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STUDY OF WELL LOGS IN THE MACHENZIE DELTA-BEAUFORT SEA AREA TO OUTLINE PERMAFROST THICKNESS AND/OR GAS HYDRATE OCCURRENCE

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Abstract

The available downhole logs for 161 wells drilled in the Mackenzie Delta - Beaufort Sea area of northern Canada were examined for indications of the presence of ground-ice and clathrate hydrates. In the report the justification for each of the picks of permafrost thickness are presented together with a map showing the distribution of permafrost. Results are compared with the downhole temperature observations of the Geothermal Service of Canada.

Résumé

On a examiné les rapports de sondage en profondeur de 161 points dans la région du delta du Mackenzie et de la mer de Beaufort pour des indications de présence de glace et d'hydrate de clathrate dans le sol on justifie et presente les choix pour les épaisseurs de pergélisol ainsi qu'une carte de distribution du pergélisol. Les résultats de l'étude sont comparés aux profils de température obtenus par le service géothermique du Canada.

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PREPARED FOR:

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ABSTRACT

This is a study of the phenonema permafrost and gas hydrate and how they manifest themselves in the earths measurable physical properties; Resistivity, Spontaneous Potential, Acoustic Velocity, Density, Neutron absorption, Gamma Ray Radiation, Temperature, bore hole competence and the presence of gas in the mud.

This understanding was used to develop a criteria for identity of 'permafrost' and gas hydrates that was systematically applied to all (161) wells available in the Beaufort Sea, MacKenzie Delta area of Northern Canada.

In theory and practice the critical data was resistivity analyzed in concert with Gamma Ray and supported by spontaneous potential and acoustic velocity. A numerical solution is made to illustrate the process, also a Log/Mate computer analysis is presented to show a continuous plot of the variation of ice present in the vicinity of $0^{o}C$.

Comparison with Geothermal Service of Canada GSC data shows generally good agreement.

The possibility of Gas Hydrates are present in 23 of the wells, this by design is optimistic so as to not condemn too easily this potential reserve.

This study, that followed a universal criteria, was compared with the results of other published work. While others used a variety of approaches there was also generally good agreement.

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STUDY OF WELL LOGS IN THE MACKENZIE DELTA-BEAUFORT SEA AREA TO OUTLINE PERMAFROST THICKNESS AND/OR GAS HYDRATE OCCURRENCE

A. DEFINITIONS AND CONCEPTS - PERMAFROST & ICE BEARING PERMAFROST

1) Permafrost and Ice Bearing Permafrost (IBPF)

Permafrost has been blessed with two distinctly separate definitions. (Appendix 1). They are:

a) ground that is frozen
b) ground that remains below $0^{o}C$ for more than two years.

In this study we shall follow the clarification given by Taylor and Judge (1981[1]) where condition a) above, shall be referred to as ice-bearing permafrost IBPF, and b) as Permafrost.

Only properly acquired temperature data can define the presence of permafrost, Taylor & Judge (1974[2]), while IBPF manifests itself as changes in measurable qualities (primarily Resistivity and Acoustic Velocity). Osterkamp & Payne (1981[3]).

Following the convention used in other comparisons the thickness shall be referred to as the base of the IBPF (or permafrost), Judge & Taylor (1981[1]). As this study is well log based, Kelly Bushing KB depths shall be the datum. GSC[2] temperature data will be converted from ground level GL to KB for comparison purposes.

IBPF will coincide with permafrost only for pure water, in a large container under the pressure of one atmos. As this study of well logs will indicate the base of the IBPF, the following will give some appreciation of how much it will differ from temperature based permafrost determination.

2) Freezing Point Depression (FPD)

The temperature at which ground becomes ice bearing is lower than $0^{o}C$ by the factor, freezing point depression (FPD). As summarized by Osterkamp & Payne[3], the FPD is caused by pressure, chemical (salts) and soil particle effects, all of which are additive.

$$To = -Tp - Tc - Ts \ ^{\cdot}C$$

where: To = freezing point
Tp = pressure correction
Tc = salt concentration correction
Ts = grain size correction

The theoretical magnitude and hence significance of these factors are:

a) Pressure Correction

$$Tp = B\,P \quad ^{\cdot}C$$

where: B is the clasius - claperyron slope ($0.00751^{\cdot}C$ atmos. $^{-1}$).
P is the presssure on the ice and water in the pore space.

At 600m, a representative depth of permafrost in this study area, Tp is $.44^{\cdot}C$.

b) Salt Concentration Correction

$$Tc = 0.0137 + 0.051990S + 0.00007225S^{2} \cdot C$$

where: S is the salinity of the pore water in parts per thousand (PPT).

This factor would range from negligable in shallow fresh water sands to approximately $1.64^{\cdot}C$ for waters at 30 PPT. In this area 15 PPT is representative of expected total solids giving $Tc = .8^{\cdot}C$.

c) Grain Size Correction

$$Ts = \left(\frac{W}{a}\right) b$$

where: W is the fractional unfrozen water content
a and b are constants related to the specific area of the soil

The FPD due to grain size ranges from near zero in coarse sands and gravels to several degrees in very fine clays.

Considering the above it is expected that, in this area the FPD would range from;

$$To = -Tp - Tc$$
$$= - .44 - .8 = 1.28\ ^{\circ}C \text{ in the gravel and coarse sands to}$$
$$To = -Tp - Tc - Ts$$
$$= -.44 - .8 - 7^{*}\ ^{\circ}C$$
$$= 8.24^{\circ}C$$

* from Timur as illustrated by Pollard & Nash (1971)[4]

in the fine grain shale. The change from freezing start to finish also covers several degrees.

In coarse material the salt concentration is dominant, and considering an average geothermal gradient of .022 °C/m Bily and Dick (1974)[5] the expected IBPF base would be $\frac{FPD}{\text{gradient}} = \frac{1.28}{.022}$ = 58m above the 0°C isotherm.

In fine material the dominant factor is Ts which is large, vague, and gradational. Thus the change from not frozen shale to frozen shale can be some hundreds of meters above the 0°isotherm, e.g., for the FPD as calculated above the IBPF base would begin:

$$\frac{FPD}{\text{gradient}} = \frac{9.28}{.022} = 422m$$

above the 0°C isotherm, with a further displacement of the same order (400± M) to arrive at the depth where fine material is frozen to its maximum state.

Hence a sharp break in log response is not expected in fine material. This is due to the effect of fine grain material that leaves a fraction of unfrozen water. In addition to the soil particle effect, other water may fail

to freeze because of the increase in salinity due to salt rejection from the ice. Thus in a static temperature regime some transition is expected in all formations, ranging from very little in coarse material to very large in fine material.

In mixed lithology e.g., shaly sand, all factors will combine to leave some vertical range of co-existence of ice and water.

3. Effects of Being Frozen

The state of being frozen affects the measurable qualities of material as follows:

a) Resistivity

Resistivity increases gradually as temperature decreases to 0°C less FPD, at which point it either increases dramatically as in the case of coarse sands, or subtly when the material is fine granual (shale).

Data acquired under laboratory condition illustrates this. King (1974)[6]. Table A describes the material, with Figure 1 displaying its resistivity response to temperature changes.

TABLE A: Physical Properties of Specimens

Specimen Number	SH2	SS1	SS4	SS5
Bulk density, frozen, gm/cm^3	2.332	2.453	2.374	2.327
Bulk density, dry, gm/cm^3	2.205	2.329	2.237	2.167
Porosity, fraction	0.13	0.14	0.15	0.17
Shale content, fraction	1.00	0.00	0.38	0.27

Note the FPD is near zero for SS1 the shale free sample, and increases as shale content increases. This allows us to create a theoretical resistivity profile for each material, (Figure 2). This illustrates the ease that IBPF can be determined in clean coarse sands, and the difficulty that shale introduces.

b) Acoustic Properties

Compressional wave behavior is what is monitored by both well bore logging and crystal cable recording.

The response of compressional wave velocity behaves in a similar fashion to Resistivity, i.e., clean sand velocity increases dramatically at 0°C - FPD, and FPD is small. The effect is less sharp as shale increases (also of course the FPD increases as well).

Figure 3 displays compressional wave velocity response to temperature change. Results are compatible to resistivity response, note that shale is almost oblivious to temperature change, both with practically no change in velocity down to 0°C - FPD, then only a gradual and minor increase.

Shear response is similiar as illustrated in Figure 5. A theoretical acoustic profile would be as in Figure 4.

c) Hysteresis

Kings [6] data indicates a reduction in FPD on ascending temperature for both Resistivity and Acoustic Velocity measurements, Figures 1, 3, & 5 This is diametrically opposite to Timur's (1968) [7] results as reported by Pollard & Nash [4], where the FPD is shown to increase on ascending temperature (acoustic velocity) Figure 6. We make no attempt to resolve this conflict, however, King's [6] data best follows the principle of hysteresis. If so, the FPD would be decreased on ascending temperature (regressing permafrost) placing the IBPF closer to the 0°C isotherm in this condition.

d) Spontaneous Potential

Where ice and water co-exists, the water increases in salinity as the salts are rejected by the ice. An increasing ice portion in the pore space effectively reduces the porosity, this reduced porosity contains water of increased salinity. As such a semi-frozen sand will generate increasing negative SP as the salinity increases following the general formulae.

$$Ec = -K \log \frac{aw}{amt}$$

where: Ec is the total electrochemical emf.
Au - chemical activity[1] of the pore water
Amf - chemical activity of the mud filtrate

1 - chemical activity is proportional to salt content

When all the water is frozen the SP will become characterless, as it does in front of zero porosity media. Theoretically the SP profile will be as shown in Figure 7.

e) Temperature

There is some difference in geothermal gradient within the IBPF relative to the non-frozen material below. Geothermal data from study area well No. 68, (YA YA P-53 69° 12.8"N 134' 42.7'W) illustrates this. Figure 8. Note geothermal gradient .0175°C/m above the 0°C isotherm and .0143 below. These gradients are comparable to those used in other studies.

Note the relatively smooth shape of the most recent temperature profile (5 years undisturbed) and contrast it with the sharp break to a plateau that is characteristic of profiles made shortly after the circulation of warm drilling fluid ceased.

The behavior of temperature with time is a function of the specific heat of adjacent material plus the latent heat of fusion. In ice bearing permafrost the later is dominant and indicates the base of IBPF at 402 ± 15m. GL. The equilibrim temperature at the base of the IBPF depth

(≤433m GL) is -0.754. This difference represents the FPD for this material.

Theoretical temperature profiles would be as in Figure 9.

f) Other Commonly Measured Properties

Natural Gamma Ray radition - no known change
Neutron absorption rate - no known change
Electron density - the change from 1000 kg/m3 water to 900 kg/m3 ice is masked by other factors (shale content, hole size and vugosity).

4. Alteration Caused By Thawing

Circulation of drilling fluid past any material will create a zone of thermal invasion whose well bore face will be at drilling fluid temperature TDF and its influence will extend some depth into the material. The depth invaded will be a function of both time exposed and the difference in drilling fluid to formation temperature.

When the drilling fluid is kept below 0°C during penetration of the permafrost zone then logged as in Figure 10, the logging devices (for resistivity, acoustic velocity, and spontaneous potential) obtain measurements that respond to the theoretical models. More common is the condition where the drilling fluid is allowed to be above 0°C during penetration and logging. Figure 11.

As complete freezing is approached, the porosity (and hence the permeability) can be reduced to the point that mud filtrate cannot be accommodated and no mud cake forms to protect the sand face from erosion. This plus thaw induced alteration (discussed below in regards to acoustic alteration) can cause large hole size, particularly in front of unconsolidated sands. Figure 12 represents the profile from borehole to unaltered material (competent and unsolidated). (Pollard & Nash)[4].

Following is the effect of changing from being frozen to being thawed.

Device	Effect
a) Resistivity	- will return to its pre-frozen lower value
b) Acoustic Velocity (Regular Tools 2' Spacing 2' Span)	- will return to its original lower pre-frozen value. Even lower velocity will be read if expansion (increase pore space) occurs, as described below.
c) Acoustic Velocity (Long Spaced Tools 11' spacing 2' span)	- this special device has the potential to read deeper than the regular device. Faster velocity indication from this tool compared to the shorter spaced tool is interpreted as deeper frozen material behind a thawed zone. The longer span increases the likihood of cycle skips due to the condition referred to below. Fig. 13. compares the refraction paths for long and regular tools in thawed and frozen material, Crain & Curwen (1982)[8].
d) Acoustic Amplitude	The presence of the bore hole allows space for the material to expand into to release the stress of freezing and thawing. The uncontained material immediate to the bore hole can fracture, causing a reduction in amplitude. This often manifests itself as cycle skip giving a log that reflects neither the velocity of the thawed zone, nor the invaded zone. Further reduction in amplitude will be caused by the interference of incoming waves from the thawed (slower) phase with compressional arrivals coming from the frozen (faster) material.
e) Spontaneous Potential	Increasing thaw diameter will result in reducing the SP increase (due to pore salinity increase).

Device		Effect
f) Depth of Thaw	-	The actual depth of thaw is predictable in advance, PUI and Kljucec (1978)[9], and can be determined after from log data, Bateman (1972)[10]. Pui and Kljucec[9] predicted a thaw depth of .5m at 600m for a well drilled to 1000m with the temperature of drilling fluid TDF at 4.5°C. As thaw diameter is sensitive to TDF and exposure time, a record of log total depth and bottom hole temperature (BHT) is included in Table 2. BHT is the reading of a maximum reading thermometer attached to the logging tool; it will err to the high side due to either warm ambient temperature or being washed with warm water.

5. Logging Device Depth of Investigation

Logging tool depths of investigation compare as follows:

a) Resistivity

1) DISFL Dual Induction Spherically Focused Log

Measurement	Depth of Investigation	Definition
SFL	.5m	Spherically Focused Log receives ½ its signal from beyond .5m. The SFL operates as a series measurement i.e., at .5m $R_{log} = .5\ R_{near}$ and $.5\ R_{far}$
ILD	1.5m	Induction Log Deep received ½ its signal from beyond 2m, ILM operates as a parallel measurement. $\frac{1}{R_{log}} = \frac{.5}{R_{near}} + \frac{.5}{R_{far}}$
ILM	1m	Induction Log Medium, as above at 1m $\frac{1}{R_{log}} = \frac{.5}{R_{near}} + \frac{.5}{R_{far}}$

2) DLL - Dual Laterolog

DLL	2m	Deep laterolog, operates as a series measurement, at 2m $R_{log} = .5\ R_{near} + .5\ R_{far}$
LLM	1.5m	Medium laterolog, as above 1.5m $R_{log} = .5\ R_{near} + .5\ R_{far}$

3) Special Long Spaced Electric Survey

20' normal is influenced by material 3m from the borehole.

b) Acoustic

1) Common Acoustic Log 13HC (3' spacing, 2' span)

Measurement Depth Borehole Compensated Sonic receives all its signal from as near as .05m from the face of the material.

2) Long Spaced Sonic LSS (up to 11 ft. spacing, 2' span or the more recent 8 and 10' spacing, 2' span BHC simultaneous tool).

These devices receive information from deeper in the formation.

3) Crystal Cable

Most of the data relates to deep unthawed materials.

4) Well Phone, Velocity Survey

Same as Crystal Cable.

c) Spontaneous Potential

1) SP

The spontaneous potential is mostly influenced by material .3m from borehole.

6. Relative Significance of Thawing on Measurement

Considering the relative depth of investigation of logging devices and the finite depth of thawing, the actual recorded data will differ from the theoretical as:

a) Crystal Cable

Crystal Cable data will be least affected and can be expected to provide a consistent IBPF indication. It is though, dependent on a significant volume of the frozen material being present.

b) Well Geophone, Velocity Survey

This type of data, while little affected by thawing, lacks detail due to the gross (≃ 150m) intervals between stations.

c) DISFL

Unless frustrated by greatly enlarged hole, the common DISFL (or earlier DILL8) will provide reasonably consistent indications. The possession of resistivty measurements at 3 depths of investigation will help to identify the presence of a thawed zone - thus giving more support to the IBPF pick.

d) DLL

This device, by being a series type measurement, acquires better data when there is large hole, salt mud (kcl), or high values of resistivity (as is frozen coarse sand). The two depths of measurement can identify the presence of a thawed zone. It is further enhanced if the shallow MSFL micro spherically focused log is included.

e) ES

Long spaced ES data when combined with regular DISFL is quite diagnostic. Cox (1973)[11], Crain (1977)[12].

f) BHCS

Regular acoustic values of velocity can vary from the low velocity of the thawed zone to the high velocity of the frozen zone depending upon the depth of thaw and the relative strength of the received thaw versus frozen signal. The BHCS logs in this area were run when significant improvement was being made in instrumentation and technique. The same condition could show as; much cycle skips and worthless trash on a poorly run log, or steady interpretable data when correctly run.

The regular sonic is the least consistent of the common devices.

A comparison of LSS to BHC data has the potential of defining the presence of deeper frozen material. In practice its use is often frustrated by loss of signal (cycle skips) due to the longer path of the LSS.

g) SP

The IBPF effects on the SP will be less as thaw depth increases (and also as hole size increases). This data is secondary to resistivity, Crystal Cable and Acoustic Velocity, so SP quality reduction is not fatal.

h) Hole Diameter

When regular tools (BHCS caliper maximum diameter 400mm) are used in the common 311mm hole, often the hole is caved beyond the tools size and its unknown if the hole is 401mm or 1000+mm. This will cause ambiguity in decyphering all other data. Bore hole geometry tool BGT reads to a maximum diameter of 1800+mm and has been run on some area wells (this data is not generally available).

B. DEFINITIONS AND CONCEPTS - GAS HYDRATES

1) Gas Hydrates

Natural gas hydrates (Clathrates) are a specific inclusions compound where spherical chambers within the host (water) molecule hold the guest (gas) molecules. Hitchon[13]. This entrance of gaseous molecules into the vacant lattice positions of liquid water causes the water to solidify at temperatures above the freezing point of water. (Katz) 1971[4].

2) Characteristics & Expected Log Response

This condition has essentially the same qualities as ice, it is resistive, will develop less SP if completely hydrated and will allow caving due to both lack of filter cake protection, and hydrate pressure generation.

Figure 14 displays a linear increase in resistivity as connate water is converted to hydrate, Makogan and Trebin (1971)[15]. The hydrated gas zone is hence more resistive than an equivalent free gas zone.

As the presence of gas causes solidification at temperatures above the freezing point of water we expect for a given depth (temperature), the resistivity of a hydrate zone to be greater than an IBPF zone. Recent labratory measurements of ICPF and hydrate support this. Pearson (1982)[16].

The hydrated zone will develop less SP if hydration is complete.

Caving will exist due to lack of protective filter cake, and the spalling (to relieve stress) of material away from the face of the reservoir.

The density of hydrate is similar to that of ice 900 kg/m3. It's neutron gamma response, due to high hydrogen content, will display low secondary gamma response (equals high porosity on a neutron porosity log). Sheshukov (1973)[17].

Acoustic velocity will be high, as in ice. This may be seen on crystal cable data, but the decomposition of hydrate near the bore hole will attenuate and cause much cycle skipping on the regular bore hole acoustic log, unless the log is obtained shortly after penetration or the TDF kept low. (Bily & Dick)[5].

The similarity of IBPF and hydrate makes identification of hydrate difficult if it is present immediately below or within the IBPF. If the hydrate is considerably below the IBPF, the difficulty is diminished.

As hydrated media contains such a disportionate amount of gas relative to a free gas zone there will be anomalously high gas readings on mud logs. Bily & Dick[5] assess this as the most pronounced characteristic of hydrate bearing zones.

3) Hydrate Possible Depth Intervals

Conditions of pressure and temperature critical for the formation of hydrates above been combined into a convenient chart, Figure 15. It shows an envelope of possible hydrate occurrence relative to permafrost depth (Bily & Dick)[5]. The hydrate prone interval is indicated to be from surface to permafrost depth plus 750m.

C. INTERPRETATION FOR IBPF AND HYDRATES

1) Criteria

With the preceding understanding of the qualities of IBPF, gas hydrate, logging tool response and measurement environment, we set up the following criteria for analyzing the 161 wells that were in the study area. The criteria was to be universal, that is:

- to be not sensitive to the individual doing the pick
- to accommodate the expected range of geological (age and lithology) and geochemical (formation water salinity) conditions
- to overcome the variations in measurement environment (hole size, drilling mud salinity, temperature of drilling fluid & time exposed).

2) Procedure

The procedure to satisfy this criteria consisted of:

a) Note the resistivity in 1) shales and 2) the wet not frozen sands below the expected base of IBPF and calibrate the resistivity response to changes in shaliness.

b) Work upward looking for increases in resistivity that are not caused by changes in shaliness.

c) Such picks are supported by:

1) Acoustic velocity increasing if the IBPF is not thawed, acoustic velocity decrease or skipping if thaw is present.

2) SP having either co-existence (increased negative values) effect or complete freezing effect (loss of character, i.e., no longer conforms to the GR indication of shale).

3) Caliper showing the sands to be caved rather than being undergauge due to protective filter cake.

d) After the above 'pick' was recorded on the analysis detail sheet Table 1, it was compared to the IBPF and $0^{o}C$ isotherm depths retrieved from temperature data of the Geothermal Service of Canada. Taylor, Burgess, Judge, Allen (1982)[17]. This resulted in agreement or;

1) If the IBPF was above the $0^{o}C$ isotherm the resultant FPD was reviewed as to reasonableness for the type of media present.

2) If the indicated IBPF was below the $0^{o}C$ isotherm the well was flagged as a gas hydrate candidate.

e) All remaining wells were then analyzed in the same manner.

f) Crystal Cable Data as it became available was then interpreted, compared then entered on this analysis detail sheet.

g) Procedure Steps 2 & 3 were applied throughout each well from surface to 2000m, with particular interest in the hydrate prone envelope, top of logged interval to base of permafrost plus 750m depth.

h) Such located hydrate zones were noted on the analysis detail sheet, then compared to mud gas data for support. If supported the interval was designated as 'hydrate likely'.

i) The log picks, with preferred pick identified, GSC data and hydrate identification are recorded in Table 2 Analysis Summary.

3) Results

The preferred log derived pick for the base of IBPF, transition zone and possible gas hydrate are listed in Table 3. Included in this list is the GSC temperature based picked for IBPF and the $0^{o}C$ isotherm.

A map displaying IBPF by location is in Appendix 2.

An annotated montage of reduced scale logs, including GSC 18 temperature converted to compatible scale by the Log/Mate system, Crain (1979)[19] is in Appendix 3 and 4.

Previously published interpretations of IBPF and hydrate were reviewed and compared to this work. Detailed comparison is included in Section D.

NOTE: The number used to identify each well reflects the sequence that these wells follow in the publication 'Schedule of Wells NorthWest Territories and Yukon Territory', Indian & Northern Affairs, Canada. Publication QS-8233-000 BB-A2.

D. COMPARISON

After following the criteria that was applied uniformally to all wells, our results were compared to the results of other published studies. All results are listed in the tables on the following pages.

REFERENCE: 4 Observation on Permafrost Logging in the Canadian Arctic
Author: Pollard, D.E. and Nash, R.G.

WELL NO.	WELL NAME	IBPF	TRANS	REASON
132	Atkinson Point H-25			
	Their Pick	460		Big hole to 460, SP drifting above 466, RES increase at 466
			478	Not given
	Our Pick	466		RES higher than for equivalent sands below, SP & Cal are supportive, velocity consistent for IBPF
			478	RES increase
	Crystal Cable			Not available
	GSC Temperature			Not available
	COMMENT:			Close agreement
143	Nuvorak O-09			
	Their Pick	357		Appears to be based on depth of deepest cave
			418	Not given
	Our Pick	360	-	RES higher than expected. Pick not made
	Crystal Cable			Not available
	GSC Temperature			Not available
	COMMENT:			Close agreement
129	Natagnak K-23			
	Their Pick	≈518		Approximate pick
	Our Pick	535		Abrupt increase in resistivity (base of a frozen sand)
	Crystal Cable			Not available
	GSC Temperature			Not available
	COMMENT:			Good agreement.

REFERENCE: 1 Canada, Indian and Northern Affairs, quoted in 'Measurement and Prediction of Permafrost Thickness, Arctic Canada'

WELL NO.	WELL NAME	IBPF	TRANS	REASON
90	Kilagmiotak M-16			
	Their Pick	725		Not given
	Our Pick	740		Abrupt RES increase
			790	Base of Gradient
	Crystal Cable	707		9500 - 6500 @ 707m
	GSC Temp.			
	COMMENT:			Generally good agreement
66	YaYa A-28			
	Their Pick	600		Not given
	Our Pick	673		Base of frozen sand
			728	RES gradient change
	Crystal Cable	573		10,200 - 6800 @ 573m
	GSC Temp.		Ex674	
	COMMENT:			Case of RES having greater ability to detect thinner frozen sands - Crystal Cable requires some mass of frozen material to respond.
65	YaYa I-17			
	Their Pick	595		Not given
	Our Pick	685		RES indicates base of frozen sand
			721	Base of RES gradient
	Crystal Cable	573		9500 - 7000 @ 573m
	COMMENT:			Case of RES having greater ability to detect thinner frozen sands - Crystal Cable requires some mass of frozen material to respond.

