Pore Pressure Prediction in Well Planning and Safe Drilling

A thesis submitted to the faculty at African University of Science and Technology in partial fulfillment of the requirements for the degree of Master of Science in the Department of Petroleum Engineering

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CERTIFICATION

This is to certify that the thesis titled **“Pore Pressure Prediction for Well Planning and Safe Drilling”** submitted to the school of postgraduate studies, African University of Science and Technology (AUST), Abuja, Nigeria for the award of the Master’s degree is a record of original research carried out by Igwe Henry Nnamdi in the Department of Petroleum Engineering.

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A THESIS APPROVED BY THE PETROLEUM ENGINEERING DEPARTMENT

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ABSTRACT

The trend of normal compaction and the pore pressure gradient plays a vital role in oil and natural gas wells designs in well planning and safe drilling. It is imperative to adequately understand the physical principles originating and facilitating these pressures and as well evaluate the models of quantification for a particular geographical area.

This research used Eaton's depth-dependent normal compaction equations for pore pressure prediction in subsurface formations of geopressures zones in an onshore well drilled in the Niger Delta region. The research focuses in the normal compaction trends using cores from sonic, density and shale resistivity logs.

The method shows a significant magnitude of pore pressure determination with high precision. From those obtainable results, I observed that the accuracy of the prediction depends on the from normal compactions trend.

Keywords:

Abnormal pressure, pore pressure, normal compaction trend, effective stress, velocity and transit time, shale resistivity, density, well logs, fracture pressure and fracture gradient.

DEDICATION

This research work is dedicated to God Almighty, My Mother Mrs. Eucharia Igwe in blessed Memory and my Uncle, Insp. Franklin Nwagwu for their supports and guidance throughout my study.

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I thank the Lord Almighty for His grace, favour, protection and inspiration in my life. This far I have reached is due to His everlasting mercies. May His name be glorified, Amen. The success in the production of this work is not without the assistance of a number of people.

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CHAPTER ONE

INTRODUCTION

1.0 Background

Over the years, the oil and gas industry has been hit with numerous drilling non-productive time (NDT) which has cause severe drilling incidents such as pressure kicks, fluid influx and well blowouts, which is believed to be cause by inaccurate prediction of abnormal pore pressure before drilling and after drilling (Zhang, 2011). It can be ascertain from study that about 2,520 shelf gas wellbores drilled in the Gulf of Mexico shows that 24%-27% non-productive time was associated with incidents of pressure kicks, shallow water flow, gas flow and lost circulation (Dodson, 2004), which were initiated by inadequate or improper pore pressure and fracture gradient estimation or prediction. Water depth greater than 3000ft which is referred as deepwater of the Gulf of Mexico, and study have shown that 5.6% of drilling time in non-subsalt wells, and 12.6% of drilling time in the subsalt wells are attributed to incidents associated with pore pressure and wellbore instability (York et al., 2009). Improper pore pressure estimation have resulted to many drilling problems, further study have shown that out of 84 wells drilled in the Gulf of Mexico, 48 wells had kicks and 21% of those kicks resulted in loss of all or part of the well (Holand and Skalle, 2001). Abnormal high pore pressures have been regarded as the fundamental causes of most drilling disaster around the world. The abnormally high pore pressures is not only limited to the causation of kicks and blowouts, but also caused geologic disasters, such as mud volcano eruptions (Davies et al., 2007; Tingay et al., 2009). Therefore, it is imperative for operators to accurately predict pore pressure so as to reduce wellbore trouble time and drilling incidents.

Overpressures have numerous mechanisms though which it can develop such as incomplete sediment compaction, faulting, aquathermal expansion, tectonic compression, salt diaperism, and massive rock salt deposition, generation of hydrocarbon, gas cracking, mineral transformation, osmosis, hydraulic head and hydrocarbon buoyancy (Gutierrez et al, 2006; Swarbrick and Osborne, 1998). In almost all the cases where incomplete sediment compaction (compaction disequilibrium) has been found to be the primary cause of geo-pressuring, the age of the rocks is geologically young. Examples of areas where compaction disequilibrium is cited as the primary sources of abnormal pressure include the U.S Gulf Coast, North Sea, Alaska Cook, Niger Delta, Mackenzie Delta, Malay

Basin, Eastern Venezuelan Basin, Adriatic Sea, Beaufort Sea, the Nile Delta, Mahakam Delta and the Potwar Plateau of Pakistan (Law and Spencer, 1998; Heppard et al., 1998; Powley, 1990;, Nelson and Bird, 2005; Morley et al., 2011).

Incomplete sediment compaction (under-compaction) is one of the major causes of abnormal pore pressure. During normal sediment compaction, there is a reduction in formation porosity at the same time as pore fluid expulsion. Overburden pressure increases during sediment burial, and this action is the principal cause of fluid expulsion. Normal compaction occurrence promote slow sedimentation rate, in other words, equilibrium between increasing overburden and reduction of pore fluid volume due to compaction is maintained (Mouchet and Mitchell, 1989). This normal compaction is responsible for the generation of hydrostatic pore pressure in the formation. Fluids expulsion in the formation responds to fast increase in overburden stress which is facilitated by rapid burial of sediments. Rapid subsidence of sediments or extremely low permeability formation will lead to partially expulsion of pore fluids in the sediments. The residual fluid in the pores of the sediments must support all or part of the weight of overly sediments, causing rapid increase in pressure of pore fluids, i.e. abnormally high pore pressure (Zhang, 2011). Due to rapid burial of sediments, the porosity decreases and formations are said to be under-compacted or in compaction disequilibrium. The abnormal pressure (overpressure) created by under-compaction in shale-dominated sequences may display the following characteristics: the abnormal pore pressure change with depth in sub-parallel to the lithostatic (overburden) pressure gradient (Swarbrick et al, 2002).

1.1. Pore Pressure and Pore Pressure Gradient

During drilling plan, geomechanical and geological analyses pore pressure is one of the most important parameters under consideration. Pore pressure exist due to fluid pressures exerted in the pore network in the porous formations. Pore pressure ranges from hydrostatic pressure, to severe overpressure. Pore pressure can be classified based on its lower or higher than the hydrostatic pressure. It is said to be abnormal pore pressure when pore pressure is greater than the hydrostatic pressure (normal pressure).

The basic theory for pore pressure prediction is coined on Terzaghi's and Biot's effective stress law (Terzaghi et al., 1996; Biot, 1941). This theory shows that pore pressure in the formation is a function of overburden stress and effective vertical stress. The pore pressure, effective vertical stress and overburden stress can be expressed in the following relationship:

$$p = \frac{(\sigma_v - \sigma_e)}{\propto} \qquad (1.0)$$

Where p is the pore pressure; σ_v is the overburden stress; σ_e is the vertical effective stress; $\propto$ is the Biot effective stress coefficient. It is conventionally assumed $\propto = 1$in geopressures vicinity.

When overburden and effective vertical stresses are known, pore pressure can be calculated from Eq. 1. Bulk density logs is the best well logs where overburden stress can be easily obtained, while effective vertical stress can be determined via correlations of well log data such as resistivity, sonic travel time/velocity, bulk density and drilling parameters (e.g., D exponent). Fig. 1 illustrates the relationship between hydrostatic pressure, overburden stress, formation pore pressure and effective vertical stress with the depth (TVD) in a conventional oil and natural exploration. The pore pressure profile with depth used in this study is similar to many geologically young sedimentary basins where abnormal pressure is encountered at depth (Zhang, 2011). Pore pressure at relatively shallow depths (less than 2,000 m) is hydrostatic, which indicate that a continuous, interconnected column of pore fluid extends from the surface to that depth. Overpressure starts at depth greater than 2,000 m, and pore pressure is proportional with depth, indicating that the pore networks of deeper formations are hydraulically isolated from shallower ones. At much greater depth (say 4,000 m), pore pressure values approaches the overburden stress. The effective stress is defined as the difference between formation pore pressure and overburden stress (refers to Eq. 1), as shown in Fig. 1, indicating that overpressure is inversely proportional to effective stress.

In drilling engineering, pore pressure gradient is an important parameter used conveniently in predicting and determining drilling fluid density (mud weight), as shown in Fig. 2. The pore pressure gradient at a given depth is the ratio of pore pressure to the true vertical depth (TVD). Prior to casing setting and cementing, it is essential to accurately determine the mud weight based on pore pressure gradient, wellbore stability and fracture gradient. The mud weight is applied in the form of mud column hydrostatic pressure to provide the wellbore walls with adequate support for preventing formation fluid influx and wellbore collapse during drilling operations. The best-in-use practice during drilling operation is to use mud weight greater than formation pore pressure in order to prevent fluid influx, kicks and wellbore instability in an open hole section. However, it is practically applicable in most geological formation that mud weight should not be greater than the formation fracture gradient of the drilling section so as to avert formation fracture, which may cause drilling fluid losses or even loss circulation. In order to prevent hydraulic fracturing of borehole by high drilling fluid, as needed in overpressure zones, casing placement is paramount to protect the overlying formations from fracturing, as shown in Fig. 2.

The normal pore pressure gradients are associated to Equivalent Water Densities (EWD) ranging from 1 g/cm^3 (0.433 psi/ft) for fresh water to 1.074 g/cm^3 (0.465 psi/ft) for salt water, as illustrated in Table 1.1.

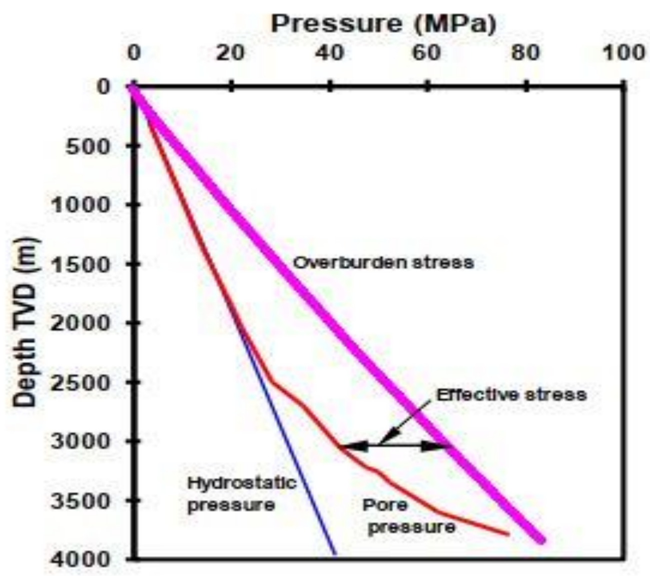

Fig. 1. Hydrostatic pressure, pore pressure, overburden stress, and effective stress in a wellbore (Zhang, 2011).

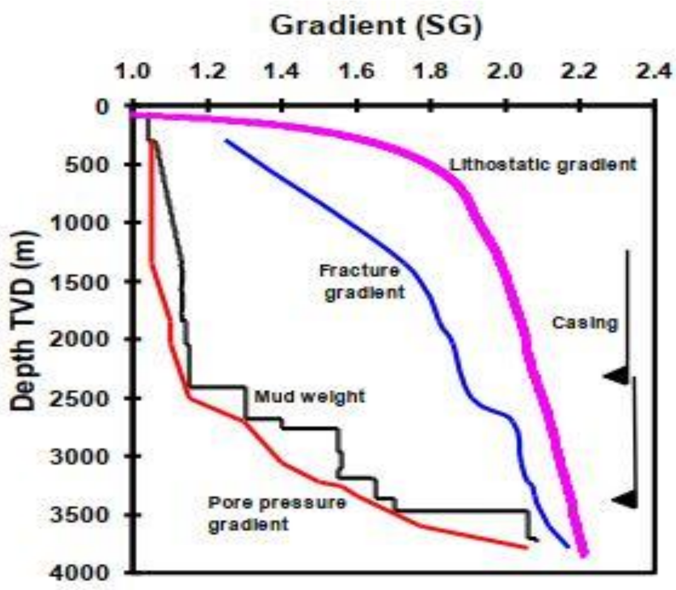

Fig. 2. Pore pressure gradient, fracture gradient, overburden stress gradient (lithostatic gradient), mud weight, and casing shoes with depth (Zhang, 2011).

Table 1.1 Normal formal pressure gradients for several areas of active drilling (Bourgoyne *et al*, 1986)

Areas/Zones	Pressure Gradient psi/ft	Equivalent Water Density g/cm^3
West Texas	0.433	1.000
Gulf of Mexico Coastline	0.465	1.074
North Sea	0.452	1.044
Niger Delta	0.433	1.000
Malaysia	0.442	1.021
Mackenzie Delta	0.442	1.021
West Africa	0.442	1.021
Anadarko Basin	0.433	1.000
Rocky Mountains	0.436	1.007
California	0.439	1.014

The analysis of pore pressure can be categorize into three aspects: pre-drill pore pressure prediction, pore pressure prediction while drilling and post-well pore pressure prediction. The pre-drill pore pressure can be predicted by using the seismic interval velocity data in the planned well location as well as using geological, well logging and drilling data in the offset wells. The pore pressure prediction while drilling mainly uses the logging while drilling (LWD), measurement while drilling (MWD), drilling parameters, and mud logging data for analyses. The post-well pore pressure prediction use available data in drilled wells to build pore pressure model, which can be used for pre-drill pore pressure predictions in the future wells.

1.2. Fracture Pressure and Fracture Gradient

The pressure required to fracture the formation and cause drilling fluid loss or mud loss circulation from the wellbore into the induced fracture is referred to as fracture pressure. Fracture gradient is determined by the ratio of the fracture pressure to the wellbore true vertical depth. It is vital to first determine the maximum mud weight (Fracture pressure) during mud weight design in both drilling planning and drilling stage. The mud weight determination is paramount because drilling fluid density higher than the formation fracture gradient will lead to wellbore tensile failure, hence, causing losses of drilling mud into the adjacent formation. Fracture pressure can be measured directly from downhole leak-off test (LOT) and formation integrity test (FIT). In drilling industry, there are two commonly methods used in calculating fracture pressure, i.e. the minimum stress method and tensile failure method.

1.3. Problem Statement

Over four decades now, there have been an increasing concern in the oil and gas and industry regarding drilling incidents such as; wellbore instability, kicks, well blowouts, and other wellbore problems. The need to improve well drilling has become imperative as operators transit from less pressure environment to more challenging and harsher vicinity such as high pressure and high temperature (HPHT) fields. Maintaining adequate wellbore pressure while drilling for safe drilling is an important subject in the oil and gas industry and in ultra-deep water wells. Drilling below formation pore pressure known as underbalance condition, will likely result in an influx of formation fluids into the wellbore, which if not controlled can lead to well blowout or loss of well section.

Therefore, it is paramount to design proper mud weight which will not fracture the formation by exceeding the fracture pressure in order to avert loss of fluid to the formation, which can lower the annulus fluid level and as a result will lower the downhole pressure, hence, a potential condition for formation fluid influx into the well.

This research addresses overpressures that exist in most oil and gas wells which induces several drilling problems (such as kicks and blowout) by providing the most commonly used pore pressure prediction model (Eaton's model) with an aim to solving the age-long drilling incidents in oil and gas industries.

1.4. Objectives of the Research

The objectives of this research are:

1. To identify zone of abnormal pressure from normal compaction trend
2. To determine the importance of pore pressure prediction on well planning and safe drilling
3. To accurately determine fracture pressure and pore pressure using Eaton's pore pressure prediction model

CHAPTER TWO

LITERATURE REVIEW

This chapter discusses the fundamental concepts of the subject matter and the review of the existing works related to the study.

2.0 Critical Literature Review

Over four decades ago, the concept of pore prediction is very important in the oil and gas industry as it can greatly increase drilling non-productive time (NPT) and cause serious drilling incidents, such as fluid influx, well blowouts, etc. To mitigate these negative consequences, this has led some researchers to develop models and correlations using well logs data such as bulk density, resistivity, gamma ray, and sonic travel time/velocity logs to predict abnormal pore pressure in oil and gas formations. The first persons to make pore pressure prediction were Hottmann and Johnson (1965). Their pore pressure prediction was made from shale properties derived from well log data (sonic travel time/velocity and resistivity) were they developed a correlation directly between the resistivity departure from the normal trend and the observed fluid pressure gradient.

$$R_r = \frac{R_{shn}}{R_{sh}} \tag{2.0}$$

Where: R_r is the resistivity ratio at depth D

R_{sh} is the shale resistivity at depth D

R_{shn} is the normal shale resistivity at depth D

From their work, they realized that some factors which influence the resistivity of reservoir rocks have the capability also to affect shale resistivity. Among these factors are (1) porosity, (2) temperature, (3) salinity of the contained fluid and (4) mineral composition. The limitation from Hottmann and Johnson (1965) was their inability to isolate the effect of each factor, and this made them assumed that the resistivity various was only due to porosity effects. Another deficiency of their method, however, is their inability to estimate pressure in shales.

Gardner et al. (1974) used the data presented by Hottmann and Johnson (1965) to propose an equation that can predict pore pressure.

$$P_f = \sigma_v - \frac{(\alpha_v - \beta)(A_1 - B_1 \ln \Delta t)^3}{Z^2} \tag{2.1}$$

Where P_f is the formation fluid pressure (psi); α_v is the normal overburden stress gradient (psi/ft); β is the normal fluid pressure gradient (psi/ft); Z is the depth (ft); Δt is the sonic transit time (μs/ft); A and B are the constants, A_1 = 82776 and B_1 = 15695.

They observed that the effect of consolidation outweighs the effect of pressure. Formation bulk density is an important parameter in determining formation pore pressure. Studies have shown that except in clays, formation porosity is inversely proportional to bulk density. I.e. increase in porosity decreases formation bulk density. Athy (1930) investigated the effect of density of sedimentary rocks (Mid-Continent shales) and discovered that bulk density increases with decreasing porosity in unconsolidated formation.

$$\varphi = 1 - \frac{\text{Bulk density}}{\text{Absolute density}} * 100 \qquad (2.2)$$

Where φ is the porosity

The shortcoming from his study was the inability to measure the amount of formation compaction directly; however, Athy (1930) suggested that formation compaction must be computed from measured changes in porosity. The relationship between porosity and vertical effective stress is very essential to predict formation pore pressure in geo-pressurized zone. Based on this, Hubbert and Rubey (1959) found a relationship between shale porosity and vertical effective stress which metamorphose to the development of equivalent depth concept by Foster and Whalen (1966).

$$\sigma_{vA} = \sum_{vA} - P_{pN} \qquad (2.3)$$

Where: σ_{vA} is the overburden stress at the abnormally pressured shale

$\sum_{vA}$ is vertical effective stress at the abnormally-pressured shale

P_{pN} is pore pressure at the abnormally-pressured shale

They used the proposed equivalent depth method to calculate shale porosity from resistivity logs using Archie's (1942) formation factor.

$$F_{sh} = \frac{R_{sh}}{R_{wsh}} \qquad (2.4)$$

Where: F_{sh} is the formation factor

R_{sh} is the electrical resistivity of shale saturated with water

R_{wsh} is the electrical resistivity of the water saturating the shale

The limitation from their study was on the assumption that resistivity of the water saturating the shales was equal to the resistivity of the water saturating the nearest sandstone. Though, Schneider et al. (1993) questioned the direct relationship between porosity and vertical effective stress based on the inability to fit porosity and vertical effective stress data from shales in the Mahakam Delta with a single trend, but later found out that hydrostatically pressured shales of shallow formation followed a trend of higher porosity values than the deeper, overpressured shales.

The major cause of overpressure is attributed to under-compaction especially in young sedimentary basin. Eaton (1972) developed one of the most industry used equation to predict pore pressure in young sedimentary basins such as the Gulf of Mexico, North Sea, etc. Eaton (1972) observed that resistivity well-log can fairly predict pore resistivity.

$$P_{pg} = OBG - (OBG - P_{ng}) \left(\frac{R}{R_n}\right)^n \qquad (2.5)$$

Where P_{pg} is the formation pore pressure gradient; OBG is the overburden stress gradient; P_{ng} is the hydrostatic pore pressure gradient (normally 0.465 psi/ft, dependent on water salinity) ; R is the shale resistivity obtained from well logging; Rn is the shale resistivity at normal (hydrostatic) pressure; n is the exponent varied from 0.6-1.5, and normally n = 1.2

Based on the result from study by Hottmann and Johnson (1965), Eaton pay more attention on the scatter observed from Hottmann and Johnson (1965) and opined that this could be explained by considering the local variations in overburden gradient. While considering effective stress relationship from study done by Terzaghi's (1943), Eaton observed that accurate knowledge of the actual overburden stress was essential to obtain reliable pore pressure estimates from this equation.

2.1 Pore Pressure Evaluation Using Drilling Data

The concept of pore pressure prediction is vital especially during drilling operation in order to drill safely to the target depth of interest. Pore pressure prediction while drilling basically uses the logging while drilling (LWD), measurement while drilling (MWD), drilling parameters, and mud logging data for analyses. Jordan and Shirley (1966) was the first to introduce the d-exponent method based on the drilling equation developed earlier by Bingham (1965) which was designed to allow real-time pore pressure estimation while drilling by analyzing drilling data. From their study, they first developed a semi-empirical technique for soft type roller cone bits to analyze Texas-Louisiana Gulf Coast formations. Jordan and Shirley (1966) proposed an equation to normalize the rate of penetration from which d-exponent, penetration rate, bit size, weight on bit (WOB) and rotary speed are calculated. It was observed that the plots of d-exponent versus depth show a decreasing trend with depth, the divergence of d-values from normal trend to lower than normal values is an indication of transition zones and geopressurized environment. It can be inferred from their study that variations in bit size and type, weight on bit, will affect the d-exponent. Inability to account for change in mud weight is another major limitation from their study. Rehm and McClendon (1971) modified the rate of penetration normalization mathematical method proposed by Jordan and Shirley (1966) to account for the effect of mud weight and bit wear. They collected drilling data from over 90 wells around the globe, and the results obtained shows that an accuracy approaching 0.2ppg was gotten in all major drilling areas investigated.

