A New Approach to Mainlaying in a Safe Environment under a Public Works Project

COMPANY

Water Supplies Department, The Government of the HKSAR
AtkinsRéalis
China International Water & Electric Corporation
Tyfron Consultancy Limited

PROJECT

Contract no. 5/WSD/18 - Water Supply to New Housing Developments in Sheung Shui and Fanling – Mainlaying in Sheung Shui and Fanling areas

LOCATION

Sheung Shui and Fanling Areas

TYPE

NEC ECC Option C

SCHEDULED TIME OF COMPLETION

February 2024

About Water Supplies Department, The Government of the HKSAR

Water Supplies Department (WSD) is responsible for providing quality water supply services in Hong Kong, with mission to adopt reliable and customer-oriented approaches in services while considering environmental responsibilities and striving for continuous improvement with efficient resources and technology.

About AtkinsRéalis

AtkinsRéalis (Atkins) is a world-leading professional services and project management company dedicated to engineering a better and sustainable future, that delivers end-to-end services across the asset lifecycle including design & engineering, project & construction management, operations & maintenance, etc.

About China International Water & Electric Corporation

China International Water & Electric Corporation (CWE), a subsidiary of China Communications Construction Group, is a renowned company in the water conservancy and hydropower industry and has ranked in ENR's lists of largest international contractors and engineering design companies, with a AAA credit rating in China.

About Tyfron Consultancy Limited

Tyfron Consultancy Limited (TYFRON) is headed by professionals, with BIM coordinate team and BIM production team, providing full management of BIM production for clients, consultants and contractors.

AUTODESK PRODUCTS USED

Autodesk® AutoCAD®
Autodesk® BIM 360®
Autodesk® Civil 3D®
Autodesk® Navisworks®
Autodesk® ReCap® Pro

Project Description

Laying of about 12km distribution mains with diameters ranging from 150mm to 700mm in the south-western part of Sheung Shui and Fanling areas and associated service connections. To provide the reclaimed water supply to Sheung Shui and Fanling areas for the existing and planned new housing developments.

Project Challenges

Pipe laying is a simple type of civil works but site planning to maximize the number of concurrent workfronts at public roads for timely project completion is crucial. During construction stage, it is commonly found limited workspace with congested existing underground utilities (UUs) from the available 2D drawings of record plans provided by others for the works. Also, project interface with other construction works, unforeseen site condition and prolonged period for obtaining approval from other parties for commencement of the works are the major project challenges. Therefore, developing an effective site management plan and safe working environment is vital to minimise impact to the construction programme.

Solutions for Challenges

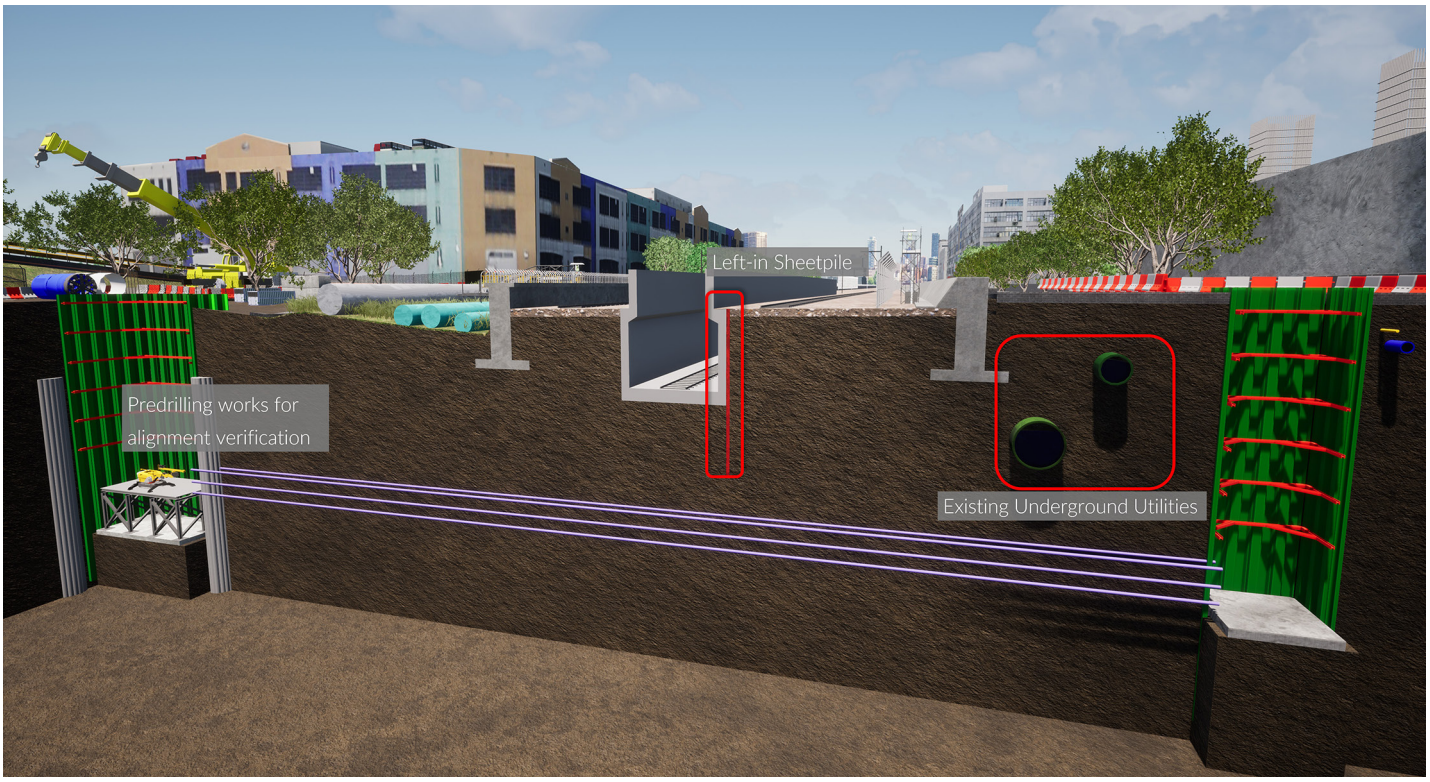
Traffic simulation models showing the designed pipe alignment, the extent of approved Temporary Traffic Arrangement (TTA) and other essential elements for complex pipe jacking works including the motions of construction vehicles can minimise the risk of insufficient working area and resolve the difficulties encountered at an early stage of the construction works. Besides, using 3D coordination analysis with Virtual reality/Augmented reality (VR/AR) technology to visualize the high-risk construction activities against the physical constraints can help the site planning and ensure the optimum plants and logistics arrangement for the works.