REFERENCE: 1

WELL NO.	NAME	IBPF	TRANS	REASON
64	Red Fox P-21			
	Their Pick	615		Not given
	Our Pick	610		RES indicates the base of deepest frozen silt.
			640	RES gradient change
	GSC Temp.		583	
	COMMENT:			Good agreement
74	Kumak E-58			
	Their Pick	204		Not given
	Our Pick	217		Abrupt RES change
			286	Base of RES gradient change
	GSC Temp.		E283	
	COMMENT:			Good agreement
101	Taglu H-54			
	Their Pick	420		Not given
	Our Pick	515 ±		RES indicates base of frozen sand
	Crystal	445		
	GSC Temp.	513±15	542	
	COMMENT:			As YaYa A-28, crystal data picks base of IBPF, RES has ability to detect small changes and can be tuned to approach GSC temperature picks.
54	Titalik O-15			
	Their Pick	107		Not given
	Our Pick	97		Point of inflection on RES rise
			107	Base of RES gradient
	COMMENT:			Good agreement

REFERENCE: 20 Permafrost Investigation by Crystal Cable

AUTHOR: Walker, T.H.D., Stuart, A.J.

WELL NO.	WELL NAME	IBPF	TRANS	REASON
122	IVIK C-52			
	Their Pick	629		Based on all data
	to	649		
	Our Pick	649		Abrupt RES increase
	Crystal Cable	649		10,200 - 6700 @ 649m
	COMMENT:			RES and Crystal Cable data agrees as this is a definite base of a massive frozen section.
116	MAGAK A-32			
	Their Pick	230		
	to	285		Based on all data
	Our Pick	236		ES indicates abrupt RES increase
	Crystal Cable	240		9000 - 6400 @ 240m
	COMMENT:			Good agreement, as IVIK C-52
100	TAGLU F-43			
	Their Pick	527		Based on all data
	to	549		
	Our Pick	548		At abrupt RES increase
			618	Base of resistivity gradient
	GSC Temp		x633	
	Crystal	518		7800 - 6500 @ 518m
	COMMENT:			Good illustration of RES & Crystal Data picking base of massive IBPF section - but Resistivity alone being most able to estimate base of transition (close to $2^{o}C$)

REFERENCE: 20

WELL NO.	WELL NAME	IBPF	TRANS	REASON
125	IMERK B-48			
	Their Pick	393		Based on all data. Section is well defined.
	to	549		
	Our Pick	542		Abrupt RES increase at base of sand - note presence of unfrozen section above.
	Crystal Cable	384		9500 - 6500 @ 384m
	COMMENT:			Good agreement. RES is sensitive to both the massive section of IBPF and the thin relic lenses below
104	UPLUK C-21			
	Their Pick	237		
	to	255		Based on all data
	Our Pick	233		Deepest that resistivity is in the IBPF range.
	Crystal	247		7800 - 5650 @ 247m
	COMMENT:			Good agreement. Note that crystal cable data has approximately + -15m range of depth accuracy.
78	NIGLINTGAK H-30			
	Their Pick	61		Based on all data
	to	92		
	Our Pick	89		Based on resistivity being higher than expected.
			189	Based on base of resistivity gradient.
	Crystal	61		
	GSC Temp.	77	E 152	From SRS Velocity 30m stations
	COMMENT:			Good agreement. Very large difference between IBPF and 0°C and also between log picks of IBPF and base of transition. This would be consistent for shale, log appearance indicates sand/shale. Suspect long section of co-existance.

REFERENCE: 21 Determination of Permafrost Thickness in Wells in Northern Canada

AUTHOR: Hnatiuk J., and Randall, A.G.

WELL NO.	WELL NAME	IBPF	TRANS	REASON
51	REINDEER F-36			
	Their Pick	338		All three curves show an increase in resistivity at a depth of 1110' (338m)
	Our Pick	342		Sands above 340m have higher resistivity than equivalent sands below.
	Crystal	347		
	GSC Temp.	349 ± 8	E363	
	COMMENT:			There is excellent agreement in the pick for IBPF. Us and the other workers have chosen IBPF base within the range of depth accuracy of confirmation by GSC temperature and crystal cable - two major standards.

The "increase in resistivity" referred to in the previous paper can not mean an increase in absolute resistivity at that point (338m) as there are many resistivity values higher in sands below. We interpret their reason as a shale base line gradient change that does occur in the vicinity of 338m.

By the second condition of our criteria our pick had to be independent of the existence of shale sections necessary to set up the gradient comparison as explained above.

Our approach on all wells was to calibrate the resistivity response in the not frozen sands and work upwards looking for resistivity increases that are not due to changes in shaliness. Our first pass gives 303m as the base of a frozen sand and 354m as the top of a non-frozen sand (of comparable shaliness). SP performance, being more negative above 303m supports this. The simple overlay of Resistivity on GR (inverted as $R_{sh} < R_{SD}$) shows depth 340m where the Resistivity becomes relatively higher than below and is hence our pick for base of IBPF.

Numerically this can be performed by calculating the expected resistivity and comparing it to the measured value, if the later is higher IBPF is indicated. In the simple but common case where porosity and formation water resistivity are constant:

$$RES_{calc} = R_{SH} + (1-Vsh)\ (RES_{SD} - RES_{SH})$$

Volume shale Vsh can be determined from the GR:

$$Vsh = \frac{GR - GR}{GR_{100} - GR_0}$$

For this well using:

RES_{SD} = 35 ohm-m GR0 = 3 divisions
RES_{SH} = 7 ohm-m GR100 = 7 divisions

Results in the following numerical solution:

DEPTH feet	GR divisions	VSH	RESC ohm-m	RESM ohm-m	RESM-RESC ohm-m
1700	3	00	35	35	0
1700	6.5	.87	11	15	4
1360	5.0	.50	24	20	-1
1315	4	.25	28	25	-3
1210	3.5	.13	31	35	4
1190	6.2	.75	15	15	0
1170	4.2	.30	27	30	3
1135-60	6.0	.75	14	10	-4
1122-28	6.0	.75	14	11	-3
1115-22	6.0	.75	14	15 -- IBPF --	1
1108-15	5.7	.68	16	25	9
1095-1103	5.5	.63	17	22	5
1075	6.0	.75	14	25	11
1040	4.7	.43	23	40	17
1010	6.5	.87	10	10	-0
980	3.5	.13	31	200	169

The IBPF is identified where RESM is greater than RESD, 1115' or 340m.

To illustrate the use of standard industry computer practice, we performed a regular Log/Mate Shaly Sand Analysis[19], Figure 16. The black infilling represents ice, Sw water saturation represents co-existing water. It shows, by continuous plot, the gradual decrease in co-existing water at depths above 340m.

E. CONCLUSIONS

1) Permafrost

Resistivity results supported its theoretical choice. It displayed the qualities of a good employee by:

a) being available for work - essentially every well had a resistivity log available.

b) doing the job required of it - 126 picks for 161 wells were resistivity based. The ubiqutous resistivity log was present over the zones of interest on more wells than any other type log. Crystal cable data was chosen for 20 wells - not because of being superior data, but because the IBPF was above the top resistivity reading. In contrast, acoustic 'picks' were preferred on only 5 wells and mostly because no resistivity was available over the IBPF depth interval.

c) having the ability to 'wear two hats'. Temperature data properly run, i.e., early data plus subsequent runs, gives the base of IBPF and the 0^{o} C isotherm depth. Only resistivity can approach this with reasonable reliability, it can by abrupt change display the base of IBPF and by subtle gradient change show the base of transition which will approximate the 0^{o}C isotherm.

d) attending to detail, the vertical resolution allows analysis with confidence of 2m thick zones. In contrast crystal cable data requires IBPF to be massive to be recognized.

Crystal cable data strength is in giving the geophysicist the near surface information needed for correct seismic interpretation, where knowing the depth of massive IBPF is much more significant than the identity of a few frozen thin stringers.

2) Gas Hydrates

All published references that was reviewed described the identity of gas hydrates in classic good quality reservoirs, e.g, Bily & Dick[5], Makogan et al[15], and Seshukov[7]. The study area, times the hydrate possible depth

interval represents an enormous volume of clastic material. Within this volume will be some poor (shaly) reservoirs as well as good reservoirs.

The difficulty in correctly identifying gas bearing shaly zones is recognized. The Milk River formation of Southern Alberta being an example. Hydrate bearing shaly reservoirs are marginally less difficult to identify.

To prevent some such zones from being condemned we have given each the benefit of doubt and have allowed our list to 'likely' gas hydrate wells to be larger than life. More detailed specific log analysis is required to resolve this.

3) Comparisons

Resistivity based 'picks' are generally supported by the GSC temperature data.

Comparison to crystal cable data is as expected it:

a) agrees well when the IBPF base is within a massive sand, or

b) resistivity shows IBPF truly to be deeper than crystal data if it extends down through a thin sand/shale sequence, or

c) crystal cable data does not clearly indicate IBPF where the volume of frozen material is small as in thin sand thick shale sequences

Comparison to other studies also gives generally good agreement which is remarkable in that this study is predominantly resistivity based and considerable variety in methods were used by other workers.

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FIGURE I

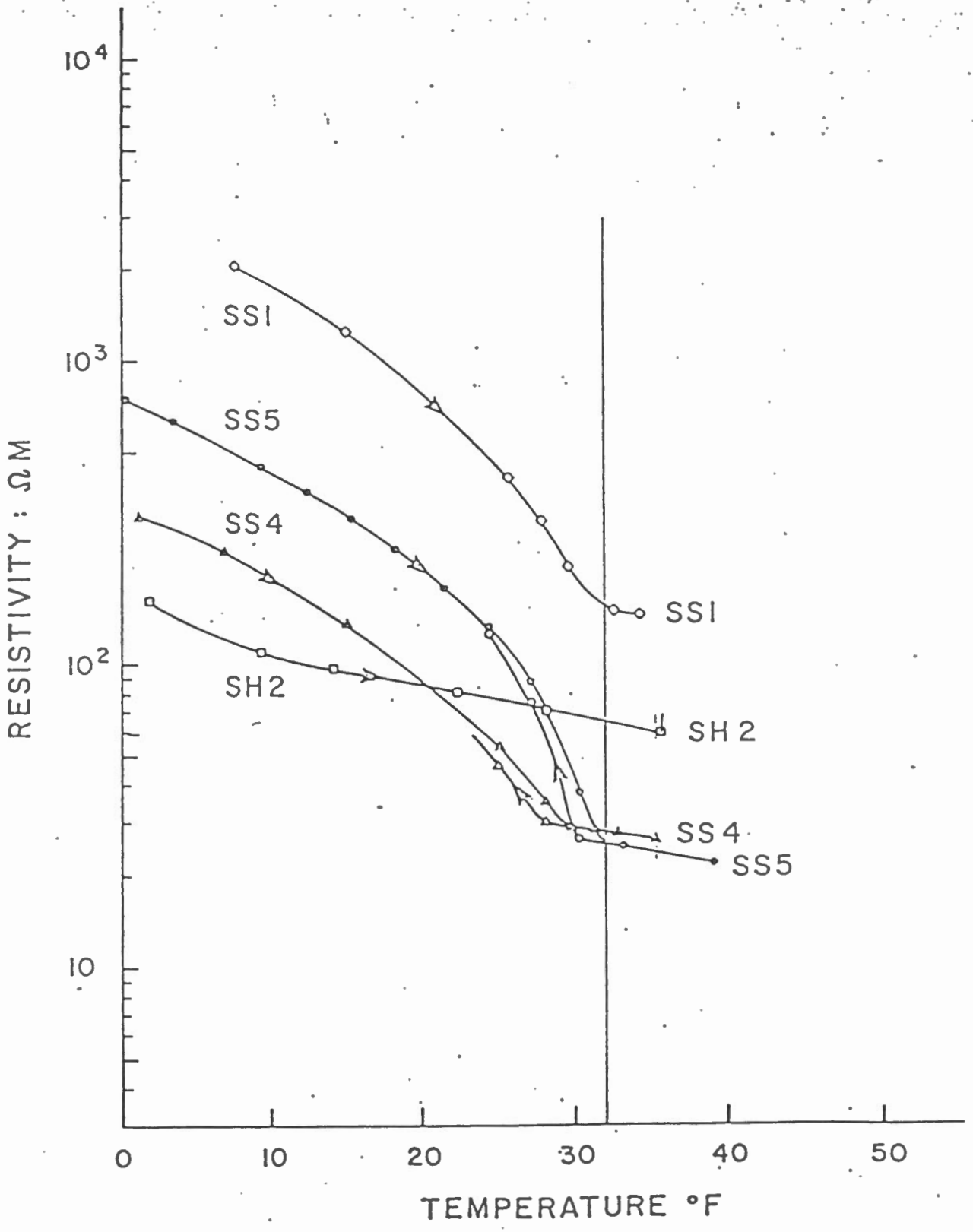


FIGURE I - RESISTIVITY AS A FUNCTION OF TEMPERATURE AT A FREQUENCY OF IKHZ[6]

FIGURE 2

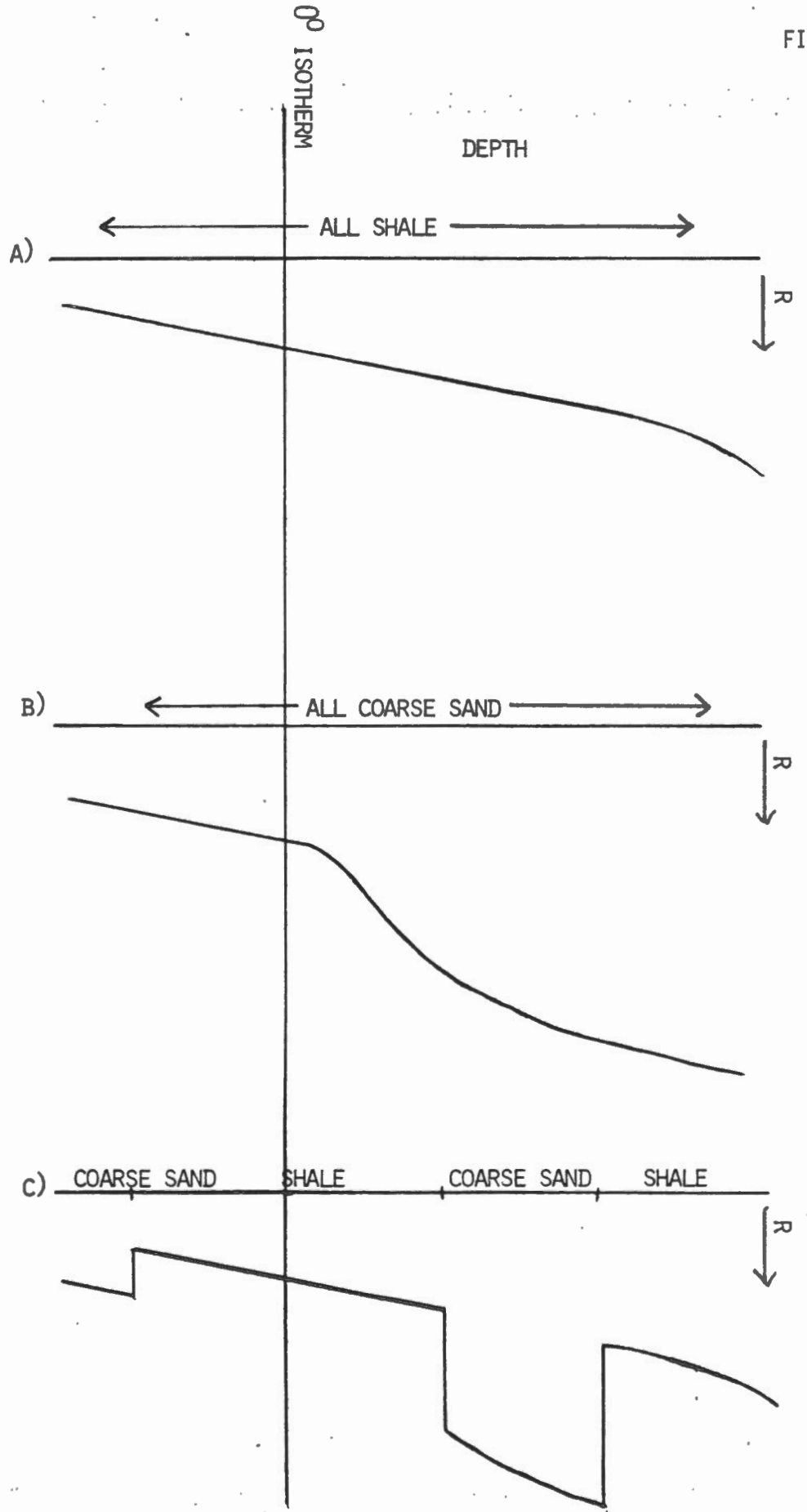


FIGURE 2 - THEORETICAL RESPONSE: RESISTIVITY VERSUS DEPTH IN THE VICINITY OF THE $0^{o}C$ ISOTHERM

FIGURE 3

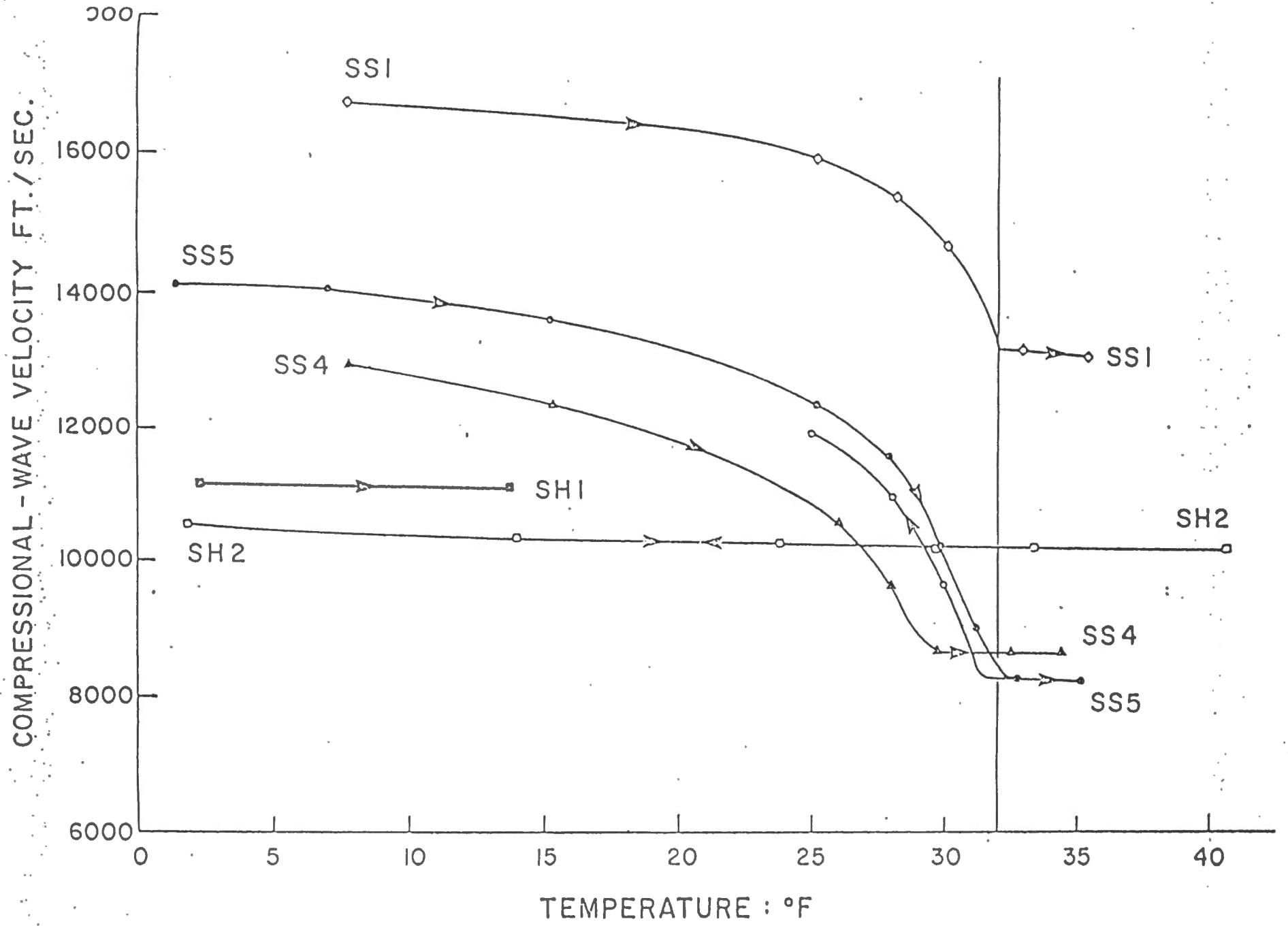


FIGURE 3: COMPRESSIONAL - WAVE VELOCITY AS A FUNCTION OF TEMPERATURE AT AN AXIAL STRESS OF 500 PSI[6]