2.2 Pore Pressure Prediction from Gamma Ray Measurement

Over the years, study and experimental investigation have shown that abnormal pore pressure change with depth is due to under-compaction or compaction disequilibrium especially in shale dominated sequences. A well logs data obtained natural gamma ray measurement is fundamental in predicting pore pressure. Zoeller (1983) studied the determination of pore pressure from natural gamma ray measurements by proposing a theorized method. He speculated that increase in concentration of potassium increases the depth in a normally compacted shale structure. He opined that compaction drives water out of the shale system, hence, leaving most potassium ions behind it. But studies have shown that under-compaction shale sediments will retain approximately similar amounts of potassium ions, but high water content in the shale sequence ensures that the volumetric concentration of these ions is lower compared to that of normally compacted shales. According to Jean-Louis (1989), an empirical quantitative correlation was developed based on the qualitative observation on well log data obtained from gamma ray measurement. A normal gamma ray trend line was defined for Gulf Coast shales, a departure from this normal trend line indicates over pressures zones.

2.3 Pore Pressure Prediction from Interval Velocity and Transit Time

Seismic survey is one of the oldest wellbore measurements in which modern pore pressure prediction is determined from interval velocities and transit time. Many researchers have proposed various methodologies for analyzing and interpreting transit time and interval velocities for use of predicting pore pressure. There is this general believe that the transform utilized for interval velocity based pore pressure prediction heavily relied on the assumption that porosity trend is directly proportional to pore pressure (Young *et al.*, 2014). Pennebaker (1968) was the first to attempt pore pressure prediction from interval velocities. Pennebaker (1968) use the interval travel time – depth relationships of wells drilled through sand-shale sequences, of the Gulf of Coast Basin along the Texas and Louisiana to develop a mathematical equations to lithology and pore pressure. Eaton (1975) presented what is regarded as the most industry used empirical equation for pore pressure prediction from sonic compressional transit time along shale sequences. He plotted interval transit time values obtained from sonic logs vs depth and established a normal compaction trend, pore pressure can be determined from the point where there is a departure from normal compaction trend. The limitations with Eaton (1975) empirical equation in some petroleum basins is its inability to consider unloading effects, and this inhibit its widespread application in geologically complicated area, as can be found in formation with uplifts. Bowers (1995) proposed a power relationship equation between sonic velocity and effective stress to determine the effective stress obtained from pore pressure data from shale sequence and its overburden stresses. He discovered that if formation uplift or unloading effect occurs, the plot of effective stress and compressive velocity do not follow the loading curve. Bowers (1995) proposed an empirical equations account for the unloading curve effects. Bowers' method is applicable to many petroleum basins (e.g., the Gulf of Mexico). However, this method overestimated pore pressure when shallow formation is poorly- or un-consolidated, because the velocity in such a formation is very slow.

2.4 Risks in Drilling Operation

Over the years, there are numerous causes of risk associated with drilling operation and the outstanding quality of the evaluation made by the proposed risk evaluation method is directly related to treating as many threat sources as possible; however, managing all the potential sources of drilling problems at once would be a perfect, excellent and overwhelming task. Therefore, it is imperative to sustain this problems especially in conventional drilling by applying several safe drilling methods not excluding managed pressure drilling or dual-gradient drilling (Cayeux et al., 2016).

Geo-pressure margin (see Figure 2.1) is understood to be the first candidate of drilling problems. This is not limited to the risk of the wellbore pressure being lower than the pore pressure anywhere along the open hole section during drilling operation evaluation, therefore having the risk of causing a formation fluid influx. It is essential to estimate the risk for borehole instabilities by comparing the collapse pressure of the open hole formation rocks to the downhole pressure. Secondly, estimating the risk of formation fracturing caused by a downhole pressure exceeding the fracturing pressure at any depth along the open hole section is vital to manage wellbore pressure while drilling. Lastly, understanding loss circulation incident caused by the hydrostatic pressure being greater than the minimum horizontal stress of the exposed formation rocks is also important.

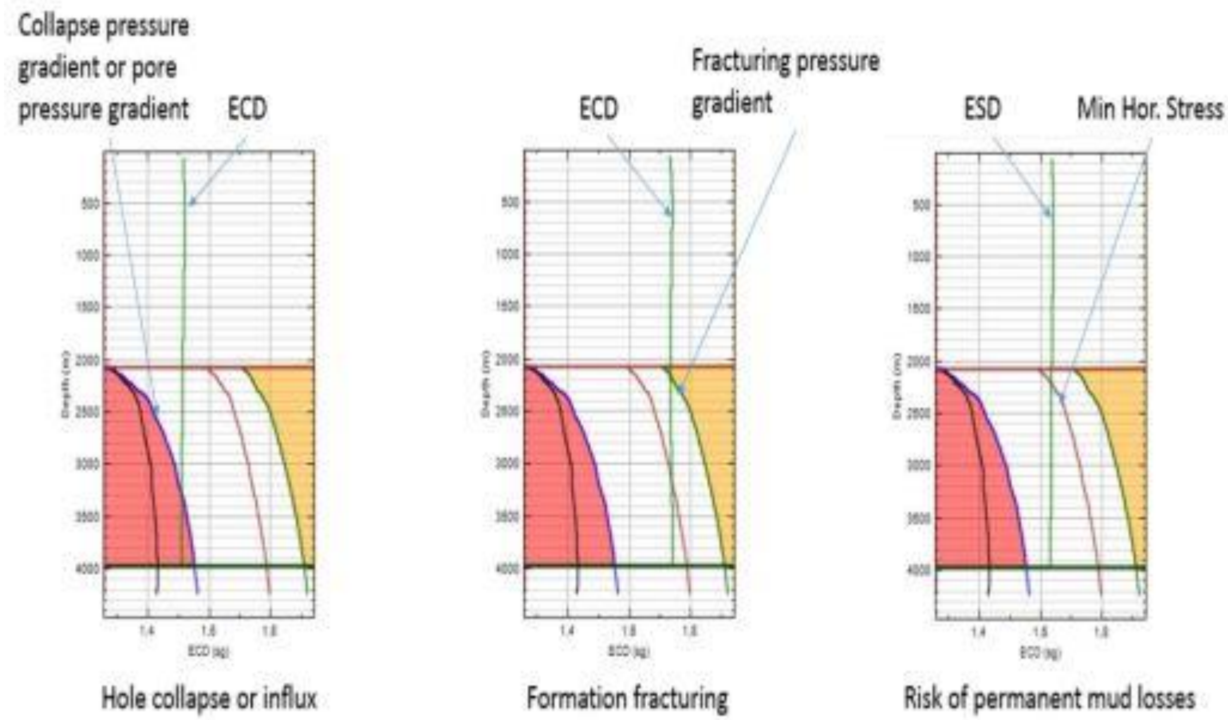

Figure 2.1 Geopressure Margin (Cayeux et al., 2016)

CHAPTER THREE

METHODOLOGY

This chapter presents approaches used in the study with a step-by-step analysis starting from the data preparation to using the data to determine the required parameters to predict the formation pore pressure for safe drilling.

3.0 Basic Techniques for Data Acquisition and Preparations

The data used in this research was obtained from a well drilled in the Niger Delta Region by using both Measurement While Drilling (MWD) and Logging While Drilling (LWD) tools to obtain several well logs data, such as density, interval transit time/velocity, gamma ray, and shale resistivity logs data at several depth of investigation. The data is obtained by the frequency of the emitted electromagnetic wave of the measuring tools. The attenuation and the phase shift of the waves generated by the tool are computed from the signals obtained at two receivers and converted into two apparent interval transit time/velocity, gamma rays, densities and resistivities which provide two depth of investigation. The obtainable data was used to calculate overburden stress ((σ_{ob}) from Mitchell's approximation of Eaton, formation pore pressure gradient, pore pressure, and other parameters.

3.1 Background of Eaton's Method

Eaton's equation is an empirical equation used for pore pressure prediction from density, sonic compressional transit time/velocity, and shale resistivity well logs. This is prominent and most commonly used method for formation pore pressure prediction which is applicable to most petroleum basins, especially young sedimentary basins where formation disequilibrium (sediment under-compaction) is the major cause of overpressure. This method uses the normal sediment compaction trend approach to estimate formation pore pressure gradient. Though, the application of this method is limited to formations with uplifts due to unloading effects.

3.2 The sequential steps taken in preparing the data used in the model

Step 1: Plot a graph of measured Shale resistivity data vs Depth, Measured Bulk Density vs Depth, and Measured Sonic Interval transit time vs Depth respectively, all in a semi-log scale.

Step 2: Establish the normal compaction trend, which can be done by using experience and any known data to help in drawing the normal line.

Step 3: Determine the slope m of all the plotted data by choosing two distinct points from density, shale resistivity and sonic transit time data respectively.

For Bulk Density well log data

$$\text{Slope m} = \frac{\text{Ln(Measured Bulk Density 2/Measured Bulk Density 1)}}{\text{(Depth 2/Depth 1)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \; 3.1a$$

For Shale resistivity well log data

$$\text{Slope m} = \frac{\text{Ln(Measured Shale Resistivity 2/Measured Shale Resistivity 1)}}{\text{(Depth 2/Depth 1)}} \quad \ldots\ldots\ldots\ldots\ldots \; 3.1b$$

For measured sonic interval transit time

$$\text{Slope m} = \frac{\text{Ln(Measured transit time 2/Measured transit time 1)}}{\text{(Depth 2/Depth 1)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.1c$$

Step 4: Determine the intercept C of all the plotted data;

For Bulk density well log data:

$$\text{Intercept C} = \left(\frac{\text{Bulk Density 1}}{\text{Exp(m} * \text{Depth 1}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.2a$$

Where m = slope of the semi-log graphs.

For Shale resistivity well log data:

$$\text{Intercept C} = \left(\frac{\text{Shale resistiviity 1}}{\text{Exp(m} * \text{Depth 1}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.2b$$

For sonic interval transit time well log data

$$\text{Intercept C} = \left(\frac{\text{Sonic transit time 1}}{\text{Exp(m} * \text{Depth 1}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.2c$$

Step 5: Determine normal bulk density, shale resistivity and transit time of deviation from normal compaction respectively.

For Bulk density well log data;

$$\text{Normal bulk density } \rho_n = C * \text{ Exp}(m * \text{ } D_n) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.3a$$

Where D_n = Depth of deviation from normal compaction

For Shale resistivity well log data

$$\text{Normal Shale resistivity } R_n = C * \text{ Exp}(m * \text{ } D_n) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3.3b$$

Where D_n = Depth of deviation from normal compaction

For sonic transit time well log data;

Normal sonic interval transit time $T_n = C * \text{Exp}(m * D_n)$ ………………...... 3.3c

Where D_n = Depth of deviation from normal compaction

Step 6: Estimate the overburden stress (σ_{ob}) from Mitchell's approximation of Eaton:

$$\sigma_{ob} = 0.84753 + 0.01494\left(\frac{D}{1000}\right) - 0.0006\left(\frac{D}{1000}\right)^2 + 1.199 * 10^{-5}\left(\frac{D}{1000}\right)^3 \text{……….. 3.4}$$

Where D is the various Depths of deviation from normal compaction in ft.

σ_{ob} is the overburden stress at various depths of deviation from normal compaction in psi/ft.

Step 7: Calculate the formation fracture pressure at various depth of deviation from normal compaction in psi/ft:

For Bulk density well log data

$$F_p = \sigma_{ob} - (\sigma_{ob} - 0.433) * \left(\frac{\rho_n}{\rho_o}\right)^n \text{…………………………………………………… 3.5a}$$

Where n = 1.2

ρ_e is the normal bulk density at various depths of deviation from normal compaction,

ρ_o is the original bulk density obtained from well logging

F_p is the formation fracture pressure at various depth of deviation from normal sediment compaction in psi/ft

For shale resistivity well log data

$$F_p = \sigma_{ob} - (\sigma_{ob} - 0.433) * \left(\frac{R_n}{R_o}\right)^n \text{………………………………………………….. 3.5b}$$

Where n = 1.2

R_n is the normal shale resistivity at various depths deviation from normal compaction.

R_o is the original shale resistivity obtained from well logging

For sonic interval transit time well log data

$$F_p = \sigma_{ob} - (\sigma_{ob} - 0.433) * \left(\frac{T_o}{T_n}\right)^n \text{……………………………………………………. 3.5c}$$

Where n = 2.0

T_n is the normal sonic interval transit time at various depths deviation from normal compaction.

T_o is the original sonic interval transit time obtained from well logging

Step 8: Calculate the formation fracture pressure at various depth of deviation from normal compaction in ppg:

For bulk density well log data

$$F_p = \left(\frac{\left(\sigma_{ob} - (\sigma_{ob} - 0.433) * \left(\frac{\rho_n}{\rho_o}\right)^n\right)}{0.052}\right) \ldots\ldots \; 3.6a$$

Where n = 1.2

For shale resistivity well log data

$$F_p = \left(\frac{\left(\sigma_{ob} - (\sigma_{ob} - 0.433) * \left(\frac{R_n}{R_o}\right)^n\right)}{0.052}\right) \ldots\ldots \; 3.6b$$

Where n = 1.2

For sonic interval transit time well log data

$$F_p = \left(\frac{\left(\sigma_{ob} - (\sigma_{ob} - 0.433) * \left(\frac{T_o}{T_n}\right)^n\right)}{0.052}\right) \ldots\ldots \; 3.6c$$

Where n = 2.0

Step 9: Calculate formation pore pressure at various depths of deviation from normal compaction.

For bulk density well log data:

$$P_p = F_p * D \ldots\ldots \; 3.7a$$

Where Pp is the formation pore pressure at various depths of deviation from normal compaction.

F_p is the formation fracture pressure at various depth of deviation from normal sediment compaction in psi/ft.

For shale resistivity well log data:

$$P_p = F_p * D \ldots\ldots \; 3.7b$$

Where Pp is the formation pore pressure at various depths of deviation from normal compaction.

F_p is the formation fracture pressure at various depth of deviation from normal sediment compaction in psi/ft.

For sonic transit time well log data:

$$P_p = F_p * D \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 3.7c$$

Where Pp is the formation pore pressure at various depths of deviation from normal compaction.

F_p is the formation fracture pressure at various depth of deviation from normal sediment compaction in psi/ft.

The equations above were used to calculate all the required parameters for predicting formation pore pressure in this research work.

CHAPTER FOUR

Results and Discussion

The following results were obtained from the spreadsheet based on the methodology applied in the study.

4.0 Numerical Examples of the Model

The above step-by-step procedures were performed using spreadsheet to obtain the results below.

The input data begins with slope of the logarithmic plot of the respective well logs (such as Density, Sonic interval transit time, and Shale resistivity) data. The tables of calculation of all the required parameters done with the spreadsheet and the results can be found in appendix A.

4.1 **Shale Density method with depth-dependent normal compaction trendline.**

It can be ascertain from this study that in Eaton's model, it is difficult to determine the normal shale density or the shale density in the condition of hydrostatic pore pressure. From this study, the shale density is assume to be constant at the normal shale compaction zone, and not a constant in most cases, but a function of the burial depth. Thus normal compaction trendline is developed to determine the formation pore pressure.

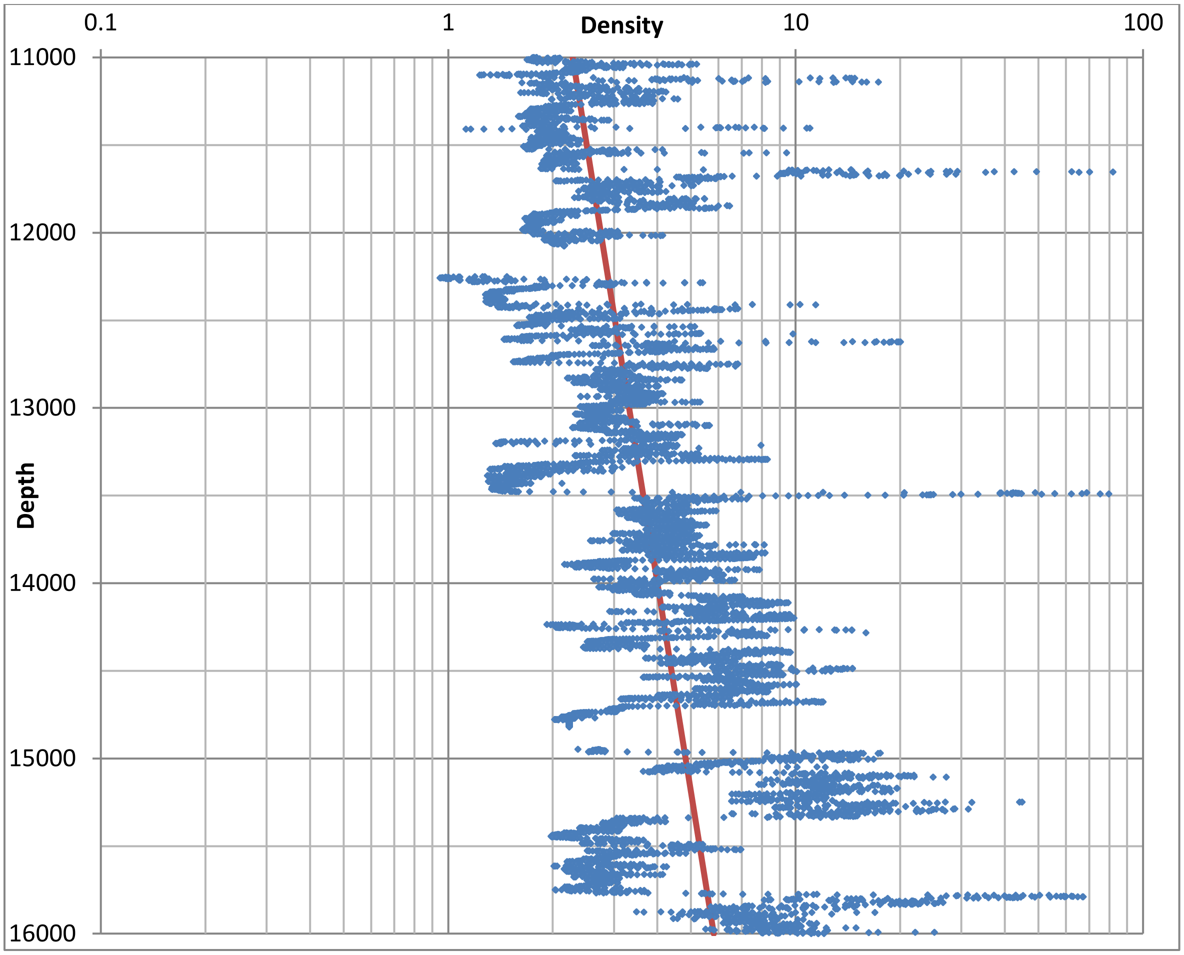

Fig. 4.1. Pore pressure calculation from the shale density method proposed in this research

Fig. 4.1 shows pore pressure calculation of formation density using the normal compaction trendline approach. It can be deduced from the graph that the normal formation compaction section end at a Depth of 12001.5ft, which is the zone where hydrostatic pore pressure exist. Beyond the zone of normal formation compaction is referred as the overpressure or geopressures zone of the formation. It can be inferred from Fig. 4.1 that deviation from normal compaction (zone of overpressure) begins at depth of 12002ft. This zones is a function of undercompaction disequilibrium due to rapid burial of sediments. Therefore, it is imperative to properly predict formation pore pressure of this zone for adequate drilling design, mud weight design and safe drilling. It can be ascertained that the Eaton's pore pressure prediction method gives a much better results when compared to other methods.

4.2. **Sonic interval transit time method with depth-dependent normal compaction trendline.**

It can be establish from this study that, it is difficult to determine the normal sonic interval transit time or the sonic interval transit time in the condition of hydrostatic pore pressure using Eaton's model. From this study, the sonic interval transit time is assume to be constant at the normal compaction zone, and not a constant in most cases, but a function of the sediments burial depth. Thus normal compaction trendline is developed to determine the formation pore pressure.

