BrisBIM

12 Feb 2020

Unlocking Facility Value Through Life Cycle Thinking

Presenters:

Prof. Rodney Stewart, Dr. Sherif Mostafa and Dr. Emiliya Suprun

Griffith University

seqwater WATER FOR LIFE

Griffith UNIVERSITY Queensland, Australia

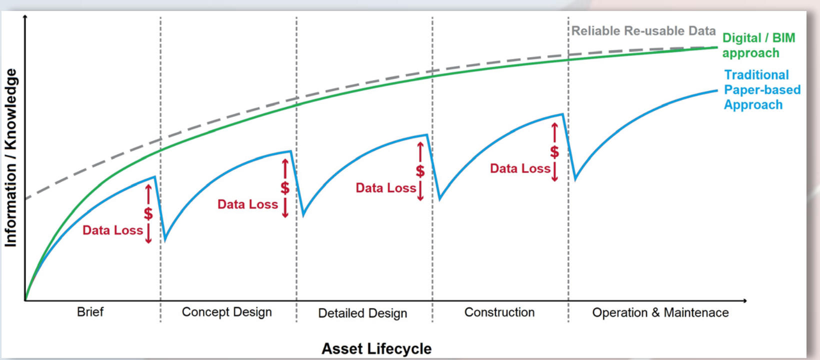
Meta Moto Navigating the Future

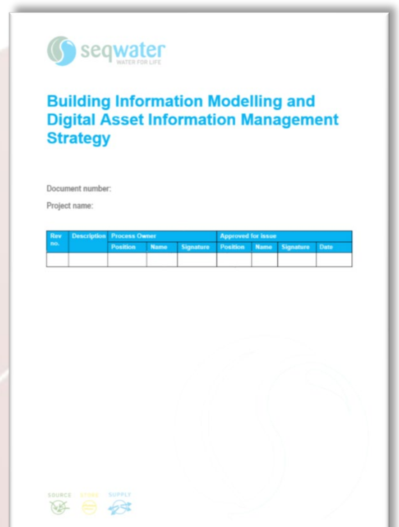
Sustainable Built Environment National Research Centre

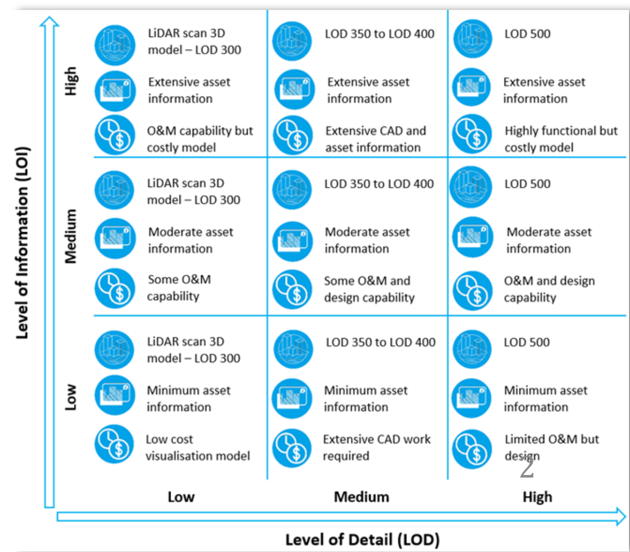
OPTIMISED MAINTENANCE

Agenda

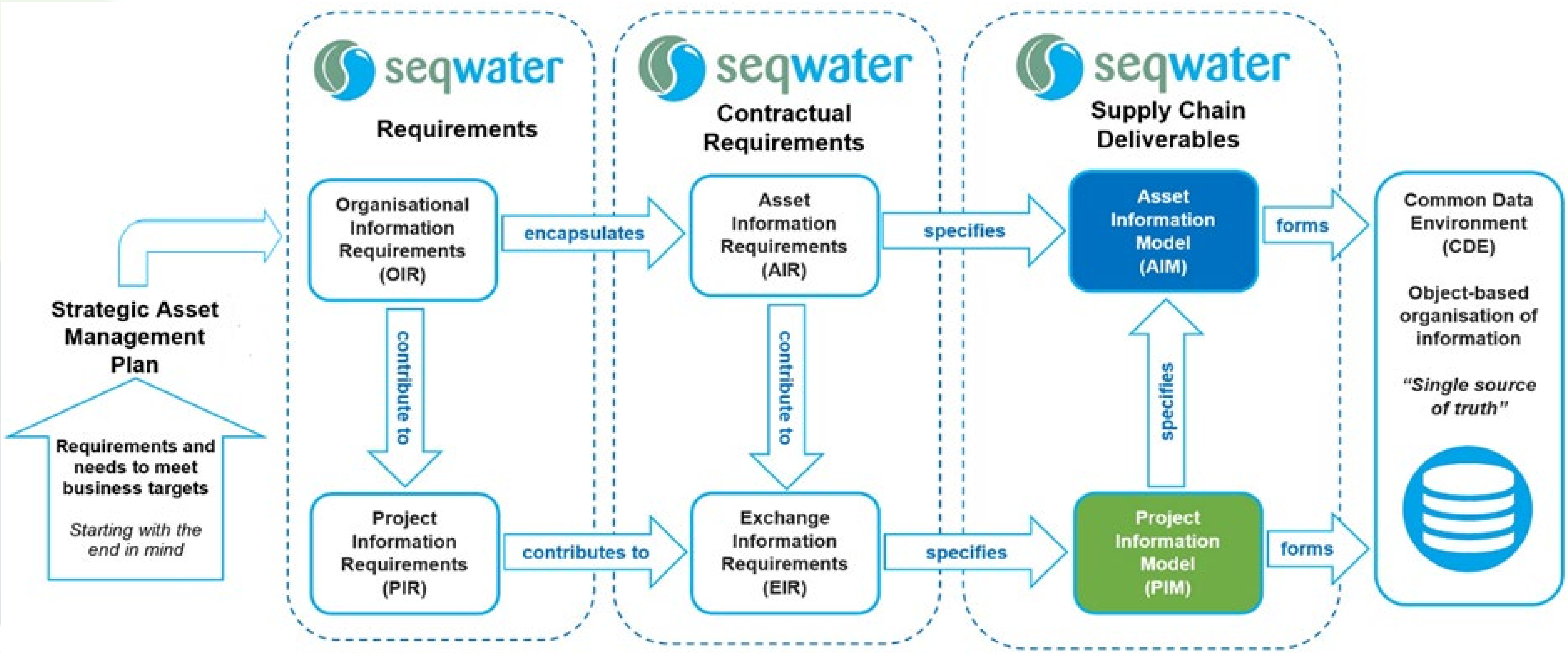
- *Part 1 -* ***BIM (Digital Twin) Transition Documentation and Planning*** – *Case of Seqwater Journey – Rodney Stewart* (5 mins)
- ***Part 2 - Case Study 1:*** ***Seqwater Canungra Water Treatment Plant*** - *Back-building digital twins of water assets – Getting the LOD-LOI business case right – Sherif Mostafa* (5 mins)
- ***Part 3 - Case Study 2:*** ***QLD Government Department of Housing and Public Works –*** *Evaluating the Benefits of BIM for life cycle asset maintenance of remote government housing – Emiliya Suprun* (5 mins)
- ***Questions*** *(5 mins)*







Part 1: *BIM (Digital Twin) Transition Documentation and Planning*



Not terribly novel stuff** – But worth mentioning that knowing what you want from BIM to meet your organisational goals and specifying it to your supply chain is essential before embarking on this BIM journey – **else business value may be destroyed by the technological disruption

