Gannett Fleming

*Excellence Delivered **As Promised***

Asset Management for MAP-21

Gary Lasham, P.E.
Jonathan Pollack

MAP-21

- **Replaced Intermodal Surface Transportation Efficiency Act (ISTEA)**
- **MAP-21 is transforming the policy and programmatic framework for investments to guide the system's growth and development, creates a streamlined and performance-based (Asset Management) surface transportation program and builds on many of the highway, transit, bike, and pedestrian programs and policies established in 1991 ISTEA.**
- **GASB 34 – Governmental Accounting Standards Board for State and Local Governments**

GASB
Government Accounting Standards Board

GASB 34

Governmental Accounting Standards Board for State and Local Governments

- Identifies the most important objectives of financial reporting by governments
- Requires governments to report information about "major" funds, including a general fund.
- Fund statements also measure and report the "operating results“
- Shows budgetary compliance
- Reports all capital assets, including infrastructure assets, and reports depreciation expense

GASB
Government Accounting Standards Board

MAP-21 Key Objective

Improving transportation investment decision making through performance-based planning and programming.

Doubling funding for infrastructure safety to make significant progress in reducing highway fatalities.

Timely delivery of transportation projects through innovations in delivering projects. Do you need a 5 year TIP?

5 Year TIP vs. 3 Year TIP

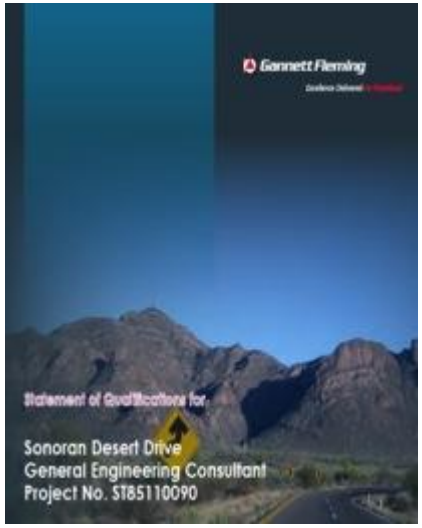
MAP-21 - 5 Major Programs

- National Highway Performance Program (NHPP): ~$21.8 billion
- Surface Transportation Program (STP): ~$10.0 billion
- Highway Safety Improvement Program (HSIP): $2.4 billion
- Congestion Mitigation Air Quality Program (CMAQ): ~$3.3 billion
- Transportation Alternatives (TA): ~$2 billion
- Transit Funding: ~$10.5 billion

Key Themes

- **Accelerated Project Delivery**
- **Asset Management**
  - Performance based management
- **Performance Measures**
- **Risk Management**
- **3D Modeling**
- **Innovative Project Delivery**
  - Public Private Partnerships
- **Transparency**

Accelerated Bridge Construction Manual for New Jersey Turnpike Authority



D/B/F Sonoran Desert Drive City of Phoenix

BIM/Innovative Project Delivery Navajo Transit System Maintenance Facility

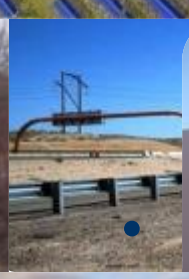
Transportation Agencies Started in the Construction Business

Focus is Shifting to Asset Preservation & Optimization

Is Your Transportation System in Compliance with MAP-21?

- **MAP-21 establishes national performance goals for Federal highway programs:**
  - ✓ **Safety** - To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
  - ✓ Infrastructure **condition** - To maintain the highway infrastructure asset system in a state of good repair.
  - ✓ **Congestion reduction** - To achieve a significant reduction in congestion on the NHS.
  - ✓ System **reliability** - To improve the efficiency of the surface transportation system.

What is an Asset?



- Roadways
- Bridges
- Pathways
- Pavement markings
- Culverts
- Guardrail
- Signs
- Traffic signals
- Street lighting
- Intelligent Transportation Systems (ITS) infrastructure
- Rest areas
- Landscaping
- Right-of-way, etc.

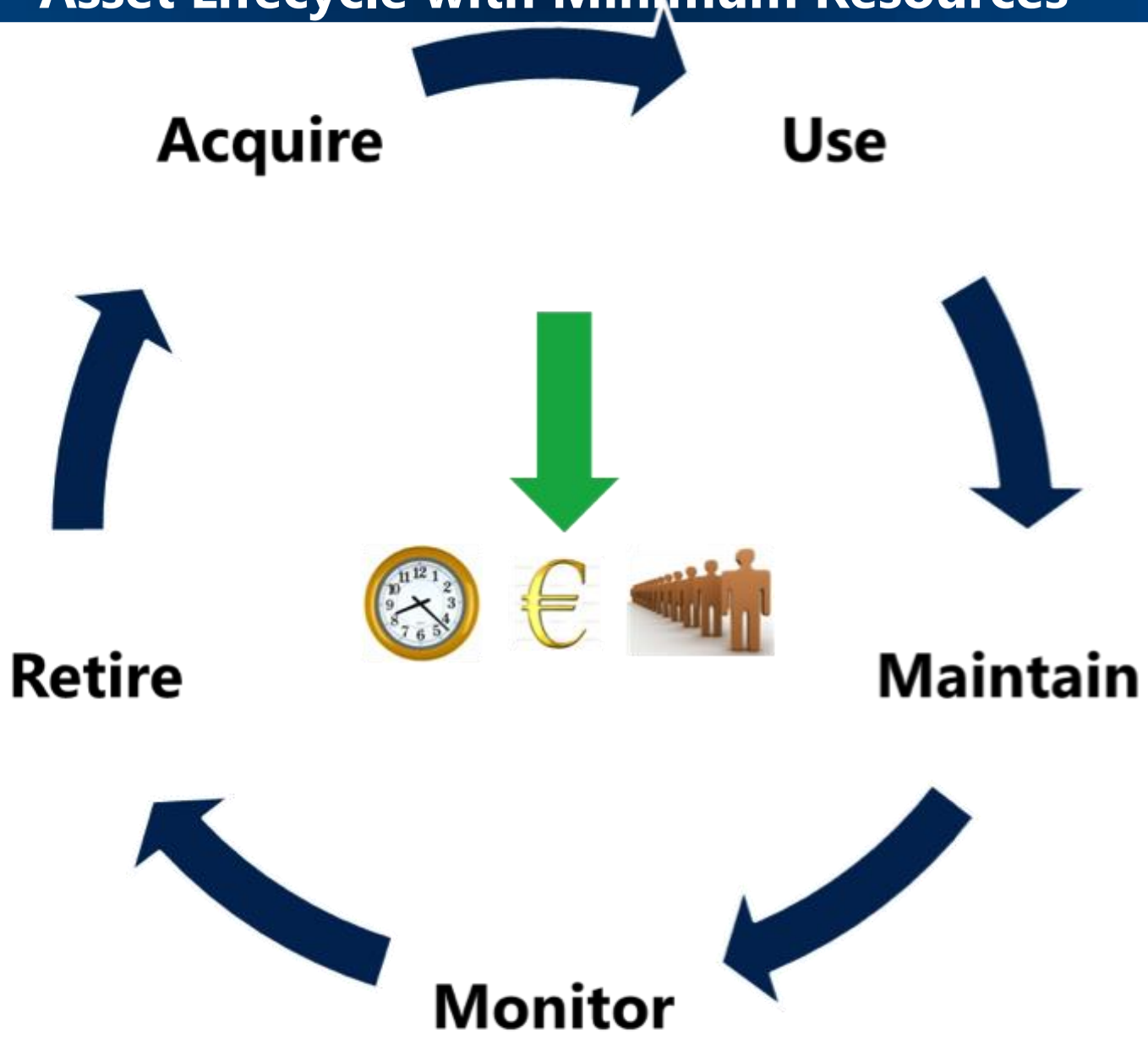
Asset Management

A strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost.

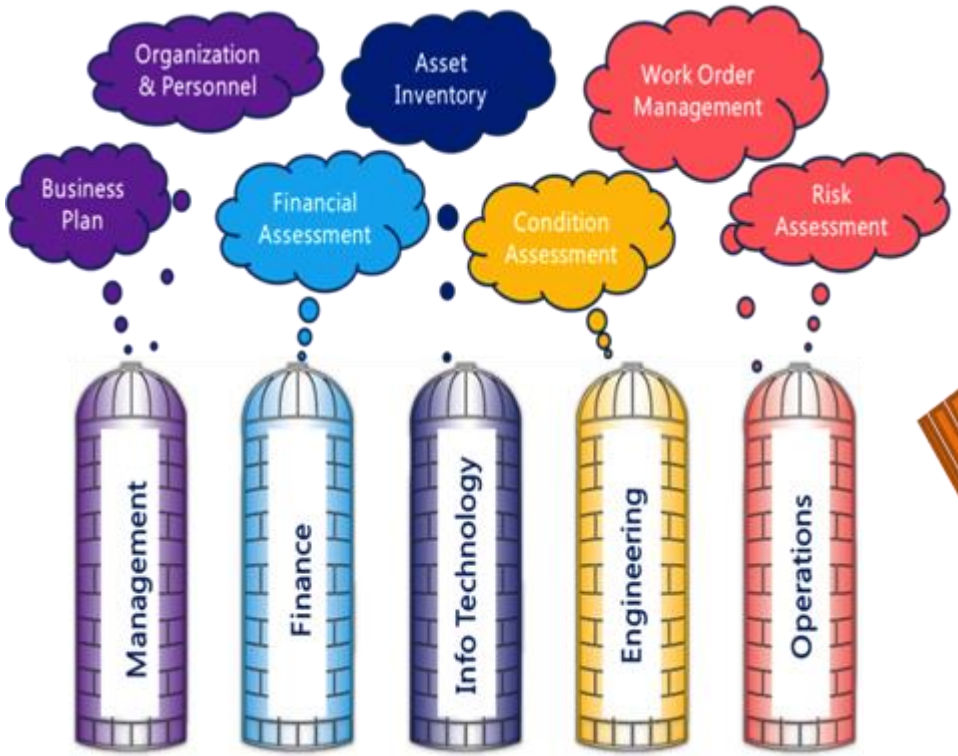
(MAP-21 § 1103)

Perform the *right* treatment at the *right* time on the *right* bridge or roadway segment. Prioritize and track Operations and Maintenance

Asset Management is a Process for Managing the Entire Asset Lifecycle with Minimum Resources



Asset Management Requires the Organization To Work Together For a Common Goal



MAP-21 Asset Management Plan

- **MAP-21 requires that an asset management plan include:**
  - 1. A summary listing of the pavement and bridge assets on the NHS in the State, including a description of the condition of those assets
  - 2. Asset management objectives and measures
  - 3. Performance gap identification
  - 4. Lifecycle cost and risk management analysis
  - 5. A financial plan
  - 6. Investment strategies

Risk Management

- **A risk-based asset management plan includes strategies that lead to a program of projects that would make progress toward achievement of the targets for asset condition and performance and support progress toward the achievement of the national goals.**
- **Entities must address pavements and bridges but are encouraged to include all infrastructure assets within the highway right-of-way in their risk-based asset management plan.**

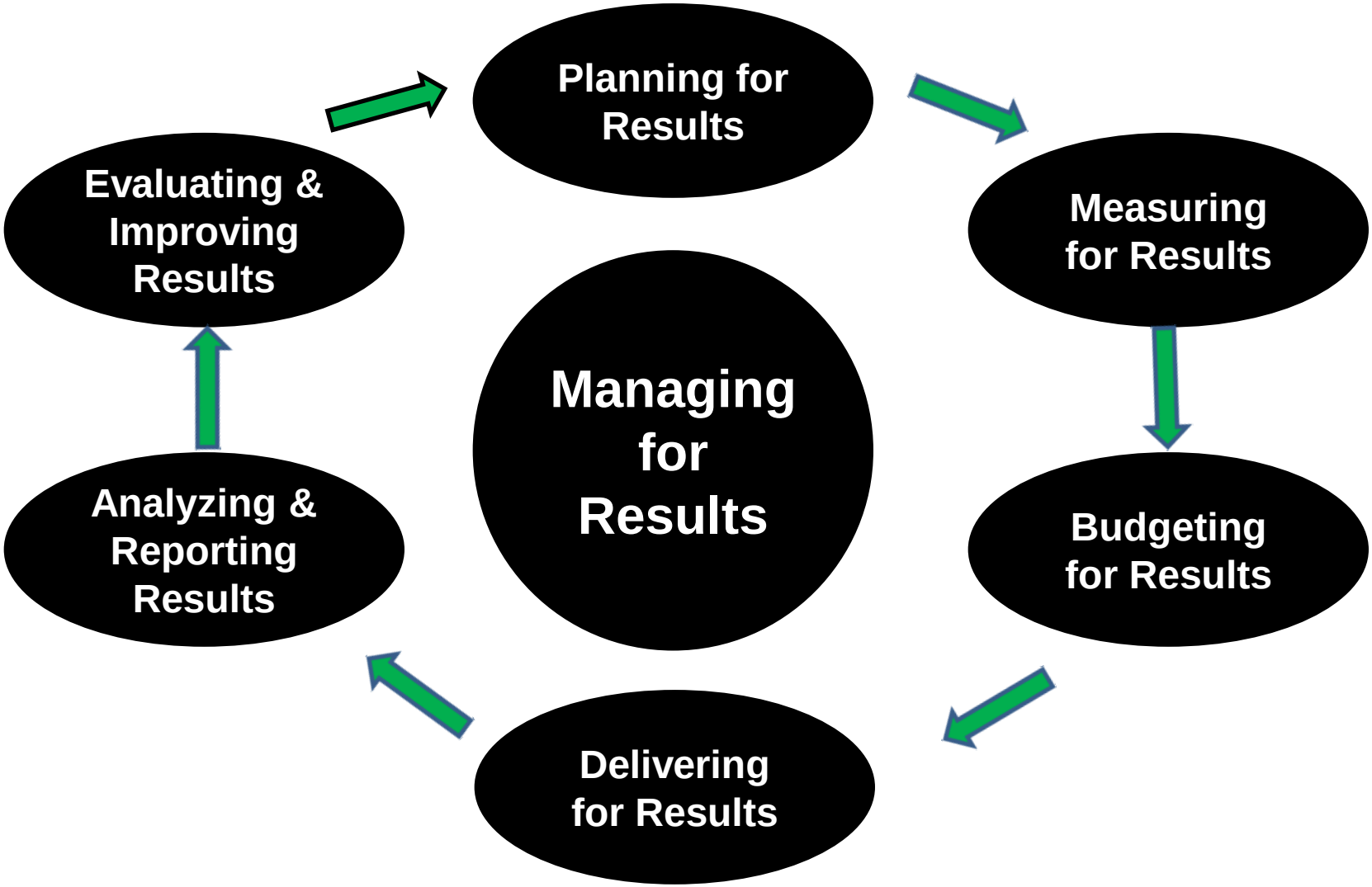
Risk Management Decision Matrix

Likelihood of Failure	Low	Moderate	High
High	Repair/Replace on Failure	Programmed Rehab/Replace	Immediate Rehab/Replace
Moderate	Monitor and Forecast	Proactive Assessment	Programmed Rehab/Replace
Low	Monitor and Forecast	Opportunistic Assessment / Forecasting	Proactive Assessment
	Consequence of Failure		