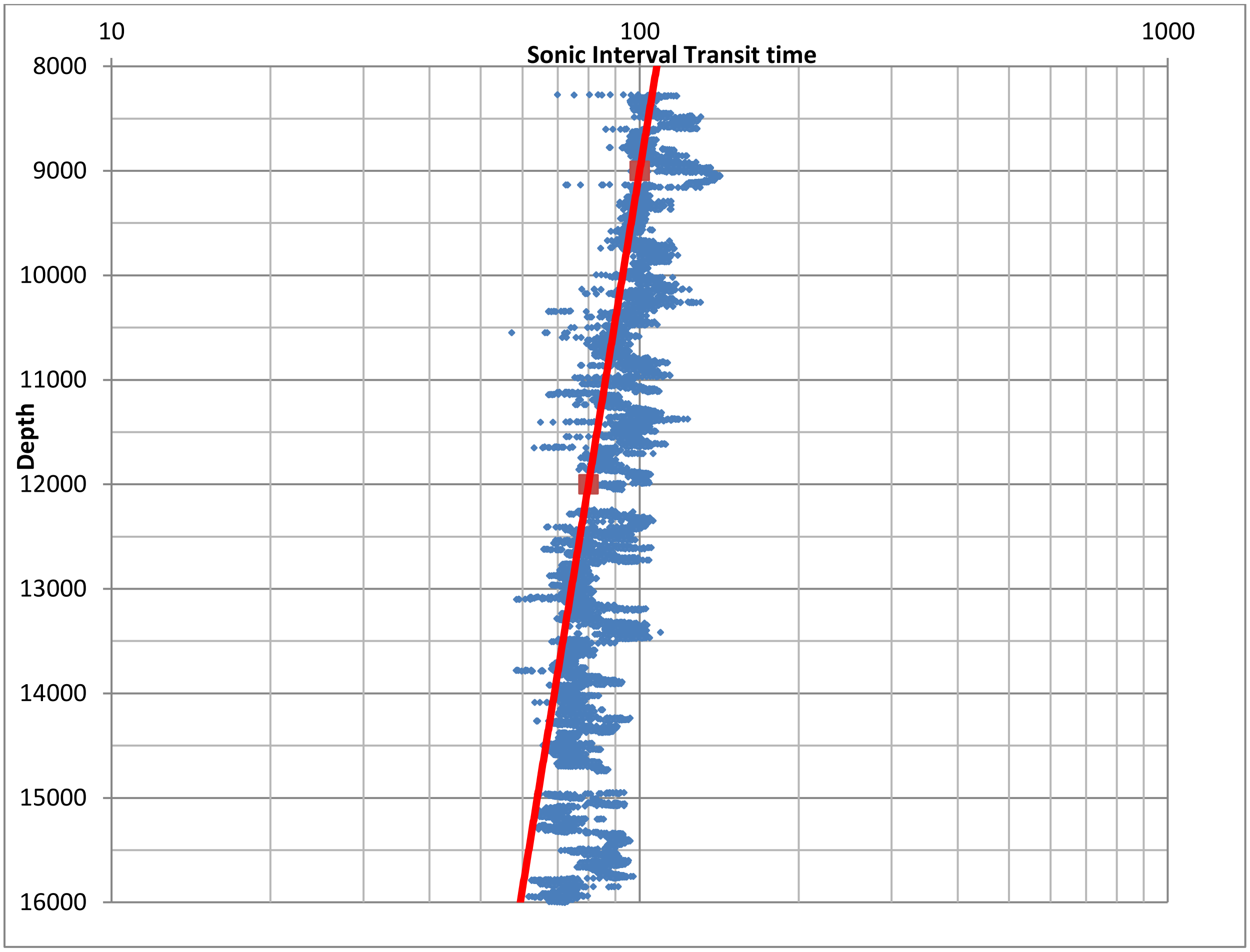

Fig. 4.2. Pore pressure calculation from the sonic interval transit time method proposed in this research

Fig. 4.2 demonstrates pore pressure calculation of formation sonic interval transit time using the normal compaction trendline approach. It can be deduced from the graph that the normal formation compaction section on this well ends at the formation Depth of 8957ft, which is the zone where hydrostatic pore pressure exist. Beyond the zone of normal formation compaction is referred as the overpressure or geopressures zone of the formation, and this zone is characterized by high overburden pressure. It can be inferred from Fig. 4.2 that deviation from normal compaction (zone of overpressure) on this well begins at depth of 8957.5ft. These zones are functions of undercompaction disequilibrium due to rapid burial of sediments. Therefore, it is imperative to properly predict formation pore pressure of this zones for adequate drilling design, mud weight design and safe drilling. It can be ascertained from this well that Eaton's pore pressure prediction method gives a much better results when compared to other methods.

4.3. **Shale resistivity method with depth-dependent normal compaction trendline**

It can be establish from this study that, it is difficult to determine the normal shale resistivity or the shale resistivity in the condition of hydrostatic pore pressure using Eaton's model. From this study, the shale resistivity is assume to be constant at the normal compaction zone, and not a constant in most cases, but a function of the sediments burial depth. Thus normal compaction trendline is developed to determine the formation pore pressure to manage pressure while drilling.

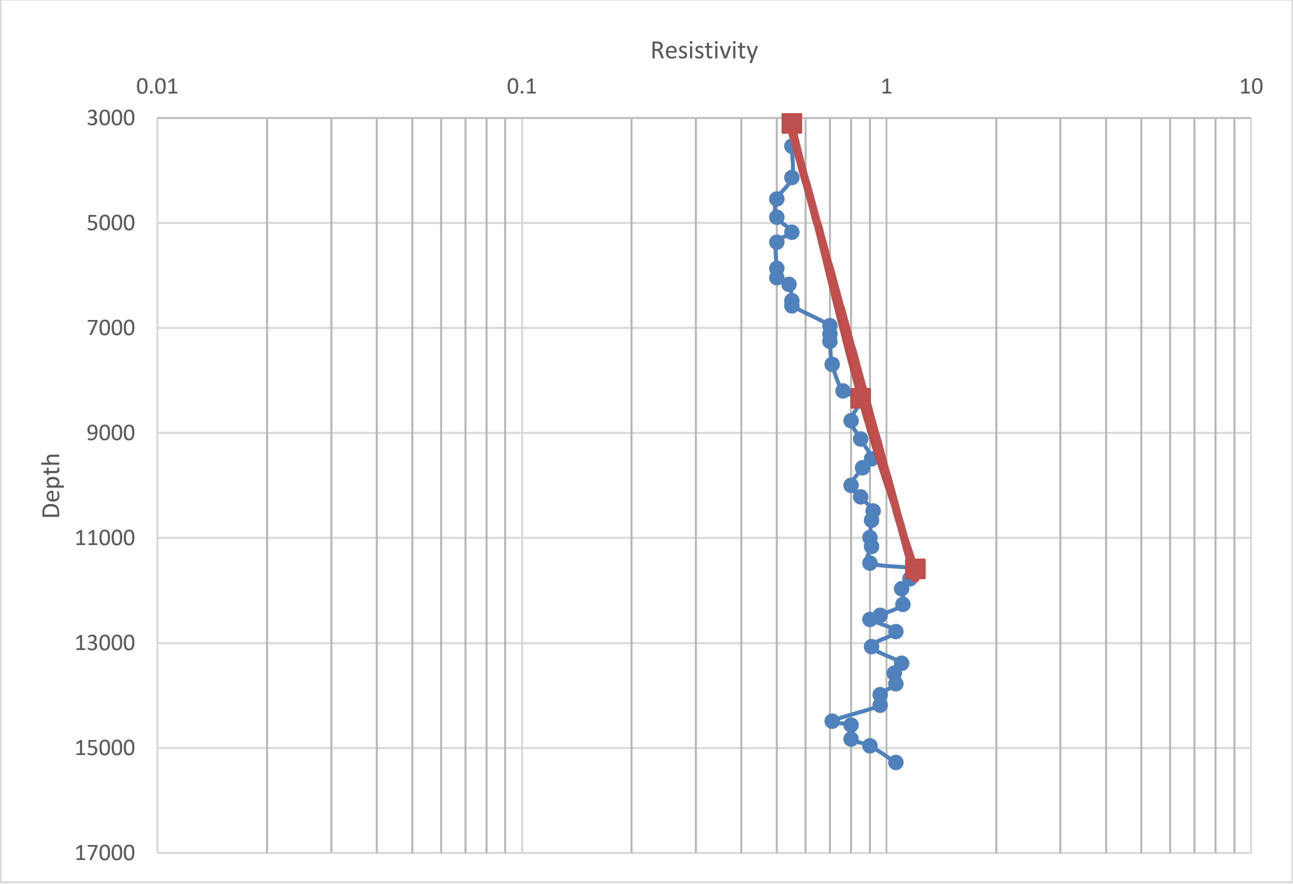

Fig. 4.3. Pore pressure calculation from the shale resistivity method proposed in this research

Fig. 4.3 indicates pore pressure calculation of formation shale resistivity using the normal compaction trendline approach. It can be inferred from the graph that the normal formation compaction section on this well ends at the formation Depth of 11478ft, which is the zone where hydrostatic pore pressure exist. Beyond the zone of normal formation compaction is referred as the overpressure or geopressures zone of the formation, and this zone is characterized by high overburden pressure. It can be inferred from Fig. 4.3 that deviation from normal compaction (zone of overpressure) on this well begins at depth of 11588ft. These zones are functions of undercompaction disequilibrium due to rapid burial of sediments. Therefore, it is imperative to properly predict formation pore pressure of this zones for adequate drilling design, mud weight design and safe drilling. It can be ascertained from this well that Eaton's pore pressure prediction method gives a much better results when compared to other methods.

CHAPTER FIVE
Conclusion and Recommendation

This chapter presents the summary of conclusions inferred from the applied methodology and results obtained. It also gives necessary suggestions for further work.

5.1 Conclusion

Based on the findings for pore pressure prediction in well planning and safe drilling, the following conclusions were made:

- The Eaton's pore pressure prediction method provide a much easier way to handle normal compaction trendlines.
- The method can accurately predict pore pressure in shales, where the compaction disequilibrium is the primary mechanism of overpressure generation.
- The reliability of the model is dependent of the degree of normally distributed of the well logs data.
- Pore pressure and fracture gradient approximately define mud windows in the absence of overburden and vertical stress data.
- The Eaton's method has the ability to predict wellbore pore pressure which is a yardstick for well planning, mud weight design and safe drilling with the accuracy of 92% for the kick and 89% for lost circulation.
- The n-exponent is a better parameter for formation pore pressure prediction especially while drilling.
- The Eaton's method can accurately geopressure gradient magnitudes within less than 0.5 ppg equivalent.

5.2 Recommendation

The following recommendations are necessary and adequate for field practice to improve pore pressure prediction in a wellbore and as well improve economic returns:

- A further study should be conducted on pore pressure prediction in well planning and safe drilling to compare model and field results.
- Proper wellbore surveillance should be carried out in case of serious deviation of overburden and vertical effective stress values from the predicted value.
- Leak off data can be used in place of fracture gradient predicted by the model.
- Minimum horizontal stress or effective stress can be used together with pore pressure to determine the minimum mud weight window.

References

Archie, Gus E., (1942) 'The electrical resistivity log as an aid in determining some reservoir characteristics' *transactions AIME*, 146:54-67.

Athy, L. F., (1930). Density, porosity, and compaction of sedimentary rocks: AAPG Bulletin, 14 (1) 1-24.

Bingham, M. Grant, (1965) "A new approach to interpreting rock drillability," *Oil and Gas Series, 21 parts*, November 2, 1964 - April 5, 1965.

Biot, M.A., (1941) "General Theory of Three-Dimensional Consolidation". *Journal of Applied Physics*. 12(1), 155-164

Bourgoyne, Adam T. Jr., Keith, K. Milleim., Martin, E. Chenevert, Young, F.S. Jr., (1986) Applied Drilling Engineering. SPE textbook series, Richardson, Texas.

Cayeux, E., Daireaux, B., Karimi Balov, M., Haavardstein, S., Magne Stokland, L., & Saasen, A. (2016). "Automatic Performance Analysis and Estimation of Risk Level Embedded in Drilling Operation Plans".

Davies, R.J., Swarbrick, R.E., Evans, R.J., Huuse, M (2007) "Birth of a Mud Volcano". *GSA Today* 17(2)

Dodson, J.K., (2004) Gulf of Mexico 'trouble time' creates major drilling expenses [online] available from <https://www.offshore-mag.com/drilling-completion/article/16756938/gulf-of-mexico-trouble-time-creates-major-drilling-expenses> [19-April 2021]

Eaton, B.A., (1972) "The Effect of Overburden Stress on Geopressures Prediction from Well Logs". Paper SPE3719. *Journal of Petroleum Technology*, Aug., 1972 (24) 929-934.

Foster, J. B. and Whalen, H. E., (1966) 'Estimation of formation pressures from electrical surveys - offshore Louisiana,' *Journal of Petroleum Technology*, 18:165-171.

Gardner, G.H.F., Gardner, L.W. and Gregory, A.R., (1974).' Formation Velocity and Density – the Diagnostic Basis for Stratigraphic Traps'. *Geophysics* 39 (6) 2085-2095.

Gutierrez, M.A., Braunsdorf, N.R., Couzens, B.A (2006) "Calibration and Ranking of Pore Pressure Prediction Models". *The Leading Edge*, 25(12), 1441-1568.

Heppard, P.D., Cander, H.S., Eggerston, E.B. (1998) "Abnormal pressure and the occurrence of hydrocarbons in offshore eastern Trinidad, West Indies., in Law, B.E., Ulmishek, G.F., and V.I Slavin eds., Abnormal pressures in hydrocarbon environments". *AAPG Memoir* 70, 215-246.

Holand P., Skalle, P., (2001) "Deepwater Kicks and BOP Performance. SINTEF Report for U.S Minerals Management Service.

Hottmann, C.E., Johnson, R.K., (1965). 'Estimation of formation pressures from log-derived shale properties'. Paper SPE1110, JPT, 17:717-722.

Hubbert, M.K. and Rubey, W.W., (1959) "Role of fluid pressure in mechanics of overthrust faulting 1 Mechanics of fluid-filled porous solids and its application to overthrust faulting," *Geol. Soc. Am. Bulletin* 70 (2) 115-166.

Jean-Louis, J.A., (1989) *Real-Time Effective Stress Evaluation in Shales: Pore Pressure and Permeability Estimation*. Unpublished PhD thesis. Louisiana: Louisiana State University

Jordan, J. B. and Shirley, O. J., 1966: "Application of drilling performance data to overpressure detection," Journal of Petroleum Technology, Vol. 18, 1387-1394.

Law, B.E., and Spencer, C.W (1998) "Abnormal Pressures in Hydrocarbon Environments, in Law, B.E., Ulmishek, G.F., and V.I Slavin eds., abnormal pressures in hydrocarbon environments". *AAPG Memoir* 70, 1-11.

Morley, C.K., King, R., Tingay, M., Backe, G (2011) "Deepwater fold and thrust belt classification, tectonics, structure and hydrocarbon prospectivity: A review". *Earth-Science Reviews* 104, 41-91.

Mouchet, J.C., Mitchell, A. (1989) Abnormal Pressures while Drilling. Editions TECHNIP, Paris.

Nelson, P.N., Bird, K.J (2005) "Porosity-Depth Trends and Regional Uplift Calculated from Sonic Logs". U.S Geological Survey, Scientific Investigation Report 2005-5051. [Online] available from <https://pubs.usgs.gov/sir/2005/5051/> [26-April, 2021]

Pennebaker, E. S., (1968) 'An Engineering Interpretation of Seismic Data'. *Society of Petroleum Engineers*. Held at Fall Meeting of the Society of Petroleum Engineers of AIME, September 29–October 2 at Houston, Texas, USA. Paper SPE-2165-MS

Powley, D.E. (1990) "Pressures and hydrogeology in petroleum basins". *Earth-Science Reviews* 29(1-4), 215-226.

Rehm, Bill and McClendon, Ray, (1971) "Measurement of formation pressures from drilling data," SPE paper 3601 presented at the 46th Annual Fall Meeting, New Orleans, LA, October 3-6.

Schneider, F., Burrus, J. and Wolf, S. (1993) 'Modelling Overpressures by Effective Stress / Porosity Relationships in Low-Permeability Rocks: empirical artifice or physical reality? *Basin Modelling: Advances and Applications*, A.G. Dore *et al* (Eds) Elsevier, Amsterdam.

Swarbrick, R.E., Osborne, M.J., (1998) "Mechanism that Generate Abnormal Pressure: an Overview, Abnormal Pressure in Hydrocarbon Environments". *AAPG Memoir* 70 13-34.

Swarbrick, R.E., Osborne, M.J., Yardley, G.S., (2002) “Comparison of overpressure magnitude resulting from the main generating mechanisms, in A. R. Huffman and G. L. Bowers, eds., Pressure regimes in sedimentary basins and their prediction”. *AAPG Memoir* 70 1-12.

Terzaghi, K., (1943) *Theoretical Soil Mechanics,* John Wiley & Sons, New-York.

Terzaghi, K., Peck, R.B., Mesri, G. (1996) Soil Mechanics in Engineering Practice (3rd Edition). John Wiley & Sons.

Tingay, M.R.P., Hillis, R.R., Swarbrick, R.E., Morley, C.K., Damit, A.R., (2009). “Origin of Over Pressure and Pore-Pressure Prediction in the Baram Province, Brunei”. *AAPG Bulletin*, 93(1) 51-74.

York, P.L., Prichard, D.M., Dodson, J.K., Dodson, T., Rosenberg, S.T., Gala, D., and Utama, B (2009) “Eliminating Non-Productive Time Associated with Drilling through Trouble Zones” *Offshore Technology Conference* SPE paper OTC-20220-MS presented at the Offshore Technology Conference, Houston, Texas, May 4.

Young, R., Salehi, S., Mannon, T. (2014) ‘Seismic Frequency versus Seismic Interval Velocity Based Pore Pressure Prediction Methodologies for a Near Salt Field in Mississippi Canyon, Gulf of Mexico: Accuracy Analysis and Implications’. *IADC/SPE Drilling Conference and Exhibition*. Held 2-4 March at Fort Worth, Texas, USA. Paper IADC/SPE 167915

Zhang, J.J., (2011) “Pore pressure prediction from well logs: Methods, modifications, and new approaches”. *Earth-Science Reviews* 108, 50-63

Zoeller, W.A., (1983) "Pore pressure detection from the MWD gamma ray," *Society of Petroleum Engineers* SPE paper 12166 presented at the 58th Annual Technical Conference and Exhibition, San Francisco, CA, October 5-8.

Appendix A

Table 4.1 Numerical results of the required parameters from the shale resistivity data using Eaton's pore pressure prediction model at given formation depths.

Depth	Resistivity R_o	Slope m	8.55185E-05
3100	0.55	Intercept C	0.386178403
8342	0.85		
11588	1.2		

Depth	Resistivity R_o	R_n	S_f	F_P,psi/ft	F_P,ppg	P_p, psi
3110	0.55					
3538	0.55					
4135	0.55					
4544	0.5					
4890	0.5					
5175	0.55					
5363	0.5					
5867	0.5					
6041	0.5					
6167	0.54					
6482	0.55					
6577	0.55					
6955	0.7					
7113	0.7					
7255	0.7					
7696	0.71					
8200	0.76					
8342	0.85					
8767	0.8					
9113	0.85					
9492	0.91					
9665	0.86					
9996	0.8					
10217	0.85					
10485	0.92					
10659	0.91					
10989	0.9					

11162	0.91					
11478	0.9					
11588	1.2	1.0403239	0.9587428	0.3347371	6.437252	3878.934
11776	1.16	1.0571848	0.9598389	0.3709324	7.133316	4368.1
11966	1.1	1.0745028	0.9609341	0.4179316	8.037145	5000.969
12265	1.11	1.1023322	0.9626328	0.428576	8.241846	5256.484
12470	0.96	1.1218278	0.963781	0.5235006	10.06732	6528.052
12550	0.9	1.1295291	0.9642256	0.5597493	10.76441	7024.854
12785	1.06	1.1524587	0.9655207	0.4838468	9.304747	6185.982
13069	0.91	1.1807914	0.9670653	0.5763718	11.08407	7532.603
13385	1.1	1.213136	0.9687594	0.4923837	9.468917	6590.555
13573	1.05	1.2327978	0.9697559	0.5270312	10.13522	7153.394
13778	1.06	1.2546009	0.9708335	0.531486	10.22088	7322.814
13983	0.96	1.2767896	0.9719023	0.5891725	11.33024	8238.399
14188	0.96	1.2993707	0.972963	0.5974631	11.48968	8476.807
14487	0.71	1.3330241	0.9744967	0.7202237	13.85046	10433.88
14566	0.8	1.3420604	0.9748995	0.6836265	13.14666	9957.703
14833	0.8	1.3730568	0.976254	0.6921452	13.31048	10266.59
14960	0.9	1.3880506	0.9768948	0.65351	12.5675	9776.51
15275	1.06	1.4259505	0.9784761	0.5963406	11.46809	9109.102

Table 4.2 Numerical results of the required parameters from the formation density data using Eaton's pore pressure prediction model at given formation depths.

