

Nord Stream 2 – A story of gas pipelines and GIS technology from the start

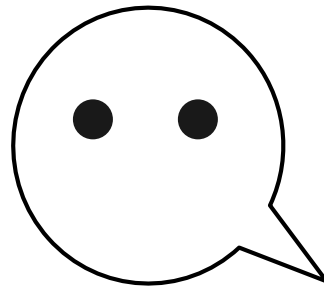
30-10-2018

Cécile Noverraz – GIS Analyst



Presentation - Outline

- > Project Overview
- > Initial GIS Project Setup
- > Project Data
- > GIS Portal:
 - > Case study – Engineering Data Flow
 - > Geoevent Server
- > Future Applications
- > Conclusions





Project Overview



The Pipeline Will Run Through the Baltic Sea – Along the Proven Nord Stream Route.

- > A double 48” pipeline from Russia to Germany
- > Approximately **1,200** km long
- > Going through 5 countries EEZ and TW
- > Pipelay began July 2018
- > Route optimised for minimum impact on the environment



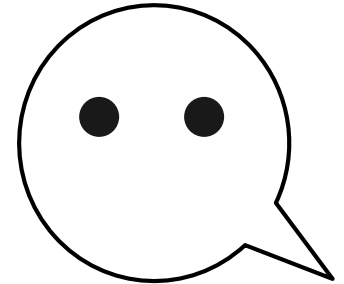
Introduction - In-House Project GIS Setup

> Advantages:

- GIS integrated from the start of the project.
- Possibility to specify data format from and to contractors (coordinate integrity).
- Direct contact with different departments and contractors.
- Ability to choose system setup and adapt it as we go.

> Disadvantages:

- IT overhead
- Licensing costs
- Experience (small department)





Introduction - Choice of ESRI AGS and Portal deployment

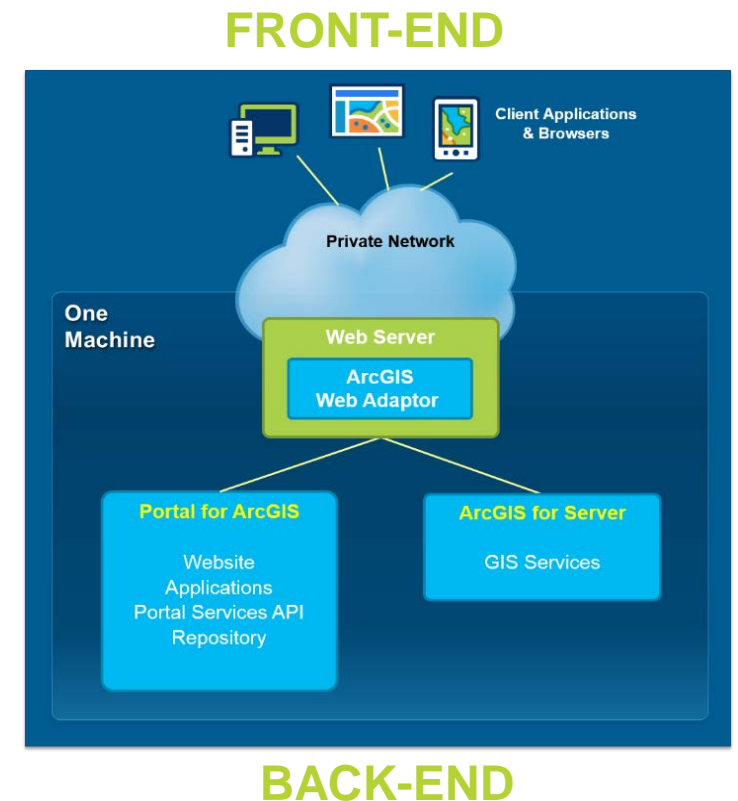
Out the box capabilities:

1. On-site deployment and management
2. Create, develop, manage and share GIS web applications
3. Company wide access to GIS content
4. Future proof (long-term support)

Value added capabilities:

1. Interactive and engaging presentations (Story maps)
2. Geoevent Server and external data sources (Vessel Tracking AIS, AGOL)
3. Digital video integration - VisualGIS Server
4. Pipeline Specific Capabilities – ArcGIS Pipeline Referencing extension

Initial – Single Machine Configuration



Project Data - Digital Data Challenges

Common Project Challenges:

- > Significant quantity of data (Geodetic Integrity)
- > Number of different technical and non-technical departments and users
- > Frequent updates to data revisions & data QC
- > Non-GIS educated user base

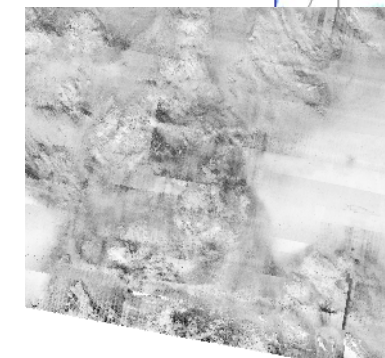
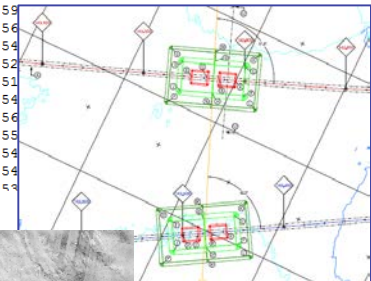
Exceptional Project Challenges:

- > Geographically extensive project (5 Countries & 3 UTM zones)
- > Onshore & Offshore
- > Schedule-driven project
- > Scrutiny of project and data

- > 2 person GIS department

Survey target ID	KP, line A or B [km]	Water depth [m]	Offset to line [m]
R-R06-7108	34.3 (B)	-72.0	-0.7
R-R06-7207	55.5 (B)	-69.6	4.0
R-R08-7236	116.4 (B)	-63.8	0.7
R-R10-5230	157.7 (B)	-71.7	-0.6
R-R10-5065	173.2 (A)	-75.5	6.0
R-R11-5232	198.6 (B)	-77.0	7.2
	5 (A)	-74.1	-2.3

1	527108.50	6134676.56	92.62
2	527110.50	6134676.56	92.60
3	527112.50	6134676.56	92.56
4	527114.50	6134676.56	92.57
5	527116.50	6134676.56	92.59
6	527118.50	6134676.56	92.56
7	527120.50	6134676.56	92.54
8	527122.50	6134676.56	92.52
9	527124.50	6134676.56	92.51
10	527126.50	6134676.56	92.54
11	527128.50	6134676.56	92.56
12	527130.50	6134676.56	92.55
13	527132.50	6134676.56	92.54
14	527134.50	6134676.56	92.54
15	527136.50	6134676.56	92.54



Project Data - Sources

Before the project:

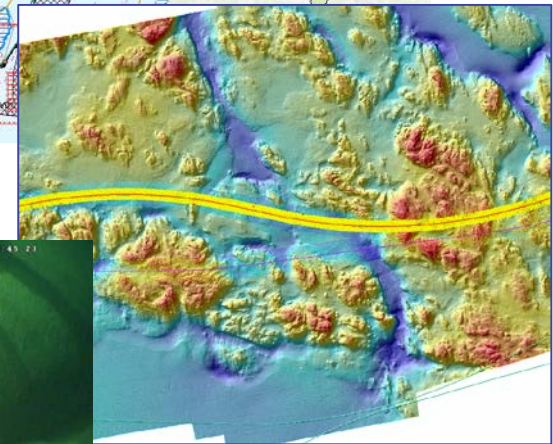
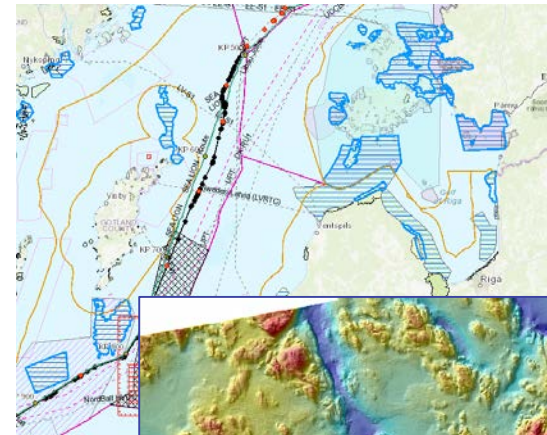
- Existing Pipeline and Cable Data
- Third Party Data (Protected and restricted areas, borders)
- Desk study Data

During the project (>90 TB):

- Design Data (Survey and Engineering)
- Third-party data
- Engineering and Construction data
- As-Built Data
- ...

