Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Aerial Image Acquisition and Processing Services

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Outline

- Applications & Benefits

- Image Sources

- Aircraft Platforms

- Image Products

- Sample Images & Comparisons

- Additional Sensor Types

Aerial Imagery & Remote Sensing Applications

- Remediation & Reclamation
  - Detailed site assessments
  - Screening studies

- Routing Studies
  - Pipelines, roads, power transmission

- Construction Monitoring
  - Permanent image record before, during, and after construction

- Hydrotechnical & Hydrology
  - River crossings, restoration
  - Drainage basins

- Vegetation Studies

- Wildlife Studies

- Volume Calculations
  - Stockpiles, cut & fill

- Spill Response
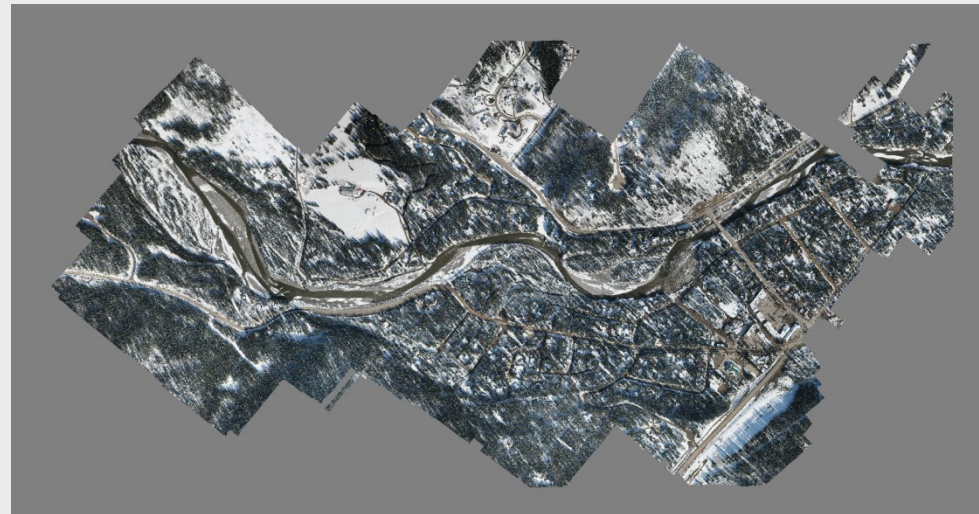
Key Project Benefits

- Engage stakeholders

- Effectively communicate

- See changes on a larger scale over time

- Our approach: Better, faster, cheaper
  - High resolution
  - High availability
  - Cost effective

Aerial Image Sources

- Google Earth

- Unmanned Aerial Vehicles

- Camera Pods

- Satellite Image Providers

- Stock Aerial Image Providers

- Custom Aerial Image Services

- Satellite Tasking

Aircraft Platforms

- Unmanned Aerial Vehicles

- Helicopters

- Fixed-Wing Aircraft

Unmanned Aerial Vehicles

- Special Flight Operations Certificate (SFOC) required
  - Mandatory for commercial operations
  - Issued by Transport Canada (TC)
  - Site-specific or blanket certificates
  - Long lead times (months)
  - **Matrix has a blanket SFOC for the prairie provinces**
- Deployable by qualified field staff
  - Pilot & spotter required
- Line of sight requirement
- Altitude < 500' AGL
- Weather considerations
  - Low ceilings not a problem
  - Wind may sometimes be a problem
- Rapid response capability
  - With SFOC and trained staff
- Mission types
  - Areas typically less than 2 hectares
  - Industrial sites
  - Spill sites

Helicopters

- SFOC not required
- Timely response capability?
  - Depends on availability of a camera equipped helicopter
- Low and slow capability
  - Typically not needed
- Expensive
  - Cost ranges from $1800 to $2500 per flight hour
  - $2500 to $3000 per day for camera and operator