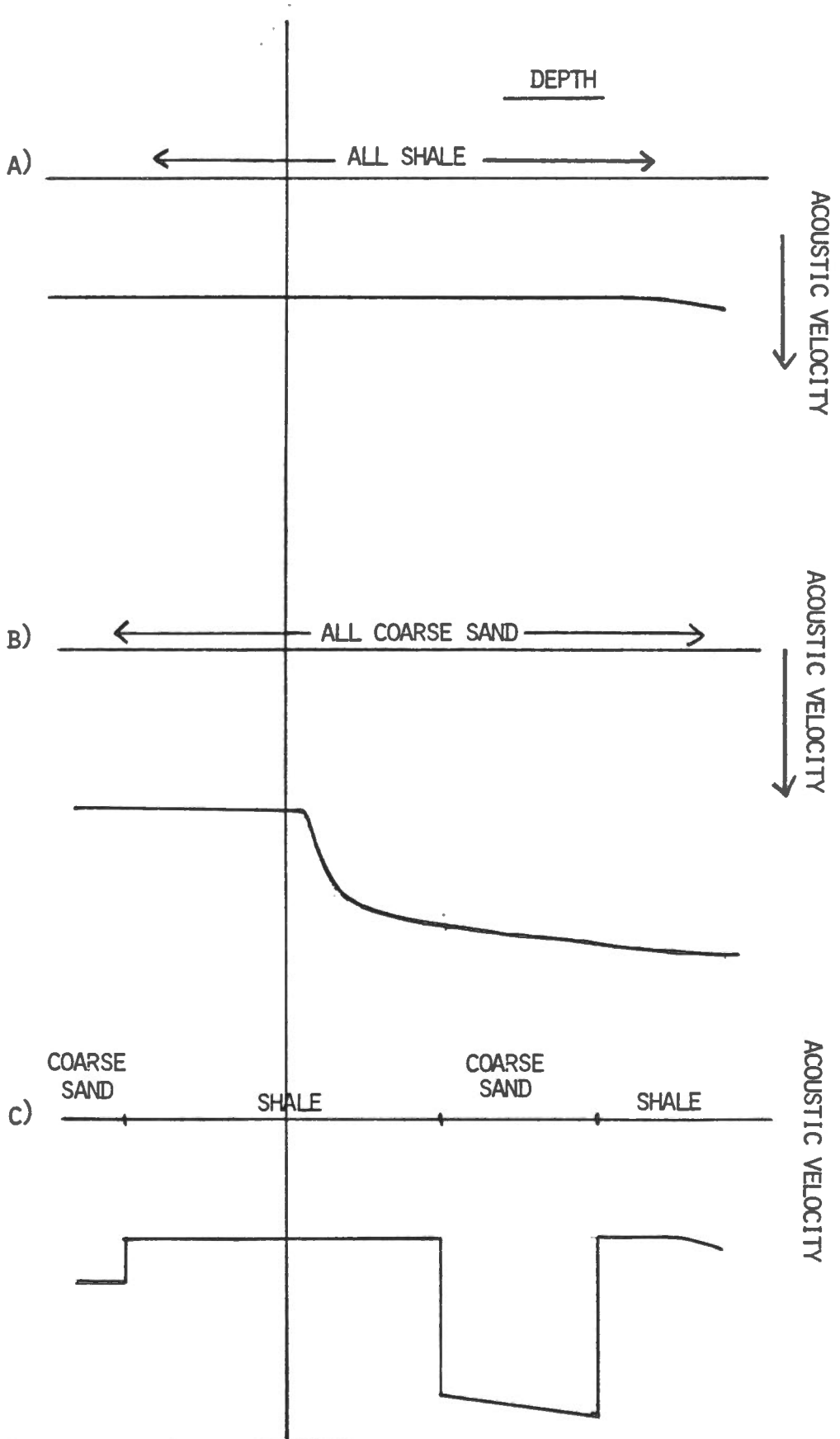


FIGURE 4: THEORETICAL RESPONSE: ACOUSTIC VELOCITY VERSUS DEPTH IN THE VICINITY OF THE $0^{o}C$ ISTOTHERM

FIGURE 5

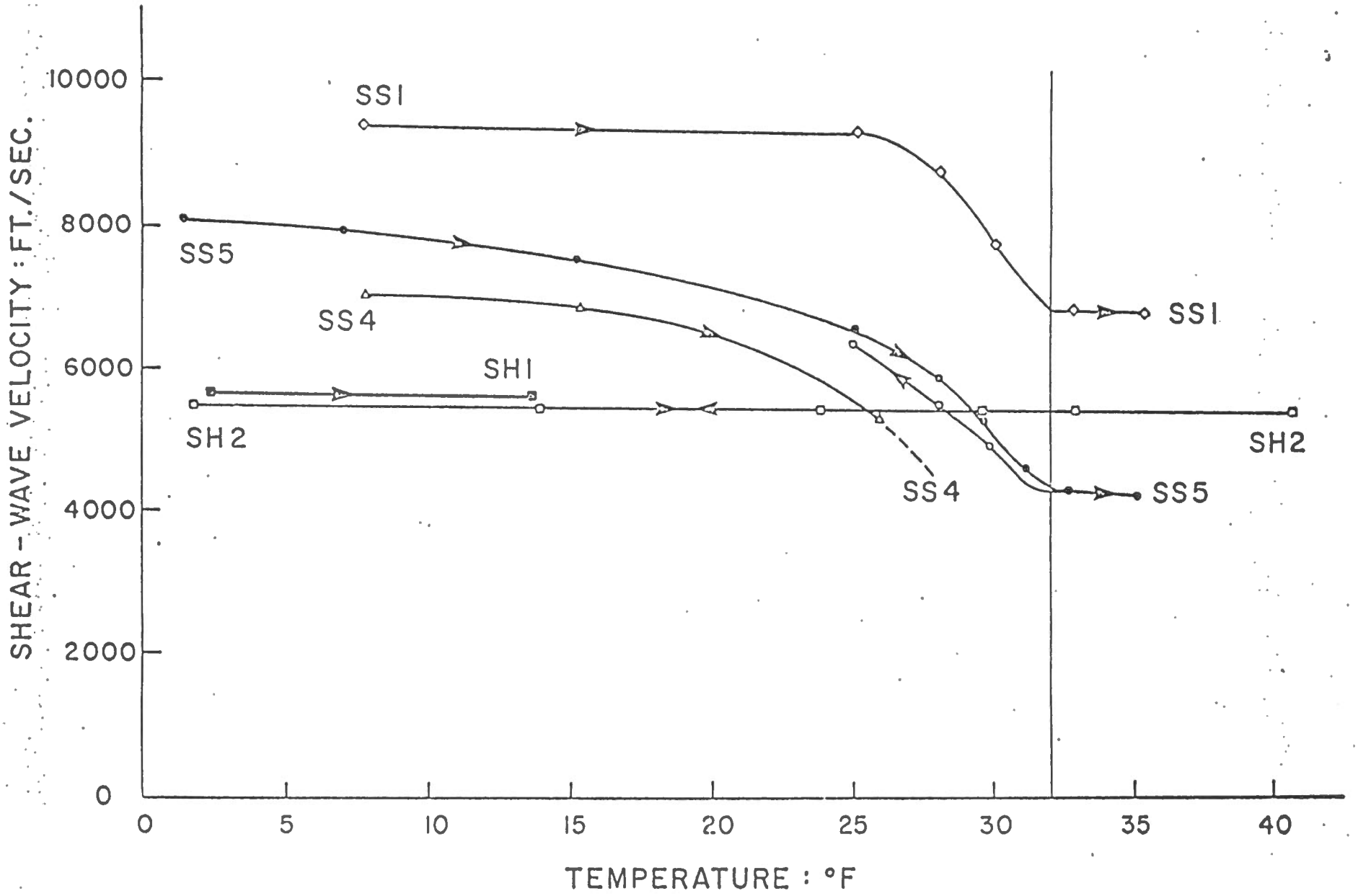


FIGURE 5: SHEAR - WAVE VELOCITY AS A FUNCTION OF TEMPERATURE AT AN AXIAL STRESS AT 500 PSI

FIGURE 6

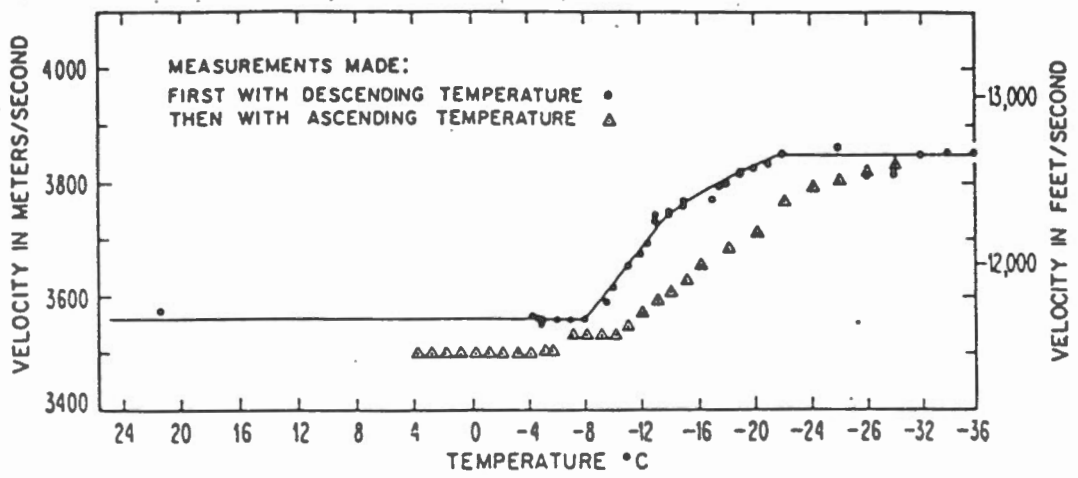


FIGURE 6: MEASUREMENT DATA: ACOUSTIC VELOCITY VERSUS TEMPERATURE[4]

FIGURE 7

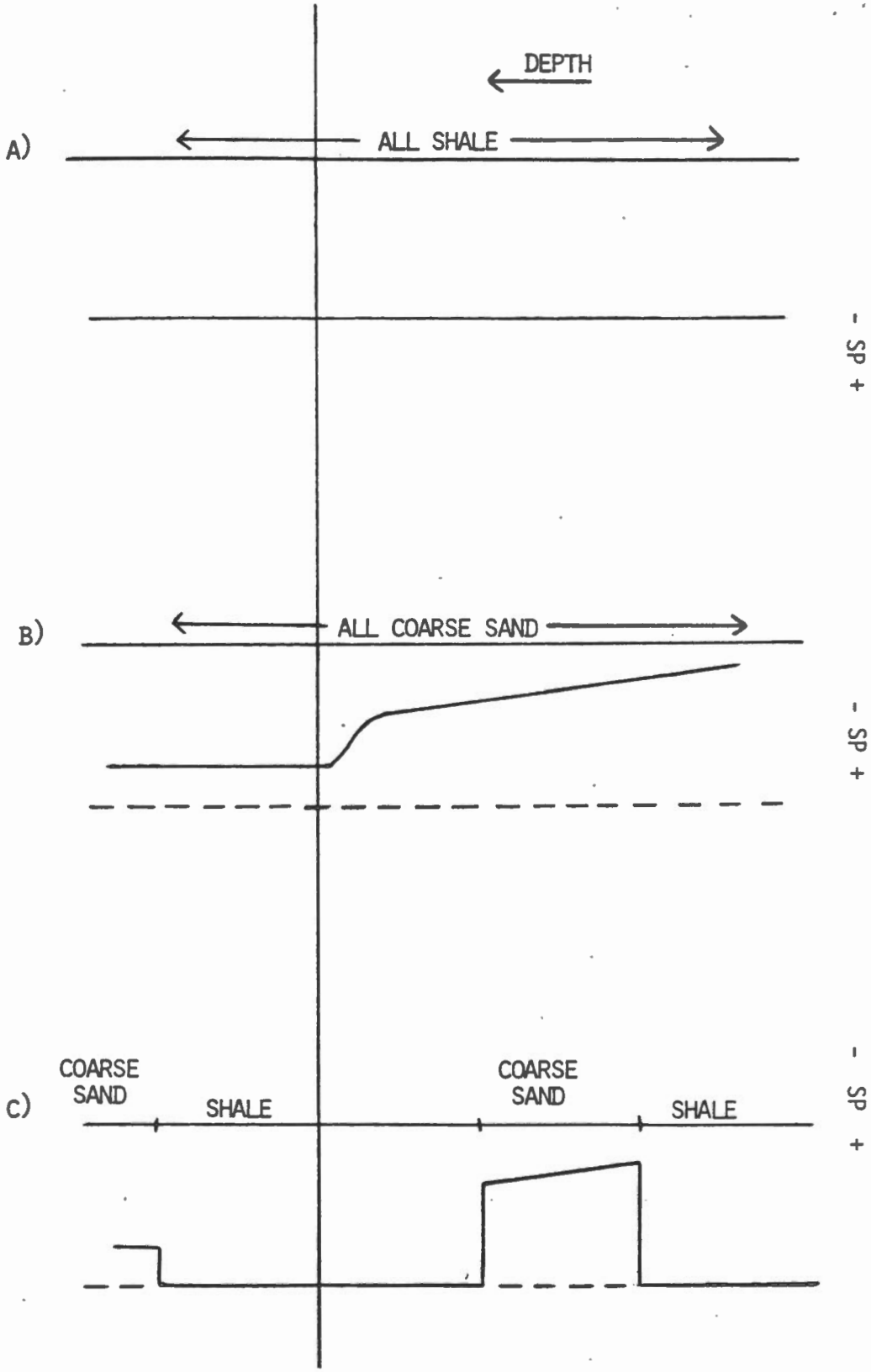


FIGURE 7: THEORETICAL RESPONSE: SPONTANEOUS POTENTIAL VERSUS DEPTH IN THE VICINITY OF $0^{o}C$ ISOTHERM

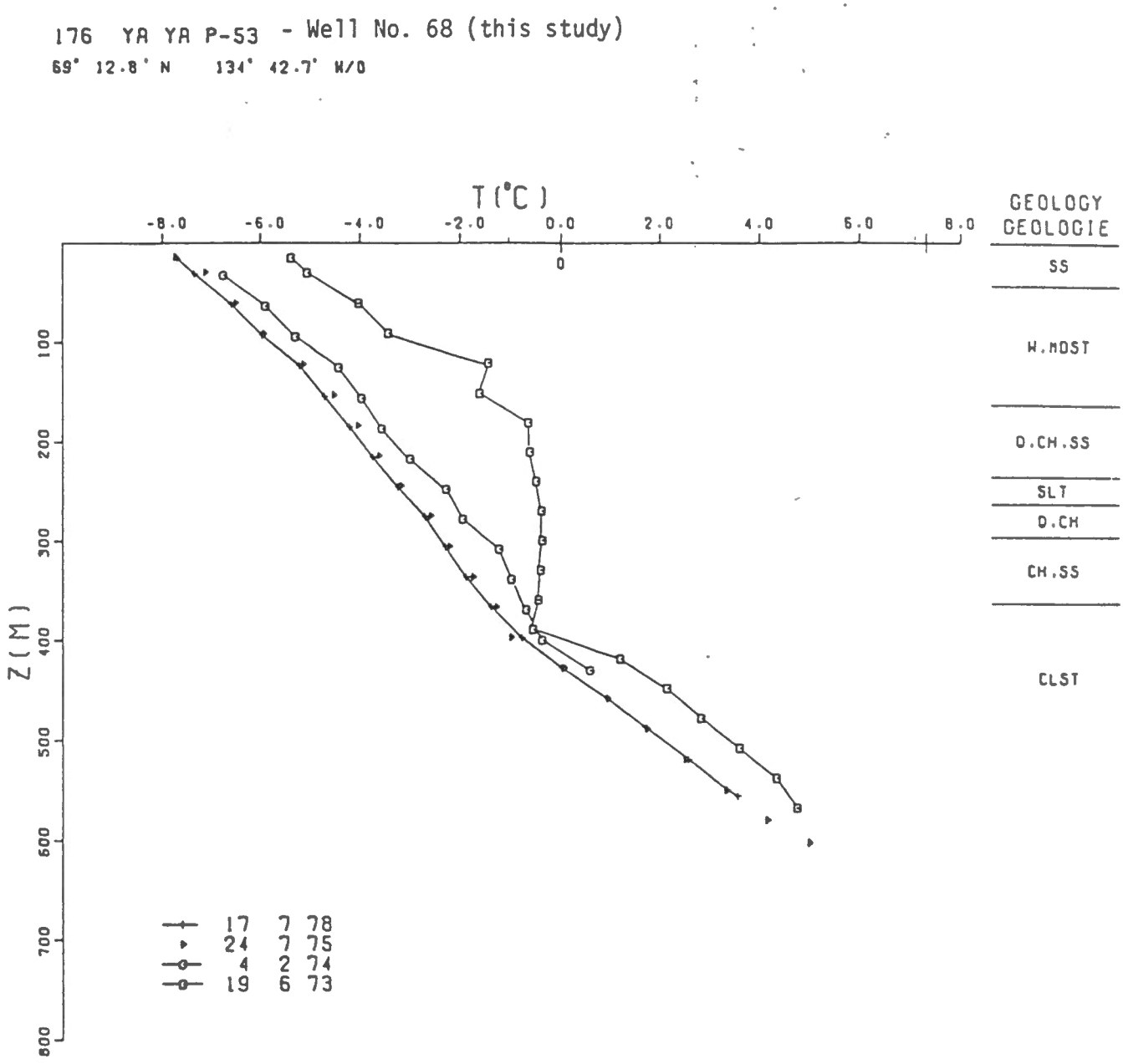


FIGURE 8: MEASUREMENT DATA: TEMPERATURE VERSUS DEPTH IN THE VICINITY OF THE 0°C ISOTHERM [18]

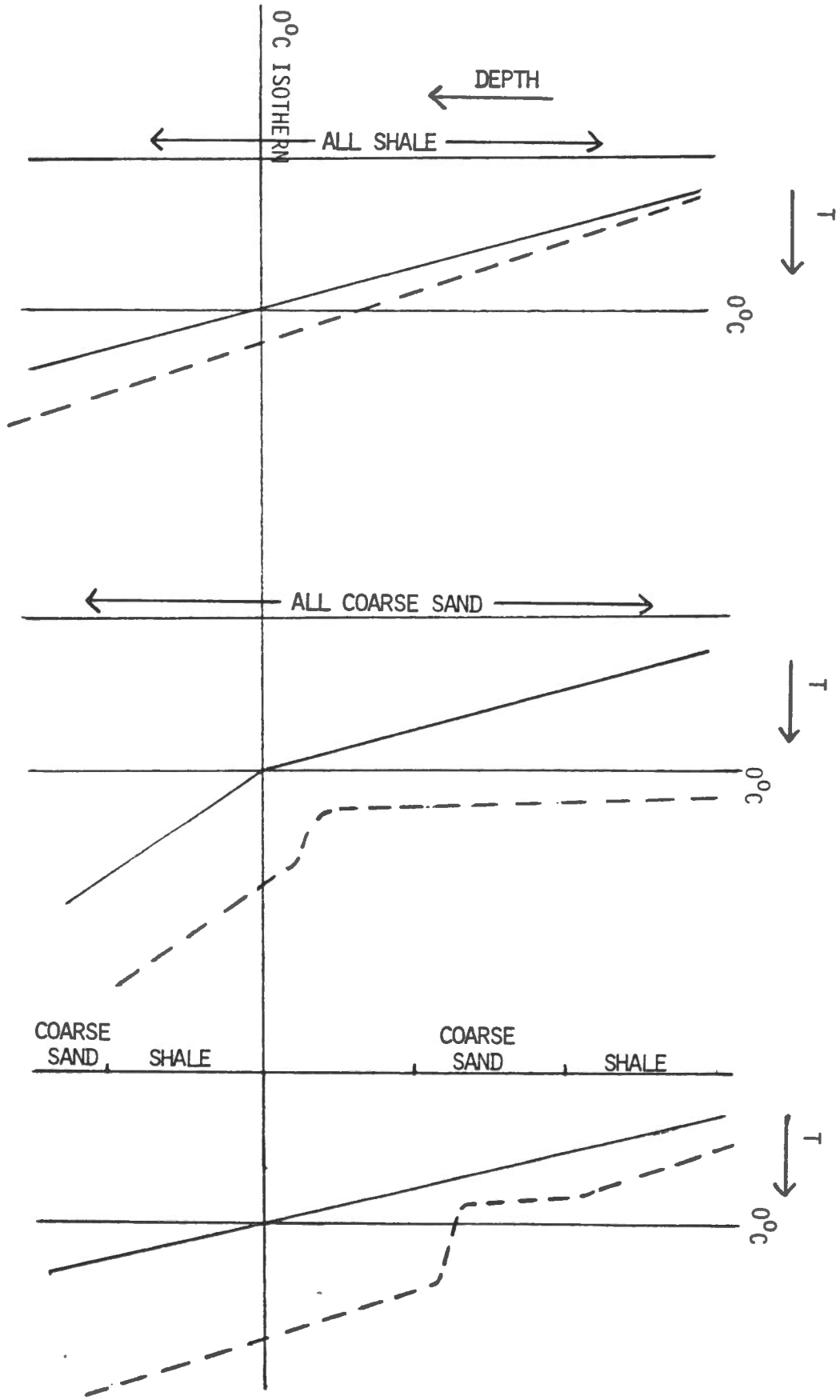


FIGURE 9: Theoretical Response: Temperature Versus Depth in the Vicinity of the 0°C Isotherm

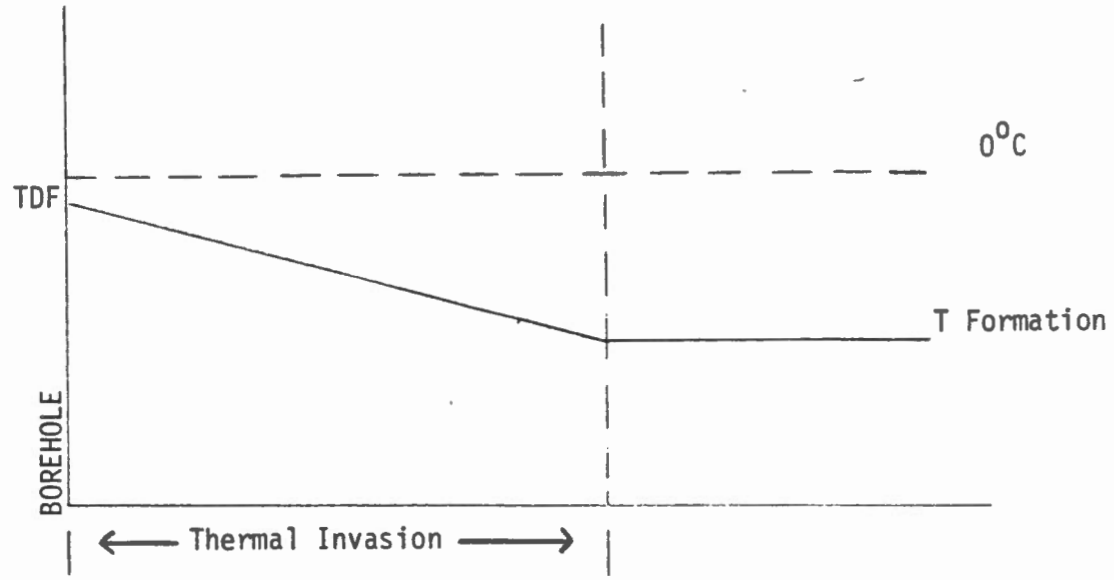


FIGURE 10: LINEAR THERMAL INVASION PROFILE
TEMPERATURE DRILL FLUID TDF $< 0^{o}C$

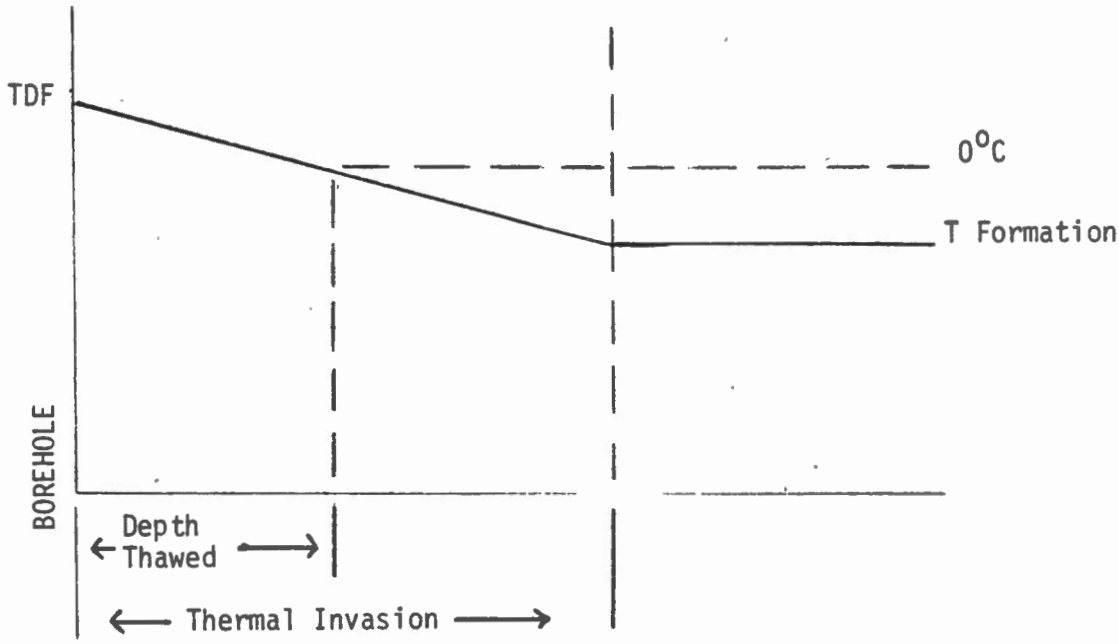
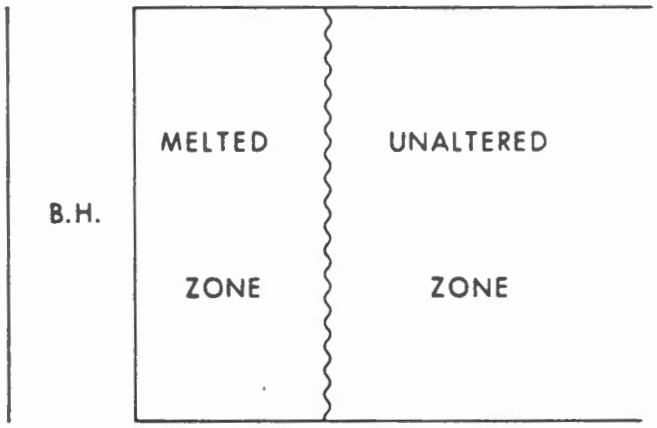


