

A stylized graphic of a globe is positioned on the left side of the slide. It is composed of several light blue curved lines that intersect to form a grid-like pattern, representing the Earth's latitude and longitude.

Seabed Survey Data Model

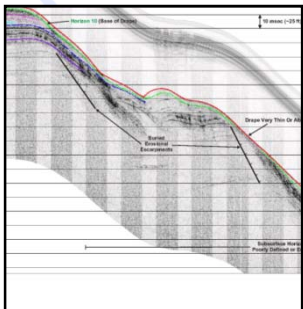
OGP Geomatics Industry Day Overview

Gareth Wright, Woodside Energy
October, 2012

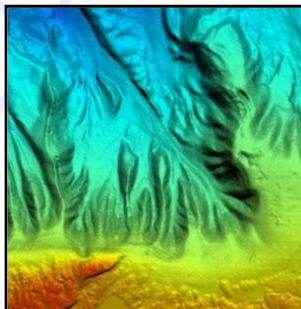
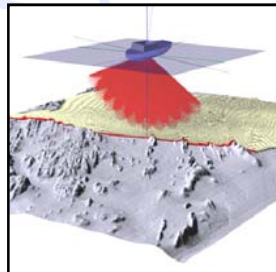
Seabed Surveys

- O&G companies spend millions of dollars each year conducting:
 - Pipeline route surveys
 - Rig site surveys
 - Field development surveys
 - Debris surveys
 - Environmental surveys etc
- The data acquired by these surveys is used for planning purposes, operational support and to manage risks

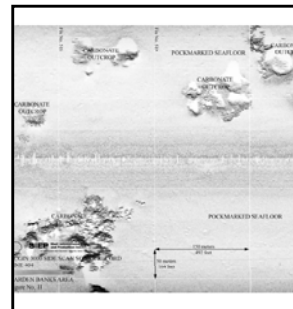
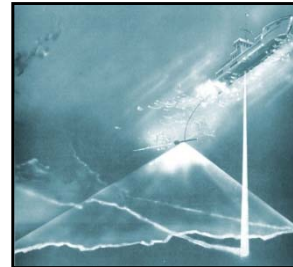
Sub-bottom profilers



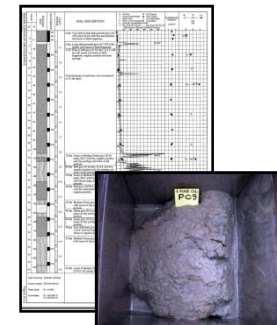
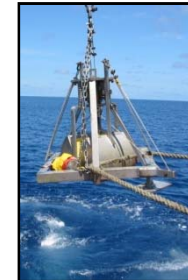
Multi-beam echosounders



Side scan sonar



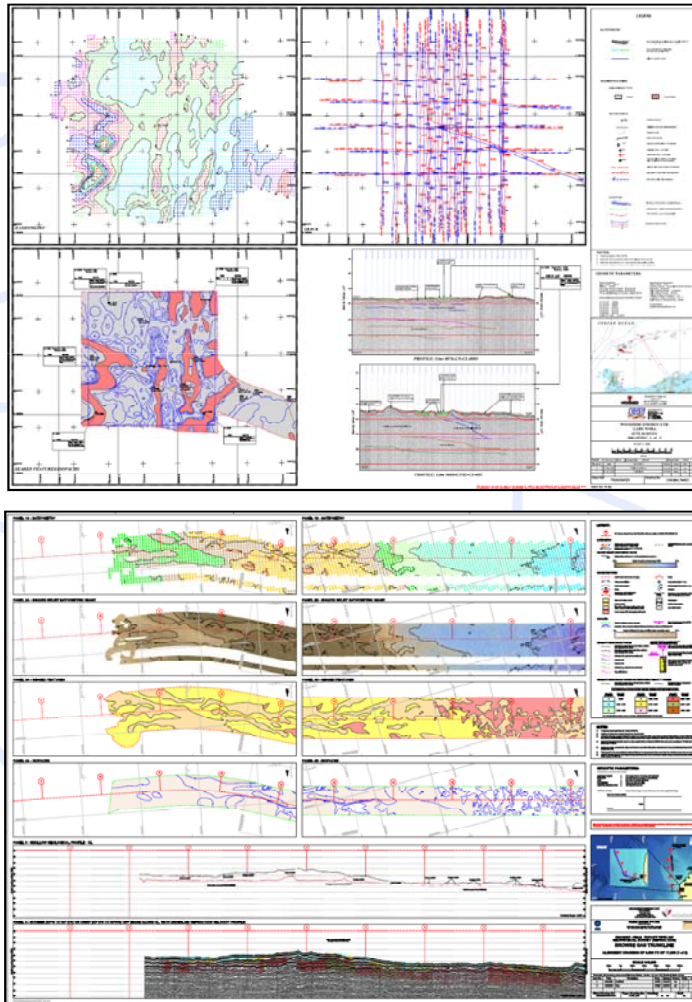
Geotechnical sampling



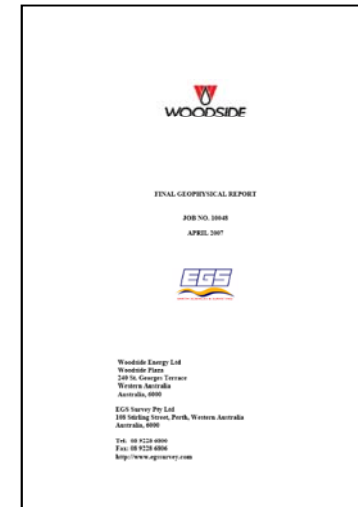
Traditional Deliverables

OGP

Hardcopy maps, CAD files and immature GIS projects



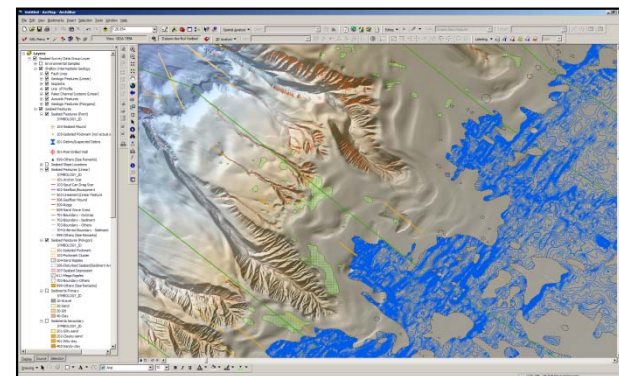
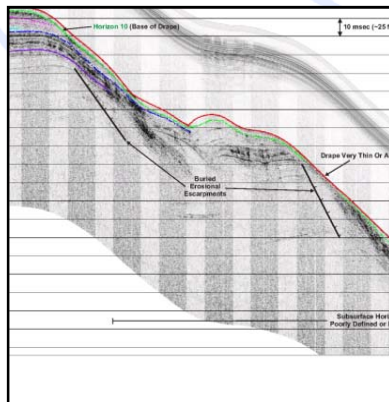
Survey reports



What is the SSDM?

- A GIS template for Seabed Survey industry
- Based on an ESRI Geodatabase format as ESRI ArcGIS this is the de-facto industry standard for spatial data management, mapping and GIS
- Provide core components typically used in Oil & Gas companies' offshore seabed surveys
- OGP SSDM effort is pioneered by Shell and Woodside
- Many surveys have been successfully delivered in SSDM

"Vision is for the industry to have a template/standard for how seabed survey data is delivered to and managed by oil and gas companies"



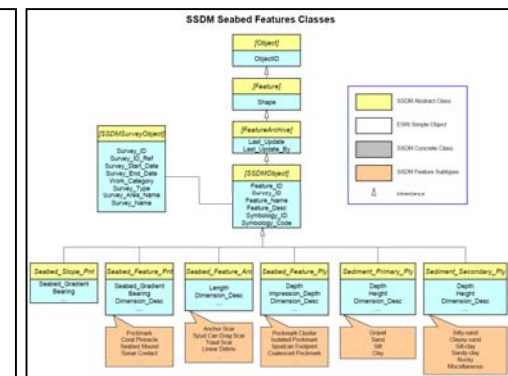
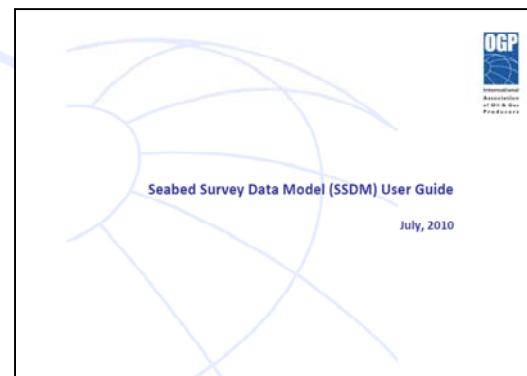
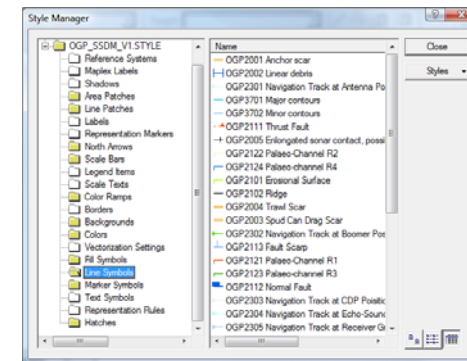
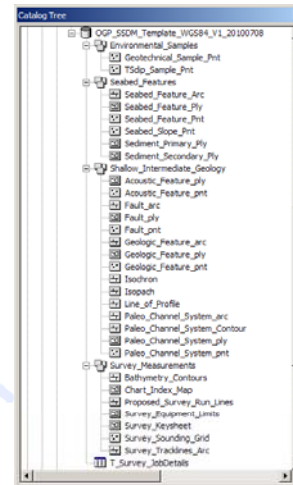
Why the need for the SSDM?

