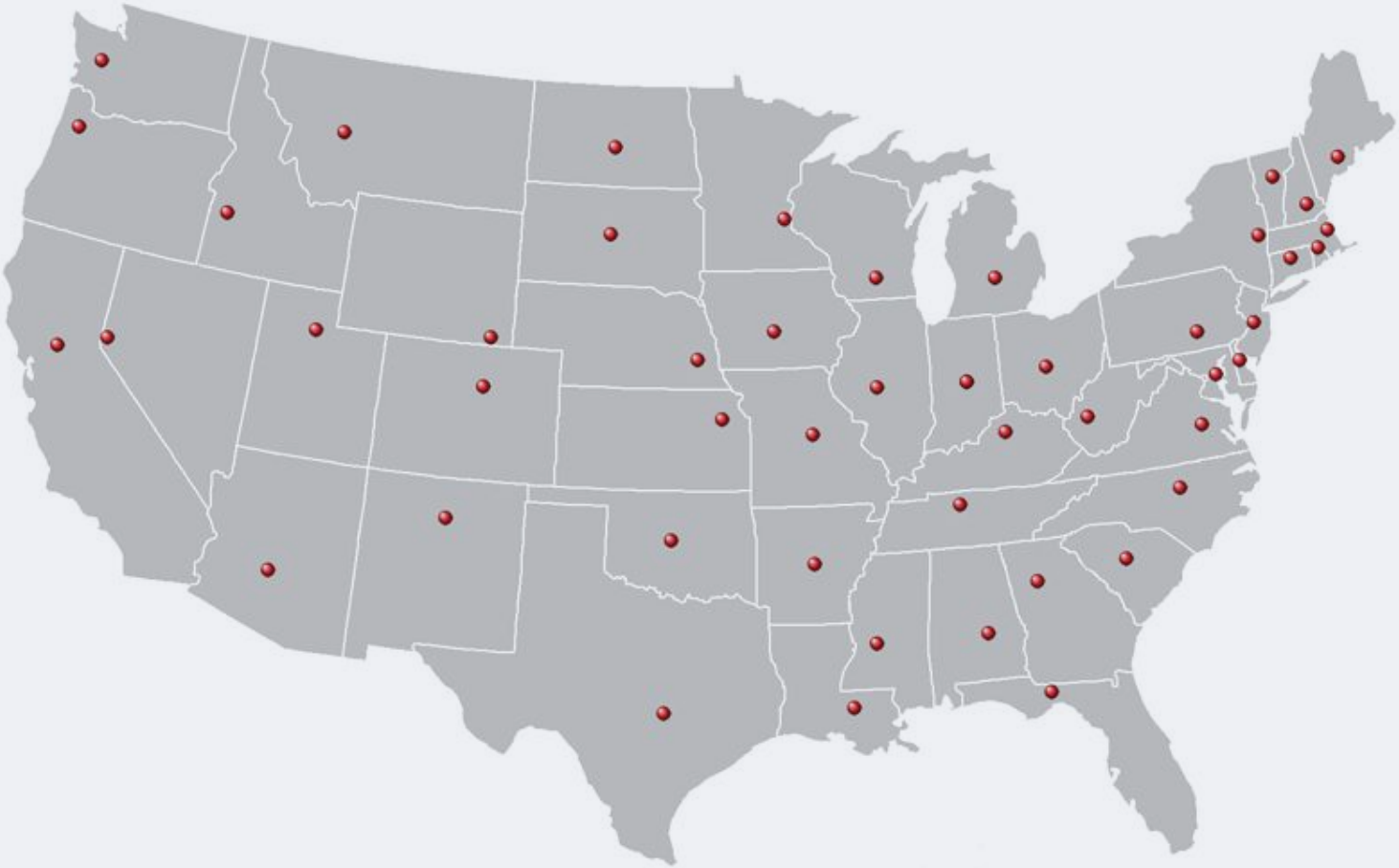
INTELLIGENT INFRASTRUCTURE MANAGEMENT

EMBA 26
CAPSTONE PROJECT

WEST
INTERSTATE
64
Norfolk

E Street
ALL TRUCKS
EXIT ONLY
66
WEST

HELLO
my name is
Taxpayer



CONTRACT
and
and shall continu

OUR SOLUTION: INTELLIGENT INFRASTRUCTURE MANAGEMENT

BIG EAST TOURNAMENT CHAMPIONS

OUR TEAM

MELBA AMISSI

BRANDON KELLEY

MARY KERTZ JONES

MATT NICOLETTA

SEAN REED

MO SHAWKY

MICHAEL WEBER

social media
TEAMWORK
30%

AGENDA

01 PROJECT OVERVIEW & HYPOTHESIS

02 WHAT IS ROAD ASSET MANAGEMENT?

03 ASSET MANAGEMENT CONTRACTS & COMPLIANCE

04 OUR DATA-DRIVEN SOLUTION TO ROAD ASSET MANAGEMENT

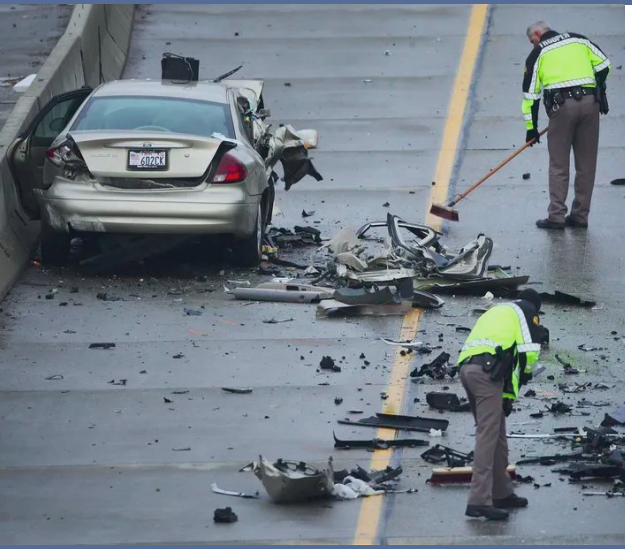
05 COMMERCIALIZING OUR PRODUCT & GO-TO-MARKET STRATEGY

06 KEY INSIGHTS & TAKEAWAYS

PROJECT HYPOTHESIS STATEMENT

The use of publicly or privately available data can help reduce financial and reputational risks for highway asset management companies through improved contract pricing in projects which are impacted by external factors.

THE THREE TYPES OF ROAD ASSET MAINTENANCE



EMERGENCY MAINTENANCE

REACTIVE MAINTENANCE

PREDICTIVE MAINTENANCE

OUTSOURCING HIGHWAY MAINTENANCE

OUTSOURCING HIGHWAY MAINTENANCE RESPONSIBILITIES HAS PROVEN TO BE COST-EFFECTIVE FOR MANY STATES.

TYPES OF OUTSOURCING CONTRACTS

INDIVIDUAL STAFF HOUR

Contract for specialized activities that are paid for on an hourly basis

UNIT/CYCLE

Specific, identified maintenance activities on a prescriptive basis

STAFF AUGMENTATION

In-house forces at state use crews provided by contractors paid at fixed rates

PERFORMANCE-BASED

Continuous routine and preventative maintenance activities based on defined performance targets

WHAT ARE PERFORMANCE-BASED CONTRACTS?

Longer-term contracts

Can result in large cost savings due to larger, more efficient grouping of work

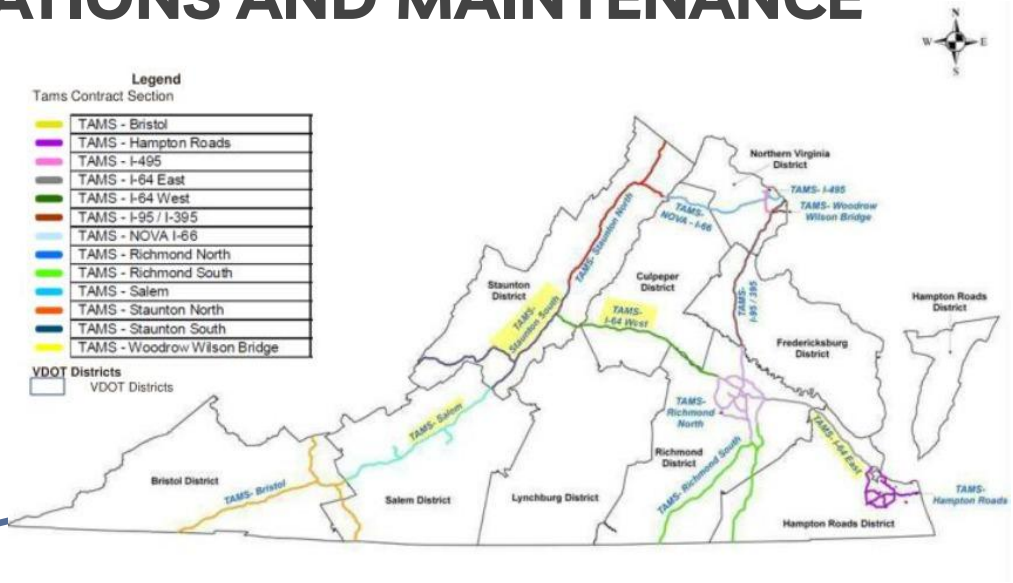
Assures the highway management company has a stake in the game and will act more like an owner

Transfers risk from government agency to contractor

IF PERFORMANCE STANDARDS ARE NOT MET, CONTRACTORS FACE FINANCIAL PENALTIES.

