

A Simple Approach to Mobile



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My Goals

- I'm a local GIS Guy
- I want to make it easy for our mobile workforce to
 - Access Maps
 - Get Info
 - Solve Problems

Does Mobile Technology *Really* Work?

- 5 Years ago: **NO**



I'm not as cool as this guy.

You'll find him at <http://www.flickr.com/photos/29881930@N00/2086642192>



Image from the Facebook
"I Hate Toughbooks" group.
Exactly.

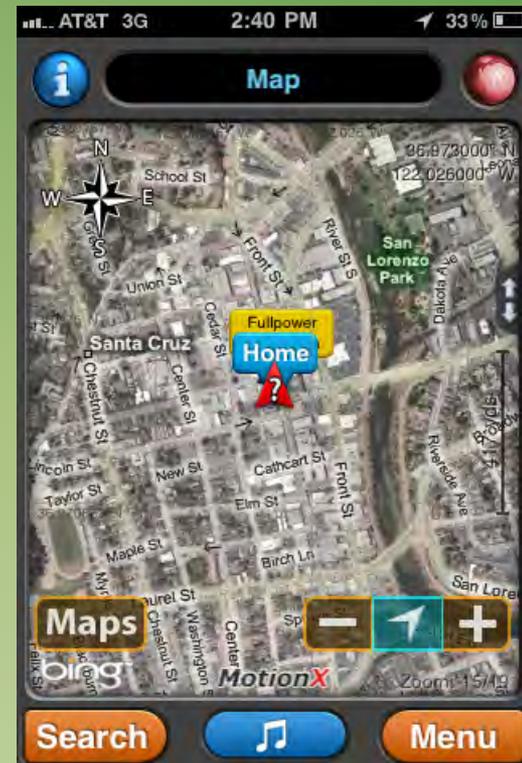
Does Mobile Technology *Really* Work?

- 2 Years ago: **Kind of**

Consumer-based map apps become popular in smart phones



iPhone Maps App



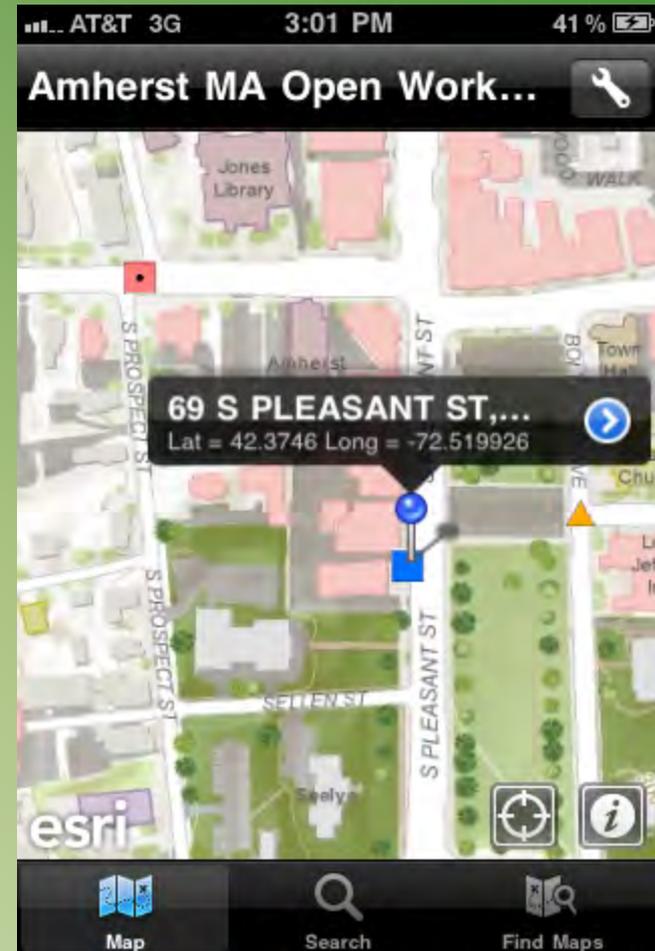
iPhone MotionX GPS App

Does Mobile Technology *Really* Work?

- Now:

YES.

- My Map.
- My Live Data.
- No Syncing.
- App Development Optional.



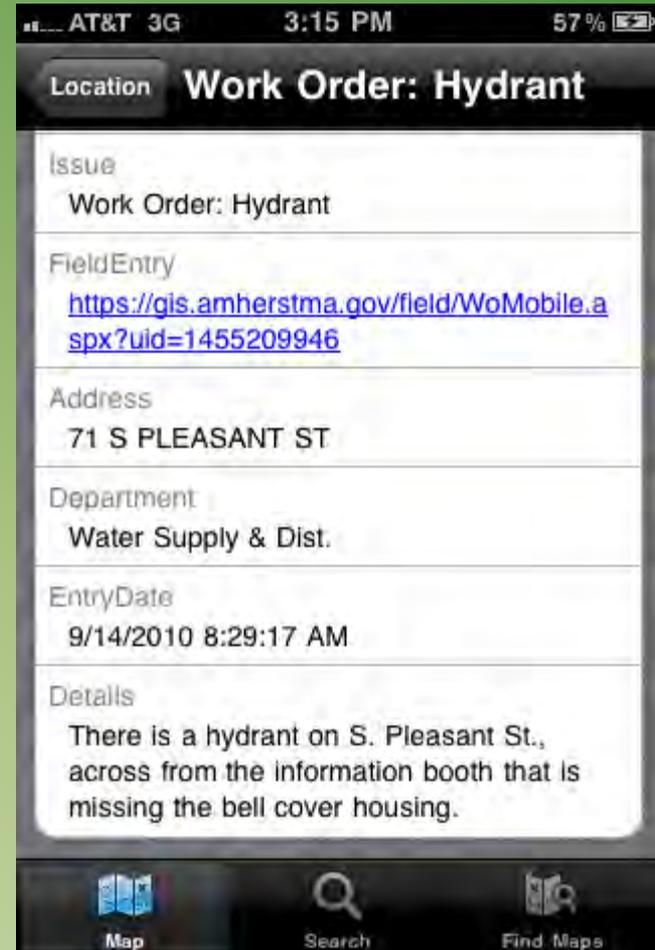
Amherst Open Work Orders Map
on the ArcGIS iOS App

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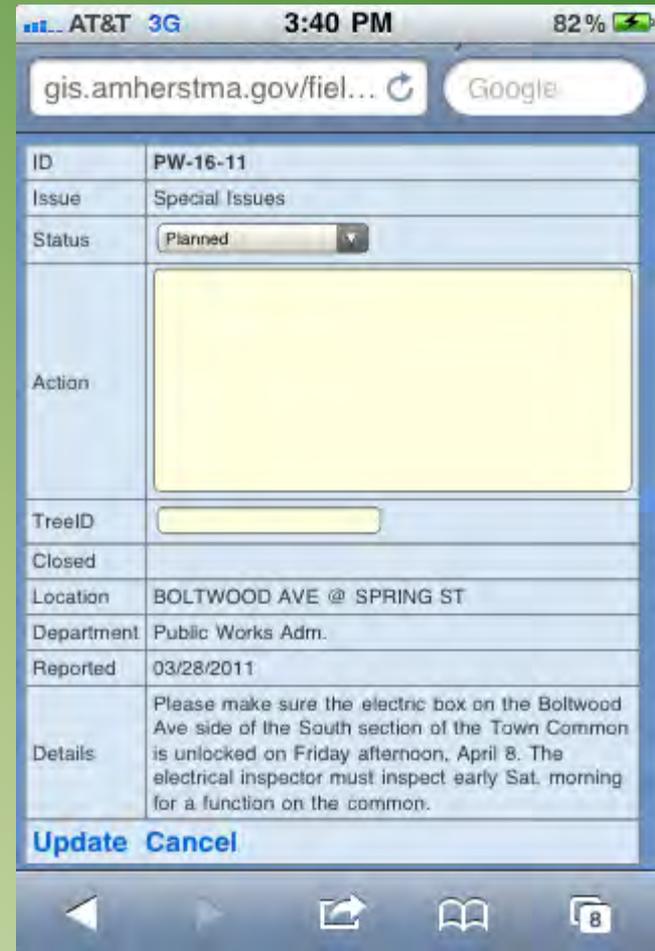
Amherst Open Work Orders Map
on the ArcGIS iOS App

Does Mobile Technology *Really* Work?

- Now:

YES.

Features linked to my own home-cooked data entry pages.



The screenshot shows a mobile browser interface with a status bar at the top displaying 'AT&T 3G', '3:40 PM', and '82%' battery. The address bar contains 'gis.amherstma.gov/fiel...' and a 'Google' search button. The main content is a form with the following fields:

ID	PW-16-11
Issue	Special Issues
Status	Planned
Action	[Empty text area]
TreeID	[Empty text input]
Closed	
Location	BOLTWOOD AVE @ SPRING ST
Department	Public Works Adm.
Reported	03/28/2011
Details	Please make sure the electric box on the Boltwood Ave side of the South section of the Town Common is unlocked on Friday afternoon, April 8. The electrical inspector must inspect early Sat. morning for a function on the common.

