9th International Conference on MANAGING PAVEMENT ASSETS (ICMPA9)

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ICMPA9 • International Conference on Managing Pavement Assets

Innovative Approach to Airfield Pavement Inspections and Distress Identification at OAK

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AASHTO THE VOICE OF TRANSPORTATION

VirginiaTech Transportation Institute

TRB

U.S. Department of Transportation Federal Highway Administration

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VDOT Virginia Department of Transportation

PORT OF OAKLAND

AECOM

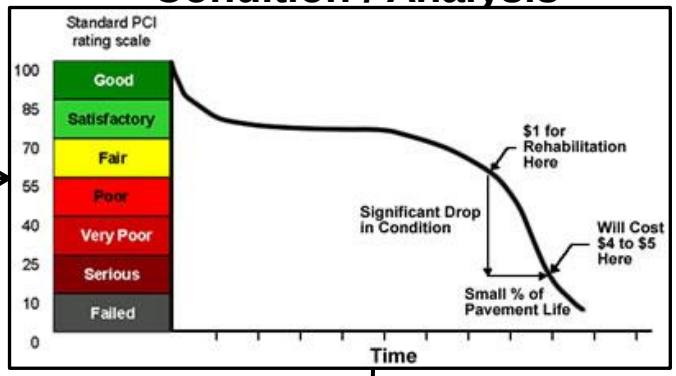
Overview

- **APMS Evolution**
- **Challenges**
- **Case Study (Oakland) and Innovations**
- **Benefits and Next Steps**