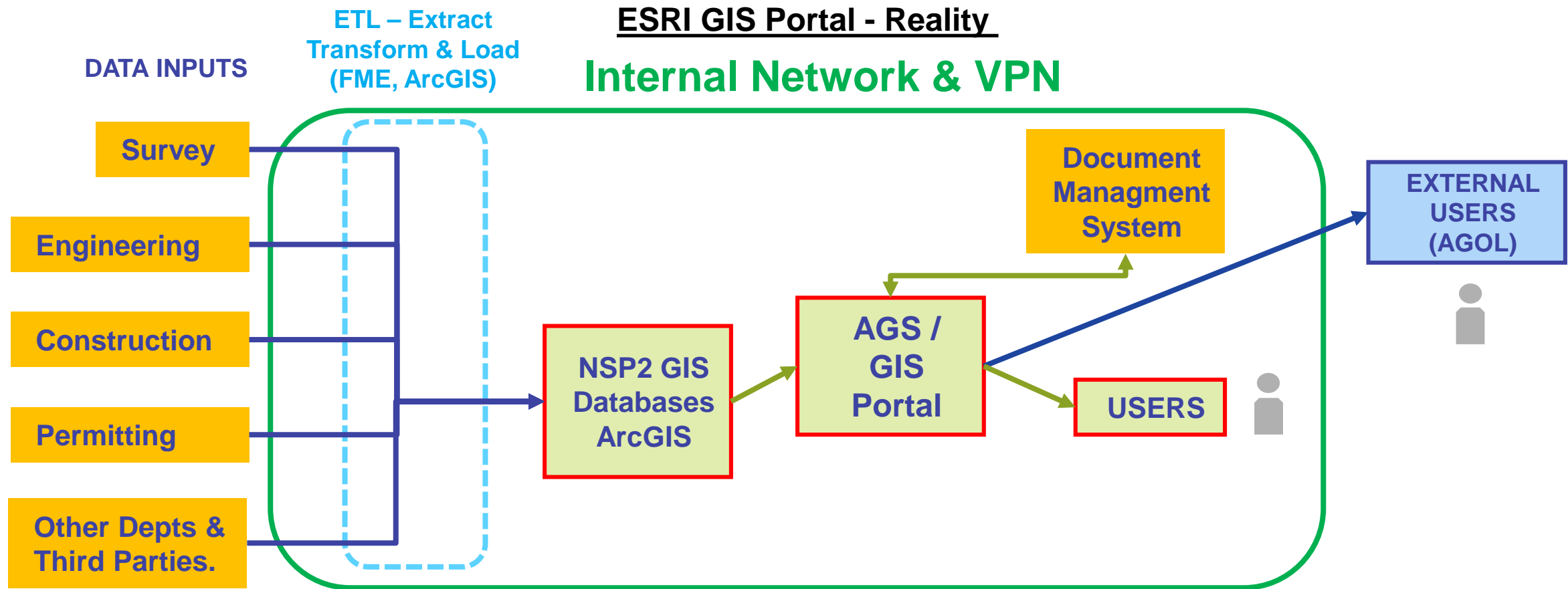
After the project:

- Inspection and Maintenance survey
- ...



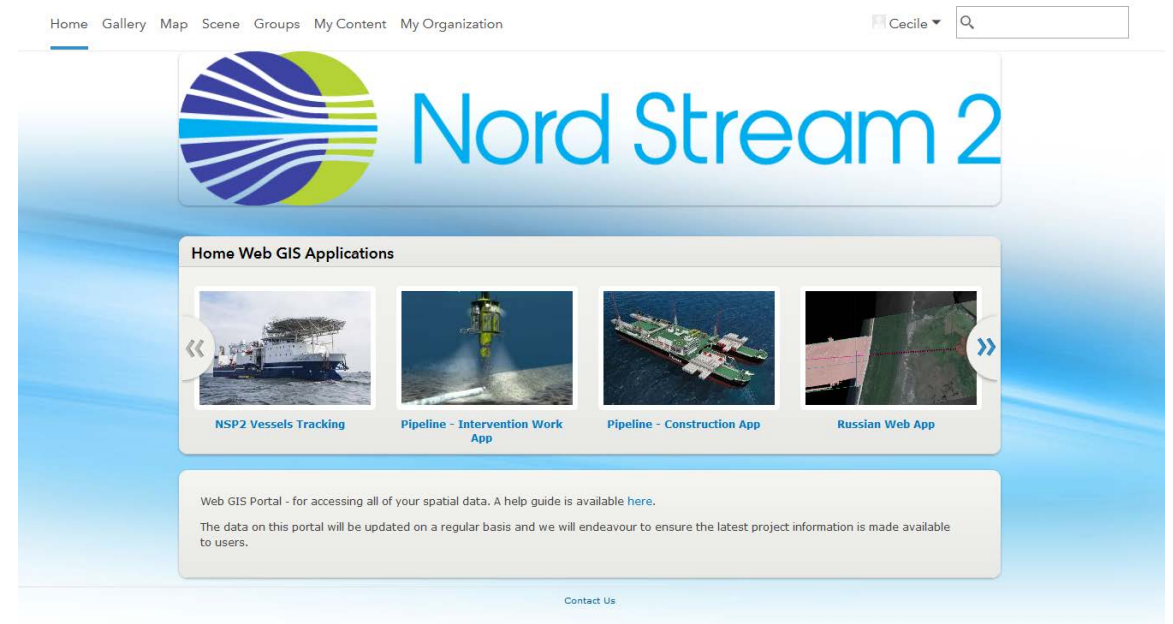


GIS Portal - Initial Setup



GIS Portal - How do we get the data to our users?

- Constantly updating datasets (route, KPs)
- Different data formats
- Few GIS expert users
- No dataset is perfect
- Different departments with different needs



The screenshot shows the Nord Stream 2 Web GIS Portal. At the top, there is a navigation menu with links for Home, Gallery, Map, Scene, Groups, My Content, and My Organization. A user profile for 'Cecile' and a search bar are also visible. The main header features the Nord Stream 2 logo and the title 'Nord Stream 2'. Below this, a section titled 'Home Web GIS Applications' displays four application thumbnails: 'NSP2 Vessels Tracking', 'Pipeline - Intervention Work App', 'Pipeline - Construction App', and 'Russian Web App'. A text box below the thumbnails states: 'Web GIS Portal - for accessing all of your spatial data. A help guide is available [here](#). The data on this portal will be updated on a regular basis and we will endeavour to ensure the latest project information is made available to users.' A 'Contact Us' link is located at the bottom right of the page.



GIS Portal – Department & Project Influence

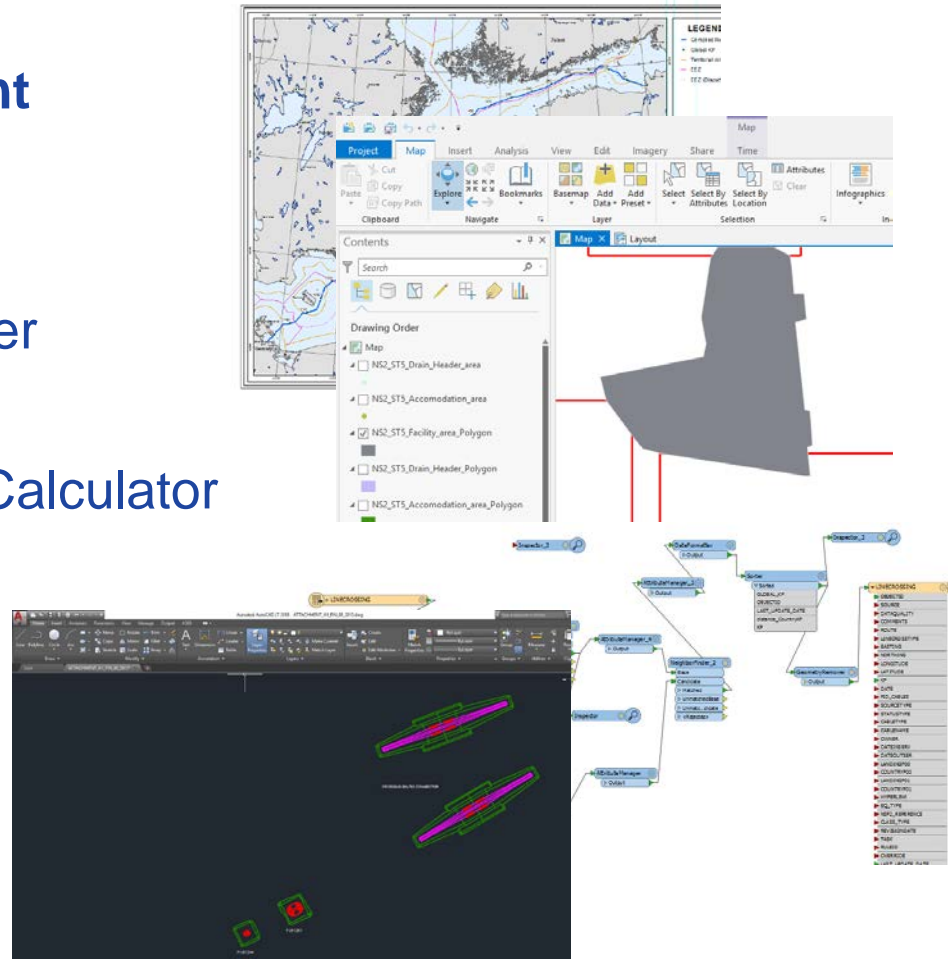




GIS Portal - GIS Capabilities Setup

GIS Department

- ArcMap
- ArcGIS Pro
- Global Mapper
- FME
- Geographic Calculator
- AutoCAD
- etc