At the bottom of the form are two buttons: 'Update' and 'Cancel'. The mobile OS navigation bar is visible at the very bottom.

Simple & secured data entry page for closing/updating work orders.

Finally...

- I can avoid all the things that I used to hate about mobile technology
 - Clunky interfaces
 - Using a stylus
 - Clumsy sync routines



WOW! PAINT on Windows CE!!!

What has made the difference?

- Apple, Google & Microsoft have learned how to make mobile GUIs that are easy to use
- Data Plans
- Bandwidth-Optimized Tiled Map Services



What has made the difference?

- ArcGIS for Smartphones
iOS, Windows Phone & Android (soon)
 - Free
 - Integrated with ArcGIS.com
 - Simple

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ArcGIS for Smartphones

Overview

Overview

The ArcGIS Apps for smartphones allows you to navigate maps, collect and report data, and perform GIS analysis. It is a part of the ArcGIS system and is a great way to

- Discover content by browsing map galleries from ArcGIS Online or leverage your existing enterprise GIS services.
- Display maps and capture information.
- Develop a custom application or brand your own [application](#) specific to your business needs.
- Extend your GIS to a wider audience.

Available on the App Store

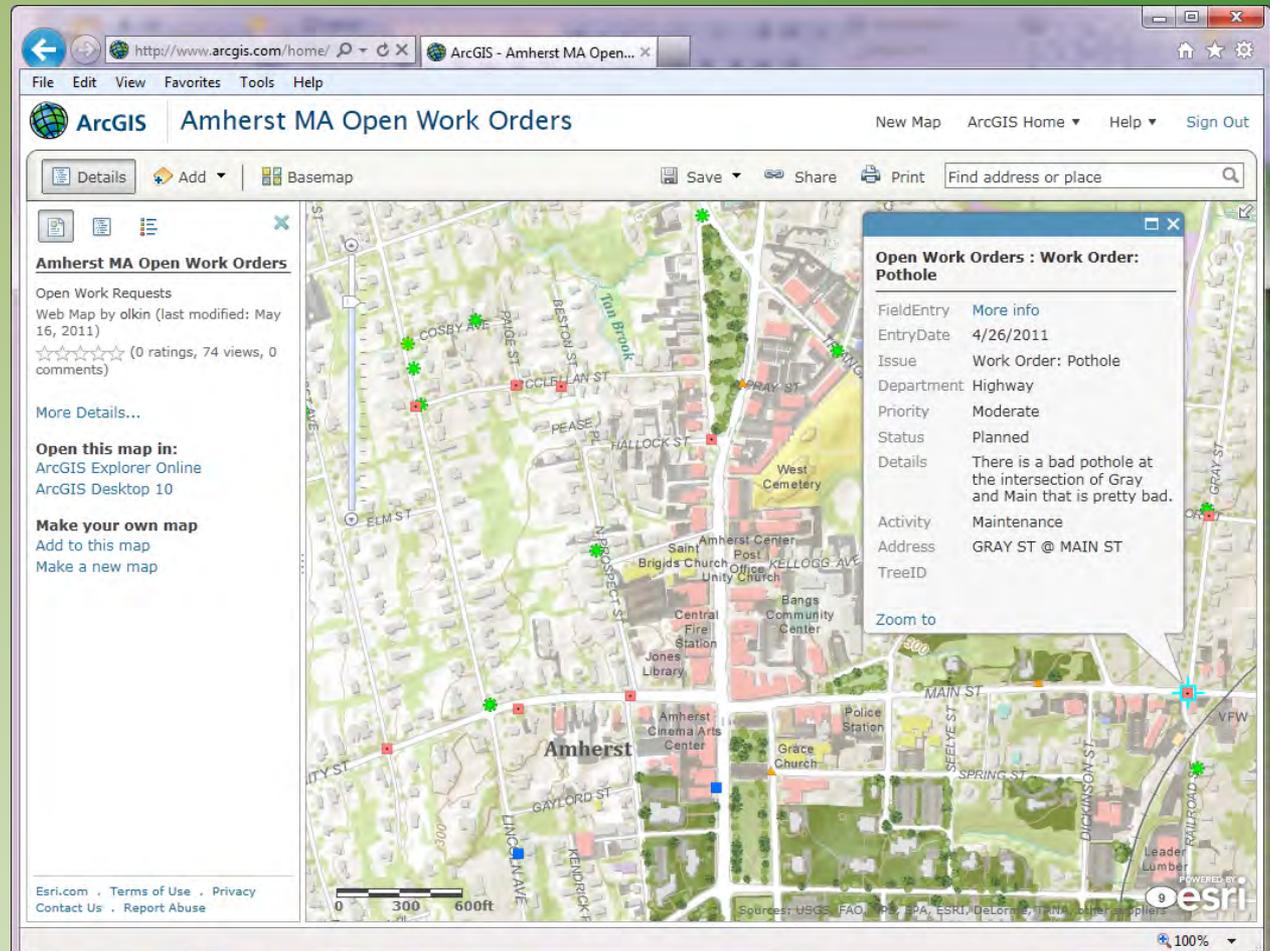
for Windows Phone 7

App for Android—expected later this year

<http://www.esri.com/software/arcgis/smartphones/>

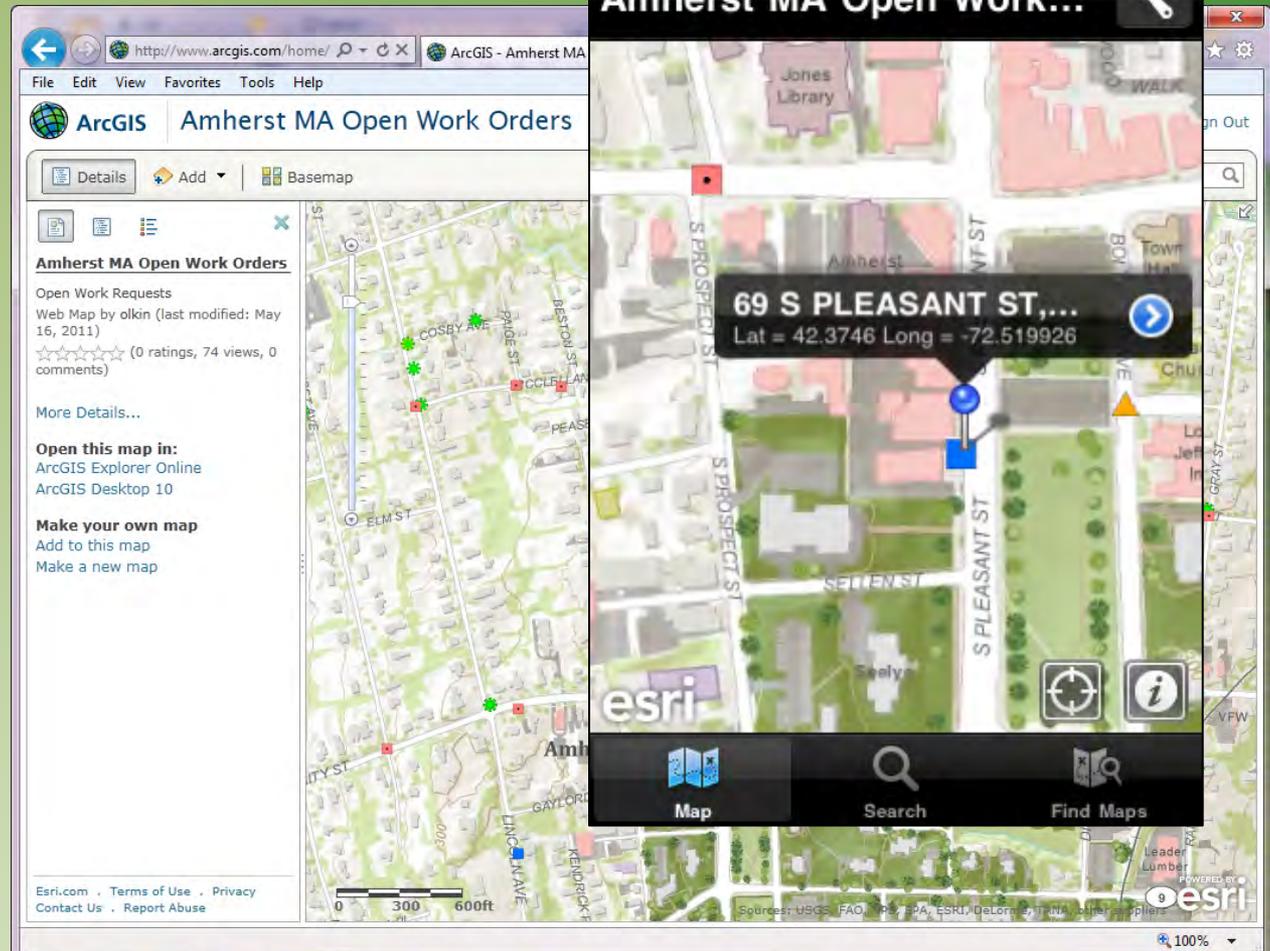
Simplest way to make a mobile map

- Publish an ArcGIS Server map service
- Author a map in ArcGIS.com
 - Optionally, secure it.