TRANSFERING RISK

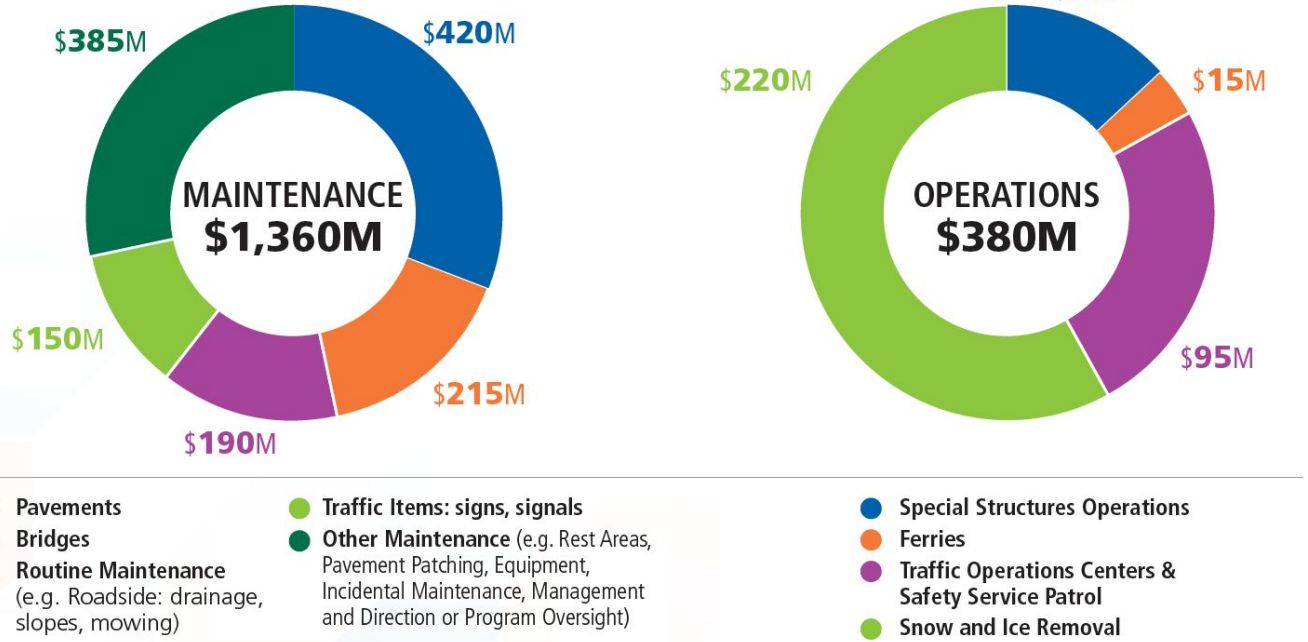
VDOT: MAJOR USER OF PERFORMANCE-BASED CONTRACTS FOR OPERATIONS AND MAINTENANCE



Virginia's Turnkey Asset Management Services (TAMS)

VDOT SPENDS ABOUT $1.7 BILLION PER YEAR ON MAINTENANCE AND OPERATIONS

BASED ON AVERAGE SPENDING FY 2015 – FY 2018



Source: VDOT Maintenance and Operations Comprehensive Review 2019

VDOT PERFORMANCE-BASED CONTRACTS

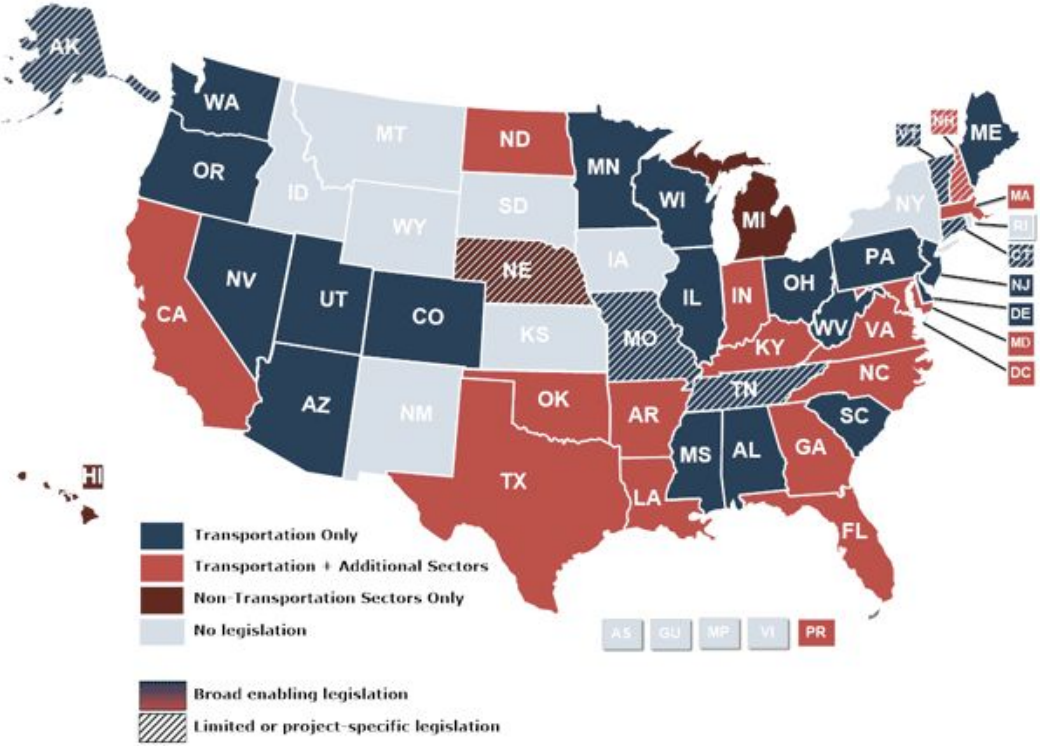
Industry Managed TAMS Contract Segments				
TAMS Contract	**Mileage**	**Routes**	**Term (years)**	**Renewals**
TAMS I-64 East	67 CL miles/ 357 lane miles	I-64	5	2/2
TAMS StauntonSouth	120 CL miles/503 lane miles	I-81, I-64	5	2/2
TAMS I-64 West	88 CL miles/374 lane miles	I-64	5	2/2
TAMS RichmondSouth	138 CL miles/621 lane miles	I-85, I-95, I-295	5	2/2
TAMS NOVA I-95 / I-395	113 CL miles/651 lane miles	I-95, I-395	5	2/2
TAMS NOVA I-66	66 CL miles/ 392 lane miles	I-66, SR-267	5	2/2
TAMS NOVA I-495	18 CL miles/211 lane miles	I-495	5	2/2
TAMS NOVA Woodrow Wilson Bridge (WWB)	**10 CL miles/103 lane miles**	**I-95**	**5**	**2/2**

VDOT Managed Contract Segments				
District	**Mileage**	**Routes**	**Term (years)**	**Renewals**
Salem	109 CL miles/ 460 lane miles	I-81, I-581, SR460, SR220	5	2/2
Bristol	149 CL miles/670 lane miles	I-81, I-77, I-381	5	2/2
Richmond North	170 CL miles/1102 lane miles	I-95, I-295, I-64, I-195, *	5	2/2
Hampton Roads	109 CL miles/691 lane miles	I-64, I-264, I-464, *	5	2/2
Staunton North	101 CL miles/428 lane miles	I-81, I-66	5	2/2

Source: VDOT TAMS Contract Overview Report

P3 PROJECTS IN THE U.S.

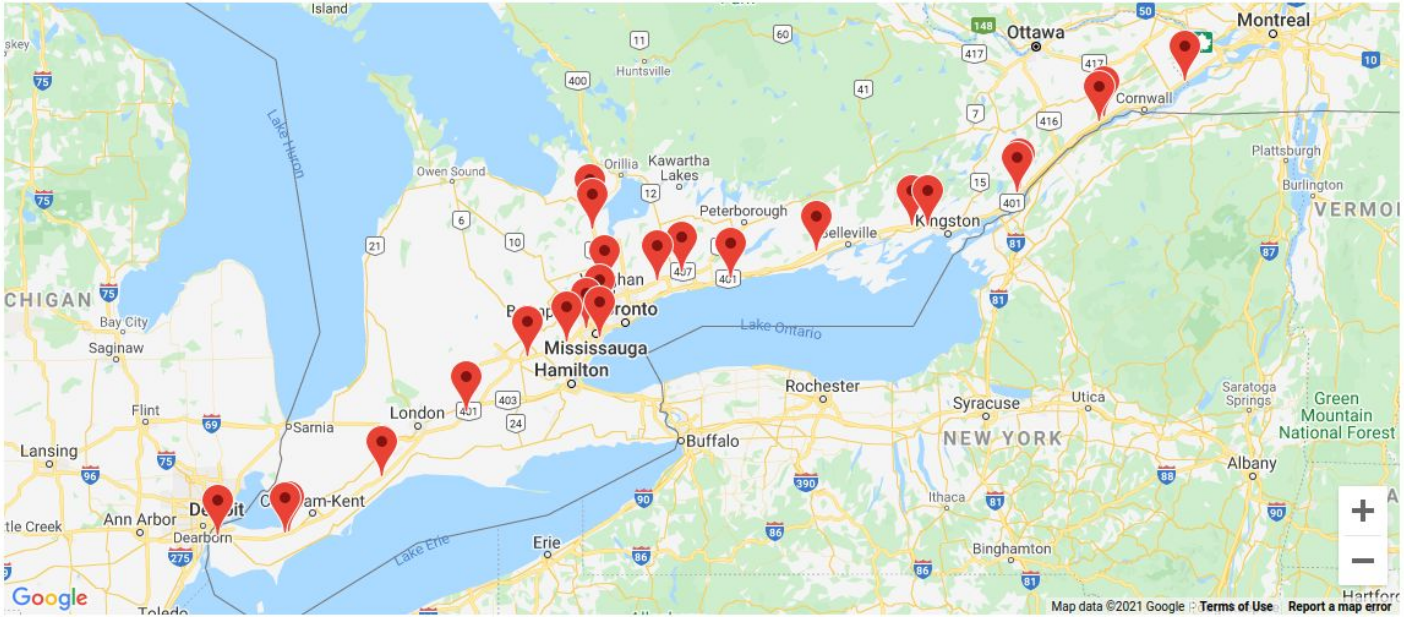
THE P3 MODEL IS GAINING RAPID ADOPTION IN THE TRANSPORTATION SECTOR



Source: National Conference of State Legislatures P3 State Legislative Update, 2016-2018

INFRASTRUCTURE ONTARIO'S P3 PROJECTS

27 currently active projects ranging from $300 million (CAD) in contract value to over $1.2 billion (CAD).