- Typically seabed survey data has been captured and delivered by survey contractors in unstructured CAD or GIS files:
 - Difficult and costly to manage internally
 - Difficult to integrate survey data
 - Difficult to share survey data with Joint Venture Partners
 - Lack of integration within business workflows
- OGP now proactively define structured data model for better data management.
- Driven by the principles of sound geo-information management, OGP endorsed the seabed survey data model (SSDM):
 - A complete survey data management workflow
 - Improved geohazards catalogue and interpretation knowledge base
 - Improved integration with geosciences software and data exchanges
 - Improved accessibility through spatial database engine and web services

The SSDM V1 Material (Released in April 2011)

OGP

- ESRI Personal Geodatabase template
- Data Dictionary
- ArcGIS Stylesheet
- Conceptual data model diagrams
- User and contractor guidelines
- ArcSDE SSDM Implementation Guide
- FAQ's document
- OGP SSDM guidance note

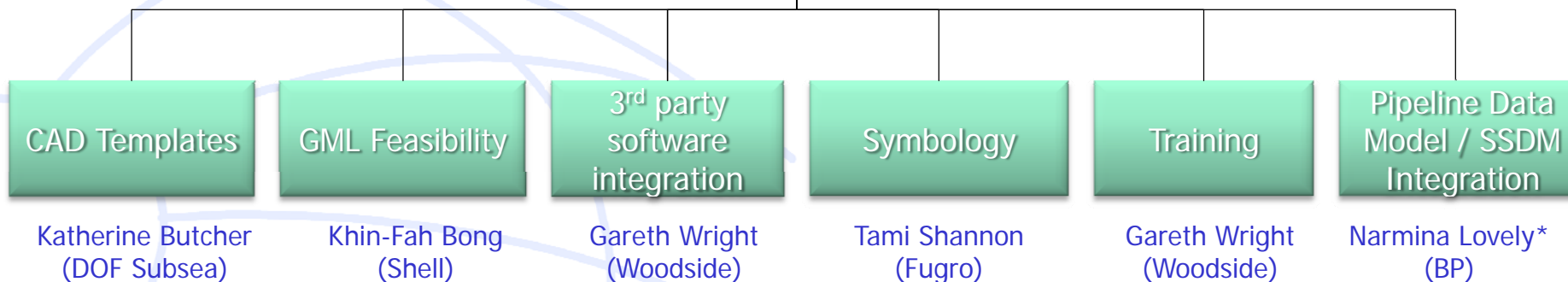


- OGP website: <http://info.ogp.org.uk/geodesy/ssdm.html>
- Now on Esri data model support page: <http://support.esri.com/en/downloads/datamodel/detail/50>

SSDM Task Force 2012-13



Seabed Survey Data Model Task Force



Task Force

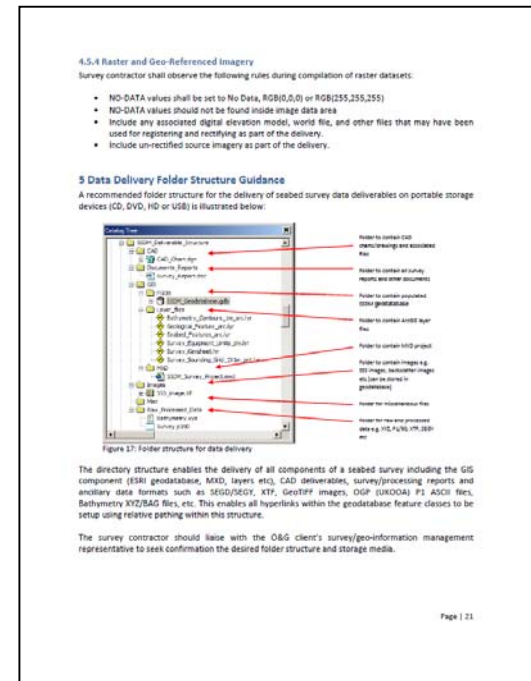
Sub-group

- SSDM Task Force Terms of Reference in place for these activities
- 2012-13 work program in place and task force sub-group leads are making good progress

** Janet Sinclair (PODS), Peter Veenstra (APDM) and Luke Hutmacher (PODS ESRI lead) will be involved*

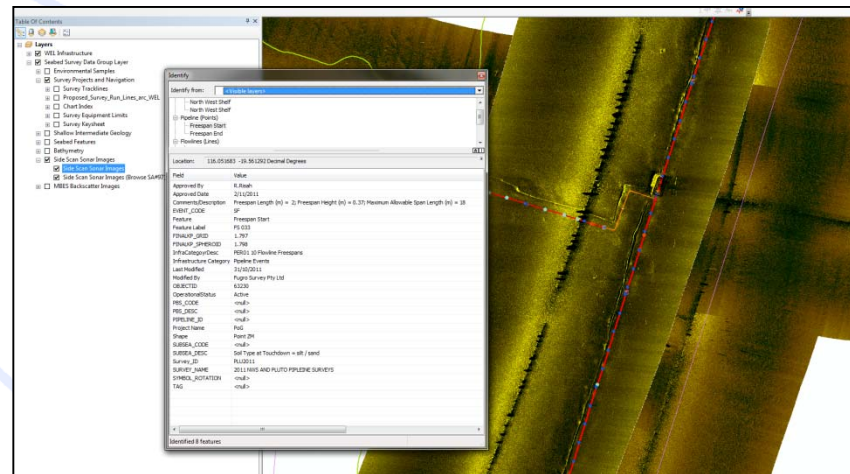
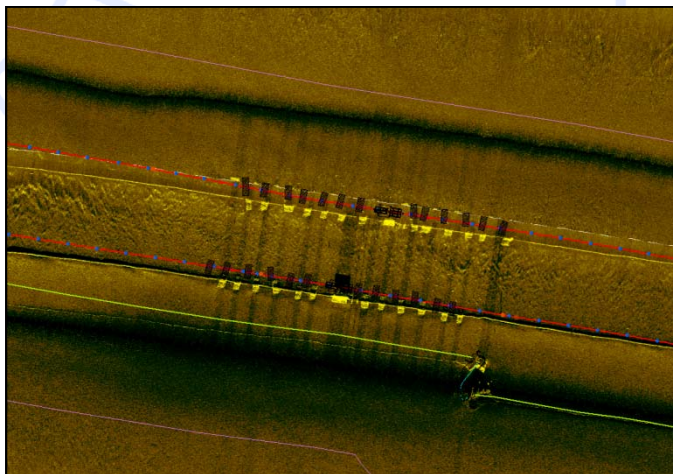
- # Technical Specification

