Modernizing Hydrant Inspection Program with the ArcGIS Platform

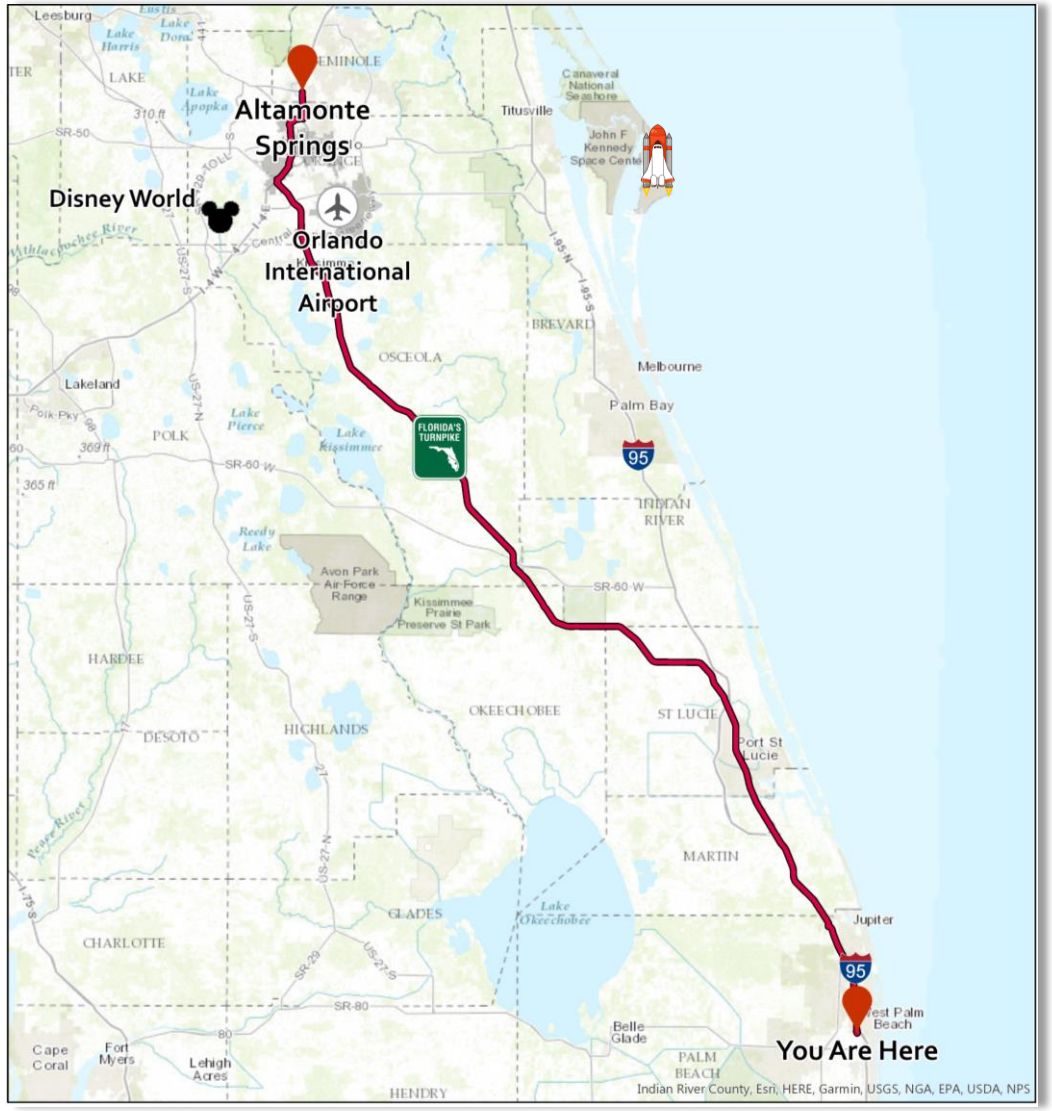
Kyle Crawford

Esri Public Sector Conference

April 13, 2017

CITY OF ALTAMONTE Springs

City of Altamonte Springs



- 10 square miles
- City population: 43,900
- Incorporated: 1920
- Public Works is our biggest GIS consumer
- Centralized GIS team

Overview

- Why inspect fire hydrants?
- Previous workflow
- Meeting with PW staff
- Solution - Why use Collector?
- Data structure
- Inspection records
- Demonstrations

Why Inspect Fire Hydrants?

- Ensure working order for fire protection
- Warn of any pressure or flow inconsistencies within distribution network
- Remove sediment from lines

Previous Workflow

- Paper form to conduct inspections
- Lacked ability to track inspection progress
- No asset management software to deliver work orders
- Data was not being fed back into GIS
- Lacked seamless migration to future software

Questions we faced…

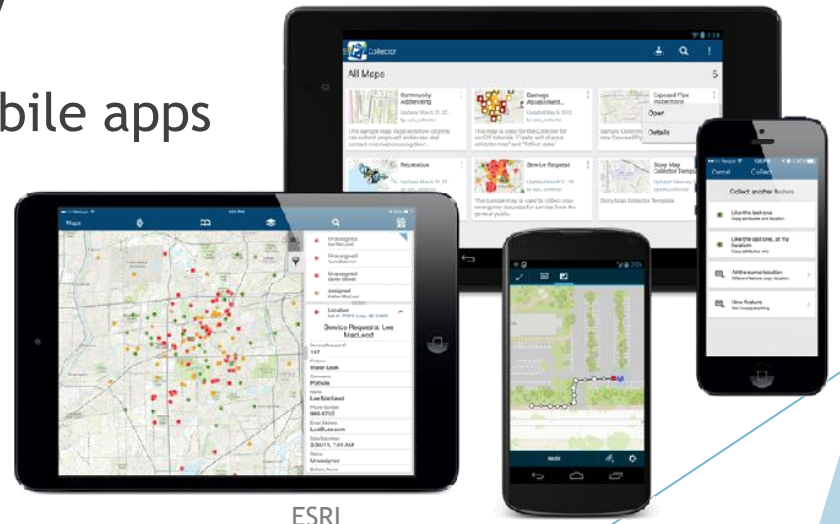
- How can we improve data collection?
- What data do we need to capture?
- How to handle collecting/storing inspection records?
- How can we track inspected hydrants?
- What processes can we automate?

Meeting with PW staff

- Observe inspection process
- Identify data to be collected
- Identify hardware needs
- Discuss workflow for providing daily work orders
- Discuss end user environment

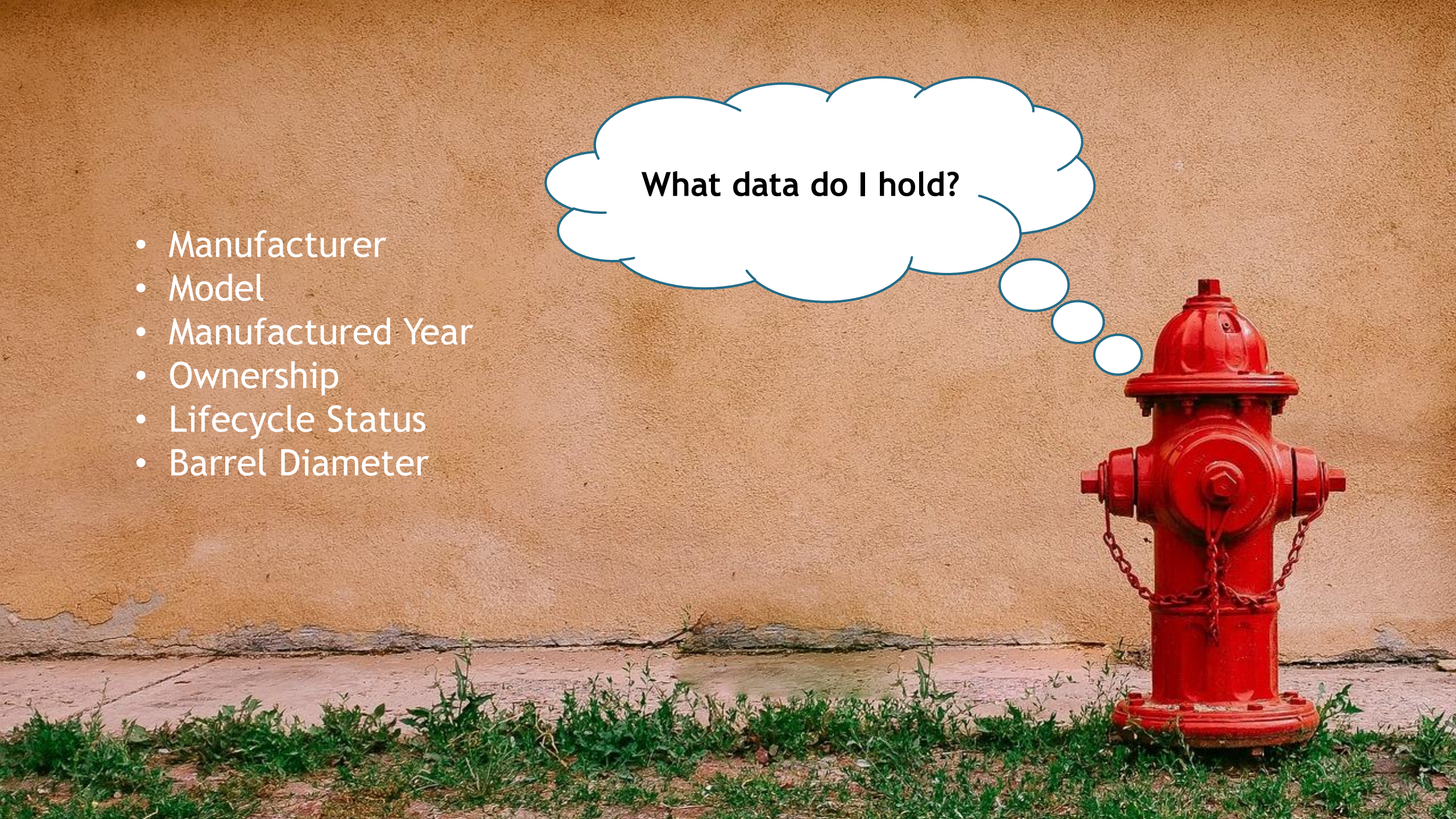
Why Collector?

- Ability to collect and update data in real time
- Track daily work
- Available on iOS, Android, and Windows 10* devices
- User-friendly – increases data integrity
- Ability to integrate with other Esri mobile apps



ESRI

*Excluding LTSB


What data do I hold?
• Manufacturer
• Model
• Manufactured Year
• Ownership
• Lifecycle Status
• Barrel Diameter

Storing Inspection Records – Related Table

- One-to-many relationship class
- Related table to hold hydrant inspection records

Hydrant ID*	Make	Model	Manufactured Year	Barrel Diameter	Inspected Year
HYD0001	American Darling	B84B	1976	5.25	2017-Flushed

Attribute table containing key hydrant data.

