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Geology programme Master's Thesis

Porosity Analysis And Characterization Of Akaso Field, Niger Delta Basin, Southern Nigeria

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ABSTRACT

This study presents shale volume result and porosity result from geophysical well logs in Akaso field Niger delta basin, Nigeria. The study aims to identify the lithology, fluid type, estimate the shale volume, porosity, and identify through correlation analysis the more reliable logging tool between density, neutron-density, and sonic estimated porosity and core derived porosity. Three reservoirs (D, E, and F) in OTI-X01, 02, and 03 were selected since core information were provided. Well logs show that the study area was characterized by sand-shale interbeds.

Hydrocarbon fluid identified were oil and water for OTI-02, and 03 well while OTI-X01 was identified to be gas saturated. The shale volume ranges from 0.061 to 0.115, 0.052 to 0.152, 0.057 to 0.15 in OTI-02, X01, and 03 respectively indicative of very good reservoir and minimal shale presence. Log derived porosity estimated from density, neutron-density, and sonic revealed porosity within the study area to range between good to excellent.

Correlation analysis between core porosity versus PHIT_ND, PHIT_S, and PHIT_D log derived porosities in sand E of OTI-02 well were 0.9465, 0.1533, 0.5991, in sand D of OTI-X01 well were 0.08306, 0.0002, and 0.05259, and in sand F of OTI-03 well were 0.8554, 0.082, and 0.6811 respectively. Hence the neutron-density log derived porosities were considered to be a more reliable measure of porosity in the reservoirs of the field as it had high correlation with core derived porosity across the field.

This report is dedicated to God almighty for the grace and strength to see this through, also to my family and friends for their moral and financial support. Lastly, special mention of my supervisor Dr Donatas Kaminskas for his guide and patience all through this research work, I'm truly grateful to you all.

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CHAPTER ONE: INTRODUCTION

1.1 Background of study

Both crude oil and natural gas naturally occur in subsurface deposits. In petroleum exploration, the first step to a successful hydrocarbon discovery is a good subsurface image and the understanding rock properties. The search for economic accumulations of hydrocarbon (oil and gas) starts with the recognition of likely geological provinces, progresses to seismic surveying, and the drilling of one or more wild-cat wells. If one is lucky then the wild-cat wells may encounter oil, and if that is the case, to access whether sufficient hydrocarbon can be produced, measurement is made down the hole with wireline tools. The combined effort of the geologist, petrophysicists, drilling engineers and even a geophysicist is required to evaluate the subsurface formation. However, it is the geologist and petrophysicists that has the most influence (Glover, 2000).

The term well logging is originated from France in 1927 (Liu, 2017). Well logging, means different things for different people. For a geologist, it is basically a mapping technique for exploring the surface. For a petrophysicist, it is a means to evaluate the hydrocarbon production potential of a reservoir. For a geophysicist, it is a source of complementary data for surface seismic analysis. For a reservoir engineer, it may simply supply input values used in simulation. Log interpretation gas outgrown the primitive status of being merely a method for delineating between hydrocarbon and water. As the measuring techniques improved and multiplied, applications began to be directed to the quantitative evaluation of hydrocarbon- bearing formations. Modern log data has become the major input into evaluation of formation characteristics, whether it be in in: an open or cased hole, an exploratory, development or producing well (Khan, 1989). The process of using bore hole measurement to evaluate the characteristics of the subsurface formations is called reservoir evaluation. These measurements are classed into four major categories:

1. Wellsite logs
2. Core analysis
3. Wireline logs
4. Productivity test

The above measurement and data have their own significance and special applications, nevertheless, they all have a common objective of evaluating the formation for:

1. Identification of reservoir
2. Estimation of hydrocarbon in place
3. Estimation of recoverable hydrocarbon

Well logs also known as electric logs, E-logs or wireline logs is a graph of depth in a wellbore versus the characteristics or property of the rock. The rock property is derived from measurements made when an instrument “a sonde” is lowered inside a wellbore on an electrical wireline or cable extending from a witch. The data are digitally recorded in a nearby logging facility and transferred to a paper log and/or saved as a digital (LAS data) file. There are different types of logs available in the petroleum industry depending on the type of property being tracked. Well log typically measure a property (physical or chemical) within a distance ranging from several centimeters (cm) up to 10 meters (m) away from the well. The main logs recorded in the industry are gamma ray, resistivity, sonic, density and nuclear magnetic resonance (NMR). Other spectral logs that help identify mineralogic composition from base elements are recorded as well (Fassihi and Blangy, 2023).

Oil and gas are contained in pore spaces of reservoir (carbonate and sandstone) rocks. The porosity and hydrocarbon saturations which defines the amount of hydrocarbon per unit volume of the rock need to be known in order to access a possible hydrocarbon reservoir. Well logging has significantly contributed to the evaluation of these two quantities.

According to Ala, (1978) well log interpretation has two aspects: Qualitative and Quantitative.

Qualitative interpretation is done by quick-look method and cursory inspection of the well logs from which the following can be identified:

1. Identification of porous and permeable beds and their boundaries.
2. Identification of pore fluids.
3. Correlation of subsurface strata.
4. Facies identification

Quantitative interpretation uses already existing empirical formula for the following:

1. Quantification of porosity and permeability.
2. Calculation of water saturation.

3. Estimation of the fractional volume of shale.

1.2 Statement of the problem

The main goal of the petroleum industry is to perform the exploration and to provide, if a discovery is made of a commercial oil and gas accumulation, a geological/geophysical description of the reservoir characteristics, heterogeneity, quality and estimate of the initial reserve hydrocarbon volume for effective hydrocarbon exploration and recovery throughout the entire life of the reservoir to minimize financial risk.

1.3 Research aim and objectives

This study is aimed at using geophysical wireline dataset to evaluate and compare the quantitative porosity result from Akaso field Niger Delta, Nigeria.

The objectives of this dissertation are;

1. Normalization of gamma ray log dataset.
2. Identify different lithology from the well log and lithostratigraphic correlation across the field.
3. Identification of fluid types across the correlated sand and fluid contacts.
4. Estimation of shale volume.
5. Quantitative porosity (total) from logs.
6. Correlation analysis of core porosity to different porosity empirical model.

1.4 Significance of the study

This study offers insight that is important as to how porosity estimation helps determine the storage capacity of a reservoir which is essential for calculating volume of hydrocarbon in place, and recovery. Therefore, providing information that is valuable to reduce risk and uncertainty from the moment the reservoir is discovered and measured, long term impacts on production, development through to depletion and final abandonment.

1.5 Scope of the study

The study is restricted to the use of well logs for quantitative evaluation of hydrocarbon bearing reservoirs. From the well log dataset, porous and permeable beds boundaries are identified and correlated across the field, fluid within the zones of interest are identified from quick-look method (qualitative interpretation), crossplot analysis are used to identify fluid type and lithology. Empirical formula are us to estimate reservoir shale volume and total porosity from different models. The evaluated porosity for each model were compared to the core derived porosity too determine the correlation of each model.

CHAPTER TWO: GEOLOGY OF NIGER DELTA

2.1 Geological setting

Nigeria is situated in West Africa (Figure 2.1) and is one of Africa's largest countries and most populous (Ebhuoma et al., 2020). The country covers an area of 923,768 square kilometer, with an estimated 4,049 kilometer of land boundaries, shared with Cameroon in the East, the Republic of Niger in the North, Chad in the North-East and Benin in the West. Nigeria's 853-kilometer coastline opens onto the Atlantic Ocean in the South. Since 1937, the Niger delta has been the focus of hydrocarbon exploration. It ranks among the world's most prolific petroleum-producing Tertiary deltas, compared to Alaska north slope, Mississippi, the Orinoco, and the Mahakam. The basin occupies the Gulf of Guinea continental margin in equatorial West Africa, between latitude 3^0 and 6^0 N and longitude 5^0 and 8^0 E (Reijers et al., 1997) and extends throughout the Niger delta province.

The Niger delta is one of the world's largest Tertiary delta systems and an extremely prolific hydrocarbon province (Corredor et al., 2005). It is situated at the intersection of the Benue trough and South Atlantic Ocean where a triple junction developed during separation of South America from Africa (Burke et al., 1972; Whiteman, 1982). The Tertiary Niger delta covers an area of approximately 140,000 square kilometer and consist of a regressive clastic succession, which attains a maximum thickness or 12,000 meters (Orife and Avbovbo, 1982) deposited initially on continental crust and later on oceanic crust.

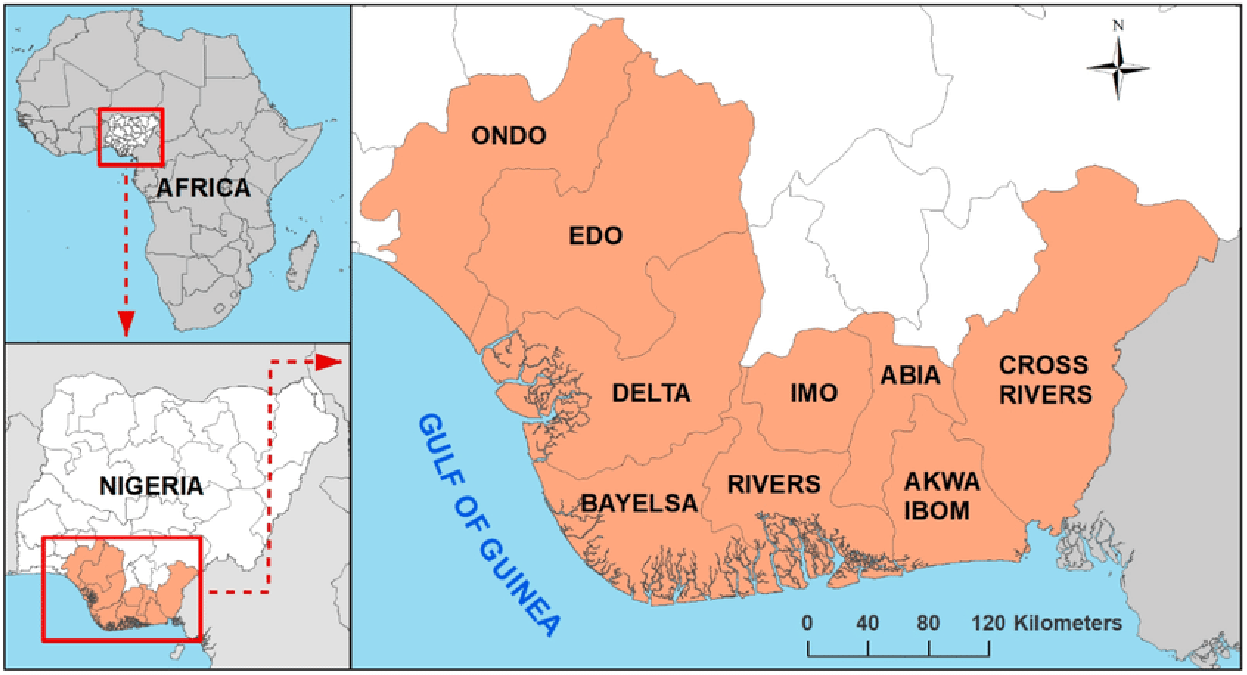

Figure 2.1: Niger delta map (Ebhuoma et al., 2020).

2.2 Regional tectonic setting

The Niger delta basin is located in the Southern part of Benue Trough. It is bounded in the East by the Cameroun volcanic line, while in the West Okitipupa separates it from the Dahomey basin. Its Northern boundary includes the Anambra basin, Calabar flank, Abakaliki, and Afikpo (Figure 2.2). The evolution of Niger delta is driven by pre- and syn-sedimentary tectonics according to Evamy et al. (1978); Knox and Omatsola (1989) and Stacher (1995).

Cohen and McClay (1996); Doust and Omatsola (1990) explained that since the late Eocene gravity-driven deformation of the Niger delta's sedimentary wedge resulted in the development of three structural zones namely (a) an extensional zone, dominated by seaward landward-dipping, normal faults; (b) a translational zone, dominated by thrust/shale-cored anticlines and shale-withdrawal intraslope basin and (c) a contractional zone, dominated by imbricated thrust sheets and associated folds.

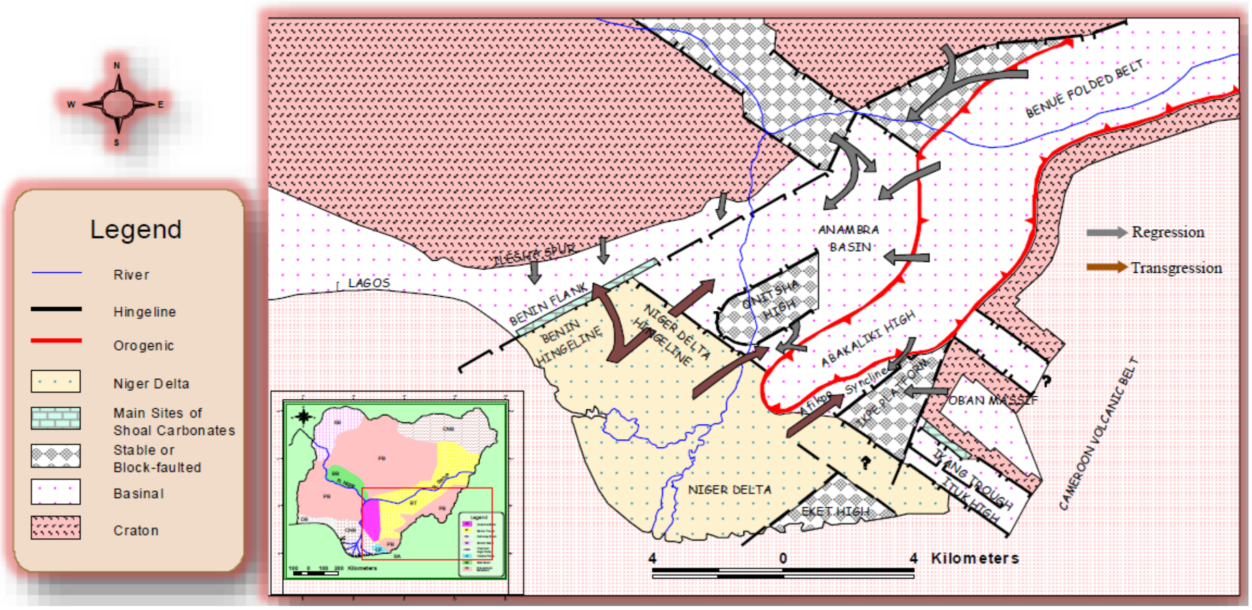

Figure 2.2: Map showing the structural configuration of the Niger delta basin (Kogbe, 1989)

2.3 Regional stratigraphy

The Tertiary section of the Niger delta according to Short and Stauble (1967); Avbovbo (1978); Doust and Omatsola (1990); and Kulke (1995) is divided into three lithostratigraphic units representing prograding depositional facies that are distinguished from one another mostly on the basis of their sand-shale ratio ranging in age from Paleocene to Recent. They include the Akata, Agbada and Benin Formation (Figure 2.3).

Akata Formation

The Akata formation is situated at the base (underlies the entire delta) of the Niger delta and is of marine origin and composed of thick shale sequence (potential source rock), turbidite sand (potential reservoirs in deep water), and minor amounts of clay and silt deposited since the beginning of the Paleocene and through the Recent formed during lowstands, this condition permitted the deposition of clay and organic matter in deep waters. The thickness of this sequence is not known for certain since no wells have fully penetrated this sequence but is estimated to reach 7000 meter in the central part of the delta and is usually over pressured (Jones, 1992).

Agbada Formation

The major hydrocarbon bearing unit in the Niger delta and overlies the Akata Formation began from the Eocene and continues into the recent. This Formation consist of an alternation of sands, silts and clays in various proportions and thicknesses, representing cyclic sequences of offlap units over 3700 meter thick. Shale and sandstone beds were deposited in equal proportions in the lower Agbada Formation, with mainly sand and minor shale interbed at the upper portion (Tuttle et al., 1999).

Benin Formation

The Agbada Formation is overlain by Benin Formation and is the shallowest (upper) part of the sequence and composed mainly of nonmarine sand from Eocene to Recent deposits in the Niger delta gave rise to a dominant fluviatile deposition environment with mappable structures such as channel fills, natural levees, point bars etc. This Formation has low records of hydrocarbon accumulation and has a thickness of 200 meters but decreases landward of the delta (Najime et al., 2016).

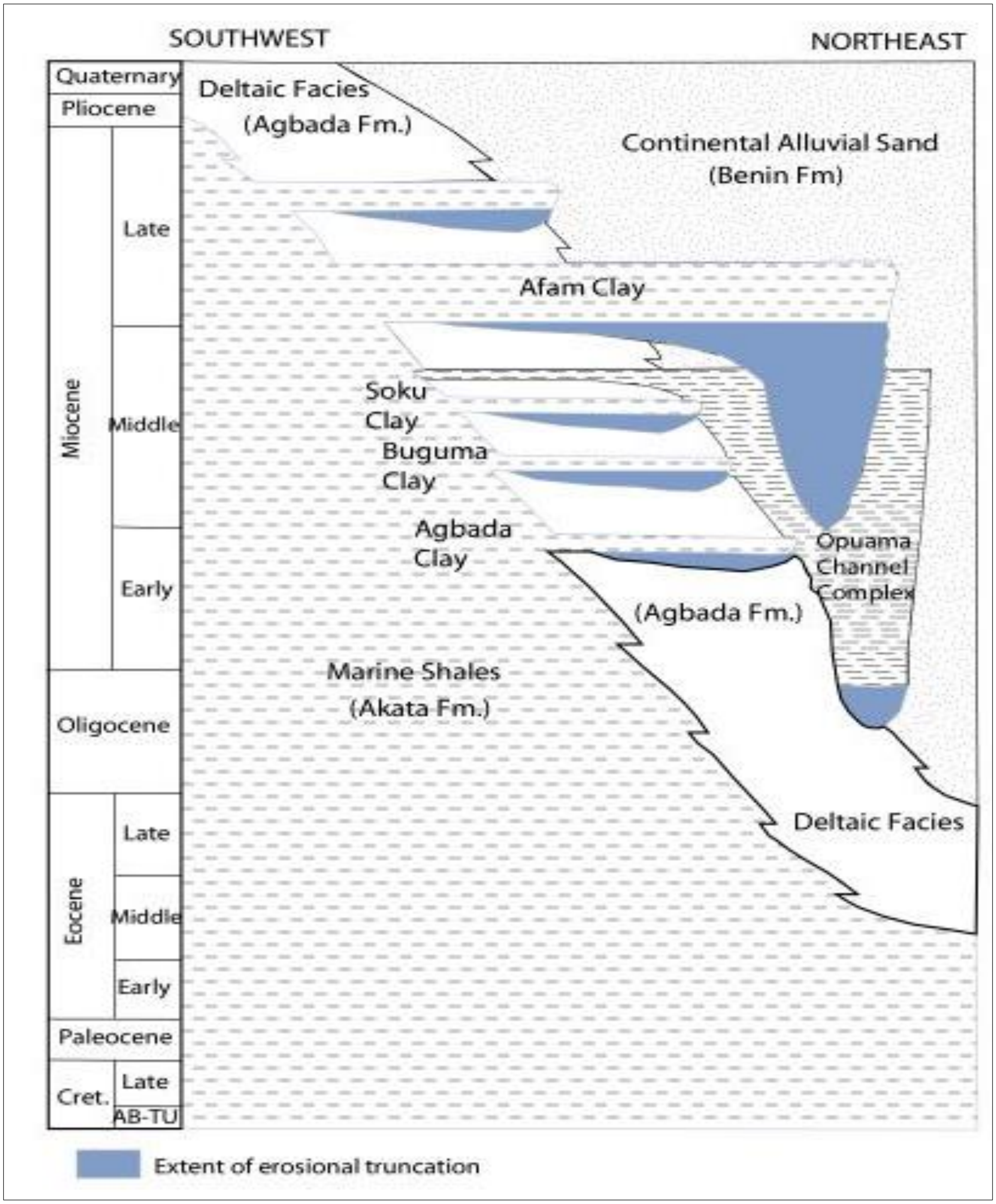

Figure 2.3: Stratigraphy showing the formations in Niger delta (Doust and Omatsola, 1990).

2.4 Literature review

Davis et al., (2018) estimated the porosity from two different reservoir in one well using sonic and density log, and core data with the aim to identify a more statistically dependable method. Normalized root mean square error (NRMSE), relative to porosities measured from core analysis at the reservoir intervals, and coefficient of variation were employed in determining which of the estimates were more reliable. For reservoir I, the NRMSE for PHIT_S and PHIT_D were 17.96% and 18.68% respectively. For reservoir II, the NRMSE for PHIT_S and PHIT_D were 17.35% and 19.29% respectively. Further analysis showed that the coefficient of variation for PHIT_S and PHIT_D in the first reservoir were 13.90% and 21.80% respectively, while they were 10.18% and 21.59% respectively in the second reservoir. Hence, sonic log derived porosities were considered to be a more reliable measure of porosity in the reservoir as it had lower measure of NRMSE and coefficient of variation. Oetomo et al., (2015) evaluated petrophysical parameters and validated the result with core data. Sand A-zone has permeability of 9.38% error curve and porosity error curve of 0.78%. Sand B-zone permeability error of 52.32% curve and porosity error of 7.13%. In sand C-zone permeability error of 198.8% curve and porosity error of 2.85%. In sand D-zone permeability error of 61.54% curve and porosity error of 29.8%. In sand E-zone permeability error of 54.73% curve and porosity error of 4.52%. There is no good correlation and error values tend to be large because the lithology in sand B and C zone has a tight range of lithology, so the reading of logging tool gives a fairly high error, especially in permeability data which still shows a decrease in error value after validated with core data. Horsfall et al., 2013 comparative analysis of porosity values computed from sonic and neutron-density logs from the same well to identify the more reliable logging tool between both logs in the estimation of porosity values in Niger delta. The analysis of sonic, density and neutron porosity values show a conventional trend of decrease in porosity with depth. Sonic porosity values for well A and B ranges between 1 to 17%, and 27 to 60% respectively while neutron-density porosity values of well A and B varies between 24 to 45% and 21 to 37% respectively. The coefficient of variation for sonic porosity data are 56%, and 23% for well A, and well B respectively, similarly the coefficient of variation for neutron-density porosity data are 15%, and 14% for well A and B respectively. Coefficient variation of neutron-density log derived porosity is more reliable tool for density porosity estimation than sonic derived porosity. Correlation analysis between sonic and density logs for porosity determination in the south-eastern part of the Niger delta (Horsfall et al., 2012) revealed that velocity and bulk density increases with depth due to compaction of rocks and the porosity obtained from both logs decreases with depth. Porosity values from both logs were subjected to statistical analysis using standard deviation and coefficient variation. Well log A coefficient of variation for sonic log derived porosity and density log derived porosity were 30% and 50% respectively. Similarly, for well B, the coefficient of variation for sonic log derived porosity and density log derived porosity 29% and 37% respectively. From the principle of statistical analysis, the coefficient of variation with lower value if preferred hence the result shows that sonic log would be more reliable than density log in the computation and determination of formation rock porosity.

CHAPTER THREE: MATERIAL AND METHODS

3.1 Dataset and Software requirements

The dataset used for this study comprised of the following;

- Well header (well location i.e., X and Y coordinated for individual wells).
- Suites of geophysical well logs (Gamma ray, resistivity, neutron, density, and sonic) for four (4) wells and core dataset.
- Well deviation survey (contain information on well trajectory).
- Schlumberger Techlog64 (version 2015.3) was used for well log evaluation.
- Microsoft Excel for statistical analysis.

3.2 Geophysical well logs

The properties of penetrated formations and their fluid contents are recorded by geophysical logs to measure their electrical resistivity and conductivity, their ability to transmit and reflect sonic energy, their natural radioactivity, their hydrogen ion content, their temperature and density. The logs are then interpreted in terms of lithology, porosity, and fluid content (Table 3.1). Geophysical logs available for this research are gamma ray, resistivity log, sonic log, density and neutron log. The principles of this logs are discussed below.

Method	Property	Application	Common units
Spontaneous potential log	Electrochemical and electrokinetic potentials	Formation water resistivity, shaliness	mV
Resistivity	Formation resistivity	Water and gas/oil saturation	Ohm.m
Sonic log	Travel time of sound	Rock permeability	μs/ft
Caliper log	Diameter of borehole	Fractures, well completion	in
Gamma ray	Natural radioactivity	Lithology	API
Density log	Bulk density	Gas, porosity, and lithology	g/cm^3
Neutron log	Hydrogen content	Gas, porosity with the aid of hydrogen content	% Porosity

Table 3.1: Geophysical well logging methods and practical applications (Assaad, 2009).

3.2.1 Gamma ray

Gamma ray logs are lithology logs that measure natural occurring radioactive element in the formation and can be used to identify lithologies, correlate zones, and calculate volume of shale. Shale-free sandstones and carbonates have very low concentrations of radioactive materials and therefore give low gamma ray reading of. As the shale content increases, the gamma ray log response increases because of the concentration of radioactive element mainly potassium(K), thorium (Th), and uranium (U) in shale (Evenick, 2008).

3.2.2 Resistivity log

A resistivity log records the resistivity, or resistance, to the flow of electricity through a formation. Resistivity is the reciprocal of conductivity and is related to the porosity and the amount and kind of fluid present in the rock and borehole. The most important use of resistivity logs is in distinguishing hydrocarbons from water. A high-porosity or hydrocarbon bearing formation has high resistivity.; a low-porosity or saltwater formation has low resistivity. Numerous types of resistivity logs correspond mainly to the depth of the measurement (e.g., shallow, medium, and deep penetration). Shallow and medium reading records the interface of the borehole and the drilling fluid within the invaded zone, while deep readings correspond to true or uninvaded formation resistivity. Shales typically have lower resistivity reading while sandstone and carbonates have high resistivity.

3.2.3 Sonic log

A sonic (acoustic) log records the speed of sound transmitted through a formation in microseconds per foot (µs/ft). the speed at which the rock transmits sound energy is related to the formation's porosity. A sonic log is a good indicator of density and presence of gas. Measurements will be lower and have locally irregular signatures where gas is present because the gas has a slower transmit time.