Seabed Survey Data Model Deliverables
- Revision history**
- | version | Date | amendment |
|---------|--------------|---|
| 0.1 | 10 May 2012 | First Draft |
| 0.2 | 10 May 2012 | Second draft that includes feedback from ISD&ITP meeting on April 18 2012 |
| 0.3 | 20 May 2012 | Third draft that includes 2 second round of ISD&ITP feedback from May 22 |
| 0.4 | 01 June 2012 | 4 th draft ITP being added 3.1.3.4, 4.1.4, 4.1.5.4.3.4.6 and various edits. |
| 0.5 | 01 June 2012 | 5 th draft including several modifications from client's inputs |
| 0.6 | 20 June 2012 | 6 th draft including 2 nd round of ISD&ITP feedback, final for US submarine cable approval. |
- ### Contents
- I Introduction
 - 1.1 Purpose
 - 1.2 Scope
 - 1.3 Target Audience
 - 2 The Seabed Survey Data Model (SSDM) Description
 - 2.1 O&G Company Obligations to the Survey Contractor
 - 3.1 The SSDEM Standard Components
 - 3.2 The Survey Job Particulars
 - 3.3 The Survey Project Co-ordinate Reference System
 - 3.4 Existing Company Database
 - 4 GIS Database Requirements
 - 4.1 SSDEM Geodatabase
 - 4.1.1 Geodesy and the Geodatabase
 - 4.1.2 Survey Timelines Measure Value
 - 4.1.3 Units of Measurement
 - 4.1.4 Hyperlinking Feature Classes to Survey Reports and Ancillary Data
 - 4.1.5 Feature Class Metadata Requirements
 - 4.1.6 Renaming the ESRI Geodatabase File
 - 4.2 Raster Datasets
 - 4.3 ArcGIS Layer Files and Symbolology
 - 4.4 AutoMap Document (MXD) Setup
 - 4.5 General GIS Requirement
 - 4.5.1 Software Version
 - 4.5.2 Chart Standard Cartographic Elements
 - 4.5.3 Topology Rules
 - 4.5.4 Raster and Gcp-referenced Imagery
 - 5 Data Delivery Folder Structure Guidance
 - 6 Governance, Version Management and Contractor Feedback
 - 7 References
 - 8 Abbreviations
 - Appendix A
 - Appendix B
- Page | i



The SSDM V2 Material (~2013 Release)

- SeabedML GML data exchange format
- CAD templates for MicroStation and AutoCAD
- Improved SSDM symbology stylesheet
- Refined geodatabase template (if warranted based on industry feedback)
- Example SSDM dataset and improved training materials
- Technical note on integrating the SSDM with industry pipeline data models e.g. PODS and APDM

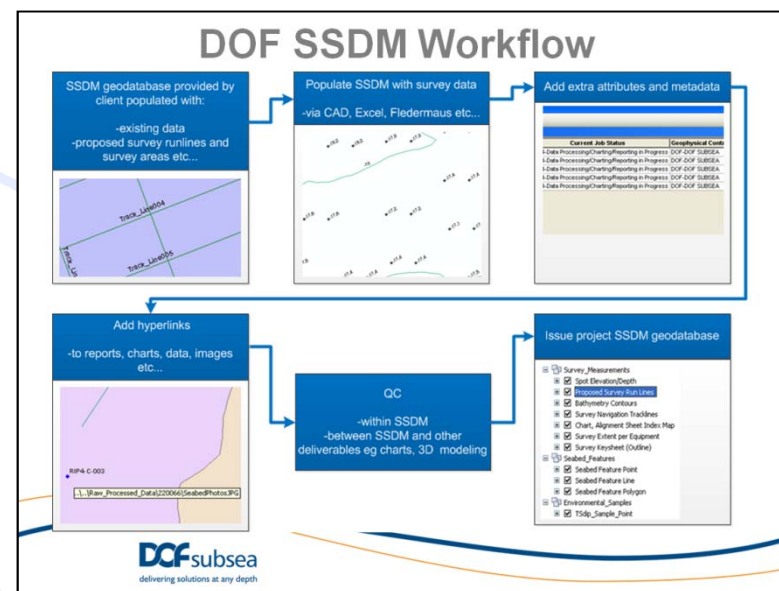
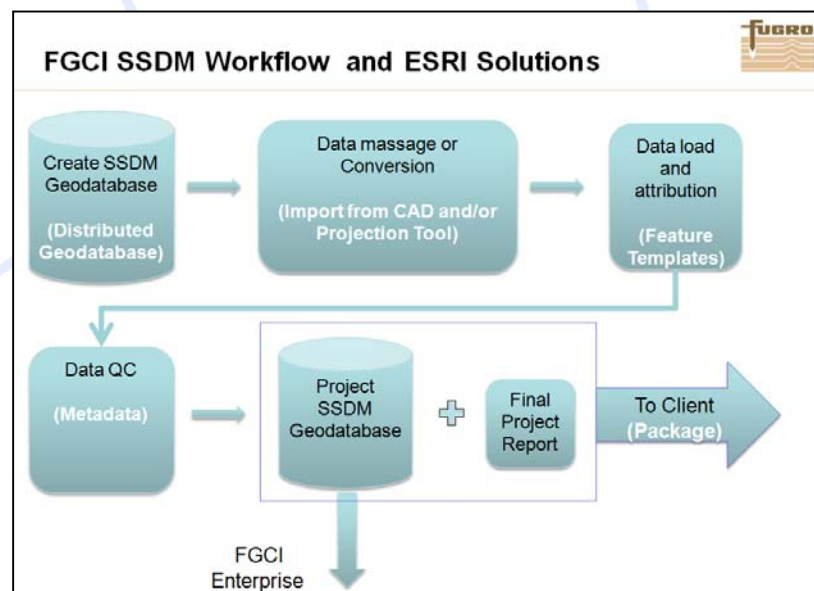


Integrating the SSDM with pipeline data models enables the SSDM to be used for as-built pipeline and pipeline inspection surveys

Global Survey Contractor Adoption

OGP

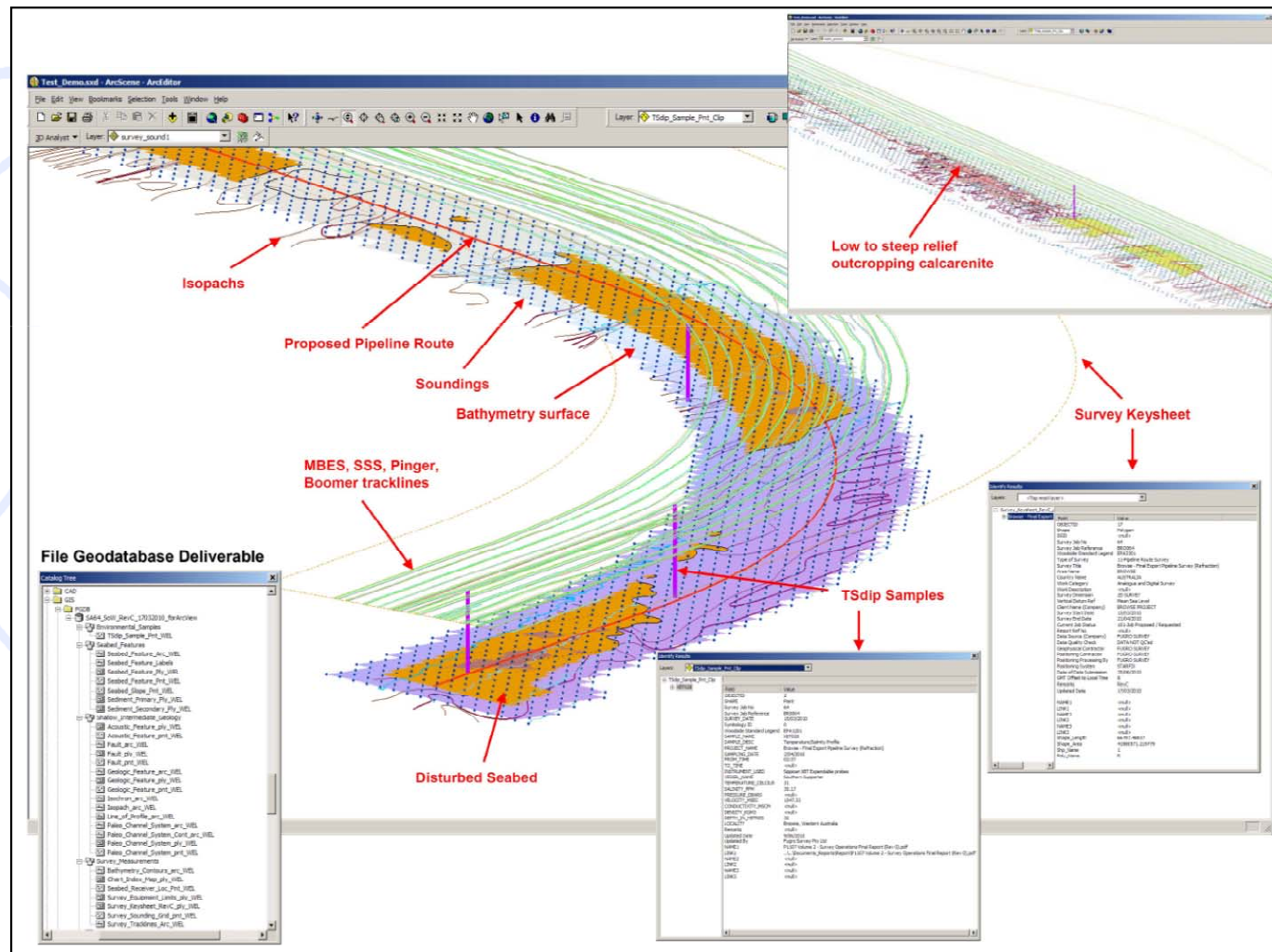
- Global survey companies are adopting the SSDM as the backbone to their survey data deliverables to clients
- A number of survey contractors are building scripts and tools to streamline the process of loading seabed survey data to the SSDM from their processing and interpretation software
- GIS capability within survey companies are matching the requirements of their clients SSDM deliverables