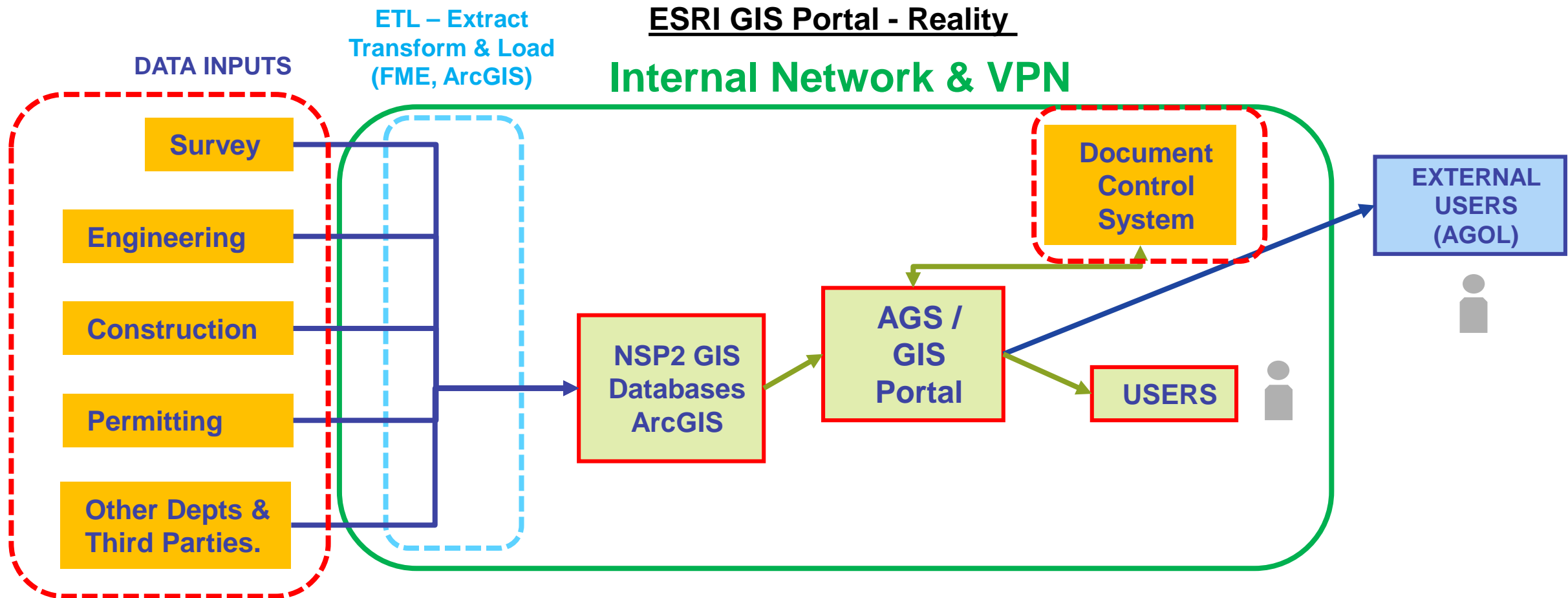
Other Users

- DMS (Easy) & Sharepoint
- GIS Portal





GIS Portal Setup - Document Control System





Document Control System (Easy) repository for project data.

Advantages:

- Data is organised and traceable
- Updates are tracked
- Can be uploaded by contractors

Disadvantages

- ***Non-spatial***
- Compiling can be complex
- Search can be difficult

The screenshot displays the 'Default' form in the Document Control System (Easy) repository. The form includes a search bar at the top left. Below it, the 'Default' section contains the following fields:

- Title: Text input field
- Document Code: Text input field
- Latest Revision: Radio buttons for Yes, No, and Undefined (selected)
- Pipeline: Dropdown menu
- Department: Dropdown menu
- Discipline: Dropdown menu
- Work Location: Dropdown menu
- Document Type: Dropdown menu
- Originator ID: Dropdown menu
- Unifier: Text input field
- Revision No.: Text input field
- Uploaded by: Dropdown menu
- Upload Date: Two date pickers
- Document Owner: Dropdown menu
- Review Manager: Dropdown menu
- Mark-up MDR [DNV-GL]: Dropdown menu
- Status [DNV-GL]: Dropdown menu
- Status Date [DNV-GL]: Two date pickers
- Mark-up MDR [GLIS]: Dropdown menu
- Status [GLIS]: Dropdown menu
- Status Date [GLIS]: Two date pickers
- Mark-up MDR [LOC]: Dropdown menu
- Status [LOC]: Dropdown menu
- Status Date [LOC]: Two date pickers



Case study – Engineering Data Flow (DMS)



Morning Cecile, I need to find the name of the closest Pre-lay berm next to Cable crossing UESF2 Line A and what are the lay restrictions?

Case study – Engineering Data Flow (DMS)

Route

PROFILE ROUTE ALIGNMENT DATA									
LINE NO.	LINE NAME	LINE TYPE	LINE STATUS	LINE COLOR	LINE WIDTH	LINE HEIGHT	LINE WEIGHT	LINE ZONE	LINE LAYER
1
2
3
4
5
6
7
8
9
10

Lay Restriction

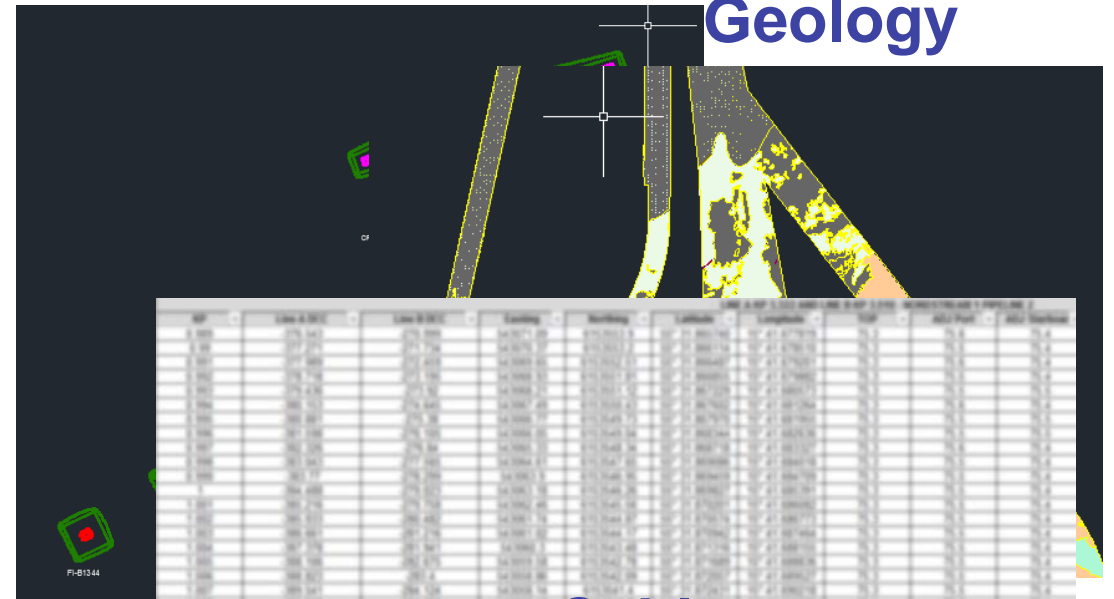
SELECTED LAY RESTRICTIONS - Project Route No.07 - Line 6									
FROM SP	EAUT	NOBTR	To SP	EAUT	NOBTR	Distance from C.L.			TOTAL
NO	NO	NO	NO	NO	NO	Left (m)	Right (m)	NO	Covered (mm)
100	100	...	...	2.0	2.0	0.0	
100	100	...	...	7.0	0.0	7.0	
100	100	...	...	2.0	7.0	10.0	
100	100	...	...	0.0	7.0	10.0	
100	100	...	...	2.0	2.0	0.0	
100	100	...	...	7.0	0.0	7.0	
100	100	...	...	2.0	0.0	0.0	
100	100	...	...	7.0	0.0	0.0	
100	100	...	...	2.0	2.0	0.0	
100	100	...	...	7.0	0.0	0.0	
100	100	...	...	2.0	2.0	0.0	
100	100	...	...	7.0	0.0	0.0	

Target Catalogue

LINE NO.	LINE NAME	LINE TYPE	LINE STATUS	LINE COLOR	LINE WIDTH	LINE HEIGHT	LINE WEIGHT	LINE ZONE	LINE LAYER
1
2
3
4
5
6
7
8
9
10

Berms

Geology

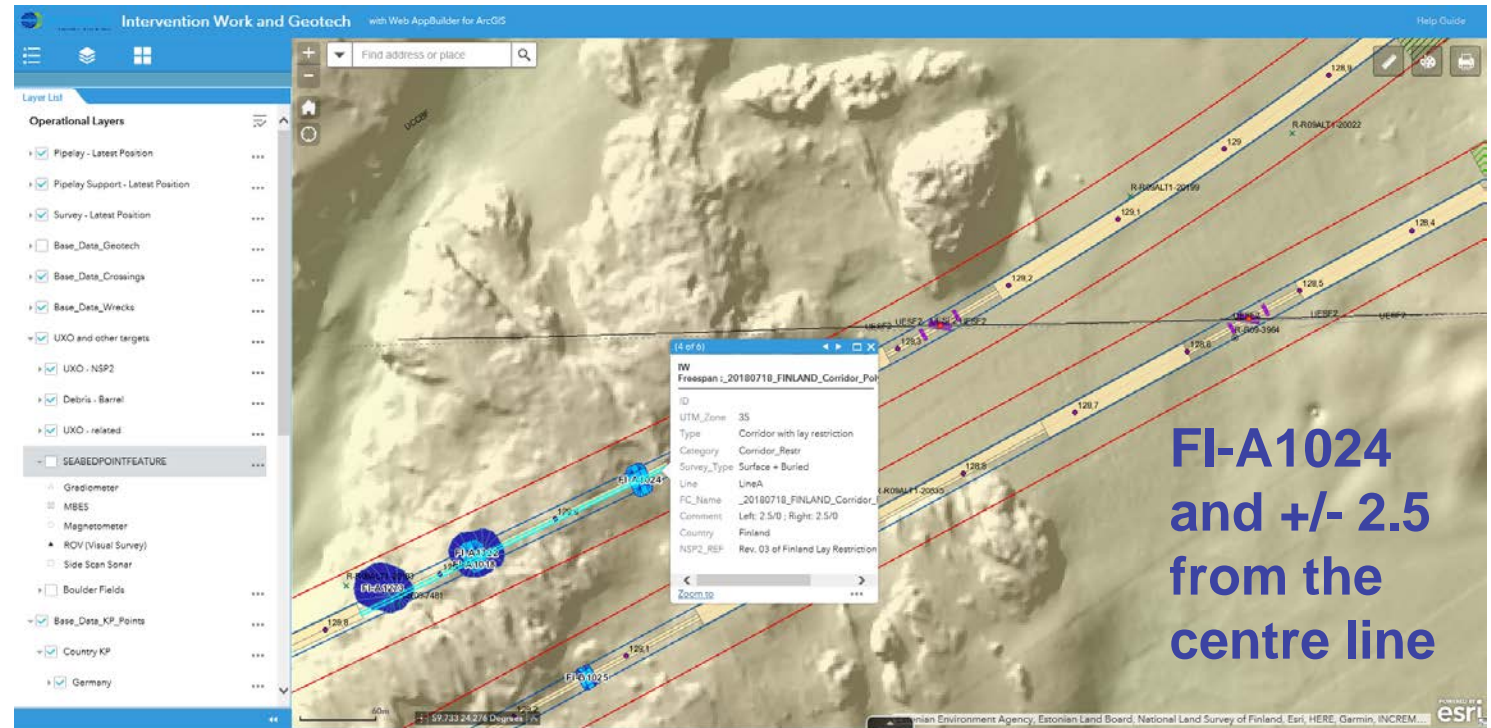


Cables

LINE NO.	LINE NAME	LINE TYPE	LINE STATUS	LINE COLOR	LINE WIDTH	LINE HEIGHT	LINE WEIGHT	LINE ZONE	LINE LAYER
1
2
3
4
5
6
7
8
9
10