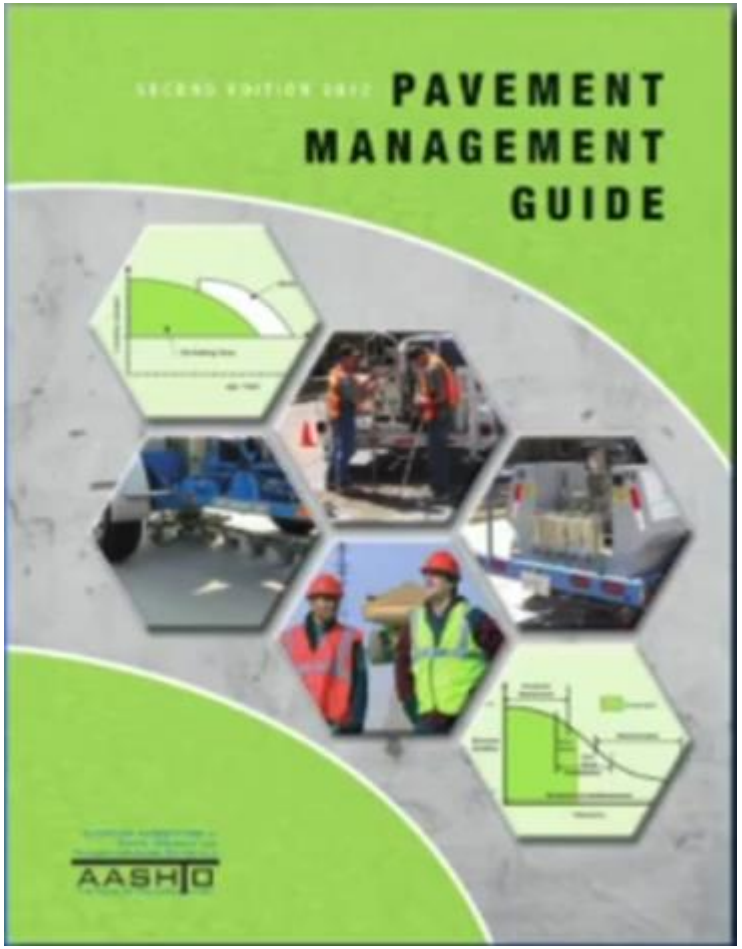
How Do You Do Business?

- Preserve your assets and minimize their whole life costs.
- Operate in a financially sustainable manner.
- Provide a framework to improve performance on a long-term basis.

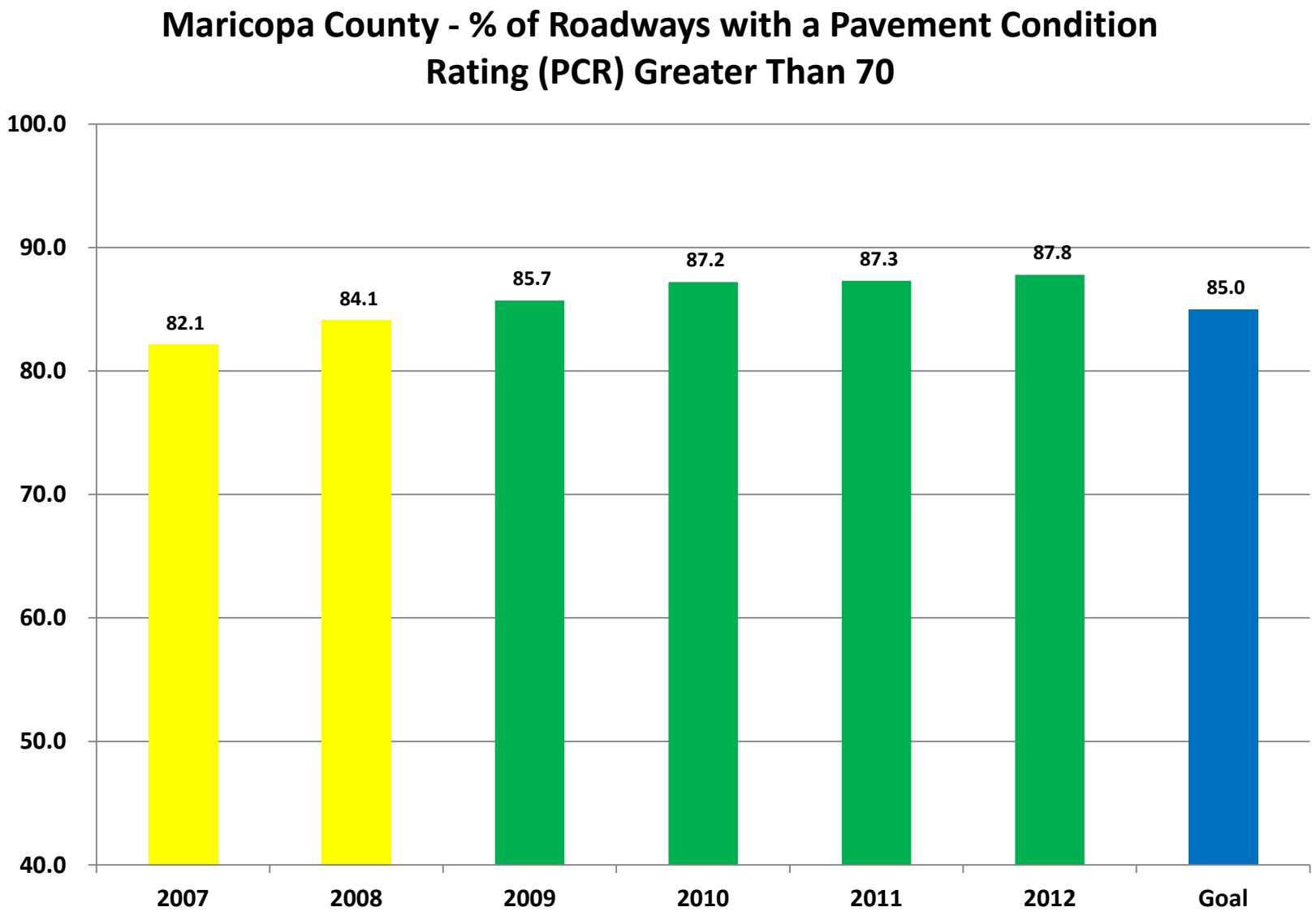
Managing for Results



AASHTO Management Systems

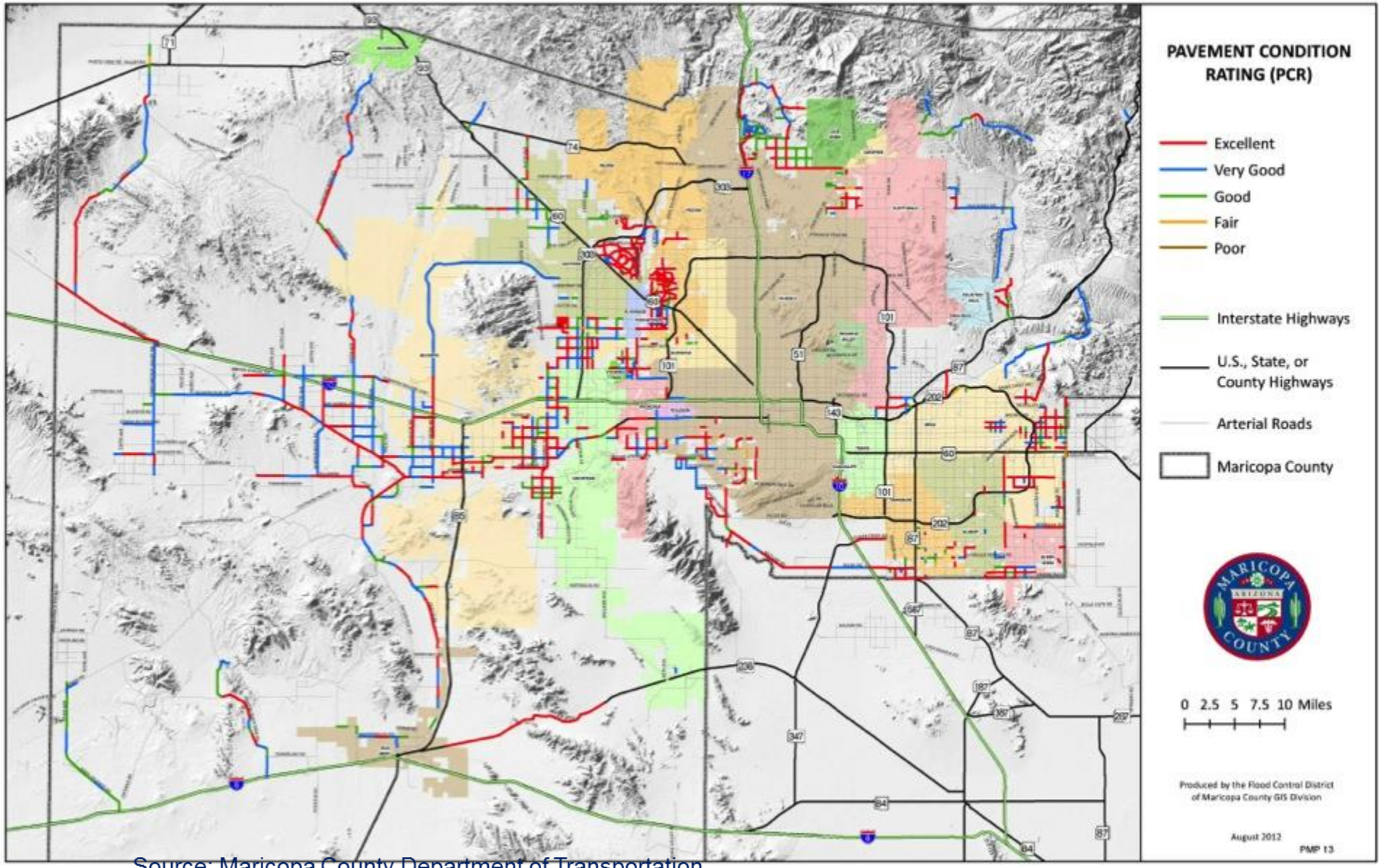


Pavement Condition Reflects the Quality of the Roads in Maricopa County



Source: Maricopa County Department of Transportation

System Pavement Condition Rating (PCR)