Fixed-Wing Aircraft

- SFOC not required
- Rapid response capability
  - Certified & portable camera pod
  - No aircraft modifications required
  - High availability of aircraft & pilots
- Cruise speeds of 80 to 130 knots
  - 140 to 240 km/hour
- Altitude 2000' AGL or higher
- Camera pod payload up to 60 pounds
- Long flight times
  - 4 to 4.5 hours max, 3 hours typical
- Land access not required
  - No prior permission, no permitting, no site-specific safety training
- Cost effective
  - Lowest cost per unit coverage area

- Mission types
  - Large areas
    - Greater than 2 hectares
    - Leases
    - Industrial sites
    - Spill sites
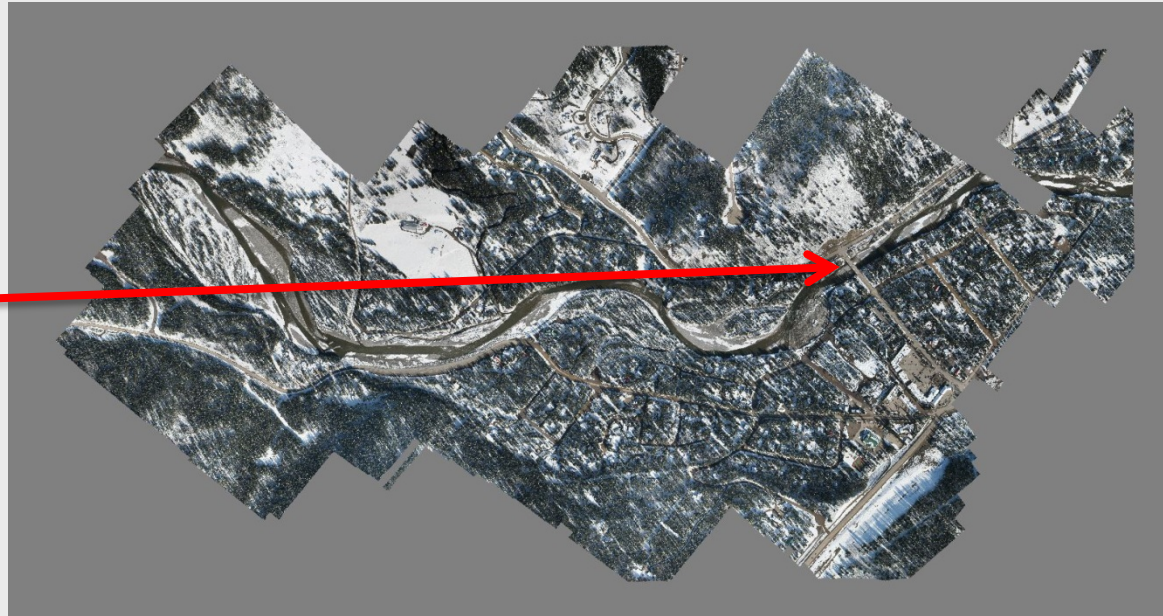 - Linear or long features
    - Pipelines
    - Rivers