Pavement Management Concept

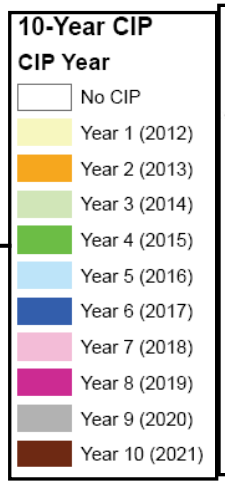
Data Collection

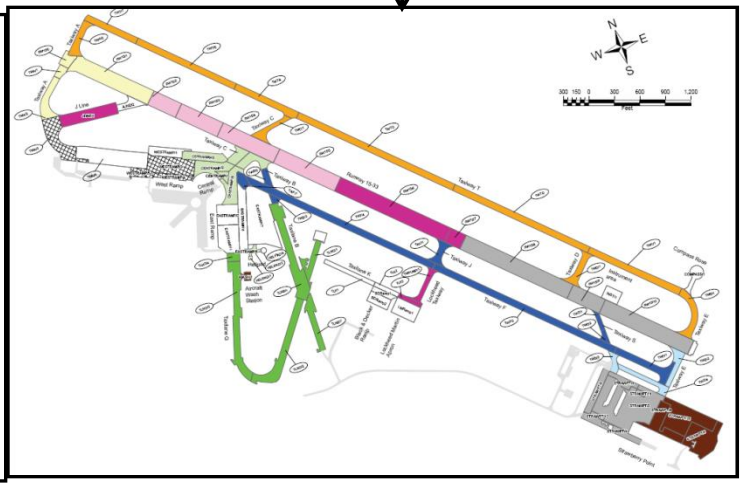
Condition / Analysis



Philosophies/Strategies

Define Inventory





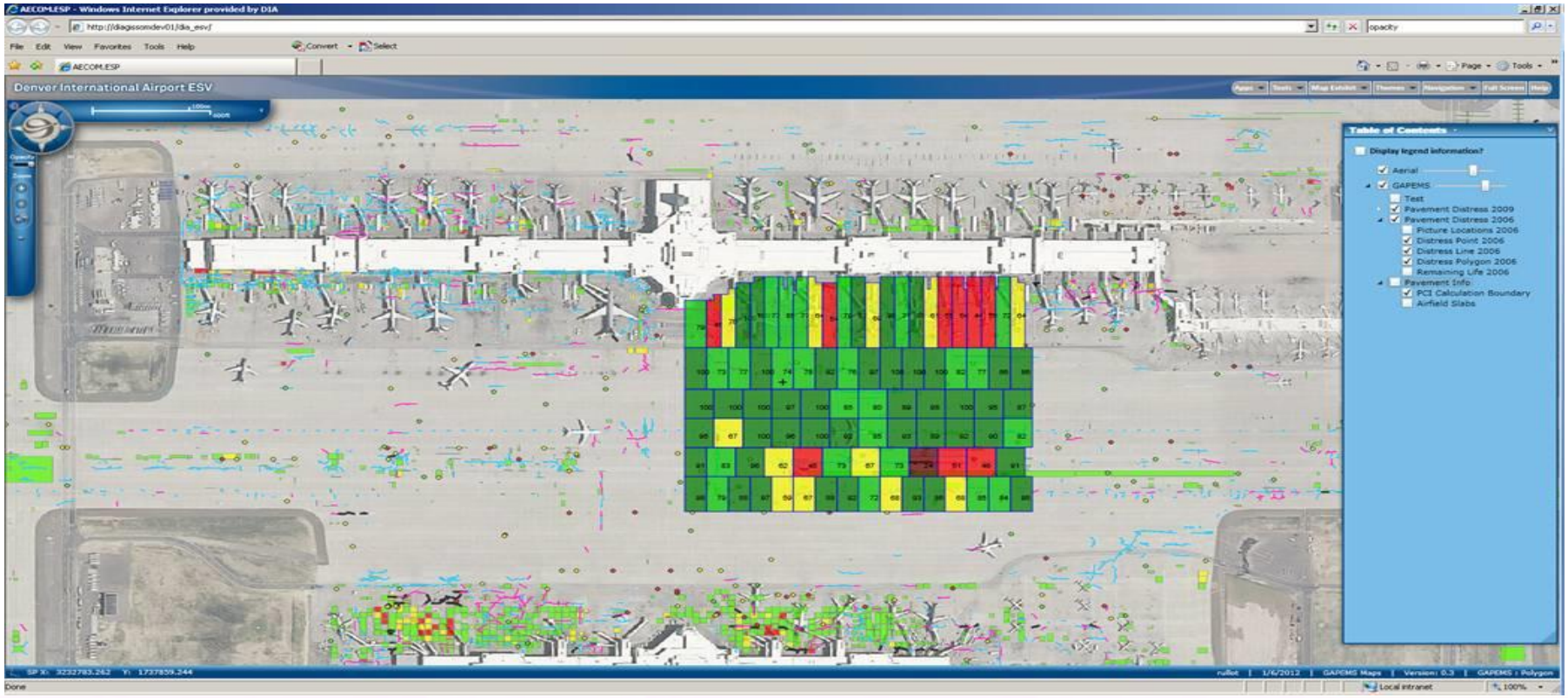
Rehabilitation Needs ($) and Timing

Airport Pavement Management

- Airport Changes:
  - Reduced airport staff available for escorts
  - Shifting escort ‘burden’ to consultants
  - Reduced available time on airfield pavement
- Can we get a bigger return on investment for time spent in field?

