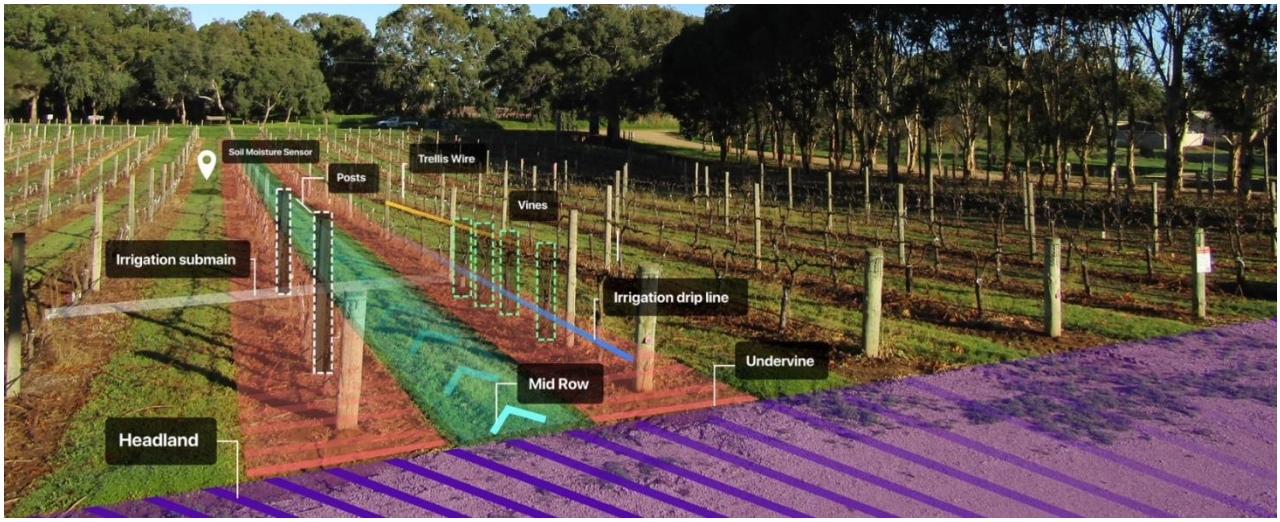
Australian Government
Wine Australia

Collabriculture

Collabriculture: an open and collaborative approach to technology in the wine industry



FINAL REPORT TO WINE AUSTRALIA

Project Number: **WAC 2012**

Principal Investigator: **Oli Madgett**

Research Organisation: **Grow4 PTY LTD (Trading as Platfarm)**

Date: **26/11/21**

Abstract

This project was designed to demonstrate the benefits of a developer centric and open standards driven strategy to technology in the Australian wine sector.

The project validated the approach of mapping vineyards at survey grade accuracy, as well as using an API orientated platform to manage key vineyard mapping layers such as block boundary files for the benefit of the wine industry. A proposes a route to implement this approach at scale.

Working with the developer and wine community, the project published key datasets such as grape vine varieties, wine region, and phylloxera boundaries in a developer orientated repository such as GitHub.

Executive Summary

This report highlights the difference between Web Grade and Survey Grade mapping of vineyard infrastructure, and the value proposition that they can deliver for the industry. While web Grade mapping meets most use cases for the industry at the moment, it is survey grade mapping of the assets and infrastructure of the vineyard that unlocks the value of technology and data in the future.

The recommendations of the #Collabriculture project are:

- Use the AgTech demo sites (initially Nuriootpa / Loxton, but ideally additional commercial vineyards) to practically demonstrate the value of Survey Grade mapping of the vineyard infrastructure, and having open and interoperable maps and data structures of vineyards being in place enabling the data set to be shared with relevant tech partners.

- The key stakeholders in the wine industry (Wine Australia / AWRI / Vine Health) to lead collaboration around a common project that uses the model of the Red Meat & Wool program to enable and support all wine producers in Australia to have useful and interoperable digital infrastructure maps of their vineyards. This common dataset of all vineyards will allow wine producers to generate reports to meet their compliance obligations (spray record keeping / sustainability reporting / biosecurity compliance).

- Continue to make organic progress with early adopter wine producers by developing a QGIS plugin that enables Survey Grade mapping of vineyards to be transformed to fit with the open vineyard data model structure.

- Continue to publish useful resources for developers in the GitHub repository, we've started with grape varieties / GI boundaries, phylloxera exclusion boundaries are in the process of

being published, and resources such as the AWRI agrochemical database are other key building blocks to publish openly in order to drive innovation across the industry.

