

Developing Quality Evaluation and Management Tools for Sewer Inspection Data

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What is Asset Management?

Asset management is the practice of managing infrastructure capital assets to minimize the total cost of owning and operating them, while delivering the service level customers desire.

- A mindset and a culture
- A recognition that assets have life cycles
- An approach that looks to get the most value out of an asset
- About understanding and managing the risk associated with owning assets

Why Asset Management Plan (AMP)

- Increasing your knowledge of your system
- Reducing system “down-time” and the number of emergency repairs
- Prioritizing rehabilitation and replacement needs
- Giving you greater access to financial assistance

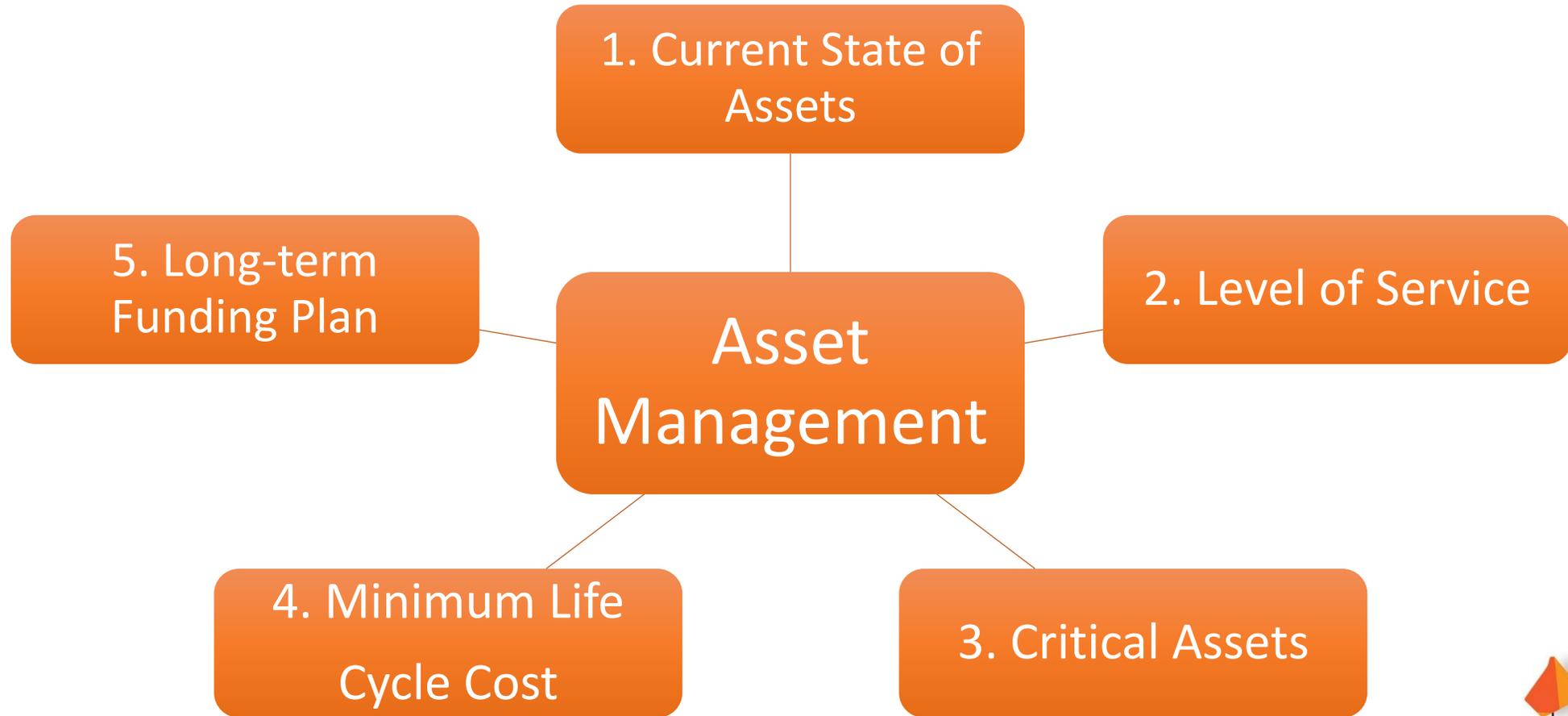
Making Smarter Decisions



***Moving from reactive
maintenance to proactive
maintenance***



Five Cores

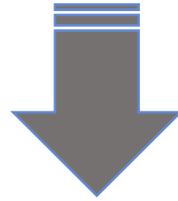


First Step ... Taking an inventory

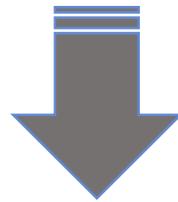
- What do we own?
 - Where is it?
 - What is its condition?
 - What is its useful life?
 - What is its value?