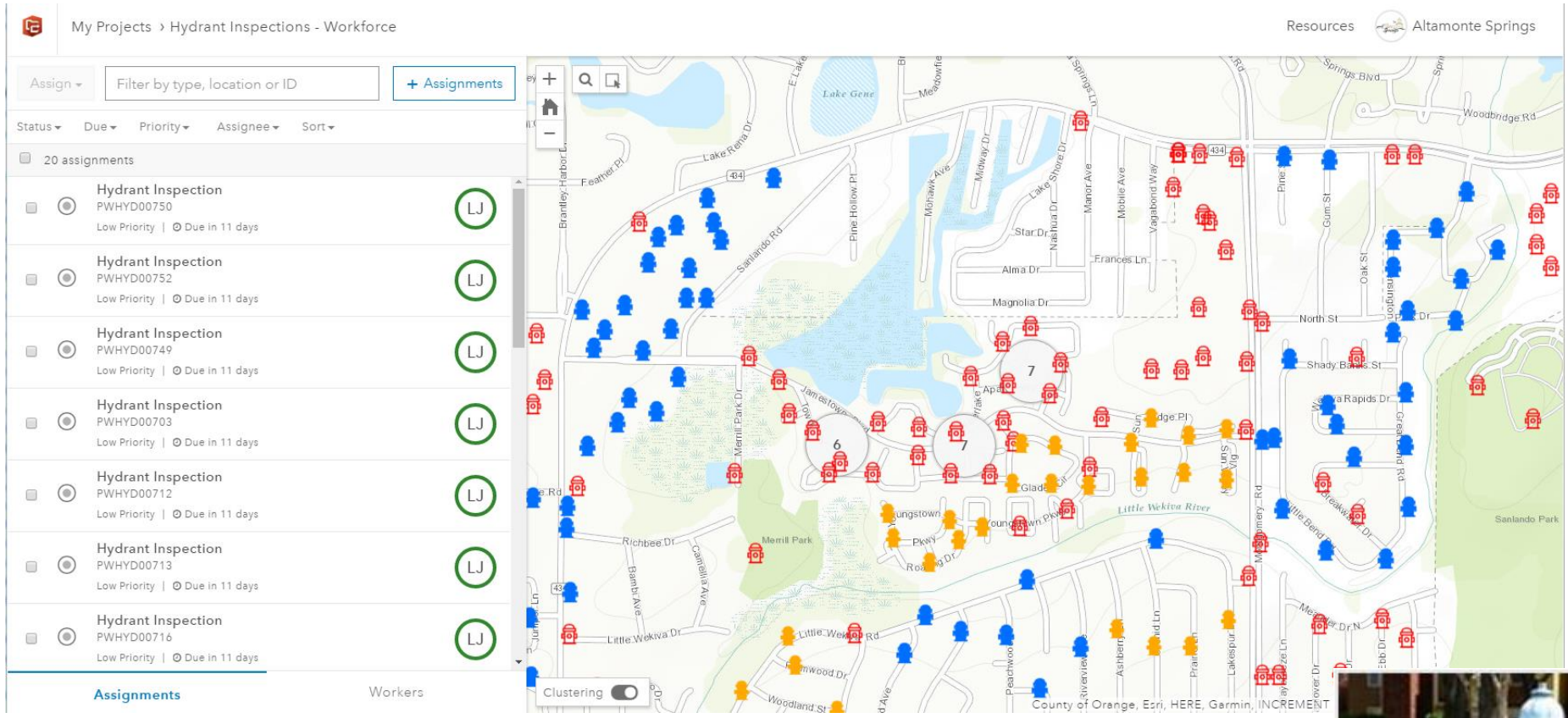
Hydrant ID*	Inspected Date	Paint Req'd?	Reflector Req'd?	Discharge GPM	Residual PSI	Static PSI
HYD0001	01/01/2017	Yes	Yes	1130	45	64
HYD0001	01/01/2018	No	No	700	15	40
HYD0001	01/01/2019	No	No	1130	45	64

Related table containing data on historical inspections.

Data Planning

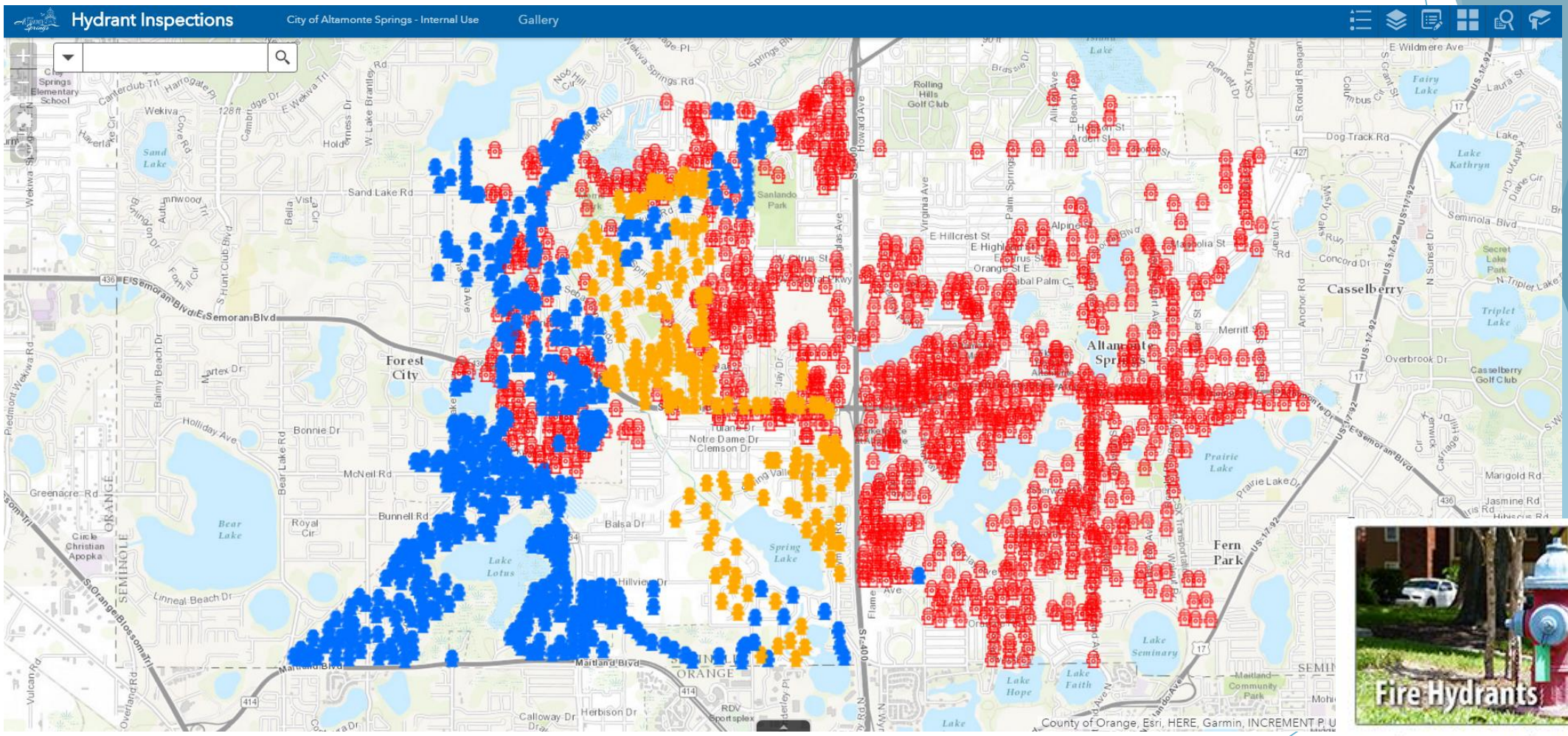
- Location Description – assign closest address
- Designate attribute domains wherever possible
- Created hydrant inspection zones
  - Calculated average time per inspection
  - Use inspection zones to create work assignments

