A Solution to MOP/MAOP Data Management in PODS

Chevron Pipe Line Company

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Agenda

- Project Background

- Engineering Terminology

- Data Modeling

- PODS Model

- MOPDET Application

- Keys to Success

MOP/MAOP Standardization Project Overview

- **Project Background**
  - Initiated in response to identified opportunities to improve the collection, storage, standardization, and visualization of MOP/MAOP data.
  - Will result in increased availability of MOP/MAOP data to company stakeholders and improved efficiency in responding to information requests.
  - Executed jointly by Engineering, Data Integrity & GIS, and IT Business Systems groups.

- **Opportunity/Scope Statement**
  - Provide a single, centralized, consistent, and standardized process and infrastructure for the efficient reporting, updating and retrieval of MOP/MAOP data by company stakeholders.

Key Project Deliverables

- **Enterprise MOP/MAOP Best Practice Calculation Standard**

- **Maintenance & Inspection Procedure** governing MOP/MAOP data management

- **Custom MOP/MAOP submodel** augmenting the PODS database.

- **MOPDET ("Maximum Operating Pressure Data Entry Tool")** web module enabling collection of MOP/MAOP and associated fundamental source data in PODS.
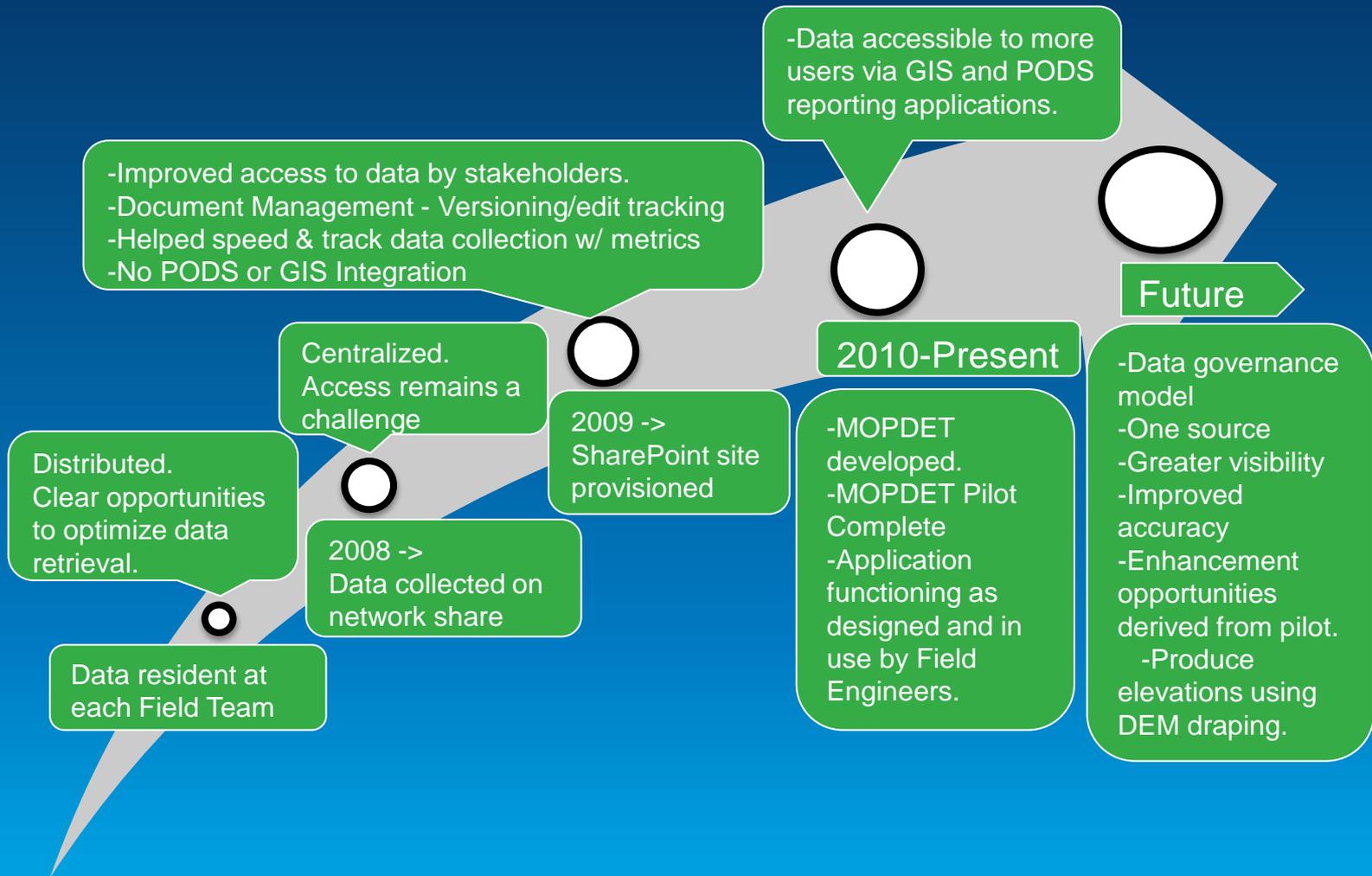
Step One: Engineering Standardization

