH ROAD  
 Singapore 758079

Attn: Cheng Tze Yung

**APPROVAL TO COMMENCE WORKS  
 REQUIRING EARTH CONTROL MEASURES**

[Section 33(5) read with Section 26(3)(b) of the Sewerage and Drainage Act, Chapter 294]

**PART I - PARTICULARS OF APPLICATION**

1. Date of Application: 22/06/2023

2. Description of the proposed development in the application:  
 WOODLANDS NEIGHBOURHOOD 1 CONTRACT 23 & 24 - PROPOSED PUBLIC HOUSING DEVELOPMENT COMPRISING 5  
 BLOCKS OF 23/23/30/33/34 - STOREY RESIDENTIAL BUILDING (TOTAL 1,186 UNITS WITH MULTISTORY CAR PARK, ENS,  
 PRECINCT FAVELLPOIN, SOCIAL COMMUNAL FACILITIES & COMMUNAL ROOD GARDENS AT WOODLANDS STREET 13,  
 WOODLANDS CENTRE ROAD & MARSHING ROAD - MK13-MK20H ("Development")  
 - ECM FOR PILING WORKS FOR HOUSING DEVELOPMENT BLOCKS (AREA 1 AND AREA 2) ("Site")

**PART II - PARTICULARS OF CLEARANCE**

1. The Earth Control Measures (ECM) proposed for the Development is hereby registered with PUB. This Approval is issued under Section 33(5) of the  
 Sewerage and Drainage Act (Chapter 294) ("Act").

**PART III - NOTES**

1. You are required to:

- Implement the ECM in accordance with the ECM plan endorsed by a Qualified Earth Control Professional (QECP) and approved by PUB before  
 the commencement of any earthwork;
- Have a full-time qualified Earth Control Measures Officer to supervise the implementation, operation and maintenance of the ECM on the Site;
- Provide, operate and maintain a CCTV system in accordance with the requirements as stipulated in Annex A at all times, and ensure that (i) clear CCTV  
 images are recorded and maintained at all times, and (ii) CCTV is in good working condition at all times;
- If there are changes to the ECM at the Site as the work progresses, you shall engage a QECP to review and re-submit the ECM plan to PUB for  
 approval before implementing the proposed changes on site;
- Ensure that the treatment plant is of adequate capacity, is in good working condition, and connected to a power supply on the Site at all times and  
 ensure that the power supply is uninterrupted;
- Monitor the quality of discharge during the site water treatment process;
- Check that the ECM provided on the Site is effective during and after a rain event, having regard to clause 6.3.5 of the Code of Practice for Surface  
 Water Drainage and take immediate remedial action to stop any site water from flowing or seeping out into any public drain;
- Keep proper ECM operation and maintenance records and make available to PUB officers as and when required;
- Submit incident report for any site water discharge incident within 3 working days from the date of incident or such other period as required by PUB;
- Before the ECM are removed from the Site, you shall check and your QECP shall verify that all earthworks are completed and the Site is fully reinstated;
- Ensure that an ECM audit check shall be jointly carried out by you and your QECP within the following time period, whichever is earlier:
  - Within 6 months upon the start of the earthworks; or
  - Within a period that is one third of the project construction period specified in the application, counted from and including the start of the  
 earthworks.

Please use the audit form available at <https://www.pub.gov.sg/documents/ECM-Site-Audit-Form-June-2021.pdf>. The form shall be signed by the  
 contractor and QECP and submitted to PUB within 14 days upon completion of the audit, and

- Comply with all ECM requirements as stipulated in the Code of Practice for Surface Water Drainage.

2. Please take note that:

- The designated discharge point for the ECM serving the Site shall adhere to the drainage plan submitted by the QECP and approved by PUB;
- PUB's approval shall be obtained separately for any temporary or permanent works which affect the existing storm-water drainage system; and
- This approval does not relieve you from complying with other laws applicable to the works described in your application. Please seek the necessary  
 approvals from the relevant agencies accordingly.

3. Information on ECM is available at our website <https://www.pub.gov.sg/infocentre/earth-control-measures>. For any queries, removal of ECM, submission of  
 ECM audit check forms, please email to [pub\\_consult@pub.gov.sg](mailto:pub_consult@pub.gov.sg) or contact the undersigned at 87213464. Your attention is drawn to the Board's powers in  
 section 26 of the Act.

40 Seletar Road #02-01 Environment Building Singapore 238201  
 Website: [www.pub.gov.sg](https://www.pub.gov.sg)

**PUB** SINGAPORE'S NATIONAL WATER AGENCY

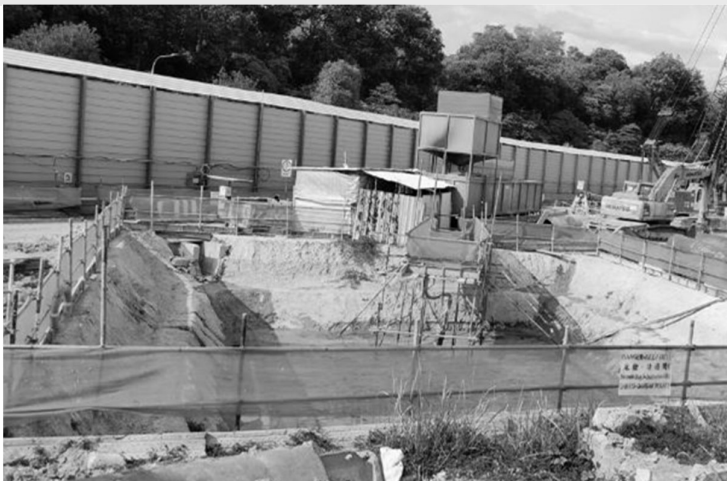
**AW KWONG YEW**  
 for DIRECTOR,  
 CATCHMENT & WATERWAYS DEPARTMENT  
 PUB, SINGAPORE NATIONAL WATER AGENCY

Cc: Developer/Owner  
 Housing AND Development Board (HDB)  
 480 LORONG 6 TOA PAYOH  
 HDB 18.13  
 Singapore 310480  
 Attn: Hany Yan Ling

Cc: QECP  
 CNG Consultants Pte Ltd  
 3791 Jalan Bukit Merah  
 10-23 E corner@Pachall  
 Singapore 159471  
 Attn: KHOO TENG HAI

Cc: QP  
 Sarbania Juring Consultants Pte Ltd  
 168 JALAN BUKIT MERAH  
 #01-01 CONNECTION ONE  
 Singapore 150168  
 Attn: Cheng Su Mei

## ECM – Site Implementations



ECM Plant



ECM Holding Pond



## ECM – Site Implementations



C7 Perimeter Drains

## ECM – Site Implementations



C7 Perimeter Drains



Seal Up Site Hoarding Base To Prevent Water Seepage To External Public Footpath

## Question 2-

How can ECMO and QECP be actively involved during the maintenance stage?