SSDM Examples

OGP

Proposed Pipeline Route Survey



Survey equipment extents (MBES, SSS)

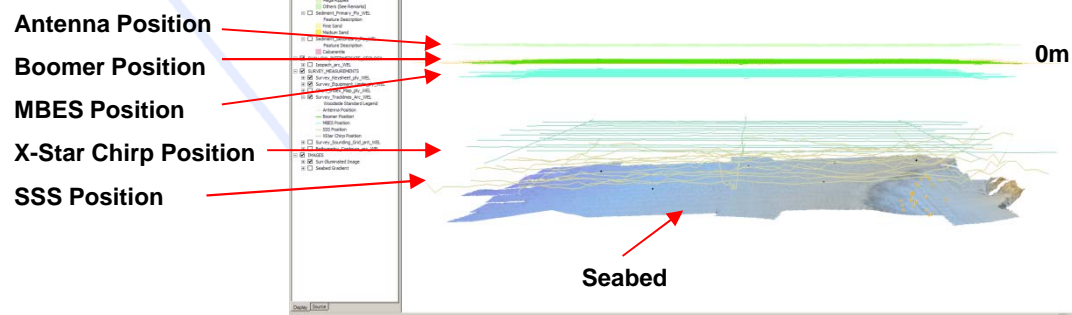
Tracklines (antenna, boomer, MBES, SSS positions etc)

Geotechnical sampling

Bathymetry data (contours, grid and soundings available)

Sediments

Seabed features (pockmarks)



SSDM Examples

OGP

Consistency in data attribution

Seabed Features

Feature Class Properties

General XY Coordinate System Tolerance Resolution Domain

Fields Indexes Subtypes Relationships Representations

Subtype Field: SYMBOLOGY_ID

Default Subtype: 101-Isolated Pockmark

Subtypes:

Code	Description
101	101-Isolated Pockmark
102	102-Pockmark Cluster
103	103-Coalesced/Combined Pockmark
104	104-Sand Ripples
105	105-High Sonar Reflective Seabed Area
106	106-Jack-up Rig/Spudcan footprint

Default Values and Domains:

Field Name	Default Value	Domain
SURVEY_ID		
SURVEY_ID_REF		
SSL_CODE	EPA3002	
FEATURE_DESC		
FEATURE_NAME	Isolated Pockmark	
SURVEY_DATE		

Use Defaults Domains...

OK Cancel Apply

Primary Sediment

Feature Class Properties

General XY Coordinate System Tolerance Resolution Domain

Fields Indexes Subtypes Relationships Representations

Subtype Field: SYMBOLOGY_ID

Default Subtype: 10-Gravel

Subtypes:

Code	Description
10	10-Gravel
20	20-Sand
30	30-Silt
40	40-Clay

Default Values and Domains:

Field Name	Default Value	Domain
SURVEY_ID		
SURVEY_ID_REF		
SSL_CODE	EPA3101	
FEATURE_DESC		
FEATURE_NAME	Gravel	

Identify Results

Layers: <Top-most layer>

Sediment_Secondary_Ply

Rocky

Field	Value
OBJECTID	2
SHAPE	Polygon
Survey Job No	40
SURVEY_ID_REF	BR0010
Symology ID	501-Rocky
Woodside Standard Legend	EPA3205
Feature Description	Calcarene
Feature Name	Rocky
Survey End Date	12/04/2008
Water Depth (Metres)	100
Height Description	Depth From LAT
Dimension Description	
Updated Date	<null>
Updated By	Fugro Survey Pty Ltd
Source of Interpretation	Side Scan Sonar
CAD Layer Name	SBF Fill
Remarks	<null>
NAME1	<null>
LINK1	<null>
NAME2	<null>
LINK2	<null>
NAME3	<null>
LINK3	<null>
SHAPE_Length	1020.452238
SHAPE_Area	49686.625332

Secondary Sediment

Feature Class Properties

General XY Coordinate System Tolerance Resolution Domain

Fields Indexes Subtypes Relationships Representations

Subtype Field: SYMBOLOGY_ID

Default Subtype: 201-Silty-sand

Subtypes:

Code	Description
201	201-Silty-sand
202	202-Clayey-sand
401	401-Silty-clay
402	402-Sandy-clay
501	501-Rocky
999	999-Miscellaneous

Default Values and Domains:

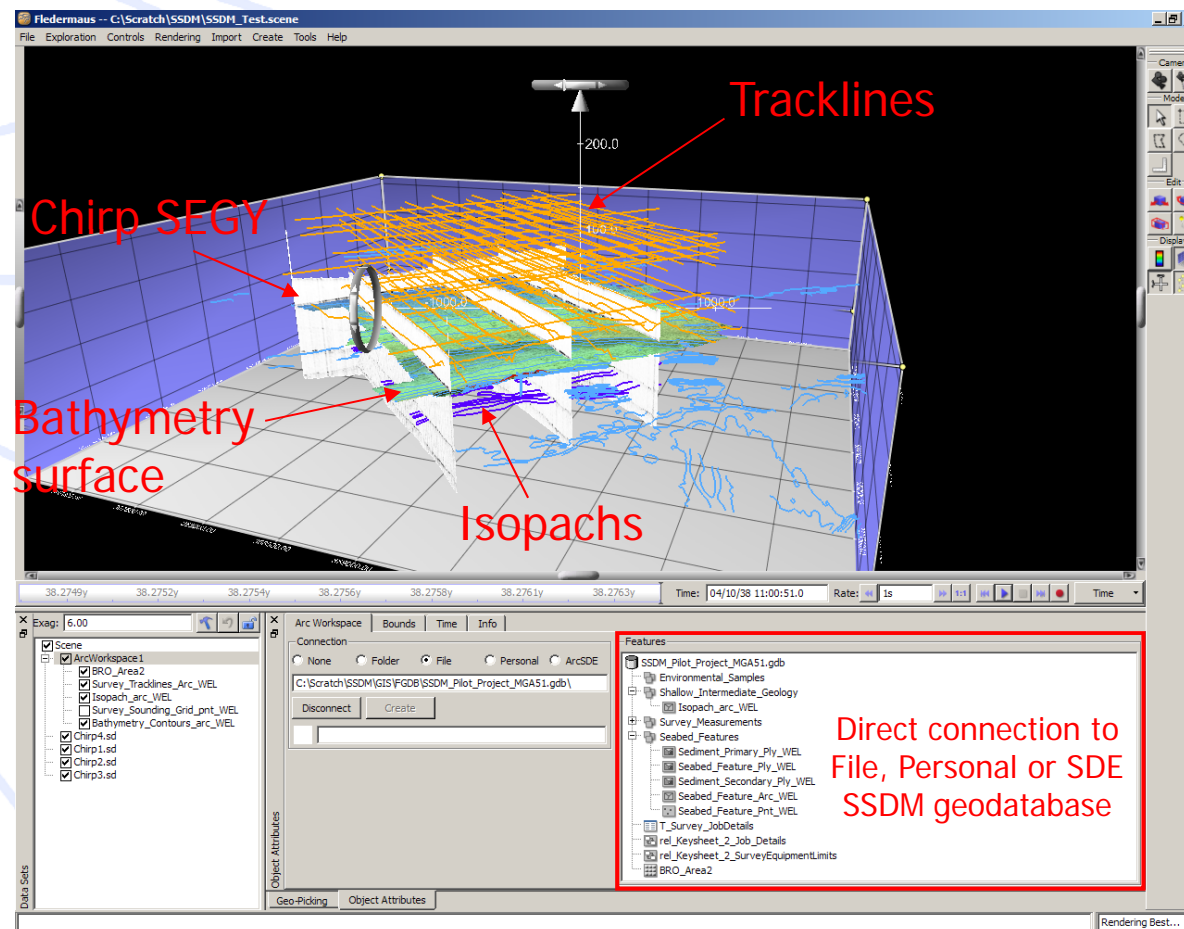
Field Name	Default Value	Domain
SURVEY_ID		
SURVEY_ID_REF		
SSL_CODE	EPA3201	
FEATURE_DESC		
FEATURE_NAME	Silty-sand	
SURVEY_DATE		

Use Defaults Domains...