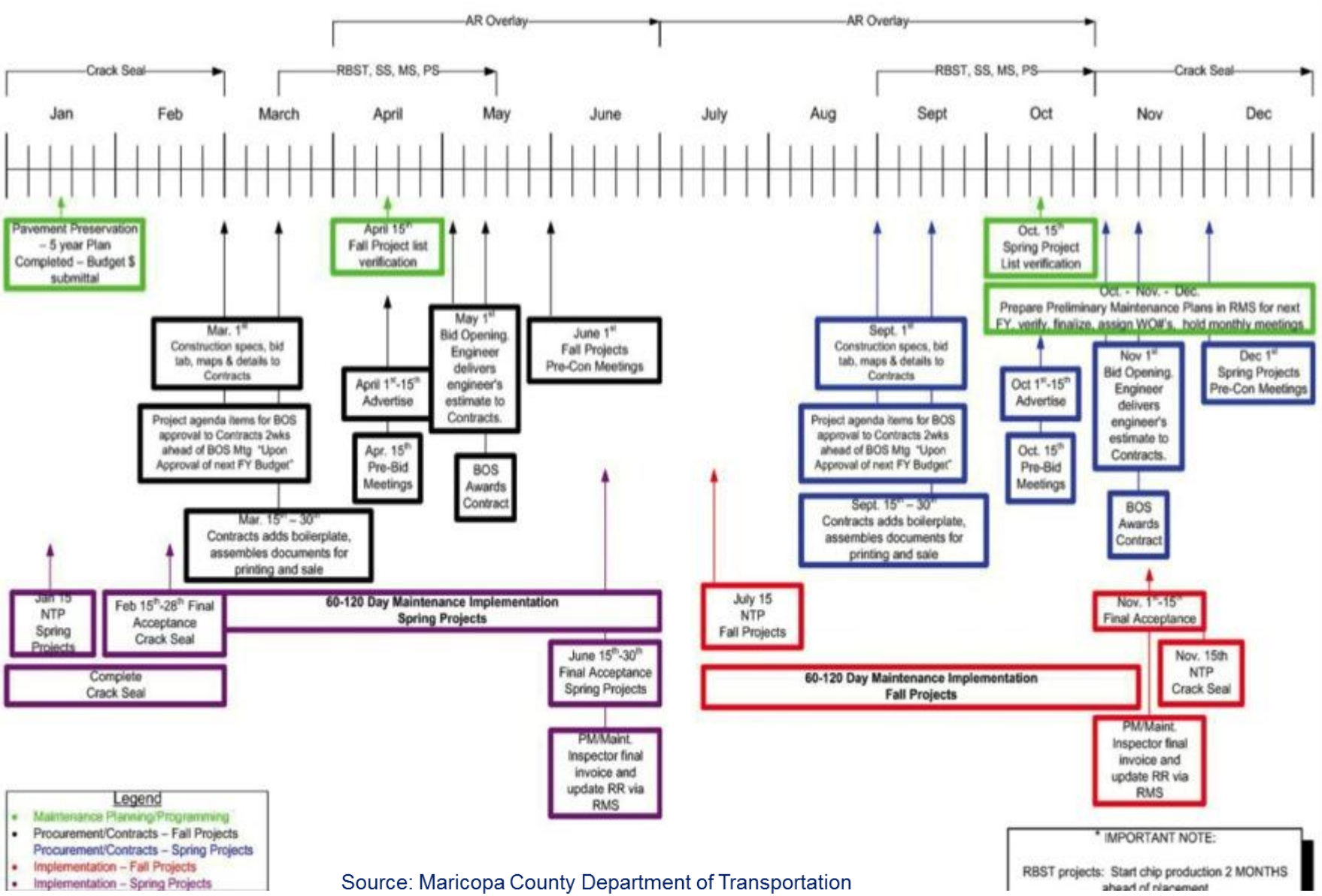


Source: Maricopa County Department of Transportation

Typical Surface Treatment Programs

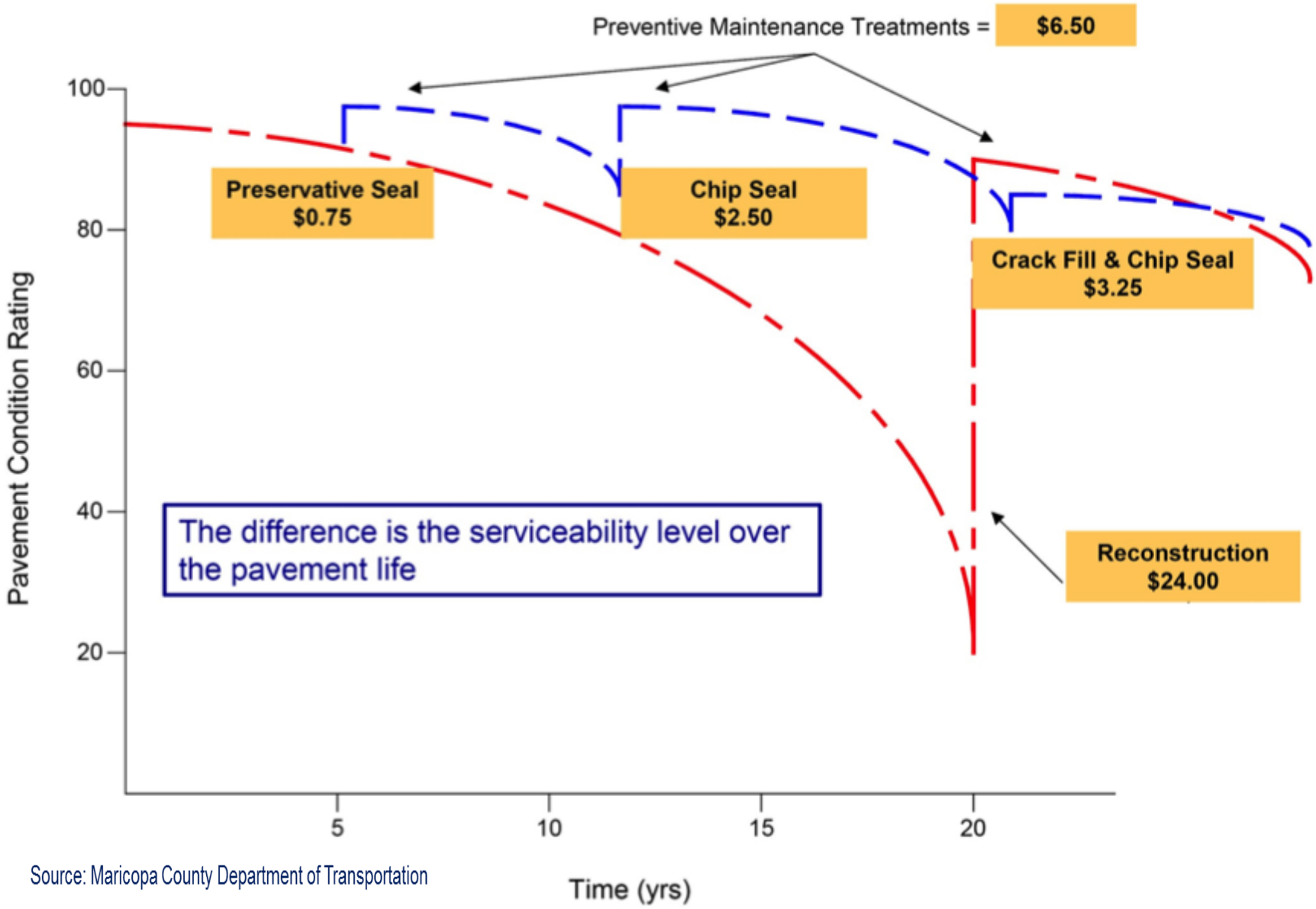
Road Condition Rating	Pavement Condition Index	International Roughness Index	Fog Seal	Preservative Seal	Crack Seal	Scrub Seal	Slurry Seal	Chip Seal	Microsurface	AR Overlay 1 1/2"	Mill & Replace 1 1/2" AR	Over Lay 2"	Cold In-Place with Chip Seal	Hot In-Place Recycle with 1 1/2" New AR	Reconstruct
EXCELLENT	100	0	■												
	95	50	■	■	■		■								
	90	80	■	■	■		■		■						
GOOD	85			■	■		■		■	■		■			
	80				■		■	■	■	■		■			
	75				■			■		■		■		■	
	70	120			■			■		■	■	■		■	
FAIR	65				■			■			■	■		■	
	60				■	■		■			■			■	
	55				■	■		■			■			■	
	50	220			■	■		■			■			■	
POOR	45					■		■			■		■		
	40					■					■		■		
	35					■							■		
	30												■		■
FAILED	25												■		■
	20												■		■
	15														■
	10														■
	5														■
	0														■
	Costs Per Syd		$0.25	$0.45	$0.50	$2.00	$2.10	$2.50	$3.25	$8.50	$9.50	$9.75	$9.80	$10.00	$25.35

Timeline for Annual Pavement Management Program



Source: Maricopa County Department of Transportation

Pavement Preservation Strategies



Source: Maricopa County Department of Transportation

Asphalt Pavement Surface Distress Rating System

Extent Spacing	Severity/Width			
	< 3/8"		> 3/8"	
> 50 ft	1	(3)	4	(6)
12 ft to 50 ft	2	(5)	5	(8)
< 12 ft	3	(7)	6	(10)T

D-76

Fatigue Cracking

Extent	Severity/Width					
	< 1/8"		> 1/8"		Blocks	
One or two < 50 sf	1	(4)	5	(5)	9	(9)
Three or more < 50 sf	2	(6)	6	(7)	10	(11)
One of two > 50 sf	3	(8)	7	(12)	11	(14)
Three or more > 50 sf	4	(10)	8	(13)	12	(15)T

D-40

Rutting

Extent	Severity	
Laser Average 0.00-0.12	0	(0)
Laser Average 0.13-0.25	1	(4)
Laser Average 0.26-0.38	2	(8)
Laser Average 0.39-0.50	3	(12)
Laser Average > 0.50	4	(15)T

D-60

Shoving/Pushing/Corr.

Extent	Severity	
Laser Avg. IRI 0-59	0	(0)
Laser Avg. IRI 60-94	1	(3)
Laser Avg. IRI 95-170	2	(5)
Laser Avg. IRI 171-220	3	(8)
Laser Avg. IRI > 220	4	(10)T

D-60

Excess Asphalt

Extent	Severity/Film			
	Thin		Thick	
Wheel Paths < 50% length	1	(3)	5	(4)
Wheel Paths > 50% length	2	(5)	6	(6)
Entire Width < 50% length	3	(7)	7	(8)
Entire Width > 50% length	4	(9)	8	(10)T

D-60

Extent	Severity/Width			
	< 3/8"		> 3/8'	
Centerline Single	1	(3)	4	(6)
Wheel Path Single	2	(5)	5	(8)
Multiples	3	(7)	6	(10)T

D-70

Block Cracks

Extent Block Size	Severity/Width			
	< 3/8"		> 3/8"	
> 50 sf	1	(3)	4	(6)
50 to 6 sf	2	(5)	5	(8)
< 6 sf	3	(7)	6	(10)T

D-50

Raveling

Extent	Severity/Width			
	Minor		Major	
Wheel Paths < 50% length	1	(2)	5	(3)
Wheel Paths > 50% length	2	(4)	6	(5)
Entire Width < 50% length	3	(6)	7	(9)
Entire Width > 50% length	4	(8)	8	(10)

D-60

Patching

Extent/Number	Severity/Quality of Repair					
	Good		Fair		Poor	
< 5 Repairs	1	(01)	4	(04)	7	(07)
5 to 15 Repairs	2	(02)	5	(05)	8	(09)
> 15 Repairs	3	(03)	6	(06)	9	(10)T

D-50

Notes:
1. All numbers in parentheses are deduction points.
2. D = Default.
3. Trigger is activated when the rating is applied if the "T" value results in a lower Pavement Condition Rating (PCR) than the sum total of the deductions.

Raveling

Extent	Severity/Width			
	Minor		Major	
Wheel Paths < 50% length	1	(2)	5	(3)
Wheel Paths > 50% length	2	(4)	6	(5)
Entire Width < 50% length	3	(6)	7	(9)
Entire Width > 50% length	4	(8)	8	(10)

D-60

Patching

	Severity/Quality of Repair	
	Good	Fair

Bridge Inspection Summary Report

Element Evaluation

Element	
38 Concrete Slab	2 L
800 AC Wear Sort	
210 R/C Pier Wall	2 Lov
215 R/C Abutment	2 Low
321 R/Conc Approach Slab	2 Low
800 AC Wear Sort	
333 Other Bridge Railing	2 Low
830 R/Conc Wing Wall	2 Low
840 Metal Trans Railing	2 Lov
835 Gatr Coat	
850 Metal Apr Railing	2 L
835 Gatr Coat	
851 Conc Appr Railing	

City of Phoenix
STREET TRANSPORTATION DEPARTMENT
Bridge & Dam Safety

Bridge Inspection Report
09599

Print Time 4/15/2013 8:37:23AM
Page 1 of 10
Inspector: Wojciechowski
Inspection Date: 03/05/2013

Structure Name: Indian Bend Wash Br **Facility:** Tatum Boulevard **Feature Crossed:** INDIAN BEND WASH
Location: Tatum N Of Cholla St

Inspection Group :**Cycle B** Road Name :**Tatum Boulevard**
Sub Group : Agency :**Phoenix**
Political Unit (A250) :**District 3** Maintenance District :**NSC**

Registered Professional Engineer (Civil) CERTIFICATE NO. 28174 MARK PILWALLIS ARIZONA, U.S.A.
Expires Sept. 2015

Last Inspection Date : **03/03/2011** Insp No (A208) : **16**
Next Inspection Date : **March 2015** Inspection By : **MBJ-ws, BW-cop**
Inspection Crew (A224) : **9** Second Inspection By :

Structure Evaluation
Deck Rating (58) : **7 Good**
Super Rating (59) : **7 Good**
Sub Rating (60) : **7 Good**
Culvert Rating (62) : **N N/A (NBI)**

Roadway Evaluation
Appr Roadway (72) : **8 Equal Desirable Crit**
Bridge Rail (36A) : **1 Meets Standards**
Transition Rail (36B) : **1 Meets Standards**
Roadway Rail (36C) : **1 Meets Standards**
End Section (36D) : **N N/A or not required**

Waterway Evaluation
Chanel Protection (61) : **8 Protected**
Waterway Adequacy (71) : **8 Equal Desirable**
Scour Critical (113) : **3 SC - Unstable**