Simplest way to make a mobile map

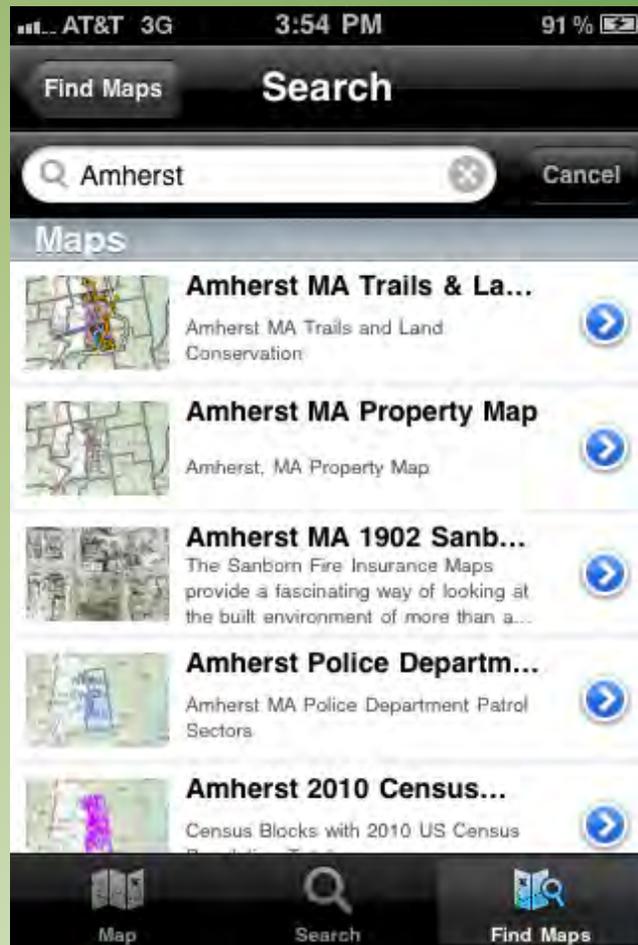
- Voila, it's in your phone or tablet.



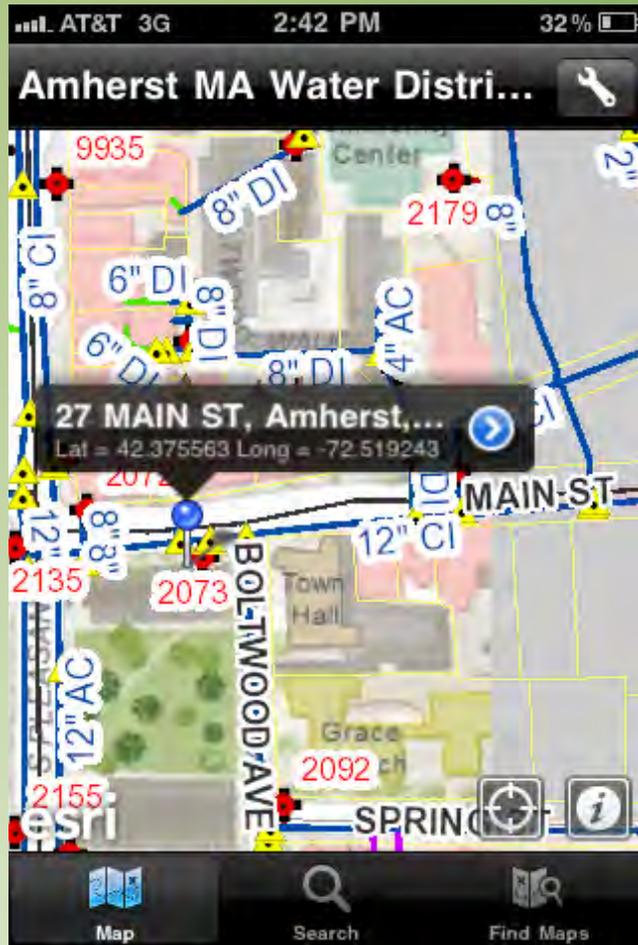
Yes, but...is Map Caching Necessary?

- Desirable, yes. Necessary, no.
- We generally don't cache our maps.
 - Dynamic content, constantly changing.
- Basemaps are cached