OK Cancel Apply

SSDM Examples

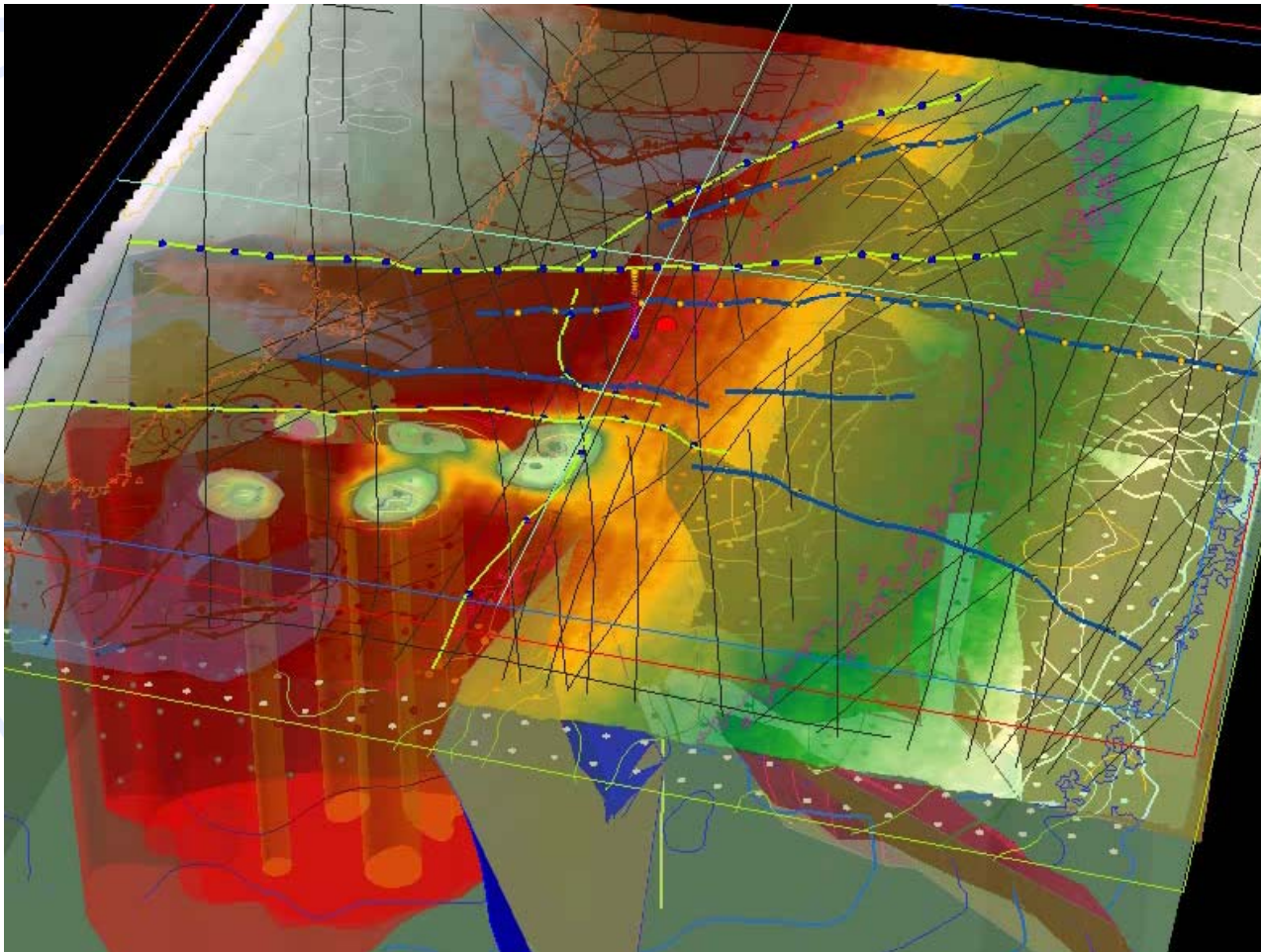
- Integration With IVS Fledermaus 7.2 for 3D Visualisation
- CARIS and CODAOctypus have expressed interest in supporting the SSDM
- A number of SSDM toolkits becoming available e.g. MariSoft, VisualGIS etc
- Consulting firms e.g. Exprodat provides history survey data conversion services



SSDM Examples

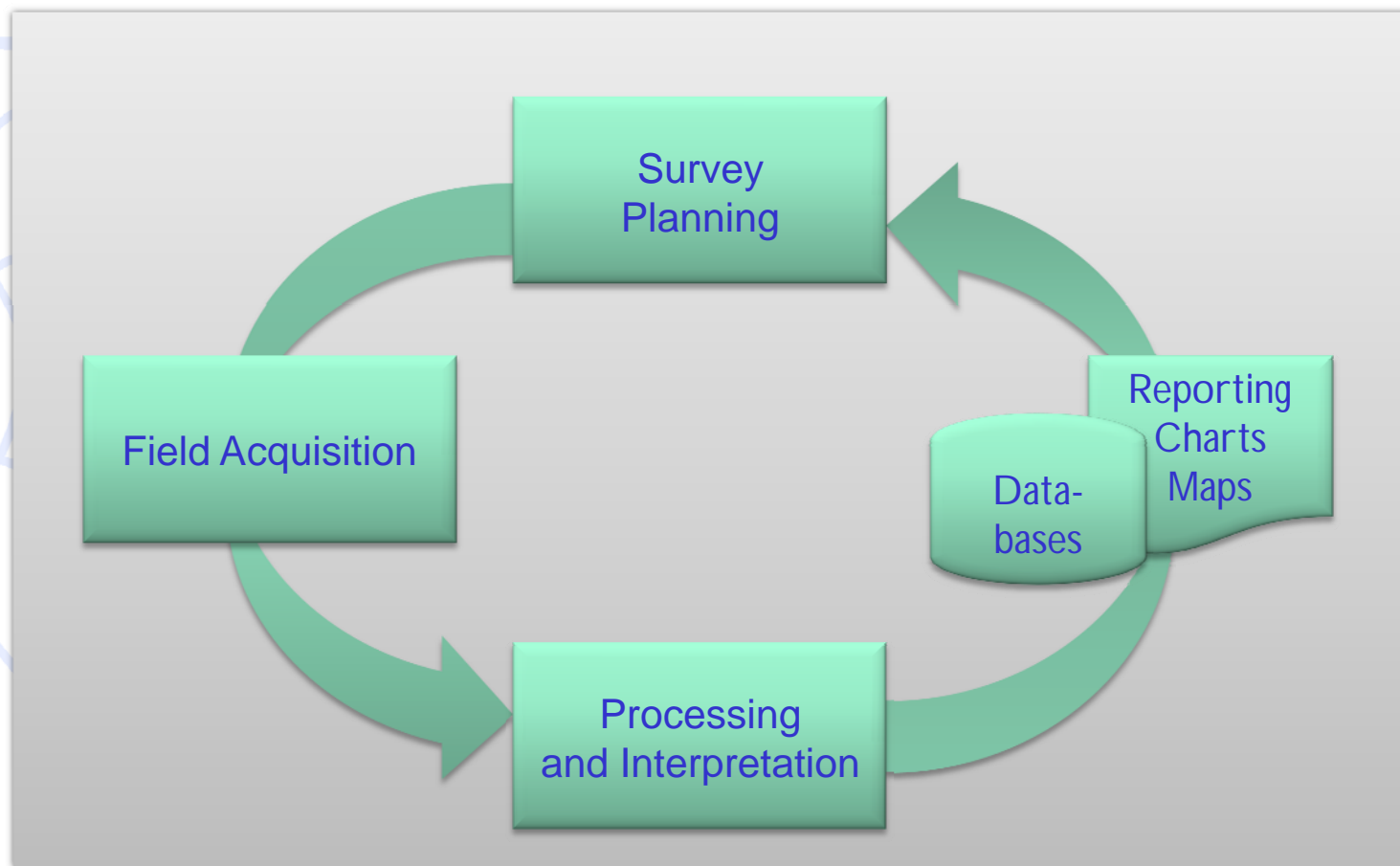
OGP

Site Survey Animation



Seabed Survey Workflow

- SSDM provides a structured workflow for managing survey data



Survey Planning

OGP

- What surveys have been undertaken previously and is this data adequate for the task at hand?

