

# **GIS Field Editing & Quality Assurance**

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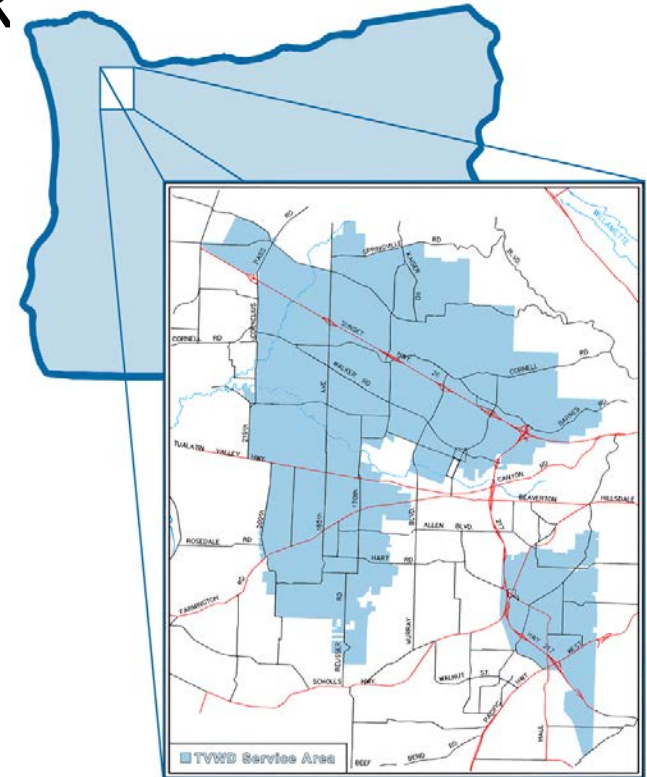
**Information Technology Officer**

**Tualatin Valley Water District**



# Tualatin Valley Water District

- Headquarters in Beaverton, OR
- Formed in 1938
- Approximately
  - 60,000 Service Connections
  - 44.2 Square Miles
  - 770+ Miles of Pipe
  - 124 Employees



# TVWD's Mobile GIS Environment

Disconnected editing and valve turning with InfraMap



Connected editing and work management with Cityworks



# Business Needs Change

- Improve timeliness of information for District
  - Ability to respond and plan
- Crews will need information at any time of day
  - No backlogs, no working hours limitations
  - All information available (CAD, aerials, GIS)
- Crews will need information in the most harsh working conditions



# Role Change for GIS Team

- GIS supports field editing by providing:
  - Oversight of data quality
  - Training and guidance to crews



- Technology requirements and support are more complex: GIS is an integrated IT technology

