The years just fly by….A CIP Update.
The years just fly by.....

Coordinated Imagery Program:

First Project: 2004-05
• Four projects
  • Photography:
    » Analog Photography: RC30 - Kodak 2444
      Leica DSW600 (Scanner)
    » Digital: UltraCam D
    » Resolution: 35cm – 50cm
  • Lidar:
    » 1.6 pts/m²
    » Two returns per pulse.
    » No ICSM classification.
Current State

- Up to 40 – 50 projects per year
  - Photography
    - 20cm to 5cm Resolution
    - Digital Only
      » 3 band (True Colour) or False Colour IR
  - Lidar
    - 4 – 16pts m²
    - 8 returns per pulse
    - ICSM Classification
The years just fly by…..

Why Did We Change?

Dec 2004

Dec 2005
Lidar Point Cloud: 2pts/m² vs 16 pts/m²
Lessons Learnt:

- Plan a head
  - Increase number of partners
  - Potential better price

- Better Partner Engagement
  - Early request for EOI’s
  - Contact potential partners

- Clear Statement of requirements
  - Less contract variation

- Acquisition/Processing schedule rarely goes to plan
Lessons Learnt:

• Changing expectations of our partners
  – Faster delivery after capture
  – Online data delivery
  – Part delivery
Lessons Learnt: Specifications

Building Lean:

Ratio: Approx. 1:3
Forward: 100%, Side: 30%

Forward: 60% - 80%, Side: 30% - 40%
Lessons Learnt: Specifications

LiDAR:
• CIP & ICSM Lidar Acquisition Specifications –
  • Enables consistent request for data
  • Greater Understanding by suppliers
  • Contractor Internal procedures
• QA4Lidar
  • Tool developed by Frontier SI supported by CIP.
    • Automatic Checks eg. Scan angles, Naming of tiles, Survey Control
# Lessons Learnt: QA/QC

<table>
<thead>
<tr>
<th>CIP QA Measure</th>
<th>QA/LiDAR Measures</th>
</tr>
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- **Project Scan in**
- **Naming Completeness & Corruption**
- **Attributes & Projection**
- **Classification Statistics**
- **Accuracy of Survey Control**
- **Point Density & DEM Resolution**
- **Flight Line Coverage**
- **Absolute & Relative Vertical Accuracy**
- **Visual Checks (Automated processes)**

<table>
<thead>
<tr>
<th>1. File Format &amp; Naming</th>
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<tr>
<td>2. Tiling</td>
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<td>4. Extent / Coverage</td>
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<td>5. Gaps / Holes / Clouds &amp; Cloud Shadow</td>
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<td>6. Edge Matching and Seamlessness</td>
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| 7. LiDAR | 8.1. Density / Point Spacing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|          | 8.2. Strikes                  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | - |
|          | 8.3. Attributes               | ✓ | ✓ | - | - | - | ✓ | - | - |
|          | 8.4. Classification           | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | - |

| 8. DEM | 9.1. Resolution / Pixel size | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|        | 9.2. Vertical Accuracy        | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

- ✓: Existing Measure met by QA/LiDAR
- ✗: Existing Measure not met by QA/LiDAR
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<td>9.3. Attribute Accuracy</td>
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<td>10.4. Contours</td>
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Where To:

- Aerial Photography:
  - Increase in resolution
    - Rural Capture (eg. Shire Extent).
    - 20cm
  - Technology changes
  - Reduced Costs
  - More captures (Outside standard season)
  - Quicker Delivery (eg. Rapid Provisional Ortho)
Drones/RPAS:

- Increased use
- Multiple sensors and platforms
  - Better sensors
  - Larger Platforms (Out of line of site)
- More products
- Considerations:
  - Products
  - Flexibility
  - Extent/Area
  - Alternatives
Where To:

Services:

• Delivery via services (WMS, WMTS)
• Additional tools
  – Swipe
  – Measure
  – History
• API’s available
Elevation:
- Lidar: Increase Point Density & returns
- Feature Extraction
- Full Waveform
New Sensors eg. Geiger-Mode:
- Photo Diode Array
- High Point Density (200MHz)
- Single Return
- One supplier: Harris Corporation*

Source: Harris Corporation
Better use of the data collected:
Better use of the data collected:
Machine Learning: Vegetation Cover

Source: Felix Lipkin Frontier SI: 2018

Baseline Year April 2011
A baseline year is set from which to measure change

A 100m hexagon grid is overlaid on top of the trees so as to visualise geographically individual tree attributes.

LiDAR integration enables the attribution of tree height and canopy height. Essentially trees become 3D objects.

Source: Felix Lipkin Fontier SI: 2018

Source: Felix Lipkin Frontier SI: 2018

Source: Felix Lipkin Fontier SI: 2018
Photogrammetry: Urban Monitor System ®

“Metropolitan monitoring and analysis of vegetation cover, heat and land use“: Plan Melbourne Action 91”

- Raw Frames (RGBI)
- Digital Frame or Push broom
  - AeroTriangulation
  - Camera Calibration
  - Ground Control Points if required
- Output
  - Radiometrically corrected true orthophotography
  - Vegetation Location & Height
  - DEM & DSM

Source: Interim Report: Urban Vegetation Cover Analysis Northern Region 2018 (unpublished); Clean Air and Urban Landscapes Hub, RMIT University, The University of Western Australia, CSIRO – Data 61
Photogrammetry: Urban Monitor System ®

% Tree Canopy 2014: Mesh Block Level

Source: Interim Report: Urban Vegetation Cover Analysis Northern Region 2018 (unpublished): Clean Air and Urban Landscapes Hub, RMIT University, The University of Western Australia, CSIRO – Data 61
Photogrammetry: Urban Monitor System ®

Vegetation Information: 2014: Mesh Block Level

Source: Interim Report: Urban Vegetation Cover Analysis Northern Region 2018 (unpublished); Clean Air and Urban Landscapes Hub, RMIT University, The University of Western Australia, CSIRO – Data 61
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