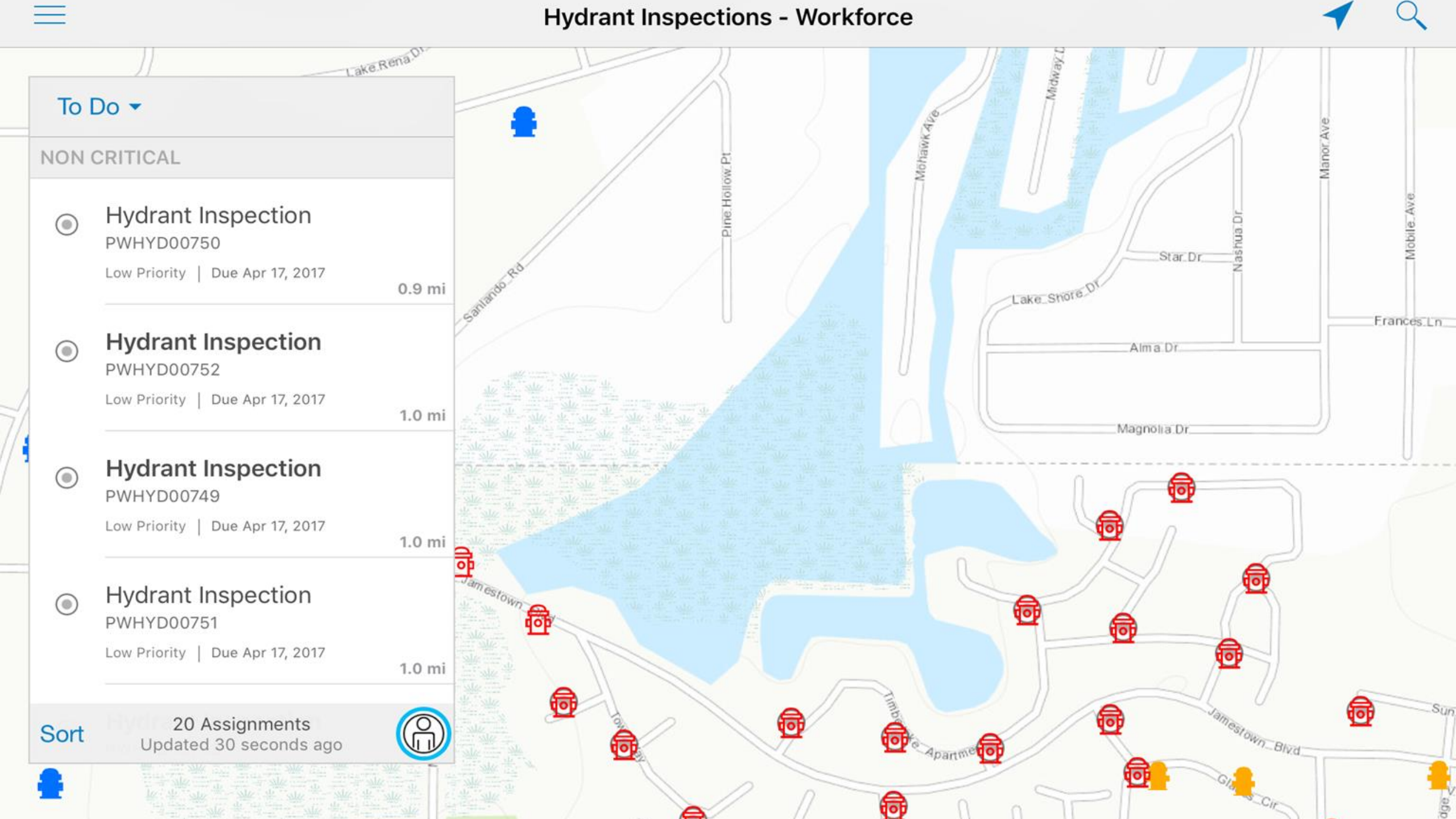
Workforce Demo

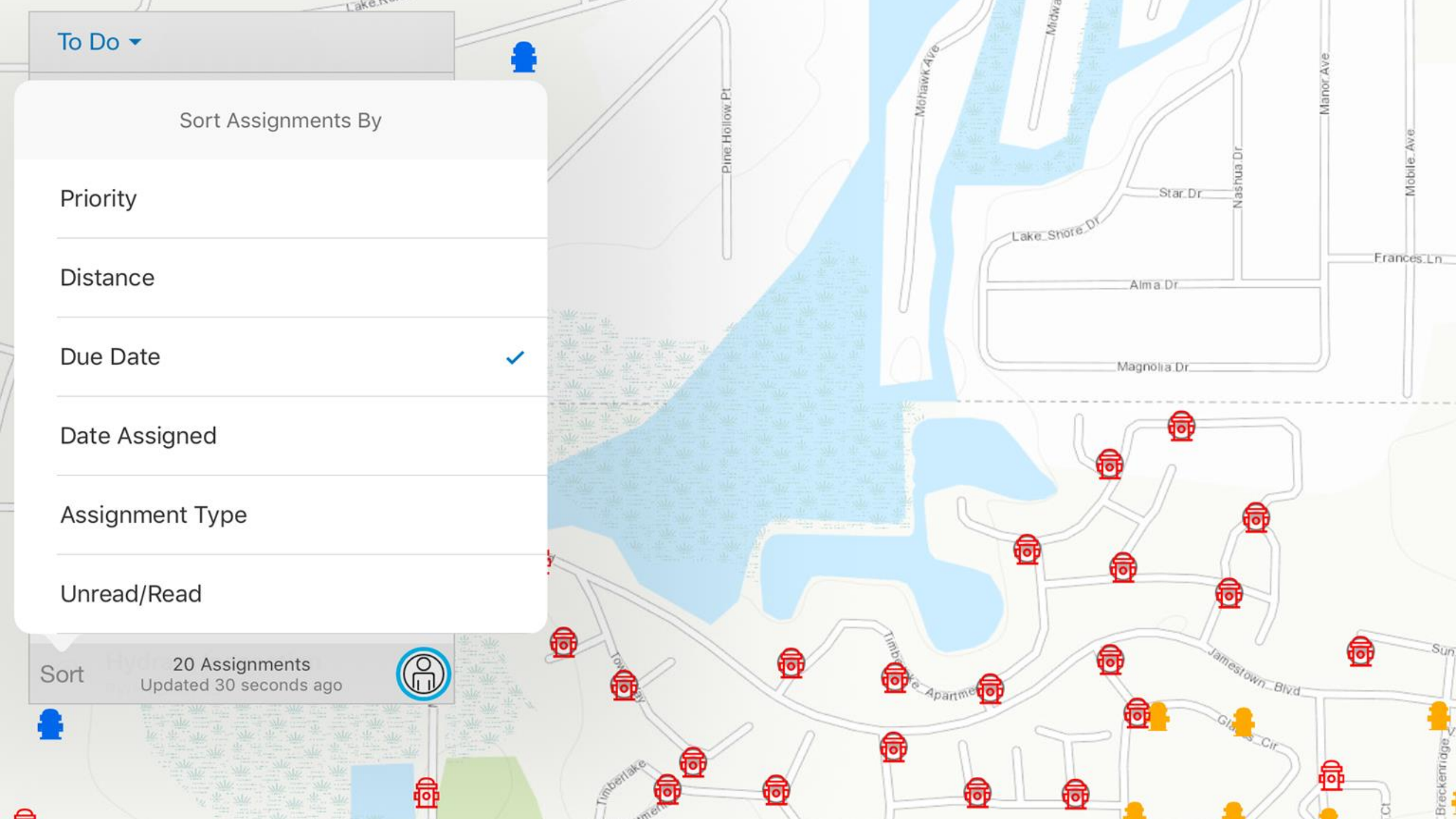


Workforce & Collector Demo

Web Application Demo




Hydrant Inspections - Workforce
To Do
NON CRITICAL
Hydrant Inspection
PWHYD00750
Low Priority | Due Apr 17, 2017
0.9 mi
Hydrant Inspection
PWHYD00752
Low Priority | Due Apr 17, 2017
1.0 mi
Hydrant Inspection
PWHYD00749
Low Priority | Due Apr 17, 2017
1.0 mi
Hydrant Inspection
PWHYD00751
Low Priority | Due Apr 17, 2017
1.0 mi
Sort
20 Assignments
Updated 30 seconds ago
Lake Rena Dr
Sanlando Rd
Pine Hollow Pt
Mohawk Ave
Midway Dr
Manor Ave
Mobile Ave
Nashua Dr
Star Dr
Lake Shore Dr
Frances Ln
Alma Dr
Magnolia Dr
Jamestown Blvd
Timberlake Apartments
Jamestown Blvd


To Do
Sort Assignments By
Priority
Distance
Due Date
Date Assigned
Assignment Type
Unread/Read
Sort
20 Assignments
Updated 30 seconds ago
Pine Hollow Pt
Mohawk Ave
Manor Ave
Mobile Ave
Nashua Dr
Star Dr
Lake Shore Dr
Frances Ln
Alma Dr
Magnolia Dr
Jamestown Blvd
Timberlake

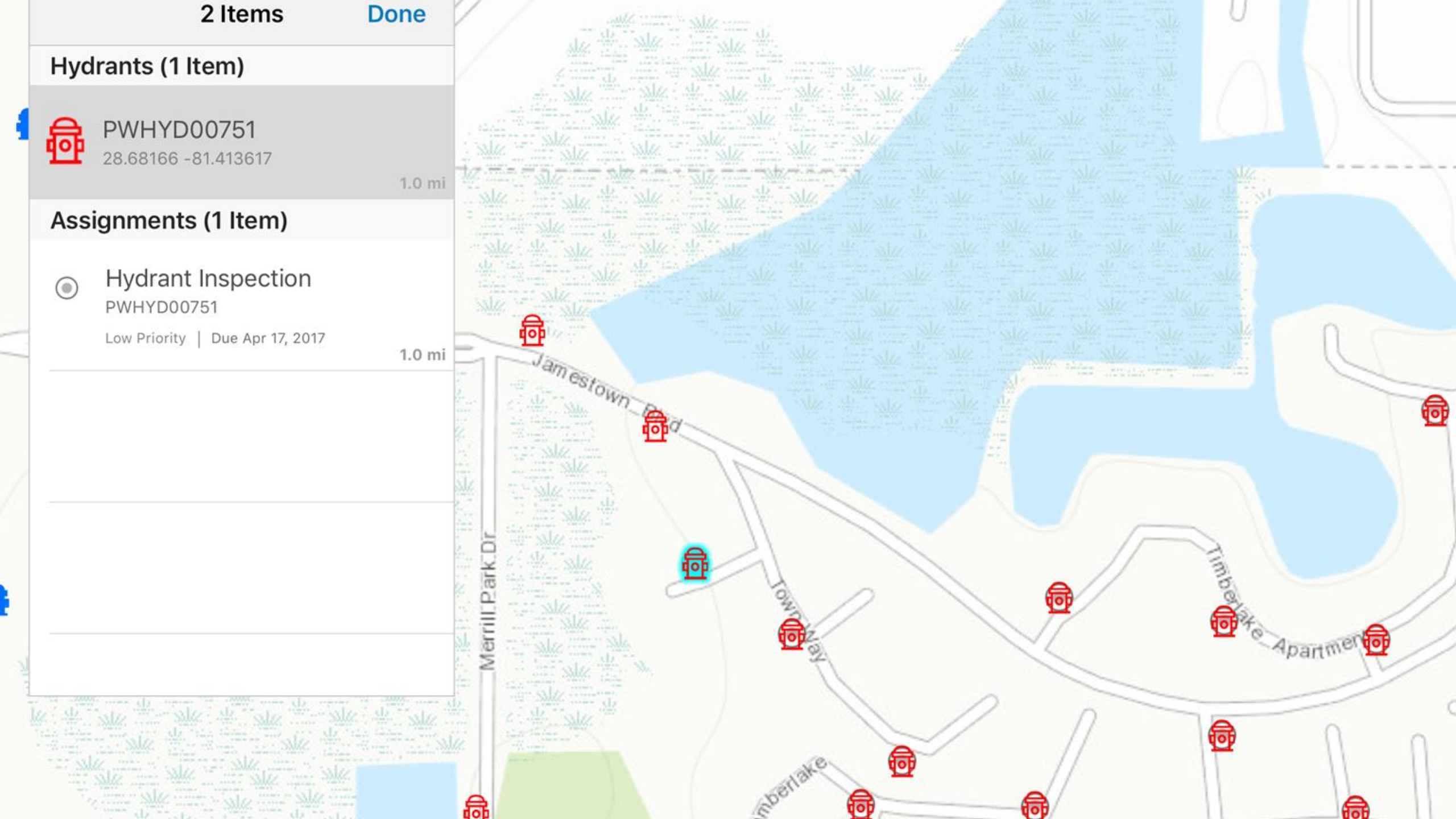
2 Items Done

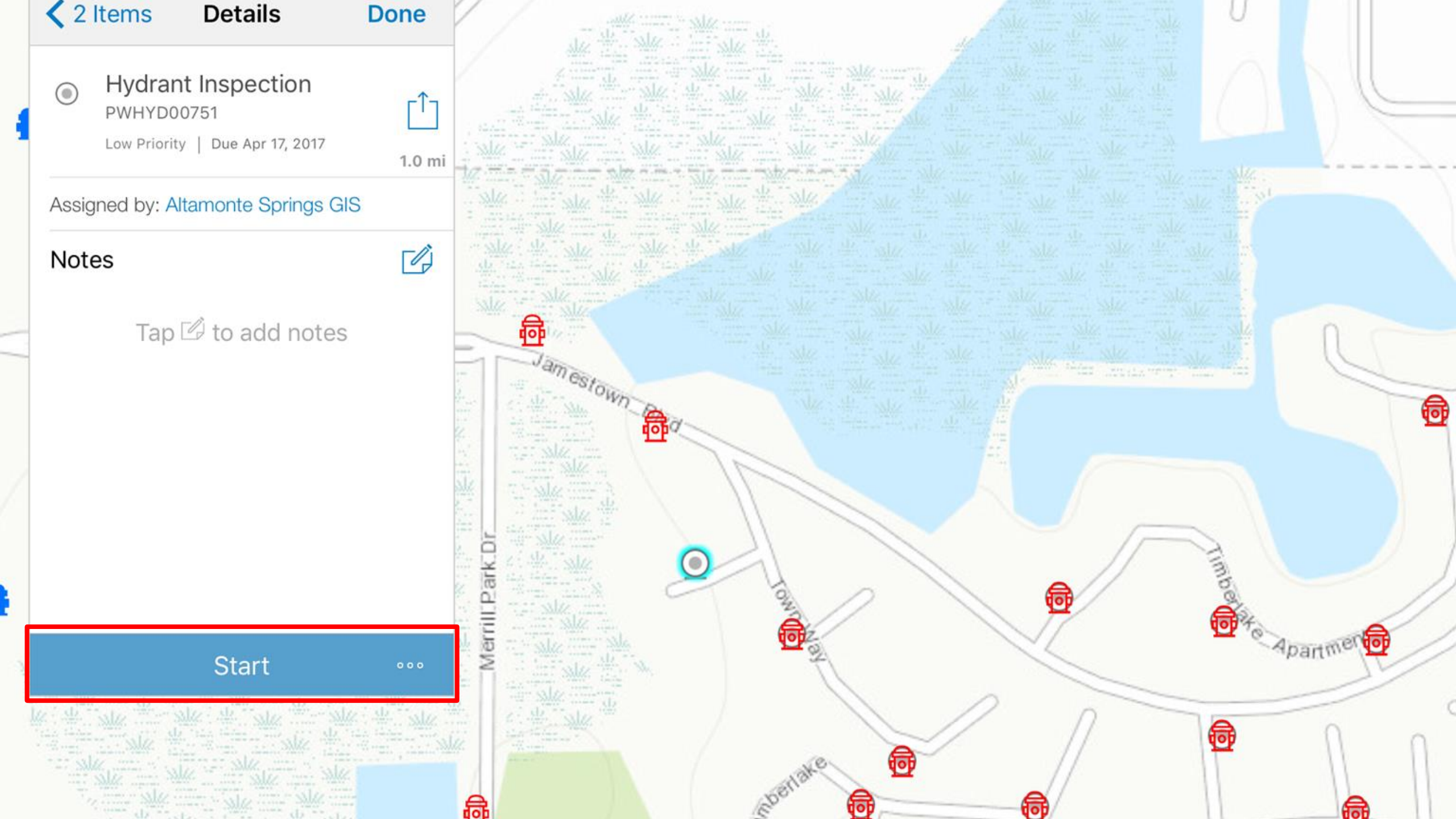
Hydrants (1 Item)