- Engineering SMEs from throughout Chevron Pipe Line Company collaborated to define:
    - Common definitions related to MOP/MAOP and associated calculations.
    - A list of fundamental source data elements required to calculate MOP/MAOP.
    - An MOP/MAOP calculation document specifying a standard enterprise MOP/MAOP calculation methodology across the corporation.
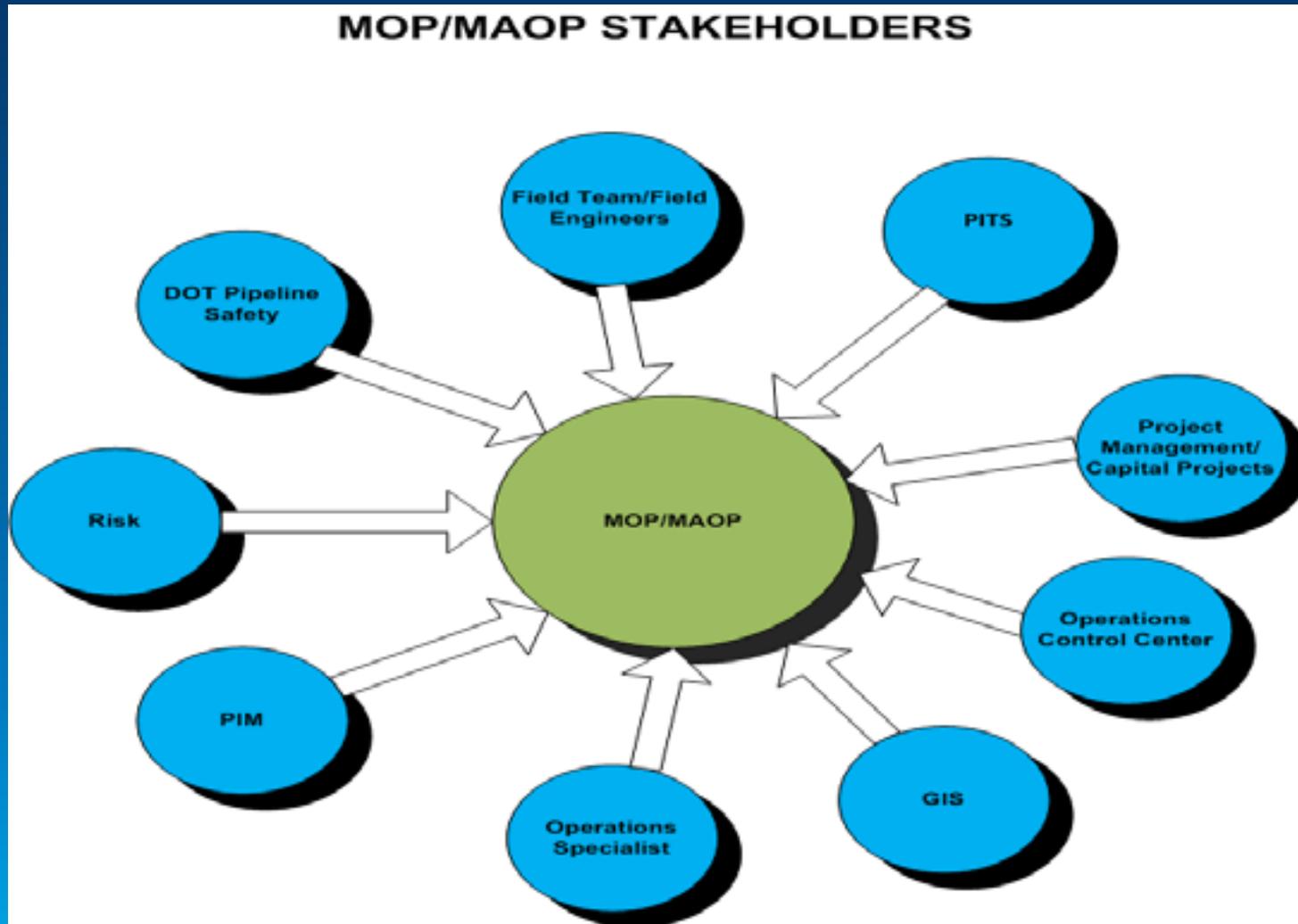
What is MOP/MAOP?