FIGURE 11: LINEAR THERMAL INVASION PROFILE
TEMPERATURE DRILL FLUID TDF $> 0^{o}C$

(a) COMPETENT FORMATION



(b) UNCONSOLIDATED SAND

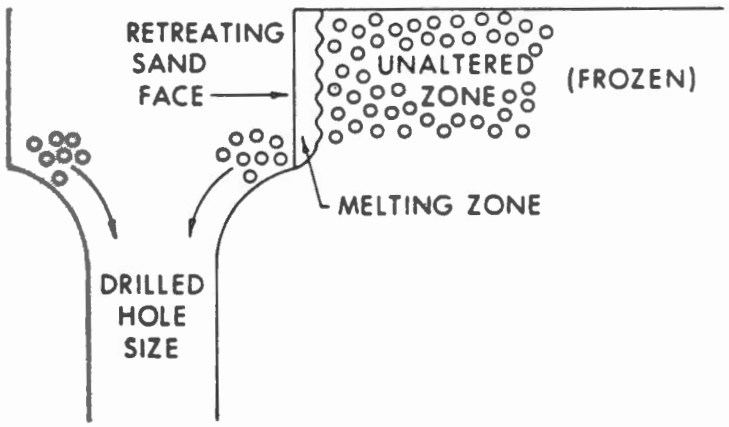
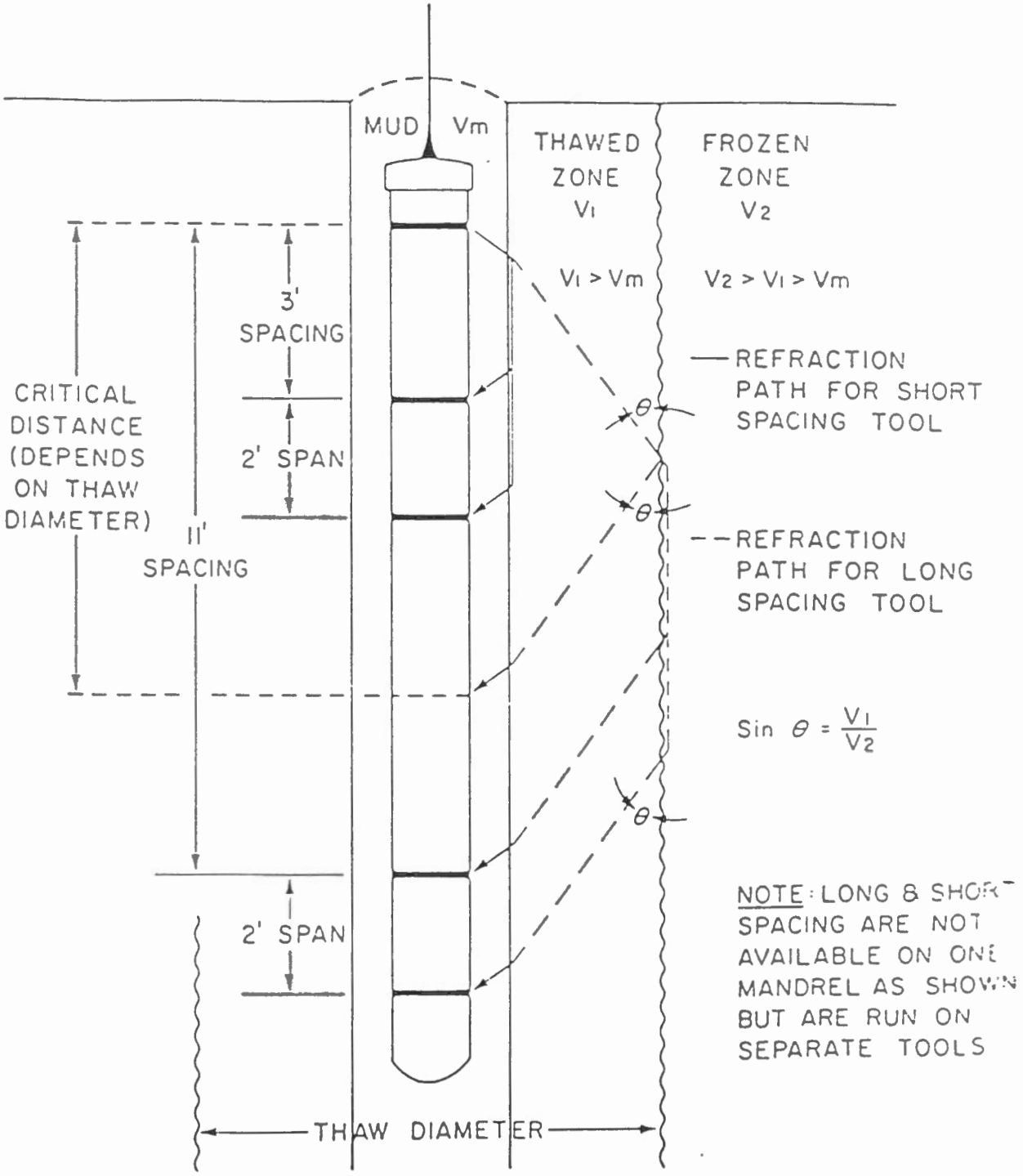
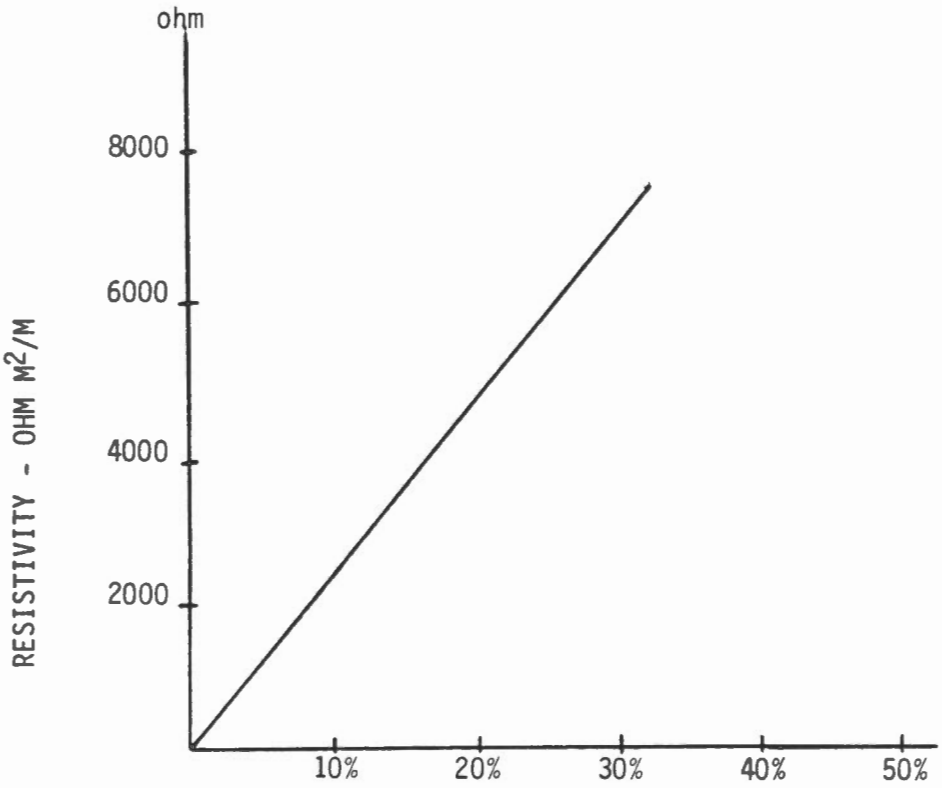


FIGURE 12: SKETCH SHOWING TWO POSSIBLE CONDITIONS AFTER DRILLING THROUGH PERMAFROST [4]

FIGURE 13: COMPARISON OF ACOUSTIC REFRACTION PATHS VERSUS SPACING





W = Amount of residual water converted to hydrate-percent.

FIGURE 14: Resistivity of specimens versus their Concentration of residual water converted to hydrate (W).[15]

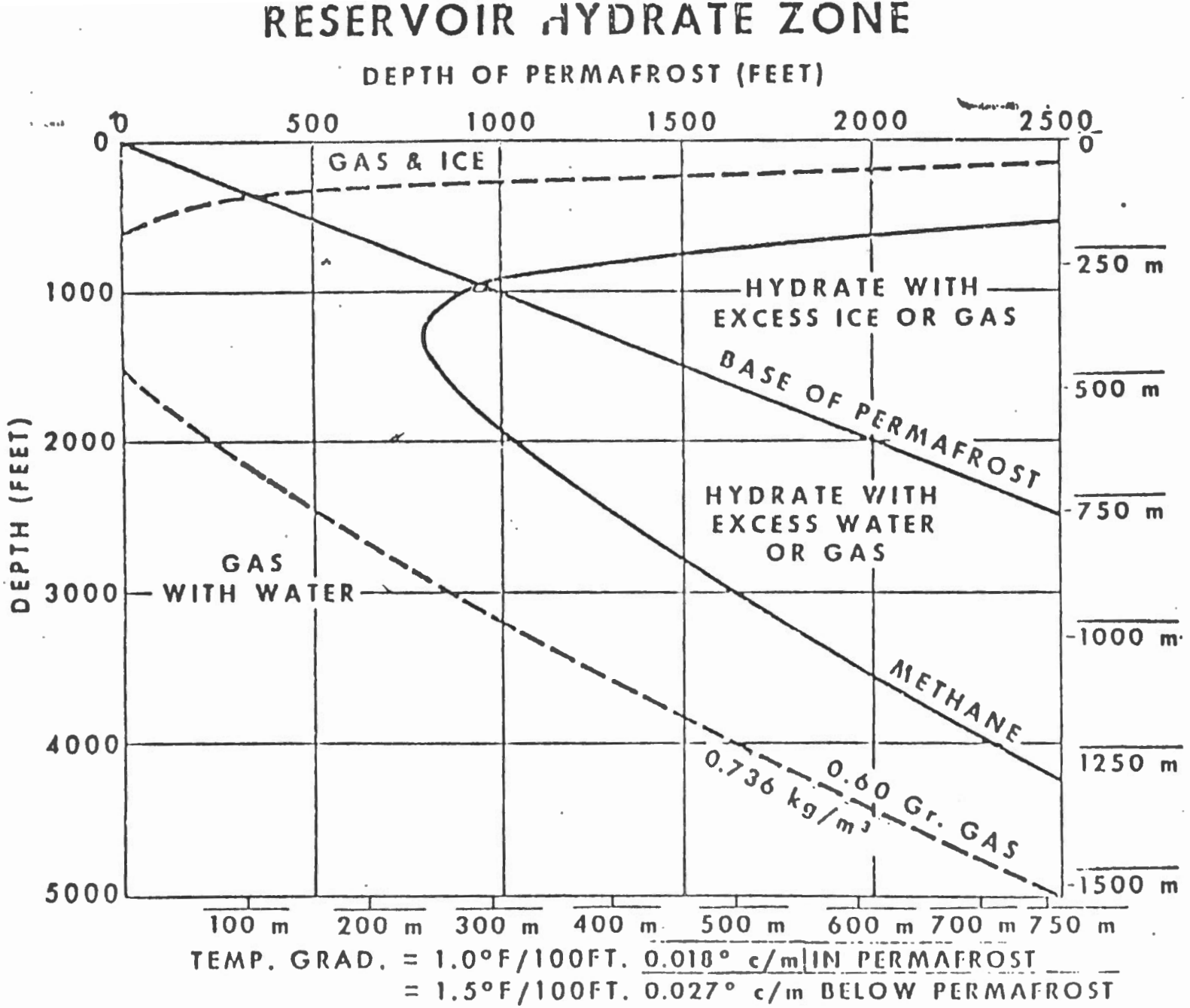


FIGURE 15: POSSIBILITY OF GAS HYDRATE RELATIVE TO: DEPTH OF PERMAFROST AND ZONE DEPTH

FIGURE 15

FIGURE 16

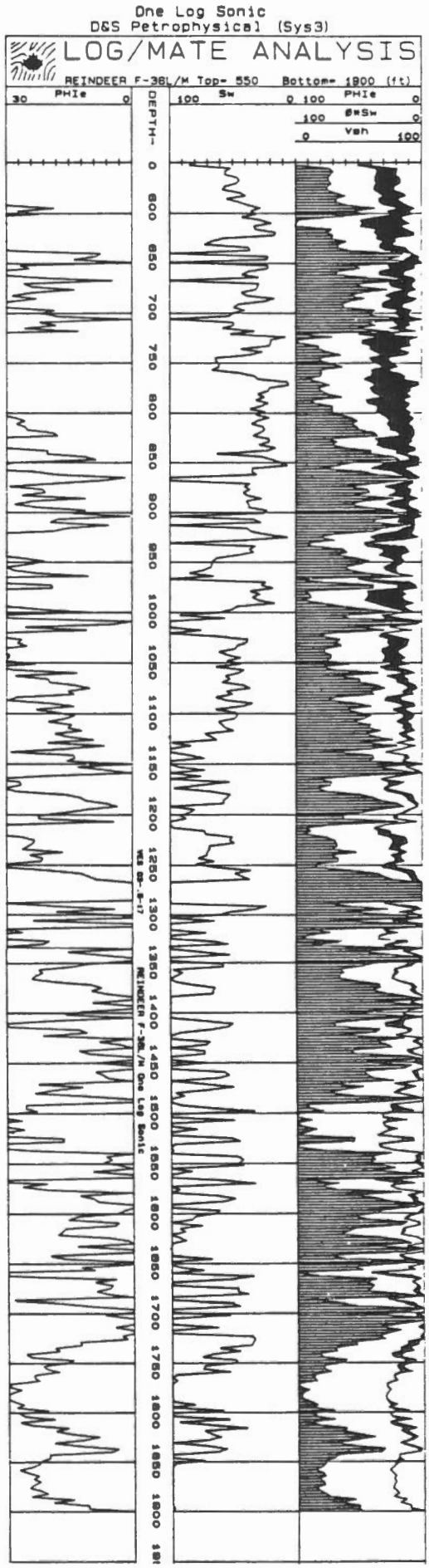


FIGURE 16: Log/Mate Computed Log Displays Ice (Black infilling) and co-existing water (Sw)

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 1 NAME: UNION AKLAVIK F-17

K.B.: 8.2 m. G.L.: 2.7 m. CSG: 161.5 m. T.D.: 892.5 m. BHT: 31.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<161		✓		IBPF above logged interval	X
Acoustic	BHCS	<161				"	S
Long Acoustic							
SP	✓	<161				"	S
GR	✓					"	S
Caliper							
Neutron							
Density							
Mud Gas							
Sample	✓	244			✓	?	
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

The pick at 244m on the sample log coincides with the top of the cretaceous with gravel and claystones above. RES is low above 244 to csg - no log evidence of IBPF.

ORIGINAL PICK D.L.

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 2 NAME: UNION AKLAVIK F-38

K.B.: 12.2 m. G.L.: 7.2 m. CSG: 841 m. T.D.: 2056 m. BHT: 51.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<841		✓		IBPF is above logged interval	X
Acoustic	BHCS					Top logged interval 841	
Long Acoustic							
SP	✓					"	
GR	✓					"	
Caliper	✓					Log top 832m	
Neutron	CNL					"	
Density	FDC					"	
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above logged interval

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 3 NAME: SHELL AKLAVIK A-37

K.B.: 9.4 m. G.L.: 3.0 m. CSG: 30 m. T.D.: 247 m. BHT: 38 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	1-ES	67	103	✓		IBPF at RES inflection point trans at base of gradient	X
Acoustic	BHCS					Unreliable skips	
Long Acoustic							
SP	✓		118		✓	Base of shift 118	
GR	✓		103		✓	Indicated rig caves above 103m	
Caliper	✓		103		✓	Caves above 103m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 4 NAME: CPOG CROSSLEY LK K-60

K.B.: 153.3 m. G.L.: 150.9 m. CSG: 215 m. T.D.: 1139 m. BHT: 22 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IND	<215		✓		IBPF above logged interval	X
Acoustic	BHCS						
Long Acoustic							
SP							
GR							
Caliper	✓						
Neutron	GRN						
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 5 NAME: UNION WOLVERINE H-34

K.B.: 145.8 m. G.L.: 140.3 m. CSG: 471.2 m. T.D.: 2041 m. BHT: 29 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<471		✓		IBPF above logged interval	X
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

All in very high resistivity, low porosity. No IBPF indicated.
(IBPF does not 'show' well in low porosity media).

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 6 NAME: AMOCO INUVIK D-54

K.B.: 42.0 m. G.L.: 36.6 m. CSG: 384 m. T.D.: 1561 m. BHT: 33 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<384		✓		IBPF above logged interval	X
Acoustic	BHCS					"	
Long Acoustic							
SP							
GR							
Caliper	✓					"	
Neutron	SNP					"	
Density	FDC					"	
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

No apparent IBPF below csg. (384m), very high resistivity, low porosity. IBPF would be difficult to pick if present.

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 7 NAME: SHELL NAPOIAK F-31

K.B.: 13.4 m. G.L.: 5.4 m. CSG: 21 m. T.D.: 160.6 m. BHT: 24 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	92	97	✓		IBPF at RES inflection point. Trans at base of gradient.	X
Acoustic							
Long Acoustic	BHCS					Reads thawed zone velocity	
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 8 NAME: SHELL BEAVER HOUSE H-13

K.B.: 74.7 m. G.L.: 67.7 m. CSG: 25 m. T.D.: 156 m. BHT: 16 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	1-ES	112	135	✓		Hi RES, step at 112	X
Acoustic	BHCS	112	135		✓	Goes to High velocity	S
Long Acoustic							
SP	✓		135		✓	Begins drift	
GR	✓					Uniform Level	
Caliper	✓					No washouts	
Neutron							
Density							
Mud Gas	✓					High gas 2130-50 2490-2600	
Sample							
Open H.Temp	✓	98.4					
GSC Temp.[2]	✓		E 204			Temp at 0°C at 175m. Ice pick indefinite	
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT As below INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS No log indication

AS INDICATED FROM MUD GAS LOGS Yes

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Possible in shaly section 650 - 655.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 9 NAME: CPOG KUGALUK N-02

K.B.: 215.9 m. G.L.: 213.5 m. CSG: 246.0 m. T.D.: 1328.6 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IND	<246		✓		IBPF above logged interval	S
Acoustic							
Long Acoustic							
SP							
GR							
Caliper							
Neutron	GRN					Gives no indication	
Density							
Mud Gas							
Sample							
Open H.Temp	✓	98			✓	Change in gradient 10.5 after circulation ceased	X
GSC Temp.[2]			E104				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No evidence INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 10 NAME: GULF EAST REINDEER P-60

K.B.: 115.9 m. G.L.: 110.6 m. CSG: 21.6 m. T.D.: 464.2 m. BHT: 18.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IEL	158		✓		Base of gradient	X
Acoustic	BHCS					Uniform readings throughout	
Long Acoustic							
SP	✓	160			✓	Anomalous negative shift unrelated to Vsh.	S
GR	✓					Uniform throughout small cave at 149m - 151.	
Caliper	✓	151					
Neutron							
Density							
Mud Gas	✓					186m - 229m	
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Gives no indication	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Possible in shaly section @ 186-229m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS Not confirmed, no sonic skip

AS INDICATED FROM MUD GAS LOGS Yes

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Possible hydrate contiguous with base of IBPF.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 11 NAME: ESSO NAPARTOK M-01

K.B.: 15.8 m. G.L.: 5.1 m. CSG: 28.8 m. T.D.: 499 m. BHT: 24 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DISFL	71		✓		Base of sharp gradient	X
Acoustic							
Long Acoustic							
SP	✓	71				Negative shift	S
GR	✓						
Caliper	✓						
Neutron							
Density	✓						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS N/A

COMMENTS: IBPF/PERMAFROST

GOOD - Strong Pick

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 12 NAME: CHEVRON FISH RIVER B-60

K.B.: 187.2 m. G.L.: 177.7 m. CSG: 232.2 m. T.D.: 864.1 m. BHT: 19.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<232		✓		IBPF above logged interval	X
Acoustic	BHCS					No anomalies	S
Long Acoustic						No anomalies	
SP	✓					No anomalies	
GR	✓						
Caliper	✓						
Neutron	CNL						
Density	✓						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Not indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS N/A

COMMENTS: IBPF/PERMAFROST

CSG (232.2) is below IBPF

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 13 NAME: GULF EAST REINDEER C-38

K.B.: 21.6 m. G.L.: 66.1 m. CSG: 490.1 m. T.D.: 2592.6 m. BHT: 59.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<490		✓		None below 490m (csg).	X
Acoustic	BHCS					No anomalies	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓						
Neutron	SNP						
Density	FDC						
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	>85			✓	To 85m (in IBPF)	X
SRS Velocity	✓					No shots above 490m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS Shows some gas in shale only

COMMENTS: IBPF/PERMAFROST

Data Gap

IBPF to 85m on Crystal cable and above 490m on RES and Acoustic.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 14 NAME: GULF OGEOQUEOQ J-06

K.B.: 84.4 m. G.L.: 75.9 m. CSG: 164.6 m. T.D.: 556.6 m. BHT: 22.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<164		✓		RES	X
Acoustic	BHCS					No anomalies	
Long Acoustic							
SP	✓	344			✓	Start of gradual shift. Shows shaliness chg.	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					To 22m only	
SRS Velocity	✓					Insufficient data	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS No log support

AS INDICATED FROM MUD GAS LOGS 911 - 1106

COMMENTS: IBPF/PERMAFROST

Fresh water sands present from casing, 164m - 580m. RES follows shaliness.

GAS HYDRATE

Not present - some gas in shale only.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 15 NAME: GULF EAST REINDEER A-01

K.B.: 190.5 m. G.L.: 184.4 m. CSG: 174.7 m. T.D.: 456.6 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL					Reflects shaliness	
Acoustic	BHCS	214			✓	Deepest High velocity	X
Long Acoustic							
SP	✓					Does not reflect GR above 286	
GR							
Caliper		214			✓	Deepest caved sand	S
Neutron	SNP						
Density	FDC						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Shallowest station at 457	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT As below INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATES

Hydrates at 360 - 365.8m

or Coal 472.7 - 478.5 489.2 - 495.3

(Coal not indicated) on sample log 1

ORIGINAL PICK YES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 16 NAME: Gulf Ikhil I-37

K.B.: 131.7 m. G.L.: 125.0 m. CSG: 230.4 m. T.D.: 1068.0 m. BHT: 37.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	351		✓		Hi RES indicates base of frozen sand	X
Acoustic	BHCS	351		✓		Cycle skips	S
Long Acoustic							
SP	✓	351			✓	Develops more - component above 352	S
GR	✓						
Caliper	✓	351				Base of big cave	S
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]		348±8	E354				
Crystal	✓					Unreliable (casing signal)	
SRS Velocity	✓	457			✓	Gross estimate - large interstation depth intervals	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT As below INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS Log not available

COMMENTS: IBPF/PERMAFROST

This sand 328 to 351 could be a gas hydrate at the base of permafrost (actual °C temperature is at 328m.)

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 17 NAME: SHELL KIPNIK O-20

K.B.: 12.3 m. G.L.: 4.0 m. CSG: 26.2 m. T.D.: 170.7 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	76		✓		Base of RES gradient	X
Acoustic	SL						
Long Acoustic	✓						
SP	✓					Other data starts at 167m	
GR	✓						
Caliper	✓						
Neutron	CNL						
Density	FDC						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Possible 253 - 261m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES acoustic CNL & FDC

AS INDICATED FROM MUD GAS LOGS YES

COMMENTS: IBPF/PERMAFROST

76m is within a sand indicated on sample log.

COMMENTS: HYDRATE

Believe gas show and log indications of gas is possible hydrate. SP has evidence of co-existance (more negative) but RES is lower than expected and CNL indicates conventional gas effect

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 18 NAME: SHELL UNAK B-11

K.B.: 10.1 m. G.L.: 2.4 m. CSG: 158.8 m. T.D.: 770.8 m. BHT: 50.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<158		✓		Resistivity follows changes in Vsh	X
Acoustic	BHCS					No anomalies	S
Long Acoustic	✓						
SP	✓						
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

No evidence of IBPF in logged interval.

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 19 NAME: SHELL ULU A-35

K.B.: 11.3 m. G.L.: 2.7 m. CSG: 227.4 m. T.D.: 913.8 m. BHT: 30 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<227		✓		RES conforms with Vsh	X
Acoustic	BHCS					No anomalies	
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]	✓		E99				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF is behind surface casing.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 20 NAME: MOBIL SADENE D-02

K.B.: 236.8 m. G.L.: 233.0 m. CSG: 127.1 m. T.D.: 503.5 m. BHT: 7.2 ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL/DLL					RES remains high through, low porosity carbonate	
Acoustic	BHCS	307			✓	Much skipping above	X
Long Acoustic							
SP	✓						
GR							
Caliper	✓	271			✓	Deepest unexplained cave	
Neutron							
Density							
Mud Gas							
Sample	✓						
Open H.Temp							
GSC Temp.[2]	✓	318±8	313+				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No hydrates evident INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

Weak pick based on depth where sonic cycle skip began.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 21 NAME: IOE BLOW RIVER YT E-47

K.B.: 117.0 m. G.L.: 112.2 m. CSG: 238.0 m. T.D.: 1261.9 m. BHT: 32.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<238		✓		Res follows cleanliness	X
Acoustic	BHCS	<238		✓		Velocity follows cleanliness	S
Long Acoustic							
SP							
GR							
Caliper							
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓						
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above surface casing (238m)

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 22 NAME: GULF KAMIK F-38

K.B.: 27.1 m. G.L.: 21.8 m. CSG: 536.8 m. T.D.: 2279.6 m. BHT: 26.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<536		✓		RES conforms with fresh water sands	X
Acoustic	BHCS	<536		✓		No anomalies	S
Long Acoustic							
SP	✓	<536				No anomalies	S
GR	✓						
Caliper	✓					Big caves ran down to 914m	
Neutron							
Density							
Mud Gas	✓					Gas responds to coal seams	
Sample	✓						
Open H.Temp	✓					Not diagnostic	
GSC Temp.[2]							
Crystal							
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Base of iBPF in above casing 536m.

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 23 NAME: GULF KAMIK D-48

K.B.: 33.2 m. G.L.: 28.0 m. CSG: m. T.D.: 1047.9 m. BHT: 22.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	390		✓		Large RES increase in Sand	X
Acoustic	BHCS	387			✓	Start gradient to level	S
Long Acoustic							
SP							
GR		✓					
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		Ex 375				
Crystal	✓	>365				Shows IBPF to 365 (deepest reading)	
SRS Velocity	✓					Not detailed enough	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Strong log pick

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 24 NAME: GULF KAMIK D-58

K.B.: 44.8 m. G.L.: 39.3 m. CSG: 165.8 m. T.D.: 1008 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	317	332	✓		This is base of last frozen sand	X
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	293			✓	8500 - 6600 at 293m.	S
SRS Velocity	✓					Not detailed enough	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None evident INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

RES of sand at 312 - 317m is greater than non-frozen sand at 344 - 350m.