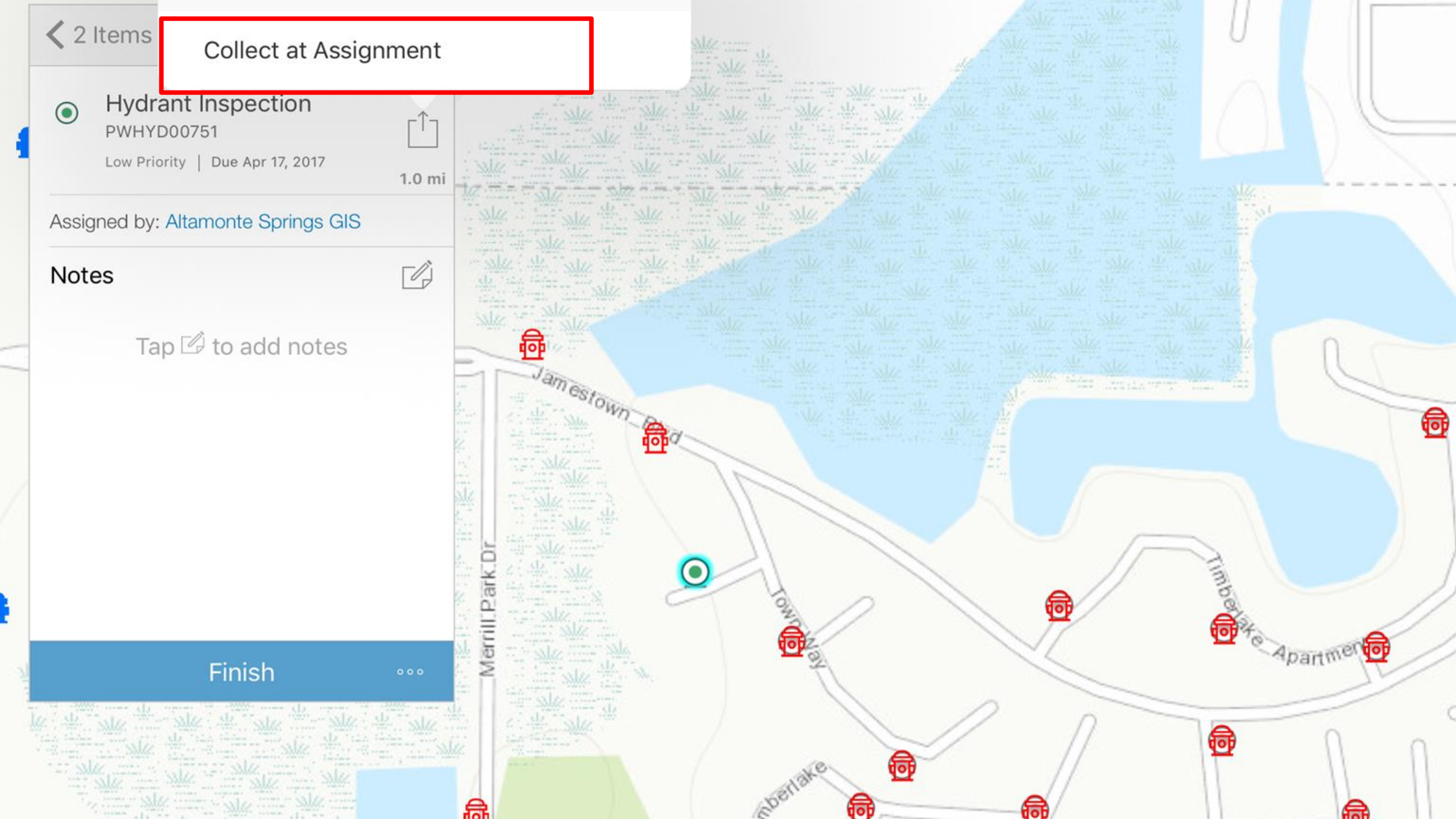
PWHYD00751
28.68166 -81.413617
1.0 mi

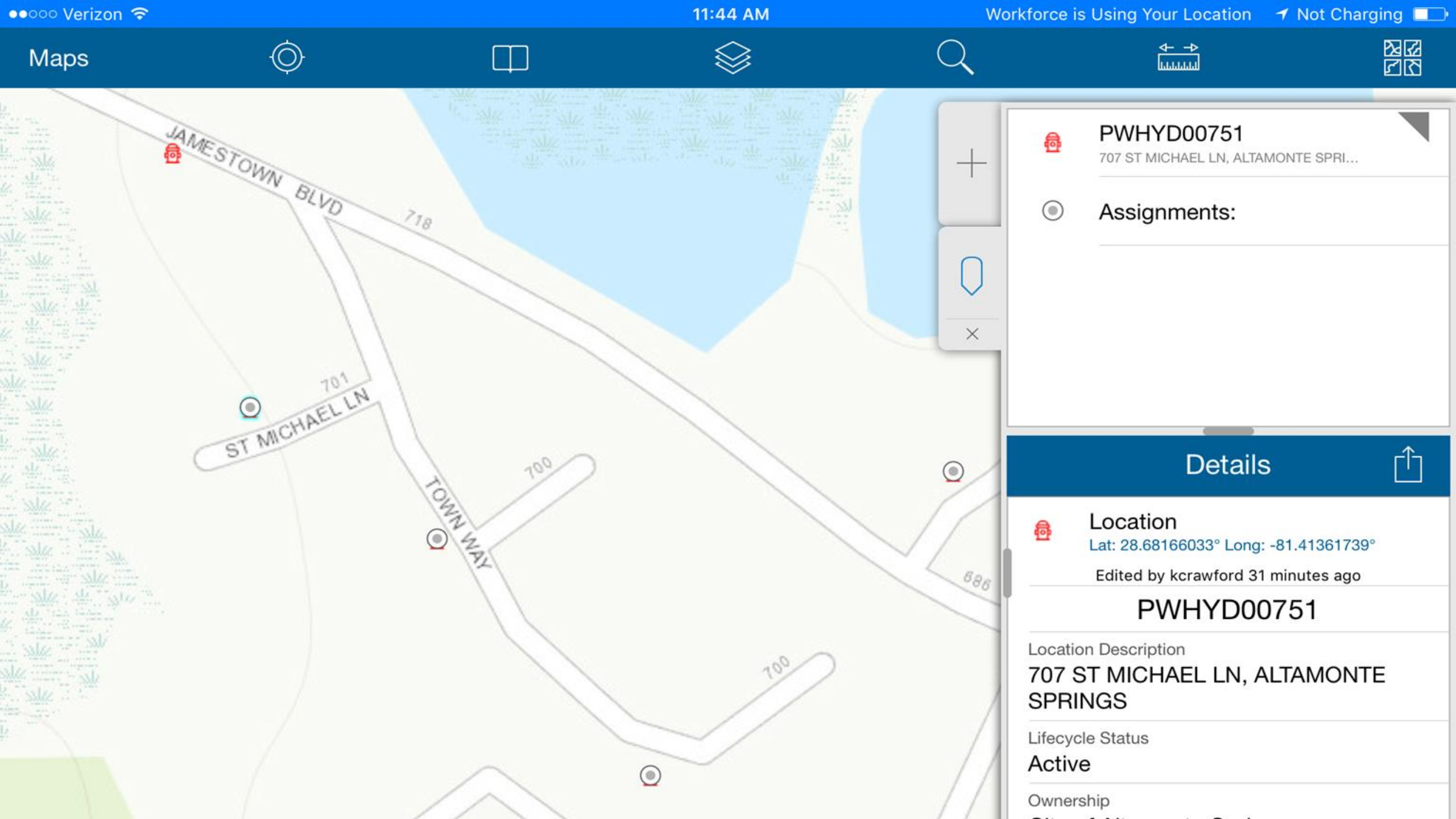
Assignments (1 Item)

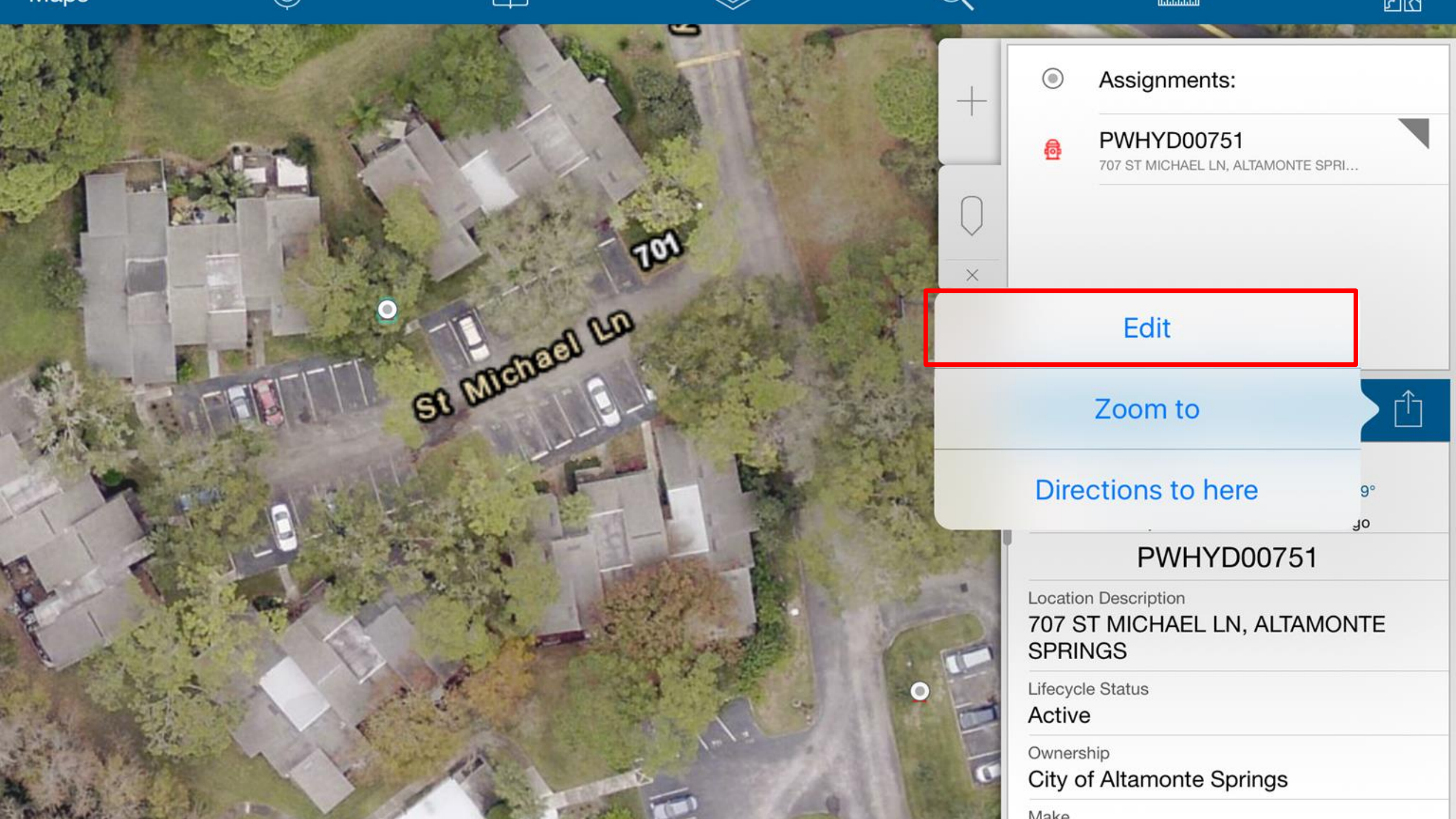
Hydrant Inspection
PWHYD00751
Low Priority | Due Apr 17, 2017
1.0 mi