- **MOP:** 49 CFR Part 195 Liquid Pipeline **M**aximum allowed **O**perating **P**ressure. Is definable at all points along the line and is the minimum of:
  - 80% of Hydro test Pressure, e.g., (test head – local elevation) * Sg * 0.8 / 2.31
  - Design Pressure of the pipe
  - Design Pressure of any component
  - De-rate pressure due to flaws or corrosion (if any)

- **MAOP:** 49 CFR Part 192 Natural and Other Gas Pipeline **M**aximum **A**llowed **O**perating **P**ressure. Is definable at all points along the line and is the minimum of:
  - Properly Factored Hydro test Pressure calculated at critical points, e.g., (test head – local elevation) * Sg / (2.31 * (Appropriate Factor from 192.619 (a)(2)(ii)))
  - Pressure that is based on DOT 192.105 Factors
  - Design Pressure of any component
  - De-rate pressure due to flaws or corrosion (if any)

Evolution of MOP/MAOP Data Collection at CPL

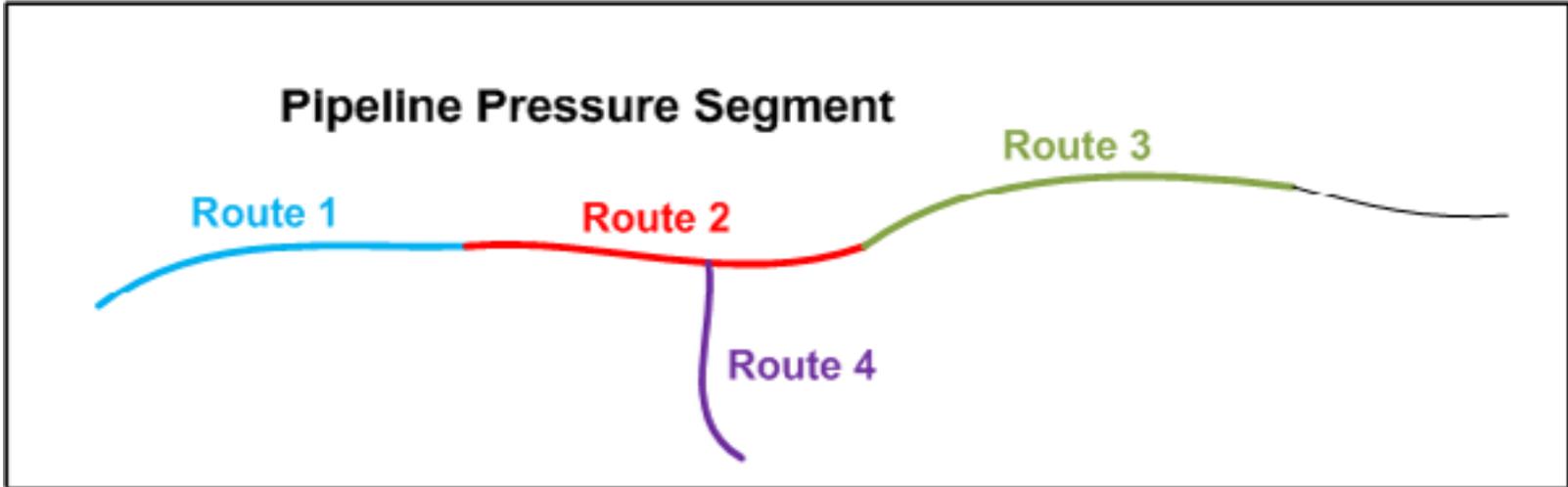-Data accessible to more users via GIS and PODS reporting applications.

-Improved access to data by stakeholders.
-Document Management - Versioning/edit tracking
-Helped speed & track data collection w/ metrics
-No PODS or GIS Integration

Centralized.
Access remains a challenge

2009 ->
SharePoint site provisioned

Future

2010-Present

Distributed.
Clear opportunities to optimize data retrieval.

2008 ->
Data collected on network share

-MOPDET developed.
-MOPDET Pilot Complete
-Application functioning as designed and in use by Field Engineers.

-Data governance model
-One source
-Greater visibility
-Improved accuracy
-Enhancement opportunities derived from pilot.
-Produce elevations using DEM draping.

Data resident at each Field Team

Stakeholder Analysis

Data Modeling Requirements

- **Pipeline Pressure Segment -** *Collection of Polylinear Features*
  - Defines an area influenced by a common pressure source
    - Often the area between pressure sources (e.g. pumps, compressors)
  - Collection of one or more Routes or parts of Routes

- **MOP (Liquids Lines) & MAOP (Gas Lines) –** *Point Features*
  - Defined at points along the centerline
    - Anywhere a key pipe property changes (e.g. wall thickness, diameter, test pressure)
  - Generally the minimum of design pressure, hydrotest pressure, pressure rating of any associated component, or applicable de-rate exception.

