

Real-Time Automated Project Controls



When Things Don't Always Go To Plan...





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Justifying Automation of Site Monitoring and Controls

Irrespective if you are an owners management team or an EPC Contractors white collar group, every construction project will need an element of site monitoring and control.

Traditionally a project would require site monitoring and control resources.



Depending on shift and rotations, this lift could double or even triple.



Why Automate Project Controls?

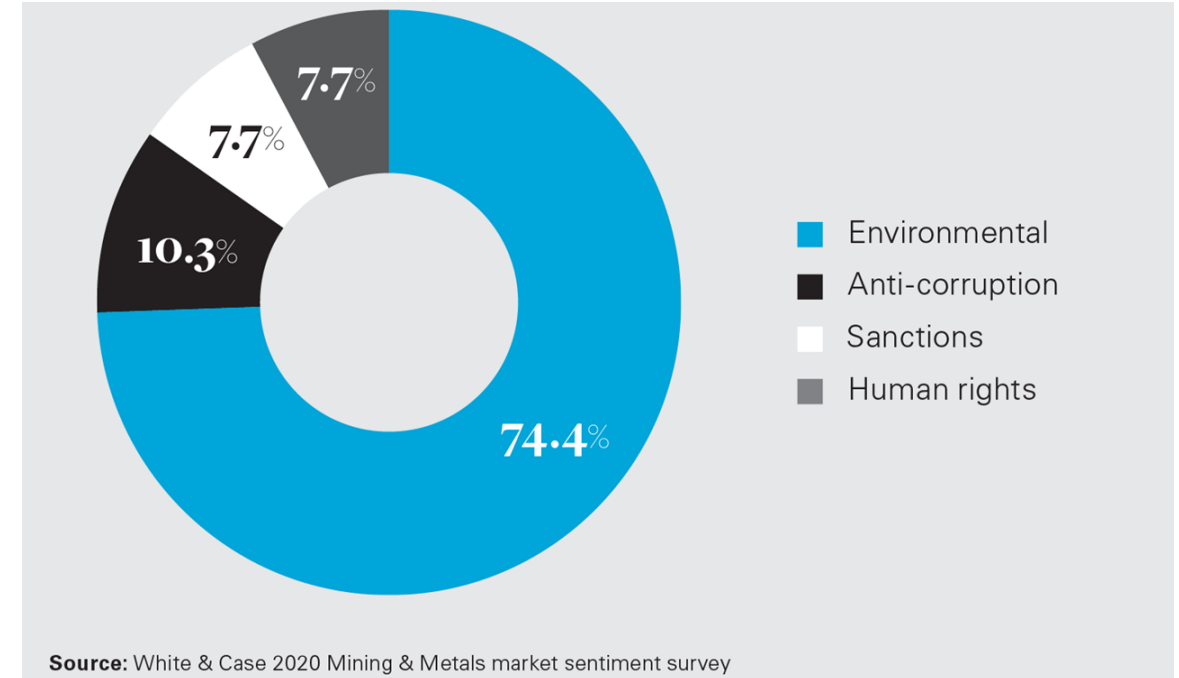
Site monitoring, in a traditional Project Controls sense, is challenged on Australian projects that have remote and sparse work fronts for the following reasons:

1. Impacts to the environment or other sensitive receptors via construction breaches cause significant damage annually
2. Resource inefficiency
3. Insufficient Resources for Controls
4. Covid impacts to travel
5. Covid impacts on work culture
6. Subjectivity



Environmental and Economic Impacts

- Local communities are increasingly rejecting mining because of perceived negative environmental and economic impacts, even though every 100 direct-mining jobs results in 390 in-direct jobs.
- With proper precautions, mining can have a small environmental impact.
- Construction Managers need to ensure that environmental conditions related to operation Permits are complied with, which is difficult in remote locations when exclusion zones are not well marked and many contract vehicles work in isolation.



Resource Inefficiency

To measure inefficiency, we use a simple formula that compares a contractor's achieved productivity in unimpacted and impacted periods. This formula calculates what we call an inefficiency factor and is depicted below:

$$\text{Inefficiency \%} = \frac{\text{Unimpacted Work} - \text{Impacted Work}}{\text{Unimpacted Work}}$$

The challenge we have is determining a calculation of unimpacted work hours vs impacted work hours. The traditional method is to rely on:

- Site records
- Equipment availability reports
- Unplanned maintenance
- Environmental impacts

In a resource constrained and remote disparate environment, maintaining a consistent and accurate log of site records is challenging.