3.2.4 Density log

Density is a porosity log that measures the electron density of a formation, and it helps identify evaporite minerals, detect gas-bearing zones, determine hydrocarbon density, and evaluate shaley sand reservoirs and complex lithologies (Schlumberger1972). The density logging device consists of a medium-energy gamma ray source that emits gamma rays into a formation. Gamma rays collide with electrons in the formation; the collisions result in a loss of energy from the gamma ray particle. In gas filled formation porosity is over estimated because the measure bulk density is lower. Hence when the overestimated porosity values (from a density log) are cross-plotted with the underestimated porosity (from a neutron log), the crossover is an indication of gas in a formation called the gas effect. Shale, coal, and bentonite beds commonly have low densities while sandstones, and carbonates generally have higher densities.

3.2.5 Neutron log

Neutron logs are porosity logs that measure the hydrogen ion concentration in a formation. In clean formations (i.e., shale-free) that are saturated with oil or water, the neutron log measures liquid-filled porosity. Neutrons that are created from a chemical source in the neutron logging tool collide with the nuclei of the formation material, resulting in the loss of some of their energy. Maximum energy loss occurs when the neutron collides with a hydrogen atom, because the hydrogen atom and the neutron are almost equal in mass. Therefore, the maximum amount of energy loss is a function of a formation's hydrogen concentration; accordingly, as the hydrogen is concentrated in the fluid-filled pores, the energy loss can be related to the formation porosity. Neutron porosity is lower in gas-filled pores than in oil- or water filled-pores because there is less concentration of hydrogen in gas (underestimate porosity) compared to oil or water.

3.2.6 Core data

A core is a sample of reservoir rock captured during drilling using a core cutting drill bit. Core samples are the most reliable source of information because they directly take samples on drilled well rock (Oetomo et al., 2019). This analysis was performed in three wells (OTI-02, 03, and X01) within sand interval E, F, and X01 respectively.

3.3 Methods

The method adopted for this study began with data loading into Schlumberger Techlog software for quality assessment (QA/QC) prior to interpretation. A detailed workflow adopted in the course of this study research is shown in Figure 3.1.

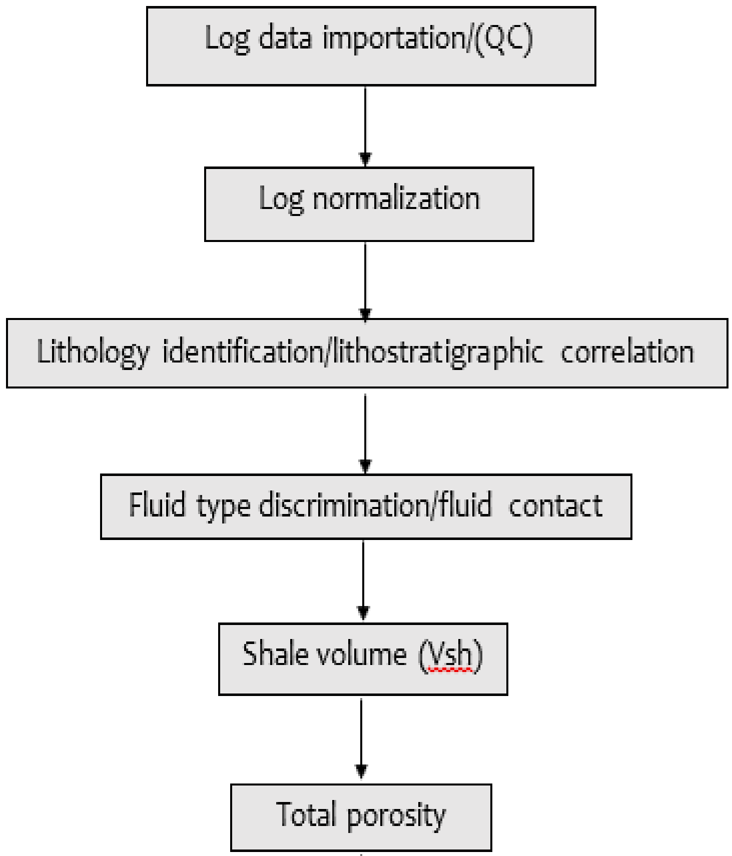

Figure 3.1: Research workflow.

3.3.1 Log normalization

Curve normalization identifies and removes systematic errors from well log data so that reliable results may be obtained for reservoir evaluation solving difficult correlation and seismic modeling problems using histograms, crossplots, depth plots, and statistical measurements (Shier, 2004). Before well log correlation or quantitative calculations from a number of wells, well log normalization is important to normalize each GR log well to a common scale as each tool will have been calibrated individually (Cannon, 2016).

3.3.2 Lithology identification/lithostratigraphic correlation

Gamma ray (GR) log was used primarily for lithology identification. This log measures the natural radiation of a formation. In a siliciclastic (sand-shale) environment, low gamma ray reading is indicative of sand while high gamma ray reading is indicative of shale. The three types of porosity log (sonic, density and neutron) which are available are recorded in drastically different unites (microseconds per foot, gram per cubic centimeter, and neutron counts or percentage porosity unit). The logs can be combined on a single track (overlay) and compared if calibrated on a common reference (sandstone and limestone compatibility) scale. An overlay of any combination of the three porosities will give immediate indications of the lithology of the well bore by virtue of the different trace responses of matrix minerals to the individual porosity logs.

By visual inspection, lithostratigraphic correlation of similar sand was identified and marked across all the wells to determine the lateral continuity of the reservoir.

3.3.3 Fluid type discrimination

Fluid type (hydrocarbon and water) was identified using resistivity log. High resistivity log reading within the zone of interest is indicative of hydrocarbon bearing zones while low resistivity log reading is indicative of brine water (Schlumberger, 1972). To further identify the different types of contact within the zones a combination of neutron density was overlay on the same track. When an increase in density porosity occurs along with a decrease in neutron porosity is a gas-bearing zone called gas effect. Gas effect is created by gas in the pores. Gas in the pores causes the density log to record too high a porosity (i.e., gas is lighter than oil or water), and causes the neutron log to record too low a porosity (i.e., gas has a very low concentration of hydrogen atoms than oil or water). The effect of gas on neutron-density log is a very important log response because it helps to detect gas-bearing zones (Asquith, 1982).

3.3.4 Shale volume (Vsh)

Calculation of gamma ray index is the first step needed to determine the volume of shale from gamma ray log (Schlumberger, 1972).

$I_{GR} = \frac{GR_{Log} - GR_{Min}}{GR_{Max} - GR_{Min}}$

The linear method Vsh = I_{GR}

The volume of shale is also calculated from the gamma ray index by the following Dresser Atlas (1979) equation.

For consolidated/older rocks:

Vsh = 0.33 * ($2^{(2* I_{GR})}$ – 1)

For unconsolidated Tertiary rock

$V_{sh} = 0.083 * (2^{(3.7* I_{GR})} - 1)$

Where: I_{GR} = Gamma ray index, GR_{Log} = Gamma ray reading of formation, GR_{Min} = Minimum gamma ray (Clean sand or carbonate), GR_{Max} = Maximum gamma ray (Shale).

3.3.5 Porosity (ϕ) estimation

Porosity is the fraction of the bulk volume of a material (rock) that is occupied by pores (voids). Porosity can be determined using either of the porosity log or a combination of two. It is widely accepted today that porosity determined from density tool is most reliable amongst others (Cannon, 2016).

Sonic logs: The sonic or acoustic measures a continuous record of the time taken, in microseconds per foot (µsec/ft) or microseconds per meter (µsec/m), by a sound wave to travel through one foot or one meter of formation: this is known as the interval transit time (Δt or t).

Quantitatively, the sonic log is used to evaluate porosity in liquid filled pores. Wyllie et al. (1956) time average equation established a relationship between travel time and porosity.

$$\Phi_{Sonic} = \frac{\Delta t_{log} - \Delta t_{ma}}{\Delta t_{fl} - \Delta t_{ma}}$$

Where Δt_{log} = interval transit time (read from log), Δt_{ma} = interval transit time for matrix (55µs/ft or 180.45 µs/m for typical sandstone reservoir) Δt_{fl} = interval transit time for fluid (215 µs/ft or 705.38 µs/m for hydrocarbon bearing formation).

Density log:

The formation density log is a porosity log that measures electron density of a formation, and it helps identify evaporite minerals, detect gas-bearing zones, determine hydrocarbon density, and evaluate shaley sand reservoirs and complex lithologies (Schlumberger, 1972).

Formation bulk density is a function of matrix density, porosity, and the density of the fluid in the pores. To determine density porosity by calculation, the matrix density and types of fluid in the borehole must be known. The formula for calculating density porosity is:

$$\Phi_D = \frac{\rho_{ma} - \rho_{log}}{\rho_{ma} - \rho_{fl}}$$

Where ρma = density of the rock matrix (2.65g/cm^3), ρlog = formation bulk density reading from log, ρfl = density of contained fluid (1.1g/cm^3 for water, 1.1 g/cm^3 for salt water and 0.7 g/cm^3 for gas).

Neutron-density log combination:

The total porosity can also be computed from the neutron density combination (Kamel and Mabrouk, 2003) as;

$$\Phi_{ND} = \frac{\emptyset_N + \emptyset_D}{2}$$

Calculated porosity from the study area is compared with Rider's porosity classification scheme (Table 3.2) to rank the identified sand zone.

Percentage porosity (%)	Qualitative description
0-5	Negligible
5-10	Poor
15-20	Good
20-30	Very good
>30	Excellent

Table 3.2: Porosity values for reservoir qualitative description (Rider, 1986).

3.3.6 Correlation analysis

Correlation analysis is a statistical analysis that is used to identify/discover how two variables might be correlated and how strong that connection is (Figure 3.2). It helps determine whether and how much one thing changes with the other. A positive correlation result means that both variable result means both variable increase in relation to each other, while a negative correlation means that as one variable decreases, the other increases. Pearson correlation coefficient method is used to measure linear relationship between different porosity dataset. The correlation is classed as $r > 0.7$ = strong correlation, $0.4 < r < 0.7$ = moderate correlation, and $r < 0.4$ = weak correlation (James, 2021).

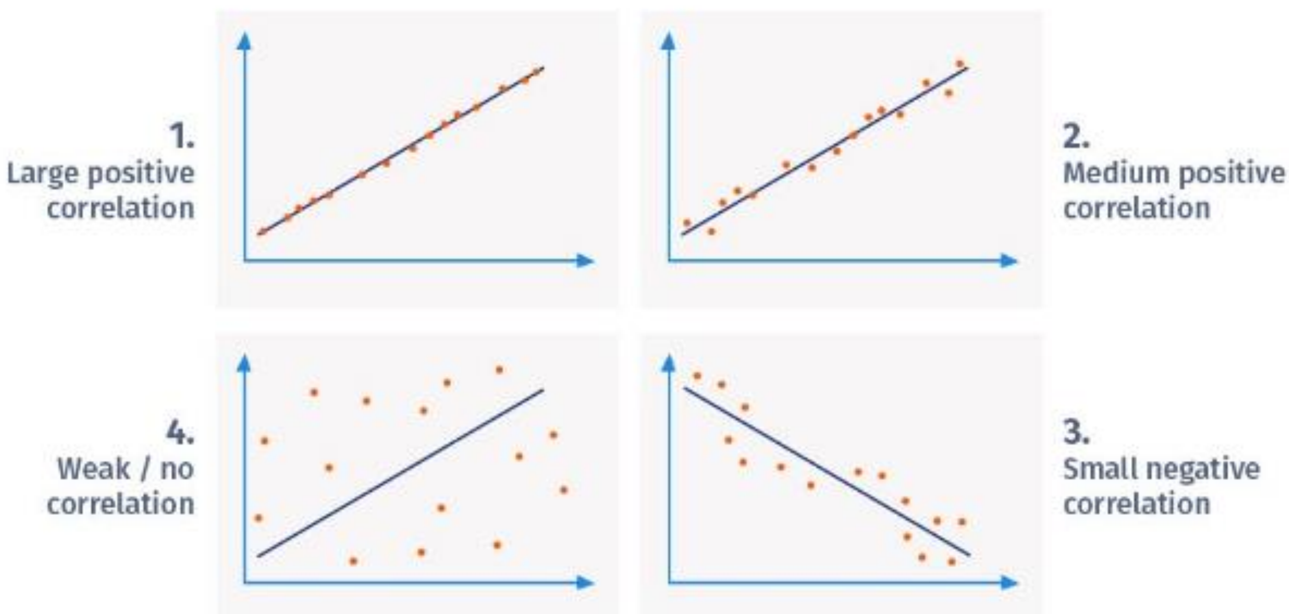

Figure 3.2: Illustration for different correlation trend.

CHAPTER FOUR: RESULTS

4.1 Log normalization

Gamma ray log histogram plot for multi-well in the study area before normalization is shown in (Figure 4.1) this plots revealed irregularities/outliers caused by equipment calibration and not a direct function of reservoir properties.

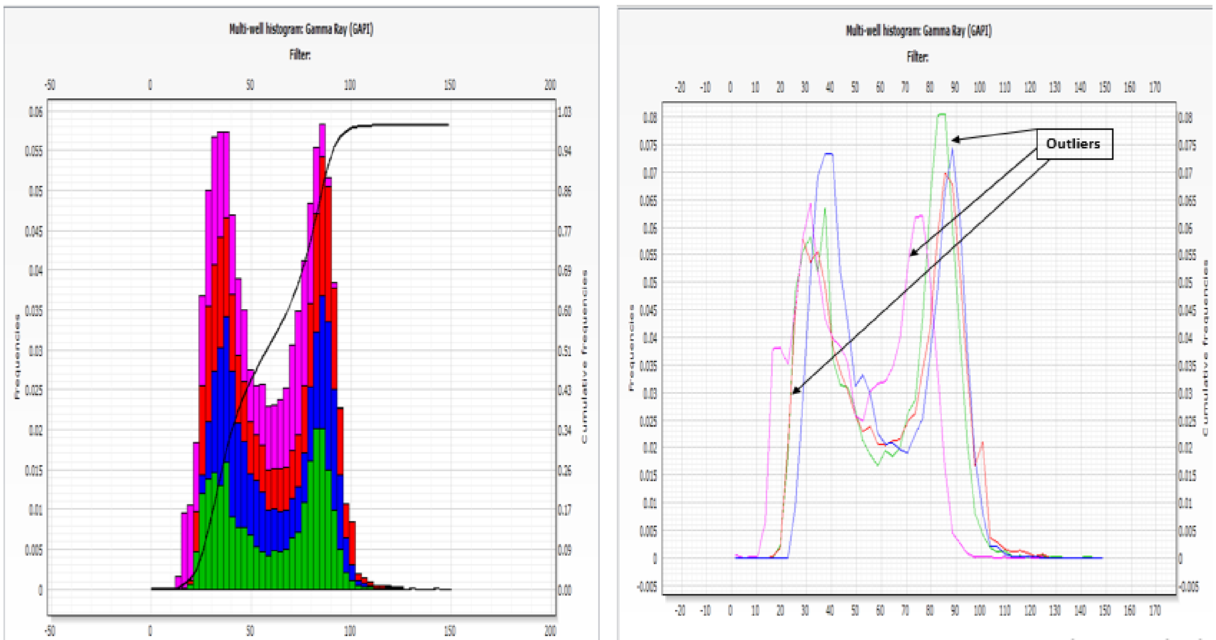

Figure 4.1: Before normalization

Figure 4.2 shows the selected calibrated well log from which the logs with outliers are calibrated and Figure 4.3 reveals the after normalization plot.

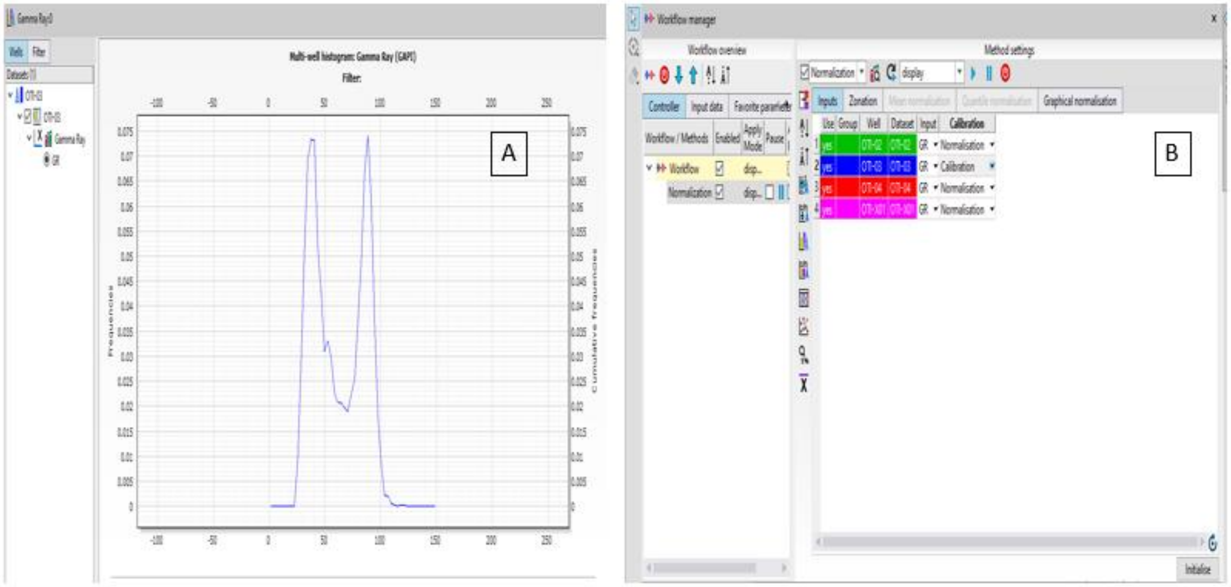

Figure 4.2: Normalization workflow.

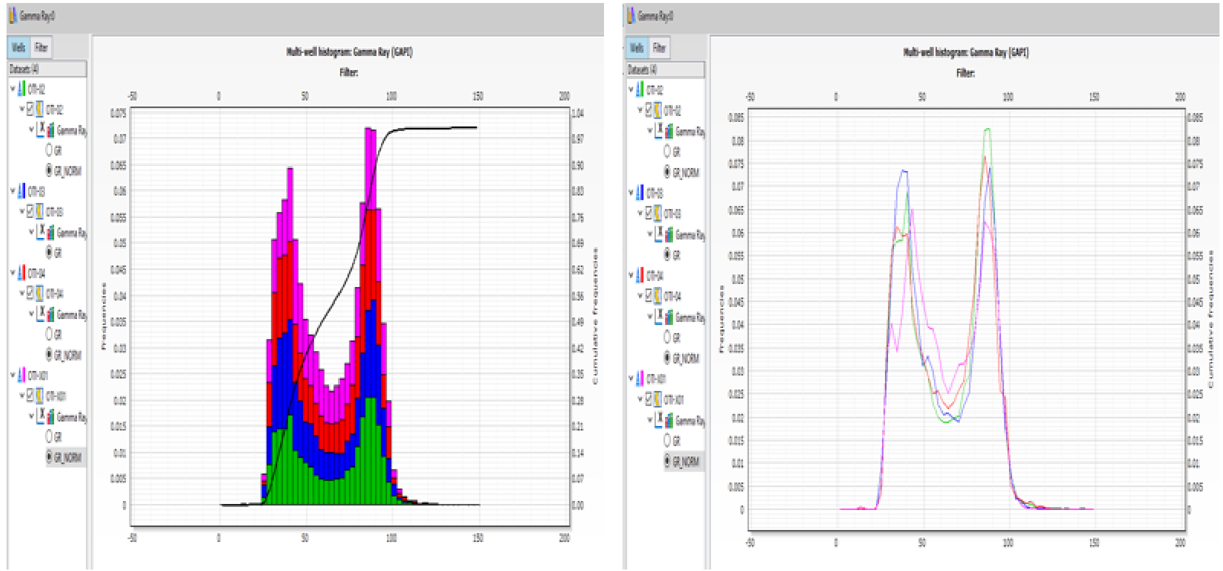

Figure 4.3: After normalization

4.2 Lithology identification/lithostratigraphic correlation

Five composite suites of logs (gamma, resistivity, neutron, density, and sonic) as shown in Figure 4.4 were run in OTI-02, OTI-03, OTI-04, OTI-X01 well. These were acquired for logs interpretation to identify the reservoir characteristics related to each log unique behavior/trace trend when in contact with different lithology and fluid type.

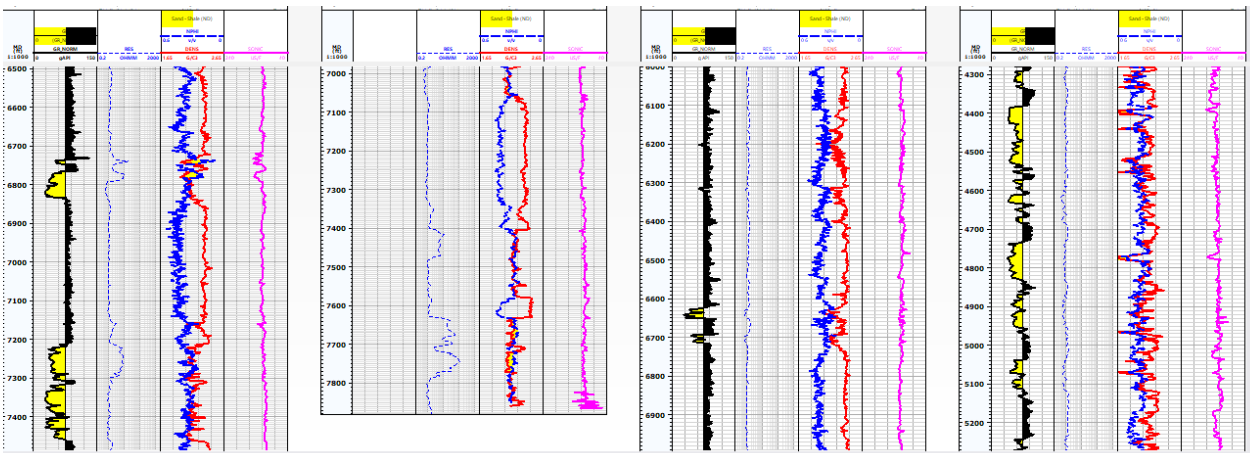

Figure 4.4: Composite log suites.

Lithologic units were identified (Figure 4.5) using gamma ray log (1st track) as the main lithology log. Lithology of similar motif were identified and correlated across the field. Cross plot of neutron-density log to validate the identified lithology from gamma ray log for the zone of interest (Figure 4.6 – 4.7).

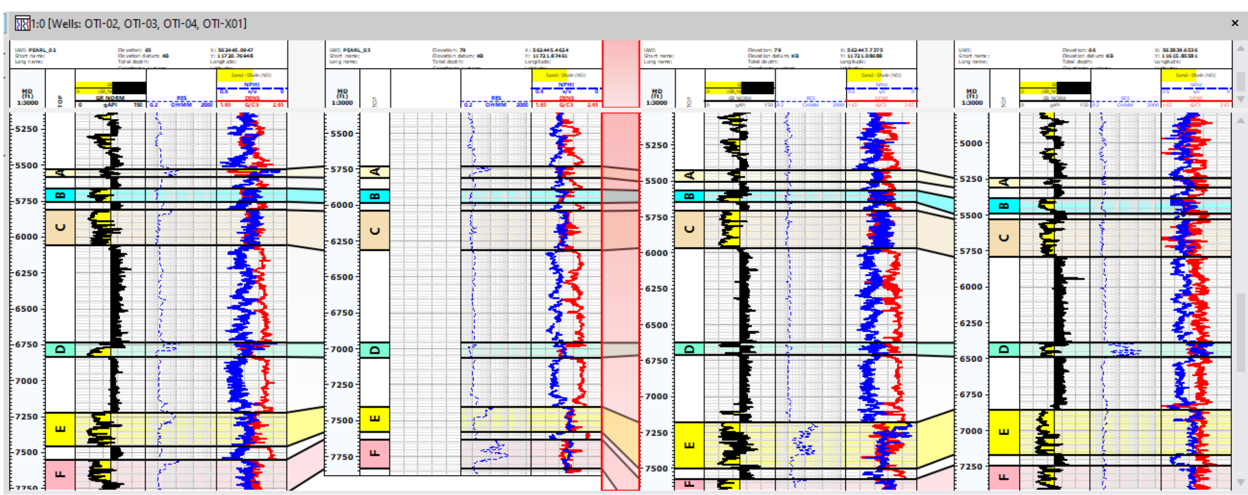

Figure 4.5: Lithostratigraphic correlation.

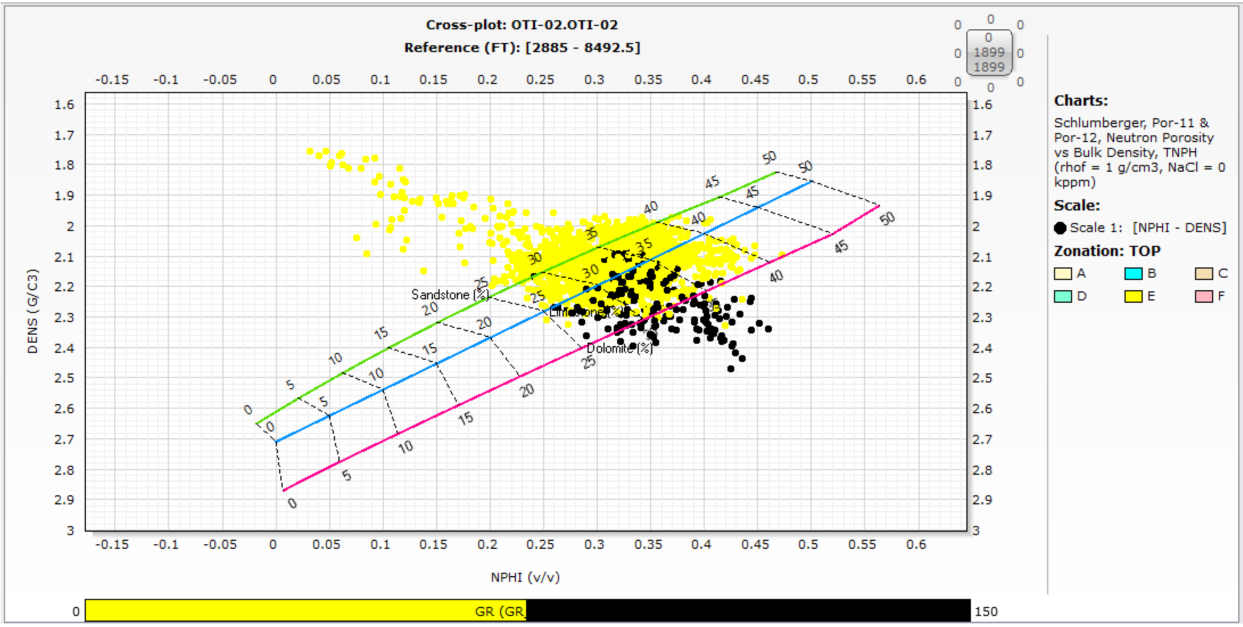

Figure 4.6: Lithology identification from neutron-density cross plot from OTI-02 well.

