

Nitrification Reporting



Green Belts: Joan Arthur
Jeff Clayton
Scott Epperly
Sheila Vega

Black Belt: Melissa Gray

Problem Statement

Tracking nitrification investigations and communicating the information to the internal customers is problematic and time consuming. A spreadsheet tool is used to track incidents, but does not allow the user to search previous incidents in an efficient manner. Users cannot trend historical information by either date or location.

Goal Statement

Increase the availability and ease of use of the Nitrification Investigation Data by developing a database and providing data management tools to query, trend, and map current and historical nitrification data by event, locations, and date range.

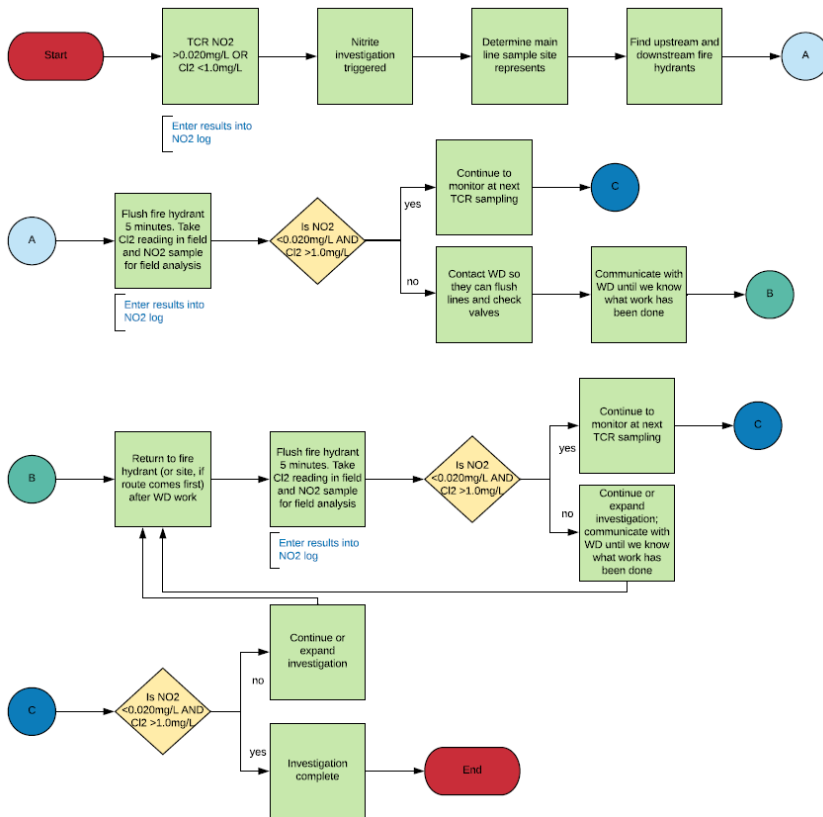
Business Case & Benefits

Improving data access will allow Water Quality Assurance and Water Distribution to make decisions regarding distribution system operation and maintenance. Historical nitrification data may also be used to educate future waterline replacement and extensions to improve water distribution system service levels and reduce cost of dead end line maintenance. Identification and the ability to map areas of chronic or repeat nitrification incidents will allow the data to be incorporated into the likelihood of failure and risk score for waterline assets.

Nitrification events happen when we find a total chlorine (Cl_2) level of $<1.0\text{mg/L}$ OR a nitrite (NO_2) level of $>0.020\text{mg/L}$ in the distribution system.

One tool for this project that our group used was a Process Map.

This shows that for every nitrification event, Water Quality Assurance (WQA) has to enter results into the nitrite log no fewer than 3 times, and we have to communicate with Water Distribution (WD) every time we follow up at a site or fire hydrant.