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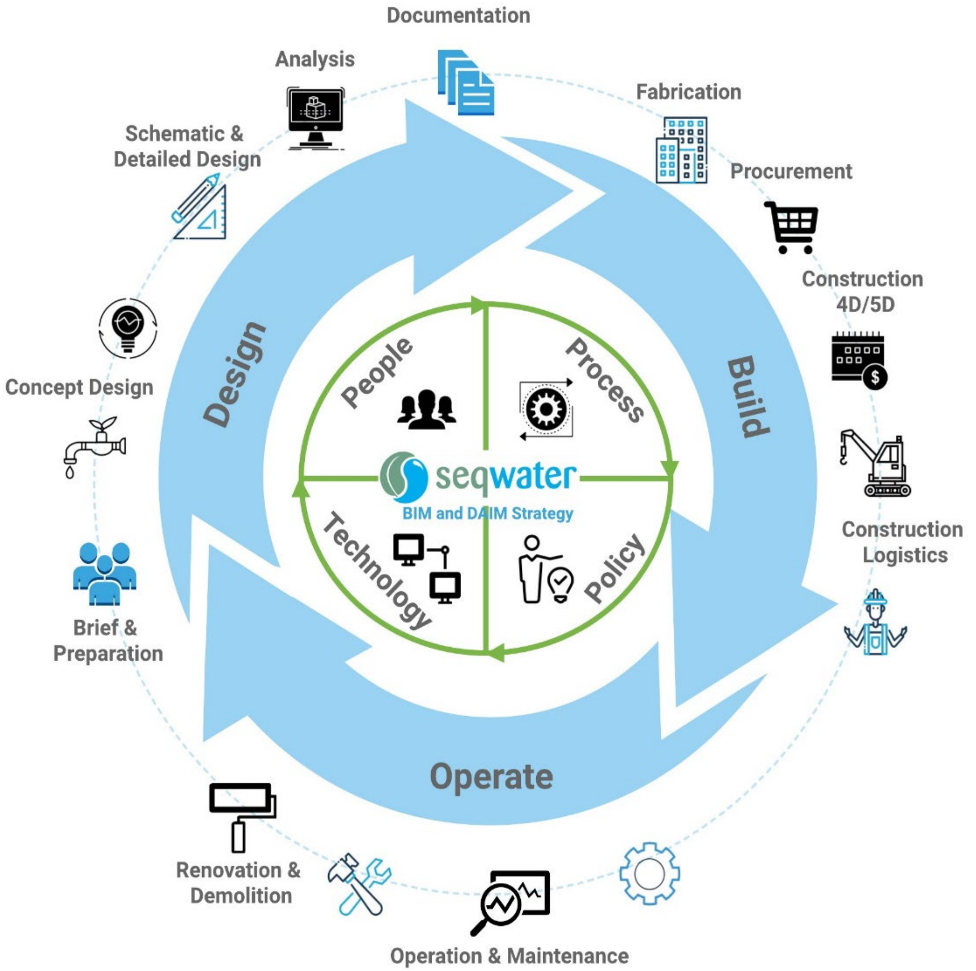
BIM and Digital Asset Management Strategy

Making BIM Level 2 'Business As Usual'

Drawings and models are always going to be important. However, for **asset management** that goes beyond the design and construction period, it is the data that is important



The Lifecycle of the Digital and Physical Asset

BIM (Digital Twin) Roadmap Workshop and Report for Seqwater

Workshop Facilitators:

Brian Smith (Director, Optimised Maintenance, optimisedmaintenance.com)
*Brian leads **Optimised Maintenance** to work with businesses in improving the understanding and execution of their assets by optimising the asset management practices.*

OPTIMISED MAINTENANCE

Richard Simpson (Director, Meta Moto, metamoto.com.au)
*Richard leads **Meta Moto** leveraging over 25 years' international experience advising in the development, implementation, and delivery of strategic assignments including geo-spatial and BIM projects.*

Meta Moto
Navigating the Future

Rodney Stewart, Emiliya Suprun and Sherif Mostafa (Research Team, **Griffith University,** https://www.griffith.edu.au/cities-research-institute/)
*The **GU team** are researchers in digital transformation research. Conduct industry collaborative research projects on the technical and management aspects of digital transformation with a specific focus on the utility sector.*

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Roadmap Workshop

Business Units

Asset Management
Asset Systems and Information Governance
Asset Lifecycle Planning
Engineering Standards and Assurance
Asset Planning
Operations - Supply System
Asset Maintenance
Maintenance Planning
Planning, Operations, Delivery
Process Engineering
Water Quality
Project Support
Program Delivery
OTE Assurance and Performance
OTE Strategy and Planning
OTE Delivery
Spatial Services
Architecture and Security
Property Services
Commercial Services
Strategic Sourcing
Work Health and Safety
Customer, Strategy & Planning
Integrated Master Planning
Project Development
More!!!!

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BIM Roadmap Workshop – Process Structure

Identify

Define the Business Case
- What is our Current State?
- What is our Required State?
- How are these measure?
- What is the gap?

How do we get from our current state to our required state?
- Define the change performance measures (KPIs). Use business risk terms.
- Define how to measure risk assessment inputs.
- Ensure all risks to the business are documented and performance gap defined.

Assess

Define the Change Requirement
- Why is our current state the way it is?
- What needs to change?

Define the Gap Assessment
- The difference between the current state and the required state.

Road Map
- How do we get there?
- What are the steps?

Improve

Make the change
- Execute the **Road Map**
- Apply structured Management of Change
- Ensure the changes are documented, risk assessed and approved before they are executed.

Review

Business Case
- Are the risks managed?
- Have we met KPIs?

Additional Work
- Has the change been successful?
- Are any further works required?

Risks
- Have the risks identified in the business case been effectively managed?
- Have any new risks been introduced?
- Are they effectively managed? How do we measure and control this?

Conducting Activities for Each Step

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BIM Implementation – Key Lessons Learned (*Critical Success Factors*)

- Unnecessary modelling of data to the nth degree (*Organisation has a good understanding of the right LOD-LOI requirements that will add value to business functions*)
- Lack of integration of systems and failure to update models (*Strategy and requirements must consider all of the organisations' information systems and seamless transfer between them*)
- Failure to implement a proper change management program for the technological improvement opportunity (*Strategy adequately considers people, constraints, organisational structure, etc.*)
- Don't try to change everything at once (*Strategy stages transition sensibly and targets best value opportunities first, and measured benefits are used to further enhance buy-in from employees*)
- Not fully knowing and/or failing to properly communicate to the entire supply chain how the organisation wants information provided to it (*Comprehensive digital strategy with EIR, etc.*)
- Not sufficiently considering software data compatibility, standards and ownership (*Strategy ensures that new and old systems can talk to other and that data is owned by the organisation and not a provider*).
- Particular software solution driving the strategic planning of the organisation (*Organisation considers the opportunities, constraints and gaps first and then selects software solutions fitting their strategy*)

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Part 2: Case Study 1: *Seqwater Canungra Water Treatment Plant*