The screenshot displays two 'Identify' windows from the ArcMap application, showing metadata for two different survey features. The left window is for 'Lady Nora Site Survey' and the right window is for 'Western Flank Pipeline'. Both windows show a table of fields and values, with several fields highlighted by red boxes. A red arrow points from the 'Survey Start Date' field in the left window to the 'Survey Start Date' field in the right window.

Left Window: Lady Nora Site Survey

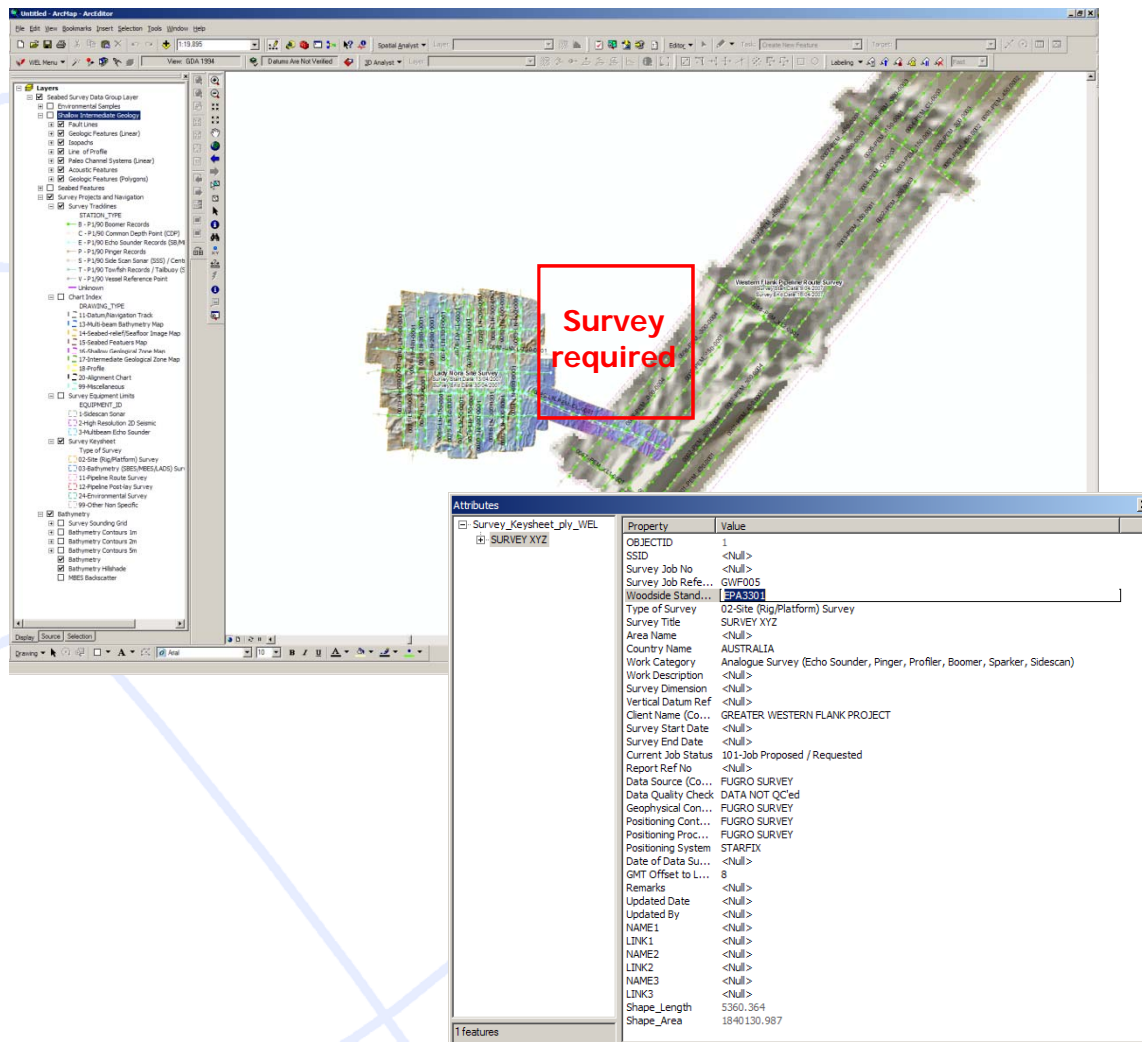
Field	Value
OBJECTID	22
SSID	<null>
Survey Job No	1
Survey Job Reference	LN001
Woodside Standard Legend	EPA3301
Type of Survey	02-Site (Rig/Platform) Survey
Survey Title	Lady Nora Site Survey
Area Name	Lady Nora
Country Name	AUSTRALIA
Work Category	Analogue Survey (Echo Sounder, Pinger, Profiler, Boomer, Sparker, Sidescan)
Work Description	MBES, SBES, SSS, Boomer
Survey Dimension	2D SURVEY
Vertical Datum Ref	Lowest Astronomical Tide
Client Name (Company)	GREATER WESTERN FLANK PROJECT
Survey Start Date	13/04/2007
Survey End Date	30/04/2007
Current Job Status	105-Data Processing/Charting/Reporting completed.
Report Ref No	EGS Job No: 10048
Data Source (Company)	EGS
Data Quality Check	DATA QC'd
Geophysical Contractor	EGS
Positioning Contractor	EGS
Positioning Processing By	EGS
Positioning System	UNKNOWN
Date of Data Submission	1/05/2010
GMT Offset to Local Time	8
Remarks	<null>
Updated Date	17/03/2010
Updated By	Gareth Wright
NAME1	Lady Nora Site Survey 2007 Final Report
LINK1	http://dmslink/link/?dmsn=3530933
NAME2	<null>
LINK2	<null>
NAME3	<null>
LINK3	<null>
Shape	Polygon
Shape.area	0.000204
Shape.len	0.08216

Right Window: Western Flank Pipeline

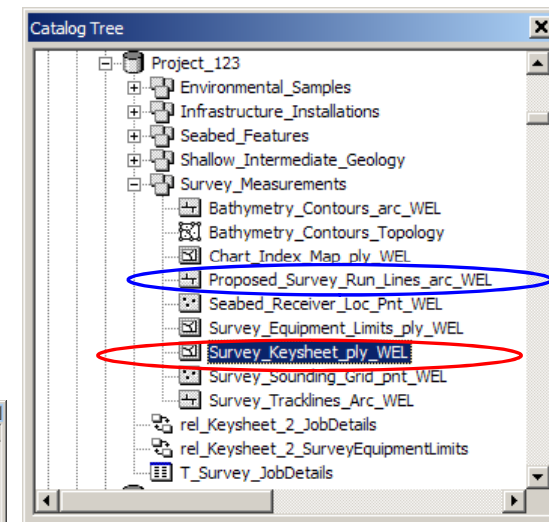
Field	Value
OBJECTID	21
SSID	<null>
Survey Job No	1
Survey Job Reference	GWIF001
Woodside Standard Legend	EPA3301
Type of Survey	11-Pipeline Route Survey
Survey Title	Western Flank Pipeline Route Survey
Area Name	Western Flank
Country Name	AUSTRALIA
Work Category	Analogue Survey (Echo Sounder, Pinger, Profiler, Boomer, Sparker, Sidescan)
Work Description	MBES, SBES, SSS, Boomer
Survey Dimension	2D SURVEY
Vertical Datum Ref	Lowest Astronomical Tide
Client Name (Company)	GREATER WESTERN FLANK PROJECT
Survey Start Date	9/04/2007
Survey End Date	16/04/2007
Current Job Status	105-Data Processing/Charting/Reporting completed.
Report Ref No	EGS Job No: 10048
Data Source (Company)	EGS
Data Quality Check	DATA QC'd
Geophysical Contractor	EGS
Positioning Contractor	EGS
Positioning Processing By	EGS
Positioning System	UNKNOWN
Date of Data Submission	<null>
GMT Offset to Local Time	8
Remarks	Original deliverable converted to SSDM format
Updated Date	22/07/2010
Updated By	G. Wright
NAME1	NWVS Subsea Projects - 2007 Western Flank Development Pipe Route Survey - Final Geophysical Re...
LINK1	http://dmslink/link/?dmsn=3552911
NAME2	<null>
LINK2	<null>
NAME3	<null>
LINK3	<null>
Shape	Polygon
Shape.area	0.003909
Shape.len	0.942926

Survey Planning

OGP



If proposed runlines are generated internally these can also be loaded to the proposed run lines feature class

