Atomic Dielectric Resonance (ADR) measurements at Mansoura, Egypt for Melrose Resources PLC

Workflow 4: Data Processing & Interpretation

Workflow 4.3 Comparison to Typecasting Database

Workflow 5: Analysis & Results Delivery

Workflow 5.5.7 Virtual Borehole Logs

Sites:

- EDIK1 (training)
- SEDIK1 (blind test & training)

Date: 25th January 2012

Strictly Confidential © Adrok Ltd. 2011

© Copyright 1999-2012 & beyond, Adrok Ltd
No Part of this document may be photocopied or otherwise reproduced without the prior permission in writing of Adrok Ltd. Such written permission must also be obtained before any part of this document is stored in an electronic system of whatever nature.

SECURITY STATUS

Strictly confidential	:	Recipients only.
Recipients of this report	:	Melrose Resources PLC (www.melroseresources.com) Adrok Limited (www.adrokgroup.com)

About Adrok
Adrok develops and uses advanced technology to supply geophysical services for locating, identifying and mapping subsurface natural resources (oil, gas, water and minerals).
We call our services *Predrilling Virtual Logging.*

For further information go to www.adrokgroup.com

Adrok Ltd.
49-1 West Bowling Green Street
Edinburgh
EH6 5NX
SCOTLAND, U.K.
Tel: +44 (0) 131 555 6662
Fax: +44 (0) 131 553 7112

Disclaimer
The results, interpretations and conclusions in this report have been derived from Adrok's electronic system measurements and, whilst reasonable diligence has been applied to ensure data quality, Adrok cannot guarantee the accuracy or correctness of any results, interpretations and conclusions derived from those measurements. As a consequence, Adrok (nor any of its directors, officers, employees, advisers and consultants, whether past or present) shall be held liable for any loss, costs, damages or expenses of whatever kind (including any consequential loss, costs, damages or expenses) incurred or sustained by any person with respect to such results, interpretations and conclusions or reliance thereon.

The following report outlines data processing, interpretation and analysis of results produced by Adrok for Melrose for two sites: (1) EDIK1 (training), and (2) SEDIK1 (originally blind test however, Adrok received a limited set of results for this well from Melrose (John Naismith) by email on 15th January 2012 and have used this as additional training).

Described herein are:

- the database created by Adrok by collecting rock signatures of rocks samples chosen by Melrose in Adrok's typecasting chamber; and
- the results for eight spectral tests (HILDA) which compare the rock signatures to Adrok's data which has been used to classify the subsurface for the aforementioned sites.

6ft sections have been selected for analysis at each of the two sites.

The results are displayed in a log format, showing depth and matches of the field data to the database. Adrok have highlighted sections where training has indicated the predominant rock type.

Strictly Confidential © Adrok Ltd. 2011

Overview of Database and Processing

Lab Rock Samples
Positive values are assigned a value of 1.
Negative values are assigned a value of 2.

Adrok Database

HILDA: Unknown

Fourier Transform

Unknown Samples
Positive values are assigned a value of 10. Negative values are assigned a value of 20.

Matching Criteria
An unknown sample is subtracted from the rocks in the type casting library. An example of how the sample is matched is given below and on the next slide

LAB	SAMPLE	Subtraction	Mat ch
1	10	9	√
2	20	18	√
2	10	8	x
1	10	9	√
1	10	9	√
1	20	19	x
2	10	8	x

9 = Agreement with a positive hit
18 = Agreement with a negative hit
8 = Disagreement with a positive hit
19 = Disagreement with a negative hit

Strictly Confidential © Adrok Ltd. 2011

Example of Matching: Unknown sample minus Rock Sample

Rock Samples																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	1	2	2	2	1	1	1	2	2	2	1	1	2	2	2	2	2
1	1	1	2	1	2	1	1	1	1	2	2	2	1	1	1	2	2	1	1	1	1
2	2	2	2	2	1	2	2	2	2	1	1	2	2	2	2	2	1	2	2	2	2
1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	2	1	1	1
2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	1	2	2	2
2	2	2	1	1	1	1	1	2	1	1	1	2	1	2	1	2	2	2	2	2	2
1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Unknown Sample
20
10
20
10
10
20
10
20
10
20
10
20
10
20
10
20
10
20
10
20
10
20
10

Unknown - Rock Samples																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
18	18	18	18	18	19	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
18	18	18	18	18	19	18	18	18	18	19	19	19	18	18	18	19	19	18	18	18	18
9	9	9	8	9	8	9	9	9	9	8	8	8	9	9	9	8	8	9	9	9	9
18	18	18	18	18	19	18	18	18	18	19	19	18	18	18	18	18	19	18	18	18	18
9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9
18	18	18	18	18	18	18	18	18	19	18	18	18	18	18	18	18	18	18	18	18	18
9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9
18	18	18	18	18	18	18	18	18	19	18	18	18	19	18	18	18	18	18	18	18	18
8	8	9	8	9	8	9	8	8	9	8	8	9	8	8	9	8	9	9	8	8	9
19	18	18	19	19	19	18	19	18	18	19	19	19	19	19	18	19	19	19	19	19	19
9	9	9	8	8	8	9	9	9	8	8	8	8	8	8	8	8	8	8	8	8	8
18	18	18	19	19	19	19	18	18	19	19	19	19	18	19	19	19	19	19	19	19	19
8	9	8	8	8	8	8	8	9	8	8	8	8	8	8	8	8	9	8	8	8	8
19	18	19	19	19	19	19	19	19	18	19	19	19	19	19	18	19	19	18	19	19	19
8	9	8	8	8	8	8	8	8	9	8	8	8	8	8	9	8	8	9	8	8	8
18	18	18	19	19	19	19	19	19	18	19	19	19	18	19	18	19	18	18	18	18	18
9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Score:	14	18	16	10	12	7	14	13	14	12	8	8	10	12	11	16	9	10	16	12	12	13