Airport Pavement Management

- Service Provider Changes: change in philosophy



Evolution of APMS Data Collection

Statistical based sampling: Manual with paper

Statistical based sampling: Manual with handheld / GPS

Statistical based sampling: Video with manual processing

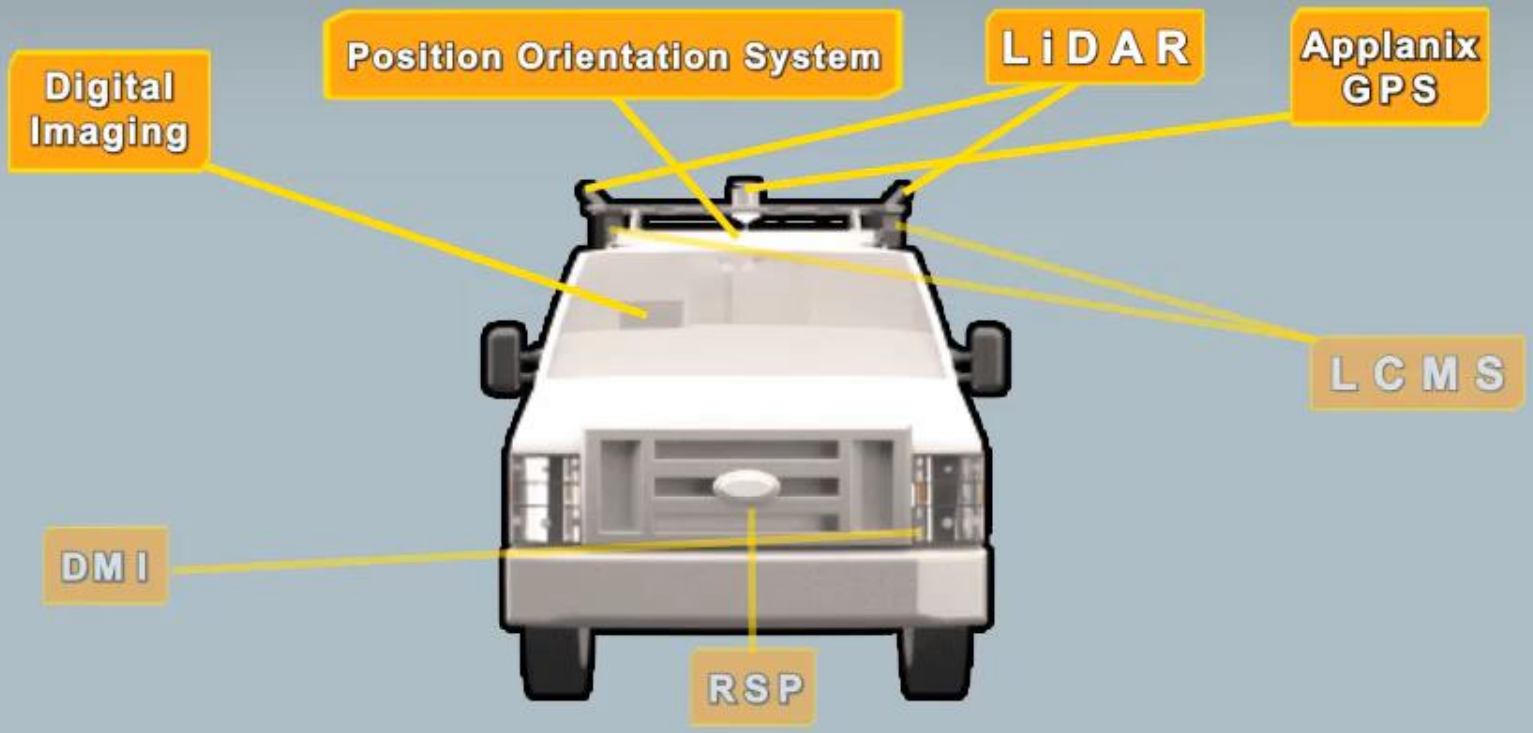
Map Cracking and PCI: Manual with GPS (GAPEMS)

