

# Enhancing Construction Safety via a **Safety Digital Twin**

## - Centralized Management Platform

Contract No. DC/2018/03

Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To

**Presented by**

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# Agenda

Background

Development of Safety Digital Twin

Continuous Development Roadmap

DSD Commitment for Safety

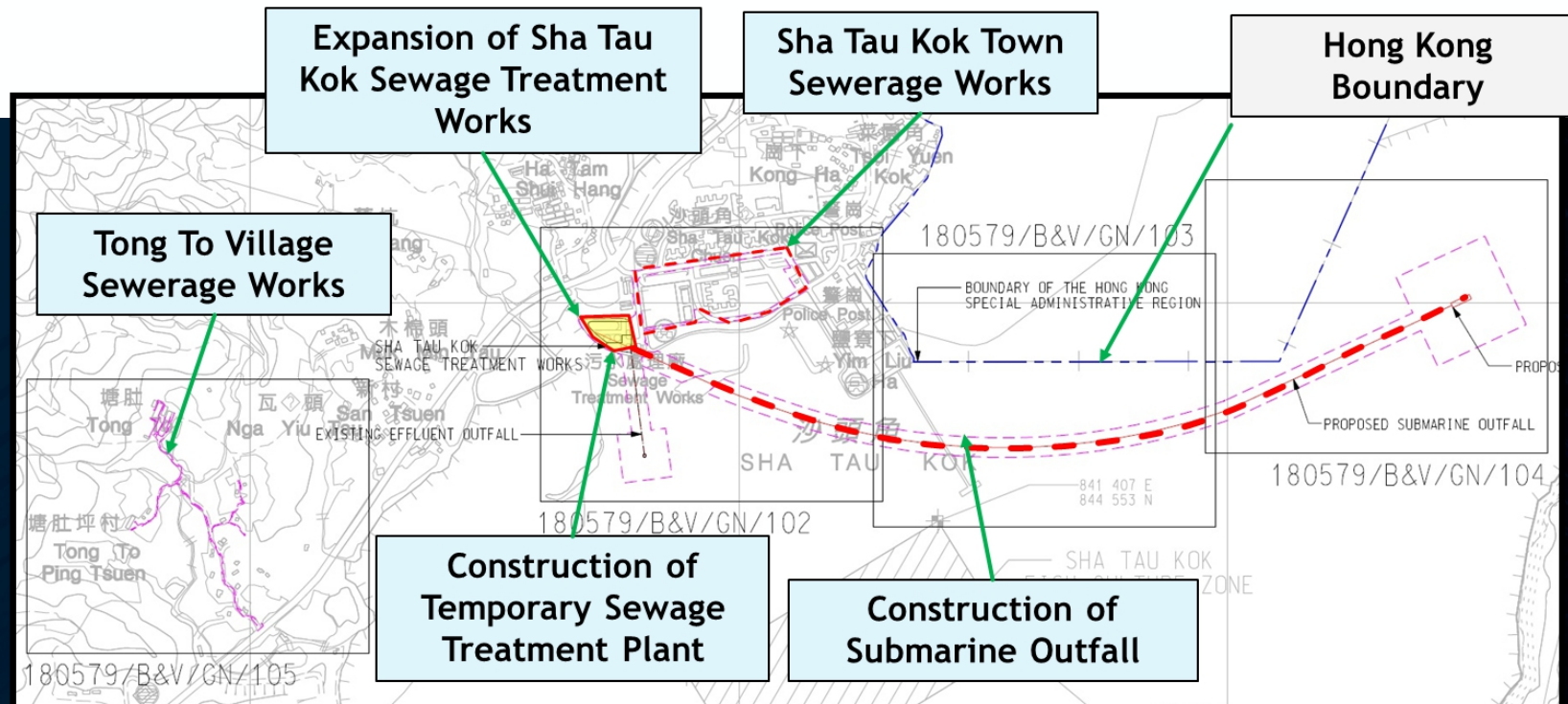




# Background Contract



Existing Sha Tau Kok Sewage Treatment Works



DC/2018/03	Expansion of Sha Tau Kok Sewage Treatment Works Phase 1 and Village Sewerage in Tong To
Employer	Drainage Services Department
Consultants	Binnies Hong Kong Limited
Contractor	Build King – Kum Shing Joint Venture
Forecast Tendered total of the Prices	\$1,123 Million
Starting Date	21 November 2018
Anticipated Completion Date	Q1 2025
NEC3 Option	ECC Option C