Case study: Engineering Data Flow (GIS Portal)





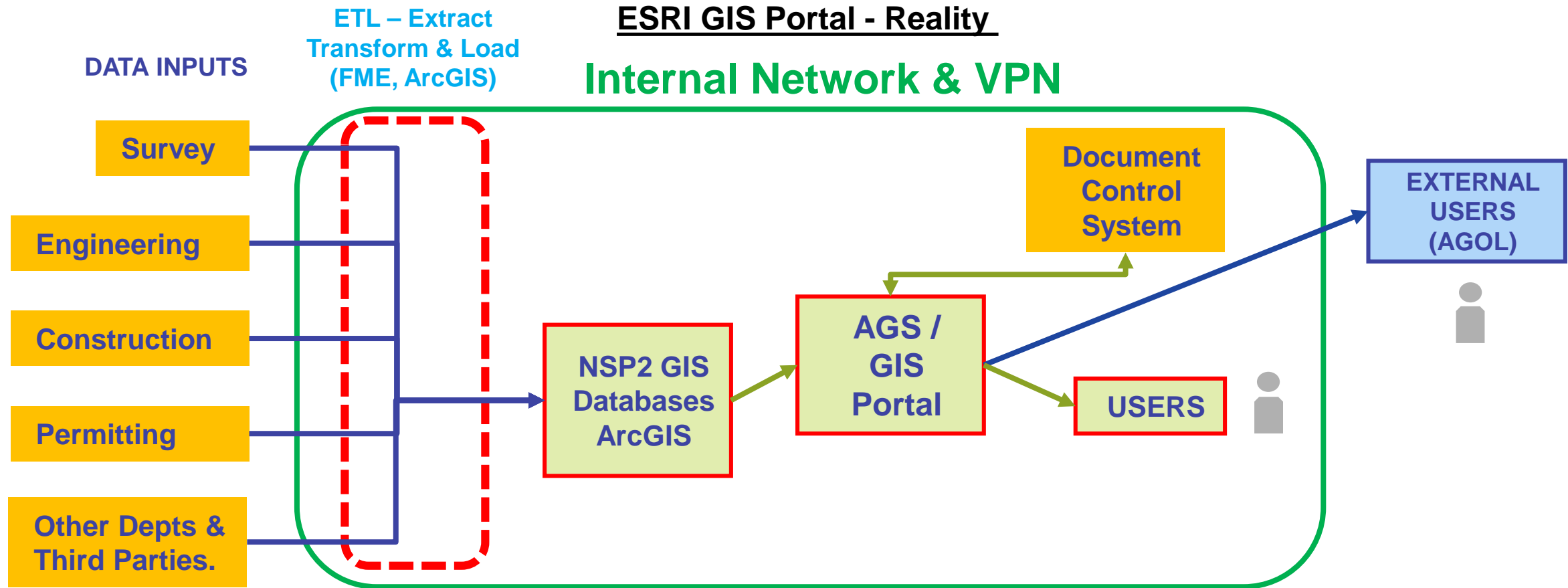
Case study: Engineering Data Flow (GIS Portal)

Data treatment and transfer

- Data selection
- Set up processes for repeated data updates
- Set up priorities
- Maintain communication with different departments
- Introduce the users to the Portal
- Enable users to answer their own questions



Case study: Engineering Data Flow (GIS Portal) - ETL



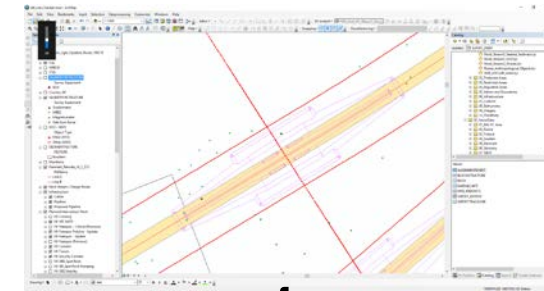


Case study: Engineering Data Flow (GIS Portal) Data processing and Aggregation

Unstructured Data
(xls, pdf, CAD)

ETL

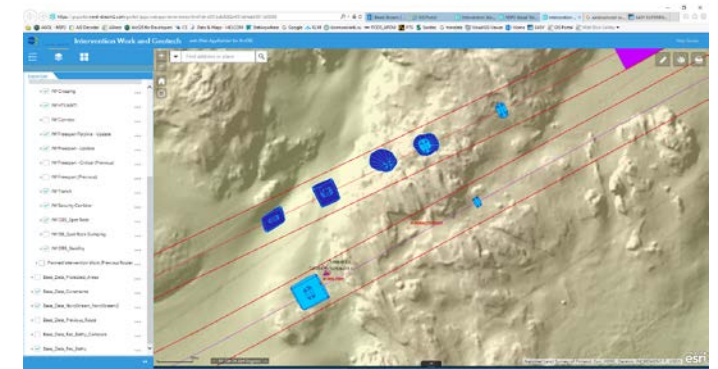
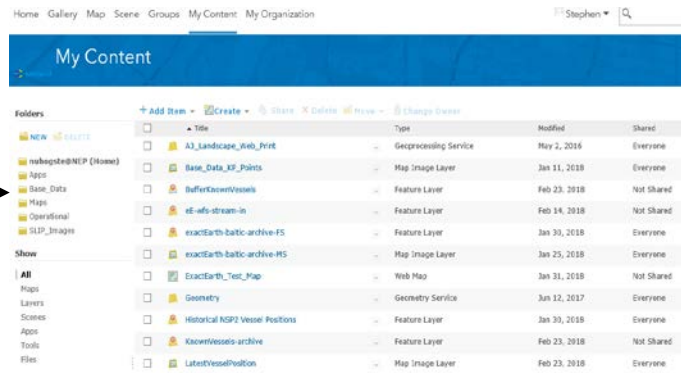
QC



Publish with AGS to Portal

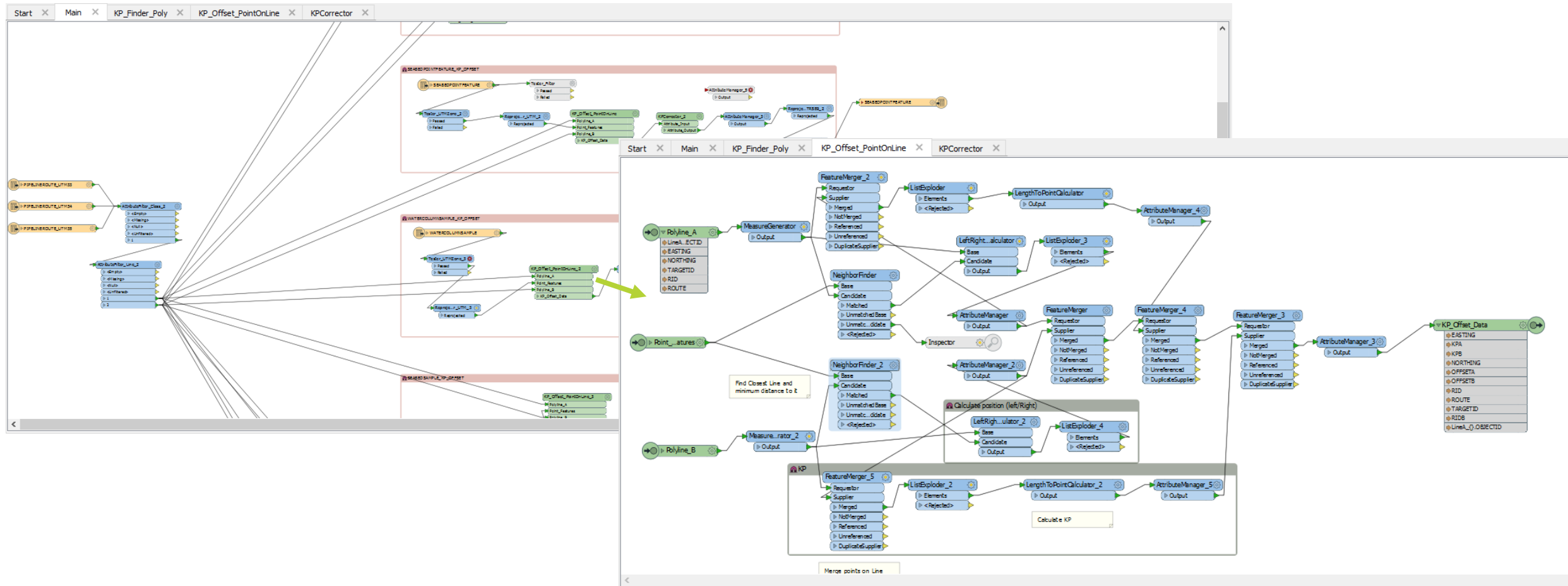
Portal Layers

GIS Portal





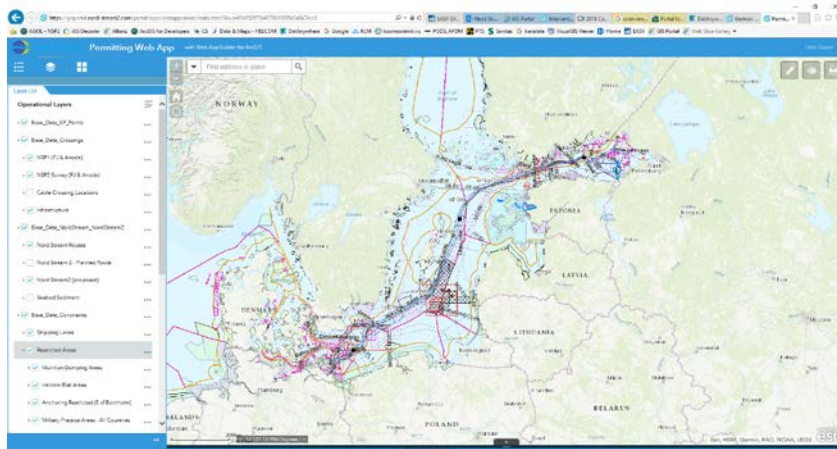
Case study: Engineering Data Flow (GIS Portal) GIS Conversion: FME jobs