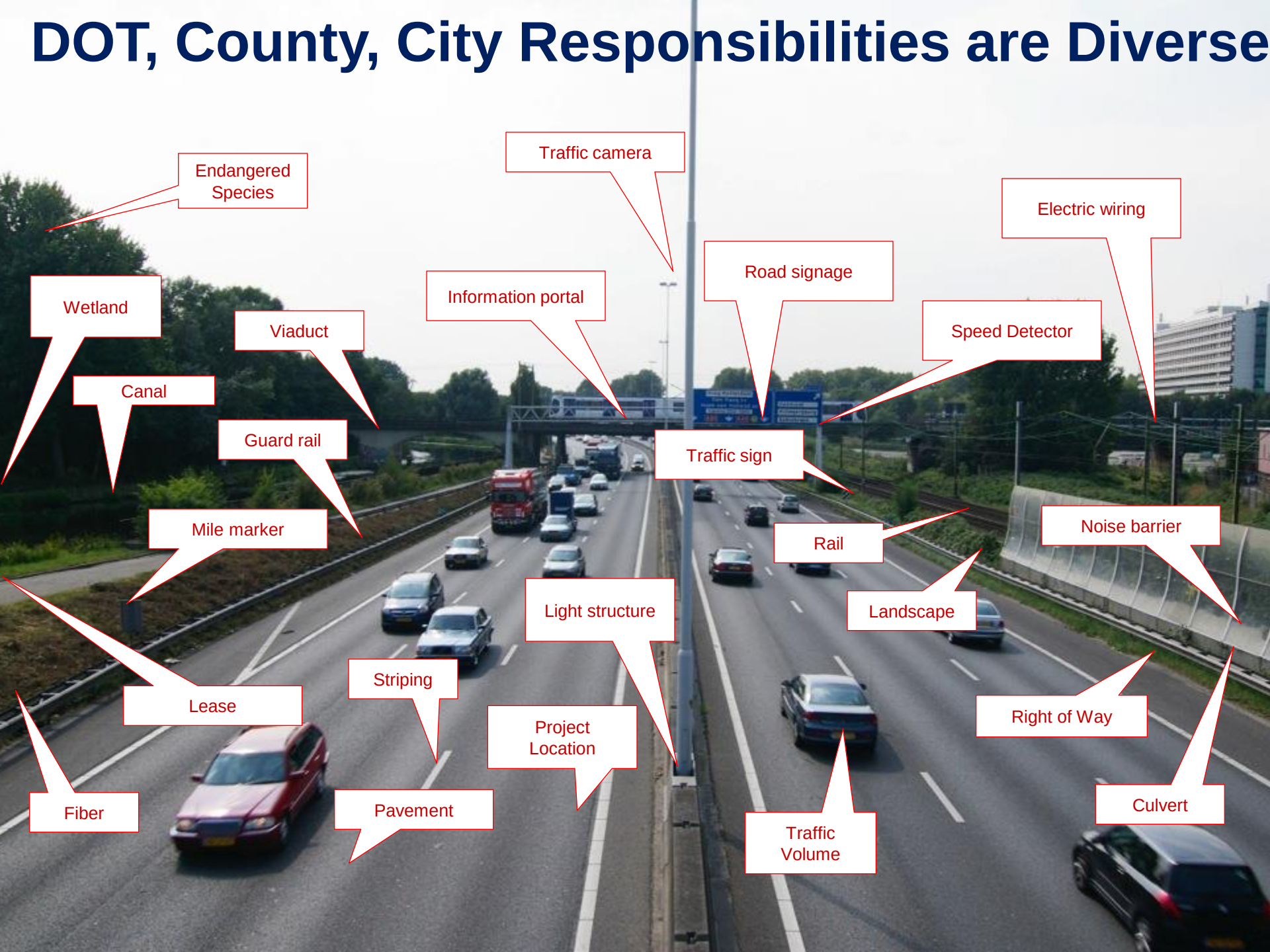
Structure Appraisal (Computed)
Structure Eval (67) : **7 Above Min Criteria**
Deck Geom (68) : **2 Intolerable - Replace**
Under Clearance (69) : **N Not applicable (NBI)**

Element Evaluation

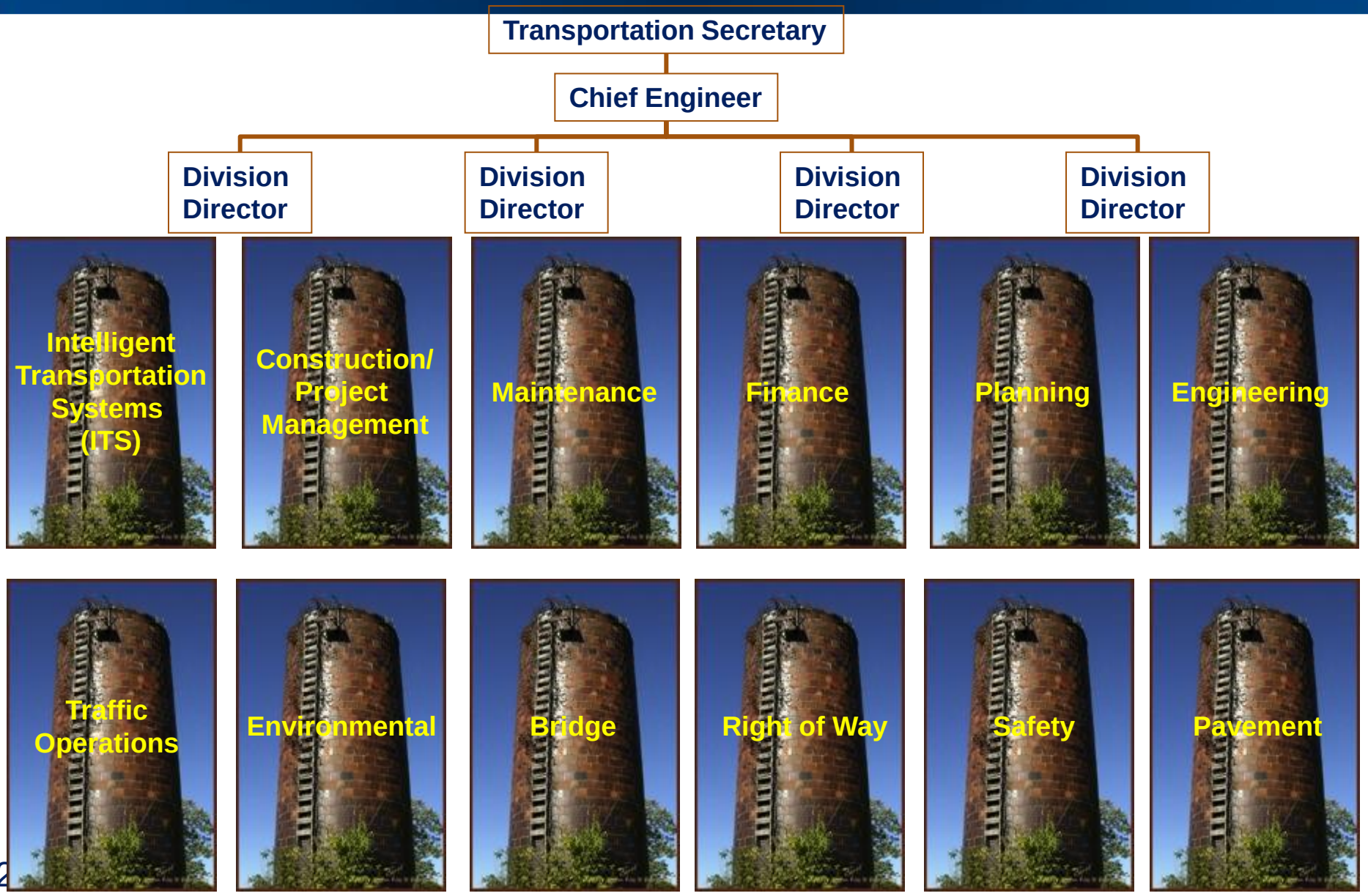
Element	Env	Span Unit	Quantity Total	State 1	State 2	State 3	State 4
38 Concrete Slab	**2 Low**	**M Main**	**18944 sq.ft**	**18944**	**0**	**0**	**0**
800 AC Wear Surf	*Protect System*	*M Main*	*13032 sq ft*	*0*	*0*	*13032*	*0*
210 R/C Pier Wall	**2 Low**	**M Main**	**600 ft**	**577**	**15**	**8**	**0**
215 R/C Abutment	**2 Low**	**M Main**	**240 ft**	**214**	**26**	**0**	**0**
321 R/Conc Approach Slab	**2 Low**	**M Main**	**2958 sq.ft**	**2958**	**0**	**0**	**0**
800 AC Wear Surf	*Protect System*	*M Main*	*2958 sq ft*	*0*	*0*	*2958*	*0*
333 Other Bridge Railing	**2 Low**	**M Main**	**361 ft**	**360**	**0**	**1**	**0**
830 R/Conc Wing Wall	**2 Low**	**M Main**	**144 ft**	**143**	**0**	**1**	**0**
840 Metal Trans Railing	**2 Low**	**M Main**	**78 ft**	**72**	**0**	**6**	**0**
835 Gatr Coat	*Protect System*	*M Main*	*351 sq ft*	*0*	*191*	*160*	*0*
850 Metal Apr Railing	**2 Low**	**M Main**	**435 ft**	**433**	**0**	**2**	**0**
835 Gatr Coat	*Protect System*	*M Main*	*1305 sq ft*	*0*	*1095*	*210*	*0*
851 Conc Appr Railing	**2 Low**	**M Main**	**28 ft**	**28**	**0**	**0**	**0**

Inspection Notes
Mike Johnson and Bobby Wojciechowksi inspected on 3-5-2013

DOT, County, City Responsibilities are Diverse



Typical Organizational Structure



Technologies in Today's Agencies Cover a Wide Assortment

What is the best way to bring all of this information together?

Accident data:
GPS, Electronic Forms

Winter Operations:
AVL, Blade & Spreader Monitoring

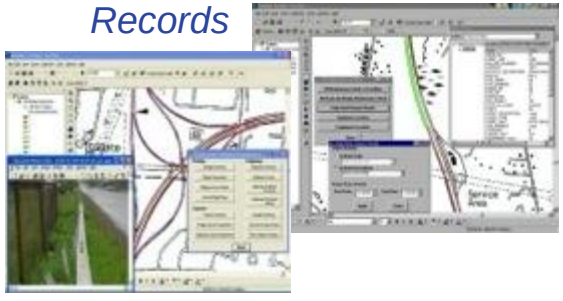
Asset Inventory:
GPS, Electronic Forms, LIDAR, Video Log, Laser

Communication & Reporting:
511 Telephones, Traveler Info Web Sites, HPMS Report, Databases, Radio Network, Computer Networks

Construction Activities:
Survey, CADD, Project Management Software

Intelligent Transportation Systems:
Road Sensors, Cameras, Fiber Variable Message Signs, Vehicle/Device Communication, Visualization

Maintenance Activities:
Automated Scheduling & Prioritization, Work Records

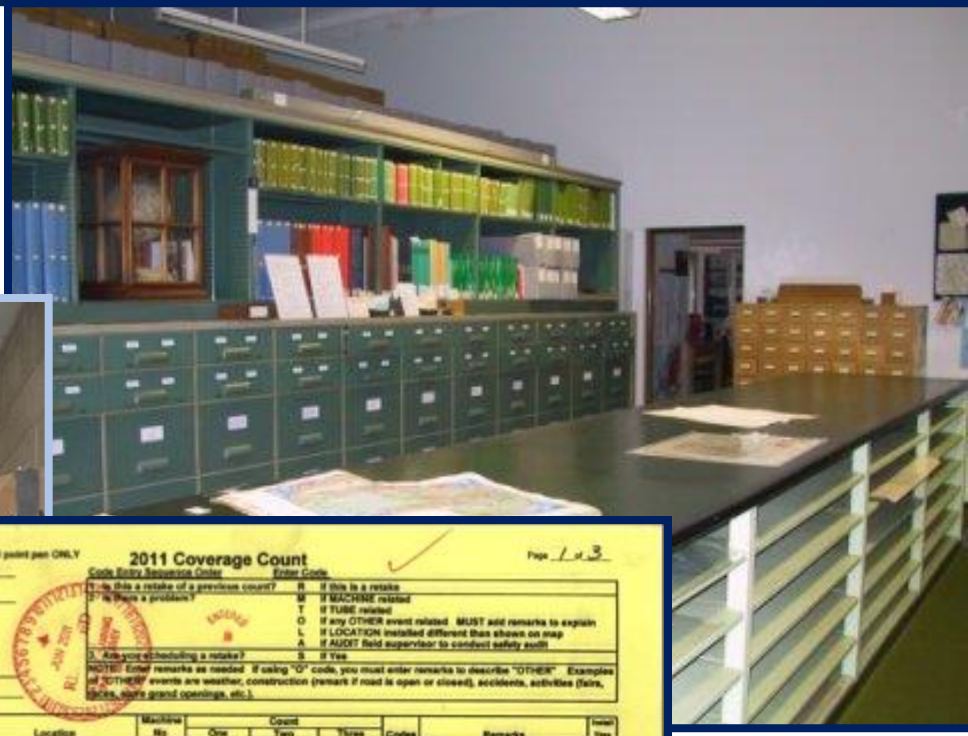


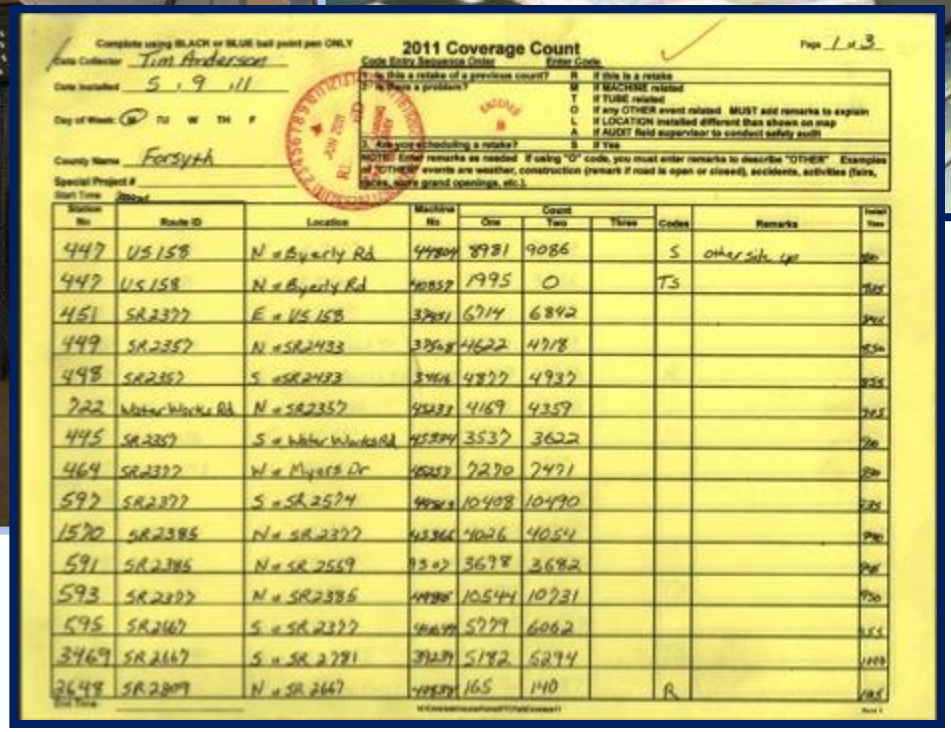
Resource Management:
Time sheets, Financial Systems

And then there is paper…

How do you make use of these data?