How does BIM benefit the project?

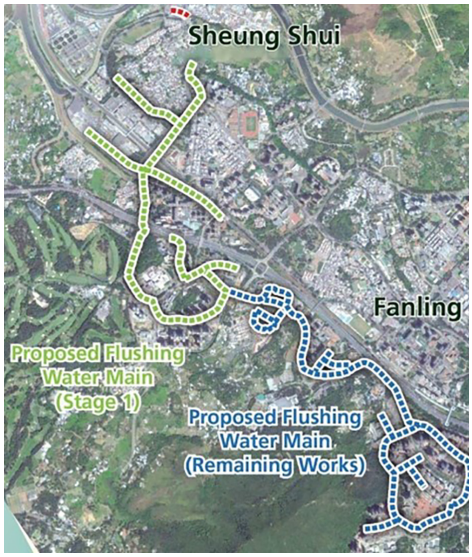
BIM enhances the design, methodology, programme and cost efficiency for the works. As completion of pipe laying for water supply to the developments is the main goal of the project, adopting the Design Resolution through BIM by identifying the key constraints and potential risks around the major works area becomes a fundamental platform.
Using BIM for transforming the integrated project programme to 4D timeliner, it helps to understand the programme sequence of logic for evaluating the constructability for project management, option comparison and works execution, which can benefit the project during the construction stage.

Better with BIM

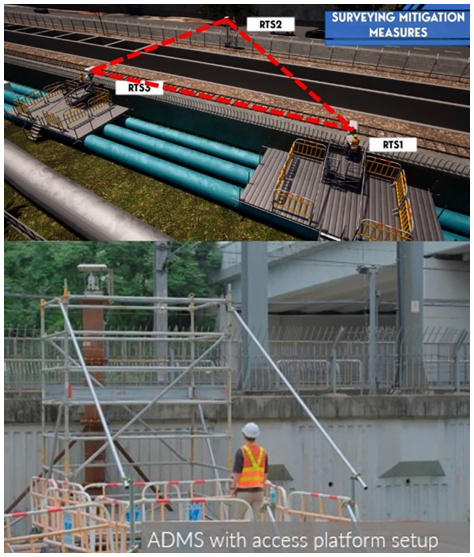
BIM allows efficient review of design, methodology, cost, and Quality, Safety and Environment (QSE) studies by team members. Validated designs are visualized by the frontline supervisor and sub-contractor to evaluate the cycle programme, which enable proactive construction planning. BIM modeling with AR also helps to overcome site constraints by previewing the site control including plants and logistics arrangements. Integrating project information into a cloud-based Common Data Environment (CDE) also enables Global Positioning System (GPS) positioning to locate the alignment of watermains based upon the as-built information. Additionally, BIM provides VR safety training to promote safety awareness.



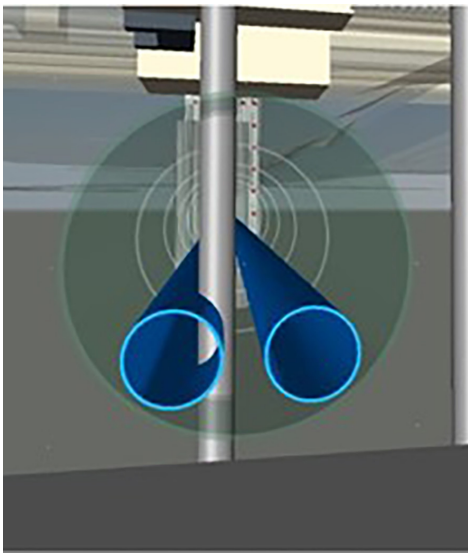
Review of Proposed Pipe Jacking Works at Critical Section by Model Simulation
Image Courtesy of Water Supplies Department, The Government of the HKSAR (WSD) and AtkinsRéalis (Atkins) and China International Water & Electric Corporation (CWE) and Tyfron Consultancy Limited (TYFRON)



Scope of Works – Mainlaying in Sheung Shui and Fanling Areas
Image Courtesy of WSD and Atkins and CWE and TYFRON



BIM Analyzation for the Optimum Position of ADMS Monitoring Points
Image Courtesy of WSD and Atkins and CWE and TYFRON



Clash Detection by AUTODESK NAVISWORKS in Design Review
Image Courtesy of WSD and Atkins and CWE and TYFRON

Visualization of Existing UUs or Planned Alignments by AR Technology
Image Courtesy of WSD and Atkins and CWE and TYFRON

Evaluation on Logistics Routing by AR Technology
Image Courtesy of WSD and Atkins and CWE and TYFRON

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