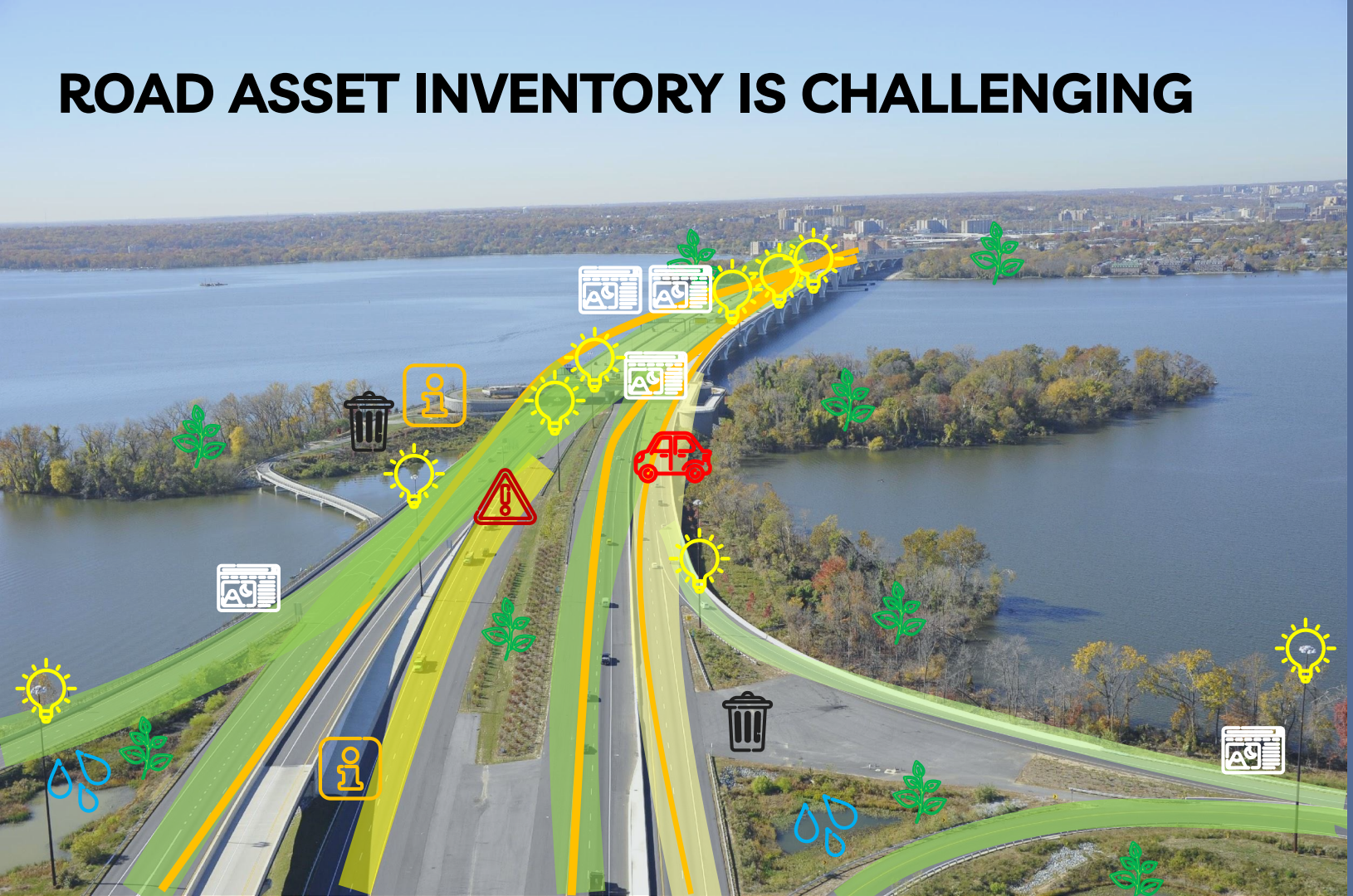


Source: https://www.infrastructureontario.ca/projects

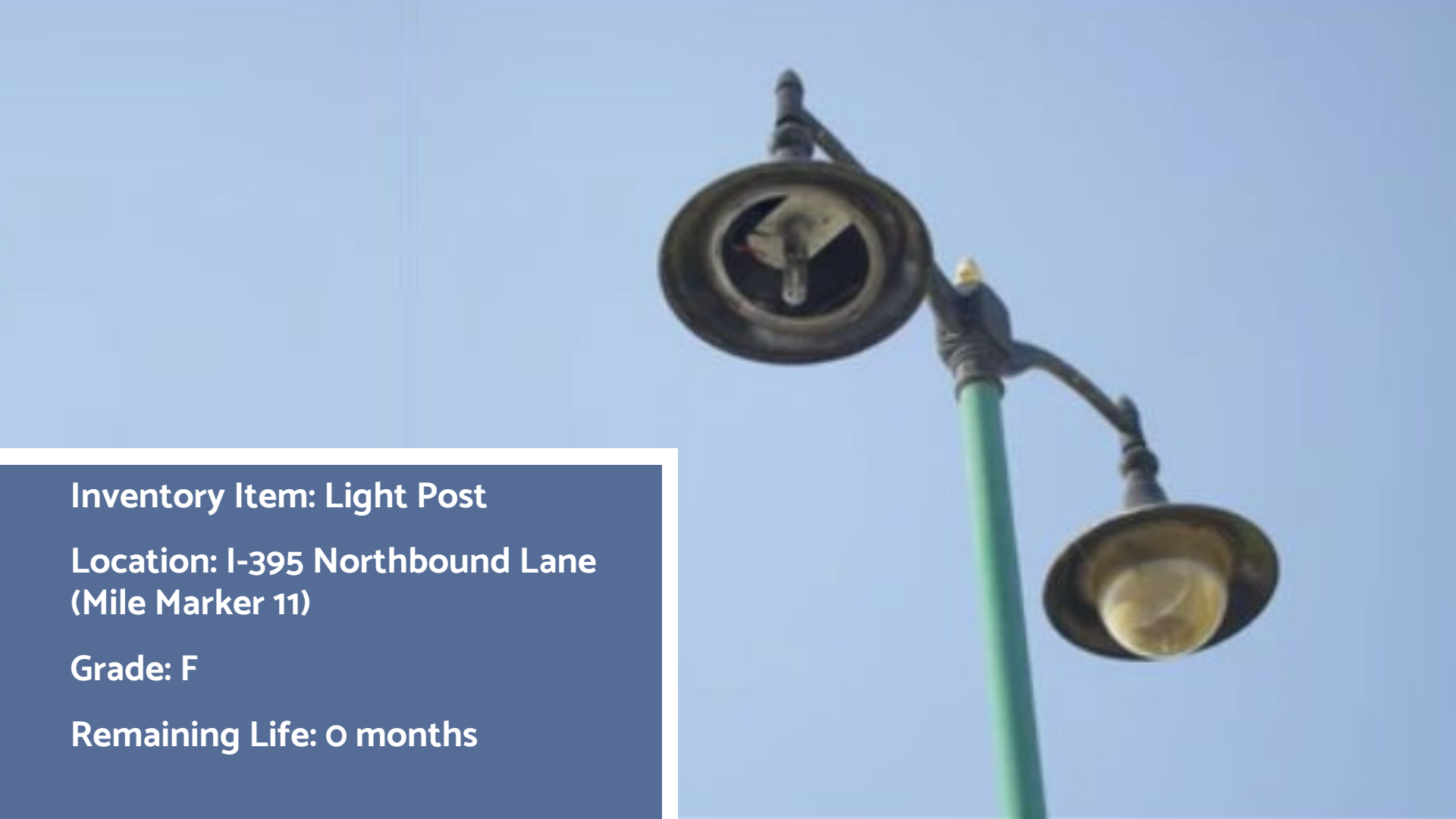
INTERNATIONAL OPPORTUNITIES

ROAD ASSET MANAGEMENT FIRMS
RELY HEAVILY ON INDIVIDUAL EXPERTISE

ROAD ASSET INVENTORY IS CHALLENGING



WOODROW WILSON BRIDGE



Inventory Item: Light Post

Location: I-395 Northbound Lane (Mile Marker 11)

Grade: F

Remaining Life: 0 months

Inventory Item: Guardrail

Location: I-95 Southbound Lane (Mile Marker 56)

Grade: F

Remaining Life: 0 months

Inventory Item: Pavement Striping

Location: I-395 Northbound Lane (Mile Marker 65)

Grade: D

Remaining Life: 9 months

Inventory Item: Sound Barrier

Location: I-495 Westbound Lane (Mile Marker 25)

Grade: B-

Remaining Life: 6 months

INCIDENT MANAGEMENT

Firms are also tasked with responding to and clearing incidents 24/7 within project limits.

Many incidents go unreported and are the responsibility of the contractor.

