



2023 Roads Australia Fellowship Program

Digitising BYDA - QLD Design Team (Group 3)

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Client: Roads Australia

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Cover Page Photo Sources – Team Members Projects throughout QLD

The Project: What is one technical innovation we can introduce to our industry that will help us achieve RA policy objectives and open up opportunities for new streams of talent in our workforce?



An average, a Before You Dig Australia inner-city referral results in up to 12 emails, more than 17 attachments and up to 67 pages of plans (mostly PDF documents).

The way underground data is shared in Australia hasn't really changed since the 1980s despite significant technical innovation within infrastructure design and construction.



Current inefficiencies within the sector:

- Information is mostly provided in PDF format
- Data is processed and converted to digital
- Information is rarely shared
- In areas of high activity, services often get located multiple times

On average, projects spend 38% of the project costs on utilities so information improvements will be impactful.



By enabling digital data sharing, significant efficiency and safety benefits can be generated, including the potential to save 180,000 working hours or 90 FTE in Australia each year. A further \$120m could be saved each year in reduced PUP strikes with further enhancements to data sharing.

The End Users of BYDA information include government agencies, design consultancies and contractors who are also RA members. As a peak body for infrastructure, RA can advocate, bring together their members and work with BYDA to encourage the digitalisation of information and ensure that the methodology adopted suits the needs of the industry. This aligns with RA's core values and policy objectives.

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Terms and Abbreviations

Table 1 Table of Terms and Abbreviations

Term	Description
AS5488.1 - 2022	Australian Standard 5488.1:2022 - Classification of Subsurface Utility Information (SUI), Part 1: Subsurface Utility Information
AS5488.2 - 2022	Australian Standard 5488.2:2022 - Classification of Subsurface Utility Information (SUI), Part 2: Subsurface Utility Engineering
BIM	Building Information Modelling
BYDA	Before You Dig Australia (formally DBYD, Dial Before You Dig)
CAD	Computer-Aided Design and Drafting software e.g. AutoCAD, Microstation
Digital Data	CAD, GIS, etc.
DTM	Digital Terrain Model
TMR	Department of Transport and Main Roads (Queensland)
End User(s)	Planner, designer, constructor, homeowner, etc.
FTE	Full Time Equivalent
GIS	Geographic Information System software e.g. ArcGIS, QGIS
GDA	Geocentric Datum of Australia
PDF	Common file format for documents
PUP	Public Utility Plant
QTRIP	Queensland Transport and Roads Investment Program
RA	Roads Australia
RVS	Recognised-Value Standard
Utility Provider(s)	Includes electrical, local council, oil gas, telecommunications, water, non-asset owner and other asset owners as defined on the BYDA website.

1.0 The Opportunity

Before You Dig Australia (BYDA) is a national organisation which allows users to access information about public utility plant (PUP) located underground in the area they intend to dig (Before You Dig Australia, 2023). The information is sourced from BYDA member groups including electrical, local council, gas, telecommunications, water, and other asset owners (Utility Providers), with the aim of preventing injury and reducing damage to the complex underground network of essential services (Before You Dig Australia, 2023).



Figure 1 Before You Dig Australia (BYDA) logo (Before You Dig Australia, 2023)

The information is typically provided to the End User by BYDA in PDF format with a 30-day validity period. When used by engineers / designers this information is often manually converted into a digital format that can be used for design development. It is the obligation of the designer to confirm the legislative requirements associated with each Utility Provider are specified in design documentation.

Typically, each Utility Provider will require physical location via potholing or other verification services which can be costly, time consuming and risky. This information is generally only used for the relevant project and retained by the project / project owner. This information is not shared back to BYDA and the Utility Providers to enhance their database or made available to the next End User when a BYDA request is made for the same location.

The QLD Design Team believes that an opportunity exists for industry to collaborate and digitise BYDA data by sharing and harnessing new technologies and innovations. This collaboration will allow existing skilled resources including designers, drafters, engineers, locators, surveyors, traffic controllers and rehabilitation crews to be redirected to alternative activities within the industry, alleviating some pressure from existing skilled resources. This collaboration will also allow new skilled resources including technical and data specialists and legal experts to join our industry.

1.1 Technical Innovation

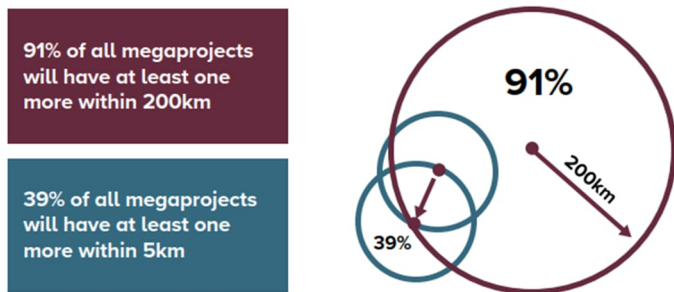
Technology advances and innovations are happening across all industries and providing significant benefits to how projects are delivered. Some examples of technology advances within our industry are as follows:

- Collection of survey, PUP and design data into consolidated Building Information Models (BIM) enabling real time visualisation and clash detection.
- Construction contractors preferring to construct and initiate level control from 3D models as opposed to drawings (noting that in most contractual agreements drawings take precedence over models).
- Enhancement of digital tools for how we manage our projects/businesses e.g. digital dashboards for finance controls.
- Increased use of coding and scripting to undertake repetitive or manual tasks.
- Introduction of Artificial Intelligence (AI) services such as ChatGPT.

While the way data is consumed is rapidly evolving, the data provided by BYDA members has not changed since the mid-1980s. There is growing concern from BYDA that industry and other End Users will turn to alternative applications to obtain service data due to the reluctance of Utility Providers to embrace digital and technical innovation (Greenall, Electricity Sector Safety Forum. A BYDA Summary and Recommendation, 2023). BYDA's CEO, Mell Greenall, described her view that unless industry is proactive in enabling the move towards sharing digital data with End Users, this will be 'done to them'. This will be either by platforms harnessing available open source data or through government intervention much like what is occurring currently in the UK as discussed in Section 2.3.

1.2 Resource Shortages

The design and construction of public infrastructure in Australia draws resources from four main groups – project management professionals; engineers, scientists and architects; structures and civil trades and labour; and finishing trades and labour (Infrastructure Australia, 2021). Labour shortages in these industries are impacting productivity and the Australian infrastructure pipeline.



The pipeline of infrastructure work is significant with ‘mega projects’ (greater than \$1 billion) increasingly being delivered on top of each other with two out of every five megaprojects planned to be delivered within five kilometres of another (Infrastructure Australia, 2021). This is contributing to the hyper-localised resource shortage and driving a rapid escalation in labour costs and retention within the industry.

Figure 2 Infrastructure Market Capacity Megaprojects Clusters (Infrastructure Australia, 2021)

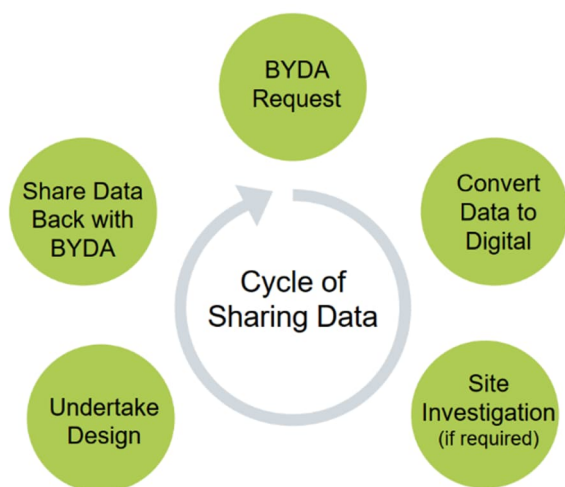
Another key contributor to the labour shortages in Australia was the COVID-19 pandemic with border restrictions impacting the ability for skilled migrants to relocate to Australia (National Skills Commission, 2022). The *Employment outlook Industry and occupation trends over the five years to November 2026* Report (National Skills Commission, 2022) indicates that the projected employment level is expected to rise by approximately 9.1%. However, the same report notes that employment within STEM occupations (those using Science, Technology, Engineering and Maths) are projected to grow by 14.2%.

The engineering and construction industry must consider alternatives to increase capacity and productivity. One option is to consider existing resources and leverage / transition them into alternate roles. Another is to lean on the digital and technology revolution.

1.3 Productivity Improvement Opportunity

The QLD Design Team has identified an opportunity to improve efficiency and productivity within the planning, design and construction phases of infrastructure projects which will enable existing skilled resources to be redirected to other critical activities.

Enhancing the service offering of BYDA to enable digital data to be shared, rather than the current PDF form, would create significant benefits to End Users. If the system provided the option to output data in a format that could be input into design or construction software (with an accuracy range), it would be possible to reduce ongoing or repeat design and investigation works ultimately allowing resources to be freed up to undertake alternative tasks.



Increased accuracy of information also removes the need for continual rework, reduces the risk of human error and allows higher accuracy of information to be provided. There is also potential to initiate a cycle of obtaining and sharing information between the Utility Providers, BYDA, and the End Users, and back from the End Users, to BYDA, and to the Utility Providers. For example, an End User requests information, uses the information for design / excavation / relocation, collects as built data and then shares the information back to BYDA and the Utility Provider for use in the future.

Figure 3 The Cycle of Sharing Data

1.4 Roads Australia's Strategy

Roads Australia's (RA's) Strategic Plan 2022-2024 (Roads Australia, 2022) articulates four core values and objectives that identify who they are and what they stand for, these are:

- **The Leader** – to be a voice of influence.
- **The Collaborator** – to advance the efficiency, development and national priority of Australia's roads and integrated transport systems which underpin the social, economic and cultural fabric of the nation.
- **The Facilitator** – to make a leading contribution to industry and public policy.
- **The Champion** – to champion a diverse, inclusive, sustainable and values-led organisation and industry.

RA's policy objectives are around four key themes, which are:

- **Resilience** – To be able to rapidly and successfully respond to change.
- **Place making** – Capitalising on neighbourhood spaces to optimise their use and to promote people's health, happiness and well-being.
- **People** – A focus on the people of transport, the workers and customers.
- **Data and Technology** – Using Information and emerging technology to deliver improvements to customers and the development of infrastructure (Roads Australia, 2022).

The End Users of BYDA information include government agencies, design consultancies and contractors who are also RA members. As a peak body for infrastructure, RA can advocate, bring together their members and work with BYDA to encourage the digitalisation of information and ensure that the methodology adopted suits the needs of the industry. This aligns with RA's core values and policy objectives.

2.0 Research & Industry Participation

To further understand the opportunity and the barriers to change from the existing BYDA service offering, the following research has been undertaken and is discussed further in the subsequent sections:

- Direct engagement with BYDA CEO, Mell Greenall
 - Mell has supported this research by meeting with the project team, providing ongoing input and insights to inform the research, and providing introductions to member organisations.
- Survey of ten (10) BYDA member organisations
 - Respondents spread across energy, oil and gas, telecommunications, water and local government.
 - Survey focused on current capability and barriers to change.
- Survey of seventeen (17) BYDA End Users
 - Respondents were industry professionals across planning, design and construction.
 - Focus of survey was to assess whether the BYDA service currently meets their needs and identifying what additional information would be beneficial to them.
- Research into the UK's National Underground Asset Network (NUAR)
 - International example of digital transformation of underground networks.
- Review of current Australian Standards
 - To identify possible opportunities to enhance standards on the way utility information is recorded and shared.

2.1 BYDA Involvement

Mell Greenall, CEO of BYDA, has personally supported the project from the development of the scoping paper. The team met with Mell in Brisbane on 23 June 2023 to discuss BYDA's organisation structure and if their topic was feasible. It was also essential to understand why BYDA had not yet transitioned to a digital platform.

The discussion covered a wide range of topics, including:

- Roads Australia Fellowship project scope
- Identification of opportunities for productivity through enhanced BYDA service offering
- Summary of how to approach engagement with Utility Providers and End Users
- Barriers BYDA are facing:
 - Some original database sets were developed in the 1980's
 - Service mapping isn't mandated in every state
 - Member organisations don't have the End User perspective in mind
 - Some member organisations are risk adverse and are concerned about providing an increased level of data
- Challenges industry are facing:
 - 38% of total projects costs are on utilities
 - There are approx. 200+ strikes per month on utilities (70% of these haven't done a referral)
 - There are only approximately 900 certified locators nationally (insufficient for the demand)
 - BYDA receives on average 20,000 referrals a day

It was clear after meeting with Mell that she is very passionate about her role and understands that if the BYDA service offering doesn't evolve then it risks the possibility of being made redundant or the information becoming open source.

A copy of the meeting minutes has been included in Appendix A.

2.1.1 How BYDA Operates

BYDA is a national member organisation through a partnership with utilities, local councils, government agencies and private enterprises. As of July 2023, BYDA has 699 members (Greenall, A Message from BYDA CEO Mell Greenall, 2022). BYDA coordinates referral requests from End Users to Utility Providers who respond (provide their PUP data) directly to the End User or through BYDA. Being the referrer only, BYDA doesn't own or control any asset information. While BYDA has an ambition to move to a more digital offering, ultimately, they require all member organisations to be open and willing to provide their digital information.

In Australia, BYDA provides a free referral service for End Users to access vital plans and information from Utility Providers especially underground services. Previously the organisation was state based. Two years ago, the state based organisations combined to create a national entity called BYDA. As service mapping is not mandated in every state in Australia, not all Utility Providers are members of BYDA. Most of the local governments in Queensland and Victoria are part of BYDA but only 50% of local governments in New South Wales are part of BYDA (Greenall, Interview with Mell Greenall - CEO of BYDA, 2023).

There are more than 200 strikes per month in Australia and 70% of the strikes have not had a BYDA request completed (Greenall, Electricity Sector Safety Forum. A BYDA Summary and Recommendation, 2023)

The main driver for BYDA is to prevent damage and injury as the BYDA requests allow:

- End Users to understand asset location, preventing damage to the underground utilities and potential injuries which could result from striking an underground service,
- Utility Providers to provide critical safety and permitting information to support safe work practices when working near their assets, and
- Utility Providers to track planned works or damages that may occur to their underground assets.

Most of BYDA's members are Utility Providers that have underground assets at risk of being damaged by excavation (IPWEA, 2022). BYDA is a not-for-profit organisation funded by the Utility Providers, who pay BYDA \$0.64 for every referral they send out (IPWEA, 2022). An average inner-city referral results in up to 12 emails, more than 17 attachments and up to 67 pages of plans (mostly PDF documents) (Greenall, Interview with Mell Greenall - CEO of BYDA, 2023).

Post processing data for the design and construction industries is time-consuming and costly and a recent survey conducted by BYDA of 200 End Users of the referral service indicated a strong preference for transitioning towards digital-based information such as CAD or GIS files (Greenall, Electricity Sector Safety Forum. A BYDA Summary and Recommendation, 2023).

2.1.2 BYDA Progress

Mell Greenall's 22-23 end of financial year message (Greenall, A Message from BYDA CEO Mell Greenall, 2022) recognised the need for BYDA to commit to creating a pathway for digital innovation and particularly made a reference to data sharing, including as-built data.

Mell shared a document that she presented to the Electricity Sector Safety Forum in May 2023 (Greenall, Electricity Sector Safety Forum. A BYDA Summary and Recommendation, 2023) which outlines the case to enable digital file sharing. The document speaks to the fact that the way BYDA provides information to End Users (PDF files) has not changed since the 1980s and BYDA are facing a race for relevance as End Users are demanding evolution to digital data sharing.

Mell has the support of the BYDA board and the financial backing to implement change within the industry. BYDA has recently approved the investment of approximately \$2million to develop a user referral portal to allow for BYDA to create data set libraries, collated responses and a pathway for digital enhancements in the future. During the teams' interview, Mell also advised that she is campaigning government agencies to change procurement policies to mandate sharing of PUP information with BYDA to further enhance the sharing of data within the industry (Greenall, Interview with Mell Greenall - CEO of BYDA, 2023).

2.1.3 BYDA Support

BYDA needs support and push from the industry to encourage the Utility Providers to enhance the information provided to End Users.

Roads Australia has influence within the industry and the membership base to support BYDA in transitioning their service offering. With the backing and support of Roads Australia and Utility Providers, and a potential update to standards, this may provide BYDA the opportunity to transition the service offering to a more digital offering.