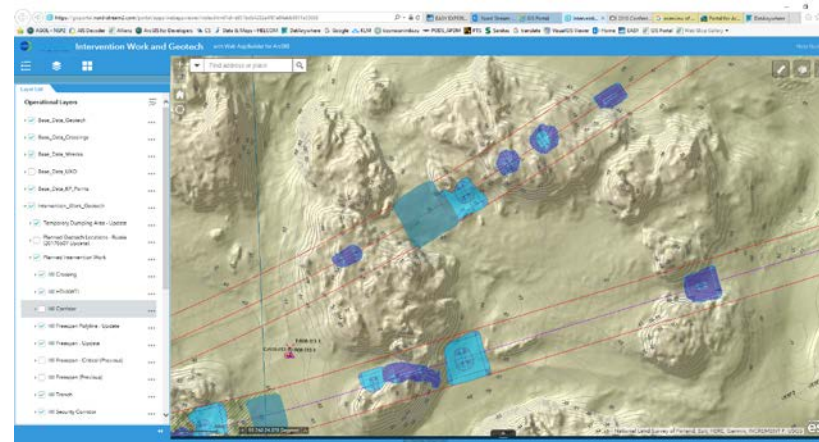
Case study: Engineering Data Flow (GIS Portal) Themed applications

Permitting



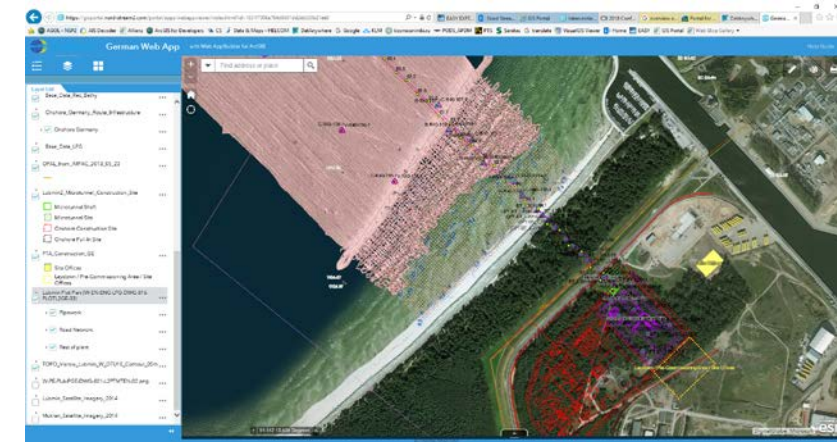
- Protected Areas
- Restricted Areas
- Latest Route & Corridors
- Country Overviews

Engineering



- Geotechnical Locations
- Planned Rock Placement
- Latest Route & Corridors
- Bathymetry

Landfall

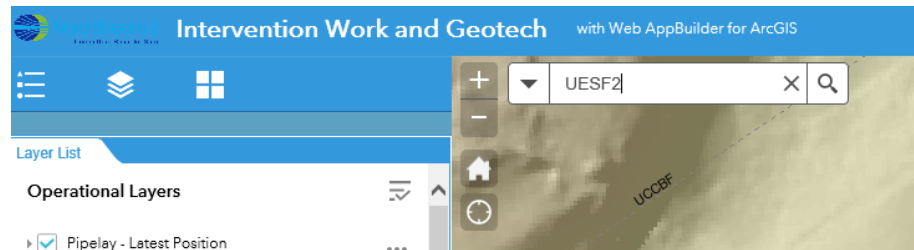


- Planned Plant Layout
- Satellite Imagery
- Latest Route & Corridors
- Bathymetry

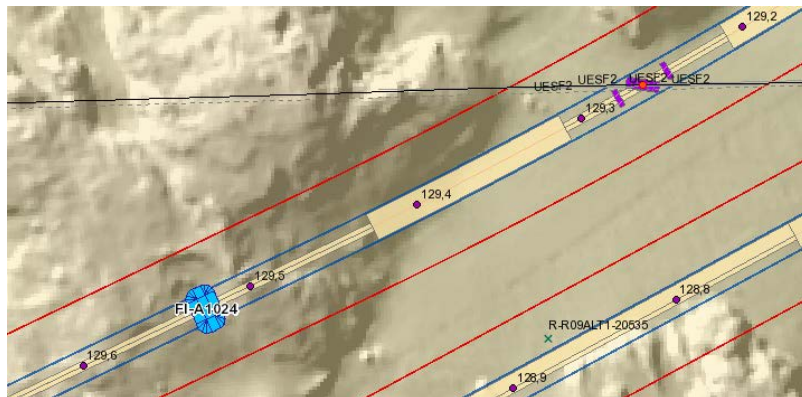


Case study: Engineering Data Flow (GIS Portal) Engineering Application

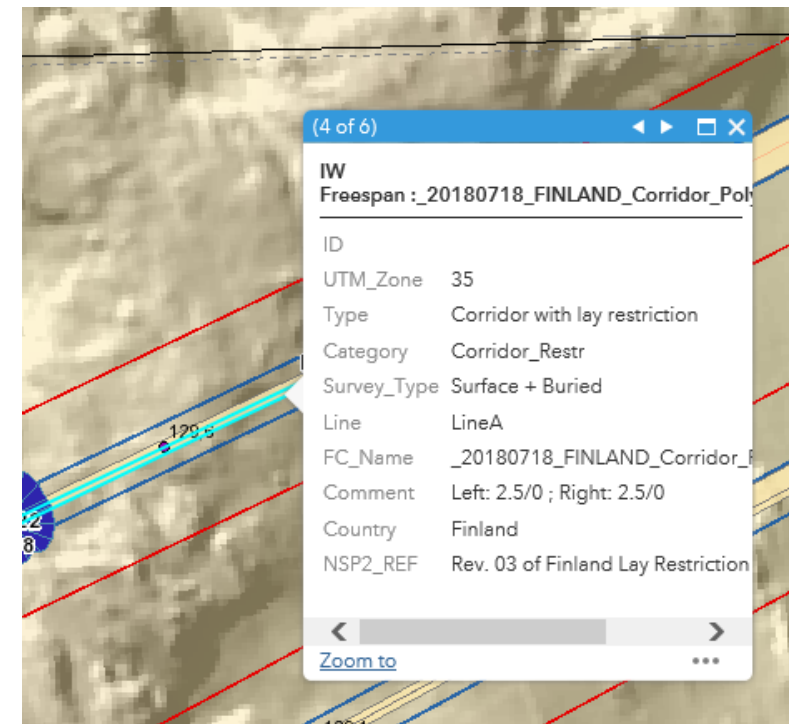
- Search on crossings locations and zoom too result