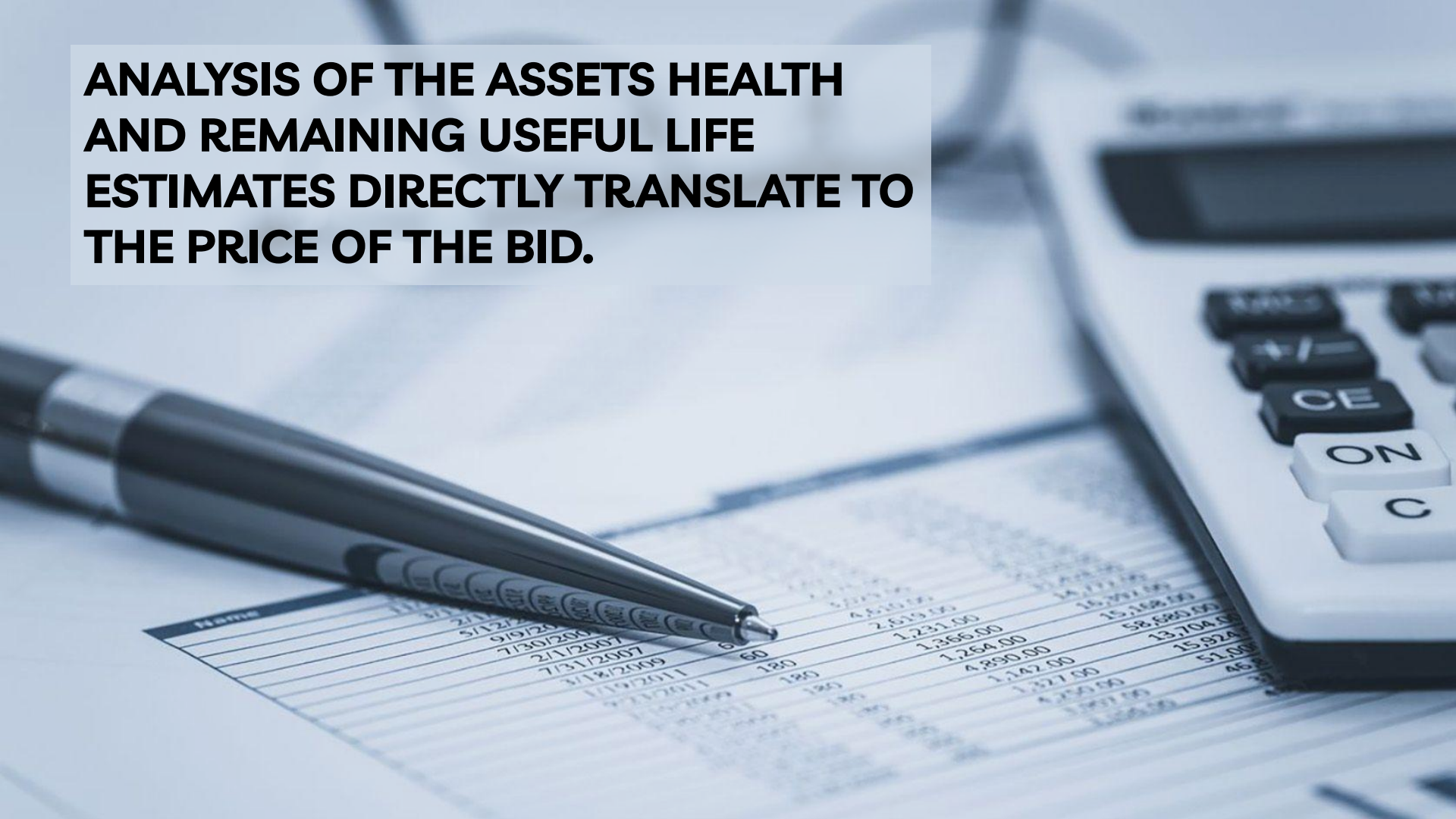
Example: Staunton TAMS

2,779 Incidents over 9 yrs

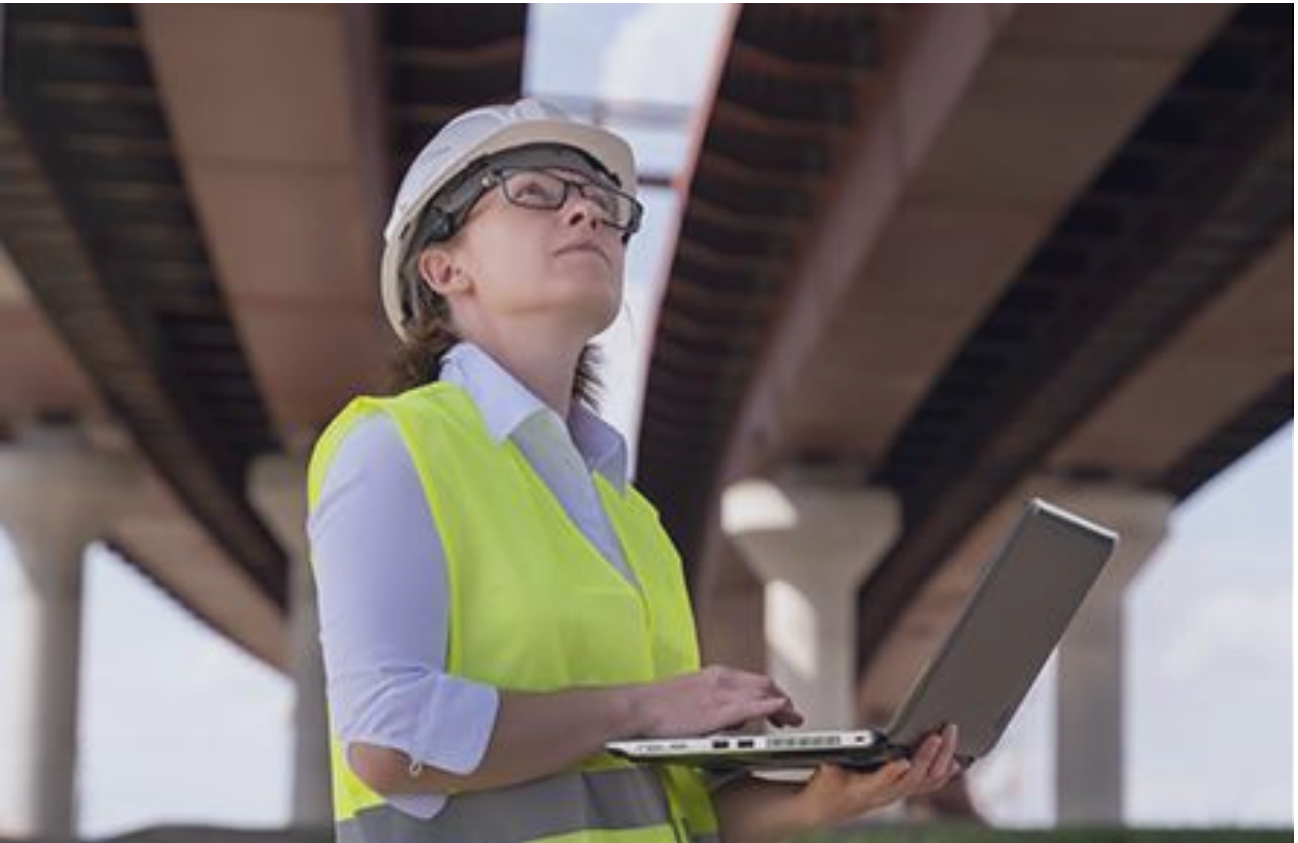
Range of Cost: $156 to $153,434

Avg Damage Cost: $5,626

Source: Virginia Dept of Transportation


ANALYSIS OF THE ASSETS HEALTH AND REMAINING USEFUL LIFE ESTIMATES DIRECTLY TRANSLATE TO THE PRICE OF THE BID.

ROUTINE CONTRACT COMPLIANCE AUDITS



DOTs perform periodic audits to ensure contract terms are met.

Auditors measure timeliness and rate maintenance effectiveness.

Poor performance can result in liquidated damages and penalties of 20% or more.

TAMS Contract Performance

"Contractor performance will be assessed and measured by two (2) separate means:

- *Daily Timeliness Requirements – evaluates whether or not Timeliness Requirements are achieved.*
- *Maintenance Rating Program (MRP) Evaluation – evaluates whether or not specified asset items meet the contractually required minimum service or maintenance condition within a highway Site." (IFB 151940-KC)*

- **Each asset in the contract has specific Timeliness Requirements**
  - Failure to meet the Timeliness Requirement results in $200-$400/day deduction. This is capped at 3% of monthly payment. (Average TAMS contract fixed monthly is approximately $185,000.)

- **Each asset in the contract has specific MRP Requirements**
  - MRP evaluation is performed twice annually
  - Route is broken into 1/10th mile segments and 5% of sites are randomly selected for review. Within each sample, all of the assets are evaluated.
  - Each asset in the sample is evaluated against its MRP Requirement.
  - Similar assets are scored together. Asset Groups must have a score of 80% or 90%. Lower score result in deductions.

- **Total Timeliness and MRP deductions are capped at 20% of annual contract value**

SAMPLE CONTRACT COMPLIANCE LANGUAGE

Daily penalty assessments

Random Audits are conducted

Source: VDOT TAMS Contract Overview Report October, 2014

DATA-DRIVEN INSIGHTS ARE NO LONGER
A LUXURY. THEY ARE A NECESSITY.

IIM PLATFORM COMPONENTS

- Publicly Available Data
- Strategic Partner Data
- II Acquired Data
- Imagery
- Live Video
- Historical Data
- AI
- ML Models
- Custom Reports
- Virtual Reality Interface
- Augmented Reality

MINIMUM VIABLE PRODUCT TESTING

“This *completely changes* how we would do things.

I can easily see us increasing our pricing accuracy by 10-20%.”