Future Sha Tau Kok Sewage Treatment Works





# Background Project Highlights

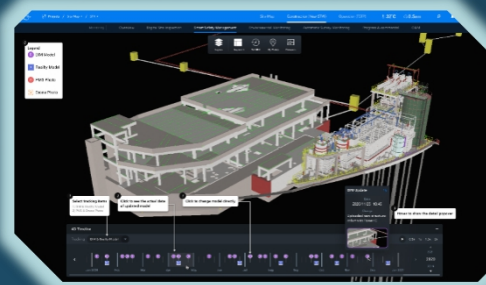
## Multi-disciplinary

- Civil Works
  - Foundation, ELS, Structures, Roads and Drainage, Sewers, Outfall
- E&M Works
  - Treatment equipment, building services



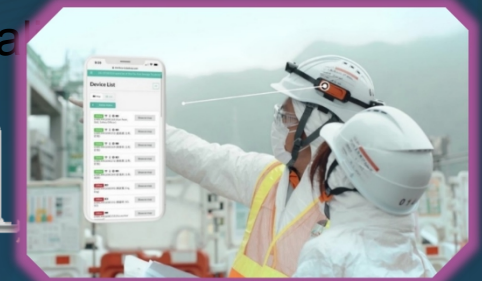
## Multi-stage

- Design, construction, operation and demolition of temporary plant
- Construction of new plant during operation of temporary plant



## Construction 2.0

- BIM
- Digital Works Supervision System (DWSS)
- Sensory technologies
- Artificial Intelligence
- Common Data Environment