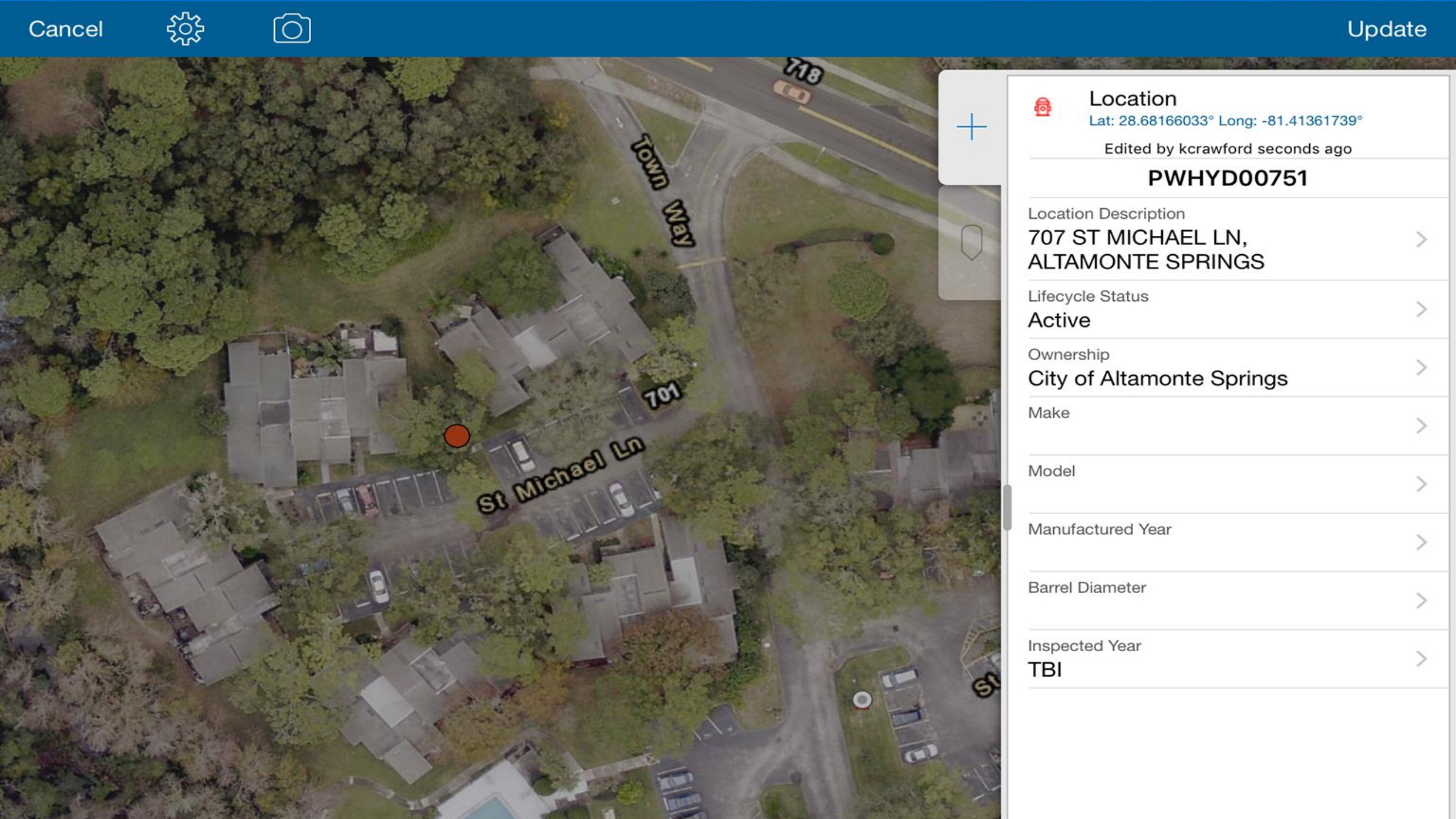



2 Items
Details
Done
Hydrant Inspection
PWHYD00751
Low Priority | Due Apr 17, 2017
1.0 mi
Assigned by: Altamonte Springs GIS
Notes
Tap to add notes
Start
Jamestown Road
Merrill Park Dr
Town Way
Timberlake Apartments


2 Items
Collect at Assignment
Hydrant Inspection
PWHYD00751
Low Priority | Due Apr 17, 2017
1.0 mi
Assigned by: Altamonte Springs GIS
Notes
Tap to add notes
Finish
Jamestown Blvd
Merrill Park Dr
Town Way
Timberlake Apartments


Verizon
11:44 AM
Workforce is Using Your Location
Not Charging
Maps
JAMESTOWN BLVD
718
701
ST MICHAEL LN
700
TOWN WAY
700
686
PWHYD00751
707 ST MICHAEL LN, ALTAMONTE SPRI...
Assignments:
Details
Location
Lat: 28.68166033° Long: -81.41361739°
Edited by kcrawford 31 minutes ago
PWHYD00751
Location Description
707 ST MICHAEL LN, ALTAMONTE SPRINGS
Lifecycle Status
Active
Ownership


Assignments:
PWHYD00751
707 ST MICHAEL LN, ALTAMONTE SPRI...
Edit
Zoom to
Directions to here
PWHYD00751
Location Description
707 ST MICHAEL LN, ALTAMONTE SPRINGS
Lifecycle Status
Active
Ownership
City of Altamonte Springs
701
St Michael Ln


Cancel
Update
718
Town Way
701
St Michael Ln
Location
Lat: 28.68166033° Long: -81.41361739°
Edited by kcrawford seconds ago
PWHYD00751
Location Description
707 ST MICHAEL LN, ALTAMONTE SPRINGS
Lifecycle Status
Active
Ownership
City of Altamonte Springs
Make
Model
Manufactured Year
Barrel Diameter
Inspected Year
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Cancel Done

Make

Filter

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American Darling ✓

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28.68166033° Long: -81.41361739°

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Barrel Diameter

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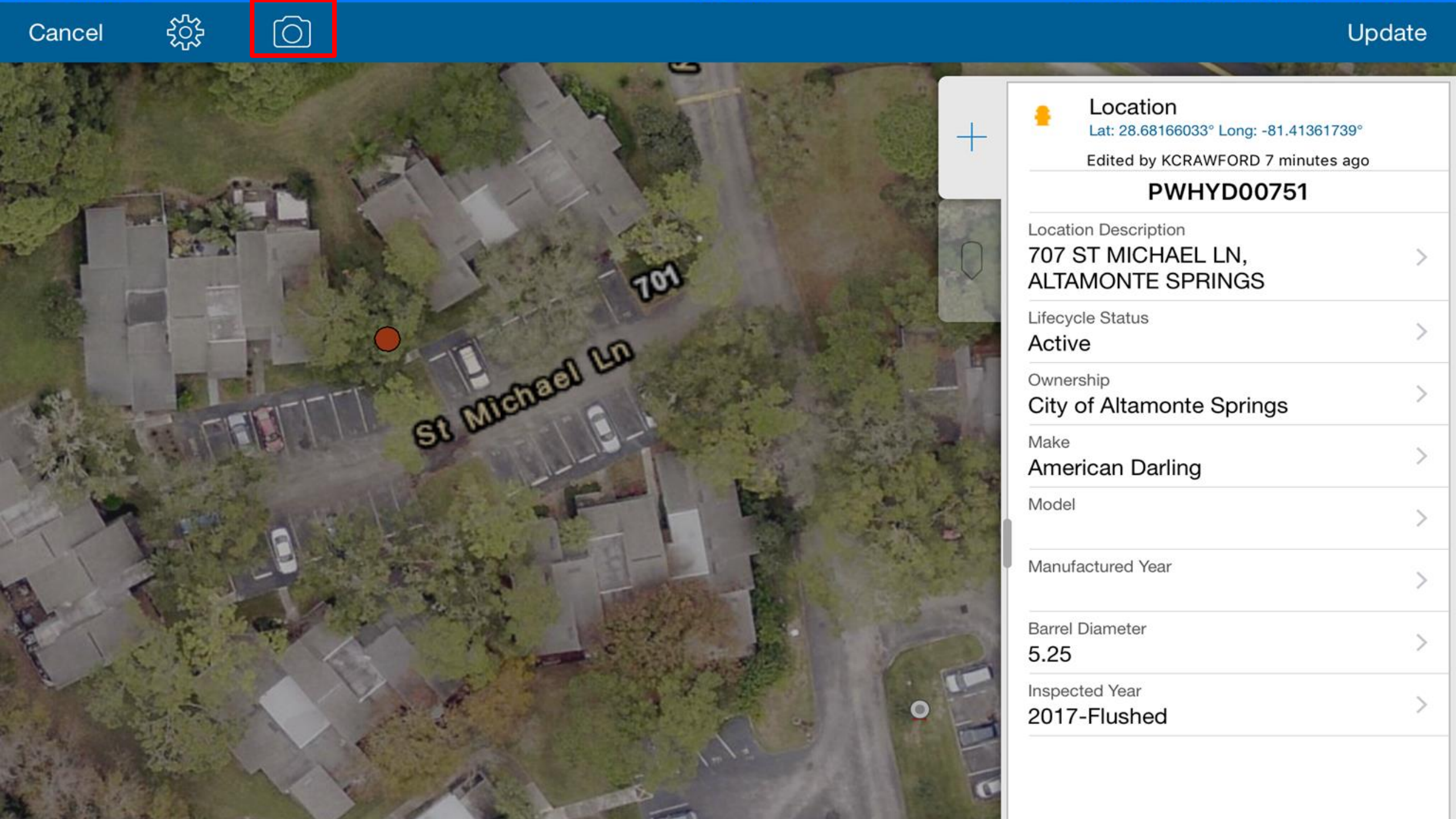
Cancel
Update
701
St Michael Ln
Location
Lat: 28.68166033° Long: -81.41361739°
Edited by KCRAWFORD 7 minutes ago
PWHYD00751
Location Description
707 ST MICHAEL LN, ALTAMONTE SPRINGS
Lifecycle Status
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Ownership
City of Altamonte Springs
Make
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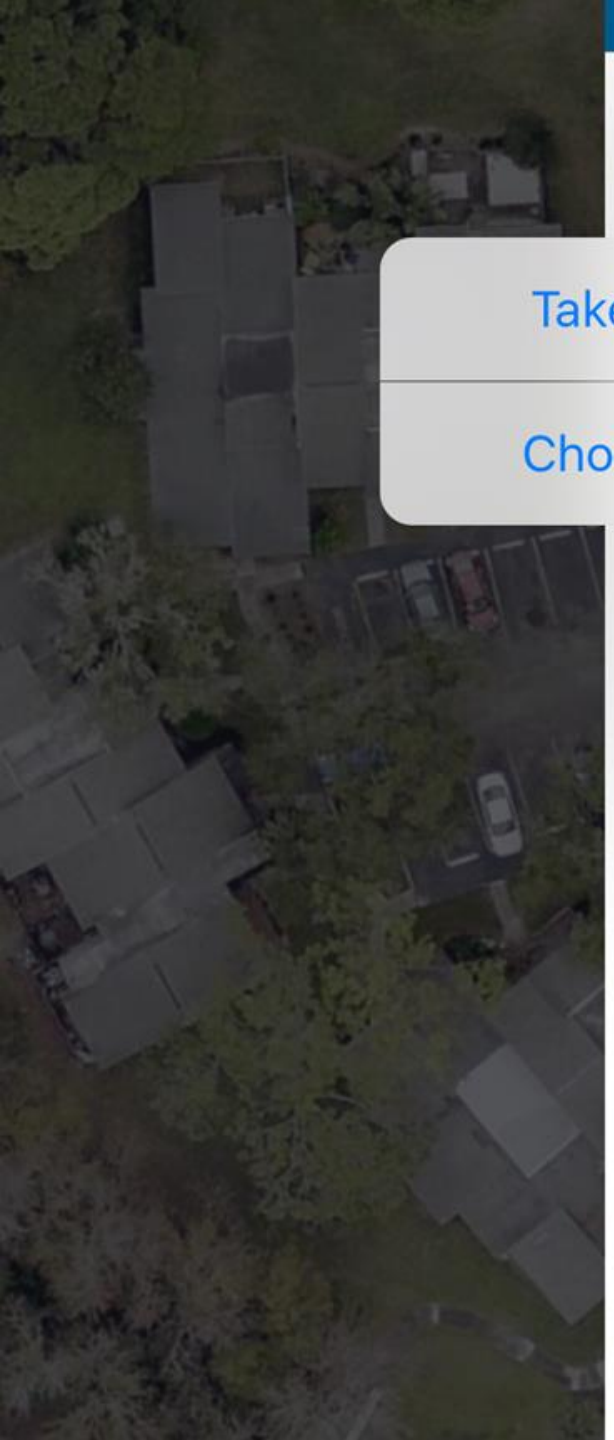
Model
Manufactured Year
Barrel Diameter
5.25
Inspected Year
2017-Flushed