2.2 Industry Participation

Two separate surveys have been undertaken to further understand the barriers and challenges that are experienced by both the Utility Providers and End Users.

2.2.1 Engagement with Utility Providers

Engagement has been undertaken with the following Utility Providers and government representatives with a total of 10 survey responses received:

- Energy Queensland
- Telstra, NBN and Optus
- Queensland Urban Utilities, Unitywater and Seqwater
- APA Gas
- Brisbane City Council, City of Gold Coast and Moreton Bay Regional Council

Responses have recognised the benefit of moving to a more efficient and cost-effective way to share their information to End Users that is easy for design consultants, contractors, homeowners and other agencies to use.

Most Utility Providers have a team of five (5) representatives or less who manage their BYDA requests, and it generally takes them less than one (1) hour to process the information following a BYDA End User request. In addition to issuing BYDA data, a proportion of the Utility Providers record the request into a database and monitor the sites/investigate areas of significance.

Figure 4 indicates that the majority of Utility Providers provide their data to BYDA in a GIS format however following a BYDA request, Figure 5 indicates End Users receive PDF files from BYDA. There are also a small number of Utility Providers who provide CAD or GIS files to the End User.

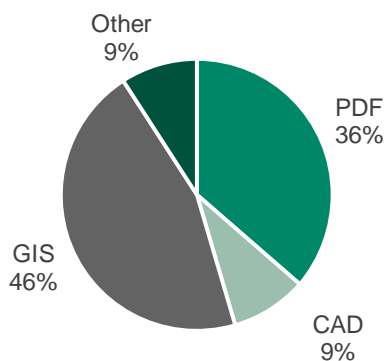


Figure 4 File format that Utility Providers provide to BYDA

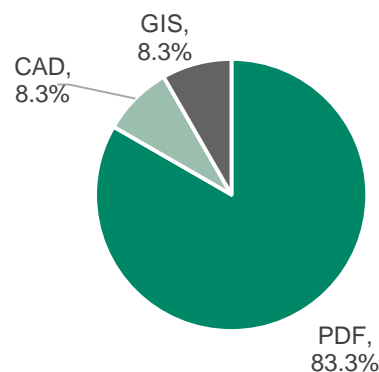


Figure 5 File format that BYDA provides to the End User

While 56% of the responses from the Utility Providers believe that the way in which their data is provided to the End Users is the most effective way of providing information, all Utility Providers that were surveyed believe that they can improve the way the data is being provided to the End Users. A Utility Provider acknowledged that End Users have complaints on the information received and 80% of Utility Providers are willing to provide spatial files such as CAD or GIS files.

As shown in Figure 6, most Utility Providers believe that the major barriers to providing digital data to BYDA or End Users are legal, security, resources, cost or technology constraints. Most Utility Providers are open to sharing their digital data with residents, developers/contractors, consultants and other Utility Providers however over 80% of responses saw value in being notified of the BYDA request.

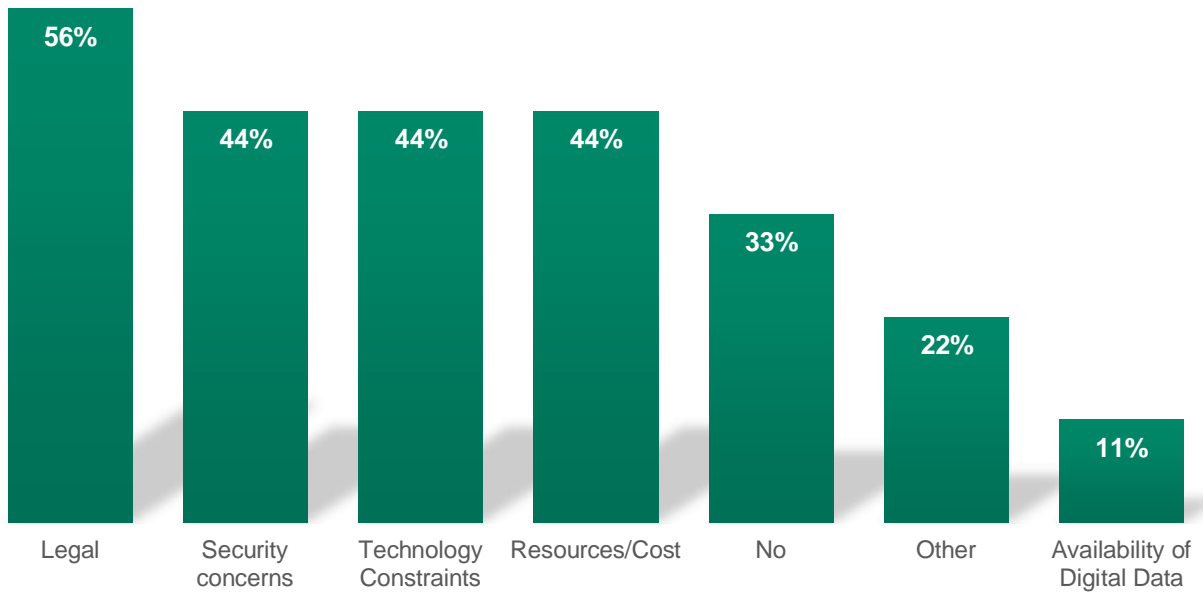


Figure 6 Barriers within Utility Providers to providing digital (spatial) data to BYDA or End Users

Although not yet available as a function of BYDA, 80% of the Utility Provider respondents saw value in receiving updated digital data (for example, survey data in accordance with AS5488, BIM model or pothole information) relating to their assets from consultants, contractors, or other Utility Providers.

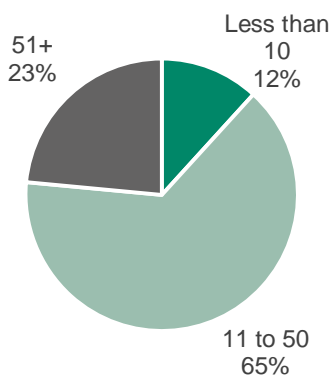
A copy of the survey engagement undertaken with Utility Providers is included in Appendix B.

2.2.2 Engagement with End Users

A separate survey was issued to End Users from various organisations (for example, design consultancies, contractors and government agencies) to understand:

- How they use the current BYDA service
- Their satisfaction with the current BYDA service
- If there are any additional features that they consider would be beneficial including receiving the information in alternative formats
- What impact the additional features would have on their business e.g. improved productivity

Figure 7 indicates that most organisations normally complete between 11 to 50 BYDA requests every year for planning, design or construction projects with typical construction values between \$1 million and \$100 million.⁸



While BYDA requests are typically used to verify existing data, support PUP locating, potholing and surveying, Figure 8 indicates that a large proportion of the requests are incorporated into planning, design and or the construction of projects. Depending on the project size, it takes on average between 1 day to 1 week to process (digitise) the data received from BYDA into a format suitable for design or construction purposes.

Figure 7 Number of BYDA requests a consultancy/contractor completes in a year

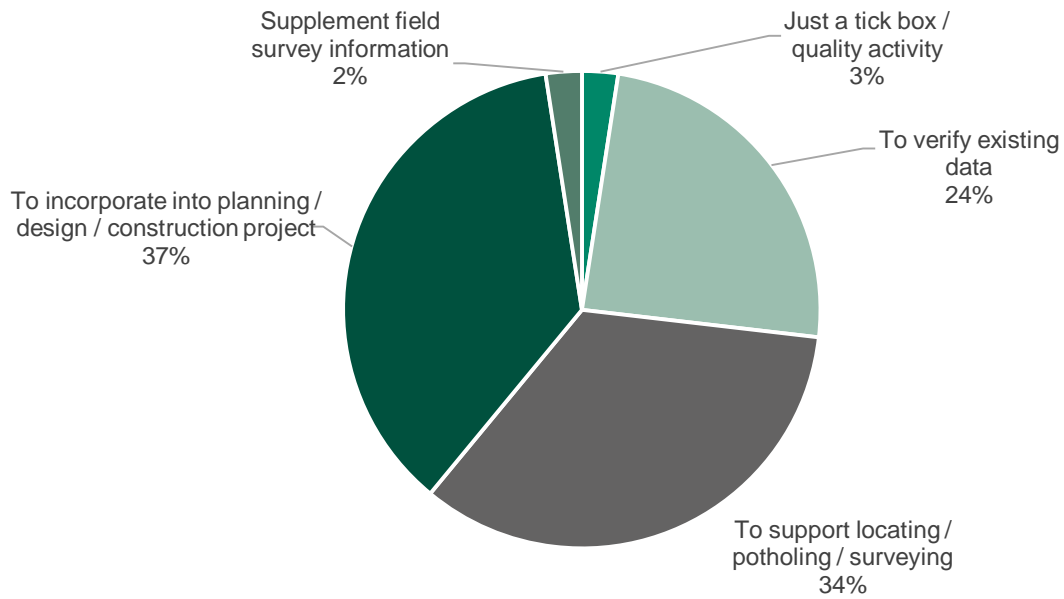


Figure 8 Reasons End Users undertake a BYDA requests

Most organisations have advised that the quality of the data from BYDA is average and generally the data is correct for size and material but often not on a correct alignment. As indicated in Figure 9, all organisations have expressed that they would like the data from BYDA to be provided in an alternative format (for example, CAD, GIS or other format).

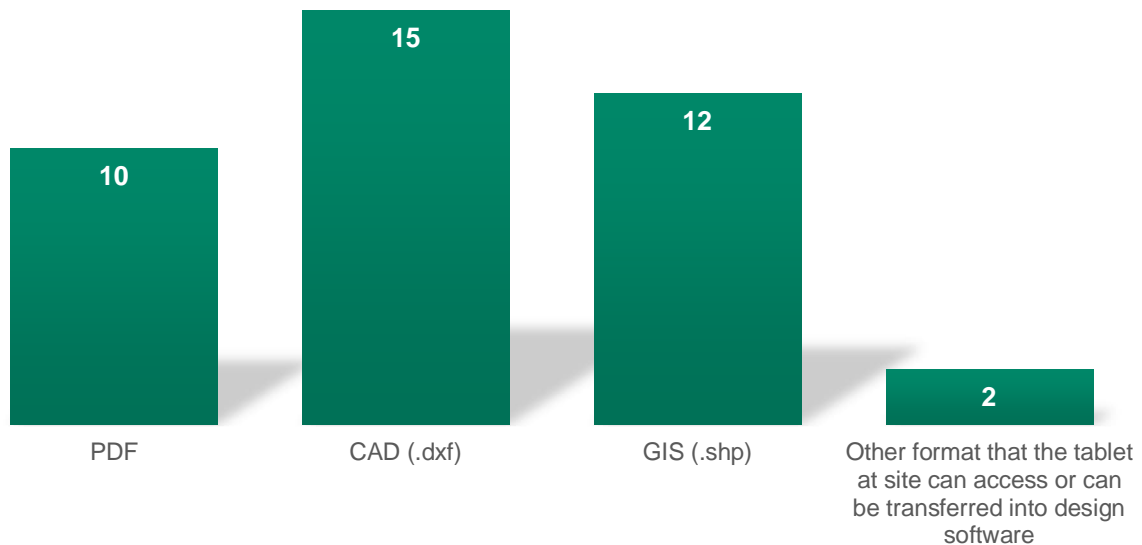


Figure 9 The preferred data format that the consultancies like to receive the data from BYDA

Most respondents have advised that their experience in getting information from BYDA/Utility Providers and interpreting the information have been mixed. Generally, the information is provided quickly but the data can be difficult to interpret and take a lot of time and resources to review depending on the type of data or the Utility Providers. The quality of the data has limited accuracy and is not good enough to rely upon but it provides good information to determine if a service is in the area. Most respondents would recommend BYDA or Utility Providers to improve the quality of the data provided by including levels, locations, and type of service.

A copy of the End User survey and responses received has been included in Appendix C.

2.3 International Example

The UK is currently transitioning towards a digital service for sharing underground data. In 2019 the government commenced working with industry to develop the National Underground Asset Register (NUAR) – a digital map of underground pipes and cables (Geospatial Commission, 2023) and (National Underground Asset Register (NUAR), 2023).

The project was established to address the challenges associated with locating underground data. Previously, parties wanting to dig had to contact multiple sources and the data was provided in different formats, scales and to varying timeframes. The government estimated that the 60,000 PUP strikes each year cost £2.4bn (~ \$4,588 million AUD) a year in direct and indirect costs (National Underground Asset Register (NUAR), 2023).

From the early pilots of NUAR, the government found significant benefits for both Utility Providers and End Users of the data.

'...improvements in sharing and accessing underground asset data have huge potential in revolutionising how infrastructure projects are planned and delivered, helping to improve efficiencies in construction and development, reduce disruption and improving workers' safety.

For Utility Providers, this service will improve current data exchange processes leading to significant efficiencies and reducing the likelihood of asset strikes.'
(National Underground Asset Register (NUAR), 2022)

The project is currently in the build phase after moving through a consultation period across 2022, and earlier this year released its initial iteration of the platform. The platform is a digital map which gives planners and excavators standardised access to the data they need when they need it, to carry out their work effectively and safely. It also includes features to keep data secure and improve its quality over time (National Underground Asset Register (NUAR), 2023).

Currently Utility Providers are voluntarily participating in the pilots and platform development, however the government is also considering options, including legislation, *'to ensure maximum participation in the program'* (National Underground Asset Register (NUAR), 2023).

The UK government anticipates that over time the platform will enable coordination of street works, emergency response, flood risk planning, resilience planning and alternative energy production and distribution (National Underground Asset Register (NUAR), 2023).

2.4 Australian Standard Approach

Australian Standards are voluntary documents that set out specifications, procedures and guidelines that aim to ensure products, services and systems are safe, consistent and reliable (SAI Global, 2023).

Within these national standards, AS5488.1 (2022) specifies the classification of all subsurface utilities which have a quality level assigned describing the accuracy of information that is collected or held. The definitions of the Quality Levels from A to D and their attributes have been included in Appendix D.

AS5488.2 (2022) defines the management of the subsurface utilities information however it is only used as a reference. While AS5488.2 provides a framework for subsurface PUP model creation, PUP clash detection and PUP design, it does not provide any recommendation on the sharing of PUP investigation information or PUP models with the public or Utility Providers.

End Users have significant concerns regarding the accuracy and consistency of plans provided by Utility Providers as the majority are quality level D as per AS5488.1. Quality level D provides an indication of PUP type however there is no tolerance applied to the indicative location. Despite only providing Quality level D information as PDF plans, Utility Providers typically have access to information between Quality level A and D based on their own locating, surveying, as-constructed plans, etc.

3.0 Case Study

It is a legal requirement for designers and constructors to identify and locate PUP within project extents to prevent damage. A typical process that is undertaken by designers and/or engineers includes:

- A **BYDA request** of the project area is undertaken.
- Extensive effort and **processing** is then required to convert the information into a digital format suitable for design software.
- Depending on the phase of the project, **validation** is then required to increase the accuracy of the information to better inform the design.
- Following the processing and validation, the data is then transferred into the design model for **use** throughout the design and indicated on construction drawings.
- This process is often iterative and undertaken on a project-by-project basis with limited information **transfer** from the consultant/contractor to the client and hence back to the Utility Providers

These steps are discussed in further detail below as applicable to a road and intersection upgrade project in Southeast Queensland which one of the Queensland Fellows was involved in (the Case Study).

3.1 BYDA Request

To use BYDA, a request is lodged through its website or phone application and PDF maps are then emailed to the End User. An example of the PDF maps generated by BYDA are shown in Figure 10. The maps provide basic two-dimensional linework indicating that a service exists.