- Bring in experts with experience in open GIS platforms and open data standards to continue to develop the GitHub repository for the industry and extend and refine the data model. A working group of willing participants from across the industry should also be formed, and they can be instrumental in developing a more open approach for the industries reporting tools, which would be another key enabler of the wine industry innovation ecosystem

Method

The project was delivered through a combination of:

Online and physical workshops to bring the community together for discussion, and to work towards reaching consensus in key areas such as how to most effectively survey and map vineyard

Ongoing communication via email, project website, social media channels, presenting at other AgTech events for the wine industry and Grape Grower magazine and Daily Wine News, and please see links to the relevant articles in the appendix.

Technical outputs were published on the projects GitHub page, with a discussion board also created and managed

Ongoing project management and coordination with key industry stakeholders and the developer community

Overview

Accurate and interoperable digital maps of vineyard infrastructure are going to be an increasingly useful asset to wine producers and other stakeholders in the wine ecosystem such as tech providers, biosecurity agencies, compliance systems, researchers, industry bodies and sustainability certification programs.

The initial objectives of #Collabriculture have been to:

1. Collectively identify the physical features/assets of vineyards that are most important to map digitally
2. Structure these vineyard mapping features in a database schema that's agnostic of any particular tech stack, so it can be useful to anyone building technology of managing data in the wine industry

3. Engage with key stakeholders and data authorities in the wine industry (Wine Australia / AWRI / Vine Health) to assist them to start publishing useful resources on GitHub, so they're in a place that developers typically took towards

We've collectively made a decent start on this, we've had engagement from across the industry and internationally (at the end of this doc we've highlighted a few of the fantastic people and organisations that have contributed so far). The #Collabriculture community reached consensus around the key features of vineyards to map, and with the help of our open GIS developer John Bryant, they're now online at https://github.com/CollabricultureOrg/.

Initial versions of useful resources such as lists of grape varieties, wine region GI boundaries are now published on GitHub, and phylloxera exclusion zone boundaries are also in the process of being published. The AWRI agrochemical list for the wine industry 'The Dog Book', as well as the E-L grapevine growth stage database would be additional resources to openly publish that would help to enable more digital innovation

The second phase of #Collabriculture has been focused on the questions of:

- How do we survey vineyards in a standardised way, and what are the routes to achieving scalability
- How accurately do we need to map the vineyard infrastructure, and what are the trade-offs in terms of the value proposition for the wine industry between mapping from space Vs aircraft/drones Vs ground based
- How will advances in space technology over the coming years impact on the accuracy of positioning in vineyards, and the accuracy of imagery to use as a base layer to create digital maps from
- What are the potential roles for players in the ecosystem, and where can the wine industry influence things to go in a progressive direction, and to build trust with wine producers
- What is it that will actually drive the adoption of accurate digital maps, and what are the next steps to achieving this

Our objective was to make a tangible start, and this document overviews the next steps that we feel the collective industry should take, and we've suggested some ways to bring in additional talent and expertise so we can go to the next level together

What is the value proposition for accurate and interoperable maps of vineyards?

We've been conscious about challenging our own assumption that there is a genuine value proposition for accurate and interoperable digital infrastructure maps for the majority of wine producers, and not just the small percentage of early adopters

Although wine producers don't currently have a digital infrastructure map of their vineyards at the centre of their work, our world is often orientated around those features

In terms of our **jobs to be done**

- We carry out work spatially, whether it be to slash a whole vineyard, harvest particular blocks, or fix things such as posts at specific points down a row
- Our record keeping is spatially orientated, for example with spray records or grape harvest tonnage reported against each block
- Our grape supply contracts are also typically structured down to the block level

