MINISTRY OF EDUCATION OF REPUBLIC OF AZERBAIJAN
KHAZAR UNIVERSITY

SCHOOL OF ENGINEERING AND APPLIED SCIENCES

Code of Major	60606-Petroleum and Gas Engineering
Name of Specialty	Petroleum Engineering

MASTER THESIS

Title: A VERIFICATION AND QUALITY CONTROL METHOD FOR PERMEABILITY DISTRIBUTION DATA IN OIL AND GAS FIELDS.

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BAKU – 2018

Acknowledgement

I would like to thank my supervisor Associate Prof. Dr. Gasham Zeynalov for his support, guidance and tireless efforts from the very start of thesis project to its end.

Heartfelt thanks go to **Prof. Hamlet Isaxanli,** founder of Khazar University**, Dr. Hassan Niknafs,** Rector of Khazar University and Dean of the Faculty of Engineering and Applied Sciences.

Special thanks also go to the department of petroleum engineering, the Head of Department, Associate Professor **Gasham Zeynalov** for providing us with the methodology and guidance into early research life. I would like to thank **Ms. Turan Jafarova,** Director of International Affairs and her team for their mental support all through my years of study at Khazar University. I will like to pour my heart out in appreciation to my brother **Eric Manga NJIE** for his tireless support both morally and financially. This adventure would have been impossible without you. My entire family is not left out, most especially my mother whose constant support has been a major booster. You have all been wonderful to me.To God the most high I give the greatest honor, for nothing good in this world is possible without his grace.

Last but not the least, I wish to express my sincere gratitude to my wife Mme.**JOSO VEVANJE epouse EPIE NJIE** for her patience, understanding and unconditional love. May God continue to guide and fortify you.

Abstract

The purpose of this research is to test the applicability of the Benford's First Digit law (FDL) as a data quality control method for permeability distribution data in oil and gas fields. The FDL involves the distribution of occurrence of first digits (from 1 to 9) in measurements emanating from natural processes. Distribution of permeability is an example of such a natural process. The FDL has been used successfully as a tool in the field of financial accounting for the detection of fraud and misrepresentative data thus giving financial auditing professionals a method of probing non-conformant FDL data sets. In this thesis, permeability distribution data from two major fields in the Norwegian continental shelf have been investigated in the light of the FDL to confirm if the data is truly from a natural geological process. In achieving this objective, samples of permeability distribution data from both fields were examined. Their first digit distributions and goodness-of –fit to the ideal Benford's FDL distribution was evaluated using the chi-square statistic. In doing this, two hypotheses were considered. These are the Null Hypothesis and the Alternative Hypothesis. The Null Hypothesis was stated as;

Ho: Permeability distribution in oilfields is a non- random natural geological occurrence which conforms to the Benford′s FDL.

The Alternative Hypothesis was stated as;

H_1: Permeability distribution in oilfield is a non- random natural geological process which does not conform to Benford̓s First-Digit Law.

The Null hypothesis that their respective permeability distributions follow the Benford's FDL distribution was clearly established and accepted based on the results of the statistical goodness-of-fit test. Although it may not be immediately concluded that non-compliant datasets are not representative of the field under investigation, a non-compliant data set is an invitation for the Petroleum Professional to ask important questions like why certain permeability range of values seem to distort this trend. Trend distortions could be as a result of geological misinterpretations, non-

standard permeability measurement techniques, data transmission, storage and decoding errors or outright fictitious data entries. All of these possibilities have to be investigated for final data validation.

XÜLASƏ

Bu tədqiqatın əsas məqsədi neft və qaz yataqlarında keçiriciliyin paylanması məlumatları üçün məlumatların keyfiyyətinə nəzarət metodu qismində Benfordun birinci rəqəm qanununun (FDL) tətbiqinin yoxlanılmasıdır. FDL təbii proseslərdən alınan ölçmələrdə birinci rəqəmlərin paylanmasını (1-dən 9-a qədər) xarakterizə edir. Belə təbii proseslərin nümunəsi kimi keçiriciliyin paylanmasını göstərmək olar.. FDL daha çox maliyyə hesabatları sahəsində düzgün olmayan və səhv məlumatların aşkar edilməsi üçün istrument kimi istifadə edilir və mçaliyyə auditi tədqiqatları üzrə FLD-yə uyğun olmayan məlumatların toplanmasında effektiv rol oynayır.

Bu tezis işində is FLD əsasında Norveç kontinental şelfində iki yataqda məsaməliyin paylanması məlumatları tədqiq edilmiş və həminməlumatların təbii geoloji proseslərin nəticələrinə uyğun olduğu müəyyən edilmişdir. Bu məqsədə çatmaq üçün hər iki yataqdan götürülmüş kernalarda keçiriciliyin paylanması məlumatları tədqiq edilmişdir. Onların birinci rəqəmlərinin paylanması və Benford FLD ideal paylanmasına uyğunluğu Chi-kvadrarik statistikanın köməyi ilə qiymətləndirilmişdir. Onlar Sıfır və Alternativ fərziyyələrdirlər. Sıfır fərziyyəsi aşağıdakı kimi müəyyən edilmişdir:

Ho: Neft yataqlarında keçiriciliyin paylanması Benford FDL-yə uyğun olan təsadüfi təbii geoloji proseslərlə əlaqədardır.

Alternativ fərziyyəsi aşağıdakı kimi müəyyən edilmişdir:

H1: Neft yataqlarında keçiriciliyin paylanması Benford FDL-yə uyğun olmayan təsadüfi təbii geoloji proseslərlə əlaqədardır.

Sıfır fərziyyəsinin keçiriciliyin uyğun palanması Benford FDL paylanmasına uyğun gəlir ki, bu da statistik sınağın yararlılıq nəticələrinin əsasında daha dəqiq müəyyən edilmiş və qəbul olunmuşdur. Baxmayaraq ki, qeyd edilən yataqlar üçün uyğun olmayan toplanmış məlumatların xarakterik olmadıgğlö haqqında fikir irəli sürmək mumkun ola bilməz, uyğun olmayan məlumatlar Petroleum Professional üçün tətbiq

ediləréк vacib sualları vermək olar olar və yəqin ki, keçiriciliyin qiymətinin müəyyən diapazonunda bu tendensiyanı xətalandırır. Bu xətaların trendi geoloji düzgün olmayan interpretasiyaların interpretasiyaların, keçiriciliyin qeyri-standart ölçülməsi , məlumtların ötürülməsində səhvlərin olması, məlumatların qeydə alınmasında saclanma və kodlaşdırmanın düzğün aparılmamasının nəticələri ola bilər. Bütün bu imkanlar məlumatların son yoxlanışında tədiq olunmalıdır.

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ABBREVIATIONS

K	Permeability
FDL	First Digit Law
b	Gas specific constant
ANN	Artificial Neural Network
P_{mean}	Mean Gas Pressure
JFm	Johansen Formation
TFm	Tarbet Formation
χ^2	Chi-Square
Ø	Porosity
DST	Drill Stem Test.
VMM	Virtual Measurement Method
DR	Change in Resistivity
DD	Change in depth corresponding to DR
NPD	Norwegian Petroleum Directorate

INTRODUCTION

1.1 **Background**

The quality and representability of permeability data is indispensable in all aspects of petroleum Engineering. In the oil and gas industry several techniques have been developed for measuring permeability data for entire oil and gas fields. Consequently, the amounts of permeability data stored about a field is enormous. Reservoir engineers are always interested in quantifying and validating description data and the effects that such data can have on fluid flow. Such quantification is necessary for full use to be made of the information in reservoir performance descriptions. For accurate reservoir modelling therefore, good quality permeability data is required. So unless the data captured and stored is actually representative of the reservoir in question, any usage of it will lead to significant errors. Therefore the need to carry out a quality assessment of the data obtained is absolutely necessary.

Recently, more attention is being placed on quantifying the effects of reservoir heterogeneities. Pratts (1972), Richardson et al. (1978) and Weber (1982) present mathematical models for evaluating the effects of small scale geological heterogeneities on effective permeabilities, directional permeability and so on. All of these are only achievable if the magnitude of the permeability and its distribution is known.

Assessment of field permeability distribution is a necessary first step for any field development work to be envisaged. This fact has already been stressed in several studies conducted in this regards. Over the past several years, methods to obtain these permeabilities have been developed and seen remarkable improvement in recent times. For field assessment purposes, there are a number of methods which are used to measure permeability. In this thesis, a review of the following methods has been made;

- Core analysis using a permeameter
- Well testing and use of empirical models

- Artificial Neural networks

Distribution of permeability in a field is a product of several geological factors. These factors (grain size and its distribution, cementation, compaction, quartz content, dolomitization,) are known as geological control elements. These interact with the environment of deposition to determine the permeability distribution of the field. The permeability is diagenetically modified to give the intrinsic permeability of the field which is determined using the methods outlined above. These diagenetic factors have also been discussed.

All of these geological processes should be understood in order that permeability data can be assessed for validity and representability. It has been established that permeability distribution in a field follows a logarithmic distribution but this information is insufficient to help field developers to distinguish between good quality permeability data from poor quality permeability data. In this regard, the modified Kozeny–Carman equation (KCE) is being employed as a permeability estimation and prediction tool. However, the KCE suffers from two main setbacks which could lead to significant errors in permeability estimation;

i) It has been found to underestimate permeability in very good quality sands.
ii) It has been found to overestimate permeability in low quality sands.

1.2 Objectives

Knowledge of the various geological environments of deposition and diagenetic factors controlling the lithification process of reservoir rocks in oil and gas fields is indispensable in assessing the quality of permeability distribution data. In this thesis, we consider the following general and specific objectives;

1.3 General Objectives

In this thesis the following general objectives are considered;

1) Examination of the processes responsible for the development of permeability

distributions in oil and gas fields.

2) To demonstrate the link between geological depositional models.

1.4 Specific objectives

1) To investigate the applicability of a natural mathematical law (Benford,s FDL) to the distribution of permeability in an oil and gas field.
2) To apply the Benford law to oil/gas field permeability data and find out which data sets should be further investigated for authenticity and representability based on their probability and percentage occurence.
3) To link deviations from non-compliant first digits in a given permeability distribution data set to the either one or a combination of several geological misinterpretations,systematic errors or false data.
4) To show that the FDL can be used a permeability distribution data quality check method.

1.5 Organization of the Thesis

This thesis is organized into four chapters as follows;

Chapter 1 examines the different types of depositional environments and models and how this affects the lithification and permeability distribution of oil and gas reservoir rocks.

Chapter 2 examines the various diagenetic factors (mechanical/chemical) and their impact on the lithification process. The link between these factors and permeability modification and distribution is also established.

Chapter 3 focuses on the current techniques used in the determination of permeability in the field and in the laboratory. Understanding of the basis of these measurement techniques and interpretation of the results thereof is important in permeability value reporting.

Chapter 4 focuses on an integrated new approach for assessing the quality of permeability distribution data using the FDL.It discusses the sources of the data used for this thesis and analyses the data for conformance to the FDL.It discusses how this new approach can be used as a quality control tool for permeability distribution data.

Conclusion/Recommendations. This thesis concludes with explanation of the major findings and more especially that, the FDL describes heterogeneity of the field beyond the concept of coefficient of variability as described by Dykstra-Parsons. It can therefore be used as a tool to determine the quality of permeability distribution data if used with a good understanding of the geological controls involved.

The limitations of the method are equally mentioned but the implications for this phenomenon are worthy of further investigation.

CHAPTER 1.

DEPOSITIONAL MODELS

Permeability distributions in reservoir rock is the resultant of so many geological parameters. Depositional environments are important in the analysis of permeability distribution because, rocks formed after the lithification process are a product of the prevailing physico-chemical environment on a given composition of sediment. Biological activity on these sediment compositions equally aid simultaneously in permeability modification. During the depositional stage rock particles or grains are arranged in three dimensional spatial configurations called frameworks. This framework determines the final permeability of the rock after compaction and the influence of the environment (Choquette & James, 1990). The compaction process then occurs subsequently and this makes the distribution of porosity and permeability more complex. In other words, the porosity and permeability post formation of the reservoir rocks, is primarily controlled by the depositional environment (Schmidt et al., 1985).The most common geological settings favorable for the depositional environment include margin reef and beach settings. However, there are number of other important settings that influence the mode of sediment deposition and hence permeability distribution.

