



# Digital Transformation in Water Accounting

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# California Water Service



- Largest regulated water utility west of the Mississippi
- Founded in 1926
- Grew to serve 484,900 residences and businesses throughout the state.



Most Outstanding Water  
Project of 2018

*Award from American Society  
of Civil Engineers*

# Keeping track of 10+ billion gallons per year!

*We keep the pumps running just fine...*

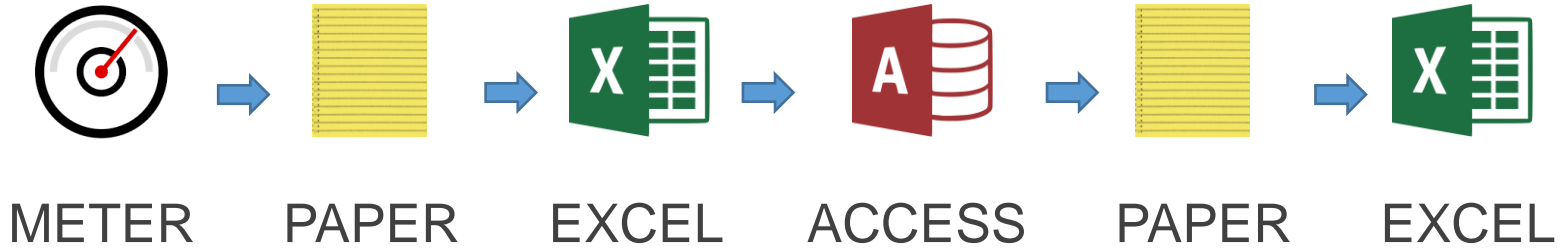
The problem ...

- Tracking flows and power for 1000+ pumps
- Rolling up this physical data into economic costs and total production value
- Publishing a report of only 10 numbers!



High horsepower pumps pump water from aquifers, lakes and rivers to distribution stations.

# Former Data Flow



1. Drive to stations to take readings on paper.
2. Compile handwritten readings into a Microsoft Excel spreadsheet.
3. Enter the Excel data into a Microsoft Access Form.
4. Generate Access report, print it, and submit to District Manager for approval.
5. Upon approval data is manually transcribed from the report into another Excel spreadsheet for use by finance and corporate.

# Biggest Issue: Computerized, but still intensely manual

- Involves many hours of travel and manual record keeping.
- Prone to transcription errors.
- The access database is flat, lacking meaningful organization.
- The Access database does not lend itself to calculations, aggregations, or trending.
- Data is stored in many different tables and formats.



# Opportunity: Organize data for Accounting



California Water Service Company

## Daily Production

Record Date: Wednesday, February 28, 2018

Summary for 2/1/18

(243 detail records)

Accounting needs only  
10 numbers per month!

- Accounting can't handle the individual metrics (flow, power, run hours) for each of 2000 operating end devices.
- **Accounting wants total amounts, costs for all districts.**

### Water Production Summary

	Daily Sum	Month to Date
CWS Wells:	16,996	471,775
Leased Water:	Null	Null
Purchased Water:	14,546	354,131
Purchased Water - Other:	1,995	48,889
Surface Water:	278	143,392
Desalted Water:	Null	Null
Subtotal:	53,367	1,380,312
Wheeled Water:	3,623	97,052
Total Production:	53,367	1,380,312
Other Water:	Null	Null
Backwash:	Null	Null
Reclaimed Water:	Null	Null

# Decision: PI AF is the only choice *to produce business metrics*

- Traditional historians restrict calculations to physical assets, not business concerns.
- PI AF provides calculations traceable to the underlying physical mechanism
- PI AF rolls up and aggregates data across all enterprise data sources

