

UNIVERSITY LANDS

3D web interface for
visualizing complex
Draft
subsurface well/lease
relationships

ESRI Energy Resources
GIS Conference

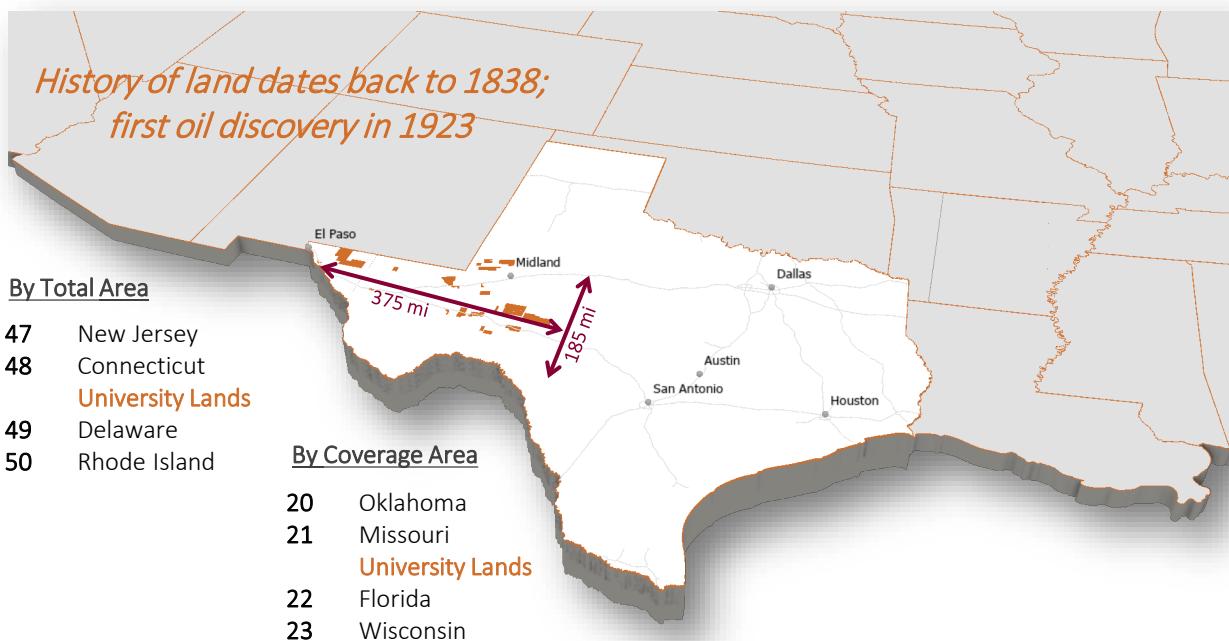
4-5 May 2022



The PUF & University Lands Organization

University Lands (UL) manages the surface and mineral interests of 2.1 million acres of land across nineteen counties in West Texas for the benefit of the Permanent University Fund (PUF).

The PUF is the largest public university endowment in the U.S. and benefits more than 20 educational and health institutions across both The University of Texas System and Texas A&M University System.



24,400
Wells drilled
to-date

9,800
Wells currently
producing

250+
Operators

79,000
Acres of renewable
energy leases

22,000
Miles of pipeline 7
powerline easements

SURFACE LEASES

- Pipelines and power lines
- Grazing and ranching
- Renewables – wind and solar
- Groundwater sales
- Environmental programs

Primary revenue driver is mineral royalty revenue.

Project Background - Drivers

Horizontal Drilling

- Wells across multiple leases
- Leases severed by depth
- Complex unit agreements

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WELL SEARCH PRODUCTION SEARCH **LEASE SEARCH** PURCHASER LOOK UP GIS DATA SITES & INFO FORMS, POLICIES & PROCEDURES

Back to Lease Search

University Lands Lease Detail: 111674

Lessee:	
Agreement Issued:	9/22/2010
Agreement Status:	Producing (9/3/2013)
Primary Term:	3 Years

Map Current Parcels (1) Past Parcels (1) Documents (1)

View Wells

Visualization Value

Land Admin Home Wells Land

API or Lease # Search

Jeff Kenney
Tuesday, May 3, 2022

Pooled Unit: 2683 - UNIVERSITY 29 SAWGRASS POOLED UNIT

Detail

- Tracts **4**
- Wells **2**
- Production **111**
- Status **1**
- Operators **1/2**
- Flags
- Documents **2**
- Notes **1**

Number: 2683
Name: UNIVERSITY 29 SAWGRASS POOLED UNIT
Type: POOLED UNIT (P)
Operator:
Status: Active (8/1/2012) 9 Years 9 Months 2 Days
Formation: Surface to 100' below the top of the Upper Clearfork
Contract Interval: From Surface to 7740 Feet
Acreage: 1046.687
Product: Both
Well Operators:

Appears to be 4 active wells participating in Pooled Unit

Visualization Value

Land Admin  Home  Wells  Land

API or Lease #  Search  Jeff Kenney
Tuesday, May 3, 2022

Pooled Unit: 2683 - UNIVERSITY 29 SAWGRASS POOLED UNIT

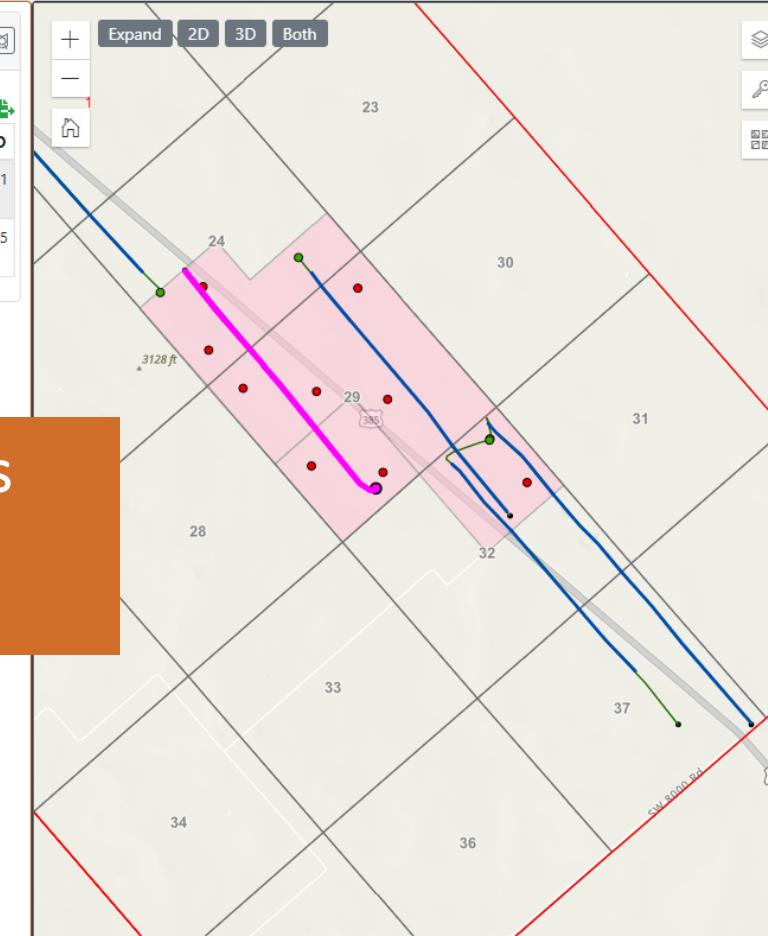
Detail
Tracts 4
Wells 2
Production 111
Status 1
Operators 1/2
Flags 1
Documents 2
Notes 1