Map Cracking and PCI: 3D Imaging / GPS with semi-automated processing

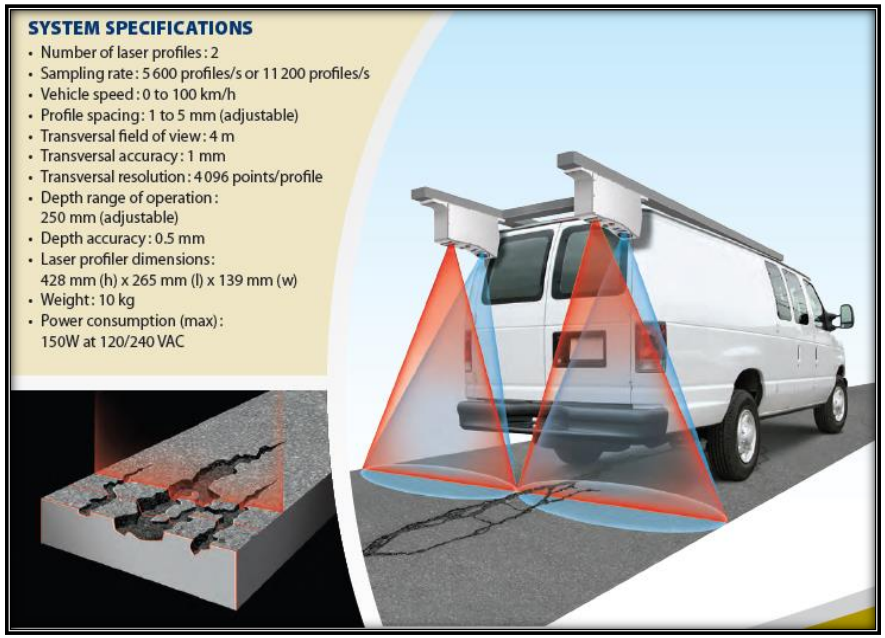
Equipment

- **3D Imagery**

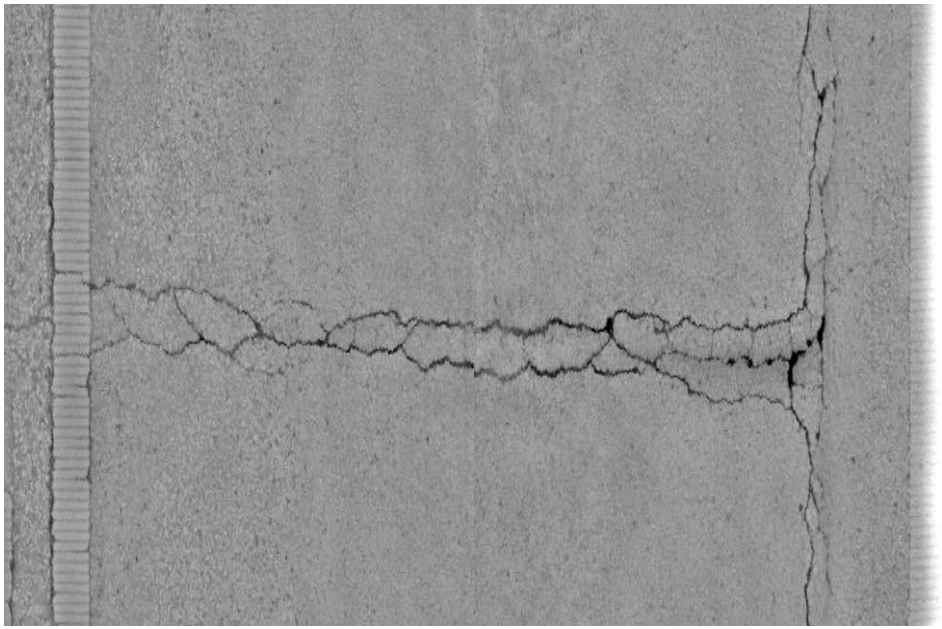
> PCI to meet FAA
> Level of processing - prioritize to your needs
> 100% mapping



Technology – 3D Imagery



High Definition 3D Imagery



Challenges

- Fitting a roadway solution to an airfield (Context)
- Not cost competitive with traditional approach (Automation)