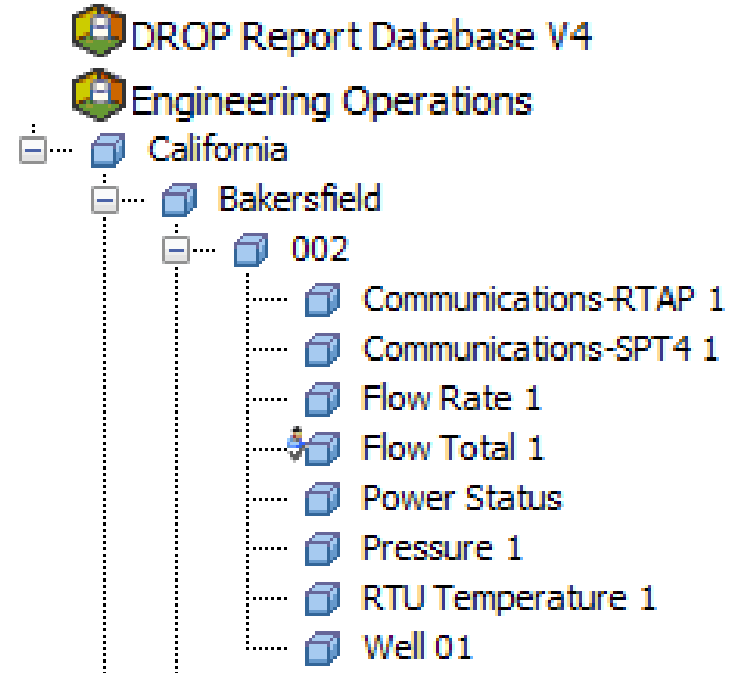


1930 Water Tank

# PI AF at Cal Water

## Many departments use their own AF Server

- *A dedicated AF Structure  
For each enterprise issue*
- *Admins of one AF structure  
needn't worry about other  
structures*





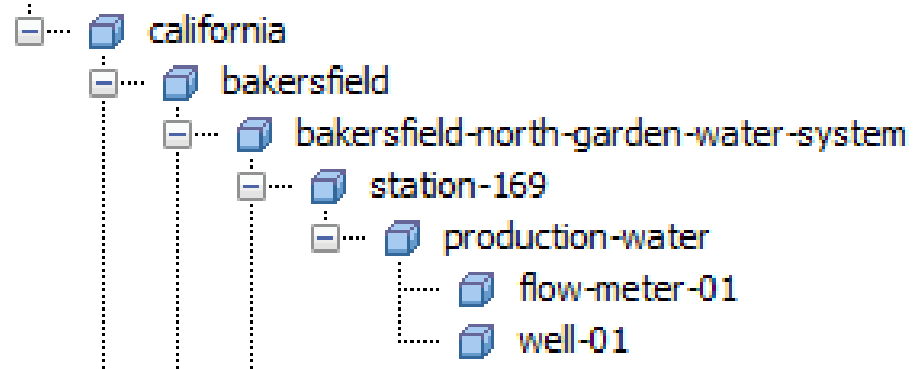
# Rollups: AF Converts Hundreds of Values to 10!

For reporting, data is organized into a hierarchy that can handle both physical and logical needs.

Maintains physical location of each asset while allowing logical separation by water type.

Rollup calculations consolidate data from all lower levels, gives district level production data from meter data.

With this hierarchy, we can generate customized reports for several enterprise departments.



# 30 AF Templates Manage 2000 End Devices!

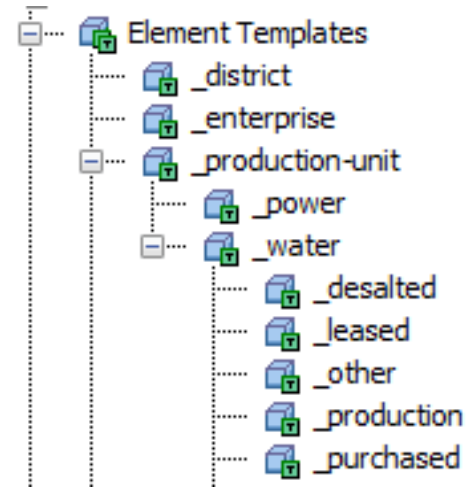
Each hierarchy member is based on a template.

With 30 templates, we can generate customized reports for many enterprise departments.

Element templates contain all relevant attributes and analyses.