Rock sample (2 – Shale) has the highest commonality with the unknown sample and therefore would be considered the best match for this test

Strictly Confidential © Adrok Ltd. 2011

Database Reclassification

Notes	Well	Depth (ft)	Depth (m)	Plate #	Description	Original Classification	New Classification
TAM1	El Tamad-2	6534	1992	1	KES SH	SHALE	SHALE
TAM2	El Tamad-2	6542	1994	2	KES SH		
TAM3	El Tamad-2	6543	1994	2	KES SH		
WD71	West Dikirnis-7	9132	2951	17	ARG SST	Medium SST / LST	Arg SST (Shaley)
WD72	West Dikirnis-7	9150	2951	19	ARG SST		
WD73	West Dikirnis-7	9146	2951	18	ARG SST		
SB5	South Batra-4	9759	2975	16	M - SST	Medium SST	Medium SST
TAM10	El Tamad-2	6624	2019	13	M SST		
SB7	South Batra-4	9687	2953	7	F SST, SILTY, RIPPLE LAM	Fine SST	F SST, SILTY, RIPPLE LAM
SB8	South Batra-4	9667	2947	5	F SST, SILTY, RIPPLE LAM		
SB9	South Batra-4	9697	2956	8	F SST, SILTY, RIPPLE LAM		
SB6	South Batra-4	9682	2951	6	F SST, SILTY, ARG, RIPPLE LAM	Fine SST (Arg)	Arg SST (Shaley)
SB10	South Batra-4	9682	2951	6	F SST, SILTY, ARG, RIPPLE LAM		
SB3	South Batra-4	9801	2987	21	VC SST	Coarse SST	Coarse SST
TAM5	El Tamad-2	6645	2025	16	M C SST		
TAM9	El Tamad-2	6628	2020	14	C SST		
SB1	South Batra-4	9848	3002	28	VC SST LAM	Coarse SST (lam)	Coarse SST (lam)
SB2	South Batra-4	9795	2986	20	VC SST LAM		
SB4	South Batra-4	9744	2970	14	M - C SST, X-LAM		
TAM6	El Tamad-2	6579	2005	7	LST	LST	LST
TAM12	El Tamad-2	6584	2007	8	LST		
TAM13	El Tamad-2	6596	2010	9	LST		

Reclassified

Reclassified

Strictly Confidential © Adrok Ltd. 2011

Points to note:

Interpreting the HILDA logs requires the adherence to certain rules. These have been established due to the sensitivity of HILDA.

- From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator as well as the Arg Sandstones.

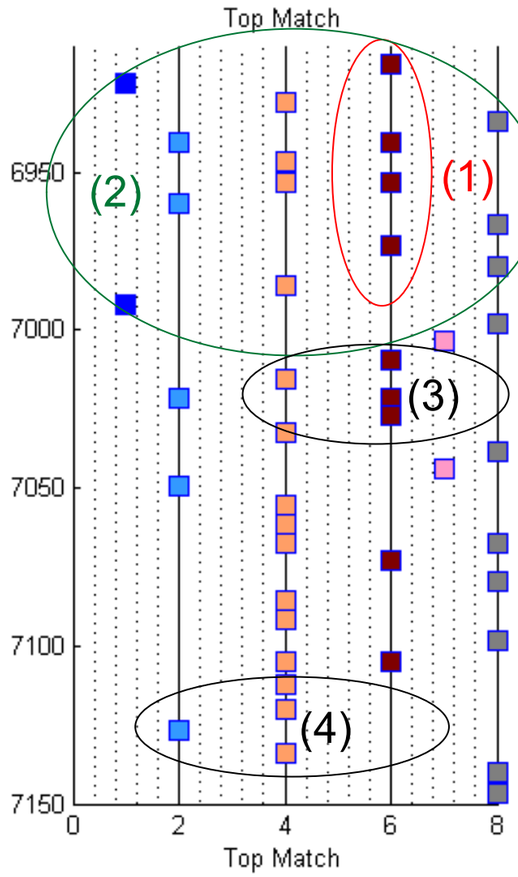
- Coarse SST that occurs at separate intervals without the presence of Coarse SST LAM is taken to be a false positive (1) and is representative of areas defined by other rock hits.

- A hit for shale (2) would be regarded as a shale area, extending this to include the areas of the other Shale indicators.

- Coarse SST that occurs in groups of 2 or more or that is interspersed with Coarse SST LAM would be considered an area of SST (3).

- Areas that are not clearly distinguished by Coarse SST hits or Shale would be classified as a silty shale area (4).

- Due to the possibility that there is a depth correction error, 50 feet has been added to the start and end depths of the areas of interest