- Identify by symbology colour the pre-lay berm, with ID

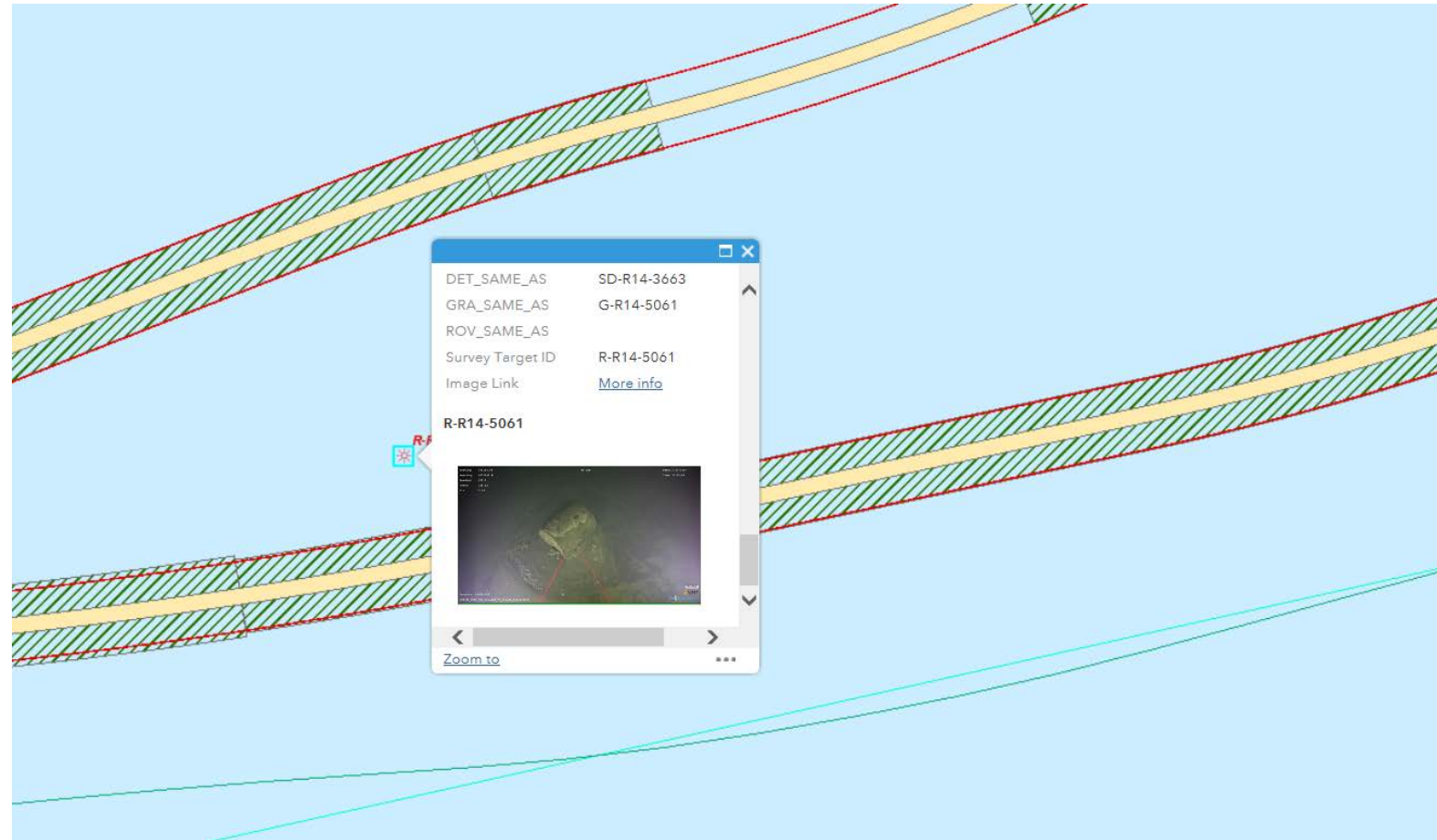


- Click on lay corridor to find out restrictions



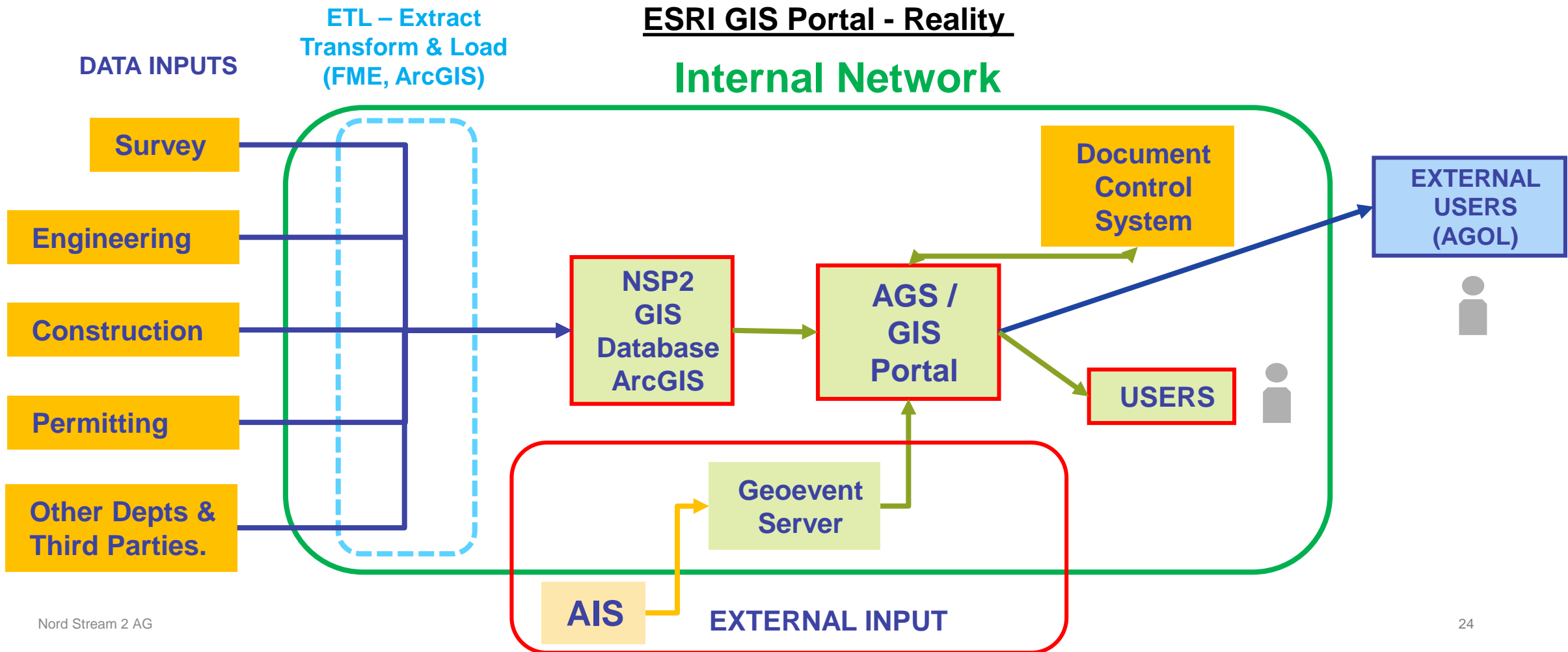
Enables further questions to be answered

- > How close is that UXO to the Route?
- > What is the total area covered by pipe at the Karlshamm logistics port.
- > Where is the planned rock berm FI-A1266?
- > What does that UXO look like and where is the related report?
- > Where is the pipelay vessel?