POOR DATA



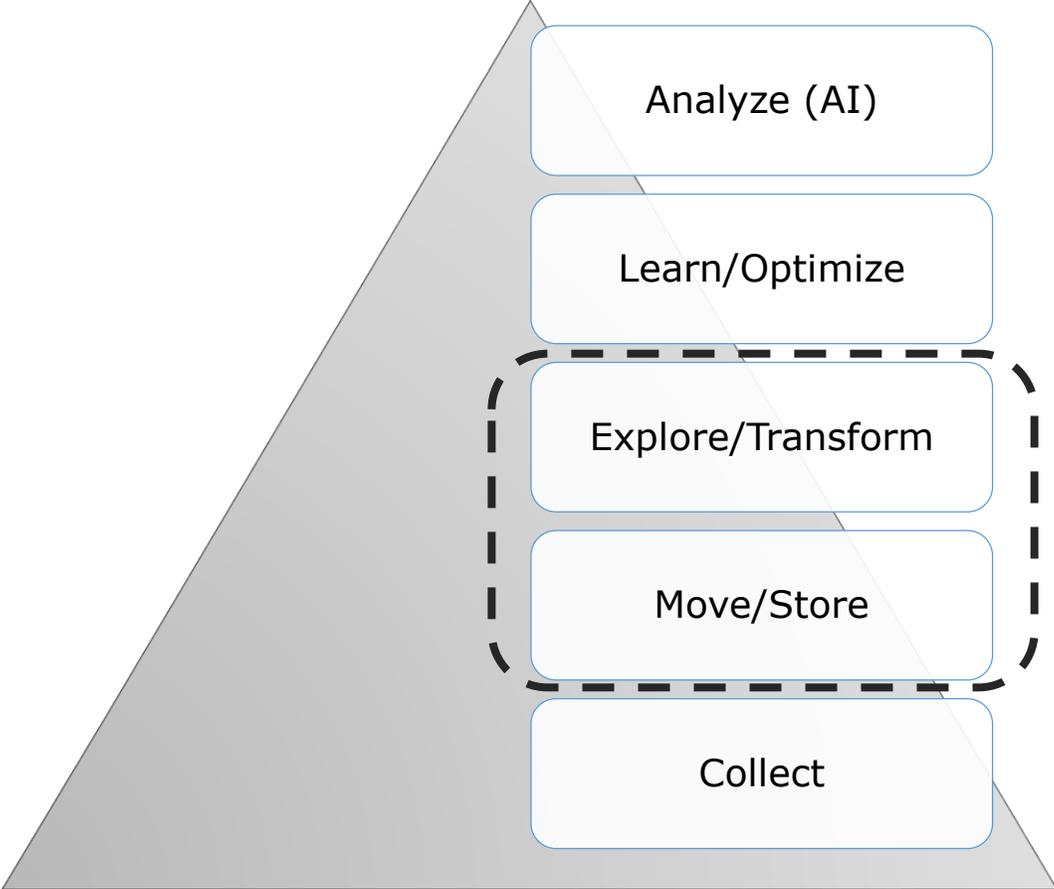
POOR DECISIONS



INCREASED COSTS

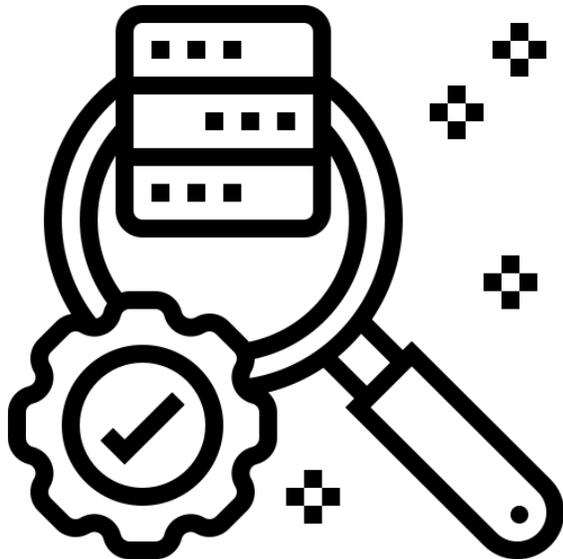


Hierarchy of Needs in Data Science

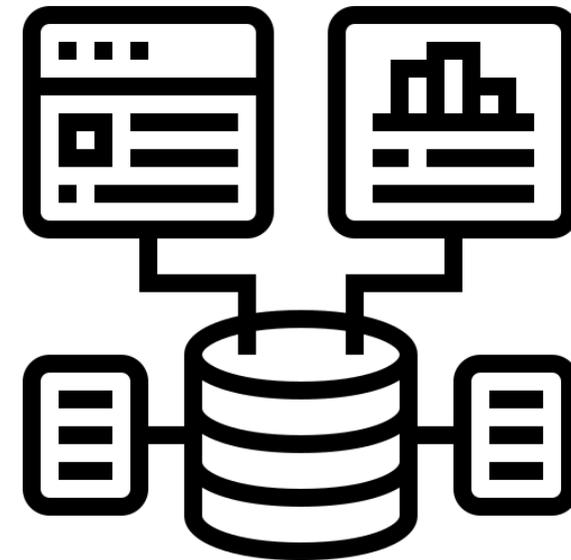


Industry Problems

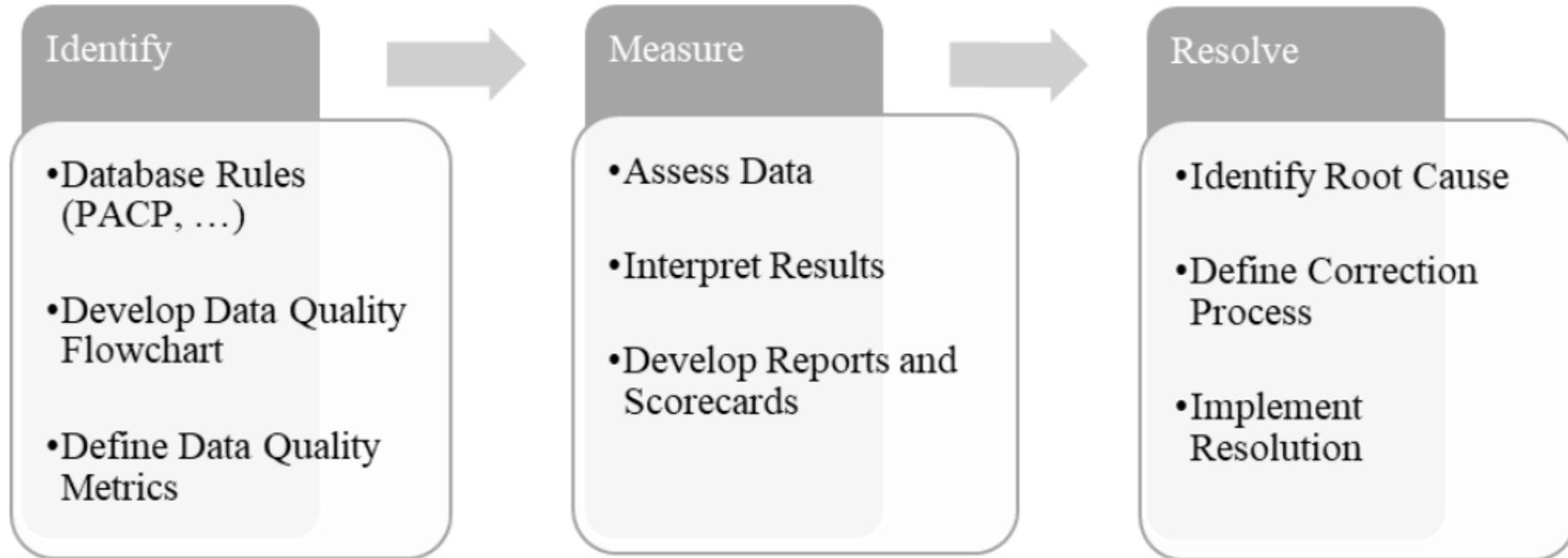
Data Quality Issues



Data Management Difficulties



Data Quality Evaluation Process



Data Quality Metrics

Metric	Description
Accuracy	Data element values are properly assigned
Accessibility	The extent to which data is available, or easily and quickly retrievable
Uniqueness	Data will be recorded no more than once.
