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## **Geological Report**

on

**Anadarko Arrowhead River K-35**

**Arrowhead River K-35**

**Well Reached Total Depth on  
Mar 25, 2003 @ 11:50**

for

**Anadarko Canada Corporation**

**Prepared For:** Mike Fawcett, Ben Urlwin  
Anadarko Canada Corporation

**Prepared By:** Erika Lange  
K.C. Waunch Petroleum Consultants L

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Erika Lange

## Table of Contents

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<u>Section</u>	<u>Page</u>
Well Abstract	1-1
Well Summary	2-1
Daily Drilling Summary	3-1
Casing Strings	4-1
Bit Records	6-1
Logging Reports	9-1
Deviation Survey Points	12-1
Mud Data	14-1
Work Schedule	15-1
Formation Tops	16-1
Sample Descriptions w/ Formation Tops	19-1

# Well Summary

Storage Units: Metric

## Well Information

Operator: Anadarko Canada Corporation  
Well Name: Anadarko Arrowhead River K-35  
Location: Arrowhead River K-35  
UWI: 300K356040122450  
Pool: Slave Point  
Field: Arwhd River  
State / Province: NWT  
Country: Canada  
License Number: 1991  
Well Status: Set surface casing, waiting for next winter

## Surface Co-ordinates

Hole Type:

Fault Indicator:

Latitude:

Longitude:

N / S: 60 34 38 1 N

E / W: 122 51 47 2

## Bottom Hole Co-ordinates

Latitude:

Longitude:

N / S:

E / W:

## Elevations

Ground Elevation:	541.70	Reference:	541.7
Kelly Bushing Elevation:	546.73	Kelly Bushing to Ground:	5.03
Casing Flange Elevation:		Cut (-):	
		Fill (+):	

## Total Depth

Total Depth Driller (Tally) :	Measured Depth	True Vertical Depth
Total Depth Driller (Strap or SLM):	652.00	652.00
Total Depth Logger:		

## Miscellaneous Depths

Plugback Depth:	Water Depth Reference: 100
Sidetrack Depth:	Water Depth:

## Well Summary

Drilling Contractor:	Shehtah Wilson #4	Spud Date:	Mar 21, 2003	@ 01:15
Rig Release Date:	Mar 27, 2003	@ 00:00	Total Depth Date:	Mar 25, 2003 @ 11:50

Cores	#	Formation	Interval	Cut	Recovered	%
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## Casing Summary

Casing Type	Casing Size	Landed Depth	Hole Size
Surface	244.5	650.00	311.0

## Logging Summary

Company	Engineer	Total Depth (MD)	Logging tools
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Anadarko Canada Corporation  
UWI 300K356040122450

Anadarko Arrowhead River K-35  
Arrowhead River K-35  
Page 2-1

## Daily Drilling Summary

Storage Units:      Metric

Date	Depth	Progress	Rotating Hours	Avg. P.R.	Daily Costs	Formation	Operational Status @ Report Time
Mar 24, 03	560.00		8.50			Scatter	Drilling Surface, towards 650m
Mar 25, 03	644.00		9.20			Garbutt	Tripping back in the hole, to drill to 650m for setting Surface Casing
Mar 26, 03	652.00					Garbutt	Finishing Cementing Surface Casing

Accumulated Daily Costs:

## Casing Data Summary

Storage Units:

Metric

**Casing Type:** Surface

**Casing Size:** 244.5

**Casing Landed @:** 650.00

**Casing Date:** Mar 25, 2003 @ 00:00

**Hole Size:** 311.0

**Total Joints:** 50

**Plug Down Date:** Mar 26, 2003 @ 00:00

**# of Joints / Length / O.D. / Weight:** 50; 13m; 244.5mm; 59.6kg/m

**Cementing Details:**

**Remarks:**

## Bit Record

### Pump Data

Pump #1	Model: 8-p-80	Size: 80	Type: triplex
	Pump Rod Diameter:	Liner Size: 152.0	Stroke Length: 203
	Efficiency Rating (%): 90		

Pump #2	Model:	Size:	Type:
	Pump Rod Diameter:	Liner Size:	Stroke Length:
	Efficiency Rating (%):		