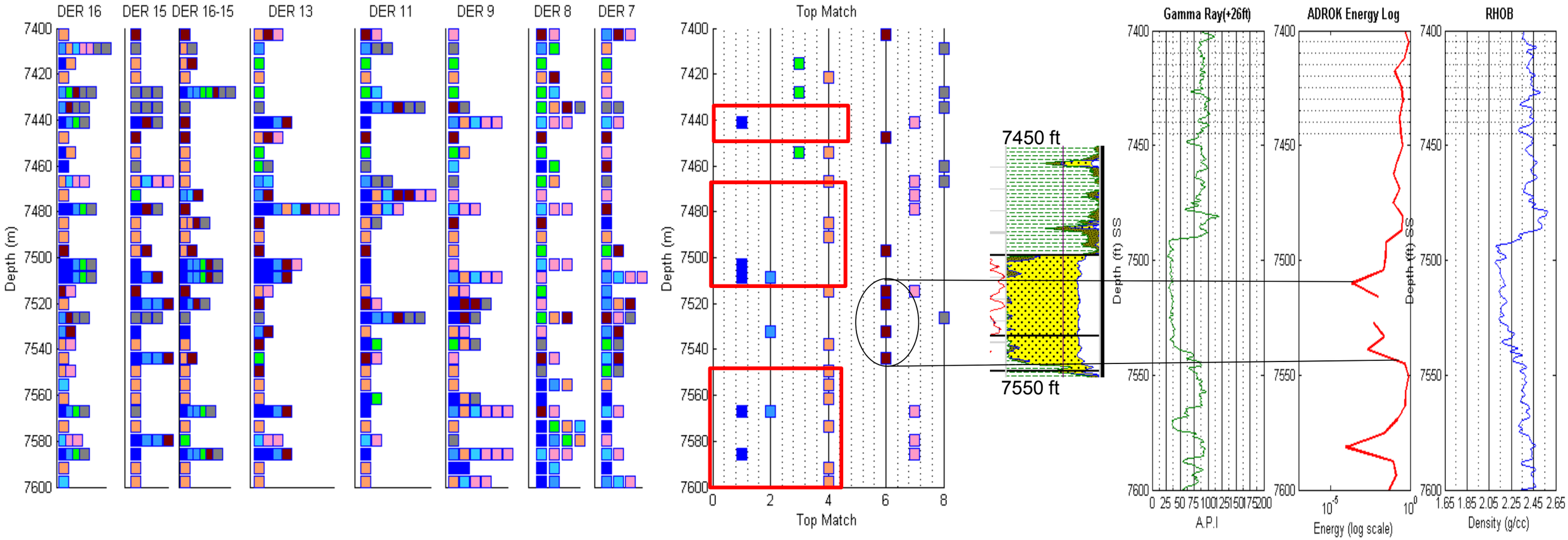
Strictly Confidential © Adrok Ltd. 2011

EDIK 1

Site: EDIK 1
Depth: 7450 – 7550 ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.



Due to the ‘pure’ shale hit using HILDA analysis and the Fine SST silty Ripple Lam indicator as well as the Adrok Energy log, the areas within the red box would be considered to be predominately shale.

Adrok:

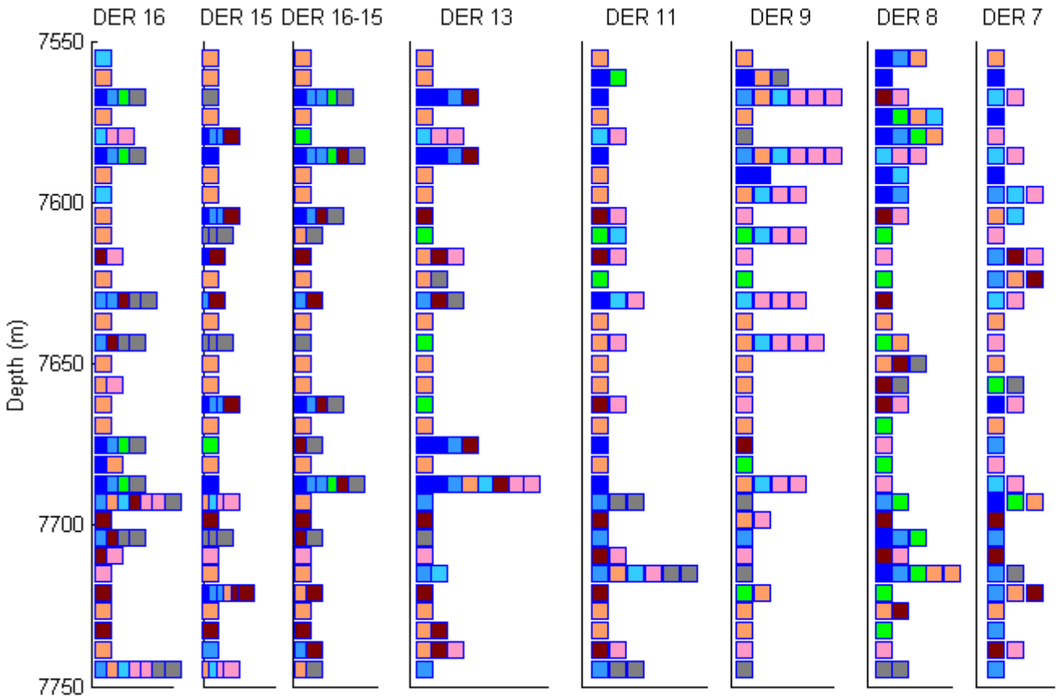
SHALE	Arg SST (Shaley)	MEDIUM SST	F ineSST Silty Ripple Lam	Arg SST (Shaley)	COARSE SST	COARSE SST (LAM)	LST