Slope (m)	-8.02336E-05
Intercept C	4.434721482

Depth (ft)	Bulk density g/cm3	Normal Bulk density, g/cm3	S_f	F_P,psi/ft	F_P,ppg	P_p, psi
11999.5	2.981					
12000	3.0104					
12000.5	3.0328					
12001	3.0449					
12001.5	3.0085					
12002	2.8649	1.692998221	0.96114	0.680205	13.08087	8163.82399
12002.5	2.7544	1.692930305	0.961143	0.666643	12.82005	8001.376905

12003	2.6151	1.692862392	0.961146	0.647735	12.45644	7774.764451
12003.5	2.4582	1.692794481	0.961149	0.623597	11.99225	7485.343581
12004	2.3806	1.692726573	0.961152	0.610368	11.73785	7326.859608
12004.5	2.2972	1.692658667	0.961154	0.595049	11.44326	7143.271332
12005	2.1676	1.692590764	0.961157	0.568647	10.93553	6826.611418
12005.5	2.0819	1.692522864	0.96116	0.5492	10.56154	6593.420232
12006	1.9739	1.692454967	0.961163	0.522028	10.03899	6267.464702
12006.5	1.8292	1.692387073	0.961166	0.480042	9.231585	5763.629116
12007	1.7716	1.692319181	0.961169	0.461235	8.8699	5538.046273
12007.5	1.7545	1.692251292	0.961172	0.455407	8.757818	5468.294034
12008	1.8054	1.692183405	0.961174	0.472493	9.086397	5673.691536
12008.5	1.8539	1.692115522	0.961177	0.487817	9.381089	5857.945941
12009	1.9417	1.692047641	0.96118	0.513406	9.8732	6165.497608
12009.5	2.1646	1.691979763	0.961183	0.568171	10.92637	6823.453882
12010	2.1759	1.691911887	0.961186	0.570639	10.97382	6853.372445
12010.5	2.1435	1.691844015	0.961189	0.563564	10.83777	6768.686156
12011	2.1543	1.691776145	0.961192	0.565975	10.88413	6797.92172
12011.5	2.188	1.691708277	0.961194	0.573287	11.02476	6886.042232
12012	2.2755	1.691640413	0.961197	0.591136	11.368	7100.726146
12012.5	2.5891	1.691572551	0.9612	0.644266	12.38974	7739.2486
12013	2.6912	1.691504692	0.961203	0.658656	12.66645	7912.428982
12013.5	2.8614	1.691436835	0.961206	0.680135	13.07952	8170.801716
12014	3.3222	1.691368982	0.961209	0.726256	13.96646	8725.238602
12014.5	3.6337	1.691301131	0.961212	0.750225	14.42741	9013.582462
12015	3.9593	1.691233282	0.961214	0.770882	14.82466	9262.149716
12015.5	4.1489	1.691165437	0.961217	0.781282	15.02465	9387.49414
12016	4.0869	1.691097594	0.96122	0.778012	14.96177	9348.5937
12016.5	3.8368	1.691029754	0.961223	0.763601	14.68463	9175.808927
12017	3.128	1.690961917	0.961226	0.708727	13.62936	8516.767506
12017.5	2.9249	1.690894082	0.961229	0.687558	13.22227	8262.727502
12018	2.7952	1.69082625	0.961232	0.672265	12.92817	8079.280535

12018.5	2.7313	1.690758421	0.961234	0.664149	12.7721	7982.075519
12019	2.7392	1.690690595	0.961237	0.665192	12.79216	7994.948016
12019.5	2.8001	1.690622771	0.96124	0.672917	12.94072	8088.128488
12020	3.0204	1.69055495	0.961243	0.697979	13.42267	8389.707341
12020.5	3.0768	1.690487131	0.961246	0.703773	13.5341	8459.705267
12021	3.0578	1.690419316	0.961249	0.701866	13.49743	8437.132448
12021.5	2.8957	1.690351503	0.961252	0.684361	13.16078	8227.040037
12022	2.7482	1.690283693	0.961254	0.666448	12.81631	8012.040397
12022.5	2.5335	1.690215885	0.961257	0.636237	12.23532	7649.154557
12023	2.1779	1.690148081	0.96126	0.571577	10.99186	6872.065963
12023.5	2.0412	1.690080279	0.961263	0.540075	10.38605	6493.587971
12024	1.9473	1.69001248	0.961266	0.515609	9.91555	6199.677675
12024.5	1.9153	1.689944683	0.961269	0.506681	9.743865	6092.585578
12025	1.9088	1.689876889	0.961272	0.504845	9.70856	6070.762587
12025.5	1.9049	1.689809098	0.961274	0.503746	9.687422	6057.796824
12026	1.9053	1.68974131	0.961277	0.503884	9.690069	6059.704254
12026.5	1.9056	1.689673524	0.96128	0.503992	9.692162	6061.264752
12027	1.9166	1.689605741	0.961283	0.507162	9.753121	6099.640929
12027.5	1.9503	1.689537961	0.961286	0.516584	9.93431	6213.215576
12028	1.9752	1.689470183	0.961289	0.523324	10.06393	6294.546501
12028.5	2.0052	1.689402409	0.961292	0.531197	10.21532	6389.500587
12029	2.021	1.689334637	0.961294	0.53525	10.29326	6438.517722
12029.5	2.0222	1.689266867	0.961297	0.535574	10.2995	6442.687906
12030	2.0186	1.689199101	0.9613	0.534684	10.28238	6432.247017
12030.5	2.0081	1.689131337	0.961303	0.532027	10.23129	6400.548861
12031	2.007	1.689063575	0.961306	0.531766	10.22626	6397.67313
12031.5	2.02	1.688995817	0.961309	0.535102	10.29042	6438.078168
12032	2.0125	1.688928061	0.961312	0.533216	10.25416	6415.658452
12032.5	2.0163	1.688860308	0.961314	0.534205	10.27318	6427.826315
12033	2.0573	1.688792558	0.961317	0.54442	10.46961	6551.003907
12033.5	2.2178	1.68872481	0.96132	0.580376	11.16108	6983.958027

12034	2.32	1.688657065	0.961323	0.600442	11.54697	7225.722289
12034.5	2.4155	1.688589323	0.961326	0.617513	11.87525	7431.458741
12035	2.4513	1.688521584	0.961329	0.623547	11.99128	7504.385654
12035.5	2.4575	1.688453847	0.961332	0.624586	12.01128	7517.209673
12036	2.4302	1.688386113	0.961334	0.620059	11.92422	7463.033857
12036.5	2.2709	1.688318382	0.961337	0.591152	11.36831	7115.403898
12037	2.2005	1.688250653	0.96134	0.576915	11.09451	6944.320564
12037.5	2.1188	1.688182927	0.961343	0.559079	10.75151	6729.910732
12038	1.9328	1.688115204	0.961346	0.512211	9.850217	6165.999173
12038.5	1.8956	1.688047484	0.961349	0.501636	9.646852	6038.948876
12039	1.8874	1.687979766	0.961352	0.499261	9.601176	6010.605181
12039.5	1.892	1.687912051	0.961354	0.500632	9.62753	6027.353593
12040	1.8962	1.687844339	0.961357	0.501878	9.651507	6042.61535
12040.5	1.896	1.687776629	0.96136	0.501843	9.650821	6042.436815
12041	1.8953	1.687708922	0.961363	0.501662	9.647337	6040.506327
12041.5	1.8959	1.687641218	0.961366	0.501859	9.651127	6043.130138
12042	1.8996	1.687573517	0.961369	0.502955	9.672209	6056.582217
12042.5	1.9213	1.687505818	0.961372	0.509183	9.791981	6131.836457
12043	1.9754	1.687438122	0.961374	0.524024	10.07739	6310.825696
12043.5	2.1353	1.687370429	0.961377	0.563045	10.82778	6781.027018
12044	2.7381	1.687302738	0.96138	0.665825	12.80432	8019.192468
12044.5	2.575	1.68723505	0.961383	0.643237	12.36994	7747.464141
12045	2.3071	1.687167365	0.961386	0.598424	11.50815	7208.013787
12045.5	2.5992	1.687099683	0.961389	0.64682	12.43886	7791.276294
12046	2.6868	1.687032003	0.961391	0.659103	12.67506	7939.55647
12046.5	2.6759	1.686964326	0.961394	0.657641	12.64694	7922.269537
12047	2.3362	1.686896652	0.961397	0.603915	11.61375	7275.361588
12047.5	2.2293	1.68682898	0.9614	0.583266	11.21665	7026.895909
12048	2.1432	1.686761312	0.961403	0.564984	10.86508	6806.927637
12048.5	2.0648	1.686693645	0.961406	0.546874	10.51682	6589.015986
12049	2.0468	1.686625982	0.961409	0.542517	10.43301	6536.784042

12049.5	2.034	1.686558321	0.961411	0.539372	10.37254	6499.166744
12050	1.9717	1.686490663	0.961414	0.523341	10.06426	6306.265053
12050.5	1.9818	1.686423008	0.961417	0.526041	10.11617	6339.053376
12051	2.0034	1.686355356	0.96142	0.531689	10.22478	6407.380833
12051.5	1.9933	1.686287706	0.961423	0.529096	10.17492	6376.398154
12052	1.9927	1.686220059	0.961426	0.528961	10.17233	6375.037182
12052.5	1.9912	1.686152414	0.961429	0.528591	10.16522	6370.846879
12053	1.9798	1.686084773	0.961431	0.52562	10.10808	6335.301071
12053.5	1.9737	1.686017134	0.961434	0.524025	10.0774	6316.335245
12054	1.9701	1.685949497	0.961437	0.523087	10.05937	6305.293863
12054.5	1.976	1.685881864	0.96144	0.524679	10.08998	6324.742037
12055	1.9854	1.685814233	0.961443	0.527181	10.13809	6355.16218
12055.5	2.0082	1.685746605	0.961446	0.533111	10.25214	6426.9254
12056	2.0814	1.685678979	0.961448	0.551144	10.59893	6644.5969
12056.5	2.0502	1.685611357	0.961451	0.543661	10.45502	6554.64802
12057	1.9953	1.685543737	0.961454	0.52985	10.18943	6388.402881
12057.5	1.9868	1.685476119	0.961457	0.527655	10.14721	6362.19728
12058	1.9894	1.685408505	0.96146	0.528356	10.1607	6370.921154
12058.5	1.9951	1.685340893	0.961463	0.529862	10.18966	6389.342147
12059	1.9995	1.685273284	0.961466	0.531023	10.21198	6403.604084
12059.5	1.9986	1.685205678	0.961468	0.530811	10.20791	6401.320788
12060	1.9988	1.685138074	0.961471	0.530884	10.20932	6402.466165
12060.5	2.019	1.685070473	0.961474	0.53607	10.30904	6465.270738
12061	2.0165	1.685002875	0.961477	0.535458	10.29727	6458.158622
12061.5	2.0111	1.684935279	0.96148	0.534106	10.27127	6442.120021
12062	2.0131	1.684867686	0.961483	0.534637	10.28147	6448.786658
12062.5	2.016	1.684800096	0.961486	0.535394	10.29605	6458.194652
12063	2.0229	1.684732508	0.961488	0.537159	10.32998	6479.746812
12063.5	2.0587	1.684664924	0.961491	0.546019	10.50036	6586.896242
12064	2.0661	1.684597342	0.961494	0.547824	10.53508	6608.951705
12064.5	2.0776	1.684529762	0.961497	0.550591	10.58829	6642.603299

12065	2.1249	1.684462186	0.9615	0.561562	10.79927	6775.248866
12065.5	2.1295	1.684394612	0.961503	0.562619	10.81959	6788.275382
12066	2.129	1.684327041	0.961505	0.562526	10.81781	6787.440446
12066.5	2.147	1.684259472	0.961508	0.566556	10.89532	6836.353469
12067	2.1444	1.684191907	0.961511	0.566002	10.88464	6829.940181
12067.5	2.1393	1.684124344	0.961514	0.56489	10.86326	6816.805104
12068	2.1413	1.684056783	0.961517	0.565354	10.87219	6822.690551
12068.5	2.1452	1.683989226	0.96152	0.566238	10.88919	6833.640156
12069	2.1505	1.683921671	0.961523	0.567426	10.91204	6848.266506
12069.5	2.1547	1.683854118	0.961525	0.568367	10.93014	6859.911203
12070	2.1531	1.683786569	0.961528	0.568037	10.92378	6856.200833
12070.5	2.1516	1.683719022	0.961531	0.567727	10.91783	6852.748684
12071	2.1638	1.683651478	0.961534	0.570409	10.96941	6885.412939
12071.5	2.1599	1.683583937	0.961537	0.569581	10.95349	6875.702658
12072	2.1536	1.683516398	0.96154	0.568225	10.9274	6859.609855
12072.5	2.1524	1.683448862	0.961543	0.567981	10.92272	6856.954595
12073	2.1518	1.683381329	0.961545	0.567869	10.92056	6855.886265
12073.5	2.152	1.683313798	0.961548	0.567933	10.92179	6856.937832
12074	2.1549	1.683246271	0.961551	0.568588	10.93439	6865.132942
12074.5	2.1569	1.683178746	0.961554	0.569045	10.94317	6870.933365
12075	2.1581	1.683111223	0.961557	0.569326	10.94859	6874.617063
12075.5	2.1504	1.683043703	0.96156	0.56766	10.91654	6854.780571
12250	1.2732	1.659643994	0.962548	0.234689	4.513246	2874.937905
12250.5	1.2561	1.659577416	0.962551	0.222817	4.284936	2729.615454
12251	1.1946	1.65951084	0.962554	0.176922	3.40234	2167.467596
12251.5	1.4749	1.659444267	0.962557	0.352525	6.779322	4318.956857
12252	1.0721	1.659377697	0.96256	0.068088	1.309376	834.2084799
12252.5	1.0804	1.659311129	0.962562	0.076368	1.468614	935.6979076
12253	1.0345	1.659244564	0.962565	0.02902	0.558078	355.5824834

Table 4.3 Numerical results of the required parameters from the sonic interval transit time/velocity data using Eaton's pore pressure prediction model at given formation depths.

Slope (m)	-6.32987E-05
Intercept C	197.4538297

Depth (ft)	Dt	Dn	Sf	FP,psi/ft	FP,ppg	Pp,psi
8952	117.7					
8952.5	117					
8953	115.2					
8953.5	115.1					
8954	114.1					
8954.5	114.7					
8955	109.3					
8955.5	113.2					
8956	117.7					
8956.5	125.6					
8957	127.2					
8957.5	124.9	112.0009	0.94183	0.532672	10.2437	8436.446
8958	126.3	111.9974	0.941834	0.541719	10.41767	8436.949
8958.5	126.6	111.9938	0.941838	0.543639	10.45459	8437.451
8959	123.5	111.9903	0.941841	0.523425	10.06586	8437.954
8959.5	120.5	111.9867	0.941845	0.50236	9.66076	8438.457
8960	118	111.9832	0.941848	0.483569	9.299411	8438.959
8960.5	113.2	111.9796	0.941852	0.443912	8.536776	8439.462
8961	115	111.9761	0.941855	0.459409	8.834783	8439.964
8961.5	118.6	111.9725	0.941859	0.488282	9.390035	8440.467
8962	120.6	111.969	0.941862	0.503229	9.677487	8440.97
8962.5	128.6	111.9655	0.941866	0.55613	10.69482	8441.472
8963	113.5	111.9619	0.941869	0.446698	8.590353	8441.975
8963.5	116.4	111.9584	0.941873	0.471095	9.05951	8442.478
8964	114.7	111.9548	0.941876	0.457067	8.789748	8442.98
8964.5	117.2	111.9513	0.94188	0.477559	9.183827	8443.483
8965	122.3	111.9477	0.941883	0.515504	9.913542	8443.986
8965.5	130	111.9442	0.941887	0.564543	10.85659	8444.488
8966	130	111.9407	0.941891	0.564567	10.85707	8444.991
8966.5	126.3	111.9371	0.941894	0.542162	10.42619	8445.493
8967	127.7	111.9336	0.941898	0.550904	10.59431	8445.996
8967.5	120.2	111.93	0.941901	0.500618	9.627262	8446.499
8968	133.9	111.9265	0.941905	0.586322	11.27542	8447.001

8968.5	133.6	111.9229	0.941908	0.584747	11.24513	8447.504
8969	135.1	111.9194	0.941912	0.592657	11.39725	8448.007
8969.5	136.1111	111.9159	0.941915	0.597849	11.4971	8448.509
8970	136.1111	111.9123	0.941919	0.597872	11.49754	8449.012
8970.5	136.1111	111.9088	0.941922	0.597895	11.49799	8449.515
8971	136.1111	111.9052	0.941926	0.597918	11.49843	8450.017
8971.5	136.1111	111.9017	0.941929	0.597941	11.49887	8450.52
8972	136.1111	111.8981	0.941933	0.597964	11.49931	8451.023
8972.5	135	111.8946	0.941937	0.592302	11.39042	8451.525
8973	135	111.8911	0.94194	0.592325	11.39087	8452.028
8973.5	135	111.8875	0.941944	0.592348	11.39132	8452.531
8974	133.8889	111.884	0.941947	0.586546	11.27972	8453.034
8974.5	132.7778	111.8804	0.941951	0.580596	11.16532	8453.536
8975	132.7778	111.8769	0.941954	0.58062	11.16578	8454.039
8975.5	131.6667	111.8734	0.941958	0.57452	11.04847	8454.542
8976	130.5556	111.8698	0.941961	0.568264	10.92816	8455.044
8976.5	130.5556	111.8663	0.941965	0.568289	10.92863	8455.547
8977	131.6667	111.8627	0.941968	0.574593	11.04987	8456.05
8977.5	131.6667	111.8592	0.941972	0.574617	11.05034	8456.552
8978	131.6667	111.8557	0.941975	0.574642	11.0508	8457.055
8978.5	132.7778	111.8521	0.941979	0.580788	11.16899	8457.558
8979	133.8889	111.8486	0.941982	0.586781	11.28425	8458.061
8979.5	133.8889	111.845	0.941986	0.586805	11.28471	8458.563
8980	133.8889	111.8415	0.94199	0.586828	11.28516	8459.066
8980.5	133.8889	111.838	0.941993	0.586852	11.28561	8459.569
8981	133.8889	111.8344	0.941997	0.586875	11.28606	8460.071
8981.5	133.8889	111.8309	0.942	0.586899	11.28652	8460.574
8982	133.8889	111.8273	0.942004	0.586922	11.28697	8461.077
8982.5	133.8889	111.8238	0.942007	0.586946	11.28742	8461.58
8983	133.8889	111.8203	0.942011	0.586969	11.28787	8462.082
8983.5	135	111.8167	0.942014	0.592813	11.40025	8462.585
8984	135	111.8132	0.942018	0.592836	11.40069	8463.088
8984.5	135	111.8096	0.942021	0.592859	11.40114	8463.59
8985	135	111.8061	0.942025	0.592883	11.40159	8464.093
8985.5	135	111.8026	0.942028	0.592906	11.40203	8464.596
8986	135	111.799	0.942032	0.592929	11.40248	8465.099
8986.5	135	111.7955	0.942035	0.592952	11.40293	8465.601
8987	135	111.792	0.942039	0.592975	11.40337	8466.104
8987.5	133.8889	111.7884	0.942042	0.587181	11.29195	8466.607
8988	132.7778	111.7849	0.942046	0.581241	11.17772	8467.11
8988.5	132.7778	111.7813	0.94205	0.581265	11.17818	8467.612

8989	132.7778	111.7778	0.942053	0.581289	11.17864	8468.115
8989.5	132.7778	111.7743	0.942057	0.581313	11.17909	8468.618
8990	133.8889	111.7707	0.94206	0.587299	11.29421	8469.121
8990.5	133.8889	111.7672	0.942064	0.587322	11.29466	8469.623
8991	133.8889	111.7637	0.942067	0.587346	11.29512	8470.126
8991.5	133.8889	111.7601	0.942071	0.58737	11.29557	8470.629
8992	133.8889	111.7566	0.942074	0.587393	11.29602	8471.132
8992.5	133.8889	111.753	0.942078	0.587417	11.29647	8471.635
8993	132.7778	111.7495	0.942081	0.58148	11.18231	8472.137
8993.5	132.7778	111.746	0.942085	0.581504	11.18276	8472.64
8994	131.6667	111.7424	0.942088	0.575417	11.0657	8473.143
8994.5	130.5556	111.7389	0.942092	0.569173	10.94564	8473.646
8995	129.4444	111.7354	0.942095	0.562768	10.82247	8474.148
8995.5	114.6	111.7318	0.942099	0.458164	8.810852	8474.651
8996	112.1	111.7283	0.942102	0.436371	8.391744	8475.154
8996.5	127.8	111.7247	0.942106	0.55302	10.63501	8475.657
8997	129	111.7212	0.94211	0.56025	10.77405	8476.16
8997.5	130.2	111.7177	0.942113	0.567282	10.90926	8476.662
8998	129.3	111.7141	0.942117	0.56207	10.80904	8477.165
8998.5	115.8	111.7106	0.94212	0.468324	9.006221	8477.668
8999	117.2	111.7071	0.942124	0.479605	9.223171	8478.171
8999.5	103.3	111.7035	0.942127	0.346795	6.669132	8478.674
9000	111.7	111.7	0.942131	0.433	8.326923	8479.176
9000.5	110.3	111.6965	0.942134	0.420026	8.077433	8479.679
9001	110.9	111.6929	0.942138	0.425693	8.186411	8480.182
9001.5	112.2	111.6894	0.942141	0.437624	8.415837	8480.685
9002	103.4	111.6859	0.942145	0.348131	6.694825	8481.188
9002.5	109	111.6823	0.942148	0.407633	7.839095	8481.69
9003	101.7	111.6788	0.942152	0.328182	6.311198	8482.193
9003.5	101.3	111.6753	0.942155	0.323362	6.218508	8482.696
9004	96.2	111.6717	0.942159	0.256055	4.924143	8483.199
9004.5	103.7	111.6682	0.942162	0.351747	6.764363	8483.702
9005	102.4	111.6647	0.942166	0.336698	6.474969	8484.205
9005.5	107.9	111.6611	0.942169	0.396885	7.632397	8484.707
9006	111.5	111.6576	0.942173	0.43156	8.299226	8485.21
9006.5	114.5	111.6541	0.942177	0.457997	8.807636	8485.713
9007	116.3	111.6505	0.94218	0.472899	9.094203	8486.216
9007.5	116.6	111.647	0.942184	0.47534	9.141156	8486.719
9008	121.2	111.6435	0.942187	0.510132	9.81024	8487.222
9008.5	118.8	111.6399	0.942191	0.492528	9.471698	8487.724
9009	118.6	111.6364	0.942194	0.491039	9.443065	8488.227