1.1. Types of Depositional Environment Models.

There are five principal types of sandstone depositional environments known to be good habitats for oil and gas. Permeability distributions in these environments depend and are characterized by their geological settings.

1.1.1 Barrier Sand Model.

Barrier Island are characterized by topologically flat areas containing sand of medium to fine granulometry. According to a study conducted by the NOAA (George Leigh et al.2012) barrier islands occur in chains and are formed by waves or tidal action propagating collinearly to the shoreline of an ocean or other large body of water. Though barrier islands are narrow and long, they carry massive amounts of sand.

Despite this narrowness, they can attain a thickness of 50ft and may extend uninterrupted over a hundred kilometers (LeBlanc, 1977).Marine processes determine the formation and shape of Barrier Islands. Wave forces produce longshore currents that are permanently and continuously transporting material along the shoreline. Important parameters affecting the resulting shape of barrier islands are the amount and type of sediment, the tidal range, and the energy content of the waves (Hayes, MO, 1979). Basement control and sea level trends also exert a significant influence on the shape of barrier islands. Barrier islands undergo modifications after formation. These changes are longshore migration and seaward progradation. This accounts for the vertical sequence of depositional facies observed. A typical sequence begins with;

(i) Basal unit of of silty clays or shales containing interbedded siltstones and very fine sand.This is overlain by,
(ii) Lower shoreface deposits of thinly bedded,highly burrowed silts and fine sands.This is laid upon by,
(iii) Coarser laminated sands of the upper shoreface and beach deposits.These are laid upon by,
(iv) Chemically oxidized sands of the bear beach.

Analysis of the texture of these sands enable the analyst to conjecture the depositional environment. This is done by comparing the sand with that of a disaggregated core from the same area and establishing the grain sizes and shape. This information is used in *empirical models to evaluate the permeability of the formation.*

Several theories have been advanced to explain the formation of barrier islands and the mode of deposition of their sediments;

1.1.1.1 Offshore Bar Theory

The major tenets of this theory are that;

- ❖ Hydrodynamic factors play the major role through which offshore bars are constructed.

- Sediments get deposited as the incoming waves loose their competence and deposit their load of sediment
- The movement of waves coastwards agitates already deposited sediments found at the bottom.

An accumulation of this sediment gives birth to offshore bars.

1.1.1.2 Spit Progradation Theory

The tenets of this theory are;

Constitutive material in Barrier Island is not procured from offshore sources. It is obtained from loose shore deposits and transported into place by longshore transport.

The resulting spit is transgressed, forming, barrier islands. In terms of age therefore, the spit is stratigraphically younger than the land mass it is adjoining with (O. F. Evans, 1942).They are less compacted and show a higher permeability than their adjoining landmass.

1.1.1.3 Beach Ridge Submergence Theory

- At the meeting point between ocean and land, beaches will be formed.
- Massive dunes ridges are formed at close proximity to the beach (Hoyt, J., 1976).

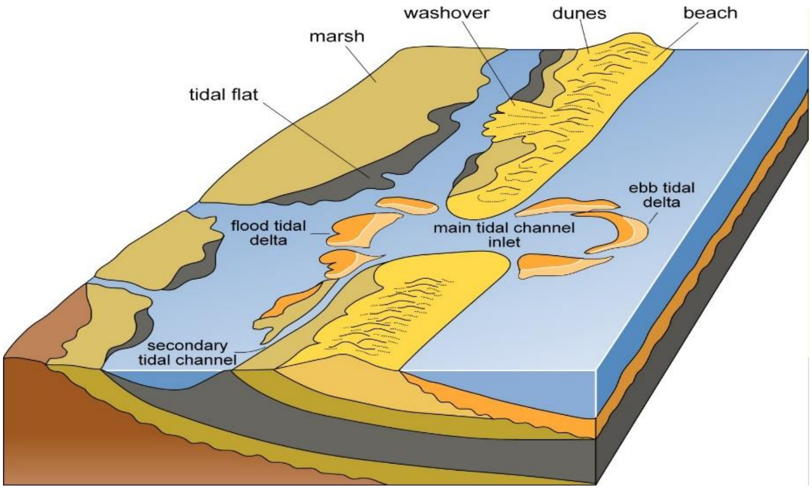


Fig 1.1:**Barrier Sand Model(Reinson G.E,1979)**

The main reservoir facies of a barrier island deposit has usually been washed free of most silt and clay. As a result, this facies shows **good permeability** and porosity (Ransein G, 1979).

1.1.2 Turbidite Sand Model

Turbidites can be defined as gravity driven mass flows (driven by turbidite currents) that transport poorly sorted sands from shallow water to deep water. They are lens-like in geometrical shape and tend to form a staked pattern with a common sediment source point (Brett, 2006).They have **coarser layers towards the bottom of the deposit and finer laminations at the top**. This is called upward finning or the Bouma sequence(Bouma et al. 1985).They show a proximal-to- distal and an axial-to-margin fining in grain size. Turbidites are also characterized by graded bedding and moderate grain sorting. (Neuendorf et al. 2000).

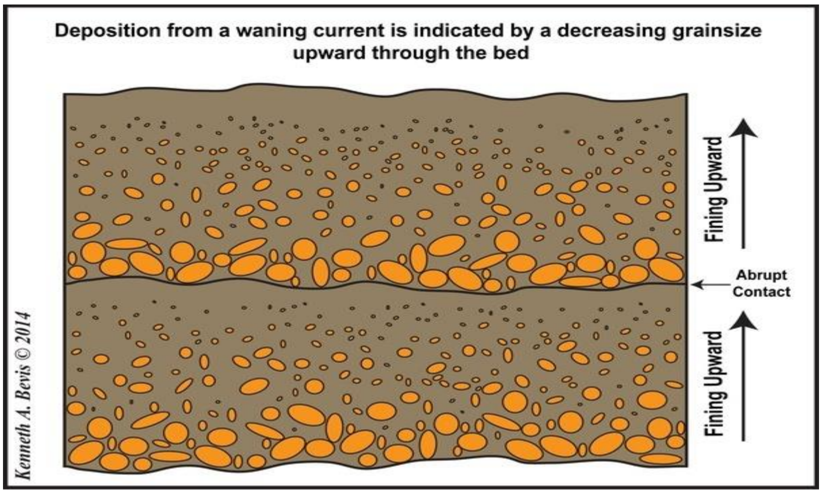


Fig 1.2. Upward fining of grains by turbidite currents [Kenneth B, 2014].

1.1.3 Tidal Sandbody Model

Tidal currents exhibit a front and back flow movement. As a result, they produce bedforms with different orientations. Tidal and depositional currents produce significant sediment movement. Tidally generated sandstone (and gravelstone) are encased in mudstone intervals.Calcerous sandstone-gravelstone are prone to diagenetic modification of primary porosity. This has a direct impact on the permeability as well. In tidal settings, current competence changes in a cyclical manner and the change in competence generates deposits that are organized into heterolithic laminae (Visier, 1980). There is an upward fining succession of grains as shown in **Fig 1.1.5** above.

However the rolling and mixing movement of tidal currents as shown in **Fig.1.1.3** below causes a slightly less orderly fining succession as it is with the case of turbidites above. This explains the variation of permeability in tidal deposits by virtue of these less orderly arrangement of rock grains.

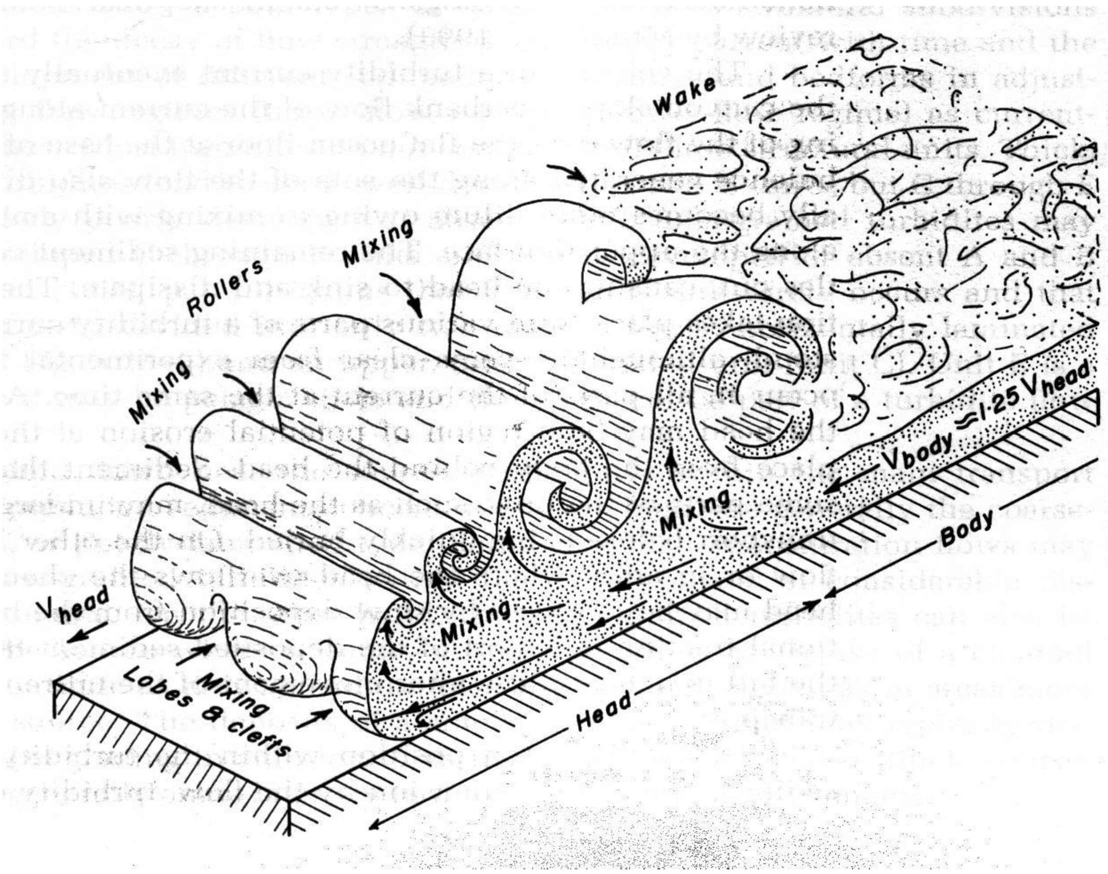


Fig.1.3: Diagram showing the mixing and rolling action of the tidal current [Visier 1980].

1.1.4 Deltaic Model

The deposition and arrangement of clastic sediments in deltas plays a major role in distribution of permeability within oil and gas reservoirs inhabiting these deltas.

Deltaic accumulations form from river systems carrying a high load of clastic sediments from an inland drainage basin to the coast. These high loads of clastic sediments are made up of a distribution of grain sizes of primarily clay and gravel. The materials are deposited into the marine environment and overbank through distributary channels. Deltas occur in a wide variety of shapes and forms determined by grain size and fluvial influx (Coleman, 1985; Reading 1986, Walker, 1992). In terms of grain distribution deltas show a coarsening upward sequence aided by the process of flocculation. Stratigraphically, three types of beds can be distinguished;

1.1.4.1 Bottomset Beds

They are the first beds to be deposited. Compositionally, these beds are comprised of good quantities of silt and relatively smaller quantities of clay. During the transport process, attrition significantly reduces the size of the particle grains progressively and this happens in the direction of transport. Permeability is lowest at the bottomset beds due to smaller grain sizes and high compaction due to overburden from the foreset and topset beds.

1.1.4.2 Foreset Beds

These beds are the next to be deposited underwater and topographically slope 10^0-25^0 towards the bottom beds. They are composed of sand and gravels with more variable sizes and constitute the main bodies of deltas. Foreset beds overly the existing bottomset beds. Permeability is higher compared the bottomset beds due to bigger grain sizes and lesser compaction due to overburden from the topset beds.

1.1.4.3 Topset Beds

They are the last beds to be deposited. Compositionally, these beds have good quantities of silt and relatively smaller quantities of clay. During the transport process, attrition has significantly reduced the size of the particle grains progressively and this happens in the direction of transport. Permeability is highest at the topset beds due to smaller grain sizes and little to no compaction.