In terms of the **pains** that we're feeling

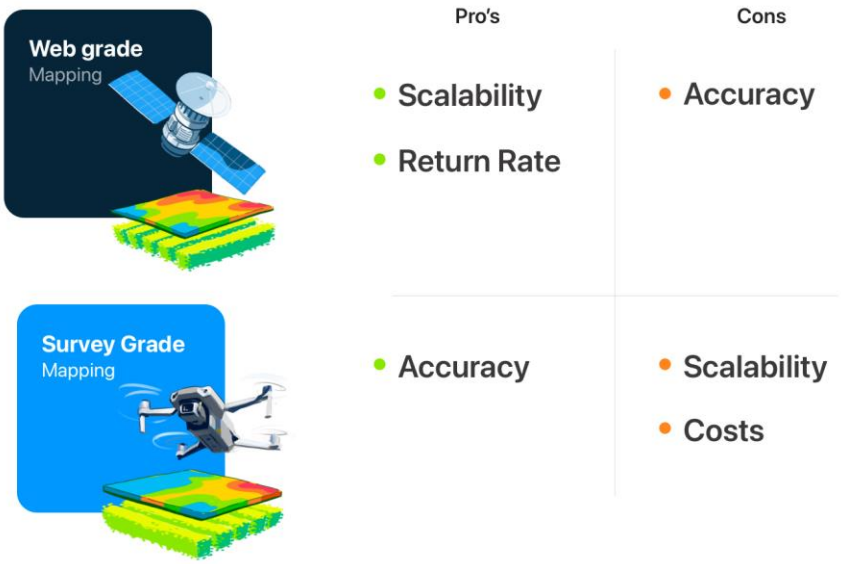
- Wine producers are increasingly being asked for digital maps of their vineyards, for example as a part of being certified by Sustainable Winegrowing Australia, or in order to access spatial data such as NDVI imagery
- Accurate and useful digital maps don't currently exist in a format that's easily reusable for the majority of growers - it's another thing that's put in the too hard basket, or is just irritating to re-draw if you do want to start using many tech tools

In terms of the **gains** for wine producers

- Useful and interoperable infrastructure maps are at the centre of getting hold of your data in a usable way, and to getting on top of the increasing compliance burden the industry creating for wine producers. Looking towards the future, accurate infrastructure maps are also going to be one of the drivers of increasing automation in vineyards, whether that be automatic collection of data as you drive down a row, auto-steering you down a row, or watching your autonomous vehicle drive itself down a row merrily working away. Sharing the #Collabricultre scheme & Geopackage with machinery suppliers will help engagement with the bespoke system by receiving 1 standard schema from across the industry.

So… what have we learned

In terms of the Pros and Cons of different approaches of mapping, there's a definite distinction to be made between 'web grade' mapping from space, and 'survey grade' that involves aircraft/drones/ground based mapping



Web grade mapping from space has the benefits of being massively scalable, but we have to be aware that there can be rights restrictions from creating maps from satellite imagery, and it's not currently accurate enough for certain use cases. On the accuracy front, if you create a map drawn from satellite imagery, when you then try and use that mapping layer on the ground you can often find that you're up to 2 row widths out in any direction depending on the region.

Web grade mapping is accurate enough the majority of current use cases in the wine industry:

- Sustainable Wine Australia
- Compliance
- Farm management at the block level
- Biosecurity spatial database
- Data sharing with other space based technologies at the block level

Where web grade mapping falls down is that it's not currently accurate enough for a lot of innovation that has the potential to transform the industry*, but that only early adopters are currently innovating with

Survey grade mapping is needed to:

- Snap data from a computer vision system against the correct vine or row, so that it can either be added into a database, or subsequently turned into a useful action like fixing or killing things
- Confidently track and direct work being carried out at the row level
- For automation in the vineyard e.g. AB lines for autonomous vehicles to drive down

*For the value of data linked to features of vineyards to be fully realised, a critical missing piece is that there needs to be an open API available to pass data onto in terms of the key industry reporting tools e.g. spray diary software, or the Sustainable Winegrowing Australia platform

So… what should we do

Our first recommendation is that it needs Wine Australia, AWRI and Vine Health to coordinate together to help create accurate, useful and interoperable digital infrastructure/asset maps at industry wide scale.

As a wine producer, by spending the time to create a digital vineyard map, it need to meet meeting the requirements of Sustainable Winegrowing Australia, Biosecurity compliance, and deliver industry insights in order to achieve adoption by the majority of growers, and not just the small percentage of innovators and early adopters.

Once the asset/infrastructure map is established it can be used by a wide range of tech companies without having to repeat the infrastructure data gathering exercise again; this approach will reduce cost to the grower (avoiding mapping the same vineyard in the say way two or more times) and speed up installation of technology growers wish to adopt.

The next national wine scan has the potential to take a significant step forwards by taking a really joined-up approach so that the process results in outputs that are useful for wine producers and the AgTech / RegTech ecosystem.

We believe that the wine industry can take real learnings from the $7.5m Red Meat & Wool program, where livestock producers received rebates from adopting core technologies that enabled them to be increasingly data driven (genetics software / ear tags / auto drafters), and they took part in practical workshops as part of the process.