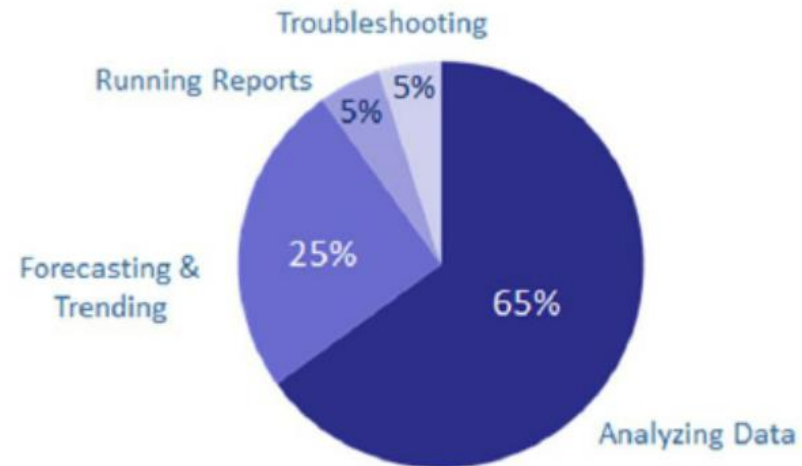
Furthermore, businesses rely on the honesty of the contractor, where supervision and oversight maybe sparse.



Insufficient Resources for Project Controls

According to a recent PMI report, the second biggest issue for Project Controls is:

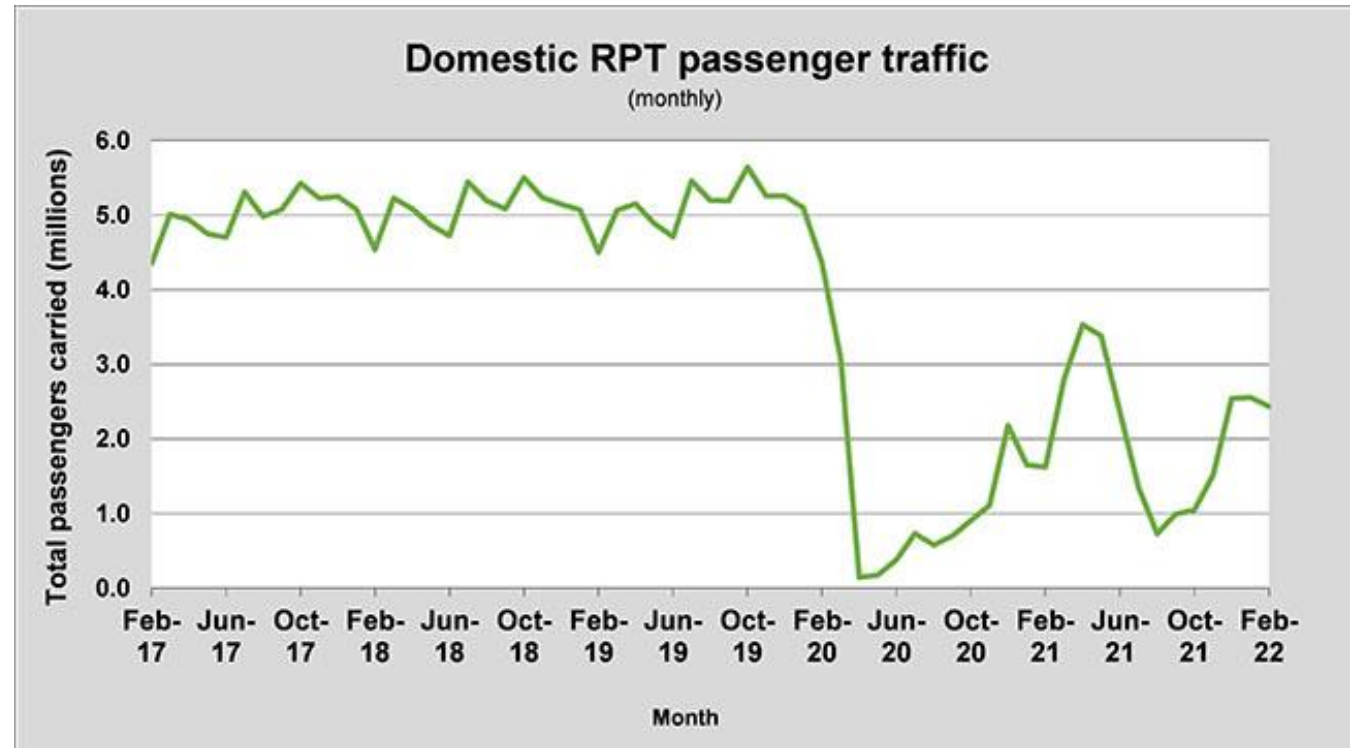
“There seems to be a greater demand for cost reporting, better planning, and scenario analysis. In a more complex environment, where there may be mergers and acquisitions, there are massive collaborations between different organizations on a project. At the same time, there is great pressure on the limited resources of the organization. The challenge becomes having the resources to provide detailed, accurate reporting in a timely fashion.”



