OVERBURDEN MAP AND THICKNESS DETERMINATIONS,
SUNNYSIDE OIL-IMPREGNATED SANDSTONE DEPOSIT,
CARBON AND DUCHESNE COUNTIES, UTAH

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by
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INTRODUCTION

This investigation into the overburden and oil-impregnated sandstone thicknesses within the Sunnyside deposits, Carbon and Duchesne Counties, Utah is done under Contract No. YA-553-CT0-1059 between the Utah Geological and Mineral Survey and the U.S. Bureau of Land Management.

PURPOSES

The purposes of this investigation is to a) develop an overburden map for the Sunnyside oil-impregnated sandstone deposit, and b) make a determination of the thickness of the oil-impregnated sands within the deposit.

AREA OF STUDY

The area of this study, as defined by township and range, covers the south half of Townships 11 South, 12 through 14 South and the north half of 15 South; Ranges include all of 13 through 16 East and the west half of 17 East. The area is shown on figure 1, the structure contour map, and on figure 3, the overburden thickness map.

DATA BASE

The data base used in this investigation consists of a) twenty-five oil well or core hole logs or interpretations thereof; four measured sections and other miscellaneous data from UGMS files, and b) UGMS Report of Investigation No. 196 by Clem, 1985. A summary of the pertinent data from the logs and measured sections is given in table 1. Confidential ore hole data received from the BLM were also analyzed in conjunction with this study, and were found to be in concurrence with the other, non-confidential data.

The well and section data are divided into two general groups. First, the well, core log and section data that have been developed within the general vicinity of the Sunnyside quarry and, second, well data associated with a northwest trending group of small oil and gas fields to the northeast of the Sunnyside quarry. Included are the Peter's Point oil field and the Nine-Mile and Stone Cabin gas fields. No well, core hole or measured section data are available for the southeast portion of the study area.

DATA DEVELOPMENT

From the preceeding data base three figures will be developed: a) a hypothetical structure contour map drawn on the top of the upper oil-impregnated sandstone zone and superimposed on a base map of the study area; b) a composite regional dip/well penetration/oil-impregnation interval cross section; this figure will be co-generated with the structure contour map; and c) a calculated overburden map.
The well locations and structure contour map and the composite regional
dip/well penetration/oil-impregnation interval cross section will be
cogenerated as figures 1 and 2 respectively, as follows.

a. The locations of the twenty-five wells and core holes and the four
measured sections were plotted and identified by number on figure 1. The map
base used is a reduced 1:100,000 metric Price, Utah base map.

b. On the base map, an arbitrary "reference line" was drawn, originating near
the southeast corner of Sec. 24, T. 15 S., R. 14 E., and bearing N. 25° W.
This line runs parallel to the approximate strike of the rocks. A vertical
reference plane extending downward from this line will be used in constructing
a composite regional dip line for the top of the upper oil-impregnated
sandstone zone (shown in figure 2).

c. The perpendicular distance from the vertical reference plane to each of
the numbered wells or measured sections was then determined from figure 1.

d. These distances along with the spudding elevation of the wells or the top
elevation of the measured sections, and the oil-impregnated intervals
encountered were then all projected onto a single vertical plane which was
perpendicular to the reference plane, as shown on figure 2. The arbitrary
position of the composite plane or cross section is shown in figure 1 and is
designated as A-A'. For wells not spudded within the oil-impregnated
sandstone, a small "T" marks the spudding elevation. The location number,
corresponding with the numbers found in Table 1, is positioned just above the
well or section "T".

e. A line approximating the uppermost surface of the oil-impregnated
sandstones throughout the study area was then drawn, as shown in figure 2.
This line also represents the composite regional dip of the upper surface of
the oil-impregnated sands.

f. A structure contour map, as shown in figure 1, was then constructed.
Straight contour lines, marked in meters above mean sea level, were drawn
parallel to and down dip from the reference plane. The horizontal spacings of
the contour lines were taken from the regional dip line on figure 2.

Overburden Map

An overburden map, see figure 3, was constructed through the following
process: 1) the differences between the structural contour and topographic
contour elevations were calculated; 2) lines of equal overburden thickness
were drawn for 1, 100, 200 and 300 meters. The overall overburden map is in
general agreement with individual point location data throughout the study
area where these data are available.

Oil-Impregnated Sandstone Thickness and Nature

The determination of the thickness of the oil-impregnated sands within the
Sunnyside deposit is a difficult task. This is partially due to the data that
are available or that could be collected, and partially due to the often unpredictable nature of oil-impregnated sandstone deposits.