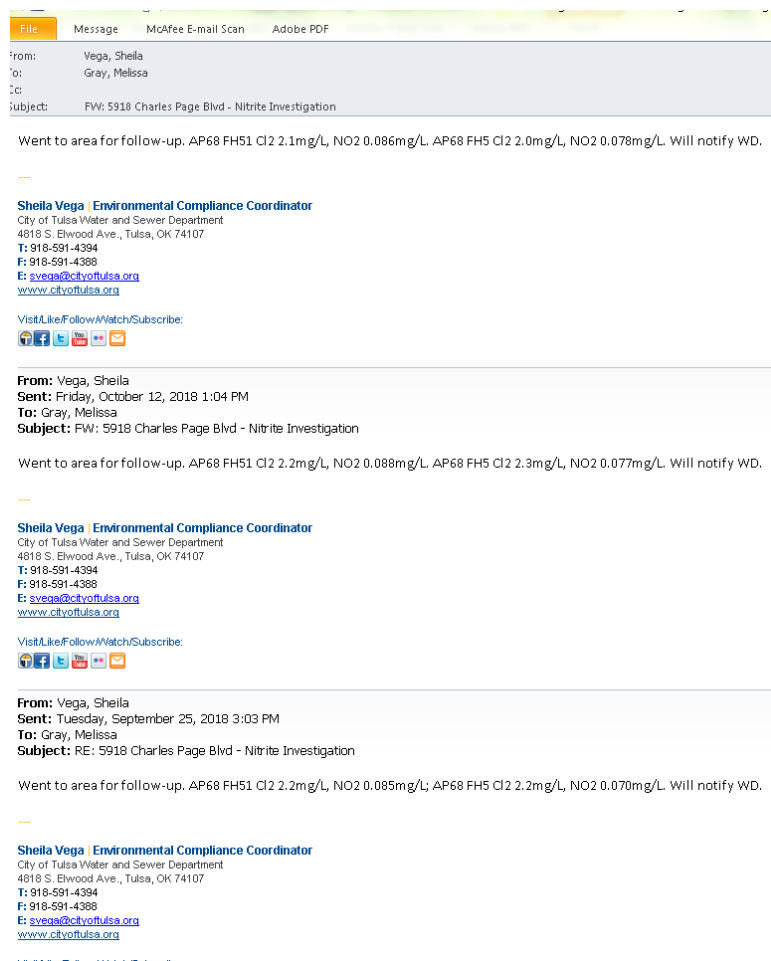


Current Process



TC095	5918 W. Charles Page Blvd	QuikStop	6/6/2018	2.4	0.022	Went to site for routine TCR monitoring. Cl2 2.4mg/L, NO2 0.022mg/L. Will investigate.
			6/7/2018	2.1	0.073	Cl2 2.1mg/L, NO2 0.073mg/L; AP68 FH51 Cl2 1.9mg/L, NO2 0.079mg/L; AP68 FH5 Cl2 2.1mg/L, NO2 0.051mg/L. Emailed R. Marrs to turn up blow-off valve; will check again Wednesday 6/13. (Blowoff turned up 6/12/18 AM)
			6/13/2018	2.0	0.079	Went for further investigation. At site, Cl2 2.0mg/L, NO2 0.079mg/L. AP68 FH51 Cl2 2.1mg/L, NO2 0.090mg/L. AP68 FH5 Cl2 2.1mg/L, NO2 0.071mg/L. Since it's only been one day since the blowoff was turned up, we will return on Friday to investigate further.
			6/15/2018	2.0	0.092	Went back for further investigation. At site, Cl2 2.0mg/L, NO2 0.092mg/L; AP68 FH51 Cl2 2.0mg/L, NO2 0.099mg/L; AP68 FH5 Cl2 2.1mg/L, NO2 0.062mg/L. Will notify WD.
			6/18/2018	2.4	0.010	Update from WD: Blow-off turned up and flushed over weekend. At site, Cl2 2.4mg/L, NO2 0.010mg/L; FH51 Cl2 1.9mg/L, NO2 0.062mg/L; FH5 Cl2 2.0mg/L, NO2 0.063mg/L. Asked us to follow up on Wednesday.
			6/20/2018	2.1	0.051	Follow-up today: AP68 FH51 Cl2 2.0mg/L, NO2 0.053mg/L; AP68 FH5 Cl2 2.0mg/L, NO2 0.050mg/L. At site, Cl2 2.1mg/L, NO2 0.051mg/L. R. Marrs said to check it next week, as it will take some time for the water to turn over out there.
			6/26/2018			Follow-up today: AP68 FH5 Cl2 2.1mg/L, NO2 0.048mg/L; AP68 FH51 Cl2 2.1mg/L, NO2 0.072mg/L. Informed R. Marrs of results. He said they would flush the line, but FH51 doesn't have much pulling from it. Will check site again on 7/5/18.
			6/27/2018	2.2	0.040	WD went to site; Cl2 2.2mg/L, NO2 0.040mg/L. Turned up blow-off valve.
			6/28/2018			WD went to AP68 FH5 NO2 0.008; AP68 FH50 NO2 0.016mg/L. Will return 7/5/18.
			7/5/2018			Went to site for routine TCR monitoring, but sample area was blocked by shelves and boxes. Will sample next week.
			7/18/2018	2.3	0.059	Went to site for routine TCR monitoring. Cl2 2.3mg/L, NO2 0.059mg/L.
			7/19/2018			Went to area for follow-up. AP68 FH5 Cl2 1.9mg/L, NO2 0.038mg/L; AP68 FH51 Cl2 1.8mg/L, NO2 0.063mg/L. Got information from R. Marrs that blow-off has been increased.