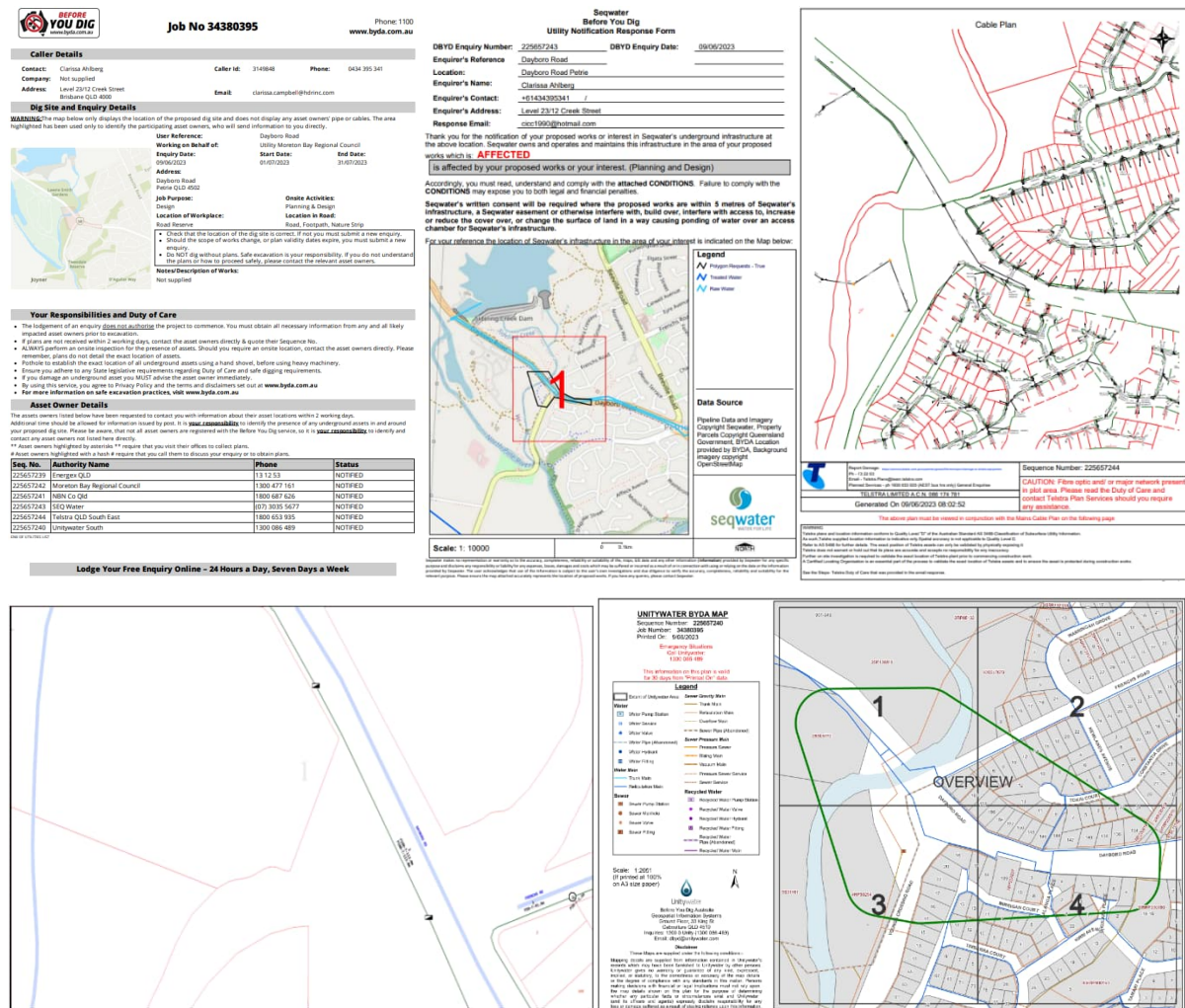


Figure 10 BYDA, Seqwater, Telstra, NBN and Unitywater BYDA PDF Maps (Source: BYDA Australia)

The Case Study generated the following content:

- 7 emails; one from BYDA and one from each of the Utility Providers (Energex, Moreton Bay Regional Council, NBN, Seqwater, Telstra, Unitywater)
- 56 pages of PDF; one from BYDA, 14 from Energex, 3 from Moreton Bay Regional Council, 18 from NBN, 5 from Seqwater, 8 from Telstra and 7 from Unitywater

3.2 Processing

Following receipt of the information from the BYDA request, the PDF information is typically digitised for use. This is usually completed in CAD or GIS which involves creating linework for every single asset (stormwater pipe, watermain, telecommunications conduit, etc.) from each of the Utility Providers.

The locations of these lines are informed by the BYDA information, but due to the scale of the maps and the lack of reference points, relies heavily on other information like survey of surface features (manholes, hydrants), standard corridors/alignments and offsets from property boundaries, and knowledge of the digitiser. Attribute information like pipe size, material, etc. is also included if provided by BYDA.

3.3 Validation

Following processing of the BYDA data, the information is typically validated against what is in the field.

In the planning phase of a project, this usually involves the following:

- If a DTM survey exists, this is often used to link services to pits or valves (Quality Level D)
- If as constructed information is available, this is often used to provide the location/size/material of key services not captured by the survey or confirm the information provided by the survey (Quality Level C)

In the design phase of a project, this usually involves the following:

- Survey and as constructed information are used initially as described above (Quality Level C)
- Surface tracing is undertaken to locate services that are conductive. However, this doesn't work on services which are not conductive i.e., sewer or water mains which do not reflect a reading and require physical locating via hydrant and manhole locations (Quality Level B for surface tracing, Quality Level A for survey of inverts)
- Potholing is undertaken to locate services that cannot be located by surface tracing or where additional information is required that is not provided by surface tracing i.e. number of conduits, size (Quality Level A)

In the construction phase of a project, all services that could be impacted by the project are potholed to confirm their location (Quality Level A).

3.4 Use

Following the validation of the BYDA data, the PUP information is then transferred into the design model for use in the design. At the planning phase of a project, this may simply be 2d lines in CAD or GIS, but in the design phase of a project, this will usually be 3d lines in 12d for coordination with the design and 2d lines in CAD for display on the drawings.

3.5 Transfer

Following the project, the above information is provided back to the client, but is rarely used to update their asset management system or offered back to the Utility Provider. For a design or construction project, this Quality Level A and Quality Level B information is valuable data that the Utility Provider could use to update their records to increase their own confidence in the data, as well as be available for future use.

3.6 Effort/Costing

The level of effort and cost to complete the BYDA request, process and then validate the BYDA data has been estimated for the Case Study below:

- Digitise BYDA data into 12d including populating with pipe sizes and estimated levels to give a 3d representation of the utilities
 - Engineer @ \$200/hr x 40hrs = \$8,000
- Digitise BYDA data for display on the drawings
 - Drafter @ \$185/hr x 40hrs = \$7,400
- PUP investigation including scoping, coordination and site involvement
 - Engineer @ \$200/hr x 40hrs = \$8,000
- PUP investigation including permitting/temporary traffic management plans/traffic control, surface tracing/ground penetrating radar/potholing, survey = \$100,000
- PUP investigation for geotechnical testing = \$2,000

Table 2 below includes both the Case Study information and a number of other example projects provided by the QLD Design Team.

Table 2 Estimated Level of Effort/Cost of Requesting, Processing and Locating the BYDA Data (PDF maps)

Project Number	Project Location	Project Phase	Approx. Construction Cost	To digitise BYDA data		Cost of Physical Location	Total estimated cost
				FTE (Weeks)	Approx. Cost		
1 (Case Study)	Urban	DD	\$70M	2.0	\$15,400	\$110,000	\$125,400
2	Urban	P	\$30M	1.0	\$7,700	-	\$7,700
3	Rural	DD	\$28M	2.25	\$13,000	\$30,000	\$43,000
4	Urban	DD	\$250M	8.0	\$80,000	\$100,000	\$180,000
5	Urban	DD & C	\$120M	3.0	\$40,000	\$300,000	\$340,000

DD – Detailed Design, P – Planning, C – Construction

The level of effort and cost to digitise the BYDA data and the cost of locating is highly variable and depends on the project location (urban/rural), project phase (planning/design/construction), project type (brownfield intersection upgrade/greenfield road construction/etc.), and utilities adjacent the project.

3.7 When It Goes Wrong

3.7.1 During Construction

A PUP strike caused by the misinterpretation of BYDA data and the misallocation of risks due to lack of understanding of the AS5488.1 Quality Level, led to serious consequences including delay and disruption to three projects and the community, and potentially affecting people's wellbeing and life. The example below is a project worked on by one of the 2023 Queensland Fellows.

In 2014, at a major road infrastructure project in Southeast Queensland, the contractor completed a BYDA request and the Utility Provider plan indicated that the telecommunication conduits travelled roughly in a straight line. However, the area had been through many developments since the Utility Provider plan was developed in the 1980s and it was supposed to be treated as AS5488.1 Quality Level D. The Contractor then proceeded to pothole the conduits at 100m intervals (AS5488.1 Quality Level A) according to the Utility Provider plan and cable located between every pothole (AS5488.1 Quality Level C).

Figure 11 shows the telecommunication conduits (Telstra, Optus, NBN, TPG and Uecomm) in the major telecommunication pit within the project site. It was later discovered that one of the telecommunication conduits did not travel in a straight line and made a slight bend for about 50m with insufficient cover under the footpath before travelling back on a straight alignment.



Figure 11 Construction Example of Major Telecommunications Pit

While the Contractor was saw cutting the footpath, the Contractor did not realise the slight change of alignment of the conduits and accidentally cut one of the major telecommunication conduits. Upon further investigations, it was discovered that 1,200 phone lines (which were 2,400 copper cables) in the conduits were damaged. This resulted in 1,200 homes having no landline connection. In addition, three of these households had an emergency medical alarm through the landline which was also lost. Free mobile phones had to be arranged immediately for the three households that required emergency medical alarm while the phone lines were being restored.

The Utility Provider mobilised two crews (one from Bundaberg and one from northern NSW) from two separate construction projects to travel to Brisbane immediately to reconnect the phone lines. This resulted in delay and disruption to this particular road infrastructure project and two other construction projects. As the copper lines had to be manually stitched together by two people at a time (one person holding each end and another person stitching it together), it took the two crews working 72 hours non-stop to stitch the 2,400 copper lines together and restore the 1,200 phone lines. The repair cost was approximately \$500,000 and the delay and disruption to this project, the other two projects and the community were significant.

3.7.2 End User

A PUP strike caused by the inaccuracy of the Utility Providers data provided via BYDA led to a utility strike in a private property. The below case study has been provided by a professional colleague of one of the 2023 Queensland Fellows, for the benefit of this research project.

In 2023, a homeowner was completing new boundary fencing of their property. A BYDA request was undertaken of the area and cadastral surveying completed to identify the property boundary prior to any physical excavation. The homeowner also obtained a copy of design plans which indicated a telecommunication service had been previously relocated to a corridor within the road reserve.

The steps identified in Section 3.1 to 3.4 above were completed and pits were identified onsite which aligned with the BYDA plans and the relocation plans. As such, it was concluded that the telecommunication service was within the road reserve. As the new fence was offset into private property the End User considered that the risk had been identified and managed.

It was determined that the level of information being adopted would be in accordance with AS5488.1 Quality Level C. The homeowner believed they had undertaken their due diligence. Unfortunately, the homeowner struck and severed the service.

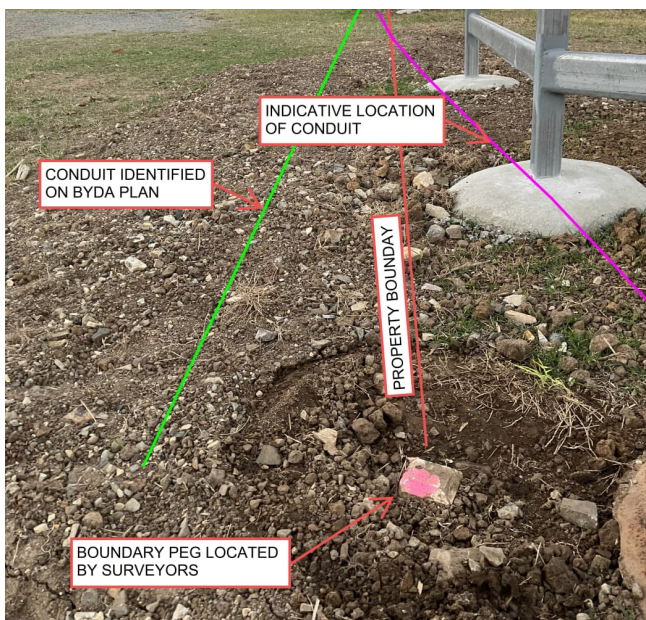


Figure 12 Homeowner Example – A

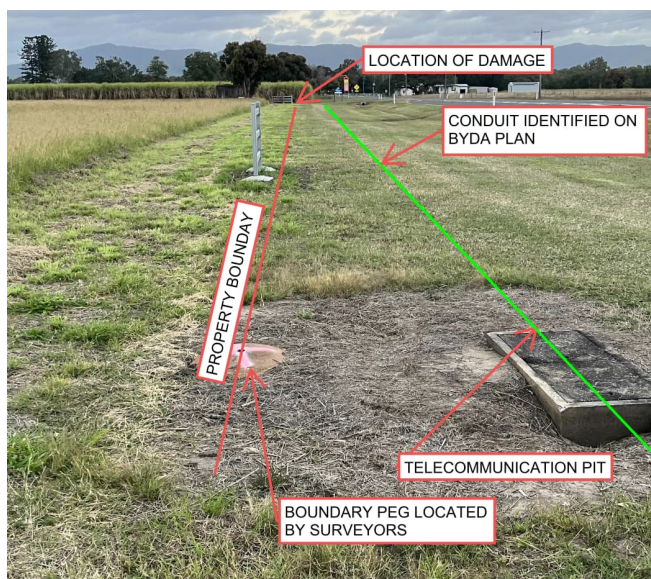


Figure 13 Homeowner Example – B

Figure 12 and Figure 13 provides a graphical representation of the information obtained. The telecommunication pits were located within the road reserve, the boundary had been surveyed by a registered surveyor and the new fence line was within private property.

Figure 14 shows the location where the service was severed as well as the repair works completed following the incident.

The Utility Provider has claimed that the homeowner did not follow their duty of care and are claiming damages. The homeowner does not agree with this assessment given the due diligence undertaken and that works were being completed inside private property. In this instance the Utility Provider has notified the homeowner that their plans are indications only as to the presence or otherwise of cable infrastructure in the general vicinity of the geographic area shown on the plan. These plans are not and do not purport to be accurate depictions of the exact location of their facilities.

As indicated in Figure 14 the repair works completed retains a significant risk to both the Utility Provider and homeowner as the fence has not yet been completed and the fence posts are a risk to the telecommunication asset. It is still unknown where the service deviates from the pit to pit alignment and into private property.



Figure 14 Telecommunication Service Severance and Repair

This incident provides an example of where opportunity could be taken by the Utility Provider to improve the accuracy of their information for future BYDA requests. The repaired service could have been surveyed and documented in accordance with AS 5488.1 Quality Level A and subsequently provided as a digital file should that be requested by the End User. The homeowner would then be aware that the service was located within private property and not within the road reserve as depicted.

4.0 Solution – Digitising BYDA

The existing BYDA service offering treats every request the same, whether it is from a homeowner, an engineer, or a contractor. The average homeowner does not need to digitise the PDF information so does not require digital data, while the average engineer does.

4.1 Available Digital Information

All Utility Providers have an asset management system which is supported by spatial mapping. Some of these organisations will provide an extract of this digital data on request, while others have a system which allows you to download their complete asset database with available attribute information in various file formats.

Figure 15 provides an example of Unitywater’s (Sewer and Water Utility Provider) Detailed Infrastructure Plan, which details all of their assets with attribute information, while Figure 16 provides an example of Moreton Bay Regional Council’s (Local Government) Datahub, which shows all of their assets with attribute information. Both of these systems allow anyone to access and download the Utility Providers data in a number of file formats.