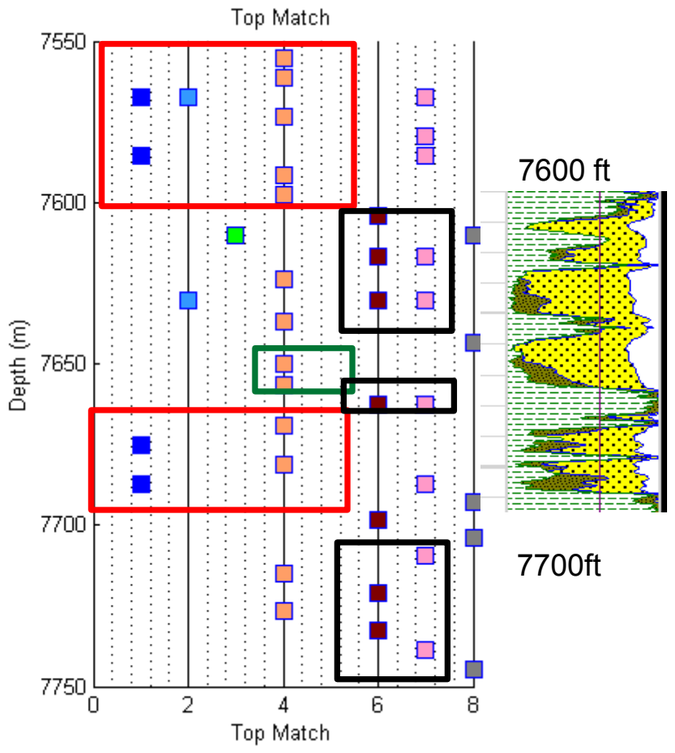
Strictly Confidential © Adrok Ltd. 2011

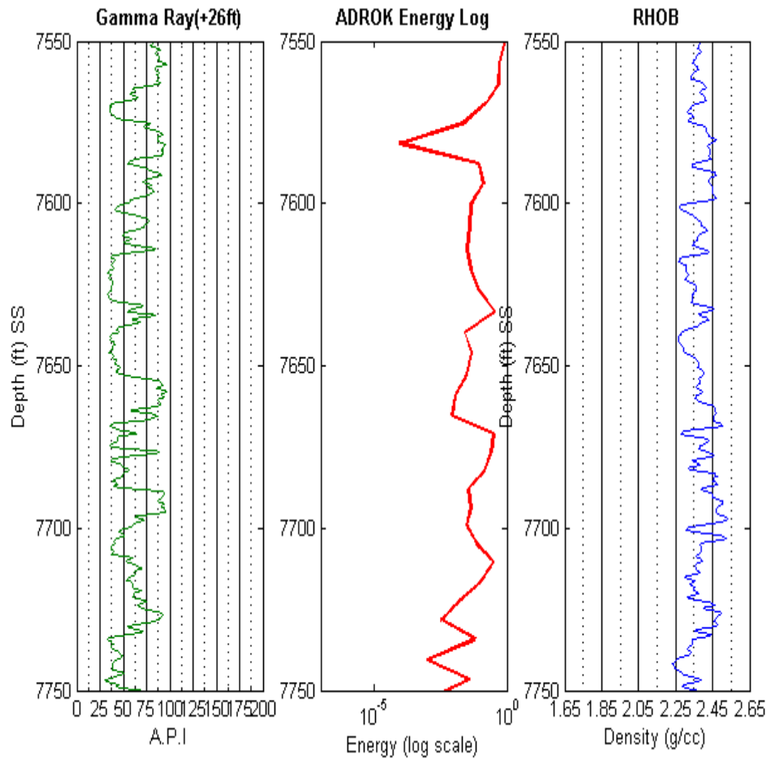
Site: EDIK 1
Depth: 7600 – 7700 ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.







Due to the 'pure' shale hit using HILDA analysis and the Fine SST silty Ripple Lam indicator as well as the Adrok Energy log, the areas within the red box would be considered to be predominately shale. The areas with the black box would be considered predominately sandstone and the area within the green box would be considered to be a silty shale.

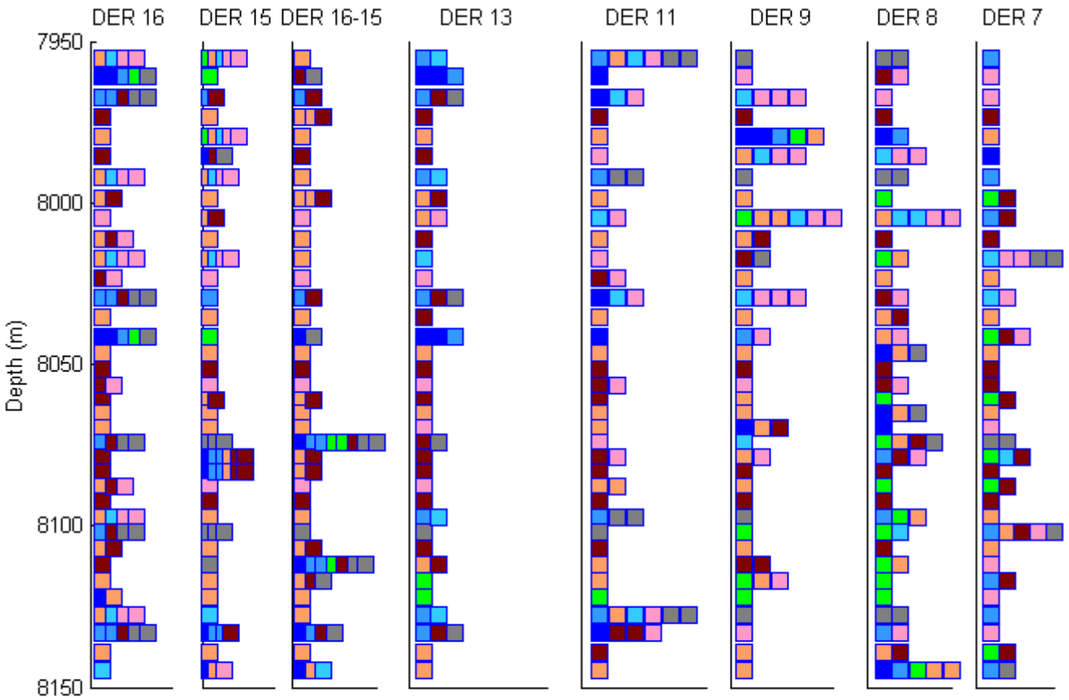
Adrok:

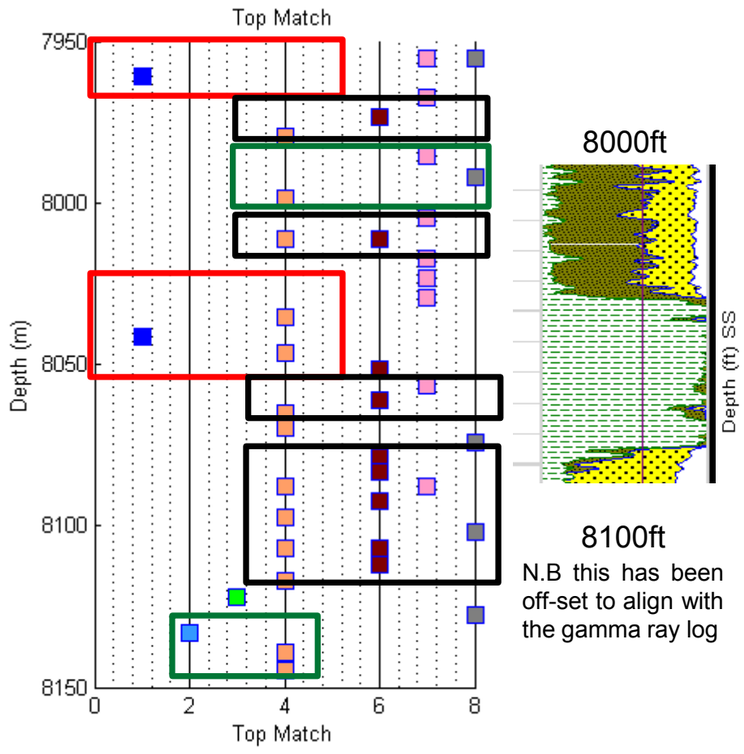
Strictly Confidential © Adrok Ltd. 2011

Site: EDIK 1
Depth: 8000 - 8100ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

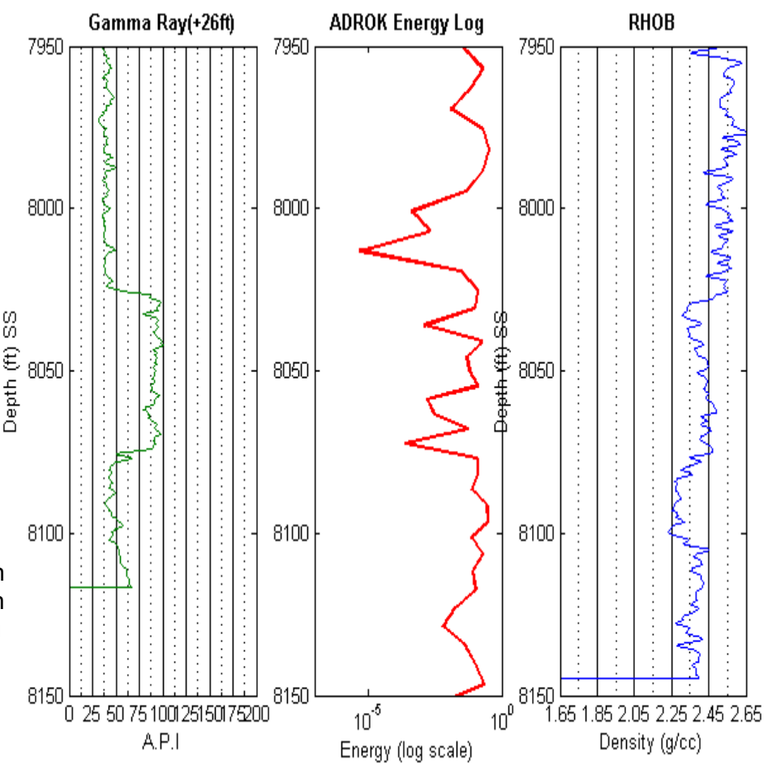
1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.





8100ft

N.B this has been off-set to align with the gamma ray log



Due to the 'pure' shale hit using HILDA analysis and the Fine SST silty Ripple Lam indicator as well as the Adrok Energy log, the areas within the red box would be considered to be predominately shale. The areas with the black box would be considered predominately sandstone and the areas within the green box would be considered to be a silty shale.

Adrok:

SHALE	Arg SST (Shaley)	MEDIUM SST	F ineSST Silty Ripple Lam	Arg SST (Shaley)	COARSE SST	COARSE SST (LAM)	LST

