DEVELOPING DIGITAL TOOLS FOR PLANNING, COORDINATION AND VISUALISATION OF DATA AND DESIGNS FOR DARWIN MIDDLE ARM

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OVERVIEW

The Darwin Middle Arm Sustainable Development Precinct (MASDP) is a Whole of Government Project led by the Northern Territory (NT) Department of Infrastructure, Planning and Logistics (DIPL). Royal HaskoningDHV (RHDHV) has been working with DIPL on the maritime infrastructure design elements of the Precinct and has also been assisting with environmental planning and approvals.

The communication of complex planning, design, environmental and commercial factors to various non-technical stakeholders is a significant challenge for major infrastructure projects like MASDP. Digital tools, including online Geospatial Information Systems (GIS) and 3D Visualisation/Building Information Modelling (BIM) modelling software, have been utilised for effective management and communication of planning and design information.

The adopted digital tools have been developed to assist the client team, design parties and key stakeholders in visualising current designs, available data, and potential constraints. These tools enable parties to view large amounts of relevant data and models quickly and to identify major constraints and challenges on an interactive online user-friendly portal. The portal was set up to meet the project security and confidentiality requirements

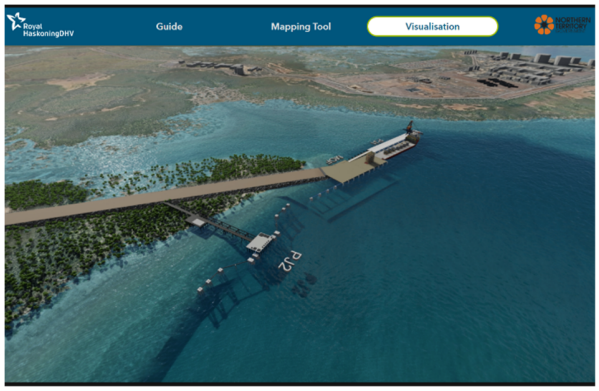

Figure 1 – GIS and Visualisation Portal: Visualisation Viewer shown (ArcGIS Online)

The use of GIS and BIM have remained largely separate on a Mapping Tool and Visualisation Tool that can both be accessed via the portal as seen in Figure 1.

Integration between GIS and BIM models were trialed using several platforms, including 'ArcGIS Geo-BIM'. Based on trials, an embedded BIM visualisation was selected as the optimal solution. The portal now contains the embedded 3D visualisation viewer in a 'Visualisation' window (see Figure 1).

The development of digital tools following the Building Information Systems (BIM) execution plan have enabled the effective tracking of new data and model updates.

GEOSPATIAL INFORMATION SYSTEMS (GIS)

An online GIS platform has been developed with an interactive mapping tool to share overlapping design, environmental, geotechnical, heritage and survey data (see Figure 1). This enables the project team and stakeholders to view their data within the project scope and to identify relevant constraints or project information.

The online GIS system (named the Geo-Portal) is managed by an internal GIS team, with data shared within the portal communicated by designated team leads, project managers and from the client. Data can be uploaded to the portal with short notice for stakeholder meetings, to enable design updates to be quickly mapped alongside the latest designs, environmental, geotechnical, and constraints data. Access to the system is restricted to approved users.

The GIS platform has been hosted on ArcGIS Online and using several ESRI applications. The system was licensed through an ESRI project specific (AEC) project delivery license. This enabled the project GIS team to manage licenses and access to the portal directly, manage the data within the online environment. It has also enabled the GIS team to provide viewer licenses to stakeholders without existing ESRI licenses improving access to the system.

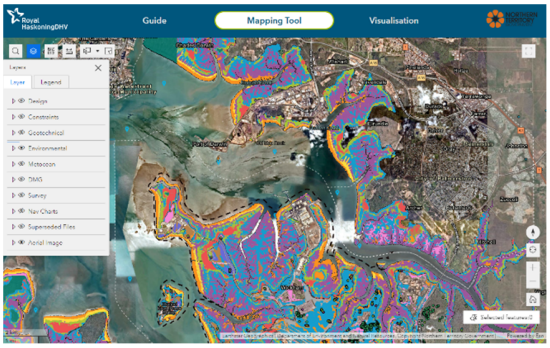

Figure 2 – GIS and Visualisation Portal: Mapping Tool shown (ArcGIS Online)

The Geo-Portal is continually developed and updated, with future updates considered including linking the portal to real-time environmental monitoring data and construction information.