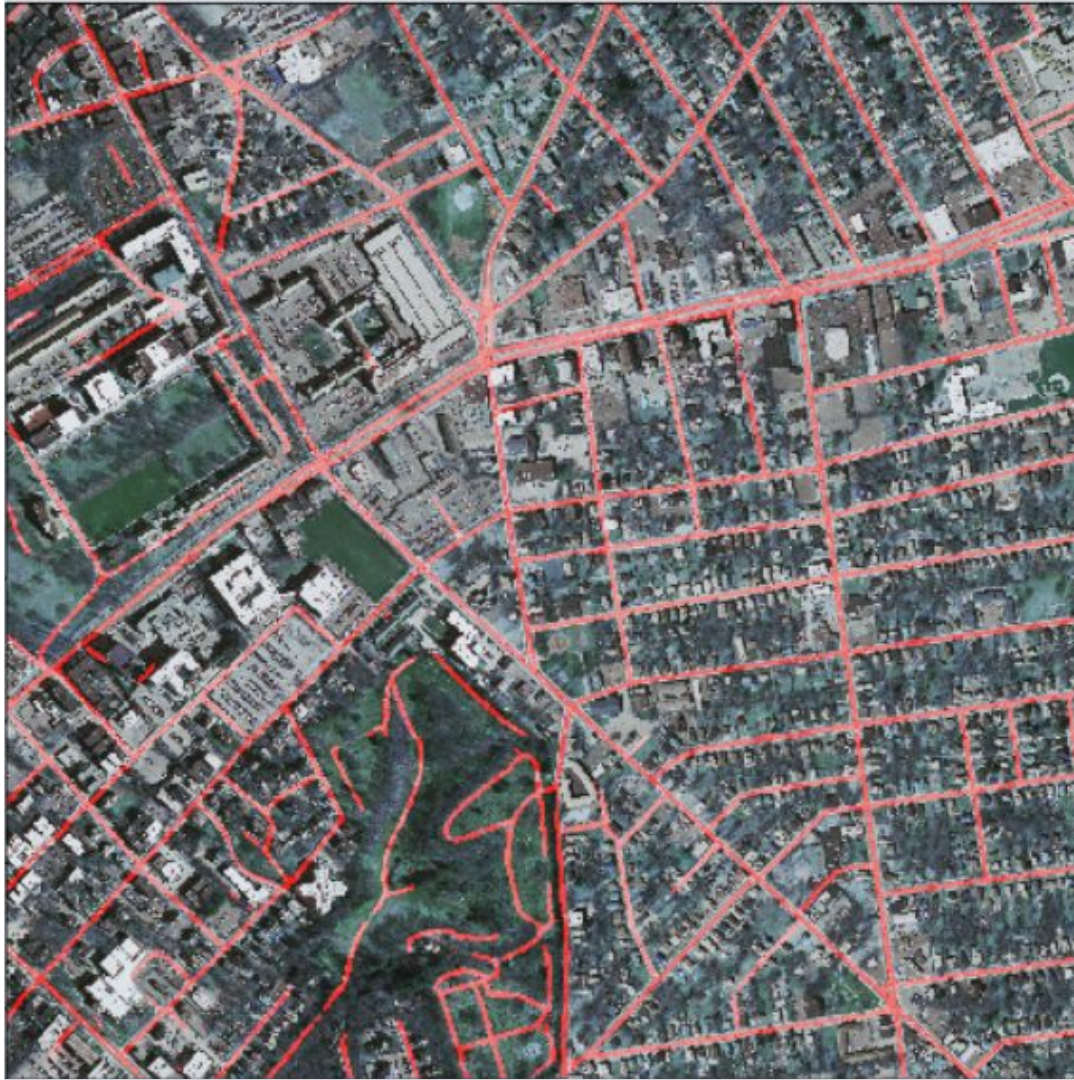
SATELLITE IMAGERY

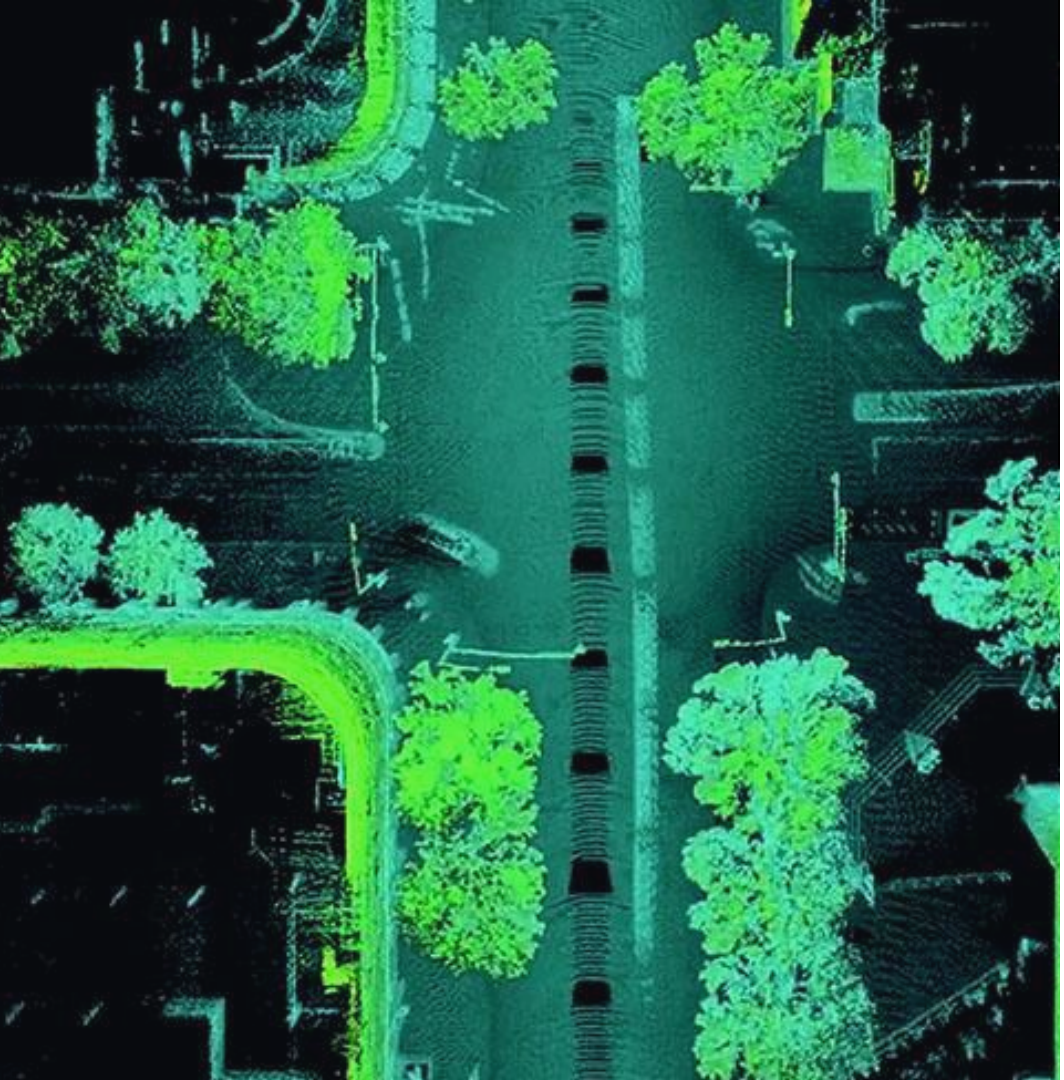
15cm Resolution

Capturing 4 million square kilometers per day

Multiple looks per day

Processed with Machine Learning techniques to extract data



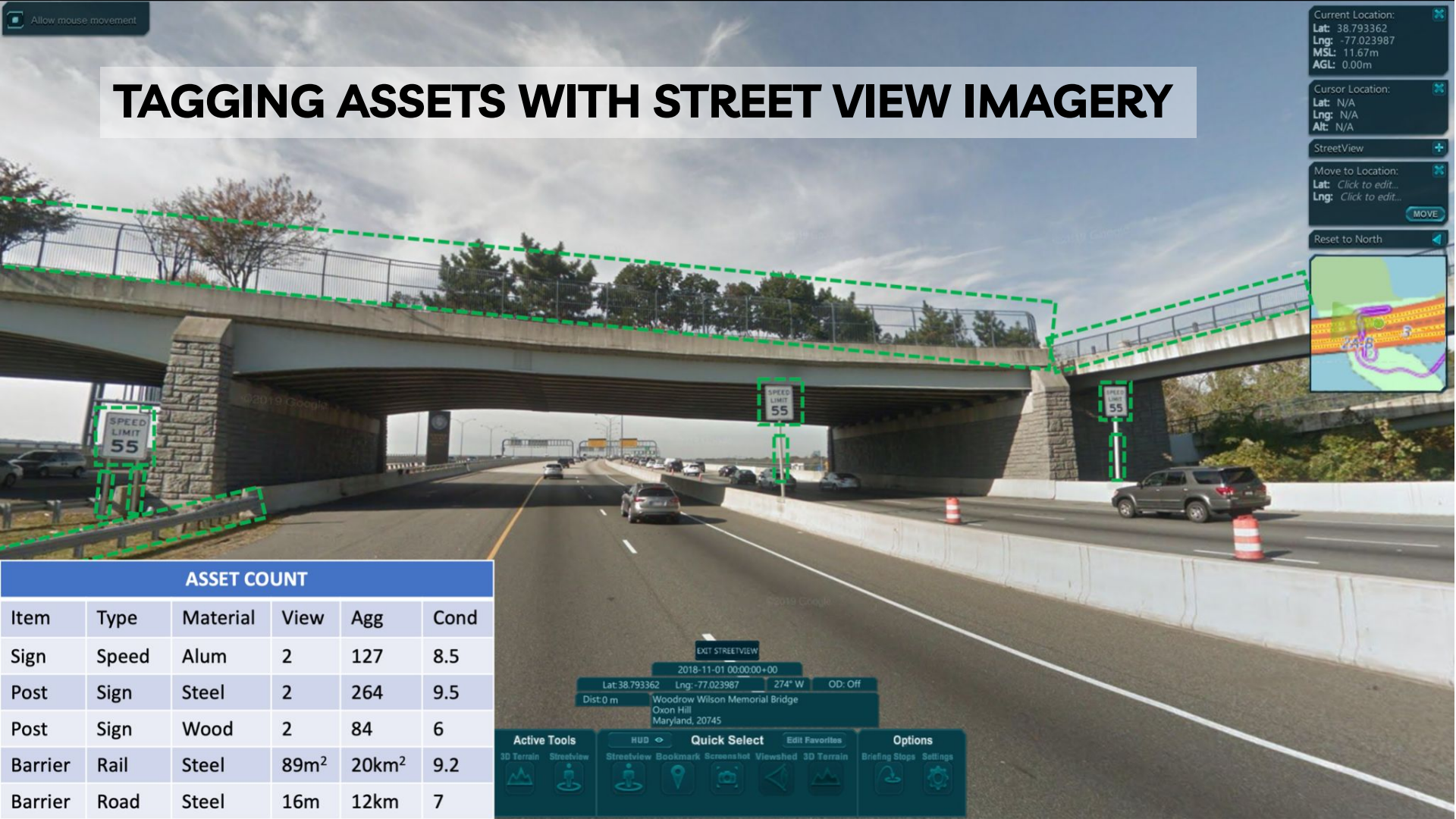


LIDAR IMAGERY

1 cm Resolution

Collected on Demand

TAGGING ASSETS WITH STREET VIEW IMAGERY



ASSET COUNT

Item	Type	Material	View	Agg	Cond
Sign	Speed	Alum	2	127	8.5
Post	Sign	Steel	2	264	9.5
Post	Sign	Wood	2	84	6
Barrier	Rail	Steel	89m^2	20km^2	9.2
Barrier	Road	Steel	16m	12km	7

REAL-TIME INSIGHTS

1 S. GLEBE RD. AT SHIRLINGTON RD.

2 I-66 / MM 40.8 / EB / East of US-15 ...

3 S. GLEBE RD. AT WALTER REED DR

4 JEFF DAVIS AT 23RD ST - CAM2

5 26TH ST. S. AT GLEBE RD.