## ECMO – Certificate of Competency

Cert No: R318619





**PUB** SINGAPORE  
WATER  
ACADEMY

### Certificate of Competency

#### In Earth Control Measures (ECM) For Construction Site Personnel

**Test Result Slip**

Test Date : 26 May 2023

Name: PICHAI PILLAI PERIYASAMY  
(NRIC No. 315L)

Result: **P**


Organised By:  
The Institution Of Engineers, Singapore

Supported By:  
PUB, the national water agency

  
Mr. Mervyn Sirisena  
Vice President, Professional Development  
The Institution of Engineers, Singapore

  
Mr. Yeo Keng Soon  
Director Catchment & Waterways  
PUB

### Earth Control Measures (ECM)



ECM Officer No  
**1825**

Valid From  
**07/23**

Good Thru  
**06/25**

### Pichai Pillai Periyasamy

This card is the property of IES and is non-transferable. It must be returned to IES upon termination of membership.

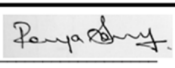
If found, kindly return to:

The Institution of Engineers, Singapore  
79 Bukit Tinggi Road  
Singapore 289758

Tel: (65) 6469 5000  
Fax: (65) 6467 1108  
Email: [ecmo@iesnet.org.sg](mailto:ecmo@iesnet.org.sg)

## ECM – Monitoring and Maintenance

KAY LIM CONSTRUCTION & TRADING PTE LTD								
(DAILY) ECM Treatment Plant Inspection Checklist								
Project: Woodlands N1C23 & C24			Date: 22/10/23 TO 28/10/23			Location: ECM - 1,2		
S/N	Item	Report of Checking						Remarks
		Mon	Tue	Wed	Thu	Fri	Sat	
1	Outer part of the tank free from crack or leakage	YES	YES					
2	The inlet pipe in good condition	YES	YES					
3	The outlet pipe free from damage or chockage	YES	YES					
4	The optimum chemical level found in the Liquid Chemical-1 AN-20 tank	YES	YES					
5	The optimum chemical level found in the Liquid Chemical -2 1020 tank	YES	YES					
6	Clean water tap is open and the clean water flows inside	YES	YES					
7	ECM Machine Ladder is in good condition	YES	YES					
8	Guard rail free of damage and in good in condition	YES	YES					
9	Hinged access in good condition	YES	YES					
10	Main switch control panel is ON	YES	YES					
11	Chemical pump switch is ON	YES	YES					
12	Chemical dosing pump is working	YES	YES					
13	Emergency switch is working	YES	YES					
14	Discharge water outlet is in good condition	YES	YES					
15	No excessive noise generated from the machine	YES	YES					
16	Equipment and machinery properly maintained (record checked)	YES	YES					
17	Sedimentation removal is maintained	YES	YES					
18	C7 Drain free from mud and silt	YES	YES					
19	Silt fence is in good condition	YES	YES					
20	TSS and CCTV is in good working condition	YES	YES					

Inspected by: 

Periyasamy (ECO/ECMO)

✓ = Satisfactory/Yes    x = Unsatisfactory/No    NA = Not applicavle

ECMO Daily  
Inspection  
Checklist

## ECM – Monitoring and Maintenance

TPM-F201-10C (Rev D - 01-07-2018)  
Page 1 of 1

**KAY LIM CONSTRUCTION & TRADING PTE LTD/  
JIA YI CONSTRUCTION PTE LTD**

**INSPECTION OF EROSION CONTROL MEASURES**

Date of Inspection: 21-09-2023  
Name of Inspecting Officer: Mr. Gary Khoo Teng Hui  
Appointment: QCEP  
Date & Time of Site Visit: 21-09-2023 Morning  
Weather Condition: Cloudy weather

Project Title: Woodlands NIC25 & C24  
Location of Site: Woodlands Street 13, Marsiling road & woodlands centre road  
Project Duration: 48 months  
Type of Present Construction Activity: Piling  
PUB Permit Number: FCM4/2023/000748/2/MS3  
Owner / Developer: HDB  
QP for Project: Mr. Edwin ONG Beng Koon  
QCEP for ECM: Mr. Gary Khoo Teng Hui  
ECOP: Mr. Pichapillai Periyasamy  
Owner / Developer's Representative on-site: Mr. Pichapillai Periyasamy

S/N	BEST MANAGEMENT PRACTICES	INSPECTION	COMPLIANCE	ACTIONS
1	Construction Sequence & Scheduling	Timing of construction areas carried out in phases?	Yes (Y) / No (N) / NA	
2	Stockpiles of Earth Materials	Stockpile location according to ECM plan?	Yes (Y) / No (N) / NA	
3	Stabilisation through laying of mulch, lean concrete, tarring, etc.	Location according to ECM schedule? Construction according to ECM details? Any signs of damage at lean concrete areas? Any signs of damage at mulched waste areas?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA	
4	Stockpiles of Earth Materials	Stockpile location according to ECM plan? Protected against erosion? Protected against sedimentation?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA	
5	Silt Traps	Installation of silt traps including location according to ECM schedule? Installation of silt traps according to ECM plan including no. & size?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA	
6	Sedimentation Basins / Storage Ponds	Installation of basins / ponds including location according to ECM schedule? Installation of basins / ponds according to ECM plan including no. & size? Concentration of TSS in effluent outlet of discharge < 50mg/l? Sediment flow to within 500mm of water discharge level of outlet structure? Sedimentation basins enter / outlet channel? Protected against sedimentation?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA	
7	Treatment Units / Pollutant Breakers	Treatment units in operation?	Yes (Y) / No (N) / NA	

**DATE OF ECM PLAN:**  
22-08-2023  
**Last Date of ECM Plan Review:**  
23-08-2023

**ADDITIONAL INFORMATION**  
Date & Time of Previous Site Visit: 21-09-2023  
Date of Last Inspection Report: 21-09-2023  
Issues Identified in Previous Site Visit: NIL

This site inspection was conducted by:  
QP / QCEP: Mr. Gary Khoo Teng Hui  
Signature: [Signature]  
Date: 26-09-2023  
Contractor: Kay Lim Construction & Trading Pte Ltd  
Signature: [Signature]  
Date: [Signature]

**Owner/Developer: HDB**  
Signature: [Signature]  
Date: [Signature]

**Note:**  
Earth Control Measures is for the treatment of silty water due to rain water. Construction wastewater (slurry, bottom, etc) due to tamping, boring, etc shall be separately treated.