3D VISUALISATION and BIM

3D visualisation and BIM modelling software have been explored and are being implemented with the aim of integrating marine and terrestrial infrastructure into a single interactive online 3D model for the precinct. Due to the scale of the project and the various types of models, a comparison study was undertaken of various visualisation software to ensure it would meet the requirements, including Infraworks, Lumion, 3D Studio Max, Enscape, Unreal Engine and Unity.

It was decided a phased approach would be undertaken where Infraworks would be used in Phase 1 as a preliminary model, followed by Lumion in Phase 2. This software was chosen due to cost, large model extent (approx. 9km x 9km), ability to import model types and produce fly-through and interactive models.

Phase 1: Infraworks was used as a preliminary model, by incorporating Revit and Civil 3D models, and available survey and aerial imagery as seen in Figure 3, including the marine structure, dredging and landside zones. The benefit of Infraworks was that this could be developed quickly at a low cost as a minimum viable product (MVP).

Figure 3 3 – Phase 1 Visualisation (Infraworks)

Phase 2: The visualisation was then improved by using Lumion for improved rendering and additional objects such as mangroves, landside facilities, vessels and offloading modules on the MOF (Module Offloading Facility) as seen in Figure 4 and 5.

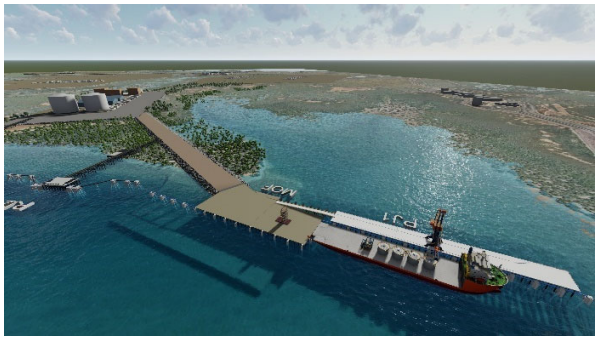

Figure 4 4 – Phase 2 Visualisation – Module Offloading Facility (Lumion)

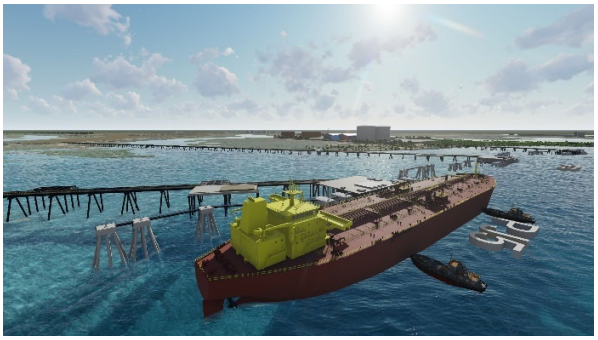

Figure 5 5 – Phase 2 Visualisation – Product Jetty 5 (Lumion)

An interactive online model viewer was developed as seen in Figure 6. This allows the user to select viewpoints to better view the model. This viewer was added to the ArcGIS Online platform as shown in Figure 1 for easy access.

Figure 66 – Interactive Online Model Viewer (Lumion)

It is expected the visualisation model will be further developed as designs become available. Future improvements include a more interactive model and animating moving components such as vessels berthing, and modules being offloaded to better understand the project. As the project develops, it is planned for other BIM solutions to be utilised such as Revizto focused on BIM Coordination and Clash Detection.

CONCLUSION

DIPL has provided very positive feedback for both the GIS platform and 3D Visualisation. Both of these digital tools have greatly benefited the project in terms of improving project understanding among stakeholders, coordinating data and models, and enabling designers and managers to identify constraints.

The poster summarises the development process and applications of the GIS platform and 3D Visualisation for the MASDP project, and the potential for additional applications in future design stages. This also covers the rationale for the selection of software, and limitations of current tools. These tools can be applied to various project types and can be effective methods of improving planning on major projects, identifying overlapping constraints, and communicating project plans to non-technical stakeholders.