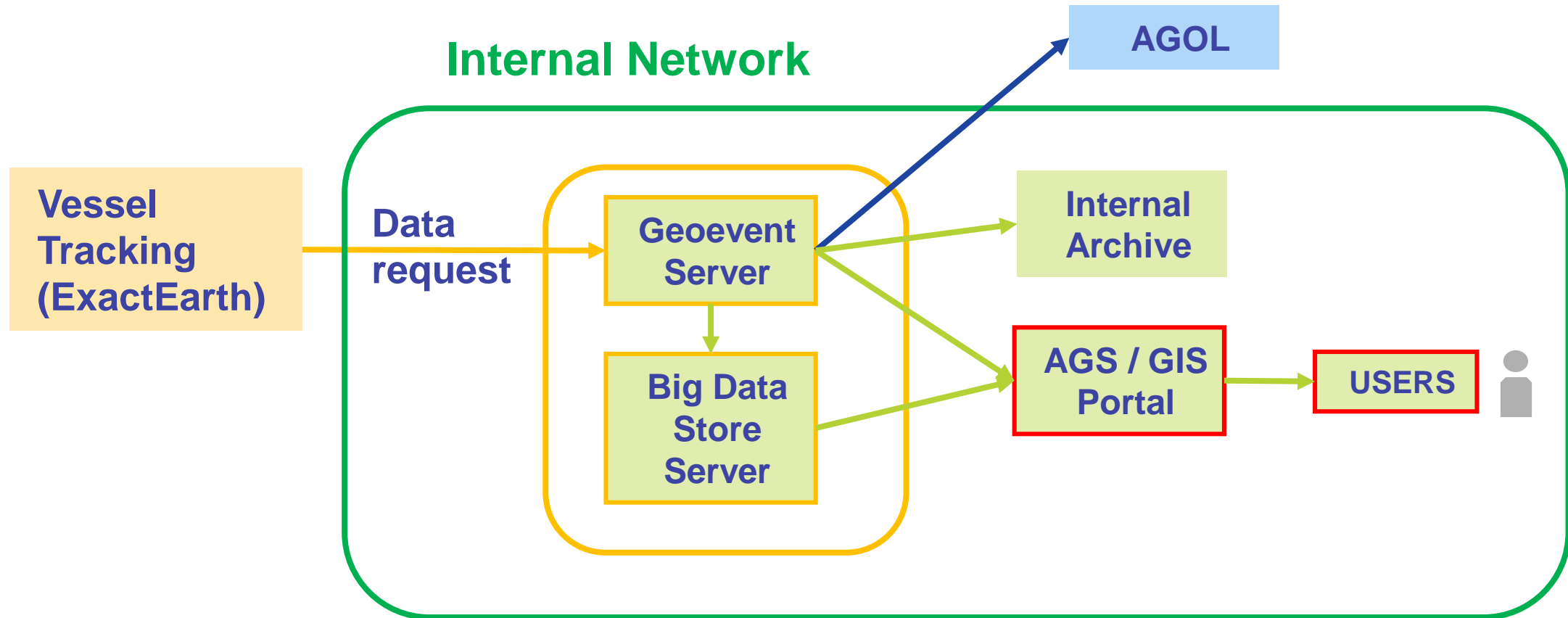


GIS Portal Setup: Geoevent Server





Geoevent Setup

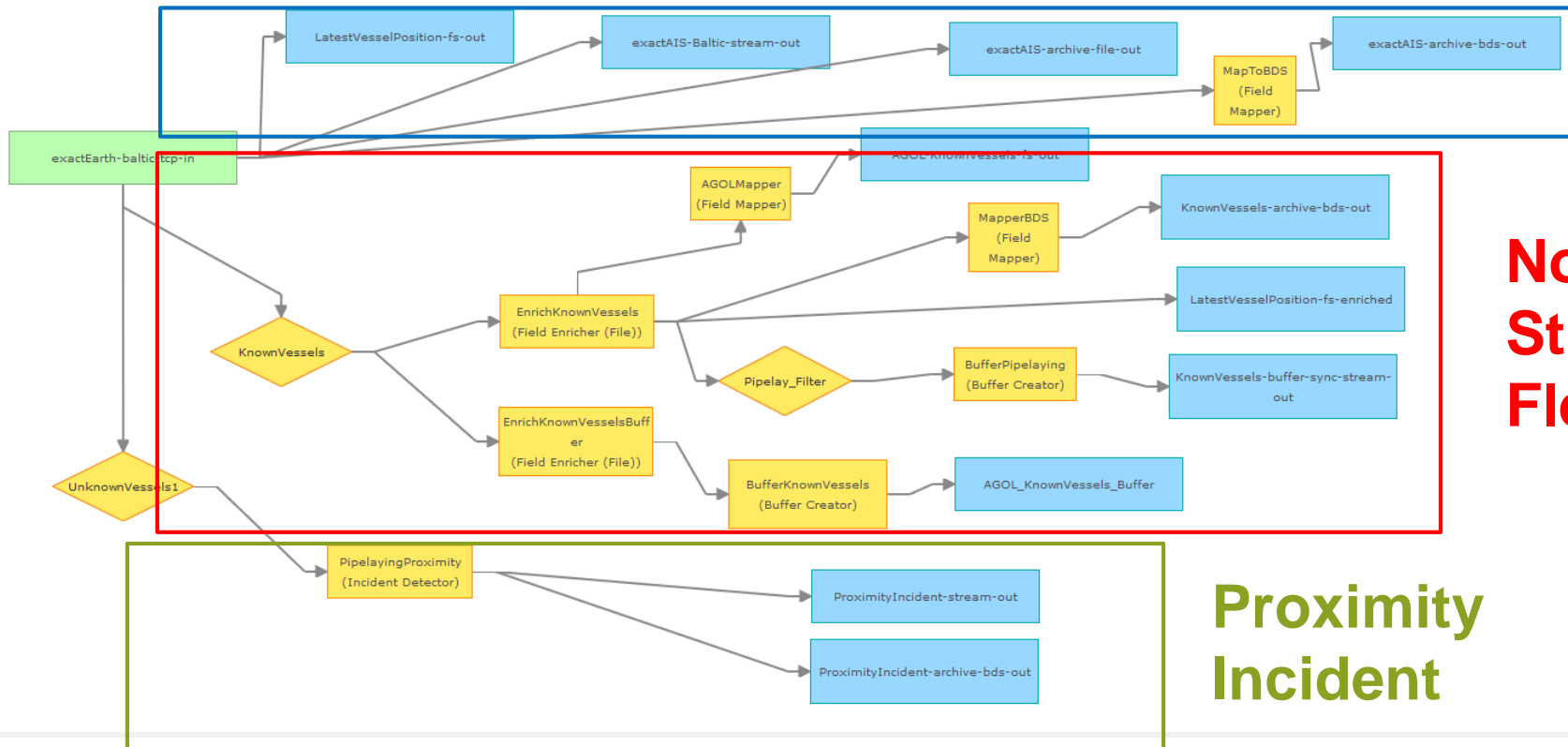




Geoevent

exactEarth-baltic *

Status	In/Out	Count	Rate (over last 5 mins)	Edit Rate	Max Rate	Time Since Last	View Graph
STARTED	In	26,781	5 /sec		8 /sec	00:02:58	
	Out	109,708	23 /sec		33 /sec	00:02:58	