As can be seen in figure 2, the thicknesses of the oil-impregnated sands is very erratic in nature. This may be due to a number of factors: a) Because outcrop exposures are limited, and when available may expose only part of the oil-impregnated sand; measured sections may not be complete, b) Wells or core holes may not cut the entire oil-impregnated section; and c) incomplete or improper analysis of core, cuttings and logs or the measuring of sections.

The unpredictable nature of oil-impregnated sandstone deposits also makes determining their thickness very difficult. These deposits do not consist of one or even a few well defined and laterally continuous beds. Instead, they consist of a zone of both impregnated and barren beds or lenses which come and go or thicken and thin. Even the vertical dimension of the zone varies laterally throughout a given deposit. The presence and degree of saturation within individual beds also varies both vertically and laterally, sometimes changing very quickly over short distances.

An analysis of the saturated intervals illustrated in figure 2 can give some idea of the thickness of the oil-impregnated sands of the Sunnyside deposit. In the vicinity of the Sunnyside oil-impregnated sandstone quarry (Sec. 4, T. 14 S., R. 14 E.), and for a distance of four to six miles in either direction along strike, data, with the exception of record numbers 13 and 18, suggest that the composite thickness of the sands, as opposed to a continuous thickness, approaches nearly 2000 feet. If record number 18 is included, these data suggest that an additional 1900 feet of composite thickness is present below the overlying 2000 feet, bringing the total composite to about 3900 feet. And, if record number 13 is included, representing sands located some fifteen miles to the northwest of the main quarry, the total composite thickness approaches 4100 feet.

Down dip from the main Roan Cliffs outcrops of the Sunnyside deposit, it appears that there are perhaps two zones of oil-impregnated sandstone. The upper of the two zones outcrops in several of the major drainages and may have a composite thickness of sands approaching 1000 feet. There are sufficient data to suggest that this is a realistic thickness in the vicinity of Townships 12 and 13 South, Range 16 East. Record numbers 7 and 15 suggest that the sands are thinning northward.

The top of the lower zone is 800 to 900 feet below the bottom of the upper zone. Record numbers 21 and 24 suggest that the lower zone may equal or exceed 1300 feet in thickness in the vicinity of Townships 12 and 13 South, Range 16 East and at least 1900 feet some 5 miles northwest of the Sunnyside quarry.

It may be that the upper and lower zones begin as a single, vertically continuous zone at the westward extent of the area and then divide into two zones down dip towards the northeast or in a basinward direction.
SUMMARY AND CONCLUSIONS

1. The majority of the overburden within the Sunnyside oil-impregnated sandstone deposit ranges from 0 to 100 meters (0 to 328 feet) in thickness. Within the central portion of the deposit (T. 1A S., R. 15, 16 E.), it ranges between 100 and 200 meters (328 to 656 feet). Near the center of T. 1A S., R. 16 E. thicknesses range between 200 and 300 meters (656 and 984 feet) in thickness.

2. Individual wells, core holes and measured sections may not give representative thicknesses of the oil-impregnated sands within the Sunnyside deposit.

3. It appears that near the westward portion of the Sunnyside, the composite oil-impregnated sand thicknesses, as opposed to continuous thickness, range from 2000 to 4100 feet in thickness. Either one or two major zones of oil-impregnated sandstone may be represented. Basinward, or down dip, two zones of oil-impregnated sand appear to be present, separated by a barren zone. The upper zone is approximately 1000 feet thick, the bottom zone some 1300 feet, and the barren zone separating the two some 800 to 900 feet.

A. The Sunnyside deposit appears to generally thin towards the north.

5. The overall thickness of the oil-impregnated zones and the individual beds or lenses within them thicken and thin making the development of an isopach map very difficult with a limited, subsurface data base.

6. The regional dip of the beds within the Sunnyside deposit range from 3 to 4 degrees to the northeast near western edge to about 1 degree to the northeast within the eastern portion.
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<th>No.</th>
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Figure 1 - Well locations and structure contours, drawn on the top of the upper oil-impregnated sandstone zone, Sunnyside area, Utah
EXPLANATION

Well or measured section location

2150m  —  2150 meter structure contour line

Base map contour interval is 250 meters

SCALE

Figure 3 - Oil-impregnated sandstone overburden map.
Sunnyside area, Utah