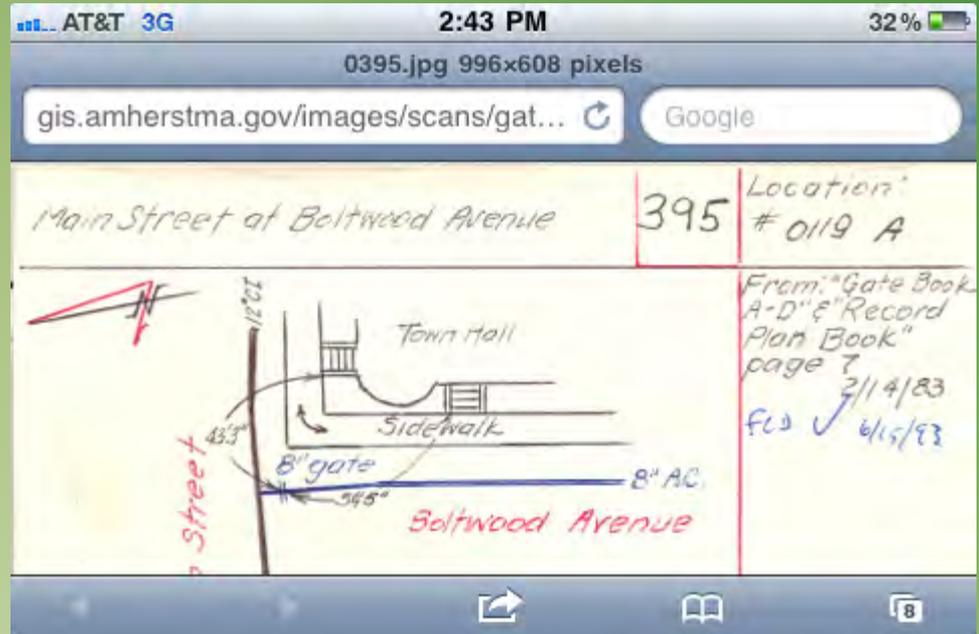
Some of our maps



Utilities & Associated Documents



Utilities & Associated Documents

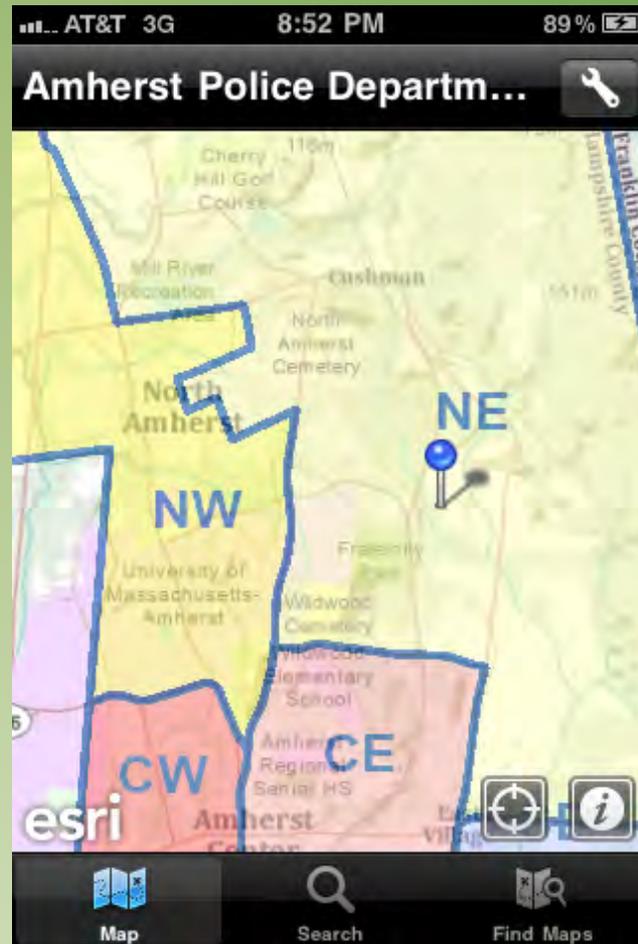


Gate Card

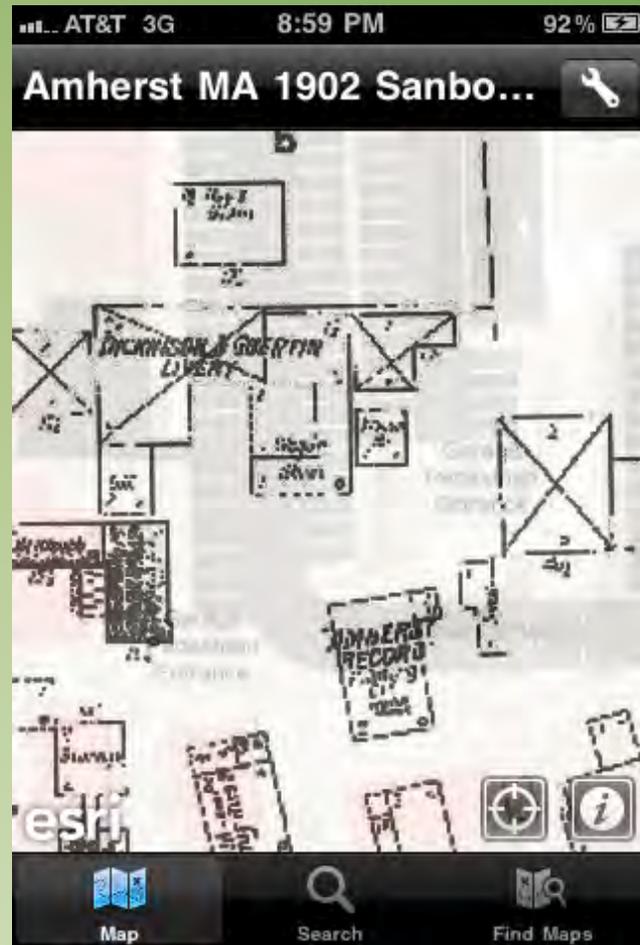
Trails & Land Conservation



Police Districts



1902 Sanborn Fire Insurance Map



Case Study

Amherst DPW Field Crew Access to Utility Maps, Plans & Cards

MIDDLE ST AT POMEROY LN 09871A
 FLD CHK 5/1/2006
 REC. PLS. 574, 382, 386
 SEE CARD 0978D FOR DIMS
 SEE CARD 0978C
 #324 POMEROY
 SEE CARD 0987B FOR DIMS

Sawmill River Stud FARM #50 STATION RD
 Tole Pole 45
 63°
 65°
 137°
 104°
 Tole Pole 44
 12° AC
 1" COPPERTUBING CORP OVER 1" PLASTIC TO CURB
 13" Ø

Town of Amherst Water System
 Please Mark Corrections As Needed
 ▲ Water Gate
 ◆ Fire Hydrant
 B Blowoff
 M Meter Pit
 — TOA Water Ln
 - - - Missing TOA Wtr Ln
 — UM/AC/HC/Private
 — Hydrant Line
 — Raw Water Line
 # Gate Card #
 # Fiche Scan #
 # Plan #
 # Linen Book #
 — Property Lines
 - - - Easement
 — Railroad
 Structures
 Road
 Unpaved Road

Amherst DPW Maps & Docs

- 2000: Water, Sewer & Drain Automation
- 2002-Present: Document Scanning / Linking
 - Record Plans
 - Service Cards
 - Gate Cards
 - Hydrant Cards

Types of Field Access to Maps & Docs

- All Hardcopy: drive back to DPW for most info
- Hardcopy Maps w/ document reference IDs
 - Drive back to DPW for documents, or
 - Scanned documents on a notebook/toughbook
 - Scanned documents on a Windows CE handheld device
- PDFs/Images on a notebook/toughbook
- **ArcGIS iOS app on an iPhone or iPad**

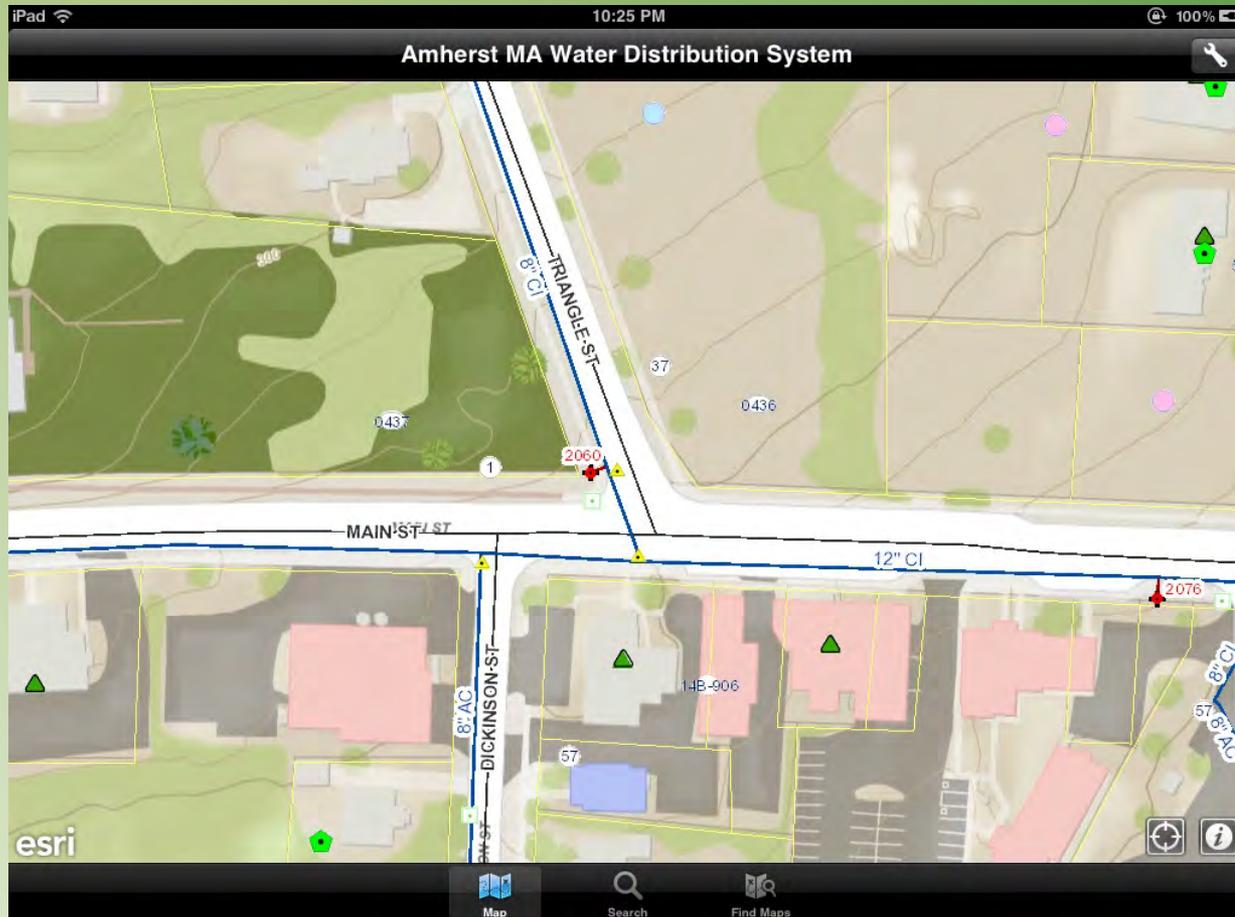
Advantages of the ArcGIS iOS app

- No need to sync documents/maps*
- Intuitive interface
- Native support of hyperlinks
- Maps are securable via groups on ArcGIS.com

*Data plan currently required

Amherst Water Distribution System Map

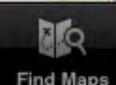
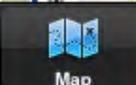
- Our first ArcGIS iOS map for our field crews