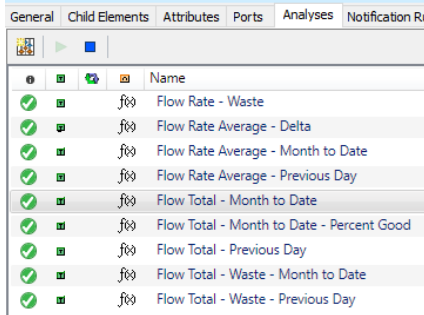
Most element configurations are automatic based on hierarchy location and attribute IDs.

If the district structure is known, it can be built in AF in a matter of minutes!



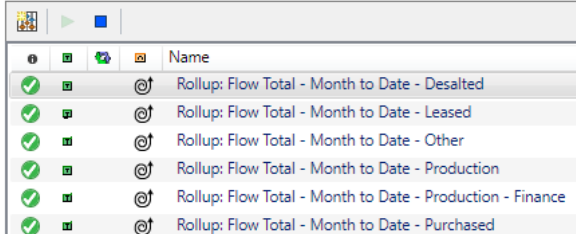
# Analyses are Performed at Each Level

- Flow totals are calculated from flow rate data & manual data.
- Run hours are calculated based on the device state tags
- Kilowatt hours are manually entered.
- From there, month to date and previous day rollup calculations are performed
- Different types of flow, such as transfer and production, are calculated separately.
- The end result is calculated district level calculations based on data from all member pumps and meters.



	Name
✓	f⊗ Flow Rate - Waste
✓	f⊗ Flow Rate Average - Delta
✓	f⊗ Flow Rate Average - Month to Date
✓	f⊗ Flow Rate Average - Previous Day
✓	f⊗ Flow Total - Month to Date
✓	f⊗ Flow Total - Month to Date - Percent Good
✓	f⊗ Flow Total - Previous Day
✓	f⊗ Flow Total - Waste - Month to Date
✓	f⊗ Flow Total - Waste - Previous Day

Analyses performed at a flow meter element.



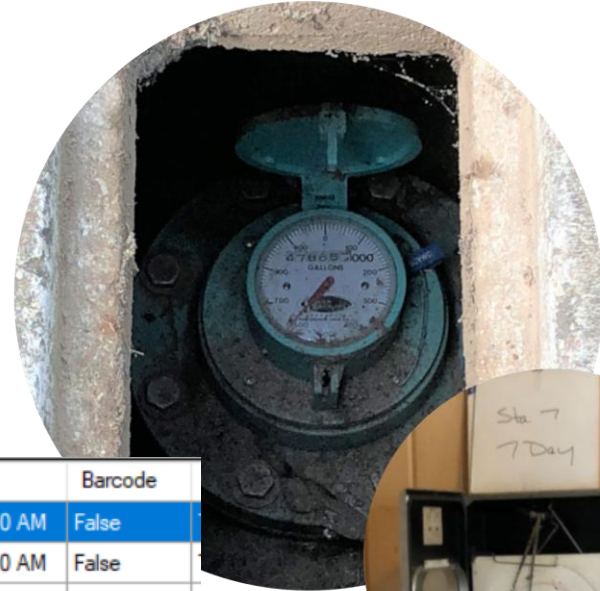
	Name
✓	@f Rollup: Flow Total - Month to Date - Desalted
✓	@f Rollup: Flow Total - Month to Date - Leased
✓	@f Rollup: Flow Total - Month to Date - Other
✓	@f Rollup: Flow Total - Month to Date - Production
✓	@f Rollup: Flow Total - Month to Date - Production - Finance
✓	@f Rollup: Flow Total - Month to Date - Purchased

Rollup analyses performed at a district element.

# Dealing with Equipment not in SCADA

Legacy Flow Meter

- **PI Manual Logger (PIML)** allows operators to enter data from non-SCADA equipment into PI
- 1500+ manual entry points, scattered across the entire state
- Each manual point is a distinct piece of equipment!