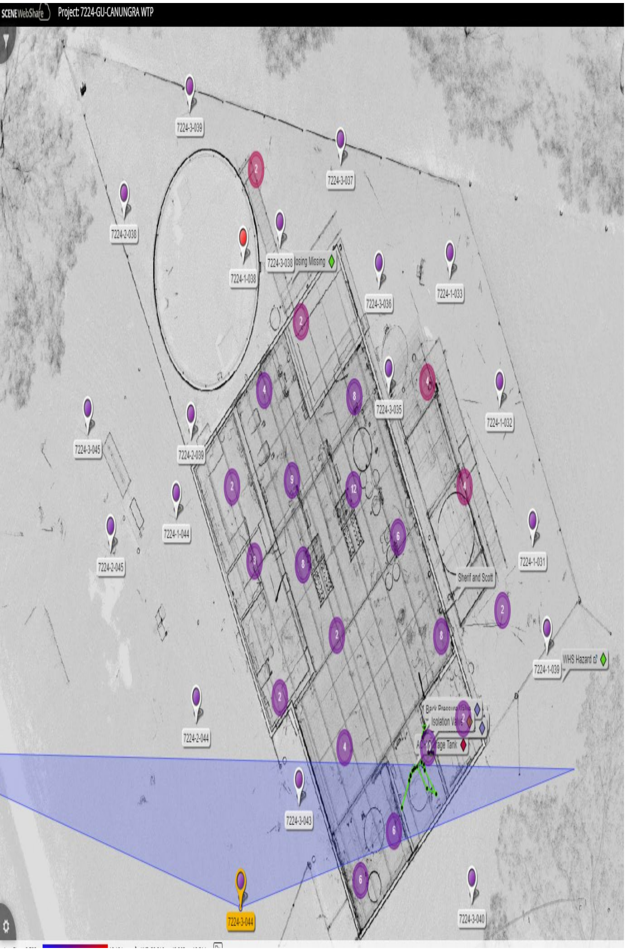
Canungra WTP
A showcase of Laser Scan Integrated BIM

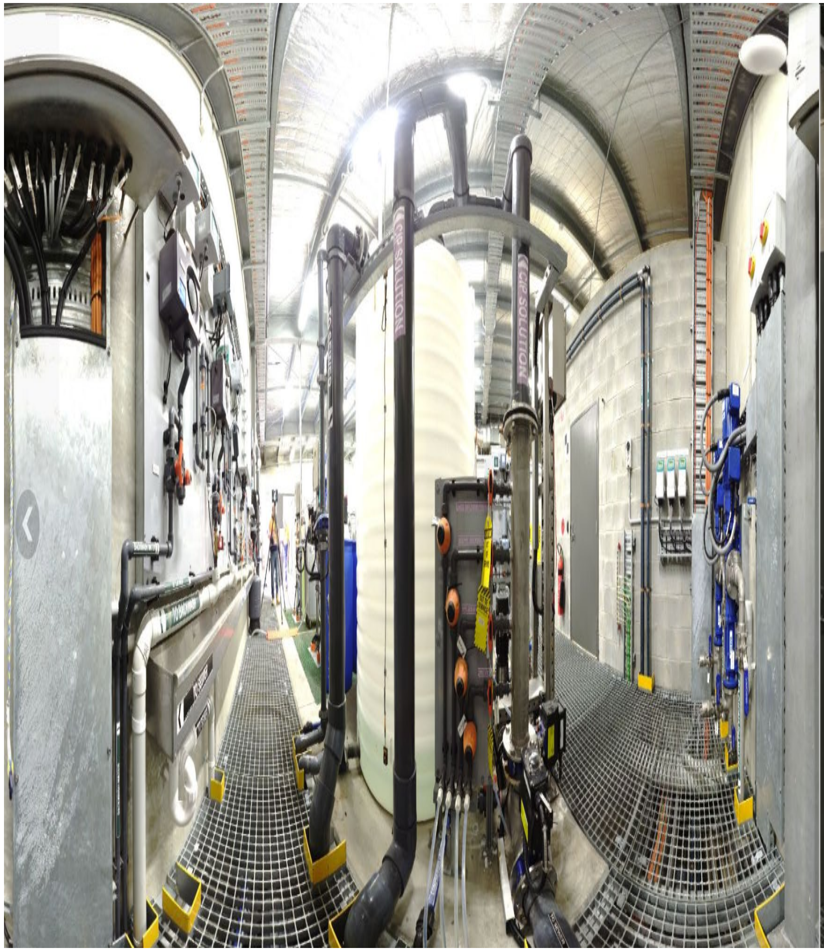
Back-building digital twins of water assets –
Getting the LOD-LOI business case right

Dr Sherif Mostafa

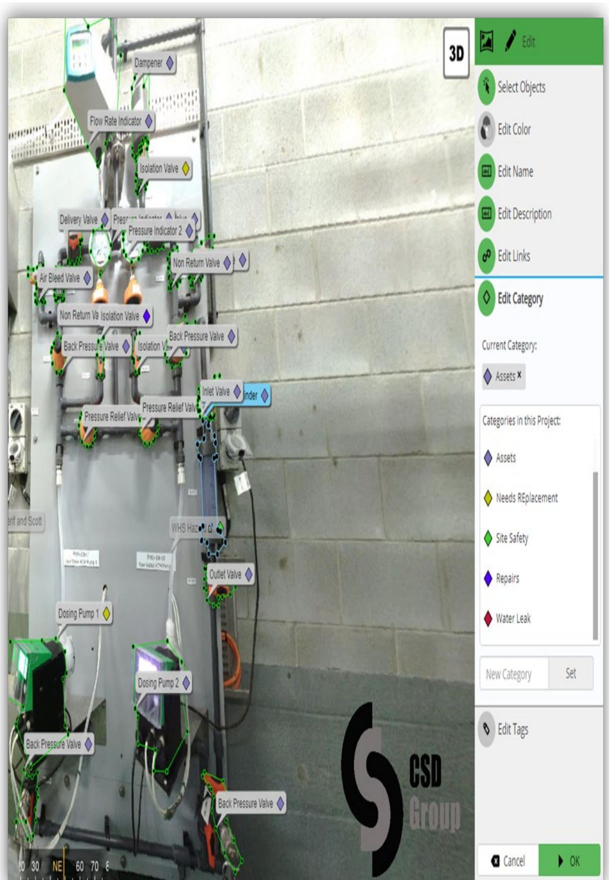
Step 1: LiDAR Scanning

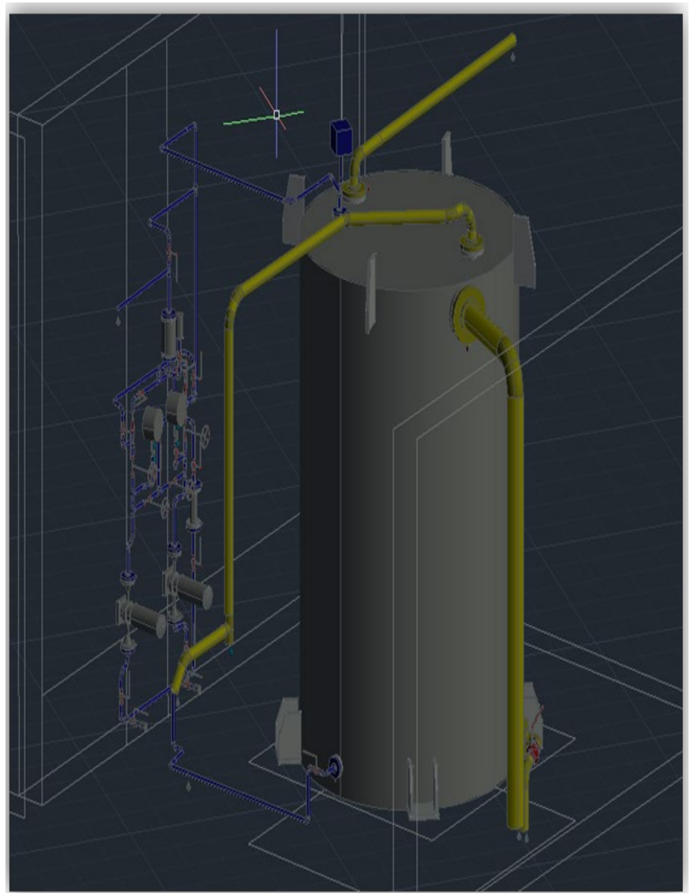
Step 2: Object Recognition and Validation