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 25 NAME: GULF KAMIK L-60

K.B.: 67.7 m. G.L.: 61.0 m. CSG: 1148.5 m. T.D.: 3029.1 m. BHT: 16.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<1148				No anomalies	
Acoustic	BHCS					No anomalies	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓						
Neutron							
Density	✓						
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	402			✓	Vel change. 15400 - 6700 at 213m 8000 - 6800 at 402m	X
SRS Velocity	✓						
Other							

[1] X = Preferred S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

Weak pick based on through casing crystal cable pick. No hydrates

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 26 NAME: GULF PARSONS K-09

K.B.: 63.1 m. G.L.: 57.6 m. CSG: 18.3 m. T.D.: 296.3 m. BHT: 33.9 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<457 >292				Gap in data. Run 1 in IBPF, Run 2 below	
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓						
Neutron	SNP						
Density	FDC						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	384			✓	11600 - 5200 at 384m	X
SRS Velocity	✓					Not detailed enough	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Possible at 244m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS Mud gas log

AS INDICATED FROM MUD GAS LOGS Yes

COMMENTS: IBPF/PERMAFROST

Base of IBPF is between Run 1 (292m) and Run 2 (457m)

HYDRATE

High mud gas log at 244 (in coal). Possible hydrate and coal. No acoustic data this interval. Is within IBPF.

ORIGINAL PICK DL & IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 27 NAME: GULF PARSONS N-10

K.B.: 67.7 m. G.L.: 61.6 m. CSG: 223.1 m. T.D.: 1187.8 m. BHT: 33.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	332		✓		RES higher than in sands below	X
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓	332				Deepest cave	S
Neutron							
Density							
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]		E347+15	E360				
Crystal	✓					IBPF not indicated on crystal cable	
SRS Velocity	✓					Not detailed enough	
Other							

[1] X = Preferred, S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No

COMMENTS: IBPF/PERMAFROST

332 is base of deepest frozen sand.

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 28 NAME: GULF PARSONS N-17

K.B.: 51.8 m. G.L.: 45.7 m. CSG: 995.8 m. T.D.: 2933.1 m. BHT: 67.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<996				Logging started below permafrost	
Acoustic	BHCS					No anomalies below casing.	
Long Acoustic							
SP	✓					No anomalies below casing.	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓					High coal gas at 95m	
Sample	✓						
Open H.Temp							
GSC Temp.[2]		326±15	E361				
Crystal	✓	286			✓	8000 - 6800 @ 286m	X
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS None indicated

COMMENTS: IBPF/PERMAFROST

IBPF is above logged interval

ORIGINAL PICK VES

CHECKED & AGREED LIN/IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 29 NAME: GULF PARSONS D-20

K.B.: 64.9 m. G.L.: 59.4 m. CSG: 1050 m. T.D.: 2995.6 m. BHT: 39.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<1050		✓		Logs start below IBPF	X
Acoustic	BHCS						
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]		358±8	E370				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No mud log

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 30 NAME: GULF PARSONS O-27

K.B.: 42.0 m. G.L.: 36.6 m. CSG: 159.5 m. T.D.: 3570.4 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	348		✓		RES higher at 348m than sands below	X
Acoustic	BHCS					Log generally hashy thruout the interval	
Long Acoustic							
SP	✓	348		✓		SP looses correlation with GR at 348m	S
GR	✓						
Caliper	✓					Overgauge above 335m	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					8700 - 7000 at 243.	
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 31 NAME: GULF PARSONS L-37

K.B.: 46.6 m. G.L.: 38.1 m. CSG: 1016.8 m. T.D.: 2232.7 m. BHT: 47.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<1016		✓		Logs start below IBPF	X
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓	320±8	x308+				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No hydrates indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF is above logged interval

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 32 NAME: GULF PARSONS P-41

K.B.: 70.7 m. G.L.: 66.1m. CSG: 308.5 m. T.D.: 2006.2 m. BHT: 40.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<308				RES follow GR. No evidence of IBPF	
Acoustic	BHCS					Generally hashy throughout	
Long Acoustic							
SP	✓					Essentially follows GR	
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	220			✓	10000 - 5000 at 220m	X
SRS Velocity	✓					Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Not indicated by mud gas INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF is above logged interval

ORIGINAL PICK YES

CHECKED & AGREED LIN/IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 33 NAME: GULF PARSONS L-43

K.B.: 64.3 m. G.L.: 55.8 m. CSG: 27.7 m. T.D.: 1037.8 m. BHT: 26.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	247		✓		RES higher in sands above 247m	X
Acoustic	BHCS	247			✓	Cycle skips above 247m	S
Long Acoustic							
SP							
GR	✓	247			✓	Lo readings indicate big cave above 247	S
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]		268±15	E302				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 34 NAME: GULF PARSONS A-44

K.B.: 63.1 m. G.L.: 53.3 m. CSG: 146.9 m. T.D.: 1023.5 m. BHT: 32.2°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	352			✓	RES higher above for equivalent zones	X
Acoustic	BHCS	359			✓	Base line (SD) shift	
Long Acoustic							
SP	✓	332			✓	Stops conforming to GR	
GR	✓						
Caliper	✓					No caves	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					Starts too deep	
SRS Velocity	✓					Starts too deep	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS None indicated

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL & IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 35 NAME: GULF PARSONS P-53

K.B.: 51.2 m. G.L.: 45.7 m. CSG: 189.0 m. T.D.: 1200.3 m. BHT: 30 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	307			✓	RES higher above for equivalent zn.	X
Acoustic	BHCS	304	320		✓	SD base line shifts	S
Long Acoustic							
SP	✓	320			✓	SP and GR stop conforming (Spurious)	
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	317			✓	7000 - 6000 at 317m	
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL & IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 36 NAME: GULF EAST REINDEER O-04

K.B.: 52.1 m. G.L.: 46.6 m. CSG: 23.2 m. T.D.: 506.9 m. BHT: 43.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	320		✓		Abrupt RES change within a sand	X
Acoustic	BHCS	323			✓	Big base line shift to low velocity	S
Long Acoustic							
SP	✓					Base line shift at 143m	
GR	✓						
Caliper	✓	365			✓	Deepest caved SD	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	>152				In IBPF at deepest reading 152m	
SRS Velocity	✓					Not enough detail	
Other						Top reading 518m	

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 37 NAME: GULF ATIGI O-48

K.B.: 90.8 m. G.L.: 84.7 m. CSG: 761.1 m. T.D.: 1979.4 m. BHT: 37.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<761				Top log 761 no indication of IBPF below.	X
Acoustic	BHCS	<761					
Long Acoustic							
SP	✓						
GR	in csg.					Top log 761m	
Caliper	✓					Top log 761m	
Neutron	CNL in csg.						
Density							
Mud Gas	✓					Coal gas 1525 - 1830m	
Sample	✓						
Open H.Temp							
GSC Temp.[2]		570±15	Ex594				
Crystal	✓	509			✓	10500 - 6500 at 509m	X
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS None

COMMENTS: IBPF/PERMAFROST

Log IBPF based on crystal cable data only

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 38 NAME: GULF OGRUKNANG M-31

K.B.: 108.2 m. G.L.: 103.0 m. CSG: 1614.2 m. T.D.: 2822.4 m. BHT: 53.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL					Top reading, 1615m	
Acoustic	BHCS	539			✓	Complete loss of signal in this sand (lower sands o.k.).	X
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Top reading at 1280m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF pick made on BHCS/GR data only

ORIGINAL PICK DL & IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 39 NAME: IOE TUNUNUK K-10

K.B.: 10.9 m. G.L.: 5.4 m. CSG: 23.5 m. T.D.: 829.1 m. BHT: 49.9°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IES	96	137	✓		IBPF at abrupt RES incr. Trans at smaller change below	X
Acoustic	BHCS					Little acoustic data	
Long Acoustic							
SP	✓	125			✓	Base line gradient change	
GR	✓	96			✓	Low value as above 96m indicates big hole	S
Caliper	✓						
Neutron	✓					Top log 762m	
Density	✓					"	
Mud Gas						"	
Sample							
Open H.Temp	✓	320			✓	320m temp. gradient change	
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Top shot at 920m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No log

COMMENTS: IBPF/PERMAFROST

Open hole temp log was run only 3 hours after circulation ceased, expect little response to the latent heat of IBPF.

ORIGINAL PICK DL & IPN

CHECKED & AGREED LIN/IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 40 NAME: GULF TUNUNUK F-30

K.B.: 35.9 m. G.L.: 29.9 m. CSG: 166.1 m. T.D.: 994.9 m. BHT: 20.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<166			✓	No anomalies below casing	X
Acoustic	BHCS					No anomalies below casing	
Long Acoustic							
SP	✓	290			✓	Base line shift	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	<301				Top station below IBPF (7400')	
SRS Velocity	✓					Not enough detail. Top shot 408m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS None indicated

COMMENTS: IBPF/PERMAFROST

No indications of IBPF below casing.

ORIGINAL PICK VES/IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 41 NAME: SHELL TULLUGAK K-31

K.B.: 9.6 m. G.L.: 1.1 m. CSG: 27.4 m. T.D.: 177.4 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	73	102	✓		RES change (inflection point)	X
Acoustic	BHCS	<274				No anomalies below 274 (top log interval)	
Long Acoustic							
SP	✓	73			✓	SP stops conforming with GR above 73m	S
GR	✓						
Caliper	✓	<274				No anomalies below 274m	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None within the hydrate envelope INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS High gas at 1100m - is in shaly sections - low acoustic velocity - possible fault zone.

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 42 NAME: SHELL KUGPIK O-13

K.B.: 10.3 m. G.L.: 1.8 m. CSG: 171.0 m. T.D.: 761.7 m. BHT: 36.7°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL/DIL	<171		✓		No anomalies below casing (171)	X
Acoustic	BHCS	<171				"	
Long Acoustic						"	
SP	✓					"	
GR	✓					"	
Caliper	✓					No caves below casing.	
Neutron							
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		E103				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No mud gas/log

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 43 NAME: SHELL KUGPIK L-24

K.B.: 12.2 m. G.L.: 2.9 m. CSG: ____ m. T.D.: 246.6 m. BHT: ____ °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	88	107	✓		IBPF at point of inflection. Trans at gradient change	X
Acoustic	BHCS					No signal skip	
Long Acoustic							
SP	✓					No particular anomalies	
GR	✓					"	
Caliper							
Neutron	CNL						
Density	FDC						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS ____

AS INDICATED FROM MUD GAS LOGS All shows associated with coal seams

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 44 NAME: DOME IMNAK J-29

K.B.: 18.3 m. G.L.: 10.1 m. CSG: 142.6 m. T.D.: 900.4 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	533		✓		Sands above 533 more RES	X
Acoustic	BHCS					Top log at 900m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓					Top log at 900m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF picked on RES increase and spike like shape that could be due to caved hole in front of high RES frozen sand.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 45 NAME: IMP NUNA A-23

K.B.: 43.6 m. G.L.: 36.6 m. CSG: 159.1 m. T.D.: 931.8 m. BHT: 18.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	390			✓	Higher RES than sands below	X
Acoustic							
Long Acoustic							
SP	✓	387			✓	SP not conforming with GR above 387	S
GR	✓	399			✓	Deepest caved sand	S
Caliper	✓						
Neutron	FDC						
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	378			✓	8800 - 6700	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No mud log

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 46 NAME: GULF SIKU C-11

K.B.: 70.1 m. G.L.: 63.4 m. CSG: ____ m. T.D.: 1129.3 m. BHT: 18.9 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	357		✓		RES higher at 357m than sands below	X
Acoustic	BHCS	357			✓	Sonic skips above 357	
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]		365±6	E385				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS ____

AS INDICATED FROM MUD GAS LOGS ____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

CHECKED & AGREED LIN/IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 47 NAME: GULF SIKU A-12

K.B.: 67.7 m. G.L.: 62.2 m. CSG: 1142.7 m. T.D.: 3278.7 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<1142				No IBPF below casing.	
Acoustic	BHCS	<1142				"	
Long Acoustic							
SP	✓					"	
GR	✓					"	
Caliper	✓					"	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp	✓	358			✓	Indicates latent heat of IBPF	X
GSC Temp.[2]		348±8	E365				
Crystal							
SRS Velocity	✓					Not enough detail. 1st reading at 2000 feet.	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 48 NAME: GULF SIKU E-21

K.B.: 64.6 m. G.L.: 55.5 m. CSG: 552.9 m. T.D.: 2283.6 m. BHT: 42.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<553				No indication below casing 553m	
Acoustic	BHCS	<553				"	
Long Acoustic							
SP	✓					SP follows GR below casing	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]		398±8	E403				
Crystal		326			✓	8400 - 6300 at 326m	X
SRS Velocity		365±			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF at 326m from crystal cable only. All other logs start below IBPF

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 49 NAME: GULF SIKU L-55

K.B.: 39.3 m. G.L.: 33.8 m. CSG: 163.7 m. T.D.: 751.6 m. BHT: 18.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	463			✓	RES generally higher (in sand & shale above this depth. Very hashy, signal lost above 440m	X
Acoustic	BHCS						
Long Acoustic							
SP	✓		493		✓		
GR	✓						
Caliper	✓					Caliper stuck at 362m	
Neutron	SNP					Start below 686m	
Density	FDC					Start below 686m	
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	457			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS Gas appears to be associated with coal only.

COMMENTS: IBPF/PERMAFROST

RES data is poor, bit size is big (400+m) and is probably caved beyond. Sonde error is set to drive cond. to zero - so log lacks resolution at high resistivity.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 50 NAME: BA IOE REINDEER D-27

K.B.: 32.3 m. G.L.: 27.4 m. CSG: 464.2 m. T.D.: 1665.1 m. BHT: 31.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	I-ES	<464		✓		No indication below casing	X
Acoustic	BHCS	<464				"	
Long Acoustic							
SP	✓						
GR	✓					GR indicates big cave above 131m	
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]		343±15	E375				
Crystal							
SRS Velocity	✓					Top shot 469 not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No mud log

COMMENTS: IBPF/PERMAFROST

IBPF located above logged interval

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 51 NAME: GULF REINDEER F-36

K.B.: 15.8 m. G.L.: 10.3 m. CSG: 168.9 m. T.D.: 614.5 m. BHT: 12.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	342		✓		Sands above 340 have higher RES than equivalent sands below	X
Acoustic	BHCS						
Long Acoustic							
SP	✓	335			✓	SP stops conforming to GR above 335m	S
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]		344±8	E363				
Crystal		347				7500 - 6600 at 347m	S
SRS Velocity		304			✓	Not enough detail	
Other							

[1] X = Preferred, S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 625 to 640m[1] 727 - 732[2] INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES acoustic SP and CAL

AS INDICATED FROM MUD GAS LOGS YES

COMMENTS: IBPF/PERMAFROST

HYDRATE:

1. High RES = 5052, SP more negative than sands below, acoustic has complete loss of signal, caliper average compared to sands below (undergauge)
2. As above RES higher than sands below, loss of acoustic caliper overgauge.
3. Note zone 1168 - 1171 has similar characteristics and tested .14 x 10^6 m3/day gas - it is below the hydrate prone envelope (permafrost +750m = 341 + 750 = 1090m)

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 52 NAME: GULF REINDEER A-41

K.B.: 29.0 m. G.L.: 19.8 m. CSG: 196.3 m. T.D.: 698.3 m. BHT: 26.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	335	420		✓	Trans - RES baseline shift IBPF at base of frozen sand	X
Acoustic	BHCS	385			✓	Base line shift	
Long Acoustic							
SP	✓					Generally conforms with GR	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Top shot 701	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS High gas 825m level

COMMENTS: IBPF/PERMAFROST

HYDRATE: All high gas readings appear to be associated with coal seams.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 53 NAME: GULF KIKORALOK N-46

K.B.: 14.9 m. G.L.: 6.1 m. CSG: 161.8 m. T.D.: 521.8m. BHT: 26.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<161		✓		Not apparent on RES	X
Acoustic	BHCS	<161				Not apparent on acoustic	
Long Acoustic							
SP	✓					Poor quality hashy data.	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Top shot 183m, not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT As below INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES SP caliper acoustic

AS INDICATED FROM MUD GAS LOGS High gas readings

COMMENTS: IBPF/PERMAFROST

IBPG above logged interval.

HYDRATE:

At the 760m level, all logs indicate good possibility of gas hydrate.

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 54 NAME: SHELL TITALIK O-15

K.B.: 12.2 m. G.L.: 4.5 m. CSG: 18.3 m. T.D.: 153.0 m. BHT: 15.5 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	97	107	✓		IBPF at point of inflection. Trans of gradient change.	X
Acoustic	BHCS					Top reading 152m	
Long Acoustic	✓						
SP	✓						
GR	✓					Top reading 158m	
Caliper	✓					"	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS High readings appear to be coal seams

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 55 NAME: GULF TITALIK K-26

K.B.: 11.5 m. G.L.: 4.5 m. CSG: 166.7 m. T.D.: 939.9 m. BHT: 42.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<167				Top log interval 167m	
Acoustic	BHCS						
Long Acoustic							
SP							
GR							
Caliper							
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]			72+				
Crystal	✓	<55		✓		Top shot at 55m is below IBPF	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF is above logged interval (167m)

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 56 NAME: IMP DELTA 5 KURK M-39

K.B.: 8.7 m. G.L.: 1.7 m. CSG: 165.8 m. T.D.: 576.7m. BHT: 16.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<167				Not apparent in logged interval 167m	
Acoustic	BHCS					Top acoustic log 488m	
Long Acoustic							
SP							
GR							
Caliper							
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	61			✓	8400 - 5000 @ 61m	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS No mud gas log

COMMENTS: IBPF/PERMAFROST

IBPF above 167m (top of logged interval)

ORIGINAL PICK YES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 57 NAME: IOE ELLICE O-14

K.B.: 5.1 m. G.L.: 0.9 m. CSG: 240.5 m. T.D.: 779.1 m. BHT: 25.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IES	<240				IBPF above logged interval	
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	38			✓	9000 - 6200 @ 38m	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT NONE INDICATED INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above logged interval

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 58 NAME: IOE SPRING RIVER YT N-58

K.B.: 96.9 m. G.L.: 92.7 m. CSG: 159.4 m. T.D.: 604.1 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<160				Not evident in logged interval	
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR		46			✓	Abnomaly low GR indicates big cave	X
Caliper							
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp	✓	46				Abrupt change in gradient (latent Heat of ice)	S
GSC Temp.[2]							
Crystal	✓					Acoustic velocity too high by crystal cable	
SRS Velocity	✓					Not detail enough - top shot 304m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above logged interval. O.H. temp survey and GR indicate IBPF at 46m.

ORIGINAL PICK VES/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 59 NAME: IOE ESKIMO J-07

K.B.: 27.1 m. G.L.: 21.0 m. CSG: 24.1 m. T.D.: 550.8 m. BHT: 49.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	I-ES	155	201	✓		IBPF is base of deepest frozen sand, trans is grad. chg.	X
Acoustic	BHCS	155				Loss of signal	S
Long Acoustic							
SP	✓		201		✓		S
GR	✓						
Caliper							
Neutron	GRN						
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					9400 to 152 (still in IBPF)	
SRS Velocity	✓					Not detailed enough	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 60 NAME: IOE TUKTU O-19

K.B.: 30.5 m. G.L.: 25.6 m. CSG: 620 m. T.D.: 2308 m. BHT: 50 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<620				No IBPF below casing.	
Acoustic	BHCS	<620				"	
Long Acoustic							
SP	✓					"	
GR	✓					"	
Caliper	✓					"	
Neutron							
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	335			✓	9000 - 7200 @ 335	X
SRS Velocity	✓					Top shot 457m, not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF is above logged interval.

ORIGINAL PICK YES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 61 NAME: IOE TUK F-18

K.B.: 25.9 m. G.L.: 18.3 m. CSG: 575 m. T.D.: 1943.7 m. BHT: 36.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	ES	<575				Top logged interval is 575m	X
Acoustic							
Long Acoustic							
SP	✓					Top logged interval is 575m	
GR	✓					Insufficient data	
Caliper							
Neutron	GRN						
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	305			✓	Not enough detail, shots at 305, 710	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Insufficient data.

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 62 NAME: IMP WAGNARK G-12

K.B.: 38.4 m. G.L.: 30.5 m. CSG: 160.9 m. T.D.: 931.5 m. BHT: 24.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	387		✓		Base of top frozen sand	X
Acoustic	BHCS	424			✓	Skips above 424	
Long Acoustic							
SP	✓					Little character throughout	
GR	✓						
Caliper	✓						
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	369			✓	8000 - 6700 @ 369	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 63 NAME: IMP DELTA 5 WAGNARK C-23

K.B.: 30.5 m. G.L.: 23.1 m. CSG: 564 m. T.D.: 3256.5 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<864				Top log interval 864m	
Acoustic	BHCS					"	
Long Acoustic							
SP	✓					Top log interval 864m	
GR	✓	487			✓	GR indicates big hole above 487m	
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	518			✓	12800-8500, 424; 8500-6500, 518	X
SRS Velocity	✓					Not enough detail, top shot 610m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above logged interval

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 64 NAME: GULF RED FOX P-21

K.B.: 31.7 m. G.L.: 23.5 m. CSG: 167.0 m. T.D.: 1280 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	610	640	✓		IBPF at base of deepest. Frozen silt. trans is gradient change	X
Acoustic	BHCS	610				Loss of signal	S
Long Acoustic							
SP	✓	625					
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		>583				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 65 NAME: GULF YA YA I-17

K.B.: 26.5 m. G.L.: 18.3 m. CSG: 160.9 m. T.D.: 1321 m. BHT: 27 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	685	721	✓		IBPF is base of frozen sand. Trans is base of gradient	X
Acoustic	BHCS						
Long Acoustic		591			✓	Loss of signal	
SP	✓					Little effect	
GR	✓					Mostly sands	
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	573			✓	9500 - 7000 at 573	
SRS Velocity	✓	610			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Conflict between log and Xtal IBPF

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 66 NAME: GULF YA YA A-28

K.B.: 48.8 m. G.L.: 39.6m. CSG: 160.0 m. T.D.: 1212 m. BHT: 16 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	673	728		✓	IBPF at base of frozen sand. Trans at gradient change	X
Acoustic	BHCS					Very hashy throughout	
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]	✓		Ex 674				
Crystal	✓	573			✓	10,200 - 6800 at 573m	
SRS Velocity	✓	762				Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Conflict with crystal cable data.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 67 NAME: GULF YA YA M-33

K.B.: 49.1 m. G.L.: 42.7 m. CSG: 158.2 m. T.D.: 898 m. BHT: 20 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	470	548	✓		IBPF at major RES change	X
Acoustic	BHCS	468			✓	Signal loss above 468	S
Long Acoustic							
SP	✓					Gradient change at 631	
GR	✓					Mostly shale	
Caliper	✓	468				Deepest big cave	S
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	423			✓	9500 - 6800 at 423	
SRS Velocity	✓					Top shot 710m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No hydrates indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 68 NAME: GULF YA YA P-53

K.B.: 41.4 m. G.L.: 36.9 m. CSG: 229.2 m. T.D.: 1058 m. BHT: 31 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	402	438	✓		IBPF at base of frozen sand. Trans at gradient chg.	X
Acoustic	BHCS	402			✓	Goes to level above 402m	S
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓	338			✓	Big cave above 338m K.B.	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]	✓	407±15	E438				
Crystal	✓	351			✓	10,900 - 6800 at 351	
SRS Velocity	✓	457				Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT As below INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

HYDRATES:

No bona fide reservoir but possible hydrated gas in shaly section 670-701m. High mud gas, loss of sonic signal - but low resistivity. Similar shows exist to base of the hydrate prone envelope (1150m), shows below are associated with shale and coal.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 69 NAME: GULF TORPOLOK H-24

K.B.: 15.8 m. G.L.: 10.6 m. CSG: 161.5 m. T.D.: 1221.9 m. BHT: 16.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	335	357	✓		IBPF at base of frozen silt. Trans base of gradient	X
Acoustic	BHCS	320			✓	Loss of signal above 320	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓	320			✓	Big caves above 320m	
Neutron	✓						
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	330			✓	10,600 - 6,600 at 330m	
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

NOTE: Logs represent dramatically the freezing of DS (320m) and less dramatically the freezing of silt (335m)

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 70 NAME: GULF TORPOLOK O-54

K.B.: 11.5 m. G.L.: 3.0 m. CSG: 189.9 m. T.D.: 1336.5 m. BHT: 25.5 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIFL	207	216	✓		IBPF at abrupt shift. Base of SD, trans at start of gradient.	X
Acoustic	BHCA	204			✓	Loss of signal	S
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal		<280				Not frozen below 280	
SRS Velocity						Not detailed enough	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 406 - 488 INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS No logs

AS INDICATED FROM MUD GAS LOGS 449 - 494

COMMENTS: IBPF/PERMAFROST

HYDRATE:

None in bona fide reservoirs, show above relatively low resistivity conglomerate, relatively clean acoustic log cycle skips.