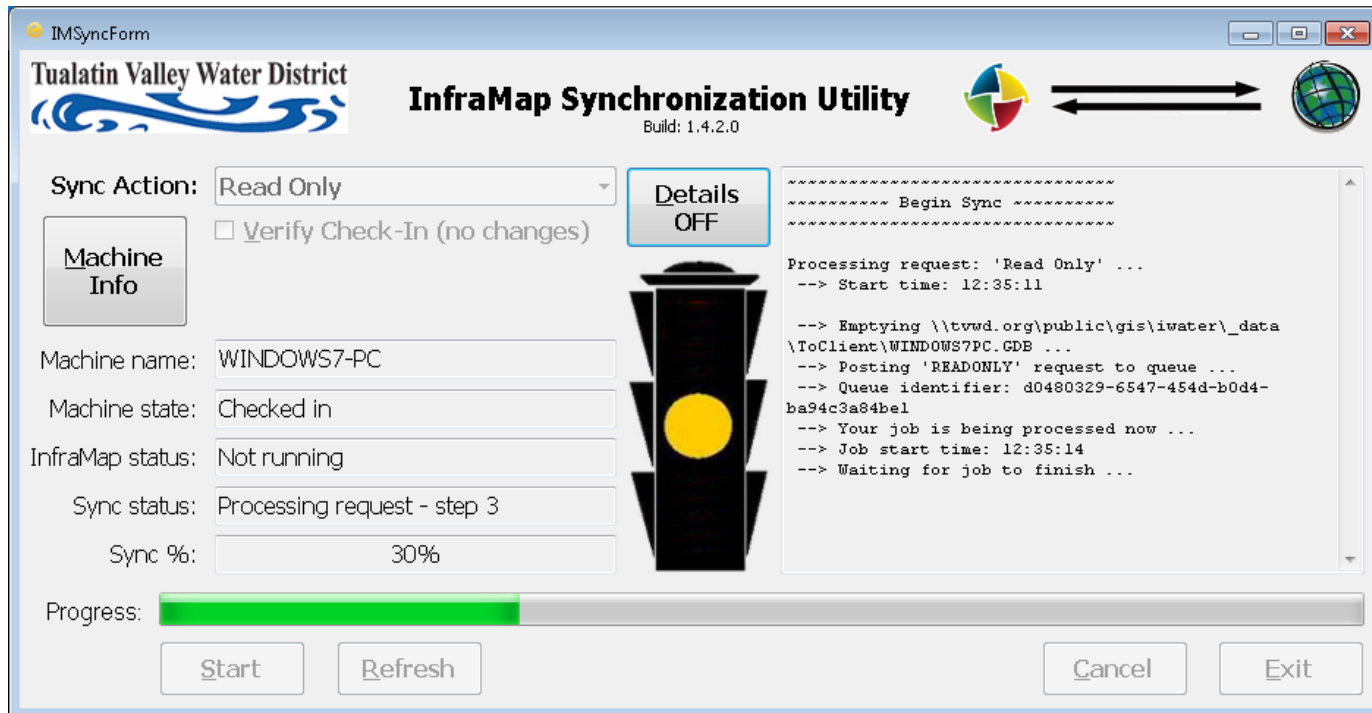


# Disconnected Editing Challenges

- #1: Each laptop carries a “replica” of the Enterprise geodatabase
  - Check-in / Check-out processes are NOT managed by ESRI
- #2: Conflict resolution after Check-in is manual process
  - ESRI provides no automation tools



# Disconnected Editing Solution #1

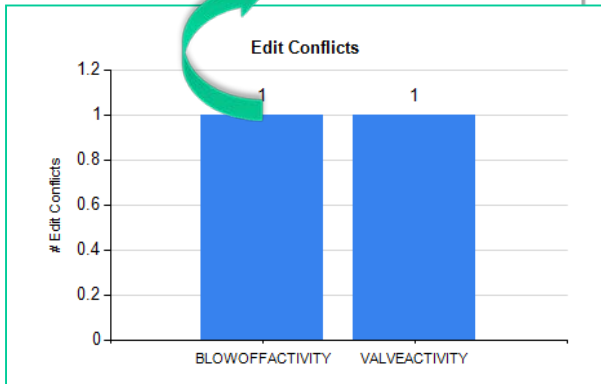


- Custom synchronization utility that queues up requests
- Provides laptop configuration managed by GIS

# Disconnected Editing Solution #2

Custom conflict detection

Asset	Asset ID
WLOWOFFASSEMBLY	1S1W24A38B090



Conflict Date	Asset	2013-05-21 09:08:18.000	2013-05-21 15:53:21.000	Complete All Conflicts
AncillaryRole	WLOWOFFASSEMBLY			
AssetID	1S1W24A38B090	1S1W24A38B090	1S1W24A38B090	
BOIdentifier	1S1W24A38B090	1S1W24A38B090	1S1W24A38B090	
BONumber	90	90	90	
BuildingNumber	6125	6125	6125	
Comments	-			
ComputerName	VALVE11	VALVE11	CONSTR2	
Condition	2	2	-8	Press to Complete Conflict
CrossStreetName	SW VERMONT ST	SW VERMONT ST	SW VERMONT ST	
DistanceToValve	1.0	1.0	1.0	
Easting				
Elevation				
Enabled	1			
EnclosureType	926	926	UNK	Press to Complete Conflict
FlushingID				
FlushPosition	OPEN			
GPSDate				
GPSTime				
HasGPSLocation				
InstallDate	1900-01-01 00:00:00.0000000	1900-01-01 00:00:00.0000000	1900-01-01 00:00:00.0000000	
IntersectionNumber	38	38	38	
LastActivity	INSPECT			
LastFlushDate	2007-12-16			