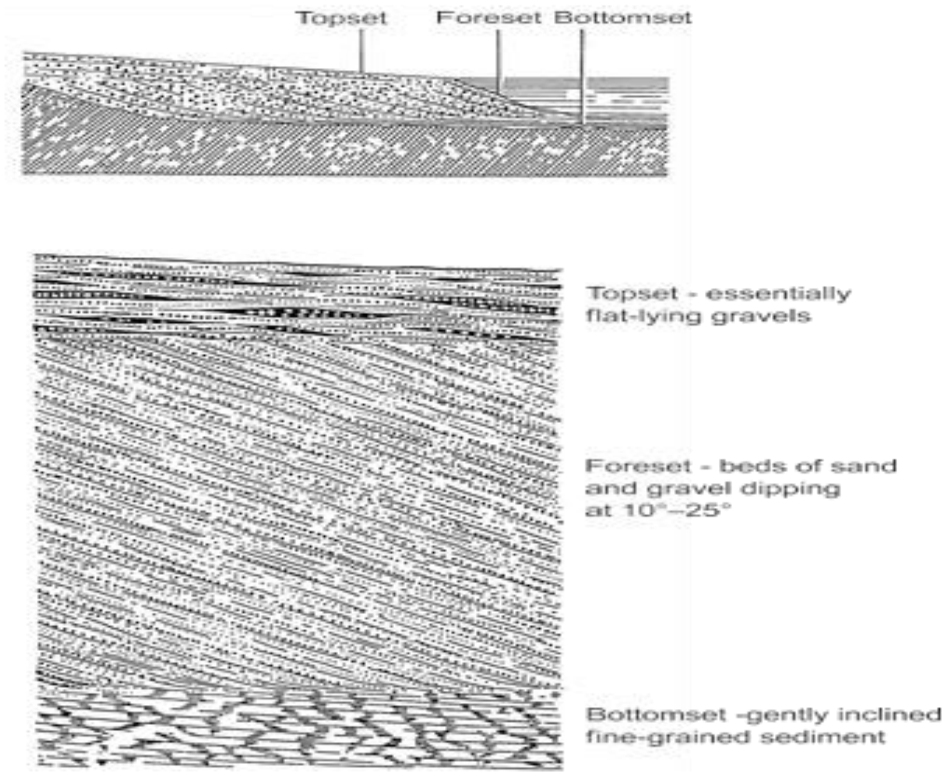


Fig 1.4:Cross-sectional facies architecture and vertical facies succession of a delta showing threefold subdivision into topset, foreset, and bottomset strata. From Elliott (1986) after Gilbert (1885) and Barrell (1912)

1.1.5 Fluvial Model

The fluvial depositional model is comprised of five typed of deposits. These include alluvial fans, braided river, meandering river, and incised valley deposits. Each of these deposits has its individual properties. These properties include particularly grain size, and grain orientation. These two characteristics determine the permeability distribution in reservoirs based on the fluvial model environment.

Fluvial deposits contain sediments generated by river and streams and aided by gravity flow processes. The following deposit types below can be distinguished;

1.1.5.1 Fluvial deposits- There are several typed of fluvially derived deposits; The Rivers provide herein, the means of transportation and when they lose their competence, the loads of sediment is deposited continentally.

.1.5.2 Alluvial Fans: These form at mountain bottom slopes at the mouth of rivers and are characterized by a fan shape.

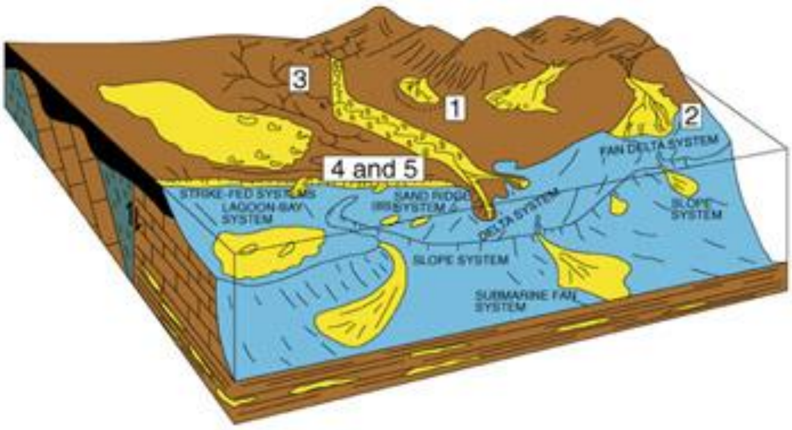
1.1.5.3 **Fan Delta deposit**: These form at the base of mountains just like alluvial fans but sediment load is deposited near a marine shoreline and also in marine waters.

1.1.5.4 **Braided River deposits**: These form in two places, the mountain base, and beyond the mountain base.

1.1.5.5 **Meandering River deposits**: These are also known as flood plain deposits. The plains are gentle sloping.

1.1.5.6 **Incised –Valley deposits**: These just fill continental valleys.

The above cited depositional and its associated types of deposits are shown in **Fig 1.1.5** below;



LEGEND

1. Alluvial Fan deposit

2. Fan Delta deposit

3. Braided river deposits

4.Incised/nonincised m.river

5. Incised River

Fig 1.5. Fluvial Depositional Model (Reprinted with permission of F. Brown.)

1.2 Gamma Ray log identification of depositional models

Permeability distributions can be correctly inferred from a good understanding of the geology of deposition (sequence stratigraphy) and most especially, the environment of deposition. Only then can a good assessment of the quality of permeability data be made.

In sequence stratigraphy, the Gamma Rays (GR) tool is employed as one of the main tools for the identification of environment of deposition. Variation of GR character is considered as an indication of grain size. With respect to the sedimentary depositional models described above, the depositional systems in relation to grain size distributions are shown in **Fig.1.6** .Grain size distributions are a direct reflection of permeability distribution.

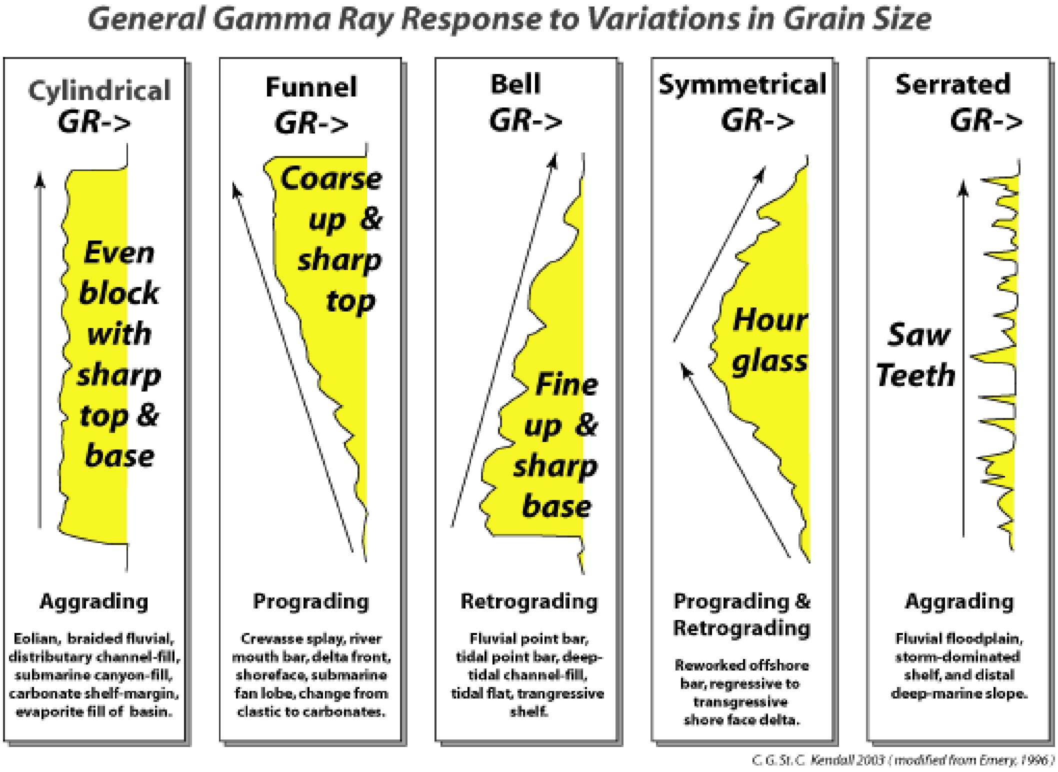
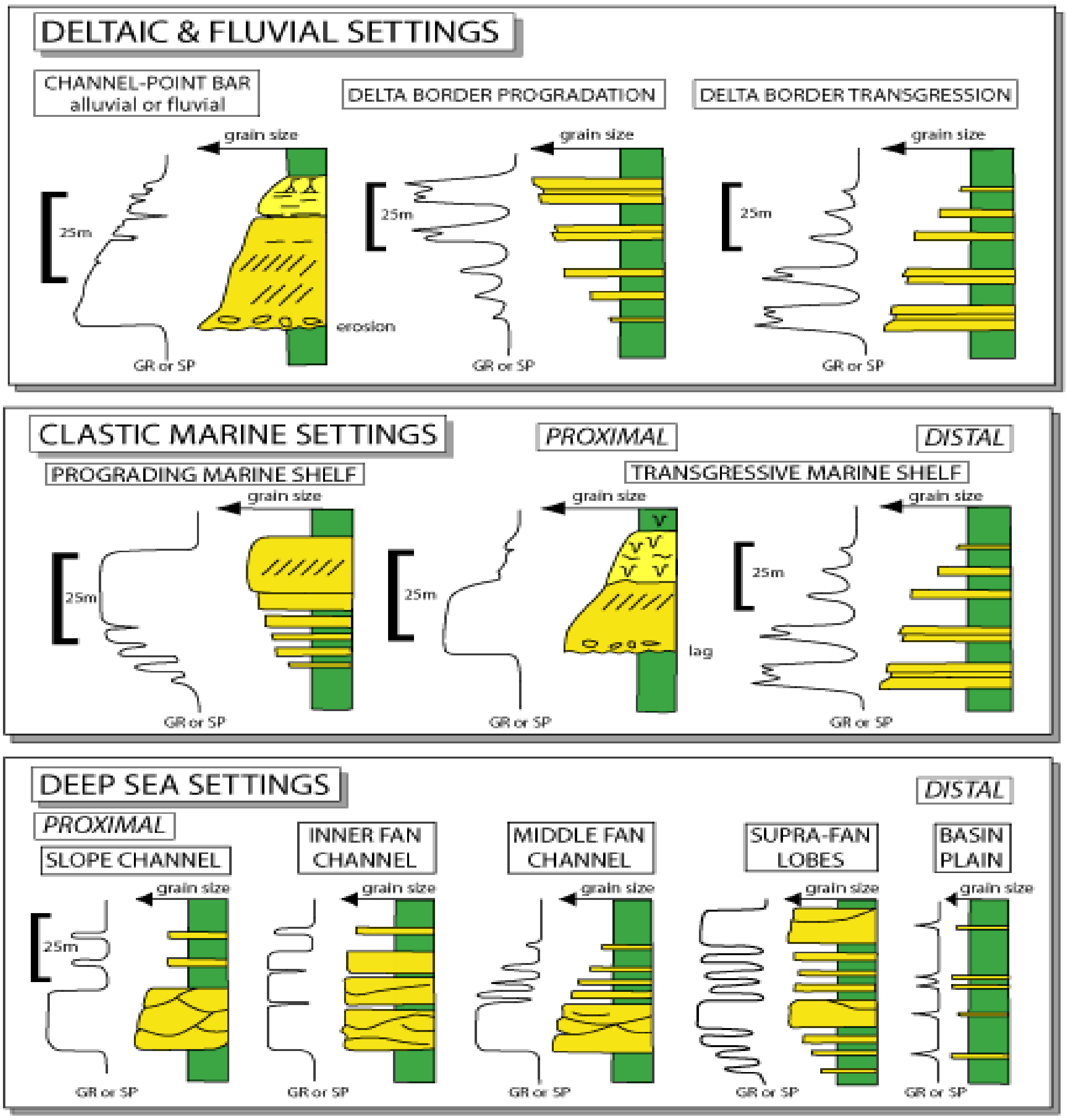


Fig 1.6 Gamma Ray response to variation in grain size. [Modified from Emery, 1996].

The environment of deposition plays a leading role in permeability distribution and as already cited above, a knowledge of the depositional environment provides clues as to the type of grain size distribution to expect and possible permeability ranges. These environments are shown in **Fig.**1.7 below.