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 71 NAME: SHELL KUMAK J-06

K.B.: 17.6 m. G.L.: 9.1 m. CSG: 159.7 m. T.D.: 617.2 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	243	291		✓	IBPF at High RES & separation between 1LD, 1LN. Trans at start of gradient	X
Acoustic	BHCS					Skips throughout	
Long Acoustic	Sonic						
SP							
GR	✓					Indicates Very big hole above 208m	
Caliper	✓					Wide open in 470mm hole	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT As below INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS Not indicated on logs

AS INDICATED FROM MUD GAS LOGS High gas 664-710, gas is from poor data, 470mm hole

COMMENTS: IBPF/PERMAFROST

COMMENTS: Hydrate

3m resistive stringer at 664 - producing interval indicated on open hole temp survey.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 72 NAME: SHELL KUMAK K-16

K.B.: 11.5 m. G.L.: 3.0 m. CSG: 160.6 m. T.D.: 606.9 m. BHT: 11.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	241	311	✓		IBPF at abrupt RES change. Trans at base of gradient	X
Acoustic	BHCS	256			✓	Signal lost above 256m	
Long Acoustic							
SP							
GR							
Caliper	✓	264			✓	Big hole above 264m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS Moderate gas readings in shaly zones.

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 73 NAME: SHELL KUMAK C-58

K.B.: 10.9 m. G.L.: 2.4 m. CSG: 134.7 m. T.D.: 614.8 m. BHT: 7.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL/DLL	247	283	✓		Abrupt RES chg. within Sd. Trans is base of gradeint.	X
Acoustic	BHCS	228				All skips above 228'	
Long Acoustic							
SP							
GR							
Caliper		220			✓	Caved above 220	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS Mud gas readings in 320m level are associated with shale and coal.

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 74 NAME: SHELL KUMAK E-58

K.B.: 10.6 m. G.L.: 2.1 m. CSG: 253.6 m. T.D.: 735.5 m. BHT: 27.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	217	288	✓		IBPF abrupt RES change. Trans at start of gradient	X
Acoustic	BHCS	217				Abrupt change to low velocity	S
Long Acoustic	✓						
SP	✓						
GR	✓						
Caliper	✓	216			✓	Big caves above 216m	S
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		E283				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 1055 - 1223 - possible INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES, Acoustic

AS INDICATED FROM MUD GAS LOGS Not enough gas for hydrate

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Above zones have low (but not lost) velocity. Are high resistivity with SP generally not conforming to GR. Mud log is not high enough - suspect fresh water above 1186m.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 75 NAME: SHELL NIGLINTGAK B-19

K.B.: 10.6 m. G.L.: 2.1 m. CSG: 33.5 m. T.D.: 334.1 m. BHT: 25.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	181	198	✓		IBPF at abrupt RES chg. Trans at base of gradient	X
Acoustic	BHCS					Starts below IBPF	
Long Acoustic	Sonic						
SP	✓						
GR	✓						
Caliper	✓					Starts below IBPF	
Neutron							
Density							
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]	✓	176±15	E181				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 872m 998m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES, Acoustic, GR, SP

AS INDICATED FROM MUD GAS LOGS Yes, High mud gas readings from 518m down 1525m

COMMENTS: IBPF/PERMAFROST

HYDRATES:

Other than 872 - 998 the high mud gas is associated with shales, above zone has high RES. Much cycle skipping is clean by the GR. SP conforms reasonably well, may be free gas - it is below the base of hydrate prone envelope.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 76 NAME: SHELL NIGLINTGAK M-19

K.B.: 10.0 m. G.L.: 1.5 m. CSG: 160.0 m. T.D.: 546.5 m. BHT: 21.7°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL/DLL	58	213		✓	Resistive point of inflection. Trans at base of gradient	X
Acoustic	BHCS					Much skips above 238	
Long Acoustic							
SP							
GR							
Caliper	✓					Much overgauge above 225	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓	57	> 148				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 806 to 851 INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS DIL, DLL, Acoustic, GR, SP

AS INDICATED FROM MUD GAS LOGS YES

COMMENTS: IBPF/PERMAFROST

Poor data, RES only, possibly IBPF is a lens only.

COMMENTS: HYDRATES

RES logs were obtained on July 24, 29 and 31. and all indicate little invasion, acoustic has lost signal, SP & GR generally conform hole is on gauge. Low probability of hydrate as it is below the depth for methane hydrate

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 77 NAME: SHELL UNIPKAT 1-22

K.B.: 9.7 m. G.L.: 1.5 m. CSG: 26.8 m. T.D.: 182.0 m. BHT: 25.5 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	58	88	✓		IBPF based on abrupt RES cg. Trans based on gradient base	X
Acoustic	BHCS					Skips throughout	
Long Acoustic							
SP							
GR							
Caliper	✓					Big caves above 88m	
Neutron							
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		E94				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 78 NAME: SHELL NIGLINTGAK H-30

K.B.: 10.0 m. G.L.: 1.8 m. CSG: 159.7 m. T.D.: 549.6 m. BHT: 32.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	89	189		✓	Resistivity higher than expected. Trans based on gradient Chg.	X
Acoustic	BHCS				✓	All skips (fr. 172m)	
Long Acoustic							
SP							
GR							
Caliper	✓	239			✓	Big caves down to 239m	
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp	✓						
GSC Temp.[2]	✓	77	E152				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 762 - 787, 902 - 924, 954 - 994, 1058-1073 INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS DIL, Acoustic, GR, SP

AS INDICATED FROM MUD GAS LOGS Moderate mud gas levels only.

COMMENTS: IBPF/PERMAFROST - All poor data, pick based on RES only. Suspect discontinuous IBPF.

COMMENTS: HYDRATE - The 762-787 zone has hydrate qualitites, High RES, low invasion, poor SP development, acoustic log has lost signal. It is at the base of hydrate prone envelope. Some possibility that this and equivalent at M-19 are coal (coal not logged in samples).
The 902 - 924, 954-994, 1058-1073 zones are similar but they have developed SP, (+) acoustic velocity in similar to coal or higher coal not logged in samples. Moderate mud gas levels, all zones are too deep for methane hydrates.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 79 NAME: IMP LANGLEY E-29

K.B.: 10.6 m. G.L.: 0.9 m. CSG: 153mm. T.D.: 939.4 m. BHT: 8.9 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DISFL	67	82	✓		IBPF at abrupt RES shift. Trans at gradient base	X
Acoustic	BHCS						
Long Acoustic							
SP	✓					SP starts below IBPF	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					7500 - 4500 at 21m	
SRS Velocity	✓					Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 80 NAME: NORTH ELLICE J-23

K.B.: 10.9 m. G.L.: 0.9 m. CSG: 158 m. T.D.: 1234 m. BHT: 23.9°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<158		✓		Not evident log top 158m	X
Acoustic							
Long Acoustic	BHCS					Top interval 1486m	
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]		62± 8	E 84				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above logged interval

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 81 NAME: IMP IKATTOK J-17

K.B.: 8.9 m. G.L.: -7.6 m. CSG: 182.6 m. T.D.: 426 m. BHT: 26 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<170		✓		IBPF above top logged interval	X
Acoustic	BHCS						
Long Acoustic							
SP	✓	<170				SP & GR generally conform	
GR	✓						
Caliper							
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					4500 from surface to 152m	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF above top of logged interval, 170m

ORIGINAL PICK _____

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 82 NAME: ARCO SMOKING HILLS A-23

K.B.: 292.1 m. G.L.: 289.7m. CSG: ____ m. T.D.: ____ m. BHT: ____ °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES						NO LOGS RUN	
Acoustic							
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT NO LOGS RUN INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS ____

AS INDICATED FROM MUD GAS LOGS ____

COMMENTS: IBPF/PERMAFROST

NO DATA

ORIGINAL PICK ____

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 83 NAME: ELF ET AL KILIGVAK I-29

K.B.: 17.4 m. G.L.: 13.7 m. CSG: 159.4 m. T.D.: 459.9 m. BHT: 27.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<159		✓		IBPF above top logged interval 159m	X
Acoustic	BHCS						
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF ABOVE TOP OF LOGGED INTERVAL

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 84 NAME: IMP AKKU F-14

K.B.: 40.2 m. G.L.: 33.5 m. CSG: 25.9 m. T.D.: 699.5 m. BHT: 10 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	229			✓	Base of significant frozen sand	X
Acoustic	BHCS	229			✓	Hi velocity of frozen sand above	S
Long Acoustic							
SP	✓					SP & GR generally conform	
GR	✓					Very big hole above 129m	
Caliper	✓	207			✓	Much big hole above 207m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	228			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Indefinite IBPF, some minor frozen lenses below pick of 229m

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 85 NAME: IOE PIKIOLIK M-26

K.B.: 24.0 m. G.L.: 17.4 m. CSG: 164.0 m. T.D.: 621.2 m. BHT: 18 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	340			✓	IBPF where RES rises	X
Acoustic	BHCS	340	356		✓	IBPF where vel. goes High. Much skipping above 356m	S
Long Acoustic							
SP	✓					SP & GR conform throughout	
GR	✓					Top reading 619m.	
Caliper							
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		368+				
Crystal	✓					12,500-7800 @158m (csg.) 7,800-6600 @ 305m	
SRS Velocity	✓	305			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 86 NAME: IMP PILIOLOK E-54

K.B.: 24.4 m. G.L.: 17.6 m. CSG: 153.6 m. T.D.: 759.6 m. BHT: 16.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	425			✓	IBPF at abrupt RES increase	X
Acoustic	BHCS	427				Deepest skip	
Long Acoustic							
SP	✓					SP generally conforms with GR	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		439+				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

From IBPF (425) to 549 the RES (R1LD) shows ice/hydrate presence in each cleaner section. This is not supported by RLL8 or R1LM and I suspect sonde error of 1LD is set too low.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 87 NAME: ESSO MAYOGIAK M-16

K.B.: 18.9 m. G.L.: 8.2 m. CSG: 152.5 m. T.D.: 912 m. BHT: 26 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	411			✓	IBPF based on abrupt RES increase	X
Acoustic							
Long Acoustic							
SP	✓					Little SP activity	
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IPBF based on RES data only

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 88 NAME: IOE MAYOGIAK J-17

K.B.: 22.5 m. G.L.: 17.6 m. CSG: 694.3 m. T.D.: 1251.2 m. BHT: 27.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<694				IBPF above log top 694m	
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓					GR indicates big caves above 433.	
Caliper	✓					Hole enlarged above 762m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp	✓	433			✓	Latent heat above 433	x
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

No open hole logs above 694m. IBPF pick based on GR and O.H. temp.

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 89 NAME: IMP MAYOGIAK L-39

K.B.: 14.3 m. G.L.: 4.9 m. CSG: 156.7 m. T.D.: 925.1 m. BHT: 26.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	636			✓	RES higher than equiv. sands below	X
Acoustic	SL					Top reading 920m	
Long Acoustic							
SP	✓					Generally conforms to GR up to 655m	
GR	✓						
Caliper	✓	549			✓	All caved above 549. 3m cave at 673m	
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	>542				Still at 10,500 at 542m	
SRS Velocity	✓	<914				Top shot 914m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF base at 636 with a 3m lens below at 673m.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 90 NAME: GULF KILAGMIOTAK M-16

K.B.: 29.8 m. G.L.: 24.4 m. CSG: 153.0 m. T.D.: 972.3 m. BHT: 15.5 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	740	790	✓		IBPF on abrupt RES increase. Trans is base of gradient	X
Acoustic	BHCS	723				Hi velocity ice above 723	S
Long Acoustic							
SP	✓					Little conforming with GR anywhere	S
GR	✓						
Caliper	✓	724			✓	Big caves above 724	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	707			✓	9500 - 6500 at 707m	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 91 NAME: GULF KILAGMIOTAK F-48

K.B.: 26.5 m. G.L.: 19.8 m. CSG: 650.1 m. T.D.: 2492.3 m. BHT: 35°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	716	747	✓		IPBF based on abrupt RES chg. Trans at Gradient change	X
Acoustic	BHCS	707			✓	Much skipping above	
Long Acoustic							
SP	✓					SP conforms with GR throughout	
GR	✓						
Caliper	✓						
Neutron	✓						
Density	✓						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		X607				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 92 NAME: IMP UMIAK N-10

K.B.: 43.9 m. G.L.: 34.4 m. CSG: 167 m. T.D.: 904.5 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	701	768	✓			X
Acoustic	BHCS					Top reading 904m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓	701			✓	Big caves above 701m	S
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓						
SRS Velocity	✓	>631				Still 9500 at 631m Top shot 720m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 93 NAME: IMP UMIAK J-37

K.B.: 28.9 m. G.L.: 20.4 m. CSG: 158.8 m. T.D.: 936 m. BHT: 16.1°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	669	733	✓		IBPF at abrupt RES increase. Trans at base of gradient	X
Acoustic	BHCS	669		✓		Base of High velocity at 669	S
Long Acoustic							
SP	✓					Generally conforms with GR	
GR	✓						
Caliper	✓	669			✓	Big caves above 669m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					8800 - 6500 @ 665	
SRS Velocity	✓					Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 94 NAME: IMP MALLIK A-06

K.B.: 33.5 m. G.L.: 25.9 m. CSG: 160.6 m. T.D.: 920.5 m. BHT: 12.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	640		✓		IBPF at abrupt RES change	X
Acoustic	BHCS					Generally poor above 640m	
Long Acoustic							
SP	✓					SP & GR conform well	
GR	✓						
Caliper	✓					Hole caved above 732m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp	✓	640		✓		Inflection on shift from latent heat above	S
GSC Temp.[2]	✓		> 258				
Crystal	✓	603				Still at 8900 at 603m	
SRS Velocity	✓	655			✓	Short spaced SRS	S
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No hydrates indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF is at base of sand unit with shale below

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 95 NAME: IMP MALLIK J-37

K.B.: 10.4 m. G.L.: 7.0 m. CSG: 160 m. T.D.: 883.9 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	622	652	✓		IBPF at base of frozen sand stringer Trans at base of gradient	X
Acoustic	BHCS						
Long Acoustic							
SP	✓					SP generally conforms with GR up to 564m	
GR	✓						
Caliper	✓					Hole is big above 884m	
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	573				11,700 - 7100 at 573m	
SRS Velocity	✓					Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS No logs

AS INDICATED FROM MUD GAS LOGS Not indicated

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATES

Considered only as it is near a known hydrate well - no support from mud log or resistivity.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 96 NAME: IOE MALLIK L-38

K.B.: 9.7 m. G.L.: .9 m. CSG: 163.7 m. T.D.: 906.5 m. BHT: 9 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	613	637	✓		IBPF at abrupt RES change. Trans at gradient change.	X
Acoustic	BHCS	575			✓	Hi velocity above 575m.	
Long Acoustic							
SP	✓					Little response	
GR	✓						
Caliper							
Neutron	SNL					Top log 906m	
Density	FDC					"	
Mud Gas							
Sample							
Open H.Temp	T.L.	>573				Appears to be still in IBPF at 573m (Deepest reading)	
GSC Temp.[2]							
Crystal	✓					Signal dominated by casing velocity	
SRS Velocity	✓					Top shot 884	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 820 to 1113 level INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES, SP, Acoustic

AS INDICATED FROM MUD GAS LOGS Yes

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATES

Classic case of hydrate, gas and water. We concur completely with prior evaluation[5], which is attached overleaf.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

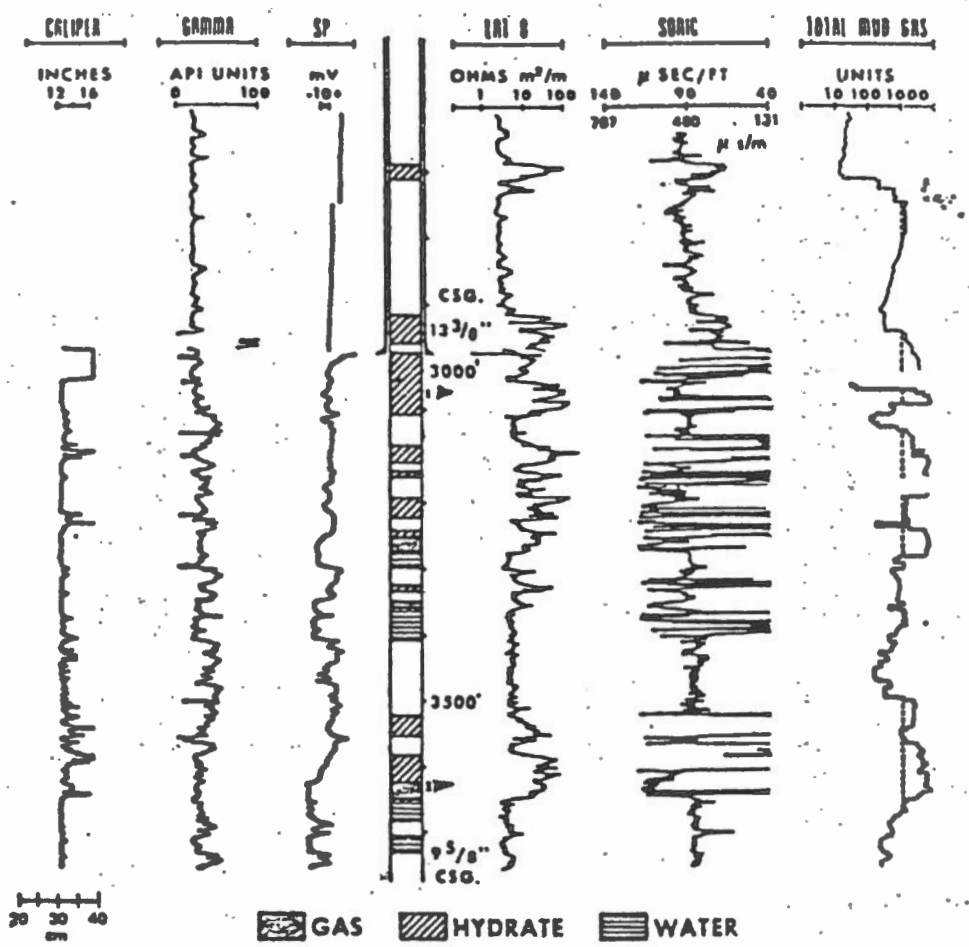


Fig. 9. Hydrate characteristics, IMP 10E Mallik L-38.

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 97 NAME: IMP MALLIK P-59

K.B.: 8.2 m. G.L.: 0.9 m. CSG: 159 m. T.D.: 1004 m. BHT: 23.9 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	645	707	✓		IBPF at abrupt change. Trans at base of gradient	X
Acoustic	BHCS				✓	Some loss of signal above 707m.	
Long Acoustic							
SP	✓					SP conforms poorly with GR	
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	640			✓	Short interval (61m) SRSS	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT No hydrates indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATES

Considered as it is close to known hydrate well (MALLIK L-38).
No indications here.

ORIGINAL PICK IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 98 NAME: IOE TAGLU G-33

K.B.: 7.9 m. G.L.: 1.8 m. CSG: 929 m. T.D.: 2330.5 m. BHT: 41°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<929				IBPF above logged interval	
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	543			✓	9000 - 7500 at 543	X
SRS Velocity	✓	457			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF above O.H. logged interval

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 99 NAME: IOE TAGLU C-42

K.B.: 12.2 m. G.L.: 1.8 m. CSG: 167.6 m. T.D.: 791.3 m. BHT: 6.7°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIFL	564	670	✓		IBPF at abrupt RES change in a sand Trans at base of gradient change.	X
Acoustic	BHCA	564				Generally poor data above 564m	S
Long Acoustic							
SP	✓					Generally conforms with GR below 545m	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		X610+				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 100 NAME: IOE TAGLU D-43

K.B.: 11.8 m. G.L.: 1.5 m. CSG: 28.7 m. T.D.: 977.5 m. BHT: 25.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	548	618	✓		IBPF at abrupt change. Trans at base of gradient	X
Acoustic	BHCS	548				Skips above 548m	S
Long Acoustic							
SP	✓					Stops conforming above 558	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		X633				
Crystal	✓	518				9600-7800 @ 387, 7800-6500 @ 518	
SRS Velocity	✓	457				Not enough detail	
Other Deep ES		548				RES deep ES >RLL8 above 548	S

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 101 NAME: IOE TAGLU H-54

K.B.: 10.6 m. G.L.: 1.5 m. CSG: 28.3 m. T.D.: 927.5 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	515			✓	IBPF at base of frozen sand	X
Acoustic	BHCS					Top logged interval 921	
Long Acoustic							
SP	✓					Conforms with GR throughout	
GR	✓						
Caliper	✓						
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]		513±15	542				
Crystal	✓					12,000-7600 @ 335, 7600-5500 @ 445	
SRS Velocity	✓	609				Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 1100m level INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES log

AS INDICATED FROM MUD GAS LOGS Not confirmed

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

RES zones are tight (FDC data)

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 102 NAME: IOE TAGLU D-55

K.B.: 11.5 m. G.L.: 1.2 m. CSG: 167.6 m. T.D.: 536.5 m. BHT: 7.2 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	> 533			✓	Run 1 still in IBPF @ 533 Run 2 top 884 below IBPF	X
Acoustic	BHCS	< 884				Top logged interval 884	
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		510+				
Crystal	✓					11,000-6700 @ 335m. Not below deepest IBPF.	
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 103 NAME: IOE TAGLU WEST P-03

K.B.: 8.5 m. G.L.: 1.2 m. CSG: 907.4 m. T.D.: 2491.7 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<907				IBPF above top log interval	
Acoustic	BHCS					"	
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	482			✓	9400 - 6400 @ 482	X
SRS Velocity	✓	481			✓	Short interval (40m) SRS	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF is above logged interval

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 104 NAME: CHEVRON UPLUK C-21

K.B.: 23.1 m. G.L.: 15.2 m. CSG: 481.9 m. T.D.: 481.9 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	233			✓	Deepest IBPF range resistivity Poor data.	X
Acoustic	BHCS					Poor quality data throughout	
Long Acoustic							
SP	✓						
GR	✓					Indicates big hole above 260m	
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	247				7800 - 5650 @ 247m	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 105 NAME: CHEVRON UPLUK M-38

K.B.: 25.6 m. G.L.: 17.0 m. CSG: 159.7 m. T.D.: 744.6 m. BHT: 18.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	409	433	✓		IBPF at abrupt RES change in sand Trans at base of ice lens	X
Acoustic	BHCS					Generally poor above 433	
Long Acoustic							
SP	✓					Little SP activity	
GR	✓					Very big hole above 381m	
Caliper	✓						
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 106 NAME: CCL UPLUK A-42

K.B.: 22.3 m. G.L.: 13.7 m. CSG: 159 m. T.D.: 922.3 m. BHT: 13.9 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	348	378	✓		IBPF at top of gradient. Trans at base of gradient	X
Acoustic	BHCS					Top logged interval 919m	
Long Acoustic							
SP	✓					Little activity, SP generally conforming to GR	
GR	✓						
Caliper							
Neutron							
Density							
Mud Gas	✓						
Sample	✓					Indicates trans in shaly section	
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None Indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 107 NAME: SUN GARRY P-04

K.B.: 8.5 m. G.L.: 1.2 m. CSG: 910.7 m. T.D.: 2441.5 m. BHT: 39.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<911				Top logged interval 911m	
Acoustic	BHCS	486			✓	Some loss of signal above 486	X
Long Acoustic							
SP	✓					Top SP logged interval 911m	
GR	✓						
Caliper	✓	>482 <512			✓	Deepest massive caved sand 415m Small sand at 482 vaced, one at 512.	S
Neutron	CNL						
Density	FDC					Top logged interval 911m	
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]	✓	509+					
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 108 NAME: SUN GARRY G-07

K.B.: 17.4 m. G.L.: 8.8m. CSG: 178.6 m. T.D.: 969.3 m. BHT: 11.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	422		✓		IBPF at abrupt RES increase (base of sand)	X
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓					Top log interval 909m	
Caliper	✓						
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 109 NAME: IMP ADGO C-15

K.B.: 9.7 m. G.L.: 1.5 m. CSG: 38.4 m. T.D.: 243.2 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<38		✓		IBPF above logged interval (38m)	X
Acoustic	BHCS					Top log interval 290m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓					Top log interval 290m	
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					4500-6200 @ 122m No IBPF present	
SRS Velocity	✓					Not enough detail, top shot 610m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 300m interval INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS not seen on RES

AS INDICATED FROM MUD GAS LOGS moderate gas readings

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Moderate gas may be free gas in water - no resistive anomaly

ORIGINAL PICK DL

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 110 NAME: IMP ADGO P-25

K.B.: 8.2 m. G.L.: -1.8 m. CSG: 169.8 m. T.D.: 486.5 m. BHT: 17.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL,DLL	<170			✓	Top DLL interval 170m	X
Acoustic	BHCS	<170				Top logged interval 170m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓					Very little caving	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp	✓					No definite gradient change	
GSC Temp.[2]	✓		0			Temperature above 0° throughout	
Crystal							
SRS Velocity	✓					Top shot 457m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Check 701 to 793 either coal or hydrate INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES and acoustic

AS INDICATED FROM MUD GAS LOGS High gas present

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Zone is deep for methane hydrate suspect free gas or gas & water.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 111 NAME: ESSO ADGO J-27

K.B.: 12.7 m. G.L.: -1.8 m. CSG: 195 m. T.D.: 705.5 m. BHT: 35 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DISFL	<195		✓		IBPF above logged interval (195m)	X
Acoustic	BHCS					Top logged interval 705m	
Long Acoustic							
SP	✓						
GR	✓					Top logged interval 705m	
Caliper	✓					"	
Neutron	CNL					"	
Density	FDC					"	
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity						Not detailed enough	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 900 - 950m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES and acoustic

AS INDICATED FROM MUD GAS LOGS Moderate high gas readings

COMMENTS: IBPF/PERMAFROST

COMMENT: HYDRATE

RES and acoustic are consistent with hydrate or free gas being present 895 to 950m - depth predicts hydrate, probably free gas.