	Tag Name	Tag Description	Value	Comment	TimeStamp	Barcode
▶	california_bakersfiel...	Manually entered mete...			12/20/2018 8:00:00 AM	False
	california_bakersfiel...	Manually entered mete...			12/20/2018 8:00:00 AM	False
	california_bakersfiel...	Manually entered mete...			12/20/2018 8:00:00 AM	False
	california_bakersfiel...	Manually entered mete...			12/20/2018 8:00:00 AM	False

# Actual DROP Report



California Water Service Company

## Summary of Daily Production Totals

**Record Date:** Thursday, May 31, 2018

Total Production			
Date	KGALS	Acre Feet	CCF
1-May-18	10,837	33.26	14,487.23
2-May-18	11,569	35.50	15,465.54
3-May-18	11,343	34.81	15,163.03

- 28 Daily Report of Production (DROP) documents per month
- Validated, digitally signed by District Managers and Engineering
- Aggregated into one Water Production Report (WPR)

### CWS WELLS

Pump:	Kgallons	Month to Date	Hours	Month to Date	KWH	Month to Date	GPM	Average for Month to Date	Difference as a Percent	Production Pump
LAS-001-02	Null	Null	0.00	3.65	Null	Null	Null	Null	Null	Yes
LAS-004-02	0.00	0.00	0.00	0.00	Null	Null	0.00	0.00	0%	Yes
LAS-006-02	764.27	1,275.06	2.95	34.50	Null	Null	530.74	28.56	-1758%	Yes
LAS-015-01	235.20	3,452.44	12.64	167.78	Null	Null	163.33	77.34	-111%	Yes
LAS-017-01	986.47	37,467.45	14.71	572.81	Null	Null	685.05	839.32	18%	Yes

# Producing the Report

## Requirement:

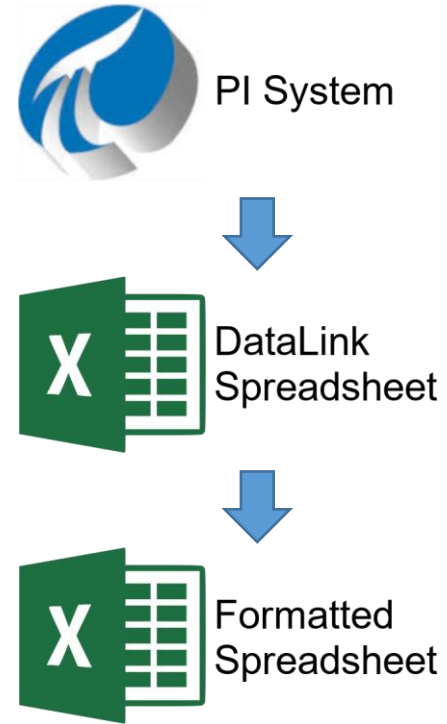
- Users can be anywhere on Enterprise Network without needing PI account

## Data access and security requirements:

- Users are on enterprise network
- Shouldn't have access to PI System

## Two spreadsheet solution:

- DataLink Spreadsheet queries PI System
- Formatted Spreadsheet copies *values only* from DataLink Spreadsheet – isolated from PI System



# Report Life Cycle



California Water Service Company

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### PI and Excel

- Data organization, and calculations
- Report generation

### Operations

- District Managers
  - Deal with one district
  - Verify raw data
  - Digitally sign

### Engineering

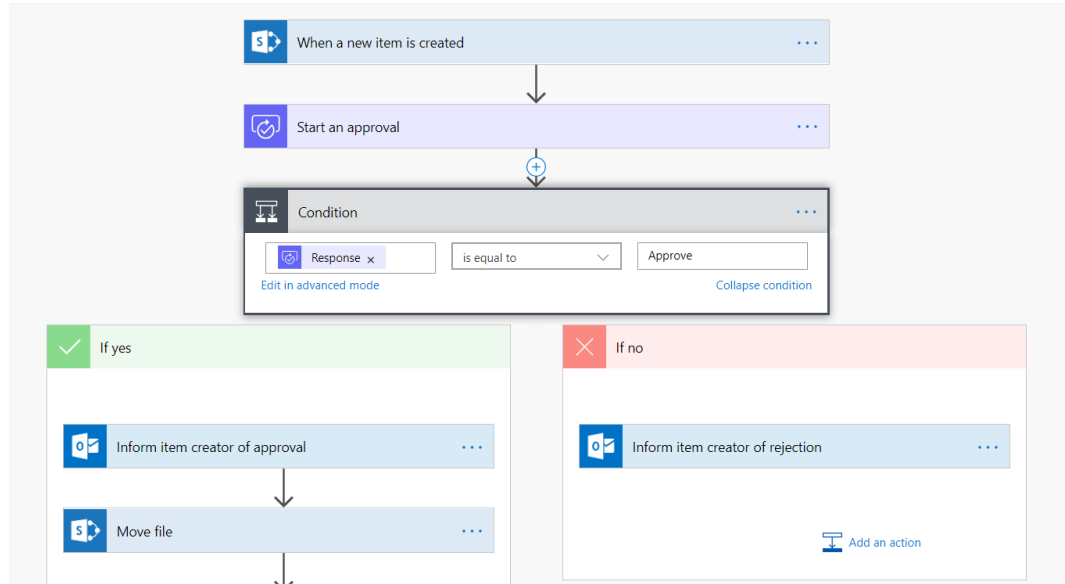
- Water Engineers
  - Deal with 28 districts
  - Check monthly averages and statistics
  - Can request edits and changes