			7/26/2018	2.1	0.050	Went to site for routine TCR monitoring. Cl2 2.1mg/L, NO2 0.050mg/L.
			8/2/2018	2.2	0.024	Went to site for routine TCR monitoring. Cl2 2.2mg/L, NO2 0.024mg/L. Will follow up next week.
			8/10/2018			Went to area for follow-up. AP68 FH51 Cl2 2.1mg/L, NO2 0.055mg/L; AP68 FH5 Cl2 2.2mg/L, NO2 0.053mg/L. Will notify WD. Update from WD (08/13/-) unidirectional flush at FH 50 - post flush readings: Cl2 2.4 mg/L, NO2 0.012 mg/L
			8/17/2018			Went to area for follow-up. AP68 FH51 Cl2 2.2mg/L, NO2 0.065mg/L; AP68 FH5 Cl2 2.2mg/L, NO2 0.053mg/L. Site has been placed on a weekly flush schedule. Will continue to monitor.
			8/21/2018	2.2	0.071	Went to site for routine TCR monitoring/follow-up. Cl2 2.2mg/L, NO2 0.071mg/L. Will follow up.
			9/6/2018	1.6	0.063	Went to site for routine TCR monitoring/follow-up. Cl2 1.8mg/L at 5 minutes, 1.5mg/L at 10 minutes, 1.3mg/L at 15 minutes, and 1.6mg/L at 20 minutes. NO2 0.063mg/L.
			9/7/2018			Went to area for follow-up. AP68 FH51 Cl2 2.4mg/L, NO2 0.066mg/L. AP68 FH5 Cl2 2.3mg/L, NO2 0.089mg/L. Will notify WD.
			9/20/2018			Went to area for routine TCR. Total Cl2 inside building 2.2 mg/L, NO2 0.097 mg/L. Will notify WD.
			9/25/2018			Went to area for follow-up. AP68 FH51 Cl2 2.2mg/L, NO2 0.085mg/L; AP68 FH5 Cl2 2.2mg/L, NO2 0.070mg/L. Will notify WD.
			10/4/2018	2.1	0.086	Went to site for routine TCR monitoring/follow-up. Total Cl2 2.1mg/L, NO2 0.086mg/L. Will follow up.
			10/12/2018			Went to area for follow-up. AP68 FH51 Cl2 2.2mg/L, NO2 0.088mg/L. AP68 FH5 Cl2 2.3mg/L, NO2 0.077mg/L. Will notify WD.
			10/15/2018			WD: Flushed 68-50 to Cl2 2.6mg/L, NO2 0.023mg/L
			10/17/2018	2.3	0.079	Went to site for routine TCR monitoring. Cl2 2.3mg/L, NO2 0.079mg/L. Will follow up.

Water Quality Assurance has been updating an Excel workbook since 2013 for every nitrification event our group finds in the distribution system. All of the chlorine and nitrite data from DEQ-approved sites have their own columns, but any follow-up data that we gather from fire hydrants gets put into a comment box, with no easy way to find or trend what we're looking for.



Each day that we get data for an investigation, we email those results to Water Distribution.