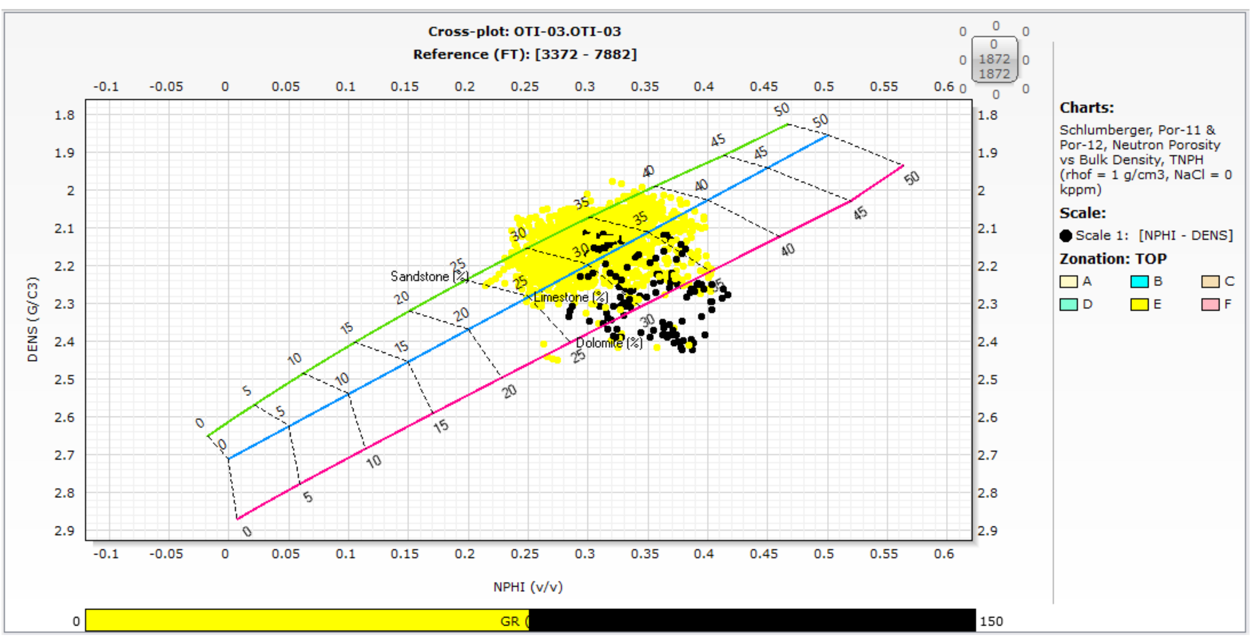

Figure 4.7: Lithology identification from neutron-density cross plot from OTI-03 well.

4.3 Fluid type discrimination

Different fluid type (gas, oil and water) trapped within the reservoir interval were identified using neutron-density log crossplot (Figure 4.8 – 4.9). Color code blue, green and red were attached to the different reservoir fluid as water, oil and gas respectively.

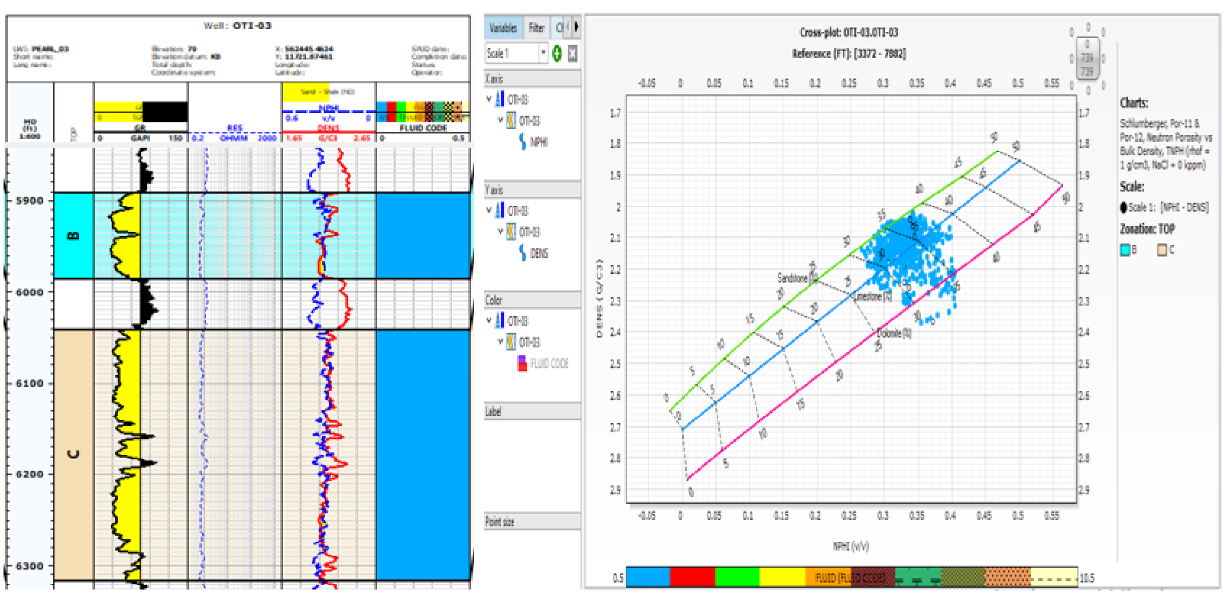

Figure 4.8: Fluid type identification using neutron-density crossplot for OTI-003 well.

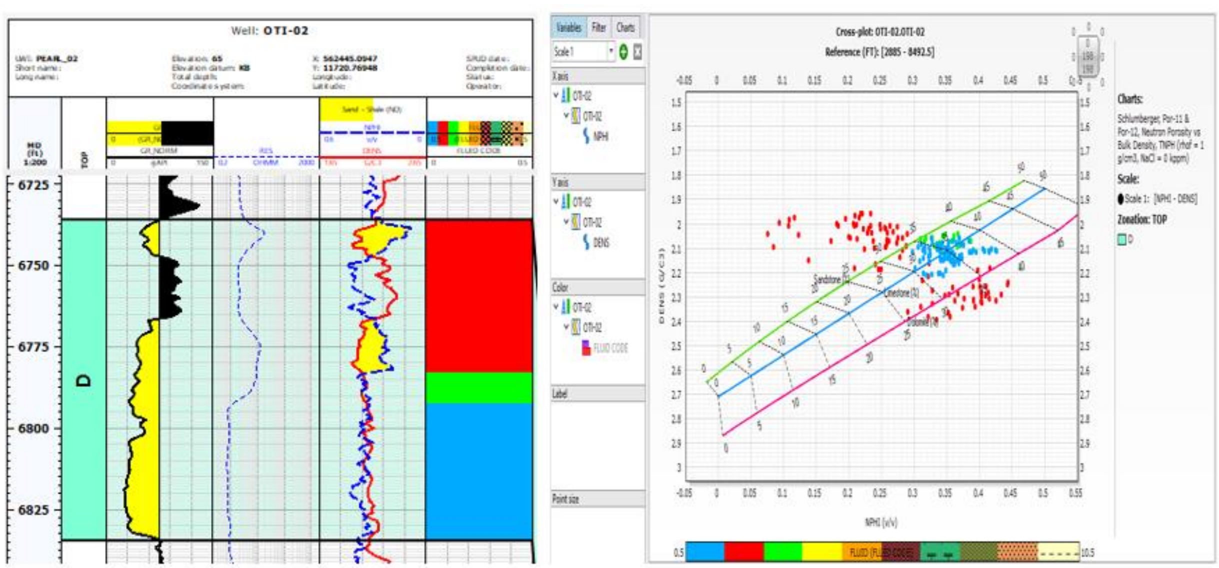

Figure 4.9: Fluid type identification using neutron-density crossplot for OTI-002 well.

Table 4.1 – 4.4 shows the various fluid types and contacts for the four wells penetrating reservoir D, E and F

OTI-02 (MD)				
Reservoir	**Top**	**Bottom**	**Hydrocarbon type**	**Fluid contact**
RES D	6047.299	6139.452	Gas Oil Water	GOC @ 6782.64 OWC @ 6791.97
RES E	6500.389	6720.337	Oil Water	OWC @ 7300.77
RES F	6804.999	7019.967	Oil water	OWC @7587.6

Table 4.1: Fluid type and fluid contact for OTI-02 well.

OTI-03 (MD)				
Reservoir	**Top**	**Bottom**	**Hydrocarbon type**	**Fluid contact**
RES D	6119.521	6218.821	Water	Water
RES E	6551.571	6724.138	Oil Water	OWC @ 7472.72
RES F	6772.939	6973.217	Oil Water	OWC @ 7774.13

Table 4.2: Fluid type and fluid contact for OTI-03 well.

OTI-04 (MD)				
Reservoir	**Top**	**Bottom**	**Hydrocarbon type**	**Fluid contact**
RES D	5795.052	5870.091	Water	Water
RES E	6274.792	6555.031	Gas Oil Water	GOC @7282.2 OWC @ 7410.25
RES F	6615.414	6871.328	Gas Oil Water	GOC @ 7575.96 OWC @ 7590.89

Table 4.3: Fluid type and fluid contact for OTI-04 well.

OTI-X01 (MD)				
Reservoir	**Top**	**Bottom**	**Hydrocarbon type**	**Fluid contact**
RES D	6322.97	6419.41	Gas	GDT
RES E	6788.88	7101.81	Water	Water
RES F	7175.64	7574.92	Water	Water

Table 4.4: Fluid type and fluid contact for OTI-X01 well.

4.4 Shale volume

Shale volume were derived from gamma ray log using the Gr clean and Gr shale as the input derived from the gamma ray multi-well histogram plot (Figure 4.10) for all the wells in the study area. The cutoff obtained from the histogram plot after gamma ray normalization automatically updates on the workflow with specified appropriate empirical formula (Figure 4.11) to obtain the shale volume (Figure 4.12).

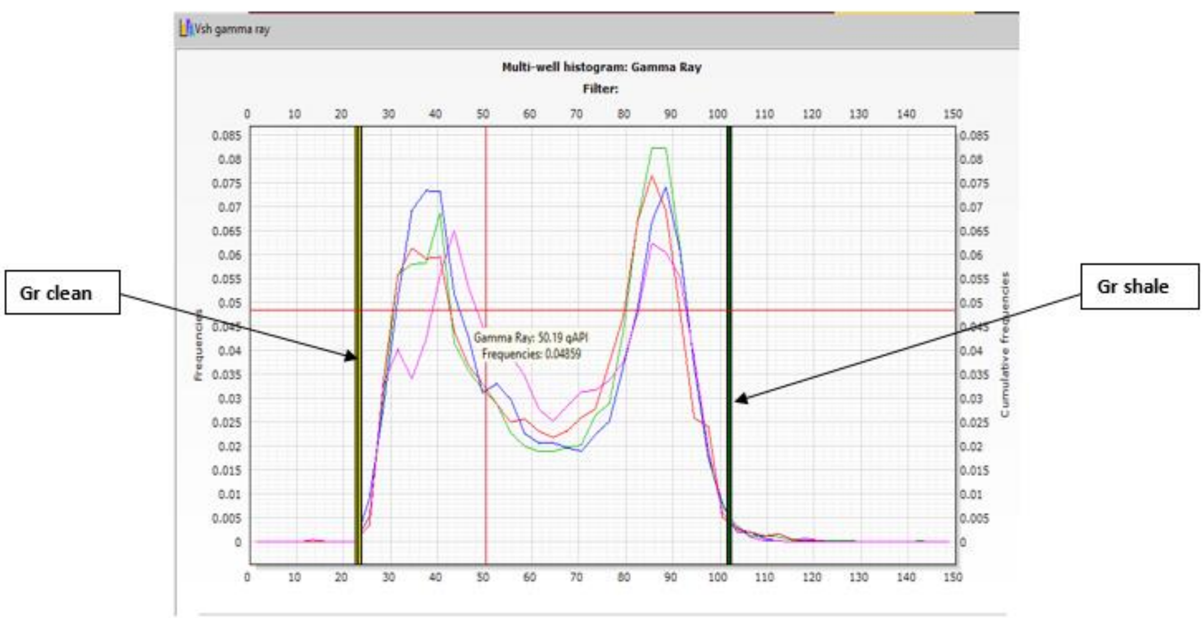

Figure 4.10: Gamma ray histogram plot.

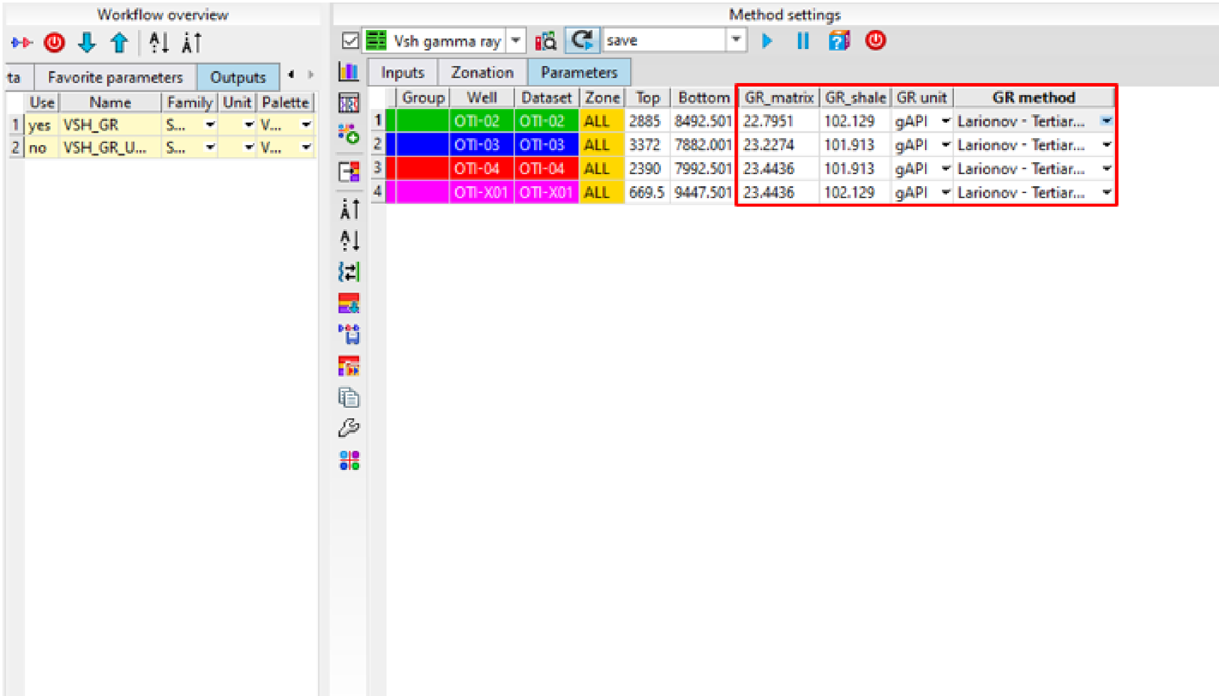

Figure 4.11: Vshale input parameter

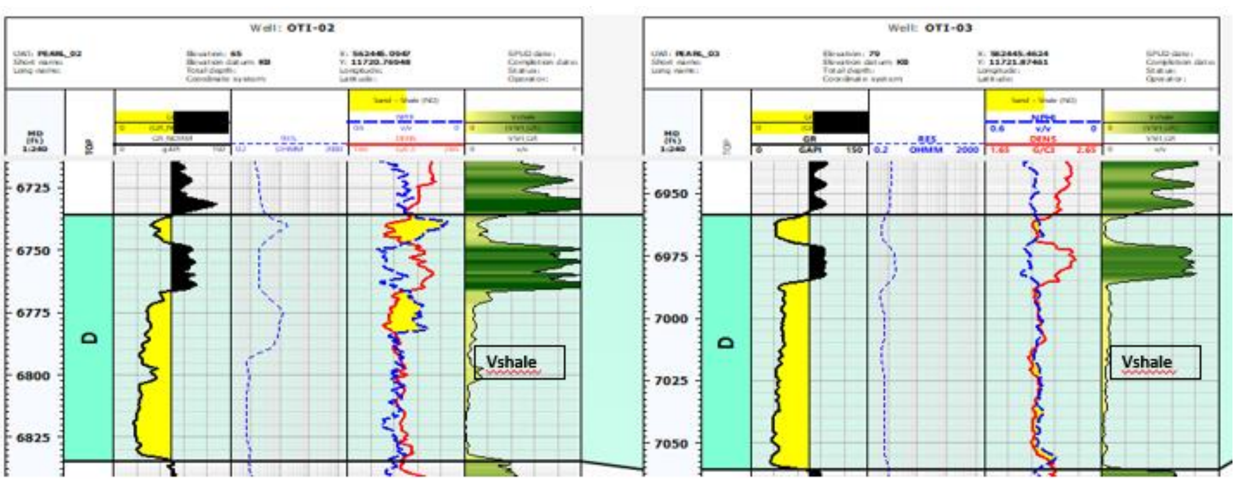

Figure 4.12: Estimated Vshale.

Reservoir and non-reservoir cutoff value within the identified zones of interest were delineated using a crossplot of multiple-well porosity on the Y-axis against shale volume on the X-axis colored by the gamma ray log. The plot (Figure 4.13) revealed the volume of shale volume pay zone and non-pay zone determined at 0.3639 (Table 4.1).

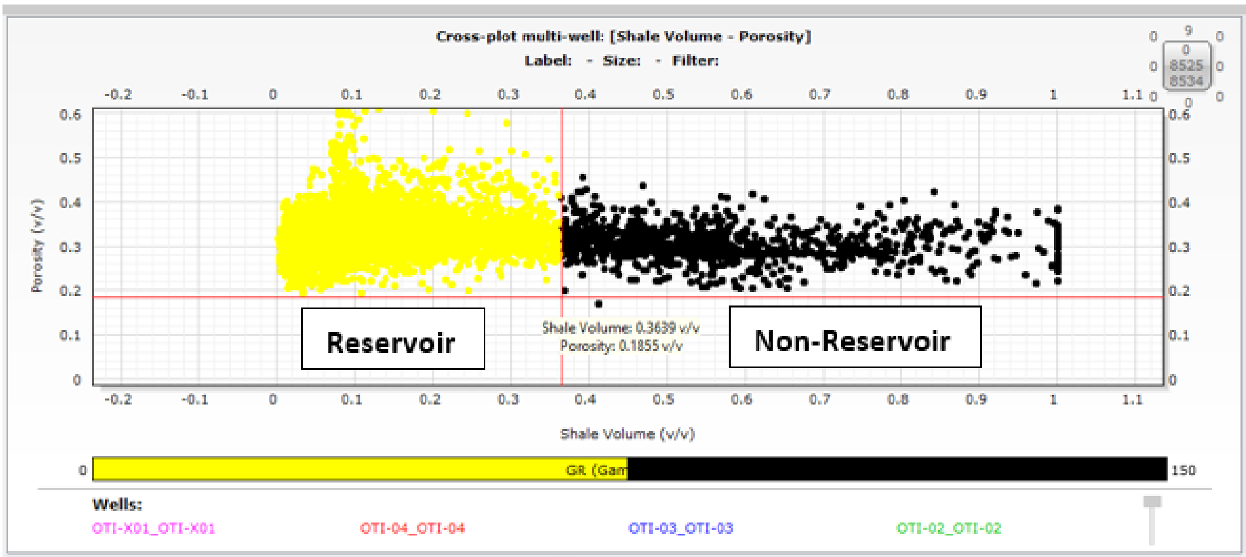

Figure 4.13: Volume of shale versus porosity and gamma ray log plot.

Shale volume in OTI-02, OTI-X01, and OTI-03 ranges between 0.061 to 0.115 with an average of 0.094, 0.052 to 0.152 with an average of 0.107, and 0.057 to 0.15 with an average of 0.09875 respectively (Table 4.5 – 4.7).

Reservoir	Well	Top	Bottom	Gross	Net	N/G	Shale volume
E	OTI-02	6500.389	6720.337	219.948	203.6	0.926	0.096
	OTI-03	6551.571	6724.138	172.567	166.808	0.967	0.061
	OTI-04	6274.792	6555.031	280.239	210.592	0.751	0.115
	OTI-X01	6788.88	7101.81	312.93	297.62	0.951	0.104
MIN				**172.567**	**166.808**	**0.751**	**0.061**
MAX				**312.93**	**297.62**	**0.967**	**0.115**
AVG				**246.421**	**219.655**	**0.89875**	**0.094**

Table 4.5: Computed shale volume for sand E OTI-02 well.

Reservoir	Well	Top	Bottom	Gross	Net	N/G	Shale volume
D	OTI-02	6047.299	6139.452	92.152	73.807	0.801	0.089
	OTI-03	6119.521	6218.821	99.301	85.694	0.863	0.052
	OTI-04	5795.052	5870.091	75.04	37.669	0.502	0.135
	OTI-X01	6322.97	6419.41	96.44	80	0.83	0.152
MIN				**75.04**	**37.669**	**0.502**	**0.052**
MAX				**99.301**	**85.694**	**0.863**	**0.152**
AVG				**90.73325**	**69.2925**	**0.749**	**0.107**

Table 4.6: Computed shale volume for sand D OTI-X01 well.

Reservoir	Well	Top	Bottom	Gross	Net	N/G	Shale volume
F	OTI-02	6804.999	7019.967	214.968	178.693	0.831	0.113
	OTI-03	6772.939	6973.217	200.278	173.934	0.868	0.075
	OTI-04	6615.414	6871.328	255.914	248.847	0.972	0.057
	OTI-X01	7175.64	7574.92	399.28	315.42	0.79	0.15
MIN				**200.278**	**173.934**	**0.79**	**0.057**
MAX				**399.28**	**315.42**	**0.972**	**0.15**
AVG				**267.61**	**229.2235**	**0.86525**	**0.09875**

Table 4.7: Computed shale volume for sand F OTI-03 well.

4.5 Porosity estimation

The result for porosity estimation from the three empirical formulas utilized for this research is shown in Table 4.4 and displayed on the well window in track 5, 6 and 7 (Figure 4.14).

In OTI-02, well density derived porosity (PHIT_D) ranges between 0.163 to 0.406 with an average of 0.299, neutron density derived porosity (PHIT_ND) ranges between 0.275 to 0.449 with an average of 0.336, sonic derived porosity (PHIT_S) ranges between 0.293 to 0.447 with an average of 0.351 while core derived porosity ranges from 0.281 to 0.409 with an average of 0.317.

In OTI-X01 well, density derived porosity (PHIT_D) ranges between 0.241 to 0.301 with an average of 0.265, neutron density derived porosity (PHIT_ND) ranges between 0.259 to 0.335 with an average of 0.298, sonic derived porosity (PHIT_S) ranges between 0.325 to 0.556 with an average of 0.453 while core derived porosity ranges from 0.258 to 0.344 with an average of 0.301.

In OTI-03 well, density derived porosity (PHIT_D) ranges between 0.158 to 0.365 with an average of 0.304, neutron density derived porosity (PHIT_ND) ranges between 0.253 to 0.360 with an average of 0.315, sonic derived porosity (PHIT_S) ranges between 0.164 to 0.528 with an average of 0.348 while core derived porosity ranges from 0.301 to 0.350 with an average of 0.318.

PARAMETERS	PHIT_D	PHIT_ND	PHIT_S	CORE POROSITY
	(frac.)	**(frac.)**	**(frac.)**	**(frac.)**
MIN	0.163	0.275	0.293	0.281
MAX	0.406	0.449	0.447	0.409
AVG	0.299	0.336	0.351	0.317

Table 4.4: Summary of log and core derived porosity from sand E OTI-02 well.

PARAMETERS	PHIT_D	PHIT_ND	PHIT_S	CORE POROSITY
	(frac.)	**(frac.)**	**(frac.)**	**(frac.)**
MIN	0.241	0.259	0.325	0.258
MAX	0.301	0.335	0.556	0.344
AVG	0.265	0.298	0.453	0.301

Table 4.5: Summary of log and core derived porosity from sand D OTI-X01 well.

PARAMETERS	PHIT_D	PHIT_ND	PHIT_S	CORE POROSITY
	(frac.)	**(frac.)**	**(frac.)**	**(frac.)**
MIN	0.158	0.253	0.164	0.301
MAX	0.365	0.360	0.528	0.350
AVG	0.304	0.315	0.348	0.318

Table 4.6: Summary of log and core derived porosity from sand F OTI-03 well.