# Background

## Construction 2.0 Technology Adoption



**Jan 19**  
R&D &  
Implementation of  
DWSS Mobile  
Application

Contract  
Commencement

**Nov 18**

**Mar 19**  
Construction of  
MiC Site Office



**Dec 19**  
Adoption of  
Survey Sensor

**Aug 19**  
Trial Adoption of  
Smart Helmet



**Oct 20**  
Adoption of  
Smart Helmet 2.0

**Jul - Aug 20**  
Adoption of AI Video Analytic &  
VR for Safety Training



**Nov 20**  
Launching of Centralized  
Management Platform



**2021**  
Continuous  
Enhancement of  
CMP with Digital  
Twin Technologies



# Development of Safety Digital Twin Construction 2.0 Technology Adoption

## Opportunity

Vast & various data

Multiple sensors & systems for real-time monitoring

## Solution

Safety Digital Twin –  
Centralized Management Platform



Accessible Anywhere & Anytime

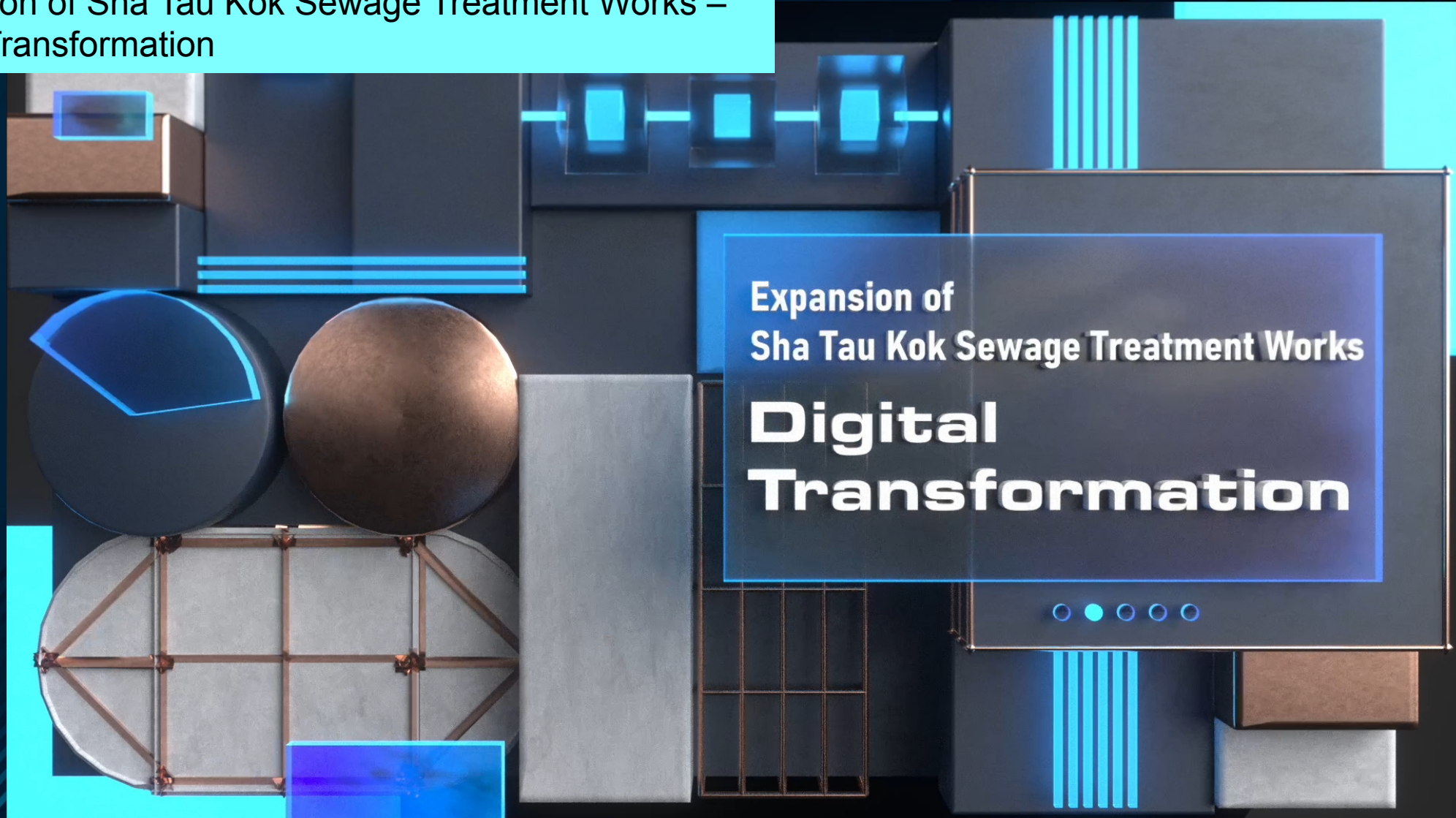




# Development of Safety Digital Twin

## Construction 2.0 Technology Adoption

Expansion of Sha Tau Kok Sewage Treatment Works –  
Digital Transformation







# Safety Digital Twin - Centralized Management Platform

## A Single Source of Truth Connecting the Physical & Digital World

### CENTRALIZED MANAGEMENT PLATFORM



Actualize Safety Digital Twin

Achieved Single Source of Truth



# CENTRALIZED MANAGEMENT PLATFORM



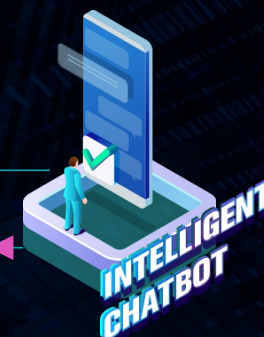
Data Analysis

Better Decision  
Making to  
Physical World



Predictive Alert

Follow-up Action





# Safety Digital Twin - Centralized Management Platform

Critical Application: Instant Monitoring & Preventive Alerts for Confined Space Works

Confined Space Modules under CMP: DWSS x BIM x Smart Helmets x Sensors



Processing  
permit-to-works  
through DWSS

- Digitalised workflow for confined space operation with DWSS for authorisation and checking
- Enhanced monitoring and supervision with application of safety helmets & sensors