Validity	Data points exist in the same and correct format everywhere they appear. This can also be called data integrity.
Completeness	Data records are “full” and contain enough information to draw conclusions.
Consistency	Data has no contradictions in your databases.

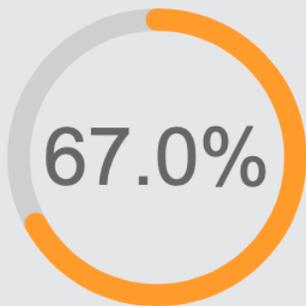




Accuracy



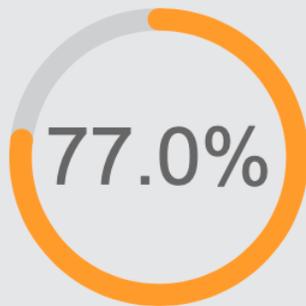
Accessibility



Uniqueness



Validity



Completeness

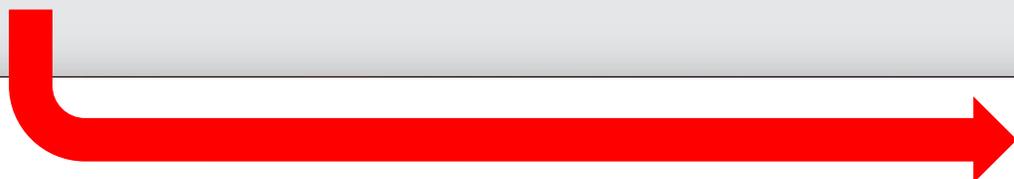


Consistency

Validity ×

 PACP CODE	 CONTINUOUS	 VALUE 1ST DIMENSION
 VALUE 2ND DIMENSION	 VALUE PERCENT	 JOINT
 CLOCK AT FROM	 CLOCK TO	 REMARKS

[Refresh data](#)
Close



What is Data Management?