Producing (2)

API	Tract(s)	Status	Operator	RRC	RRC Lease Name	TVD
4200344574	1,2,3	Producing (10/31/2012)	(0000950523)	43529-8-O	UNIVERSITY "29" SAWGRASS #5H	7161
4200344926	1,3,4	Producing (2/7/2013)	(0000950523)	43529-8-O	UNIVERSITY 29 SAWGRASS #2H	7155

Unit agreement records indicate only 2 wells

Expand 2D 3D Both



3128 ft

385

385

3128 ft

Esri, NASA, NGA, USGS, FEMA | Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, SafeGraph... Powered by Esri

Visualization Value

Land Admin Home Wells Land

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Detail

Tracts 4

Wells 2 **4**

Production 111

Status 1

Operators 1/2

Flags 1

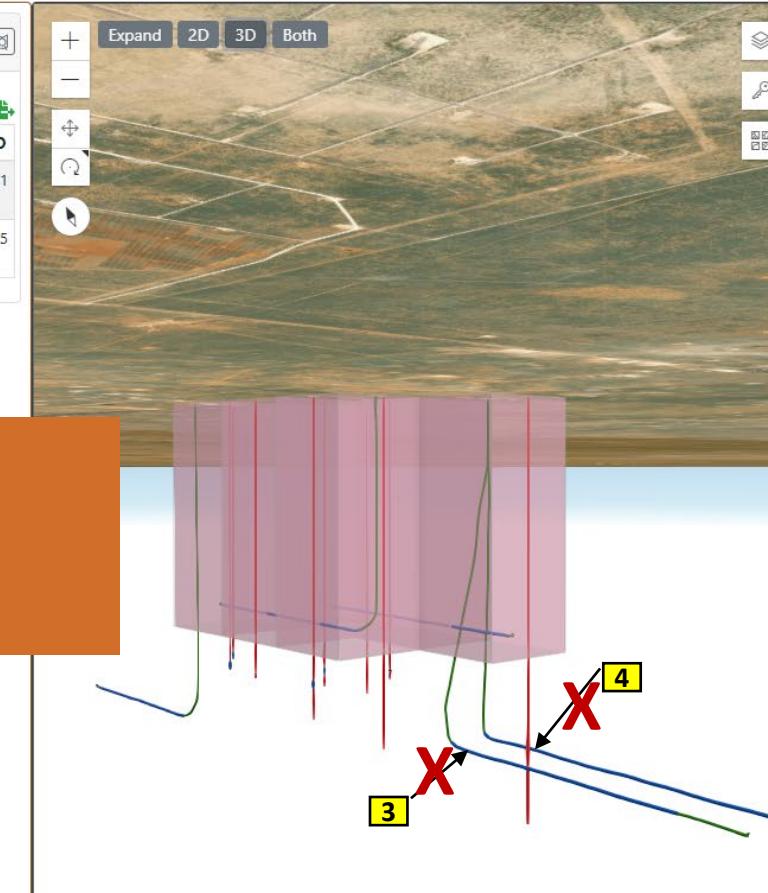
Documents 2

Notes 1

Producing (2)

API	Tract(s)	Status	Operator	RRC	RRC Lease Name	TVD
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Additional 2 wells clearly below the severed Unit depth



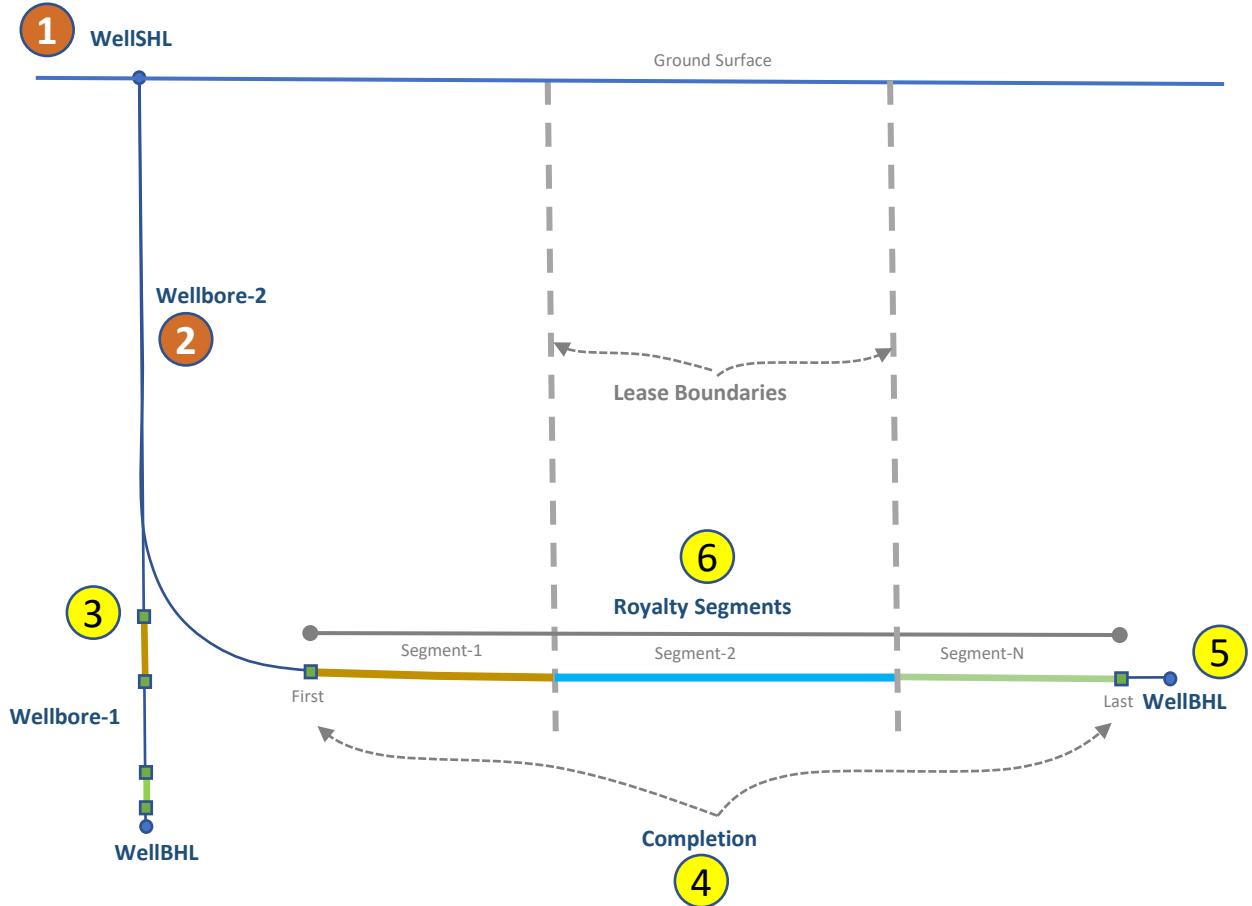
Maxar | Source: USGS, NGA, NASA, CGIAR, GEBCO, N Robinson, NCEAS, NLS, OS, NMA, Geodatas... Powered by Esri