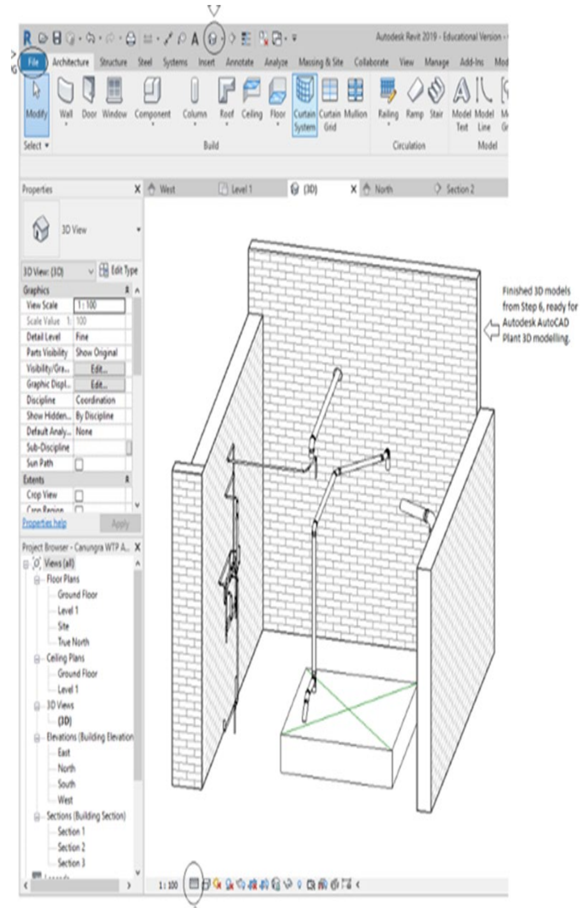




Step 3: Asset Data Using Different LOD & LOI





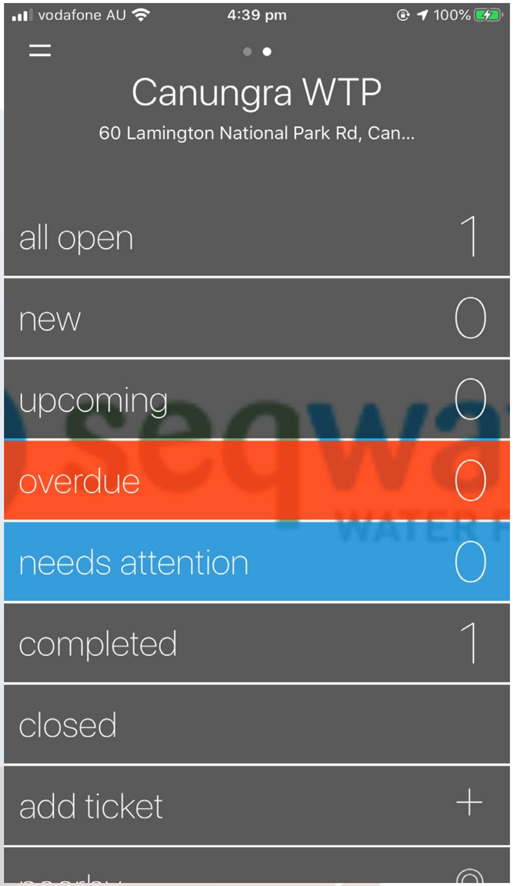


SCENE Webshare

Plant 3D

Revit

BIM 360 Ops for Common Data Environment



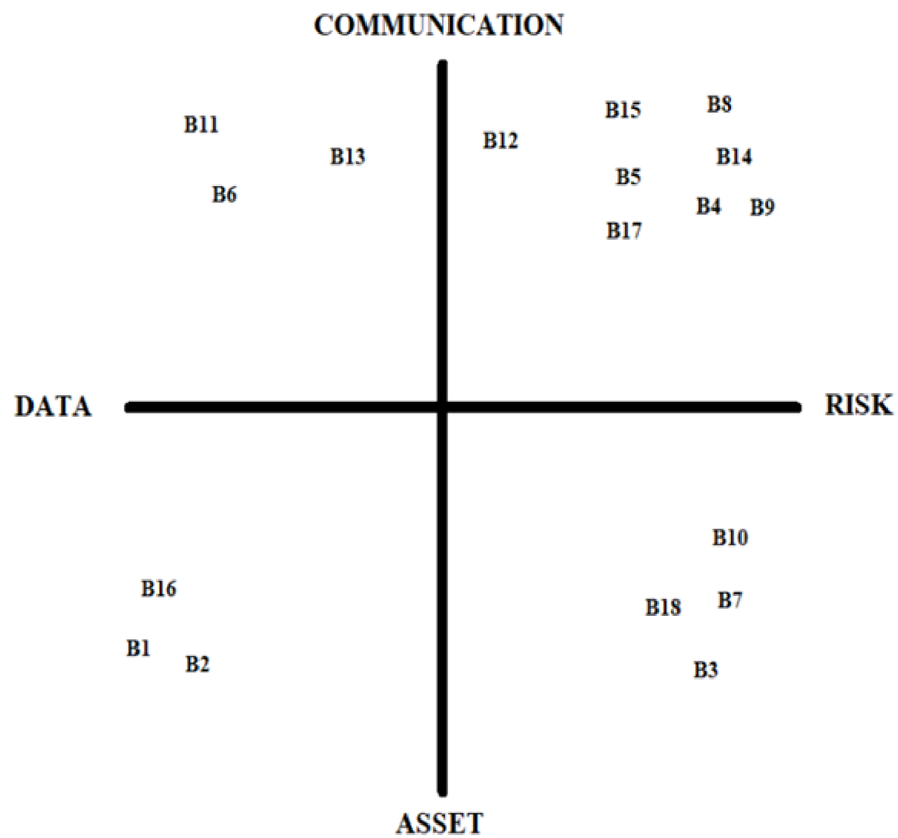
Step 4: Costs of BIM integration

Activity	Code	Processes / Function	Cost Element			
			Software	Hardware	Labour	Training
Experimental BIM Design						
LiDAR Scan	C1	Scan survey	AUD$3,500			
Point Cloud	C2	Scanning processes	S2	H1	L2	T1
WebShare	C3	Uploading processes	Scan Package			
Laser-Scanned Integrated BIM	C4	3D Modelling (AEC)	S4	H1	L1	T1
	C5	3D Modelling (Pipes, etc.)	S5			
	C6	Smart P&ID Drafting			L3	
	C7	Asset input				T2
	C8	Validation		H4		T3
	C9	Upload processes	S6	H1		T2
O&M and Potential Upgrade						
Access	C10	WebShare viewing		H4	L3	T3
	C11	3D view (Navisworks)	S6	H2	L2	T2
Input	C12	WebShare data relay		H4		
	C13	Revit data update / relay	S4	H3	L1	T1
	C14	Plant 3D data update / relay	S5			
Output	C15	WebShare print out		H4	L3	T2
	C16	Revit data print out	S4	H1		T3
	C17	Plant 3D data print out	S5			
Survey	C18	WebShare measuring		H4	L2	T2

