



Highway Management Information System & Automated Inventory Collection

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Purpose of HMIS Database

- Main roadway inventory database for MSHA
- Establishes routes and milepoints for all other databases
- Source of all HPMS submitted data
- Source that creates MSHA LRS and base GPS for GIS



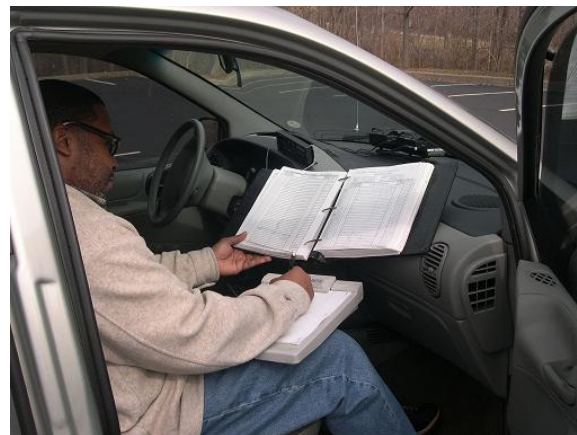
Six Components to System

- HMIS Database
- Inventory/GPS data collection
- Validation and DB sync
- Main HMIS editing screens
- Web-based reporting and mapping
- Line diagram and ad-hoc query



Inventory Process – Before Automation

- A manual process - Log books, spreadsheets, data entry
- Data scribed in log books
- Data taken back to the office, (re-drawn), and keyed into the system





Items Asked To Consider

- Voice activation?
- Work in moving van (mouse, joystick, TouchScreen)
- Must be finished before next inventory Cycle
- Integration with GPS and DMI
- Real-time Navigation and GPS
- Not significantly different than manual process
- Validation and access to all county data
- Automate tedious processes such as road name changes



Application Challenges

- Not a “Standard” database application
- Need high level of customization for field use
- Inventory crew uses different terminology to “call” the road
- Need high degree of business logic (“intelligence”) in the app
- Integration with DMI and GPS
- Must be easy to use with minimal training
- Limited screen space (1024x768)
- Enforce quality control



Equipment & Tools

- GPS
 - Trimble Pro XR
 - Trimble SDK and ESRI MapObjects for custom GPS

- DMI
 - Nu-Metrics NiteStar

- Panasonic Toughbook
 - Touch-screen Monitor





Office Application

HPMS Prototype

File Edit View Report Tools Window About

Universe

County: ANNE ARUNDEL County: ANNE ARUNDEL, MunSort: NONE, Rte No: 97, Suffix: , MP: .38

MunSort: NONE MainLine: MAIN ISSample ISDonut Open Sample...

Rte Info: IS 97 Bg.Mp: 0.38 End Mp: 0.48 Date Last Changed: 1/3/2003 4 History Notes...

Road Name: NO NAME Assoc.Pre: Ramp#: Exit#:

Rec.Status: Base Data Rec.Desc: Valid.Comm.:

Physical Attributes Admin Other Data

LO CRB/SHLD/SW	LT RD. T/W	LI CRB/SHLD/SW	MED.T/W	RI CRB/SHLD/SW	RT RD. T/W	RO CRB/SHLD/SW
LO-STY: SURFACED	L-RDTY: HIGH BITUM	LI-STY: SURFACED	MED-TY: POSITIVE BARRIER	RI-STY: SURFACED	R-RDTY: HIGH BITUM	RO-STY: SURFACED
LO-SIDEWALK: NONE	L-LANETY:	LI-PAVEMTY: ROAD IS NON	MED-WD: 42	RI-PAVEMTY: ROAD IS NON	R-LANETY:	RO-SIDEWALK: NONE
LO-SHLDWD: 10	L-RWD: 24 L-THLA: 2	LI-SIDEWALK: NONE		RI-SIDEWALK: NONE	R-RWD: 24 R-THLA: 2	RO-SHLDWD: 10
		LI-SHLDWD: 4		RI-SHLDWD: 4		
LO-AUX AUX-TY:		LI SHLD/AUX AUX-TY:		RI-AUX AUX-TY:		RO SHLD/AUX AUX-TY:
AUX-WD: 0 AUX-NUM: 0		AUX-WD: 0 AUX-NUM: 0		AUX-WD: 0 AUX-NUM: 0		AUX-WD: 0 AUX-NUM: 0
FACTY: TWO WAY ROAD	SEC-LENGT: 0.1	Roughness: 95	StationID: B020015			
THRU-LA: 4	SPEED: 65	PSR: 0	AADT: 76150			