6 OLD DOMINION DR AT 26TH ST

CROWDSOURCING PHOTOS TO DETECT ANOMALIES

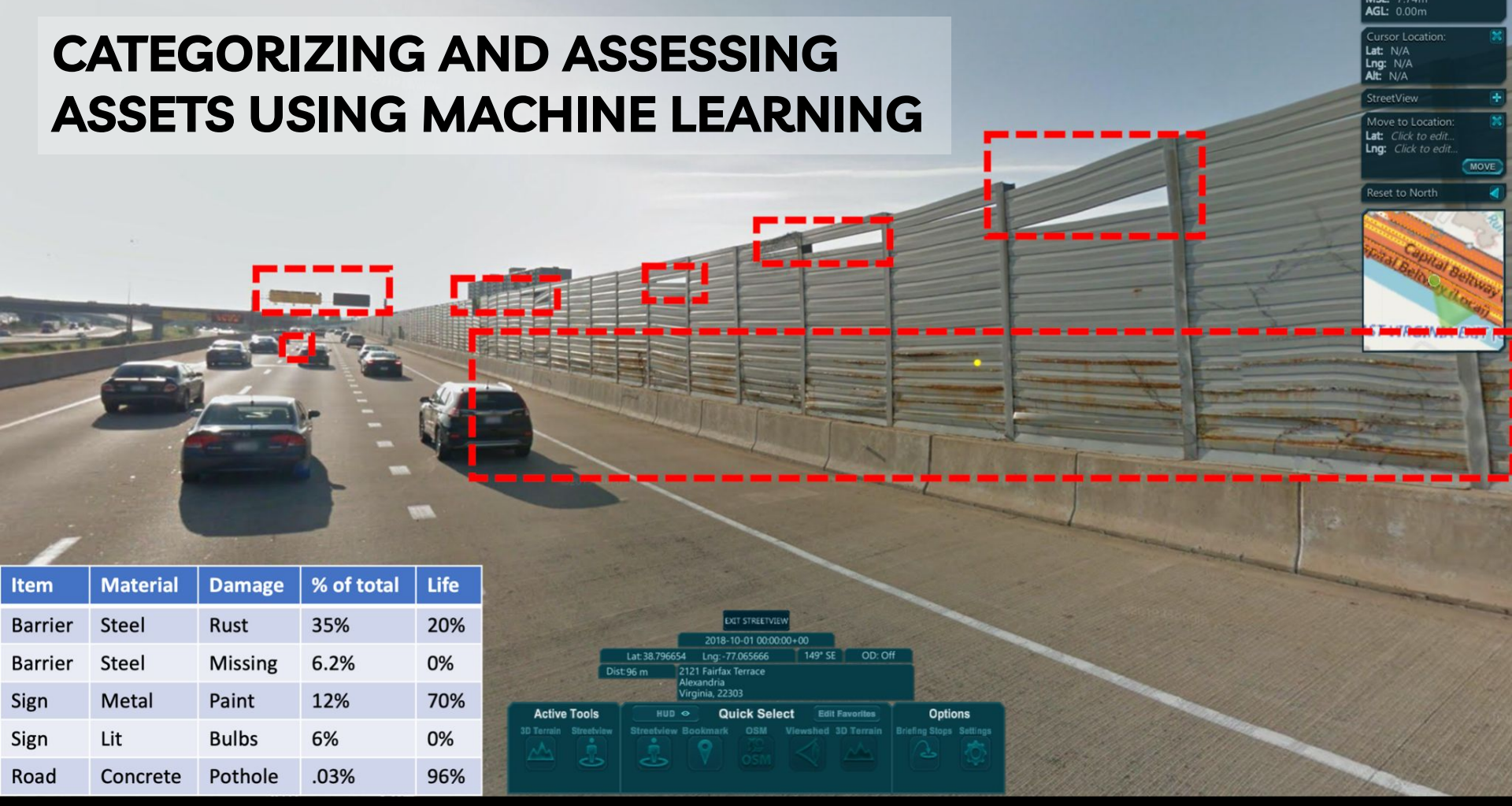
HISTORICAL DATA CAN BE USED TO AUGMENT ML MODELS

ATD_WORK_	WORK_ORDI	ASSET_TYPE	ASSET_ID	ATD_LOCATI	CREATED_DA	MODIFIED_D	SUBMITTED_	CLOSED_DAT	WORK_TYPE	WORK_NEEI	WORK_TYPE	WORK_REQU	JOB_DESCRII	PROBLEM_F	ACTION_TAK	FOLLOW_UP	CHILD_WORI	PARENT_WC	IS_FOLLOW_	TMC_ISSUE_	SR_NUMBEF
WRK17-0028	Closed	No Asset / Other			09/28/2017	10/09/2017	09/28/2017	10/09/2017	Scheduled Work			Austin Trans	clean out my	none	cleaned my t	FALSE					
WRK17-0016	Closed	Signal			08/19/2017	11/29/2017	08/19/2017	11/29/2017	Scheduled Work			Austin Trans	portation Staff			FALSE					
WRK17-0016	Closed	School Flasher			08/19/2017	09/14/2017	08/19/2017	09/14/2017	Scheduled W	Call-Back (Test Monitors a		Austin Trans	HAVE AUSTII	N/A.	AUSTIN ENE	FALSE					
WRK17-0024	Assigned	No Asset / Other			09/11/2017	09/11/2017	09/11/2017	08:50:00 PM	Scheduled W	Call-Back (Test Monitors a		Austin Trans	3000 SPEEDWAY - CABINET/BOX DOOR			FALSE					
WRK17-0024	Unassigned	No Asset / Other			09/11/2017	09/11/2017	09/11/2017	06:23:00 AM	Scheduled W	Call-Back (Test Monitors a		Austin Trans	DIG TESS			FALSE					
WRK17-0023	Assigned	Signal			09/11/2017	09/11/2017	09/11/2017	06:22:00 AM	Scheduled W	Call-Back (Test Monitors a		Austin Trans	DIG TESS			FALSE					
WRK17-0015	Closed	N/A			08/15/2017	08/15/2017	08/15/2017	09/06/2017	Scheduled W	Call-Back (Test Monitors a		Austin Trans	DIG TESS @			FALSE					
WRK17-0016	Closed	Signal			08/19/2017	08/19/2017	08/19/2017	09/06/2017	Scheduled W	Call-Back (Test Monitors a		Austin Trans	CALLBACK	N/A.	LOCATION V	FALSE					
WRK17-0024	Closed	Signal			09/12/2017	09/14/2017	09/12/2017	09/14/2017	Scheduled W	Call-Back (Test Monitors a		Austin Trans	3000 SPEED\	NO SIGNALS	LOCATION V	FALSE					
WRK17-0024	Closed	Signal			09/12/2017	09/14/2017	09/12/2017	09/14/2017	Scheduled W	Call-Back (Test Monitors a		Austin Trans	823 CONGRE	NONE.	LOACTION V	FALSE					
WRK17-0044	Closed	School Beacon			11/06/2017	11/27/2017	11/06/2017	11/27/2017	Trouble Call	Communication Failure		311	school zone	Web I/O tim	Logged into	FALSE				TMC17-0305	17-00332589
WRK17-0044	Closed	School Beacon			11/06/2017	11/27/2017	11/06/2017	11/27/2017	Trouble Call	Communication Failure		311		Web I/O got	Reprogramm	FALSE				TMC17-0305	17-00332590
WRK17-0032	Closed	School Beacc	7308		10/11/2017	10/13/2017	10/11/2017	10/13/2017	Trouble Call	Communication Failure		TMC	no comm	Cable no scr	Screwed in c	FALSE				TMC17-0058	17-00303955
WRK17-0025	Closed	School Beacon			09/15/2017	09/15/2017	09/15/2017	09/15/2017	Scheduled W	Day-Call (Deliver Timing s		Austin Trans	SCHOOL ZON	BAD CABLE F	ALL FLASHER	FALSE					
WRK17-0018	Closed	School Flasher			08/22/2017	09/14/2017	08/22/2017	09/14/2017	Scheduled W	Day-Call (Deliver Timing s		Austin Trans	HILL ANDERS	N/A	SOURCE TIEI	FALSE					
WRK17-0026	Closed	School Beacon			09/19/2017	09/22/2017	09/19/2017	09/22/2017	Scheduled W	Day-Call (Deliver Timing s		Austin Trans	SCHOOL ZON	NO POWER	POWER	FALSE					
WRK17-0050	Submitted	Signal			11/13/2017	12/01/2017	12/01/2017	01:56:00 PM	Trouble Call	Detection Failure		TMC	Slaughter and	heb #730 loops cut south		FALSE					
WRK17-0061	Closed	No Asset / Unkown Location / Other			12/04/2017	12/05/2017	12/05/2017	12/05/2017	Trouble Call	Digtess		311		no problem f	marked out i	FALSE				TMC17-0342	17-00360308
WRK17-0061	Submitted	Signal			12/04/2017	12/04/2017	12/04/2017	01:00:00 PM	Trouble Call	Detection Failure		TMC	Detection no	Intersection	All loops wei	FALSE					
WRK17-0050	Closed	No Asset / Unkown Location / Other			11/14/2017	12/05/2017	11/14/2017	12/05/2017	Trouble Call	Digtess		311		W Annie and	Verified loca	FALSE				TMC17-0321	17-00340926
WRK17-0061	Assigned	No Asset / Unkown Location / Other			12/03/2017	12/03/2017	12/03/2017	09:47:00 PM	Trouble Call	Digtess		311	1783752339			FALSE				TMC17-0342	17-00360022
WRK17-0061	Submitted	No Asset / Unkown Location / Other			12/03/2017	12/03/2017	12/03/2017	08:39:00 PM	Trouble Call	Digtess		311		None.	Checked loca	FALSE				TMC17-0342	17-00359972
WRK17-0068	Submitted	Other / No Asset			12/12/2017	12/12/2017	12/12/2017	12:06:00 PM	Trouble Call	Digtess		311 Custome	Dig tess.	Called in as /	called 311 ar	FALSE			FALSE	TMC17-0352	17-00366414
WRK17-0068	Submitted	Other / No Asset			12/12/2017	12/12/2017	12/12/2017	11:57:00 AM	Trouble Call	Digtess		311 Custome	Dig tess at 2	none (no loc	Called 311 ,	FALSE			FALSE	TMC17-0350	17-00365011
WRK17-0068	Submitted	Other / No Asset			12/12/2017	12/12/2017	12/12/2017	12:01:00 PM	Trouble Call	Digtess		311 Custome	Dig tess at 4	None (no lo	Called 311 a	FALSE			FALSE	TMC17-0351	17-00365733
WRK17-0054	Closed	No Asset / Unkown Location / Other			11/18/2017	12/11/2017	11/18/2017	12/11/2017	Trouble Call	Digtess		311		Contractor di	checked all e	FALSE				TMC17-0329	17-00345915
WRK17-0017	Closed	Signal			08/19/2017	08/19/2017	08/19/2017	09/06/2017	Trouble Call	DigtessCall-Back (Test Mo		311 Custome	DIG TESS - A	NONE.	LOCATION V	FALSE					
WRK17-0017	Closed	N/A			08/20/2017	09/14/2017	08/20/2017	09/14/2017	Trouble Call	DigtessCall-Back (Test Mo		311 Custome	DIG TESS - E	N/A	LOCATION V	FALSE					
WRK17-0016	Closed	Signal			08/19/2017	08/19/2017	08/19/2017	09/06/2017	Trouble Call	DigtessCall-Back (Test Mo		Austin Trans	DIG TESS	NONE	LOCATION	FALSE					
WRK17-0070	Submitted	Signal			12/13/2017	12/13/2017	12/13/2017	10:27:00 PM	Scheduled W	Installation - Build Signal		TMC	Set poles an	no problem.	Built intersec	FALSE			FALSE		
WRK17-0069	Submitted	Signal			12/13/2017	12/13/2017	12/13/2017	10:13:00 PM	Scheduled W	Installation - Build Signal		TMC	Build signal I	no problem.	Installed Hav	FALSE			FALSE		
WRK17-0071	Submitted	Signal			12/15/2017	12/15/2017	12/15/2017	01:17:00 PM	Scheduled W	Installation - Cable		TMC	Finish inters	No problem.	Install breake	FALSE			FALSE		
WRK17-0055	Submitted	Signal			11/29/2017	11/30/2017	11/30/2017	01:07:00 PM	Scheduled W	Installation - Fiber		TMC	ijy8ut78y	was a test	hahahaha	FALSE					
WRK17-0025	Closed	School Beacc	7506		09/18/2017	09/22/2017	09/18/2017	09/22/2017	Scheduled W	Installation - Install Heads		Austin Trans	BRIDGEPOIN	BRIDGEPOIN	WB	FALSE					
WRK17-0045	Closed	Signal			11/07/2017	12/04/2017	11/07/2017	12/04/2017	Scheduled W	Installation - Other		TMC	S-1St/Mario	No Problem.	Build interse	FALSE					
WRK17-0033	Closed	Signal			10/16/2017	10/26/2017	10/18/2017	10/26/2017	Trouble Call	Knockdown		Austin Trans	17-	Signal pole k	Re-used all r	FALSE				TMC17-0048	17-00292439
WRK17-0035	Unassigned	Signal			10/20/2017	10/20/2017	10/20/2017	06:36:00 PM	Trouble Call	Knockdown		TMC				FALSE					
WRK17-0068	Unassigned	Signal			12/11/2017	12/11/2017	12/11/2017	08:51:00 PM	Scheduled W	Knockdown Follow-Up		TMC				FALSE			FALSE		
WRK17-0024	Closed	No Asset / Unkown Location / Other			09/13/2017	11/30/2017	09/13/2017	11/30/2017	Trouble Call	LED Out		TMC/KITS				FALSE				TMC17-003015	
WRK17-0040	Closed	School Beacc	7512		10/31/2017	11/07/2017	10/31/2017	11/07/2017	Trouble Call	LED Out		TMC	not flashing	6305 Clarion	Verified all b	FALSE				TMC17-0296	17-00325508
WRK17-0041	Closed	School Beacc	7308		10/31/2017	11/07/2017	10/31/2017	11/07/2017	Trouble Call	LED Out		TMC	not flashing	NB Parker ha	Replaced bat	FALSE				TMC17-0297	17-00326190
WRK17-0032	Closed	Signal			10/12/2017	10/12/2017	10/12/2017	10/12/2017	Trouble Call	LED OutDetection - Other		TMC	bulb out	none		FALSE				TMC17-0060	17-00000000
WRK17-0032	Unassigned	Signal			10/16/2017	10/16/2017	10/16/2017	01:51:00 PM	Scheduled W	Misc - Assist TxDOT		TMC				FALSE					