Step 5: Benefits of BIM Integration to the BAU

Most valuable benefits

Code	Benefit
	Top benefits of BIM
B1	better design solutions
B2	reduced errors and omissions in project documents
B3	better ability to maintain quality
B4	reduced rework during construction
B5	better control/ predictability
B6	reduced cycle time of workflows between multiple parties
B7	reduced construction cost
B8	improved safety, faster approval cycles
B9	better safety performance for all companies involved
B10	reduced project duration
	Top business impacts of BIM use
B11	ability to work collaboratively with other project team companies
B12	increased client satisfaction
B13	overall enhancement of organisations' reputation as an industry leader
B14	offering new services
B15	marketing new business to new clients
B16	ability to attract / retain talented staff
B17	maintaining repeat business with past clients
B18	increased profits on projects using BIM



Stakeholders' BIM Life Cycle Stage Relevance

Stakeholders		Code	BIM life-cycle stage relevance			
			BIM design	O&M	Upgrade design	Upgrade construction
BIM technical team	BIM Coordinator	St1	✓	✓	✓	✓
	3D BIM Designers	St2	✓	✓	✓	✓
Facility Personnel	Operators	St3		✓		
	Maintenance Officers	St4		✓		
	Scheduler	St5		✓		
	Process engineers	St6		✓	✓	
Managers	Facility Manager	St7	✓	✓		
	Asset Manager	St8	✓	✓	✓	✓
	Project Manager	St9	✓	✓		✓
Contractors	Main contractors	St10			✓	✓
	Sub-contractors	St11			✓	✓
	Suppliers	St12			✓	✓
Clients	Local residents	St13			✓	
	Local businesses	St14			✓	
	Others	St15			✓	
Owner/s	Seqwater	St16	✓	✓	✓	✓
	Local government	St17			✓	✓
	State government	St18			✓	✓
	National government	St19			✓	✓
AEC professionals	Architects	St20			✓	✓
	Engineers	St21			✓	✓
	Construction personnel	St22			✓	✓

Laser Scan Integrated BIM Cost-benefit Data Map

Stakeholders	Relevance: Webshare Cloud	Relevance: LS-I-BIM	BIM life cycle stage: BIM design	BIM life cycle stage: O&M	BIM life cycle stage: Upgrade design	BIM life cycle stage: Upgrade construction	Potential Costs	Potential Benefits
BIM coordinator	✓	✓	✓	✓	✓	✓	C1 to C14	B1 to B3, B5, B8 to B9
3D BIM Designers	✓	✓	✓	✓	✓	✓	C1 to C14	B1 to B3, B5, B8 to B9
Operators	✓	✓		✓			C10 to C18	B2, B3, B5, B6, B8, B9
Maintenance Planners	✓	✓		✓			C10 to C18	B2, B3, B5, B6, B8, B9
Schedulers	✓	✓		✓			C10 to C18	B2, B3, B5, B6, B8, B9
Process engineers	✓	✓		✓	✓		C9 to C18	B2, B3, B5, B6, B8, B9
Facility Manager	✓	✓	✓	✓			C10 to C11, C5 to C17	B2, B3, B5 to B9, B11 to B18
Asset Manager	✓	✓	✓	✓	✓	✓	C4 to C18	B2, B3, B5 to B9, B11 to B18
Project Manager	✓	✓	✓	✓		✓	C10 to C11, C5 to C17	B2, B3, B5 to B9, B11 to B18
Main contractors	✓				✓	✓	C10 to C11, C15 to C18	B2, B3, B5, B6, B8, B9, B11 to B18
Sub-contractors	✓				✓	✓	C10 to C11, C15 to C18	B2, B3, B5, B6, B8, B9, B11 to B18
Suppliers	✓				✓	✓	C10 to C11, C15 to C18	B2, B3, B5, B6, B8, B9, B11 to B18
Local residents	✓				✓		C10	B12, B14, B15, B17
Local businesses	✓				✓		C10	B12, B14, B15, B17
Others	✓				✓		C10	B12, B14, B15, B17
Seqwater	✓	✓	✓	✓	✓	✓	C10 to C11, C5 to C17	B1 to B18
Local government	✓				✓	✓	C10	B1 to B18
State government	✓				✓	✓	C10	B1 to B18
National government	✓				✓	✓	C10	B1 to B18
Architects	✓	✓			✓	✓	C4 to C18	B1 to B11, B16 to B18
Engineers	✓	✓			✓	✓	C4 to C18	B1 to B11, B16 to B18
Construction personnel	✓	✓			✓	✓	C9 to C18	B1 to B11, B16 to B18

Laser Scan Integrated BIM

Point Cloud

and/o

and/or

AUTODESK® REVIT®

AutoCad Plant 3D

AUTODESK® NAVISWORKS®

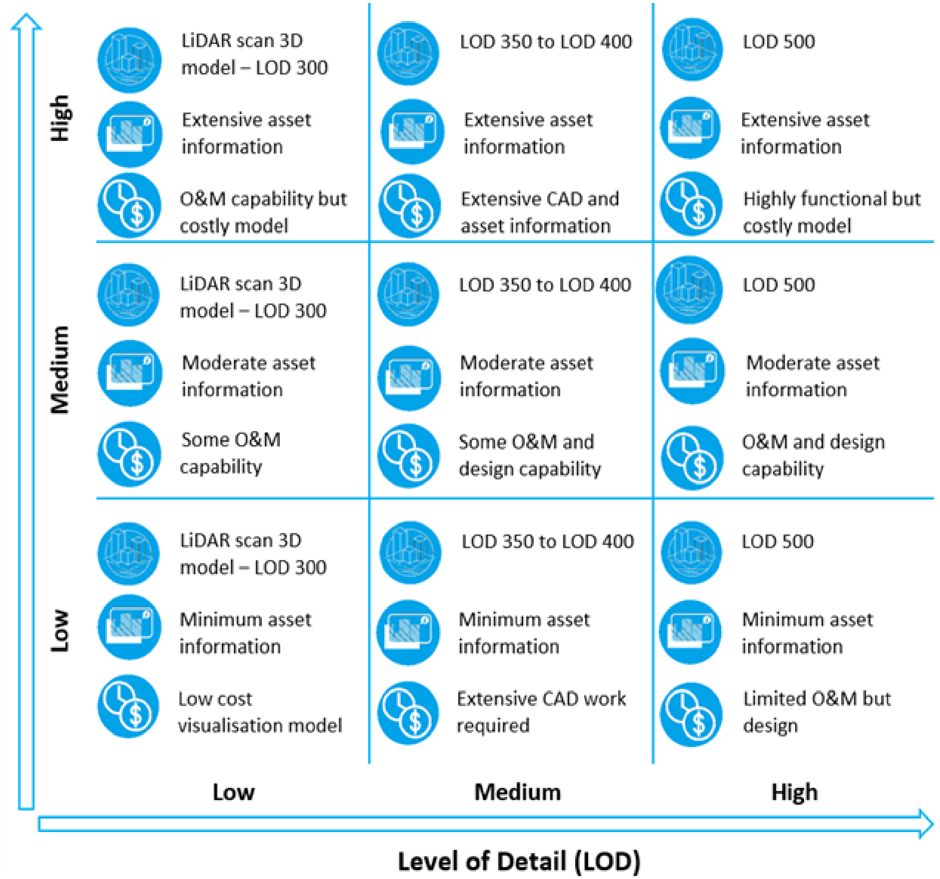
AUTODESK® BIM 360® OPS

Webshare dataset

and/or

Comparison of Different LOD Models

Capability	WebShare LOD 300	Revit LOD 350	Plant 3D LOD 400	Plant 3D + Revit LOD 500
Live interaction	✔		✔	✔
All asset data & info	✔	✔	✔	✔
Manufacturer & supply data	✔	✔	✔	✔
AEC design		✔		✔
External link attachment	✔	✔	✔	✔
Pipe & plant creation		✔	✔	✔
Simulation		✔	✔	✔
"Smart" P&ID			✔	✔
Clash detection		✔	✔	✔
GIS data	✔	✔	✔	✔
Single mode assembly		✔		✔
Phone access	✔			✔
O&M manuals & other data	✔	✔	✔	✔
Reduces construction costs & duration		✔	✔	✔
Life cycle & maintenance data	✔		✔	✔
Quality reports		✔	✔	✔
Bill of materials		✔	✔	✔