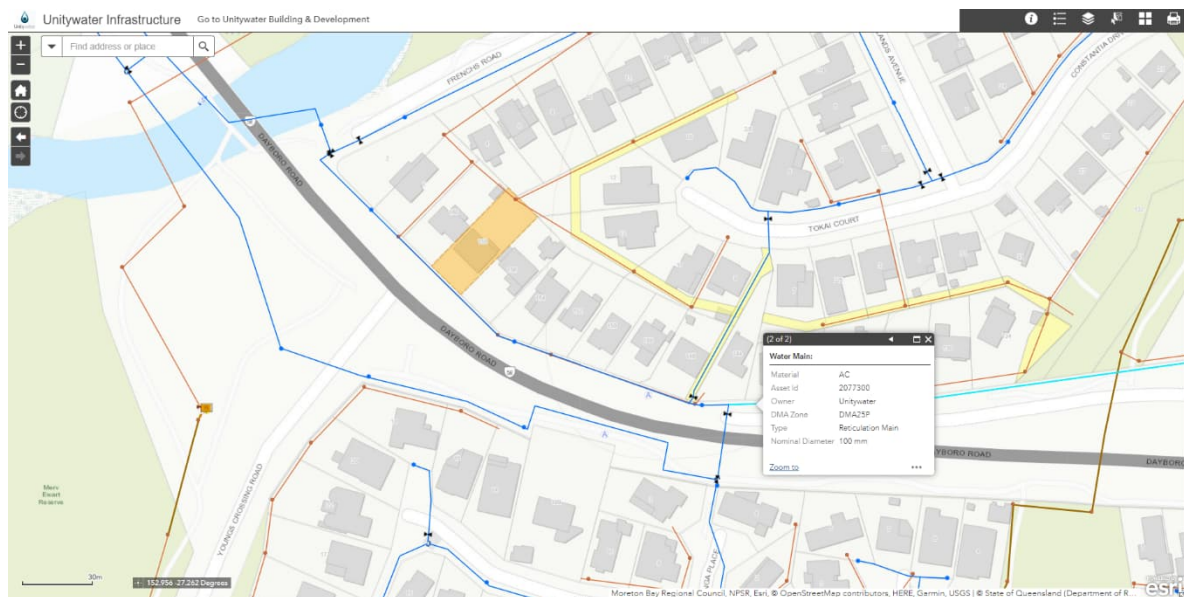


Figure 15 Extract from Unitywater’s Detailed Infrastructure Plan showing Sewer and Water Utilities (Unitywater, 2023)

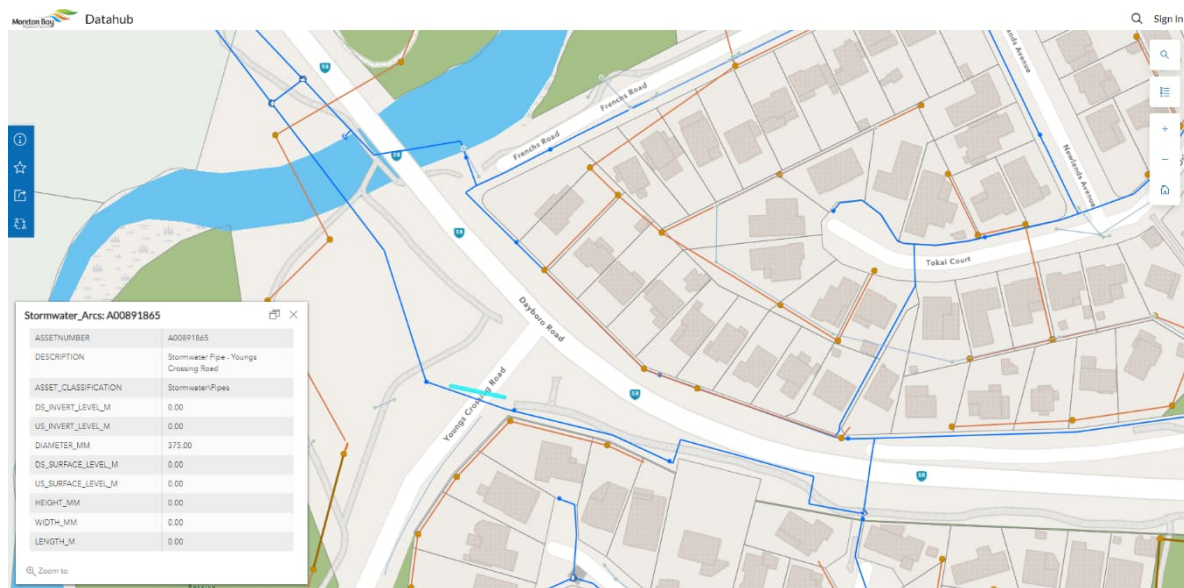


Figure 16 Extract from Moreton Bay Regional Council’s Datahub showing Sewer, Water and Stormwater Utilities (Moreton Bay Regional Council, 2023)

Figure 17 and Figure 18 show what this extracted digital data looks like in GIS and CAD. In GIS, the attribute information is readily available and the two-dimensional linework can be output for use in CAD.



Figure 17 Extracted Spatial Data from the Utility Providers shown in GIS



Figure 18 Extracted Spatial Data from the Utility Providers shown in CAD

4.2 BYDA Enhanced Service Offering

There is an opportunity to improve efficiency across the planning, design and construction of transport infrastructure projects through enhancing the BYDA service offering to facilitate the sharing of digital data between Utility Providers and End Users. Our analysis and recommendations are based on the following facts:

1. All Utility Providers have an asset management system which is supported by spatial mapping.
2. Some Utility Providers have a system in place where their spatial mapping is made available to BYDA to generate the PDF maps.
3. BYDA have a system in place where End Users can request PDF maps showing utilities in an area of interest.
4. Some End Users digitise the BYDA data into CAD or GIS format to enable them to validate and use the data.

Based on these facts, BYDA can initially enhance their service offering by leveraging Utility Providers who already allow BYDA access to their digital data to generate the PDF maps. Ultimately, BYDA can enhance their service offering by working with all Utility Providers to share their digital data, but this is expected to require more engagement and a technology solution to enable this sharing.

Figure 19 shows extracts from the BYDA Mobile Application showing how a normal BYDA search is completed. BYDA could facilitate the sharing of digital data with modification to Step 1 and the addition of Step 7 as described below. The same process can be embedded into the BYDA Website and could be linked to the BYDA User Portal where additional data libraries could be established to support the process.

Step 1: At the sign in stage, the email addresses of the End Users could be used to screen who should have access to digital data. Each Utility Provider would have to decide who should have access, and it is expected this would vary significantly between each Utility Provider, from no digital data sharing to digital data sharing only with some End Users (e.g. Engineering Consultancies or Construction Contractors as “authorised End Users”), to digital data sharing with all End Users. The email domain of the authorised End Users could be added to a database to facilitate this access.

Step 7: This additional stage would be added to allow authorised End Users to select the format of the digital data. It is anticipated that PDF maps would still be provided to allow BYDA and the Utility Providers to include their standard terms and conditions and allow tracking of requests, however the End User could also select to receive the data in CAD or GIS format. The mechanism to prepare the digital data will depend on how the Utility Provider is storing it and generating their PDF maps currently, but it is anticipated this process could be easily automated in most asset management/spatial mapping systems. In particular, for those Utility Providers who already have a spatial mapping system set up with BYDA to generate PDF maps, it is anticipated that the system could be modified and a process established to include digital data.

The above recommendations are related to enhancements to the End User interface of the BYDA Mobile Application, however can equally be applied to the BYDA Website. There will need to be further consideration regarding the technology architecture required to enable the sharing of digital data between the Utility Providers and the End Users. How and where this data is stored, accessed and shared will require engagement and ultimately agreement with the Utility Providers.

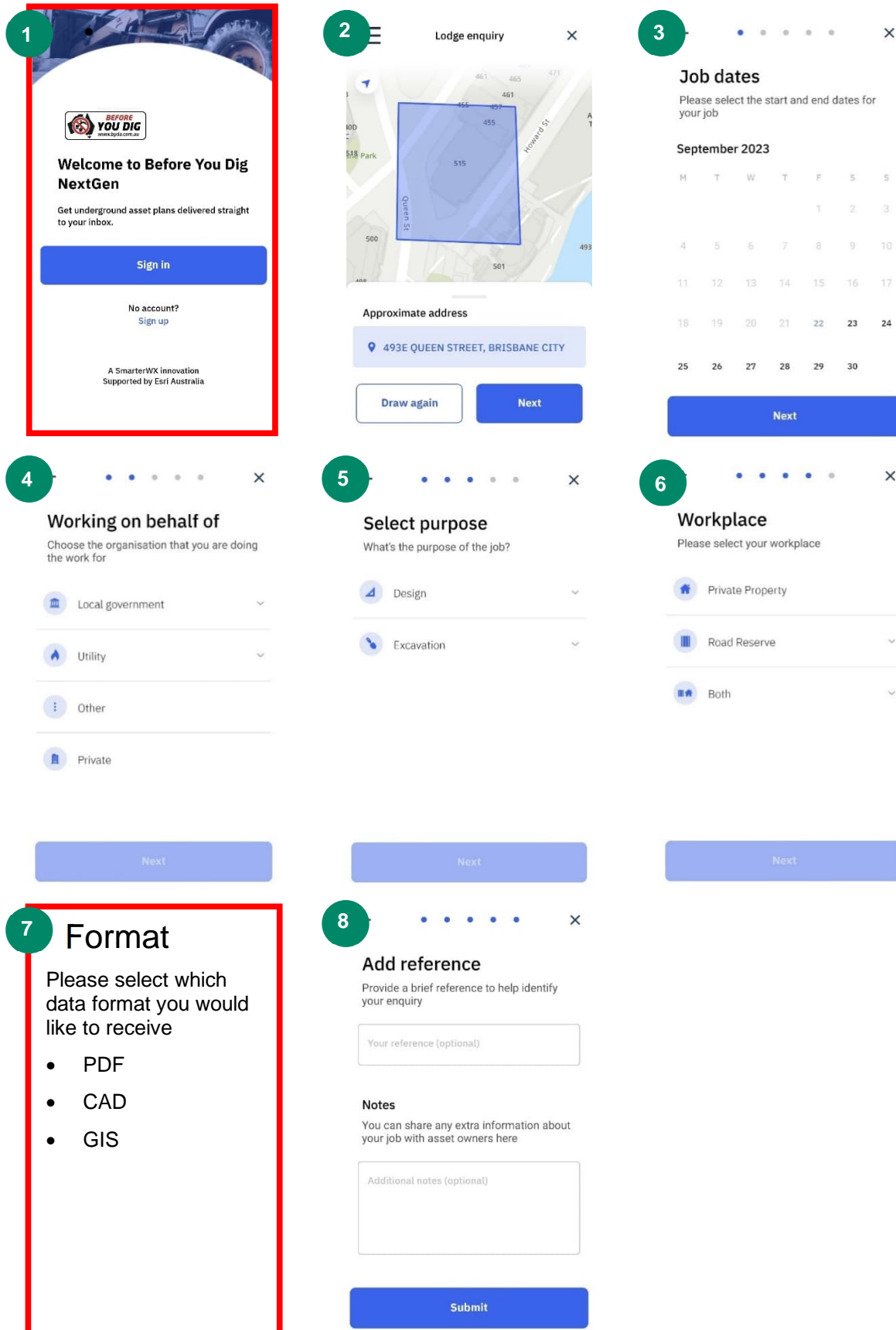


Figure 19 Example BYDA Mobile Application Search Changes to Facilitate Enhanced Service Offering

4.3 Impact on Case Study

The estimated level of effort/cost from the Case Study has been updated to reflect digital data being provided by BYDA. Table 3 shows the reduced level of effort/cost (estimated 50% reduction) to digitise the data, noting there is still effort to request and validate the BYDA data, as well as physically locate the PUP.

Table 3 Comparison of Estimated Level of Effort/Cost of Requesting and Processing BYDA Data

Project Number	Project Location	Project Phase	Approx. Construction Cost	To digitise BYDA data (PDF maps)		To digitise BYDA data (Digital data)	
				FTE (Weeks)	Approx. Cost	FTE (Weeks)	Approx. Cost
1 (Case Study)	Urban	DD	\$70M	2.0	\$15,400	1.0	\$7,700
2	Urban	P	\$30M	1.0	\$7,700	0.5	\$3,850
3	Rural	DD	\$28M	2.25	\$13,000	1.13	\$6,500
4	Urban	DD	\$250M	8.0	\$80,000	4.0	\$40,000
5	Urban	DD & C	\$120M	3.0	\$40,000	1.5	\$20,000

DD – Detailed Design, P – Planning, C – Construction

4.4 Suggested Enhancements to the Australian Standards

Enhancing the current Australian Standard would support the transition to digital data sharing by providing a framework for End Users to share location information back to the Utility Providers. Despite the standard not being mandatory, this would provide a consistent framework and set of principles for industry to follow.

AS5488.1 recognises that “increasingly accurate and accessible positioning methods, coupled with progressively improving catalogues of PUP positions, have the potential to drive significant improvements in subsurface PUP management” (SAI Global, 2023).

AS5488.1s objective is to provide a framework for the consistent classification of information concerning subsurface utilities. This standard could be further expanded to include a section that documents how information is required to be shared back with Utility Providers in the following situations:

- Site investigation (potholing) – once potholing data is captured and processed by surveyors, information is required to be shared with Utility Providers.
- Site Investigation (feature survey) – ground feature survey of PUP assets such as watermain hydrants, sewer manholes, etc. is required to be shared back with Utility Providers.
- Design relocations – design information at appropriate maturity level to be shared with Utility Providers.

The standard could describe the methods and processes to which information is to be shared back with BYDA or directly with the Utility Providers, such as file formats and metadata which would contribute to enhancing the data source available for future End Users. Government procurement policies could be updated to require compliance with the standard, ensuring that information obtained on underground assets while conducting investigations on government projects is shared back.

Enhancing AS5488 would be a cost-effective solution to enable data to be provided back to the Utility Providers and may reduce the expenditure across the industry on repeated investigations in high activity areas. The benefit to the Utility Providers in enhancing their databases would be significant in their ability to manage assets and also provide benefits to the End Users of BYDA.

4.5 Benefits

As discussed in section 2.2, our research has identified that 75% of End Users surveyed digitise the data received from BYDA. Most of these End Users spend between one day to one week digitising this data with 12% spending more than one week (Survey Results - End User, 2023). Based on the project teams' experience this process usually takes at least one engineer and one drafter to update the information.

The digital information will need to be verified on site through investigation works at the start of the design development phase. Multiple traffic controllers, surveyors and PUP locators complete the site investigation works at the start of the design development phase, and the same investigation works need to occur again at the start of construction. Digitising the information allows resources like engineers, drafters, traffic controllers, surveyors and PUP locators to reduce the time spent on processing data and identifying utilities, allowing them to work on other projects or tasks.

Digitisation of the PUP information can also result in End Users having more confidence in the PUP data as the information that is shared should be the most up-to-date and thus reduces the amount of investigation works and associated damage to other infrastructure while conducting investigations. As digitisation of the PUP information provides a better indication of the location and level of the utilities, it is easier to understand the risks associated with utilities and develop appropriate treatments in the early stages of projects and therefore provide more accurate estimates of costs.

Digitisation of PUP information also results in reduced impacts to PUP and risk of being damaged during investigations or construction. A PUP strike can cost millions of dollars to fix and cause major inconvenience to the community. This is particularly the case as Australia is experiencing a labour shortage, as PUP strike impacts multiple disciplines, teams and emergency services.

Figure 20 represents the various groups, teams or individuals that can be impacted by a single PUP strike. Impacted resources are typically diverted from other projects to repair damaged PUP resulting in delay, disruption and increased cost to construction.



Figure 20 Project PUP Strike – Resource Impacts

The benefits associated with BYDA transitioning to being able to provide digital data to End Users are primarily around reduced time, effort and cost in design and improved accuracy. However, providing a framework to enable sharing of location investigative work back to the Utility Providers or BYDA has the ability to provide significant benefits including:

- Better informed projects in early stages:
 - This will improve accuracy of cost estimates and enhance understanding of risks.
 - Inform optioneering in early project phases to optimise business cases.
- Reduced ongoing or repeat investigation works:
 - Investigation works need to occur at the beginning of the design phase of a project and again at the beginning of the construction phase.
 - Being able to access historical investigative work would allow these resources to undertake alternative tasks and would reduce the cost and duration of the construction phase.
- Reduced damage to other infrastructure while conducting investigations:
 - Reducing the number of times investigative work is conducted reduces risk of damage to underground assets.
- Improved safety for those digging due to more reliable and accurate information:
 - Improving the accuracy of the location of underground assets will improve the safety for those digging.