8	Perimeter cut-off drains	Installation of cut-off drains including location according to ECM schedule? Installation of cut-off drains according to ECM plan including lengths? Cut-off drain tested? Any signs of inadequate capacity? (flooding) Any obstruction / sediment? Any signs of damage?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA
9	Whorled wash areas, entry/exit points	Location according to ECM plan? Construction according to details? Any signs of damage? Run-off from whorled wash areas and overflow / discharge channelled to suitable areas for proper treatment? Any signs of silty water from these areas into public drains (drains / roads / etc)?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA
10	Others	Any areas without adequate ECM? Public drains at discharge points silted? Public drains in vicinity of site silted / obstructed? Run-off from site not channelled through all fences / cut-off drains / silt traps? Any discharge of water into public drains? Earth surfaces / slopes adjacent to any drain not turfed, paved or covered?	Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA Yes (Y) / No (N) / NA

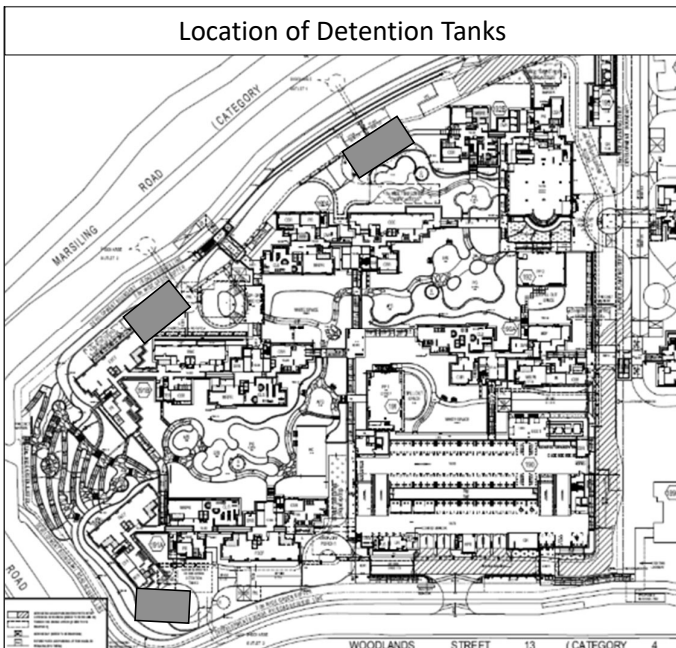
Any other observations / comments:  
No sign of silty water discharge during the inspection.  
Contractor also required to adhere to ECM plan and ensure discharge to be less than 50ppm.