In situations that the water quality is at a point that we don't feel an email will be seen fast enough, we call Water Distribution for a faster response.

In reply, we receive emails or phone calls telling us what action was taken, or in some cases, no information at all.



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Because of this back-and-forth between the two groups, the occasional missed written communication, and the difficult-to-read Excel file we track data in, it is difficult to get a clear, entire picture of the water quality in an area we're investigating.



Voice of the Customer



Our group identified that our main customer is the supervisor of the Water Distribution group that remediates the nitrite issues.

We created a list of questions we felt were important, and went to get the Voice of the Customer.

Questions for WDS Operations (SSGB Project)

1. How do you use the data from WQA?
A Point to aim. QA locates trouble spots
use data to fix issues
1st Pinpoint area 2nd Bring quality up to meet regulations.
2. What are questions you ask WQA?
QA Giving information rather than asking questions. ^{WB}
3. What type of access is needed for historical info?
It would help WB to have historical data
to determine repeat offenders.
4. How is an incident reported?
QA contacts WB could use both email for emergency
report for more routine.
5. What field data is collected?
Routine - pH, Temp, conductivity, Free and Total Cl₂, bacterial, NO₂
Incident - Total Cl₂, NO₂
WB - Flow Rate, Cl₂, H₂O₂
6. Do you create a Workorder for incident?
WB Paper Presently
Eventually - Lucity

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From these questions, we realized:

1: We need a more reliable way to communicate what each group has done

2: It would be helpful to Water Distribution if they had all of the historical data on a site, rather than piecemeal reporting

3: We need a better tracking system than a comment log in an Excel file



Flushing Worksheet

Date 10-02-18

- Crew 399
- Atlas Page 68
- Address 5918 Charles Pk. Blvd.
- Hydrant Number 50
- Pre-Flush
 - CL2 2.4
 - NO2 _____
- Length of Time Flushed 1hr
- Gallons Flushed ~~22~~
- Post Flush
 - CL2 2.7
 - NO2 _____
- Comments

From this meeting, Water Distribution came up with a Flushing Worksheet that they send us every time they go to a site for remedial action.

It includes all of the information we need to track what is being done to a site, and is filled out and sent to us on a daily basis for all of the investigations we're involved in.

This not only helps Water Quality Assurance track and log what is going on for a more complete picture, but also helps Water Distribution to have a written account of what they've done, what they haven't done, what has helped, and what has not.

Water Information Management Solution (WIMS)



Hach WIMS is a software that is designed to manage data for water and wastewater utilities.

It secures data collection, streamlines reporting, and helps you see the complete picture of your water quality.

This tool is one that the City of Tulsa has already invested in, and we wanted to use it for nitrite reporting.



Data Entry



TC095 Investigation - Monthly Data Entry (6/1/2018 - 6/30/2018)

File Edit Format

Jun 2018 Friday, June 01, 2018 Comments Calc Lock Filter

Approve Approve All

Entry Min _____ Daily Limit Min _____ Var Info 32113 TC095 T.Cl2 (mg/l)
 Max _____ Max _____ Equation _____