The project team calculates that digitisation of BYDA information could generate:

- An estimated annual saving of **\$60 million** from reduced PUP strikes across Australia based on the following assumptions:
 - An average of 200 PUP strikes each month in Australia based on discussions with BYDA CEO as outlined in Section 2.1.
 - Fixing asset strikes is estimated to cost Utility Providers a minimum of \$10,000 to more than \$1,000,000 (based on the experience of the project team).
 - An estimated cost to Utility Providers of approximately \$120 million per year (assuming each PUP strike costs on average \$50,000 to fix and there are 200 strikes per month).
 - That enhanced location information would reduce this strike rate by 50% delivers an estimated annual saving of \$60 million per year.
- Based on the number of projects listed in the Queensland Transport and Roads Investment Program (QTRIP) 2023-24 to 2026-27 program, TMR has the potential to save **\$15.5 million** and **125,000 working hours**:
 - This saving is realised from a reduced time and cost of translating BYDA information to a digital platform and locating the services on site to verify the information.
 - Most End Users spend on average of between \$10,000 to \$20,000 (on average 1-2 weeks with 2 full time equivalent people) to translate BYDA information to a digital platform and then spend another \$20,000 to \$300,000 (from 1-6 weeks on site investigation with 1 service locator, 1 surveyor and 2 traffic controllers) to locate the services.
 - QTRIP 2023-24 to 2026 -27 lists approximately 1,045 projects as either planning, design or construction projects.
 - If each project in the QTRIP requires \$10,000 and 2 FTE to translate BYDA information to a digital platform and then spend \$20,000 and 4 FTE to complete service investigations, this is equivalent to a minimum of \$31 million and 250,000 hours spent in total from getting information from BYDA to translating it on digital platform and then locating the service to verify its accuracy.
 - If we assume that digitisation of BYDA could reduce the effort required across these activities by 50% then the potential savings across TMR projects across the four-year period could be \$15.5 million and 125,000 hours.

- Using the same assumptions as above, the estimated savings from reduced time and cost of translating BYDA information to digital platform and locating the services on site based on the five-year infrastructure budget in Australia would be approximately \$110 million and 890,000 working hours. ***This is equivalent to \$22 million every year and 180,000 working hours or 90 FTE*** in Australia being re-allocated to other tasks or projects based on approximately 250 working days in a year and 8 hours in a working day (Infrastructure Australia, 2021):
 - Although not all states or councils in Australia publish the list of projects for the next 5 years similar to QTRIP in Queensland (that is, other states provide a budget which lists major projects and then a few lines to summaries smaller projects), Queensland accounts for \$34 billion of the \$237 billion five-year major public infrastructure budget in Australia. This equates to approximately 14% of the five-year major public infrastructure budget in Australia (Infrastructure Australia, 2021).
 - As BYDA requests are completed for each project instead of a particular budget, analysing the State Budget does not reflect the number of BYDA requests completed in each state.
 - Therefore, the analysis is based on the amount of potential savings from Queensland and the percentage of Queensland's five-year major public infrastructure budget in Australia compared to the rest of Australia assuming that all states have similar types of projects in Queensland.

Based on the UK government's policy paper on "National Underground Asset Register (NUAR) - Economic Case Summary" (National Underground Asset Register (NUAR), United Kingdom, 2021), the savings from the digitisation of their PUP information is ~\$675 million AUD per year which is made up of the following:

- Savings from reduced PUP strikes, £240 million per year (~ \$467 million AUD)
- Reduced cost of sharing data, saving £91 million per year (~ \$177 million AUD)
- On-site efficiency improvements for projects, saving £16 million per year (~ \$31 million AUD)

The extent of the estimated savings in the UK suggest that the estimates provided in this research paper may be understated.

4.6 Risk

The risks associated with maintaining the current practice of sharing information in PDF format are primarily the converse of the benefits identified above. However, BYDA has identified additional risks to member organisations if they don't enable this change. These risks include reputational damage associated with not moving towards best practice and the risk that the transition could be taken out of their hands and facilitated through the government, much like the NUAR example in the UK.

BYDA has identified the primary challenge in transitioning to a central platform that isn't controlled by the Utility Providers, is that Utility Providers want visibility when searches are conducted. In particular, they wanted to be notified when risky activity happens and if damage occurs where, when and who caused it (Greenall, Interview with Mell Greenall - CEO of BYDA, 2023).

This was confirmed through the Utility Providers survey conducted where 78% of Utility Providers surveyed confirmed that they saw value being notified of a BYDA request. One respondent provided the following additional insight:

'We have over 750-1000 request per work day. We may be interested in specific request when near our critical infrastructure, but have not yet developed the capability to do so' (Survey Results - Utility Providers, 2023)

In order to consider how the NUAR development team is addressing this concern the research team contacted the NUAR product owner, Dr Neil Brammall (refer to Appendix E – *Email from NUAR asset owner – project details 100923*). Dr Brammall confirmed that when End Users conduct the Intention to Dig request they must provide information about the intended works, including dates and the nature of the work. Although there is still work to be done in developing the NUAR product, the intent is for Utility Providers to be notified of the proposed works in cases where the proximity of the works and the nature of the affected asset warrants it. They will also have access to usage reports via an administration portal and historical information is retained by NUAR for six years (Brammall, 2023).

4.7 Overcoming Barriers to Digitisation

In conducting this research, Utility Providers have identified a number of challenges associated with providing spatial data to BYDA or End Users directly, including legal concerns, security concerns, technology constraints and resources/costs (refer to Figure 6 above in Section 2.2.1). Consideration of potential mitigations to each of these concerns is outlined below. BYDA's views are provided in Appendix E - *Email from BYDA CEO – barriers to transition 110923*.

4.7.1 Legal

56% of member organisations surveyed identified legal concerns as a barrier to providing spatial data to BYDA or End Users. The project team understands that the basis of this concern relates to liability. In providing spatial data, End Users' level of reliance on this information may increase which leads to concerns around liability should any risk materialise as a result of the reliance on this information.

The project team anticipates that this could be mitigated through a legal disclaimer that End Users need to accept prior to accessing the spatial data. BYDA believes the appropriate disclaimers can be developed with industry to overcome this barrier. Additionally, BYDA can develop file sharing logs that ensure that data files are time and date stamped so that an audit trail of the exact digital information provided by the Utility Provider through the BYDA platform can be provided when damage investigations etc. are required ensuring Utility Providers can validate what information was provided to End Users and when.

4.7.2 Security

44% of Utility Providers surveyed identified security concerns as a barrier to providing digital information to End Users. BYDA has advised that these concerns are based on having detailed spatial files for critical infrastructure (including telecommunications, gas and electricity networks) freely available to any party to search. Despite this risk existing when providing PDF versions of these spatial files, the perception of the Utility Providers is that the risk increases when providing spatial files.

This perceived increase in risk could be mitigated by providing digital information to a subset of End Users (for example designers and excavators) which are registered and verified. However, constraining this enhanced capability to a subset of End Users would need to be considered in the context of the benefits to those End Users that don't have access to this enhanced capability.

BYDA is developing an End User portal that will allow for strengthened credentialing of End Users which will then enable BYDA to "authorise" which End Users could access digital data. BYDA believes that authorisation to engineers, larger construction and design firms as well as locators should be a reasonable expectation whilst continuing to provide the one off/residential End User the traditional PDF files.

Some Utility Providers have expressed interest in being part of an inter-organisational portal similar to what BYDA is currently developing, but addressing the security concerns from the Utility Providers will be critical to the success of the portal. It was evident from the survey results that there is a genuine security concern from most Utility Providers, but the perceived security risk is different between each Utility Provider.

We'd be happy to discuss an inter-organisational interlock for sharing that data.
(Survey Results - Utility Providers, 2023)

4.7.3 Technology constraints

44% of Utility Providers also identified technology constraints as being a barrier to digital data sharing. Enabling digital data sharing is likely to require a substantial uplift in capability across both BYDA and the Utility Providers. BYDA has advised that they are committed to develop the architecture to enable this transition and have adequate budget to deliver this capability. However, it will require Utility Providers to commit to enabling this from their end. The focus of this research project is on making clear the case for change – providing Utility Providers with the End Users perspective on the substantial benefits of digitisation.

4.7.4 Resources and Costs

44% of Utility Providers identified that resources/costs were a barrier to transitioning to digital data sharing. The challenge with making this transition is that the cost of transitioning falls solely with the Utility Providers and BYDA (which is member funded) whereas the benefits are spread across both Utility Providers and End Users.

To invest in this uplift, Utility Providers need to make the case internally that the benefits associated with transitioning to digital data sharing and the risks of not transitioning outweigh the costs. This research project hopes to support this case for transitioning.

4.8 Productivity Improvement – Resourcing

The design and construction of public infrastructure in Australia draws resources from four main groups – project management professionals; engineers, scientists and architects; structures and civil trades and labour; and finishing trades and labour (Infrastructure Australia, 2021). Yet the skills shortage and employment growth rates across the majority of these industries have continued to rise. The *Employment outlook Industry and occupation trends over the five years to November 2026* Report indicates that STEM occupations (those using science, technology, engineering and maths) are projected to grow by 14.2% which is well above the overall expected employment rise of 9.1% (National Skills Commission, 2021).

For the engineering and construction industry to continue evolving, industry must maximise their available resources as well as consider alternative methods to increase productivity to meet the enormous infrastructure pipeline across the next decade and beyond. While the proposed solution to digitise outputs from BYDA might seem like a small technology enhancement, it automatically facilitates productivity improvements allowing resources to leverage and transition themselves into alternate roles.

In addition to freeing up resources currently within the industry, digitisation will also draw the following roles into the industry:

- Technical solution architects
- Data storage providers
- Data or application integration specialist
- Data governance specialists
- App developers to enhance the BYDA interface
- Legal experts to draft data sharing agreements and enhancements to Australian Standards

4.9 Roads Australia

It is anticipated that RA could assist BYDA by advocating the benefits and solutions to Utility Providers and government agencies. RA is a member driven organisation represented by over 120 government agencies, design consultancies, service, technology providers and contractors. RA has the ability to access industry leaders and influence policy outcomes within Australia. By bringing together their members and working with BYDA, a strategy towards digitising both the inputs and outputs could be developed.

RA is committed to supporting their four key policy themes with Data and Technology - the use of information and emerging technology to deliver improvements to customers and the development of infrastructure one of them. Transitioning one aspect of the transport infrastructures planning, design and construction requirements to a digital enhancement has the ability to significantly reduce resourcing constraints.

4.10 Future Recommendations and Roadmap

This research project is focused on making the case for change to BYDA, industry and Utility Providers to enable this transformation and realise the significant benefits outlined in section 4.5.

Figure 21 and Table 3 provides a suggested timeline that could be implemented to enable the digital transition.

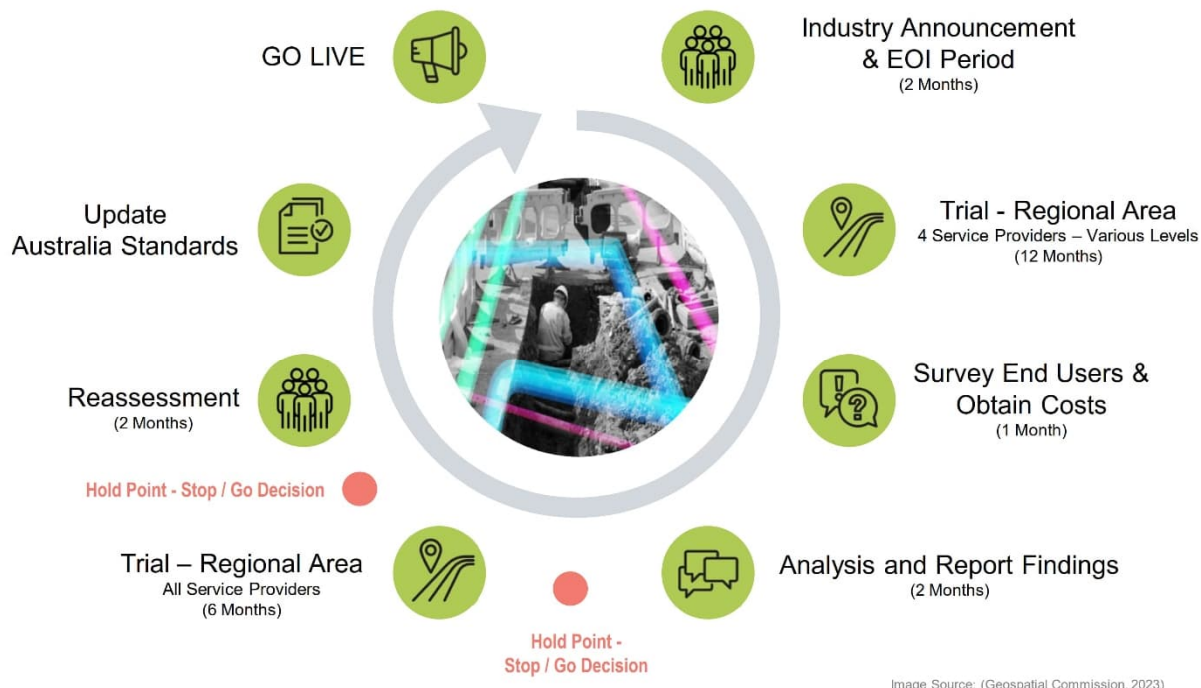


Image Source: (Geospatial Commission, 2023)

Figure 21 Key steps in timeline

Table 4 further details the recommendations and suggested responsibility for each activity.

Table 4 Detailed Recommendations

	Recommendations	Timeframe (Months)	Suggested Responsibility
1.	Board Approval – Seek Board Approval for commencement of program and trial	1	BYDA
2.	Engagement with Utility Providers – Workshops and engagements with Utility Providers to discuss barriers and options to mitigate.	3	RA / BYDA
3.	Industry Announcement – BYDA and RA to advocate the benefits of Utility Providers sharing their data in a digital format and announce the need for change.	1	RA / BYDA
4.	EOI – Expression of interest for Utility Providers in a regional area to undertake a trial of sharing digital information following a BYDA request.	1	BYDA
5.	Award – Appoint four suitable Utility Providers to undertake trial. Obtain costing information on the previous year for baseline comparison. <i>The selected four Utility Providers organisations are to represent all levels of Utility Providers from major providers to minor.</i>	0	BYDA / Utility Providers
6.	Milestone Trial – Commence trial in regional area of selected four Utility Providers providing digital information following BYDA request.	12	BYDA / Utility Providers

	Recommendations	Timeframe (Months)	Suggested Responsibility
7.	Research – Survey End Users and obtain costing information from Utility Providers for comparison against baseline information.	1	BYDA
8.	Report – Analysis and report findings.	2	BYDA
9.	Present – Present findings to industry with recommendations about how barriers such as risk, security and technology can be overcome.	0	RA / BYDA
10.	Stop / Go Decision	-	BYDA
11.	Milestone Extended Trial – Commence Trial in regional area of all Utility Providers providing digital information following BYDA request.	6	BYDA / Utility Providers
12.	Analysis – Analysis and reassess findings.	2	BYDA
13.	Engagement – Identify if government funding could be sought to assist with the digital transition noting that benefits are spread between the Utility Providers and End Users.	2**	BYDA
14.	Develop a list of verified End Users which authorises End Users that can access the digital data.	1**	BYDA
15.	Draft enhancements to the current Australian Standard (AS 5488.1 and AS 5588.2) to support the transition to digital data sharing. This would provide a consistent framework and set of principles for industry to follow.	2**	AS
16.	Stop / Go Decision	-	BYDA
17.	Release Updated Australia Standard (AS 5488.1 and AS 5588.2).	1**	AS
18.	Utility Providers to update their systems further to allow for the public to report inaccurate information.	2**	Utility Providers
19.	Go Live	-	BYDA / Utility Providers
20.	Future provisions for additional information to be managed and shared could include: <ul style="list-style-type: none"> • Geotechnical Information (boreholes) • Soil Testing (contamination) • Heritage Investigation Information • Stormwater Assets • As-built Data • Augmented reality 	2 years +	

**Denotes parallel activities

5.0 Conclusion

It is clear from the findings of this research project that improvements to the management and sharing of underground data will unlock significant benefits across our industry. These benefits relate to both productivity and safety improvements and will enable our industry to more efficiently meet the enormous infrastructure pipeline across the next decade and beyond.

Despite significant technical innovation within infrastructure design and construction, the way underground data is shared in Australia hasn't really changed since the 1980s. Industry is calling for Utility Providers to enable the transition to digital data sharing and Utility Providers are starting to listen. The barriers that they have identified are solvable but require consideration, effort and investment. The platform for change is starting to be made by both BYDA and End Users because the cost of not transitioning is high.