Current PMI trends suggest, there is an increased requirement for Data Analysis in the Project Controls space. To support this trend, construction projects are finding ways to lessen the burden of gathering accurate data in a more automated and timely fashion.

How has Covid-19 impacted Travel?

- Covid-19 has significantly impacted many aspects of the economy, particularly International/ Regional travel.
- The drop in regional travel is an indicator of how difficult the last two years have been moving project resources around the country, from homes to work sites.
- According to the Bureau of Infrastructure and Transport Research Economics (BITRE), there were 2.69 Million passengers carried on Australian domestic commercial aviation (including charter operations) in February 2022, considerably less when compared to 4.60 million in February 2020.



Covid -19 Impacts on Work Culture

- COVID-19 forced many workers and firms to experiment with working from home
- Showing that many jobs can be done remotely, the amount working from home is likely to remain much higher than it was before the pandemic.
- Before the pandemic, about 8% of people regularly worked some time from home. After the pandemic, the number of people working from home has remained at just under 40%.
- The increase in working from home is a major change in the labour market that has occurred at unprecedented speed, bringing about cultural change in the expectations of work/life balance.
- In a post-pandemic world, employee retention, work-life balance, and global team engagement will be top-of-mind for company leaders. This new era of work requires more diligence than ever before — and being aware of the upcoming workforce trends, it will help companies boost retention and attract top global talent. We do not expect the mining and construction industries to buck the trend.
- To address this pending issue for site related roles, new tools that circumvent the need to be on site and on the ground are required by industry.
- Less people are choosing Project Administration type careers - ABS suggests a 2.5% drop in Construction workers and a massive 11% drop in Administrative and Support professionals

References:

<https://www.pc.gov.au/research/completed/working-from-home/working-from-home.pdf>
<https://www.globalization-partners.com/resources/ebook-2022-global-workforcetrends>



How is the Industry Responding to These Challenges?

A wave of innovation is being developed and released to address limitations encountered via traditional execution:

Artificial Intelligence

A.L.I.C.E (Planning)
Endeavour (Cost)

BIM Modeling

4D and 5D models – Planning and Cost Integration with 3D Design
LiDAR – GEOSlam 3D Progress measurement

Cloud-Based Information Management

E7
Rail Diary

Software Based Analysis Tools

Logic+

Geospatial Real-Time Resource Monitoring

SMART
Coates Hire



How is the Industry Responding to These Challenges?

A comparison of popular tools targeting aspects of the Project Management and Controls Ecosystem