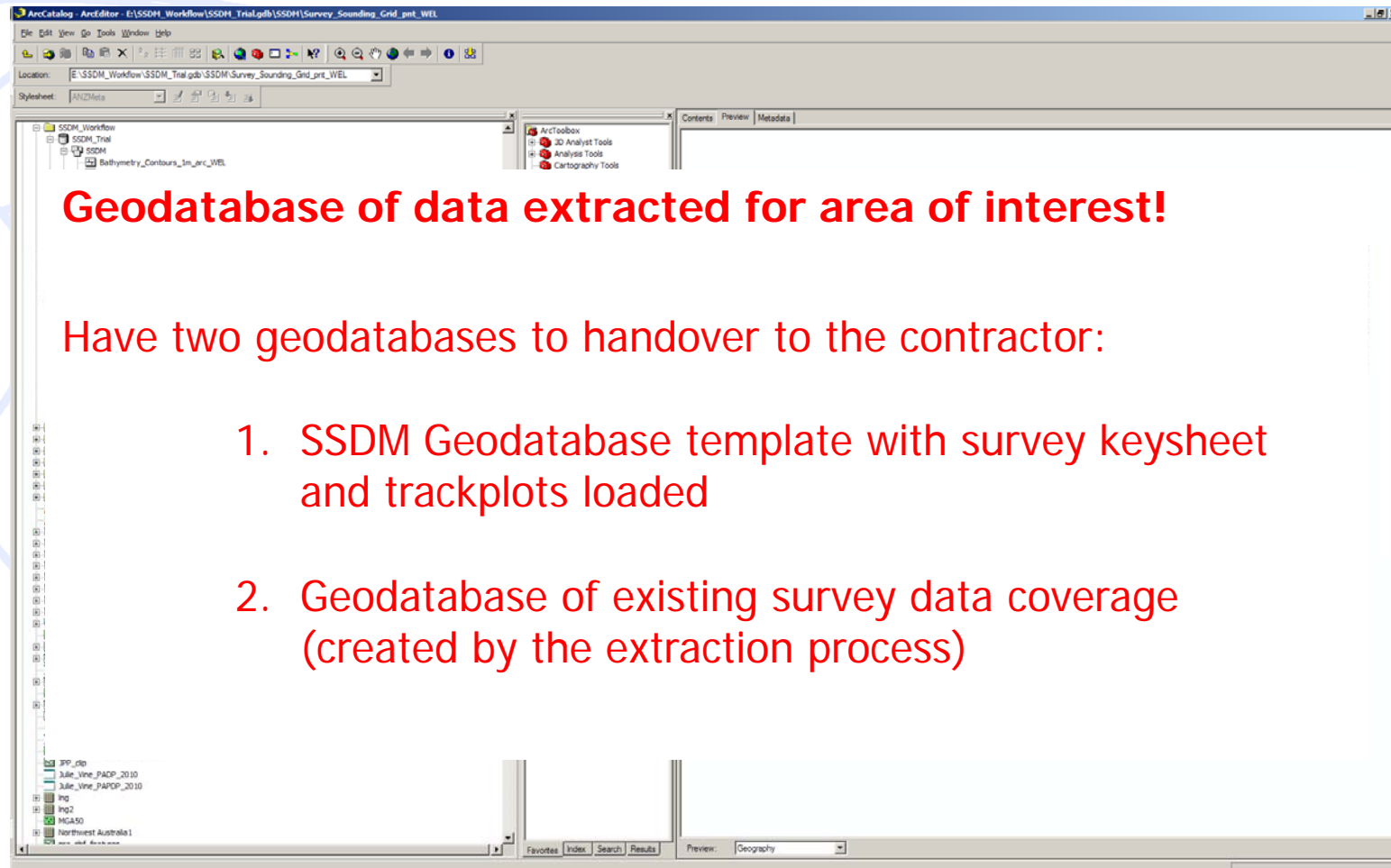


Survey keysheet (survey extent) and survey details can be loaded e.g. survey name, survey type etc.

SSDM template used to load the runlines and keysheet can then be forwarded on to survey contractor to populate with data acquired by the survey

Survey Planning

OGP

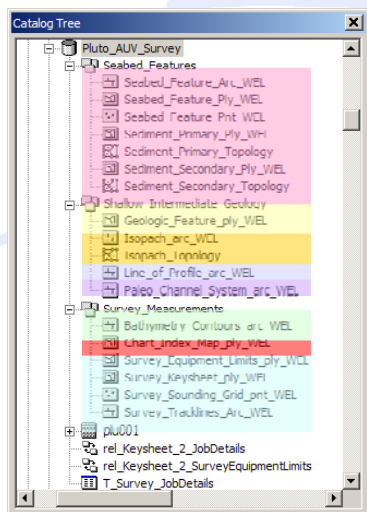


Geodatabase of data extracted for area of interest!

Have two geodatabases to handover to the contractor:

1. SSDM Geodatabase template with survey keysheet and trackplots loaded
2. Geodatabase of existing survey data coverage (created by the extraction process)

OGP



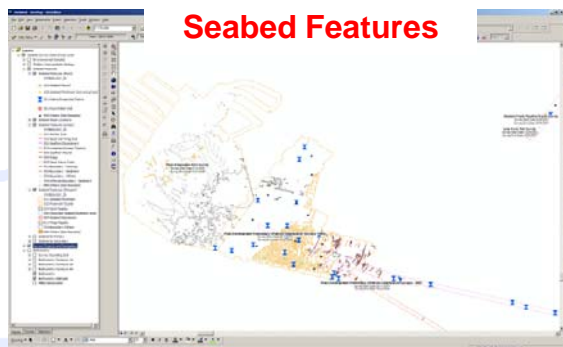
SDE Load

The screenshot shows the ArcCatalog - ArcEditor application window. The title bar indicates the current workspace is 'devapp270.sde\sdet.GIS_DBA.SSDM'. The 'Location' field shows the connection path: 'Database Connections\Connection to ArcSDE Test Instance ADMIN (devapp270.sde)'. The 'Stylesheet' is set to 'ANZMeta'. The main content area displays a tree view of the 'sdet.GIS_DBA.SSDM' workspace, listing numerous feature classes. The right-hand pane shows the 'Contents' tab, displaying a table of the selected feature class, 'sdet.GIS_DBA.Acoustic_Feature_ply_WEL', with columns for 'Name' and 'Type'. The table indicates it is an 'SDE Feature Class'.

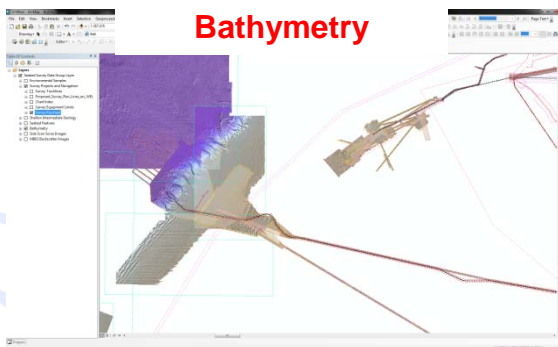
Name	Type
sdet.GIS_DBA.Acoustic_Feature_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Acoustic_Feature_pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Bathymetry_Contours_2m_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Bathymetry_Contours_2m_pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Bathymetry_Contours_2m_arc_WEL2	SDE Feature Class
sdet.GIS_DBA.Bathymetry_Contours_2m_pnt_WEL2	SDE Feature Class
sdet.GIS_DBA.Chart_Index_Map_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Environmental_Sample_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Fault_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Fault_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Fault_pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Geologic_Feature_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Geologic_Feature_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Geologic_Feature_pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Geophysical_Sensors_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Geotechnical_Cores_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Isochron_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Isopach_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Line_of_Profile_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Paleo_Channel_System_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Paleo_Channel_System_Cont_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Paleo_Channel_System_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Paleo_Channel_System_pnt_WEL	SDE Feature Class
sdet.GIS_DBA.projectname_inf_arc	SDE Feature Class
sdet.GIS_DBA.projectname_inf_pipeflow	SDE Feature Class
sdet.GIS_DBA.projectname_inf_ply	SDE Feature Class
sdet.GIS_DBA.projectname_inf_pnt	SDE Feature Class
sdet.GIS_DBA.Proposed_Survey_Run_Lines_arc_WEL	SDE Feature Class
sdet.GIS_DBA.Seabed_Feature_Arc_WEL	SDE Feature Class
sdet.GIS_DBA.Seabed_Feature_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Seabed_Receiver_Loc_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Seabed_Slope_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Sediment_Primary_Ply_WEL	SDE Feature Class
sdet.GIS_DBA.Sediment_Secondary_Ply_WEL	SDE Feature Class
sdet.GIS_DBA.Survey_Equipment_Limits_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Survey_Keysheet_ply_WEL	SDE Feature Class
sdet.GIS_DBA.Survey_Sounding_Grid_Pnt_WEL	SDE Feature Class
sdet.GIS_DBA.Survey_Tracklines_Arc_WEL	SDE Feature Class
sdet.GIS_DBA.TSdp_Sample_Pnt_WEL	SDE Feature Class