Gamma Ray Log Response & Depositional Setting

C. G. St. C. Kendall 2003 (modified from Malcolm Rider 1999)

Fig.1.7 **Gamma Ray Response and Depositional Setting [Rider 1999].**

CHAPTER 2

DIAGENETIC DETERMINANTS OF PERMEABILITY DISTRIBUTION

Diagenesis is defined as the alteration of sediments and their constituent minerals during burial after deposition. Diagenetic processes include the formation of new minerals, the redistribution and recrystallization of the substances within the sediments, and lithification (sediments turning into rock).

Permeability acquired by virtue of the depositional environment is not a static process. It is a dynamic process in which permeability acquired may be destroyed or enhanced in the sedimentation cycle. Recently, there has been improved understanding that there are changes in minerology, cementation, compaction etc. which affect porosity and permeability. These processes include increasing pH, increasing depth (Rittenhouse 1971), increasing pressure, increasing pressure and original sandstone composition. (Scholle and Schluger., 1979).A good understanding of the impact of these parameters provides a valuable insight into distribution of porosity and **permeability** in oilfields. Furthermore, an understanding of this permeability distribution in sedimentary facies and its relationship to depositional processes are key to predict subsurface flow patterns and the occurrence of hydrocarbons (Hurst and Rosvoll 1991., Kerans et al., 1994).

2.1 Effect of dolomitization on Permeability

Permeability is affected negatively by chemical dolomitization. This process produces dolomite cement.

$Ca^{2+}+Mg^{2+}+2CO_3^{2-}$……………….>$CaMg\ (CO_3)_2$.

Permeability can however be enhanced by the replacement of pre-existing limestone.

$2CaCO_3+Mg^{2+}$…………………..>$CaMg\ (CO_3)_2+\ Ca^{2+}$

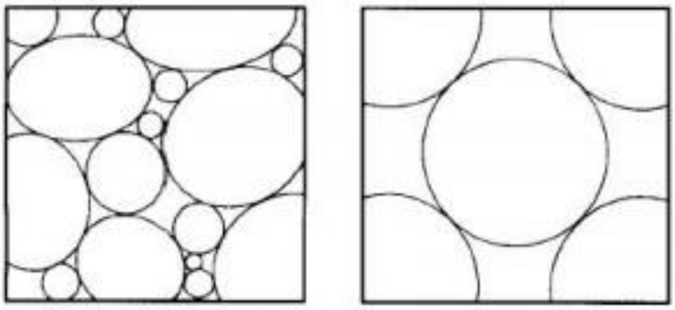
Pore water provides magnesium ions for the above process. The size of dolomite crystals is controlled by the magnesium content of the dolomitizing fluid (Berner, 1971). Smaller dolomite crystals are indicative of more proximal hydrodynamic environments and are the result of supersaturated fluids. Larger crystals characterize more distal hydrodynamic environments where dolomitizing fluids are less saturated.

2.2 Effect of Grain Size Distribution on Permeability.

Permeability in a formation in which oil and gas have been generated and can flow is a direct consequence of depositional and diagenetic parameters. These parameters interplay to generate unique 3-D pore space geometries during the lithification of the rock.

2.3 Effect of grain sorting on permeability.

Grain sorting refers to distribution of grains making up the porous medium. If all the particles are of equal diameter, the system is described as being well sorted. If the sedimentary rock contains grains of dissimilar diameters the result is a poorly sorted system. In the case where there is a large difference in the diameters of the grains, the smaller grains can block the pore throats of the system and cause a reduction in permeability (North, 1985).This phenomenon is illustrated in Fig 2.3 below;



(A) **(B)**

Fig 2.1 Well Sorted (**B**) and Poorly Sorted (**A**) grains [Selley, 2000].

2.4 Effect of grain size on permeability.

This parameter plays a central role as a permeability control element. Generally smaller grains have smaller pores and by virtue of that, will also contain smaller pore throats. The reverse is true with larger grains. Fine-grained reservoir sandstones have a lower permeability than coarse –grained sandstones. A distribution of small and large permeability values within an oilfield directly implies that the sandstones are made up of a distribution of grain sizes or diameters. Experimental evidence has proven that;

$$K \infty Cd^2.$$

Where k is intrinsic permeability; C is a dimensionless constant describing the path tortuosity, particle shape, sediment sorting and possible porosity; and d is either the diameter for the pore throat or grain diameter. Recently, grain size of beds can be more exactly determined by processing digital images of such beds. The digital image processors use a calibrated spatial autocorrelation algorithm to provide the grain sizes. These values are fitted into various empirical permeability models discussed in the next chapter to provide an estimate of the formation permeability of the bed under investigation.

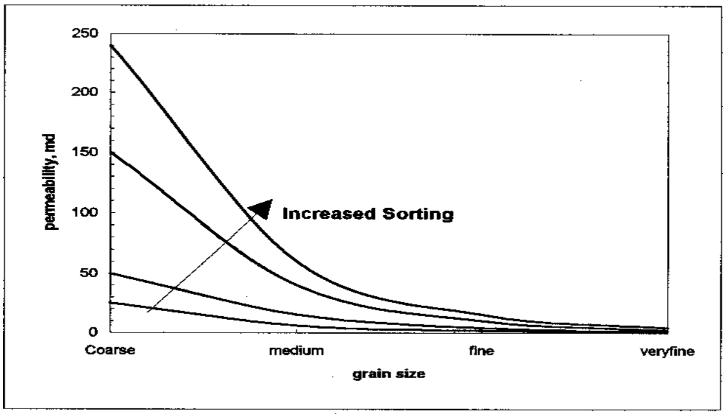


Fig 2.2 Effect of grain size on permeability

It follows from the above expression that, as grain size increases, pore throat size also increases and consequently, permeability increases.However it should be noted that, for measurement of permeability distributions in the field,grain size is rarely used.However, it plays an indicative role in that regard.The reason is that, clays and silts exist in the rocks and just a slight increase in the clay and silts content reduces the permeability values by orders of magnitude.

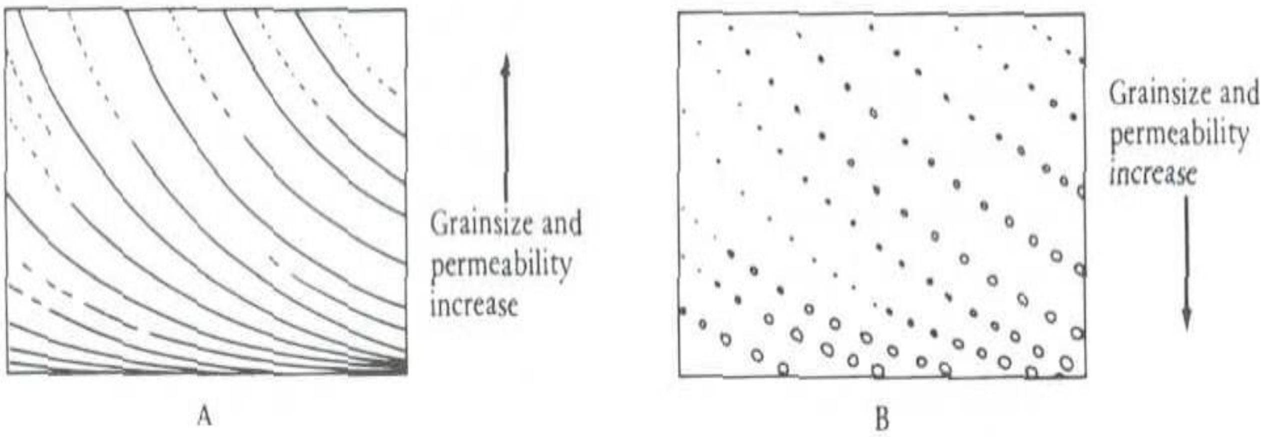


Fig 2.3 Source: Selley R.C. (1997) Elements of Petroleum Geology, 2nd edition, Academic Press.

The scenario in diagram A is highly likely found in marine barrier bars(upward-coarsening), while the scenario in diagram B is likely in fluvial and marine channel deposits(downward-coarsening). These geological control processes lead to permeability anisotropy.

2.5 Effect of Grain Shape on permeability.

The grain shape refers to the roundness and sphericity of the grains. As the roundness and sphericity of the grains increases, the permeability also increases.

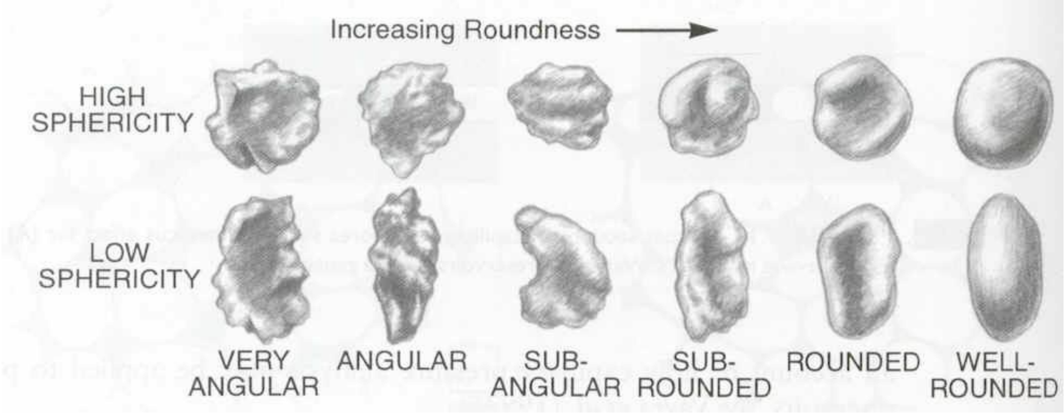


Fig 2.4 Effect of grain shape on permeability (Powers, 1953).

2.6. Clay Mineralization Control on Permeability.

The presence of clay and the characteristics of the clay determines the distribution of permeability in a reservoir sandstone. There are three main types of clays predominant in sandstones and which exert a profound impact on its permeability as outlined in a, b, and c below. An integrated understanding of the amounts, forms and distribution of the clays provides valuable insight into the distribution of permeability throughout the lateral extent of the reservoir (Takahashi et al. 2007).

2.6.1 Kaolinite.

The chemical composition and morphology of Kaolinite is important for the role it plays within the rock matrix during the lithification process

Kaolinite ($Al_2Si_2O_5(OH)_4$.) is a major component of reservoir sandstones. It occurs in platy forms. Another close relative of Kaolinite is Halloysite with similar composition but having a tubular morphology. The growth of these clay minerals within the pore throats of reservoir rocks is a determining factor in their permeability.

2.6.2 Chlorite.

Authigenic chlorite blocks pathways through sandstone reservoirs. As a result it has a significant impact on permeability and its distribution.

2.6.3 Fibrous Illites.

Illites make up from 3 percent to 8 percent of the whole rock volume. They extend inter-bridge between reservoir rock grain particles and block major permeability pathways. This greatly reduces the permeability.

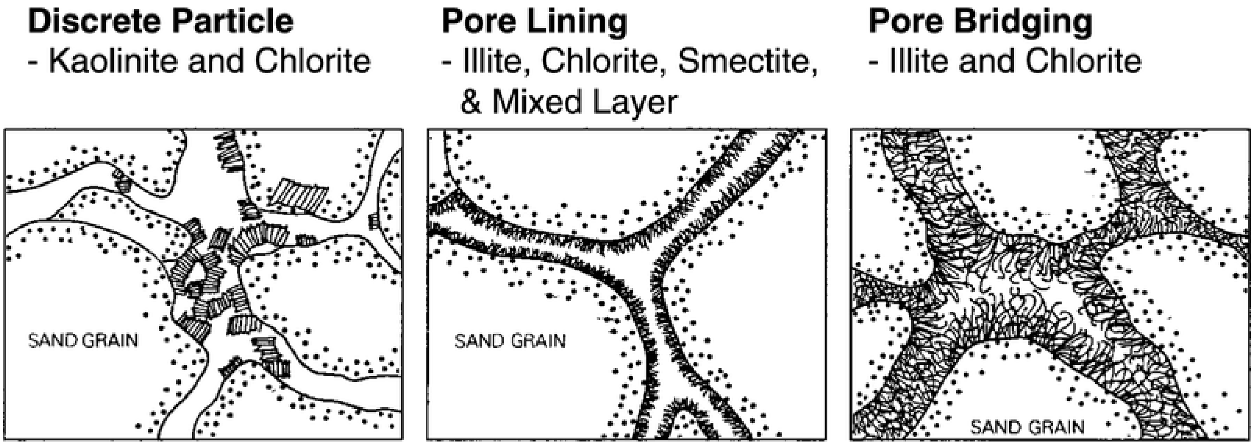


Fig 2.5: Effect of clay Mineralization on Permeability (Neasham, 1977)

2.7 Compaction control on Permeability.

Compaction has the effect of reducing the reservoir rock grain sizes. It brings about a mechanical rearrangement of grains, resulting in a reduction of pore-throat sizes. As a consequence, permeability is reduced. It has been shown that, the larger grains are more affected by the compaction process than the smaller grains. Field studies have shown the trends in **Table 1**.