Data management is the practice of collecting, organizing, protecting, and storing data so it can be analyzed for asset management

- Visibility: allowing people to find the data they need to better do their jobs
- Reliability: minimizing potential errors and building trust in the data being used
- Security: Protecting data from losses and breaches authentication and encryption tools.
- Compatibility: Providing integrated data to share across different platforms

Compatibility Problems

Data cannot imported from another format

Data cannot exported into different formats

6500 Inspections

85,000 conditions records



47,000 incompatibility errors



Collected Data Formats

- Info
- L
- LI
- LO
- Media
- Media_Path
- MH
- MHC
- MHCI
- MHI
- MHO
- ML
- MLI
- MLO
- Project_Info

- S_T
Date Created: 7/29/2008 3:36:27 PM
Date Modified: 4/15/2016 9:50:32 AM
- SF_T
Date Created: 7/29/2008 3:36:28 PM
Date Modified: 4/15/2016 9:50:32 AM
- SI_T
Date Created: 7/29/2008 3:36:28 PM
Date Modified: 4/15/2016 9:50:33 AM
- SO_T
Date Created: 7/29/2008 3:36:28 PM
Date Modified: 4/15/2016 9:50:33 AM
- TE_T
Date Created: 7/29/2008 3:36:28 PM
Date Modified: 4/15/2016 9:50:33 AM
- Temp_Export
Date Created: 4/3/2009 1:35:10 PM
Date Modified: 4/3/2009 1:35:10 PM
- V_T
Date Created: 7/29/2008 3:36:28 PM
Date Modified: 7/29/2008 3:36:31 PM

- ASSET
- CODE
- CODE_CATEGORY
- CODE_SYSTEM
- CODES_GROUP
- MAIN_INSPECTION
- MANHOLE
- MEDIA_CATALOG
- OBSERVATION
- OBSERVATION_PHOTOS
- PHOTO
- PROJECT
- UNIT
- UNIT_CLASS
- UNIT_SYSTEM
- VIDEO_MEDIA



39 Pages!!!

Multiple pipes at same address

S_ID	S_Project_ID	S_Mandant	S_Print_ID	S_Sat_ID	S_AutoNumb
FDA33F963A6C}	8BA162405386}	1210667AB892}	54457B3C5B53}		4
F115DDEFD173}	8BA162405386}	1210667AB892}	6E3F8E8C503E}		3
CE9A4350487C}	8BA162405386}	1210667AB892}	573B75594C3D}		1
CA0592F8135B}	8BA162405386}	1210667AB892}	506A99444863}		2
I4FE28ADABD8}	8BA162405386}	1210667AB892}	4753645B4D88}		5

SI_ID	SI_Section_ID	SI_Mandant	SI_Sat_ID	SI_Drawing_ID	SI_Text_ID
I58DECB983A3}	CE9A4350487C}	1210667AB892}			
9F541AB75A22}	F115DDEFD173}	1210667AB892}			
12103F76254A}	FDA33F963A6C}	1210667AB892}			
C4A94EE660DF}	I4FE28ADABD8}	1210667AB892}			
307293C5CE7D}	CA0592F8135B}	1210667AB892}			

SO_ID	SO_Inspc_ID	SO_Sat_ID	SO_AutoNumb	SO_Counter	SO_Position
I5A5C45EBCAE}	C4A94EE660DF}		66	3	2.8042
340FBFF7BBA1}	I58DECB983A3}		20	18	56.2966
C2F6ED6A32F0}	I58DECB983A3}		7	5	19.5072
398EE71EB061}	I58DECB983A3}		10	8	32.6136
I5CDF62626CDC}	I58DECB983A3}		11	9	43.3121

Inspection Report

Date: 7/23/2015	Job #:	Weather: Sunny, Dry	Operator: J. Pittman	Section #: 1	Section name:
Present: R. Mcknight	Vehicle: 720	Camera:	Preset: 0	Cleaned: No	Rate:

Street 1: 4008 W Yorkshire Dr	Map # 1:	From MH: 3613
Street 2: Stillwater	Map # 2:	To MH: 3612
City:	VCR #:	Section length: 310.50 ft
Insp. method:	Media #:	Joint length:

Reason of inspection: gen. condition control
 Section type: WasteWater
 Area:

Pipe shape: Round
 Pipe size: 8 inch
 Pipe material: VCP
 Lining:

Remarks:

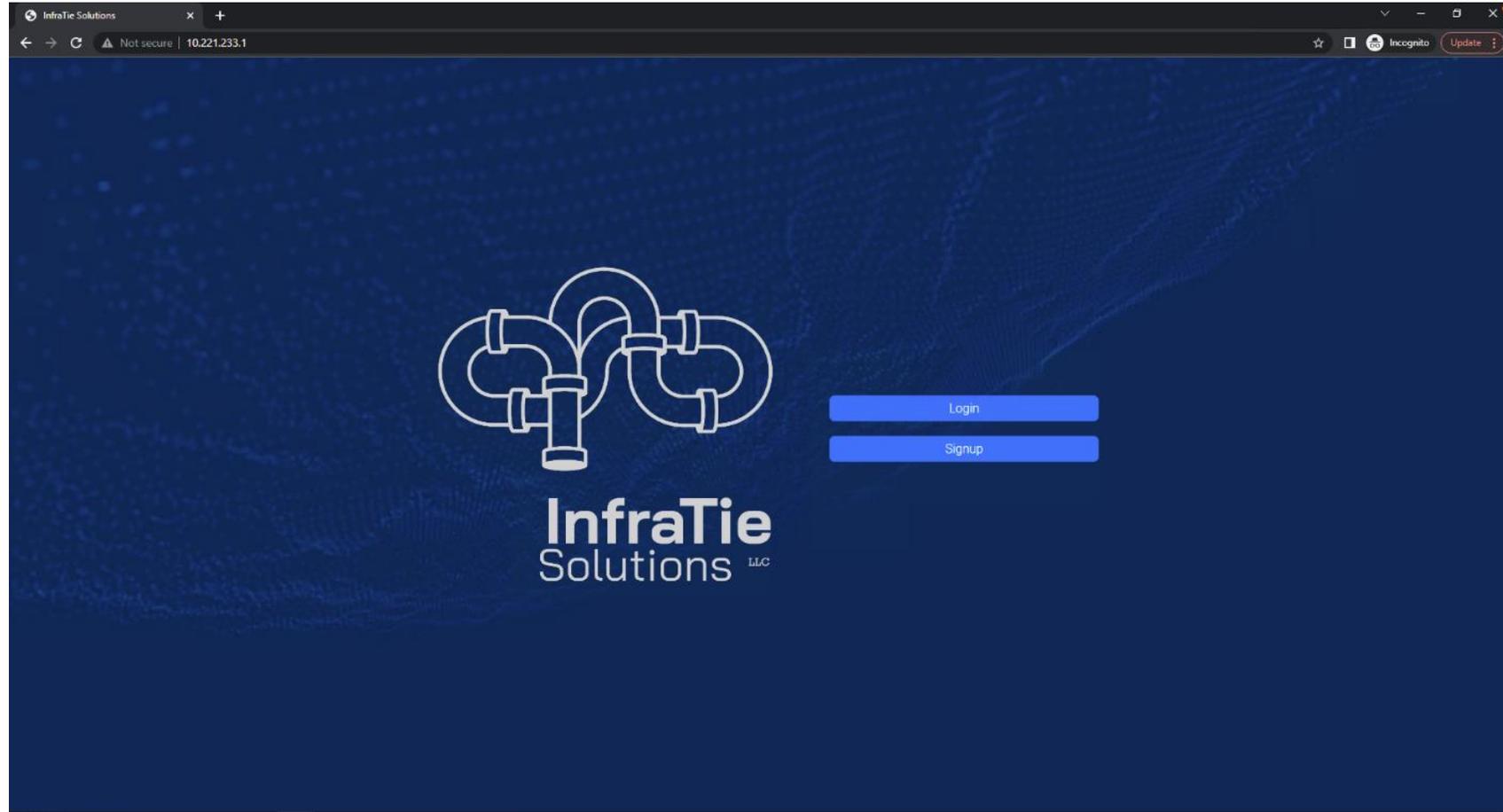
1:396	Position	Code	Observation	Rate
	0.00	0	inspection begins at downstream manhole	
	0.60	110	scale/mineral deposits light from 09 to 03 o'clock	
	24.60	150	offset joint, slight	
	28.80	0	service connection, at 10 o'clock	
	64.00	0	service connection, at 12 o'clock	
	96.20	130	roots light	
	104.80	0	Multiple Cracks, from 12 to 12 o'clock	
	107.00	360	service connection with roots heavy, at 11 o'clock	
	142.10	230	roots medium	
	143.00	0	Longitudinal Crack, at 12 o'clock	
	151.00	0	Longitudinal Crack, at 12 o'clock	
	152.20	130	roots light	
	155.20	0	service connection, at 12 o'clock	
	158.70	130	roots light	