- **Station MOP/MAOP –** *Point Features*
  - Defined at upstream pressure source points (e.g. pumps, compressors)
  - Maximum pressure such that downstream MOP/MAOPs are not exceeded

- **Features (Source Data) –** *Polylinear and Point Features*
  - Examples include Pipe Segment, DOT Class, Flange, Valve, Meter, Offshore Riser, and Test Pressure

Pipeline Pressure Segment
Illustrated

Pipeline Pressure Segment

Route 1   Route 2   Route 3   Route 4

MOP/MAOP & Station MOP/MAOP
Illustrated

MOP & Station MOP (Liquids System)

Pressure Segment "A"

Pressure Segment "B"

Pressure Segment "C"

MOP = 1700 psi
MOH = 4800 ft hd
Elev = 750

MOP = 1200 psi
MOH = 3500 ft hd
Elev = 500

MOP = 1065 psi
MOH = 3035 ft hd
Elev = 400 ft

(Pump Station)
Station MOP = 650 psi
Elev = 700 ft

Limiting Point
MOP = 1060 psi
MOH = 3030 ft hd
Elev = 390 ft

MOP = 1030 psi
MOH = 3040 ft hd
Elev = 500 ft
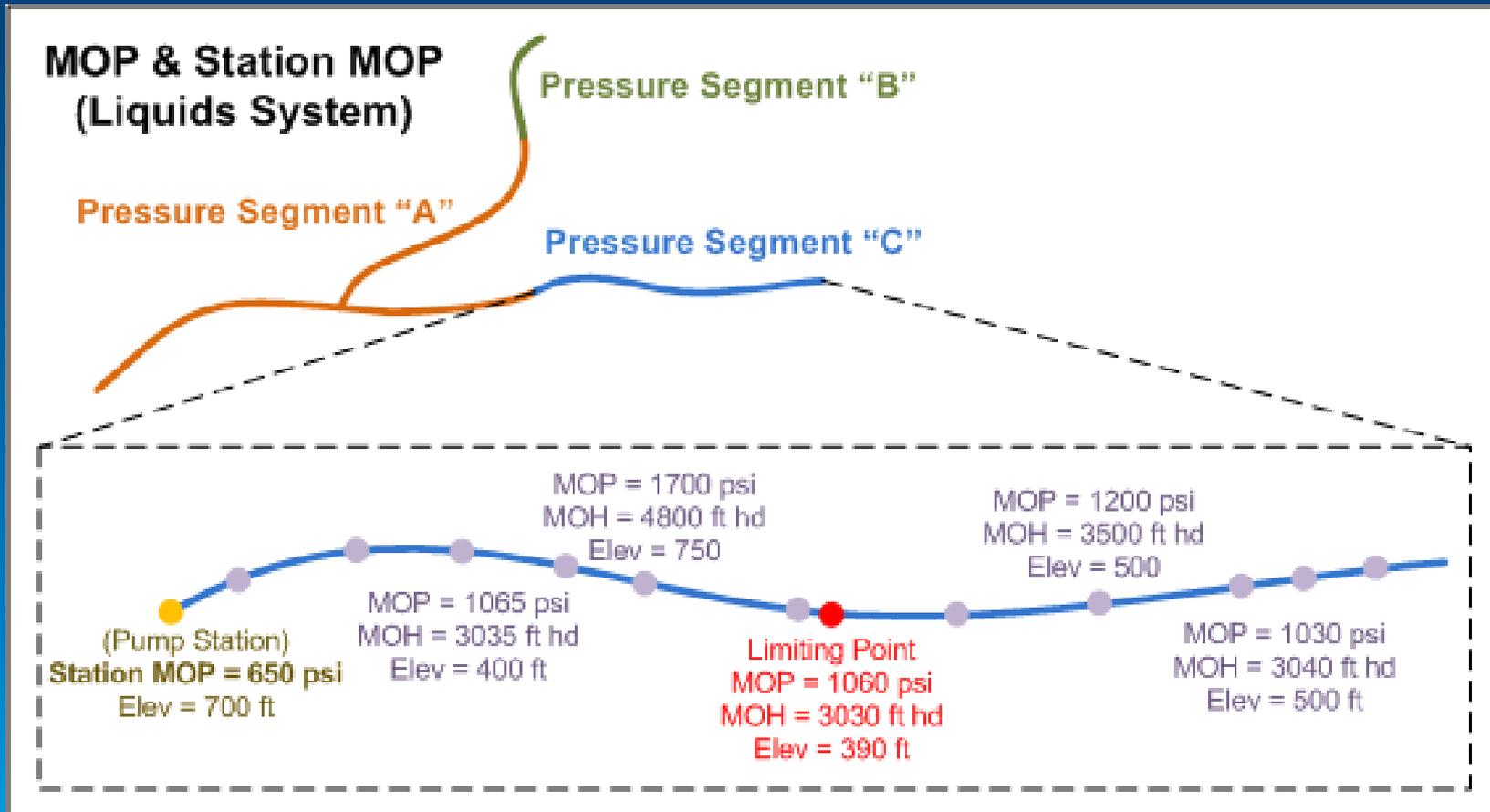
PODS: Pipeline Open Data Standard

- Consortium of pipeline operators and service providers founded in 1998.