Well Features

- 1 **WellSHL (pt)** – Surface Hole Location
- 2 **Wellbore (line)** – drilled well path

Derivative Layers

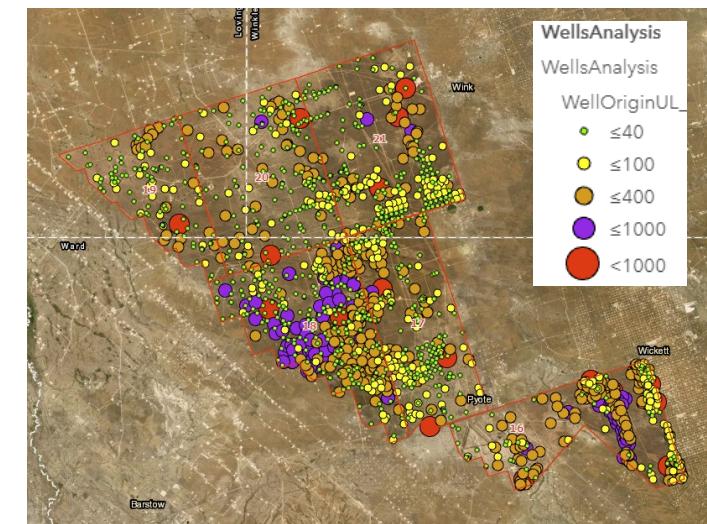
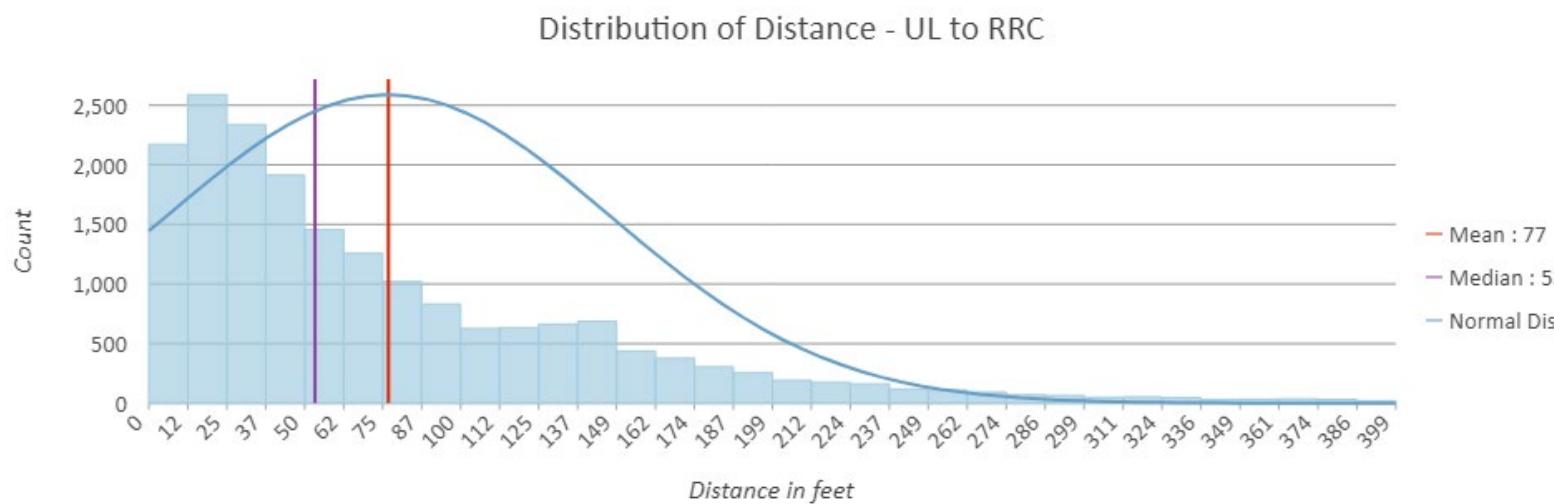
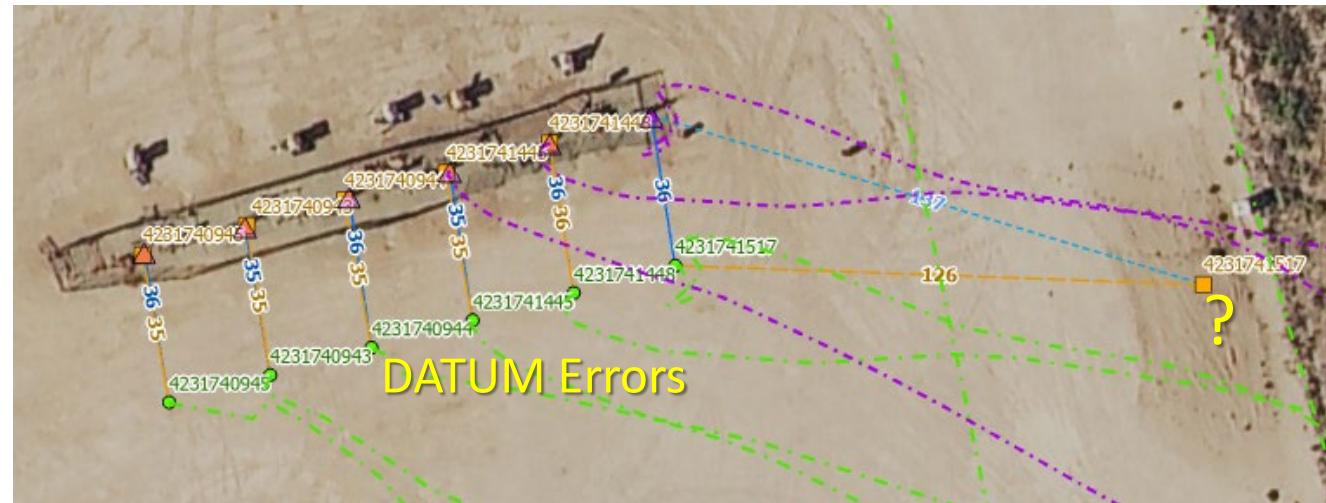
- 3 **Perfs** (pts) first & last takes
- 4 **Completion** (line) production interval
- 5 **WellBHL** (pt) End point of Wellbore
- 6 **Royalty Segment** (line) Completions split by Oil & Gas Lease boundaries. Used to calculate % wellbore allocation within each lease.