New Record

Add/Copy Add Save Update Delete Cancel Close

Status 3/14/2003 9:38 AM

- Not usable in the field



Field Application – The Data View

Road Inventory Data Entry (RIDE)

File Reports Utilities Window Help

County: BALTIMORE Prefix: US Route: 40 Suffix: Mun: 0 - NONE Type: MAINLINE

Log View New Road... Data View Map View/GPS Notes... DMI: 0.000 ON/OFF Imp. #: 02-010

Data View

County: BALTIMORE Route: US 40 - MAINLINE Mun: 0 - NONE Flip... Split... Merge... Help... Close

Previous break: Current milepoint interval: 0.000 to 0.180 Connect to DMI First ← → Last Go to...

Pavement Data

Road name: Section length: Inv. Direction: Facility Type:

BALTO NATIONAL PIKE 0.18 Refresh E TWO WAY ROAD

3 ft. POSITIVE BARRIER Median **

2 24 ft. of I

2 ML LEFT

2 ML RIGHT

Adjust MP... Add... Edit... Delete... Quick Add: Get DMI Enter MP Sample...

Intersecting Features

Milepoint Feature Show only current interval Refresh Quick report: All features... Intersections... Begin Bridge End Bridge Add... Edit... Delete... Quick Add: Intersection Culture

0.000 GEOGRAPHIC BOUNDARY HOWARD CO/L BRIDGE - STRUC OV WATER STRUC #3109 PATAPSCO RIVER START OF INVENTORY

* = Added Record, ** = Modified record

- Translates “data” to field terminology

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Demonstration



Conclusion

- Not a typical desktop application
 - Different Tools
 - Different Environment
 - Own Language
- Has improved the inventory process ...
 - Efficiency
 - Accuracy
 - Easy to use
- Yes, you can eliminate all paper!



After Automation



- The inventory process is now 100% digital



Questions and Answers

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Screen shots



Inventory Requests – The Log View

Log View [Window Controls]

Type: All types | Status: All | Sort By: Route | Data View | Print | Help | Close

	Improvement #	Route	Mile	Description
1.	2002 CO EX # 4	CO72	1.08	ROAD UNDER CONSTRUCTION DUE TO NORBECK RD EXT
2.	02-132-CO	CO289	0.18	ROAD EXTENSION: (0.03MILES, 26' OF G) REINVEN-
3.	2002 CO EX # 6	CO356	0	(MAPPING TEAM REQUEST) ROAD BETWEEN ARLINGTON
4.	02-145-CO	CO533	0.12	THE BRIDGE OVER THE RAILROAD TRACKS HSA BEEN I
5.	2002 CO EX # 8	CO1191	0	(ALSO GV 1191) MAP LINEWORK DOES NOT MATCH ON
6.	2002 CO EX #13	CO1234	0	THE INVENTORY OF CO 507 SHOWS THIS ROAD TO BE
7.	02-24-CO	CO1560	0.42	THIS ROAD HAS BEEN EXTENDED, (0.16MILES, 26' (
8.	02-139-CO	CO1878	0	ROAD EXTENSION: (0.36MILES, 50' OF I). REINVEN
9.	02-18-CO	CO3259	0.09	ROAD EXTENDED (0.05MILES 20' OF G). REINVENTO

Info | More...

Prefix	Route	Suffix	Main Line	Mun	MP	Req MP	End MP	A.P.:	Exit #:	Ramp #:
CO	72		1		1.08	0	1.98	Ramps: CO		0

Road Name: NORWOOD RD | NONE

Comments: ROAD UNDER CONSTRUCTION DUE TO NORBECK RD EXT., RE-OPENED JULY 11, 2002. - REINV., GPS_TIE-IN. SEE ACCESS PERMIT M-7381-00.