Recommendations

- **The SCENE WebShare model – LOD 300** can be implemented as a temporary solution for O&M purposes.
- **Plant 3D model – LOD 400** for the design and process engineering and the amount of possible input provided
- **BIM 360 – LOD 500** is recommended when a WTP or a new section of an existing one has to be constructed.
- **Create 3D digital scans of all of built assets** (i.e. point cloud digital twins) by employing a small survey team and purchase LiDAR scanning equipment which would be useful for a range of functions including remote visual checking, safety training, asset identification, model creation for later refurbishments, etc.
- **Having well defined software use and data/model exchange workflows**. A clear plan of software available and processes needs to be outlined before 3D modelling can proceed.

		LOD 500 AUTODESK BIM 360 OPS
	LOD 400 AutoCad Plant 3D	
Webshare model LOD 300 SCENE WebShare		

Part 3: Case Study 2: *QLD Government Department of Housing and Public Works*

Evaluating the Benefits of BIM for life cycle asset maintenance of remote government housing

Dr Emiliya Suprun

Sustainable Built Environment National Research Centre

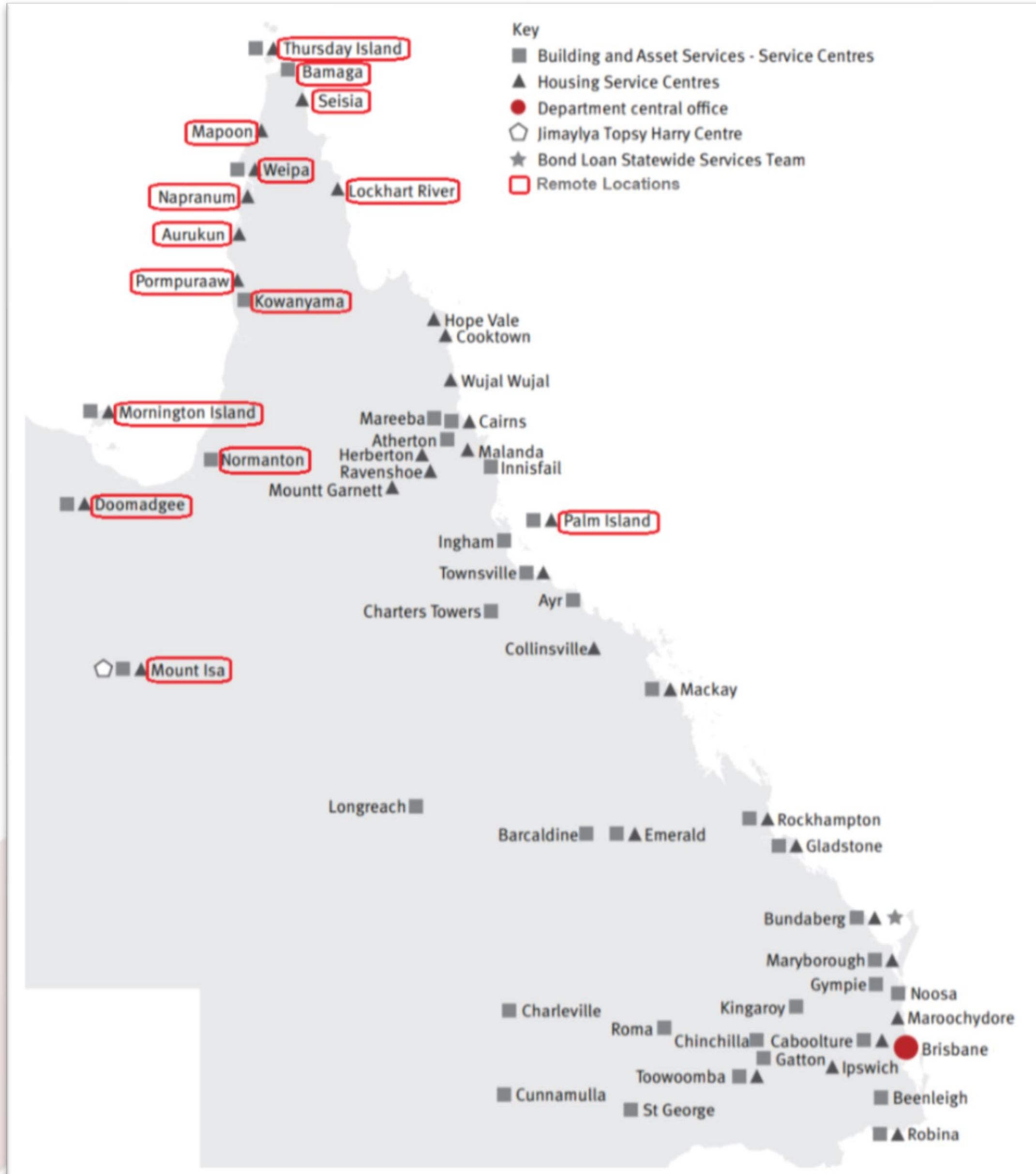
Griffith University Queensland, Australia