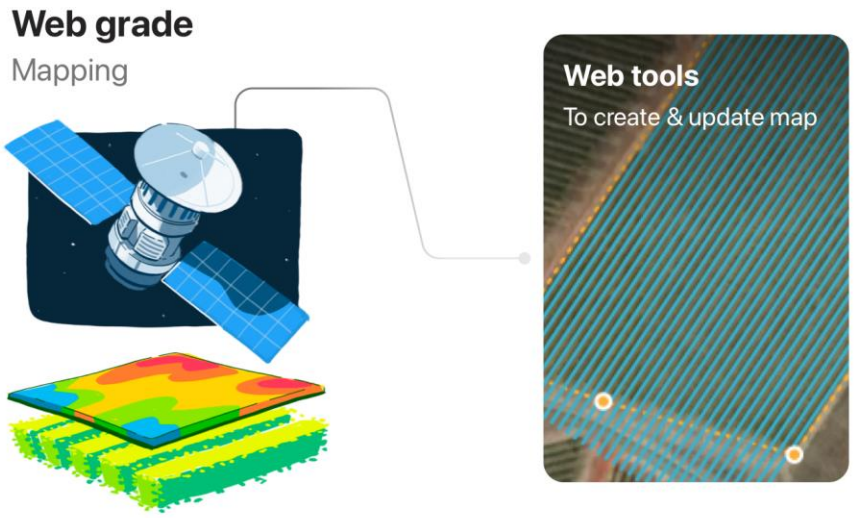
Accurate, useful and interoperable asset/infrastructure maps are going to increasingly be a valuable digital asset for wine producers, and it is our recommendation that the industry co-ordinates together to implement a joined-up approach to helping wine producers to put them in place.

For this to happen optimally, it requires Wine Australia / AWRI / Vinehealth / Australian Grape & Wine / Regional grower groups to coordinate together to implement a national project to enable wine producers to put in place useful digital maps that are accurate enough for their needs.

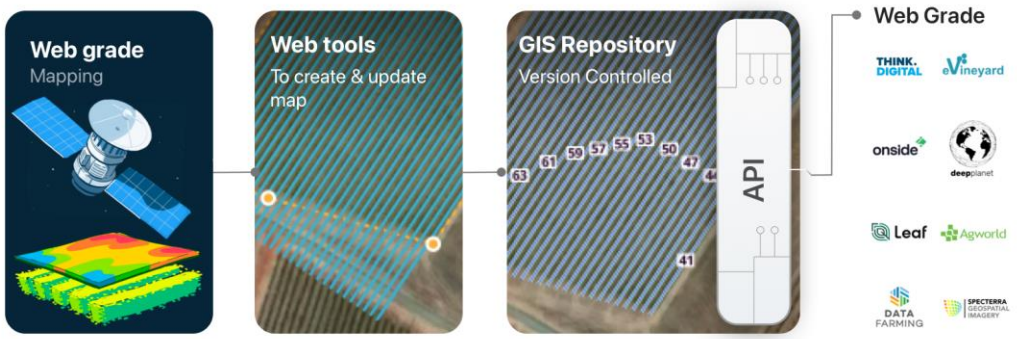
From the AgTech and research community perspective, we need to deliver an open online tool that enables wine producers to draw their vineyard blocks to a web grade, with the output of the map following the open vineyard/#Collabriculture data model structure.

It’s going to be vital to support wine producers through the process of creating their vineyard maps using the web drawing tools, and this can be delivered via online screen sharing with a mapping expert, and this is going to be an ideal opportunity to develop regionally based mapping technology talent.

We propose that the online drawing tools use Oauth 2.0 so that the wine producer is always in control of who they’re sharing their mapping data with.