### Bit Data

Storage Units:      Metric

Bit #: 1	Make: Smith	Type: SDGH	IADC Series / Type: /
Serial #: YD1813	Size: 311.0 Jets / Nozzles:	15.90 / 15.90 / 15.90 /	T.F.A.:
Depth In: 0.00	Depth Out: 176.00	Made: 176.00	Rotating Hours: 13.74
	Average Drill Rate:	12.81	Total Rotating Hours: 13.74

Bit Grade / Condition I.A.D.C.: 2 / 2 / WT / A / / / 1 / BC / / T/B/G: 2 / 2 / 1

Remarks:

Formations Drilled: Surface

Drilling Parameters

	Min		Max		Min		Max
Force on Bit:	2,000	/	8,000	R.P.M.:	65	/	140
Pump 1 S.P.M. / Volume:	85	/	1,239	Pump 2 S.P.M. / Volume:		/	
S.P.P.:	2,469	/	6,000	Fluid Density:	1,060	/	1,100
Drift Angle:	0.000	/	1.000	Funnel Viscosity:	40	/	67

Annular Velocity	Drill Collars:	HeavyWeight Drill Pipe:	Drill Pipe:
Bottoms Up	Depth:	Theoretical:	Actual:

Bit #: 2	Make: Hughes	Type: SDGH	IADC Series / Type: /
Serial #: YD813	Size: 311.0 Jets / Nozzles:	14.30 / 14.30 / 12.70 /	T.F.A.:
Depth In: 176.00	Depth Out: 483.00	Made: 307.00	Rotating Hours: 16.25
	Average Drill Rate:	18.89	Total Rotating Hours: 29.99

Bit Grade / Condition I.A.D.C.: 2 / 3 / CT / A / / / 1 / BC / / T/B/G: 2 / 3 / 1

Remarks:

Formations Drilled:

Drilling Parameters

	Min		Max		Min		Max
Force on Bit:	7,000	/	11,000	R.P.M.:	120	/	140
Pump 1 S.P.M. / Volume:	105	/	1,239	Pump 2 S.P.M. / Volume:		/	
S.P.P.:	2,500	/	9,000	Fluid Density:	1,100	/	
Drift Angle:		/		Funnel Viscosity:		/	

Annular Velocity	Drill Collars:	HeavyWeight Drill Pipe:	Drill Pipe:
Bottoms Up	Depth:	Theoretical:	Actual:

**Bit Data**

Storage Units:

Metric

Bit #:	3	Make:	Smith	Type:	SDGH	IADC Series / Type:	/
Serial #:	YD9033	Size:	311.0 Jets / Nozzles:	15.90 / 15.90 / 15.90 /	T.F.A.:		
Depth In:	483.00	Depth Out:	652.00	Made:	169.00	Rotating Hours:	11.75
			Average Drill Rate:	14.38	Total Rotating Hours:	41.74	

Bit Grade / Condition I.A.D.C.: 3 / 4 / BC / A / / I / NO / TD / TD T / B / G: 3 / 4 / I

**Remarks:**

Formations Drilled: Scatter, Garbutt

**Drilling Parameters**

	Min	Max		Min	Max
Force on Bit:	11,000 /	12,000	R.P.M.:	120 /	180
Pump 1 S.P.M. / Volume:	105 /	1,239	Pump 2 S.P.M. / Volume:	/	
S.P.P.:	2,500 /	10,000	Fluid Density:	1,120 /	
Drift Angle:	/		Funnel Viscosity:	75 /	

Annular Velocity  
Bottoms UpDrill Collars:  
Depth:HeavyWeight Drill Pipe:  
Theoretical:Drill Pipe:  
Actual:

## Work Schedule

Storage Units:

Metric

**Company:** K.C.Waunch Petroleum Cons Ltd  
**Geologist:** Erika Lange

<b>Work Performed</b>	<b>From:</b>	Mar 24, 2003	<b>To:</b>	Mar 26, 2003
<b>Depths Logged</b>	<b>From:</b>	200.0	<b>To:</b>	650.0