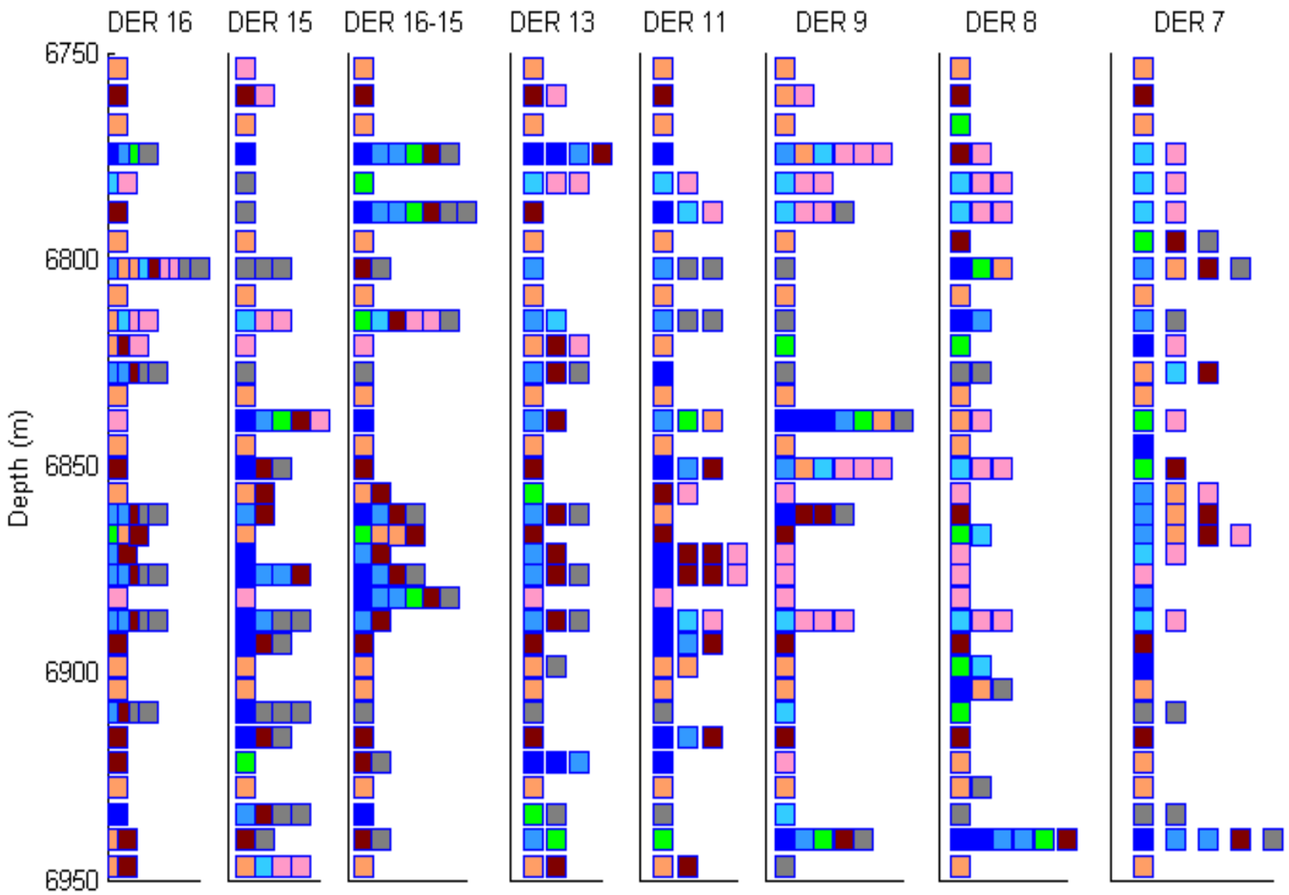
Strictly Confidential © Adrok Ltd. 2011

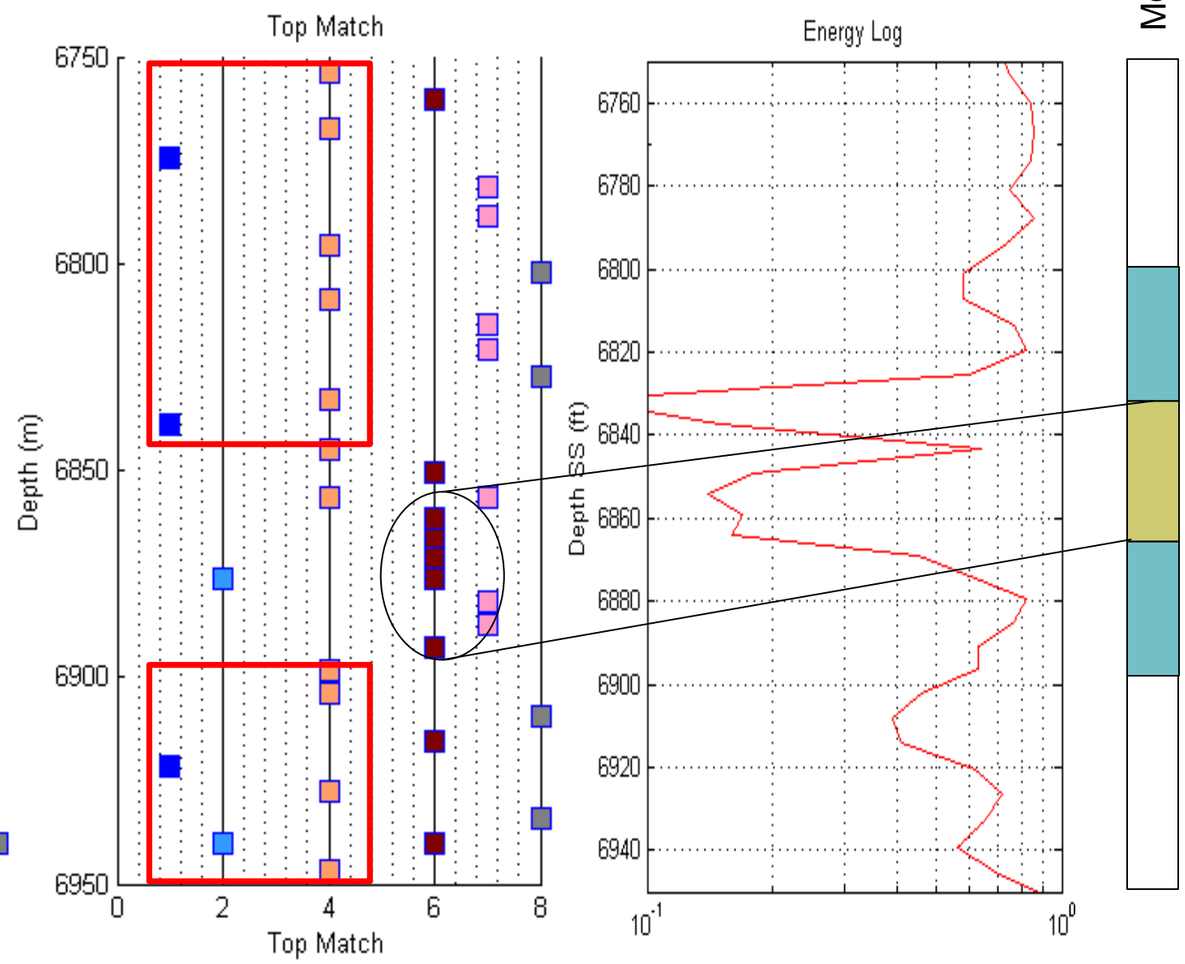
SEDIK 1

Site: SEDIK 1
Depth: 6800 - 6900ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.





Melrose:
Shale Sandstone

Due to the 'pure' shale hits using HILDA analysis and the Fine SST silty Ripple Lam