How do you make use of this data?





2011 Coverage Count

Page 1 of 3

Date Collector: Tim Anderson

Date Installed: 5/9/11

Day of Week: TU W TH F

County Name: Forsyth

Special Project #:

Start Time: 0800

Code Entry Sequence Order | Enter Code

1 - Is this a retake of a previous count? R If this is a retake

2 - Is there a problem? M If MACHINE related; T If TUBE related; O If any OTHER event related MUST add remarks to explain; L If LOCATION installed different than shown on map; A If AUDIT field supervisor to conduct safety audit

3 - Are you rescheduling a retake? S If Yes

NOTE: Enter remarks as needed. If using "O" code, you must enter remarks to describe "OTHER". Examples of "OTHER" events are weather, construction (remark if road is open or closed), accidents, activities (fairs, races, store grand openings, etc.).

Station No	Route ID	Location	Machine No	Count One	Count Two	Count Three	Codes	Remarks	Initial Time
447	US 158	N of Byerly Rd	44980	8981	9086		S	other side up	
447	US 158	N of Byerly Rd	40852	1995	0		TS		
451	SR 2377	E of US 158	37451	6714	6842				
449	SR 2357	N of SR 2433	37568	4622	4718				
498	SR 2357	S of SR 2433	37464	4877	4937				
722	Water Works Rd	N of SR 2357	45233	4169	4359				
445	SR 2357	S of Water Works Rd	45394	3537	3622				
464	SR 2377	W of Myers Dr	40253	7270	7471				
597	SR 2377	S of SR 2574	44934	10408	10490				
1570	SR 2385	N of SR 2377	45366	4026	4054				
591	SR 2385	N of SR 2569	45107	3678	3682				
593	SR 2377	N of SR 2385	44988	10544	10731				
595	SR 2167	S of SR 2377	44699	5779	6062				
3469	SR 2167	S of SR 2781	39439	5182	5294				
3648	SR 2809	N of SR 2167	40859	165	140		R		

Detailed Integration

File Edit View Favorites Tools Help

Favorites | BPA Test | District 4

Project Suite | Web

ProjectSuite

FM#:

Advanced Search

Project Tree

Sync View

- 421662.1
  - Video Log
  - Project Impacts (GIS)
  - Scope
  - Schedule Changes
  - Scheduling
  - EVT
  - Drainage
  - Final Plans
  - Contracts
  - Environmental Tracking System
  - Commitment
  - Status
  - Contacts
  - File Uploads

Project Specific Options

Item Segment

Item Segment	Project Manager	Goes With	Lead Job	Related Projects
421662.1	Fausto Gomez	--	--	

Location

County	City
BROWARD	COCONUT CREEK CORAL SPRINGS MARGATE PARKLAND

Roadway ID	Side	MP From/To	Section Work Length
86100000	Composite	20.941 / 23.359	2.418
86100102	Composite	0.000 / 0.226	0.226

Show All Locations...

SR/Local Name	Limits
SR-7/US-441	FM SAMPLE RD N. APPROACH TO N OF SAWGRASS/TPK

Description

Work Mix	Status	Cont.Class	Federal Oversight
RESURFACING	CONTRACT EXECUTED	TO BE LET	NO

Item Segment Comments/Extra Description

INCLUDES 2 NORTHERN RAMPS UNDER SECTION 86100102 & 103/ SCOPE INCLUDES SAFETY WORK PH52 SPLIT FUNDED DDR/HSP APPROVED BY SAFETY COMMITTEE 4/19/07

Financial

Phase	(PDC) Funded	FY(1st)	UnFunded	Fed Aid #
Preliminary Engineering (3X)	$857,841.00	2008	$0.00	--
Construction (5X)	$3,358,663.00	2011	$0.00	4751-128-P
Consultants/Contractors (52)	$3,358,663.00	2011	$0.00	4751-128-P
Construction Support (6X)	$783,138.00	2011	$0.00	--

Earned Value

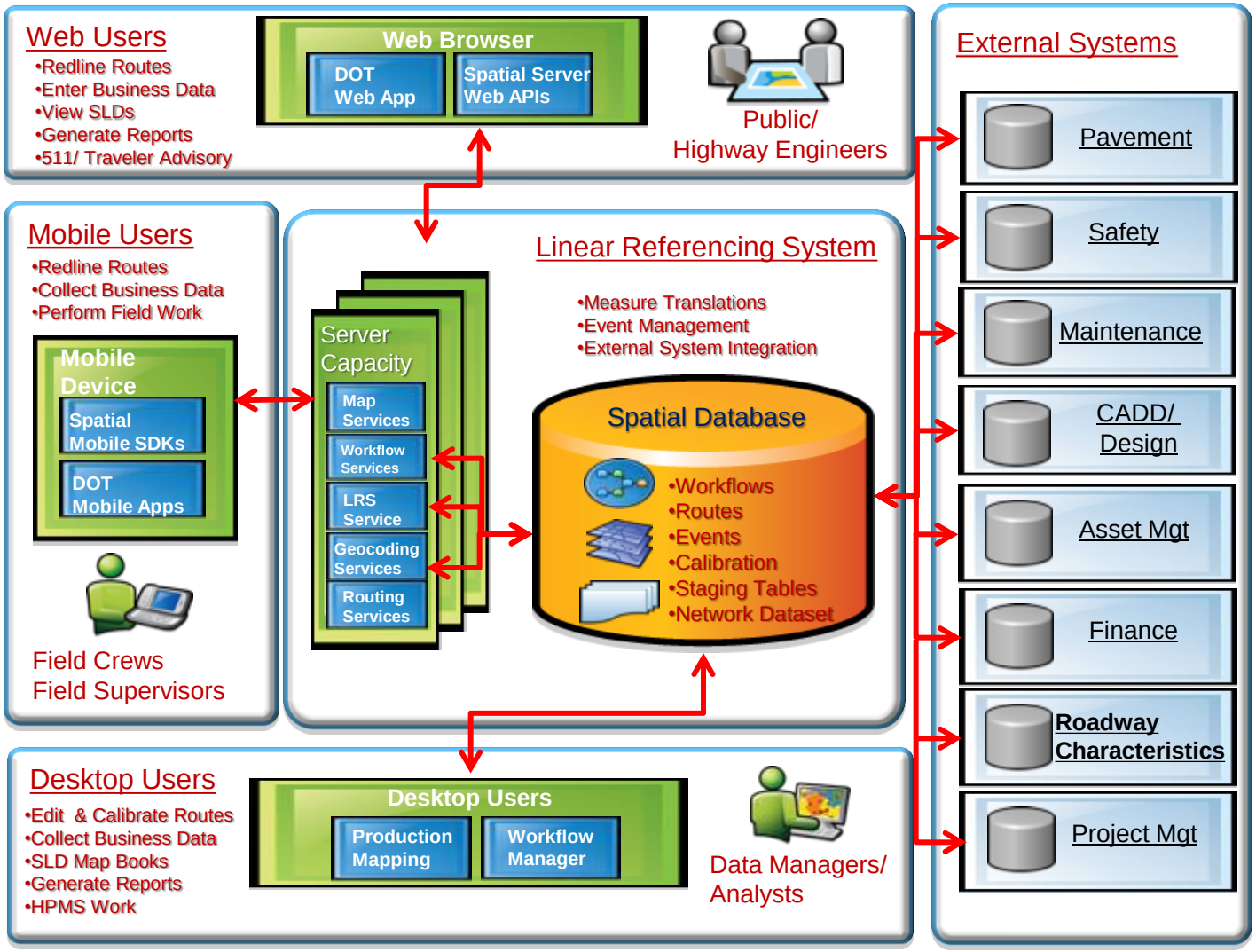
Cost Performance Indicator

1.03

Schedule Performance Indicator

1.02

Fundamentals For a Highly Integrated Engineering Environment



GIS

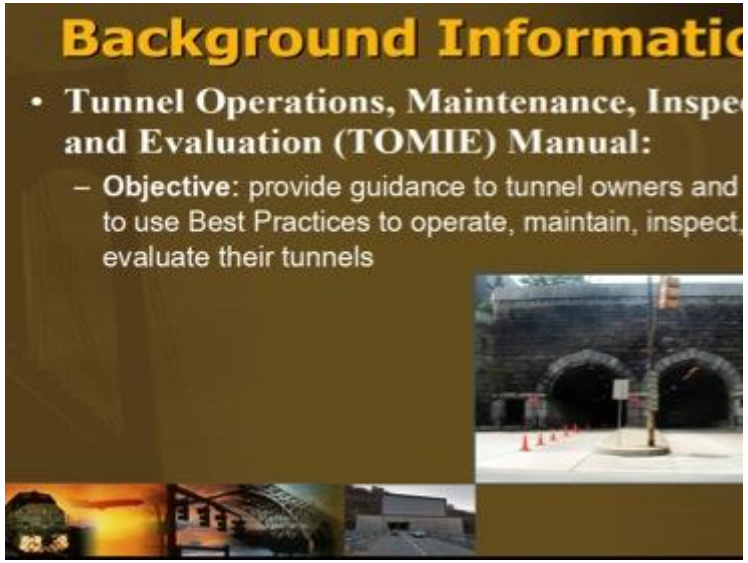
- **Does my LRS support a stable multiple linear referencing system, dual carriageways, and event data over time for local, state and federal roads?**
- **Is my roadway information management system efficient enough to collect and manage changes for local, state, and federal roads?**
- **Can I quickly and accurately comply with HPMS and other federal reporting?**
- **Does my performance management system provide accurate reports and analytics for external and internal communications?**

GIS Support to MAP-21

- **Linear Referencing**
  - Multiple linear referencing methods
  - Multiple geometric representation
- **Roadway Inventory Management**
  - Event data management of roadway assets and HPMS section data
- **Highway Safety Planning**
  - Locate crash data
  - Identify hot spots
  - Monitor effect of counter-measures
- **HPMS Report**
  - Manage, view, report
  - Pull in data from different sources
  - Validate
  - Submit
  - HPMS 2014 requires dual carriageway
- **Performance Monitoring and Management**

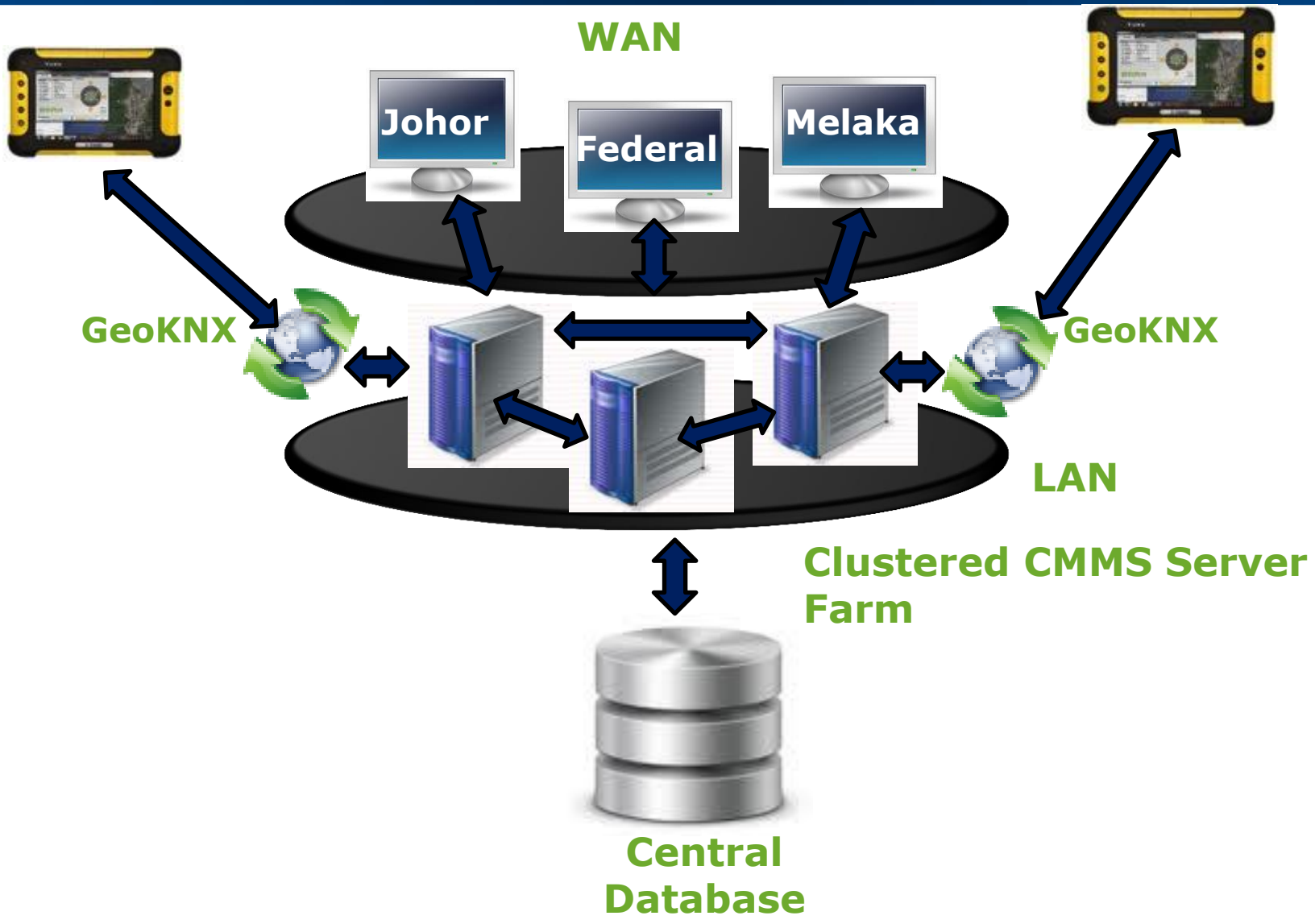
Transportation Infrastructure Management