**Remarks:**

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## Formation Top Summary

Storage Units:

Metric

Kelly Bushing Elevation:  
Ground Elevation:

546.73  
541.70

Casing Flange Elevation:

**\*\* All Depths measured from Kelly Bushing Elevation \*\***

Group Formation Member	Prognosis (TVD)	Sample Top (MD)	Sample Top (TVD)	Log Top (MD)	Log Top (TVD)	Subsea	Thickness
<b>Surface</b>		0.00	0.00			546.73	505.00
<b>Scatter</b>		505.00	505.00			41.73	47.00
<b>Garbutt</b>		552.00	552.00			-5.27	97.00
<b>Total Depth</b>		652.00	652.00			-105.27	

## Sample Descriptions

Storage Units:    Metric

Surface: 0.00 MD, 0.00 TVD, 546.73 SSL

200.00 to 230.00 (30.00)	90%	<b>Shale</b> black, dark gray, silty, earthy, slightly micromicaceous, moderately hard, blocky, trace glauconite, quartz
	10%	<b>Sandstone</b> light gray, quartz, trace glauconite, very fine to fine grains, subangular, moderately well sorted, 10% calcite cement, moderately poor relief, fairly tight
230.00 to 235.00 (5.00)	75%	<b>Shale</b> dark gray, as above but less silty
	25%	<b>sandstone</b> as above, but more fine grains
235.00 to 240.00 (5.00)	100%	<b>Shale</b> dark brown black, micromicaceous, earthy, hard, blocky
240.00 to 245.00 (5.00)	60%	<b>Sandstone</b> white gray, quartz, glauconite, occasional mica, very fine to fine grains, subangular, moderately sorted, 20% calcite cement, poor releif, tight
	40%	<b>Shale</b> dark gray, occasional brown, slightly micromicaceous, hard, blocky, few earthy
245.00 to 250.00 (5.00)	60%	<b>Shale</b> black gray, slightly micromicaceous, hard, mostly blocky, few platy, trace glauconite
	40%	<b>Sandstone</b> white gray, quartz, glauconite, occasional mica, very fine grains, subangular, moderately sorted, 20% calcite cement, poor releif, tight
250.00 to 255.00 (5.00)	60%	<b>Sandstone</b> brown, quartz, glauconite, very fine grains, subangular to angular, moderately sorted, 10% calcite cement, poor releif, tight
	25%	<b>Shale</b> black, slightly micromicaceous, hard, platy and blocky; trace calcite crystals
	15%	<b>Siderite</b> red to orange, rhty, silty, massive
255.00 to 260.00 (5.00)	60%	<b>Sandstone</b> light gray, quartz, glauconite, very fine to fine grains, subangular, moderately sorted, 30% calcite cement, poor releif, tight
	40%	<b>Shale</b> dark gray, slightly micromicaceous, blocky, silty, occasionally platy and massive

## Sample Descriptions

Storage Units:    Metric

260.00 to 265.00 (5.00)	70%	<b>Sandstone</b> brown and gray, quartz, trace glauconite, very fine grains, subangular, moderately sorted, 20% calcite cement, poor releif, tight
	30%	<b>Shale</b> med gray, slightly micromicaceous, moderately hard, blocky and platy
265.00 to 270.00 (5.00)	75%	<b>Sandstone</b> white gray, quartz, trace glauconite, very fine grains, subangular, moderately sorted, 20% calcite cement, poor releif, tight
	25%	<b>Shale</b> dark gray, occasionally micromicaceous, moderately hard, slightly earthy, blocky
270.00 to 275.00 (5.00)	60%	<b>Sandstone</b> gray, quartz, trace glauconite, and shale, very fine grains, subangular, moderately sorted, 10% calcite cement, poor releif, tight
	40%	<b>Shale</b> dark gray, occasionally micromicaceous, slightly earthy, moderately hard; trace siderite
275.00 to 300.00 (25.00)	80%	<b>Sandstone</b> white, mostly quartz, trace glauconite and shale, mostly very fine grains, subrounded, well sorted, some unconsolidated, moderate releif, Type IB 8% porosity; stringers of consolidated sand with 20 % calcite cement
	20%	<b>Shale</b> black, moderately hard, slightly platy, mostly massive
300.00 to 325.00 (25.00)	80%	<b>Sandstone</b> white and gray, mostly quartz, trglau and shale, very fine to fine grains, subangular to subrounded, well sorted, fairly consolidated, occasional calcite cement, moderate releif, Type IB-IC, 6% porosity
	20%	<b>Shale</b> dark gray, brown, micromicaceous, moderately hard, blocky; trace pyrite
325.00 to 330.00 (5.00)	80%	<b>Sandstone</b> white gray, quartz, glauconite, very fine grains, subrounded, well sorted, 10% calcite cement, poor to moderate releif, fairly tight
	20%	<b>Shale</b> dark gray, hard, mostly blocky
330.00 to 335.00 (5.00)	50%	<b>Sandstone</b> white gray, quartz, glauconite, very fine grains, subangular, well sorted, 20% calcite cement, consolidated, poor releif, tight