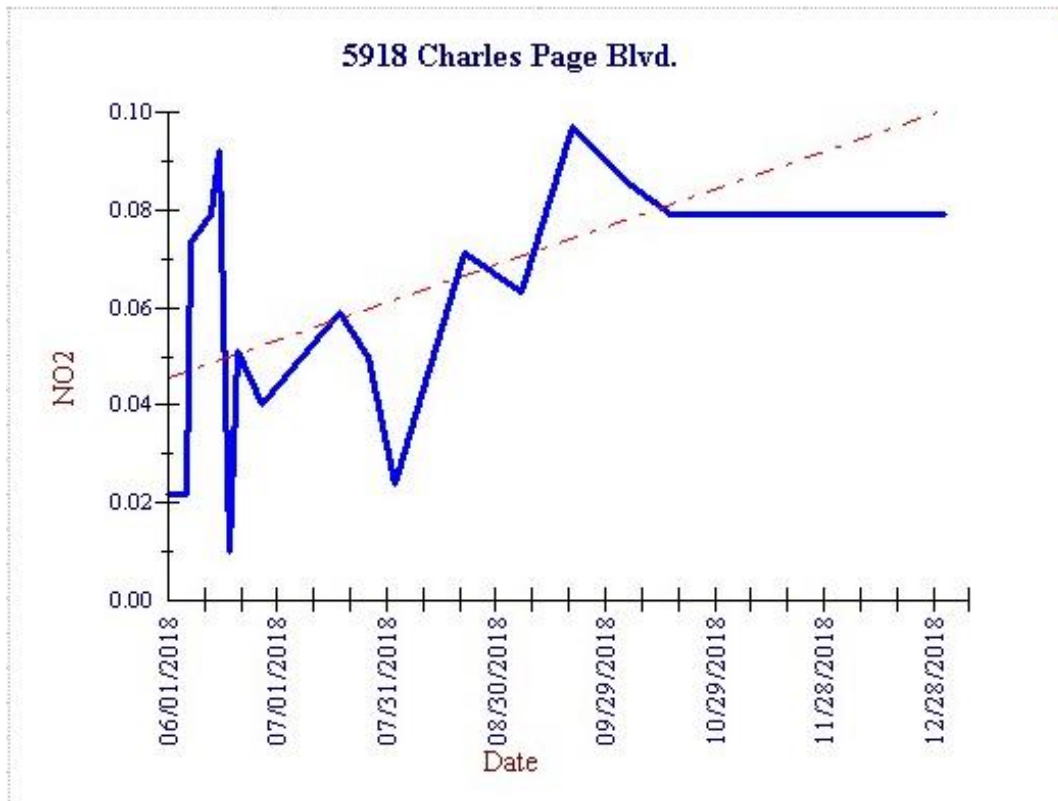
	Daily Com	Nitrite Investigations\TC095\5918 W. Charles Page Blvd.		Nitrite Investigations\TC095\68-51		Nitrite Investigations\TC095\68-5		Nitrite Investigations\TC095\68-50		Nitrite Investigations\TC095
		32113	32114	32131	32132	32121	32122	32141	32142	32159
		TC095 T.Cl2 mg/l	TC095 NO2 mg/l	68-51 T.Cl2 mg/l	68-51 NO2 mg/l	68-5 T.Cl2 mg/l	68-5 NO2 mg/l	68-50 T.Cl2 mg/l	68-50 NO2 mg/l	TC095 Comments
1 Fri										N
2 Sat										
3 Sun										
4 Mon										
5 Tue										
6 Wed			2.4							
7 Thu			2.1		1.9	0.079	2.1	0.051		
8 Fri										
9 Sat										
10 Sun										
11 Mon										
12 Tue										Blowoff turned up
13 Wed			2.0	0.079	2.1	0.090	2.1	0.071		
14 Thu										
15 Fri			2.0	0.092	2.0	0.099	2.1	0.062		
16 Sat										
17 Sun										Blowoff turned up over weekend
18 Mon			2.4	0.010	1.9	0.062	2.0	0.063		
19 Tue										
20 Wed			2.1	0.051	2.0	0.053	2.0	0.050		
21 Thu										
22 Fri										
23 Sat										
24 Sun										
25 Mon										
26 Tue					2.1	0.072	2.1	0.048		
27 Wed			2.2	0.040						Blowoff turned up
28 Thu								0.008	0.016	
29 Fri										
30 Sat										

Although it does take some effort and time to initially set up each location in WIMS, when it's finished we get a data entry form for each location so it's just a matter of plugging in numbers and adding additional comments.

After the data has been entered, rather than sending an email to Water Distribution about what was done on that day, we can send them, with just a couple of clicks, an entire history of a particular site and the locations of investigation.