High Spatial Resolution

- Bragg Creek, Alberta, May 7, 2014
- Canon Rebel XSi, 12.1 MP, Zeiss 35 mm f/2.0, 2500 ft AGL
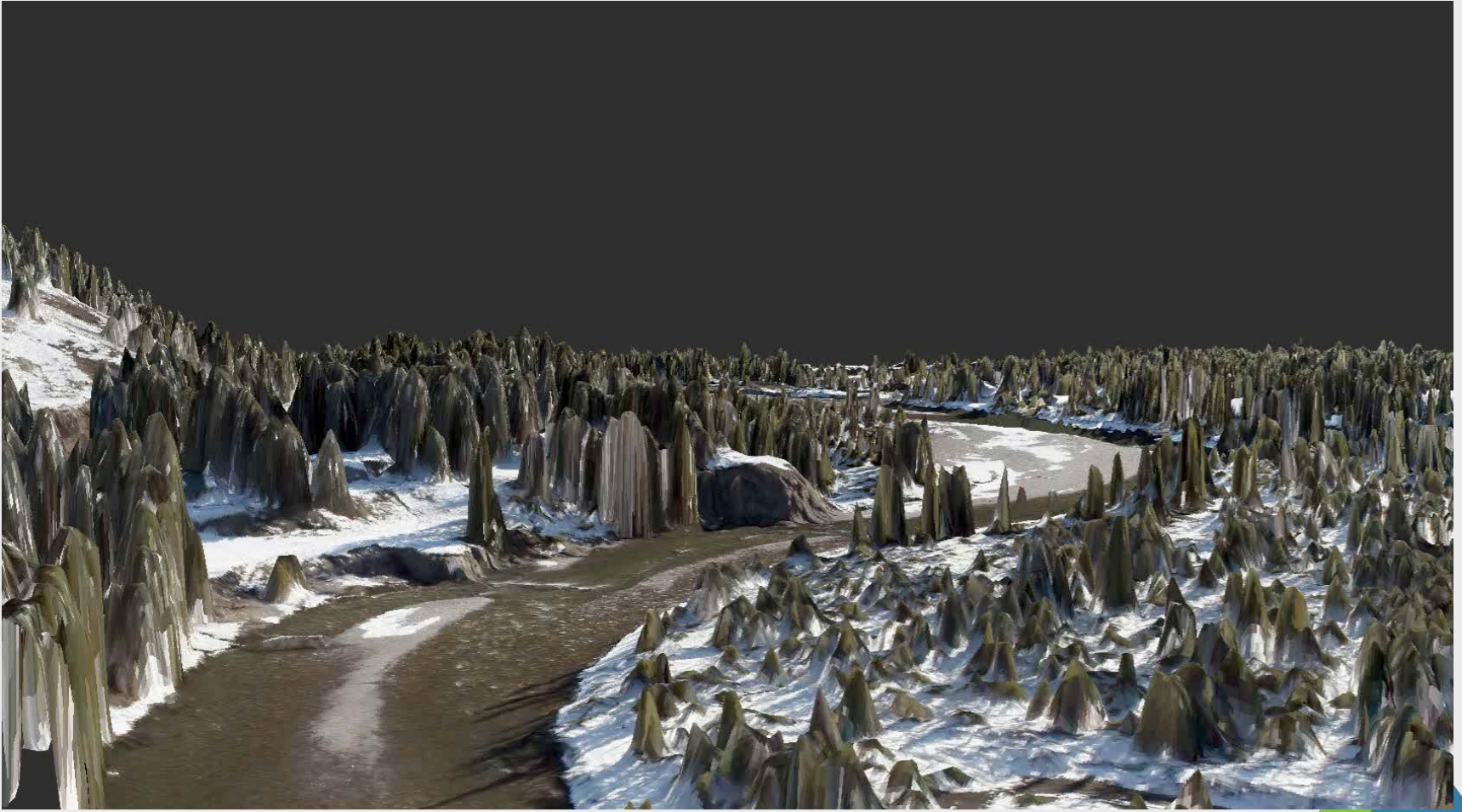- 11.3 cm resolution

Orthorectified Photo Mosaic

- Bragg Creek, Alberta, May 7, 2014
- Canon Rebel XSi, 12.1 MP, Zeiss 35 mm f/2.0, 2500 ft AGL
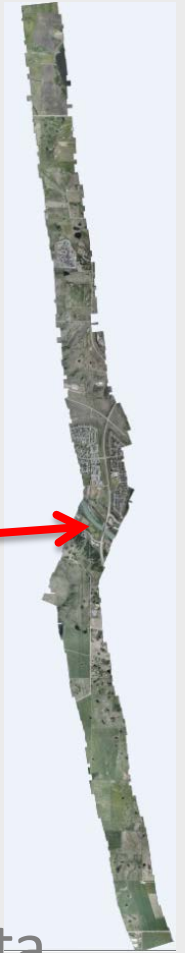- 11.3 cm resolution