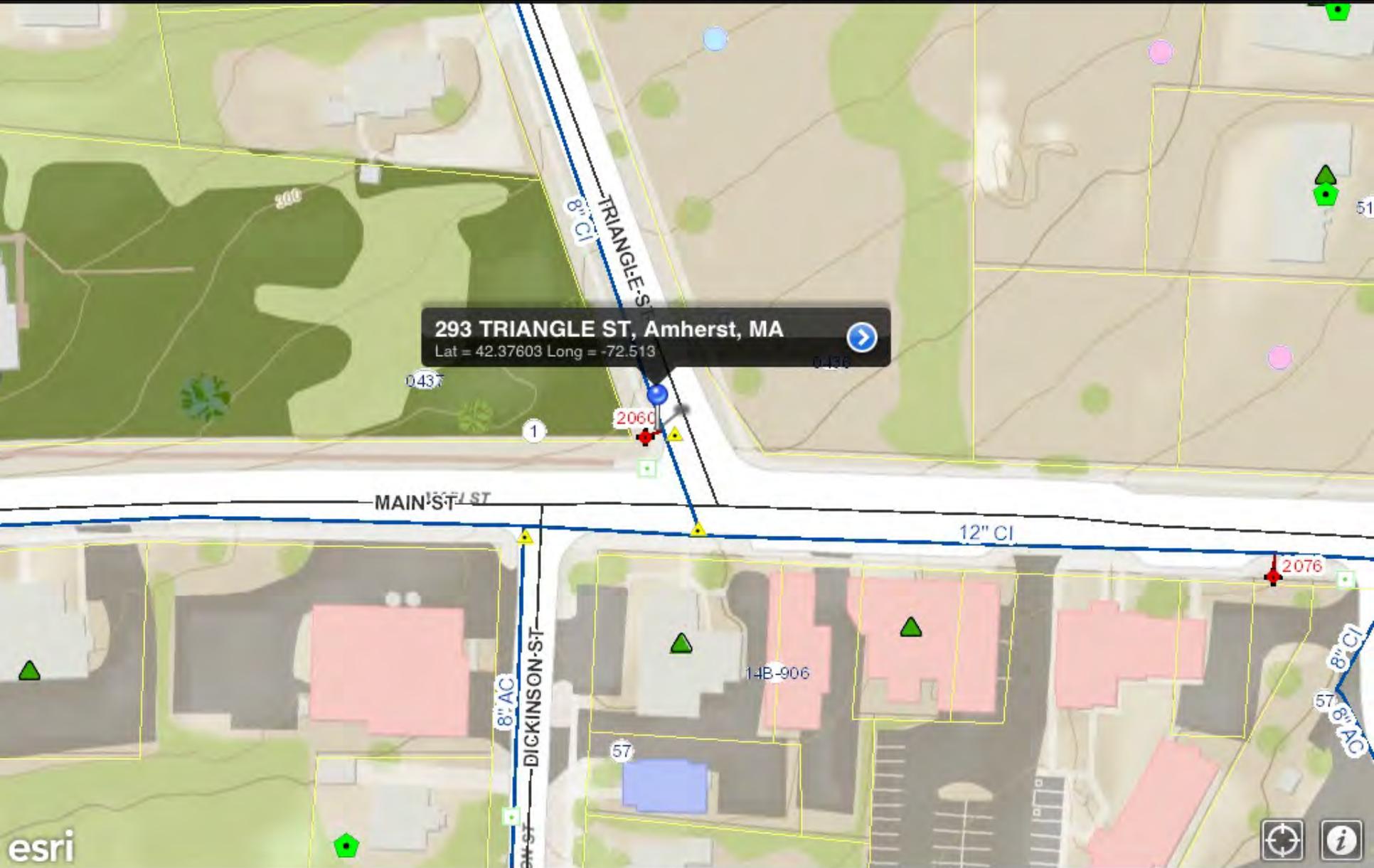
Amherst MA Water Distribution System



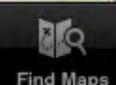
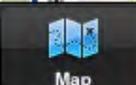
esri



Amherst MA Water Distribution System



293 TRIANGLE ST, Amherst, MA
Lat = 42.37603 Long = -72.513



293 TRIANGLE ST

Amherst, MA

Lat = 42.3760, Long = -72.5130

MLG



Water Hydrant #2060



Hydrant Line



Water Main



Map



Search



Find Maps

Location

Water Hydrant #2060

HYD_ID

2060

StaticPSI

not recorded

ID

Water Hydrant #2060

Source

MAPCO

Opens

Right

FieldAction

<http://gis2.amherstma.gov/field/entry.aspx?id=6&lyr=Fire%20Hydrant>

YearInstalled

1959

Style

B-50-B

Size

5.00'

HydrantCard

<http://gis.amherstma.gov/images/scans/Hydrants/2060.jpg>

GateRadius

13' 8"

Manufacturer

Darling



Map



Search

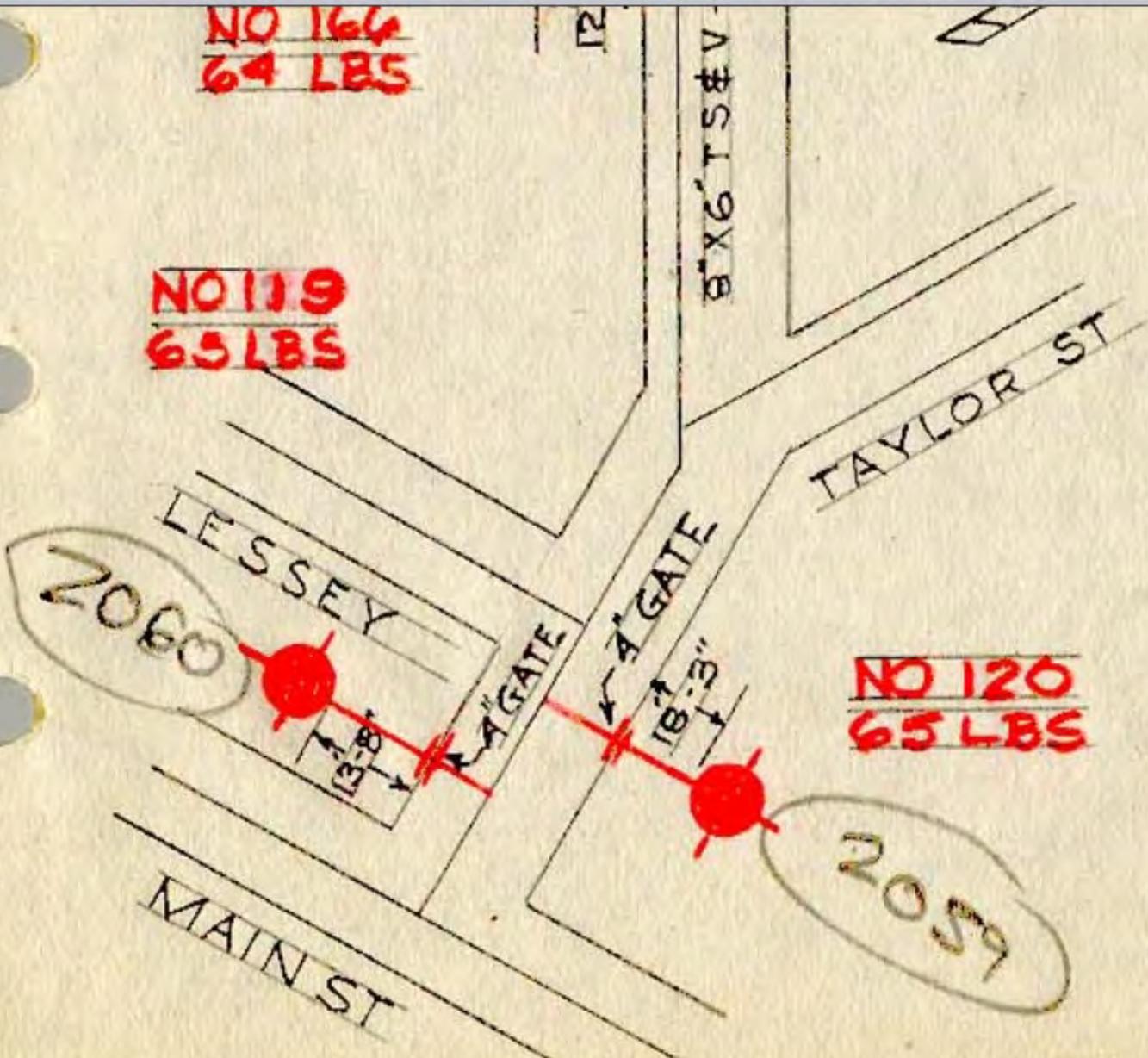


Find Maps

NO 166
64 LBS

NO 119
65 LBS

NO 120
65 LBS



ArcGIS iOS app deployment result

- Resounding success for those who have data plans (just a handful so far)
 - Minimal up-front training
 - No need to sync data / docs
 - No more complaints about long device boot times

Case Study 2

Improving our Work Order Management Practices

Open Work Orders Closed Work Orders

All Categories

Map all results

Map	ID	Issue	Location	Department	Reported	Details		Status
Map It!	HW-1550-11	Drainage	48 WOODLOT RD	Highway	6/22/2011 1:12:25 PM	She called about a drainage easement on the side of her house that is full and needs clearing out. I don't know what she means as far as an "easement" Can you check out and call her with questions???	Edit	Planned
Map It!	HW-1549-11	Road Runoff	512 BAY RD	Highway	6/22/2011 11:09:54 AM	he called to say the pitch of the road is causing all the water to run down his driveway and wash it out. He would like someone to come out and look at it today while it's raining and call him to discuss.	Edit	Planned
Map It!	HW-1548-11	Pothole	MEADOW ST @ ROUTE 116	Highway	6/22/2011 10:24:45	There is a really big pothole on Meadow St., just as you turn off of 116. There was a cone in it to alert people, but someone has stolen the cone.	Edit	Planned

Outmoded Work Order Management Model

- Until March, 2011:
 - Desktop software-based system only available to office staff
 - All work orders were printed or emailed by the DPW office staff
 - Field Crew would write actions taken onto printed work orders & hand them back (or not)
 - DPW office staff would update the work order status &/or close out work orders
 - Many unclosed work orders would slip through the cracks

Work Order Mgmt System Specs

- Cartegraph Desktop Software
 - Integrated with ArcGIS/ArcEngine to geocode work order locations
 - X & Y Coordinate fields
 - MS SQL Server database
 - Cartegraph Mobile products are now available, but well beyond our budgetary means

Our Goals

- Make it possible for DPW Field Crewmembers to update &/or close out work orders on their own in the office or in the field
- Make it possible to view open work orders on a map in the office or in the field

“In the Office” Solution

- Work Order Search Page & Web GIS Map

The screenshot displays the 'AMHERST MASSACHUSETTS STAFF GIS VIEWER' interface. The top navigation bar includes the URL 'http://gis.amherstma.gov' and a 'Back To GIS Search' link. The main interface is divided into several sections:

- Map Section:** Shows an aerial satellite view of a residential area. A yellow marker is placed on a road labeled 'WOODLOT RD'. The map includes standard GIS navigation tools like zoom in/out, pan, and scale (1" = 300 ft).
- Selection Panel:** Contains a table of work orders. One work order is selected and highlighted in yellow.
- Work Order Info Panel:** Provides details for the selected work order, including contact information and a description of the issue.