ORIGINAL PICK DL

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 112 NAME: IMP ADGO F-28

K.B.: 8.2 m. G.L.: -2.1 m. CSG: 150.6 m. T.D.: 940 m. BHT: 26.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<151		✓		IBPF above top logged interval	X
Acoustic	BHCS					Top logged interval 940m	
Long Acoustic							
SP	✓					Little character	
GR	✓					Top GR at 940m	
Caliper	✓					Top Caliper at 940m	
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Not enough detail. Top shot 152m.	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 490m level INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES log only

AS INDICATED FROM MUD GAS LOGS Not available

COMMENTS: IBPF/PERMAFROST

COMMENT: HYDRATE

RES only indicates possible hydrate - higher than normal resistivity.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 113 NAME: IMP SARPIK B-35

K.B.: 10.0 m. G.L.: -4.3 m. CSG: 38.4 m. T.D.: 581.3 m. BHT: 21.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<38		✓		IBPF above logged interval 38m	X
Acoustic	BHCS					Top logged interval 574m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper							
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					5000 - 6000 @ 189m No. IBPF present	
SRS Velocity	✓						
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 450m level INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES, Cal. and acoustic

AS INDICATED FROM MUD GAS LOGS Not recognized by mud log

COMMENTS: IBPF/PERMAFROST

COMMENT: HYDRATE

Log indications not supported by mud gas data.

ORIGINAL PICK DL

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 114 NAME: PACIFIC ROLAND BAY YT L-41

K.B.: 20.1 m. G.L.: 12.5 m. CSG: 140.2 m. T.D.: 607.8 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<142			✓	RES follows velocity and density throughout	X
Acoustic	BHCS					Skips 350-375m (fractures?)	
Long Acoustic							
SP	✓					SP Generally follows GR	
GR	✓						
Caliper	✓						
Neutron							
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					Still at 12,000 at 555m (correct for 80 usec formation.	
SRS Velocity						Not enough detail top shot 549m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

No evidence of IBPF in logged interval.

ORIGINAL PICK DL

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 115 NAME: AMAGUK H-16

K.B.: 20.1 m. G.L.: 17.0 m. CSG: 157.6 m. T.D.: 609.6 m. BHT: 17.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	210			✓	IBPF pick at deepest non-conforming with acoustic	X
Acoustic	BHCS						
Long Acoustic							
SP	✓	213			✓	SP diverts from GR at 213	S
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 116 NAME: IOE MAGUK A-32

K.B.: 35.0 m. G.L.: 30.7 m. CSG: 617.8 m. T.D.: 1670.6 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<618				IBPF above logged interval (618m)	
Acoustic	BHCS					"	
Long Acoustic							
SP	✓					Generally conforms to GR to 186m	
GR	✓					GR indicates very big hole above 174m	
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp	✓	320				Min. temp at 320m	
GSC Temp.[2]							
Crystal	✓	240			✓	9000 - 6400 at 240m	
SRS Velocity	✓	<304				Top shot 304m	
Other	ES	236		✓		IBPF at abrupt RES increase (at base of a sand)	X

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL & IPN

CHECKED & AGREED IPN

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 117 NAME: IOE KIMIK D-29

K.B.: 18.6 m. G.L.: 10.0 m. CSG: 758.0 m. T.D.: 2646.6 m. BHT: 47.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<759				IBPF above logged interval	
Acoustic	BHCS					IBPF above logged interval	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓						
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]			X672				
Crystal	✓	631		✓		8500 - 6200 @ 631	X
SRS Velocity	✓	610			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 118 NAME: IMP ATERTAK E-41

K.B.: 19.8 m. G.L.: 12.5 m. CSG: 159.1 m. T.D.: 615.4 m. BHT: 15.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	527	553	✓		IBPF at abrupt RES increase	X
Acoustic	BHCS	527			✓	Shift to higher velocity above 527m	S
Long Acoustic							
SP	✓					Poor conforming with GR above 700m	
GR	✓						
Caliper	✓					Top logged interval 612.	
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]			542+				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 119 NAME: IMP KUGMALLIT H-59

K.B.: 11.5 m. G.L.: -5.5 m. CSG: 177.4 m. T.D.: 754.7 m. BHT: 10 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	LL8 MSFL	690			✓	IBPF at base of deepest RES. sand	X
Acoustic	BHCS					Skips above 671m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓	690				Deepest paved sand	
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	793			✓	Deepest velocity step	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 120 NAME: IMP IVIK N-17

K.B.: 35.3 m. G.L.: 28.3m. CSG: 157.9 m. T.D.: 885.1 m. BHT: 15.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	672	697	✓		IBPF where RES rises abruptly. Trans at base of gradient	X
Acoustic	BHCS					Sonic erratic above 710	
Long Acoustic							
SP	✓	655			✓	SP conforms with GR below 655	
GR							
Caliper	✓	674			✓	Sands caved above 674	S
Neutron	SNP						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	588				Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 121 NAME: IMP IVIK J-26

K.B.: 30.5 m. G.L.: 23.1 m. CSG: 154.8 m. T.D.: 843.1 m. BHT: 12.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	646	678	✓		IBPF at RES, increase in a sand Trans at base of gradient (sand)	X
Acoustic	BHCS					High velocity above 648m	S
Long Acoustic							
SP	✓	646			✓	SP not conforming with GR above 646m	S
GR	✓						
Caliper	✓					Sands cave down to 939m	
Neutron	SNP					Top log interval 838	
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]			X507				
Crystal	✓	>506				11,700 at 506m still in IBPF	
SRS Velocity	✓	610			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 980 - 1021 INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS Yes

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Classic example, previously published[5]. We concur completely with prior evaluation, which is enclosed overleaf.

ORIGINAL PICK IPN

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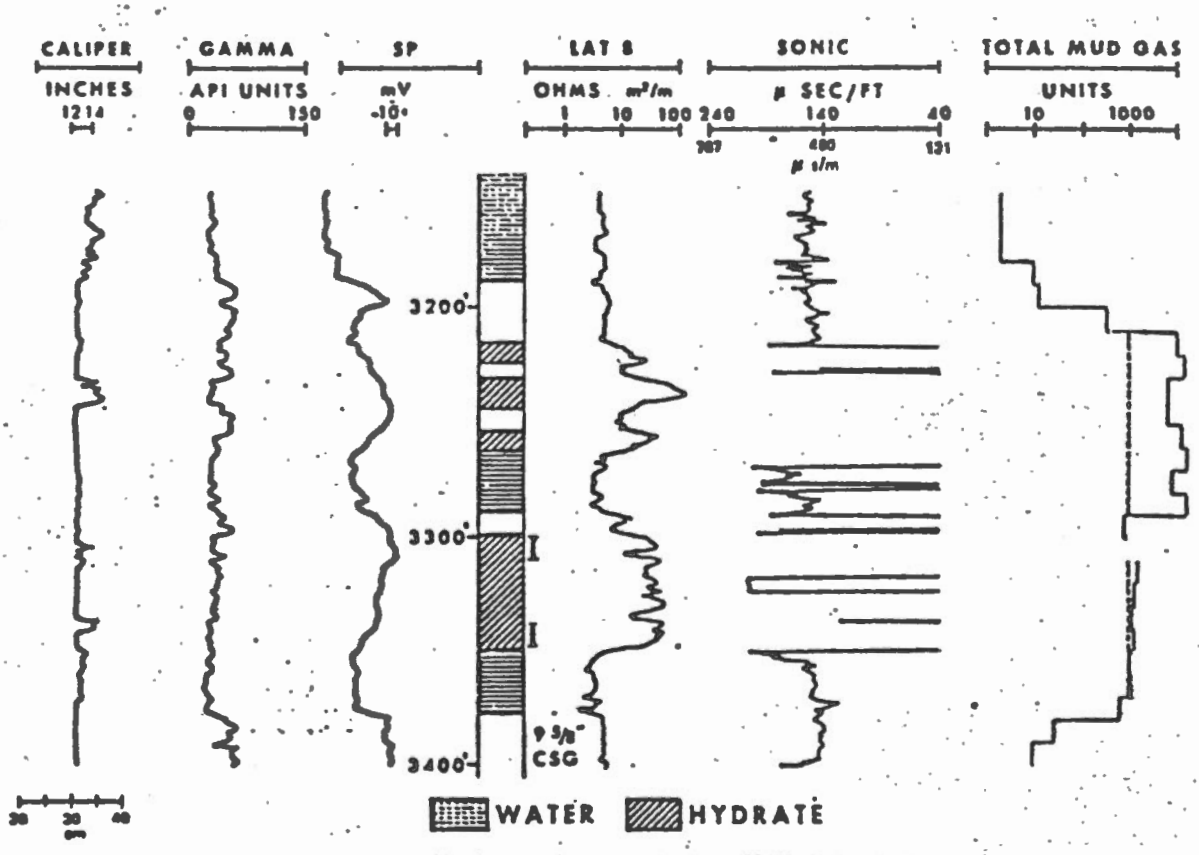

Fig. 10. Hydrate characteristics, IMP Ivik J-26.

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 122 NAME: IMP IVIK C-52

K.B.: 21.3 m. G.L.: 13.1 m. CSG: 160.3 m. T.D.: 935.4 m. BHT: 14.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	649		✓		IBPF at abrupt RES increase	X
Acoustic	BHCS	646			✓	Higher velocity above 646	S
Long Acoustic							
SP	✓	649			✓	SP stops conforming with GR above 649m	S
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	649		✓		10,200 - 6700 @ 649m	S
SRS Velocity	✓	610			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 123 NAME: IMP IVIK K-54

K.B.: 42.3 m. G.L.: 32.9 m. CSG: 160.0 m. T.D.: 1018.0 m. BHT: 26.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	668	726	✓		IBPF at abrupt RES increase. Trans at base of gradient	X
Acoustic	BHCS					Step to high velocity above 660	
Long Acoustic							
SP	✓	668				SP not conforming with GR above 608	S
GR	✓						
Caliper	✓						
Neutron	SNP					Top log interval 1524m	
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	625		✓		10,000 - 6500	
SRS Velocity	✓	610			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK IPN

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IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 124 NAME: SUN BVX ET AL UNARK L-24

K.B.: 9.7 m. G.L.: -1.8 m. CSG: 1205.2m. T.D.: 2728.6 m. BHT: 40 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES							
Acoustic	BHCS	649			✓	High velocity above 655	X
Long Acoustic	✓						
SP							
GR						All sand above 655 and below 692	
Caliper	✓					Top logged interval 1220	
Neutron	CNL					"	
Density	FDC					"	
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF based on acoustic log only appears shale interval 655 to 692. Separates IBPF from non-frozen sand below.

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 125 NAME: IMP IMMERK B-48

K.B.: 13.7 m. G.L.: -3.0 m. CSG: 178 m. T.D.: 925.7 m. BHT: 40.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	542			✓	Abrupt RES increase at base of sand	X
Acoustic	BHCS						
Long Acoustic							
SP	✓	509				SP not conforming to GR above 509	
GR	✓						
Caliper	✓	542				Deepest caved sand	S
Neutron							
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	304		✓		9500 - 6500 at 384	
SRS Velocity	✓	396			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF is base of deepest IBPF. There is an unfrozen section above the base.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 126 NAME: SUN PELLY B-35

K.B.: 8.2 m. G.L.: -3.7 m. CSG: 175.6 m. T.D.: 655.9 m. BHT: 8.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	451		✓		IBPF at abrupt RES change	X
Acoustic	BHCS	451				Sudden shift to low velocity	S
Long Acoustic	BHCS	451				"	S
SP	✓					Little SP activity	
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT Possible at 793 INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES and acoustic

AS INDICATED FROM MUD GAS LOGS Not available

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Three intervals 759 - 768, 795-799, 838-841 all have high resistivity, loss of acoustic signal, caved. Acoustic signal is lost from base of deepest sand (841) to top of run (654).

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 127 NAME: IMP NETSERK F-40

K.B.: 12.7 m. G.L.: -7.6 m. CSG: 169.2 m. T.D.: 572.4 m. BHT: 26.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	518			✓	IBPF at base of deepest RES. sand	X
Acoustic	BHCS					Top logged in interval 570m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓					Big caves, above 518. Less caving below	
Neutron							
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	366				7500 - 6500 @ 366m	
SRS Velocity	✓					Top shot 548	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 128 NAME: IMP NETSERK B-44

K.B.: 13.4 m. G.L.: -1.5 m. CSG: 176.5 m. T.D.: 541.9 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	378		✓		IBPF at abrupt RES increase (at top of sand)	X
Acoustic	BHCS					Top logged interval 543	
Long Acoustic							
SP	✓					Little activity	
GR	✓						
Caliper	✓						
Neutron	FDC						
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	487				7400 - 6300 @ 487m	
SRS Velocity	✓					Top shot 549.	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 129 NAME: IOE NATAGNAK K-23

K.B.: 26.8 m. G.L.: 22.8 m. CSG: 24.1 m. T.D.: 748.3 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IES	535		✓		Abrupt incr. in RES (Base of frozen sand) Log is erratic above 527m	X
Acoustic	BHCS						
Long Acoustic							
SP	✓					Does not conform with GR above 535m	
GR	✓						
Caliper	✓					521 is deepest cave	
Neutron	SNP					Top logged interval 732m	
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS None indicated

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 130 NAME: IOE NATAGNAK H-50

K.B.: 6.4 m. G.L.: 0.9 m. CSG: 25.3 m. T.D.: 762.6 m. BHT: 9.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	538	546	✓		IBPF at RES increase in a sand Trans at base of gradient	X
Acoustic	BHCS					Weak signal above 591. Signal lost above 546	
Long Acoustic							
SP	✓					Does not conform to GR	
GR	✓						
Caliper	✓	540				Big caves above 540 base of sands all shale below	S
Neutron	SNL						
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Top shot 518m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 131 NAME: IMP NATAGNAK K-53

K.B.: 20.1 m. G.L.: 13.4 m. CSG: 159.1 m. T.D.: 652.9 m. BHT: 12.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	561	576	✓		IBPF at abrupt RES increase. Trans at deepest non-conforming RES vs GR	X
Acoustic	BHCS	561				Abrupt shift to high velocity	S
Long Acoustic							
SP	✓					Generally conforms except 549-571 (sands)	
GR	✓						
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	524				8600 - 6300 at 524m	
SRS Velocity	✓					Top shot 457 - not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 132 NAME: IOE ATKINSON H-25

K.B.: 8.5 m. G.L.: 3.9 m. CSG: 612 m. T.D.: 1765.1 m. BHT: 36.7°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<612				IBPF above top of logged interval	
Acoustic	BHCS					Higher velocity above 466m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓	533			✓	Deepest substantial caved sand	X
Neutron	SNL					Top logged interval 612	
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	457				Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF based on caliper data indicating depth of deepest caved sand.

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 133 NAME: IOE ATKINSON M-53

K.B.: 12.8 m. G.L.: 7.6 m. CSG: 18.3 m. T.D.: 762 m. BHT: 12.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	490	512	✓		IBPF at abrupt RES increase Trans at base of gradient	X
Acoustic	BHCS						
Long Acoustic							
SP	✓					SP includes extraneous activity	
GR	✓						
Caliper	✓					Big caves above 505m	S
Neutron	SNL						
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					11000 - 7900 @ 381 7900 - 6400 @ 473	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 134 NAME: IMP ATKINSON A-55

K.B.: 8.8 m. G.L.: 2.1 m. CSG: 159.7 m. T.D.: 813.2 m. BHT: 20 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	565			✓	IBPF at base of deepest frozen sd.	
Acoustic	BHCS					Top logged interval 813m	
Long Acoustic							
SP	✓						
GR	✓					Top logged interval 813m	
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	619		✓		8000 - 6600 at 619	X
SRS Velocity	✓	457				Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 135 NAME: IMP ARNAK L-30

K.B.: 14.9 m. G.L.: -8.2 m. CSG: 174.9 m. T.D.: 737.6 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	662		✓		IBPF at abrupt RES increase (within a sand)	X
Acoustic	BHCS					Top logged interval 832m	
Long Acoustic							
SP							
GR	✓						
Caliper	✓	660				Deepest caved sand	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	>646		✓		Still in IBPF (9400)	
SRS Velocity	✓	655			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 136 NAME: IMP PULLEN E-17

K.B.: 12.8 m. G.L.: -1.8 m. CSG: 161.5 m. T.D.: 924.2 m. BHT: 18.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	604			✓	IBPF at abrupt RES increase	X
Acoustic	BHCS					Top of logged interval 911	
Long Acoustic							
SP	✓					Does not generally conform with GR	
GR	✓						
Caliper	✓	604				Deepest substantial cave	S
Neutron							
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK YES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 137 NAME: IMP NUKTAK C-22

K.B.: 47.5 m. G.L.: 38.1 m. CSG: 174.9 m. T.D.: 913.8 m. BHT: 18.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DILF	701		✓		IBPF at abrupt RES increase	X
Acoustic	BHCA					Loss of signal above 695	
Long Acoustic							
SP	✓					SP conforms with GR below 701m	
GR	✓						
Caliper							
Neutron	SNL					Top logged interval 848m	
Density	CDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	>686		✓		Still in IBPF at 686m	
SRS Velocity	✓					Top shot 610 (7300)	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS 945m and deeper

COMMENTS: IBPF/PERMAFROST

COMMENT: HYDRATE - high gas readings are not supported by resistivity.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 138 NAME: DOME NATSEK E-56

K.B.: 12.2 m. G.L.: -55.0 m. CSG: 149 m. T.D.: 534 m. BHT: 18 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL/DLL	<149				IBPF above logged interval 149m Top logged interval 1650m	S
Acoustic							
Long Acoustic	✓						
SP	✓						
GR	✓						
Caliper	✓						
Neutron	CNL					Top logged interval 1650m	
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	0			✓	No IBPF indicated (4600 surf. to 60m)	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

NO IBPF

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 139 NAME: ELF HORTON RIVER G-02

K.B.: 38.1 m. G.L.: 33.5 m. CSG: 371 m. T.D.: 1466 m. BHT: 35 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	IEL	<371		✓		IBPF above logged interval	X
Acoustic	BHCS						
Long Acoustic							
SP	✓						
GR	✓					Negative drift above 600m	
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]	✓		E146				
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 140 NAME: NICHOLSON N-45

K.B.: 16.7 m. G.L.: 14.6 m. CSG: 89.6 m. T.D.: 863.5 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	EL		198		✓	Base of gradient change	X
Acoustic							
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Shale section, hence long gradual transition of zone.

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 141 NAME: TEXCAN NICHOLSON G-56

K.B.: 73.5 m. G.L.: 71.3 m. CSG: 158.2 m. T.D.: 863.5 m. BHT: 14.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	EL		378		✓	Base of gradient change	X
Acoustic							
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

Shale section hence long gradual transition zone

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 142 NAME: IMP KAPIK J-39

K.B.: 13.4 m. G.L.: 6.4 m. CSG: 160.0 m. T.D.: 758.6 m. BHT: 12.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	509	527	✓		IBPF at abrupt RES increase. Trans at gradient change.	X
Acoustic	BHCS					Generally off scale and cycle skipping	
Long Acoustic							
SP	✓					SP generally follows GR below 475m	
GR	✓					IBPF is through deepest DS	
Caliper	✓					Appears stuck at 9" in 8.75" hole	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	463		✓		8600 - 6500 at 463m	
SRS Velocity						Top shot 762m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 143 NAME: IOE NUVORAK O-09

K.B.: 10.9 m. G.L.: 6.1 m. CSG: 23.5 m. T.D.: 629.4 m. BHT: 1.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	I-ES	360		✓		IBPF RES higher than expected	X
Acoustic	DIL					DIL top log 632	
Long Acoustic	BHCS						
SP	✓					SP generally does not conform	
GR	✓						
Caliper	✓	355			✓	Big caves above 355m	S
Neutron	SNL					Top log 632	
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓	350			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 144 NAME: IMP AMOROK N-44

K.B.: 19.2 m. G.L.: 12.5 m. CSG: 159.4 m. T.D.: 906.5 m. BHT: 12.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	350		✓		IBPF at RES increase	X
Acoustic	BHC					Top log reading 903m	
Long Acoustic							
SP	✓					SP drifting and not conforming	
GR	✓						
Caliper	✓						
Neutron							
Density	FDL						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	348		✓		8000 - 6000 at 348m	S
SRS Velocity	✓	457			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 145 NAME: IOE KANGUK I-24

K.B.: 11.3 m. G.L.: 7.3 m. CSG: 613.3 m. T.D.: 1601.4 m. BHT: 39.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<613				IBPF above logged interval	
Acoustic	BHCS					"	
Long Acoustic							
SP	✓					"	
GR	✓						
Caliper	✓					Top caliper 613m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	421			✓	7700 - 6500 at 421m	X
SRS Velocity	✓	305+			✓	Not enough detail	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

IBPF from crystal data only

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 146 NAME: IMP CIGOL KANGUK F-42

K.B.: 7.9 m. G.L.: 1.2 m. CSG: 160.6 m. T.D.: 649.2 m. BHT: 14.4 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	473	479		✓	RES increase within a sand Trans at base of gradient	X
Acoustic	BHCS					Unstable above 498m	
Long Acoustic							
SP	✓					Generally poor conforming with GR	
GR	✓						
Caliper	✓					Deepest significant cave 409m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	476		✓		7800 - 6300 at 476m	S
SRS Velocity	✓					Top shot 534m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 147 NAME: IMP LOUTH K-45

K.B.: 8.6 m. G.L.: 1.5 m. CSG: 159.7m. T.D.: 827.5 m. BHT: 7.8 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	564	598	✓		IBPF at abrupt Rise. Trans at base of gradient	X
Acoustic	BHCS					Top log 819m	
Long Acoustic							
SP	✓						
GR	✓						
Caliper	✓					Top log 819m	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	561		✓		10,000 - 6300 at 561m	S
SRS Velocity	✓					Top shot 610m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

IBPF EXTENDS TO BASE OF SAND SEQUENCE 564m

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 148 NAME: IMP ISSERK E-27

K.B.: 11.3 m. G.L.: 12.8 m. CSG: 181.7 m. T.D.: 855.6 m. BHT: 6.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	674		✓		Abrupt RES increase in a sand	X
Acoustic	BHCS					Log top 864m	
Long Acoustic							
SP							
GR							
Caliper	✓	674			✓	Deepest caved sand	S
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 149 NAME: DOME TARSIUT A-25

K.B.: 12.2 m. G.L.: -22.9 m. CSG: 413.6 m. T.D.: 1536.0 m. BHT: 27 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<1521				IBPF above logged interval	
Acoustic	LSS	< 413				Reasonable data to casing	
Long Acoustic							
SP							
GR	✓						
Caliper							
Neutron	CNL					Log top 413m	
Density	FDC					"	
Mud Gas							
Sample	✓						
Open H.Temp	✓					Temperature decreases to min at 150m	
GSC Temp.[2]							
Crystal	✓	0			✓	4700 from surface	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 580-605, 710-812 INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS Acoustic

AS INDICATED FROM MUD GAS LOGS As above plus 518-525

COMMENTS: IBPF/PERMAFROST

No evidence of IBPF

COMMENTS: HYDRATES

Upper 2 gas kicks are in shale but lower (710-812) gives acoustic velocity of water. It is in a big cave, samples show shaly sand. Gas analysis indicates C_1, depth is outside the envelope for methane which precludes these as hydrate zones.

ORIGINAL PICK DL/IPN

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 150 NAME: IMP RUSSELL G-23

K.B.: 10.6 m. G.L.: 3.9 m. CSG: 158.2m. T.D.: 768.4 m. BHT: 21.1 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	455	506	✓		IBPF at hi res thin sand. Trans to base of gradient	X
Acoustic	BHCS					Log top 768m	
Long Acoustic							
SP	✓					Conforms little with GR	
GR	✓						
Caliper	✓					All sand caved. Deepest sand 455	S
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None evident INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 151 NAME: IMP KANNERK G-42

K.B.: 12.2 m. G.L.: -8.5 m. CSG: 184.4 m. T.D.: 893.1 m. BHT: 30.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	601	665	✓		IBPF at abrupt RES increase. Trans at base of gradient	X
Acoustic	BHCS					Log top 688m	
Long Acoustic							
SP							
GR							
Caliper	✓	601				Deepest frozen sand	S
Neutron	CNL						
Density	FDC						
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 152 NAME: DOME UKALERK C-50

K.B.: 11.5 m. G.L.: -41.5 m. CSG: 288.3 m. T.D.: 759.3 m. BHT: 27.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	689		✓		IBPF at abrupt RES increase	X
Acoustic							
Long Acoustic	Sonic						
SP	✓						
GR	✓						
Caliper	✓	704				Sands caved above 704m	
Neutron	CNL					Log top 753	
Density	FDC					"	
Mud Gas	✓						
Sample	✓						
Open H.Temp	✓	716				Gradient change	
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 1150 - 1250m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES and acoustic

AS INDICATED FROM MUD GAS LOGS Moderate gas levels

COMMENTS: IBPF/PERMAFROST

COMMENT: HYDRATE

This interval @ 1150m has relatively high resistivity and high acoustic velocity - consistent for frozen hydrate.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 153 NAME: DOME UKALERK 2C-50

K.B.: 11.6 m. G.L.: -29.9 m. CSG: 596.8 m. T.D.: 1366.4 m. BHT: 26.7 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	677	690	✓		IBPF at abrupt change. Trans deepest abnormal RES.	X
Acoustic							
Long Acoustic	Sonic						
SP	✓						
GR	✓						
Caliper	✓	677				Deepest caved sand	S
Neutron	CNL						
Density	FDC						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	607			✓	10,000 - 6000 @ 607	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS No indication on RES log.