9009.5	115.6	111.6329	0.942198	0.467349	8.98749	8488.73
9010	116.3	111.6293	0.942201	0.473078	9.097662	8489.233
9010.5	116.3	111.6258	0.942205	0.473108	9.098238	8489.736
9011	112.5	111.6223	0.942208	0.440915	8.479133	8490.239
9011.5	115	111.6187	0.942212	0.462504	8.894306	8490.742
9012	115.4	111.6152	0.942215	0.465854	8.958732	8491.244
9012.5	114.9	111.6117	0.942219	0.46173	8.879419	8491.747
9013	116.1	111.6081	0.942222	0.471641	9.070021	8492.25
9013.5	125	111.6046	0.942226	0.536293	10.31332	8492.753
9014	122.4	111.6011	0.942229	0.518891	9.978681	8493.256
9014.5	124.5	111.5975	0.942233	0.533079	10.25152	8493.759
9015	125.8	111.594	0.942236	0.541518	10.4138	8494.262
9015.5	127.7	111.5905	0.94224	0.553379	10.6419	8494.764
9016	130.9	111.5869	0.942243	0.572183	11.00352	8495.267
9016.5	132.9	111.5834	0.942247	0.583261	11.21656	8495.77
9017	135	111.5799	0.942251	0.594366	11.43011	8496.273
9017.5	135	111.5763	0.942254	0.594389	11.43055	8496.776
9018	135	111.5728	0.942258	0.594412	11.431	8497.279
9018.5	135	111.5693	0.942261	0.594435	11.43144	8497.782
9019	135	111.5657	0.942265	0.594458	11.43189	8498.285
9019.5	135	111.5622	0.942268	0.594481	11.43233	8498.788
9020	135	111.5587	0.942272	0.594504	11.43278	8499.29
9020.5	135	111.5551	0.942275	0.594528	11.43322	8499.793
9021	133.8889	111.5516	0.942279	0.588755	11.32222	8500.296
9021.5	133.8889	111.5481	0.942282	0.588779	11.32267	8500.799
9022	133.8889	111.5446	0.942286	0.588802	11.32312	8501.302
9022.5	133.8889	111.541	0.942289	0.588826	11.32357	8501.805
9023	133.8889	111.5375	0.942293	0.588849	11.32402	8502.308
9023.5	133.8889	111.534	0.942296	0.588873	11.32447	8502.811
9024	133.8889	111.5304	0.9423	0.588896	11.32492	8503.314
9024.5	134.4445	111.5269	0.942303	0.591834	11.38143	8503.817
9025	135	111.5234	0.942307	0.594736	11.43722	8504.32
9025.5	136.1111	111.5198	0.94231	0.60041	11.54634	8504.822
9026	136.1111	111.5163	0.942314	0.600433	11.54678	8505.325
9026.5	137.2222	111.5128	0.942317	0.605969	11.65325	8505.828
9027	137.2222	111.5093	0.942321	0.605992	11.65369	8506.331
9027.5	138.3333	111.5057	0.942324	0.611395	11.7576	8506.834
9028	138.3333	111.5022	0.942328	0.611417	11.75802	8507.337
9028.5	138.8889	111.4987	0.942332	0.614081	11.80926	8507.84
9029	139.4444	111.4951	0.942335	0.616713	11.85987	8508.343
9029.5	139.4444	111.4916	0.942339	0.616735	11.86029	8508.846

9030	139.4444	111.4881	0.942342	0.616757	11.86071	8509.349
9030.5	139.4444	111.4846	0.942346	0.616779	11.86113	8509.852
9031	139.4444	111.481	0.942349	0.616801	11.86156	8510.355
9031.5	139.4444	111.4775	0.942353	0.616823	11.86198	8510.858
9032	139.4444	111.474	0.942356	0.616845	11.8624	8511.361
9032.5	139.4444	111.4704	0.94236	0.616866	11.86282	8511.864
9033	139.4444	111.4669	0.942363	0.616888	11.86324	8512.367
9033.5	139.4444	111.4634	0.942367	0.61691	11.86366	8512.87
9034	139.4444	111.4599	0.94237	0.616932	11.86408	8513.372
9034.5	139.4444	111.4563	0.942374	0.616954	11.8645	8513.875
9035	139.4444	111.4528	0.942377	0.616976	11.86492	8514.378
9035.5	139.4444	111.4493	0.942381	0.616998	11.86534	8514.881
9036	139.4444	111.4458	0.942384	0.61702	11.86576	8515.384
9036.5	139.4444	111.4422	0.942388	0.617041	11.86618	8515.887
9037	139.4444	111.4387	0.942391	0.617063	11.8666	8516.39
9037.5	139.4444	111.4352	0.942395	0.617085	11.86702	8516.893
9038	139.4444	111.4316	0.942398	0.617107	11.86744	8517.396
9038.5	139.4444	111.4281	0.942402	0.617129	11.86786	8517.899
9039	139.4444	111.4246	0.942405	0.617151	11.86828	8518.402
9039.5	139.4444	111.4211	0.942409	0.617173	11.8687	8518.905
9040	139.4444	111.4175	0.942412	0.617194	11.86912	8519.408
9040.5	139.4444	111.414	0.942416	0.617216	11.86954	8519.911
9041	139.4444	111.4105	0.942419	0.617238	11.86997	8520.414
9041.5	139.4444	111.407	0.942423	0.61726	11.87039	8520.917
9042	139.4444	111.4034	0.942426	0.617282	11.87081	8521.42
9042.5	139.7222	111.3999	0.94243	0.618595	11.89606	8521.923
9043	140	111.3964	0.942434	0.619901	11.92117	8522.426
9043.5	140.2778	111.3929	0.942437	0.621199	11.94613	8522.929
9044	140.5555	111.3893	0.942441	0.622488	11.97093	8523.432
9044.5	141.1111	111.3858	0.942444	0.625024	12.0197	8523.935
9045	141.6666	111.3823	0.942448	0.62753	12.06789	8524.438
9045.5	141.6667	111.3788	0.942451	0.627552	12.0683	8524.941
9046	141.6667	111.3752	0.942455	0.627573	12.06871	8525.444
9046.5	141.6667	111.3717	0.942458	0.627594	12.06912	8525.947
9047	141.6667	111.3682	0.942462	0.627616	12.06953	8526.45
9047.5	141.6667	111.3647	0.942465	0.627637	12.06994	8526.953
9048	141.6667	111.3611	0.942469	0.627658	12.07035	8527.456
9048.5	141.6667	111.3576	0.942472	0.627679	12.07076	8527.959
9049	141.6667	111.3541	0.942476	0.627701	12.07117	8528.462
9049.5	141.6667	111.3506	0.942479	0.627722	12.07158	8528.965
9050	141.6667	111.347	0.942483	0.627743	12.07199	8529.468

9050.5	141.6667	111.3435	0.942486	0.627764	12.07239	8529.971
9051	141.6667	111.34	0.94249	0.627786	12.0728	8530.475
9051.5	141.6667	111.3365	0.942493	0.627807	12.07321	8530.978
9052	141.6667	111.3329	0.942497	0.627828	12.07362	8531.481
9052.5	140.5556	111.3294	0.9425	0.622855	11.97798	8531.984
9053	140.5556	111.3259	0.942504	0.622877	11.9784	8532.487
9053.5	140.5556	111.3224	0.942507	0.622898	11.97881	8532.99
9054	140.5556	111.3188	0.942511	0.62292	11.97923	8533.493
9054.5	140.5556	111.3153	0.942514	0.622941	11.97964	8533.996
9055	139.4444	111.3118	0.942518	0.61785	11.88173	8534.499
9055.5	138.3333	111.3083	0.942521	0.612635	11.78145	8535.002
9056	137.2222	111.3048	0.942525	0.607294	11.67873	8535.505
9056.5	137.2222	111.3012	0.942528	0.607316	11.67916	8536.008
9057	137.2222	111.2977	0.942532	0.607339	11.67959	8536.511
9057.5	137.2222	111.2942	0.942535	0.607361	11.68002	8537.014
9058	137.2222	111.2907	0.942539	0.607384	11.68045	8537.517
9058.5	137.2222	111.2871	0.942542	0.607406	11.68089	8538.02
9059	137.2222	111.2836	0.942546	0.607428	11.68132	8538.523
9059.5	137.2222	111.2801	0.942549	0.607451	11.68175	8539.026
9060	137.2222	111.2766	0.942553	0.607473	11.68218	8539.53
9060.5	137.2222	111.2731	0.942556	0.607496	11.68261	8540.033
9061	137.2222	111.2695	0.94256	0.607518	11.68304	8540.536
9061.5	137.2222	111.266	0.942563	0.607541	11.68347	8541.039
9062	137.2222	111.2625	0.942567	0.607563	11.6839	8541.542
9062.5	137.2222	111.259	0.94257	0.607585	11.68433	8542.045
9063	137.2222	111.2554	0.942574	0.607608	11.68476	8542.548
9063.5	137.2222	111.2519	0.942578	0.60763	11.68519	8543.051
9064	137.7778	111.2484	0.942581	0.610348	11.73747	8543.554
9064.5	138.3333	111.2449	0.942585	0.613033	11.7891	8544.057
9065	138.3333	111.2414	0.942588	0.613055	11.78953	8544.56
9065.5	138.3333	111.2378	0.942592	0.613078	11.78995	8545.064
9066	138.3333	111.2343	0.942595	0.6131	11.79038	8545.567
9066.5	138.3333	111.2308	0.942599	0.613122	11.7908	8546.07
9067	138.3333	111.2273	0.942602	0.613144	11.79123	8546.573
9067.5	138.3333	111.2238	0.942606	0.613166	11.79165	8547.076
9068	138.3333	111.2202	0.942609	0.613188	11.79208	8547.579
9068.5	138.3333	111.2167	0.942613	0.61321	11.7925	8548.082
9069	138.3333	111.2132	0.942616	0.613232	11.79293	8548.585
9069.5	138.3333	111.2097	0.94262	0.613254	11.79335	8549.088
9070	138.3333	111.2062	0.942623	0.613276	11.79378	8549.592
9070.5	138.3333	111.2026	0.942627	0.613298	11.7942	8550.095

9071	138.3333	111.1991	0.94263	0.613321	11.79463	8550.598
9071.5	138.3333	111.1956	0.942634	0.613343	11.79505	8551.101
9072	138.3333	111.1921	0.942637	0.613365	11.79548	8551.604
9072.5	138.3333	111.1886	0.942641	0.613387	11.7959	8552.107
9073	138.3333	111.185	0.942644	0.613409	11.79632	8552.61
9073.5	138.3333	111.1815	0.942648	0.613431	11.79675	8553.114
9074	138.3333	111.178	0.942651	0.613453	11.79717	8553.617
9074.5	138.3333	111.1745	0.942655	0.613475	11.7976	8554.12
9075	138.3333	111.171	0.942658	0.613497	11.79802	8554.623
9075.5	138.3333	111.1675	0.942662	0.613519	11.79845	8555.126
9076	138.3333	111.1639	0.942665	0.613541	11.79887	8555.629
9076.5	138.3333	111.1604	0.942669	0.613563	11.7993	8556.132
9077	138.3333	111.1569	0.942672	0.613586	11.79972	8556.636
9077.5	138.3333	111.1534	0.942676	0.613608	11.80015	8557.139
9078	138.3333	111.1499	0.942679	0.61363	11.80057	8557.642
9078.5	138.3333	111.1463	0.942683	0.613652	11.80099	8558.145
9079	138.3333	111.1428	0.942686	0.613674	11.80142	8558.648
9079.5	138.3333	111.1393	0.94269	0.613696	11.80184	8559.151
9080	138.3333	111.1358	0.942693	0.613718	11.80227	8559.655
9080.5	138.3333	111.1323	0.942697	0.61374	11.80269	8560.158
9081	138.3333	111.1288	0.9427	0.613762	11.80312	8560.661
9081.5	138.3333	111.1252	0.942704	0.613784	11.80354	8561.164
9082	138.3333	111.1217	0.942707	0.613806	11.80397	8561.667
9082.5	138.3333	111.1182	0.942711	0.613828	11.80439	8562.17
9083	138.3333	111.1147	0.942714	0.61385	11.80481	8562.674
9083.5	138.3333	111.1112	0.942718	0.613872	11.80524	8563.177
9084	138.3333	111.1077	0.942721	0.613894	11.80566	8563.68
9084.5	138.3333	111.1041	0.942725	0.613916	11.80609	8564.183
9085	138.3333	111.1006	0.942728	0.613939	11.80651	8564.686
9085.5	138.3333	111.0971	0.942732	0.613961	11.80693	8565.19
9086	138.3333	111.0936	0.942735	0.613983	11.80736	8565.693
9086.5	138.3333	111.0901	0.942739	0.614005	11.80778	8566.196
9087	138.3333	111.0866	0.942742	0.614027	11.80821	8566.699
9087.5	138.3333	111.083	0.942746	0.614049	11.80863	8567.202
9088	138.3333	111.0795	0.942749	0.614071	11.80905	8567.706
9088.5	138.3333	111.076	0.942753	0.614093	11.80948	8568.209
9089	138.3333	111.0725	0.942756	0.614115	11.8099	8568.712
9089.5	137.2222	111.069	0.94276	0.608794	11.70757	8569.215
9090	137.2222	111.0655	0.942763	0.608816	11.708	8569.718
9090.5	136.1111	111.062	0.942767	0.603364	11.60316	8570.222
9091	135.5556	111.0584	0.94277	0.6006	11.54999	8570.725

9091.5	135	111.0549	0.942774	0.5978	11.49616	8571.228
9092	133.8889	111.0514	0.942777	0.592074	11.38604	8571.731
9092.5	132.7778	111.0479	0.942781	0.586204	11.27315	8572.235
9093	132.7778	111.0444	0.942784	0.586228	11.27361	8572.738
9093.5	132.7778	111.0409	0.942788	0.586251	11.27406	8573.241
9094	132.7778	111.0373	0.942791	0.586275	11.27452	8573.744
9094.5	132.7778	111.0338	0.942795	0.586298	11.27497	8574.247
9095	132.7778	111.0303	0.942798	0.586322	11.27542	8574.751
9095.5	132.7778	111.0268	0.942802	0.586346	11.27588	8575.254
9096	132.7778	111.0233	0.942805	0.586369	11.27633	8575.757
9096.5	132.7778	111.0198	0.942809	0.586393	11.27679	8576.26
9097	132.7778	111.0163	0.942812	0.586416	11.27724	8576.764
9097.5	132.7778	111.0128	0.942816	0.58644	11.27769	8577.267
9098	132.7778	111.0092	0.942819	0.586464	11.27815	8577.77
9098.5	133.3333	111.0057	0.942823	0.58945	11.33558	8578.273
9099	133.8889	111.0022	0.942826	0.5924	11.39231	8578.777
9099.5	134.4445	110.9987	0.94283	0.595314	11.44834	8579.28
9100	135	110.9952	0.942833	0.598191	11.50367	8579.783
9100.5	135	110.9917	0.942837	0.598214	11.50411	8580.286
9101	135	110.9882	0.94284	0.598237	11.50455	8580.79
9101.5	135	110.9846	0.942844	0.59826	11.50499	8581.293
9102	135	110.9811	0.942847	0.598282	11.50543	8581.796
9102.5	135	110.9776	0.942851	0.598305	11.50587	8582.3
9103	135	110.9741	0.942854	0.598328	11.50632	8582.803
9103.5	134.4445	110.9706	0.942858	0.595499	11.4519	8583.306
9104	133.889	110.9671	0.942861	0.592633	11.3968	8583.809
9104.5	133.8889	110.9636	0.942865	0.592656	11.39724	8584.313
9105	133.8889	110.9601	0.942868	0.592679	11.39768	8584.816
9105.5	133.8889	110.9566	0.942872	0.592703	11.39813	8585.319
9106	132.7778	110.953	0.942875	0.586841	11.28541	8585.822
9106.5	131.6667	110.9495	0.942879	0.580831	11.16983	8586.326
9107	131.1111	110.946	0.942882	0.57778	11.11116	8586.829
9107.5	130.5556	110.9425	0.942886	0.574691	11.05175	8587.332
9108	129.4444	110.939	0.942889	0.568367	10.93013	8587.836
9108.5	129.4444	110.9355	0.942893	0.568392	10.93061	8588.339
9109	128.8889	110.932	0.942896	0.565181	10.86887	8588.842
9109.5	128.3333	110.9285	0.9429	0.561929	10.80632	8589.346
9110	127.7778	110.925	0.942903	0.558634	10.74296	8589.849
9110.5	127.2223	110.9214	0.942907	0.555296	10.67878	8590.352
9111	127.2222	110.9179	0.94291	0.555321	10.67925	8590.855
9111.5	127.2222	110.9144	0.942914	0.555347	10.67974	8591.359

9112	127.2222	110.9109	0.942917	0.555372	10.68023	8591.862
9112.5	126.1111	110.9074	0.942921	0.548539	10.54882	8592.365
9113	125.5556	110.9039	0.942924	0.545067	10.48206	8592.869
9113.5	125	110.9004	0.942928	0.541549	10.4144	8593.372
9114	124.4445	110.8969	0.942931	0.537984	10.34584	8593.875
9114.5	123.889	110.8934	0.942935	0.534371	10.27636	8594.379
9115	123.8889	110.8898	0.942938	0.534397	10.27686	8594.882
9115.5	123.8889	110.8863	0.942942	0.534423	10.27737	8595.385
9116	123.8889	110.8828	0.942945	0.53445	10.27788	8595.889
9116.5	123.8889	110.8793	0.942949	0.534476	10.27839	8596.392
9117	123.8889	110.8758	0.942952	0.534503	10.2789	8596.895
9117.5	123.8889	110.8723	0.942956	0.534529	10.27941	8597.399
9118	123.8889	110.8688	0.942959	0.534556	10.27992	8597.902
9118.5	124.4445	110.8653	0.942963	0.538221	10.3504	8598.405
9119	125	110.8618	0.942966	0.541836	10.41993	8598.909
9119.5	125	110.8583	0.94297	0.541862	10.42043	8599.412
9120	125	110.8548	0.942973	0.541889	10.42093	8599.915
9120.5	125	110.8513	0.942977	0.541915	10.42144	8600.419
9121	126.1111	110.8477	0.94298	0.548976	10.55724	8600.922
9121.5	126.1111	110.8442	0.942984	0.549002	10.55773	8601.425
9122	126.1111	110.8407	0.942987	0.549028	10.55823	8601.929
9122.5	126.1111	110.8372	0.942991	0.549054	10.55872	8602.432
9123	126.1111	110.8337	0.942994	0.549079	10.55922	8602.936
9123.5	125	110.8302	0.942998	0.542071	10.42445	8603.439
9124	125	110.8267	0.943001	0.542098	10.42495	8603.942
9124.5	125	110.8232	0.943005	0.542124	10.42546	8604.446
9125	123.8889	110.8197	0.943008	0.534927	10.28707	8604.949
9125.5	123.8889	110.8162	0.943012	0.534954	10.28758	8605.452
9126	122.7778	110.8127	0.943015	0.527562	10.14542	8605.956
9126.5	122.7778	110.8092	0.943019	0.527589	10.14594	8606.459
9127	122.7778	110.8057	0.943022	0.527616	10.14646	8606.963
9127.5	122.7778	110.8021	0.943026	0.527643	10.14697	8607.466
9128	123.8889	110.7986	0.943029	0.535087	10.29013	8607.969
9128.5	125	110.7951	0.943033	0.542333	10.42947	8608.473
9129	126.1111	110.7916	0.943036	0.549388	10.56515	8608.976
9129.5	126.1111	110.7881	0.94304	0.549414	10.56565	8609.479
9130	126.1111	110.7846	0.943043	0.549439	10.56614	8609.983
9130.5	126.1111	110.7811	0.943047	0.549465	10.56664	8610.486
9131	102.9	110.7776	0.94305	0.351916	6.767616	8610.99
9131.5	102.1	110.7741	0.943054	0.342654	6.589491	8611.493
9132	104.3	110.7706	0.943057	0.367751	7.072132	8611.996

9132.5	87.7	110.7671	0.94306	0.129399	2.488437	8612.5
9133	85.3	110.7636	0.943064	0.08302	1.596544	8613.003
9133.5	72.5	110.7601	0.943067	-0.2474	-4.75772	8613.507
9134	73.1	110.7566	0.943071	-0.22787	-4.38211	8614.01
9134.5	84.7	110.7531	0.943074	0.070951	1.364433	8614.514
9135	77.3	110.7496	0.943078	-0.10396	-1.99919	8615.017
9135.5	94	110.746	0.943081	0.23507	4.520576	8615.52
9136	93.7	110.7425	0.943085	0.230573	4.434091	8616.024
9136.5	97.1	110.739	0.943088	0.279638	5.377653	8616.527
9137	95.1	110.7355	0.943092	0.251482	4.836186	8617.031
9137.5	95.3	110.732	0.943095	0.254424	4.892767	8617.534
9138	98.1	110.7285	0.943099	0.293216	5.638761	8618.038
9138.5	102.4	110.725	0.943102	0.346687	6.667054	8618.541
9139	98.3	110.7215	0.943106	0.295937	5.691104	8619.044
9139.5	105.6	110.718	0.943109	0.382356	7.352997	8619.548
9140	104.3	110.7145	0.943113	0.368326	7.083195	8620.051
9140.5	104.6	110.711	0.943116	0.371654	7.147197	8620.555
9141	103.2	110.7075	0.94312	0.356081	6.84771	8621.058
9141.5	103.9	110.704	0.943123	0.364	7.00001	8621.562
9142	103.3	110.7005	0.943127	0.35729	6.870963	8622.065
9142.5	103.3	110.697	0.94313	0.357327	6.871666	8622.568
9143	104.6	110.6935	0.943134	0.371833	7.150634	8623.072
9143.5	104.9	110.69	0.943137	0.375132	7.214068	8623.575
9144	104.8	110.6865	0.943141	0.374083	7.193897	8624.079
9144.5	104.7	110.683	0.943144	0.373031	7.173669	8624.582
9145	104.3	110.6795	0.943148	0.368685	7.090105	8625.086
9145.5	104.5	110.676	0.943151	0.370918	7.13304	8625.589
9146	103	110.6725	0.943155	0.354166	6.810893	8626.093
9146.5	102.1	110.669	0.943158	0.343774	6.611044	8626.596
9147	102	110.6655	0.943162	0.342636	6.589151	8627.1
9147.5	103.5	110.662	0.943165	0.359953	6.922167	8627.603
9148	104.8	110.6585	0.943169	0.374368	7.199376	8628.107
9148.5	104.7	110.655	0.943172	0.373316	7.179157	8628.61
9149	106.2	110.6515	0.943176	0.389335	7.487209	8629.114
9149.5	104.6	110.648	0.943179	0.372297	7.159567	8629.617
9150	103.3	110.6444	0.943183	0.357875	6.882209	8630.121
9150.5	104.9	110.6409	0.943186	0.375629	7.223638	8630.624
9151	106.6	110.6374	0.94319	0.393622	7.569645	8631.127
9151.5	106.8	110.6339	0.943193	0.395712	7.609853	8631.631
9152	107	110.6304	0.943197	0.397791	7.649834	8632.134
9152.5	105.1	110.6269	0.9432	0.377929	7.267862	8632.638