Bragg Creek Digital Surface Model Video 1

Bragg Creek Digital Surface Model Video 2

Foothills Pipeline

- Foothills Pipeline Bow River Crossing at Cochrane, Alberta, June 10, 2014
- Canon Rebel XSi, 12.1 MP, Zeiss 35 mm f/2.0, 3500 ft AGL
- 15.8 cm resolution

Foothills Pipeline Right-of-Way Digital Surface Model

- Foothills Pipeline near Bragg Creek, Alberta, June 10, 2014

- Canon Rebel XSi, 12.1 MP, Zeiss 35 mm f/2.0, 3500 ft AGL

- 15.8 cm resolution

Wellsite Image Comparison

← Matrix

Google →

Image Detail Comparison

↑Matrix   ↓Google

Image Detail Comparison
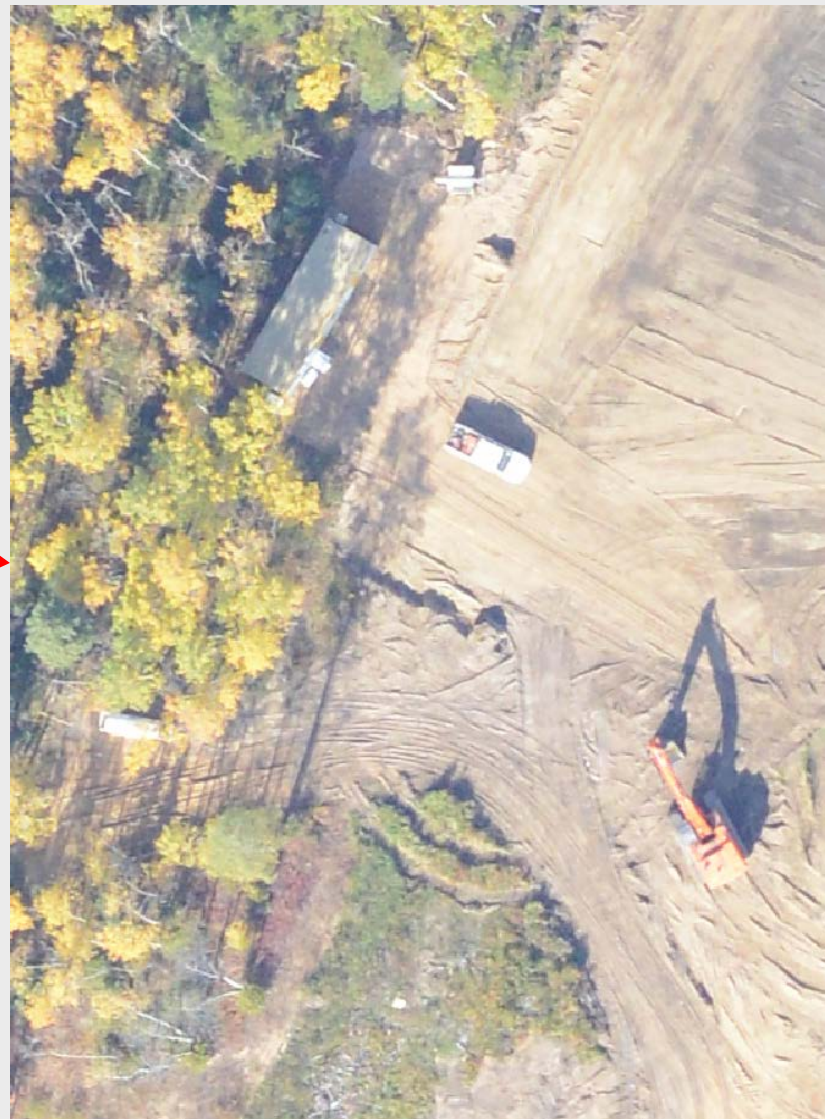
- Google Maps

Image Detail Comparison

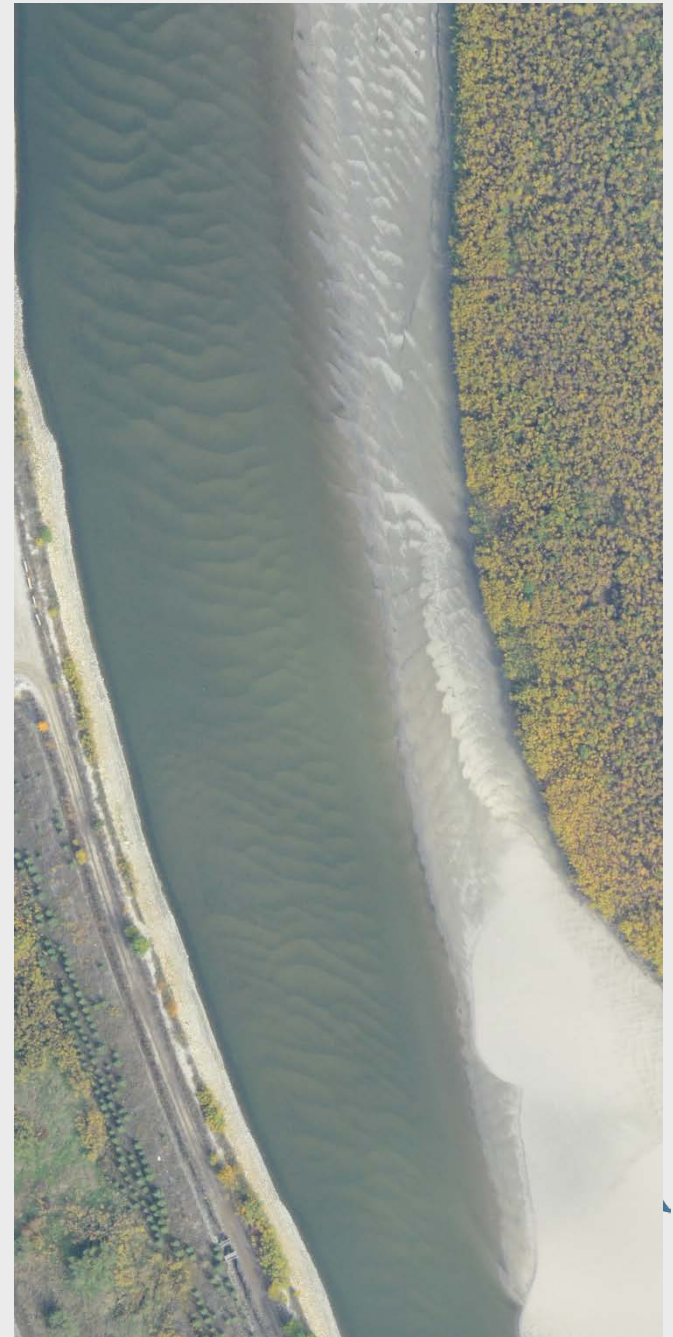- Matrix – 36 MP camera, 3500' AGL, 10.4 cm pixel resolution
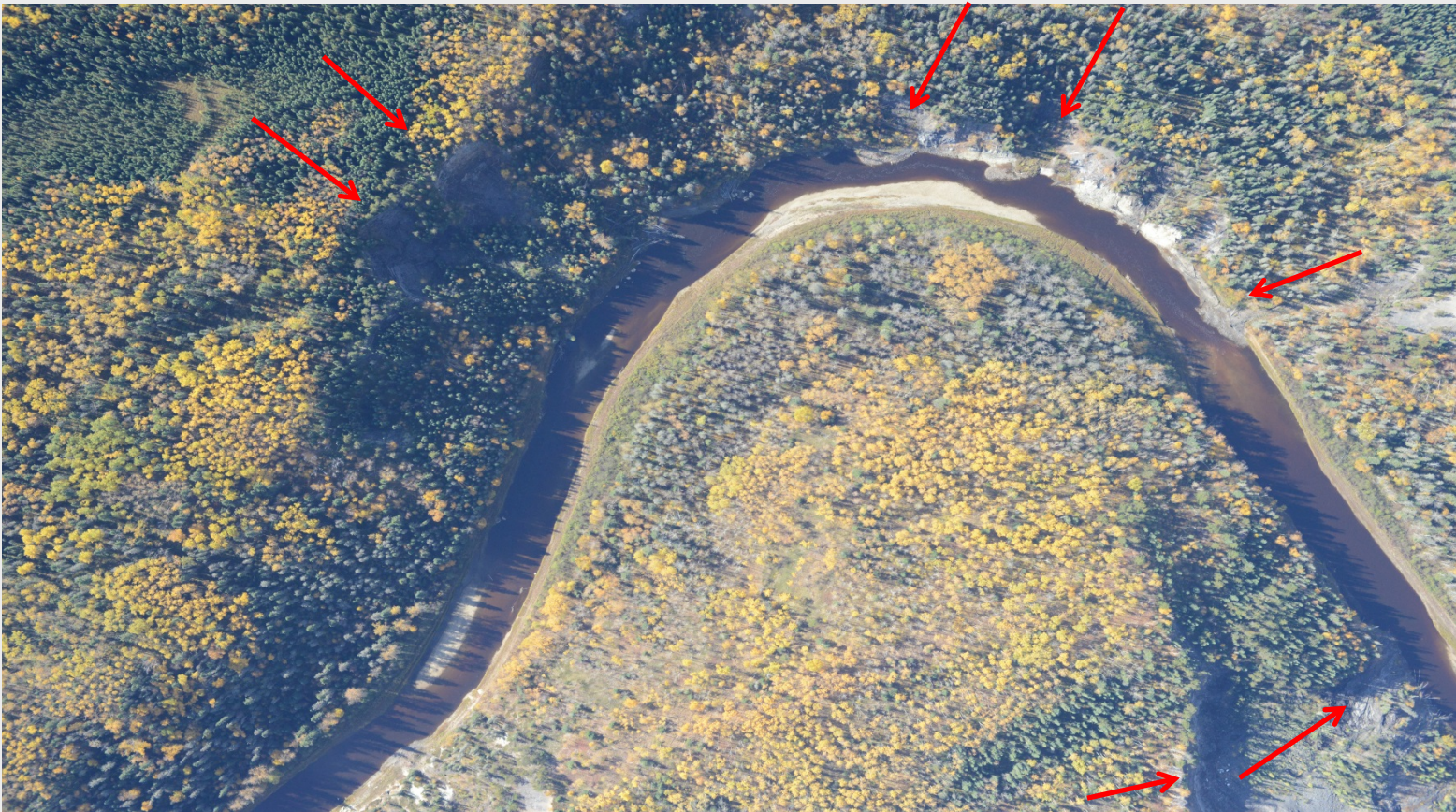
Image Detail - Matrix