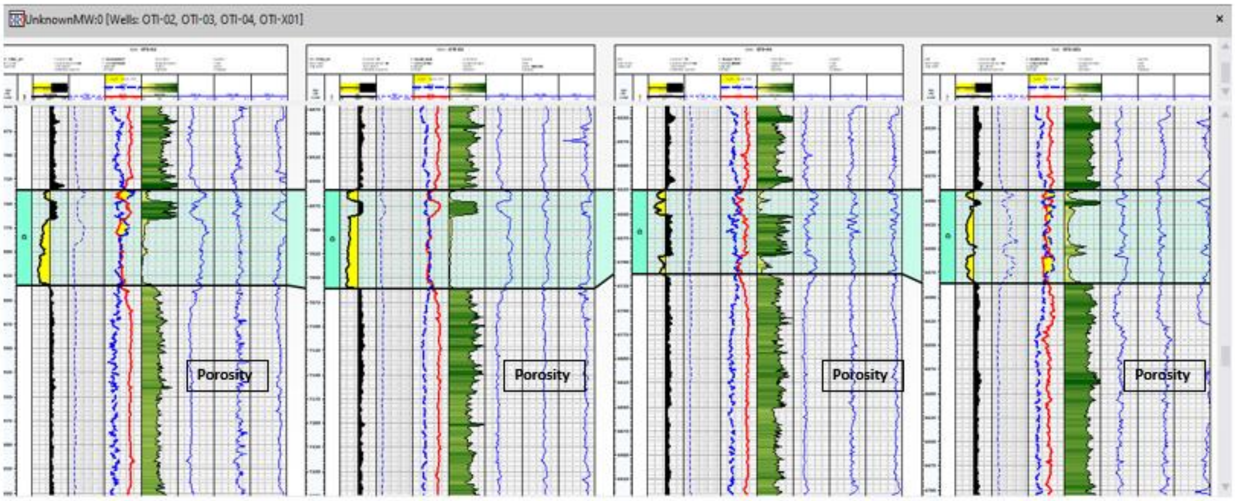

Figure 4.14: Estimated porosity from density, neutron-density, and sonic log.

4.6 Correlation analysis

Porosity values were calculated from the various empirical (density, neutron-density, sonic) formula for the four wells. Correlation analysis were carried out on three wells (OTI-02, OTI-X01, and OTI-03) at different sand level (E, D, and F).

OTI-02 Well

Figure 4.15 shows the comparison of empirical model derived porosity (red line trace) with core derived porosity (blue dot) within the sand E. Figure 4.16 to 4.18 shows the correlation analysis plot between core derived porosity and empirical model porosity within sand E.

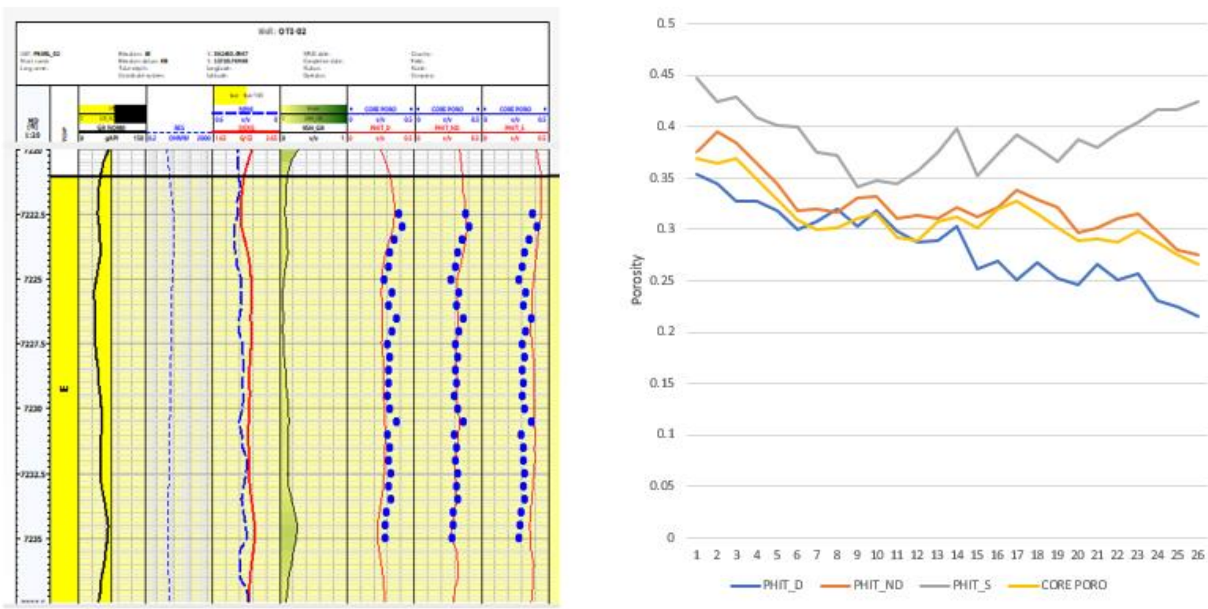

Figure 4.15: Log derived porosity compared with core derived porosity for sand E OTI-02 well.

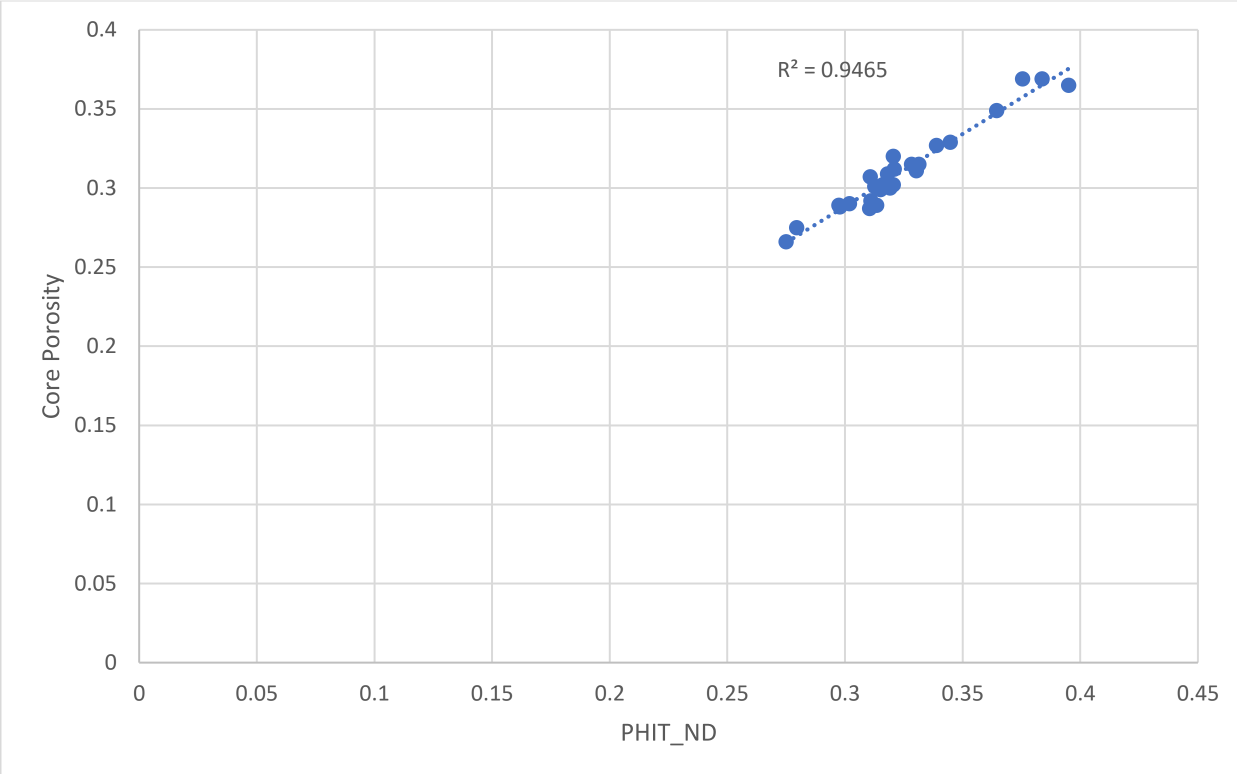

Figure 4.16: Relationship between core derived porosity and neutron-density derived porosity for sand E OTI-02 well.

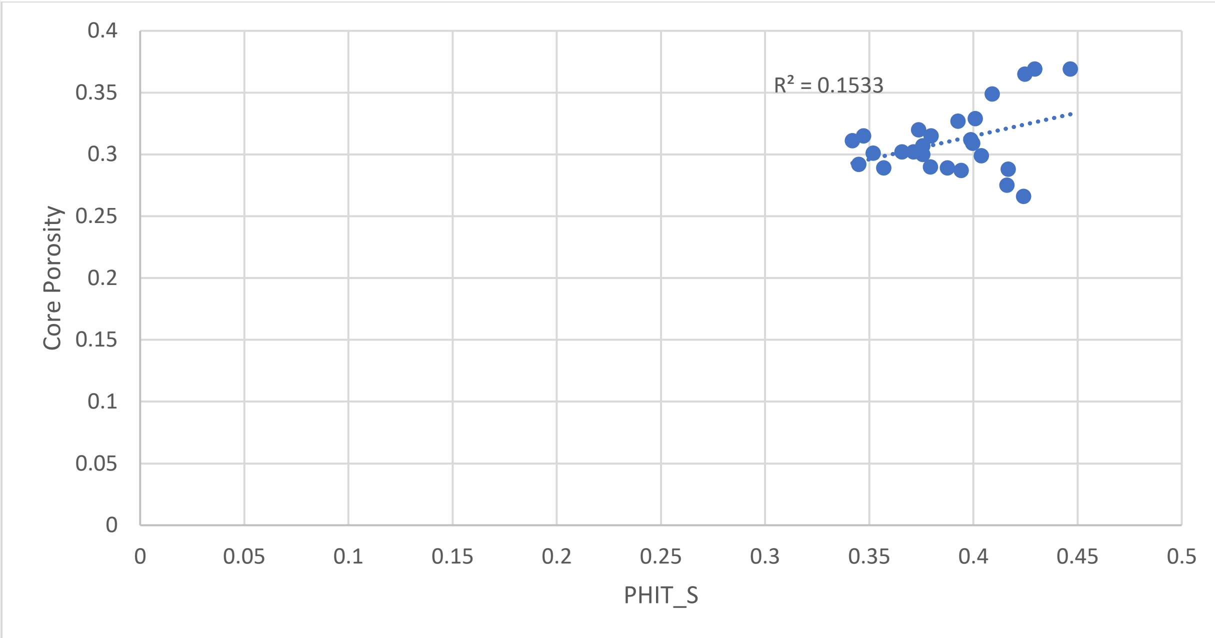

Figure 4.17: Relationship between core derived porosity and sonic derived porosity for sand E OTI-02 well.

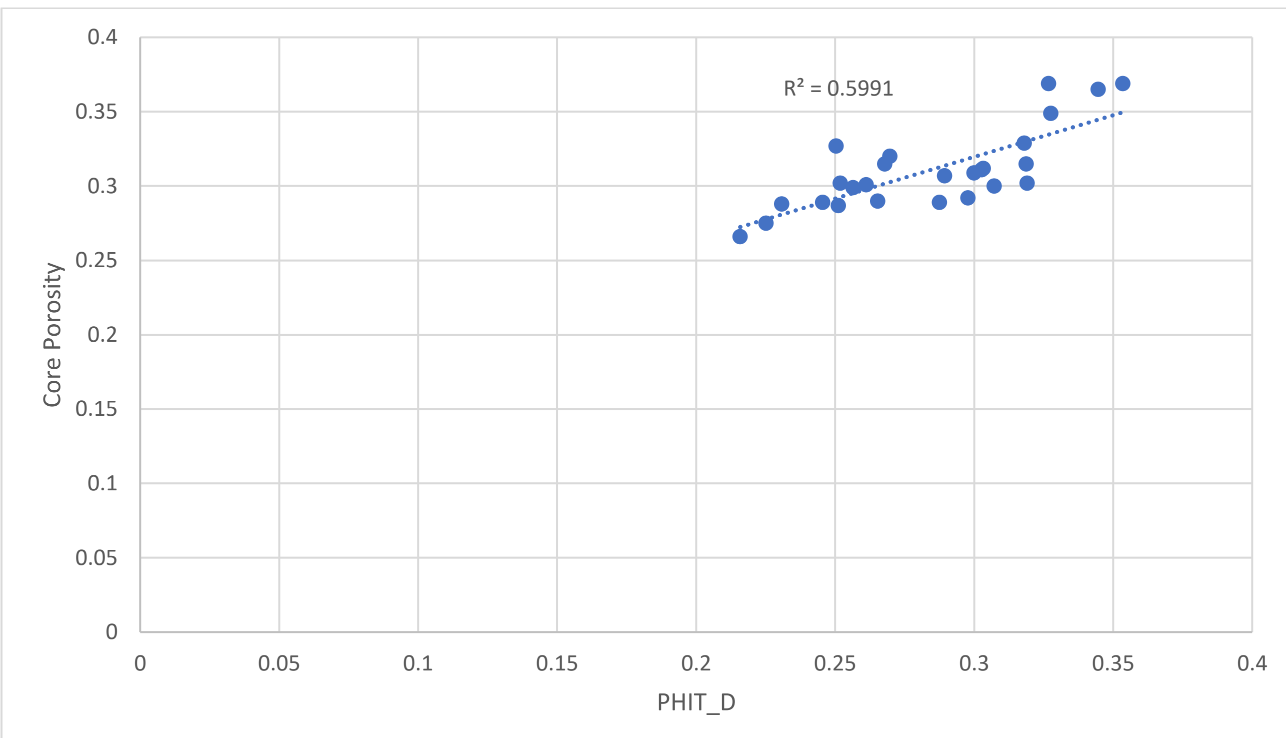

Figure 4.18: Relationship between core derived porosity and density derived porosity for sand E OTI-02 well.

OTI-X01 Well

Figure 4.19 shows the comparison of empirical model derived porosity (red line trace) with core derived porosity (blue dot) within the sand E. Figure 4.20 to 4.22 shows the correlation analysis plot between core derived porosity and empirical model porosity within sand D.

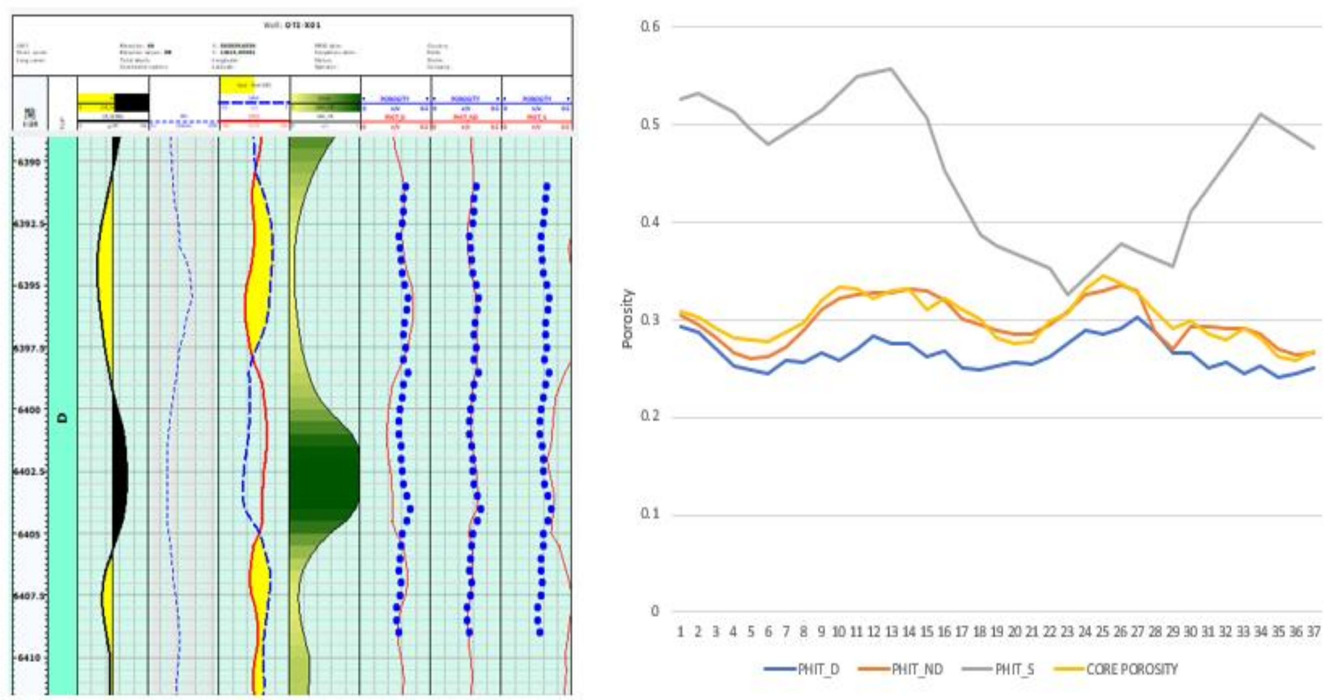

Figure 4.19: Log derived porosity compared with core derived porosity for sand D OTI-X01 well.

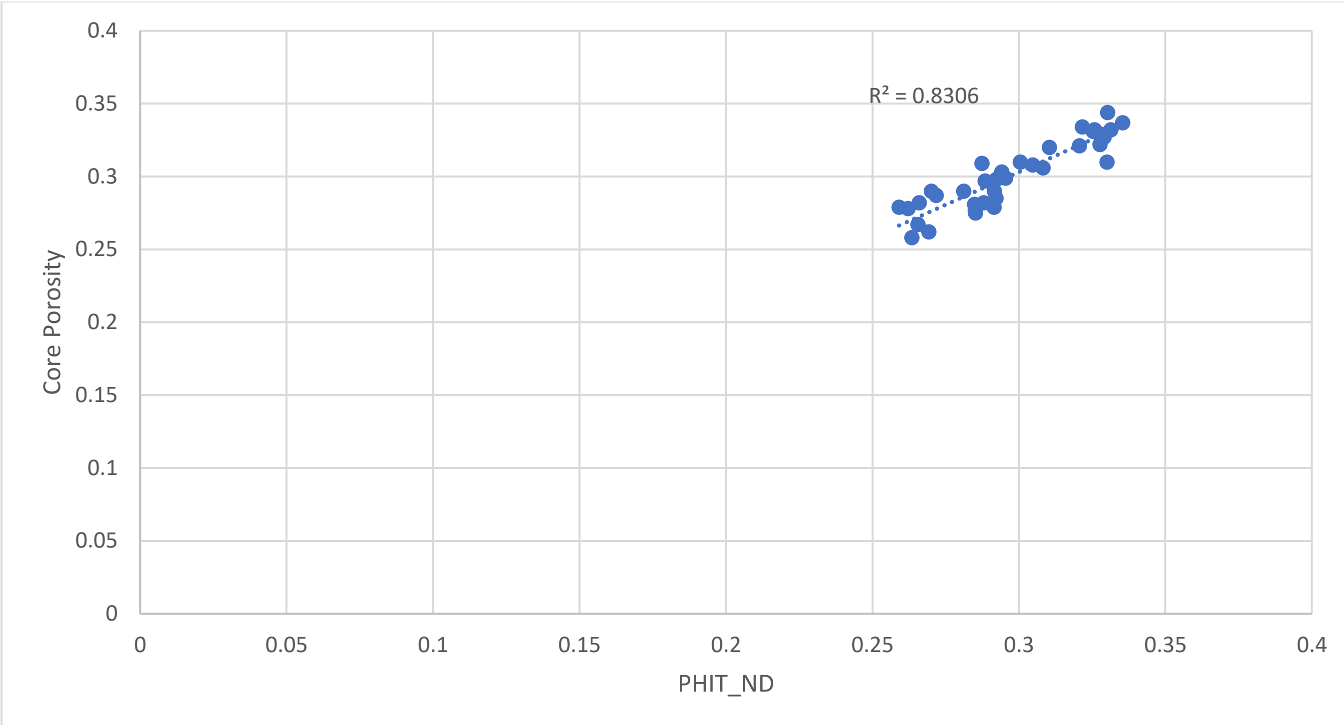

Figure 4.20: Relationship between core derived porosity and neutron-density derived porosity for sand E OTI-X01 well.

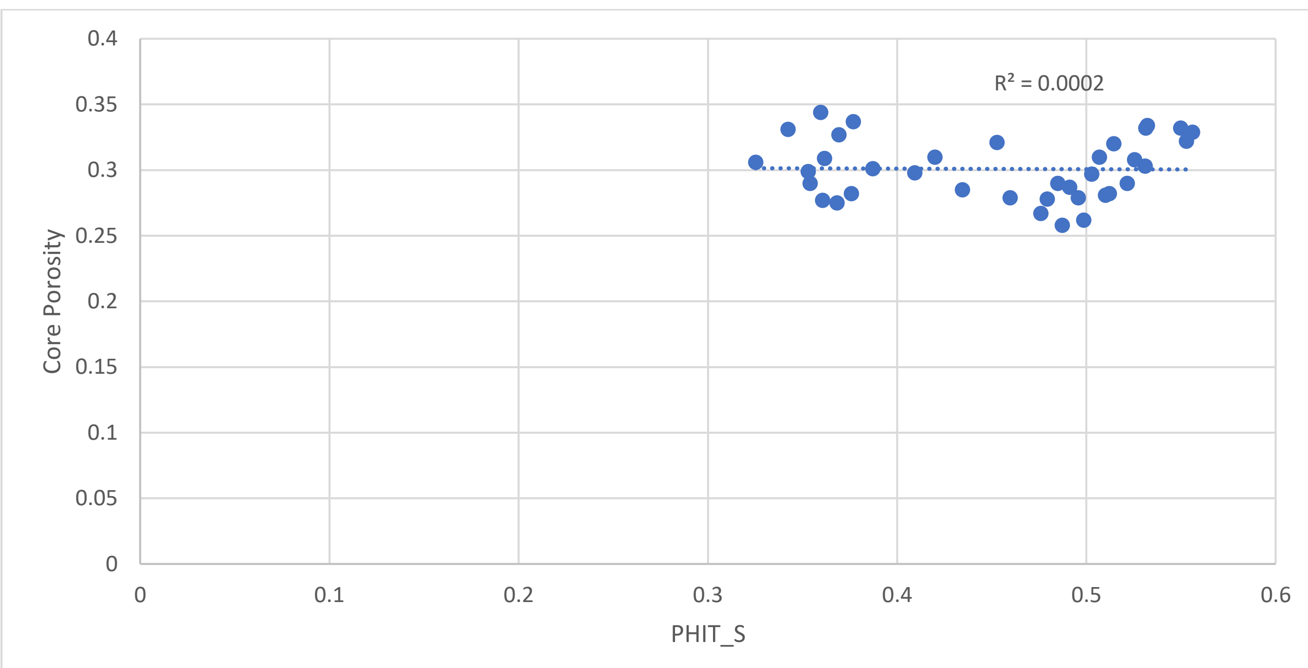

Figure 4.21: Relationship between core derived porosity and sonic derived porosity for sand D OTI-X01 well.

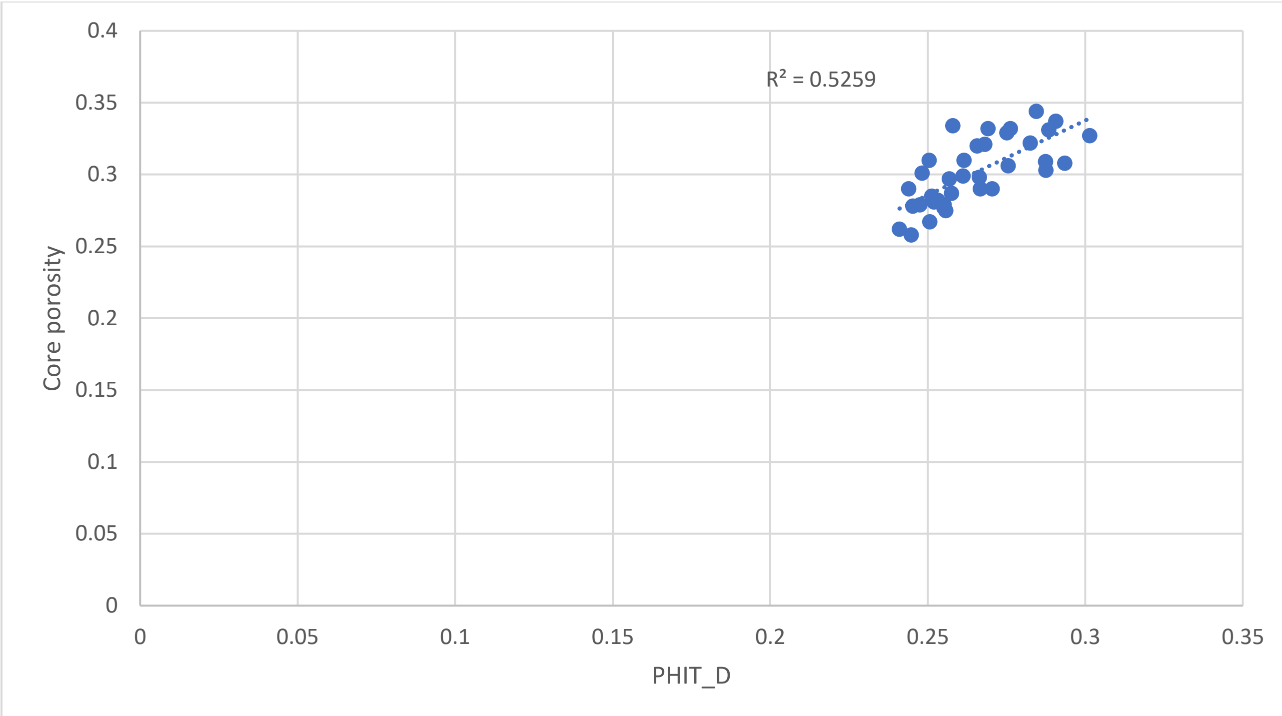

Figure 4.22: Relationship between core derived porosity and density derived porosity for sand E OTI-X01 well.

OTI-03 Well

Figure 4.23 shows the comparison of empirical model derived porosity (red line trace) with core derived porosity (blue dot) within the sand E. Figure 4.24 to 4.26 shows the correlation analysis plot between core derived porosity and empirical model porosity within sand F.