| | Smart | RailDiary | Sinc | Procore | A.L.I.C.E | Endeavour | BIM | GEOSlam | E7 | Coates Hire | Logic+ |
|---|---|------------------------------------|------------------------------|-----------------------------|--|---|-----|---------|----------------------------|----------------------------|--------|
| Schedule Design | ✓✓ | x | x | x | ✓ Schedule Modeling and Simulaiton | x | ✓ | x | x | ✓ Can use custom scheduler | ✓ |
| Schedule Management | ✓✓ | ✓ Better knowledge of site records | x | ✓ | ✓ Schedule Modeling and Simulaiton | ✓ Task Tracking and Document Management | x | x | ✓ Via Excel import /export | ✓ | ✓ |
| P6 Integration | ✓ | ✓ Read From Only | x | ✓ | ✓ Supported | ✓ Supported | x | x | x | ✓ Can be customised | ✓ |
| Commute to work | ✓✓ Automated recording | ✓ Electronic recording | x | x | x | x | x | x | x | ✓ Can be customised | NA |
| Pre-start/handover | ✓✓ Automated recording | x | ✓ Electronic recording | x | x | ✓ Tracking crews via document control | x | x | ✓ Electronic recording | ✓ Can be customised | NA |
| Work zone assignment / mobilise | ✓✓ Live update from schedule | ✓ Live update from planners | ✓ Live update from calendar | ✓ Live update from calendar | x | x Task Tracking | x | x | ✓ Electronic recording | ✓ Can be customised | NA |
| Resource management & re-allocation | ✓✓ Real time & historical 3D resource display | x | ✓ Real time resource display | x | ✓ Schedule Scenario Modelling for Reallocation | x | x | x | ✓ Daily reporting | ✓ Daily recording | NA |
| Safety & Compliance | ✓✓ Automated email & SMS alerts | x | x | x | x | ✓ Tracking compliance certificates | x | x | ✓ Assists manual process | ✓ Electronic Reporting | NA |
| Continuous awareness control | ✓✓ Real time display resource movements and conflicts | x | ✓ Assists | ✓ Assists | x | x | x | x | x | x | NA |
| Productivity & Availability | ✓ Automated utilisation recording | x | ✓ Electronic recording | ✓ | ✓ Schedule Scenario Modelling | ✓ Picture bank of site records | ✓ | ✓ | ✓ Electronic recording | ✓ Electronic Reporting | NA |
| Quality Control | x | x | x | ✓ Electronic recording | x | ✓ Document Control | ✓ | x | ✓ Assists manual process | x | NA |
| Progress & automatic site record validation | ✓ Validation only | ✓ Electronic recording | x | ✓ Assists | x | ✓ Picture bank of site records | ✓ | ✓ | ✓ Assists manual process | x | NA |
| Benchmarking | ✓ Extensive reporting and analysis enabled | x | x | ✓ | x | x | x | x | ✓ Provides data | x | NA |
| Reporting | ✓✓ Real time auto updates | ✓ Real time | ✓ Daily | ✓ Real time | ✓ Real time | ✓ Real Time | x | x | ✓ Comprehensive | ✓ Comprehensive | NA |
| Remote sites | ✓ Yes | x GSM only | x GSM only | x GSM only | x | ✓ Cloud based | x | ✓ | x | x | NA |
| Real time resource display | ✓ Yes | ✓ Yes | ✓ Yes | x No | x | x | x | x | x | x | NA |
| Document management | x | ✓ Yes | ✓ Yes | ✓ Yes | x | ✓ Yes | x | x | ✓ Electronic | ✓ Comprehensive | NA |