Queensland Government

Curtin University

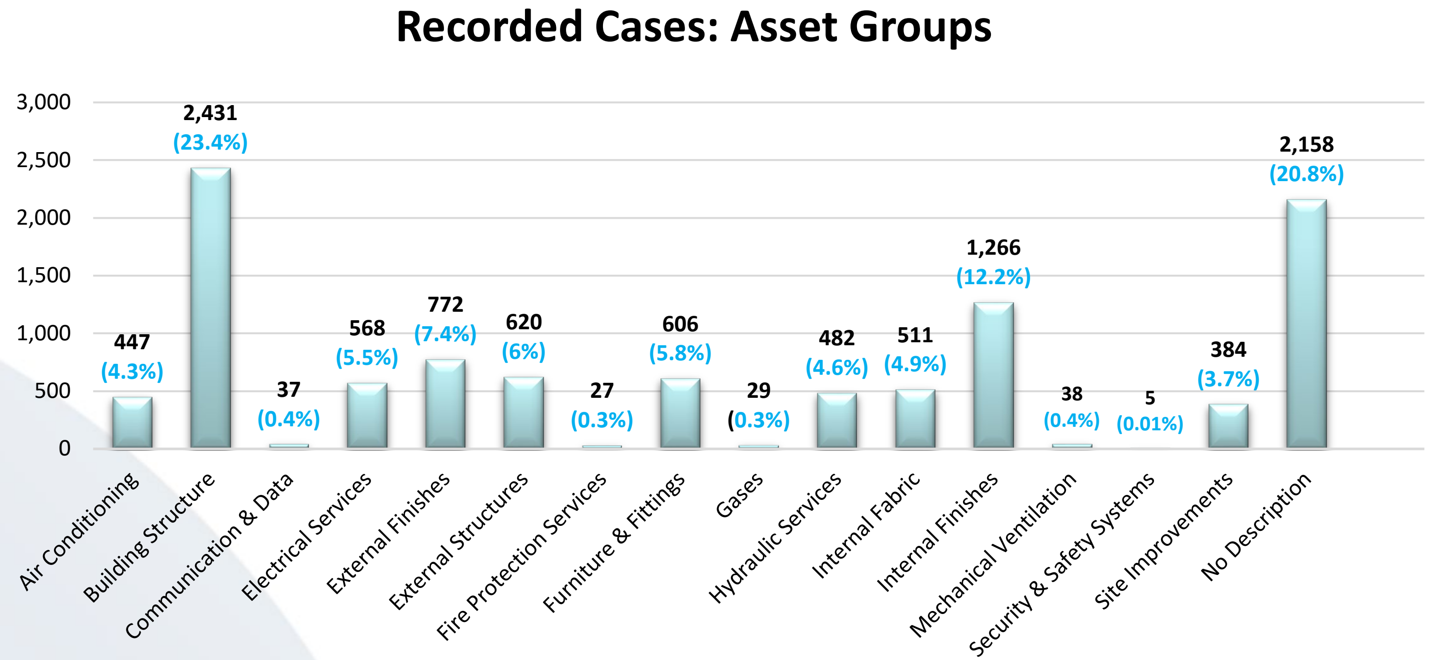
O&M Challenges

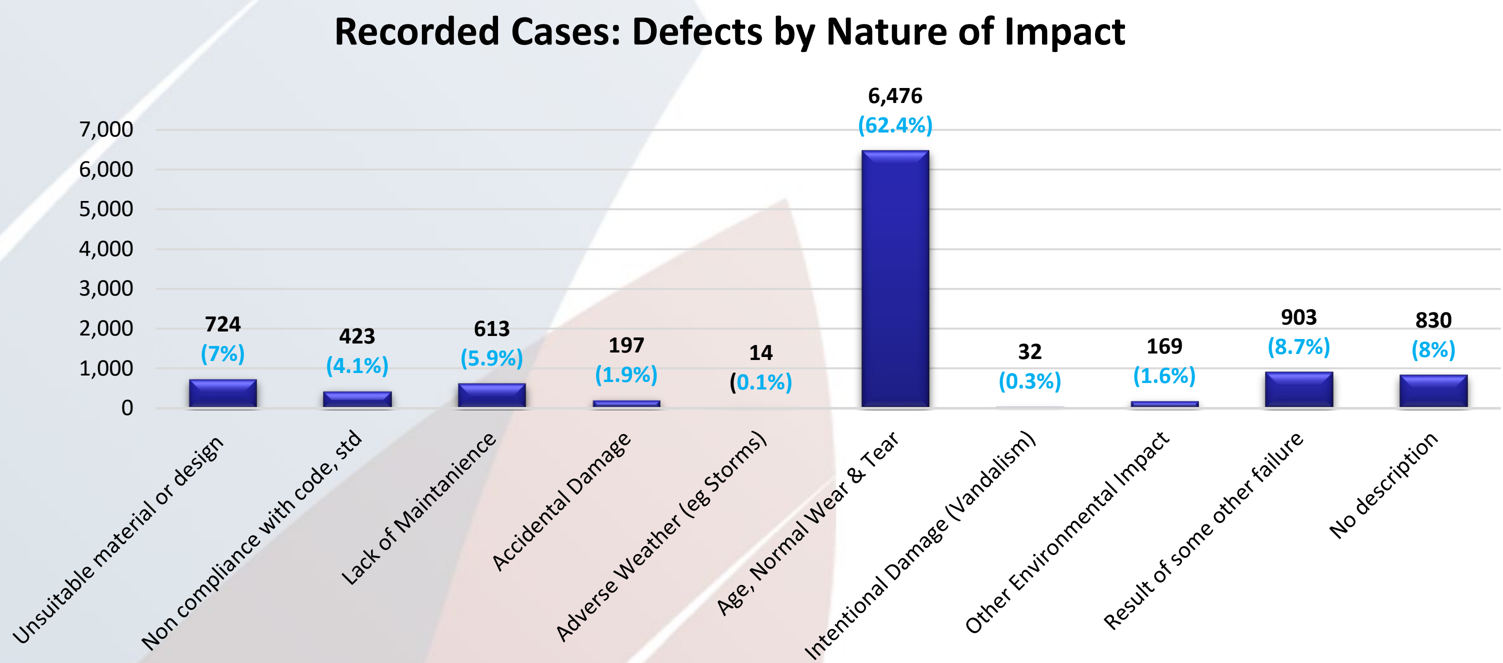
- Remote locations are often located many kilometers from service centers
- OH&S challenges
- Expensive contractor services
- Travel times rapidly blow-out a housing repairs and maintenance budget
- Maintenance scheduling
- Performance measurement
- Traceability of specific materials or components



Queensland remote regions (Adapted from QDHPW, 2016)

Remote Housing: O&M





Remote Housing: Critical Assets

Air-conditioning

Building Structure

- Roofs
- Windows
- External & Internal stairs
- Walls
- Stumps & Posts

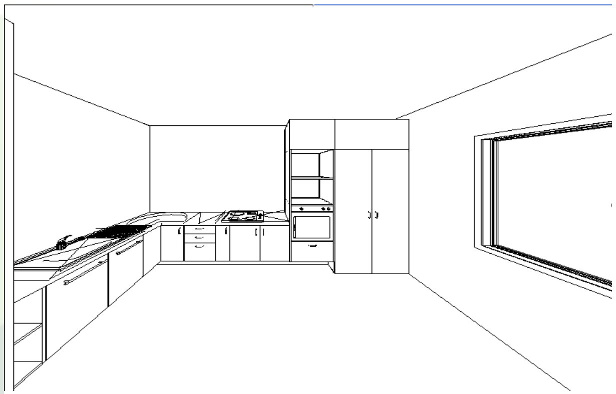
Internal and External Finishes

- Internal & External wall finishes
- Internal & External floor finishes
- Internal & External structure finishes

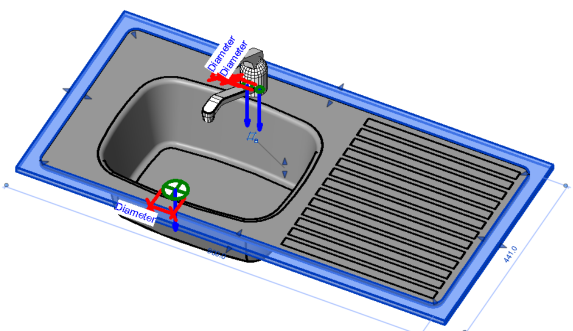
Site Upgrades

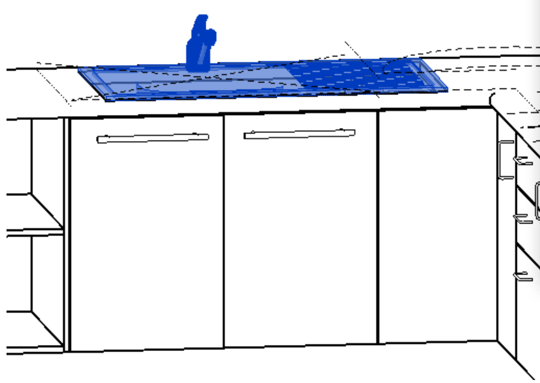
- Internal & External structure components
- Boundary walls, fences and gates
- Driveways & Footpaths
- Foundation & Slabs
- Plumbing upgrades
- Hard surfaced & Paved areas
- Landscaping & Gardening
- Retaining walls
- Drainage