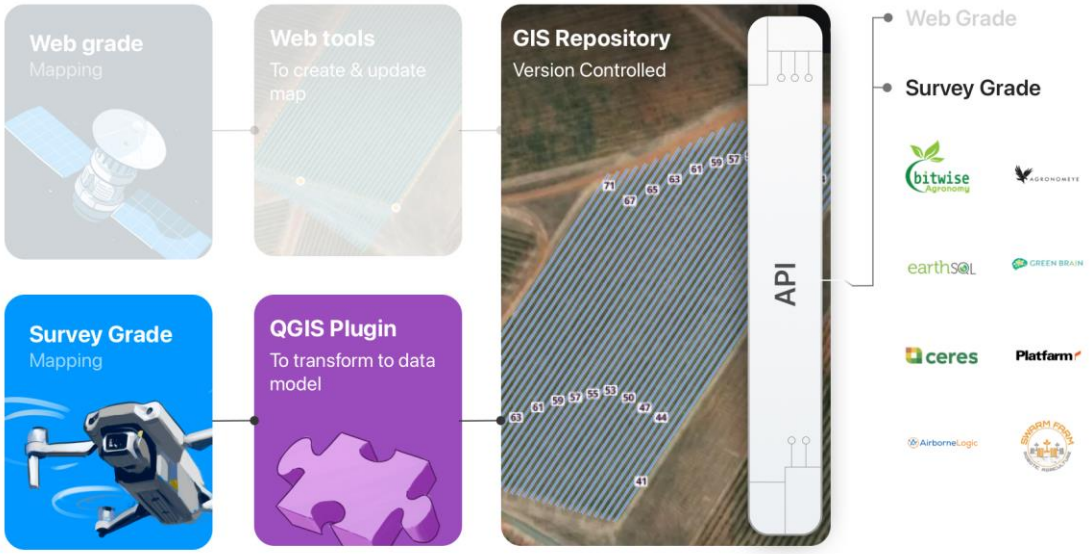
Once the wine producer has drawn their asset/infrastructure vineyard map, the version controlled web grade map is securely stored in a GIS repository, and the wine producer receives a link to download their map in useful formats, so they can also store them on their own server, and there’s an open API for 3rd party tech providers to link into. Our recommendation is that the online drawing tools and GIS repository sit under a wine producer body, so it’s being built from a wine producer centric position of trust from the ground up. As a part of this project the team at Kart demonstrated the flow of implementing this with our pilot vineyard maps, with a brief video here



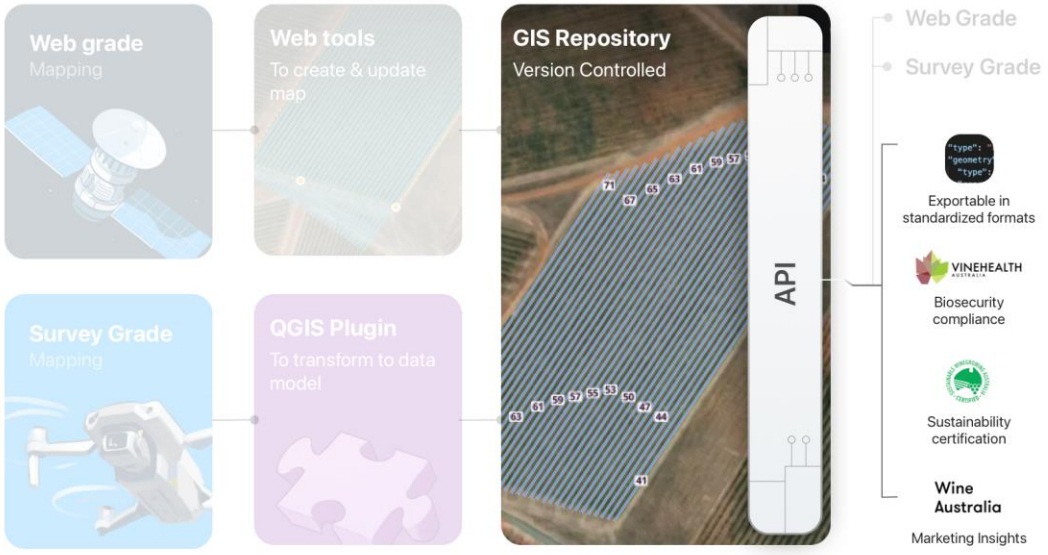
Following a model similar to the Red Meat & Wool program, wine producers who want to have a survey grade infrastructure map of their vineyards are able to apply for a rebate to support them putting this in place.

Surveys are carried out via aircraft / drones or are ground based, with a number of surveying partners being highlighted for wine producers to work with that survey vineyards in accordance with the open vineyard data model, with surveys being carried out using the current GDA2020 datum. The survey data needs to be transformed into the open vineyard data model structure as a part of the producer receiving the rebate.

As a part of this project, we have piloted transforming surveyed data into the open vineyard data model structure, but this has been a manual process, and in order for this to scale to industry wide roll-out, the recommendation is is to develop a QGIS plugin to assist with the transformation of data. Existing GIS data from the establishment of the vineyard could also be imported and transformed, with the QGS plugin initially identifying if the previously surveyed data conforms to the data model structure, and what if any changes are required.



The wine producer can share their map with Vine Health (or other biosecurity agencies), use it as a part of the Sustainable Winegrowing Australia compliance process, share it with 3rd party AgTech/RegTech providers, and data can also be shared with the industry insights project.