We estimate that \$22M and 180,000 working hours could be saved every year just by enabling the sharing of digital spatial data between BYDA and our industry. This is the equivalent of nearly 90 full time professionals that could redirect their efforts to other necessary activities enabling projects to be delivered faster and at lower cost.

Future enhancement to the BYDA platform to ensure underground asset location information is shared back to BYDA will enable ongoing enhancements to location information which we estimate will deliver savings in reduced PUP strikes of at least \$120m each year.

To enable this transition to digital data sharing, Utility Providers will need to be engaged, protocols will need to be established and technology architecture will need to be designed and built. This will require support from adjacent industries including technical solution architects, data specialists, application developers and legal experts. The project team has developed a high-level roadmap which could enable this transformation and the significant benefits it will unlock.

BYDA is advocating for this digital transition. Our industry needs this transition to occur to deliver both significant productivity and safety benefits. This research project is focused on making the case for change to the Utility Providers to enable this transformation.

To start this process BYDA's CEO requested to share this research paper with her internal team and the BYDA Board (refer email of 30 September 2023 in Appendix E). RA represents our industry and has the ability to access industry leaders and influence policy outcomes within Australia. RA could assist in this transition by advocating the benefits of digital transformation to Utility Providers and government agencies by creating the case for change.

6.0 References

- Acuity Insurance. (2023, September 22). *Understanding Below Ground Construction Dangers*. Retrieved from Acuity Insurance: <https://www.acuity.com/the-focus/contractor/understanding-below-ground-construction-dangers>
- Before You Dig Australia. (2023). *BYDA - About Us*. Retrieved from BYDA: <https://www.byda.com.au/about/>
- Brammall, D. N. (2023). NUAR Technical Product Owner. *Geospatial Commission - NUAR Delivery*. Geospatial Commission. (2023). *National Underground Asset Register (NUAR)*. Retrieved from <https://www.gov.uk/guidance/national-underground-asset-register-nuar>
- Greenall, M. (2022). *A Message from BYDA CEO Mell Greenall*. Retrieved from <https://www.byda.com.au/2023/07/03/a-message-from-byda-ceo-mell-greenall/>
- Greenall, M. (2023). *Electricity Sector Safety Forum. A BYDA Summary and Recommendation*. BYDA. Retrieved from <https://www.byda.com.au/wp-content/uploads/2023/07/BYDAs-forum-May-2023.pdf>
- Greenall, M. (2023, June 23). Interview with Mell Greenall - CEO of BYDA. (G. Robazza, C. Ahlberg, H. Lam, & B. Rutter, Interviewers)
- Greenall, M. (2023, May 16). *The PDF Dilemma, a Question of Relevance*. Retrieved from LinkedIn: <https://www.linkedin.com/pulse/pdf-dilemma-question-relevance-before-you-dig-australia/>
- Infrastructure Australia. (2021). *Infrastructure Market Capacity*. Retrieved from <https://www.infrastructureaustralia.gov.au/publications/2021-infrastructure-market-capacity-report>
- Infrastructure Australia. (2021). *Infrastructure Workforce and Skills Supply*. Retrieved from <https://www.infrastructureaustralia.gov.au/infrastructure-workforce-skills-supply>
- Infrastructure Australia. (2021). *Infrastructure Workforce and Skills Supply*.
- IPWEA. (2022, November 23). *Before You Dig goes national*. Retrieved from Community News by Institute of Public Works Engineering Australasia: <https://insite.ipwea.org/before-you-dig-goes-national/>
- Moreton Bay Regional Council. (2023, May 15). *Underground Infrastructure Map*. Retrieved from Moreton Bay Regional Council: <https://datahub.moretonbay.qld.gov.au/maps/underground-infrastructure-map/about>
- National Underground Asset Register (NUAR). (2022, October). *The National Underground Asset Register (NUAR) Consultation*. Retrieved from National Underground Asset Register: <https://www.gov.uk/government/consultations/the-national-underground-asset-register-nuar/the-national-underground-asset-register-nuar-consultation>
- National Skills Commission. (2021). *Employment Outlook (Five years to November 2026)*. Retrieved from <https://www.nationalskillscommission.gov.au/sites/default/files/2022-11/employment-outlook-industry-and-occupation-trends.pdf>
- National Skills Commission. (2022). *Employment Outlook (Five years to November 2026)*. Retrieved from <https://www.nationalskillscommission.gov.au/sites/default/files/2022-11/employment-outlook-industry-and-occupation-trends.pdf>
- National Underground Asset Register (NUAR). (2023, September). *Information on the National Underground Asset Register (NUAR)*. Retrieved from National Underground Asset Register (NUAR): <https://www.gov.uk/guidance/national-underground-asset-register-nuar>
- National Underground Asset Register (NUAR), United Kingdom. (2021, November 4). *National Underground Asset Register (NUAR) - Economic Case Summary*. Retrieved from UK Government Publication: <https://www.gov.uk/government/publications/national-underground-asset-register-unlocking-value-for-industry-and-the-wider-economy/national-underground-asset-register-nuar-economic-case-summary>
- Roads Australia. (2022). *Strategic Plan 2022-2024*. Retrieved from <https://roads.org.au/wp-content/uploads/Roads-Australia-Strategic-Plan-2022-2024.pdf>
- SAI Global. (2023). *Australian Standards*. Retrieved from <https://infostore.saiglobal.com/>
- Survey Results - End User. (2023).
- Survey Results - Utility Providers. (2023).
- Unitywater. (2023, May 15). *Detailed Infrastructure Plans*. Retrieved from Unitywater: <https://www.unitywater.com/business/building-and-landscaping/before-you-start/detailed-infrastructure-plans>

Appendix A

BYDA Meeting Minutes

BYDA Meeting

Interview with Mell Greenall - CEO of BYDA

Subject	Roads Australia	Page	1
Venue	Chocolate Soldier, 400 George Street, Brisbane	Time	10 to 11am
Participants	Mell Greenall (BYDA), Georgia Robazza (Transurban), Clarissa Ahlberg (HDR), Ho Yee Lam (BG&E), Brendan Rutter (Mott MacDonald)		
Apologies	Anita Mumford (AECOM)	Date	23/6/23
Distribution	As above		

No	Item	Action	Date
1.	Introduction and Roads Australia Project Summary		
2.	<p>Summary:</p> <ul style="list-style-type: none"> • Mell is highly supportive of the project and it is highly aligned to BYDA strategy • Opportunity for the research project to help in creating a burning platform for change – to get the member organisations to invest in the IT required to share digitally • Potential for Roads Australia (RA) to help by campaigning their call to the RA members including government agencies 		
3.	<p>Detail</p> <ul style="list-style-type: none"> • Original database was set up in the 1980's • BYDA is a team of 20 backed by a board with a budget. • Board is made up of 5 member reps (gas and electricity) and 2 independents across Australia. • What's in it for the member organisations? ie why change? <ul style="list-style-type: none"> - Damage prevention - 200+ strikes/month in Australia – of these 70% haven't done a data request - Strikes are heavily under reported - Barriers include legal approvals and availability of infrastructure - Some surveyors are willing to share their data • Service mapping isn't mandated in every State <ul style="list-style-type: none"> - Most of the QLD LG's are part of BYDA, 99% in Vic and 50% in NSW • On average, projects spend 38% of the total project cost on utilities • BYDA is investing \$2m in the portal enabling plans to be downloaded and has budget to enable change. • BYDA is campaigning government agencies to change procurement policies to mandate sharing of PUP information with BYDA (that is, pulling information from BIM modelling). 		

No	Item	Action	Date
	<ul style="list-style-type: none"> - BYDA will manage this - Backed by ESRI - Pelican Corp are a providers - BYDA are targeting these at government agencies and Tier 1 and 2 consultancies, rather than construction initially • Member organisations don't have the End User perspective in mind – we should provide case studies to make the case for change clear in our project submission • BYDA is working with Utility Providers to resolve their concerns with legal requirements, security risks and lack of budget to upgrade the Utility Providers' platform for data sharing. • Mell sees strategy for change as policy – make it mandated, strengthen AS5488. <ul style="list-style-type: none"> - Strengthen Australian standard AS5488 to provide data to minimum quality C which includes depth and offset. • Only 900 certified locators nationally – BYDA receives 20K requests/day <ul style="list-style-type: none"> - The average response comprises 12 emails with 67 pages of information • Is there something we can learn from other jurisdictions? <ul style="list-style-type: none"> - US and Canada have a different model – Utility Providers locate utilities for anyone who lodges request for information - NZ very small but similar to Aus - In UK they have gone to extreme of having all open source data to no request trigger back to utilities <ul style="list-style-type: none"> ▪ Look at NAUR project in UK for extreme example National Underground Asset Register (NUAR) - GOV.UK (www.gov.uk) ▪ To retain business model of having control of data and enabling a 'trigger' whenever End User does a search – enables member org to know when risky activity happens and if damage occurs where, when and who caused it. • Sydney light rail is an example of how PUP investigation has been done poorly. There was a 3 to 8% increase in project cost for utility strikes/relocations. • United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) encourage PUP mapping to improve community outcome and minimise PUP strike • Created an industry based on inefficiency <ul style="list-style-type: none"> - Locate services - Never share information - Locate services again - How many times are the same services located within our cities? • Is there a way that we can enable the sharing of data that is available? • Actions: <ul style="list-style-type: none"> - We will develop a list of End Users we would like to contact and send them across - BYDA to share Strategic Vision, survey results of End Users and TfNSW contact 		

Appendix B

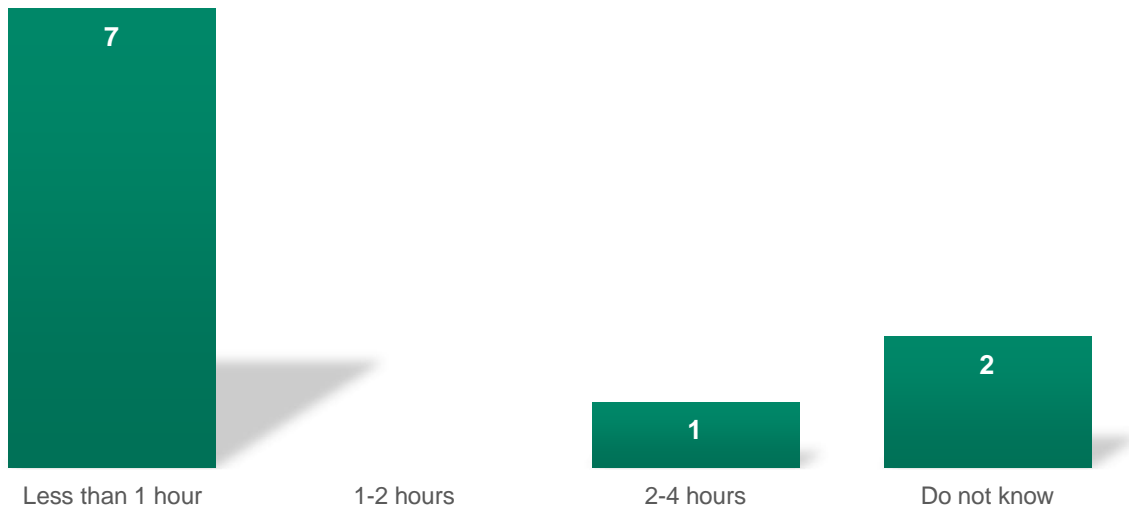
Survey Results – Utility Providers

Appendix B Survey Results – Utility Providers

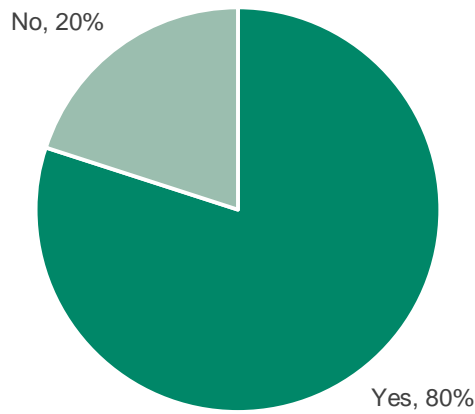
Question 1 – What is your current team size for managing BYDA requests?



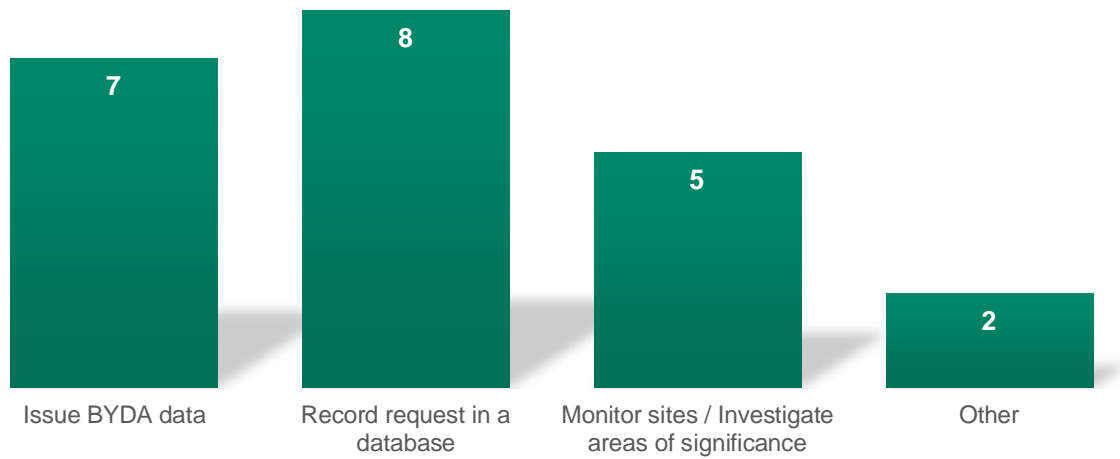
Question 2 - Average time it takes a Utility Providers to provide information following a BYDA application?



Question 3 - Do you see value in being notified of a BYDA request?



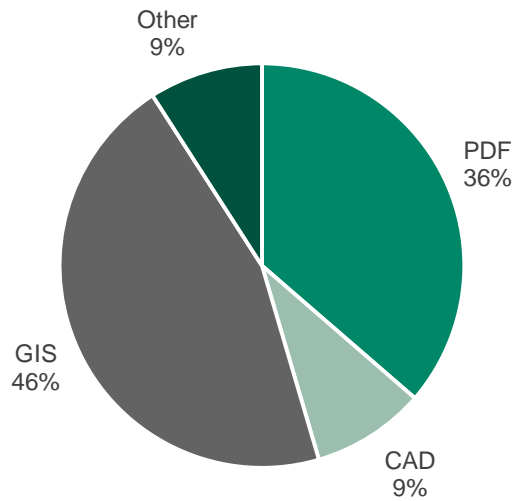
Question 4 - Apart from providing the requested information, what other action does Utility Providers take following a BYDA request? Select all that apply



Detailed responses from those who responded to "other"

Discuss planned works with others due to proximity to high-risk assets

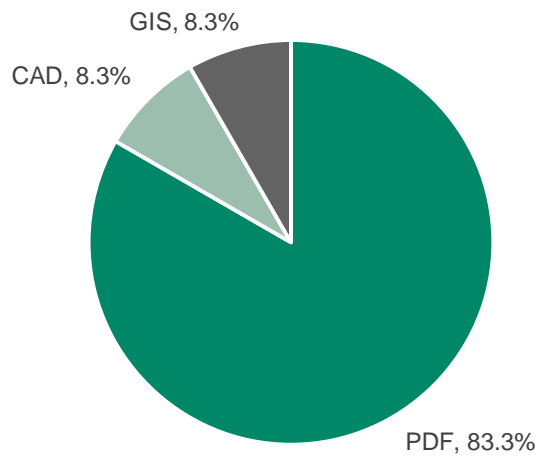
Question 5a – What format do you provide information to BYDA?