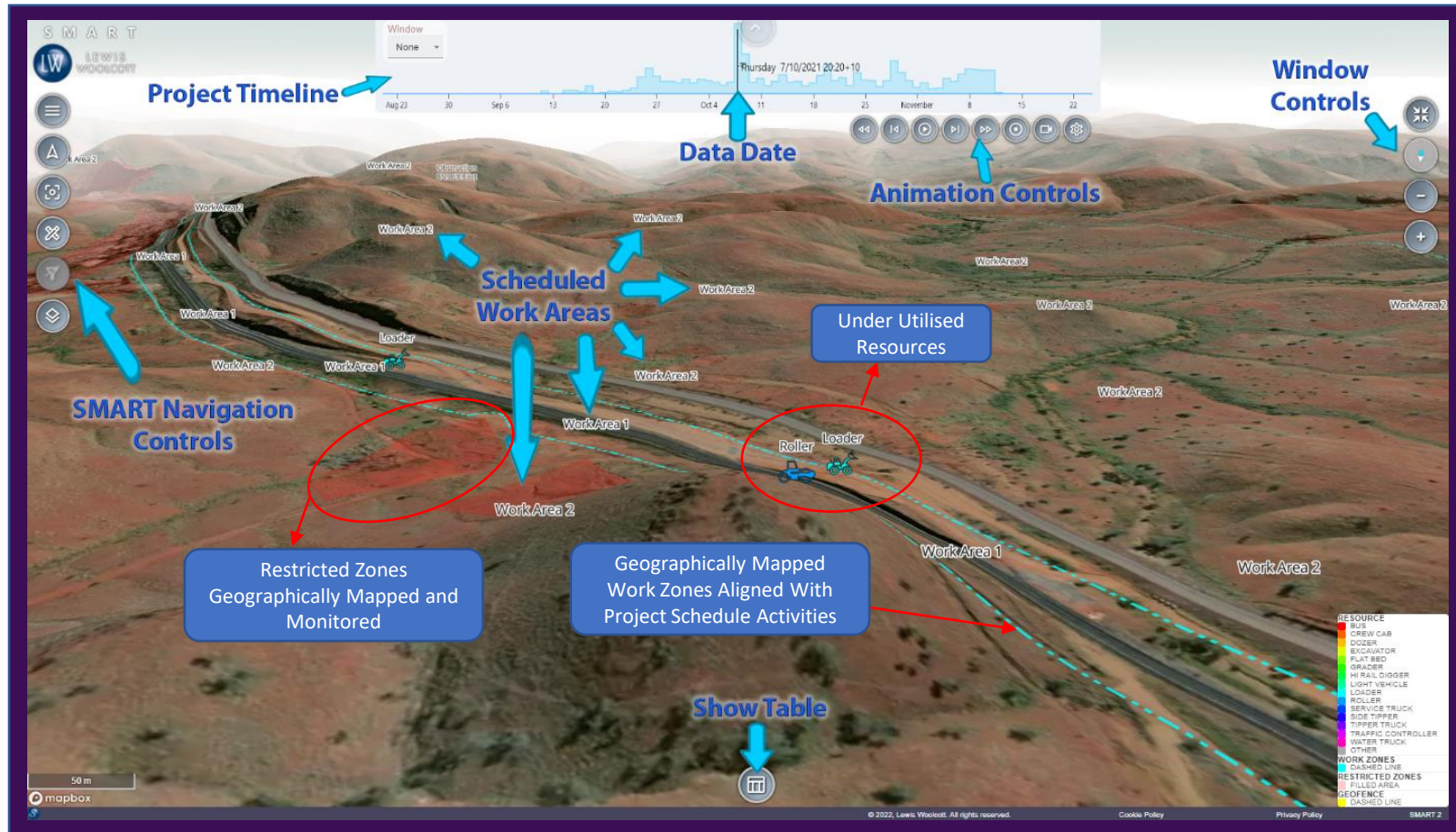
Is an advanced 3D design technology with ability to distribute models to site devices.

Is an advanced 3D survey technology capable of monitoring physical progress to a degree.