WorkOrder	Status	Issue	Reported
HW-1550-11	Open	Drainage	6/22/2011 1:10:38 PM

Work Order Info

Phone ()
E-Mail ()
Details She called about a drainage easement on the side of her house that is full and needs clearing out. I don't know what she means as far as an "easement" Can you check out and call her with questions???

Action
Edit Update Work Order

This partial screenshot shows the search results area of the web GIS map. It includes a search bar and a table with the following columns: Status, Action, and Closed. The table contains two rows of work order data.

Status	Action	Closed
Planned	Edit	
Planned	Edit	

Map It!	HW-1550-11	Drainage	48 WOODLOT RD	Highway	6/22/2011 1:12:25 PM	side of her house that is full and needs clearing out. I don't know what she means as far as an "easement" Can you check out and call her with questions???	Edit	Planned	
Map It!	HW-1549-11	Road Runoff	512 BAY RD	Highway	6/22/2011 11:09:54 AM	he called to say the pitch of the road is causing all the water to run down his driveway and wash it out. He would like someone to come out and look at it today while it's raining and call him to discuss.	Edit	Planned	



Amherst DPW Work Order Search

This search page displays Work Orders logged by the Amherst Department of Public Works. Mapped locations are automatically generated by the Work Order system & are APPROXIMATE ONLY.

Open Work Orders Closed Work Orders

All Categories

Map all results

Map	ID	Issue	Location	Department	Reported	Details	Status	Action	Closed
Map It!	HW-1550-11	Drainage	48 WOODLOT RD	Highway	6/22/2011 1:12:25 PM	She called about a drainage easement on the side of her house that is full and needs clearing out. I don't know what she means as far as an "easement" Can you check out and call her with questions???	Edit	Planned	
Map It!	HW-1549-11	Road Runoff	512 BAY RD	Highway	6/22/2011 11:09:54 AM	he called to say the pitch of the road is causing all the water to run down his driveway and wash it out. He would like someone to come out and look at it today while it's raining and call him to discuss.	Edit	Planned	
Map It!	HW-1548-11	Pothole	MEADOW ST @ ROUTE 116	Highway	6/22/2011 10:24:45	There is a really big pothole on Meadow St., just as you turn off of 116. There was a cone in it to alert people, but someone has stolen the cone.	Edit	Planned	



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Map	ID	Issue	Location	Department	Reported	Details		Status	Action	Closed
Map It!	HW-1550-11	Drainage	48 WOODLOT RD	Highway	6/22/2011 1:12:25 PM	She called about a drainage easement on the side of her house that is full and needs clearing out. I don't know what she means as far as an "easement"	Update Cancel	<ul style="list-style-type: none"> Completed Given to tree warden In Progress On Hold Planned Planned 		



Work Orders Size

[Help](#) **Work Orders** Scale 1" = 300 ft

[More Maps Here -->](#) v3.1.2 AppGeo

Selection

Select

WorkOrder	Status	Issue	Reported
HW-1550-11	Open	Drainage	6/22/2011 1:10:38 PM

1 selected [To Mailing Labels](#) [To Spreadsheet](#)

Work Order Info

Phone

Email

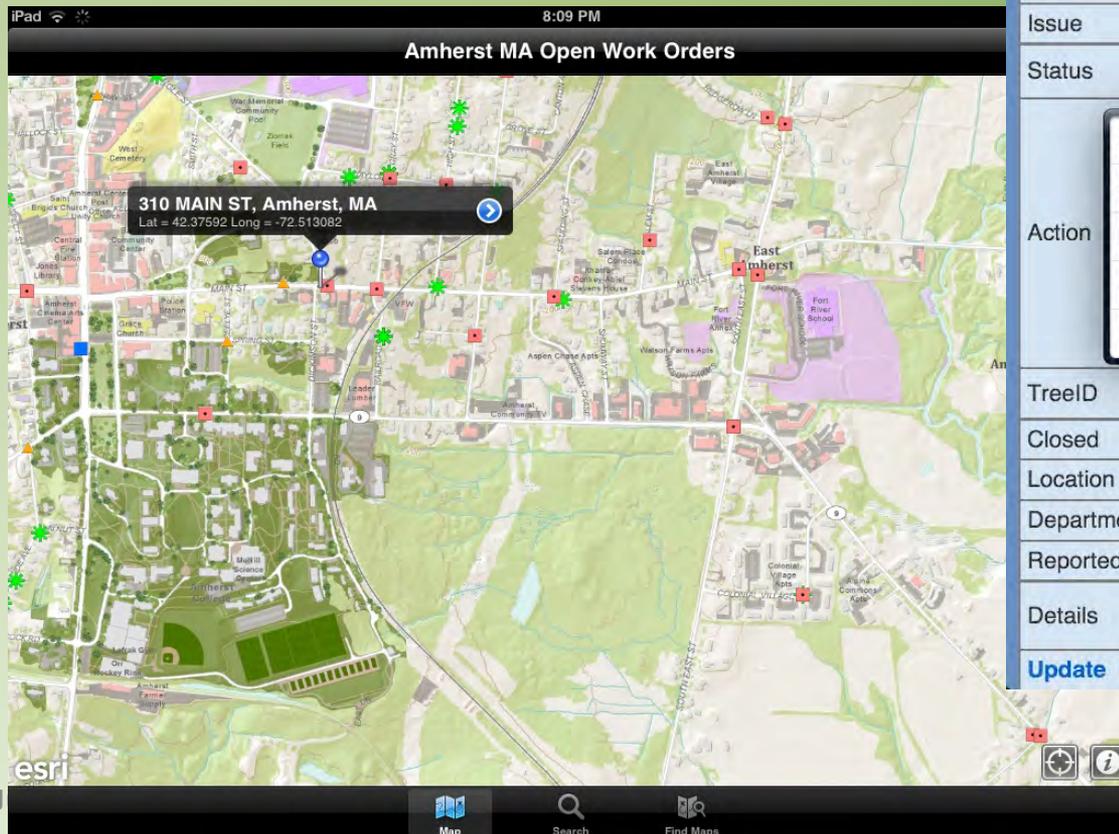
Details She called about a drainage easement on the side of her house that is full and needs clearing out. I don't know what she means as far as an "easement" Can you check out and call her with questions???

Action

[Edit Update Work Order](#)