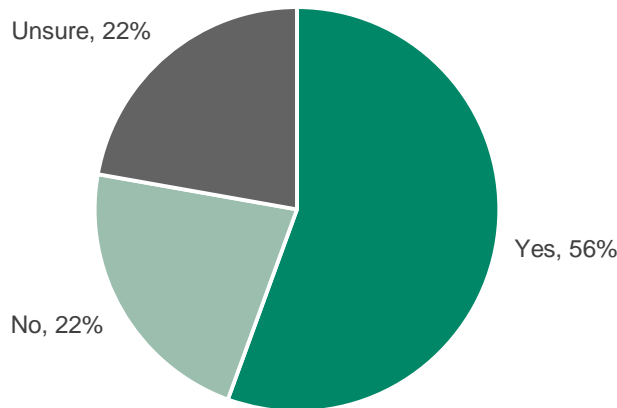
Question 5b – Do you believe this is the most effective way to provide the data?

Yes	No
100%	0%

Question 6 - What format does BYDA provide the requested information to your End Users? Please select all that apply

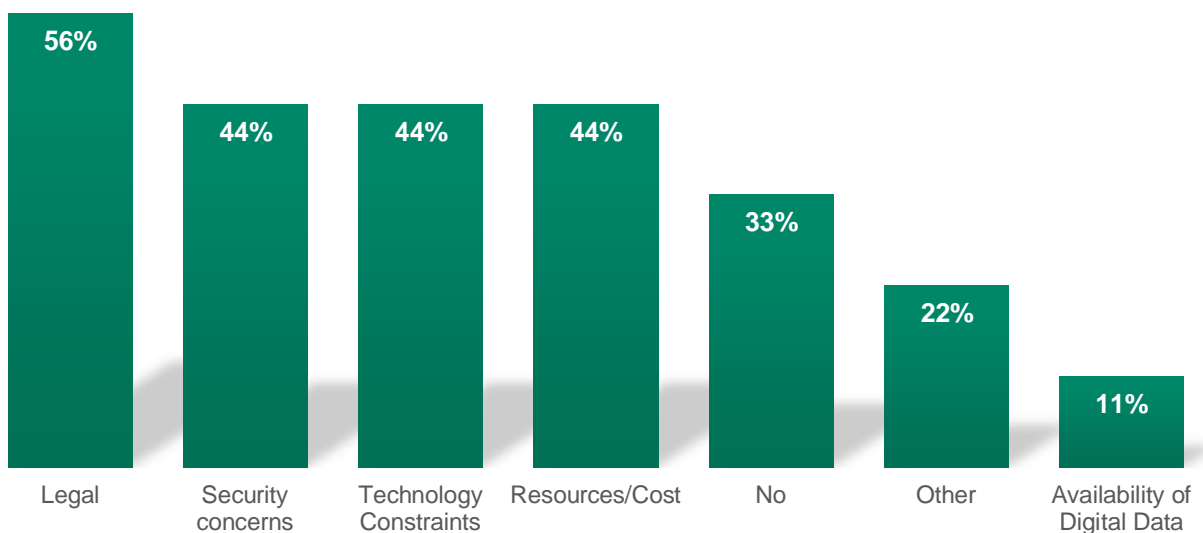


Question 7 - Do you believe the way in which data is provided to the End Users is the most effective way of providing information?



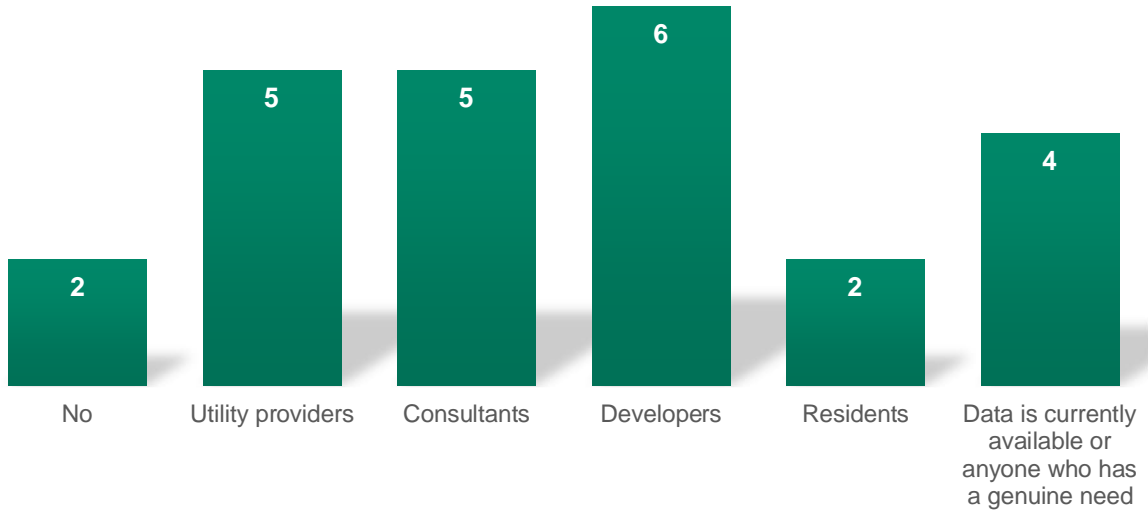
Detailed responses from those who responded to “no/unsure”
Numerous complaints from End Users
Providing the option of receiving a GIS spatial file provides many benefits
Digital files require additional software to be utilised by End User (potentially makes information unusable)
Depends on the requirements of the enquirer. There should be an option to get spatial files to those that would make use of them.

Question 8 - Are there barriers within Utility Providers to providing digital (spatial) data to BYDA or End Users?



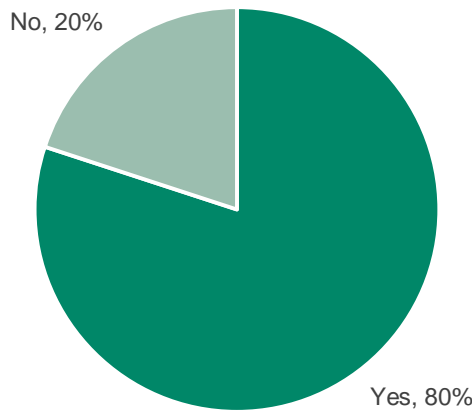
Detailed responses from those who responded to “other”
Unknown at this point – currently investigating
We are currently considering an uplift in our automated response system, which could provide spatial files. A number of issues will need to be considered as part of this process including legal and security

Question 9 - Do you currently or would you consider providing digital (spatial) data to any external parties?



Detailed responses from those who responded to "other"
We don't currently but we would consider it if there was a business case for it
We currently provide to anyone that has a valid need for spatial data (some require data agreements)
We have an open data portal

Question 10 - Would Utility Providers like to receive updated digital data relating to their assets from consultants, contractors, other Utility Providers (e.g. survey data in accordance with AS5488, BIM model and Pothole Information)?



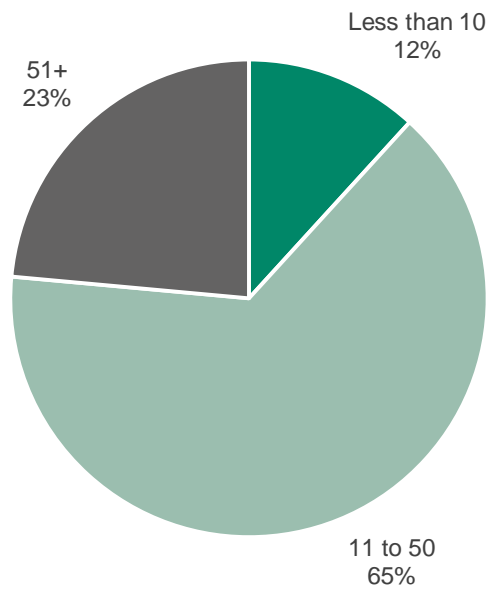
Additional comments from Utility Providers
Yes, to improve the quality of our data, including resolving errors
We currently collect data in the field from potholing to improve accuracy
Yes, we store this information on file to inform future planned works
We already require our consultants/contractors/developers to provide data in digital formats

Appendix C

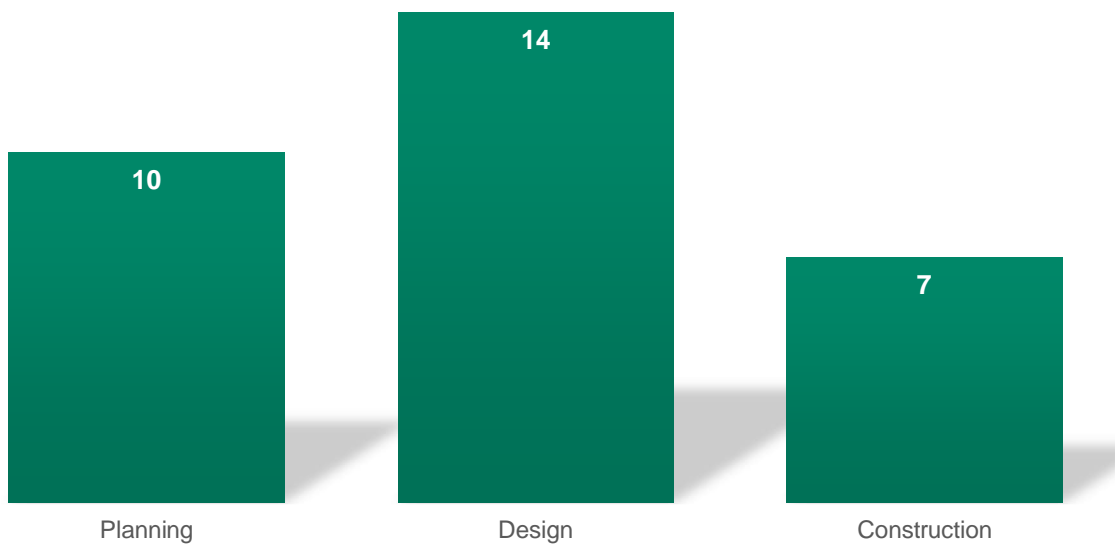
Survey Results – End User

Appendix C Survey Results – End User

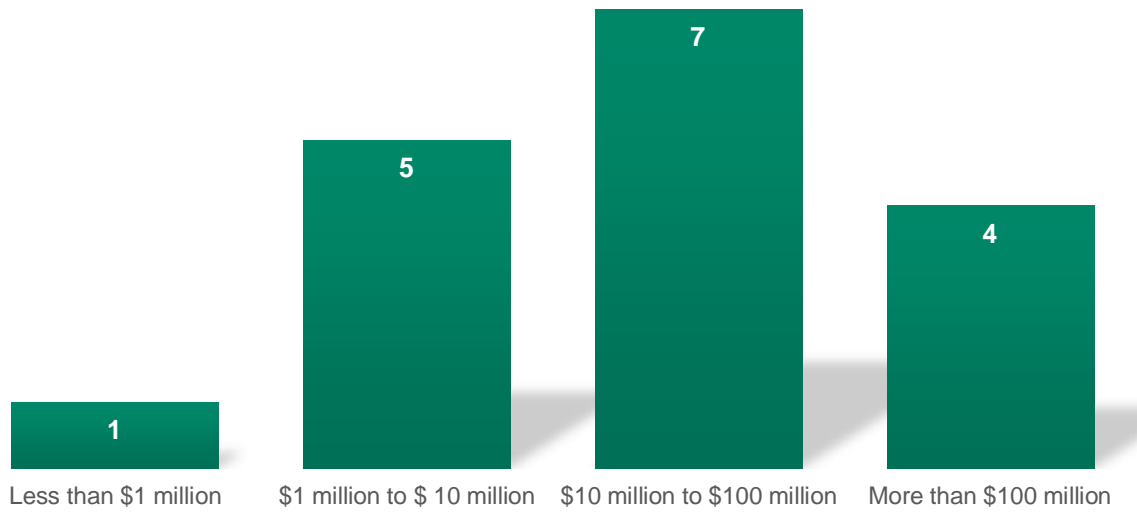
Question 1 - How many BYDA requests does your team normally do in a year?



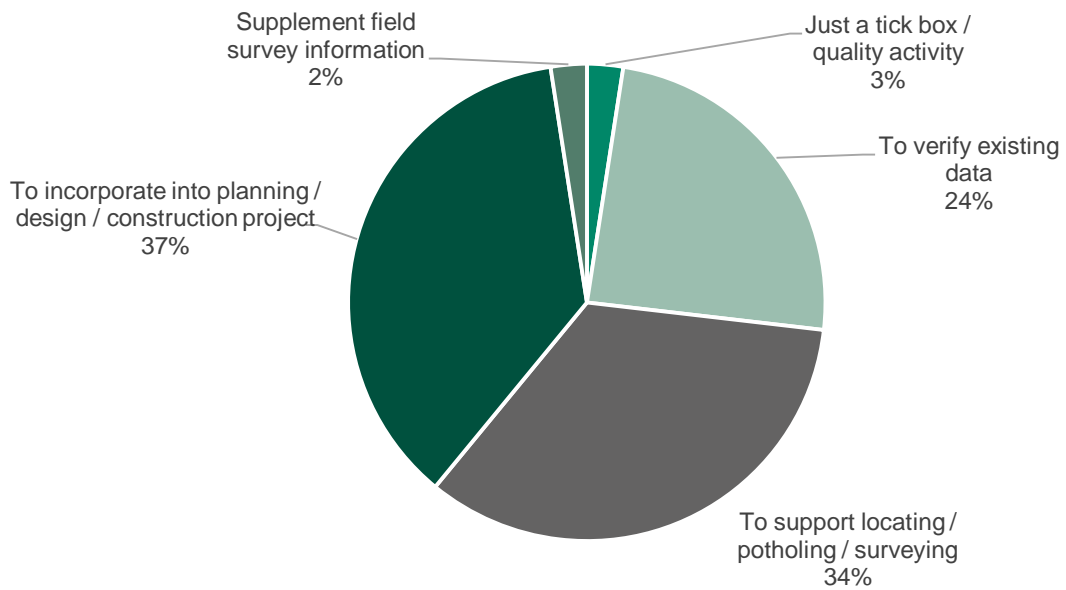
Question 2 - What sort of projects are these requests for?



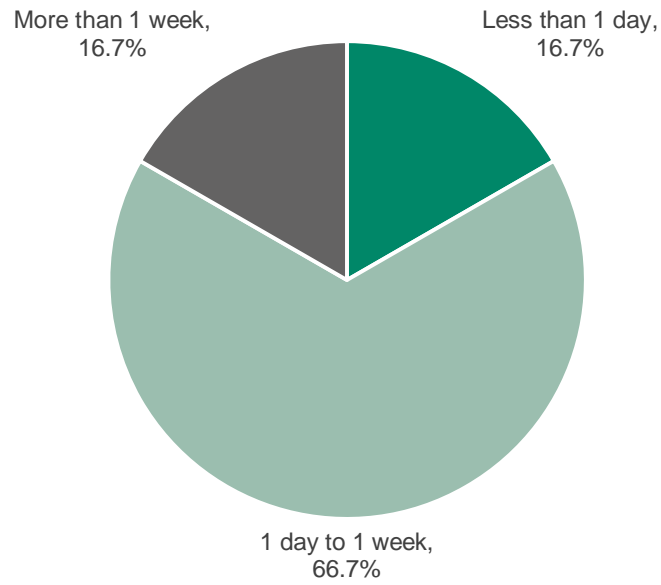
Question 3 - What is the average construction value of projects of these requests?



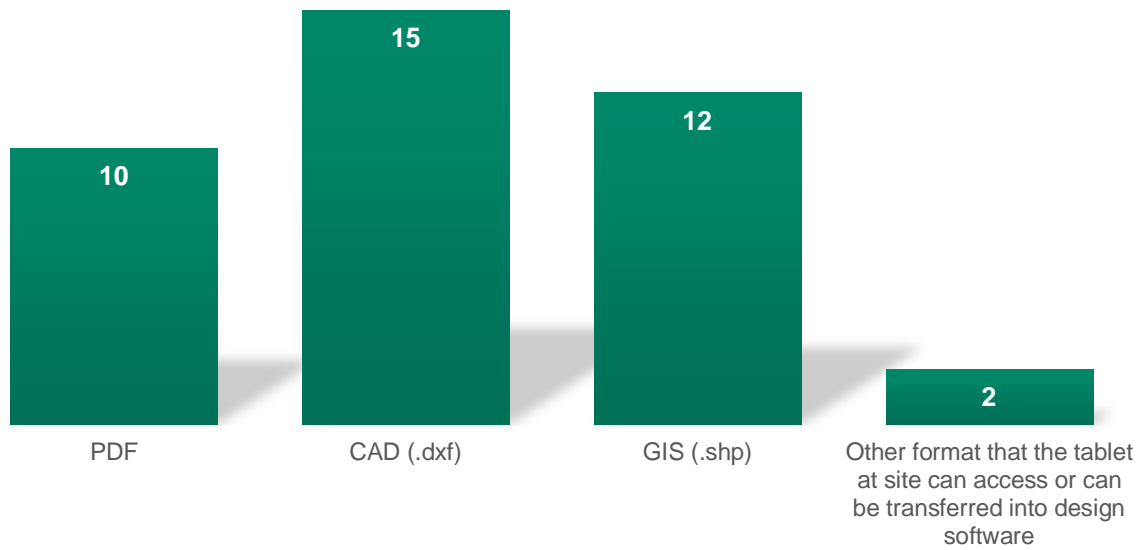
Question 4 - Why do you do BYDA requests? Please select all that apply.