Is a planning and schedule analysis tool



The SMART System



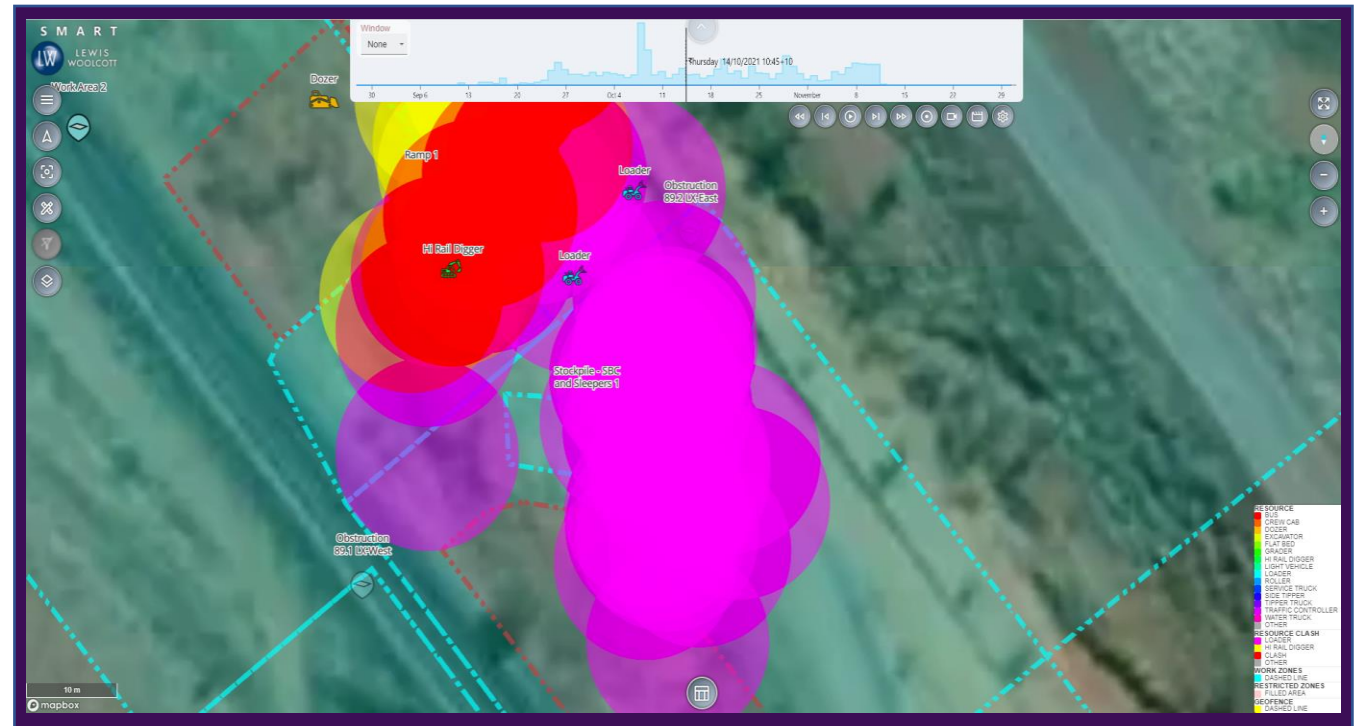
SMART In Action

Go To SMART Application

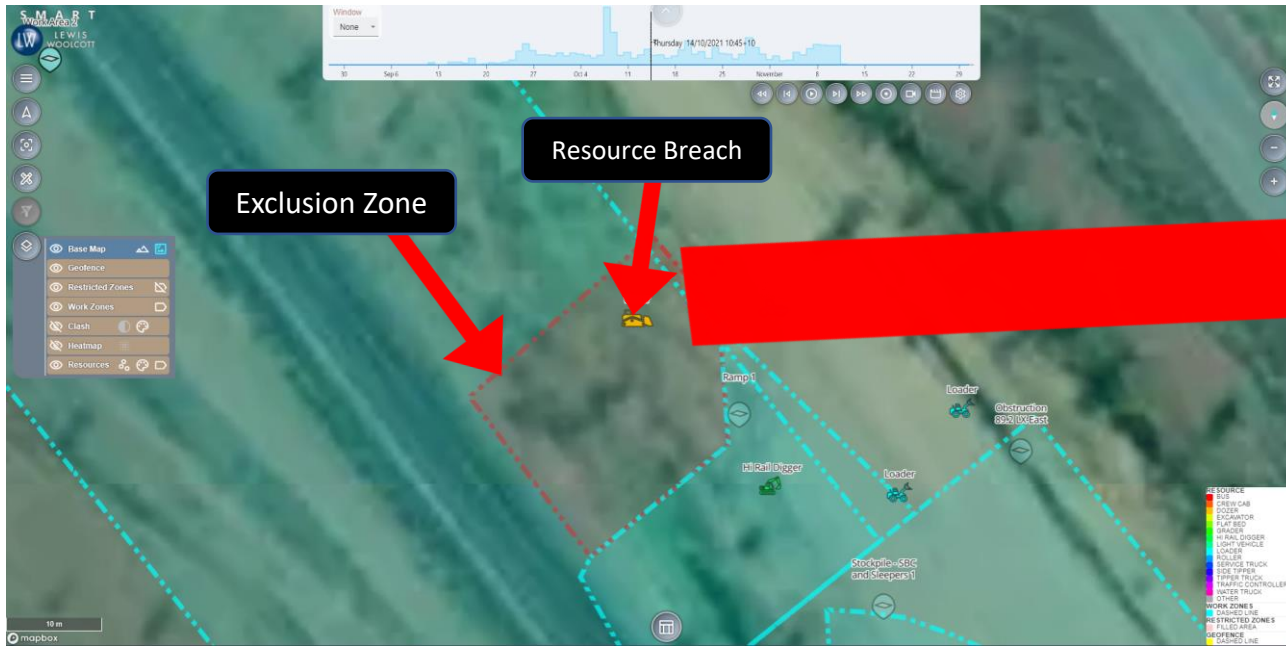


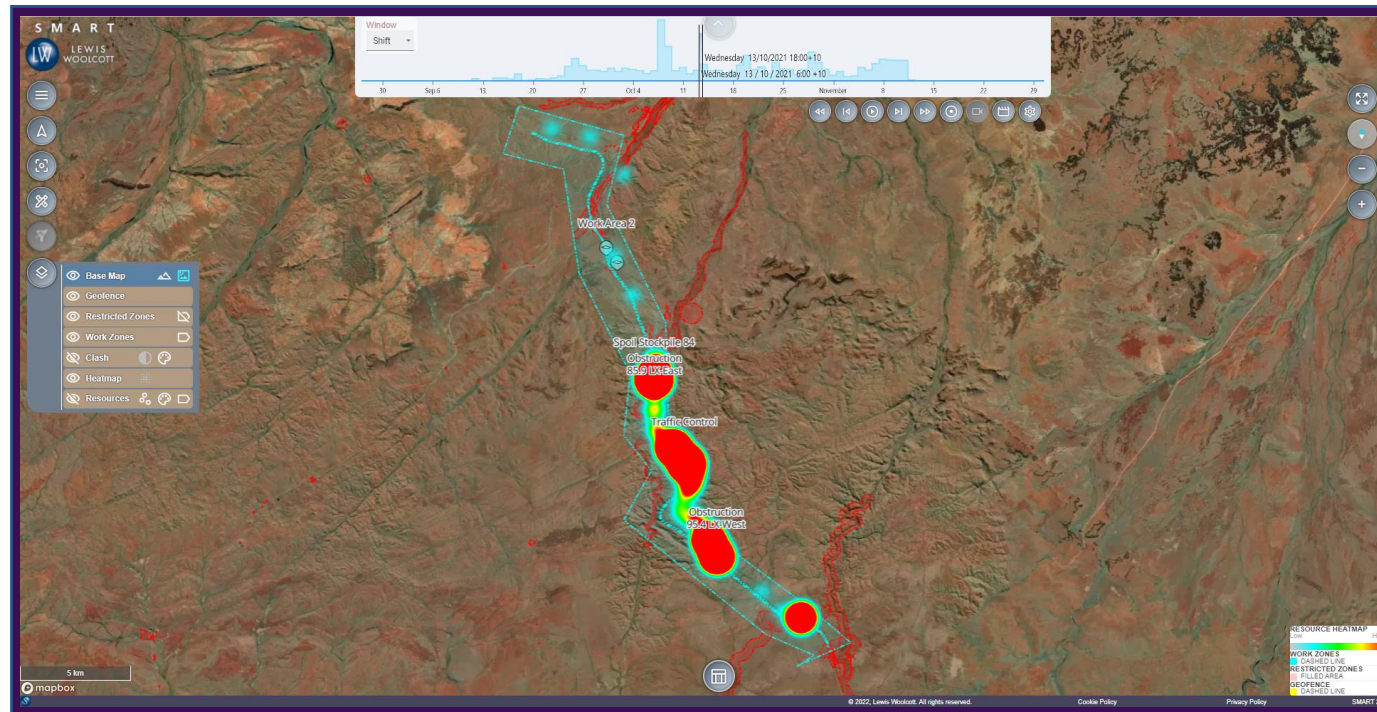
SMART & Project Controls

- There are many ways that project controls can benefit from Smart tracking and real-time information.
- SMART can show where two clashing trades are working alongside each other.
- For specific WBS - the High Rail (Yellow Trade) was delayed 3 hours due to the Loader (Pink Trade) work front clash.
- Delay could have been avoided and High Rail trade re-allocate.



- Automated alert triggers as events occur, such as resources entering 'no-go' zones.