# Safety Digital Twin - Centralized Management Platform

## Critical Application: Instant Alert Handling by Chatbot

### Safety Alert Handling: Alert Centre x Chatbot



- Instant alert handling everywhere, every site personnel
- Immediate reporting and data reflection in alert centre on CMP
- Data collection and analysis for continuous improvement

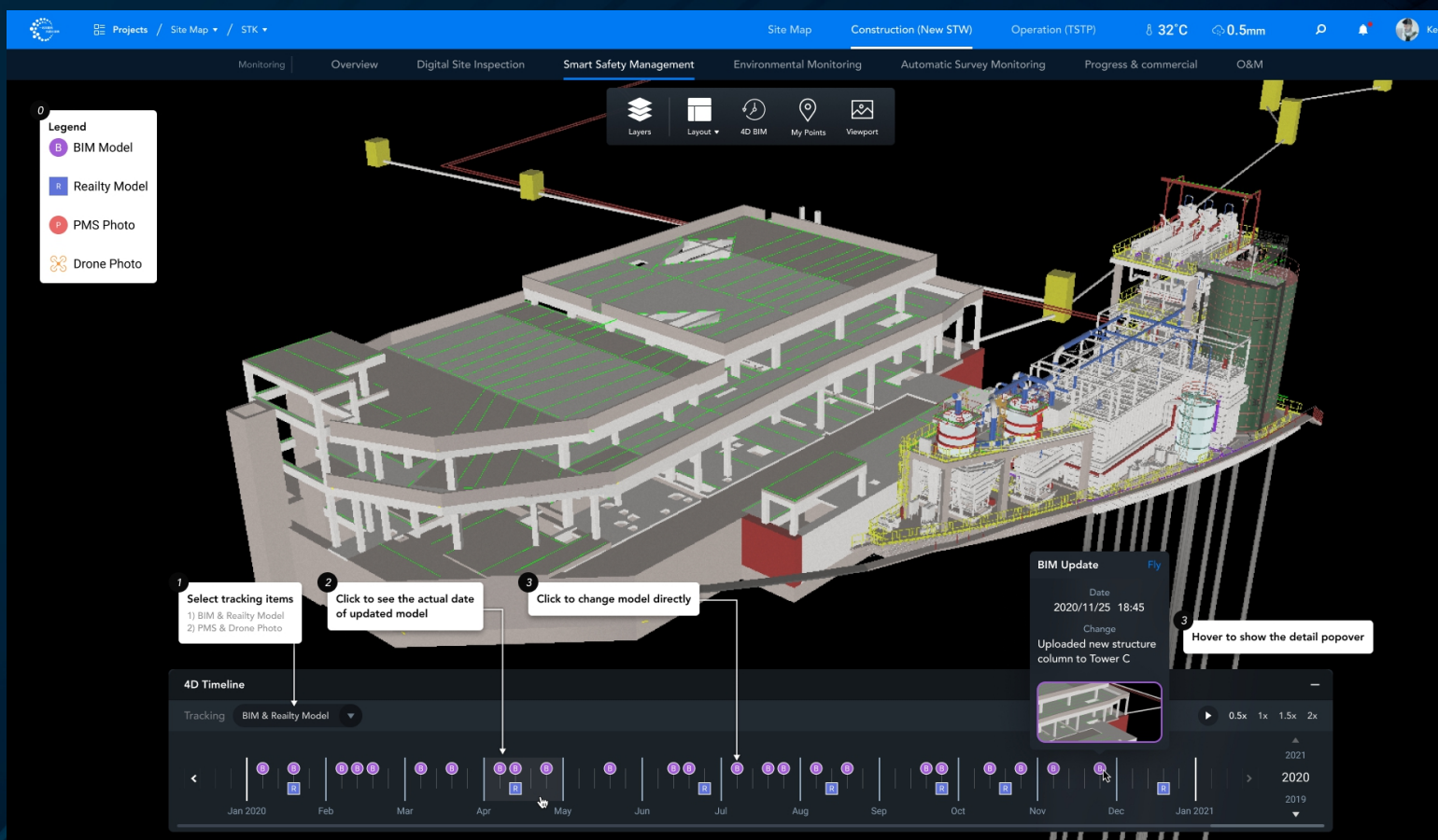




# Safety Digital Twin - Centralized Management Platform

## Risk Anticipation and Visualization with the Use of BIM

Enhanced Collaboration and Risk Anticipation:  
4D BIM x Reality Model x Construction Sequence Simulation