### Accounting and Compliance

- Accountants
  - Aggregate 28 District reports into one

# SharePoint

- Workflow guides the report through its life cycle
  - Validation by District
  - Verification by Engineering
  - Aggregation by Accounting
- SharePoint manages electronic signatures, and controls access to reports





# Digital Transformation in Water Production



Cal Water produces 10+ billion gallons per year of clean and cost effective water to ½ million CA residents and businesses. Our biggest challenge is keeping track of each gallon.

Our new production reporting process is an entirely digital process composed of clicks with little manual handling. More accurate data, delivered sooner means users discuss business issues rather than production mechanics.



## CHALLENGE

Maximizing water for CA means keeping track of each gallon- its cost, its price, its quality and its location

- Monthly production reports were plagued by outdated water data, analyzed in manually manipulated spreadsheet reports.
- Monthly effort involved many people, cost too much in time and money

## SOLUTION

We re-organized our production information architecture into a digital data hierarchy managed by PI AF and PI analytics

- The data hierarchy is based on business information needs (flow, cost, location) in addition to engineering needs (pumps, meters, etc.)
- Each Water District has its own standard AF structure that is easy to maintain.

## RESULTS

Production reporting effort cut in half; quantity and quality of data improved. Accounting and Engineering now discuss business values rather than production mechanics.

- 30 separate reports automatically compiled into one report within minutes
- SOX compliance, accounting, much easier

# Let's talk again....

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  - California Water Service
  
- **Greg Dumas**
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  - CTO
  - DST Controls

You can trust Gary and  
Greg!  
Visit them at DST's  
booth



***Doggo, the best Golden Lab in the world***

謝謝 KEA LEBOHA  
 TAPADH LEIBH 고맙습니다  
 БАЯРЛАЛАА MISAOTRA ANAO  
 DZIĘKUJĘ CI NGIYABONGA TEŞEKKÜR EDERIM GRACIES OBRIGADO شكرا SALAMAT  
 KÖSZÖNÖM DANKIE TERIMA KASIH DANKON TANK TAPADH LEAT SALAMAT  
 СПАСИБО МУЛТUMESC  
 PAKMET CIZGE GO RAIBH MAITH AGAT HVALA FAAFETAI  
 БЛАГОДАРЯ GRACIAS ESKERRIK ASKO  
 TI БЛАГОДАРАМ MAHADSANID HVALA ХВАЛА ВАМ  
 TAK DANKE TEŞEKKÜR EDERIM  
 RAHMAT MERCI DANK JE EΥΧΑΡΙΣΤΩ GRATIAS TIBI GRAZIE  
 AČIŮ SALAMAT MAHALO IĀ 'ŌE TAKK SKALDU HA DI OU MÈSI  
 GRAZZI ПAKKA PĒR ありがとうございます ǃAKUJEM  
 PAXMAT CAĜA SIPAS JI WERE TERIMA KASIH MATUR NUWUN  
 CẢM ƠN BẠN UA TSAUG RAU KOJ  
 WAZVIITA TI БЛАГОДАРАМ  
 СИПОС  
 FALEMINDERIT