Issue Date: 01-02-2018  
Page 1  
Revision: D

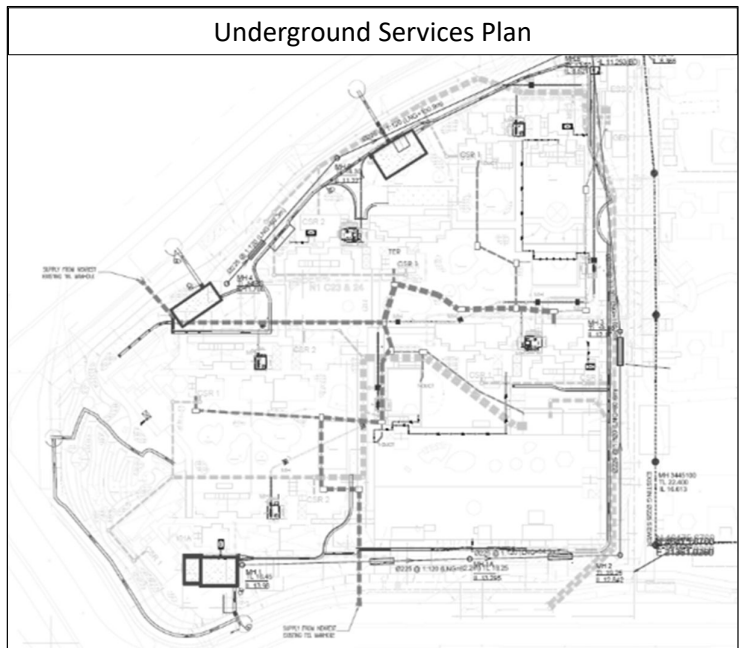
## QCEP Monthly Inspection Checklist

## ECM – Review In Tandem With Progress of Work

Location of Detention Tanks



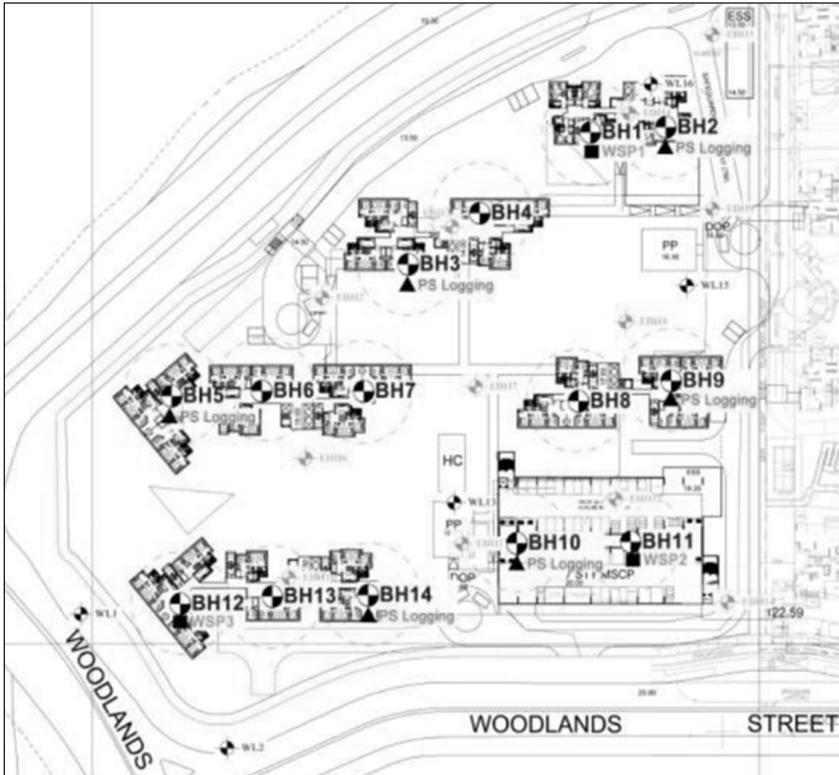
Underground Services Plan



ECMO/QCEP to review ECM plan and revise (if required) when,

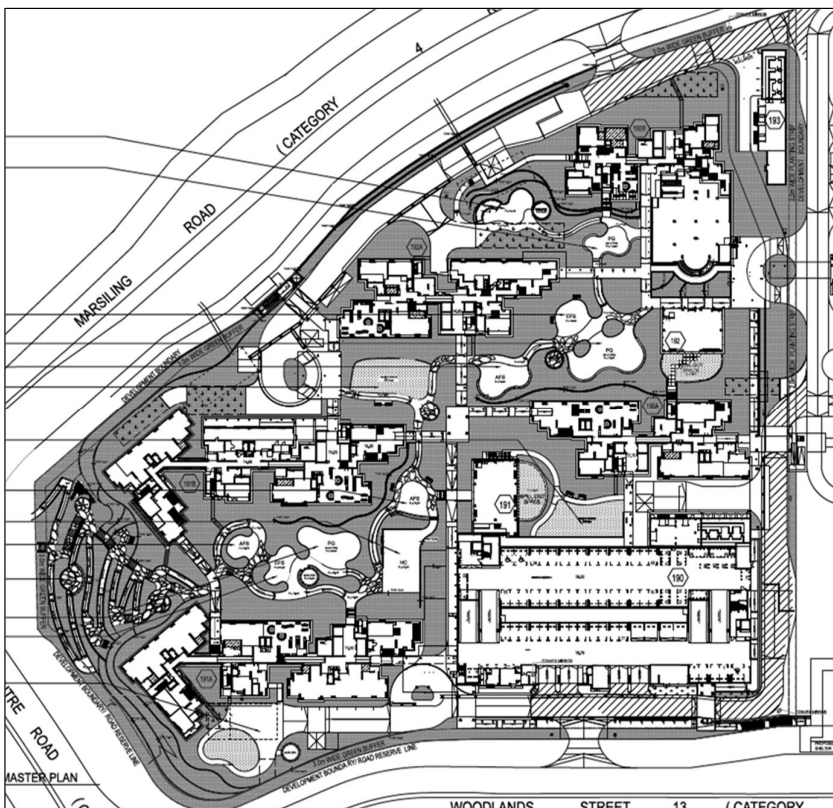
- Detention Tanks completed and are able to be used as holding ponds
- All the underground services completed and backfilled

## ECM – Review In Tandem With Progress of Work



- ECMO/QECP to review ECM plan and revise (if required) when residential blocks and MSCP are in super-structure stage, where the temporary site vehicular access are concreted and the surface runoff are clean and not muddy.

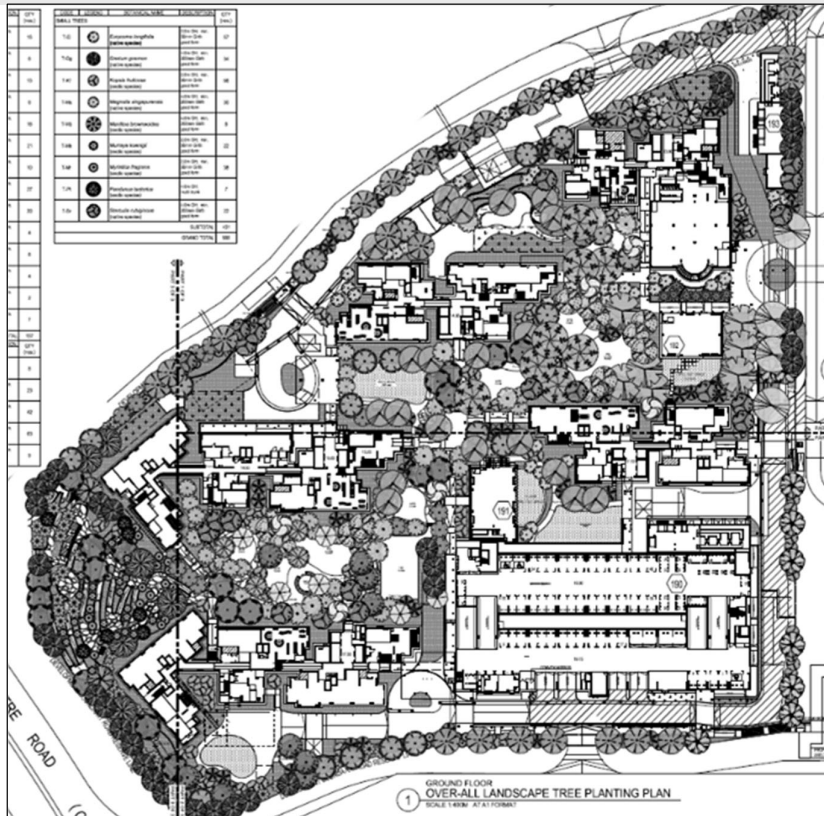
## ECM – Review In Tandem With Progress of Work



- ECMO/QECP to review ECM plan and revise (if required) when 50% of the service road and landscaping (turf, shrubs and trees) are completed



## ECM – To Remove After All Works Completed



- Before ECM removal,
- Ensure that all works completed
  - Provide finishing surfaces (turfing, road surfaces)
  - Obtain QECP's approval

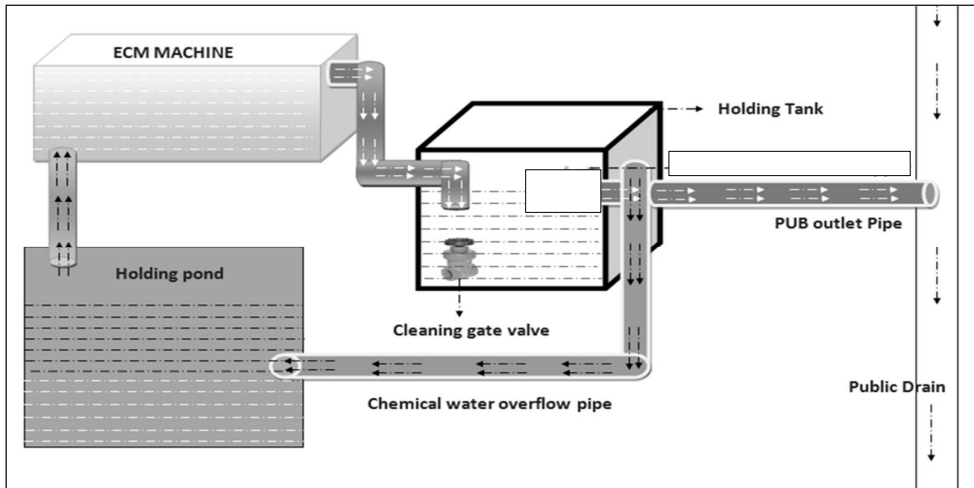
## Question 3-

Invite company sensor management (Mr Simon Ang) to comment on  
 “What did your company do to make the ECM more professional and more productive”?