Challenges – Data Quality

Location Accuracy

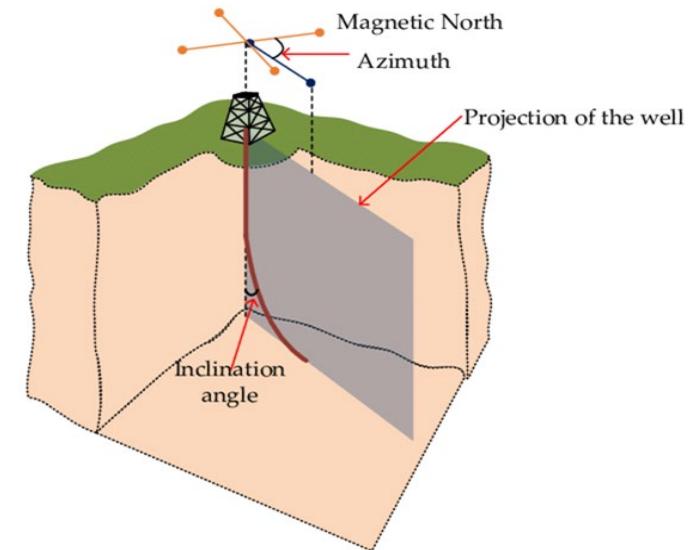
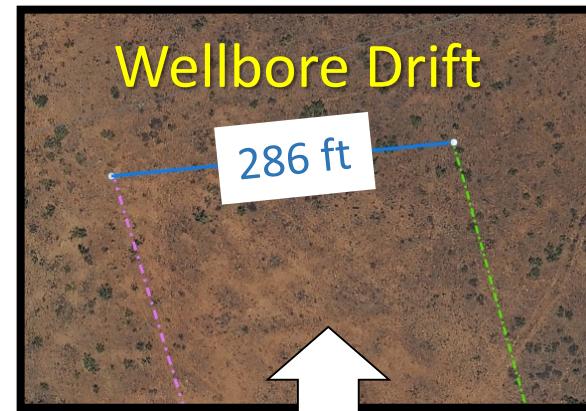
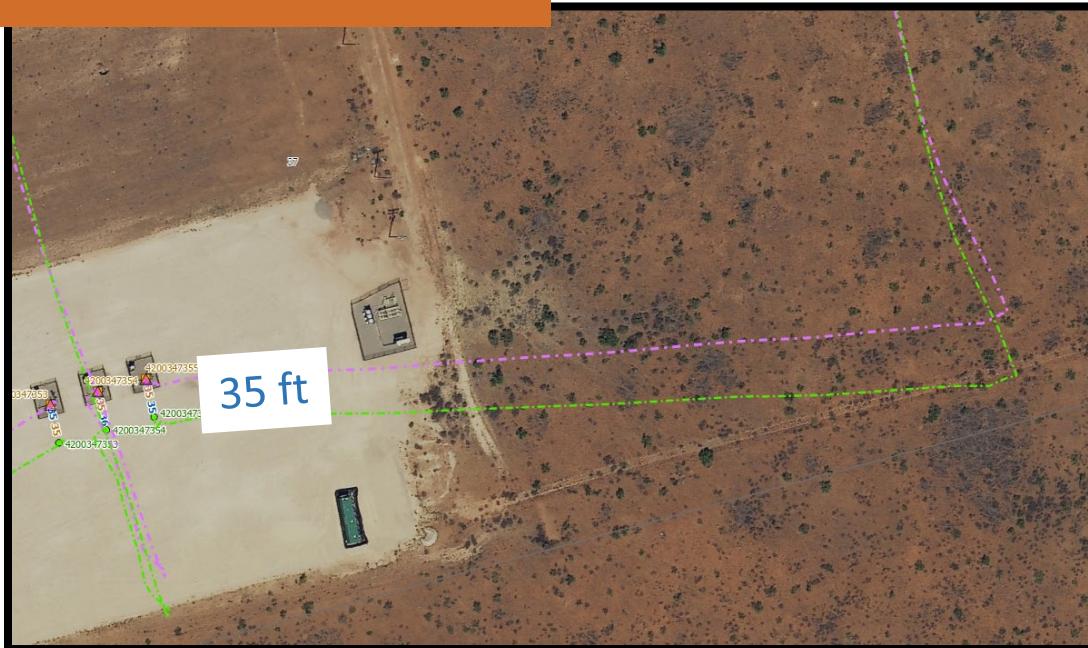
A variety of Surface Hole Location (SHL) discrepancies between different well data sources.



Challenges – Data Quality

Wellbore Build Process

Inconsistent in-house methods being used for building 3D wellbore features.