Baltic Data

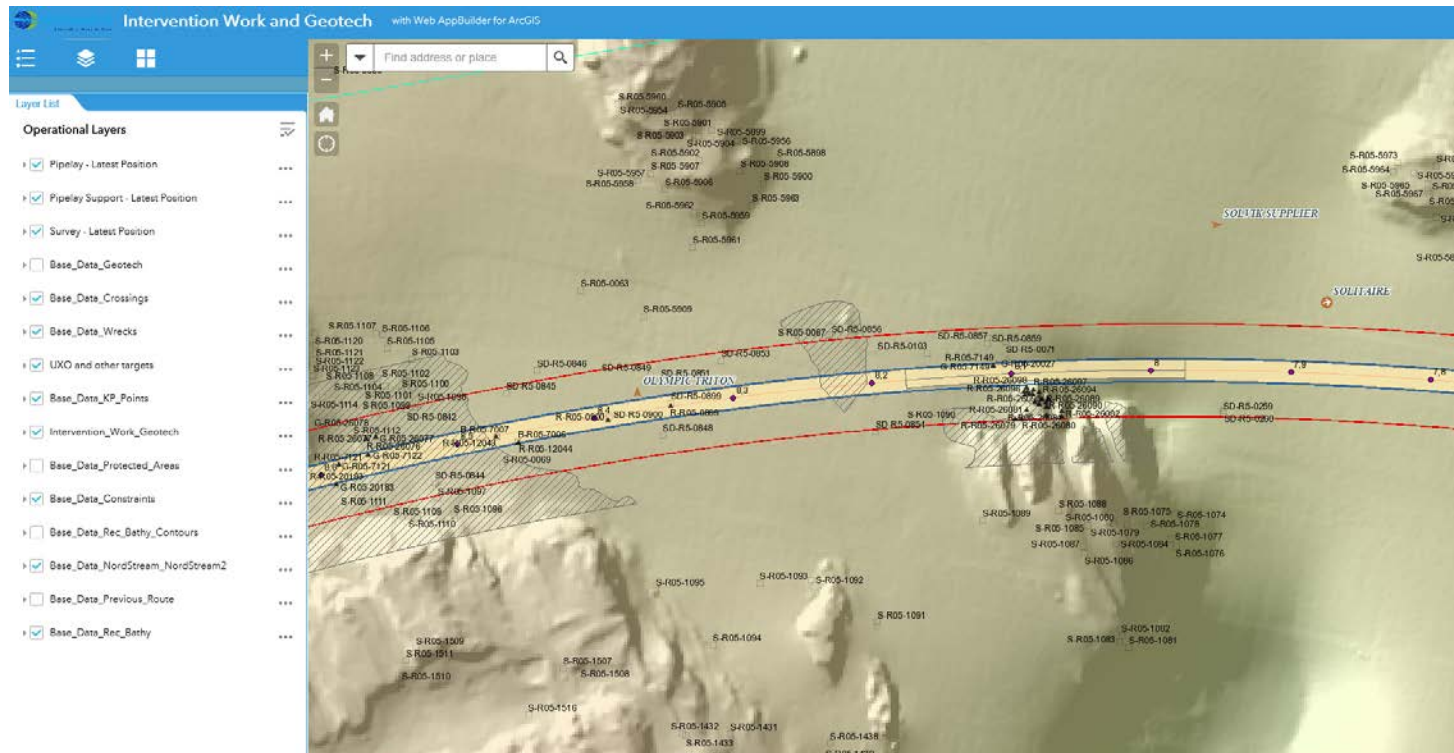
Nord Stream 2 Fleet

Proximity Incident

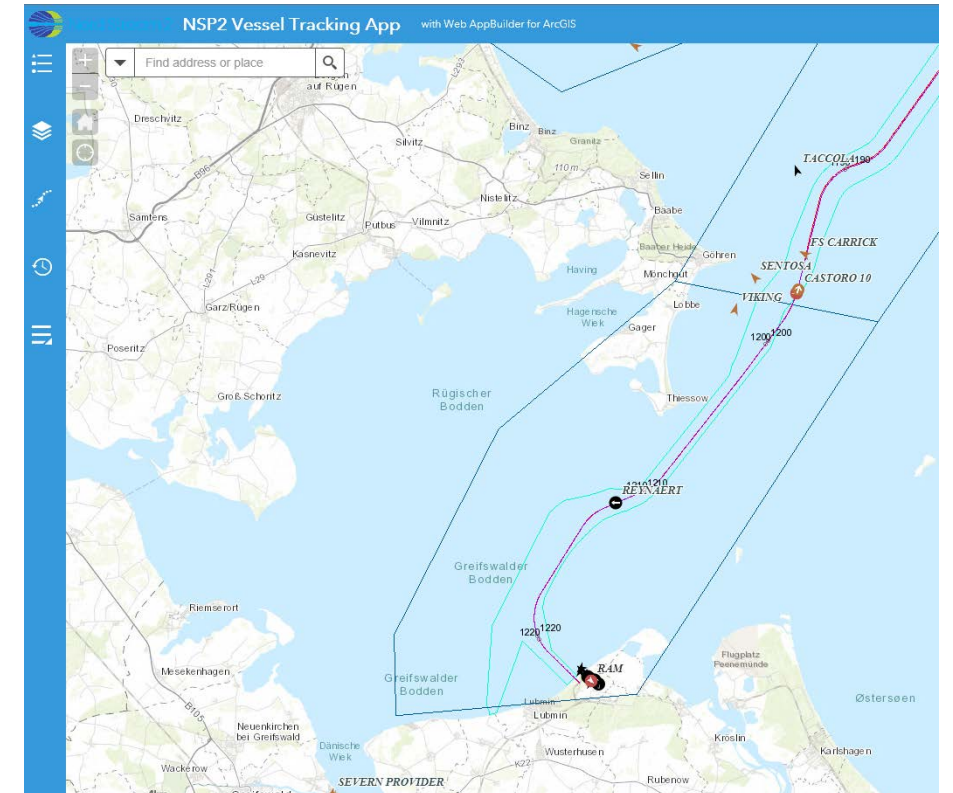


Geoevent Vessel Monitoring

- Pipelay Vessel – Solitaire, with support vessels



- Pipelay and Dredging vessel spreads



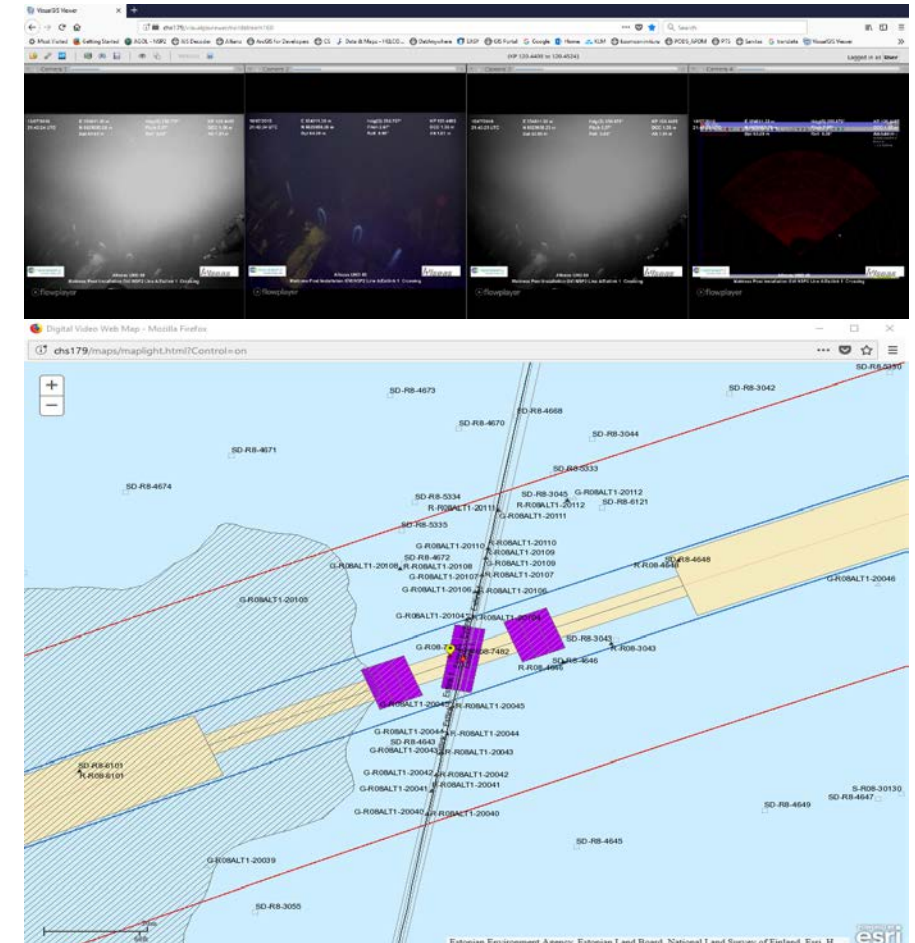
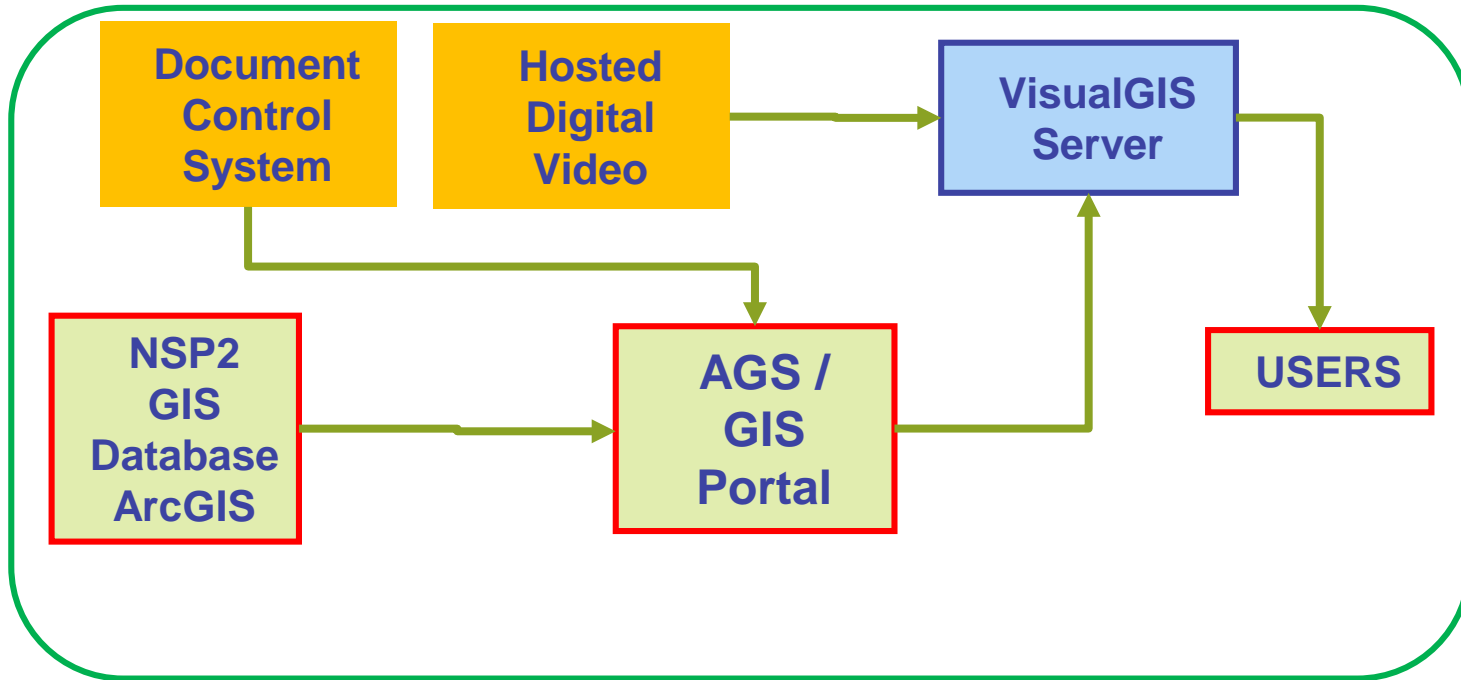
Future development: Lifetime of the project

- Data consistency and continuity over the lifetime of the project
- High quality data that can be traced by users
- Inspection and Maintenance survey
- Adapt to the evolution of the project



Future development: VisualGIS Server

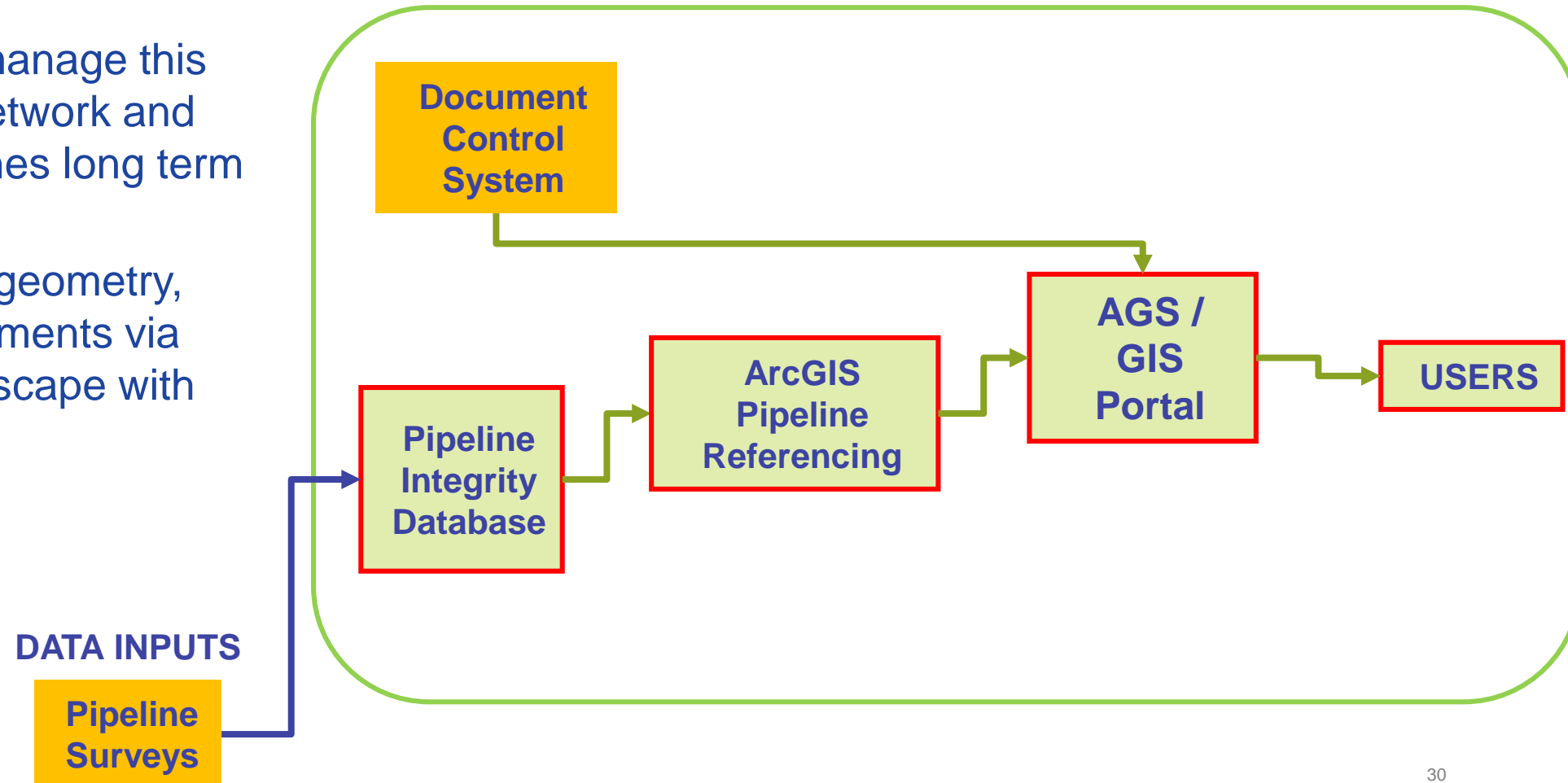
- ROV video to GIS and / or GIS to ROV video.
- Pre-lay, As-laid, Pre-commissioning, As-built, Inspection & Maintenance > 100TB of Digital Video to manage and share.





Future development – ArcGIS Pipeline Referencing

- Requirement to manage this large trunk line network and ensure the pipelines long term integrity.
- Manage pipeline geometry, events and monuments via existing GIS landscape with addition of APR.





Conclusion

- Portal and GIS deliverables were initiated from the start of the project.
- Anticipating and adapting to user's need has been key.
- Set up processes for data treatment.
- Successful information sessions have seen an increase in Portal use and ensure Portal limitations are known.
- Interaction with users helps to refine Portal content.
- Portal and GIS data can help ensure long-term data integrity.



END