Capture conflicts after check-in and resolve conflicts during working hours



# Disconnected Editing Support

All Machine Definitions

Machine Name	Machine State	Previous State	Requested State	Is Mobile	Is Read Only	Replica Name	Replica Exists	Owner Group	Add Member...	
CONSTR2	CHECKOUT	CHECKIN	CHECKOUT	Yes	No	CONSTR2	Yes	VALVE	Edit...	Remove...
DISTRIBUTION8	CHECKOUT	FORCECHIN	CHECKOUT	Yes	No	DISTR8_CHUCK	Yes	DISTRIB	Edit...	Remove...
ENG14	READONLY	READONLY	READONLY	Yes	Yes	ENG14_HERB	No	INSPECTOR	Edit...	Remove...
ENG16	READONLY	READONLY	READONLY	Yes	Yes	ENG16_JAMES_J	No	INSPECTOR	Edit...	Remove...
FCS4	READONLY	READONLY	READONLY	Yes	Yes	FCS4_MONTE	No	FIELDCS	Edit...	Remove...
FIELDOPS6	READONLY	READONLY	READONLY	Yes	No	FIELDOPS6	No	VALVE	Edit...	Remove...
FIELDOPS8	READONLY	CHECKIN	READONLY	Yes	No	FIELDOPS8_KEVIN	No	VALVE	Edit...	Remove...
FO-MGR	READONLY	READONLY	READONLY	Yes	Yes	FO_MGR_DALE	No	VALVE	Edit...	Remove...
GIS_1	READONLY	READONLY	READONLY	Yes	No	GIS1	No	GIS	Edit...	Remove...
GISlaptop	READONLY	FORCECHIN	READONLY	Yes	No	GISlaptop	No	GIS	Edit...	Remove...
IS5	READONLY	READONLY	READONLY	Yes	No	IS5	No	ITTEST	Edit...	Remove...
MAINTENANCE2	CHECKIN	CHECKOUT	CHECKIN	Yes	No	MAINT2_GREG_J	No	MAINT	Edit...	Remove...
VALVE10	CHECKIN	CHECKOUT	CHECKIN	Yes	No	VALVE10	No	VALVE	Edit...	Remove...
VALVE11	CHECKOUT	CHECKIN	CHECKOUT	Yes	No	VALVE11	Yes	VALVE	Edit...	Remove...
VALVE14	CHECKIN	CHECKOUT	CHECKIN	Yes	No	VALVE14	No	VALVE	Edit...	Remove...
VALVE15	CHECKOUT	CHECKIN	CHECKOUT	Yes	No	VALVE15	Yes	VALVE	Edit...	Remove...
VALVE17	CHECKOUT	CHECKIN	CHECKOUT	Yes	No	VALVE17	Yes	VALVE	Edit...	Remove...
VALVE6	READONLY	CHECKIN	READONLY	Yes	No	VALVE6	No	VALVE	Edit...	Remove...
VALVE7	READONLY	CHECKIN	READONLY	Yes	No	VALVE7	No	VALVE	Edit...	Remove...
VALVE9	CHECKOUT	CHECKIN	CHECKOUT	Yes	No	VALVE9	Yes	VALVE	Edit...	Remove...
WINDOWS7-PC	READONLY	READONLY	READONLY	No	No	WINDOWS7PC	No	ITTEST	Edit...	Remove...

GIS supports crews by

- monitoring and coordinating “replicas”
- receives calls from crew members to resolve mapping issues