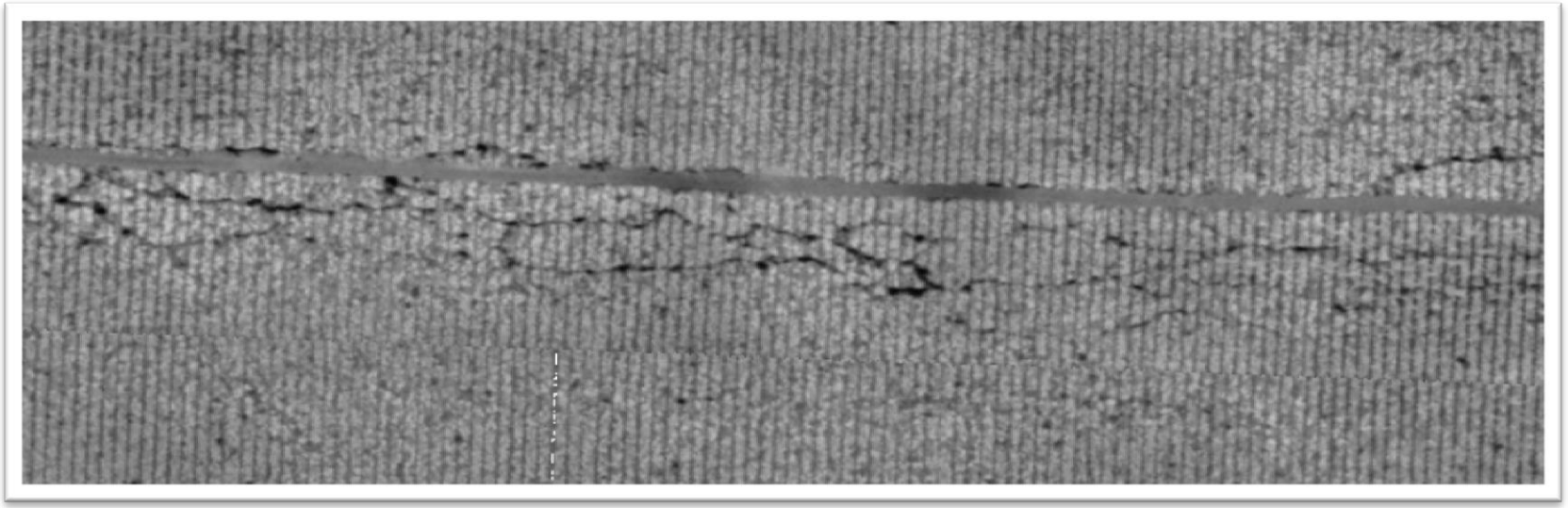
Context

Runway
(12-16 passes)

Roadway
(1 pass per lane)

Automation

- ASTM D5340
- Different than typical roadway / State Highway requirements



Oakland – Case Study

- 10 million passengers/year
- 556,000 tons Cargo
- RW12-30= 10,000ft
- Asphalt
- **1 weekly closure Monday 1:30am-6:00am**