Athabasca River, Alberta

- River bottom ripples & sand bars imaged
- Channel deepest on west bank
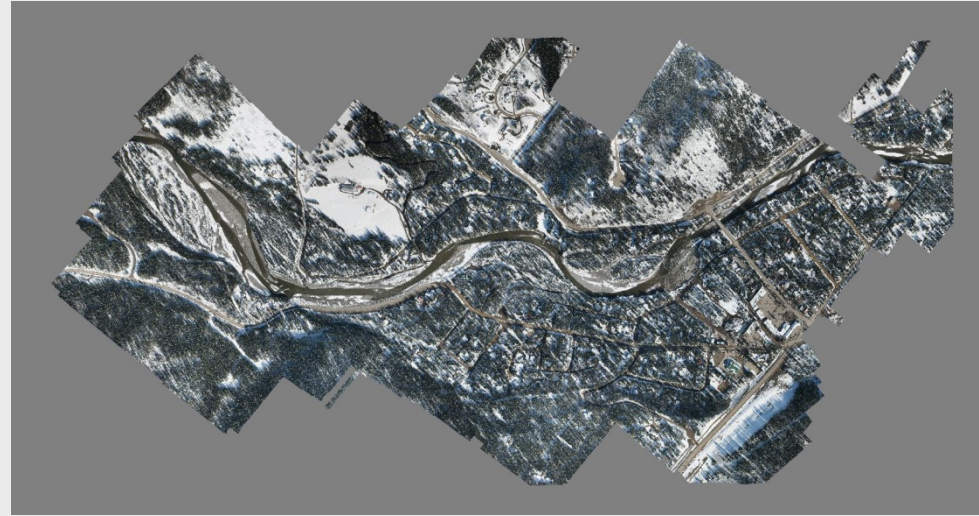- 36 MP camera, 3500' AGL, 10.4 cm pixel resolution