USING AI TO PREDICT PROJECT COST LIABILITIES

ROADSIDE	436 Reworking Shoulders	SY	**286,653**	10.00%	28,665.3	3ft wide estimate
ROADSIDE	437 Misc Slope & Ditch Repair	Each	**81**	25.00%	20.4	Estimate
ROADSIDE	459 Concrete Sidewalk Repair	SY	-	0.01%	-	
ROADSIDE	527 Fence Repair - wire	Linear Feet	**214,990**	1.00%	2,149.9	
DRNGE	UD cleaning	LF	**214,990**	10.00%	21,499.0	deleted/n/a
DRNGE	430 Manhole Maintenance	EA	-	25.00%	-	Clean 25% per year. Estimate. 1at 250ft in median
DRNGE	451 Clean Culvert Structures (storm pipe)	LF	**10,749.50**	25.00%	2,687.4	Clean 25% per year. Estimated
DRNGE	452 Clean Drainage Structures	EA	**214.99**	50.00%	107.5	clean all inlets every 2 years. Estimated; 1 per 50ft run

CATEGORIZING AND ASSESSING ASSETS USING MACHINE LEARNING



Item	Material	Damage	% of total	Life
Barrier	Steel	Rust	35%	20%
Barrier	Steel	Missing	6.2%	0%
Sign	Metal	Paint	12%	70%
Sign	Lit	Bulbs	6%	0%
Road	Concrete	Pothole	.03%	96%

COMPLIANCE REPORTING

Quarterly Compliance Report 4/1/2021 1:32PM EST		
Asset	Status	Notes
Grass & Vegetation	Compliant	No Litter, no invasive species detected
Brush & Trees	Compliant	Sight distance clear up to 500'. No dead trees leaning towards roadway
Debris & Road Kill	Compliant	No obstructions found on roadways or shoulders

COMPLIANCE REQUIREMENTS

Administrative Services/ Procurement
RFP # 155187-FH
Title: WWB BIMS

VDOT Virginia Department of Transportation

ATTACHMENT J-A
Performance Criteria Part A

ASSET	OUTCOME	TOLERANCE AND CRITERIA
ROADSIDE ASSET GROUP		
Grass and Vegetation	Healthy Growing Neat appearance Acceptable coverage Proper sight distance	**Requirement:** • Litter pickup shall occur in advance of each mowing cycle • Prevent the growth of unwanted weeds, grass, brush and trees. **MRP Requirements:** • <10% of mowable area to exceed (10") in height (unless otherwise noted). • All sight distances are clear. • Neat /trimmed around guardrail, headwalls, retaining walls, wall railings, paved ditches, signs and other fixed objects. • <10% bare ground per 10th mile section. • No cut less than 2" in height. • No invasive species in mowable areas (Canadian Thistle, Kudzu Vine, Johnson Grass, Japanese Knotweed). **Timeliness Requirement:** Vegetation affecting sight distance presenting a safety hazard shall be removed within 24 hours of notification or discovery.
Brush & Trees	No hazardous trees Unobstructed sight distance Vertical clearance Structure inspection & repairs unobstructed Proper notification shall be provided to owners before trimming trees	**Requirements:** • Notification of removal/trimming of trees still standing shall be made to adjacent properties – when requested in writing by the adjacent City/Government Agencies or property owners. **MRP Requirements:** • No trees or brush affecting sight distance. • Vertical clearance of 30' over roadway (includes shoulders). • Vertical clearance of 7' over sidewalks and trails. • No leaning or dead trees that present a hazard. *Note: A "hazardous tree" is a tree with structural defects likely to cause failure of all or part of the tree, which could strike a roadway, paved shoulder, bridge, or overhead sign structure, or any situation or condition that causes, or has the ability to cause, an unsafe condition to the traveling public or presents the possibility to cause damage to a public and/or private property.*

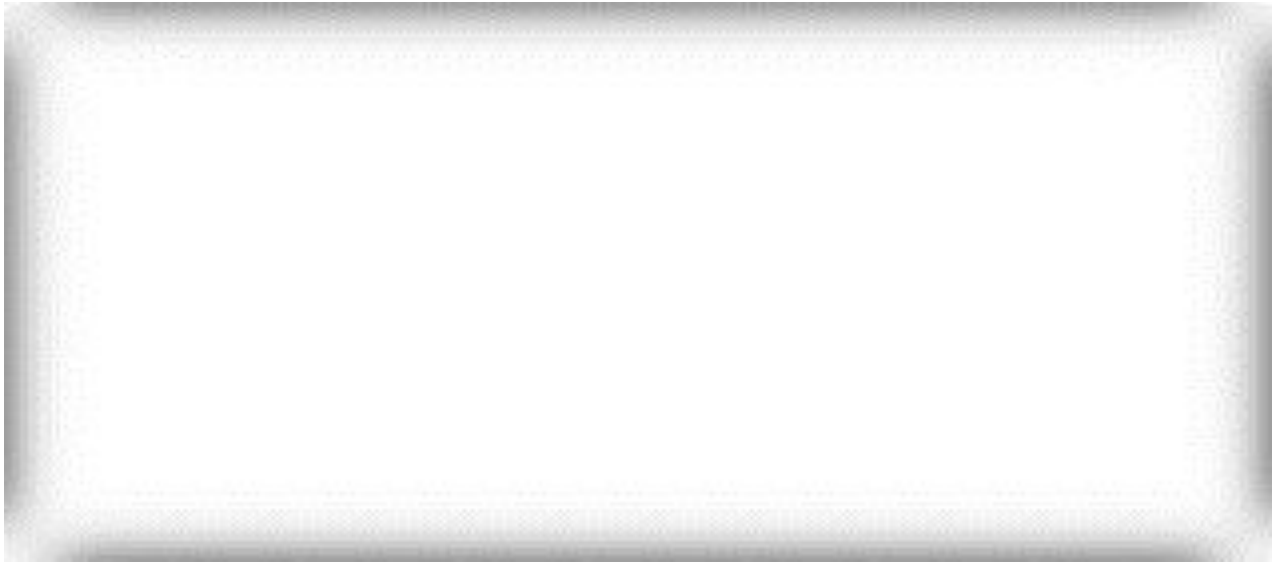
Administrative Services/ Procurement
RFP # 155187-FH
Title: WWB BIMS

VDOT Virginia Department of Transportation

ASSET	OUTCOME	TOLERANCE AND CRITERIA
		• No brush or trees that affect the inspection or repair of bridges or other structures.

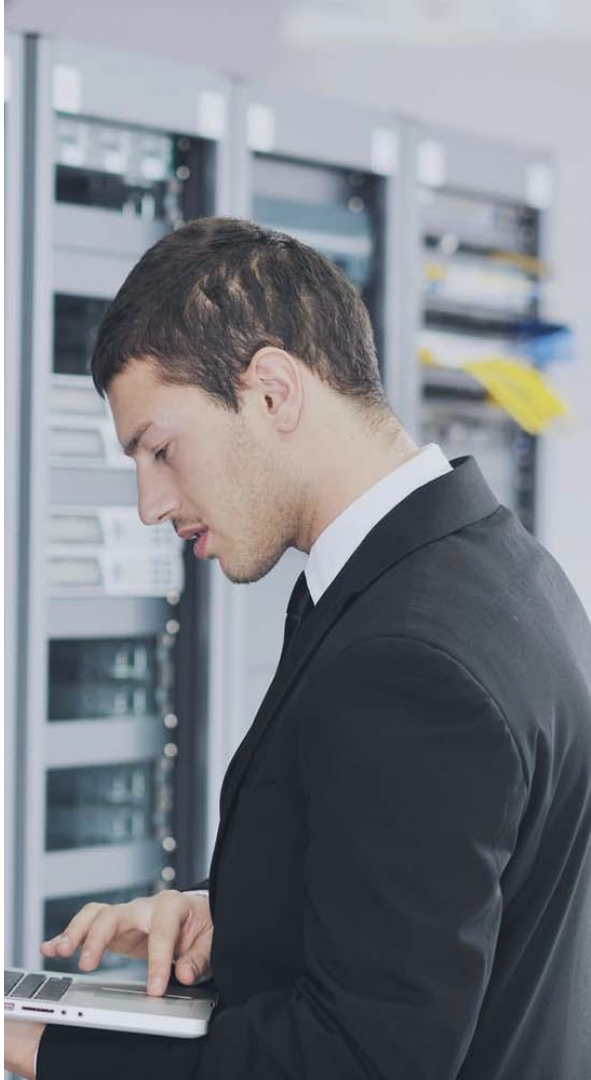
DATA-DRIVEN MANAGEMENT LOWERS OPERATIONS AND MAINTENANCE COSTS

Facial images, car number plates, and other data that would allow an individual to be identified need to be obscured.



DATA COMPLIANCE

- Build or augment a data provider's data sets
- Enact clear data disclosure policies
- Implement and maintain administrative, physical and technical safeguards



COMMERCIAL MODEL

Data repository aggregating multiple data sources for rapid access. Includes satellite, CCTV and road sensors.

B2B subscription-based model. License fee per user. Environment allows users to annotate and document observations.

PLATFORM AS A SERVICE

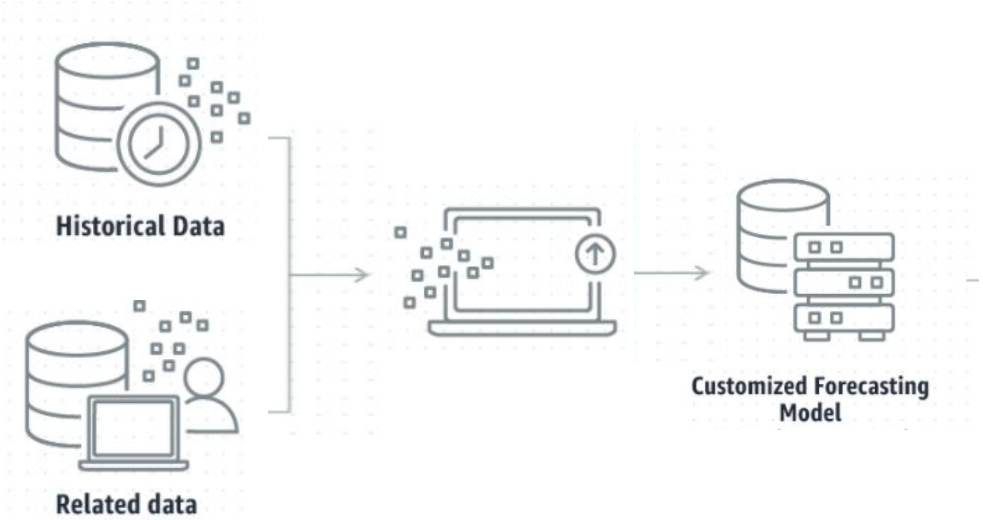
COMMERCIAL MODEL

Use Machine learning to combine data sources and deliver highly accurate forecasts.