## ECM Innovation – The Conceptualization of Smart Silt Stopper



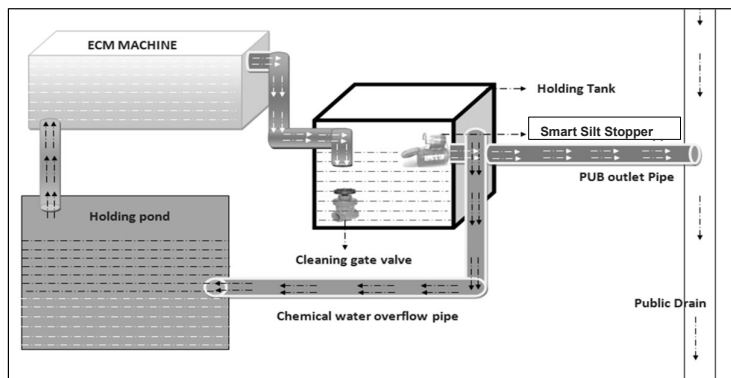
Traditional ECM Work Flow



In the Traditional ECM holding tank,

- When the Total Suspended Solid (TSS) of the treated water exceed 50mg/l, the ECM sensor in the holding tank will notify the registered staff via SMS
- The registered staff will then go to the ECM holding tank to close the outlet pipe and the silty water will flow back to the holding pond to be treated again, thus, preventing silty water from discharging to the public drain
- It can take 10 to 15min to close the outlet pipe depending on the location of the staff at that moment. During this period, silty water will continue to enter the public drain.
- Consequently, contractor will get fine for non-compliances

## ECM Innovation – The Conceptualization of Smart Silt Stopper



ECM Work Flow



Smart Silt Stopper



Mobile App

To prevent the silty discharge to public drain,

- ✓ Kay Lim's ECM team conceptualize the idea of instantly and remotely closing the outlet pipe in the holding tank using mobile app, upon receiving alert message from the ECM sensor
- ✓ The remote closing of the outlet pipe can be done anywhere, even if the registered staff is on leave overseas.
- ✓ In this innovative application, when the TSS of the treated water in the holding tank exceed 50mg/l, the ECM sensor will notify registered staff via SMS. The registered staff will then instantly activate the Smart Silt Stopper by using the mobile app from any location, thus preventing silty water from discharging into public drain



### **Advantages of using Smart Silt Stopper**

- 1) Simple to install and apply
- 2) Instantly (less than 5 seconds) stop the silty water from discharging to public drain
- 3) Increase Productivity
- 4) Low cost to implement (Around \$200 per set)
- 5) Easy to install
- 6) Minimum maintenance required

## Summary

### **Effective ECM Measures At Construction Sites**

- 1) ECM Design
  - Close collaboration between QECP, Contractor's site team, Consultants and HDB
  - Design needs to be thorough and complete, taking into consideration contractor's site facilities, sequence and schedules of construction works, etc.
- 2) ECM Site Implementation
  - Adhere to QECP endorsed and PUB approved ECM plan
  - Constantly review and revise (if necessary) ECM plan (by ECMO/QECP), in tandem with progress of works on site
- 3) ECM Monitoring and Maintenance
  - ECMO to inspect daily for ECM compliances and effectiveness
  - QECP to inspect regularly (monthly) for ECM compliances and effectiveness
- 4) Before remove ECM
  - Ensure that all works on site are completed
  - Obtain QECP's approval

Thank You

Talking about innovation –

I think OKP also have an innovative idea to share..



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OR KIM PEOW CONTRACTORS (PTE) LTD  
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## SMART ECM SYSTEM



## Innovation



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### Background:



For larger project sites, multiple ECM treatment systems are provided and require workers to manually activate the systems in the event of rain.

There are many instances, workers may not activate the systems in time, resulting in overflow of silty water from the holding pond.

Workers are required to remain on standby at the ECM treatment plant when system is in operation. Workers may make procedural mistakes when they are under pressure in times of emergency.

Faulty ECM treatment system can lead to silty water discharge into public drains.

## Innovation

## Typical ECM Set Up

Collaboration with LTA, OKP and technical consultant in overcoming the challenges.

### Challenges:

### Manpower Dependence

- ☞ Workers must be present on site to turn on generator manually.
- ☞ Workers need to monitor at sampling tank to ensure quality of treated water is maintained.

### Off Peak Hours

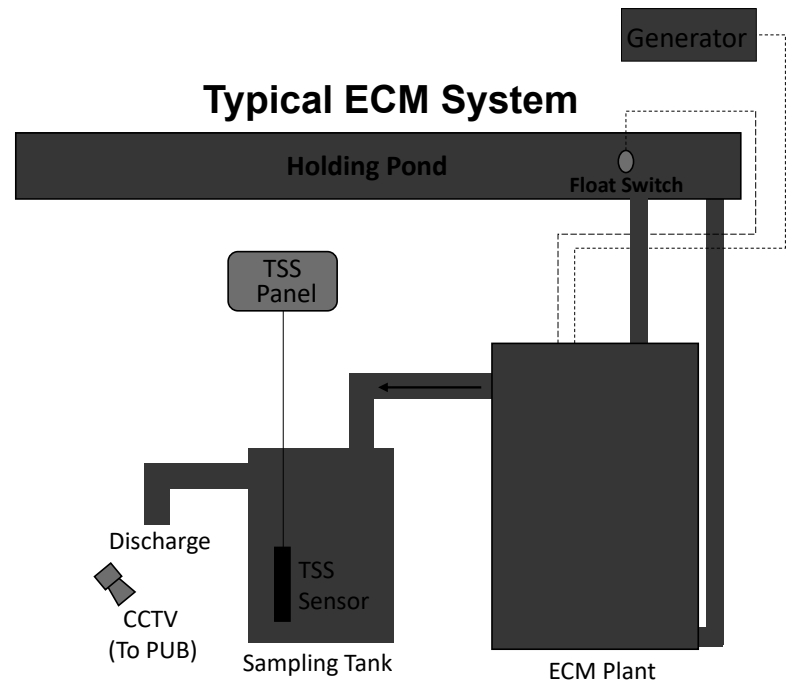
- Workers might not be on site to turn on ECM in time result in silty water discharge.**

### Safety Aspect

- ❖ Workers exposed to adverse weather conditions such as lightning.
- ❖ Workers need to operate ECM in wet and slippery workplace.