Done

Attachments

Add

Take Photo or Video

Choose From Library

28.68166033° Long: -81.41361739°

ted by KCRAWFORD 7 minutes ago

PWHYD00751

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Attachments

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Cancel

Update

Location

Lat: 28.68166033° Long: -81.41361739°

Edited by KCRAWFORD 7 minutes ago

PWHYD00751

Location Description
707 ST MICHAEL LN, ALTAMONTE SPRINGS

Lifecycle Status
Active

Ownership
City of Altamonte Springs

Make
American Darling

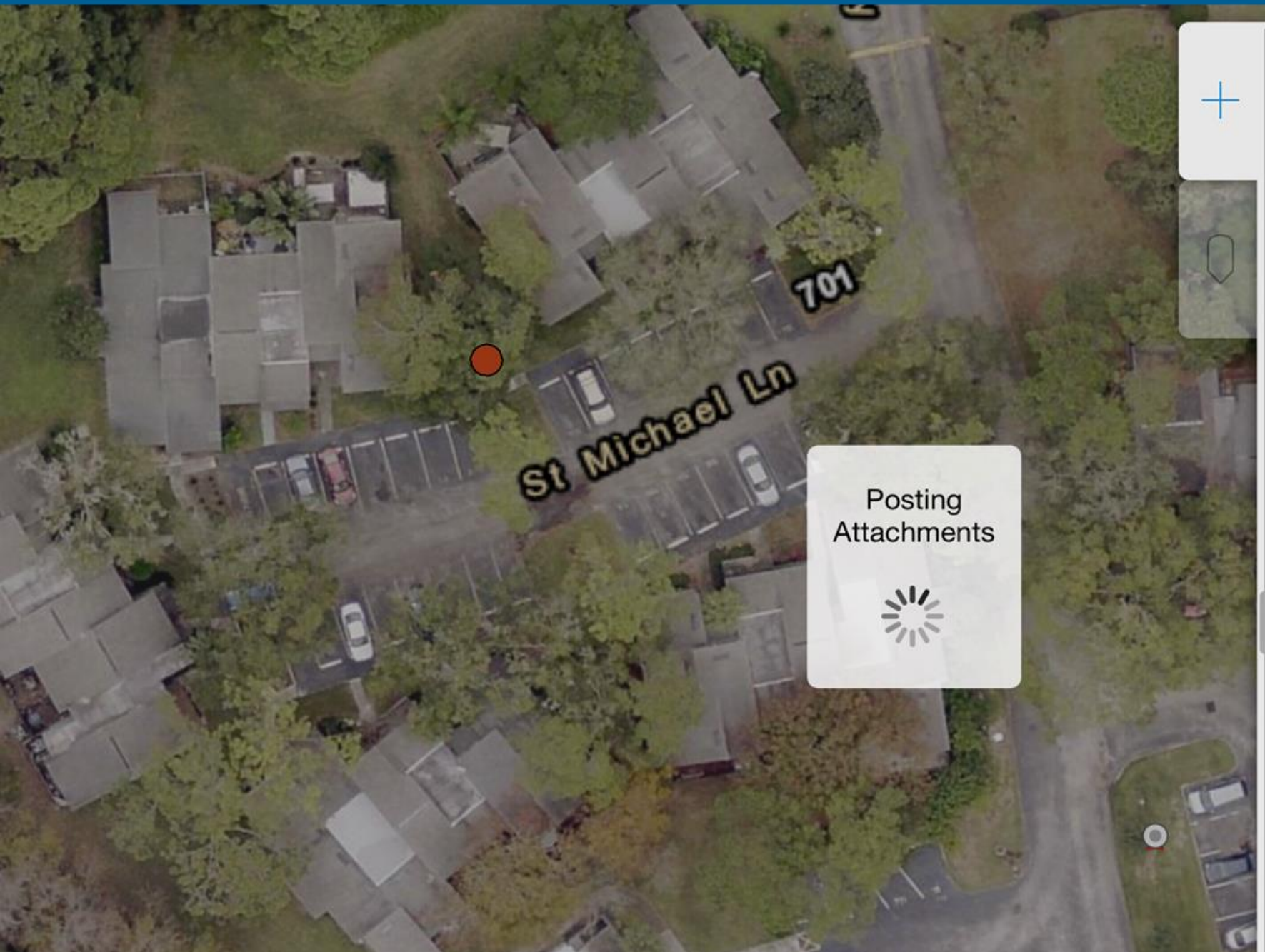
Model

Manufactured Year

Barrel Diameter
5.25

Inspected Year
2017-Flushed

Cancel



Posting Attachments

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PWHYD00751

Location Description
707 ST MICHAEL LN, ALTAMONTE SPRINGS

Lifecycle Status
Active

Ownership
City of Altamonte Springs

Make
American Darling

Model

Manufactured Year

Barrel Diameter
5.25

Inspected Year
2017-Flushed

Assignments:

PWHYD00751

707 ST MICHAEL LN, ALTAMONTE SPRI...

Details

Location

Lat: 28.68166033° Long: -81.41361739°

<Null>

Hydrant Inspection History

View

New

Attachments

Photo1.jpg

679.7 KB

Cancel

Submit

Inspection Date

Inspector
Lantrez Jones

Exercised Valve

Hydrant Flushed

Paint Req'd?

Marker Req'd?

Lubrication Req'd?