Information captured by users will improve the accuracy over time.

Pay for what you use: No minimum fees or upfront commitments.

FORECASTING AS A SERVICE



COMMERCIAL MODEL

Analysts develop custom reports for:

- Data preparation and workflow auditing
- Simulation and scenario analysis
- Economic impact analysis
- Industry Trends

CONSULTING SERVICES

PRODUCT DEVELOPMENT ROADMAP

PHASE 1

- Navigate and document assets leveraging VR and AR
- Annotate on-the-fly records captured in database
- Forecasts future events based on historical data

PHASE 2

- Object Recognition
- Anomaly detection
- Crowdsource ML training data
- Custom model to address project specifics

PHASE 3

- Compliance reports. Automate work order generation and closure
- Quality and accuracy control for bids leveraging bid predict functionality

PHASE 4

- ML deployed on edge devices. Inferring on the edge
- ML deployed on live footage. Reduce the administrative burden

PRE- COMMERCIAL

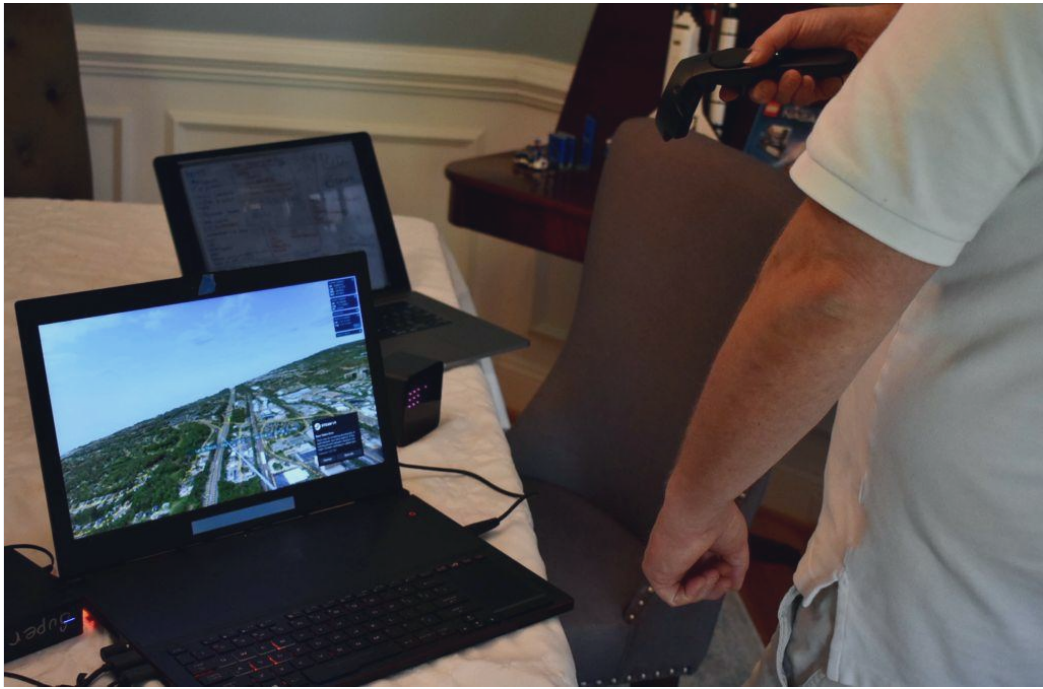
Work backwards from asset manager challenge

Reduce administrative burden and de-risk project leveraging data

Leverage success with reference customer in promoting solution

LOI from asset management contingent on success with MVP

PRODUCT DEVELOPMENT



COMMERCIAL PRODUCT

Publish website - Main channel to deploy services

Co-author technical paper with reference customer

Publish case study with reference customer

Exhibit at infrastructure maintenance trade shows

P3C Dallas

Targeted ad campaigns leveraging LinkedIn

GO TO MARKET STRATEGY

P3C
PUBLIC-PRIVATE PARTNERSHIP
CONFERENCE

Google Ads

INTELLIGENT INFRASTRUCTURE MANAGEMENT

INTELLIGENT INFRASTRUCTURE MANAGEMENT

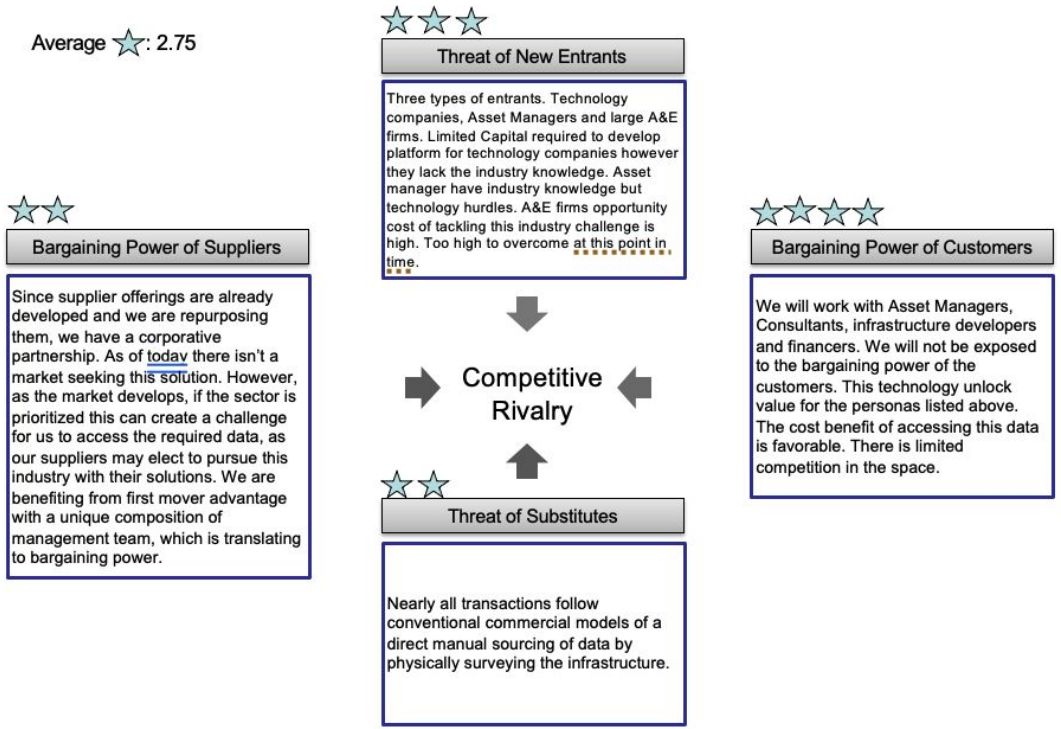
WHAT WE LEARNED

Wealth of applicable public and private data is available today

We built a viable product using virtual and augmented reality and forecasting models

Industry players have expressed interest in partnering with us to develop our solution

Five Forces


Average ☆: 2.75
☆☆☆
Threat of New Entrants
Three types of entrants. Technology companies, Asset Managers and large A&E firms. Limited Capital required to develop platform for technology companies however they lack the industry knowledge. Asset manager have industry knowledge but technology hurdles. A&E firms opportunity cost of tackling this industry challenge is high. Too high to overcome at this point in time.
☆☆
Bargaining Power of Suppliers
Since supplier offerings are already developed and we are repurposing them, we have a corporative partnership. As of todav there isn't a market seeking this solution. However, as the market develops, if the sector is prioritized this can create a challenge for us to access the required data, as our suppliers may elect to pursue this industry with their solutions. We are benefiting from first mover advantage with a unique composition of management team, which is translating to bargaining power.
Competitive Rivalry
☆☆☆☆
Bargaining Power of Customers
We will work with Asset Managers, Consultants, infrastructure developers and financers. We will not be exposed to the bargaining power of the customers. This technology unlock value for the personas listed above. The cost benefit of accessing this data is favorable. There is limited competition in the space.
☆☆
Threat of Substitutes
Nearly all transactions follow conventional commercial models of a direct manual sourcing of data by physically surveying the infrastructure.

SWOT Analysis

INTERNAL FACTORS	
STRENGTHS (+)	**WEAKNESSES (–)**
▪ Existing relationships with key suppliers ▪ Access to internal technical resources ▪ A solution with a clear value proposition that unlocks value in short term ▪ A simple commercial model that does not require a major investment ▪ Interest from perspective clients	▪ As we are first to market for this specific use case, we have limited information in the way of addressable market as well as adoption rates ▪ The first phase of our solution does not allow for IP protections ▪ Commercial model does not allow for high frequency of validation ▪ Limited access to capital. Team members are leveraging their network and time to validate the business model.

EXTERNAL FACTORS	
OPPORTUNITIES (+)	**THREATS (–)**
▪ Sensors and edge devices are becoming cheaper and more readily available. ▪ More projects that will include operations and maintenance that will need to leverage data. ▪ A recognition that data has and important role to play, and and industry that is willing to explore solutions that unlock the value of existing data. ▪ A central platform to store and access data does not exist. And opportunity exists to build a go-to data repository for the transportation space.	▪ As market matures some of our suppliers may opt to provide their own solution ▪ As the solution is proven, asset managers may decide to develop this competency in-house ▪ As this is a new solution to market, we may face challenges related to the accuracy of the solution

We Make No Representations and Warranties use in Appendix

- Fitness for a particular purpose,
- Noninfringement,
- Interruption of service,
- Accuracy, or that the data is error free
- Arising from the information supplied by any third party data supplier

This data is furnished by third parties which may be obtained by them directly or through another third party(ies). We have no control over the accuracy, quality or timeliness of the data.

Key Personas We Need (Melba recommends use in Appendix)

Data Engineering	Data Analytics	Data Science
• Building the platform for which all data is collected, organized, and analyzed • Ingesting all data into this platform • Cleanse data ingested into data platform • Prep data for analysis based on guidance from data modelers and data analysts/scientists • Maintain and support these environments to ensure reliability and performance	• Work with Data Engineering to ensure data is properly structured and complete for analysis • Develop and support internal and external customers decision makers by providing easy to use data tools and guidance on how to use them • Coordinate with Data Science team deeper studies that should be performed and any preliminary findings • Develop and provide analytics platform for internal and external customers users to find and interact with data	• Work with Data Engineering and Data Analytics teams to ensure sufficient data is being collected and is organized in a proper way for use • Support strategic decision that will have a great impact to the internal business or customers • Work with Data Analytics to uncover deeper questions to explore using statistical and machine learning methods • Build intelligence systems that can enhance the business' processes and products • Provide guidance and mentorship to internal and external customers on proper interpretation of data and how to test hypothesis

Available Market (Melba recommends use in Appendix)