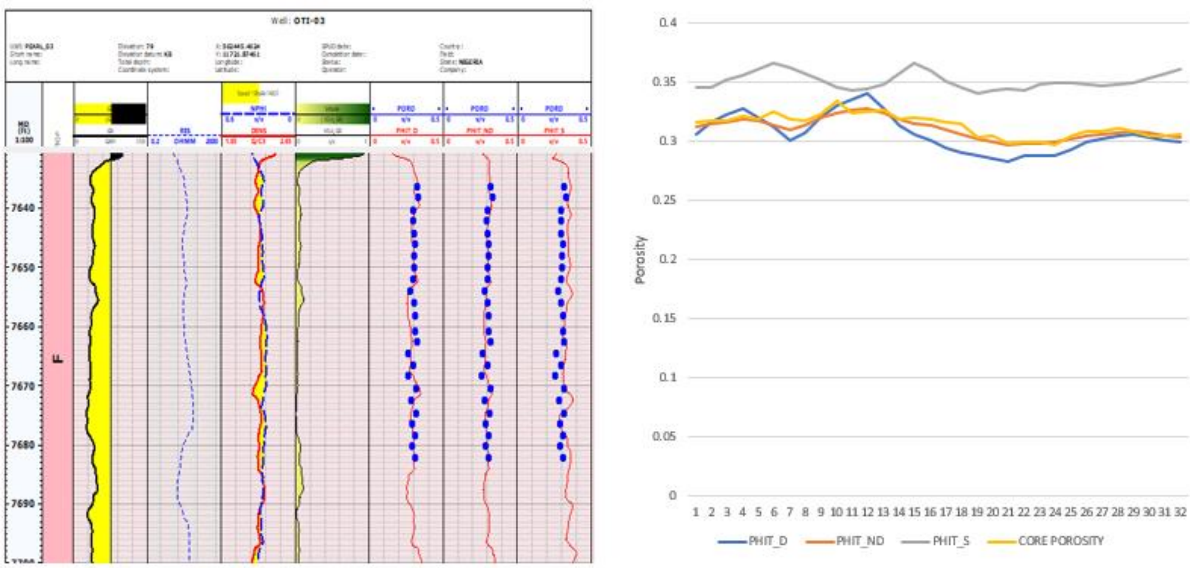

Figure 4.23: Log derived porosity compared with core derived porosity for sand F OTI- X03 well.

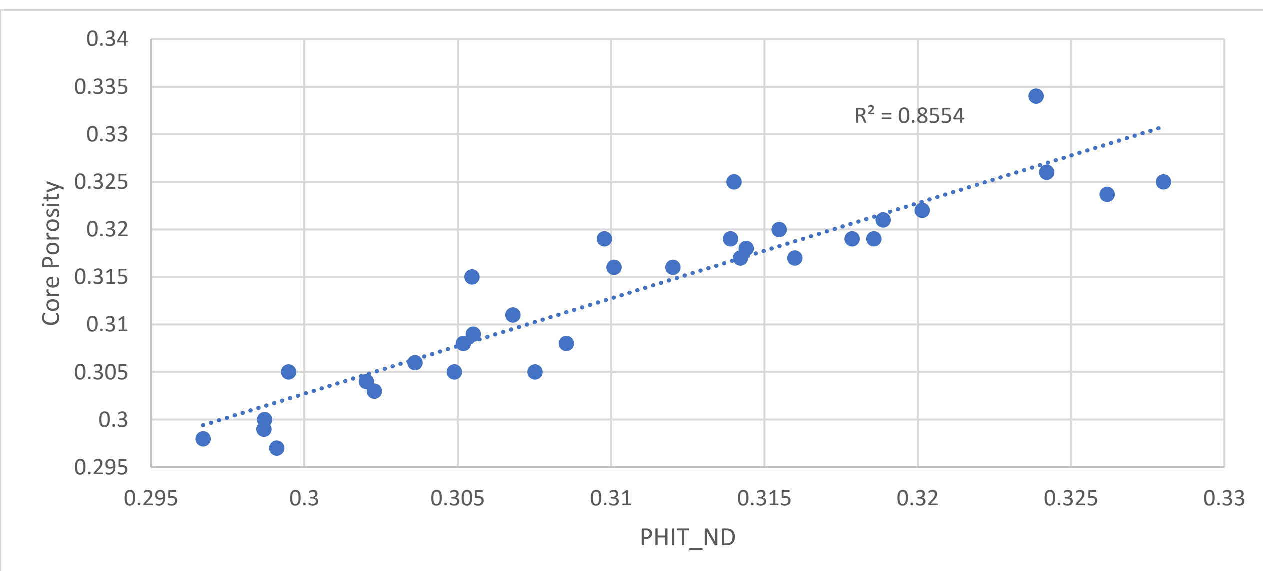

Figure 4.24: Relationship between core derived porosity and neutron-density derived porosity for sand F OTI-03 well.

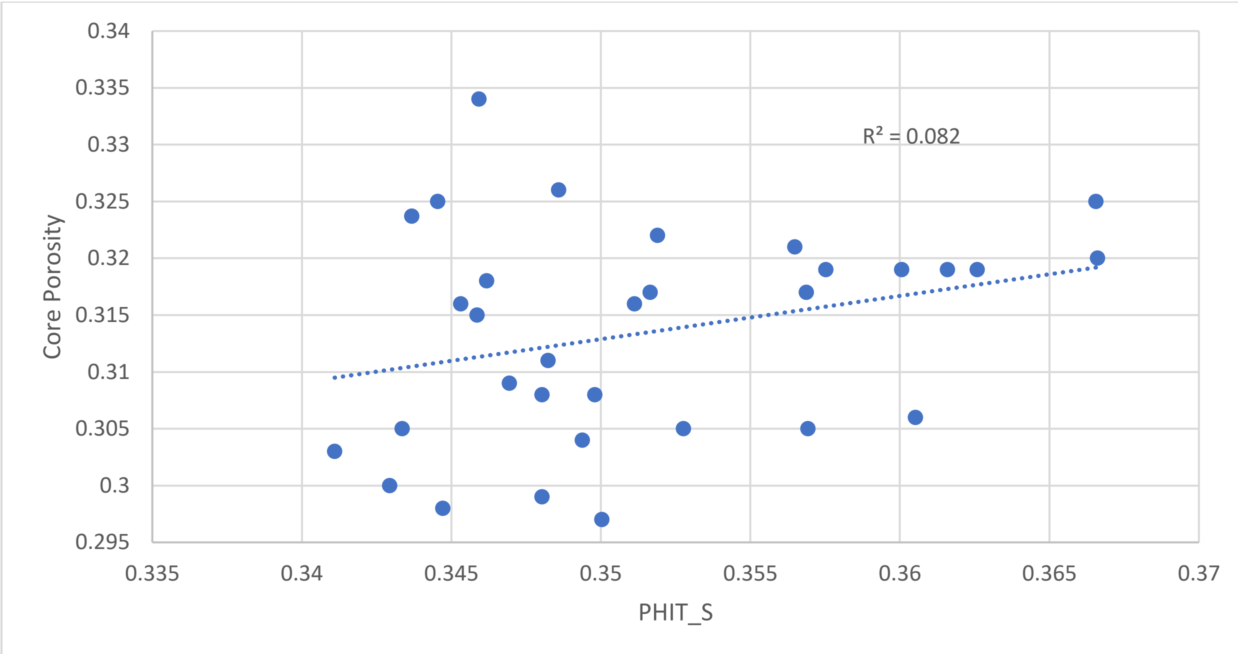

Figure 4.25: Relationship between core derived porosity and sonic derived porosity for sand F OTI-03 well.

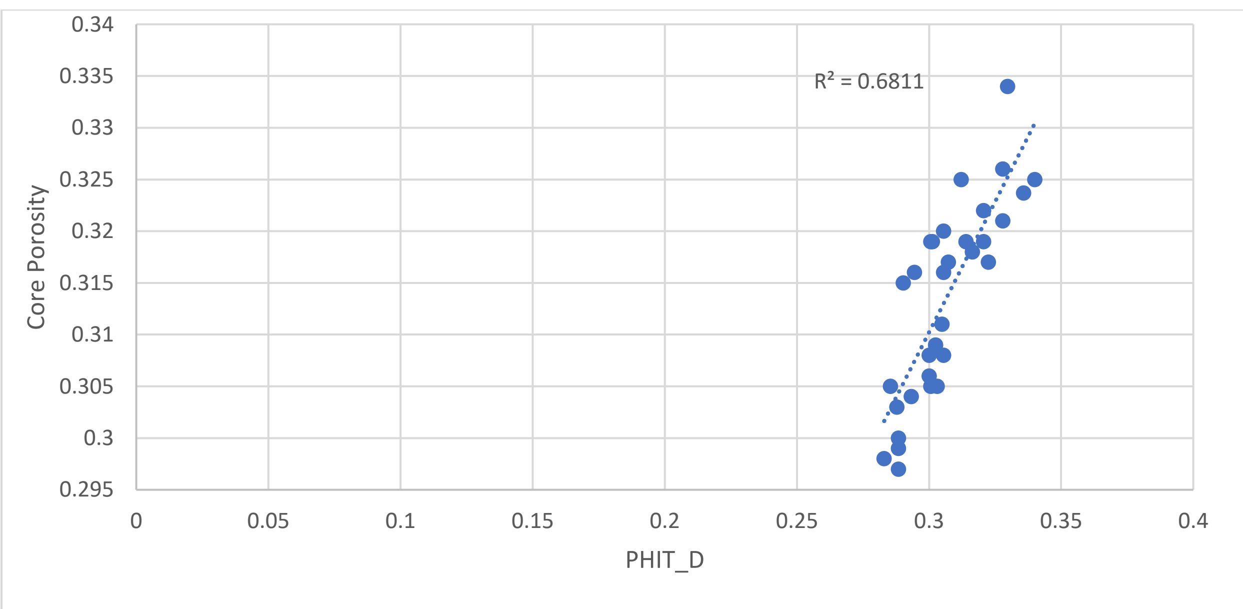

Figure 4.26: Relationship between core derived porosity and density derived porosity for sand F OTI-03 well.

CHAPTER FIVE: DISCUSSION AND CONCLUSION

5.1 Log normalization

Figure 4.3 shows the distribution from multi-well histogram aligned to a common statistical range using OTI-03 as the reference well. Normalization range between 20 - 35 is indicative of cleans sand zone while 100 – 110 is indicative of shale zone. This allows for consistent lithology interpretation and improves correlation across multiple wells and define appropriate ranges for sand and shale cutoffs for shale volume estimation.

5.2 Lithology identification/lithostratigraphic correlation

The lithology for the four wells across reservoir D, E, and F revealed from gamma ray log ranges between 24.556 to 108.034 gAPI with an average of 57.256 gAPI, 21.59 to 119.24 gAPI with an average of 45.4091 gAPI, and 23.29 to 102.9598 gAPI with an average of 46.1556 gAPI. The result (Figure 4.4) clearly identified two dominant lithologies across the field as sandstone - low gamma reading (non-radioactive sands) coloured yellow, bulk density deflected to the left and neutron deflected to the right and shale - high gamma ray reading, bulk density deflected to the right and neutron log to the left in track 2 and 3.

5.3 Fluid type discrimination

In water-bearing sandstones deep and shallow resistivity will be similar; the deep resistivity measurement will increase in hydrocarbon zones. Density log which measures the bulk matrix of the formation and fluid contained in the pore spaces is intensely affected by the presence of gas in the formation therefore resulting in very low-density values. Neutron porosity tools records the hydrogen content in the formation.

Hydrocarbon gas and oil will have similar high deep resistivity responses. The best visual identification of gas is a very low bulk density value (over estimating porosity), and a very low neutron value (underestimating porosity). This is seen shown in Figure 4.9 as a large deflection of the density log to the left, and large deflection of the neutron log to the right- the gas effect (colored red), also the gas revealed to plot above the sand matrix line in the upper left corner of the crossplot. This separation becomes smaller indicating fluid change to oil saturation (colored green), and when then both logs overlay each other, this reveals the presence of water (colored blue), both fluid (oil and water) plot just below the sand matrix line around the central corner of the crossplot.

5.4 Shale volume

Using Larionov tertiary equation, the sand and shale baseline were picked from the normalized gamma ray histogram plot (Figure 4.10). The calculated shale volume is presented in Table 4.5 – 4.7 for reservoir D, E, and F. The result reveals that reservoir E shows the cleanest overall reservoir with the lowest average shale volume of 0.094, and the highest net-to-gross ratio of 0.899 followed by reservoir F which have an average shale volume of 0.099 and net-to-gross ratio of 0.86525 while reservoir D is more shaley with an average shale volume of 0.107 and a net-to-gross ratio of 0.749.

Using Figure 4.13, the net sand for the study area is calculated at Vsh= 0.3639. This removes shaly intervals within the reservoir of interest.

5.5 Porosity estimation

Comparing the calculated porosity result for reservoir D, E, and F Table 4.4 – 4.6 penetrated by the four wells to Rider's classification scheme (Table 3.2). The porosity is ranked to be very good (20 – 30 %) and excellent (>30). Porosity > 40 were observed predominantly from sonic derived porosity resulting from hydrocarbon presence.

5.6 Correlation analysis

5.6.1 OTI-02 well

Figure 4.15A shows the plot of the calculated porosity from three empirical formula on the same track with the core porosity plot while Figure 4.15B shows the different porosity output relative to each other with the zone. Output from neutron-density model estimate revealed a closer match to the porosity data closely followed by density derived porosity while sonic derived porosity over estimated porosity output.

The correlation analysis (Figure 4.16 - 4.18) of core derived porosity versus different empirical model revealed that there is a strong positive correlation (R^2 = 0.9465) between core porosity versus PHIT_ND, core porosity versus PHIT_S (R^2 = 0.1533) revealed weak positive correlation, and a moderate positive correlation between core porosity and PHIT_D (R^2 = 0.5991).

5.6.2 OTI-X01 well

Figure 4.19A shows the plot of the calculated porosity from three empirical formula on the same track with the core porosity plot while Figure 4.19B shows the different porosity output relative to each other with the zone. Output from neutron-density model estimate revealed a closer match to the porosity data closely followed by density derived porosity while sonic derived porosity over estimated porosity output.

The correlation analysis (Figure 4.20 – 4.22) of core derived porosity versus different empirical model revealed that there is a strong positive correlation (R^2 = 0.8306) between core porosity versus PHIT_ND, core porosity versus PHIT_S (R^2 = 0.0002) revealed weak positive correlation, and a moderate positive correlation between core porosity and PHIT_D (R^2 = 0.5259).

5.6.3 OTI-03 well

Figure 4.23A shows the plot of the calculated porosity from three empirical formula on the same track with the core porosity plot while Figure 4.23B shows the different porosity output relative to each other with the zone. Output from neutron-density model estimate revealed a closer match to the porosity data closely followed by density derived porosity while sonic derived porosity over estimated porosity output.

The correlation analysis (Figure 4.24 – 4.26) of core derived porosity versus different empirical model revealed that there is a strong positive correlation (R^2 = 0.8554) between core porosity versus PHIT_ND, core porosity versus PHIT_S (R^2 = 0.082) revealed weak positive correlation, and a moderate positive correlation between core porosity and PHIT_D (R^2 = 0.6811).

5.7 Conclusion

This study was aimed at comparing and determining the most reliable way to estimate porosity from empirical relationships using density, neutron-density, and sonic log in a sandstone reservoir of Akaso Field within the Niger delta.

Quick-look/qualitative analysis of the suites logs identified predominantly two lithology known to be sandstone and shale within the Niger delta. The lithology identified is similar to other reservoir system reported by Collins et al., 2019; Finecountry and Inichinbia, 2020.

Shale volume within the zones of interest revealed very low shale volume and high net-to-gross ratio and the estimated porosity ranked between good to excellent. This interpretation agrees with Kamayou et al. 2021.

Core porosity versus Neutron-density derived porosities revealed the highest correlation followed by core porosity versus density derived porosities plot revealed moderate correlation while core porosity versus sonic derived porosities revealed the lowest correlation across the various reservoir interval. This is evident that neutron-density log derived porosities provide a better estimated of the in-situ porosity in the Niger delta. This finding is in line with Horsfall et al., 2013.

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APPENDIX

Table 1: Porosity estimate obtained OTI-X01 well sand D.

DEPTH	DENS	NPHI	SONIC	PHIT_D	PHIT_ND	PHIT_S
6389	2.2532	0.304	135.4561	0.240485	0.2867939	0.502851
6389.5	2.2392	0.2989	136.3596	0.24897	0.2879104	0.508498
6390	2.1969	0.2925	137.2632	0.274606	0.2974744	0.514145
6390.5	2.1608	0.2794	138.1668	0.296485	0.3069973	0.519792
6391	2.1328	0.241	139.0705	0.313455	0.3047182	0.525441
6391.5	2.1262	0.2036	139.9742	0.317455	0.2941217	0.531089
6392	2.1377	0.1804	138.4594	0.310485	0.2811965	0.521621
6392.5	2.15	0.1524	136.9445	0.30303	0.2659449	0.512153
6393	2.1591	0.1439	134.321	0.297515	0.2590981	0.495756
6393.5	2.1464	0.1384	131.6973	0.305212	0.2621463	0.479358
6394	2.1261	0.142	133.5752	0.317515	0.271723	0.491095
6394.5	2.0942	0.1522	135.4532	0.336849	0.2884883	0.502833
6395	2.0466	0.159	137.3312	0.365697	0.3104765	0.51457
6395.5	2.0263	0.1669	140.15	0.378	0.3216727	0.532188
6396	2.0244	0.1763	142.9689	0.379152	0.3257947	0.549806
6396.5	2.0353	0.1944	143.4697	0.372546	0.327702	0.552936
6397	2.0641	0.2293	143.9705	0.355091	0.3281271	0.556066
6397.5	2.0953	0.2752	140.0363	0.336182	0.3313945	0.531477
6398	2.136	0.319	136.1019	0.311515	0.3301134	0.506887
6398.5	2.2077	0.342	127.4298	0.268061	0.3206596	0.452686
6399	2.2697	0.3367	122.1846	0.230485	0.3004493	0.419904
6399.5	2.2899	0.3361	116.9392	0.218242	0.2943541	0.38712
6400	2.3147	0.3375	115.121	0.203212	0.2879996	0.375756
6400.5	2.3271	0.339	113.9058	0.195697	0.2852422	0.368161
6401	2.3349	0.3429	112.6908	0.19097	0.2851154	0.360568
6401.5	2.3294	0.3578	111.4758	0.194303	0.2954229	0.352974

6402	2.3162	0.3726	107.0354	0.202303	0.3082505	0.325221
6402.5	2.2897	0.3875	109.7851	0.218364	0.3254354	0.342407
6403	2.2797	0.390564	112.5347	0.224424	0.3303481	0.359592
6403.5	2.2694	0.3937	115.2841	0.230667	0.3354024	0.376776
6404	2.2681	0.3834	114.0692	0.231455	0.3290682	0.369183
6404.5	2.2748	0.3162	112.8544	0.227394	0.2874346	0.36159
6405	2.2264	0.2466	111.6396	0.256727	0.2701303	0.353998
6405.5	2.1444	0.2189	120.5023	0.306424	0.2923333	0.409389
6406	2.12	0.1912	124.5274	0.321212	0.2922044	0.434546
6406.5	2.0969	0.1635	128.5523	0.335212	0.2915201	0.459702
6407	2.0903	0.1565	132.5769	0.339212	0.291655	0.484856
6407.5	2.1188	0.1697	136.6013	0.32194	0.2849036	0.510008
6408	2.1698	0.1828	134.7816	0.29103	0.2692676	0.498635
6408.5	2.1967	0.1959	132.9619	0.274727	0.2634193	0.487262
6409	2.2035	0.209	131.1423	0.270606	0.2655284	0.475889
6409.5	2.1993	0.2221	129.3229	0.273152	0.2718887	0.464518
6410	2.1696	0.2226	127.5035	0.291152	0.2836972	0.453147
6410.5	2.1438	0.2176	129.1095	0.306788	0.2921088	0.463184
6411	2.1388	0.2127	127.7436	0.309818	0.2923496	0.454648
6411.5	2.1511	0.2154	126.3778	0.302364	0.2884317	0.446111
6412	2.1692	0.2304	125.0121	0.291394	0.2866261	0.437576
6412.5	2.1919	0.2454	123.6464	0.277636	0.2830516	0.42904
6413	2.1981	0.253104	126.3268	0.273879	0.2833523	0.445793
6413.5	2.204	0.2604	129.0069	0.270303	0.2836239	0.462543
6414	2.2102	0.2575	131.6869	0.266545	0.2802133	0.479293
6414.5	2.2071	0.2408	131.1269	0.268424	0.2755243	0.475793
6415	2.1679	0.2241	130.567	0.292182	0.2849	0.472294
6415.5	2.1416	0.2087	130.0071	0.308121	0.2898076	0.468794
6416	2.1179	0.2135	129.4473	0.322485	0.3009664	0.465296
6416.5	2.1112	0.2133	129.8946	0.326545	0.3035761	0.468091

6417	2.126	0.207	130.3418	0.317576	0.2954172	0.470886
6417.5	2.1322	0.2002	130.789	0.313818	0.2905061	0.473681
6418	2.1345	0.2172	131.2361	0.312424	0.2956607	0.476476
6418.5	2.1415	0.2118	130.2232	0.308182	0.2909555	0.470145
6419	2.1477	0.2148	129.2104	0.304424	0.2895649	0.463815
6419.5	2.1362	0.2335	128.1976	0.311394	0.3007429	0.457485
6420	2.1239	0.2522	127.1849	0.318849	0.3121421	0.451156
6420.5	2.128	0.2543	126.1722	0.316364	0.3112452	0.444826
6421	2.1357	0.2461	128.0457	0.311697	0.3053498	0.456536
6421.5	2.153	0.2469	129.9191	0.301212	0.2988025	0.468244
6422	2.1674	0.253	131.7924	0.292485	0.2952799	0.479953
6422.5	2.1672	0.2603	131.1824	0.292606	0.2979003	0.47614
6423	2.169	0.2677	130.5724	0.291515	0.2997629	0.472328
6423.5	2.172	0.277185	131.0194	0.289697	0.3018664	0.475121
6424	2.1751	0.2873	131.4664	0.287818	0.3041332	0.477915
6424.5	2.1593	0.3022	131.9134	0.297394	0.3153566	0.480709
6425	2.1238	0.3236	132.3604	0.318909	0.3364314	0.483503
6425.5	2.1024	0.3329	131.5491	0.331879	0.3479369	0.478432
6426	2.1553	0.3366	130.7379	0.299818	0.3313139	0.473362
6426.5	2.181	0.3399	129.9268	0.284243	0.3265481	0.468293
6427	2.2016	0.3438	129.1158	0.271758	0.3233489	0.463224
6427.5	2.2096	0.3306	130.3846	0.266909	0.3135853	0.471154
6428	2.2151	0.3092	131.6534	0.263576	0.3001351	0.479084
6428.5	2.2218	0.304	132.9221	0.259515	0.2954641	0.487013
6429	2.2313	0.3137	134.2242	0.253758	0.2981891	0.495151
6429.5	2.2439	0.2974	135.5263	0.246121	0.2857971	0.503289
6430	2.2646	0.3111	137.0296	0.233576	0.2874925	0.512685
6430.5	2.2554	0.3184	138.5327	0.239152	0.2941163	0.522079
6431	2.2376	0.3196	135.9105	0.249939	0.2997329	0.505691
6431.5	2.2263	0.3214	133.2884	0.256788	0.3038477	0.489303

6432	2.2221	0.3263	133.9363	0.259333	0.3077525	0.493352
6432.5	2.2141	0.3334	134.5842	0.264182	0.3139658	0.497401
6433	2.192	0.3396	135.2321	0.277576	0.3234676	0.501451
6433.5	2.164	0.342821	135.8799	0.294546	0.332672	0.505499
6434	2.1364	0.346	134.8175	0.311273	0.3415482	0.498859
6434.5	2.1231	0.3514	133.7552	0.319333	0.3480065	0.49222
6435	2.1166	0.3522	132.6929	0.323273	0.3505349	0.485581
6435.5	2.1039	0.3487	131.6307	0.33097	0.3525571	0.478942
6436	2.0611	0.3395	131.7253	0.356909	0.3664621	0.479533
6436.5	2.0204	0.3275	131.8199	0.381576	0.3787873	0.480124
6437	2.0942	0.3164	131.9145	0.336849	0.3456964	0.480716
6437.5	2.1135	0.3042	132.0091	0.325152	0.3339895	0.481307
6438	2.1339	0.2885	128.1812	0.312788	0.3206494	0.457383
6438.5	2.1392	0.2688	130.0862	0.309576	0.3118277	0.469289
6439	2.1135	0.2504	131.9911	0.325152	0.3156475	0.481194
6439.5	2.1074	0.2321	133.393	0.328849	0.3117127	0.489956
6440	2.1097	0.2165	134.7949	0.327455	0.3053094	0.498718
6440.5	2.1043	0.236	133.9843	0.330727	0.3143126	0.493652
6441	2.1012	0.2543	133.1738	0.332606	0.3218908	0.488586
6441.5	2.1463	0.2361	132.3633	0.305273	0.2976598	0.483521
6442	2.1633	0.2263	131.9048	0.29497	0.2874926	0.480655
6442.5	2.1633	0.2174	131.4464	0.29497	0.2843236	0.47779
6443	2.1535	0.2179	130.9879	0.300909	0.2883731	0.474924
6443.5	2.1493	0.218161	130.5295	0.303455	0.2901287	0.472059
6444	2.1454	0.2184	134.9473	0.305818	0.291759	0.499671
6444.5	2.1424	0.2193	137.5552	0.307636	0.2932685	0.51597
6445	2.1458	0.2365	134.533	0.305576	0.2979979	0.497081
6445.5	2.1239	0.2575	131.5111	0.318849	0.3139752	0.478194
6446	2.116	0.2756	128.4893	0.323636	0.3233166	0.459308
6446.5	2.1101	0.2971	125.8028	0.327212	0.332942	0.442518