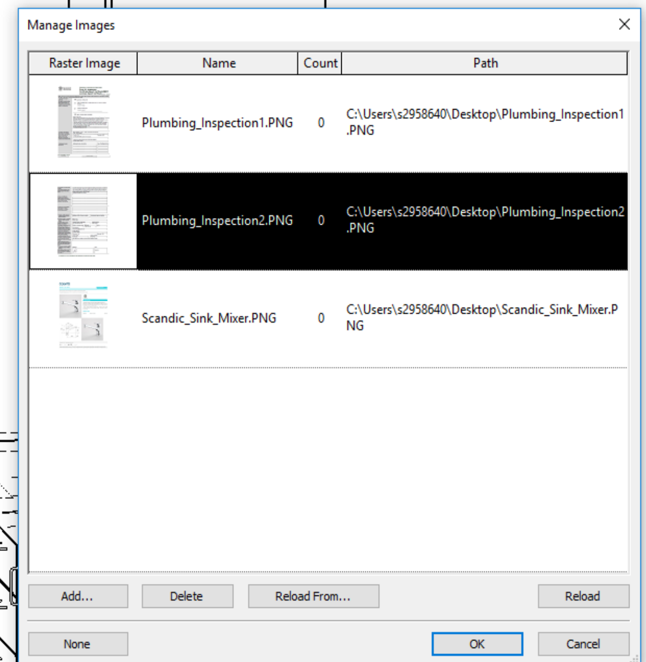
BIM for Remote Housing Maintenance



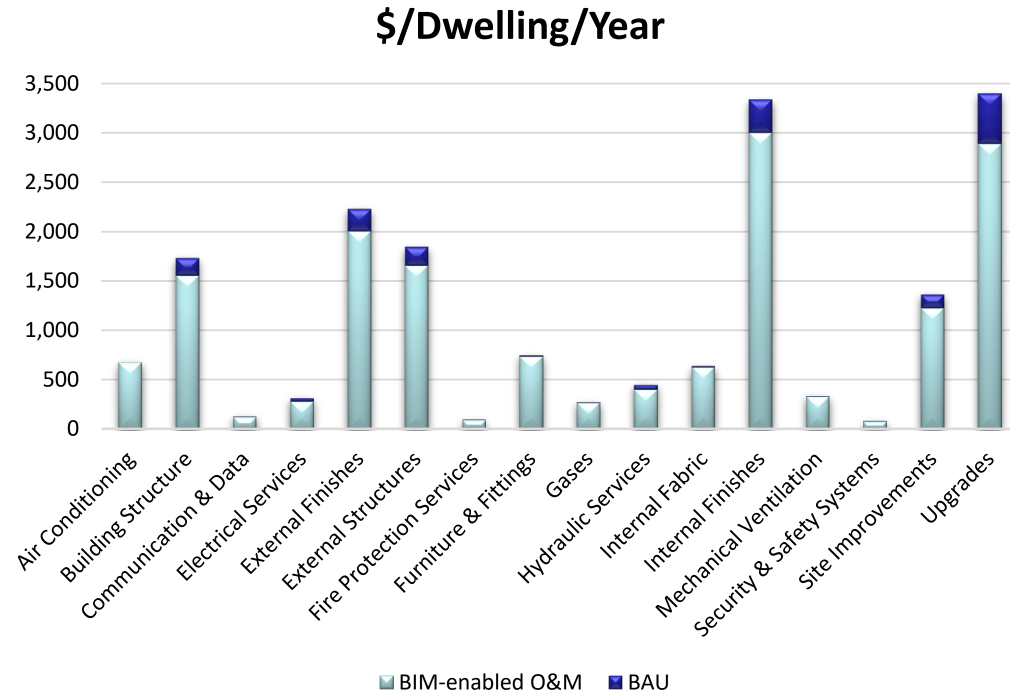
Object oriented asset information and maintenance actions repository as an accessible single source of truth for maintenance workers

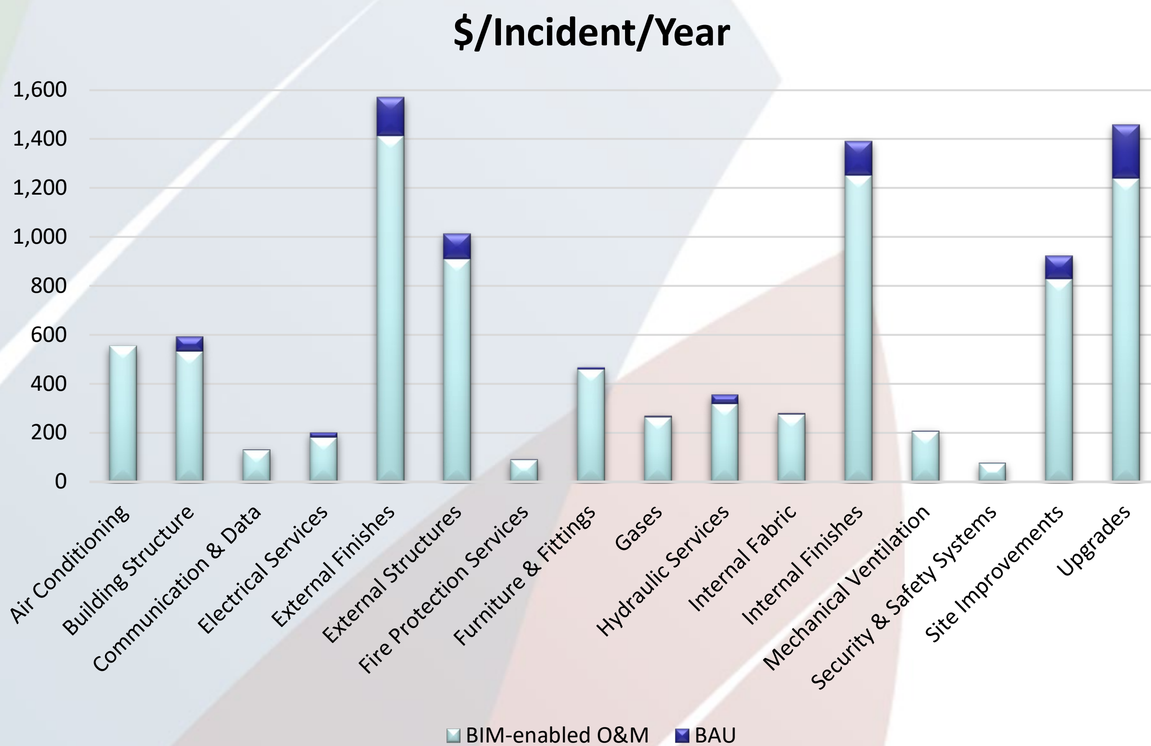






BAU vs BIM-enabled Operation and Maintenance for regional and remote government housing





Modelling the life cycle asset maintenance business case for BIM

Benefits of BIM Implementation for Asset Management in Remote Regions

- Resource saving within the Department of Housing and Public Works
- Resource saving by contractors
- Close control and monitoring of critical assets
- Improved statistical data collection and evaluation
- Rework cost savings up to 25% for individual assets
- Easy-to-use unite “eco-system”
- Better understanding of assets
- Enhanced quality of maintenance services for public houses

Source: Department of Housing and Public Works

Acknowledgements

- **Sustainable Built Environment National Research Centre (SBEnrc)** and its partners for funding ***Projects 2.64: Unlocking Facility Value Through Life Cycle Thinking***

- **Seqwater** for funding the Project titled ***Developing a Digital Asset Information Model Framework***

- Personnel from Queensland Government *Department of Housing & Public Works* and *Seqwater* that participated in a number of meetings, site visits and workshops

Thank you!

Any questions?