Question 5 - Do you digitise the data provided by BYDA from .pdf to another form (e.g. CAD, GIS, etc.)? If yes, how long does it take you on average per project?



Question 6 - How would you like to receive the data from BYDA?



Question 7 - What is your experience in getting information from BYDA/Utility Providers and interpreting the information?

Summary of responses	Number of responses*
The existing BYDA system works well and the information is reasonably accurate but depends on the type/Utility Providers.	6
Some information is very clear and accurate (i.e. lines up with survey information such as pits/poles etc). Others not so much and requires a lot of time to review and include. Some also can't be verified based on survey information which becomes a risk to the project.	8
The BYDA information doesn't reflect the actual location. Processing (tracing) increases the level of risk. Difficult to keep a historic record of what has been received.	3

**Responses have been grouped into themes*

Question 8 - What is the quality of the information that you get from BYDA and Utility Providers?

Summary of responses	Number of responses*
Good/Mostly accurate	2
Average/Varied – Requires processing and verification	8
Poor	7

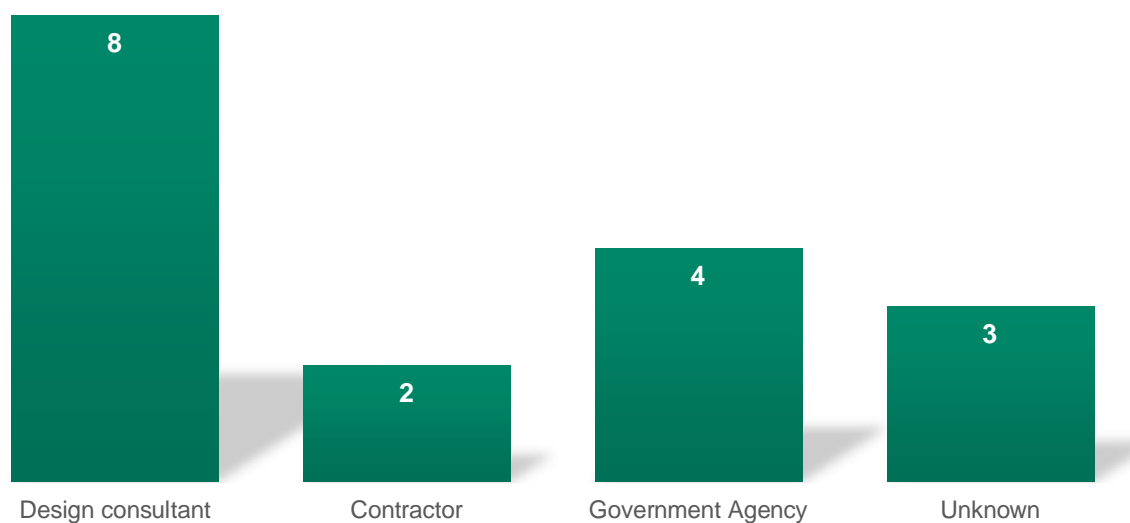
**Responses have been grouped into themes*

Question 9 - What improvement would you recommend for BYDA or Utility Providers?

Summary of responses	Number of responses*
More detail	6
Digitisation of all information	10
None	1

**Responses have been grouped into themes*

Question 10 – Type of organisations



Appendix D

AS 5488.1
Quality Level Extract

Appendix D AS 5488.1 Quality Level Extract

Table 5 Quality level and associated attribution information in accordance with AS5488.1

Quality Level	Attribution Information
A	<ul style="list-style-type: none"> • Utility owner • Utility type, status, material, size and configuration • Date of installation (if known) • Condition of the utility (if known) • Feature codes of surface features, including but not limited to pits, access chambers, poles, valves and hydrants • Location of points surveyed on surface and subsurface features measured in terms of absolute spatial positioning with a maximum horizontal and vertical tolerance of $\pm 50\text{mm}$
B	<ul style="list-style-type: none"> • Utility owner • Indication of the utility type • Date of installation (if known) • Condition of the utility (if known) • Feature codes of surface features, including but not limited to pits, access chambers, poles, valves and hydrants • Location of surface features measured in terms of relative spatial positioning with a maximum horizontal tolerance of $\pm 300\text{mm}$ • Location of subsurface features measured in terms of relative spatial positioning with a maximum horizontal tolerance of $\pm 300\text{mm}$ and maximum vertical tolerance of $\pm 500\text{mm}$
C	<ul style="list-style-type: none"> • Utility owner • Indication of the utility type • Date of installation (if known) • Condition of the utility (if known) • Interpolation of the location and direction of the subsurface utility using surface features as points of reference • Feature codes of surface features, including but not limited to pits, access chambers, poles, valves and hydrants • Location of surface features measured in terms of relative spatial positioning with a maximum horizontal tolerance of $\pm 300\text{mm}$
D	<ul style="list-style-type: none"> • Utility owner • Indication of the utility type • Date of installation (if known) • Condition of the utility (if known) • Indicate of the surface and subsurface features of the utility • Tolerance shall not apply to the indicative location

Appendix E

Email Correspondence

Georgia Robazza

From: Mell Greenall <mell.greenall@byda.com.au>
Sent: Monday, 11 September 2023 9:42 AM
To: Georgia Robazza
Subject: RE: RA research paper - request for feedback

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This message came from outside Transurban and may be unsafe. **If in doubt, report it!**

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Hello

Happy to help, I have added in some extra commentary below in red.

Cheers
Mell



Mell Greenall | CEO
Before You Dig Australia Ltd

m: 0407 166 706
a: 35 Railway Road, Blackburn, VIC 3130



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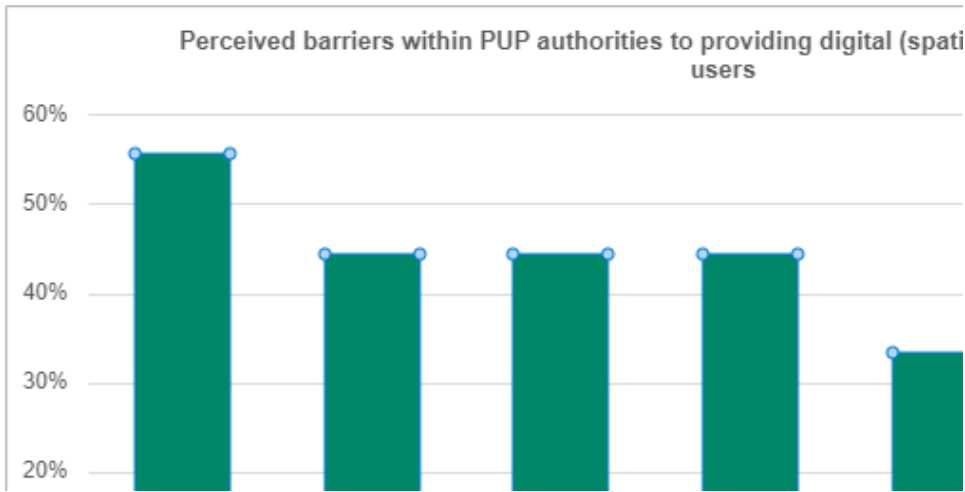
Please consider the environment before printing this email.

From: Georgia Robazza <GRobazza@transurban.com>
Sent: Sunday, September 10, 2023 4:26 PM
To: Mell Greenall <mell.greenall@byda.com.au>
Subject: RA research paper - request for feedback

Hi Mell

Our research project is coming together but I would value your feedback on a section I have just drafted on 'Overcoming barriers to digitisation'.

Our survey asked asset owners 'Are there barriers within PUP authorities to providing digital (spatial) data to BYDA or end users?'. The results are in the graph below.



I have drafted some comments in the paper in relation to the top 4 concerns raised (wording below) and I would appreciate your feedback and any other insights you can provide.

We hope to have an early draft of the paper ready later this month – we will share a copy with you for your comments before we submit it to Roads Australia.

Thanks so much.

Georgia

5.8 Overcoming barriers to digitisation

In conducting this research, asset owners have identified a number of challenges associated with providing spatial data to BYDA or end users directly including legal, security concerns, technology constraints and resources/costs. Consideration of potential mitigations to each of these concerns is outlined below.

5.8.1 Legal

56% of asset owners surveyed identified legal concerns as a barrier to providing spatial data to BYDA or end users. The project team understands that the basis of this concern relates to liability - in providing spatial data, users' level of reliance on this information may increase. This leads to concerns around liability should any risk materialise as a result of the reliance on this information.

The project team anticipates that this could be mitigated through a legal disclaimer that users need to accept prior to accessing the spatial data. **BYDA believes the appropriate disclaimers can be developed with industry to overcome this barrier. Additionally BYDA can develop file sharing logs that ensure that data files a time and date stamped so that an audited trail of the exact digital information provided by an asset owner through the BYDA platform can then be provided when damage investigations etc are required ensuring asset owners can validate what information was provided to end users and when.**

5.8.2 Security

44% of asset owners surveyed identified security as a barrier to providing digital information to end users. BYDA has advised that these concerns are based on having detailed spatial files for critical infrastructure (including telecommunications, gas and electricity networks) freely available to any party to search. Despite this risk existing when providing pdf versions of these spatial files, the perception of the asset owners is that the risk increases when providing the spatial files.

This perceived increase in risk could be mitigated by providing digital information to a subset of end users (for example designers and excavators) which are registered and verified. However, constraining this enhanced capability to a subset of end users would need to be considered in the context of the benefits to those end users that don't have access to the this enhanced capability. **BYDA is developing a user portal that will allow for strengthened credentialing of users which will then enable BYDA to "authorise" which users could access digital data, BYDA believes that authorisation to engineers, larger construction and design firms as well as locators should be a reasonable expectation whilst continuing to provide the once off/residential user the traditional PDF's**

5.8.3 Technology constraints

44% of asset owners also identified technology constraints as being a barrier to digital data sharing. Enabling digital data sharing is likely to require a substantial uplift in capability across both BYDA and the asset owners. BYDA has advised that they are committed to develop the architecture to enable this transition and have adequate budget to deliver this capability. However it will require asset owners to commit to enabling this from their end. The focus of this research project is on making clear the case for change – providing asset owners with the end user’s perspective on the substantial benefits of digitisation.

5.8.4 Resources and Costs

44% of asset owners identified that resources/costs were a barrier to transitioning to digital data sharing. The challenge with making this transition is that the cost of transitioning falls solely with the asset owners and BYDA (which is member funded) where as the benefits are spread across both asset owners and end users.

To invest in this uplift asset owners need to make the case internally that the benefits associated with transitioning to digital data sharing and the risks of not transitioning outweigh the costs. This research project hopes to support this case for transitioning.

Georgia Robazza

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Georgia Robazza

From: Mell Greenall <mell.greenall@byda.com.au>
Sent: Saturday, 30 September 2023 12:07 PM
To: Georgia Robazza
Cc: anita.mumford@aecom.com; brendan.rutter@mottmac.com; Ho Yee Lam; Ahlberg, Clarissa
Subject: RE: Roads Australia Fellowship - Draft research project

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Hi team

I have added some notes through out the document, its looking great. Once submitted, it would be great to have your permission to share with the BYDA board and my internal team – I would love to learn how you validated the case studies especially the “when things go wrong section”, these are great and I think tell a powerful narrative.

Well done, I can honestly say your research has opened my eyes even further to the productivity impact BYDA/and the utilities have on a project through our lack of digital options and the need for us to evolve to be a “good” partner in project delivery.

Cheers
Mell



Mell Greenall | CEO
Before You Dig Australia Ltd

m: 0407 166 706
a: 35 Railway Road, Blackburn, VIC 3130



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From: Georgia Robazza <GRobazza@transurban.com>
Sent: Thursday, September 28, 2023 7:55 AM
To: Mell Greenall <mell.greenall@byda.com.au>
Cc: anita.mumford@aecom.com; brendan.rutter@mottmac.com; Ho Yee Lam <Hoyee.lam@bgeeng.com>; Ahlberg, Clarissa <Clarissa.ahlberg@hdrinc.com>
Subject: Roads Australia Fellowship - Draft research project

Hi Mell

I hope you are well.

Next Friday (6 Oct) our research project is due to Roads Australia. We have been working towards finalising it and think that we are close, albeit with some final tweaks and polishing still to go.

We would appreciate any comments you have on the paper before we submit, in particular *Section 4 – Solution*. We have included some recommendations and a roadmap which we would really value your feedback on - [230923 Draft Research Paper.docx](#)

Thanks so much for all your support across the last few months – we have really valued your insights and the time committed to supporting this piece of work.

Cheers

Georgia

Georgia Robazza

Development Director
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Georgia Robazza

From: Neil Brammall <neil.brammall@cabinetoffice.gov.uk>
Sent: Sunday, 10 September 2023 5:55 PM
To: Georgia Robazza
Subject: Re: NUAR Enquiry
Attachments: image002.png

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Hi Georgia.

Yes, the Asset Owner organisations are involved in every aspect of the programme, and one of the key elements of getting the programme off the ground was the fact that the need we very much driven from the bottom up. Getting Asset Owners signed up to the legal framework and sharing data is one of the main delivery challenges, but we're making great progress on this front with hundreds of organisations now engaged.

Regards the download of GIS data - this is not currently within scope due to the security implications, and the loss of "control" over access and visualisation of that data. We're always reviewing future use cases though, so this could come into play in the future, for some target audiences or for some specific purposes, but not at this stage.

All the best,

Neil

On Sat, 2 Sept 2023 at 07:57, Georgia Robazza <GRobazza@transurban.com> wrote:

Thanks so much for your response Neil. I will incorporate this into our research.

I am also interested in the asset owners are how involved they have been in designing the framework?
Are they onboard?

Finally – I note your advice that the Intention to Dig process results in a pdf work pack being generated – do you also share GIS files with users if requested?

⌵

Georgia Robazza

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Phone: +61 7 3182 2637

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Email: grobazza@transurban.com

From: Neil Brammall <neil.brammall@cabinetoffice.gov.uk>

Sent: Saturday, September 2, 2023 12:46 AM

To: Georgia Robazza <GRobazza@transurban.com>

Subject: NUAR Enquiry

Hi Georgia.

How are you doing? I'm just responding to the enquiry you sent through to the NUAR email address.

I'll be happy to talk in more detail if required, but as I understand it your question was about notifications to Asset Owners about enquiries made around their assets, and information available to support incident investigations (let me know if I've mis-understood).

The NUAR platform is still under development, so some features are still evolving, but there are two key elements in relation to your question I think:

1. The "Intention to Dig" process
2. The data retention policy

Re. Intention to Dig, as well as providing an interactive map of buried assets, we have implemented (partially at this stage) a process for users to undergo once they have oriented themselves using the map, and have sufficient information to consider undertaking works. The Intention to Dig process captures information about those intended works, including dates and the nature of the work. This then results in a PDF Work Pack being generated. This is the point at which Asset Owners will potentially be notified of these works - in cases where the proximity of the works and the nature of the "affected" asset warrants it. There is still work to be done in this area as we're still at MVP stage, but this is the intent. One of the challenges here is the nature of that notification, and the level of integration with Asset Owner systems.

Regarding data retention, the key is that, for any incident investigation, we retain information about the enquiry and the response to it for a sufficient period to support an investigation which may go on for a significant period. We are complying with UK Government data retention guidelines as outlined here:

<https://www.gov.uk/government/publications/hmrc-records-management-and-retention-and-disposal-policy/records-management-and-retention-and-disposal-policy#retention-and-disposal-policy>

So basically 6 years plus current.

I hope this helps.

All the best,

Neil

--

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