- Provides pipeline operators with a highly scalable and extensible database architecture to integrate critical records and analysis data with geospatial location for each component of their pipeline systems on a vendor-neutral platform.

- The PODS data model contains modules for capturing pipeline location and attribute data related to centerline definition, asset specifications, regulatory compliance, inspection, risk, and more.

- Standard data model variants include the "PODS Relational" model as well as "PODS ESRI Spatial", an enterprise geodatabase implementation.
  - Relational model specifies location non-spatially via station/measure along a Route.

- CPL created a custom MOP/MAOP submodel extending the existing PODS 3.2 implementation to fit our data modeling requirements.

PODS Environment at Chevron

Data Entry Tools → *Collect* → **Staging** → *Load* → **PODS Relational** → *Spatialize Nightly* → **ArcSDE** → Map Services / ArcGIS Desktop / Reporting / Analysis Applications

Staging: Validation Approval
PODS Relational: Relational Tables
ArcSDE: Feature Classes
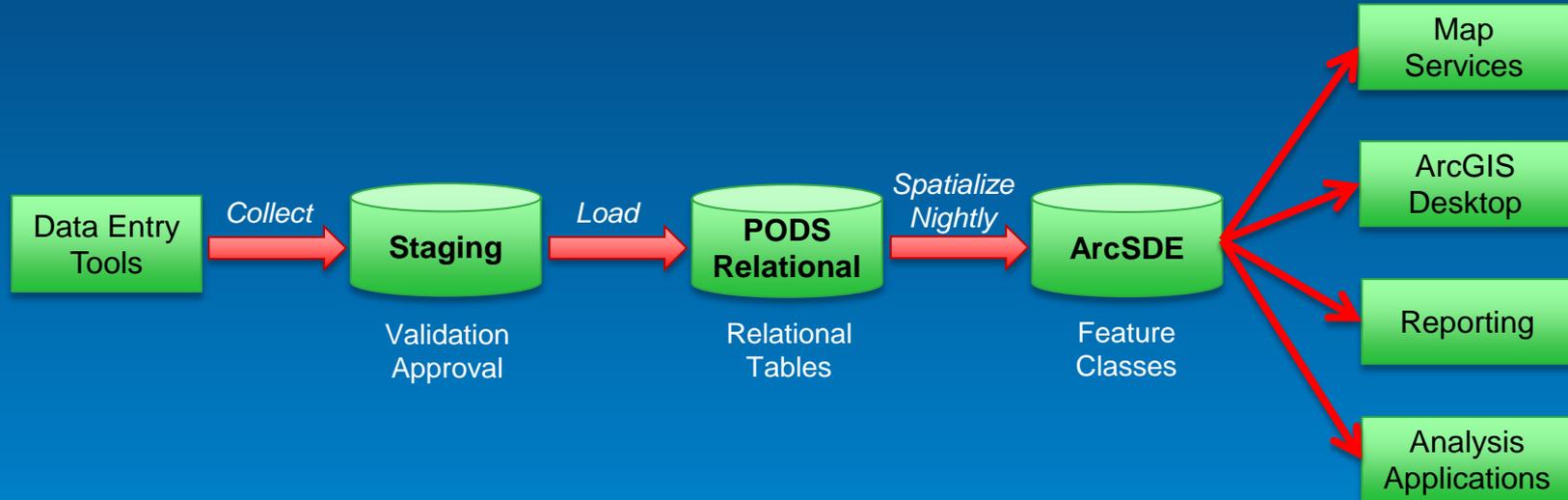
MOP/MAOP Data Sample
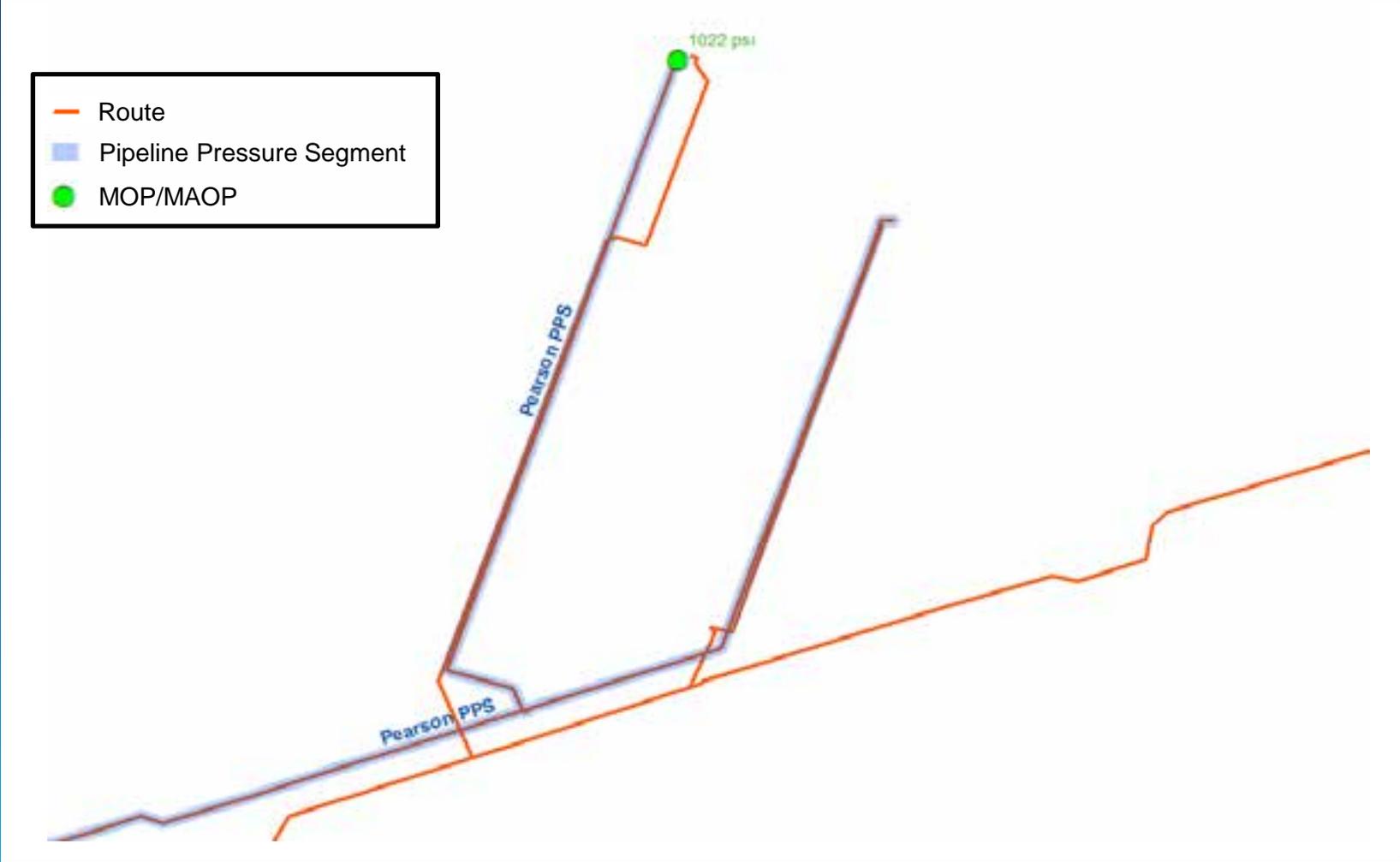
What is MOPDET?
Maximum Operating Pressure Data Entry Tool