Corporate Seabed Survey Layers

OGP



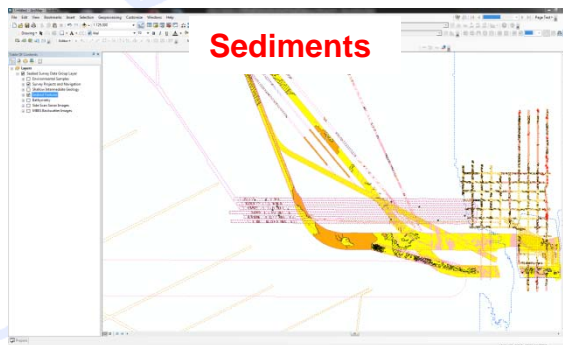
Seabed Features



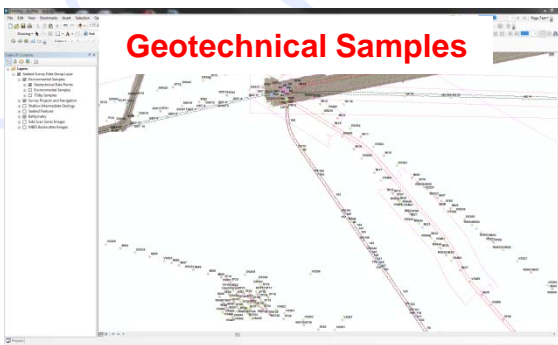
Bathymetry



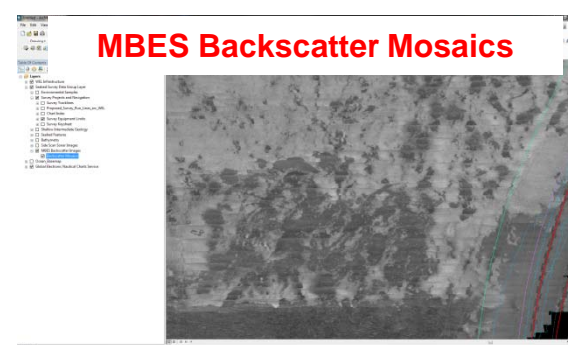
Side Scan Mosaics



Sediments



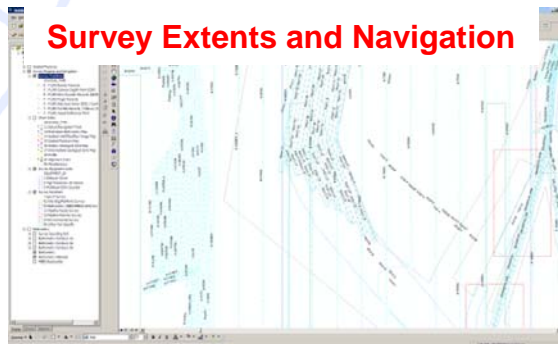
Geotechnical Samples



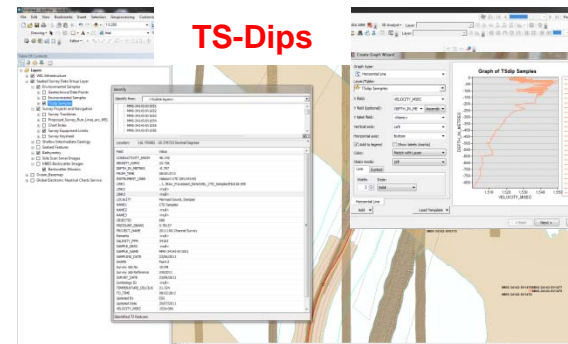
MBES Backscatter Mosaics



Shallow Geohazards



Survey Extents and Navigation

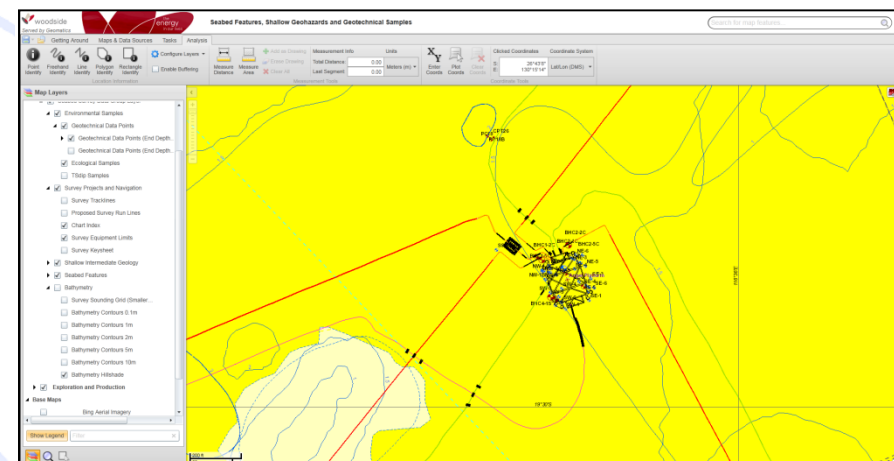
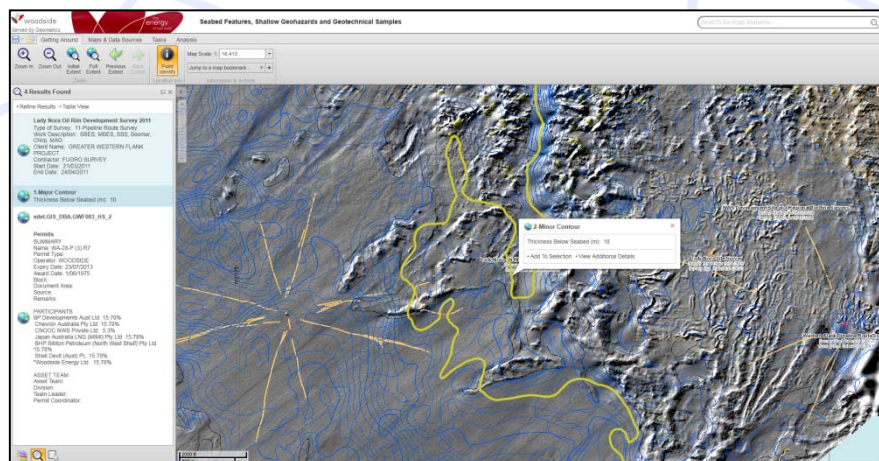
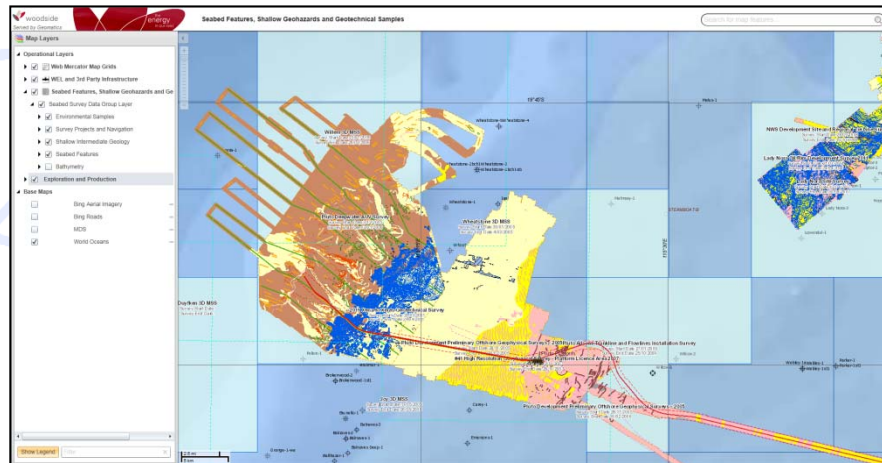


TS-Dips

Web Maps

OGP

- Provide the data to the enterprise without the need for users to have ArcGIS Desktop e.g. drillers



Summary



- The SSDM provides a better framework for managing and utilising seabed survey data
- Better storage and management of seabed survey data provides huge business value to O&G companies
 - Operational support
 - Improves the efficiency of regional geohazards studies
- The SSDM has been proven to work through its use within Shell and Woodside
- SSDM has good survey contractor and software vendor support
- The OGP Seabed Survey Data Model V1 is officially available and can be downloaded from the [OGP Geomatics site](#)
- For any SSDM questions please contact:

Lucyna Kryla-Straszewska

OGP Geomatics Co-ordinator

Email: Lucyna.Kryla-Straszewska@ogp.org.uk

Questions?

OGP