INNOVATIONS

High-Speed Data Collection

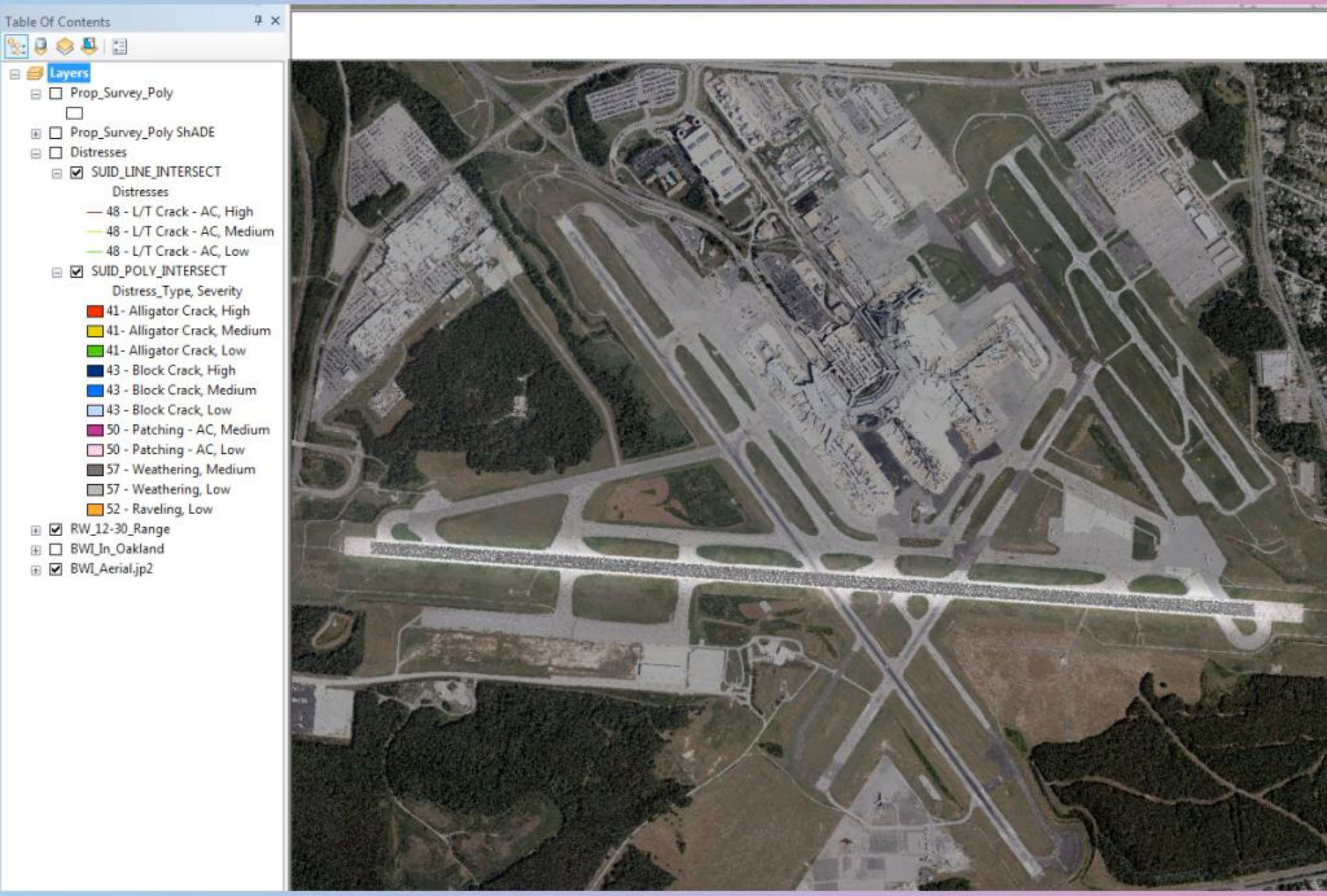
Method	Yield	Time in field	Resources
Walking	25% Sample	12 hours**	2 walking 1 escort 1 other vehicle towing light plant
Video	100%	2 hours	1 escort 2 in van