Timeline across Project Life Cycle



Reality Model vs BIM



Construction Sequence Simulation

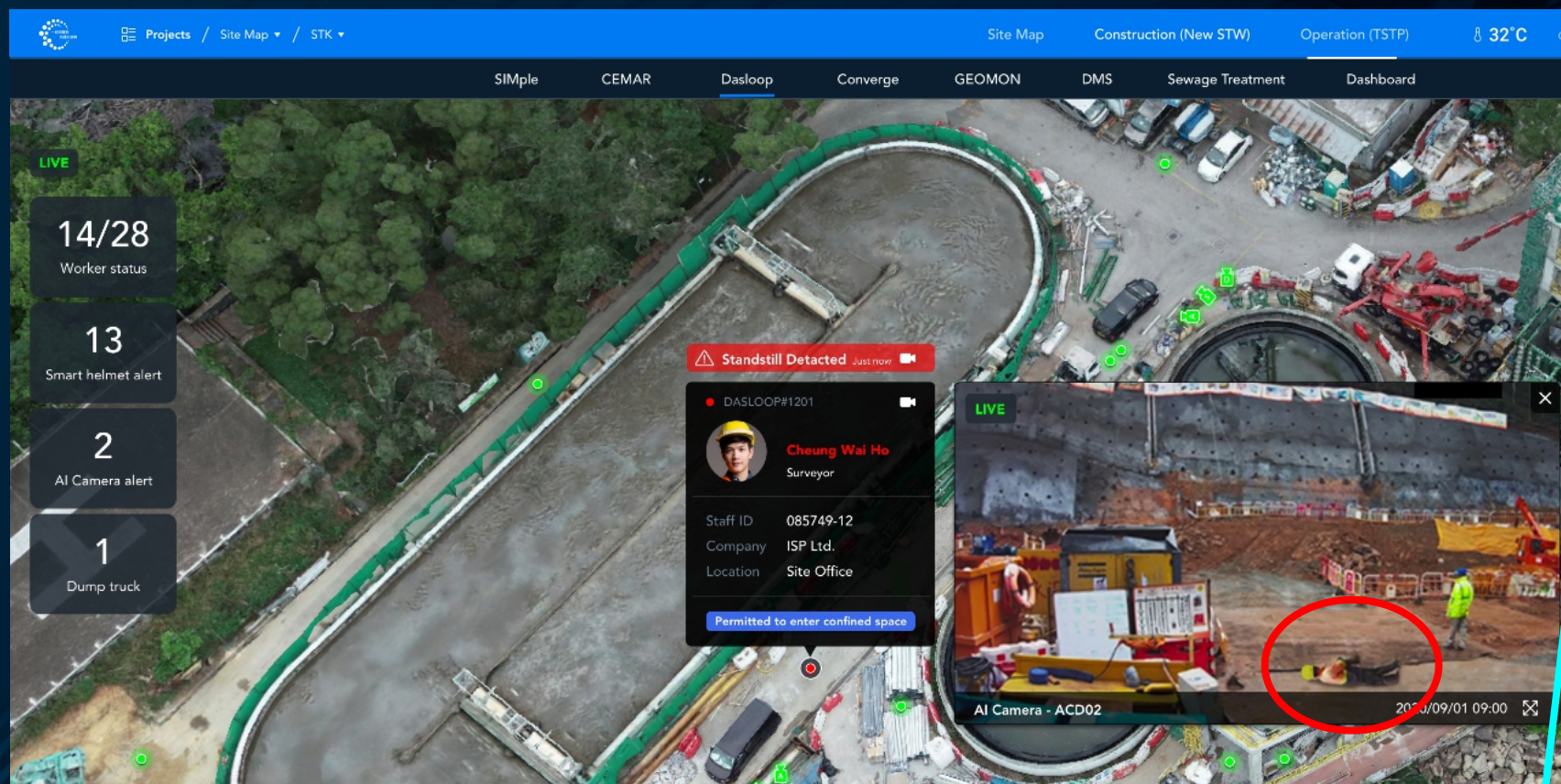




# Continuous Development Roadmap

## Data Driven Decision Making & Predictive Analysis

### Example: Predictive insight of workers' health by Smart Helmet & AI CCTV



- Instant alert for workers' condition from Smart Helmet
- Livestream of AI CCTV targeting at the worker with abnormal situation
- More comprehensive analysis