Orientation (Azimuth & Inclination)

Magnetic north
Geographic north (latitude and longitude)
Grid north [projected coordinate system]

Measurement Methods

Tangential
Balanced Tangential
Average Angle
Curvature Radius
Minimum Curvature

Challenges – Data Quality

Attributes

Missing, inaccurate, inconsistent...

Validation Exceptions

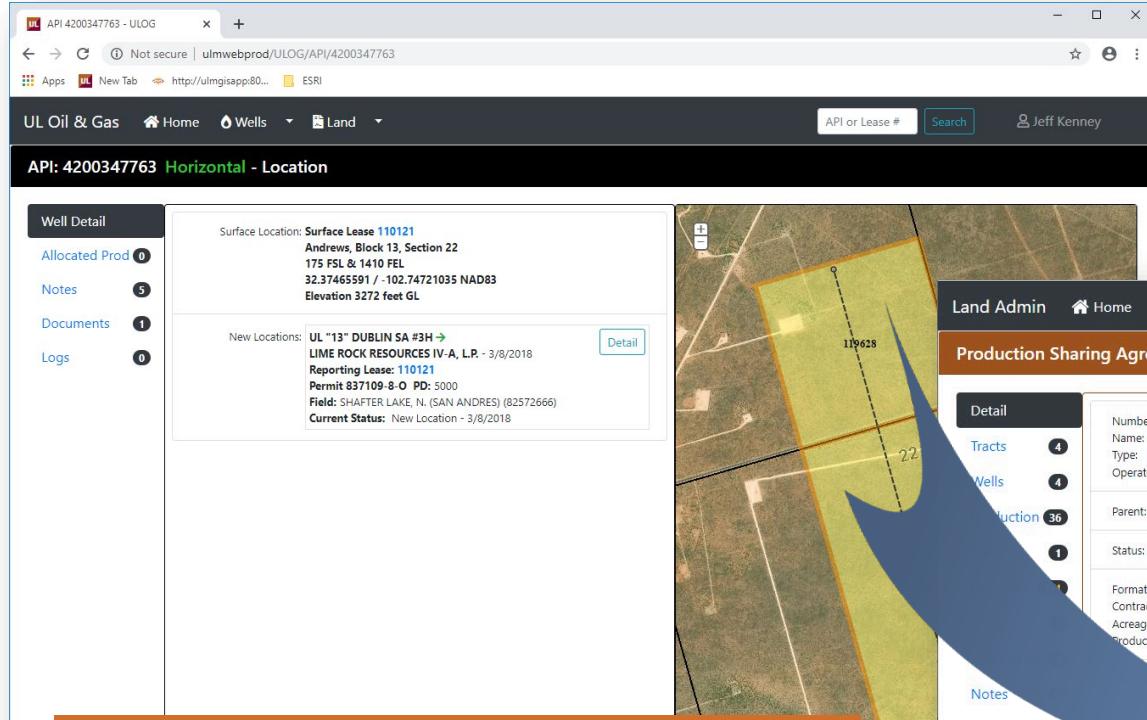
- Ground elevation missing
- Ground Elevation out of tolerance with DEM
- SHL Lat/Lon out of tolerance w/wellbore start node
- SHL out of tolerance with other sources
- Total Measure Depth (TD) missing
- Total Vertical Depth (TVD) missing
- TVD > TD
- Perf(s) missing
- Last Take < First Take
- Last Take > Total Depth
- Hole Direction missing
- Hole Direction inconsistent with Wellbore feature
- Etc...