- Web-based application enabling Field Engineers to review/enter fundamental source data, utilize said data to facilitate MOP/MAOP calculations, and record the results.

- Data stored in PODS, CPL's centralized repository for pipeline technical data.

- New addition to CPL's suite of PODS data collection applications with look & feel consistent with existing apps.

- Data staged for validation and approval before promotion to PODS and spatialization in to ArcSDE feature classes. .
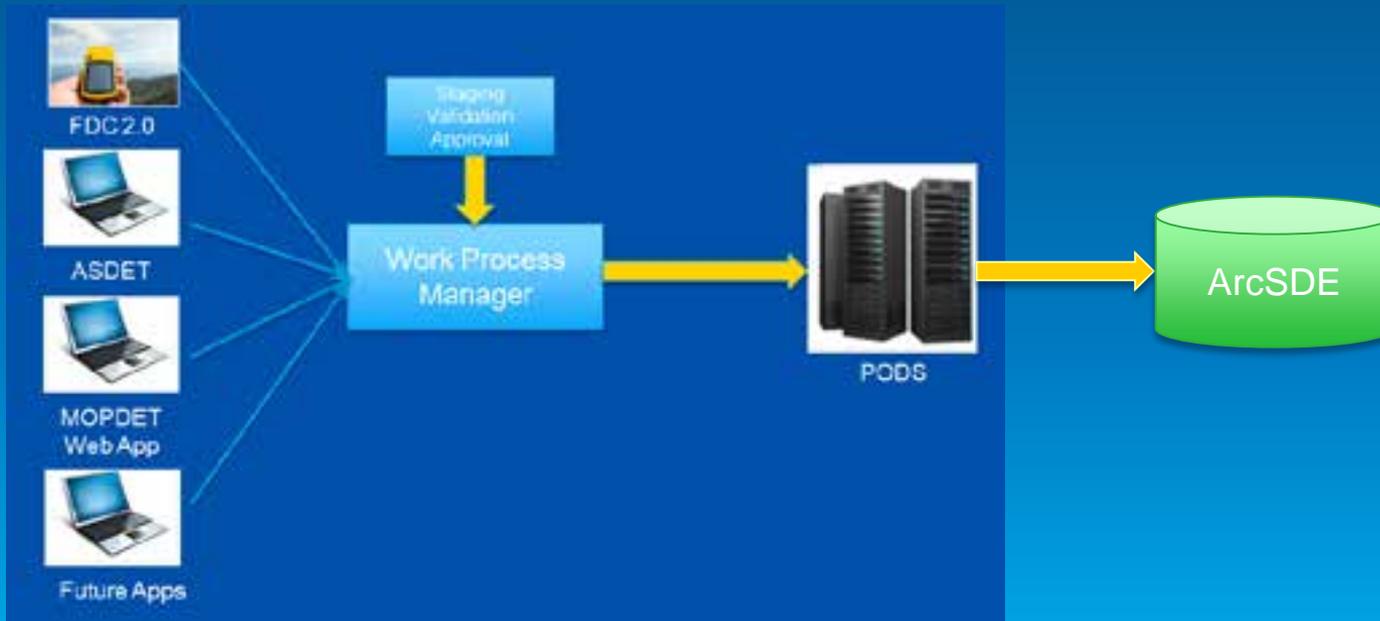
MOPDET Fundamental Process Design