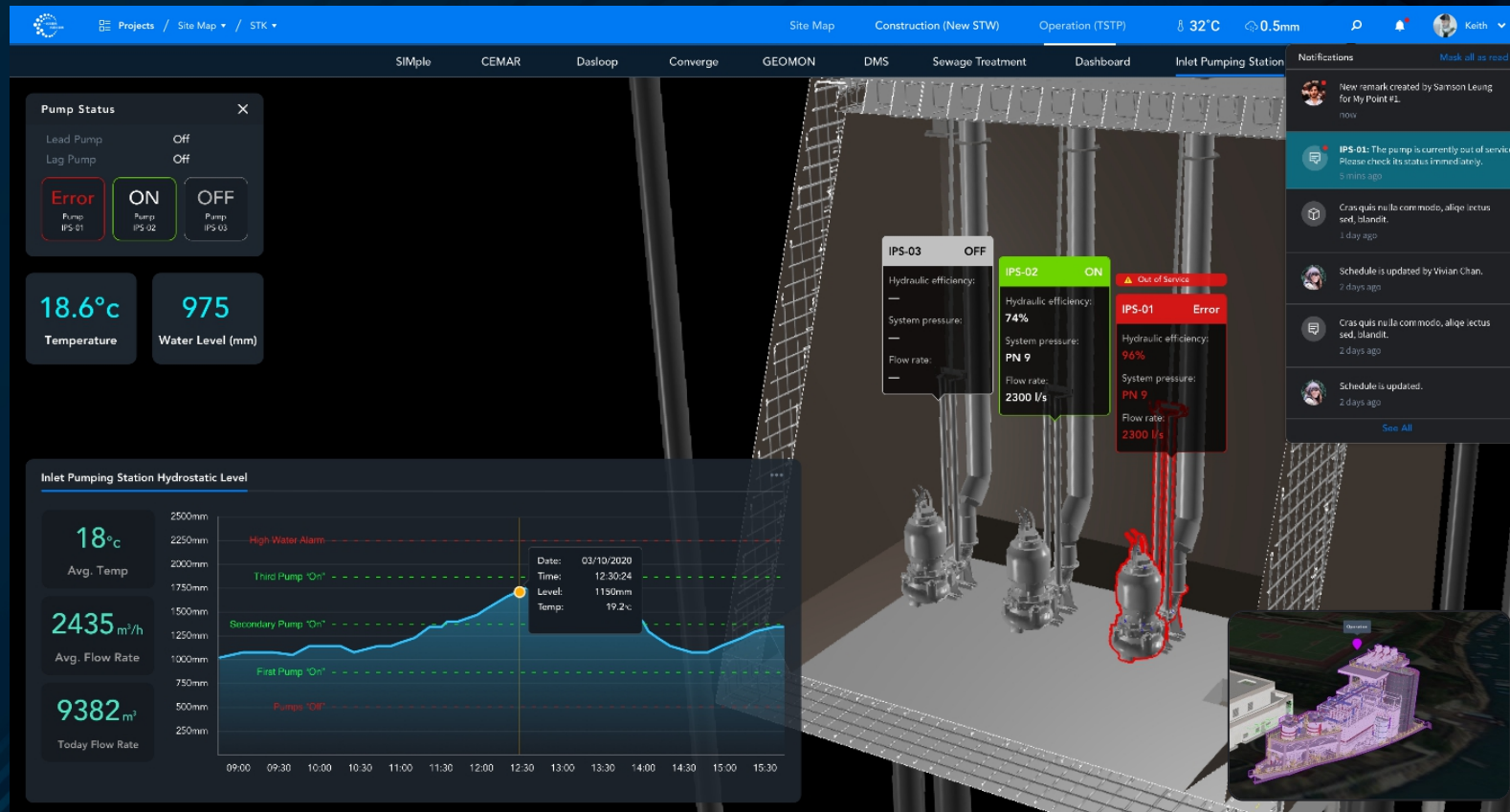




# Continuous Development Roadmap

## Data Driven Decision Making & Predictive Analysis

### Example: Application for More Efficient FM & AM



- Predictive insight with data from HKO (e.g. storm surge)
- Instant alert for invert water level (e.g. overflow)
- Prompt response to manipulate the plant operation
- Consistent information across all levels





# Construction 2.0 Pilot Project for DSD

## Project Based Platform Contributing to the Departmental Centralized Platform

### Vision of the Future – Building a Departmental Centralized Platform







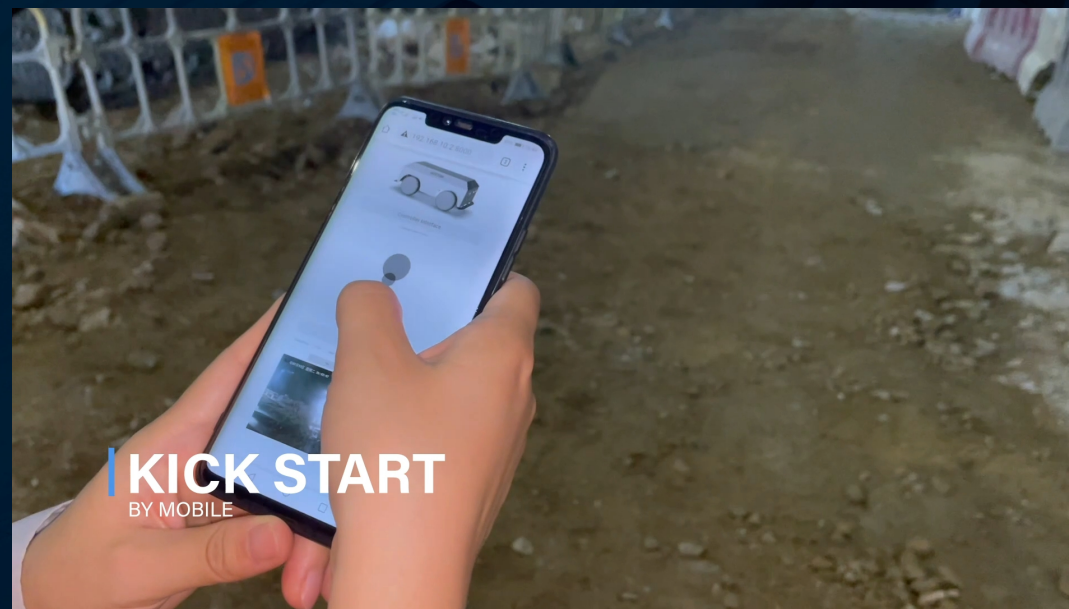
# DSD Commitment for Safety

## Enhanced Safety by Innovative Robotic Application

### Tunnel Monitoring Robot for Construction



Tunnel Monitoring Robot  
“岩洞探哥”



- Make good use of 5G transmission technology
- One machine, multiple-purpose
- Accurate blasting profile with point cloud technology
- **Real time air quality readings to safeguard workers' safety**





# DSD Commitment for Safety

## Enhanced Safety by Innovative Robotic Application

### Desilting Robots for Operation

The Big Bull  
“大鐵牛”



Lung Mun Robot No. 1  
“龍門一號”



The Mini Bull  
“小鐵牛”

- Robots for different working environments (low visibility, confined space... etc.)
- **No man entry required and minimised confined space operations**
- High efficiency with enhanced safety

# *Together We Create a SAFER, SMARTER & MORE SUSTAINABLE Construction Practice with Digitalization*

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- Centralized Management Platform

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