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

COMMENTS: HYDRATE

Considered hydrate as Ukalerk C-50 had show at 1300 - 1400m on RES log and mud gas. This well shows no resistivity evidence of hydrate.

ORIGINAL PICK VES

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 154 NAME: ESSO ISSUNGNAK

K.B.: 7.9 m. G.L.: -1.2 m. CSG: 903 m. T.D.: 2667 m. BHT: 63 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<900		✓		IBPF above logged interval	X
Acoustic	BHCS					Top log 900m	
Long Acoustic							
SP	✓					"	
GR	✓						
Caliper	✓						
Neutron	CNL					Top log 900m	
Density	FDC					Top log 900m	
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 1067 - 73m INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES, Acoustic

AS INDICATED FROM MUD GAS LOGS No mud log.

COMMENTS: IBPF/PERMAFROST - IBPF above logged interval (900m)

COMMENTS: HYDRATE - The RES and acoustic data are consistent for hydrate (high RES no acoustic signal).

ORIGINAL PICK DL

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The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 155 NAME: DOME TINGMIARK K-91

K.B.: 11.5 m. G.L.: -28.0 m. CSG: 1219.2 m. T.D.: 2194.3 m. BHT: 80.6 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<1219				IBPF above interval logged	
Acoustic							
Long Acoustic	BHCS					"	
SP							
GR							
Caliper	✓						
Neutron	GRH						
Density							
Mud Gas							
Sample							
Open H.Temp	✓	552			✓	Temp gradient change	X
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 156 NAME: DOME NERLERK M-98

K.B.: 11.5 m. G.L.: -52.1 m. CSG: 535.5 m. T.D.: 1524.0 m. BHT: °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	688			✓	IBPF at abrupt RES increase (in a sand)	X
Acoustic							
Long Acoustic	Sonic					Acoustic velocity of water is being read in caves	
SP	✓						
GR	✓						
Caliper	✓	695				Deepest substantial cave	
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal	✓					9000 - 6700 at 253 (deepest level 414.6)	
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT The base of IBPF INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES and acoustic

AS INDICATED FROM MUD GAS LOGS at 550 - 700m

COMMENTS: IBPF/PERMAFROST - crystal cable gives base of upper IBPF section, but was not recorded deep enough to measure the deepest IBPF.

COMMENTS: HYDRATE - Possible hydrates in 550 to 700m level, Log qualities of IBPF/hydrate and high mud gas, lower mud gas readings at 1200m are also supported by resistivity and acoustic data

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 157 NAME: HUNT KOPANOAR M-13

K.B.: 12.5 m. G.L.: -57.3 m. CSG: 699.8 m. T.D.: 1643.2 m. BHT: 33.3 °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DIL	<700				IBPF above logged interval	
Acoustic							
Long Acoustic	Sonic					Top reading 700m	
SP	✓					"	
GR	✓						
Caliper							
Neutron	CNL					Through casing data	
Density							
Mud Gas							
Sample							
Open H.Temp	✓	402				Min temp. at 61m. Gradient change at 402m.	S
GSC Temp.[2]							
Crystal	✓	402			✓	6000 - 4500 at 402.	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT 700 - 730m level INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS RES, GR, Acoustic

AS INDICATED FROM MUD GAS LOGS Moderate levels

COMMENTS: IBPF/PERMAFROST - IBPF based on Temp and crystal data

COMMENTS: HYDRATES - High resistivity, lost acoustic signal characteristics are 300m below temp. crystal IBPF pick. Could be contiguous hydrate. Lower high mud gas values are not supported by Resistivity readings.

ORIGINAL PICK DL

CHECKED & AGREED IPN

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS DETAIL

WELL No.: 158 NAME: HUNT KOPANOAR D-14

K.B.: ____ m. G.L.: ____ m. CSG: ____ m. T.D.: ____ m. BHT: ____ °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES							
Acoustic						NO LOGS AVAILABLE	
Long Acoustic							
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK _____

CHECKED & AGREED _____

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 159 NAME: DOME ET AL KOPANOAR I-44

K.B.: 12.2 m. G.L.: -54.0 m. CSG: 200 m. T.D.: 510 m. BHT: ^{o}C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	408			✓	IBPF at abrupt RES increase in a shaly sand	X
Acoustic							
Long Acoustic	Sonic						
SP	✓						
GR	✓					Bit size 660mm to 195m, 445 to 500.	
Caliper	✓						
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity	✓					Top shot 1000m	
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS

AS INDICATED FROM MUD GAS LOGS

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 160 NAME: DOME ET AL NEKTORALIK K-59

K.B.: 13.1 m. G.L.: -64.3 m. CSG: 320.3 m. T.D.: 784.9 m. BHT: 22.2°C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES	DLL	<320				IBPF above logged interval	
Acoustic							
Long Acoustic	Sonic						
SP	✓						
GR	✓						
Caliper	✓						
Neutron	CNL					Log top 773m	
Density	FDC						
Mud Gas	✓						
Sample	✓						
Open H.Temp							
GSC Temp.[2]							
Crystal	✓	<232			✓	At 5200 at 232m	X
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT None indicated INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK DL

CHECKED & AGREED IPN

The D & S Group

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS DETAIL

WELL No.: 161 NAME: DOME KAGLUKIK A-75

K.B.: ____ m. G.L.: ____ m. CSG: ____ m. T.D.: ____ m. BHT: ____ °C

Data Catagory	Avail Type	Indicates IBPF	Indicates Trans	Reliable Hi	Reliable Lo	Reason	Picks[1]
RES							
Acoustic							
Long Acoustic						WELL NOT LOGGED	
SP							
GR							
Caliper							
Neutron							
Density							
Mud Gas							
Sample							
Open H.Temp							
GSC Temp.[2]							
Crystal							
SRS Velocity							
Other							

[1] X = Preferred
S = Supportive

[2] Depth Adjusted to KB Datum

CONSIDER GAS HYDRATES AT _____ INTERVALS

AS INDICATED FROM PETROPHYSICAL LOGS _____

AS INDICATED FROM MUD GAS LOGS _____

COMMENTS: IBPF/PERMAFROST

ORIGINAL PICK _____

CHECKED & AGREED _____

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF 0°C	Likely Hydrate Intervals
1	Aklavik F-17	<161	R		
2	Aklavik F-38	<841	R		
3	Aklavik A-37	67 103	R		
4	Crossley Lake SK60	<215	R		
5	Wolverine H-34	<471	R		
6	Scurry Inuvik D-54	<384	R		
7	Napoiak F-31	92 97	R		
8	Beaverhouse Creek	112 135	R	98.4 E204	650-655
9	Kuglauk N-02	98	O	E104	
10	East Reindeer P-60	158	R		186-229
11	Napartok M-01	71	R		
12	Fish River B-60	<232	R		
13	East Reindeer C-38	<490	R		
14	Ogeoqeoq J-06	<164	R		
15	East Reindeer A-01	214	A		360-365.8, 472.7-478.5 489.2-495.3
16	Ikhil I-37	351	R	348±8 E354	328-351
17	Kipnik O-20	76	R		253-261

1 Type Log R - Resistivity C - Caliper O - O.H. Temp
A - Acoustic S - SP G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF 0°C	Likely Hydrate Intervals
18	Unak B-11	<158	R		
19	Ulu A-35	<227	R	E99	
20	Sadene D-02	307	A	318±8 313+	
21	Blow River YT E-47	<238	R		
22	Kamik F-38	<536	R		
23	Kamik D-48	390	R	Ex375	
24	Kamik D-58	317 332	R		
25	Kamik L-60	402	G		
26	Parsons F-09	384	G		244
27	Parsons N-10	332	R	E347±15 E360	
28	Parsons N-17	286	G	326±15 E361	
29	Parsons D-20	<1050	R	358±8 E370	
30	Parsons O-27	348	R		
31	Parsons L-37	<1016		320±8 x308+	
32	Parsons P-41	220	G		
33	Parsons L-43	247	R	268±15 E302	

1 Type Log R - Resistivity A - Acoustic C - Caliper S - SP O - O.H. Temp G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF $0^{o}C$	Likely Hydrate Intervals
34	Parsons A-44	352	R		
35	Parsons P-53	307	R		
36	East Reindeer G-04	320	R		
37	Atigi O-48	509	G	570±15 Ex 594	
38	Ogruknang M-31	539	A		
39	Tununuk K-10	96 137	R		
40	Tununuk F-30	<166	R		
41	Tulugak K-31	73 102	R		
42	Kugpik O-13	<171	R	E103	
43	Kugpik L-24	88 107	R		
44	Dome Imp Imnak J-29	533	R		
45	Imp Nuna A-32	390	R		
46	Siku C-11	357	R	365±8 E385	
47	Siku A-12	358	O	348±8 E365	
48	Siku E-21	326	G	398±8 E403	
49	Siku C-55	463	R		
50	Reindeer D-27	<464	R	343±15 E375	

1 Type Log R - Resistivity C - Caliper O - O.H. Temp
A - Acoustic S - SP G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF 0°C	Likely Hydrate Intervals
51	Reindeer F-36	342	R	344±8 E363	625-640 727-732
52	Reindeer A-41	335 420	R		
53	Kikoralok N-46	<161	R		760
54	Titalik O-15	97 107	R		
55	Titalik K-26	<55	G	72+	
56	Kurk M-39	61	G		
57	Ellice O-14	38	G		
58	Spring River YT N-58	46	O		
59	Eskimo J-07	155 201	R		
60	Tuktu O-19	335	G		
61	Tuk F-18	<575	R		
62	Wagnark G-12	387	R		
63	Wagnark C-23	518	G		
64	Red Fox P-21	610 640	R		
65	Ya Ya I-17	685 721	R		
66	Ya Ya A-28	674 728	R	Ex 674	
67	Ya Ya M-33	470 548	R		

1 Type Log R - Resistivity C - Caliper O - O.H. Temp
A - Acoustic S - SP G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF $0^{o}C$	Likely Hydrate Intervals
68	Ya Ya P-53	402 438	R	407 ± 15 E 438	670-701
69	Torpolok H-24	335 357	R		
70	Torpolok O-54	207 216	R		
71	Kumak J-06	243 291	R		664-710
72	Kumak K-16	241 311	R		
73	Kumak C-58	247 283	R		
74	Kumak E-58	217 288	R	 E283	
75	Niglintgak B-19	181 198	R	176±15 E181	872-998
76	Niglintgak M-19	58 213	R	57 >148	806-851
77	Unipkat I-22	58 88	R	 E94	
78	Niglintgak H-30	89 189	R	69 E152	762-787,902-924 954-994, 1058-1073
79	Langley E-29	67 82	R		
80	North Ellice J-23	<158	R	62±8 E84	

1 Type Log R - Resistivity A - Acoustic C - Caliper S - SP O - O.H. Temp G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF 0°C	Likely Hydrate Intervals
81	Ikattok J-17	<170	R		
82	Smoking Hills A-23	No logs run			
83	Kiligvak I-29	<159	R		
84	Akku F-14	229	R		
85	Pikiolik M-26	340	R	368+	
86	Pikiolik E-54	425	R	439+	
87	Mayogiak M-16	411	R		
88	Mayogiak J-17	433	O		
89	Mayogiak L-39	636	R		
90	Kilagmiotak M-16	740 790	R		
91	Kilagmiotak F-48	716 747	R	x 607	
92	Umiak N-10	701 768	R		
93	Umiak J-37	669 733	R		
94	Mallik A-06	640	R	>258	
95	Mallik J-37	622 652	R		
96	Mallik L-38	613 637	R		820-1113
97	Mallik P-59	645 707	R		
98	Taglu G-33	543	G		

1 Type Log R - Resistivity, A - Acoustic, C - Caliper, S - SP, O - O.H. Temp, G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF $0^{o}C$	Likely Hydrate Intervals
99	Taglu C-42	564 670	R	x 610+	
100	Taglu F-43	548 618	R	x 633	
101	Taglu H-54	515	R	513±15 542	
102	Taglu D-55	>533, <884	R	510+	
103	Taglu West P-03	482	G		
104	Upluk C-21	233	R		
105	Upluk M-38	409 433	R		
106	Upluk A-42	348 378	R		
107	Garry P-04	486	A	509+	
108	Garry G-07	422	R		
109	Adgo C-15	<38	R		300
110	Adgo P-25	<170	R		701-793
111	Adgo J-27	<195	R		900-950
112	Adgo F-28	<151	R		490
113	Sarpik B-35	< 38	R		450
114	Roland Bay YT L-41	<142	R		
115	Amaguk H-16	210	R		
116	Maguk A-32	236	R		
117	Kimik D-29	631	G	X672	

1 Type Log R - Resistivity C - Caliper O - O.H. Temp
A - Acoustic S - SP G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF 0°C	Likely Hydrate Intervals
118	Atertak E-41	527 543	R	542	
119	Kugmallit H-59	690	R		
120	Ivik N-17	672 697	R		
121	Uvik J-26	646 678	R	x507	980-1021
122	Ivik C-52	649	R		
123	Ivik K-54	668 726	R		
124	Unark L-24	649	A		
125	Imerk B-48	542	R		
126	Pelly B-35	451	R		759-768, 795-799 838-841
127	Netserk F-40	518	R		
128	Netserk B-44	378	R		
129	Natagnak K-23	535	R		
130	Natagnak H-50	538 546	R		
131	Natagnak K-53	561 576	R		
132	Atkinson H-25	533	C		
133	Atkinson M-33	490 512	R		
134	Atkinson A-55	619	G		
135	Arnak L-30	662	R		
136	Pullen E-17	604	R		

1 Type Log R - Resistivity C - Caliper O - O.H. Temp
A - Acoustic S - SP G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF $0^{o}C$	Likely Hydrate Intervals
137	Nuktak C-22	701	R		
138	Natsek E-56	0	G		
139	Horton River G-02	<371	R	E146	
140	Nicholson N-45	198	R		
141	Nicholson G-56	378	R		
142	Kapik J-39	509 527	R		
143	Nuvorak O-09	360	R		
144	Amorok N-44	350	R		
145	Kanguk I-24	421	G		
146	Kanguk F-42	473 479	R		
147	Louth K-45	564 598	R		
148	Isserk E-27	674	R		
149	Tarsiut H-25	0	G		580-605, 710-812
150	Russell H-23	455 506	R		
151	Kannerk G-42	601 665	R		
152	Ukalerk C-50	689	R		1150-1250
153	Ukalerk 2C-50	677 690	R		
154	Issungnak O-61	<900	R		1067-1073

1 Type Log R - Resistivity C - Caliper O - O.H. Temp
A - Acoustic S - SP G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

TABLE 2 RESULTS

WELL		DEPTHS			
No.	Name	Preferred Log Pick IBPF Base of Trans.	Type Log	GSC Temp Data IBPF 0°C	Likely Hydrate Intervals
155	Tingmiark K-91	552	O		
156	Nerlerk M-98	668	R		550-700
157	Kopanoar M-13	402	G		700-730
158	Kopanoar I-14	No logs available			
159	Kopanoar I-44	408	R		
160	Nektoralik K-59	<232	G		
161	Kaglulik A-75	WELL NOT LOGGED			

1 Type Log R - Resistivity A - Acoustic C - Caliper S - SP O - O.H. Temp G - Crystal

IBPF/PERMAFROST/GAS HYDRATE

ANALYSIS SUMMARY

TABLE 3

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
1	Aklavik F-17	<161	<161	<161							
2	Aklavik F-38	<841									
3	Aklavik A-37	67 103		118	103						
4	Crossley Lake S K-60	<215									
5	Wolverine H-34	<471									
6	Scurry Inuvik D-54	<384									
7	Napoiak F-31	92 97									
8	BeaverHouse Creek H-13	112 135	112 135	135		98.4			E204	Yes	Yes
9	Kugaluk N-02	<246				98			E104		
10	East Reindeer P-60	158		160	151					Yes	Yes
11	Napartok M-01	71		71							
12	Fish River B-60	<232									
13	East Reindeer C-38	<490					>85				

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
14	Ogeoqeoq J-06	<164		344						Yes	No
15	East Reindeer A-01		214		214					Yes	Yes
16	Ikhil I-37	351	351	351	351				348±8 E354	Yes	Yes
17	Kipnik O-20	76								Yes	Yes or gas
18	Unak B-11	<158									
19	Ulu A-35	<227							E99		
20	Sadene D-02		307		271				318±8 313+		
21	Blow River YT E-47	<238	<238								
22	Kamik F-38	<536	<536	<536							
23	Kamik D-48	390	387				>365		Ex375		
24	Kamik D-58	317 332					293				
25	Kamik L-60	<1148					402				
26	Parsons F-09	<457 >292					384			Yes	Yes

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC $0^{o}C$	Hydrate Considered	Hydrate Likely
27	Parsons N-10	332			332				E347±15 E360		
28	Parsons N-17	<996					286		326±15 E361		
29	Parsons D-20	<1050							358±8 E370		
30	Parsons O-27	348		348							
31	Parsons L-37	<1016							320±8 X308+		
32	Parsons P-41	<308					220				
33	Parsons L-43	247	247		247				268±15 E302		
34	Parsons A-44	352	359	332							
35	Parsons P-53	307	304 320	320			317				
36	East Reindeer G-04	320	323		365		152				
37	Atigi O-48	<761	<761				509		570±15 Ex594		

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC $0^{o}C$	Hydrate Considered	Hydrate Likely
38	Ogruknang M-31		539								
39	Tununuk K-10	96 137		125	96	320					
40	Tununuk F-30	<166		190			<301				
41	Tulugak K-31	73 102	<274	73							
42	Kugpik O-13	<171	<171						E103		
43	Kugpik L-24	88 107									
44	Dome Imp Imnak J-29	533									
45	Imp Nuna A-32	390		387			378				
46	Siku C-11	357	357						365±8 E385		
47	Siku A-12	<1142	<1142			358			348±8 E365		
48	Siku E-21	<553	<553				326	365±	398±8 E403		

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC $0^{o}C$	Hydrate Considered	Hydrate Likely
49	Siku C-55	463		493				457			
50	Reindeer D-27	<464	<464						343±15 E375		
51	Reindeer F-36	342		335			347	304	344±8 Ex363	Yes	Yes
52	Reindeer A-41	335 420	385							Yes	No
53	Kikoralok N-46	<161	<161							Yes	Yes
54	Titalik O-15	97 107									
55	Titalik K-26	<167					55		72+		
56	Kurk M-39	<167					61				
57	Ellice O-14	<240					38				
58	Spring River YT N-58	<160		46		46					
59	Eskimo J-07	155 201	155	201							
60	Tuktu O-19	<620	<620				335				

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC $0^{o}C$	Hydrate Considered	Hydrate Likely
61	Tuk F-18	<575						305			
62	Wagnark G-12	387	424				369				
63	Wagnark C-23	<864					518				
64	Red Fox P-21	610 640	610	625					>583		
65	Ya Ya I-17	685 721	591				573	610			
66	Ya Ya A-28	673 728					573	762	Ex674		
67	Ya Ya M-33	470 548	468		468		423				
68	Ya Ya P-53	402 438	402		338		351	457	407±15 E438	Yes	Yes
69	Torpolok H-24	335 357	320		320		330				
70	Torpolok O-54	207 216	204				280			Yes	No
71	Kumak J-06	243 291								Yes	Yes

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0^oC	Hydrate Considered	Hydrate Likely
72	Kumak K-16	241 311	256		264						
73	Kumak C-58	247 283	228		220					Yes	No
74	Kumak E-58	217 288	217		216				E283	Yes	No
75	Niglintgak B-19	181 198							176±15 E181	Yes	Yes or gas
76	Niglintgak M-19	58 213							57 148	Yes	Yes or gas
77	Unipkat I-22	58 88							E94		
78	Niglintgak H-30	89 189			239				69 E152	Yes	Yes or gas
79	Langley E-29	67 82									
80	North Ellice J-23	<158							62±8 E84		
81	Ikattok J-17	<170		<170							
82	Smoking Hills A-23	NO LOGS RUN									

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
83	Kiligvak I-29	<159									
84	Akku F-14	229	229		207			228			
85	Pikiolik M-26	340	340 356					305	369+		
86	Pikiolik E-54	425	427						439+	Yes	No
87	Mayogiak M-16	411									
88	Mayogiak J-17	<694				433					
89	Mayogiak L-39	636			549		>542	<914			
90	Kilagmiotak M-16	740 790	723		724		707				
91	Kilagmiotak F-48	716 742	707						x 607		
92	Umiak N-10	701 768			701		>631				
93	Umiak J-37	669 733	669		669						
94	Mallik A-06	640				640	>603	655	>258		

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
95	Mallik J-37	622 652					573			Yes	No
96	Mallik L-38	613 637	575			>573				Yes	No
97	Mallik P-59	645 707						640		Yes	No
98	Taglu G-33	<929					543	457			
99	Taglu C-42	564 670	564		545				x610+		
100	Taglu F-43	548 618	548				518	457+	x633		
101	Taglu H-54	515						609	513±15 542	Yes	No
102	Taglu D-55	>533 <884							510+		
103	Taglu West P-03	<907					482	481			
104	Upluk C-21	233									
105	Upluk M-38	409 453									

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC $0^{o}C$	Hydrate Considered	Hydrate Likely
106	Upluk A-42	348 378									
107	Garry P-04	<911	486		>482 <512				509+		
108	Garry G-07	422									
109	Adgo C-15	<38								Yes	No
110	Adgo P-25	<170	<170						0	Yes	Yes or gas
111	Adgo J-27	<195								Yes	Yes or gas
112	Adgo F-28	<151								Yes	Yes
113	Sarpik B-35	<38								Yes	No
114	Roland Bay YT L-41	<142									
115	Amaguk H-16	210		213							
116	Maguk A-32	236				320	240	<304			
117	Kimik D-29	<759					631	610	x672		

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
118	Atertak E-41	527 553	527						542+		
119	Kugmallit H-59	690			690			793			
120	Ivik N-17	672 697		655	674			588			
121	Ivik J-26	646 678		646			>506	610	x507	Yes	Yes
122	Ivik C-52	649	646	649			649	610			
123	Ivik K-54	668 726		668			625	610			
124	Unark L-24		649								
125	Imerk B-48	542		509	542		304	396			
126	Pelly B-35	451	451							Yes	Yes
127	Netserk F-40	518					366				
128	Netserk B-44	378					487				
129	Natagnak K-23	535									

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
130	Natagnak H-50	538 546			540						
131	Natagnak K-53	561 576	561				524				
132	Atkinson H-25	<612			533			457			
133	Atkinson M-33	490 512									
134	Atkinson A-55	565					619	457			
135	Arnak L-30	662			660		>646	655			
136	Pullen E-17	604			604						
137	Nuktak C-22	701					>686				
138	Natsek E-56	<149					0				
139	Horton River G-02	<371							E146	Yes	No
140	Nicholson N-45	198									
141	Nicholson G-56	378									
142	Kapik J-39	509 527					463				

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC $0^{o}C$	Hydrate Considered	Hydrate Likely
143	Nuvorak O-09	360			355			350			
144	Amorok N-44	350					348	457			
145	Kanguk F-42	<613					421	305+			
146	Kanguk F-42	473 479					476				
147	Louth K-45	564 598					561				
148	Isserk E-27	674			674						
149	Tarsiut H-25	<1521	<413				0			Yes	Yes
150	Russell H-23	455 506									
151	Kannerk G-42	601 665			601						
152	Ukalerk C-50	689			704	716				Yes	Yes
153	Ukalerk 2C-50	677 690			677		607			Yes	No
154	Issungnak O-61	<900								Yes	Yes

1 Preferred Value Underlined

IBPF/PERMAFROST/GAS HYDRATE
ANALYSIS SUMMARY

WELL		IBPF Depth Indicated / Base of Transition									
No.	Name	Res	Acoustic	SP	Caliper	OH Temp	Crystal	SRS	GSC/IBPF GSC 0°C	Hydrate Considered	Hydrate Likely
155	Tingmiark K-91	<1219				552					
156	Nerlerk M-98	668*			695					Yes	Yes
		*could be hydrates contiguous with IBPF									
157	Kopanoar M-13	<700				402	402			Yes	Yes
158	Kopanoar I-14	NO LOGS AVAILABLE									
159	Kopanoar I-44	408									
160	Nektoralik K-59	<320					<232				
161	Kaglulik A-75	WELL NOT LOGGED									

1 Preferred Value Underlined