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REMOTE SENSING, LLC
CopelandRemoteSensing.com

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US Patent 10,761,237 B1

RW CARTER HYDROCARBON SURVEY POINTS OF INTEREST

Waterflood application of HS technology

Two pay zone HS survey scenarios

Introduction: Subject well – RW Carter 4BH, 42-055-34885, Texas RRC lease #14965, IP test May 14, 2008. It was drilled horizontally in the Edwards zone, which is some 350 ft below the existing Austin Chalk producing zone to tap the **strong water drive Edwards**. The initial production (IP) of the well was **flowing up the 7" casing, 284 bopd & 6,188 bwpd which is a 4.6% oil cut**.

A medium resolution Hydrocarbon Surveys survey was run on the entire lease which revealed a high area around the 1B location. It showed a much higher area near the southwest side of the lease. The HS data value code is shown on the left side of the Carter illustration. A vertical value presentation of the HS survey is also included.

To determine the best member of the Upper Edwards to drill the lateral in, 4 vertical wells were drilled straddling the path of the proposed 1,000 ft lateral. These wells were logged with high resolution, 20-inch logs through the Upper Edwards formation. The log on the #1B well showed higher potential than the other 3 wells. Given the correlation between the HS readings around the #1B and the well logs, the operator reversed the direction of the lateral to the southwest and made a VERY SUCCESSFUL WELL. It produced some **75,116 bo in the first 19 months, still making 91 bopd**, before another well was added to the lease.

Hydrocarbon Surveys Points of Interest

1. **Hydrocarbon Surveys (HS) technology is an extremely useful tool for WATERFLOOD scenarios.**
2. This is a **two-pay zone scenario** with the horizontal, Edwards, being below the existing Austin Chalk formation. The total vertical depth (TVD) of the Edwards is only 2,800 feet.
3. The play is based on a large, 450 ft, fault which traps the Edwards up against shales. This fault was shown by the HS system, as well as another known fault, down-dip to the east. HS survey data indicated an UNKNOWN CROSS FAULT.
4. Additionally, HS data indicates a small oil reservoir on the down-thrown side of the main fault which was caused by a dragging effect (see diagram). This is not the case on the lesser fault to the east.
5. A few years later HS road surveys along a road on the north side of lease showed lower HS readings, which confirms drainage by the horizontal wells.

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Hydrocarbon Surveys (HS) - GREAT SUCCESS

Direction of lateral REVERSED AFTER HS SURVEY

WATERFLOOD & 2 Pay Zone technology application

NORTH SOUTH OIL, LLC
RW Carter Lease - Texas RRC #14965
RW Carter 4BH - API 42-055-34885
Caldwell County, Texas
Hydrocarbon Survey Map
HydrocarbonSurveys.com
Mapping based on Medium Density Survey
February 23, 2008.

HYDROCARBON SURVEYS
US PATENT #US 10,761,237 B1

Red DOTS are HS Survey Points

Approximate IN ZONE (Only 200 Ft.)

4BH

#1 DISPOSAL WELL

VERY GOOD WELL from HS SURVEY

#3B

#2B

Approximate Original Drilling Plan

#1B

FAULT LINES

CROSS FAULT

CROSS FAULT FOUND WITH HS SURVEY

FAULT LINES

N

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HS READINGS

HYDROCARBON PREDOMINANCE

FAULTING PREDOMINANCE

Salt Flat Field
Luling Fault System
Up-to-the Coast Fault

Multi-Pay Fault Block

Austin Chalk Production

Austin Chalk Producing Zone

Edwards

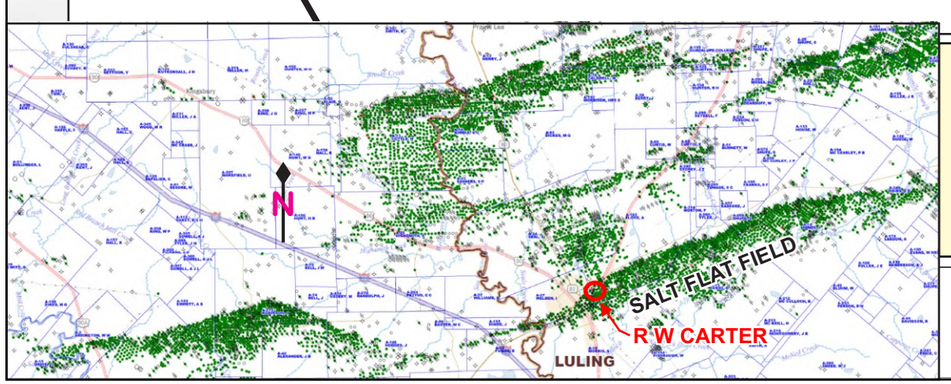
EDWARDS Zone - Horizontgal Target

App. 450ft

PRESENTATION NOT TO SCALE

Austin Chalk

HS SURVEY SHOWED Oil trapped on down thrown side of fault due to formation dragging and breaking up as the fault occurred. Verified by disposal well log.



Hydrocarbon Surveys Field Example: The direction of the horizontal lateral was change to encounter a HS HIGH READING AREA. The well only has 200 feet in zone. Lease production was **75,116 BARRELS OIL IN THE FIRST 19 MONTHS** and was still producing approximately 91 barrels per day (App. 2800 ft TVD).

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0 180 360 540 720 900 ft
Data Zoom 15-0

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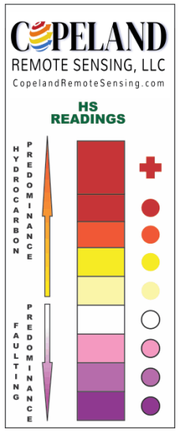
Hydrocarbon Surveys (HS) - GREAT SUCCESS

Direction of lateral REVERSED AFTER HS SURVEY

WATERFLOOD & 2 Pay Zone technology application



Vertical Value View
Vertical Emphasized & Map Is Rotated & Tilted
For Presentation Purposes

Approximate
IN ZONE (Only 200 Ft.)

VERY GOOD WELL
from HS SURVEY

4BH

FAULT

Approximate
Original
Drilling
Plan

Area of new well 1B

FAULT

FAULT

Area of new well 1B

Vertical Value View
This plane is contoured and color coded based on HS reading values. ALSO, HS Values determine the vertical disposition of HS data points.

Normal Flat Plane
This plane is contoured and color coded based on HS reading values.

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Hydrocarbon Surveys
US PATENT #US 10,761,237 B1

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Vertical Value View
Hydrocarbon Surveys
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Mapping based on Medium Density Survey
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Hydrocarbon Surveys (HS) OIL & GAS REMOTE SENSING TECHNOLOGY

WATERFLOOD & 2 PAY ZONE
Technology Application

Production Hub Pages

drillinginfo

RW Carter #4BH – Only 200 foot lateral in Edwards –
Location selected from Copeland Remote Sensing , LLC high reading show.

Field	Operator	Location
SALT FLAT (EDWARDS)	NORTH SOUTH OIL, LLC	District: 1; Caldwell County, Texas
Lease Name	**Oil Lease Number**	**Cumulative (since 2008)**
CARTER, R. W.	14965	**75,116 BO**

Wells

42-055-34882(1BH) 42-055-34883(2B) 42-055-34884(3B) **42-055-34885(4BH)**

42-055-34909(5BH) 42-055-34910(6BH)

(2B, 3B, & 6BH not on line at this time)

Oil Production