6447	2.0979	0.3204	123.1164	0.334606	0.345565	0.425728
6447.5	2.0626	0.3516	120.4302	0.356	0.3698271	0.408939
6448	2.1076	0.359	122.3545	0.328727	0.356278	0.420966
6448.5	2.1571	0.3623	124.2786	0.298727	0.3460293	0.432991
6449	2.2065	0.363	126.2026	0.268788	0.3335052	0.445016
6449.5	2.2146	0.3536	128.1265	0.263879	0.3256347	0.457041
6450	2.1942	0.3321	130.0503	0.276242	0.3185717	0.469064
6450.5	2.1932	0.2982	126.4933	0.276849	0.3008501	0.446833
6451	2.1946	0.2671	122.9366	0.276	0.2895977	0.424604
6451.5	2.2207	0.2764	119.3802	0.260182	0.2827686	0.402376
6452	2.2468	0.2878	118.3026	0.244364	0.2798331	0.395641
6452.5	2.2128	0.3008	117.2252	0.26497	0.296173	0.388908
6453	2.1506	0.3138	116.1478	0.302667	0.3226643	0.382174
6453.5	2.1423	0.2915	113.9317	0.307697	0.3183708	0.368323
6454	2.165	0.271875	111.7158	0.29394	0.3027674	0.354474
6454.5	2.1883	0.2517	114.4232	0.279818	0.2866668	0.371395
6455	2.2343	0.261	117.1305	0.25194	0.2721812	0.388316
6455.5	2.2436	0.2726	119.8042	0.246303	0.2726496	0.405026
6456	2.2446	0.2792	122.4776	0.245697	0.2758752	0.421735
6456.5	2.2718	0.3262	125.1509	0.229212	0.2938768	0.438443
6457	2.3248	0.3374	130.7709	0.197091	0.2849991	0.473568
6457.5	2.3418	0.3363	131.6691	0.186788	0.2793145	0.479182
6458	2.2651	0.2941	132.5672	0.233273	0.2780977	0.484795
6458.5	2.1884	0.2256	133.4653	0.279758	0.2773952	0.490408
6459	2.1117	0.1815	134.3633	0.326242	0.2920522	0.496021
6459.5	2.035	0.1677	134.826	0.372727	0.3183727	0.498913
6460	2.0335	0.1582	135.2886	0.373636	0.3155891	0.501804
6460.5	2.0505	0.1574	135.7512	0.363333	0.3082941	0.504695
6461	2.0528	0.1597	136.8834	0.36194	0.3081782	0.511771
6461.5	2.0572	0.1689	138.0155	0.359273	0.3096827	0.518847

6462	2.0619	0.1747	139.1476	0.356424	0.309838	0.525923
6462.5	2.0515	0.1723	136.3294	0.362727	0.3132371	0.508309
6463	2.0402	0.1775	133.5114	0.369576	0.3197254	0.490696
6463.5	2.0439	0.1881	131.8317	0.367333	0.3219644	0.480198
6464	2.0532	0.1983	130.1521	0.361697	0.3217633	0.469701
6464.5	2.054	0.2073	128.4726	0.361212	0.3245958	0.459204
6465	2.053	0.2086	130.2741	0.361818	0.3254571	0.470463
6465.5	2.0598	0.2049	132.0756	0.357697	0.3213972	0.481723
6466	2.0703	0.2032	133.8769	0.351333	0.3165372	0.492981
6466.5	2.0781	0.2025	133.5194	0.346606	0.3131298	0.490746
6467	2.0802	0.1975	133.162	0.345333	0.3105108	0.488513
6467.5	2.0802	0.1874	132.8046	0.345333	0.3069201	0.486279
6468	2.0728	0.1795	132.4472	0.349818	0.3071074	0.484045
6468.5	2.0671	0.1784	133.5789	0.353273	0.3090379	0.491118
6469	2.0793	0.1827	134.7107	0.345879	0.305607	0.498192
6469.5	2.0889	0.189	135.8423	0.340061	0.3039629	0.505264
6470	2.095	0.1902	135.0331	0.336364	0.3019229	0.500207
6470.5	2.094	0.1851	134.224	0.33697	0.3005021	0.49515
6471	2.0912	0.1794	133.415	0.338667	0.2995903	0.490094
6471.5	2.0916	0.1762	133.9108	0.338424	0.2982758	0.493193
6472	2.093	0.1758	134.4066	0.337576	0.2975632	0.496291
6472.5	2.0915	0.1806	133.4638	0.338485	0.2999	0.490399
6473	2.0825	0.1981	132.5211	0.34394	0.309792	0.484507
6473.5	2.0729	0.2372	131.5784	0.349758	0.3273188	0.478615
6474	2.0683	0.2734	130.6357	0.352546	0.3415605	0.472723
6474.5	2.0629	0.2888	129.6931	0.355818	0.3489172	0.466832
6475	2.048	0.2957	128.7506	0.364849	0.357195	0.460941
6475.5	2.049	0.3021	127.942	0.364242	0.3589286	0.455888
6476	2.057	0.31	127.1333	0.359394	0.3583568	0.450833
6476.5	2.064	0.3164	126.3248	0.355152	0.3576886	0.44578

6477	2.0761	0.3186	126.921	0.347818	0.3536043	0.449506
6477.5	2.082	0.3188	127.5172	0.344243	0.3513285	0.453233
6478	2.0829	0.3182	128.1133	0.343697	0.3507721	0.456958
6478.5	2.0879	0.3147	128.7094	0.340667	0.3476253	0.460684
6479	2.0929	0.3062	125.4931	0.337636	0.3428056	0.440582
6479.5	2.0972	0.2917	122.2769	0.33503	0.3362287	0.420481
6480	2.0962	0.2743	119.061	0.335636	0.3307301	0.400381
6480.5	2.0974	0.2807	115.8452	0.334909	0.332428	0.380283
6481	2.1081	0.2973	117.9464	0.328424	0.3338	0.393415
6481.5	2.1144	0.305	120.0473	0.324606	0.3339035	0.406546
6482	2.1168	0.3086	122.1482	0.323152	0.3341663	0.419676
6482.5	2.1318	0.3148	124.249	0.314061	0.3303515	0.432806
6483	2.1934	0.3267	125.4469	0.276727	0.3157192	0.440293
6483.5	2.22	0.3443	123.8028	0.260606	0.3186685	0.430018
6484	2.2253	0.3555	122.1589	0.257394	0.3238568	0.419743
6484.5	2.2227	0.3566	120.5151	0.25897	0.3252293	0.409469
6485	2.1852	0.344	118.8714	0.281697	0.3278268	0.399196
6485.5	2.1428	0.3152	117.2278	0.307394	0.32618	0.388924

Table 2: Porosity estimate obtained OTI-02 well sand E.

DEPTH	DENS	NPHI	SONIC	PHIT_D	PHIT_ND	PHIT_S
7221	2.1204	0.368816	126.25	0.32097	0.359155	0.445313
7221.5	2.0944	0.350832	125.8	0.336727	0.356998	0.4425

7222	2.0721	0.381667	125.8	0.350243	0.378438	0.4425
7222.5	2.0668	0.375152	126.45	0.353455	0.37549	0.446563
7223	2.0814	0.409567	122.95	0.344606	0.395009	0.424688
7223.5	2.1274	0.408569	122.1	0.316727	0.383741	0.419375
7224	2.1755	0.398116	120.45	0.287576	0.364397	0.409063
7224.5	2.2078	0.381376	119.15	0.268	0.344702	0.400938
7225	2.2212	0.343873	117.35	0.259879	0.318092	0.389688
7225.5	2.2257	0.347726	115.1	0.257152	0.319124	0.375625
7226	2.2226	0.341103	114.4	0.25903	0.316095	0.37125
7226.5	2.2165	0.362247	114.5	0.262727	0.330341	0.371875
7227	2.2232	0.366926	113.75	0.258667	0.331391	0.367188
7227.5	2.2247	0.333262	115	0.257758	0.311	0.375
7228	2.2087	0.329919	116.9	0.267455	0.313441	0.386875
7228.5	2.198	0.319999	118.3	0.27394	0.310727	0.395625
7229	2.1991	0.338537	117.2	0.273273	0.32096	0.38875
7229.5	2.2026	0.32551	117.7	0.271152	0.312587	0.391875
7230	2.1886	0.332961	118	0.279636	0.320551	0.39375
7230.5	2.1875	0.363593	117.8	0.280303	0.338932	0.3925
7231	2.1752	0.340176	118.95	0.287758	0.328228	0.399688
7231.5	2.185	0.331288	118.3	0.281818	0.32055	0.395625
7232	2.1954	0.290649	118.6	0.275515	0.297419	0.3975
7232.5	2.1957	0.302293	117.3	0.275333	0.301917	0.389375
7233	2.2027	0.321865	116.45	0.271091	0.310511	0.384063
7233.5	2.227	0.341395	114.8	0.256364	0.315061	0.37375
7234	2.2528	0.323621	113.6	0.240727	0.297765	0.36625
7234.5	2.2785	0.303703	112.8	0.225152	0.279517	0.36125
7235	2.2774	0.294785	113.25	0.225818	0.274998	0.364063
7235.5	2.255	0.35913	114.4	0.239394	0.317806	0.37125
7236	2.2287	0.358798	117.05	0.255333	0.324912	0.387813
7236.5	2.2074	0.357001	116.9	0.268242	0.329621	0.386875

7237	2.1958	0.293802	115.6	0.275273	0.298345	0.37875
7237.5	2.189	0.279873	114.1	0.279394	0.296189	0.369375
7238	2.1942	0.292316	113.2	0.276242	0.298453	0.36375
7238.5	2.2011	0.290409	113.05	0.272061	0.295138	0.362813
7239	2.2013	0.2939	112.2	0.27194	0.296258	0.3575
7239.5	2.1978	0.263046	111	0.274061	0.286947	0.35
7240	2.1977	0.260494	110.15	0.274121	0.286095	0.344688
7240.5	2.2107	0.262366	109.3	0.266242	0.281724	0.339375
7241	2.2111	0.277887	109.75	0.266	0.286971	0.342188
7241.5	2.1975	0.289989	111.75	0.274243	0.296382	0.354688
7242	2.1812	0.312068	112.6	0.284121	0.311085	0.36
7242.5	2.1745	0.308932	113.6	0.288182	0.311729	0.36625
7243	2.1892	0.308376	112.2	0.279273	0.307044	0.3575
7243.5	2.1997	0.288898	111.9	0.272909	0.295159	0.355625
7244	2.1874	0.29528	113.55	0.280364	0.302094	0.365938
7244.5	2.1711	0.299888	114.8	0.290243	0.309982	0.37375
7245	2.1706	0.289708	116.5	0.290546	0.306707	0.384375
7245.5	2.1817	0.28039	116.1	0.283818	0.299198	0.381875
7246	2.1808	0.283818	114.7	0.284364	0.300725	0.373125
7246.5	2.1609	0.29867	114.75	0.296424	0.313536	0.373438
7247	2.1266	0.305862	114.45	0.317212	0.329391	0.371563
7247.5	2.0896	0.311457	114.5	0.339636	0.34587	0.371875
7248	2.0927	0.319022	113.95	0.337758	0.347163	0.368438
7248.5	2.1108	0.320717	112.55	0.326788	0.340581	0.359688
7249	2.1473	0.308241	111.35	0.304667	0.32208	0.352188
7249.5	2.1618	0.305175	110.2	0.295879	0.315391	0.345
7250	2.1746	0.293181	109.95	0.288121	0.306338	0.343438
7250.5	2.1679	0.305599	110.5	0.292182	0.313162	0.346875
7251	2.1614	0.312196	109.7	0.296121	0.317918	0.341875
7251.5	2.1603	0.33387	109.7	0.296788	0.328467	0.341875

7252	2.172	0.321012	111.6	0.289697	0.318174	0.35375
7252.5	2.1722	0.331645	112.4	0.289576	0.324113	0.35875
7253	2.1726	0.325749	113.15	0.289333	0.32067	0.363438
7253.5	2.1696	0.326978	114.5	0.291152	0.322146	0.371875
7254	2.1731	0.31464	113.5	0.28903	0.314479	0.365625
7254.5	2.1683	0.329946	111.95	0.29194	0.324163	0.355938
7255	2.1842	0.332	112.7	0.282303	0.321166	0.360625
7255.5	2.2048	0.312571	113.3	0.269818	0.304778	0.364375
7256	2.2155	0.2912	112.8	0.263333	0.290481	0.36125
7256.5	2.2078	0.307156	112.55	0.268	0.300991	0.359688
7257	2.1934	0.341035	113.55	0.276727	0.323928	0.365938
7257.5	2.1691	0.39822	113.15	0.291455	0.366117	0.363438
7258	2.1551	0.417443	113.9	0.299939	0.383303	0.368125
7258.5	2.1453	0.432705	116.05	0.305879	0.397698	0.381563
7259	2.1251	0.414956	119	0.318121	0.388943	0.4
7259.5	2.098	0.425967	118.9	0.334546	0.403557	0.399375
7260	2.0801	0.437583	120.2	0.345394	0.416853	0.4075
7260.5	2.0961	0.447395	120.3	0.335697	0.421923	0.408125
7261	2.1087	0.443393	118.75	0.328061	0.415515	0.398438
7261.5	2.117	0.39843	116.9	0.32303	0.379129	0.386875
7262	2.1277	0.356295	116.65	0.316545	0.349775	0.385313
7262.5	2.1461	0.345671	117.7	0.305394	0.338907	0.391875
7263	2.1516	0.369905	118.95	0.302061	0.352104	0.399688
7263.5	2.1354	0.368491	117.9	0.311879	0.35528	0.393125
7264	2.1328	0.354959	117.5	0.313455	0.347717	0.390625
7264.5	2.1344	0.341272	116.05	0.312485	0.339739	0.381563
7265	2.1486	0.361831	114.7	0.303879	0.3479	0.373125
7265.5	2.1438	0.3636	114.75	0.306788	0.350185	0.373438
7266	2.1425	0.395564	114.75	0.307576	0.371004	0.373438
7266.5	2.1381	0.37077	114.75	0.310243	0.356023	0.373438

7267	2.1476	0.336883	114.2	0.304485	0.333446	0.37
7267.5	2.154	0.261567	113.8	0.300606	0.303512	0.3675
7268	2.1657	0.246771	112.6	0.293515	0.293768	0.36
7268.5	2.1735	0.270404	113.6	0.288788	0.298943	0.36625
7269	2.1829	0.29041	113.4	0.283091	0.302171	0.365
7269.5	2.1811	0.302595	113.15	0.284182	0.307024	0.363438
7270	2.175	0.287152	113.9	0.287879	0.304121	0.368125
7270.5	2.1643	0.288588	113.9	0.294364	0.308777	0.368125
7271	2.1704	0.279952	112.5	0.290667	0.303441	0.359375
7271.5	2.1803	0.28985	112	0.284667	0.302987	0.35625
7272	2.2052	0.278811	111.8	0.269576	0.289563	0.355
7272.5	2.2091	0.27881	111.75	0.267212	0.28806	0.354688
7273	2.2138	0.256576	112.05	0.264364	0.2785	0.356563
7273.5	2.1946	0.262482	113	0.276	0.28799	0.3625
7274	2.1961	0.275774	113.8	0.275091	0.292025	0.3675
7274.5	2.1969	0.301399	112.8	0.274606	0.301072	0.36125
7275	2.2033	0.303225	111.6	0.270727	0.300062	0.35375
7275.5	2.1974	0.275523	111.75	0.274303	0.291436	0.354688
7276	2.1791	0.243057	112.2	0.285394	0.287218	0.3575
7276.5	2.1676	0.232725	112.3	0.292364	0.288078	0.358125
7277	2.1798	0.255756	112.7	0.28497	0.291397	0.360625
7277.5	2.2117	0.281725	111.8	0.265636	0.288068	0.355
7278	2.2295	0.27948	111.4	0.254849	0.280228	0.3525
7278.5	2.216	0.267342	110.15	0.26303	0.281421	0.344688
7279	2.1961	0.26312	111.15	0.275091	0.287631	0.350938
7279.5	2.1921	0.283473	109.8	0.277515	0.296229	0.3425
7280	2.1989	0.303642	109.8	0.273394	0.30147	0.3425
7280.5	2.216	0.310396	110.4	0.26303	0.300548	0.34625
7281	2.2238	0.307068	110.05	0.258303	0.296594	0.344063
7281.5	2.2052	0.305363	111.7	0.269576	0.300713	0.354375

7282	2.1829	0.319358	112.8	0.283091	0.314384	0.36125
7282.5	2.1722	0.332321	113.85	0.289576	0.324498	0.367813
7283	2.1606	0.321306	114.55	0.296606	0.321301	0.372188
7283.5	2.138	0.318383	115	0.310303	0.329124	0.375
7284	2.1137	0.32374	116.45	0.32503	0.340447	0.384063
7284.5	2.0966	0.325283	117.1	0.335394	0.347701	0.388125
7285	2.0964	0.324194	118.75	0.335515	0.347419	0.398438
7285.5	2.0999	0.286673	119.2	0.333394	0.333459	0.40125
7286	2.1008	0.303791	118.35	0.332849	0.33887	0.395938
7286.5	2.0988	0.302458	117.9	0.334061	0.339214	0.393125
7287	2.0996	0.319721	116.9	0.333576	0.344667	0.386875
7287.5	2.0902	0.315884	113.55	0.339273	0.347108	0.365938
7288	2.1263	0.349415	113.7	0.317394	0.346051	0.366875
7288.5	2.1742	0.372061	109.7	0.288364	0.347661	0.341875
7289	2.2686	0.421336	110.15	0.231152	0.355018	0.344688
7289.5	2.2742	0.38054	114.3	0.227758	0.325489	0.370625
7290	2.2137	0.371279	114.1	0.264424	0.336685	0.369375
7290.5	2.168	0.316222	118.75	0.292121	0.316472	0.398438
7291	2.1365	0.345354	118.75	0.311212	0.341145	0.398438
7291.5	2.1046	0.368124	118.3	0.330546	0.362518	0.395625
7292	2.0794	0.411139	119.6	0.345818	0.396565	0.40375
7292.5	2.0876	0.40698	119.95	0.340849	0.391813	0.405938
7293	2.0835	0.386763	121.15	0.343333	0.379134	0.413438
7293.5	2.0437	0.359961	121.9	0.367455	0.380063	0.418125
7294	2.014	0.337684	120.8	0.385455	0.384687	0.41125
7294.5	2.0197	0.350487	120.9	0.382	0.386569	0.411875
7295	2.0379	0.313887	120.6	0.37097	0.367286	0.41
7295.5	2.0034	0.347197	119	0.391879	0.392039	0.4
7296	1.9808	0.335733	117.3	0.405576	0.39742	0.389375
7296.5	2.0535	0.364029	113.95	0.361515	0.377487	0.368438

7297	2.1761	0.360312	110.75	0.287212	0.339921	0.348438
7297.5	2.2628	0.372049	108.6	0.234667	0.323428	0.335
7298	2.2209	0.374467	110.95	0.260061	0.336732	0.349688
7298.5	2.1579	0.373284	113.3	0.298242	0.352618	0.364375
7299	2.0801	0.36728	116.5	0.345394	0.367652	0.384375
7299.5	2.036	0.383802	119.1	0.372121	0.39083	0.400625
7300	2.0147	0.370008	117.8	0.38503	0.394886	0.3925
7300.5	2.0247	0.355848	117.55	0.37897	0.386309	0.390938
7301	2.0188	0.378017	120.25	0.382546	0.395826	0.407813
7301.5	2.0184	0.376604	121.5	0.382788	0.395531	0.415625
7302	2.0422	0.404862	118.5	0.368364	0.400047	0.396875
7302.5	2.0868	0.38512	119.55	0.341333	0.377326	0.403438
7303	2.0835	0.375007	117.7	0.343333	0.371689	0.391875
7303.5	2.0621	0.350592	118.1	0.356303	0.369696	0.394375
7304	2.0324	0.340785	119.7	0.374303	0.378327	0.404375
7304.5	2.0434	0.336414	119.8	0.367636	0.372502	0.405
7305	2.0459	0.362737	118.65	0.366121	0.380088	0.397813
7305.5	2.0788	0.404974	117.8	0.346182	0.392359	0.3925
7306	2.1488	0.43112	117.6	0.303758	0.395532	0.39125
7306.5	2.2414	0.428383	115.4	0.247636	0.368361	0.3775
7307	2.3083	0.398891	114.4	0.207091	0.327397	0.37125
7307.5	2.3224	0.451147	114.4	0.198545	0.36167	0.37125
7308	2.3381	0.459737	112	0.18903	0.364	0.35625
7308.5	2.3414	0.443798	109.25	0.18703	0.349549	0.339063
7309	2.3475	0.407029	109.15	0.183333	0.320924	0.338438
7309.5	2.3431	0.394938	109.4	0.186	0.314263	0.34
7310	2.3436	0.409958	110.25	0.185697	0.324129	0.345313
7310.5	2.3623	0.416087	110.6	0.174364	0.322305	0.3475
7311	2.3804	0.415834	111.75	0.163394	0.316386	0.354688
7311.5	2.377	0.417999	111.7	0.165455	0.318952	0.354375

7312	2.3531	0.408438	111.55	0.179939	0.320142	0.353438
7312.5	2.3407	0.406815	111.4	0.187455	0.32288	0.3525
7313	2.3464	0.402222	107.85	0.184	0.318038	0.330313
7313.5	2.3481	0.402698	106.45	0.18297	0.31783	0.321563
7314	2.3705	0.415507	105.7	0.169394	0.319311	0.316875
7314.5	2.3684	0.406083	104.2	0.170667	0.31378	0.3075
7315	2.3406	0.369357	104.6	0.187515	0.299005	0.31
7315.5	2.2884	0.34986	104.65	0.219152	0.302783	0.310313
7316	2.2494	0.342355	107.1	0.242788	0.309425	0.325625
7316.5	2.2329	0.376879	107.8	0.252788	0.334865	0.33
7317	2.2217	0.368161	110.1	0.259576	0.332564	0.344375
7317.5	2.1994	0.347638	111.15	0.273091	0.32619	0.350938
7318	2.1849	0.339415	111.45	0.281879	0.32524	0.352813
7318.5	2.2065	0.339609	111.65	0.268788	0.319594	0.354063
7319	2.2349	0.363186	110.4	0.251576	0.325873	0.34625
7319.5	2.2322	0.361216	110.9	0.253212	0.325416	0.349375
7320	2.1956	0.35699	111.5	0.275394	0.332775	0.353125
7320.5	2.1694	0.344821	112	0.291273	0.332441	0.35625
7321	2.162	0.309823	112.95	0.295758	0.316884	0.362188
7321.5	2.1553	0.321177	112.7	0.299818	0.32331	0.360625
7322	2.1459	0.317003	112.15	0.305515	0.325574	0.357188
7322.5	2.1353	0.328676	111.9	0.31194	0.333619	0.355625
7323	2.1393	0.325859	111.1	0.309515	0.331116	0.350625
7323.5	2.1506	0.342015	109.95	0.302667	0.335637	0.343438
7324	2.1733	0.336624	111.2	0.288909	0.326674	0.35125
7324.5	2.1774	0.339295	111.1	0.286424	0.327143	0.350625
7325	2.1865	0.314195	111	0.280909	0.310571	0.35
7325.5	2.1929	0.306582	109.9	0.27703	0.305117	0.343125
7326	2.2253	0.284987	108.4	0.257394	0.284607	0.33375
7326.5	2.2408	0.285712	106.8	0.248	0.280383	0.32375

7327	2.2623	0.291552	105.8	0.23497	0.277514	0.3175
7327.5	2.264	0.30234	106.8	0.23394	0.282866	0.32375
7328	2.246	0.321385	108.25	0.244849	0.298404	0.332813
7328.5	2.2007	0.323013	110.2	0.272303	0.311692	0.345
7329	2.1609	0.31673	112.1	0.296424	0.319638	0.356875
7329.5	2.1578	0.312888	111.75	0.298303	0.319552	0.354688
7330	2.1883	0.347111	110.85	0.279818	0.328832	0.349063
7330.5	2.2157	0.354573	108.6	0.263212	0.325918	0.335
7331	2.2244	0.372421	107.3	0.257939	0.334487	0.326875
7331.5	2.2227	0.367317	107.1	0.25897	0.331769	0.325625
7332	2.2267	0.364222	104.9	0.256546	0.328766	0.311875
7332.5	2.2395	0.337967	104.6	0.248788	0.309632	0.31
7333	2.2404	0.329351	104.55	0.248242	0.30445	0.309688
7333.5	2.2163	0.308966	106.35	0.262849	0.299681	0.320938
7334	2.188	0.309365	107.4	0.28	0.307938	0.3275
7334.5	2.1727	0.305365	108.4	0.289273	0.311219	0.33375
7335	2.1687	0.341359	108.2	0.291697	0.330606	0.3325
7335.5	2.1535	0.330858	108.3	0.300909	0.328501	0.333125
7336	2.1446	0.318418	108.2	0.306303	0.326557	0.3325
7336.5	2.1305	0.310098	107.5	0.314849	0.329283	0.328125
7337	2.1355	0.321899	107.85	0.311818	0.331279	0.330313
7337.5	2.1338	0.333741	107.45	0.312849	0.33589	0.327813
7338	2.1342	0.344603	107.2	0.312606	0.341278	0.32625
7338.5	2.1176	0.326836	107.3	0.322667	0.339944	0.326875
7339	2.1144	0.329543	107.75	0.324606	0.342101	0.329688
7339.5	2.1097	0.310681	107.4	0.327455	0.337663	0.3275
7340	2.107	0.317747	107.75	0.329091	0.341089	0.329688
7340.5	2.113	0.312347	107.5	0.325455	0.336919	0.328125
7341	2.119	0.309579	107.25	0.321818	0.333629	0.326563
7341.5	2.1214	0.334326	107.5	0.320364	0.34094	0.328125