- **Locate**
  - Infrastructure
  - Hazardous Locations
  - Crashes
- **Inspect (e.g. bridges and tunnels)**
- **Monitor**
- **Report**
  - Prioritize Capital Improvement
  - Effects of Safety Planning Overtime
  - Streamline Reporting
    - Internal
    - Share with public
    - Thematic maps

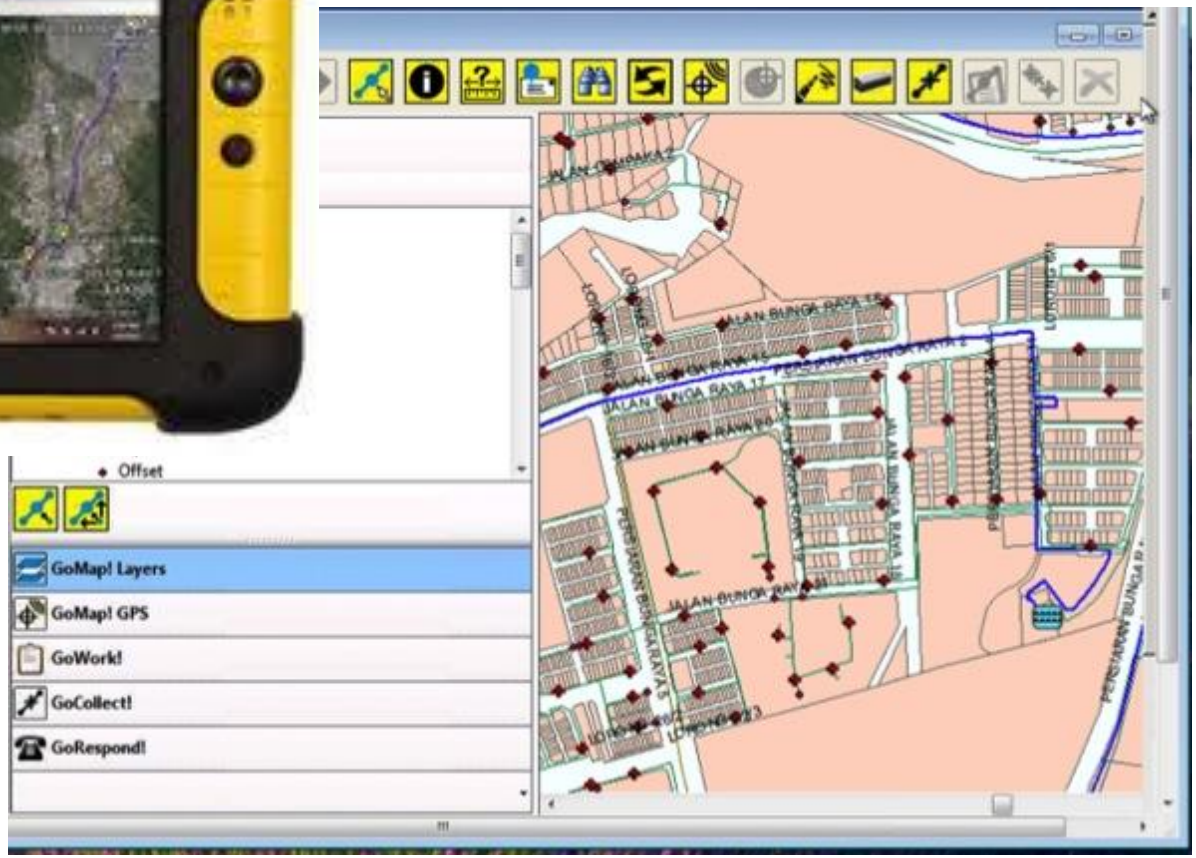


Tunnel Operations, Maintenance, Inspection & Evaluation

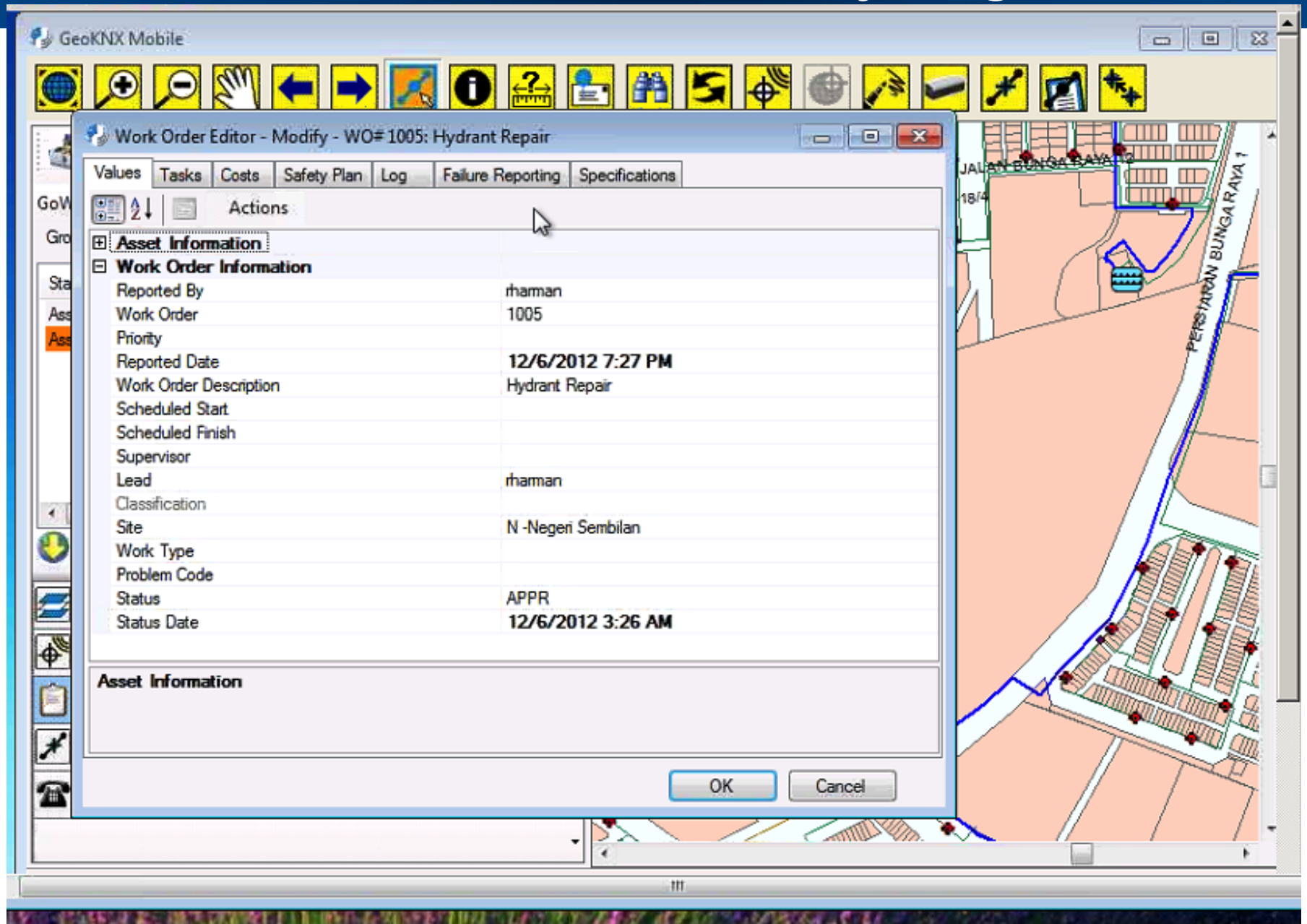
So What Might This System Look Like?



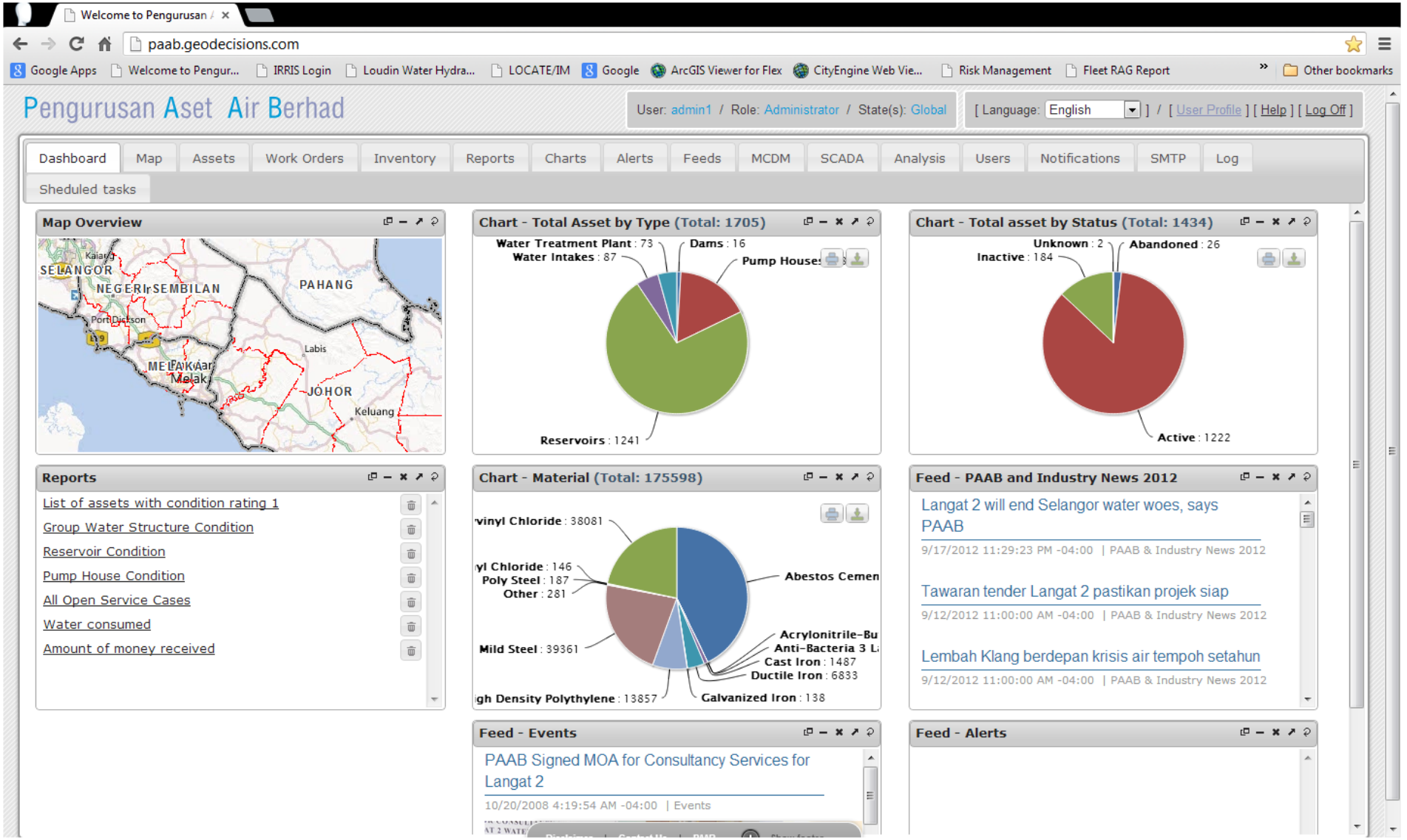
Mobile Data Collection Tool
Syncs with Office Database