9153	102.9	110.6234	0.943203	0.353536	6.798774	8633.141
9153.5	104	110.6199	0.943207	0.36598	7.038079	8633.645
9154	104.7	110.6164	0.94321	0.373708	7.186699	8634.148
9154.5	109.5	110.6129	0.943214	0.422576	8.126459	8634.652
9155	108.6	110.6094	0.943217	0.413944	7.960464	8635.155
9155.5	114.2	110.6059	0.943221	0.46461	8.934801	8635.659
9156	115	110.6024	0.943224	0.471276	9.062991	8636.163
9156.5	114.9	110.5989	0.943228	0.470484	9.047767	8636.666
9157	121.6	110.5954	0.943231	0.521171	10.02252	8637.17
9157.5	127.6	110.5919	0.943235	0.559955	10.76837	8637.673
9158	130.1	110.5884	0.943238	0.574568	11.04939	8638.177
9158.5	122.5	110.5849	0.943242	0.527431	10.1429	8638.68
9159	120.8	110.5814	0.943245	0.515673	9.916788	8639.184
9159.5	118.2	110.5779	0.943249	0.496685	9.551625	8639.687
9160	113	110.5744	0.943252	0.45467	8.743658	8640.191
9160.5	104.1	110.5709	0.943256	0.367593	7.069089	8640.694
9161	103.1	110.5674	0.943259	0.356408	6.854	8641.198
9161.5	102.2	110.5639	0.943263	0.346064	6.655072	8641.701
9162	101	110.5604	0.943266	0.331827	6.381281	8642.205
9162.5	102.2	110.5569	0.94327	0.346138	6.656503	8642.708
9163	101.1	110.5534	0.943273	0.333111	6.40599	8643.212
9163.5	100.7	110.5499	0.943277	0.328293	6.313321	8643.715
9164	100.5	110.5464	0.94328	0.325881	6.266941	8644.219
9164.5	98.8	110.5429	0.943284	0.304491	5.855599	8644.723
9165	99.7	110.5394	0.943287	0.316011	6.077132	8645.226
9165.5	103.1	110.5359	0.943291	0.356738	6.860337	8645.73
9166	100.6	110.5324	0.943294	0.327261	6.293478	8646.233
9166.5	99.8	110.5289	0.943298	0.317384	6.103535	8646.737
9167	97.8	110.5255	0.943301	0.291563	5.606973	8647.24
9167.5	96.5	110.522	0.943304	0.273926	5.267804	8647.744
9168	97.1	110.5185	0.943308	0.282214	5.427183	8648.247
9168.5	99.4	110.515	0.943311	0.312493	6.009473	8648.751
9169	99.2	110.5115	0.943315	0.309986	5.961262	8649.255
9169.5	101.6	110.508	0.943318	0.339591	6.530594	8649.758
9170	98.9	110.5045	0.943322	0.306217	5.888779	8650.262
9170.5	99.4	110.501	0.943325	0.312649	6.012481	8650.765
9171	101.2	110.4975	0.943329	0.334922	6.440816	8651.269
9171.5	100.6	110.494	0.943332	0.327682	6.301572	8651.772
9172	103.2	110.4905	0.943336	0.358349	6.89132	8652.276
9172.5	102.5	110.487	0.943339	0.350368	6.737851	8652.78
9173	102.3	110.4835	0.943343	0.348085	6.693933	8653.283

9173.5	101.2	110.48	0.943346	0.335112	6.444455	8653.787
9174	100.4	110.4765	0.94335	0.325418	6.258047	8654.29
9174.5	99.5	110.473	0.943353	0.314228	6.04285	8654.794
9175	100.7	110.4695	0.943357	0.329171	6.330213	8655.298
9175.5	98.2	110.466	0.94336	0.297541	5.721939	8655.801
9176	99.3	110.4625	0.943364	0.311809	5.996325	8656.305
9176.5	100.5	110.459	0.943367	0.326839	6.285367	8656.808
9177	98.5	110.4555	0.943371	0.301588	5.799768	8657.312
9177.5	100.6	110.452	0.943374	0.328141	6.310396	8657.816
9178	100.7	110.4485	0.943378	0.3294	6.334617	8658.319
9178.5	100.4	110.445	0.943381	0.325764	6.264688	8658.823
9179	101.3	110.4415	0.943385	0.336727	6.475523	8659.326
9179.5	102.6	110.438	0.943388	0.35204	6.770002	8659.83
9180	99.5238	110.4345	0.943391	0.314958	6.056883	8660.334
9180.5	99.5238	110.431	0.943395	0.314997	6.057633	8660.837
9181	99.5238	110.4275	0.943398	0.315036	6.058382	8661.341
9181.5	98.73015	110.4241	0.943402	0.304933	5.864087	8661.845
9182	98.73015	110.4206	0.943405	0.304972	5.864847	8662.348
9182.5	98.73015	110.4171	0.943409	0.305012	5.865608	8662.852
9183	97.93649	110.4136	0.943412	0.294663	5.666594	8663.355
9183.5	97.93649	110.4101	0.943416	0.294703	5.667366	8663.859
9184	97.14288	110.4066	0.943419	0.284101	5.463483	8664.363
9184.5	97.14288	110.4031	0.943423	0.284142	5.464266	8664.866
9185	97.14288	110.3996	0.943426	0.284183	5.465049	8665.37
9185.5	97.14288	110.3961	0.94343	0.284223	5.465832	8665.874
9186	97.14288	110.3926	0.943433	0.284264	5.466615	8666.377
9186.5	97.14288	110.3891	0.943437	0.284305	5.467398	8666.881
9187	97.14288	110.3856	0.94344	0.284345	5.46818	8667.385
9187.5	97.14288	110.3821	0.943444	0.284386	5.468963	8667.888
9188	97.14288	110.3786	0.943447	0.284427	5.469746	8668.392
9188.5	97.14288	110.3751	0.943451	0.284467	5.470529	8668.896
9189	97.14288	110.3716	0.943454	0.284508	5.471311	8669.399
9189.5	97.14288	110.3682	0.943458	0.284549	5.472094	8669.903
9190	97.14288	110.3647	0.943461	0.28459	5.472877	8670.407
9190.5	97.14288	110.3612	0.943464	0.28463	5.473659	8670.91
9191	97.14288	110.3577	0.943468	0.284671	5.474442	8671.414
9191.5	97.14288	110.3542	0.943471	0.284712	5.475224	8671.918
9192	97.14288	110.3507	0.943475	0.284752	5.476007	8672.421
9192.5	97.14288	110.3472	0.943478	0.284793	5.476789	8672.925
9193	97.14288	110.3437	0.943482	0.284834	5.477572	8673.429
9193.5	97.14288	110.3402	0.943485	0.284874	5.478354	8673.932

9194	97.14288	110.3367	0.943489	0.284915	5.479136	8674.436
9194.5	97.14288	110.3332	0.943492	0.284956	5.479919	8674.94
9195	97.14288	110.3297	0.943496	0.284996	5.480701	8675.443
9195.5	97.14288	110.3262	0.943499	0.285037	5.481483	8675.947
9196	97.14288	110.3228	0.943503	0.285078	5.482265	8676.451
9196.5	97.14288	110.3193	0.943506	0.285118	5.483047	8676.954
9197	97.14288	110.3158	0.94351	0.285159	5.483829	8677.458
9197.5	97.14288	110.3123	0.943513	0.2852	5.484611	8677.962
9198	97.14288	110.3088	0.943517	0.28524	5.485393	8678.465
9198.5	97.14288	110.3053	0.94352	0.285281	5.486175	8678.969
9199	97.14288	110.3018	0.943524	0.285322	5.486957	8679.473
9199.5	97.14288	110.2983	0.943527	0.285362	5.487739	8679.977
9200	97.14288	110.2948	0.94353	0.285403	5.488521	8680.48
9200.5	97.14288	110.2913	0.943534	0.285444	5.489303	8680.984
9201	97.14288	110.2878	0.943537	0.285484	5.490085	8681.488
9201.5	97.93649	110.2843	0.943541	0.296146	5.695116	8681.991
9202	98.33331	110.2809	0.943544	0.3014	5.79616	8682.495
9202.5	98.73012	110.2774	0.943548	0.306591	5.895984	8682.999
9203	98.73015	110.2739	0.943551	0.306631	5.89675	8683.503
9203.5	98.73015	110.2704	0.943555	0.30667	5.897509	8684.006
9204	98.73015	110.2669	0.943558	0.30671	5.898267	8684.51
9204.5	98.73015	110.2634	0.943562	0.306749	5.899026	8685.014
9205	98.73015	110.2599	0.943565	0.306789	5.899785	8685.518
9205.5	98.73015	110.2564	0.943569	0.306828	5.900543	8686.021
9206	98.73015	110.2529	0.943572	0.306868	5.901302	8686.525
9206.5	98.73015	110.2495	0.943576	0.306907	5.902061	8687.029
9207	98.73015	110.246	0.943579	0.306947	5.902819	8687.532
9207.5	98.73015	110.2425	0.943583	0.306986	5.903578	8688.036
9208	98.73015	110.239	0.943586	0.307025	5.904336	8688.54
9208.5	98.73015	110.2355	0.943589	0.307065	5.905094	8689.044
9209	99.5238	110.232	0.943593	0.317215	6.100292	8689.547
9209.5	99.5238	110.2285	0.943596	0.317254	6.101039	8690.051
9210	99.5238	110.225	0.9436	0.317293	6.101787	8690.555
9210.5	99.5238	110.2215	0.943603	0.317332	6.102534	8691.059
9211	99.5238	110.2181	0.943607	0.317371	6.103281	8691.562
9211.5	100.3175	110.2146	0.94361	0.327279	6.293829	8692.066
9212	100.7143	110.2111	0.943614	0.332164	6.387771	8692.57
9212.5	101.1111	110.2076	0.943617	0.336992	6.480607	8693.074
9213	101.5079	110.2041	0.943621	0.341762	6.572355	8693.578
9213.5	101.9047	110.2006	0.943624	0.346478	6.663031	8694.081
9214	101.9048	110.1971	0.943628	0.346516	6.663769	8694.585

9214.5	102.6984	110.1936	0.943631	0.355745	6.841257	8695.089
9215	102.6984	110.1901	0.943635	0.355782	6.841962	8695.593
9215.5	102.6984	110.1867	0.943638	0.355819	6.842668	8696.096
9216	102.6984	110.1832	0.943642	0.355855	6.843373	8696.6
9216.5	99.5	110.1797	0.943645	0.317498	6.10574	8697.104
9217	100.1	110.1762	0.943648	0.325021	6.250397	8697.608
9217.5	102.3	110.1727	0.943652	0.351379	6.757291	8698.112
9218	101.7	110.1692	0.943655	0.344407	6.623219	8698.615
9218.5	99.2	110.1657	0.943659	0.313862	6.035804	8699.119
9219	101.9	110.1623	0.943662	0.346832	6.669841	8699.623
9219.5	101.2	110.1588	0.943666	0.338584	6.511237	8700.127
9220	102.1	110.1553	0.943669	0.349242	6.716189	8700.63
9220.5	101.1	110.1518	0.943673	0.337462	6.489657	8701.134
9221	100.1	110.1483	0.943676	0.325328	6.256307	8701.638
9221.5	101.5	110.1448	0.94368	0.342306	6.582802	8702.142
9222	101.9	110.1413	0.943683	0.347055	6.674132	8702.646
9222.5	102.1	110.1378	0.943687	0.349427	6.719751	8703.15
9223	101.6	110.1344	0.94369	0.343601	6.607712	8703.653
9223.5	101.2	110.1309	0.943694	0.338886	6.517029	8704.157
9224	102.5	110.1274	0.943697	0.354166	6.810894	8704.661
9224.5	102.9	110.1239	0.9437	0.358777	6.899566	8705.165
9225	102.3	110.1204	0.943704	0.351933	6.767942	8705.669
9225.5	101.8	110.1169	0.943707	0.346143	6.656593	8706.172
9226	100.6	110.1135	0.943711	0.33184	6.381536	8706.676
9226.5	101	110.11	0.943714	0.336715	6.475279	8707.18
9227	100.3	110.1065	0.943718	0.328251	6.312512	8707.684
9227.5	99.2	110.103	0.943721	0.314565	6.049317	8708.188
9228	99.3	110.0995	0.943725	0.31587	6.074423	8708.692
9228.5	99.2	110.096	0.943728	0.314643	6.050818	8709.195
9229	98.3	110.0925	0.943732	0.30311	5.829041	8709.699
9229.5	99.2	110.0891	0.943735	0.314721	6.052319	8710.203
9230	98.6	110.0856	0.943739	0.307081	5.905411	8710.707
9230.5	99.6	110.0821	0.943742	0.31984	6.150773	8711.211
9231	100.6	110.0786	0.943745	0.33222	6.38885	8711.715
9231.5	100.1	110.0751	0.943749	0.326134	6.271811	8712.218
9232	99	110.0716	0.943752	0.312372	6.00716	8712.722
9232.5	98.3	110.0682	0.943756	0.303388	5.83438	8713.226
9233	98	110.0647	0.943759	0.299501	5.759635	8713.73
9233.5	97.4	110.0612	0.943763	0.291579	5.607296	8714.234
9234	98	110.0577	0.943766	0.299581	5.761168	8714.738
9234.5	98.7	110.0542	0.94377	0.308725	5.937021	8715.242

9235	98.6	110.0507	0.943773	0.307476	5.912995	8715.745
9235.5	98.4	110.0473	0.943777	0.304926	5.863964	8716.249
9236	99.3	110.0438	0.94378	0.316493	6.086402	8716.753
9236.5	100.6	110.0403	0.943784	0.332638	6.396892	8717.257
9237	102.8	110.0368	0.943787	0.358553	6.895249	8717.761
9237.5	104.5	110.0333	0.943791	0.377475	7.259128	8718.265
9238	104.6	110.0298	0.943794	0.378592	7.280623	8718.769
9238.5	102.2	110.0264	0.943797	0.351772	6.764845	8719.273
9239	101	110.0229	0.943801	0.337658	6.493426	8719.776
9239.5	98.3	110.0194	0.943804	0.303943	5.845052	8720.28
9240	98	110.0159	0.943808	0.300059	5.770367	8720.784
9240.5	97	110.0124	0.943811	0.286758	5.514578	8721.288
9241	99	110.0089	0.943815	0.313077	6.020704	8721.792
9241.5	100	110.0055	0.943818	0.325667	6.262822	8722.296
9242	101.4	110.002	0.943822	0.342656	6.589531	8722.8
9242.5	101.9	109.9985	0.943825	0.348578	6.703419	8723.304
9243	100.2	109.995	0.943829	0.328247	6.312437	8723.808
9243.5	99.2	109.9915	0.943832	0.315812	6.073311	8724.312
9244	98.5	109.9881	0.943836	0.306894	5.901803	8724.815
9244.5	98.5	109.9846	0.943839	0.306933	5.902562	8725.319
9245	97.3	109.9811	0.943842	0.291167	5.599362	8725.823
9245.5	98	109.9776	0.943846	0.300497	5.778794	8726.327
9246	98.2	109.9741	0.943849	0.303155	5.829901	8726.831
9246.5	99	109.9707	0.943853	0.313507	6.028976	8727.335
9247	99	109.9672	0.943856	0.313546	6.029728	8727.839
9247.5	99.5	109.9637	0.94386	0.319903	6.151989	8728.343
9248	97.8	109.9602	0.943863	0.298063	5.731983	8728.847
9248.5	95.9	109.9567	0.943867	0.272261	5.235798	8729.351
9249	95.2	109.9533	0.94387	0.262391	5.045973	8729.855
9249.5	94.6	109.9498	0.943874	0.253761	4.880021	8730.359
9250	94.8	109.9463	0.943877	0.256712	4.936773	8730.862
9250.5	96.2	109.9428	0.94388	0.276608	5.319394	8731.366
9251	97.1	109.9393	0.943884	0.288961	5.556947	8731.87
9251.5	96.7	109.9359	0.943887	0.283573	5.453321	8732.374
9252	95.5	109.9324	0.943891	0.266916	5.132997	8732.878
9252.5	94.9	109.9289	0.943894	0.258371	4.968668	8733.382
9253	96.3	109.9254	0.943898	0.278199	5.349982	8733.886
9253.5	97	109.9219	0.943901	0.287813	5.534865	8734.39
9254	97.6	109.9185	0.943905	0.295895	5.690287	8734.894
9254.5	99.6	109.915	0.943908	0.321697	6.186476	8735.398
9255	100.9	109.9115	0.943912	0.337664	6.493546	8735.902

9255.5	102.2	109.908	0.943915	0.353026	6.788967	8736.406
9256	101.9	109.9045	0.943919	0.349579	6.722673	8736.91
9256.5	102	109.9011	0.943922	0.350781	6.745784	8737.414
9257	102.4	109.8976	0.943925	0.355442	6.83543	8737.918
9257.5	103	109.8941	0.943929	0.362315	6.967594	8738.422
9258	103.2	109.8906	0.943932	0.364603	7.0116	8738.926
9258.5	103.1	109.8872	0.943936	0.363515	6.990675	8739.43
9259	103	109.8837	0.943939	0.362424	6.96969	8739.934
9259.5	102.9	109.8802	0.943943	0.361329	6.948643	8740.438
9260	100.8	109.8767	0.943946	0.336839	6.47767	8740.942
9260.5	99.2	109.8732	0.94395	0.317136	6.098763	8741.446
9261	95.7	109.8698	0.943953	0.27049	5.201737	8741.95
9261.5	96.3	109.8663	0.943957	0.278897	5.36341	8742.454
9262	95.5	109.8628	0.94396	0.26775	5.149038	8742.957
9262.5	96.1	109.8593	0.943963	0.276209	5.311705	8743.461
9263	98.5	109.8559	0.943967	0.308392	5.930614	8743.965
9263.5	99.8	109.8524	0.94397	0.324881	6.247704	8744.469
9264	100.9	109.8489	0.943974	0.338343	6.506601	8744.973
9264.5	102.8	109.8454	0.943977	0.36056	6.933844	8745.477
9265	100.4	109.842	0.943981	0.332372	6.391771	8745.981
9265.5	99.5	109.8385	0.943984	0.321296	6.178778	8746.485
9266	100.7	109.835	0.943988	0.336086	6.463201	8746.989
9266.5	99.4	109.8315	0.943991	0.32012	6.156161	8747.493
9267	98.3	109.828	0.943995	0.306119	5.886909	8747.997
9267.5	98.3	109.8246	0.943998	0.306159	5.887669	8748.501
9268	98.4	109.8211	0.944001	0.307494	5.913346	8749.005
9268.5	96.9	109.8176	0.944005	0.287676	5.532229	8749.509
9269	99.4	109.8141	0.944008	0.320314	6.159885	8750.014
9269.5	98.8	109.8107	0.944012	0.312755	6.014517	8750.518
9270	99.9	109.8072	0.944015	0.326618	6.281121	8751.022
9270.5	100.8	109.8037	0.944019	0.337632	6.492918	8751.526
9271	101.2	109.8002	0.944022	0.342453	6.585641	8752.03
9271.5	100.8	109.7968	0.944026	0.337707	6.49437	8752.534
9272	99.8	109.7933	0.944029	0.325534	6.260271	8753.038
9272.5	98.4	109.7898	0.944033	0.307849	5.920171	8753.542
9273	99.1	109.7863	0.944036	0.316844	6.093145	8754.046
9273.5	99.2	109.7829	0.944039	0.318146	6.118197	8754.55
9274	98.5	109.7794	0.944043	0.309258	5.94727	8755.054
9274.5	98.3	109.7759	0.944046	0.306712	5.898304	8755.558
9275	97	109.7724	0.94405	0.289555	5.568358	8756.062
9275.5	96.7	109.769	0.944053	0.285528	5.490924	8756.566