	5918 Charles Page Blvd		AP68 FH51		AP68 FH5		AP68 FH50		Comments
	Cl2 (mg/L)	NO2 (mg/L)	Cl2 (mg/L)	NO2 (mg/L)	Cl2 (mg/L)	NO2 (mg/L)	Cl2 (mg/L)	NO2 (mg/L)	
	32113	32114	32131	32132	32121	32122	32141	32142	32159
06/01/2018									
06/02/2018									
06/03/2018									
06/04/2018									
06/05/2018									
06/06/2018	2.4	0.022							
06/07/2018	2.1	0.073	1.9	0.079	2.1	0.061			
06/08/2018									
06/09/2018									
06/10/2018									
06/11/2018									
06/12/2018									Blowoff turned up
06/13/2018	2.0	0.079	2.1	0.090	2.1	0.071			
06/14/2018									
06/15/2018	2.0	0.092	2.0	0.099	2.1	0.062			
06/16/2018									
06/17/2018									
06/18/2018	2.4	0.010	1.9	0.062	2.0	0.063			Blowoff turned up over weekend
06/19/2018									
06/20/2018	2.1	0.051	2.0	0.053	2.0	0.050			
06/21/2018									
06/22/2018									
06/23/2018									
06/24/2018									
06/25/2018									
06/26/2018			2.1	0.072	2.1	0.048			
06/27/2018	2.2	0.040							Blowoff turned up
06/28/2018						0.008		0.016	
06/29/2018									
06/30/2018									
07/01/2018									
07/02/2018									
07/03/2018									
07/04/2018									
07/05/2018									Went to site, unable to sample
07/06/2018									
07/07/2018									
07/08/2018									
07/09/2018									
07/10/2018									
07/11/2018									
07/12/2018									

This should make it easier for Water Distribution to see, at a glance, whether the action they took at a site at a particular time was helpful or not.



WIMS also has the capability of graphing and trending any information that we want.

Nitrite issues are rarely a one-time, short-term problem, and sometimes it's hard to determine if the actions taken are actually helping.

Graphs like this one can show us the basic trend of data, letting us know if the problem is gradually getting better or gradually getting worse, so that we can change the way we respond.

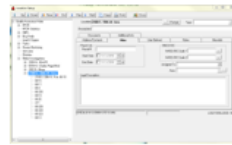
Control

In an effort to control and standardize WIMS reports, we made a detailed how-to guide for setting up new sites.

Head WIMS -> Log In -> This can be set up later.

Enable setup

1. Use the setup / Enable setup
2. Add site address and use standard business meeting for the breakdown to be used



Enable setup

1. Use the setup / Enable setup
2. Add site address
3. Check appropriate breakdown

1

1. Park breakdown build form of 4, include data -> get appropriate break plan



2. Park breakdown build form of 4, include data -> get appropriate break plan



2

4. Form for build form alternative table of 4, build -> get appropriate



3. Use Park Form


1. Use the build form table
2. Add site address
3. Add address to table from "Use Data"



3

2. Use the setup / Use Park Form / Use address

3. Create a table of appropriate information for the table -> use the table



4. Use the table

5. Use the table to create the appropriate information for the table -> use the table

6. Use the table to create the appropriate information for the table -> use the table

1. Use the table to create the appropriate information for the table -> use the table
2. Use the table to create the appropriate information for the table -> use the table
3. Use the table to create the appropriate information for the table -> use the table
4. Use the table to create the appropriate information for the table -> use the table
5. Use the table to create the appropriate information for the table -> use the table
6. Use the table to create the appropriate information for the table -> use the table