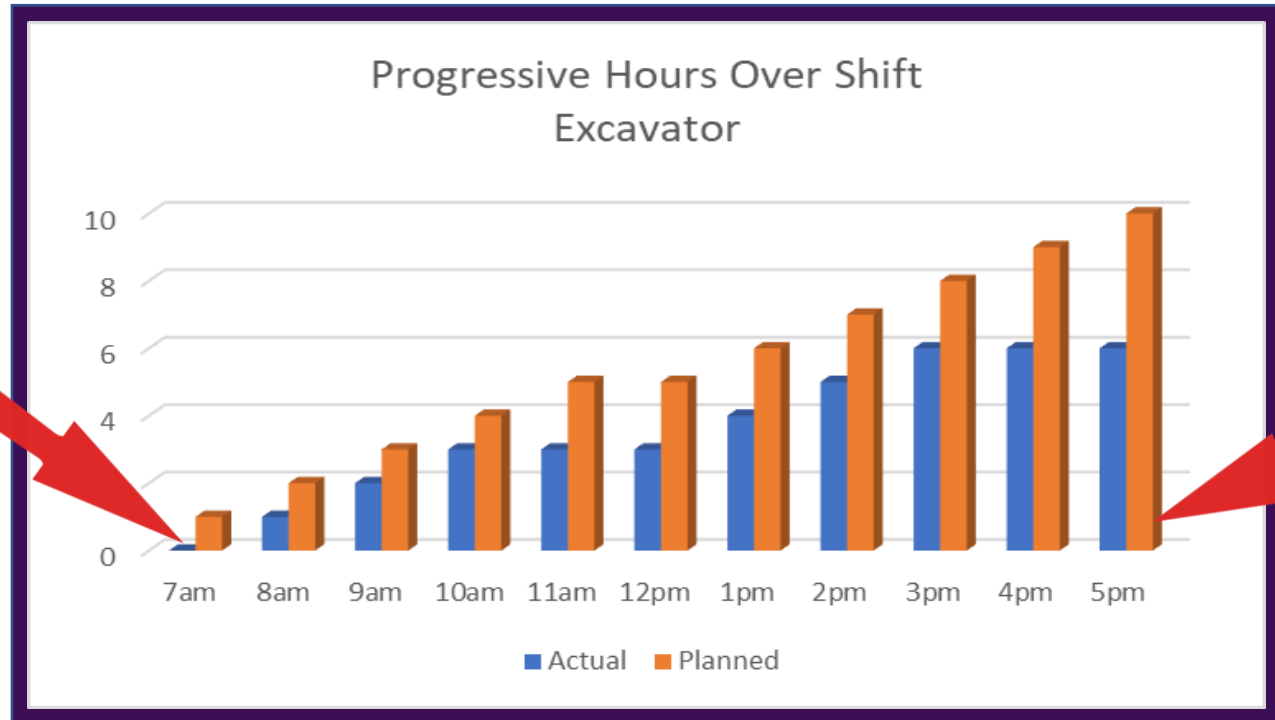




- Heatmap analysis of where resources have mobilised over a shift for comparison against Work Breakdown Structure (WBS).
- Heat blob locations and size represent activity concentrations.

Tracking Actual Vs. Planned

SMART can read data directly from P6 so Planned vs. Actual work hours can be compared in real-time



Transforming SMART Data Into Project Controls Gold

Lewis Woolcott Power-BI Reporting Suite

Welcome

- Device Register
- Heritage Breach
- Hours Burned Workzone
- Overlapping Resources
- Time Between Rounds
- Previous Day Utilisation
- Weekly Hours
- Plant Movement
- Leaving Site Office



Welcome to the Lewis Woolcott Reporting Suite

This suite of complementary reports is provided as part of the SMART Tracking System.

To make the most out of these reports please switch between the various views of data using the tabs below. Data ranges and categories are interactive to allow for target analysis





| | 2,527,395 | 2,123,012 | 1,719,420 |
|-----------------------|-------------------|-------------------|------------------|
| ABC Civil | 1,397,500 | 1,173,900 | 880,500 |
| dozer1 | 156,000 | 131,040 | 91,750 |
| dozer2 | 156,000 | 131,040 | 93,500 |
| dozer3 | 156,000 | 131,040 | 92,000 |
| dozer4 | 156,000 | 131,040 | 98,500 |
| dozer5 | 386,750 | 324,870 | 253,000 |
| dozer6 | 386,750 | 324,870 | 251,750 |
| Dozer Operator | 279,500 | 234,780 | 206,950 |
| dozer_operator_1 | 31,200 | 26,208 | 24,550 |
| dozer_operator_2 | 31,200 | 26,208 | 24,200 |
| dozer_operator_3 | 31,200 | 26,208 | 23,700 |
| dozer_operator_4 | 31,200 | 26,208 | 24,100 |
| dozer_operator_5 | 77,350 | 64,974 | 55,050 |
| dozer_operator_6 | 77,350 | 64,974 | 55,350 |
| Total | 12,647,024 | 10,623,500 | 9,178,822 |



\$324.77K (9.36%)

\$359.4K (10.36%)

\$892.6K (25.74%)

\$455.91K (13.15%)

\$585.78K (16.89%)

\$807.98K (23.3%)

\$3.47M
Opportunity Lost

Productivity Tracker



Weekly Hours Burned



Hours Burned By Zone Report



Plant Movement Report





The Future of SMART

Underground Tracking

Data Integration

Using BOM to understand rain periods and volumes.

Predictive Event Triggers

SMART has identified that productivity could increase by 30% based off current truck wait times, if an additional Excavator was mobilised.

More Sensors

Bucket Movements, Fuel Consumption, Real-time Progress.



THANK YOU