Pressure Segment Management	**Managing Pressure Segment**	The Pipeline Pressure Segment record is either created or edited. It is tied to one or more Routes (aka Parts), which are added through the application.
Feature Management	**Managing Source Data**	The Source Data (Pipe Segment, DOT Class, Flange, Valve, Meter, Offshore Riser, and Test Pressure) are validated, edited or added to the routes of the associated Pipeline Pressure Segment. The Source Data will either come from PODS or will be entered by the user.
	Managing MAOP/MOP	After all Source Data have been validated, updated, or added to the Pipeline Pressure Segment, the data is extracted from the application to calculate the MOP/MAOP *(Calculation is performed outside of the MOPDET Application)*. The result is added to a new MOP/MAOP or an existing record. The supporting documentation is attached to the associated Pipeline Pressure Segment record.
Pressure Segment Management	**Approving Pressure Segment**	Approval is submitted to the appropriate Field Engineering Supervisor to accept or reject the Pipeline Pressure Segment based on the MOP/MAOP calculation. *A previously approved Pipeline Pressure Segment can also be reopened to change or update MOP / MAOP.*

MOPDET Web Application – Home Screen

MOPDET Web Application – PPS Management Screen

MOPDET Web Application – Feature Management Screen

Data Extract and Calculation Process
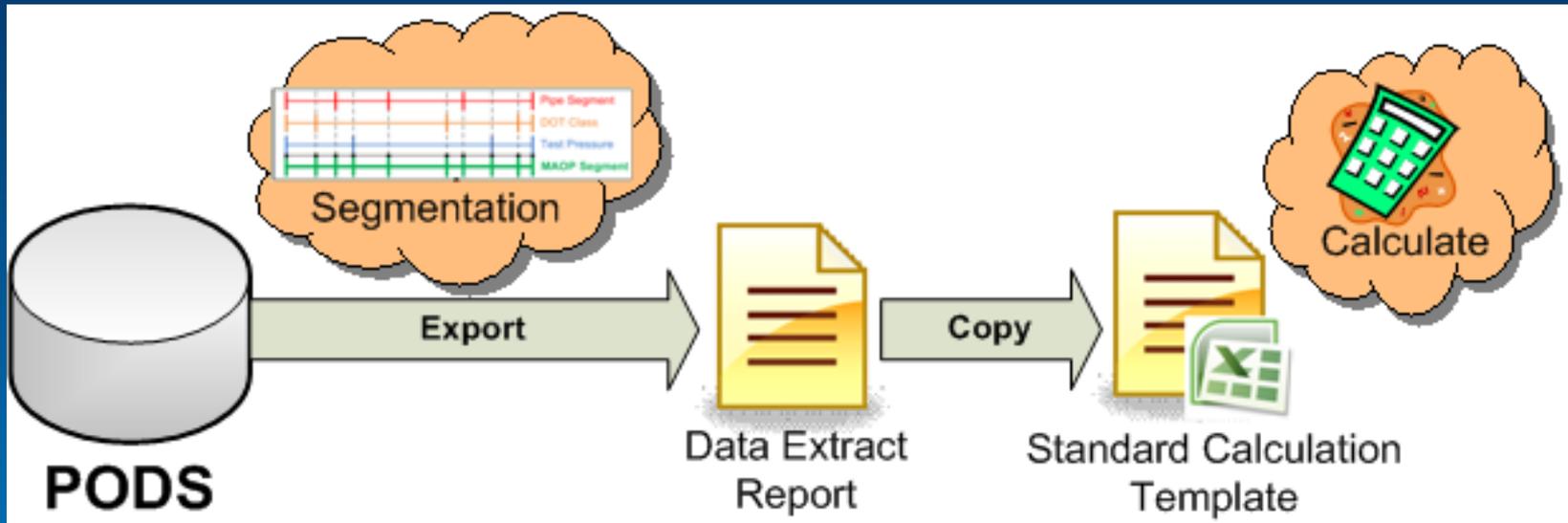
- Calculation occurs outside of the application.
- Data is exported from PODS and copied into the standard Excel template.
- The Excel spreadsheet facilitates the calculation, and it enables the manipulation of calculation parameters as well as "what-if" scenarios.
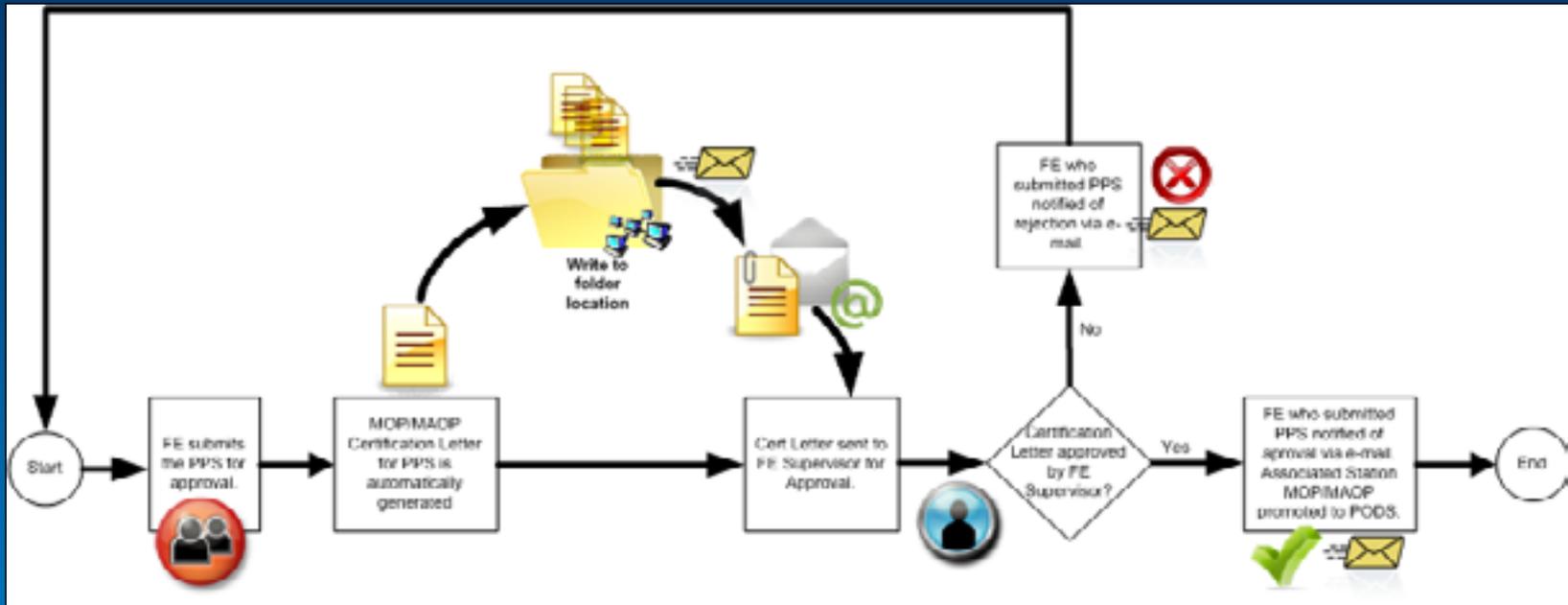