# Disconnected Editing Support

- Automate Daily Quality Checks
- Provide Feedback

## GIS Query Definition for WISOLATION VALVE

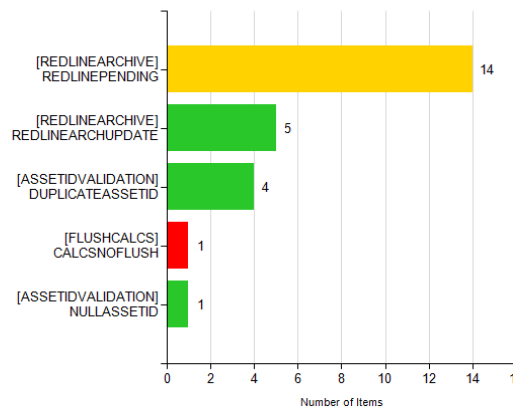
### Asset List

AssetID='1N1W21A16V8' OR  
AssetID='1N1W34C49V1' OR

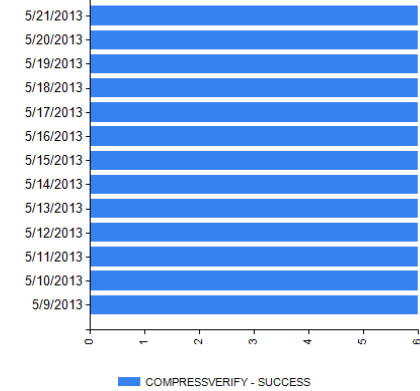
## GIS Nightly Process Dashboard

5/22/2013 8:19:03 AM

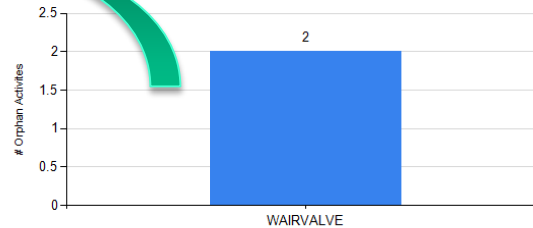
### Processing Results



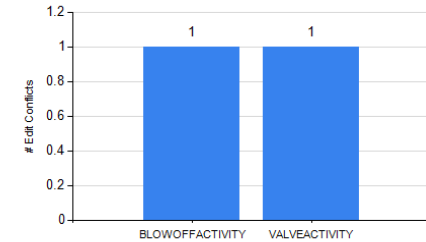
### Compress Activity for TVWDWaterR2



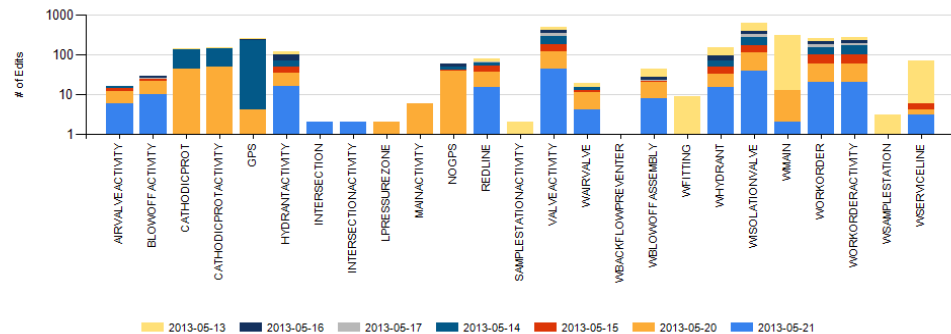
### Orphan Activities



### Edit Conflicts



### Raw Edits Summary



# Connected Editing Challenges

- Conflict Resolution
- Redlining is inadequate
- Connectivity

The screenshot displays the Cityworks GIS application interface. The top menu bar includes options like 'Inbox', 'Recent', 'Work Orders', 'Inspections', 'Requests', 'GIS Search', 'Reports', 'Crews', 'UCF Manager', and 'Admin'. A search bar is located on the right. The left sidebar contains several data tables:

- Open FCS Work Orders (5 records)**

Id	Description	Priority	Status	Submit To	Proj Start Date	Proj Finish Date
269	Meter Box Replace	3	OPEN	ETIENNE, MIKE	12/26/2014 3:32 PM	
282	Meter Correction	3	OPEN		12/29/2014 12:55 PM	
313	AMR Retrofit	3	OPEN		1/27/2015 9:50 AM	
314	Meter Exchange	3	OPEN		1/27/2015 11:38 AM	
315	Meter Exchange	3	OPEN		1/27/2015 11:44 AM	
- FCS Inspections**
  - Open Meter Inspections (4 records)**

Id	Address	Inspection Type	Date Inspected	Inspected By	Status	Submit To
2545	18890 NW AVERY PARK WAY	METER_INSTALL	12/19/2014 10:51 AM			
2629	18852 NW PARK RIDGE WAY	METER_INSTALL	12/22/2014 2:10 PM			
2696	18920 NW PARK RIDGE WAY	METER_EXCHANGE	12/23/2014 3:06 PM			
2843	1051 NW KATSULES PL	METER_CORRECTION	2/4/2015 2:42 PM			
  - Closed Meter Inspections (Last 7 Days)**

No records to display.
  - Rejected Meter Inspections (6 records)**

Id	Address	Initiated By	Initiated Date	Inspection Type	Date Inspected	Inspected By
2078	2088 SW 187TH AVE	WILLIAMS, BROCK	12/2/2014 3:26:09 PM			
2109	0000 SE 78TH AVE	JOHNSON, CHRIS	12/8/2014 8:59:42 AM			
2110	0000 SW FRAMMY LN	JOHNSON, CHRIS	12/8/2014 9:09:22 AM			
2257	8976 SW ENRIQUE CT	WILLIAMS, BROCK	12/16/2014 3:20:41 PM			

The main map area shows a network of blue lines representing water mains. Various colored markers (purple, yellow, red) are placed along these lines, corresponding to the work order IDs listed in the tables. A toolbar on the left side of the map provides navigation and editing tools. The bottom status bar shows coordinates: X: 7599019.03117 Y: 680061.26322.