7342	2.1224	0.341072	108.3	0.319758	0.342357	0.333125
7342.5	2.1109	0.35876	107.9	0.326727	0.355346	0.330625
7343	2.1068	0.348803	108.5	0.329212	0.351452	0.334375
7343.5	2.1052	0.327975	108	0.330182	0.345201	0.33125
7344	2.1074	0.322921	108.45	0.328849	0.342655	0.334063
7344.5	2.1139	0.306376	108.2	0.324909	0.334563	0.3325
7345	2.1088	0.305352	107.95	0.328	0.336231	0.330938
7345.5	2.1089	0.282003	107.35	0.327939	0.328308	0.327188
7346	2.1103	0.286481	106.1	0.327091	0.329273	0.319375
7346.5	2.1169	0.296489	105.3	0.323091	0.330051	0.314375
7347	2.1155	0.318006	104.7	0.323939	0.337827	0.310625
7347.5	2.1209	0.300946	105.7	0.320667	0.329978	0.316875
7348	2.1253	0.308549	105.2	0.318	0.330805	0.31375
7348.5	2.1289	0.309444	104.4	0.315818	0.329692	0.30875
7349	2.1354	0.305087	103.85	0.311879	0.325675	0.305313
7349.5	2.1373	0.292537	103.85	0.310727	0.320685	0.305313
7350	2.1454	0.282079	104.15	0.305818	0.313944	0.307188
7350.5	2.1409	0.296189	107.25	0.308546	0.320511	0.326563
7351	2.1363	0.317092	105.5	0.311333	0.329357	0.315625
7351.5	2.1404	0.326234	106.3	0.308849	0.330812	0.320625
7352	2.1505	0.308925	107.45	0.302727	0.321062	0.327813
7352.5	2.1535	0.306129	106.15	0.300909	0.318947	0.319688
7353	2.1539	0.298258	106.8	0.300667	0.316127	0.32375
7353.5	2.1353	0.30658	107.65	0.31194	0.326217	0.329063
7354	2.1165	0.293014	108.15	0.323333	0.329035	0.332188
7354.5	2.1033	0.292441	108.7	0.331333	0.334061	0.335625
7355	2.122	0.322236	109.1	0.32	0.336683	0.338125
7355.5	2.12	0.312506	109.4	0.321212	0.334216	0.34
7356	2.1256	0.33632	108.4	0.317818	0.339954	0.33375
7356.5	2.1175	0.340466	108.75	0.322727	0.344501	0.335938

7357	2.1162	0.350541	109.55	0.323515	0.34948	0.340938
7357.5	2.1082	0.349195	109.5	0.328364	0.350579	0.340625
7358	2.1061	0.344978	107.6	0.329636	0.350468	0.32875
7358.5	2.1028	0.359557	109.85	0.331637	0.358146	0.342813
7359	2.0972	0.338891	109.5	0.33503	0.351967	0.340625
7359.5	2.097	0.318366	112.5	0.335152	0.345244	0.359375
7360	2.1009	0.291	109.85	0.332788	0.334525	0.342813
7360.5	2.0995	0.322178	110.3	0.333636	0.345524	0.345625
7361	2.097	0.310418	109.8	0.335152	0.342593	0.3425
7361.5	2.1039	0.306811	108.5	0.33097	0.338656	0.334375
7362	2.11	0.286203	107.9	0.327273	0.329298	0.330625
7362.5	2.1153	0.300906	108.25	0.324061	0.332172	0.332813
7363	2.1264	0.311537	108.6	0.317333	0.331376	0.335
7363.5	2.1285	0.30302	109.3	0.316061	0.327687	0.339375
7364	2.1385	0.312457	109.55	0.31	0.326941	0.340938
7364.5	2.1335	0.301828	108.25	0.31303	0.325321	0.332813
7365	2.1312	0.303479	107.85	0.314424	0.326781	0.330313
7365.5	2.1396	0.294926	105.8	0.309333	0.320593	0.3175
7366	2.1925	0.311632	102.6	0.277273	0.307562	0.2975
7366.5	2.2205	0.304883	102.5	0.260303	0.296301	0.296875
7367	2.2252	0.29347	101.9	0.257455	0.288833	0.293125
7367.5	2.1857	0.305087	103.5	0.281394	0.305845	0.303125
7368	2.1742	0.321892	106.05	0.288364	0.318093	0.319063
7368.5	2.1822	0.343596	105.75	0.283515	0.328381	0.317188
7369	2.198	0.361909	103.55	0.27394	0.335117	0.303438
7369.5	2.2267	0.330862	102	0.256546	0.309083	0.29375
7370	2.2571	0.342891	102	0.238121	0.307583	0.29375
7370.5	2.2888	0.301718	103.6	0.218909	0.275511	0.30375
7371	2.2874	0.33343	106.55	0.219758	0.293542	0.322188
7371.5	2.2542	0.317928	106.4	0.239879	0.294189	0.32125

7372	2.2044	0.351987	107.2	0.270061	0.327426	0.32625
7372.5	2.183	0.344891	107	0.28303	0.328928	0.325
7373	2.1756	0.332467	107.85	0.287515	0.323693	0.330313
7373.5	2.1613	0.303148	108.55	0.296182	0.314899	0.334688
7374	2.1448	0.300992	107.8	0.306182	0.32061	0.33
7374.5	2.1282	0.326309	108.4	0.316242	0.335609	0.33375
7375	2.1216	0.311832	107.1	0.320243	0.333361	0.325625
7375.5	2.1355	0.303809	106.95	0.311818	0.325205	0.324688
7376	2.1498	0.280858	106.8	0.303152	0.311801	0.32375
7376.5	2.1517	0.316187	105.9	0.302	0.323038	0.318125
7377	2.1474	0.341298	106.3	0.304606	0.336035	0.320625
7377.5	2.1416	0.353065	106.5	0.308121	0.344396	0.321875
7378	2.1477	0.344068	106.5	0.304424	0.337567	0.321875
7378.5	2.1603	0.353395	106.9384	0.296788	0.339848	0.324615
7379	2.1625	0.353678	107.4	0.295455	0.339452	0.3275
7379.5	2.1299	0.356519	108.15	0.315212	0.349366	0.332188
7380	2.1037	0.369316	108.3	0.331091	0.363463	0.333125
7380.5	2.1018	0.380308	107.7	0.332243	0.370784	0.329375
7381	2.1283	0.394446	106.7	0.316182	0.373721	0.323125
7381.5	2.1495	0.365037	105.6	0.303333	0.34963	0.31625
7382	2.163	0.409613	104.9	0.295152	0.375561	0.311875
7382.5	2.1598	0.400114	105.15	0.297091	0.369798	0.313438
7383	2.1544	0.410441	106.3	0.300364	0.378343	0.320625
7383.5	2.1429	0.362746	108	0.307333	0.34989	0.33125
7384	2.1387	0.373522	108.7	0.309879	0.357593	0.335625
7384.5	2.1211	0.407006	110	0.320546	0.384126	0.34375
7385	2.1109	0.413013	110.25	0.326727	0.390841	0.345313
7385.5	2.1112	0.420658	109.65	0.326545	0.396469	0.341563
7386	2.121	0.376119	110	0.320606	0.363562	0.34375
7386.5	2.1203	0.37624	109.1	0.32103	0.363808	0.338125

7387	2.1181	0.332052	109.35	0.322364	0.34148	0.339688
7387.5	2.1196	0.335877	109.2	0.321455	0.34216	0.33875
7388	2.1425	0.320454	108.95	0.307576	0.328059	0.337188
7388.5	2.159	0.355414	109	0.297576	0.341387	0.3375
7389	2.1648	0.353878	107.15	0.294061	0.338979	0.325938
7389.5	2.1862	0.336221	106.2	0.281091	0.323055	0.32
7390	2.2043	0.313832	105.5	0.270121	0.305609	0.315625
7390.5	2.2209	0.316413	105.5	0.260061	0.302541	0.315625
7391	2.2286	0.378621	106.3	0.255394	0.337161	0.320625
7391.5	2.2383	0.364762	105.75	0.249515	0.325898	0.317188
7392	2.2336	0.383626	106.185	0.252364	0.338979	0.319906
7392.5	2.2243	0.331321	106.65	0.258	0.310001	0.322813
7393	2.2057	0.349541	106.75	0.269273	0.325624	0.323438
7393.5	2.2051	0.317633	107.7	0.269636	0.307502	0.329375
7394	2.1967	0.320468	110.7	0.274727	0.311337	0.348125
7394.5	2.1642	0.338381	113.25	0.294424	0.330049	0.364063
7395	2.1314	0.349653	114.85	0.314303	0.344923	0.374063
7395.5	2.1305	0.385697	117.2	0.314849	0.367393	0.38875
7396	2.1208	0.365013	116.3	0.320727	0.356725	0.383125
7396.5	2.1096	0.348594	114.55	0.327515	0.349869	0.372188
7397	2.0937	0.342463	114	0.337152	0.354524	0.36875
7397.5	2.1037	0.348121	113.5	0.331091	0.352447	0.365625
7398	2.1241	0.370495	112.7	0.318727	0.359295	0.360625
7398.5	2.1557	0.359541	112	0.299576	0.344712	0.35625
7399	2.191	0.366688	111.2	0.278182	0.33991	0.35125
7399.5	2.211	0.389749	109.55	0.266061	0.3492	0.340938
7400	2.244	0.382341	108.7	0.246061	0.335242	0.335625
7400.5	2.2652	0.367758	109	0.233212	0.320095	0.3375
7401	2.2914	0.321962	108.25	0.217333	0.285921	0.332813
7401.5	2.3219	0.339428	106.7	0.198849	0.287009	0.323125

7402	2.358	0.349677	106	0.17697	0.282162	0.31875
7402.5	2.3778	0.392448	105.4	0.16497	0.301981	0.315
7403	2.3287	0.419112	105.5	0.194727	0.334959	0.315625
7403.5	2.2419	0.435462	107.7	0.247333	0.373666	0.329375
7404	2.1564	0.403008	109.75	0.299152	0.372672	0.342188
7404.5	2.1127	0.335567	110.7	0.325636	0.344766	0.348125
7405	2.0927	0.303127	111.65	0.337758	0.341856	0.354063
7405.5	2.097	0.308684	111.6	0.335152	0.342013	0.35375
7406	2.0977	0.33931	111.55	0.334727	0.351908	0.353438
7406.5	2.1016	0.356895	111.8	0.332364	0.356644	0.355
7407	2.104	0.346668	111.9	0.330909	0.351851	0.355625
7407.5	2.1193	0.322039	112.1	0.321637	0.337678	0.356875
7408	2.1115	0.289802	111.8	0.326364	0.329924	0.355
7408.5	2.0871	0.309862	110.6	0.341152	0.346329	0.3475
7409	2.0905	0.324377	109.2	0.339091	0.349812	0.33875
7409.5	2.1539	0.355163	105.8	0.300667	0.342538	0.3175
7410	2.2632	0.348022	103.8	0.234424	0.308872	0.305
7410.5	2.2889	0.366906	104.5	0.218849	0.312763	0.309375
7411	2.2125	0.355199	106.9	0.265152	0.327161	0.324375
7411.5	2.1257	0.351308	110.35	0.317758	0.347316	0.345938
7412	2.0967	0.329971	111.05	0.335333	0.349216	0.350313
7412.5	2.1008	0.334899	110.6	0.332849	0.349229	0.3475
7413	2.1097	0.349059	110.4	0.327455	0.350068	0.34625
7413.5	2.1116	0.36583	109.6	0.326303	0.359445	0.34125
7414	2.1053	0.363148	109.85	0.330121	0.35933	0.342813
7414.5	2.1025	0.338603	109.9	0.331818	0.349783	0.343125
7415	2.089	0.311677	109.3	0.34	0.346182	0.339375
7415.5	2.0866	0.296035	109.2	0.341455	0.341897	0.33875
7416	2.0809	0.299678	108.6	0.344909	0.345386	0.335
7416.5	2.0769	0.309752	108.85	0.347333	0.350344	0.336563

7417	2.0725	0.334681	110.3	0.35	0.36035	0.345625
7417.5	2.0658	0.350962	110.4	0.354061	0.368349	0.34625
7418	2.0669	0.35257	109.45	0.353394	0.368438	0.340313
7418.5	2.0655	0.339926	108.9	0.354242	0.364853	0.336875
7419	2.0697	0.33861	108.5	0.351697	0.362754	0.334375
7419.5	2.1166	0.326818	105.9	0.323273	0.340331	0.318125
7420	2.1746	0.325628	108.35	0.288121	0.320079	0.333438
7420.5	2.2182	0.31901	109.75	0.261697	0.304723	0.342188
7421	2.184	0.335092	109.65	0.282424	0.322987	0.341563
7421.5	2.1417	0.346077	111.3	0.308061	0.340254	0.351875
7422	2.115	0.327941	111.25	0.324242	0.341333	0.351563
7422.5	2.1048	0.318895	110.8	0.330424	0.342339	0.34875
7423	2.0901	0.340717	110.45	0.339333	0.35537	0.346563
7423.5	2.0789	0.36962	112.05	0.346121	0.369496	0.356563
7424	2.0854	0.369506	112.7	0.342182	0.368207	0.360625
7424.5	2.1028	0.346199	112.9	0.331637	0.352168	0.361875
7425	2.1053	0.331412	112.4	0.330121	0.346302	0.35875
7425.5	2.101	0.334114	111.6	0.332727	0.34889	0.35375
7426	2.0906	0.32116	111.3	0.33903	0.348705	0.351875
7426.5	2.0897	0.307011	110.8	0.339576	0.344346	0.34875
7427	2.0873	0.304932	110.25	0.34103	0.344602	0.345313
7427.5	2.104	0.325197	109.5	0.330909	0.344752	0.340625
7428	2.1227	0.33134	107.8	0.319576	0.339439	0.33
7428.5	2.1343	0.324992	108.35	0.312546	0.332781	0.333438
7429	2.1462	0.301504	106.6	0.305333	0.320235	0.3225
7429.5	2.1613	0.27833	106.65	0.296182	0.306435	0.322813
7430	2.1802	0.280857	105.9	0.284727	0.299941	0.318125
7430.5	2.2234	0.300372	103.65	0.258545	0.293053	0.304063
7431	2.2771	0.343581	102.65	0.226	0.302332	0.297813
7431.5	2.3315	0.353332	102.6	0.19303	0.29217	0.2975

7432	2.3568	0.350695	103.4	0.177697	0.28311	0.3025
7432.5	2.3227	0.33254	104.5	0.198364	0.282842	0.309375
7433	2.2489	0.326543	107.4	0.243091	0.300499	0.3275
7433.5	2.163	0.331875	109.1	0.295152	0.326633	0.338125
7434	2.1189	0.317827	110	0.321879	0.336429	0.34375
7434.5	2.1149	0.333277	111	0.324303	0.343143	0.35
7435	2.1242	0.324215	109.8	0.318667	0.336479	0.3425
7435.5	2.12	0.345582	107.95	0.321212	0.345453	0.330938
7436	2.1129	0.333316	109.15	0.325515	0.343942	0.338438
7436.5	2.1017	0.357969	109.7	0.332303	0.35726	0.341875
7437	2.0897	0.364692	110.15	0.339576	0.364253	0.344688
7437.5	2.0739	0.378536	110.65	0.349152	0.37606	0.347813
7438	2.0715	0.356995	112.15	0.350606	0.36806	0.357188
7438.5	2.067	0.365608	110.8	0.353333	0.372646	0.34875
7439	2.0702	0.344638	110.6	0.351394	0.364534	0.3475
7439.5	2.0695	0.360449	110.9	0.351818	0.369978	0.349375
7440	2.0696	0.362253	110.9	0.351758	0.370525	0.349375
7440.5	2.0768	0.37891	111.15	0.347394	0.375648	0.350938
7441	2.0902	0.361424	111.35	0.339273	0.361775	0.352188
7441.5	2.091	0.381278	112.5	0.338788	0.373907	0.359375
7442	2.0811	0.360025	112.6	0.344788	0.365252	0.36
7442.5	2.0826	0.375434	112.6	0.343879	0.37216	0.36
7443	2.0846	0.367351	113.5	0.342667	0.366991	0.365625
7443.5	2.0806	0.365931	113.75	0.345091	0.367018	0.367188
7444	2.0724	0.356141	113.7	0.350061	0.367425	0.366875
7444.5	2.068	0.446707	112.9	0.352727	0.427298	0.361875
7445	2.0943	0.472343	112	0.336788	0.449365	0.35625
7445.5	2.1222	0.403425	112.65	0.319879	0.381343	0.360313
7446	2.1202	0.396987	113	0.321091	0.377386	0.3625
7446.5	2.0882	0.420465	113.5	0.340485	0.401482	0.365625

7447	2.0777	0.420893	110.2	0.346849	0.404077	0.345
7447.5	2.1172	0.405512	107.3	0.322909	0.383991	0.326875
7448	2.1381	0.355096	106.8	0.310243	0.34648	0.32375
7448.5	2.1142	0.361187	107.15	0.324727	0.356002	0.325938
7449	2.0586	0.348547	111.1	0.358424	0.370418	0.350625
7449.5	2.0605	0.364158	113.2	0.357273	0.37475	0.36375
7450	2.0619	0.396827	112.85	0.356424	0.390493	0.361563
7450.5	2.0663	0.428179	112.95	0.353758	0.412053	0.362188
7451	2.064	0.430118	112.7	0.355152	0.414047	0.360625
7451.5	2.0636	0.395791	112.3	0.355394	0.389439	0.358125
7452	2.0675	0.354371	112.3	0.35303	0.368788	0.358125
7452.5	2.0741	0.400069	111.9	0.34903	0.390027	0.355625
7453	2.0804	0.38666	111.65	0.345212	0.379765	0.354063
7453.5	2.0815	0.413816	111.4	0.344546	0.398033	0.3525
7454	2.0846	0.343105	110.6	0.342667	0.358329	0.3475
7454.5	2.081	0.344573	110.8	0.344849	0.360235	0.34875
7455	2.084	0.326141	110.9001	0.34303	0.35297	0.349376
7455.5	2.0774	0.336558	111.85	0.34703	0.359025	0.355313
7456	2.0791	0.340381	111.8	0.346	0.35961	0.355
7456.5	2.0788	0.348131	112.3	0.346182	0.362272	0.358125

Table 3: Porosity estimate obtained OTI-03 well sand F.

DEPTH (F)	DENS	NPHI	SONIC	PHIT_D	PHIT_ND	PHIT_S
7630.5	2.389	0.351947	99.3454	0.158182	0.2741437	0.277159
7631	2.377	0.343755	96.6478	0.165455	0.2730708	0.260299
7631.5	2.268	0.335124	93.8271	0.231515	0.300025	0.242669
7632	2.186	0.322302	101.006	0.281212	0.3152099	0.287538
7632.5	2.171	0.308218	107.5075	0.290303	0.3128451	0.328172
7633	2.161	0.299411	110.1358	0.296364	0.3137485	0.344599
7633.5	2.152	0.288405	110.8164	0.301818	0.3135181	0.348853
7634	2.146	0.277146	110.2508	0.305455	0.3120203	0.345318
7634.5	2.128	0.263446	110.3883	0.316364	0.3144035	0.346177
7635	2.118	0.256562	111.2631	0.322424	0.3159902	0.351644
7635.5	2.109	0.254568	112.038	0.327879	0.3188775	0.356488
7636	2.121	0.265462	112.8537	0.320606	0.317866	0.361586
7636.5	2.135	0.270332	113.6487	0.312121	0.3140089	0.366554
7637	2.153	0.278617	113.0131	0.301212	0.3097799	0.362582
7637.5	2.143	0.280132	112.1001	0.307273	0.3142205	0.356876
7638	2.121	0.272108	111.3029	0.320606	0.3201449	0.351893
7638.5	2.106	0.265586	110.3473	0.329697	0.3238581	0.345921
7639	2.096	0.260752	109.9872	0.335758	0.3261812	0.34367
7639.5	2.089	0.25795	110.1269	0.34	0.3280137	0.344543
7640	2.109	0.270093	110.7745	0.327879	0.3242094	0.348591

7640.5	2.132	0.280194	112.2042	0.31394	0.3185676	0.357526
7641	2.146	0.287274	113.6577	0.305455	0.315482	0.366611
7641.5	2.154	0.291815	112.61	0.300606	0.3138978	0.360063
7642	2.164	0.292099	111.1798	0.294546	0.3100923	0.351124
7642.5	2.171	0.286542	110.3365	0.290303	0.3054681	0.345853
7643	2.175	0.281782	109.5758	0.287879	0.3022796	0.341099
7643.5	2.179	0.278189	109.9365	0.285455	0.2994884	0.343353
7644	2.183	0.274594	110.1546	0.28303	0.2966942	0.344716
7644.5	2.174	0.27028	109.8706	0.288485	0.2987048	0.342941
7645	2.174	0.270208	110.6855	0.288485	0.2986799	0.348034
7645.5	2.174	0.271422	111.0057	0.288485	0.2990995	0.350036
7646	2.166	0.270851	110.9012	0.293333	0.3020235	0.349383
7646.5	2.155	0.267522	110.6843	0.3	0.3051791	0.348027
7647	2.151	0.263932	110.5104	0.302424	0.3055086	0.34694
7647.5	2.147	0.263116	110.7177	0.304849	0.3067985	0.348236
7648	2.146	0.267015	110.9668	0.305455	0.3085377	0.349793
7648.5	2.15	0.268621	111.442	0.30303	0.3075199	0.352763
7649	2.154	0.265545	112.1072	0.300606	0.3048885	0.35692
7649.5	2.155	0.262971	112.6832	0.3	0.3036059	0.36052
7650	2.151	0.261598	112.4328	0.302424	0.3047012	0.358955
7650.5	2.154	0.257436	111.5981	0.300606	0.3020796	0.353738
7651	2.133	0.253275	110.7255	0.313333	0.3089119	0.348284
7651.5	2.125	0.250508	109.4402	0.318182	0.3111194	0.340251
7652	2.111	0.259928	108.4087	0.326667	0.3199289	0.333804
7652.5	2.109	0.27083	108.5201	0.327879	0.3244613	0.334501
7653	2.149	0.276698	111.0002	0.303637	0.3106896	0.350001
7653.5	2.195	0.281755	112.7975	0.275758	0.2945157	0.361234
7654	2.209	0.287222	113.9645	0.267273	0.2910008	0.368528
7654.5	2.218	0.29147	114.8668	0.261818	0.2901334	0.374168
7655	2.222	0.294575	114.1106	0.259394	0.2903028	0.369441

7655.5	2.22	0.291211	111.8277	0.260606	0.289043	0.355173
7656	2.226	0.289429	109.574	0.25697	0.2864485	0.341088
7656.5	2.222	0.284715	108.7472	0.259394	0.284937	0.33592
7657	2.219	0.279734	108.5908	0.261212	0.2845767	0.334943
7657.5	2.22	0.265855	108.2016	0.260606	0.2793644	0.33251
7658	2.217	0.254835	107.0359	0.262424	0.2766551	0.325224
7658.5	2.215	0.249024	106.336	0.263637	0.2753786	0.32085
7659	2.206	0.244215	106.1796	0.269091	0.2771593	0.319873
7659.5	2.197	0.24056	106.1009	0.274546	0.2793591	0.319381
7660	2.192	0.235303	105.9445	0.277576	0.2794428	0.318403
7660.5	2.188	0.233825	105.5553	0.28	0.2804786	0.315971
7661	2.186	0.232348	105.0107	0.281212	0.2807353	0.312567
7661.5	2.184	0.230883	104.6214	0.282424	0.2809966	0.310134
7662	2.178	0.23054	105.6296	0.286061	0.2832233	0.316435
7662.5	2.17	0.235708	106.8708	0.290909	0.2881898	0.324193
7663	2.175	0.238284	108.1119	0.287879	0.2871393	0.331949
7663.5	2.18	0.237787	108.3437	0.284849	0.285007	0.333398
7664	2.184	0.237411	107.8768	0.282424	0.2833108	0.33048
7664.5	2.187	0.23799	107.5652	0.280606	0.2823445	0.328533
7665	2.188	0.240489	107.2535	0.28	0.282838	0.326584
7665.5	2.187	0.243237	107.0195	0.280606	0.2841975	0.325122
7666	2.185	0.240641	106.3197	0.281818	0.2840618	0.320748
7666.5	2.189	0.238345	105.5422	0.279394	0.2816901	0.315889
7667	2.194	0.236276	105.1529	0.276364	0.2790088	0.313456
7667.5	2.198	0.236073	104.9189	0.27394	0.2773801	0.311993
7668	2.177	0.238254	104.7625	0.286667	0.2863457	0.311016
7668.5	2.155	0.240753	105.072	0.3	0.2958625	0.31295
7669	2.142	0.23933	105.5367	0.307879	0.3004927	0.315854
7669.5	2.127	0.236955	105.8462	0.31697	0.3056044	0.317789
7670	2.107	0.235982	106.1557	0.329091	0.313228	0.319723