## Sample Descriptions

Storage Units:    Metric

330.00 to 335.00 (5.00)	50%	<b>Shale</b> 20% gray as above, 30% brown, silty, earthy, hard, blocky
335.00 to 340.00 (5.00)	50%	<b>Sandstone</b> white gray, quartz, glauconite, very fine grains, subangular, moderately sorted, 20% calcite cement, well consolidated, poor releif, tight
	50%	<b>Shale</b> as above
340.00 to 345.00 (5.00)	70%	<b>Sandstone</b> as above
	30%	<b>Shale</b> dark gray, slightly micromicaceous, hard, blocky
345.00 to 350.00 (5.00)	70%	<b>Sandstone</b> orange brown, quartz, very fine grains, subangular, moderately sorted, silty, 10% calcite cement, poor releif, tight, earthy
	30%	<b>shale</b> dark gray, micromicaceous, hard, massive, blocky
350.00 to 355.00 (5.00)	70%	<b>Shale</b> black gray, as above
	30%	<b>Sandstone</b> tl gray, quartz, trace glauconite, very fine grains, subangular, moderately sorted, 20% calcite cement, well consolidated, poor relief, tight
355.00 to 360.00 (5.00)	90%	<b>Shale</b> black, massive, platy, occasionally micromicaceous, occasional trace glauconite, moderately hard
	10%	<b>Sandstone</b> as above
360.00 to 370.00 (10.00)	70%	<b>Shale</b> dark gray, slightly micromicaceous, moderately hard, slightly earthy, blocky; trace pyrite
	30%	<b>Sandstone</b> white gray, quartz, trace glauconite, very fine to fine grains, subangular to subrounded, well sorted, 20% calcite cement, moderately poor releif, tight
370.00 to 380.00 (10.00)	50%	<b>Sandstone</b> white and gray, mostly quartz, glauconite, very fine grains, subrounded to angular, moderately sorted, 10% calcite cement, occasionally silty, poor releif, tight

## Sample Descriptions

Storage Units:    Metric

370.00 to 380.00 (10.00)	50%	<b>Shale</b> black gray, micromicaceous, moderately hard, slightly rhty, blocky
380.00 to 385.00 (5.00)	50%	<b>Shale</b> as above
	30%	<b>sandstone</b> as above; few stringers of white, fine grain, no cement, moderate relief, 6% porosity grains
	20%	<b>Siltstone</b> light gray, very very fine grains, well consolidated, calcite cement
385.00 to 390.00 (5.00)	80%	<b>Shale</b> dark gray, occasionally brown, slightly micromicaceous, blocky, hard, massive
	20%	<b>Siltstone</b> as above
390.00 to 395.00 (5.00)	70%	<b>Shale</b> as above
	30%	<b>Siltstone</b> as above
395.00 to 445.00 (50.00)	70%	<b>Shale</b> dark gray, slightly micromicaceous, moderately hard, blocky, occl silty
	30%	<b>Sandstone</b> white gray, mostly quartz, glauconite, trace shale, very fine grains, subangular, moderately sorted, 20% calcite cement, poor releif, tight, stly
445.00 to 470.00 (25.00)	90%	<b>Shale</b> dark gray, micromicaceous, moderately hard, blocky, glauconite associated, occasionally earthy
	10%	<b>Siltstone</b> gray, quartz, glauconite, very very fine grains, moderately sorted, well cemented, well consolidated, tight
470.00 to 480.00 (10.00)	100%	<b>Shale</b> black gray, slightly micromicaceous, hard, rhty, trace glauconite associated, occasionally platy; trace Siltstone
480.00 to 485.00 (5.00)	90%	<b>Shale</b> as above