Responses - Data Quality

1. Master Data Management
2. Spatial Validations (FME)

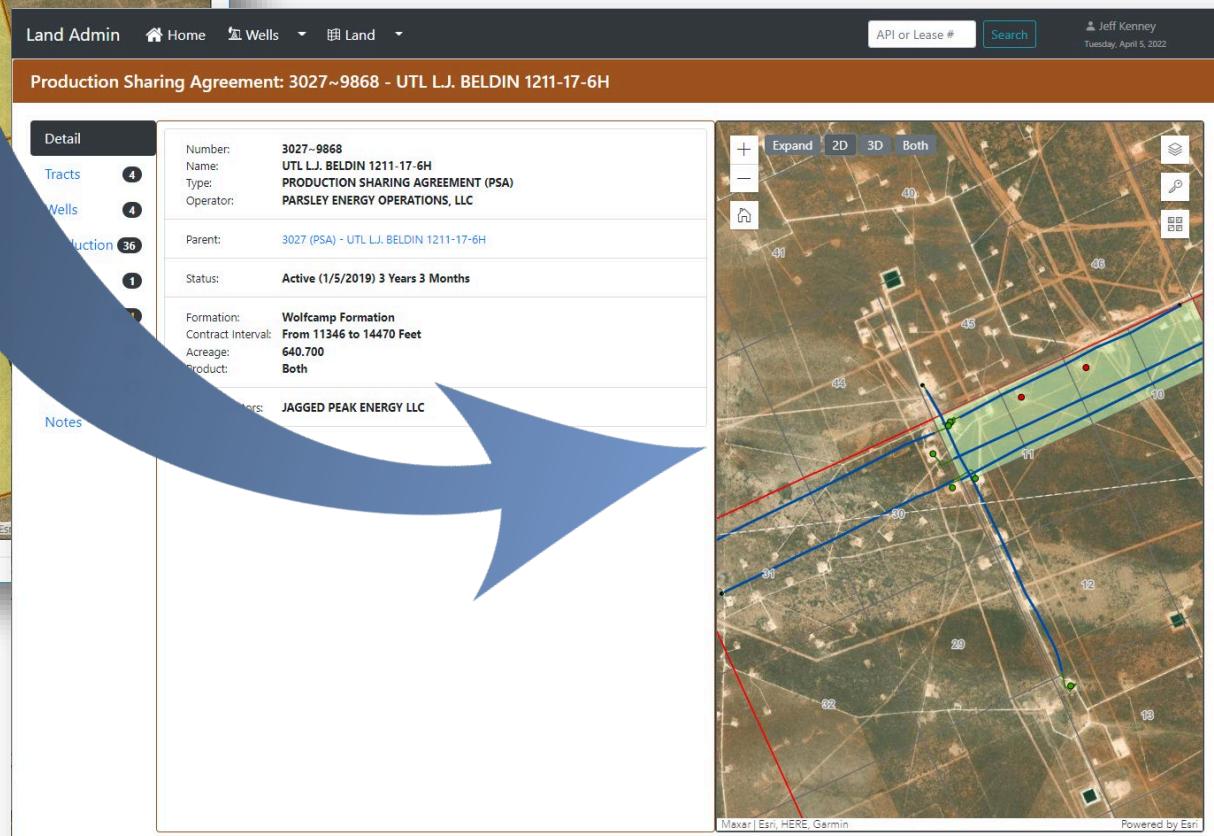


Challenges - Development

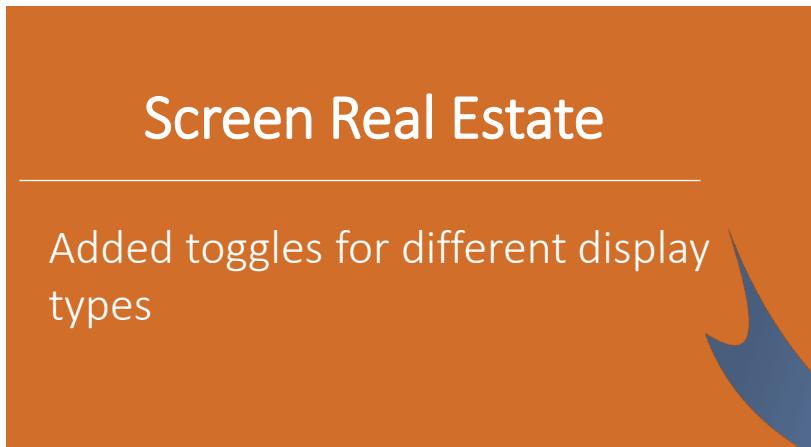


- Limited screen real estate
- How much functionality?
- Mix of 2D & 3D data

Replace embedded maps
in existing Well & Lease
search applications



Responses – Development



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Back to Lease Search

University Lands Lease Detail: 111453

Lessee:	JAGGED PEAK ENERGY ET AL
Agreement Issued:	9/22/2010
Agreement Status:	Producing (12/22/2015)
Primary Term:	3 Years

Map Current Parcels (1) Documents (1)

Powered by Esri

View Wells

Responses – Development



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WELL SEARCH

PRODUCTION SEARCH

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2D 3D Both

Maxar | Source: USGS, NGA, NASA, CGIAR, GEBCO, N Robinson, NCEAS, NLS, OS, NMA, Geodatasy, relsen and the GIS User Community | Esri, HERE, G... Powered by Esri

View Wells

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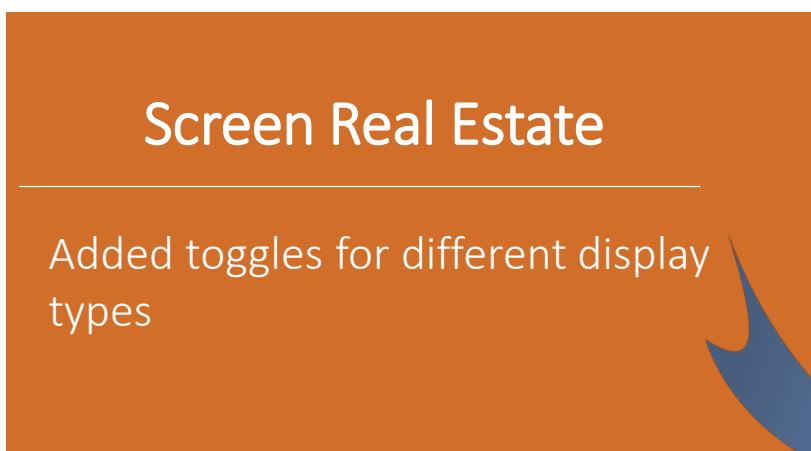
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View Wells

Responses – Development



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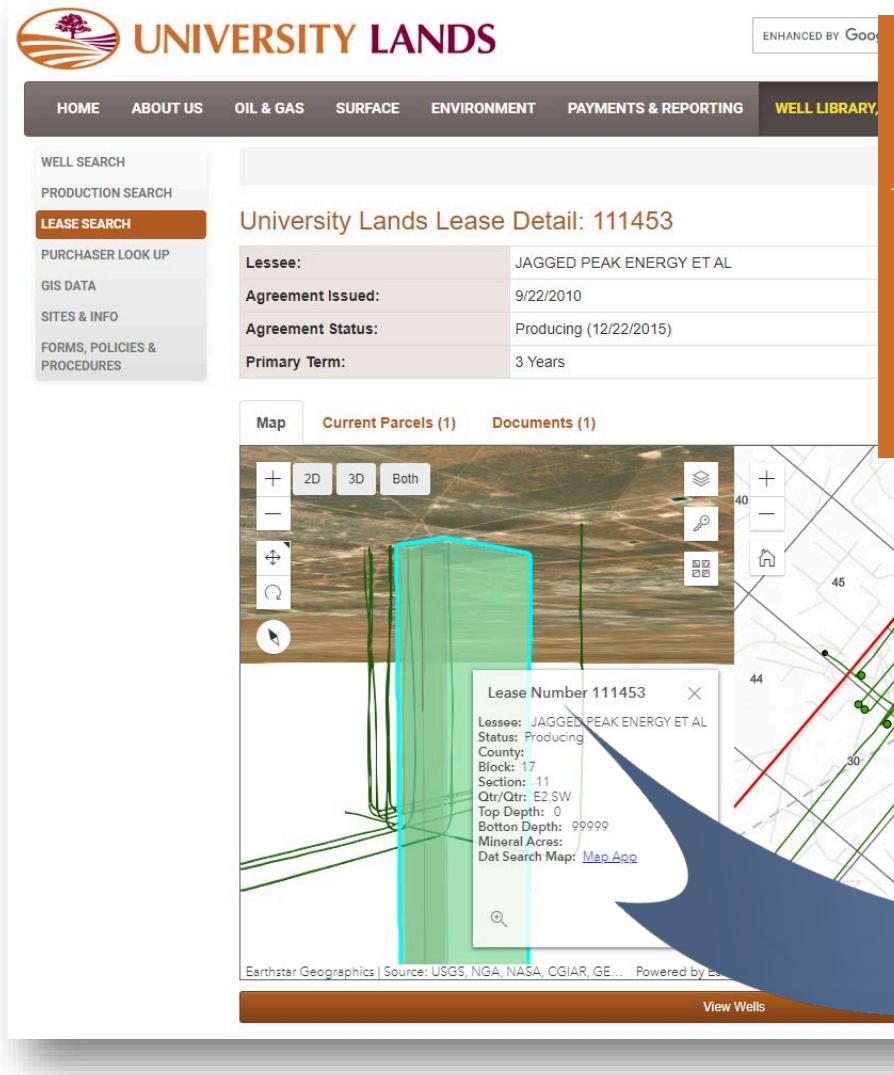
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Map Current Parcels (1) Documents (1)