Table 1: Effect of compaction on permeability

Newly deposited beach sands	Permeability exceeds 30000md
Partially consolidated sandstones	Permeability is in range of 300-2000md
Consolidated Sandstones	Permeability is in range of 0.01-100md
Tight Gas Sandstones	Permeability is less than 0.01md

2.8 Cementation control on Permeability.

Cementation involves the precipitation and deposition of minerals within the pore space. The minerals deposited in this process emanate from the sediment. Another source of supply of these minerals is interstitial water or waters circulating within the reservoir. The cementation process occurs post depositionally through chemical interaction between unstable grains and unstable formation water. It can also occur by circulation of formation waters in the pore spaces of the rocks. The diagram below show a summary of diagenetic permeability/porosity control elements. Precipitation of these minerals blocks major pathways and reduces the permeability of the system.

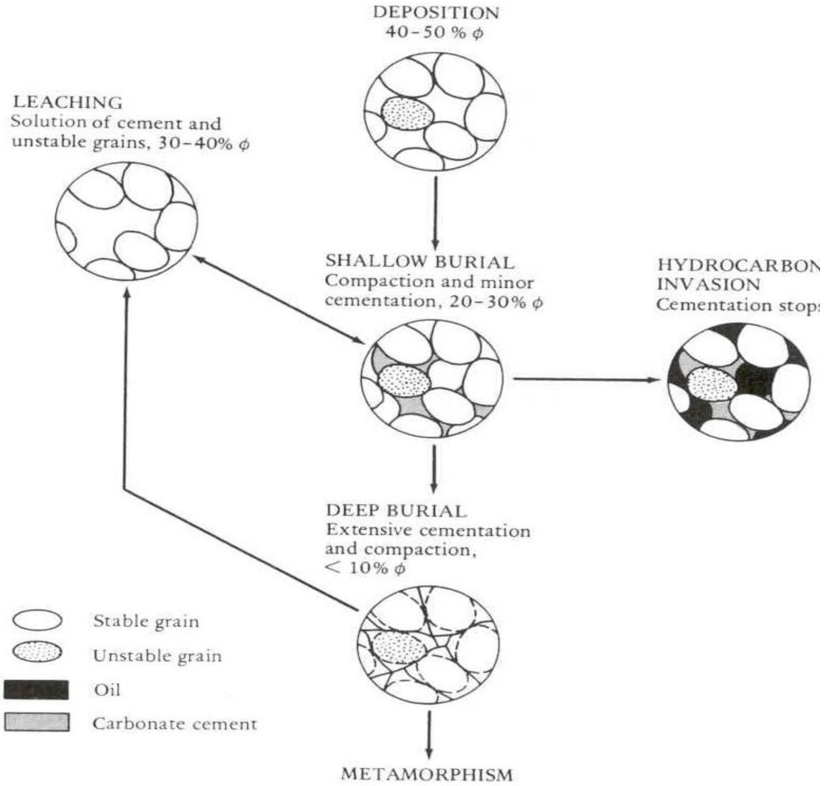


Fig. 2.6 – Illustration of impact of primary depositional features in Sandstones [Selley, *Elements of Petroleum Geology, 1998*].

CHAPTER 3.

PERMEABILITY DETERMINATION TECHNIQUES

Permeability plays a central role in flow in petroleum porous media. However it is the most difficult parameter to measure due to its spatial variability. Understanding of the basis of these measurement techniques and interpretation of the results thereof is important in permeability value reporting.

3.1 Determination from well logs

From a practical point of view, there are three methods of determining the permeability distribution on an oilfield. These are the empirical, statistical and virtual measurement methods (VMM).While the empirical methods make use of empirically determined models, the statistical method makes use of multiple variable regression .The VMM makes us of Artificial Neural Networks (ANN).In this thesis, the empirical and VMM methods are discussed.

3.1.1 Empirical Models

These models are constructed on the relation and correlation between porosity and permeability and irreducible water saturation. These models are incorporated into permeability calculation software and the resulting output value for permeability will be determined by the model used. For purposes of quality control, it is necessary to know the type of model that was used especially in the building of the sedimentological model of the field or reservoir. In this thesis, the four most used empirical models are briefly described. These include;

i) **Tixier Model**
ii) **Coates and Dumanoir Model**
iii) **Timur Model**
iv) **Coates Model**

Other empirical models include the Berg's Model, Van Baaren's Model and the Mineralogical Model but are not discussed in this thesis.

3.1.1.1 Tixier Model

This model was constructed by Tixier in 1949.It makes use of the empirical relationship between resistivity and water saturation, water saturation/capillary pressure and capillary pressure/permeability to calculate permeability according to the formulae below;

$$\boldsymbol{K = C\left[a\frac{2.3}{\rho_w - \rho_o}\right]^2} \text{-----------------------------} (3.1)$$

$$a = \frac{\Delta R}{\Delta D} x \frac{1}{R_O} \text{-----------------------------} (3.2)$$

$\boldsymbol{C}$ = a constant, about 20

$\Delta R = change\ in\ resistivity(\Omega m)$

$\Delta D = change\ in\ depth(ft)\ corresponding\ to\ \Delta R$

$\rho_w = formation\ water\ density(\frac{g}{cc})$

$\rho_o = hydrocarbon\ density(\frac{g}{cc})$

Equation 3.1 and 3.2 can be rearranged to give permeability of the zone of interest.

$$\boldsymbol{\left(\frac{K}{20}\right)^{0.5} = \frac{2.3}{R_O(\rho_w - \rho_o)} * \frac{\Delta R}{\Delta D}}$$

The resistivity gradient measured above is determined using a deep logging investigation tool .e.g. the laterolog or the deep induction logging tool. The resistivity gradient is recorded after correcting for borehole effects. In establishing the resistivity gradient, the saturation exponent used is taken to be 2.

3.1.1.2 Coates and Dumanoir Model

In 1974, Coates and Dumanoir proposed that the permeability for clean oil- bearing formations with oil density of 0.8 can be empirically determined by

$$\boldsymbol{K} = [\frac{\boldsymbol{C}}{\boldsymbol{W^4}} \text{ x } \frac{\boldsymbol{\emptyset^{2W}}}{\boldsymbol{Rw/_{Rti}}}]^2 \text{--- (3.3)}$$

Where $C = 23 + 465\rho_h - 188(\rho_h)^2$ and;

$$W^2 = (3.75 - \emptyset) + \frac{1}{2}[\log_{10}(Rw/Rti) + 2.2]^2 \text{ ------------------------------ (3.4)}$$

Both researchers after studying cores and logs agreed that a common exponent can be used for the saturation n and the cementation exponent.

I.e. m =n=w.

However not all hydrocarbon reservoirs have a density of 0.8 for this equation to apply. When the density is different from 0.8, the log readings of $\boldsymbol{Rti}$ are multiplied before entering equation (3.2) by a correction factor given by;

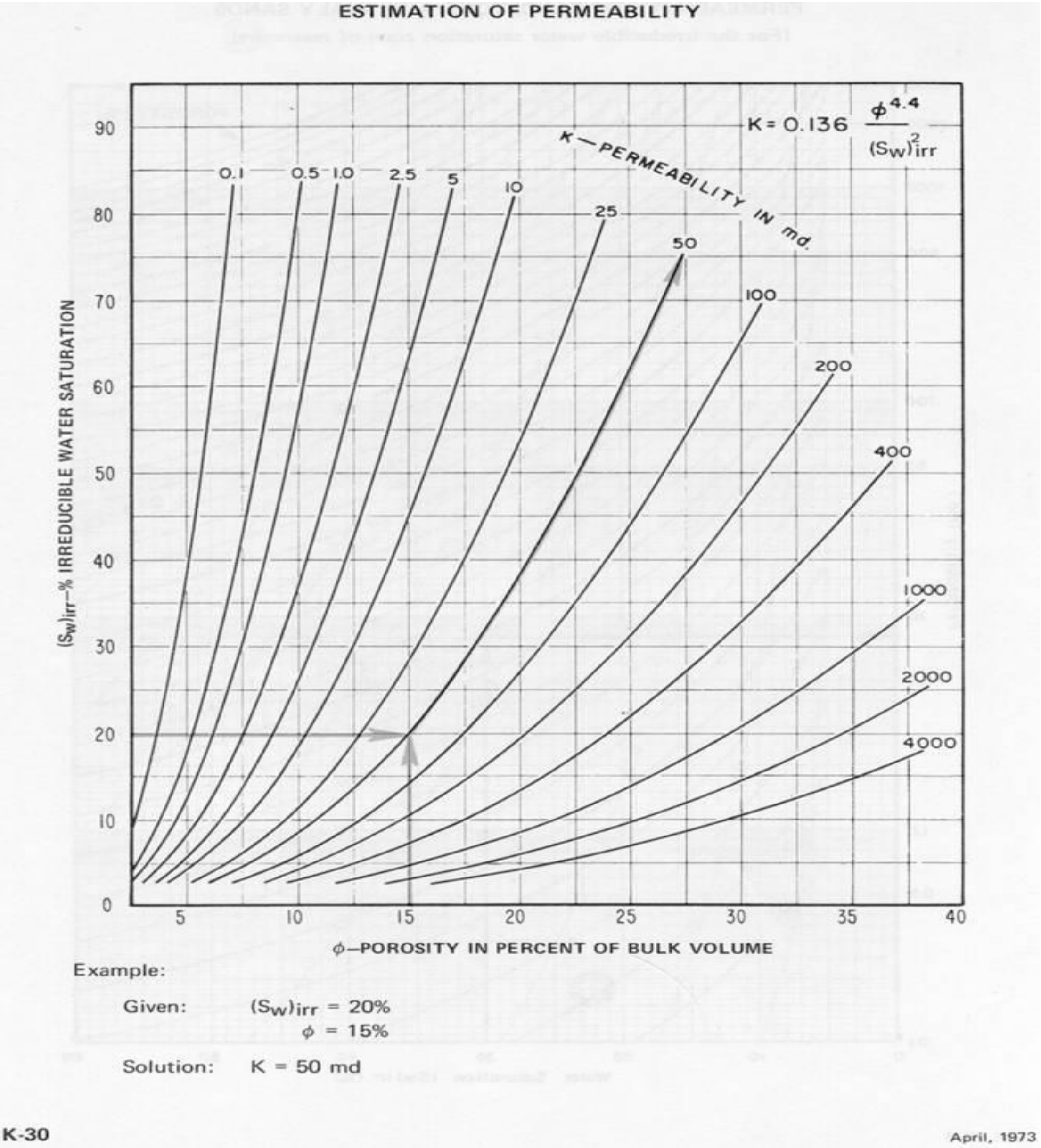
$$\frac{\boldsymbol{R_{tcorr}}}{\boldsymbol{R_{tlog}}} = \boldsymbol{0.077 + 1.55\rho_h - 0.627(\rho_h)^2} \text{ ----------------------- (3.3)}$$

3.1.1.3 Timur Model

In 1968, Timur proposed the following expression to estimate the permeability based on the work of Kozeny, Willie and Rose.

$$\boldsymbol{K = 0.136\frac{\emptyset^{4.4}}{S^2_{wirr}}} \text{-- (3.4)}$$

The Timur model is represented graphically in **Fig 3.1**



Example:

Given: $(S_W)_{irr} = 20\%$
$\phi = 15\%$

Solution: K = 50 md

K-30

April, 1973

Fig 3.1 Chart for estimation of permeability from irreducible water saturation (Schlumberger, 1973).