4008 W Yorkshire Dr // Page: 1

UNDERGROUND CONSTRUCTION TECHNOLOGY

THE UNDERGROUND UTILITIES EVENT | February 7-9, 2023 | Orlando, FL

Data Management Tool



UNDERGROUND CONSTRUCTION TECHNOLOGY
THE UNDERGROUND UTILITIES EVENT | February 7-9, 2023 | Orlando, FL



CCTV Data

CCTV Old												CCTV New	Manholes	tab	tab		
Data Exchange												Show 20 entries Search:		Toggle Column Visibility			
ID	Surveyed By	Pipe Segment Reference	Date	Upstream MH	Downstream MH	Sewer Use	Direction	Height	Width	Shape	Material	Lining Me					
						Show All			Show All	Show All							
1	John Huff	742	2017-01-27	2186	2185		D			Round	VCP						
3	John Huff	1257	2017-01-06	2617	2616		D			Round	VCP						
5	John Huff		2017-01-06	2616	2617		U			Round	VCP						
7	John Huff	731	2017-01-17	208	2689		U			Round	VCP						
8	John Huff	1271	2017-01-05	2641	2640		U			Round	VCP						
9	John Huff	1271	2017-01-05	2641	2640		U			Round	VCP						
11	John Huff	1515	2017-01-19	1394	5672		D			Round	VCP						
13	John Huff		2017-01-18	unknown LH	3345		U			Round	VCP						
14	John Huff	2406	2017-01-20	1936	1935		U			Round	VCP						
15	John Huff	2407	2017-01-20	1935	419		D			Round	VCP						
16	John Huff	627	2017-01-30	3020	3022		D			Round	VCP						
17	John Huff	628	2017-01-30	3021	3020		U			Round	VCP						
18	John Huff	1823	2017-01-30	3017	3018		U			Round	VCP						
19	John Huff	625	2017-01-30	3018	3019		U			Round	VCP						
20	John Huff	626	2017-01-30	3019	3020		D			Round	VCP						
22	John Huff	2964	2017-01-09	2958	2957		D			Round	VCP						
24	John Huff		2017-01-11	1047	1046		U			Round	VCP						
25	John Huff		2017-01-10	477	478		U			Round	VCP						
26	Philin W	1655	2017-01-10	481	1561		U			Round	VCP						

Showing 1 to 20 of 35 entries

Previous 1 2 Next



Manhole Inspection Data

	CCTV Old	CCTV New	Manholes		tab	tab	
Data Exchange	Show	20	entries	Search:	<input type="text"/>		
	Manhole ID	Inspector	Date	Time	Address/Intersection	Location Condition	Present Use
Database	0	Christian Arvizo	2020-06-23	11:26:00	S. Boomer Rd. GIS App GPS is not linking up with actual manhole location, This might be	Grass_Easement	Sanitary Sewer
	0	Scott Howard	2021-01-06	10:56:00	1101 e 6th	Grass_Easement	Sanitary Sewer
Data Quality	0	Matthew Sample	2020-12-03	08:54:00	801 s ramsey	Street	Sanitary Sewer
	0	Matthew Sample	2020-12-03	09:07:00	S Ramsey and 4th	Street	Sanitary Sewer
Data Analysis	1	Jordan Philpott	2020-08-26	10:01:00	Unknown mh 3 feet north of mh835	Paved_Easement	Sanitary Sewer
	1	Scott Howard	2020-08-28	10:22:00	Unknown manhole on corner of Duncan and 7th	Paved_Easement	Sanitary Sewer
Dashboard	1	Matt Stanley	2020-01-09	09:14:00	W. Shiloh creek. Unknown manhole 90 feet south of manhole 4705. And 70 feet north of manhole 4704. L	Street	Sanitary Sewer
	1	Scott Howard	2021-01-15	14:16:00	998 s Denver st	Grass_Easement	Sanitary Sewer
Reports	1	Jordan Philpott	2020-08-26	08:26:00	Unknown MH at 7th and blakeley	Grass_Easement	Sanitary Sewer
	2	Phillip Robinson	2021-01-19	09:15:00	999 S Denver St	Grass_Easement	Sanitary Sewer
Work Order	3	Phillip Robinson	2021-01-19	08:17:00	999 S Hightower St	Grass_Easement	Sanitary Sewer
	4	Nathan Tselee	2021-07-23	11:06:00	W fifth Ave/ eastern Villa	Grass_Easement	Sanitary Sewer
Map	5	Phillip Robinson	2021-04-21	10:38:00	2218 Timbercrest Dr	Grass_Easement	Sanitary Sewer
	6	Phillip Robinson	2021-04-21	09:02:00	2118 post oak dr	Sidewalk	Sanitary Sewer
Tools	7	Phillip Robinson	2021-04-22	09:18:00	2222 crest wood dr	Grass_Easement	Sanitary Sewer
	8	Phillip Robinson	2021-04-21	10:51:00	2209 post oak dr	Grass_Easement	Sanitary Sewer
	9	Phillip Robinson	2021-04-22	11:27:00	2205 crestwood dr	Grass_Easement	Sanitary Sewer
	10	Phillip Robinson	2021-04-23	08:38:00	10 crestwood circle	Grass_Easement	Sanitary Sewer
	11	Brayden Graham	2022-02-09	01:50:00	N Denver	Grass_Easement	Sanitary Sewer