Earthstar Geographics | Source: USGS, NGA, NASA, CGIAR, GE... Powered by Esri, Bureau of Land Management, Texas Parks & Wildlife, Esri, HERE... Powered by Esri

View Wells

Responses – Development



University Lands

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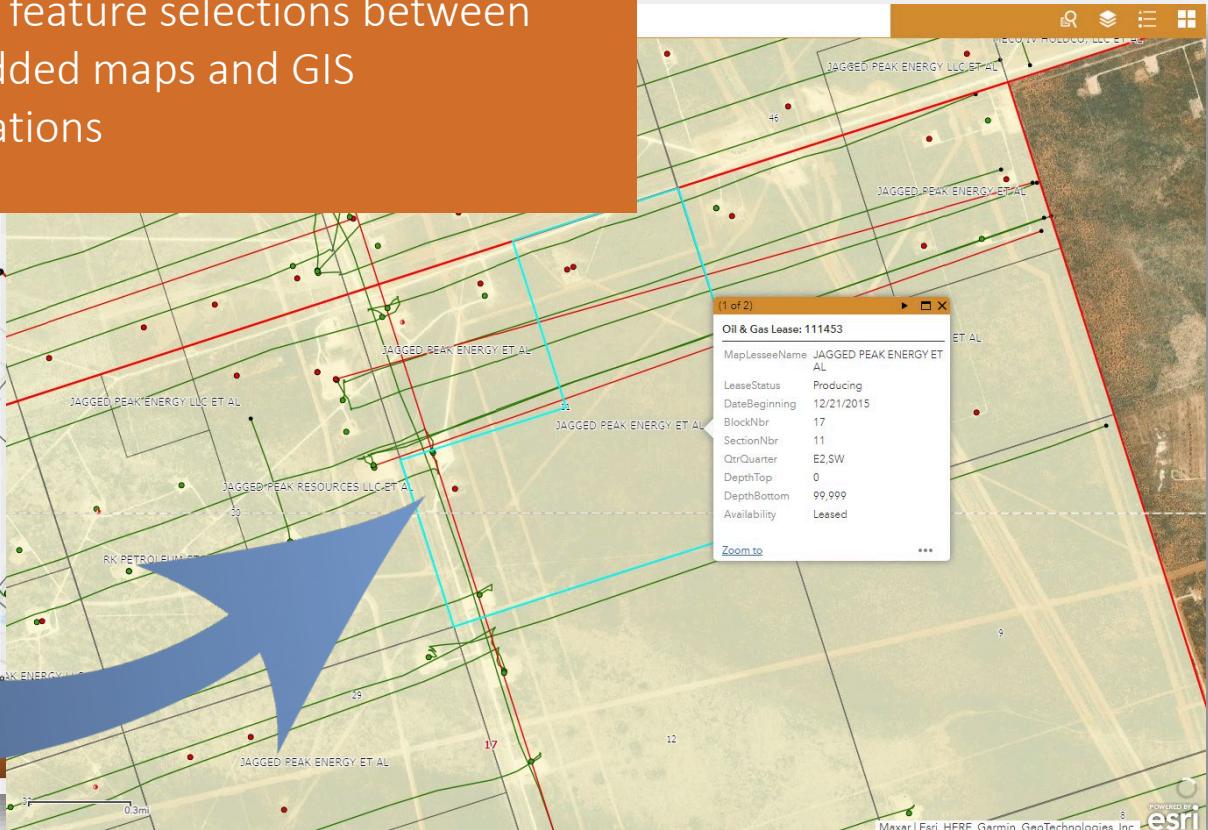
Lease Number 111453

Lessee: JAGGED PEAK ENERGY ET AL
Status: Producing
County:
Block: 17
Section: 11
Qtr/Qtr: E2.SW
Top Depth: 0
Bottom Depth: 99999
Mineral Acres:
Dat Search Map: [Map App](#)