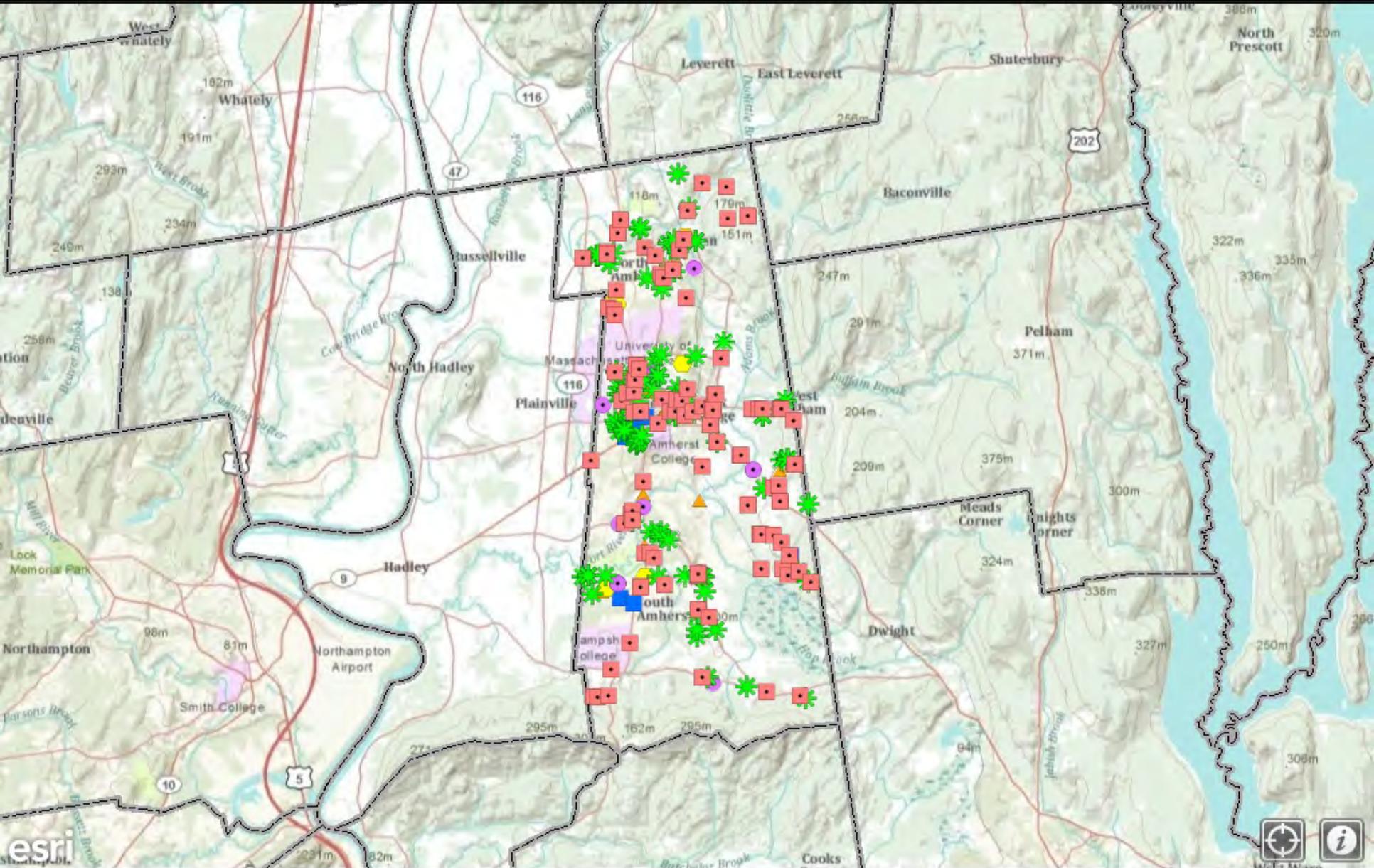
Our Field Solution

- ArcGIS iOS Work Order Map linked to a secured data entry page

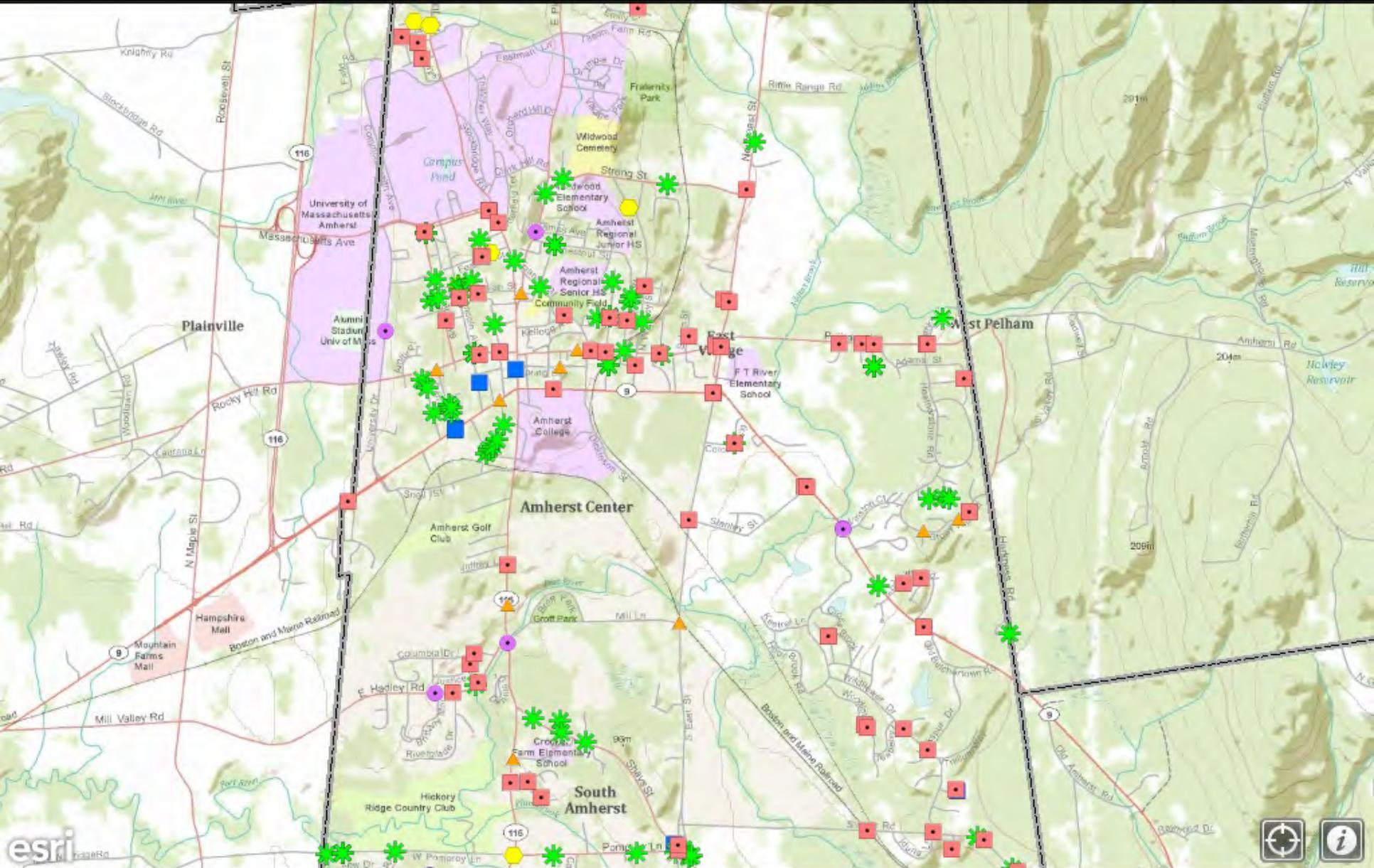


ID	HW-1512-11
Issue	Pothole
Status	Planned
Action	<div style="border: 1px solid black; padding: 5px;"><p>Completed</p><p>Given to tree warden</p><p>In Progress</p><p>On Hold</p><p>Planned <input checked="" type="checkbox"/></p></div>
TreedID	
Closed	
Location	MAIN ST @ TRIANGLE ST
Department	Highway
Reported	06/07/2011
Details	Could we please fill the pothole on Main St., just as you turn onto Triangle St. It's a pretty big one.
Update Cancel	