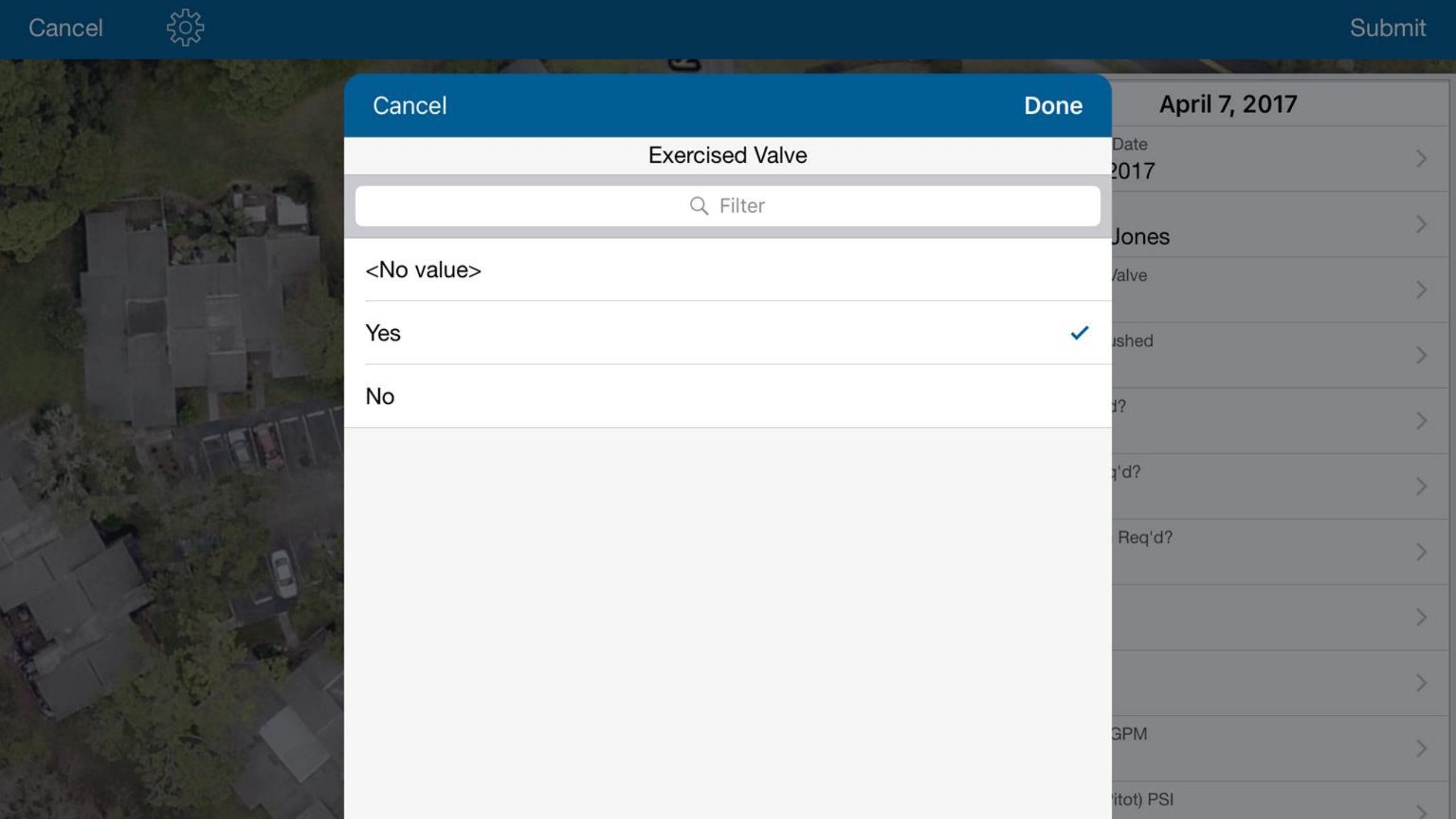
Grade

Static PSI

Discharge GPM

Residual (Pitot) PSI

Repairs Made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Submit
Cancel
Done
Exercised Valve
Filter
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No
April 7, 2017
Date
2017
Jones
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GPM
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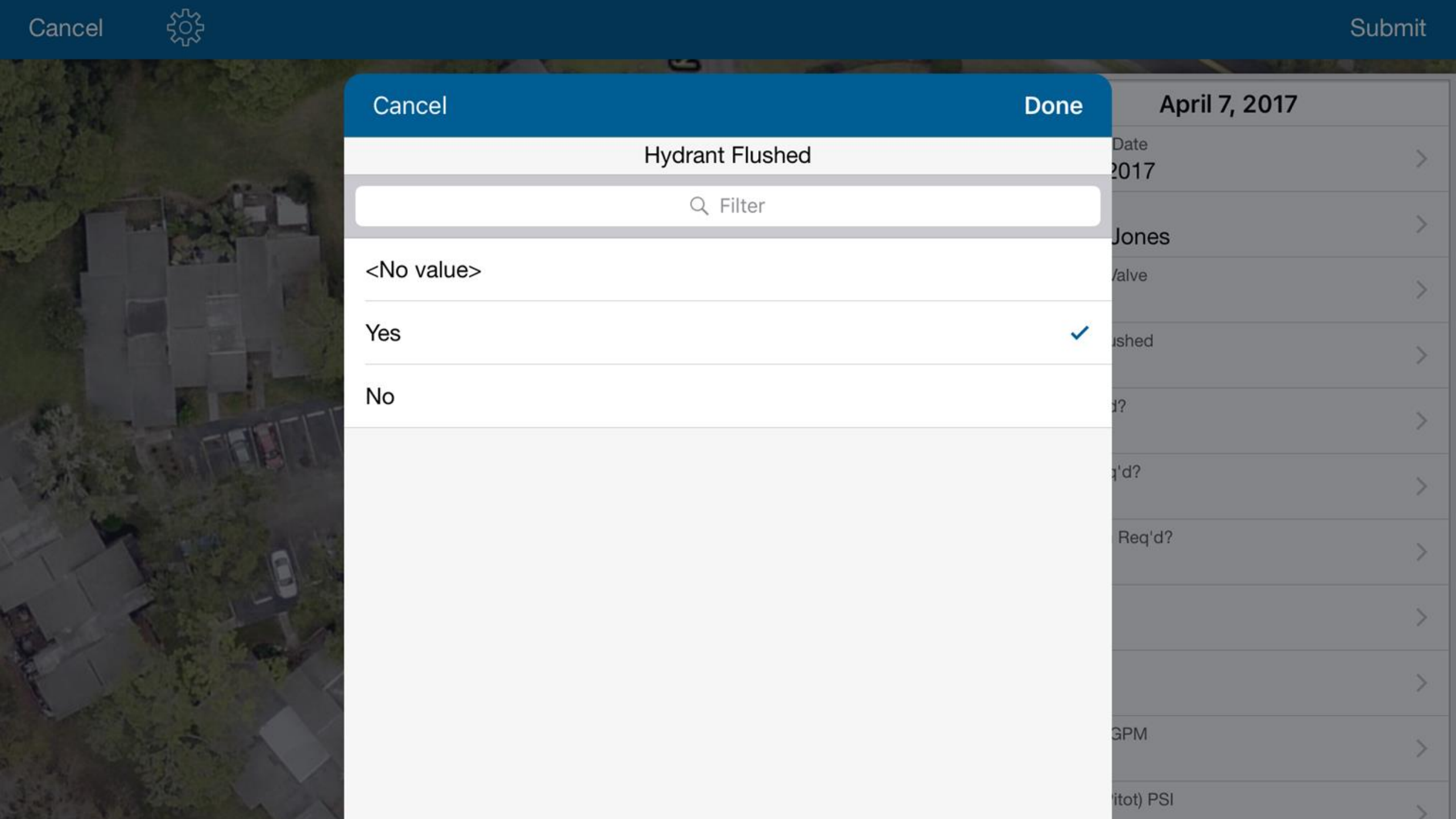
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Hydrant Flushed
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No
April 7, 2017
Date
2017
Jones
Valve
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d?
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Req'd?
GPM
itot) PSI