indicator as well as the Adrok Energy log, the areas within the red box would be considered to be predominately shale.

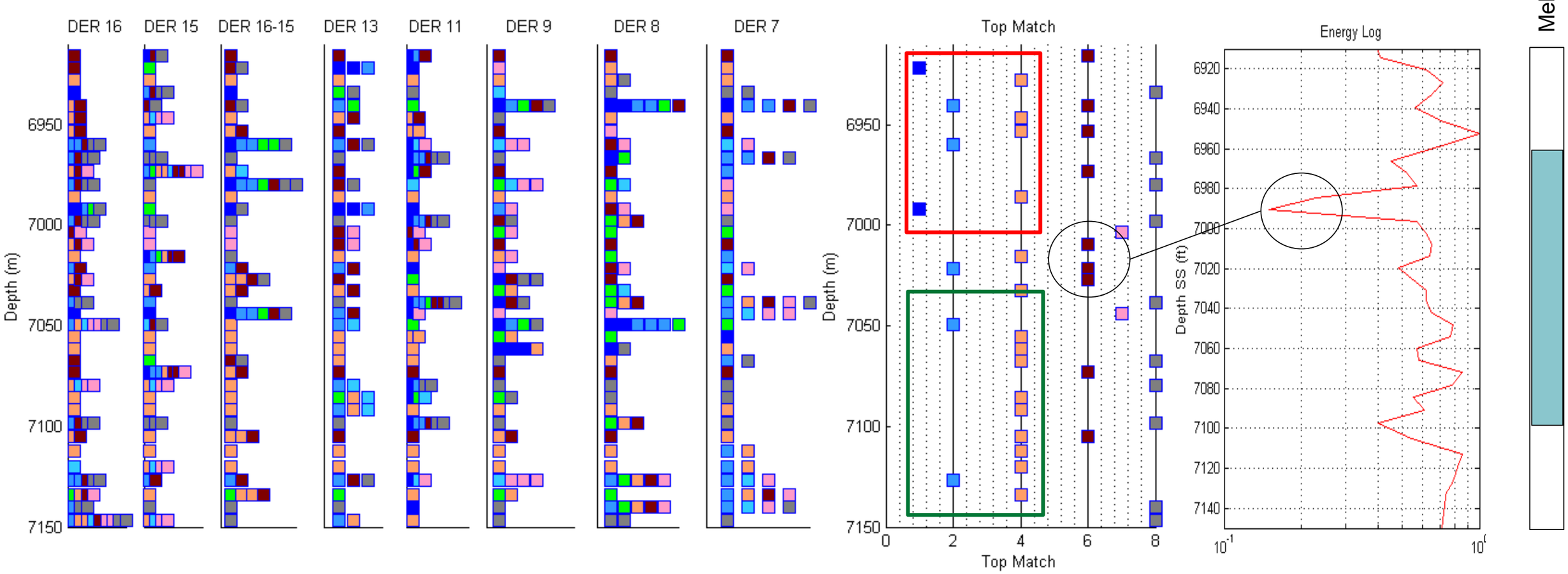
Adrok:

Strictly Confidential © Adrok Ltd. 2011

Site: SEDIK 1
Depth: 6960 – 7100ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.



Melrose:

Shale Sandstone

Adrok:

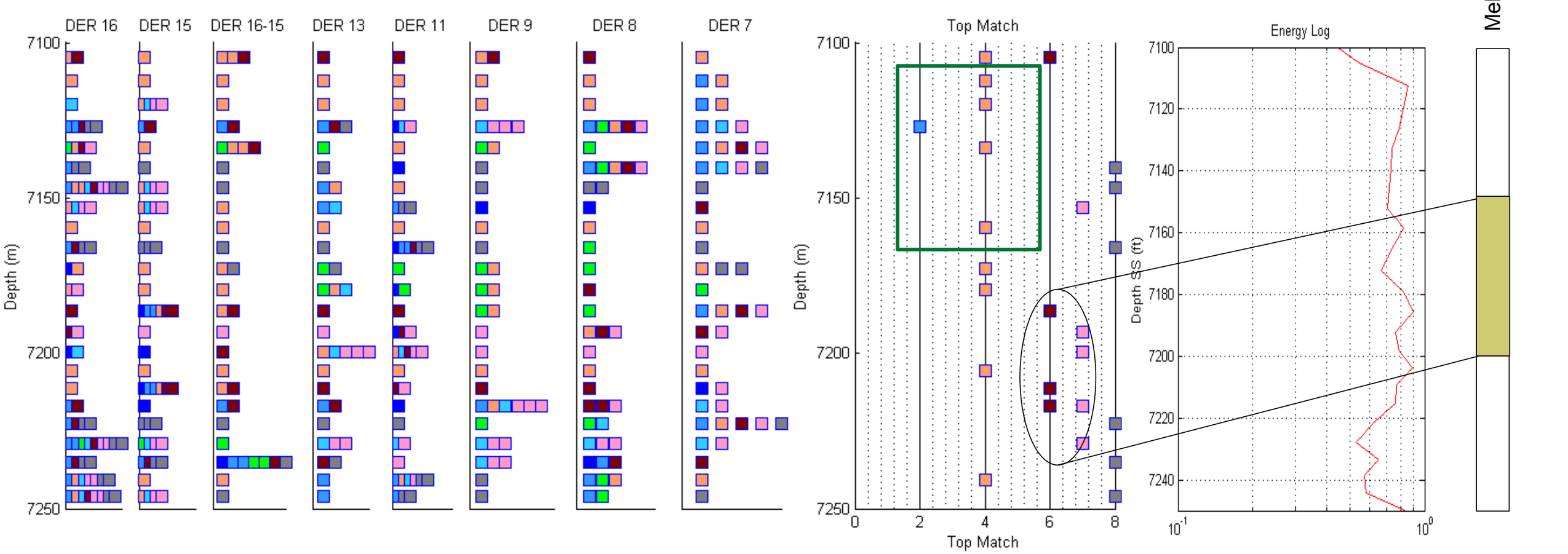
Due to the 'pure' shale hits using HILDA analysis and the Fine SST silty Ripple Lam indicator as well as the Adrok Energy log, the areas within the red box would be considered to be predominately shale. The area within the green box would be considered to be a silty shale.

Strictly Confidential © Adrok Ltd. 2011

Site: SEDIK 1
Depth: 7150 - 7200ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.



Melrose:
Shale Sandstone

Due to the absence of ‘pure’ shale hits using HILDA analysis with the Fine SST silty Ripple Lam indicator, the areas within the green box would be considered to be a silty shale.

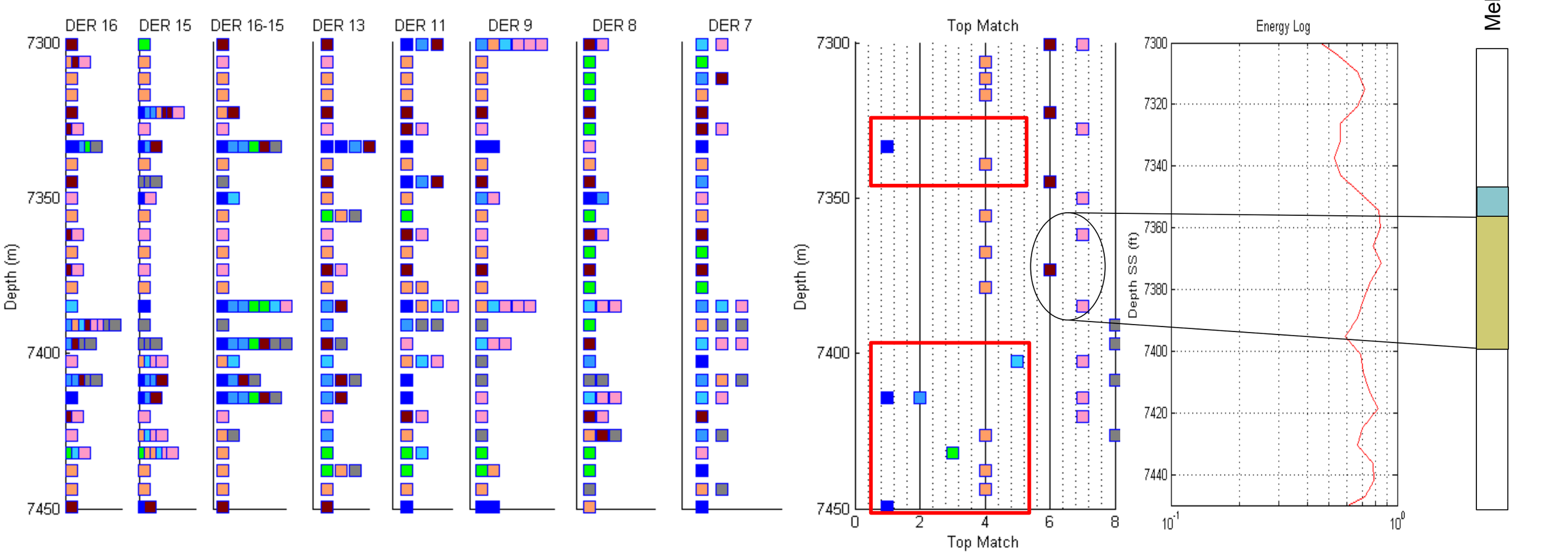
Adrok:

Strictly Confidential © Adrok Ltd. 2011

Site: SEDIK 1
Depth: 7350 - 7400ft
(50 feet has been added at each end to allow for possible discrepancies in depth)

Points to note:

1. Adroks HILDA analysis is very sensitive and will identify trace material.
2. From Adroks training, Fine SST Silty Ripple Lam is considered to be a Shale indicator.



Melrose:

Shale Sandstone

Due to the 'pure' shale hit using HILDA analysis and the Fine SST silty Ripple Lam indicator as well as the Adrok Energy log, the areas within the red box would be considered to be predominately shale.

Adrok:

Strictly Confidential © Adrok Ltd. 2011