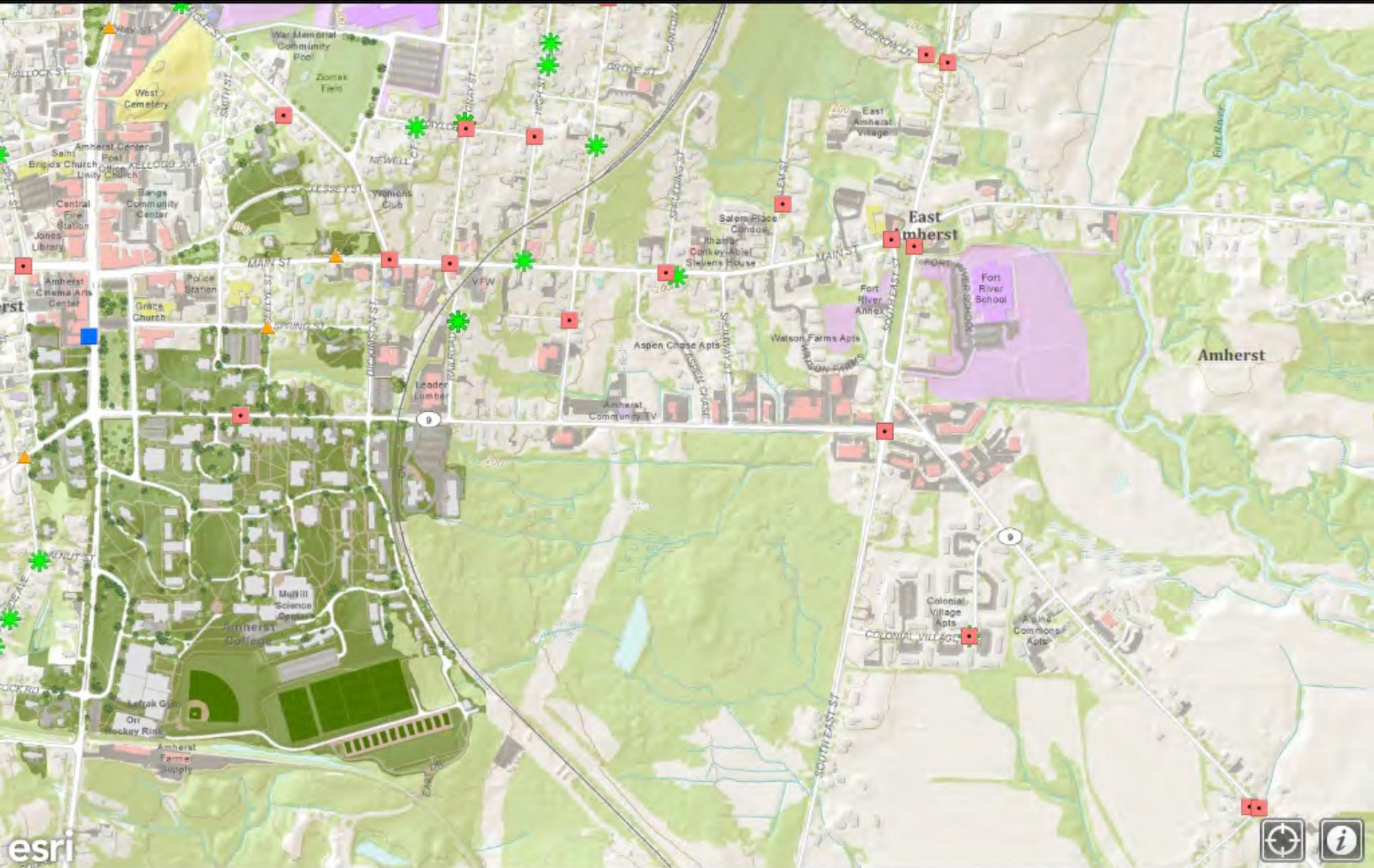
Amherst MA Open Work Orders



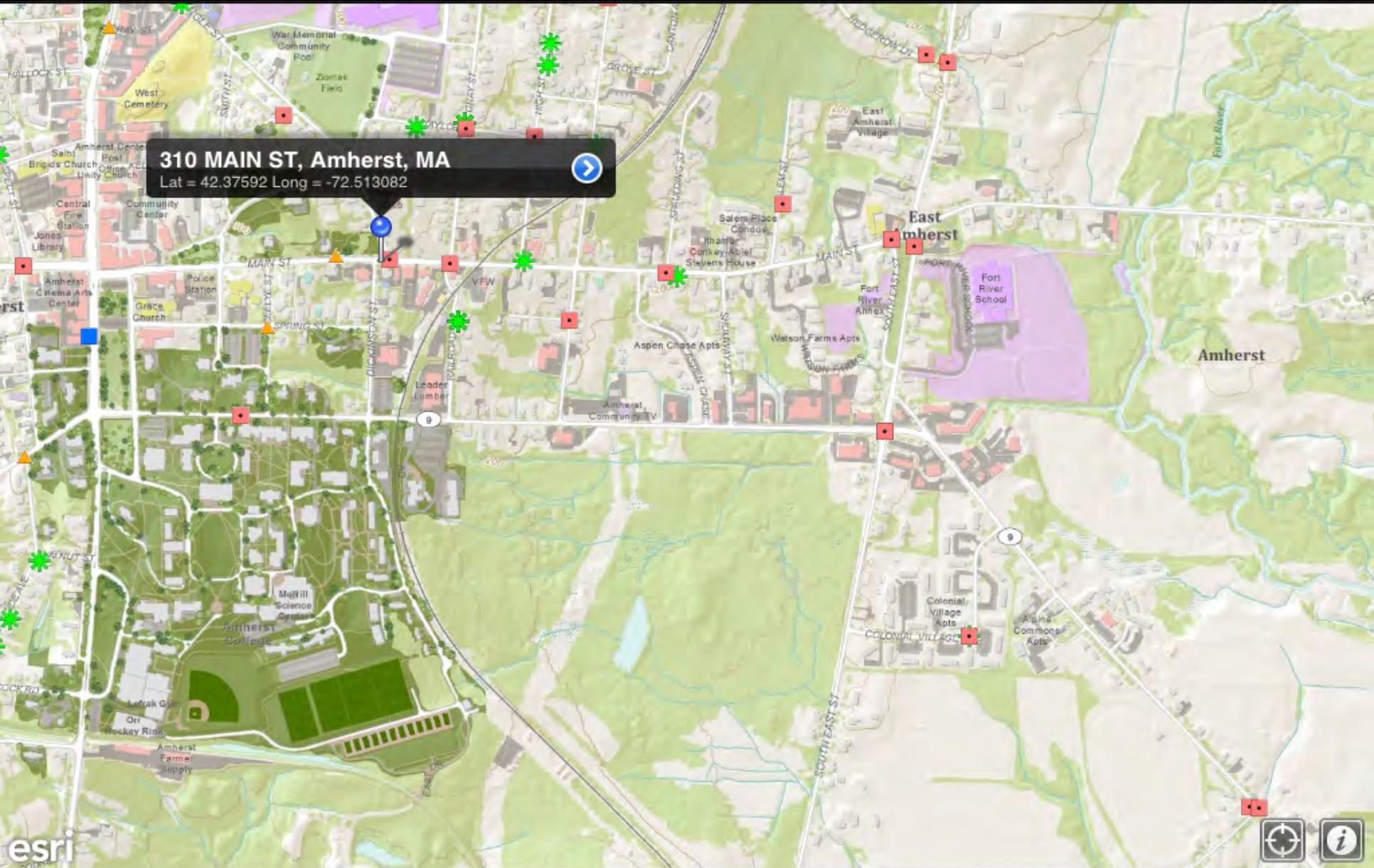
Amherst MA Open Work Orders



Amherst MA Open Work Orders



Amherst MA Open Work Orders



310 MAIN ST
Amherst, MA
Lat = 42.3759, Long = -72.5131

Work Order: Pothole**14B-61****14B-60****14B-28****14B-27****14B-19****14B-59****14B-58****14B-19E****AMHERST**

Map



Search



Find Maps

Work Order: Pothole

Status

Planned

ID

HW-1512-11

Issue

Work Order: Pothole

FieldEntry

<https://gis.amherstma.gov/field/WoMobile.aspx?uid=1028788166>

Address

MAIN ST @ TRIANGLE ST

Department

Highway

Priority

Moderate

EntryDate

6/7/2011 12:17:50 PM

Details

Could we please fill the pothole on Main St., just as you turn onto Triangle St. It's a pretty big one.

Activity

Maintenance



Map



Search



Find Maps

Authentication Required
gis.amherstma.gov

user name

password

Cancel Log In



ID	HW-1512-11
Issue	Pothole
Status	Planned
Action	
TreeID	<input type="text"/>
Closed	
Location	MAIN ST @ TRIANGLE ST
Department	Highway
Reported	06/07/2011
Details	Could we please fill the pothole on Main St., just as you turn onto Triangle St. It's a pretty big one.

Update Cancel

ID	HW-1512-11
Issue	Pothole
Status	Planned
Action	<div> <p>Completed</p> <p>Given to tree warden</p> <p>In Progress</p> <p>On Hold</p> <p>Planned ✓</p> </div>
TreeID	
Closed	
Location	MAIN ST @ TRIANGLE ST
Department	Highway
Reported	06/07/2011
Details	Could we please fill the pothole on Main St., just as you turn onto Triangle St. It's a pretty big one.

Update Cancel

Results

- Less wasteful & more efficient work order update/closeout process
- Reduced stress upon the office staff
- Empowerment for the field crews
- Fewer instances of redundant work orders (double-entries for long-standing issues)
- More comprehensive view of the big picture for everyone

Want more?

Let's Get Geeky

- Our Work Order System has X & Y numeric fields in the work order table.
- How do we make this work for an ArcGIS Server Map Service?
 - My approach: Make a Query Layer

wdWOMainGe...	ID	cgLastModified	X	Y	Status	Activity
50351328	HW-1550-11	2011-06-22 13:10:...	389454.956249997	2953786.044	Planned	NULL
59227093	HW-1523-11	2011-06-22 11:09:...	380607.1875	2962511.375	Completed	NULL
326886659	HW-1518-11	2011-06-22 11:09:...	378487.25	2972022.75	Completed	NULL
773091626	HW-1549-11	2011-06-22 11:08:...	384723.908250004	2942579.78425001	Planned	NULL
1674775178	HW-1548-11	2011-06-22 10:23:...	375861.775999993	2975742.317	Planned	Maintena
2146898923	HW-1547-11	2011-06-21 16:16:...	391128.562000006	2963697	Planned	NULL
1147108079	HW-1546-11	2011-06-21 16:15:...	391583.665000007	2950613.789	Planned	Repair Ci

X/Y Pairs -> points in ArcGIS Server

- 3 Steps:
 - Create a database view that includes a geometry (Shape) field & a Unique ID (ObjectID) field
 - Add that view to a map as a Query Layer
 - Symbolize the Query Layer & publish the map

Database View w/ Shape & ObjectID

- SQL Server 2008 has a geometry data type, replicated with a “cast” statement in this view
 - Looks like this: **point (389454 2953786)**
- The OID (aka ObjectID) field is basically faked here based upon the order of another field

```
SELECT
CAST('point (' + CAST(WO.X AS varchar) + ' ' + CAST(WO.Y AS varchar) + ') ' AS geometry) AS SHAPE,
cast(ROW_NUMBER() OVER (ORDER BY WO.cglastmodified DESC) AS int) AS OID,
WO.ID,
WO.wdWOMainGeneralOID AS UID,
'https://gis.amherstma.gov/field/wo.aspx?id=' + WO.ID AS FieldEntry,
WO.cgLastModified,
WO.EntryDate,
WO.StopDateActual,
WO.EnteredBy,
WO.Issue AS Issue,
```


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