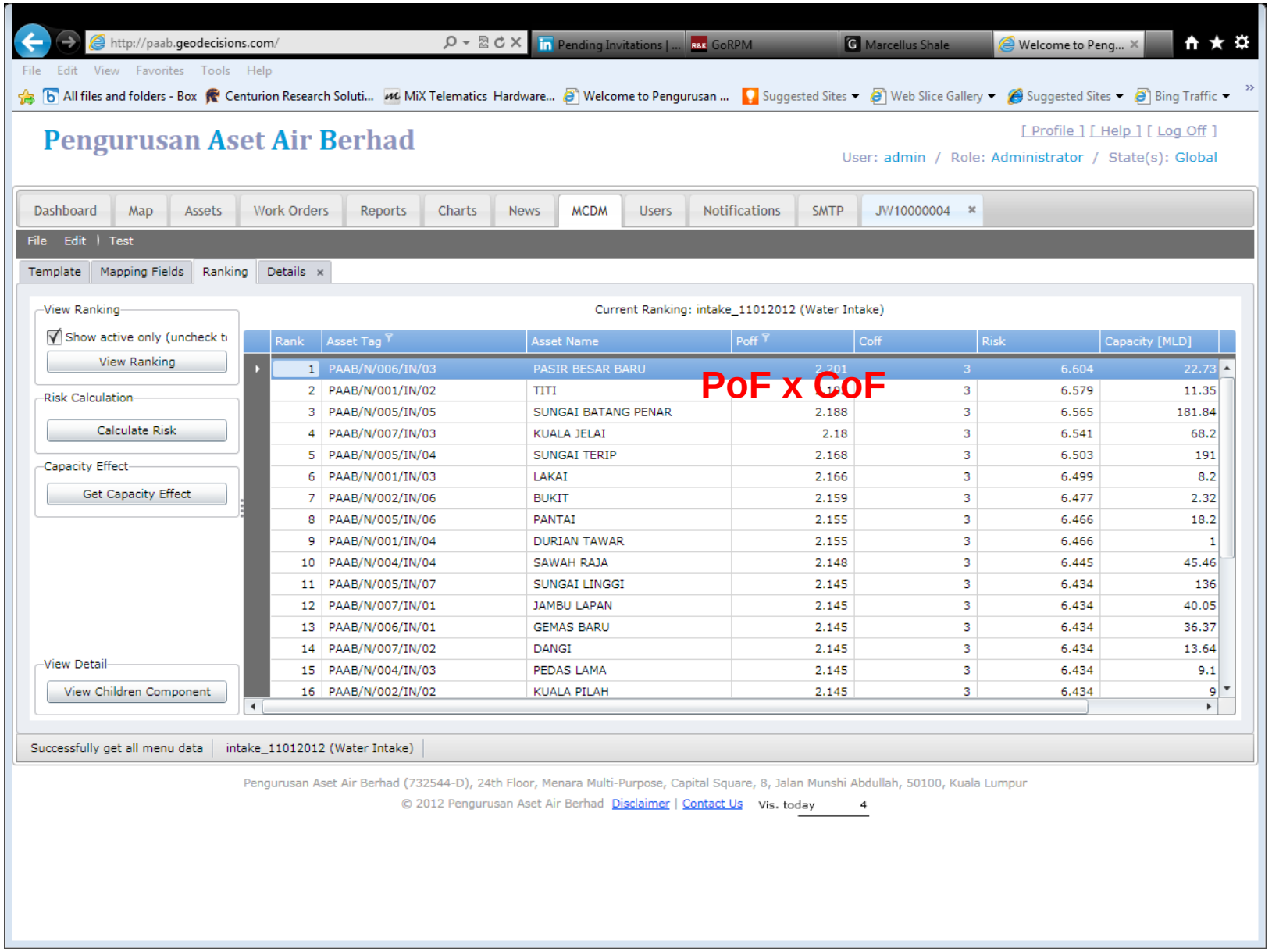
And Includes Work Order Editor, Syncing Real Time



Customizable User Interface – “Dashboard”

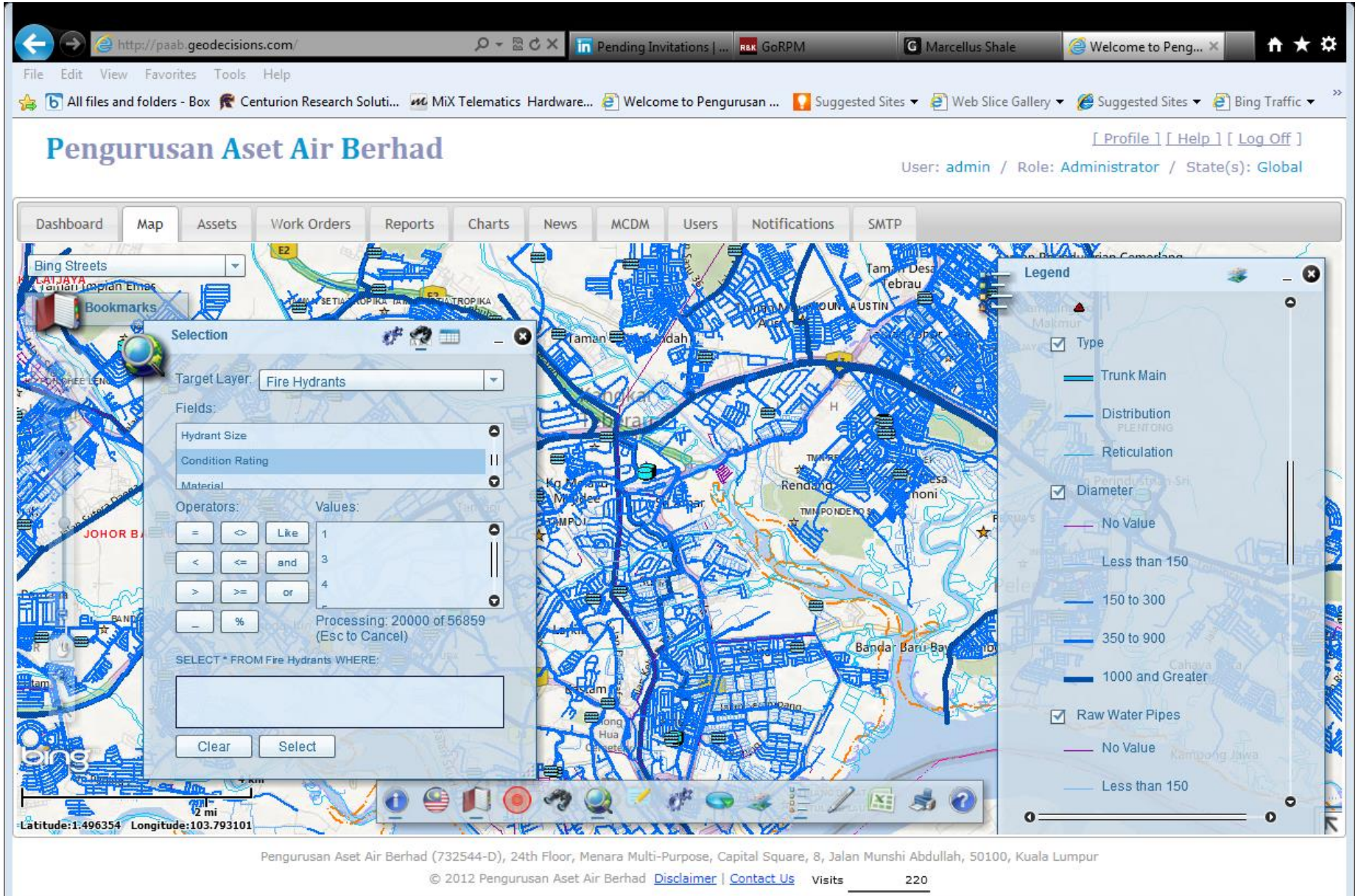


And Multiple Criteria Decision Model – Asset Rankings

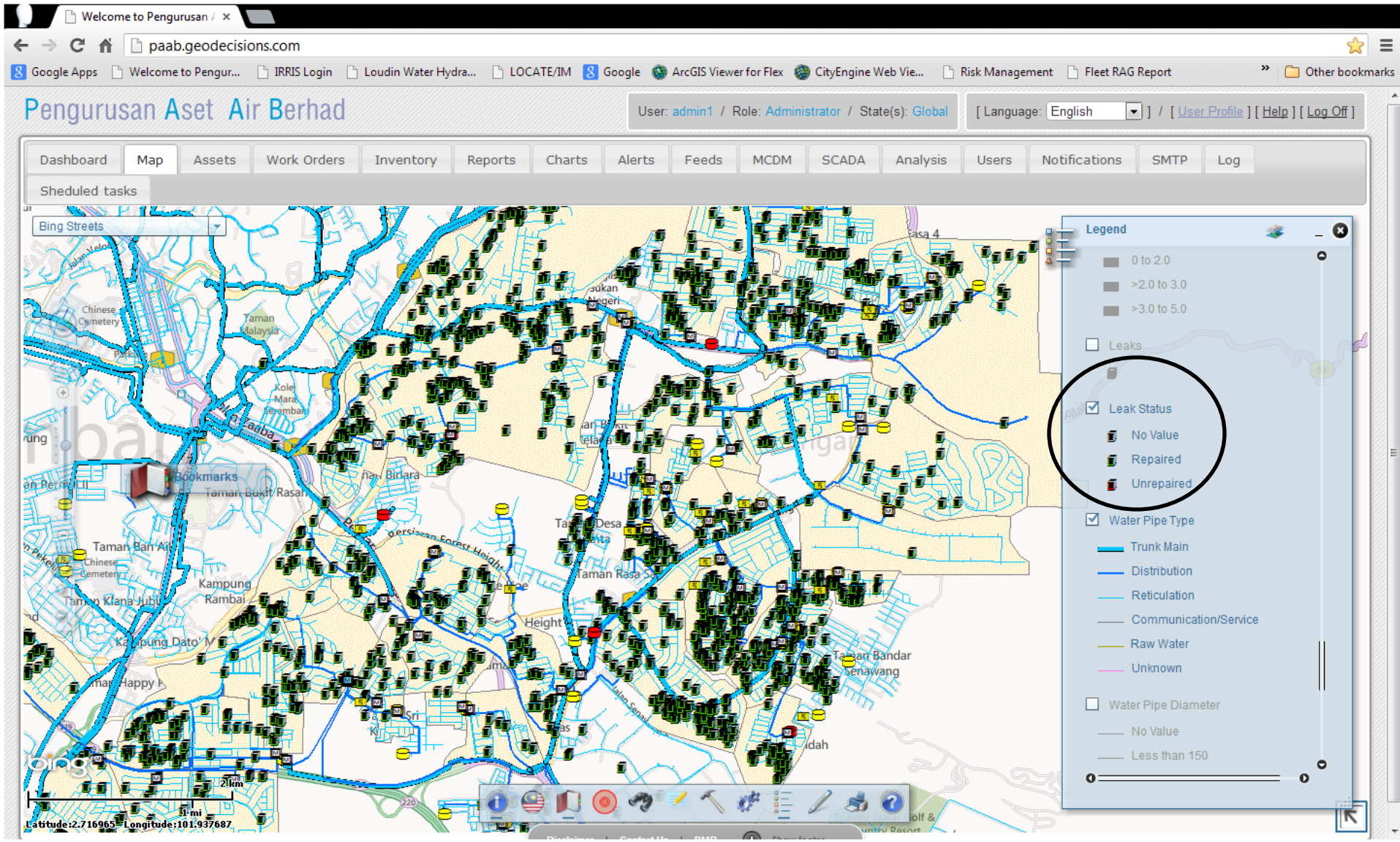


Rank	Asset Tag	Asset Name	Poff	Coff	Risk	Capacity [MLD]
1	PAAB/N/006/IN/03	PASIR BESAR BARU	2.201	3	6.604	22.73
2	PAAB/N/001/IN/02	TITI	2.193	3	6.579	11.35
3	PAAB/N/005/IN/05	SUNGAI BATANG PENAR	2.188	3	6.565	181.84
4	PAAB/N/007/IN/03	KUALA JELAI	2.18	3	6.541	68.2
5	PAAB/N/005/IN/04	SUNGAI TERIP	2.168	3	6.503	191
6	PAAB/N/001/IN/03	LAKAI	2.166	3	6.499	8.2
7	PAAB/N/002/IN/06	BUKIT	2.159	3	6.477	2.32
8	PAAB/N/005/IN/06	PANTAI	2.155	3	6.466	18.2
9	PAAB/N/001/IN/04	DURIAN TAWAR	2.155	3	6.466	1
10	PAAB/N/004/IN/04	SAWAH RAJA	2.148	3	6.445	45.46
11	PAAB/N/005/IN/07	SUNGAI LINGGI	2.145	3	6.434	136
12	PAAB/N/007/IN/01	JAMBU LAPAN	2.145	3	6.434	40.05
13	PAAB/N/006/IN/01	GEMAS BARU	2.145	3	6.434	36.37
14	PAAB/N/007/IN/02	DANGI	2.145	3	6.434	13.64
15	PAAB/N/004/IN/03	PEDAS LAMA	2.145	3	6.434	9.1
16	PAAB/N/002/IN/02	KUALA PILAH	2.145	3	6.434	9

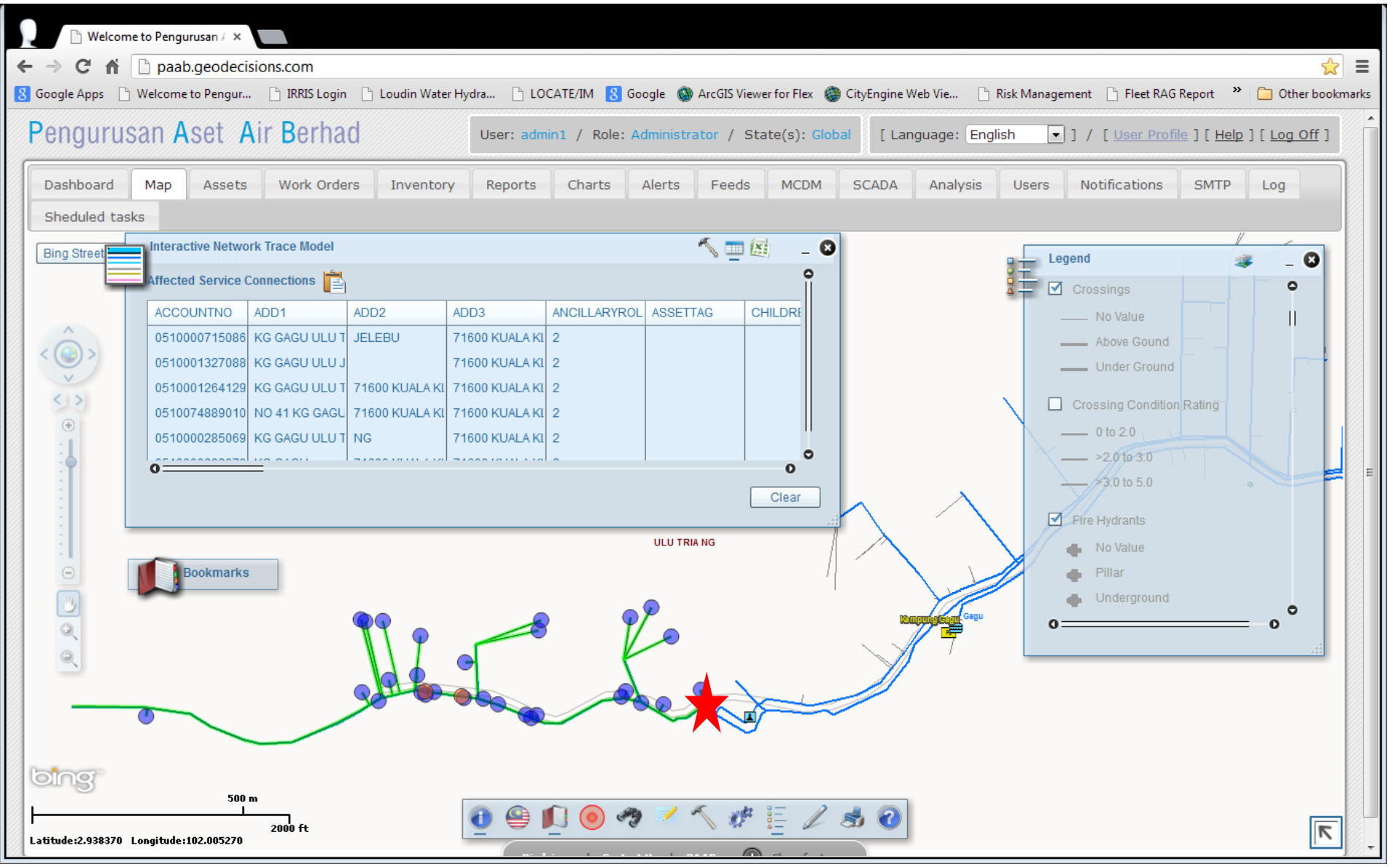
Searchable Maps Enhance Access and Understanding