3.1.1.4 Coates Model

In 1981 Coates and Donoo proposed that permeability can be evaluated using the expression

$$\boldsymbol{K} = [\boldsymbol{100}\frac{\boldsymbol{\emptyset^2}}{\boldsymbol{S_{wirr}}}(\boldsymbol{1} - \boldsymbol{S_{wirr}})]^2 \text{ --- } (3.5)$$

3.2 Determination from Routine Core Analysis

Permeability can be measured from core plugs.The plugs are treated by thoroughly washing them with organic solvents such as alcohols(e.g ethanol,propanol,) and then followed by drying.. Each core plug are tested at ambient conditions. Darcy’s law is applied to measure the permeability values using a gas permeameter apparatus at ambient conditions under steady – state flow. In routine core analysis, almost all permeability’s are obtained by flowing gas, either air or nitrogen through the samples.Obtaining a proper sample to utilize for the evaluation of permeability is the most importantant step.The bedding planes have to be clearly delineated and such a sample drilled parallel to it.In sandstone formations this is done adequately.However for wind deposited sedimentary layers,there is some form of cross-bedding on the sample.Also the vertical permeability is measured but the core is drilled and removed at an angle of 90 degrees to the bedding planes.Information pulled from vertically drilled core will provide a good comprehension of the level of permeability anisotropy involved.

3.2.1 Permeameter.

Permeameters are used frequently in core permeability assessments. This instrument consists of a cylindrical core-sample holder, a pump that forces fluid through the core sample, pressure gauges upstream and downstream of the sample to measure the drop in pressure, and a flow meter to measure the rate of flow of the fluid in the core sample. Measurements are standardized so that statistically comparable data can be obtained: core samples are cylindrical, of a diameter of 2 cm and a length of 3 cm.A schematic of the principle involved in permeability measurement is shown in Fig 3.4

As previously stated, a representative sample is lodged securely into the holder.Care is taken to ensure that it fits perfectly, tightly and hermetically and no air allowed to pass along the sides of the sample.In order to obtain the pressure differential across the core, the downstream/upstream presures are determined for the exercise.This knowledge is then employed in estimating the core permeability from the Darcy Equation.

Fig 3.2 Industry standard permeameter(Courtesy COREIA)

3.2.2 Permeability Estimation from Full Diameter Cores.

The use of full diameter cores are limited only to carbonates.Some formation which are vugular and fractured also belong to this category.However,sandstones core permeability can also be placed in this category but provided that precautions are taken to ensure that solids from drilling muds do not penetrate into the core and reduce the permeability(e.g.Chalky Limestone).Sometimes the permeability reduction can be brought about by the fine particulate matter plastering itself on the surface of the core during the coring process.This powder is cleaned away and the core is cleaned and dried before measurements are made.Otherwise it forms a kind of skin that will result to ***erroneously low permeability values.***

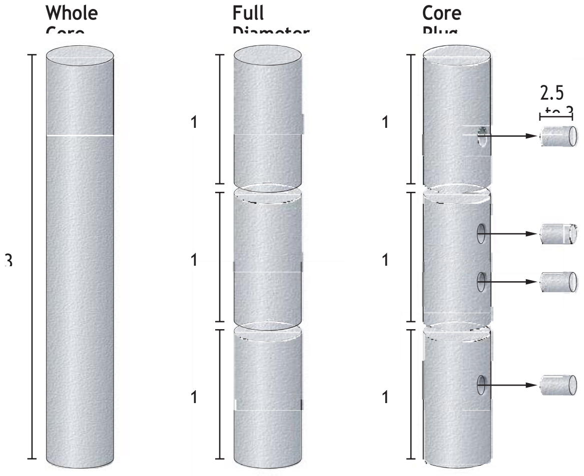


Fig 3.3 Full Diameter Cores(Image courtesy Schlumberger)

The Hassler type core holder permeameter is used in the core laboratory to measure the vertical permeability.Once a representative sample is obtained,it is put into the apparatus and ensuring that it is well secured.Air at a predetermined high presure is then pumped to the core holder and making sure that there are no leaks.Air at a conveniently low pressure is applied at the opposite end of the high pressure side of the core.All computations and corrections required to compute permeability are performed.

The next challenge is to obtain the horizontal permeability of the full core.To perform this task, a representative core is padded with specially designed screens and then placed into the core holder with the rubber discs securely in place.While ensuring that the tubing properly surrounds the core,it is the collapsed.Due process is followed to obtain the permeability.

It is common practise to obtain two estimates of permeabilty in the horizontal direction(perpendicular to each other) for comparison purposes.The second measurement is made at right angles to the first.Sometimes,careful examination of the cores reveals the presence of fractures.When this situation occurs,the initial measurment is should be made parallel to the fracture. For good measurements, the integrity of the core holder is primordial.An good industry standard is the Hassler Core holder shown in Fig.3.4 below;

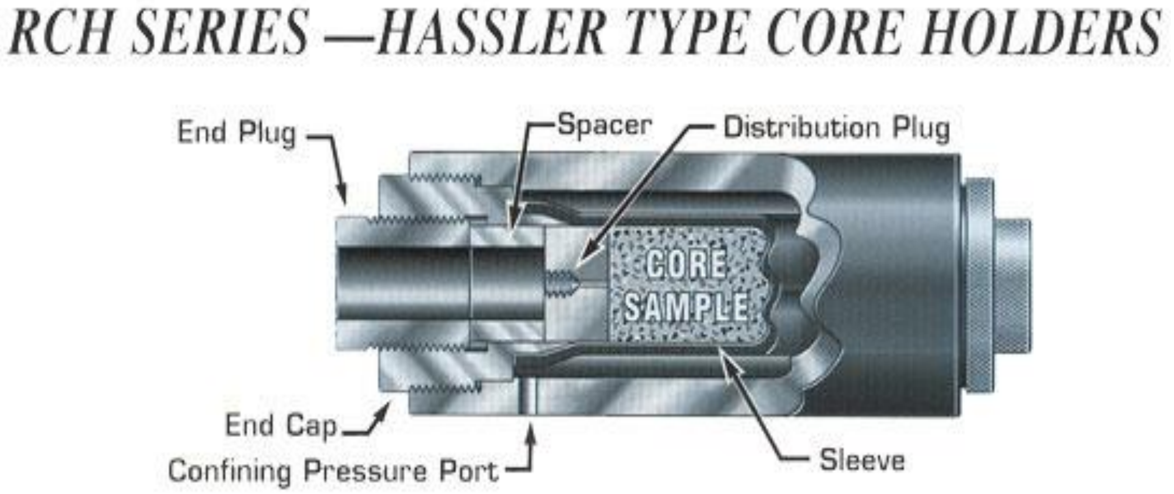


Fig 3.4 Hassler Type Permeameter core Holder (Image courtesy CORElA)

3.2.3 Sidewall Coring.

A knowlege of the process of sidewall coring is important in the quality analysis of reported permeability values.In the sidewall coring process, sidewall cores are mounted in thin-walled jackets and permeability is measured as for normally drilled cores.In the field,when a sufficiently large core is obtained, a portion of it is cut and while taking all precautions to reduce error, it is tested normally.

Estimation of permeabilty is performed by taking into consideration the grain size and its distribution in modern sidewall core analysis laboratories. In practice, it is observed that permeability measured from sidewall cores is lower than those for conventional cores even when both are pulled from the same type of deposit.The observation is that, estimated/calibrated values are too high in sidewall cores.This is especially so when the rock is hard and brittle. During the coring,such brittle materials break up randomly via the impact of bullet used to retrieve the sidewall cores.Such events will produce unrepresentative data and there is a need to find out if that has indeed occured(petroleumcrudeoil.blogspot.com).

3.2.4 Quality control for Measured Values.

As stated above, certain events in the process of acquiring permeability may introduce flaws in permeability values actually reported. For example, estimating permeability from fractured cores. It is therefore important to know these processes and the steps taken to correct or calibrate the data in such a manner that it reflects the reality of the field. Permeabilities measured in the laboratory using air as the flowing fluid, on rock samples from non-fractured reservoirs turn out higher permeability values than normal. Gas slippage is responsible for this anomaly and is described as the Klinkenberg effect. Reported permeability values have to be corrected for this effect.

3.3 Permeability determination from well testing.

In the oil and gas industry, well testing is performed to obtain a more detailed knowledge of the properties of the reservoir and increase the depth of knowledge vis-a-vis the interaction between the fluid and the reservoir rock. To put a well on production, it has to be tested. A well test therefore, in its simplest form, consists of producing a well at a controlled rate for a period of time and measuring the pressure response at the producing well or at some nearby observation well. The pressure response depends on rock and fluid properties. The main objectives of that exercise is to enable the operator obtain the information cited above on which to optimize the design of production facilities and well completions. Well testing also provides information

- **Skin and permeability measurement**
- Reservoir characterisation
- Formation fluid characterisation
- Formation pressure measurement.

The movement of pressure transients in the reservoir provides a method of measuring the permeability of the reservoir. Pressure transient data can be used to derive good estimates of univariate and spatial distribution of permeability in an oil field (Yadavali et al., Sangsou, 1995).

Following the work of Olivier, it was assumed that permeability varies about a reference or average value. He hypothesized that, permeability is a function of an (r, ø) coordinate system.

3.3.1 Backus and Gilbert Method

Pressure transients generated in the well testing process travel through the reservoir and are used as such to extract the permeability of the formation. They provide measurements beyond the region of the wellbore. A permeability distribution can therefore be validly obtained thereof. In the analysis, base permeability is determined from a semi-log plot of pressure versus time. Oliver proved that the relation between permeability distribution and porosity did not introduce any bias in the measurement of permeability.

In the work of Feitosa et al, the concepts advanced by Olivier and Backus were used to determine field wide permeability distributions from pressure data from single wells. This was accomplished by using an inverse solution algorithm. Further work performed by Feitosa et al. showed that permeabilities can be calculated from instantaneous values of pressure derivatives. These derivatives were correlated with calculated values of radius. Their solution was applicable for large contrasts in permeabilities. It also applied for scenarios in which the pressure data elicited no semi-log straight line behavior.

3.4 Conventional well testing methods for field permeability measurement.

For the purpose of measuring permeability distributions, we can distinguish two types of well tests. The quality of the data obtained from these tests are dependent on the test design and analysis of the results produced. As a data quality control measure, strict industry accepted norms for such well tests must be carried out and the process and results documented for reference purposes in case there is reason to question certain types of values in field permeability distributions.

3.4.1 Pressure Build-Up Test.

This test is the most commonly used pressure transient test. In this test certain assumptions are made

a) Reservoir is infinite acting

b) Ei approximation is applicable

c) Reservoir is infinite acting

d) Reservoir is homogenous, slightly compressible and fluid is single phase.

For the ideal pressure build-Up tests ,the following steps are performed;

1. The well is produced at a constant (stabilized) rate and at time t_p the well is closed.
2. The last flowing pressure called p_{wf} is recorded.At time of shut-in, shutin pressure p_{ws} is recorded and the permeability calculation is made and interpreted. (Tom Aage Jelmert, NTNU).

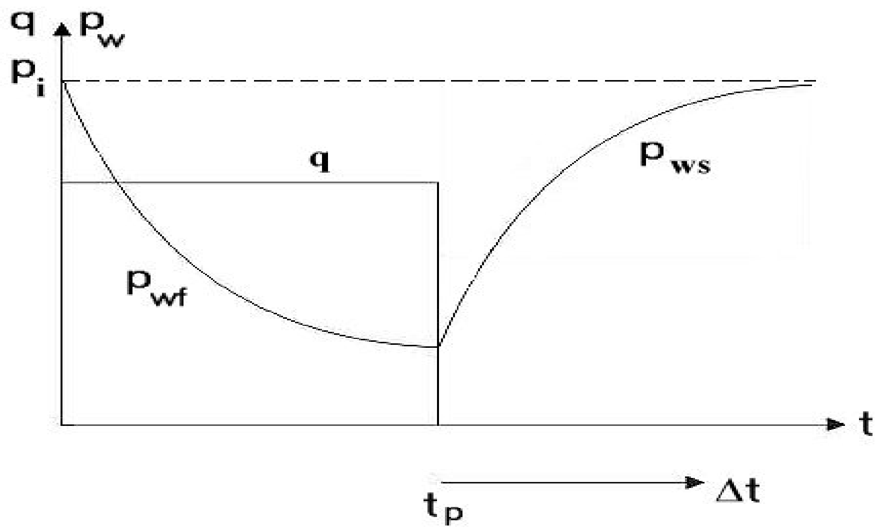


Fig 3.5:Ideal Pressure Build-Up Test Pressure profile

In Fig. 3.4.1 above, t_p and Δt denote the production time and the shut-in time respectively. For the this ideal case in an infinite acting reservoir, the Horner solution is written as

$$\boldsymbol{Pws = Pi - \frac{q\mu B(1.15)}{2\pi kh}\log(\frac{tp + \Delta t}{\Delta t})}$$

When Pws Vs $\log(\frac{tp+\Delta t}{\Delta t})$ is plotted on Cartesian coordinates, the straight line graph in **Fig.3.6** below is obtained.