9276	95.6	109.7655	0.944057	0.270328	5.198616	8757.07
9276.5	95.5	109.762	0.94406	0.268958	5.172269	8757.574
9277	95.8	109.7586	0.944064	0.273221	5.254249	8758.078
9277.5	98.6	109.7551	0.944067	0.31082	5.977304	8758.582
9278	97.4	109.7516	0.944071	0.29516	5.676158	8759.086
9278.5	96.6	109.7481	0.944074	0.284408	5.469394	8759.59
9279	96.5	109.7447	0.944077	0.283081	5.443873	8760.094
9279.5	96.6	109.7412	0.944081	0.28449	5.470961	8760.598
9280	97.7	109.7377	0.944084	0.299299	5.755748	8761.102
9280.5	97.3	109.7342	0.944088	0.294027	5.654361	8761.606
9281	96.8	109.7308	0.944091	0.287335	5.525664	8762.111
9281.5	97.3	109.7273	0.944095	0.294107	5.655907	8762.615
9282	99.5	109.7238	0.944098	0.322571	6.203292	8763.119
9282.5	99.7	109.7203	0.944102	0.325101	6.251937	8763.623
9283	99.4	109.7169	0.944105	0.321397	6.180718	8764.127
9283.5	98.9	109.7134	0.944108	0.315124	6.060079	8764.631
9284	99.8	109.7099	0.944112	0.326456	6.277995	8765.135
9284.5	100.9	109.7065	0.944115	0.339887	6.536292	8765.639
9285	99.8	109.703	0.944119	0.326532	6.279471	8766.143
9285.5	97	109.6995	0.944122	0.290404	5.584689	8766.647
9286	96.9	109.696	0.944126	0.289094	5.559507	8767.151
9286.5	96.4	109.6926	0.944129	0.282323	5.429282	8767.655
9287	95.3	109.6891	0.944133	0.266998	5.134586	8768.16
9287.5	95.7	109.6856	0.944136	0.272689	5.24401	8768.664
9288	96.5	109.6822	0.94414	0.283816	5.457999	8769.168
9288.5	96.8	109.6787	0.944143	0.287943	5.537367	8769.672
9289	98	109.6752	0.944146	0.303955	5.84528	8770.176
9289.5	95.2	109.6717	0.94415	0.265784	5.111235	8770.68
9290	94.2	109.6683	0.944153	0.251348	4.833611	8771.184
9290.5	99.1	109.6648	0.944157	0.318204	6.119315	8771.688
9291	114.7	109.6613	0.94416	0.476923	9.1716	8772.192
9291.5	113	109.6579	0.944164	0.46279	8.899802	8772.697
9292	110.9	109.6544	0.944167	0.444418	8.546504	8773.201
9292.5	108.6	109.6509	0.944171	0.423059	8.13575	8773.705
9293	102.2	109.6474	0.944174	0.355786	6.842033	8774.209
9293.5	104.7	109.644	0.944177	0.383584	7.376619	8774.713
9294	103.8	109.6405	0.944181	0.373856	7.189547	8775.217
9294.5	102.7	109.637	0.944184	0.36161	6.954042	8775.721
9295	94.7	109.6336	0.944188	0.259066	4.982044	8776.225
9295.5	99.6	109.6301	0.944191	0.324858	6.247271	8776.73
9296	102.3	109.6266	0.944195	0.357155	6.868373	8777.234

9296.5	98.3	109.6232	0.944198	0.308447	5.931682	8777.738
9297	103.1	109.6197	0.944202	0.366303	7.044279	8778.242
9297.5	103.6	109.6162	0.944205	0.371903	7.151982	8778.746
9298	101.3	109.6128	0.944208	0.345657	6.647255	8779.25
9298.5	98.2	109.6093	0.944212	0.30731	5.909805	8779.754
9299	104.8	109.6058	0.944215	0.385039	7.404604	8780.259
9299.5	100.9	109.6023	0.944219	0.341015	6.557978	8780.763
9300	93.6	109.5989	0.944222	0.243299	4.678834	8781.267
9300.5	91.7	109.5954	0.944226	0.213997	4.115333	8781.771
9301	95	109.5919	0.944229	0.26389	5.074804	8782.275
9301.5	100.9	109.5885	0.944233	0.341165	6.560867	8782.779
9302	98.8	109.585	0.944236	0.315295	6.063369	8783.283
9302.5	99.4	109.5815	0.944239	0.322904	6.209687	8783.788
9303	96.5	109.5781	0.944243	0.285039	5.481515	8784.292
9303.5	103.4	109.5746	0.944246	0.370118	7.117656	8784.796
9304	98.3	109.5711	0.94425	0.309038	5.943043	8785.3
9304.5	103.4	109.5677	0.944253	0.37019	7.119038	8785.804
9305	102	109.5642	0.944257	0.35436	6.814616	8786.308
9305.5	101.8	109.5607	0.94426	0.352077	6.770708	8786.813
9306	99.2	109.5573	0.944264	0.320667	6.166671	8787.317
9306.5	98.3	109.5538	0.944267	0.309235	5.946829	8787.821
9307	98.4	109.5503	0.94427	0.310564	5.972393	8788.325
9307.5	97.6	109.5469	0.944274	0.300173	5.77256	8788.829
9308	98.9	109.5434	0.944277	0.317034	6.096801	8789.334
9308.5	97.8	109.5399	0.944281	0.302884	5.824697	8789.838
9309	98.2	109.5365	0.944284	0.308138	5.925736	8790.342
9309.5	96.6	109.533	0.944288	0.286931	5.517908	8790.846
9310	96.5	109.5295	0.944291	0.285609	5.492477	8791.35
9310.5	95.7	109.5261	0.944295	0.274592	5.280609	8791.855
9311	98	109.5226	0.944298	0.305697	5.878795	8792.359
9311.5	101.2	109.5191	0.944301	0.345482	6.643884	8792.863
9312	97.4	109.5157	0.944305	0.297885	5.728565	8793.367
9312.5	99.2	109.5122	0.944308	0.32117	6.176346	8793.871
9313	97.5	109.5087	0.944312	0.299291	5.755588	8794.376
9313.5	98.4	109.5053	0.944315	0.311075	5.982212	8794.88
9314	97.7	109.5018	0.944319	0.302008	5.807851	8795.384
9314.5	96	109.4983	0.944322	0.279099	5.367296	8795.888
9315	97.5	109.4949	0.944326	0.29945	5.758659	8796.392
9315.5	98	109.4914	0.944329	0.306053	5.885642	8796.897
9316	99	109.4879	0.944332	0.318922	6.133106	8797.401
9316.5	97.1	109.4845	0.944336	0.294247	5.658594	8797.905

9317	98	109.481	0.944339	0.306172	5.887923	8798.409
9317.5	100.4	109.4775	0.944343	0.336355	6.468369	8798.914
9318	104.8	109.4741	0.944346	0.386371	7.430209	8799.418
9318.5	103.9	109.4706	0.94435	0.376698	7.244192	8799.922
9319	103.9	109.4671	0.944353	0.376734	7.244876	8800.426
9319.5	99	109.4637	0.944357	0.319193	6.138331	8800.931
9320	98.7	109.4602	0.94436	0.315426	6.065886	8801.435
9320.5	102.1	109.4567	0.944363	0.356653	6.858715	8801.939
9321	102.6	109.4533	0.944367	0.362404	6.969303	8802.443
9321.5	102.8	109.4498	0.94437	0.364702	7.013505	8802.948
9322	106.2	109.4464	0.944374	0.401258	7.716509	8803.452
9322.5	107.2	109.4429	0.944377	0.411378	7.911107	8803.956
9323	102.6	109.4394	0.944381	0.362549	6.9721	8804.46
9323.5	105.9	109.436	0.944384	0.39828	7.659231	8804.965
9324	107.5	109.4325	0.944387	0.414449	7.970165	8805.469
9324.5	103.9	109.429	0.944391	0.377124	7.252394	8805.973
9325	110.2	109.4256	0.944394	0.440162	8.46466	8806.477
9325.5	109.9	109.4221	0.944398	0.437438	8.412266	8806.982
9326	109.5	109.4186	0.944401	0.43376	8.341531	8807.486
9326.5	103.1	109.4152	0.944405	0.368431	7.085213	8807.99
9327	100.6	109.4117	0.944408	0.339486	6.52858	8808.494
9327.5	97.3	109.4083	0.944412	0.297798	5.726877	8808.999
9328	114.6	109.4048	0.944415	0.478317	9.19841	8809.503
9328.5	105.8	109.4013	0.944418	0.397591	7.645981	8810.007
9329	110.4	109.3979	0.944422	0.442242	8.504663	8810.512
9329.5	101.5	109.3944	0.944425	0.350352	6.737529	8811.016
9330	93.4	109.3909	0.944429	0.242886	4.670884	8811.52
9330.5	95	109.3875	0.944432	0.26636	5.122302	8812.024
9331	91.4	109.384	0.944436	0.211938	4.075726	8812.529
9331.5	94.6	109.3806	0.944439	0.260698	5.013415	8813.033
9332	100.5	109.3771	0.944442	0.338659	6.512672	8813.537
9332.5	109.5	109.3736	0.944446	0.43418	8.34961	8814.042
9333	103.9	109.3702	0.944449	0.377728	7.264005	8814.546
9333.5	111	109.3667	0.944453	0.447941	8.614242	8815.05
9334	106.9	109.3633	0.944456	0.409158	7.868421	8815.554
9334.5	111.3	109.3598	0.94446	0.450676	8.666853	8816.059
9335	104.5	109.3563	0.944463	0.384358	7.391498	8816.563
9335.5	109.7	109.3529	0.944467	0.436232	8.389073	8817.067
9336	108.6	109.3494	0.94447	0.425917	8.190706	8817.572
9336.5	96.6	109.3459	0.944473	0.289122	5.560039	8818.076
9337	94.3	109.3425	0.944477	0.256806	4.93858	8818.58

9337.5	94.7	109.339	0.94448	0.262645	5.050869	8819.085
9338	96.3	109.3356	0.944484	0.285155	5.483745	8819.589
9338.5	99.9	109.3321	0.944487	0.331856	6.381843	8820.093
9339	100.6	109.3286	0.944491	0.340389	6.545952	8820.598
9339.5	101.2	109.3252	0.944494	0.347569	6.684014	8821.102
9340	104.7	109.3217	0.944497	0.386846	7.43934	8821.606
9340.5	105.3	109.3183	0.944501	0.393217	7.56187	8822.111
9341	106.3	109.3148	0.944504	0.403575	7.761052	8822.615
9341.5	100.6	109.3113	0.944508	0.340578	6.549568	8823.119
9342	101.6	109.3079	0.944511	0.352444	6.777776	8823.624
9342.5	100.6	109.3044	0.944515	0.340653	6.551014	8824.128
9343	98	109.301	0.944518	0.308225	5.927413	8824.632
9343.5	97.1	109.2975	0.944521	0.296416	5.7003	8825.137
9344	98.2	109.2941	0.944525	0.310893	5.978717	8825.641
9344.5	97.1	109.2906	0.944528	0.296496	5.701843	8826.145
9345	97.6	109.2871	0.944532	0.303158	5.829966	8826.65
9345.5	99.1	109.2837	0.944535	0.322466	6.201267	8827.154
9346	99	109.2802	0.944539	0.321247	6.177831	8827.658
9346.5	97.3	109.2768	0.944542	0.299317	5.756095	8828.163
9347	99.5	109.2733	0.944546	0.327572	6.29947	8828.667
9347.5	100.2	109.2698	0.944549	0.336201	6.465395	8829.171
9348	97.9	109.2664	0.944552	0.30732	5.91	8829.676
9348.5	97.6	109.2629	0.944556	0.303436	5.835313	8830.18
9349	96.9	109.2595	0.944559	0.29418	5.657312	8830.685
9349.5	95.4	109.256	0.944563	0.273609	5.261705	8831.189
9350	95	109.2525	0.944566	0.267988	5.153622	8831.693
9350.5	95.6	109.2491	0.94457	0.276496	5.317222	8832.198
9351	96.7	109.2456	0.944573	0.291649	5.608628	8832.702
9351.5	96.3	109.2422	0.944576	0.286254	5.504885	8833.206
9352	98.3	109.2387	0.94458	0.312809	6.015557	8833.711
9352.5	97.1	109.2353	0.944583	0.297137	5.714177	8834.215
9353	98.3	109.2318	0.944587	0.312887	6.017064	8834.72
9353.5	98.7	109.2283	0.94459	0.318036	6.116077	8835.224
9354	99.2	109.2249	0.944594	0.324375	6.237975	8835.728
9354.5	98.5	109.2214	0.944597	0.315567	6.068598	8836.233
9355	98.7	109.218	0.9446	0.318153	6.118321	8836.737
9355.5	98	109.2145	0.944604	0.309211	5.946363	8837.242
9356	96.8	109.2111	0.944607	0.2934	5.642307	8837.746
9356.5	95.8	109.2076	0.944611	0.279775	5.380287	8838.25
9357	96.4	109.2042	0.944614	0.288066	5.539725	8838.755
9357.5	98.2	109.2007	0.944618	0.311953	5.999103	8839.259

9358	100	109.1972	0.944621	0.334562	6.433889	8839.764
9358.5	98.4	109.1938	0.944624	0.314601	6.050013	8840.268
9359	97.4	109.1903	0.944628	0.301637	5.800717	8840.772
9359.5	96.2	109.1869	0.944631	0.285537	5.491089	8841.277
9360	101.3	109.1834	0.944635	0.350268	6.735923	8841.781
9360.5	105	109.18	0.944638	0.391453	7.52795	8842.286
9361	103.3	109.1765	0.944642	0.373132	7.175614	8842.79
9361.5	103.5	109.173	0.944645	0.375374	7.218734	8843.295
9362	100.2	109.1696	0.944648	0.337298	6.486493	8843.799
9362.5	100.8	109.1661	0.944652	0.344544	6.625844	8844.303
9363	101.3	109.1627	0.944655	0.35049	6.7402	8844.808
9363.5	100.8	109.1592	0.944659	0.344619	6.627282	8845.312
9364	100.4	109.1558	0.944662	0.339866	6.535877	8845.817
9364.5	99.3	109.1523	0.944666	0.32643	6.277509	8846.321
9365	100.2	109.1489	0.944669	0.337524	6.490854	8846.826
9365.5	101.6	109.1454	0.944672	0.354178	6.811122	8847.33
9366	102.9	109.142	0.944676	0.36904	7.096928	8847.834
9366.5	107.7	109.1385	0.944679	0.41924	8.062311	8848.339
9367	114.6	109.135	0.944683	0.480638	9.243035	8848.843
9367.5	114.2	109.1316	0.944686	0.477411	9.180986	8849.348
9368	109.4	109.1281	0.94469	0.43554	8.375768	8849.852
9368.5	99.6	109.1247	0.944693	0.330455	6.3549	8850.357
9369	93.2	109.1212	0.944696	0.243243	4.677742	8850.861
9369.5	97.3	109.1178	0.9447	0.301152	5.79139	8851.366
9370	106.9	109.1143	0.944703	0.411582	7.915031	8851.87
9370.5	108.4	109.1109	0.944707	0.426267	8.197434	8852.375
9371	101.9048	109.1074	0.94471	0.358108	6.886701	8852.879
9371.5	101.9048	109.104	0.944714	0.358145	6.887405	8853.383
9372	101.1111	109.1005	0.944717	0.348937	6.710331	8853.888
9372.5	101.1111	109.0971	0.94472	0.348974	6.711045	8854.392
9373	101.1111	109.0936	0.944724	0.349012	6.71176	8854.897
9373.5	101.1111	109.0902	0.944727	0.349049	6.712474	8855.401
9374	100.3175	109.0867	0.944731	0.339624	6.531238	8855.906
9374.5	100.3175	109.0833	0.944734	0.339662	6.531962	8856.41
9375	99.5238	109.0798	0.944738	0.330011	6.346364	8856.915
9375.5	99.5238	109.0763	0.944741	0.330049	6.347099	8857.419
9376	99.5238	109.0729	0.944744	0.330087	6.347834	8857.924
9376.5	99.5238	109.0694	0.944748	0.330126	6.348569	8858.428
9377	99.5238	109.066	0.944751	0.330164	6.349303	8858.933
9377.5	99.5238	109.0625	0.944755	0.330202	6.350038	8859.437
9378	99.5238	109.0591	0.944758	0.33024	6.350773	8859.942

9378.5	99.5238	109.0556	0.944762	0.330278	6.351508	8860.446
9379	99.5238	109.0522	0.944765	0.330317	6.352243	8860.951
9379.5	99.5238	109.0487	0.944768	0.330355	6.352977	8861.455
9380	99.5238	109.0453	0.944772	0.330393	6.353712	8861.96
9380.5	99.5238	109.0418	0.944775	0.330431	6.354447	8862.464
9381	99.5238	109.0384	0.944779	0.330469	6.355181	8862.969
9381.5	99.5238	109.0349	0.944782	0.330508	6.355916	8863.473
9382	99.5238	109.0315	0.944786	0.330546	6.35665	8863.978
9382.5	99.5238	109.028	0.944789	0.330584	6.357385	8864.482
9383	99.5238	109.0246	0.944792	0.330622	6.358119	8864.987
9383.5	99.5238	109.0211	0.944796	0.33066	6.358854	8865.491
9384	99.5238	109.0177	0.944799	0.330699	6.359588	8865.996
9384.5	99.5238	109.0142	0.944803	0.330737	6.360323	8866.5
9385	99.5238	109.0108	0.944806	0.330775	6.361057	8867.005
9385.5	99.5238	109.0073	0.944809	0.330813	6.361791	8867.509
9386	99.5238	109.0039	0.944813	0.330851	6.362525	8868.014
9386.5	99.5238	109.0004	0.944816	0.33089	6.36326	8868.519
9387	99.5238	108.997	0.94482	0.330928	6.363994	8869.023
9387.5	99.5238	108.9935	0.944823	0.330966	6.364728	8869.528
9388	99.5238	108.9901	0.944827	0.331004	6.365462	8870.032
9388.5	99.5238	108.9866	0.94483	0.331042	6.366196	8870.537
9389	99.5238	108.9832	0.944833	0.33108	6.36693	8871.041
9389.5	99.5238	108.9797	0.944837	0.331119	6.367664	8871.546
9390	99.5238	108.9763	0.94484	0.331157	6.368398	8872.05
9390.5	99.5238	108.9728	0.944844	0.331195	6.369132	8872.555
9391	99.5238	108.9694	0.944847	0.331233	6.369866	8873.059
9391.5	99.5238	108.9659	0.944851	0.331271	6.3706	8873.564
9392	99.5238	108.9625	0.944854	0.331309	6.371334	8874.069
9392.5	99.5238	108.959	0.944857	0.331348	6.372067	8874.573
9393	99.5238	108.9556	0.944861	0.331386	6.372801	8875.078
9393.5	99.5238	108.9521	0.944864	0.331424	6.373535	8875.582
9394	99.5238	108.9487	0.944868	0.331462	6.374268	8876.087
9394.5	99.5238	108.9452	0.944871	0.3315	6.375002	8876.591
9395	99.5238	108.9418	0.944875	0.331538	6.375736	8877.096
9395.5	99.5238	108.9383	0.944878	0.331576	6.376469	8877.601
9396	99.5238	108.9349	0.944881	0.331615	6.377203	8878.105
9396.5	99.5238	108.9314	0.944885	0.331653	6.377936	8878.61
9397	99.5238	108.928	0.944888	0.331691	6.37867	8879.114
9397.5	99.5238	108.9246	0.944892	0.331729	6.379403	8879.619
9398	99.5238	108.9211	0.944895	0.331767	6.380136	8880.123
9398.5	99.5238	108.9177	0.944898	0.331805	6.38087	8880.628

9399	99.5238	108.9142	0.944902	0.331843	6.381603	8881.133
9399.5	99.5238	108.9108	0.944905	0.331881	6.382336	8881.637
9400	99.5238	108.9073	0.944909	0.33192	6.383069	8882.142
9400.5	99.5238	108.9039	0.944912	0.331958	6.383803	8882.646
9401	99.5238	108.9004	0.944916	0.331996	6.384536	8883.151
9401.5	99.5238	108.897	0.944919	0.332034	6.385269	8883.656
9402	100.3175	108.8935	0.944922	0.341731	6.571756	8884.16
9402.5	100.7143	108.8901	0.944926	0.346512	6.663697	8884.665
9403	101.1111	108.8866	0.944929	0.351237	6.754556	8885.169
9403.5	101.1111	108.8832	0.944933	0.351274	6.755268	8885.674
9404	101.1111	108.8797	0.944936	0.351311	6.75598	8886.179
9404.5	101.5079	108.8763	0.944939	0.35598	6.845763	8886.683
9405	101.9047	108.8729	0.944943	0.360594	6.934498	8887.188
9405.5	101.9048	108.8694	0.944946	0.360632	6.935222	8887.692
9406	101.9048	108.866	0.94495	0.360668	6.935924	8888.197
9406.5	102.1693	108.8625	0.944953	0.363726	6.994724	8888.702
9407	102.4339	108.8591	0.944957	0.366761	7.053091	8889.206
9407.5	102.6984	108.8556	0.94496	0.369771	7.110984	8889.711
9408	102.6984	108.8522	0.944963	0.369807	7.111676	8890.216
9408.5	102.6984	108.8487	0.944967	0.369843	7.112368	8890.72
9409	102.6984	108.8453	0.94497	0.369879	7.11306	8891.225
9409.5	102.3016	108.8418	0.944974	0.365445	7.027797	8891.729
9410	101.9048	108.8384	0.944977	0.36096	6.941538	8892.234
9410.5	101.9048	108.835	0.94498	0.360996	6.94224	8892.739
9411	101.9048	108.8315	0.944984	0.361033	6.942941	8893.243
9411.5	100.5	108.8281	0.944987	0.344631	6.627523	8893.748
9412	102.1	108.8246	0.944991	0.363336	6.987238	8894.253
9412.5	96.8	108.8212	0.944994	0.297939	5.7296	8894.757
9413	95.3	108.8177	0.944998	0.277451	5.335599	8895.262
9413.5	98.4	108.8143	0.945001	0.318888	6.132468	8895.767
9414	102.8	108.8109	0.945004	0.371374	7.141815	8896.271
9414.5	103.1	108.8074	0.945008	0.374744	7.206606	8896.776
9415	102.4	108.804	0.945011	0.366956	7.056855	8897.281
9415.5	100.9	108.8005	0.945015	0.349679	6.724594	8897.785
9416	99.4	108.7971	0.945018	0.331614	6.377184	8898.29
9416.5	100.4	108.7936	0.945021	0.343809	6.611719	8898.795
9417	98.5	108.7902	0.945025	0.320431	6.162125	8899.299
9417.5	99.4	108.7867	0.945028	0.331728	6.379385	8899.804
9418	99.8	108.7833	0.945032	0.336672	6.474467	8900.309
9418.5	99.8	108.7799	0.945035	0.33671	6.475195	8900.813
9419	99.8	108.7764	0.945039	0.336748	6.475923	8901.318