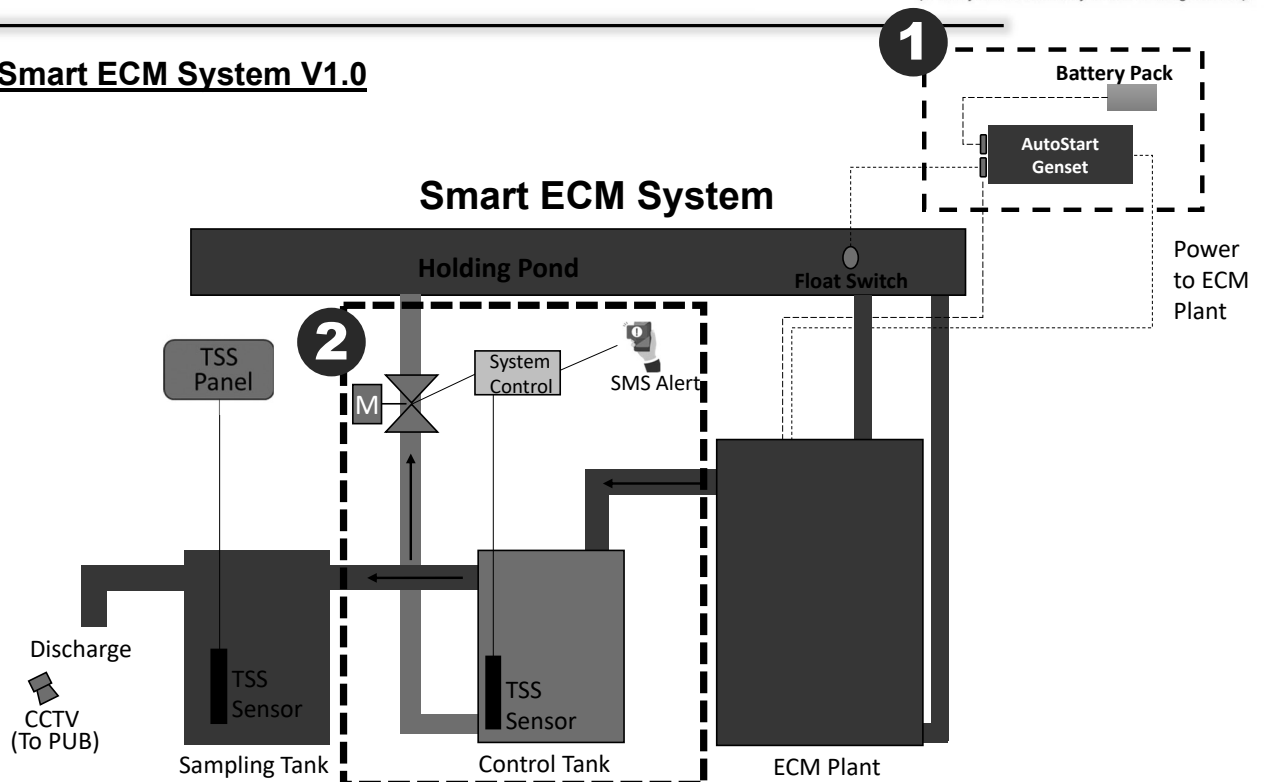
### Fuel Wastage

- ❗ Diesel generator continues running after water treatment completed unless workers intervene.



## Innovation

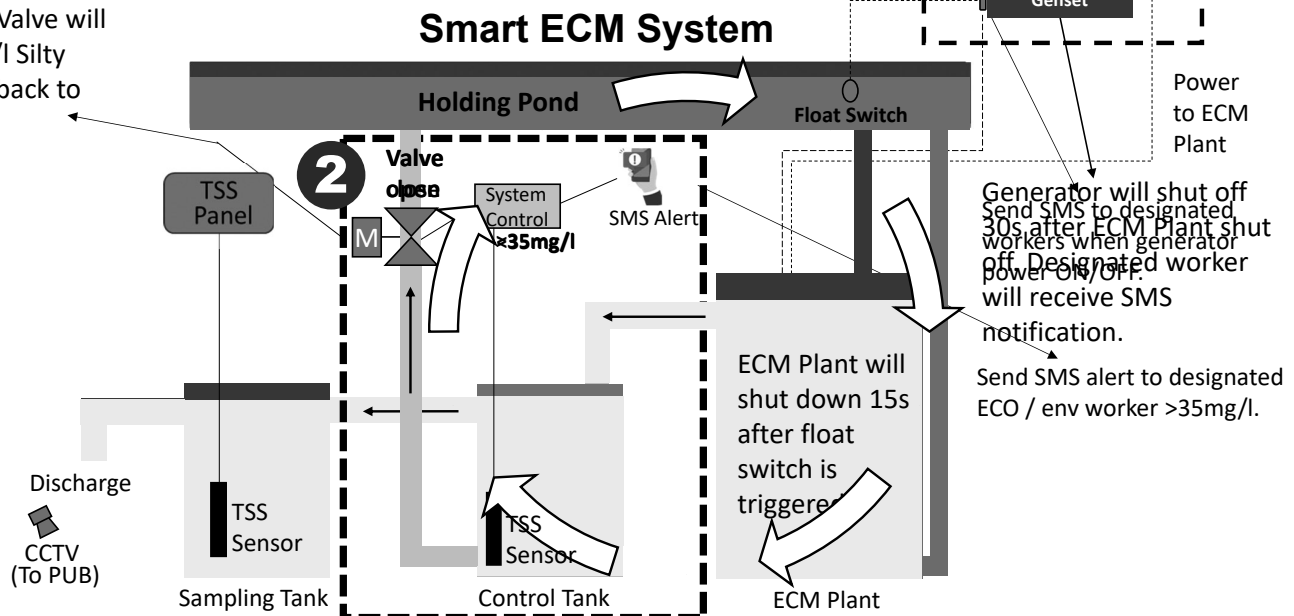
## Our Solution – Smart ECM System V1.0



## Innovation

## Our Solution – Smart ECM System V1.0

Motorised Control Valve will open if TSS >35mg/l Silty water will channel back to holding pond.