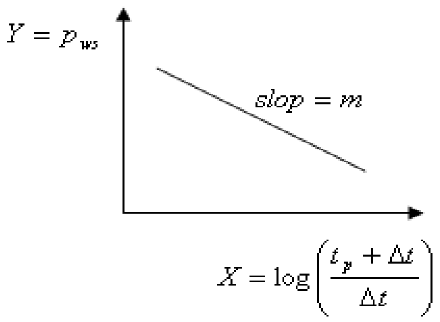


Fig 3.6 Horner Plot on Cartesian coordinates

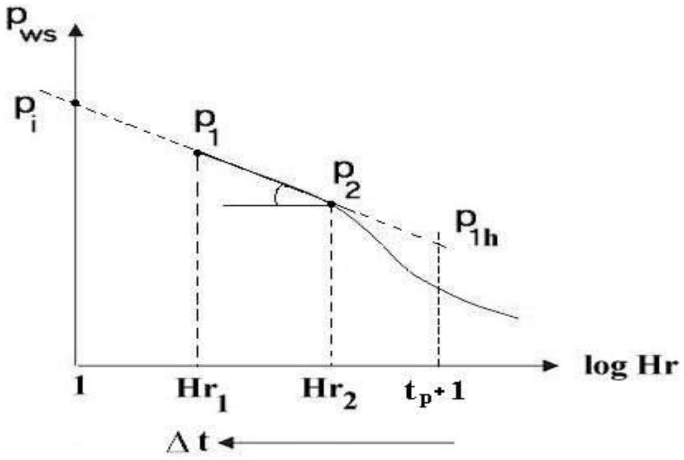


Fig 3.7: Horner Ratio Plot

For practical purposes however, the ideal profile herein does not exactly describe the flow situation. This is due to the overflow into the wellbore when the well was shut in during the build-up process. To account for this, use is made of the Horner ratio defined as Hr $=\frac{tp+\Delta t}{\Delta t}$. A graph of these Horner values Vs Pws is drawn as shown in **Fig** 3.7 above.

The gradient of the Horner straight line from the graph above is given by;

$m = \frac{P1-P2}{\log Hr1 - logHr2}$ .The Permeability $\boldsymbol{k}$ is evaluated from the expression below;

$$\boldsymbol{k = \frac{q\mu B(1.15)}{2\pi mh}}$$

3.4.2 Drill stem Test.

This is a method for testing a formation when the drill string is in the hole. It helps in determining;

- Fluid content in the rservoir
- Productive capacity of the formation
- **Permeability of the formation in the tested zone**

Meanwhile in the open-hole environment, the testing is performed before casing is set. This is an economical way to determine permeability of the reservoir. The set up for this tool is shown below

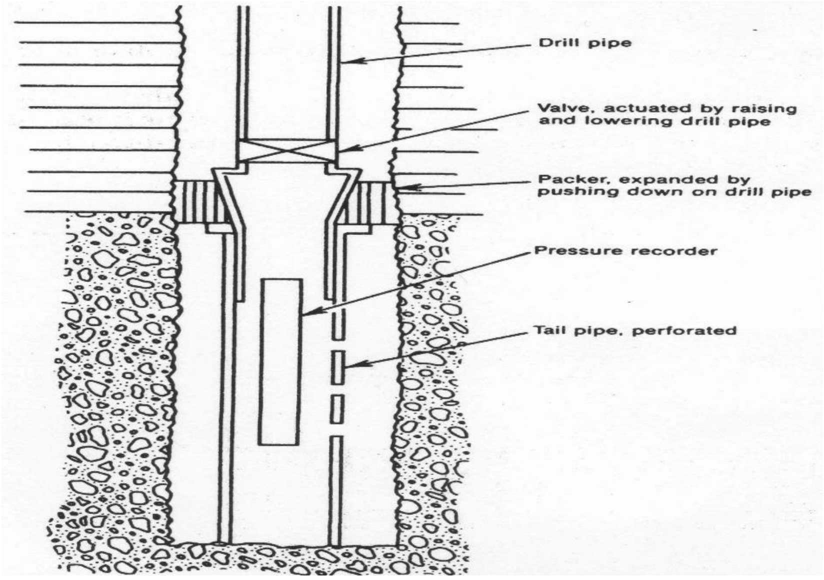


Fig 3.8: Drill stem test set-up

As stated above, the DST involves lowering the drill stem test tool and accompanying set- ups down to the zone under investigation before the well is completed. The quality of the data obtained from a DST is a function of the types and reliability of instruments used in the process. It is also highly dependent on the expertise of the personnel involved in making interpretation of results obtained. Microfiche charts have reliable DST data and this data is indispensable in plotting and interpreting the resulting Horner Plot.

The permeability of a given zone is determined by first estimating its thickness in feet. Then flow rate from this zone is calculated and the standard oil industry equation for estimating permeability is applied to estimate the permeability of the zone under investigation.

$$\boldsymbol{K} = \frac{\mathbf{162.6}\boldsymbol{QU}\text{ß}}{\boldsymbol{mh}}$$

Where;

$\boldsymbol{K}$ = permeability, Q = flow rate, ß = 1, U = viscosity, m = psi/log cycle, h = net pay.

3.5 Artificial Neural Networks.

Artificial Neural networks (ANN) are computational analysis set ups of varying complexity. They are characterized by the simultaneous use of large number of small processors in executing large computational tasks (Han Wu et al., 2015) In terms of computational power and memory, each processor is comparably small. Interestingly, ANN are non-linear devices and are adaptable. Because of this characteristic, ANNs can be employed to real practical problems and this is the case in Petroleum Engineering as ANN have been used for the prediction of permeability, working from initially known values.

To measure permeability, core and log data as already discussed above are used to construct a network model. Logs (G-Ray, induction log, sonic transit time) and core measurements and their corresponding log responses are now used to train the ANN.

In training the ANN, two steps are used. These are the Forward Propagation Step (FPS) and the Backward Propagation Step (BPS)

3.5.1 Forward Propagation Step.

In the FPS, input values or signals from the GR-log, Sonic Log, Deep Induction log are sent through the neurons at each layer. An output is then produced and the permeability recorded.

3.5.2 Backward Propagation Step.

In terms of architecture, Back Propagation Step neural network is made up of three layers. These are the input and output layer, both of which are sandwiched by a middle layer. All three layers contain neurons through which the processing is carried out.

Neurons in one layer are connected to other neurons in the preceding layer by means of a link known as a weighted link. An illustration of this arrangement is shown in Fig.3.9 below.

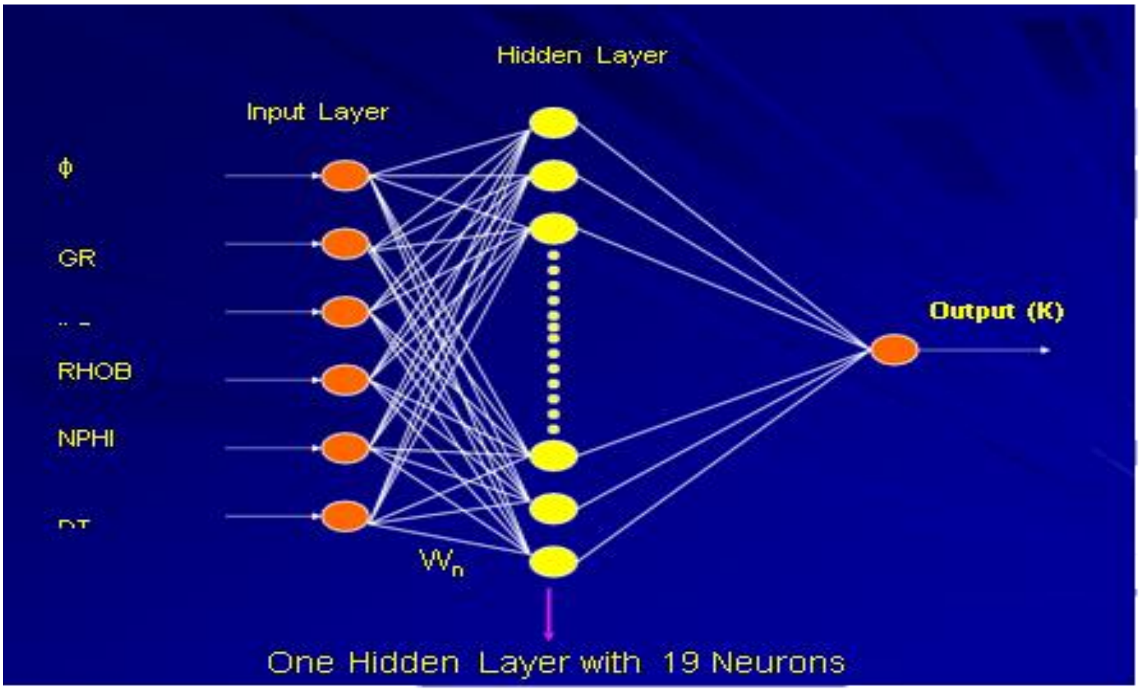


Fig 3.9: Schematic diagram of the organization of an Artificial Neural Network (ANN). From Dubois et al. (2006)

This Architecture has n1 neurons representing n1 types of well logs. There are also n2 hidden neurons and the output is the **permeability (K)**.

ANN predict permeabilities with a good degree of accuracy if training is done with as many permeability dependent variables are used. However they do not incorporate depth as a parameter.

CHAPTER 4

NEW APPROACH FOR PERMEABILITY DISTRIBUTION QUALITY CONTROL

Several researchers have attempted to unlock the pattern by which permeability in an oil and gas fields is distributed and various theories have been postulated. This is done for a good reason because a knowledge of this information will aid in decision making in developing the oil and gas field. For example, it will be proper to site water injectors in a waterflooding project in a zone of comparatively better permeability distribution than in a less permeable zone. The reservoir permeability distribution must be as accurate and as representative as possible.

The theory of permeability distributions is based on the postulate that the most frequently occurring permeability in the reservoir is the harmonic mean of the frequency distribution of permeability. However, it is unclear how to tell if the permeability data collected indeed reflects the actual reservoir. The Dykstra-Parsons Equation is also being used in many permeability distribution studies by exploiting the logarithmic nature of such distributions.

Research has indeed proven that permeabilities in most reservoirs exhibit a log normal distribution as shown in Fig 4.1.This can be interpreted as meaning that, the geological processes that create permeability in reservoir rocks tend to produce distributions centered about the geometric mean. However, the distributions of the other values about this mean is unclear. The geometric mean is a point statistic and provides no information on the magnitude of permeability values are located on either side of this mean and in what proportions. Several identical distributions can be drawn for this same data. This is the inverse problem.

Distribution of permeability within an oil and gas field must conform to a law which describes their distribution in another way to enable data quality control to be attempted.