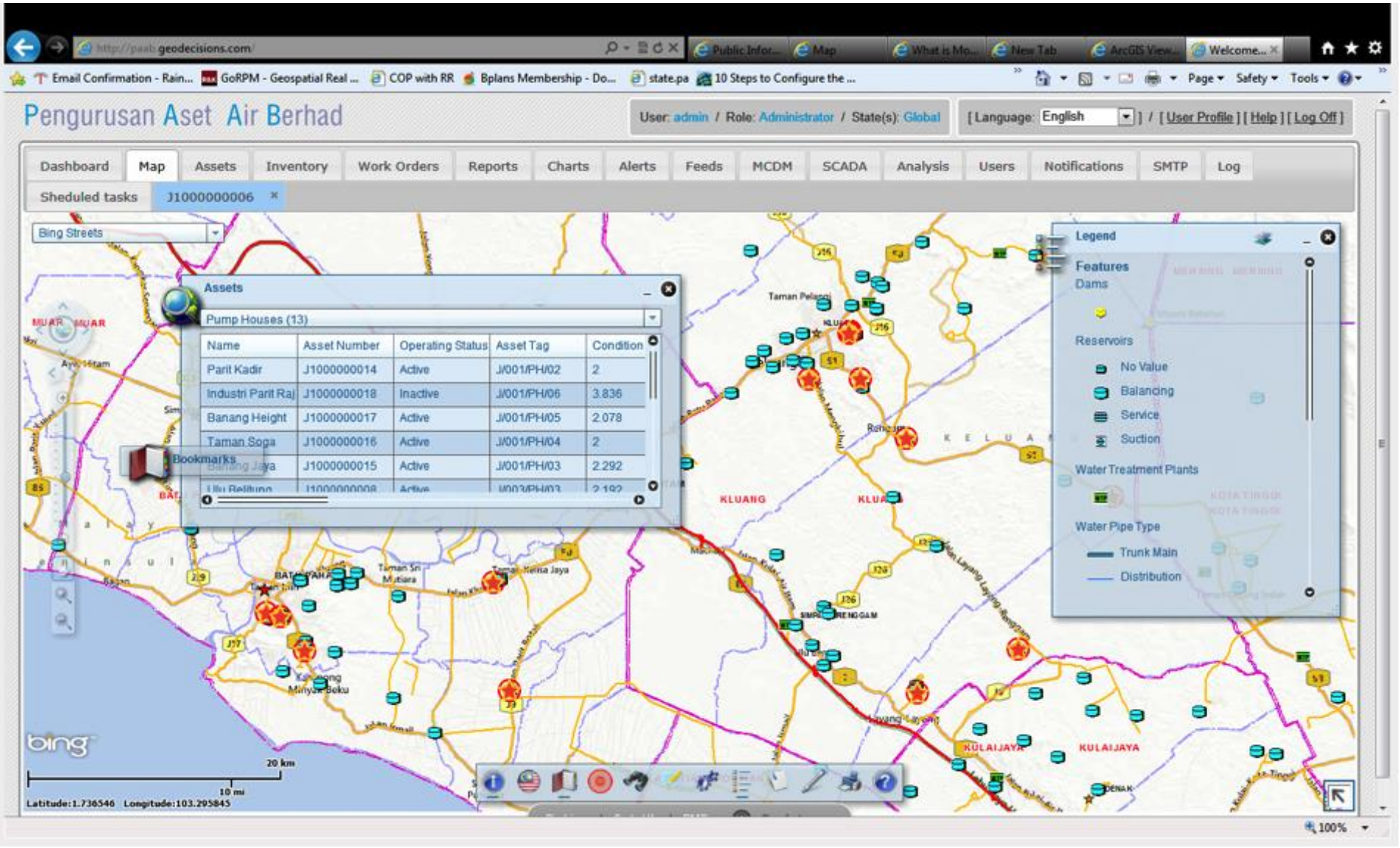
This "Theme" Example Shows System Leak History



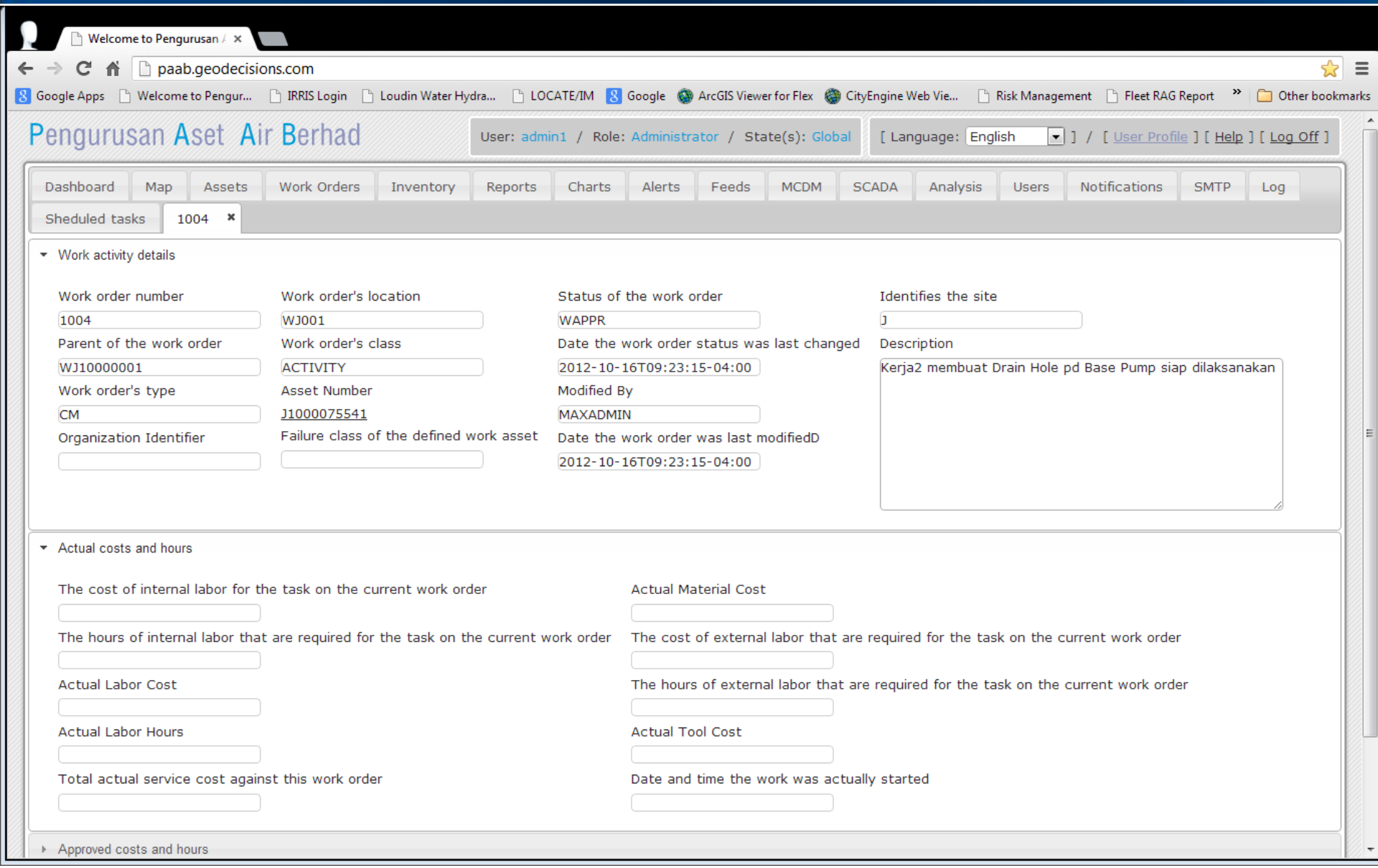
So You Can Use Network Tracing to Show Customers Affected…and Consequence of Failure



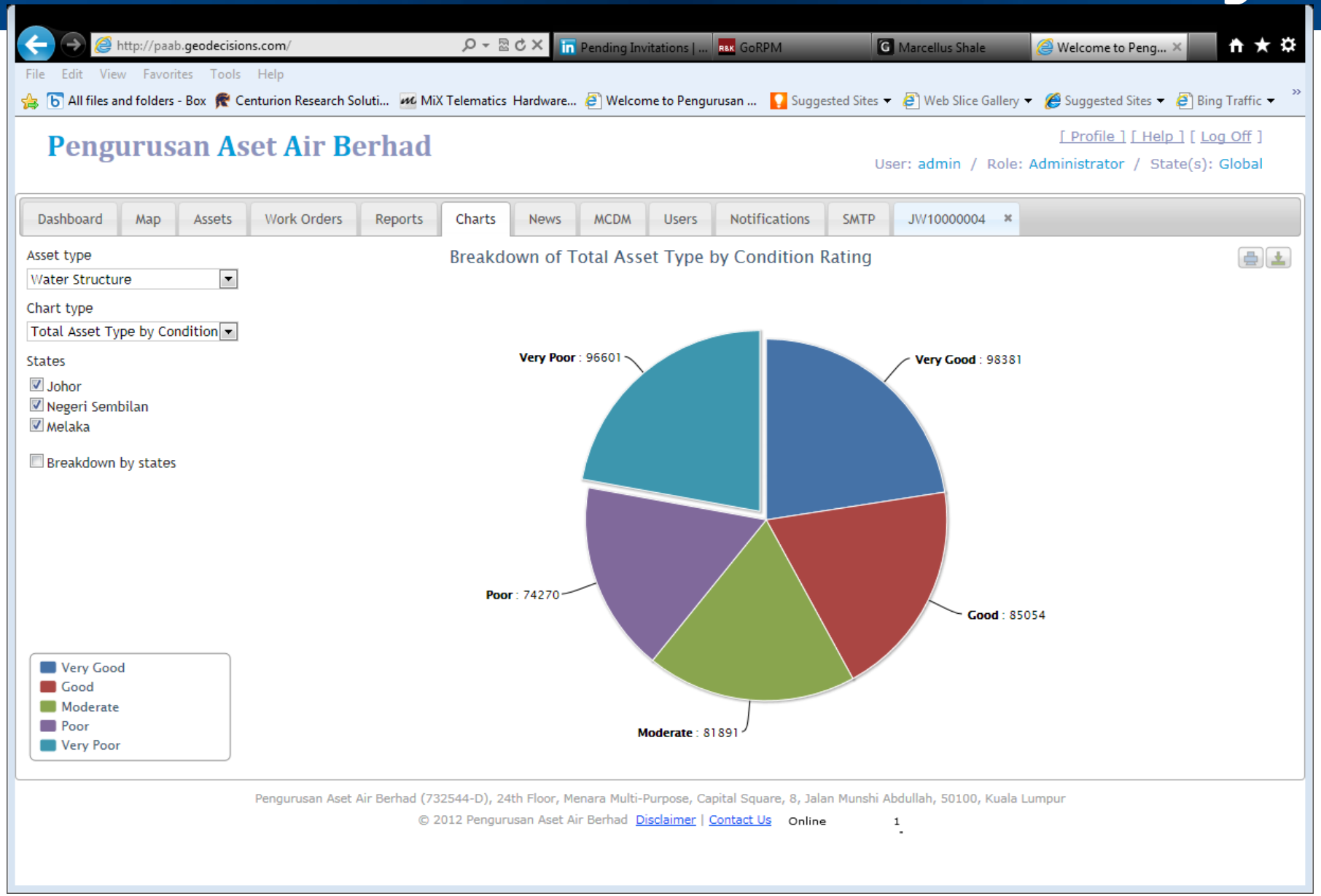
You Can See Spatial Overlay of Work Orders with High Risk Assets



Work Order Detail



Custom Charts Assist in Condition Monitoring



Where Do We Go From Here?

- **Visioning Workshop**
  - Gap analysis
  - Prioritize tasks
- **Data Integration Portal**
  - Inventory
  - Collaboration
  - Analysis
  - KPIs
- **Implementation and Training**

Asset Management

In developing an effective transportation asset management system that includes a strategic approach to obtaining information you will have the tools to help you readily share the data with others.

As a result, you're able to make meaningful decisions related to the development, operations, repair, rehabilitation, and preservation of transportation infrastructure while taking into account stakeholders, processes, policies, lifecycle, and costs.

Thank You!

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  - Pamela Iacovo, piacovo@gfnet.com