## Innovation

## Physical set up of Smart ECM System Version 1.0

## 1 AutoStart Generator

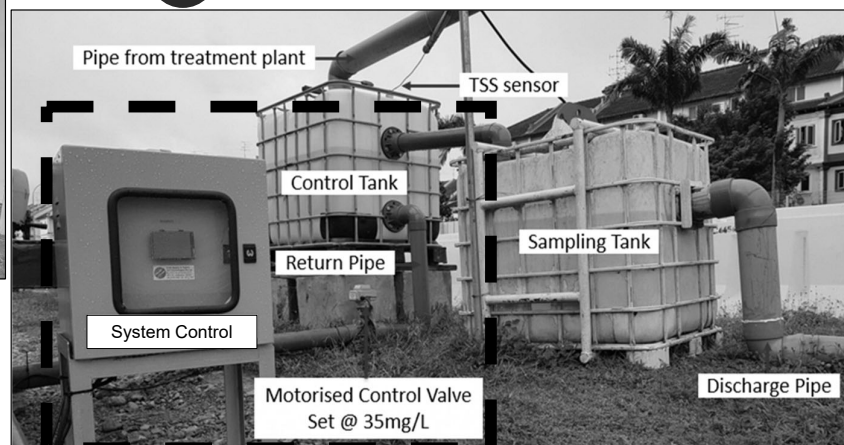


➡ AutoStart Kit



## Battery Pack

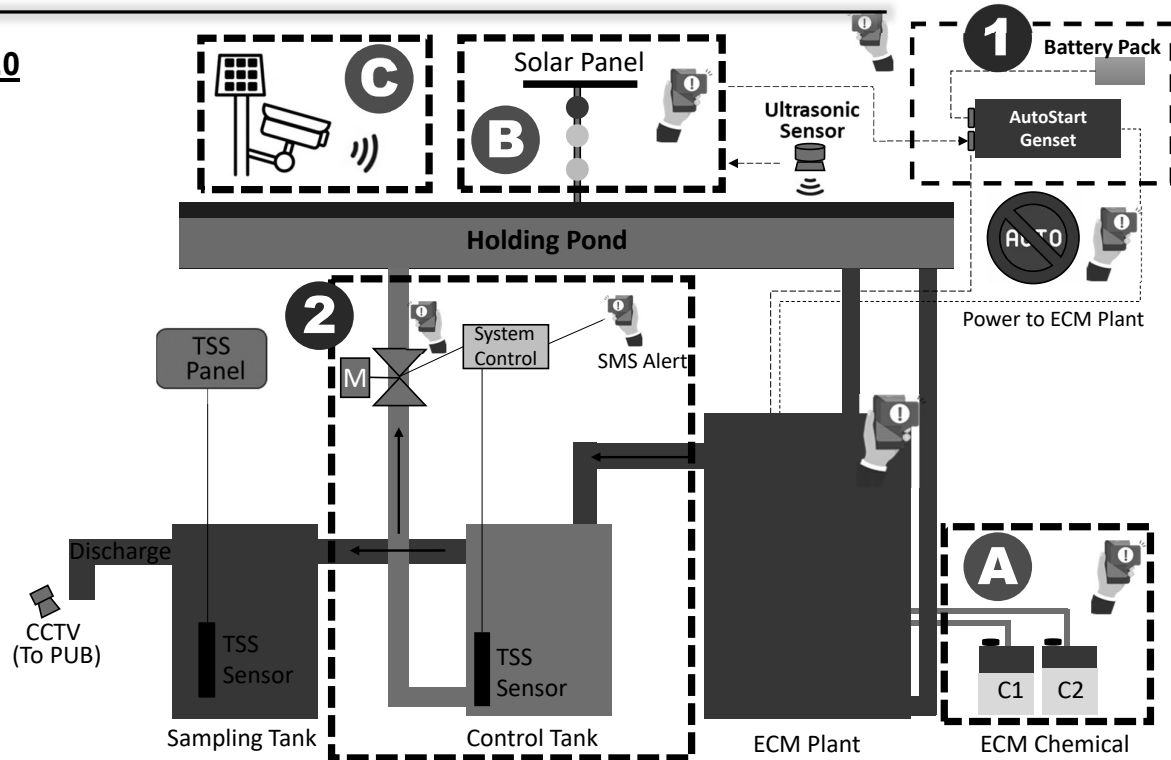
## 2 Additions to ECM Plant



### System Control, Control Tank & Motorised Control Valve



## Smart ECM System V2.0



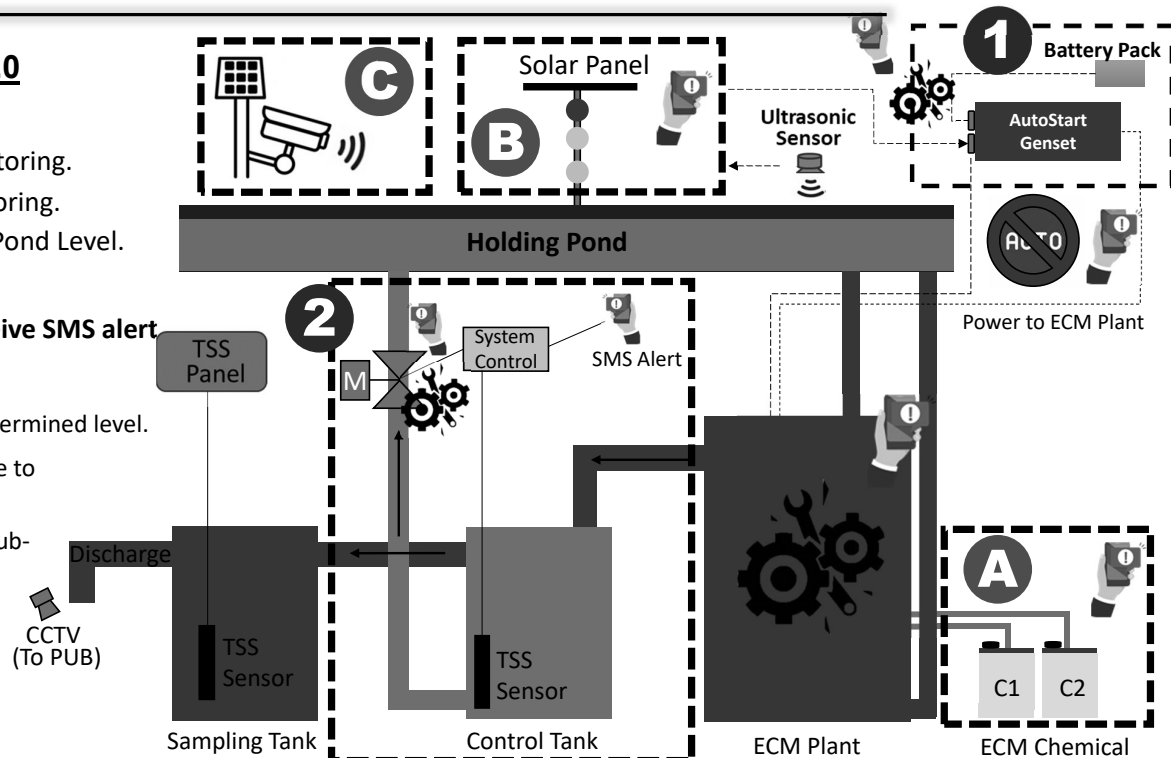
## Smart ECM System V2.0

### Added Functions

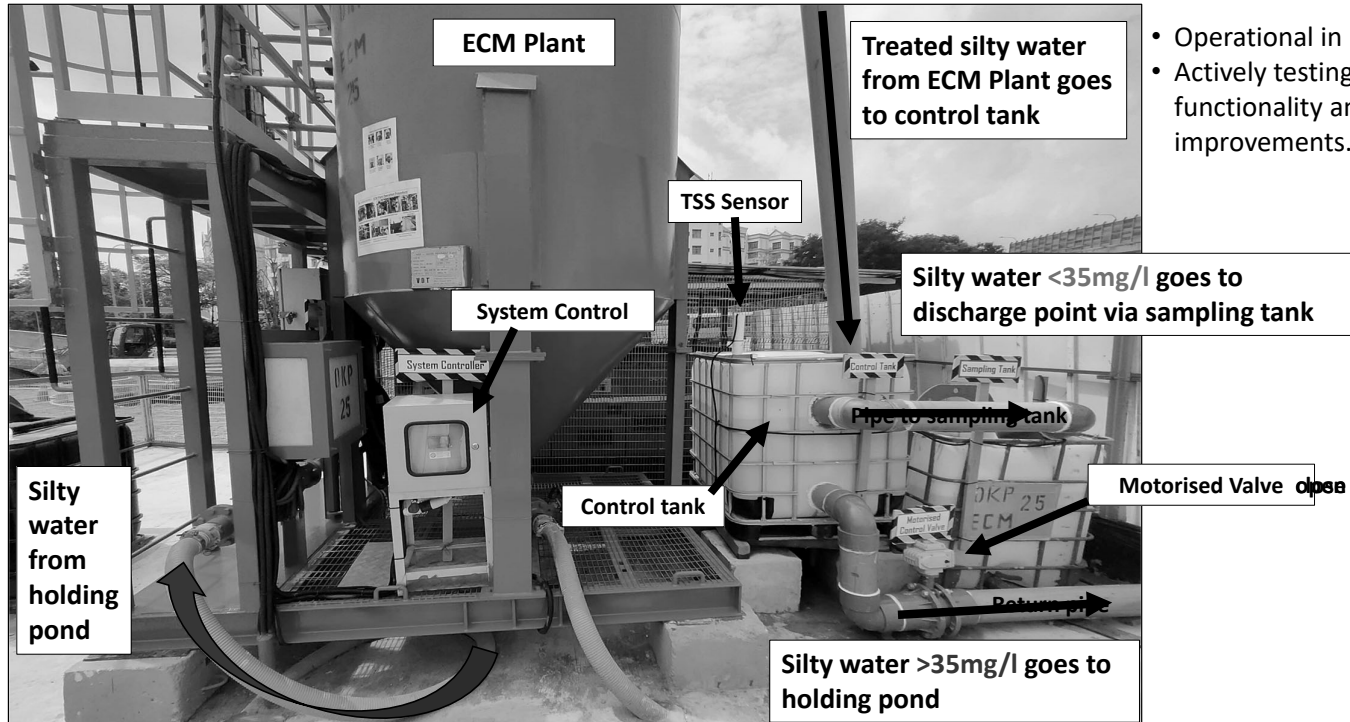
- A. ECM Chemical Level Monitoring.
- B. Holding Pond Level Monitoring.
- C. CCTV to Monitor Holding Pond Level.
- d. Alerts function.

**Designated workers will receive SMS alert in the event of:**

- ☞ Chemical level drop to predetermined level.
- ☞ Water in the holding pond rise to predetermined level.
- ☞ AutoStart generator and/or sub-pump fail to start.
- ☞ ECM plant fail to start.
- ☞ Auto mode function disable.
- ☞ Control Valve Malfunction.

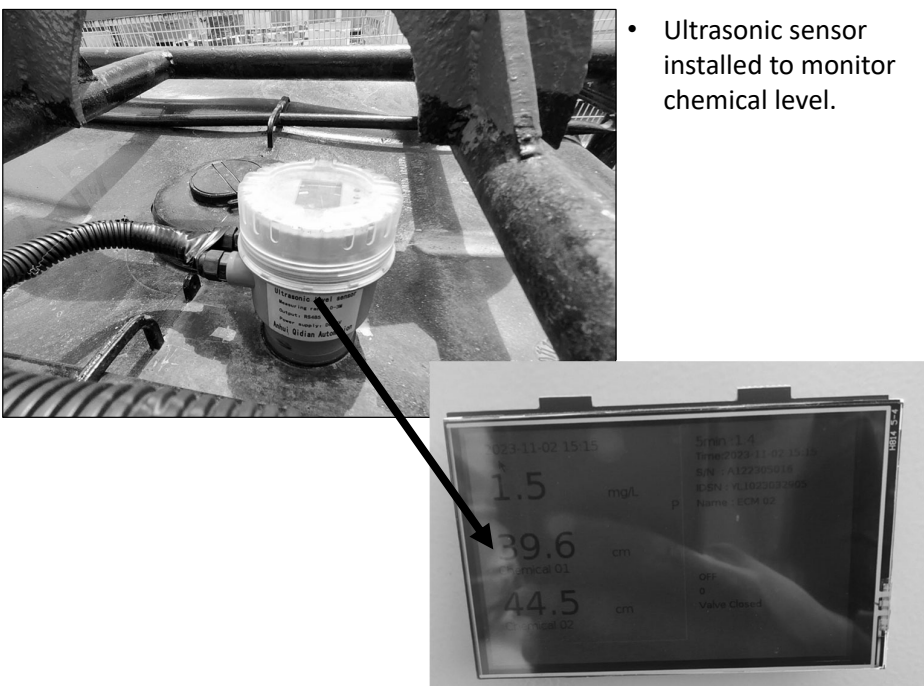


## Physical set up of Smart ECM System Version 2.0



- Operational in LTA DE143 Site.
- Actively testing for system functionality and further improvements.

## Physical set up of Smart ECM System Version 2.0



- Motorised Control Valve to direct silty water back to holding pond.

## Physical set up of Smart ECM System Version 2.0



- Solar powered camera for remote monitoring.
- Revolving lights to indicate genset running.
- Ultrasonic sensor to detect water level in holding pond.



- Solar-powered lights indicator for holding pond water level monitoring.

## Advantages compared to traditional setup

- Motorised control valve ensures that silty water will not be discharged to the public drain.
- Efficient and effective manpower management
  - Workers do not need to be physically present to activate the ECM treatment system.
  - Workers do not need to remain on standby at the ECM treatment plant when it is in operation.
  - Workers will have more time to respond to rain events and identify and rectify the cause of silty water when there are equipment failure.





# THANK YOU



*Invite LTA to comment on ...—*

*-- What are the “drive” and “push” for such innovation?*

Thank you...