Mackay River, Alberta

- Slope failures and slumps into river
- 36 MP camera, 3500' AGL, 10.4 cm pixel resolution
- 3D image processing pending

Visible Light Image Products

- Photo mosaics
  - Orthorectified
  - Georeferenced

- Photogrammetry products
  - Digital surface models
  - Stockpile quantities
  - Cut and fill volumes

Additional Sensor Types

- Near Infrared
  - Vegetation health
    - Normalized difference vegetation index (NDVI)

- Thermal Infrared
  - Fish habitat - Stream temperature refugia
  - Groundwater & surface water interaction
    - Groundwater discharge areas
  - Wildlife studies

- Multispectral
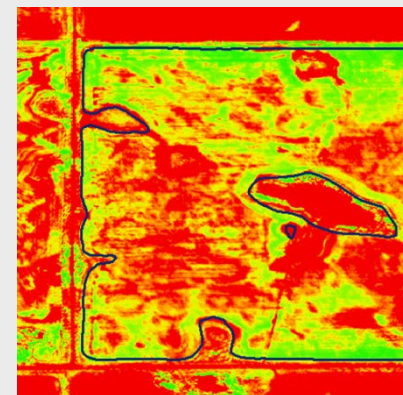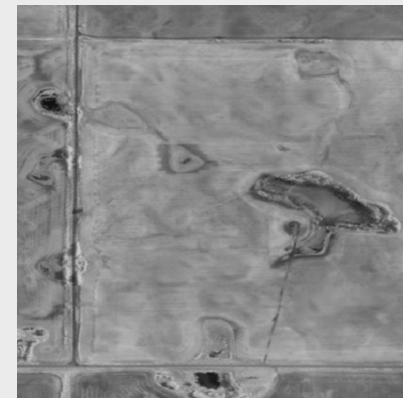
Advantages of Matrix Imaging Services

- Short lead times & rapid response
- Better integration between project disciplines
  - Flight planning & image acquisition
  - GIS image processing
  - Multidisciplinary subject matter experts
- First-hand knowledge of imaging capabilities & limitations
  - Currently developing additional remote sensing capabilities
- One-stop shop
  - Acquire, process, classify, interpret, report
- Cost & schedule effectiveness
  - Fly high-resolution imagery, complete desktop study, follow-up site visits if and where necessary
- All of the above deliver value

Thanks

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Aerial Image Acquisition and Processing Services

Matrix Solutions has developed an innovative approach for acquiring high-resolution georeferenced imagery in a timely and cost effective manner for our clients utilizing either high-availability fixed-wing aircraft or unmanned aerial vehicles (UAVs). Our UAV system is utilized to acquire still imagery or high definition video for small areas (<2ha). Alternatively, our fixed-wing platform is best suited for acquiring imagery over large or inhabited areas (>2ha), long features (>1km) such as utility rights-of-way or rivers, and near infrared (NIR) or multi-spectral imaging. Visible light imagery is obtained at a ground sampling distance (pixel resolution) as low as 10 cm. This presentation will provide information regarding Matrix's aerial image acquisition and processing services and how they might benefit your next project.