Showing 1 to 20 of 3,767 entries

Previous 1 2 3 4 5 ... 189 Next



Work Order History

Open Closed Outsourced Work Notification

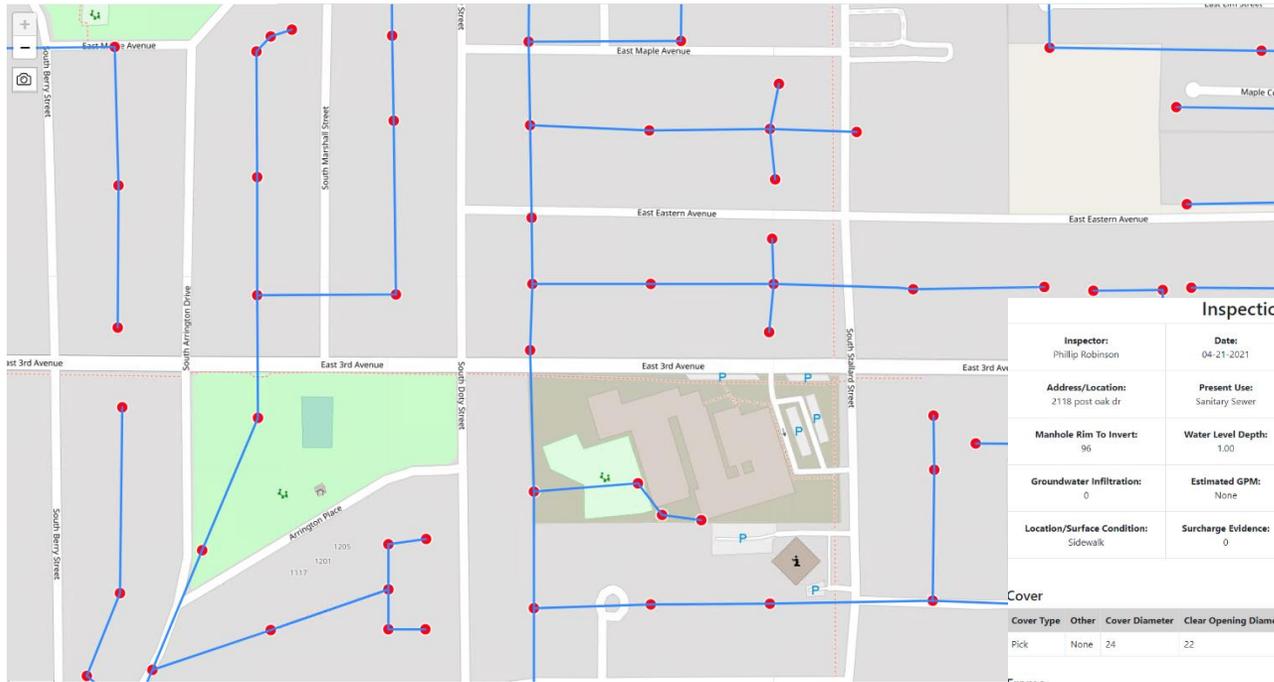
Date Ascending All

Work Orders Search... Create Work Order

Location	Technician	Time Range	Status
302 S. Benjamin	Andrea Whoe	Aug. 8, 2022 8:00 AM - 10:30 PM	Open
215 E 11th		Aug. 23, 2022 7:00 AM - 3:36 PM	Open
E McElroy Rd	Customer	Aug. 30, 2022 12:30 PM - 3:30 PM	Outsourced Work
City Wide		Sept. 2, 2022 7:00 AM - 3:30 PM	Closed
2023 E Linda	Tom Smith	Sept. 15, 2022 12:00 PM - 3:30 PM	Closed
N Park Dr / E Thomas Ave		Dec. 8, 2022 9:00 AM - 12:00 PM	Outsourced Work
N Park Dr / E Thomas Ave		Dec. 9, 2022 9:00 AM - 12:00 PM	Closed
707 E 8th Ave	Other Guy	Dec. 14, 2022 7:30 AM - 10:30 AM	Closed
Sample 2	Sample 2	March 1, 2023 8:00 AM - 10:30 PM	Closed



GIS Integration



Inspection Report

Time & Date: 8:31 a.m. June 22, 2022	Surveyed By: None	Street: 1813 s fern	City: stlwater
PSR: 3334	Upstream MH: 3187	Downstream MH: 3185	Direction: 2
Shape: C	Height: 6	Material: VCP	Length: 193.000



Distance	Counter	PACP Code	Continuous	1st Dim.	2nd Dim.	Value %	Joint	Clock At From	Clock To	Remarks	Time	Delete	Edit
0	None	MWL	None	None	None	5	0	None	None	None	00:00:00		
0	None	AMH	None	None	None	None	0	None	None	3165	00:00:00		
12	None	RMJ	None	None	None	15	1	8	10	None	00:01:25		
21	None	CM	None	6	None	None	0	3	5	None	00:02:57		
21	None	TFA	None	4	None	None	0	11	None	None	00:02:35		
26	None	RMJ	None	None	None	5	1	2	4	None	00:03:25		
											00:03:45		
											00:03:49		
											00:04:19		