7670.5	2.088	0.242585	106.6204	0.340606	0.32312	0.322628
7671	2.079	0.250529	108.1721	0.346061	0.3294672	0.332326
7671.5	2.072	0.256335	113.3729	0.350303	0.3342663	0.364831
7672	2.122	0.259248	115.0022	0.32	0.315331	0.375014
7672.5	2.147	0.262176	115.467	0.304849	0.3064735	0.377919
7673	2.1548	0.266538	114.3789	0.300121	0.3049178	0.371118
7673.5	2.162	0.274791	111.971	0.295758	0.3049444	0.356069
7674	2.175	0.268092	108.6314	0.287879	0.297558	0.335196
7674.5	2.182	0.250774	104.9036	0.283637	0.2887962	0.311898
7675	2.187	0.246459	101.4864	0.280606	0.2853322	0.29054
7675.5	2.191	0.243471	101.0194	0.278182	0.2827218	0.287621
7676	2.194	0.239259	101.0184	0.276364	0.2800657	0.287615
7676.5	2.181	0.236975	101.3278	0.284243	0.284329	0.289549
7677	2.173	0.236965	103.423	0.289091	0.2874572	0.302644
7677.5	2.165	0.242066	103.4996	0.29394	0.2923918	0.303123
7678	2.16	0.247092	105.8277	0.29697	0.2961172	0.317673
7678.5	2.148	0.248523	108.0005	0.304243	0.3013383	0.331253
7679	2.15	0.248513	109.7851	0.30303	0.3005469	0.342407
7679.5	2.157	0.250037	109.784	0.298788	0.2983251	0.3424
7680	2.164	0.254363	109.7829	0.294546	0.2970871	0.342393
7680.5	2.165	0.258372	110.17	0.29394	0.2980911	0.344813
7681	2.156	0.257786	112.4205	0.299394	0.3014158	0.358878
7681.5	2.149	0.254353	113.0405	0.303637	0.3029745	0.362753
7682	2.141	0.256294	112.496	0.308485	0.3067998	0.35935
7682.5	2.148	0.259567	112.4949	0.304243	0.3051772	0.359343
7683	2.152	0.26199	112.4938	0.301818	0.3044441	0.359336
7683.5	2.15	0.263756	112.1821	0.30303	0.3058406	0.357388
7684	2.143	0.265224	111.5599	0.307273	0.3091	0.353499
7684.5	2.167	0.267211	110.9377	0.292727	0.3003748	0.349611
7685	2.202	0.266124	109.772	0.271515	0.2863947	0.342325

7685.5	2.2065	0.262713	109.3827	0.268788	0.2834663	0.339892
7686	2.211	0.265576	109.304	0.266061	0.2827301	0.3394
7686.5	2.218	0.263518	109.1476	0.261818	0.2793161	0.338423
7687	2.227	0.261753	108.6807	0.256364	0.2752415	0.335504
7687.5	2.228	0.26	108.0585	0.255758	0.2742427	0.331616
7688	2.224	0.259752	107.7468	0.258182	0.2756905	0.329668
7688.5	2.226	0.262734	108.134	0.25697	0.2759689	0.332088
7689	2.228	0.268818	107.3565	0.255758	0.2773311	0.327228
7689.5	2.223	0.273751	110.5386	0.258788	0.2809661	0.347116
7690	2.205	0.276395	114.8077	0.269697	0.2888038	0.373798
7690.5	2.176	0.279348	115.4277	0.287273	0.3010538	0.377673
7691	2.165	0.281984	114.3397	0.29394	0.306244	0.370873
7691.5	2.156	0.2826	113.2516	0.299394	0.3099704	0.364073
7692	2.146	0.280017	111.9307	0.305455	0.3130036	0.355817
7692.5	2.151	0.277313	111.3861	0.302424	0.3101164	0.352413
7693	2.154	0.276166	111.0745	0.300606	0.3085472	0.350466
7693.5	2.147	0.275	110.7628	0.304849	0.3108917	0.348518
7694	2.14	0.273792	110.2182	0.309091	0.3132277	0.345114
7694.5	2.147	0.274625	109.7513	0.304849	0.3107629	0.342196
7695	2.156	0.27526	109.0515	0.299394	0.3074528	0.337822
7695.5	2.163	0.270301	108.4292	0.295152	0.303006	0.333933
7696	2.171	0.264469	108.1176	0.290303	0.2978627	0.331985
7696.5	2.177	0.260526	109.8246	0.286667	0.2941517	0.342654
7697	2.164	0.27651	111.9974	0.294546	0.3047544	0.356234
7697.5	2.106	0.286123	115.4125	0.329697	0.3308546	0.377578
7698	2.0991	0.294189	118.6722	0.333879	0.3363144	0.397951
7698.5	2.092	0.297798	119.2923	0.338182	0.340345	0.401827
7699	2.082	0.300499	118.2042	0.344243	0.345224	0.395026
7699.5	2.069	0.303649	116.8056	0.352121	0.3514536	0.386285
7700	2.062	0.306508	114.8635	0.356364	0.355199	0.374147

7700.5	2.053	0.309399	114.5519	0.361818	0.3597554	0.372199
7701	2.061	0.312196	115.8707	0.35697	0.3574896	0.380442
7701.5	2.066	0.312082	117.6553	0.353939	0.3554582	0.391596
7702	2.064	0.309349	119.0517	0.355152	0.3553468	0.400323
7702.5	2.069	0.306225	118.6624	0.352121	0.352313	0.39789
7703	2.078	0.304278	118.8166	0.346667	0.3480794	0.398854
7703.5	2.1	0.301305	117.6509	0.333333	0.338352	0.391568
7704	2.17	0.297267	113.3797	0.290909	0.3095176	0.364873
7704.5	2.231	0.29448	109.5742	0.25394	0.2877843	0.341089
7705	2.256	0.29216	104.6818	0.238788	0.2796046	0.310511
7705.5	2.282	0.290044	104.1373	0.22303	0.2711493	0.307108
7706	2.298	0.288266	106.0772	0.213333	0.2656433	0.319233
7706.5	2.308	0.286516	107.163	0.207273	0.2618455	0.326019
7707	2.32	0.284917	107.3172	0.2	0.2575413	0.326983
7707.5	2.335	0.283742	104.9869	0.190909	0.2525776	0.312418
7708	2.345	0.301423	103.2778	0.184849	0.2591275	0.301736
7708.5	2.352	0.312261	101.3357	0.180606	0.2629717	0.289598
7709	2.338	0.316789	100.8688	0.189091	0.269563	0.28668
7709.5	2.306	0.321142	102.1099	0.208485	0.2812706	0.294437
7710	2.307	0.326992	104.5933	0.207879	0.284261	0.309958
7710.5	2.308	0.334594	104.7475	0.207273	0.2882804	0.310922
7711	2.33	0.329353	105.2899	0.19394	0.278909	0.314312
7711.5	2.368	0.32399	103.8913	0.170909	0.2647195	0.305571
7712	2.385	0.321497	102.1821	0.160606	0.2582325	0.294888
7712.5	2.389	0.322719	103.5009	0.158182	0.2577107	0.303131
7713	2.344	0.319388	105.5961	0.185455	0.2692429	0.316226
7713.5	2.325	0.315201	110.2534	0.19697	0.2724757	0.345334
7714	2.308	0.309399	108.3113	0.207273	0.274203	0.333196
7714.5	2.302	0.305433	104.4282	0.210909	0.2737595	0.308926
7715	2.309	0.314433	102.4085	0.206667	0.2766836	0.296303

7715.5	2.316	0.326652	100.9322	0.202424	0.2814644	0.287076
7716	2.23	0.312417	100.3102	0.254546	0.2978371	0.283189
7716.5	2.233	0.303489	108.6884	0.252727	0.2921145	0.335553
7717	2.249	0.291073	116.2053	0.24303	0.2809733	0.382533
7717.5	2.2584	0.285013	117.606	0.237333	0.2751114	0.391288
7718	2.267	0.279713	118.2676	0.232121	0.2698846	0.395423
7718.5	2.287	0.275854	118.5498	0.22	0.2621924	0.397186
7719	2.301	0.27576	116.3522	0.211515	0.2581527	0.383451
7719.5	2.159	0.279713	114.3168	0.297576	0.3078082	0.37073
7720	2.112	0.274417	112.9899	0.326061	0.3244968	0.362437
7720.5	2.099	0.26325	112.4831	0.333939	0.3258423	0.359269
7721	2.091	0.25793	112.4106	0.338788	0.327208	0.358816
7721.5	2.085	0.24971	113.4178	0.342424	0.3267815	0.365111
7722	2.079	0.244623	114.3895	0.346061	0.3274328	0.371184
7722.5	2.074	0.24055	114.8917	0.349091	0.3280352	0.374323
7723	2.073	0.251655	113.3949	0.349697	0.3322608	0.364968
7723.5	2.083	0.260505	112.0466	0.343636	0.3312873	0.356541
7724	2.0872	0.268631	111.3944	0.341091	0.3323849	0.352465
7724.5	2.091	0.277209	112.4803	0.338788	0.3337886	0.359252
7725	2.09	0.282847	110.6786	0.339394	0.3360979	0.347991
7725.5	2.087	0.287944	110.4594	0.341212	0.339014	0.346621
7726	2.081	0.293124	111.8249	0.344849	0.3431468	0.355156
7726.5	2.083	0.291444	112.5534	0.343636	0.3417855	0.359709
7727	2.108	0.285328	111.7585	0.328485	0.3297929	0.354741
7727.5	2.116	0.281059	111.4641	0.323636	0.325177	0.352901
7728	2.126	0.277594	112.0228	0.317576	0.3200453	0.356393
7728.5	2.132	0.275302	113.7566	0.31394	0.3168953	0.367229
7729	2.123	0.273002	114.5663	0.319394	0.3196602	0.372289
7729.5	2.117	0.275208	114.2218	0.32303	0.322787	0.370136
7730	2.114	0.278909	113.5298	0.324849	0.3252362	0.365811

7730.5	2.102	0.281544	113.0101	0.332121	0.3308879	0.362563
7731	2.095	0.283751	113.6459	0.336364	0.3344157	0.366537
7731.5	2.096	0.282899	114.0292	0.335758	0.3337298	0.368933
7732	2.099	0.279087	114.3295	0.333939	0.3312447	0.370809
7732.5	2.097	0.276375	114.4058	0.335152	0.331118	0.371286
7733	2.087	0.277657	114.4796	0.341212	0.3355339	0.371748
7733.5	2.087	0.281094	114.4759	0.341212	0.3366987	0.371724
7734	2.085	0.28165	114.3996	0.342424	0.3376836	0.371248
7734.5	2.079	0.280406	114.5696	0.346061	0.3396552	0.37231
7735	2.077	0.278346	115.1002	0.347273	0.3397566	0.375626
7735.5	2.072	0.275979	115.2503	0.350303	0.3409534	0.376564
7736	2.067	0.272503	114.8482	0.353333	0.3417773	0.374051
7736.5	2.071	0.267408	114.2946	0.350909	0.3384448	0.370591
7737	2.076	0.26774	113.2816	0.347879	0.3365563	0.36426
7737.5	2.081	0.275052	112.0438	0.344849	0.337043	0.356524
7738	2.079	0.277751	111.0353	0.346061	0.3387565	0.350221
7738.5	2.07	0.283821	110.0348	0.351515	0.3444028	0.343968
7739	2.07	0.289073	109.5736	0.351515	0.3461712	0.341085
7739.5	2.068	0.286271	109.4958	0.352727	0.3460275	0.340599
7740	2.078	0.278742	110.519	0.346667	0.3394912	0.346994
7740.5	2.097	0.266704	112.2321	0.335152	0.3278207	0.357701
7741	2.104	0.261423	115.3237	0.330909	0.3232255	0.377023
7741.5	2.106	0.258372	117.0253	0.329697	0.3213813	0.387658
7742	2.108	0.263425	117.7988	0.328485	0.3223224	0.392493
7742.5	2.097	0.272929	118.4176	0.335152	0.3299451	0.39636
7743	2.077	0.279755	118.5717	0.347273	0.3402334	0.397323
7743.5	2.064	0.289021	112.7476	0.355152	0.3485516	0.360923
7744	2.061	0.293871	109.7185	0.35697	0.3513781	0.341991
7744.5	2.054	0.299998	108.6304	0.361212	0.3562265	0.33519
7745	2.047	0.295542	107.7752	0.365455	0.3575432	0.329845

7745.5	2.054	0.277323	106.6095	0.361212	0.3486204	0.322559
7746	2.049	0.26539	108.7823	0.364242	0.3465941	0.336139
7746.5	2.053	0.261825	108.8588	0.361818	0.3437736	0.336618
7747	2.071	0.256191	108.9353	0.350909	0.3346179	0.337096
7747.5	2.096	0.250129	110.8751	0.335758	0.3225273	0.349219
7748	2.104	0.244918	112.0386	0.330909	0.3175319	0.356491
7748.5	2.111	0.253593	112.6586	0.326667	0.3177454	0.360366
7749	2.116	0.260051	112.8903	0.323636	0.3179864	0.361814
7749.5	2.12	0.266466	113.2774	0.321212	0.3186067	0.364234
7750	2.123	0.273002	112.3446	0.319394	0.3196602	0.358404
7750.5	2.114	0.276896	112.9646	0.324849	0.3245503	0.362279
7751	2.099	0.280485	112.9634	0.333939	0.3317194	0.362271
7751.5	2.075	0.28566	112.6517	0.348485	0.3430257	0.360323
7752	2.071	0.290399	111.7966	0.350909	0.3462175	0.354979
7752.5	2.076	0.295191	110.5532	0.347879	0.3458327	0.347208
7753	2.083	0.296322	111.5614	0.343636	0.3434253	0.353509
7753.5	2.091	0.295499	113.2683	0.338788	0.3399691	0.364177
7754	2.076	0.294249	114.3541	0.347879	0.3455165	0.370963
7754.5	2.081	0.295739	116.6822	0.344849	0.3440253	0.385514
7755	2.086	0.296563	116.1376	0.341818	0.3423133	0.38211
7755.5	2.091	0.295516	115.36	0.338788	0.3399749	0.37725
7756	2.088	0.290649	115.2813	0.340606	0.3395284	0.376758
7756.5	2.096	0.28426	115.7459	0.335758	0.3341908	0.379662
7757	2.107	0.280105	116.2883	0.329091	0.3284159	0.383052
7757.5	2.115	0.293339	117.3741	0.324242	0.3297369	0.389838
7758	2.121	0.297344	116.9848	0.320606	0.3287232	0.387405
7758.5	2.127	0.302647	116.5178	0.31697	0.3281506	0.384486
7759	2.133	0.305191	115.9732	0.313333	0.3266514	0.381083
7759.5	2.138	0.302782	114.4192	0.310303	0.323878	0.37137
7760	2.116	0.302209	112.4771	0.323636	0.332334	0.359232

7760.5	2.104	0.304194	112.2431	0.330909	0.3377392	0.357769
7761	2.099	0.305725	112.5525	0.333939	0.3402305	0.359703
7761.5	2.102	0.298815	113.4054	0.332121	0.3367232	0.365034
7762	2.109	0.287744	114.6465	0.327879	0.3302158	0.372791
7762.5	2.116	0.282908	115.2665	0.323636	0.3258059	0.376666
7763	2.122	0.277928	116.8958	0.32	0.3217386	0.386849
7763.5	2.127	0.274469	117.4381	0.31697	0.3185822	0.390238
7764	2.107	0.273772	117.437	0.329091	0.3262593	0.390231
7764.5	2.074	0.276385	116.5818	0.349091	0.3402912	0.384886
7765	2.067	0.27892	115.9595	0.353333	0.3439486	0.380997
7765.5	2.061	0.280927	115.5702	0.35697	0.3470284	0.378564
7766	2.05	0.283005	116.3454	0.363636	0.3521393	0.383409
7766.5	2.049	0.284899	116.8102	0.364242	0.353177	0.386314
7767	2.054	0.285922	116.3432	0.361212	0.3515147	0.383395
7767.5	2.061	0.284566	116.0315	0.35697	0.3482541	0.381447
7768	2.073	0.282337	116.8067	0.349697	0.3427034	0.386292
7768.5	2.068	0.27999	118.0478	0.352727	0.3439098	0.394049
7769	2.06	0.27772	118.9007	0.357576	0.3463473	0.399379
7769.5	2.053	0.279703	119.4431	0.361818	0.349824	0.402769
7770	2.049	0.288856	117.268	0.364242	0.3545044	0.389175
7770.5	2.052	0.298951	113.3849	0.362424	0.3566776	0.364906
7771	2.062	0.303565	109.8123	0.356364	0.3542183	0.342577
7771.5	2.1	0.3062	108.1031	0.333333	0.339994	0.331894
7772	2.129	0.30811	107.4809	0.315758	0.3292039	0.328006
7772.5	2.149	0.310173	107.7903	0.303637	0.3220676	0.329939
7773	2.195	0.314109	110.0407	0.275758	0.3082561	0.344004
7773.5	2.219	0.318631	111.9805	0.261212	0.3042937	0.356128
7774	2.227	0.323402	114.8521	0.256364	0.3047794	0.374076
7774.5	2.236	0.328252	116.2485	0.250909	0.3050424	0.382803
7775	2.203	0.332776	118.033	0.270909	0.316604	0.393956

7775.5	2.177	0.339137	115.1592	0.286667	0.3271559	0.375995
7776	2.17	0.341812	113.0618	0.290909	0.3305316	0.362886
7776.5	2.165	0.335633	111.042	0.29394	0.3282622	0.350263
7777	2.157	0.328045	108.7117	0.298788	0.3264697	0.335698
7777.5	2.148	0.319786	112.8255	0.304243	0.3256883	0.361409
7778	2.141	0.317636	113.5231	0.308485	0.3277008	0.365769
7778.5	2.135	0.315476	115.23	0.312121	0.3293243	0.376438
7779	2.128	0.310887	117.9463	0.316364	0.3305295	0.393414
7779.5	2.122	0.30878	119.5756	0.32	0.33218	0.403598
7780	2.115	0.308689	120.6614	0.324242	0.3349053	0.410384
7780.5	2.091	0.324686	120.8932	0.338788	0.3497166	0.411833
7781	2.093	0.334544	119.4169	0.337576	0.3521891	0.402606
7781.5	2.11	0.334429	117.7853	0.327273	0.3454509	0.392408
7782	2.122	0.319992	116.7749	0.32	0.3359341	0.386093
7782.5	2.13	0.312082	116.4632	0.315152	0.3301456	0.384145
7783	2.138	0.305316	116.8502	0.310303	0.324733	0.386564
7783.5	2.141	0.304052	117.3149	0.308485	0.3231314	0.389468
7784	2.127	0.302824	116.9256	0.31697	0.3282102	0.387035
7784.5	2.114	0.301347	114.44	0.324849	0.3328327	0.3715
7785	2.106	0.299854	112.4202	0.329697	0.3354902	0.358876
7785.5	2.109	0.303001	110.8663	0.327879	0.3353628	0.349164
7786	2.117	0.312563	109.3123	0.32303	0.3354159	0.339452
7786.5	2.125	0.319109	108.1466	0.318182	0.3344612	0.332166
7787	2.129	0.326141	107.9126	0.315758	0.3352396	0.330704
7787.5	2.129	0.331486	109.3089	0.315758	0.3370187	0.339431
7788	2.135	0.327494	111.7146	0.312121	0.3333421	0.354466
7788.5	2.142	0.321624	113.4992	0.307879	0.3286458	0.36562
7789	2.145	0.316282	114.1968	0.306061	0.3256838	0.36998
7789.5	2.151	0.311608	115.3603	0.302424	0.3217705	0.377252
7790	2.156	0.30792	114.4275	0.299394	0.3185774	0.371422

7790.5	2.159	0.310805	110.0009	0.297576	0.3183825	0.343756
7791	2.161	0.312286	108.6022	0.296364	0.3181037	0.335014
7791.5	2.162	0.312172	107.5918	0.295758	0.3176764	0.328699
7792	2.157	0.314303	109.7645	0.298788	0.3203396	0.342278
7792.5	2.157	0.337818	112.3255	0.298788	0.3315781	0.358284
7793	2.146	0.343773	115.5852	0.305455	0.3378255	0.378658
7793.5	2.131	0.33863	111.935	0.314546	0.3386221	0.355844
7794	2.128	0.330857	109.6823	0.316364	0.3372011	0.341764
7794.5	2.126	0.323025	107.1967	0.317576	0.3353765	0.326229
7795	2.126	0.316089	104.3229	0.317576	0.3330586	0.308268
7795.5	2.124	0.312188	102.2255	0.318788	0.3325371	0.295159
7796	2.121	0.307215	101.6032	0.320606	0.3320478	0.29127
7796.5	2.119	0.301947	100.8257	0.321818	0.3310634	0.286411
7797	2.112	0.298131	103.1538	0.326061	0.332539	0.300961
7797.5	2.102	0.30072	109.752	0.332121	0.3373637	0.3422
7798	2.103	0.30585	111.7348	0.331515	0.3386901	0.354593
7798.5	2.102	0.306333	113.4721	0.332121	0.3392474	0.365451
7799	2.102	0.301161	114.6506	0.332121	0.3375119	0.372816
7799.5	2.106	0.291522	115.3647	0.329697	0.3326812	0.377279
7800	2.113	0.284426	114.3244	0.325455	0.327508	0.370778
7800.5	2.118	0.293003	111.8068	0.322424	0.3284391	0.355043
7801	2.126	0.298892	109.9338	0.317576	0.3272772	0.343336
7801.5	2.129	0.304278	108.9772	0.315758	0.3279142	0.337358
7802	2.132	0.296434	108.5667	0.31394	0.3240871	0.334792
7802.5	2.125	0.290969	108.134	0.318182	0.3249904	0.332088
7803	2.128	0.285704	107.668	0.316364	0.3220206	0.329175
7803.5	2.134	0.281438	107.0205	0.312727	0.3182047	0.325128
7804	2.137	0.279306	106.4426	0.310909	0.3162961	0.321516
7804.5	2.134	0.279703	106.0191	0.312727	0.3176123	0.318869
7805	2.138	0.280494	105.8708	0.310303	0.3163089	0.317943

7805.5	2.155	0.280944	106.3315	0.3	0.3097945	0.320822
7806	2.146	0.279849	108.1459	0.305455	0.3129461	0.332162
7806.5	2.136	0.275572	110.0759	0.311515	0.3154121	0.344224
7807	2.124	0.271921	110.8044	0.318788	0.3188949	0.348778
7807.5	2.112	0.26916	110.9534	0.326061	0.3227001	0.349709
7808	2.112	0.279901	111.089	0.326061	0.3263657	0.350556
7808.5	2.12	0.304337	111.4792	0.321212	0.3314739	0.352995
7809	2.128	0.312645	112.1789	0.316364	0.3311194	0.357368
7809.5	2.128	0.316757	113.1291	0.316364	0.3324973	0.363307
7810	2.129	0.320516	112.6098	0.315758	0.3333624	0.360061
7810.5	2.151	0.32359	110.9568	0.302424	0.3257928	0.34973
7811	2.173	0.327684	109.2724	0.289091	0.3216575	0.339203
7811.5	2.19	0.323088	107.0042	0.278788	0.3145899	0.325026
7812	2.199	0.306775	104.8122	0.273334	0.3031565	0.311326
7812.5	2.219	0.301313	103.9356	0.261212	0.2947655	0.305848
7813	2.244	0.300652	104.6258	0.246061	0.2875314	0.310161
7813.5	2.244	0.297387	106.1708	0.246061	0.2857624	0.319818
7814	2.196	0.293287	108.624	0.275152	0.298091	0.33515
7814.5	2.137	0.288926	110.5316	0.310909	0.3195758	0.347073
7815	2.129	0.289732	110.3252	0.315758	0.3229955	0.345783
7815.5	2.126	0.301118	109.586	0.317576	0.3280284	0.341163
7816	2.138	0.308986	108.6022	0.310303	0.3259692	0.335014
7816.5	2.158	0.315734	107.0613	0.298182	0.3204319	0.325383
7817	2.177	0.312629	105.5821	0.286667	0.3124031	0.316138
7817.5	2.186	0.30949	104.8645	0.281212	0.3084263	0.311653
7818	2.213	0.306342	104.4002	0.264849	0.2991384	0.308751
7818.5	2.2198	0.304077	106.8035	0.260727	0.2960519	0.323772
7819	2.227	0.299964	108.4339	0.256364	0.2918463	0.333962
7819.5	2.229	0.293665	109.5904	0.255152	0.2878952	0.34119
7820	2.167	0.299292	110.7356	0.292727	0.3113725	0.348348

7820.5	2.153	0.305048	110.1973	0.301212	0.318777	0.344983
7821	2.153	0.314611	108.5762	0.301212	0.3220012	0.334851
7821.5	2.161	0.319611	107.1058	0.296364	0.3200963	0.325661
7822	2.171	0.324748	105.4348	0.290303	0.3205328	0.315218
7822.5	2.17	0.323033	108.0833	0.290909	0.3198278	0.331771
7823	2.17	0.314036	111.8463	0.290909	0.3149137	0.355289
7823.5	2.169	0.301491	128.8142	0.291515	0.3113419	0.461339
7824	2.157	0.286254	139.4739	0.298788	0.310829	0.527962
7824.5	2.147	0.272139	126.2568	0.304849	0.3099088	0.445355
7825	2.148	0.265379	113.0397	0.304243	0.3071871	0.362748
7825.5	2.152	0.26199	105.1803	0.301818	0.3044441	0.313627
7826	2.1535	0.262186	103.7706	0.300909	0.3039229	0.304816
7826.5	2.155	0.267646	103.9007	0.3	0.3052219	0.305629
7827	2.141	0.273116	104.9215	0.308485	0.3126025	0.312009
7827.5	2.134	0.278617	106.2923	0.312727	0.3172413	0.320577
7828	2.134	0.282838	105.9393	0.312727	0.3186823	0.318371
7828.5	2.139	0.287335	101.906	0.309697	0.318249	0.293163
7829	2.146	0.290969	95.3536	0.305455	0.3167402	0.25221
7829.5	2.15	0.292806	88.8011	0.30303	0.315799	0.211257
7830	2.15	0.290883	81.2888	0.30303	0.3151448	0.164305
7830.5	2.112	0.288839	119.1085	0.326061	0.3293998	0.400678
7831	2.105	0.287021	108.6957	0.330303	0.3315549	0.335598
7831.5	2.099	0.285223	108.8509	0.333939	0.3333255	0.336568
7832	2.088	0.288778	109.9379	0.340606	0.3388976	0.343362
7832.5	2.08	0.292453	111.0248	0.345455	0.3433194	0.350155
7833	2.076	0.296898	109.2391	0.347879	0.3464053	0.338994
7833.5	2.085	0.303111	105.6677	0.342424	0.3449063	0.316673
7834	2.094	0.306899	104.8137	0.33697	0.3426036	0.311336
7834.5	2.122	0.303817	104.4255	0.32	0.3305116	0.308909
7835	2.135	0.299496	105.3571	0.312121	0.3239446	0.314732

7835.5	2.157	0.295166	104.8913	0.298788	0.3138662	0.311821
7836	2.178	0.290649	104.4255	0.286061	0.304153	0.308909