** At Oakland, this is 3 separate Monday closures

Video – Less Time, Higher Yield

Context

- ArcGIS Integration
- Viewing images as ‘aerial’ with ability to zoom to see individual image from 3D vehicle
- Portable to the client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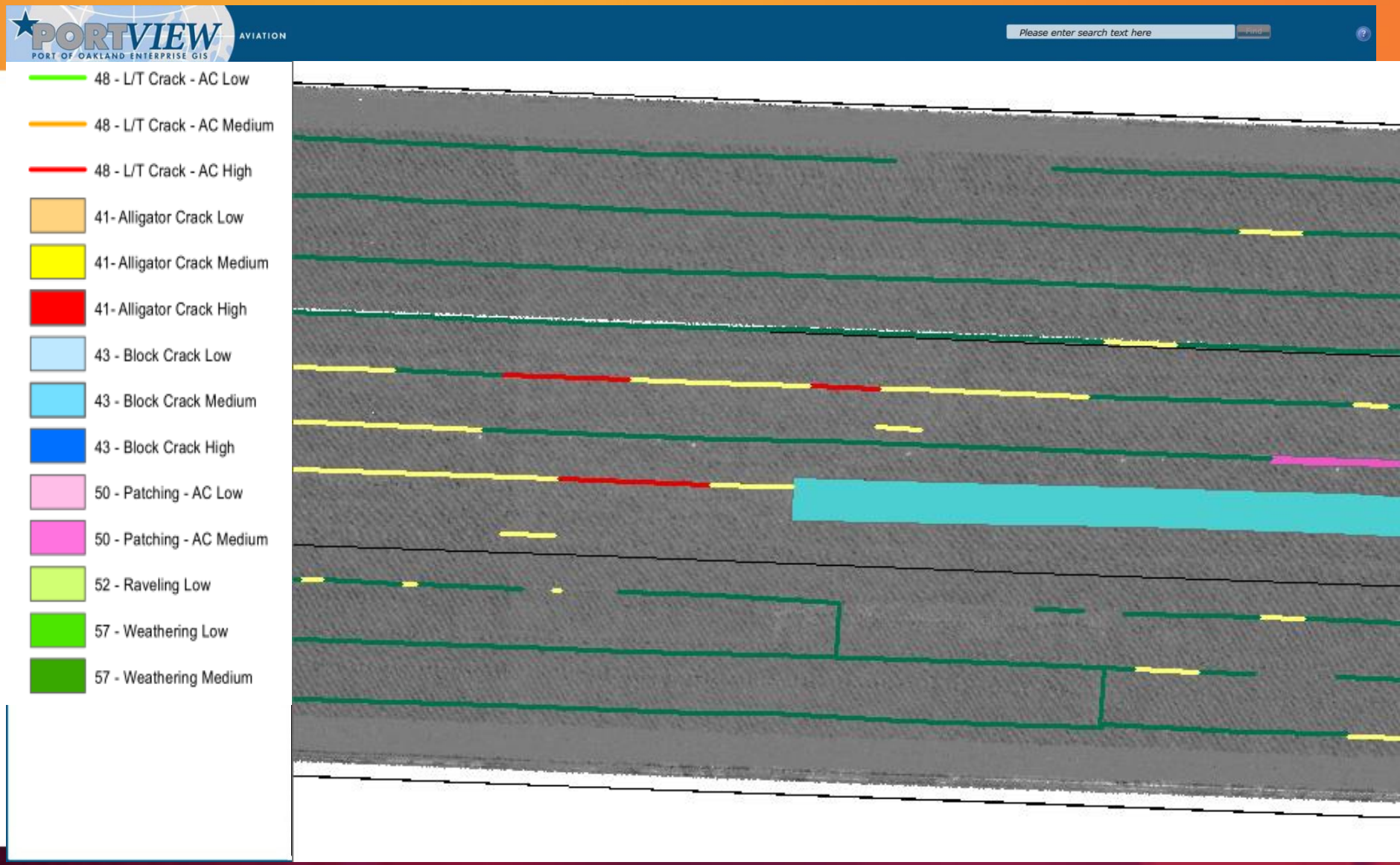
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Automation

- Not for all airports…

Method	Field Cost	Post-Processing	Operational Impact	Total Time
Walking	12 hours x 3 people	negligible	high	36 person-hours
Video	2 hours x 2 people -Mob/demob -Equipment Fee	Image processing Distress / PCI (100% compared to 20% sample)	negligible	60 person-hours plus video related costs

- Why automate? Video cost can be 2x more in dollars

Automation

- Test cases –
  - Manual review to develop the baseline distress
  - Models developed and applied

Automation

Distress	Runway 12-30		Runway 15-33	
	Pass 1	Pass 2	Pass 1	Pass 2
Linear / Transverse Cracking	291	260	121	43
Patching	111	39	80	81
Alligator Cracking	6	16	11	12
Weathering	1	5	0	0
Block Cracking	0	0	18	29
Total Distress Samples	409	320	230	165
Total Images	396	396	127	127

Distress	Model AUC
Linear / Transverse Cracking	0.96
Patching	0.91
Alligator Cracking	0.67
Weathering	0.97
Block Cracking	0.78

Benefits to OAK

- Minimum disruptions to Airport Operations
- 100% coverage - PCI + Maintenance Plan (Enhanced APMS)
- Improved geospatial accuracy of distress – used by Port Ops and Maintenance (Work order management integration)
- Images of condition in 2015
- Data accessibility to the Port

Going Forward

- Efficiency Improvement
  - Improving coverage in data collection (driving paths, laser span)
  - Image stitching of non-linear features (already improved at San Bernardino on Aprons)
  - Automation of airfield distresses
- Cost Reduction

Application