Inspection Report

Inspector: Phillip Robinson	Date: 04-21-2021	Time of day: 9:02 a.m.	Manhole ID: 6
Address/Location: 2118 post oak dr	Present Use: Sanitary Sewer	Strong Odor: 0	Lid Removable: 1
Manhole Rim To Invert: 96	Water Level Depth: 1.00	Manhole Diameter: 48	Height Above Grade: 0
Groundwater Infiltration: 0	Estimated GPM: None	Precipitation: 0	Ponding/Sheeting: 0
Location/Surface Condition: Sidewalk	Surcharge Evidence: 0	Describe Surcharge: None	Depth of Surcharge (in.): None



Cover

Cover Type	Other	Cover Diameter	Clear Opening Diameter	Cover Condition	Other	Bolt Holes	Bolts Missing	Vented	Pick Holes	Rim/Cover Fit	Evidence of Inflow/Infiltration	Evidence of Corrosion	Root Intrusion	Describe Below
Pick	None	24	22	Sound	None	0	0	0	0	1	0	0	0	None

Frame

Frame Material	Other	Frame Condition	Other	Frame Seal	Evidence of Inflow/Infiltration	Evidence of Corrosion	Root Intrusion	Describe Below	Material	Other	Height	Inside Diameter
Cast Iron	None	other	None	Dieter	0	None	0	None	none	None	None	None

Cone

Cone Construction	Other	Cone Height	Cone Top Diameter	Cone Condition	Other	Evidence Of Inflow/Infiltration	Evidence Of Corrosion	Root Intrusion	Describe Below
Precast	None	25	31	Sound	None	0	0	0	None



Data Dashboard and Reports

FROM 01/05/2017

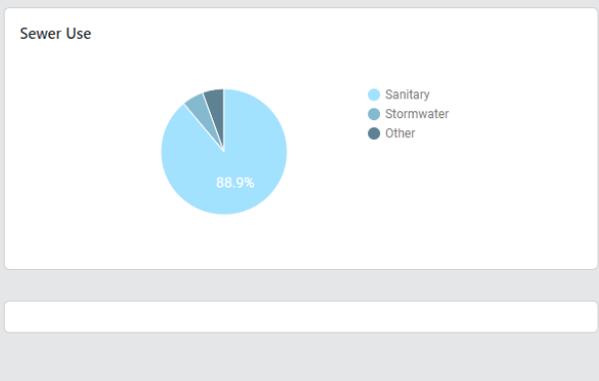
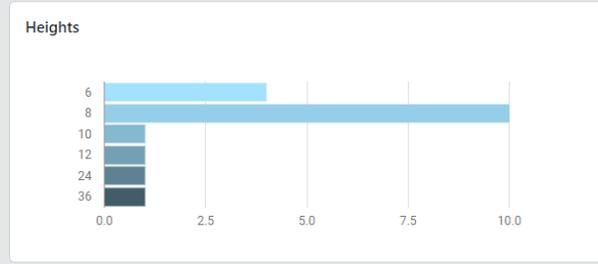
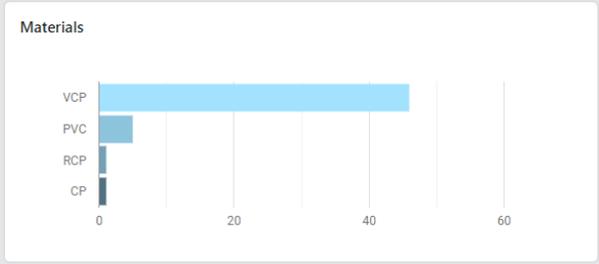
TO 07/26/2022

66 INSPECTIONS

18 PIPE SEGMENT REFERENCES

9859.7 METERS SURVEYED

78 PACP CODES



2020 January

Crews Accomplishments	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Easement Clearing	0																															
Sewer Lines Treated footage (obliterated)	0																															
Manholes Inspected	108			1			14	14		12	12				15		1	4						17	4				4		10	
SL-Rat Inspections	73			10												18	20					17	8									
Sanitary Sewer Overflows (SSO) Reported	1																											1				
MH/LH Installed	0																															
MH/LH Repaired	0																															
MH/LH Replaced	0																															
MH/LH Located	0																															
MH/LH Raised	0																															
Sewer Line Point Repairs Completed	2						1																		1							
Restoration of Yards and/Or Streets	3										1	1																1				
Sewer Lines Televised	4909	454				289	403	140						548							966	742					154	580	433	200		
Sewer Calls	5			1																								2		2		
Confined Space	0																															
Assist Other Divisions/Departments	28						1	2	1	1	1			1	3	1	1				1	4	1	2			1	1	4	1	1	
Gallons Water Used	9130	100	620				150			1000	300			800	400						600	1580	1810					1190	580			



Conclusion

- Sewer asset management decisions rely on quality data
- Data quality needs to be measured so it can be improved continuously
- Data management is a key to the success of sewer asset management
- Data integration helps retrieving information easily without any coding knowledge



Questions?

For more information contact us

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