4

7. Use the table to create the appropriate information for the table -> use the table




8. Use the table to create the appropriate information for the table -> use the table



5

1. Use the table to create the appropriate information for the table -> use the table




2. Use the table to create the appropriate information for the table -> use the table




6

3. Use the table to create the appropriate information for the table -> use the table

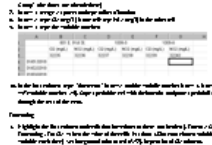


4. Use the table to create the appropriate information for the table -> use the table

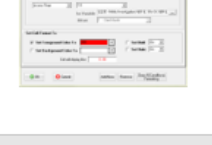


7

5. Use the table to create the appropriate information for the table -> use the table




6. Use the table to create the appropriate information for the table -> use the table




8

7. Use the table to create the appropriate information for the table -> use the table




8. Use the table to create the appropriate information for the table -> use the table




9

9. Use the table to create the appropriate information for the table -> use the table

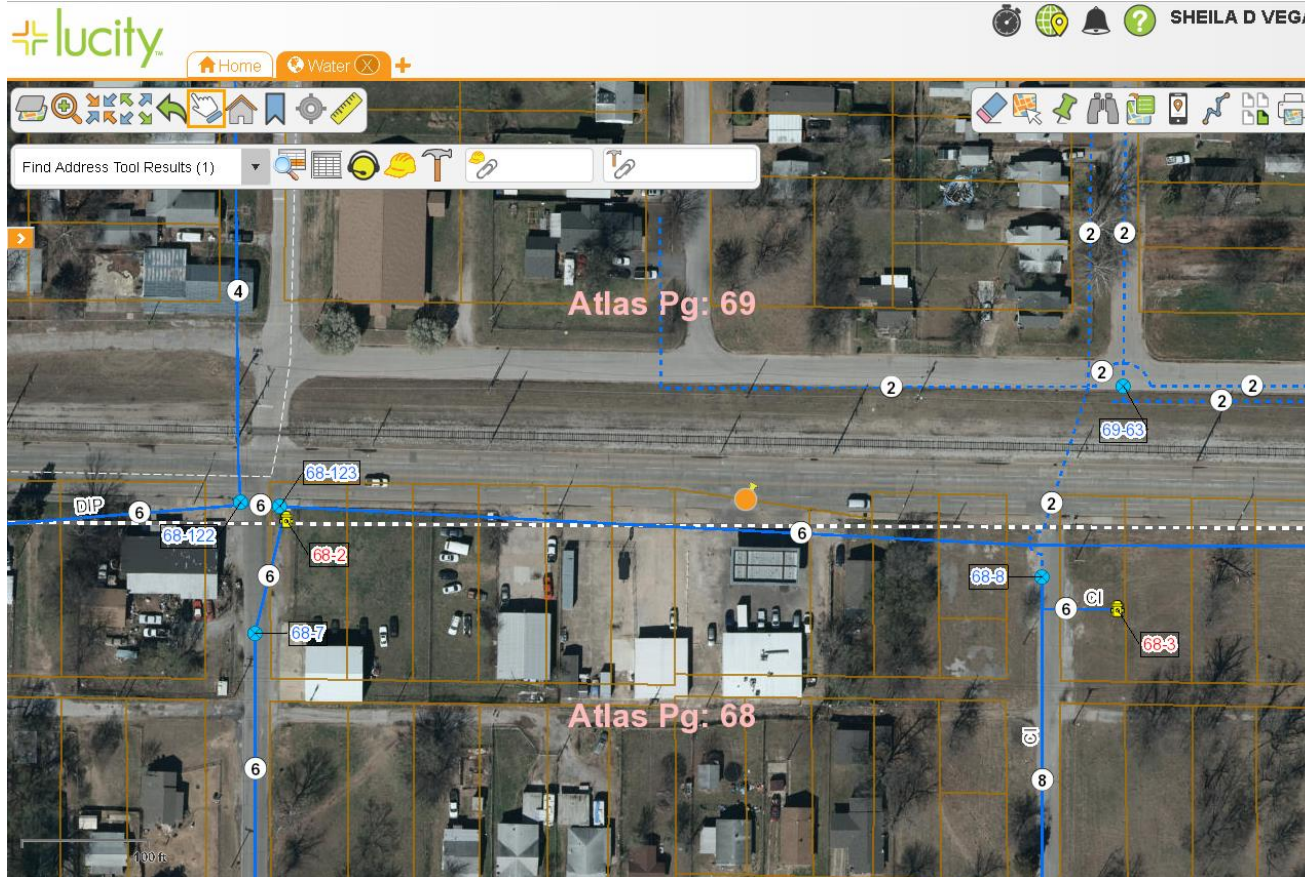


10. Use the table to create the appropriate information for the table -> use the table



10

Continuous Improvement



We also used the nomenclature found in Lucity so that someday in the future, the data we enter in WIMS can interface with Lucity.

When that happens, we will be able to see the history of a site or fire hydrant by clicking on the map element we're interested in.

Questions/Comments



Sheila Vega

(918) 591-4394

svega@cityoftulsa.org

Joan Arthur

jarthur@cityoftulsa.org

Jeff Clayton

jclayton@cityoftulsa.org

Scott Epperly

sepperly@cityoftulsa.org