Standard Calculation Template

This section will be values copied from the "Extract Report" from MOPDET.

This section will be filled in by the End User.

This section will calculate MAOP/MOP from the blue and pink seciton.

Approval Process

- Upon submitting a Pipeline Pressure Segment and associated Station MOP/MAOP, an approval request with certification letter is generated and sent to the appropriate Field Engineering Supervisor.

- The Field Engineering Supervisor may approve or reject the request.

- Upon approval, the Station MOP/MAOP record is promoted to PODS.

Benefits of Standardizing and Centralizing MOP/MAOP Data and Processes

Centralizing and standardizing MOP/MAOP data and processes will…

- § Ensure one location for MOP/MAOP data.
- § Reduce the time required for stakeholders to find MOP/MAOP data.
- § Enhance CPL's ability to respond to information requests.
- § Augment the enterprise view of CPL's assets and their operating capabilities.
- § Create a more efficient MOP/MAOP reporting and retrieval process.
- § Expose MOP/MAOP and verified fundamental source data to other applications that can render the data on maps (e.g. GIS).

Keys to Project Success

Business Partnership
- Strong partnership between business groups, Data Integrity & GIS team and IT

Stakeholder Engagement
- Constant stakeholder engagement and change management with effective and timely communication

Leverage Technology
- Usage of existing technology framework and data repository

Establish Standards
- Establishment of enterprise calculation best practice and business process prior to IT implementation.

Pilot
- Pilot with single Field Engineering asset team to validate business processes and resource requirements

Questions