View Wells

Functionality Hand-off

Passes feature selections between embedded maps and GIS applications



Responses – Development

Mix of 2D & 3D data

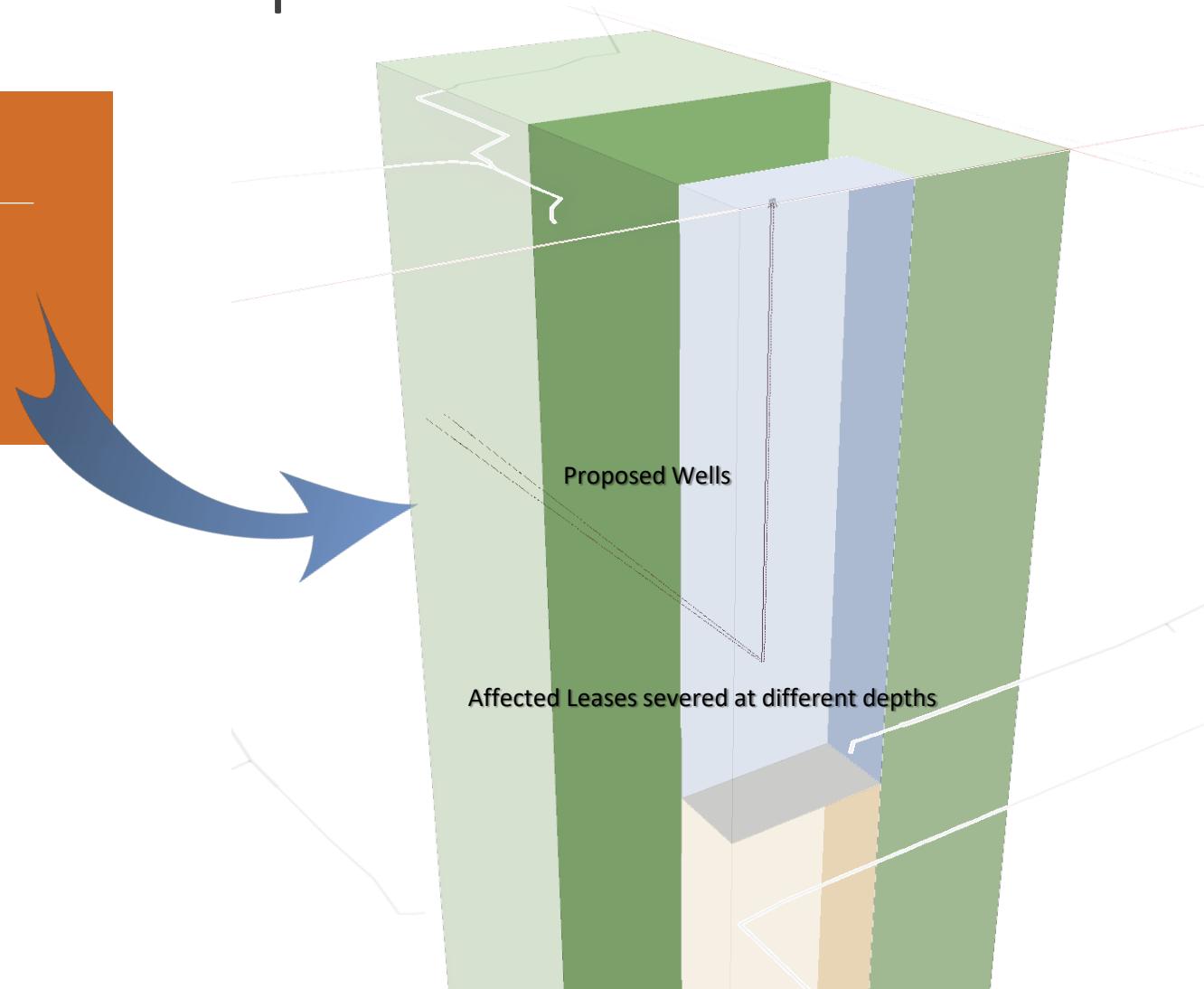
Needed to migrate all Well & Lease related features to accommodate 3D analysis

Available Leases

Not stored in our Land Admin

Permitted Wells

3D lines vs 2D draped on surface



Key Take-Aways

1. Under estimated the data engineering effort
 - FME critical component
2. Pleasantly surprised with ArcGIS Enterprise
 - 3D web visualization performance out of the box
3. 3D visualization provides business value
 - if for no other reason than improved data quality

Going Forward

Validation

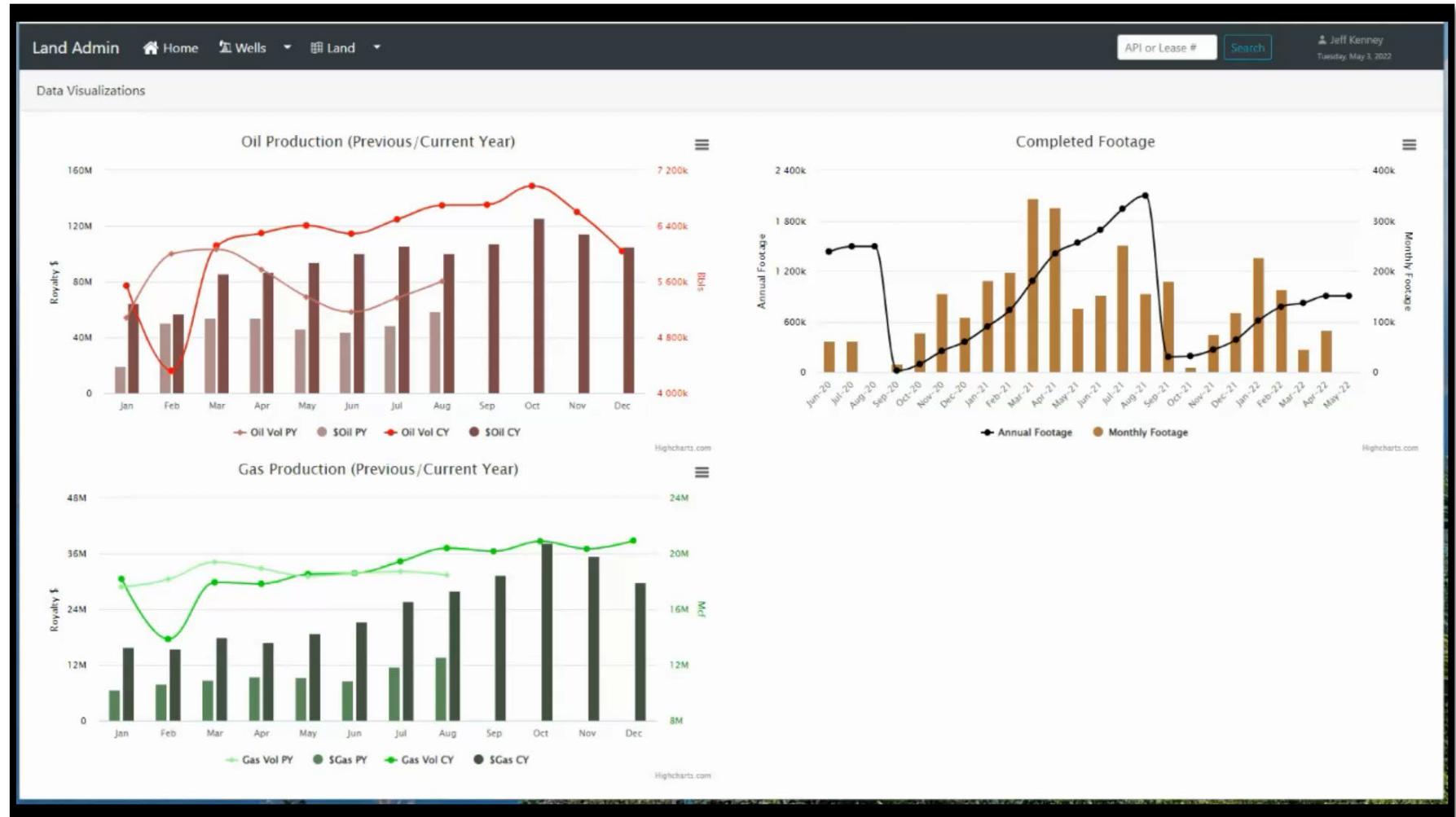
Expand on automated spatial validation

Visualization

Incorporate data quality factors into display

Cleanup

Embedded tools for in-place corrections



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