Recommendations

In the short term (2021/22 season), in order to keep up momentum we recommend:

- Using the AgTech demo sites as a testbed to practically demonstrate the benefits of having survey grade mapping in place, with data linking directly back to the appropriate feature (vine / post etc) and accurately tasking and tracking work being carried out. We've accurately mapped out the vineyard at the Loxton AgTech demo site, and that can be leveraged by the VitiVisor project as well. With the demo sites, we propose to work with an economist to quantify the benefits of having survey grade mapping in place, as a part of developing the investment case for the national rollout phase.

- In terms of creating an effective AgTech ecosystem, it would also be really beneficial if a number of the major corporates in the wine industry (TWE / Pernod / Accolade / Casella's etc) also had vineyards that acted as demo sites for showcasing the benefits of having accurate and interoperable vineyard maps. Again, this could also be integrated into the existing small number of VitiVisor grower support sites. We also want to extend our thanks to wine producers such as Taylors Wines in Clare, Penley Estate in Coonawarra and Brown Brothers Tamar Ridge vineyard in Tasmania that have been so supportive of pushing things forwards to this point.

- As a part of this initial next step, we'd propose that a working group of willing participants in a more open and interoperable future for the wine industry is formed, and they take on responsibility for the next phase of interaction of the GitHub repository and any developments to extend the initial version of the data model (e.g. to add posts). We would recommend that an organisation with expert knowledge in this area are brought in, and we'd strongly recommend that the industry continues to work with John Bryant as an expert in Open GIS technology

- Organic progress around Survey Grade mapping can continue to make progress with the ecosystem of service providers already in the industry (e.g. Airborne Logic / Agronomeye), and a practical next step to take will be the development of a QGIS plugin which will enable the transformation of survey data into the open vineyard data model

In the medium term (2022/23 season)

- Given the structure of the wine industry, we believe that it is really pivotal that the key stakeholders (Wine Australia / AWRI / Vine Health) come together to be aligned around the common need to create accurate, useful and interoperable digital maps of vineyards, and put forward a united case for a funding mechanism along the lines of the Red Meat & Wool program to put standardised digital maps in place for the majority of wine producers

Additional recommendations

- Collaborate with GeoScience Australia to use the demo site as a testbed for showcasing the benefits of SBAS positioning

- Collaborate with Horticulture Innovation Australia to identify cross-industry opportunities which could assist with any proposal to e.g. Agricultural Innovation Australia (AIA) for national roll-out of accurate, useful, interoperable maps, and this will build on the success of already collaborating with HIA around the use case of how accurate maps of 'permanent alley crops' are a building block for effectively sampling soil carbon under the 2021 soil carbon methodology

- Collaborate with GeoScience Australia and the Satellite CRC to flag-up the issues facing the wine industry in terms of accurately mapping from space-based imagery

- Continue to share learnings with OIV to assist with developing global standards around mapping in vineyards and use Wine Tech 2022 as a key platform to share these learnings

- Collaborate with AgriTech NZ through Rezare Systems to link into their work to standardise geospatial data for agriculture, and also with the Australian AgriFood Data Exchange. We believe that if the wine industry embraces the AgriTech NZ approach to standardising data exchange formats, and adopting open APIs, it will help to solve the current challenge of data not being able to easily be passed onto the wine industries key reporting tools, which is a blocker for innovation at present.

Thank you to all these people

Thanks to the over 200 people that have been a part of the workshops that we're run both in-person and virtually, to PIRSA and Wine Australia for funding the workshops to date, and to everyone that contributed their time and ideas to present:

Bitwise Agronomy
Emly Eros
GAIA / Green Brain
Platfarm
FrontierSI
University of New South Wales
Ian Beecher-Jones
eVineyards
Agronomeye
Peter Hayes
Brad Nott and the VitiVisor team

ThinkDigital
Airborne Logic
Hans Loder (Look out for Hans Nuffield Scholarship which in this same area “Here come the robots, but what do we do with the data?”)
EarthSQL

Appendix

As a part of the project the #Collabriculture community created these 2 articles for Grape Grower Magazine, and also presented at the 2021 VitiTech event in the Adelaide Hills and at the PIRSA AgTech day at Loxton in the Riverland

https://winetitles.com.au/what-are-the-most-important-features-of-your-vineyard-to-map/

https://winetitles.com.au/accurate-maps-will-show-the-path-to-technologys-treasures/