9419.5	99.5	108.773	0.945042	0.333112	6.406009	8901.823
9420	99.3	108.7695	0.945045	0.330683	6.359292	8902.327
9420.5	99.6	108.7661	0.945049	0.334417	6.431088	8902.832
9421	99.9	108.7626	0.945052	0.338116	6.502237	8903.337
9421.5	99.6	108.7592	0.945056	0.334493	6.43255	8903.841
9422	99.8	108.7558	0.945059	0.336975	6.480291	8904.346
9422.5	99.2	108.7523	0.945062	0.329635	6.33914	8904.851
9423	98.5	108.7489	0.945066	0.320896	6.171073	8905.355
9423.5	97.6	108.7454	0.945069	0.309371	5.949438	8905.86
9424	97.9	108.742	0.945073	0.3133	6.025001	8906.365
9424.5	98.5	108.7386	0.945076	0.321012	6.173309	8906.87
9425	99.2	108.7351	0.945079	0.329827	6.342819	8907.374
9425.5	98.9	108.7317	0.945083	0.326127	6.27167	8907.879
9426	98.4	108.7282	0.945086	0.319859	6.151144	8908.384
9426.5	99.1	108.7248	0.94509	0.328699	6.32114	8908.888
9427	98.9	108.7213	0.945093	0.326242	6.273889	8909.393
9427.5	99.4	108.7179	0.945097	0.332491	6.394049	8909.898
9428	98.8	108.7145	0.9451	0.325066	6.251268	8910.403
9428.5	98	108.711	0.945103	0.314941	6.056552	8910.907
9429	96.3	108.7076	0.945107	0.292536	5.625691	8911.412
9429.5	95	108.7041	0.94511	0.274595	5.280679	8911.917
9430	93.6	108.7007	0.945114	0.25443	4.892879	8912.421
9430.5	93.9	108.6973	0.945117	0.258878	4.978428	8912.926
9431	94.9	108.6938	0.94512	0.273306	5.255882	8913.431
9431.5	95.7	108.6904	0.945124	0.284532	5.471764	8913.936
9432	96.4	108.6869	0.945127	0.294131	5.656363	8914.44
9432.5	96.6	108.6835	0.945131	0.296864	5.70892	8914.945
9433	96	108.6801	0.945134	0.288776	5.55338	8915.45
9433.5	96.8	108.6766	0.945137	0.29962	5.761919	8915.955
9434	96	108.6732	0.945141	0.288857	5.554941	8916.459
9434.5	95.9	108.6697	0.945144	0.287528	5.529388	8916.964
9435	96.5	108.6663	0.945148	0.295721	5.686934	8917.469
9435.5	95.6	108.6629	0.945151	0.283476	5.451465	8917.974
9436	97.7	108.6594	0.945155	0.311654	5.993353	8918.478
9436.5	98.4	108.656	0.945158	0.320674	6.166814	8918.983
9437	99.1	108.6526	0.945161	0.329504	6.336608	8919.488
9437.5	100.8	108.6491	0.945165	0.350132	6.733305	8919.993
9438	99.3	108.6457	0.945168	0.332057	6.385719	8920.497
9438.5	96.7	108.6422	0.945172	0.298684	5.743931	8921.002
9439	95.7	108.6388	0.945175	0.285144	5.483537	8921.507
9439.5	95.5	108.6354	0.945178	0.282417	5.431105	8922.012

9440	95.3	108.6319	0.945182	0.279674	5.378343	8922.516
9440.5	95.2	108.6285	0.945185	0.278316	5.352234	8923.021
9441	95.4	108.625	0.945189	0.28115	5.406737	8923.526
9441.5	96.1	108.6216	0.945192	0.290829	5.592873	8924.031
9442	95.4	108.6182	0.945195	0.281232	5.408315	8924.535
9442.5	94.4	108.6147	0.945199	0.267133	5.137167	8925.04
9443	93.9	108.6113	0.945202	0.259935	4.998741	8925.545
9443.5	93.9	108.6079	0.945206	0.259977	4.999553	8926.05
9444	94.9	108.6044	0.945209	0.274383	5.276599	8926.555
9444.5	95.7	108.601	0.945212	0.285593	5.492164	8927.059
9445	96.9	108.5975	0.945216	0.301869	5.805165	8927.564
9445.5	96.9	108.5941	0.945219	0.301908	5.805931	8928.069
9446	97.1	108.5907	0.945223	0.304595	5.857605	8928.574
9446.5	95.9	108.5872	0.945226	0.288503	5.548142	8929.079
9447	96.1	108.5838	0.94523	0.291274	5.601433	8929.583
9447.5	95.9	108.5804	0.945233	0.288585	5.549704	8930.088
9448	95.4	108.5769	0.945236	0.281724	5.417778	8930.593
9448.5	95.6	108.5735	0.94524	0.284539	5.471896	8931.098
9449	95.6	108.5701	0.945243	0.284579	5.472681	8931.603
9449.5	96.4	108.5666	0.945247	0.29554	5.683452	8932.107
9450	96.5	108.5632	0.94525	0.296925	5.710106	8932.612
9450.5	95.8	108.5597	0.945253	0.287457	5.528021	8933.117
9451	95	108.5563	0.945257	0.276373	5.314866	8933.622
9451.5	95.5	108.5529	0.94526	0.2834	5.449993	8934.127
9452	93.5	108.5494	0.945264	0.254824	4.90047	8934.631
9452.5	93.7	108.546	0.945267	0.257811	4.957905	8935.136
9453	94.1	108.5426	0.94527	0.263685	5.070868	8935.641
9453.5	93.7	108.5391	0.945274	0.257896	4.959534	8936.146
9454	92.8	108.5357	0.945277	0.244541	4.702721	8936.651
9454.5	92.1	108.5323	0.945281	0.233893	4.497941	8937.156
9455	92	108.5288	0.945284	0.232389	4.469026	8937.66
9455.5	92.6	108.5254	0.945287	0.241641	4.646944	8938.165
9456	94.5	108.522	0.945291	0.269693	5.186406	8938.67
9456.5	95.7	108.5185	0.945294	0.28657	5.510971	8939.175
9457	96.8	108.5151	0.945298	0.301496	5.798006	8939.68
9457.5	97.4	108.5117	0.945301	0.309443	5.950829	8940.185
9458	96.7	108.5082	0.945304	0.300244	5.773922	8940.689
9458.5	96.6	108.5048	0.945308	0.298948	5.748995	8941.194
9459	97.2	108.5013	0.945311	0.306942	5.90274	8941.699
9459.5	97.4	108.4979	0.945315	0.309601	5.953862	8942.204
9460	96.8	108.4945	0.945318	0.301736	5.802606	8942.709

9460.5	97.2	108.491	0.945321	0.307061	5.905022	8943.214
9461	97.5	108.4876	0.945325	0.311022	5.981196	8943.719
9461.5	99.4	108.4842	0.945328	0.335077	6.443797	8944.223
9462	101.3	108.4807	0.945332	0.357791	6.880603	8944.728
9462.5	101.9	108.4773	0.945335	0.364726	7.013968	8945.233
9463	102.7	108.4739	0.945338	0.373772	7.187931	8945.738
9463.5	102.2	108.4704	0.945342	0.368202	7.080811	8946.243
9464	101.2	108.467	0.945345	0.356777	6.86109	8946.748
9464.5	99.2	108.4636	0.945349	0.332843	6.400826	8947.253
9465	98.3	108.4601	0.945352	0.321615	6.184895	8947.758
9465.5	98.4	108.4567	0.945355	0.32292	6.210007	8948.262
9466	96.5	108.4533	0.945359	0.298209	5.734783	8948.767
9466.5	96.1	108.4499	0.945362	0.292851	5.631742	8949.272
9467	96.2	108.4464	0.945366	0.294247	5.658591	8949.777
9467.5	96.3	108.443	0.945369	0.295639	5.685356	8950.282
9468	98.4	108.4396	0.945373	0.323114	6.213724	8950.787
9468.5	99.4	108.4361	0.945376	0.335609	6.454018	8951.292
9469	98.4	108.4327	0.945379	0.323191	6.215211	8951.797
9469.5	97.6	108.4293	0.945383	0.312989	6.019012	8952.302
9470	97.2	108.4258	0.945386	0.307813	5.919472	8952.806
9470.5	97.4	108.4224	0.94539	0.310468	5.970531	8953.311
9471	98.7	108.419	0.945393	0.327121	6.290794	8953.816
9471.5	99.7	108.4155	0.945396	0.339499	6.528836	8954.321
9472	98.5	108.4121	0.9454	0.324685	6.243945	8954.826
9472.5	98.7	108.4087	0.945403	0.327237	6.293011	8955.331
9473	102	108.4052	0.945407	0.366625	7.050476	8955.836
9473.5	99.5	108.4018	0.94541	0.337213	6.48486	8956.341
9474	99.2	108.3984	0.945413	0.333567	6.414742	8956.846
9474.5	99.2	108.3949	0.945417	0.333605	6.415474	8957.351
9475	98.6	108.3915	0.94542	0.326175	6.272587	8957.856
9475.5	98.1	108.3881	0.945424	0.319885	6.151632	8958.36
9476	99.5	108.3847	0.945427	0.337402	6.4885	8958.865
9476.5	100.7	108.3812	0.94543	0.351844	6.766228	8959.37
9477	100.1	108.3778	0.945434	0.344744	6.629693	8959.875
9477.5	99.8	108.3744	0.945437	0.341165	6.560863	8960.38
9478	98.1	108.3709	0.945441	0.320079	6.155367	8960.885
9478.5	99.4	108.3675	0.945444	0.336368	6.468607	8961.39
9479	96.7	108.3641	0.945447	0.30192	5.806155	8961.895
9479.5	98.3	108.3606	0.945451	0.322737	6.206486	8962.4
9480	98.6	108.3572	0.945454	0.326559	6.279987	8962.905
9480.5	100.7	108.3538	0.945457	0.35214	6.771924	8963.41

9481	102.3	108.3504	0.945461	0.37059	7.126735	8963.915
9481.5	99.4	108.3469	0.945464	0.336595	6.472981	8964.42
9482	99.4	108.3435	0.945468	0.336633	6.47371	8964.925
9482.5	98.7	108.3401	0.945471	0.328005	6.307783	8965.43
9483	99.1	108.3366	0.945474	0.333017	6.40418	8965.935
9483.5	99.3	108.3332	0.945478	0.33552	6.452307	8966.439
9484	97.8	108.3298	0.945481	0.316705	6.090483	8966.944
9484.5	95.6	108.3264	0.945485	0.287473	5.528333	8967.449
9485	95.7	108.3229	0.945488	0.288888	5.555546	8967.954
9485.5	97.9	108.3195	0.945491	0.318106	6.11742	8968.459
9486	94.7	108.3161	0.945495	0.275031	5.289058	8968.964
9486.5	98.5	108.3126	0.945498	0.325803	6.26544	8969.469
9487	101.2	108.3092	0.945502	0.358465	6.893561	8969.974
9487.5	100.1	108.3058	0.945505	0.34553	6.644804	8970.479
9488	102.1	108.3024	0.945508	0.368841	7.093097	8970.984
9488.5	99.8	108.2989	0.945512	0.341993	6.576779	8971.489
9489	99.3	108.2955	0.945515	0.335937	6.460335	8971.994
9489.5	99.2	108.2921	0.945519	0.334746	6.43742	8972.499
9490	98.5	108.2887	0.945522	0.326072	6.270624	8973.004
9490.5	95.5	108.2852	0.945525	0.286584	5.511223	8973.509
9491	97.5	108.2818	0.945529	0.313379	6.026521	8974.014
9491.5	95.9	108.2784	0.945532	0.29215	5.618267	8974.519
9492	97.93649	108.2749	0.945536	0.319079	6.136137	8975.024
9492.5	97.93649	108.2715	0.945539	0.319118	6.136885	8975.529
9493	97.93649	108.2681	0.945542	0.319157	6.137633	8976.034
9493.5	97.93649	108.2647	0.945546	0.319196	6.138381	8976.539
9494	97.93649	108.2612	0.945549	0.319235	6.139129	8977.044
9494.5	97.93649	108.2578	0.945553	0.319274	6.139877	8977.549
9495	97.14288	108.2544	0.945556	0.309038	5.943048	8978.054
9495.5	97.14288	108.251	0.945559	0.309078	5.943807	8978.559
9496	97.14288	108.2475	0.945563	0.309117	5.944566	8979.064
9496.5	97.14288	108.2441	0.945566	0.309157	5.945325	8979.569
9497	97.14288	108.2407	0.94557	0.309196	5.946084	8980.074
9497.5	96.34922	108.2373	0.945573	0.298709	5.744408	8980.579
9498	96.34922	108.2338	0.945576	0.298749	5.745178	8981.084
9498.5	96.34922	108.2304	0.94558	0.298789	5.745948	8981.589
9499	95.55556	108.227	0.945583	0.288041	5.539254	8982.094
9499.5	94.76191	108.2236	0.945587	0.277022	5.327352	8982.599
9500	94.76191	108.2201	0.94559	0.277064	5.328145	8983.104
9500.5	94.76191	108.2167	0.945593	0.277105	5.328939	8983.609
9501	94.76191	108.2133	0.945597	0.277146	5.329733	8984.114

9501.5	94.76191	108.2099	0.9456	0.277187	5.330527	8984.619
9502	94.76191	108.2064	0.945603	0.277229	5.331321	8985.124
9502.5	94.76191	108.203	0.945607	0.27727	5.332115	8985.629
9503	94.76191	108.1996	0.94561	0.277311	5.332908	8986.135
9503.5	94.76191	108.1962	0.945614	0.277353	5.333702	8986.64
9504	95.55556	108.1927	0.945617	0.288448	5.547072	8987.145
9504.5	95.55556	108.1893	0.94562	0.288488	5.547853	8987.65
9505	95.55556	108.1859	0.945624	0.288529	5.548635	8988.155
9505.5	95.55556	108.1825	0.945627	0.28857	5.549416	8988.66
9506	95.55556	108.179	0.945631	0.28861	5.550198	8989.165
9506.5	95.55556	108.1756	0.945634	0.288651	5.550979	8989.67
9507	95.55556	108.1722	0.945637	0.288692	5.55176	8990.175
9507.5	94.76191	108.1688	0.945641	0.277683	5.34005	8990.68
9508	94.76191	108.1653	0.945644	0.277724	5.340843	8991.185
9508.5	94.76191	108.1619	0.945648	0.277765	5.341637	8991.69
9509	94.76191	108.1585	0.945651	0.277806	5.34243	8992.195
9509.5	93.96825	108.1551	0.945654	0.266519	5.125371	8992.7
9510	93.96825	108.1516	0.945658	0.266561	5.126177	8993.205
9510.5	93.96825	108.1482	0.945661	0.266603	5.126982	8993.71
9511	93.96825	108.1448	0.945665	0.266645	5.127788	8994.215
9511.5	93.96825	108.1414	0.945668	0.266687	5.128593	8994.721
9512	94.76191	108.138	0.945671	0.278054	5.347188	8995.226
9512.5	94.76191	108.1345	0.945675	0.278095	5.347981	8995.731
9513	94.76191	108.1311	0.945678	0.278136	5.348774	8996.236
9513.5	95.55556	108.1277	0.945681	0.28922	5.561914	8996.741
9514	95.55556	108.1243	0.945685	0.28926	5.562695	8997.246
9514.5	96.34922	108.1208	0.945688	0.30007	5.770576	8997.751
9515	97.14288	108.1174	0.945692	0.310616	5.973379	8998.256
9515.5	97.14288	108.114	0.945695	0.310655	5.974136	8998.761
9516	97.14288	108.1106	0.945698	0.310694	5.974894	8999.266
9516.5	97.14288	108.1072	0.945702	0.310734	5.975651	8999.771
9517	97.14288	108.1037	0.945705	0.310773	5.976408	9000.277
9517.5	97.14288	108.1003	0.945709	0.310813	5.977166	9000.782
9518	97.14288	108.0969	0.945712	0.310852	5.977923	9001.287
9518.5	97.14288	108.0935	0.945715	0.310891	5.97868	9001.792
9519	97.93649	108.0901	0.945719	0.321177	6.176478	9002.297
9519.5	97.93649	108.0866	0.945722	0.321216	6.177224	9002.802
9520	98.73015	108.0832	0.945726	0.331254	6.370268	9003.307
9520.5	98.73015	108.0798	0.945729	0.331292	6.371003	9003.812
9521	98.73015	108.0764	0.945732	0.33133	6.371738	9004.317
9521.5	99.5238	108.0729	0.945736	0.341128	6.560154	9004.823

9522	99.5238	108.0695	0.945739	0.341166	6.560879	9005.328
9522.5	99.5238	108.0661	0.945742	0.341203	6.561603	9005.833
9523	99.5238	108.0627	0.945746	0.341241	6.562327	9006.338
9523.5	100.3175	108.0593	0.945749	0.350806	6.746266	9006.843
9524	100.3175	108.0558	0.945753	0.350843	6.74698	9007.348
9524.5	100.3175	108.0524	0.945756	0.35088	6.747693	9007.853
9525	100.7143	108.049	0.945759	0.355595	6.838368	9008.358
9525.5	101.1111	108.0456	0.945763	0.360255	6.927975	9008.864
9526	101.1111	108.0422	0.945766	0.360291	6.928678	9009.369
9526.5	101.1111	108.0387	0.94577	0.360328	6.929382	9009.874
9527	101.1111	108.0353	0.945773	0.360364	6.930085	9010.379
9527.5	101.1111	108.0319	0.945776	0.360401	6.930788	9010.884
9528	101.1111	108.0285	0.94578	0.360438	6.931492	9011.389
9528.5	101.1111	108.0251	0.945783	0.360474	6.932195	9011.895
9529	101.1111	108.0217	0.945787	0.360511	6.932898	9012.4
9529.5	101.1111	108.0182	0.94579	0.360547	6.933602	9012.905
9530	101.1111	108.0148	0.945793	0.360584	6.934305	9013.41
9530.5	101.1111	108.0114	0.945797	0.36062	6.935008	9013.915
9531	101.1111	108.008	0.9458	0.360657	6.935711	9014.42
9531.5	101.1111	108.0046	0.945803	0.360694	6.936414	9014.925
9532	100.7143	108.0011	0.945807	0.356111	6.848284	9015.431
9532.5	100.3175	107.9977	0.94581	0.351474	6.759108	9015.936
9533	99.5238	107.9943	0.945814	0.341994	6.576804	9016.441
9533.5	98.73015	107.9909	0.945817	0.332285	6.390101	9016.946
9534	98.33331	107.9875	0.94582	0.327362	6.295417	9017.451
9534.5	97.93649	107.9841	0.945824	0.322379	6.199587	9017.957
9535	97.14288	107.9806	0.945827	0.31219	6.003649	9018.462
9535.5	96.74606	107.9772	0.945831	0.307021	5.904245	9018.967
9536	96.34925	107.9738	0.945834	0.301788	5.803615	9019.472
9536.5	95.55556	107.9704	0.945837	0.291085	5.59779	9019.977
9537	94.76191	107.967	0.945841	0.280113	5.386787	9020.482
9537.5	94.76191	107.9635	0.945844	0.280154	5.387578	9020.988
9538	94.76191	107.9601	0.945847	0.280195	5.388369	9021.493
9538.5	94.76191	107.9567	0.945851	0.280236	5.38916	9021.998
9539	94.76191	107.9533	0.945854	0.280277	5.389951	9022.503
9539.5	94.76191	107.9499	0.945858	0.280319	5.390742	9023.008
9540	95.15875	107.9465	0.945861	0.285899	5.498054	9023.514
9540.5	95.55556	107.943	0.945864	0.291409	5.604021	9024.019
9541	95.55556	107.9396	0.945868	0.29145	5.6048	9024.524
9541.5	95.55556	107.9362	0.945871	0.29149	5.605578	9025.029
9542	95.55556	107.9328	0.945874	0.291531	5.606357	9025.534

9542.5	95.55556	107.9294	0.945878	0.291571	5.607136	9026.04
9543	95.55556	107.926	0.945881	0.291612	5.607914	9026.545
9543.5	95.55556	107.9226	0.945885	0.291652	5.608693	9027.05
9544	95.55556	107.9191	0.945888	0.291692	5.609471	9027.555
9544.5	95.15875	107.9157	0.945891	0.286266	5.505114	9028.061
9545	94.76194	107.9123	0.945895	0.280771	5.399446	9028.566
9545.5	94.76191	107.9089	0.945898	0.280812	5.400228	9029.071
9546	94.76191	107.9055	0.945902	0.280853	5.401018	9029.576
9546.5	94.36507	107.9021	0.945905	0.275289	5.29402	9030.081
9547	93.96825	107.8986	0.945908	0.269655	5.185672	9030.587
9547.5	93.96825	107.8952	0.945912	0.269697	5.186474	9031.092
9548	93.1746	107.8918	0.945915	0.25817	4.96481	9031.597
9548.5	93.1746	107.8884	0.945918	0.258213	4.965625	9032.102
9549	93.1746	107.885	0.945922	0.258255	4.96644	9032.608
9549.5	93.1746	107.8816	0.945925	0.258297	4.967255	9033.113
9550	93.1746	107.8782	0.945929	0.25834	4.96807	9033.618