# Basic Data Quality Checks

Table Name:  Column Name:

Exclude Activity Tables:

1 of 1 100% Find | Next

### GIS Data Quality Statistics for TVWDWaterR2

6/11/2013 3:57:36 PM

Table	Column	Total Rows	Total NULL	Total Empty	Total Data	Error Rate	Domain Name	In Domain	Not In Domain
Meters	AssetID	60067	0	0	60067	0.00%			
Meters	BuildingNumber	60067	1573	0	58494	2.62%			
Meters	City	60067	1573	0	58494	2.62%			
Meters	Comments	60067	60067	0	0	100.00%			
Meters	ComputerName	60067	0	0	60067	0.00%			
Meters	Condition	60067	60067	0	0	100.00%			
Meters	CrossStreetName	60067	1573	0	58494	2.62%			
Meters	Easting	60067	60067	0	0	100.00%			
Meters	Elevation	60067	60067	0	0	100.00%			
Meters	ExchangedMeterID	60067	50539	0	9528	84.14%			
Meters	FlushingID	60067	60067	0	0	100.00%			
Meters	GPSDate	60067	60067	0	0	100.00%			
Meters	InstallDate	60067	0	5219	54848	8.69%			
Meters	LegacyID	60067	0	0	60067	0.00%			
Meters	LifeCycleStatus	60067	0	0	60067	0.00%	dSELifeCycleStatus_2	60067	0
Meters	Location	60067	0	38775	21292	64.55%			
Meters	MatchAddress	60067	1573	0	58494	2.62%			
Meters	MTComments	60067	60067	0	0	100.00%			
Meters	MTCondition	60067	60067	0	0	100.00%			
Meters	MTInstallDate	60067	0	8979	51088	14.95%			
Meters	MTIsRadio	60067	0	0	60067	0.00%	dYesNoOnly	60067	0
Meters	MTLastActivity	60067	60067	0	0	100.00%	dMTActivity_3	0	0
Meters	MTLastFlowTestDate	60067	60067	0	0	100.00%			

### Distribution for Meters.LifeCycleStatus {dSELifeCycleStatus\_2}

Code	Count
ACTIVE	59751
DORMANT	47
INACTIVE	269

Code	Value
DORMANT	Dormant
RETIRED	Removed
ABANDONED	Abandoned
ANNEXED	Annexed
INACTIVE	Inactive
ACTIVE	Active
UNK	Unknown

- Automated daily profile of all feature and object classes
- Look for training or data collection issues

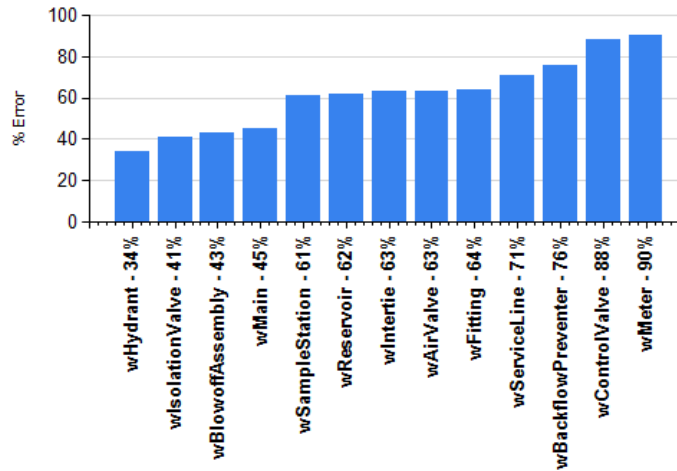
# Overall Data Quality Checks

- Target data collection efforts
- Provide insight into overall quality of system information

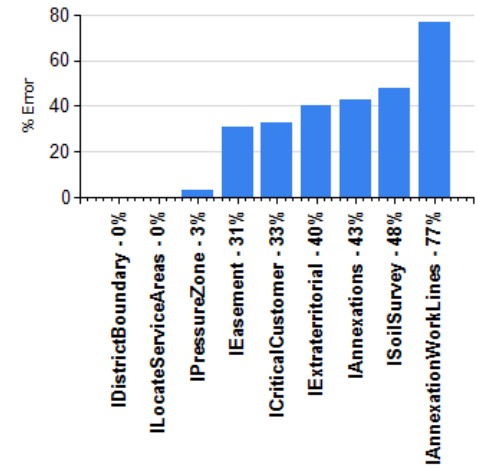
## Asset Tables Only

5/22/2013 8:29:48 AM

% Error of Water Feature Dataset Tables



% Error of Landbase Feature Dataset Tables



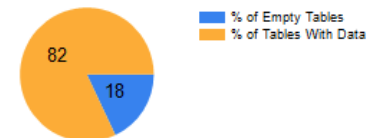
% of Error Due to LifeCycleStatus in (Abandoned, Retired, Proposed)

No Data Available

% Avg Error Overall



% Completeness



# Summary

- GIS business needs have shifted
- Technology exists to support the shift
  - ESRI is a development platform
- Develop GIS work processes to support the shift
- Develop GIS tools to manage the work



# Questions?

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