Description:

Location:

Reason:

Requested by: AMD | 4/5/2002 | X,Y: 1307467 | 527675 | Go to...

Comments: T/W CHANGES FROM .65 TO 1.98 SCARFIED OP 392, P/U T/L AND ENTS.

Status: IFC - In Field Complete | Date Completed: 1/22/2003 (mm/dd/yyyy) | Save

- Used to plan/track the inventory process



Pavement Data

Editing pavement data: US 40 - MAINLINE, milepoint = 0

Milepoint: **0.000** Median type: 2 - POSITIVE BARRIER Width: 3 ft. Reversible Lane(s): ... Facility type: TWO WAY ROAD

Lt Outer Shoulder	LO-Auxiliary	Lt Roadway	LI-Auxiliary	Lt Inner Shoulder	Rt Inner Shoulder	RI-Auxiliary	Rt Roadway	RO-Auxiliary	Rt Outer Shoulder
... ft.	0	24	0	... ft.	... ft.	0	24	0	... ft.
Type: No Shld/No Curb	Type: NA	Type: 1	Type: NA	Type: No Shld/No Curb	Type: No Shld/No Curb	Type: NA	Type: 1	Type: NA	Type: No Shld/No Curb
	Lanes: 0	Lanes: 2	Lanes: 0			Lanes: 0	Lanes: 2	Lanes: 0	
Sidewalk: UK - UNKNOWN		Sidewalk: Marked		Sidewalk: UK - UNKNOWN	Sidewalk: UK - UNKNOWN		Sidewalk: Marked		Sidewalk: UK - UNKNOWN

Road Name: BALTO NATIONAL PIKE

Show Generic Fields >> Sample Data...

Save Help... Close/Cancel

Left Roadway

Right Roadway



Intersection Data

Edit intersecting feature for: US 29 - MAINLINE

1. Mile point: Get DMI Reverse mile point: Get DMI Rev
(For divided roads only)

Road name: Refresh Road Name

2.

Intersecting Route: Reports:

County:

Prefix: Route: Suffix:

Municipality:

Main Line:

Road Name:

Milepoint:

Inventory direction:

Intersection Type:

Address Ranges:

- Intersection type, milepoints, address ranges



Other Intersecting Features

1. Mile point: Get DMI Reverse mile point: Get DMI Rev
(For divided roads only)

Road name: Refresh Road Name

2.

Enter description:

Save - Close Save - Add Another Reset Help... Close/Cancel

- 25 types of intersecting features
- Data entry based on type



GPS Roads – The Map View

Map View

Start Receiver Start Tracking Pause Tracking Track vehicle Configure Help...

Track Data Points Map Layers Setup

New... Export all... Export sel. Delete Delete all...

City-Mun-Pref-Rte-Suffix-Type-Dir-Sect-Assoc. Pref-Exit#-Ramp#

15000C00072 - 1 - S - 1	NORWOOD RD
15000C00072 - 1 - S - 2	NORWOOD RD
15000C00072 - 1 - N - 1	NORWOOD RD
15000C00289 - 1 - S - 1	WEST AVE
15000C00629 - 1 - S - 1	FENTON ST
15000C01560 - 1 - S - 1	BERKSHIRE DR
15000C03259 - 1 - E - 1	MARTELLO DR
15000C04089 - 1 - W - 1	OLNEY MILL RD

Record: 5 of 176 Data points: 31

Track Features

ID: 15000C00629

Type: 1 GPS Direction: S

Assoc. Prefix: Exit #: Ramp #: 0

Rd. Name: FENTON ST

Begin MP: 1.014 End MP: 1.074

Comments: Field crew: SSNYDER/

Latitude Longitude Altitude No. Sats PDOP SNR DGPS Status Speed GPS Time

- Real-time differentially corrected GPS data
- Eliminated post-processing of GPS data



Other Features/Utilities

- Download from HMIS database (by county)
Locks records while inventory in process
- Management reports in the field
Track progress, detect errors
- Upload data to HMIS database on completion
- Export GPS data to Shapefile