## Sample Descriptions

Storage Units: Metric

480.00 to 485.00 (5.00)	10%	<b>Sandstone</b> white gray, mostly quartz, glauconite, very fine grains, subangular, moderately sorted, 20% calcite cement, poor relief, tight
485.00 to 505.00 (20.00)	85%	<b>Shale</b> dark gray, slightly micromicaceous, platy, earthy, hard
	15%	<b>Sandstone</b> as above
<b>Scatter: 505.00 MD, 505.00 TVD, 41.73 SSL</b>		
505.00 to 515.00 (10.00)	50%	<b>Sandstone</b> light gray, occasionally light brown, quartz, glauconite, trace shale, very fine to fine grains, subangular, moderately sorted, occasional 20% calcite cement, moderate and poor relief, occasional 5% porosity
	50%	<b>Shale</b> black gray, slightly micromicaceous, blocky, hard, massive, occasional trace glauconite associated
515.00 to 520.00 (5.00)	60%	<b>Sandstone</b> light gray and light brown, mostly quartz, glauconite, trace shale, mostly fine grains, subangular, moderately well sorted, less calcite cement, moderate relief, Type IB, occasional 8% porosity
	40%	<b>Shale</b> as above
520.00 to 530.00 (10.00)	70%	<b>Sandstone</b> as above
	30%	<b>Shale</b> dark gray = slightly micromicaceous, hard, blocky, slightly earthy; brown = massive, hard blocky
530.00 to 535.00 (5.00)	75%	<b>Shale</b> as above
	25%	<b>Sandstone</b> as above
535.00 to 540.00 (5.00)	40%	<b>Shale</b> light and dark gray, micromicaceous, blocky, hard; trace pyrite
	30%	<b>Sandstone</b> light gray and light brown, quartz, glauconite, trace shale, very fine to fine grains, subangular, moderately sorted, moderate relief, Type IB, 5% porosity

## Sample Descriptions

Storage Units: Metric

535.00 to 540.00    30%    **Siltstone**  
(5.00)                      light brown, massive, blocky, hard

540.00 to 545.00    70%    **Shale**  
(5.00)                      med gray, slightly micromicaceous, hard, blocky

30%    **Siltstone**  
light brown, massive, hard, silty

### Garbutt: 552.00 MD, 552.00 TVD, -5.27 SSL

545.00 to 555.00    50%    **Shale**  
(10.00)                      as above

50%    **Siltstone**  
as above

555.00 to 570.00    90%    **Shale**  
(15.00)                      dark gray and black, slightly micromicaceous, massive, blocky, hard

10%    **Siltstone**  
dark gray, quartz and glauconite, very very fine grains, moderately sorted, well consolidated, hard

570.00 to 615.00    100%    **Shale**  
(45.00)                      mostly black, occasional brown in upper, dark gray in lower, moderately soft, slightly micromicaceous, blocky and occasionally platy

615.00 to 620.00    85%    **Shale**  
(5.00)                      as above

15%    **Siltstone**  
dark gray, quartz, well consolidated, tight

620.00 to 625.00    90%    **Shale**  
(5.00)                      as above

10%    **Siltstone**  
as above

625.00 to 640.00    100%    **Shale**  
(15.00)                      mostly black, slightly micromicaceous, soft, platy, occasionally blocky

640.00 to 645.00    100%    **Shale**  
(5.00)                      dark gray, slightly micromicaceous, moderately hard, platy, occasionally blocky; trace pyrite, coal

## Sample Descriptions

Storage Units: Metric

Total Depth: 652.00 MD, 652.00 TVD, -105.27 SSL