Cancel

Submit

April 7, 2017

Inspection Date
April 7, 2017

Inspector
Lantrez Jones

Exercised Valve
Yes

Hydrant Flushed
Yes

Paint Req'd?
Yes

Marker Req'd?
No

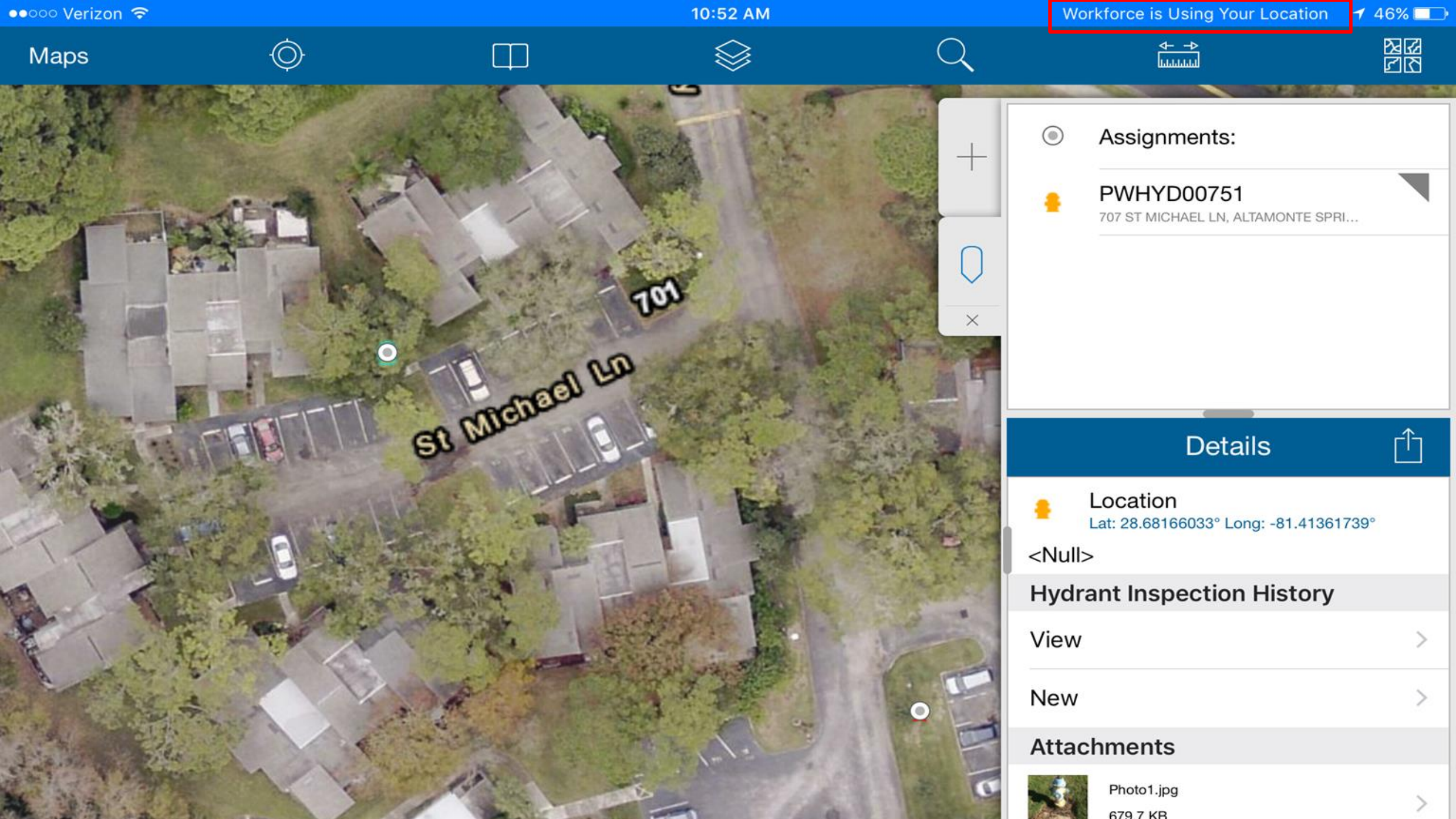
Lubrication Req'd?
Yes

Grade

Static PSI
65

Discharge GPM
1,190

Residual (Pitot) PSI
50


Verizon
10:52 AM
Workforce is Using Your Location
46%
Maps
701
St Michael Ln
Assignments:
PWHYD00751
707 ST MICHAEL LN, ALTAMONTE SPRI...
Details
Location
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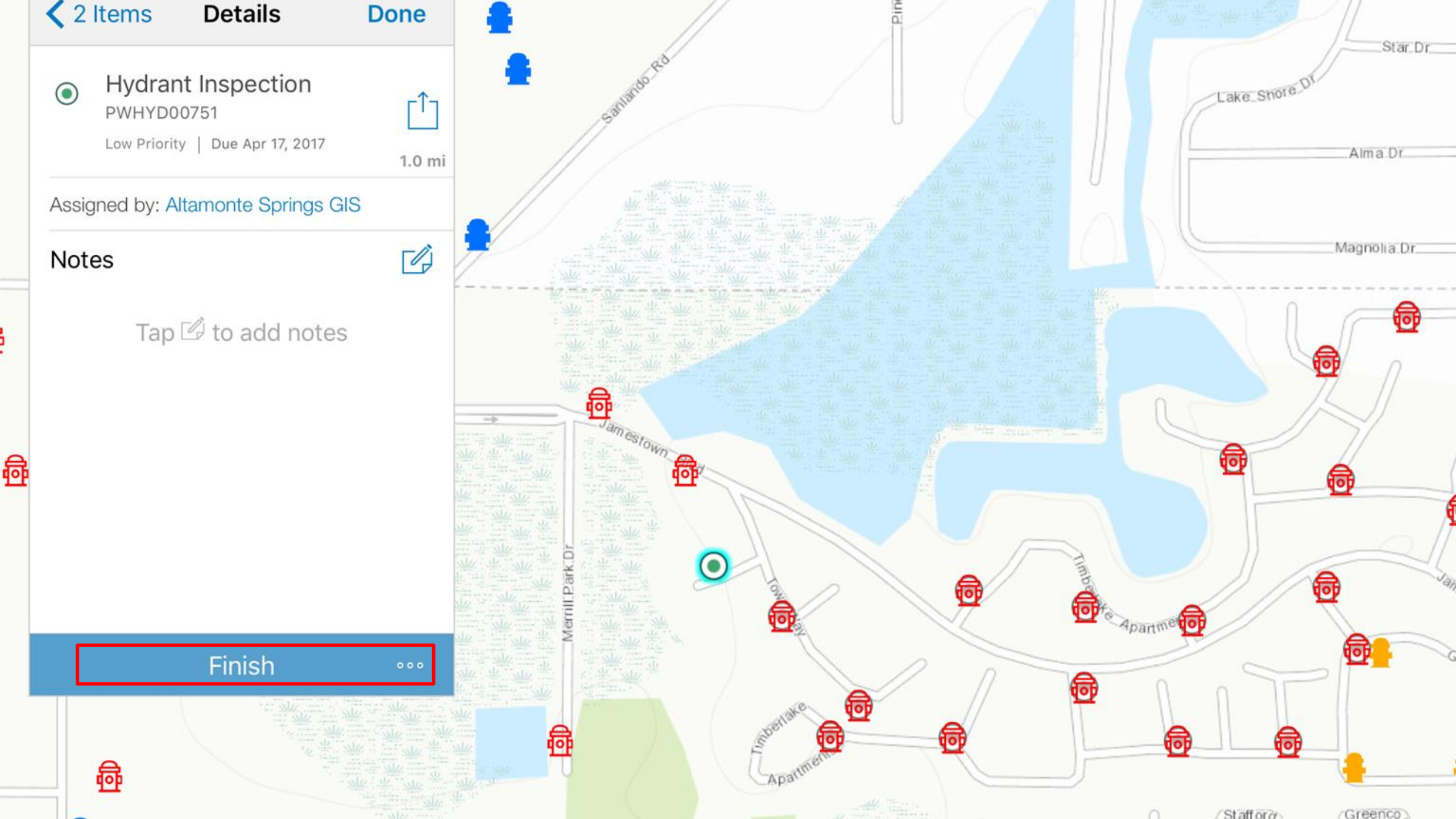
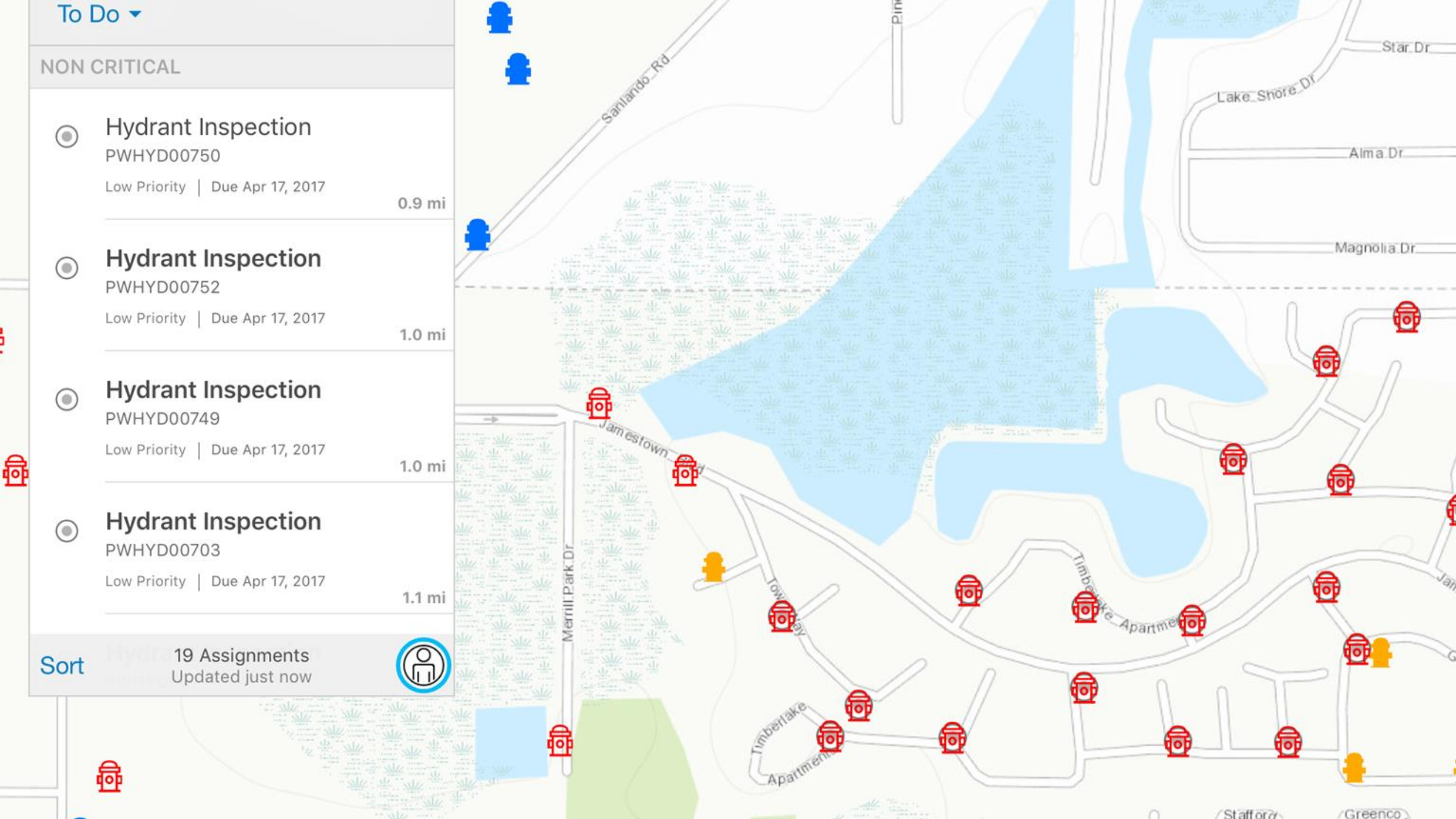
Hydrant Inspection History
View
New
Attachments
Photo1.jpg
679.7 KB


2 Items
Details
Done
Hydrant Inspection
PWHYD00751
Low Priority | Due Apr 17, 2017
1.0 mi
Assigned by: Altamonte Springs GIS
Notes
Tap to add notes
Finish
Sanlando Rd
Lake Shore Dr
Star Dr
Alma Dr
Magnolia Dr
Jamestown
Merrill Park Dr
Timberlake
Apartments
Stafford
Greenco


To Do
NON CRITICAL
Hydrant Inspection
PWHYD00750
Low Priority | Due Apr 17, 2017
0.9 mi
Hydrant Inspection
PWHYD00752
Low Priority | Due Apr 17, 2017
1.0 mi
Hydrant Inspection
PWHYD00749
Low Priority | Due Apr 17, 2017
1.0 mi
Hydrant Inspection
PWHYD00703
Low Priority | Due Apr 17, 2017
1.1 mi
Sort
19 Assignments
Updated just now
Sanlando Rd
Star Dr
Lake Shore Dr
Alma Dr
Magnolia Dr
Jamestown
Merrill Park Dr
Timberlake
Apartments
Stafford
Greenco

Data automation

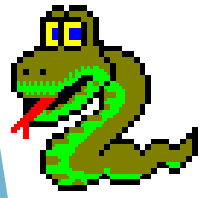
- Calculate Assumed GPM at 0 PSI and 20 PSI

GPM at 20 PSI = !DISCHARGEGPM! * ((!STATICPSI! - 20.0) / (!STATICPSI! - !RESIDUALPSI!)) ** 0.54

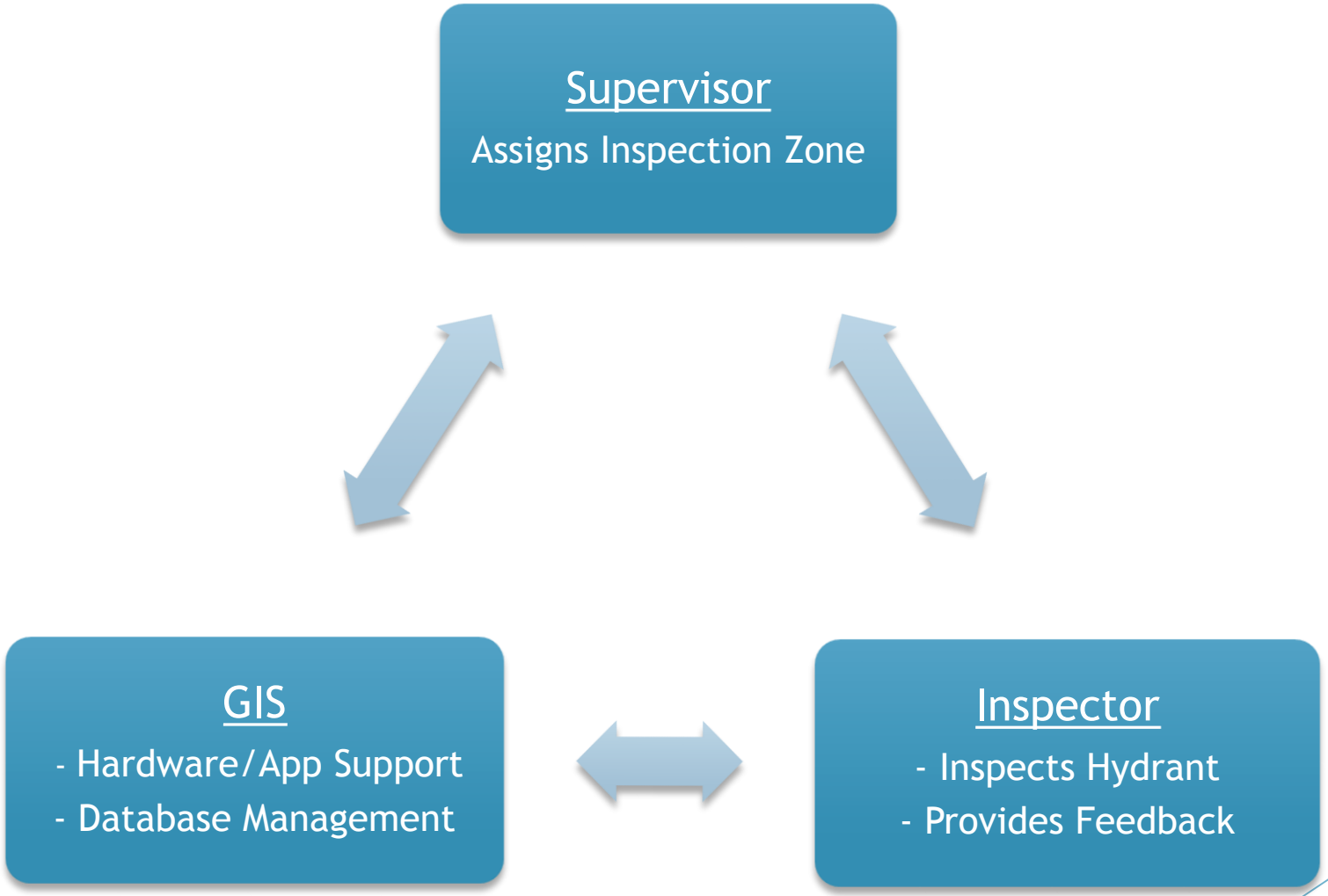
GPM at 0 PSI = !DISCHARGEGPM! * ((!STATICPSI! - 0.0) / (!STATICPSI! - !RESIDUALPSI!)) ** 0.54

- Write Assumed GPM at 20 PSI to parent table
- Define auxiliary hydrant color based on Assumed GPM at 20 PSI
- https://github.com/Esri/workforce-scripts

```
# Process: Calculate Field (Available GPM @ 20 PSI)
arcpy.CalculateField_management(hydrantinspection, "AvailableGPM_20psi", "!DISCHARGEGPM! * (( !S

print 'Calculation Complete'

# Process: Add Join (Join Hydrants to Inspections)
arcpy.MakeFeatureLayer_management(hydrant, "fcpath")
arcpy.AddJoin_management("fcpath", "Unique_ID", hydrantinspection, "FACILITYKEY", "KEEP_COMMON")

print 'Join Complete'

# Process: Calculate Field (Available GPM @ 20 PSI in Hydrant FC)
arcpy.CalculateField_management("fcpath", "PW_WaterSystem.DBO.wHydrant.Assumed_gpm_at_20_psi", "

print 'Field Calculate Complete'

#arcpy.RemoveJoin_management ("fcpath",HydrantInspection)

edit = arcpy.da.Editor(workspace)
edit.startEditing(False, True)
edit.startOperation()

#Process: Calculate Field (Aux Color in Hydrant FC)

with arcpy.da.UpdateCursor (hydrant, [ "Assumed_gpm_at_20_psi","AuxColor"]) as cursor:
        for row in cursor:
            if (row[0] >= 0 and row[0] < 500):
                row[1] = "Red"
            elif (row[0] >= 500 and row[0] <= 999):
                row[1] = "Orange"
            elif (row[0] >= 1000 and row[0] < 1500):
                row[1] = "Green"
            elif (row[0] > 1500):
                row[1] = "Light Blue"
                cursor.updateRow(row)
```



Project Roles



Conclusion

- Accurate hydrant spatial data provided framework
- Ability to query/edit data in web application is key
- 1:M relationship class to relate hydrants to inspections

Looking forward…

- Apply workflow to valve exercising
- Explore CollectorX Beta

Questions?

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(407) 571-8059