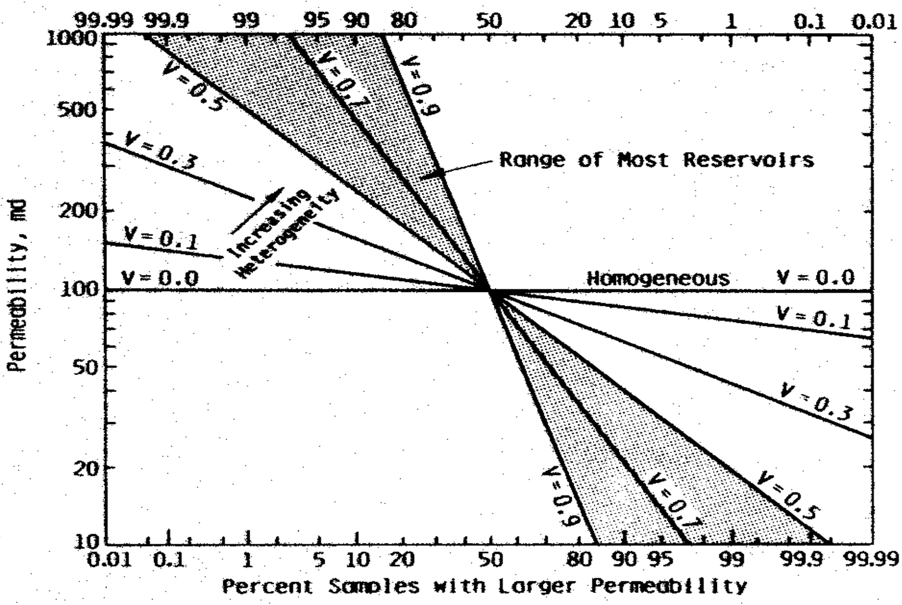


Fig 4.1 Characterization of reservoir heterogeneity by permeability variation (Willhite, 1986)

4.1 The Benford's law distribution

In this work, I attempt to investigate the conformance of permeability distribution data with the Benford's first digit distribution law and make use of the properties of FDL to probe the quality of field permeability distribution data. So far, the modified Kozeny-Carman Equation that has been used to match field and laboratory determined permeability values by exploiting the empirical relationship between porosity, permeability and grain size distribution. Permeability distribution is strongly influenced by the degree of heterogeneity of the reservoir formation. This variation or distribution of permeability can be assessed by the Dykstra-Parsons coefficient of permeability variation, based on routine-core analysis data. The coefficient of variation of permeability in most reservoirs ranges from **0.5 to 0.9**.The higher the coefficient, the higher the heterogeneity. However, this coefficient does not tell if the data itself is likely to represent the formation in question. This is because the Dysktra-Parsons approach is based on arranging the permeability data of pay intervals in descending order. Permeability distribution in oil and gas fields is a direct consequence of geological controls. This means that creation and distribution of permeability is a natural geological process and its measurement will therefore entail the measurement of a truly natural real-life source of data. The arrangement described by the Dykstra-Parsons is not what obtains in nature. Benford's first digit law exploits the distribution of digits in such natural phenomena like permeability distribution and that is the main thrust of this thesis.

4.1.1 Definition.

Benford's law describes the frequency distribution of first and second digits appearing in the first position in sources of data drawn from real-life. It is observed that for such data sets, the percentage of numbers beginning with 1 is approximately 30.1%.Furthermore,the percentage of 2 appearing in the first position is about 17.6%.So
while smaller digits have a high chance of occurring in the first position, the higher digits have a small chance of occurring in the first position.

The FDL described herein applies if the data set obeys the following preconditions;

i) The distribution of measurements of the phenomenon under consideration is from a natural process and not fabricated, like when using *random number generators* or *mental guesswork*.

ii) The distribution of these measurements must span several orders of magnitude.

iii) The numbers should not come from a collection of numbers that are limited by a minimum or maximum or some other criteria that may introduce statistical bias.

Permeability distribution obeys all three conditions cited above and is therefore expected to be Benford's FDL compliant. With respect to the first condition above, field studies have established permeability ranges for most oil and gas bearing rocks. This is shown in **Table 2.** below;

Table 2. **Permeability distribution ranges in oil/gas reservoir rocks**.

Consolidated rocks	**Highly fractured rocks**	Oil reservoir rocks	**Fresh sandstone**	**Fresh limestone and dolomite**	**Fresh granite**
K range(cm^2)	0.01- 1x10^{-6}	10^{-9}-10^{-7}	10^{-11}-10^{-10}	10^{-13}-10^{-12}	10^{-15}-10^{-14}
K range(millidarcy)	10^5-10^8	100-10000	1-10	0.01-1	0.0001-0.001

It states generally that the probability of the first digit being D is expressed as

$$\mathbf{P\ (D)\ =\ = \ln\left(1+\frac{1}{D}\right)/\ln 10} \text{ -- (4.1)}$$

The above equation (3) can be expressed in terms of the normal base 10 logarithm

$$\mathbf{P\ \ (D)\ \ = \boldsymbol{Log}\left(1+\frac{1}{D}\right)} \text{--- (4.2)}$$

The major premise of the FDL advances that, the set of values of measurements produces a result which to a good extent, is even in its distribution. The FDL was discovered based on observation of many phenomena in nature. When we substitute values of D beginning from 1-9 the probability of occurrence of each digit is plotted as shown in **Fig 4.2** below. The results of these substitutions are shown in **Table** 3.

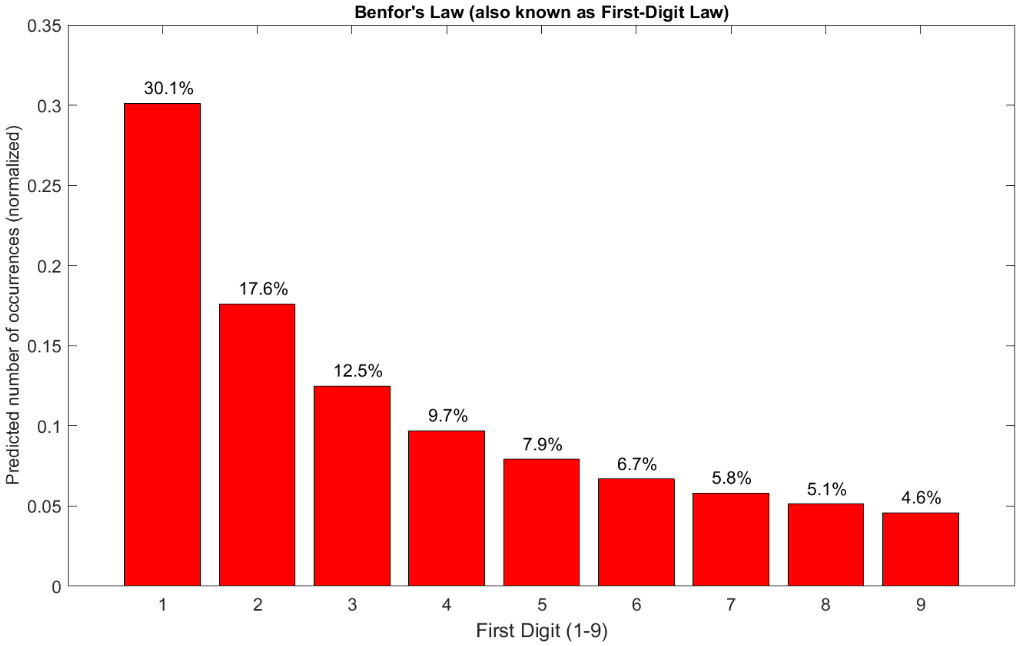


Fig 4.2: **FDL probability distributions.**

Table 3. Benford's Probability of Occurrence

FD	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
%	**30.12**	**17.6**	**12.5**	**9.7**	**7.9**	**6.7**	**5.8**	**5.1**	**4.6**

Evidence suggests that there is a natural tendency to choose units so that our numbers are evenly distributed by orders of magnitude rather than absolute value (Nigrini, 1997).

4.1.2 Mathematical Formulation

Consider that we have a scale invariant probability distribution *P(x)* over numbers, such that,

$$P(kx) = f(k)P(x).$$

If $\int P(x)$= 1, then $\int P(x)$= 1/k

After normalization,$f(k) = 1/k$

Now setting k=1, and differentiating with respect to k,

$$xP'(x) = -P(x).$$

The probability that the first digit is D is given by

$$\boldsymbol{P(D) = \frac{\int_D^{D+1} P(x)dx}{\int_1^{10} P(x)dx}} \;=\; \mathbf{\log_{10}(1 + 1/D)}$$---

(4.3)

A very important property of the FDL is that, it is scale invariant as already stated during the derivation above. If the law holds for a distribution of numbers, then the law will still hold true even if the system of units used for measurement is changed to another consistent set of units.

4.2 Method and Data Analysis

Data Source 1. (**Johansen Formation**)

The data used for this thesis was obtained from the Johansen Formation (Fm) in the Troll Field in Norway.

4.2.1 Geological setting of Johansen Formation

The Johansen Fm.is described by the NPD as belonging to the Lower Jurassic Dunlin Group. The Dunlin group contains other formations like the Drake Formation, the Cook Formation, and the Amundsen Formation. The Johansen Fm. sandstone does not extend beyond the Horda platform and is found more specifically east of the extreme North Sea. (Vollseth and Dore, 1984).It is a sandstone formation under evaluation as a possible candidate for gas storage. This shown in **Fig 4.3** below as well as the structural map shown in **Fig 4.4**.

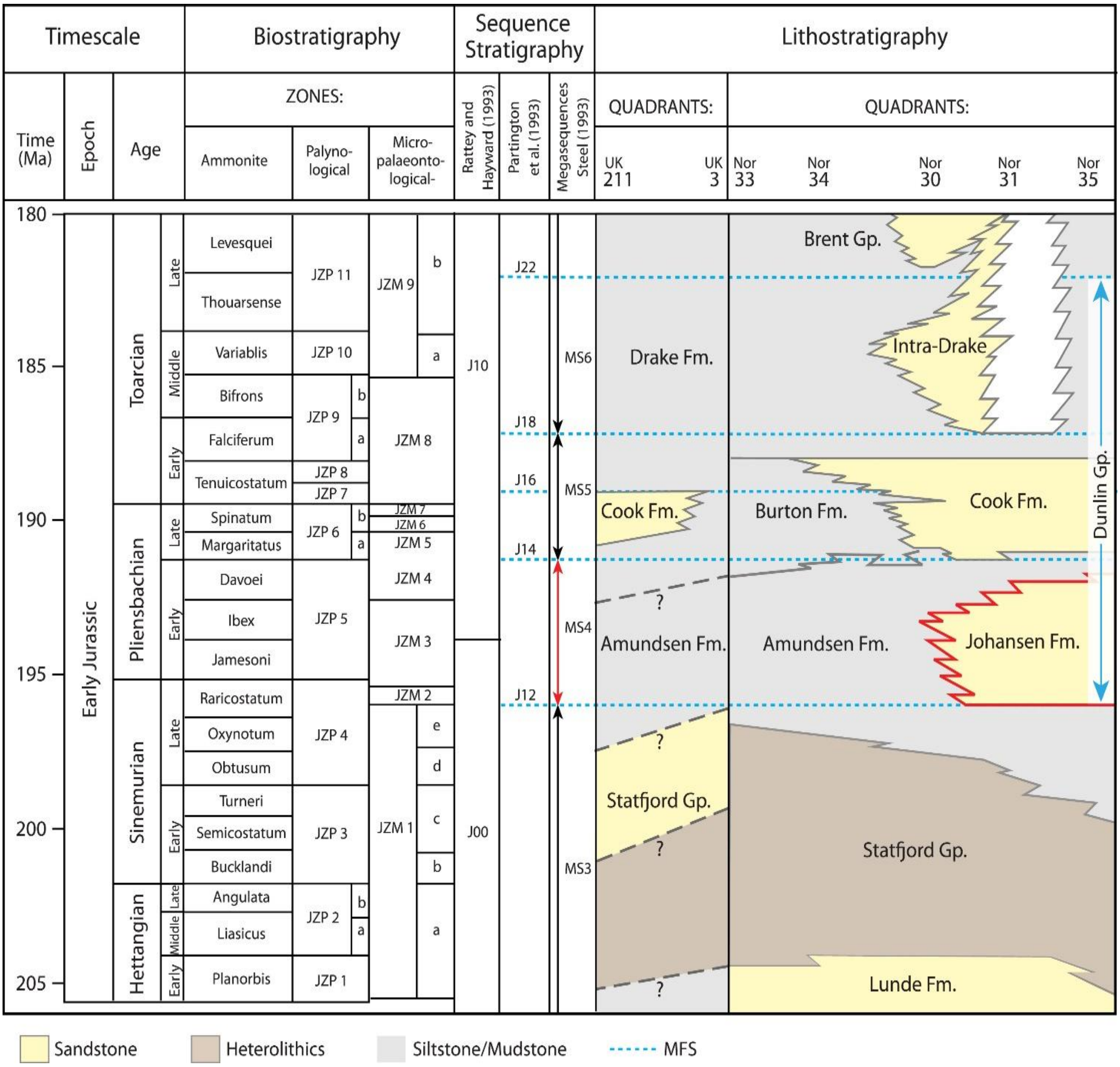


Fig 4.3: **Bio-sequence- and lithostratigraphy of the Dunlin Group (sandwiching the JFm), based on major boundaries as defined by Steel (1993) and Partington et al. (1993).**

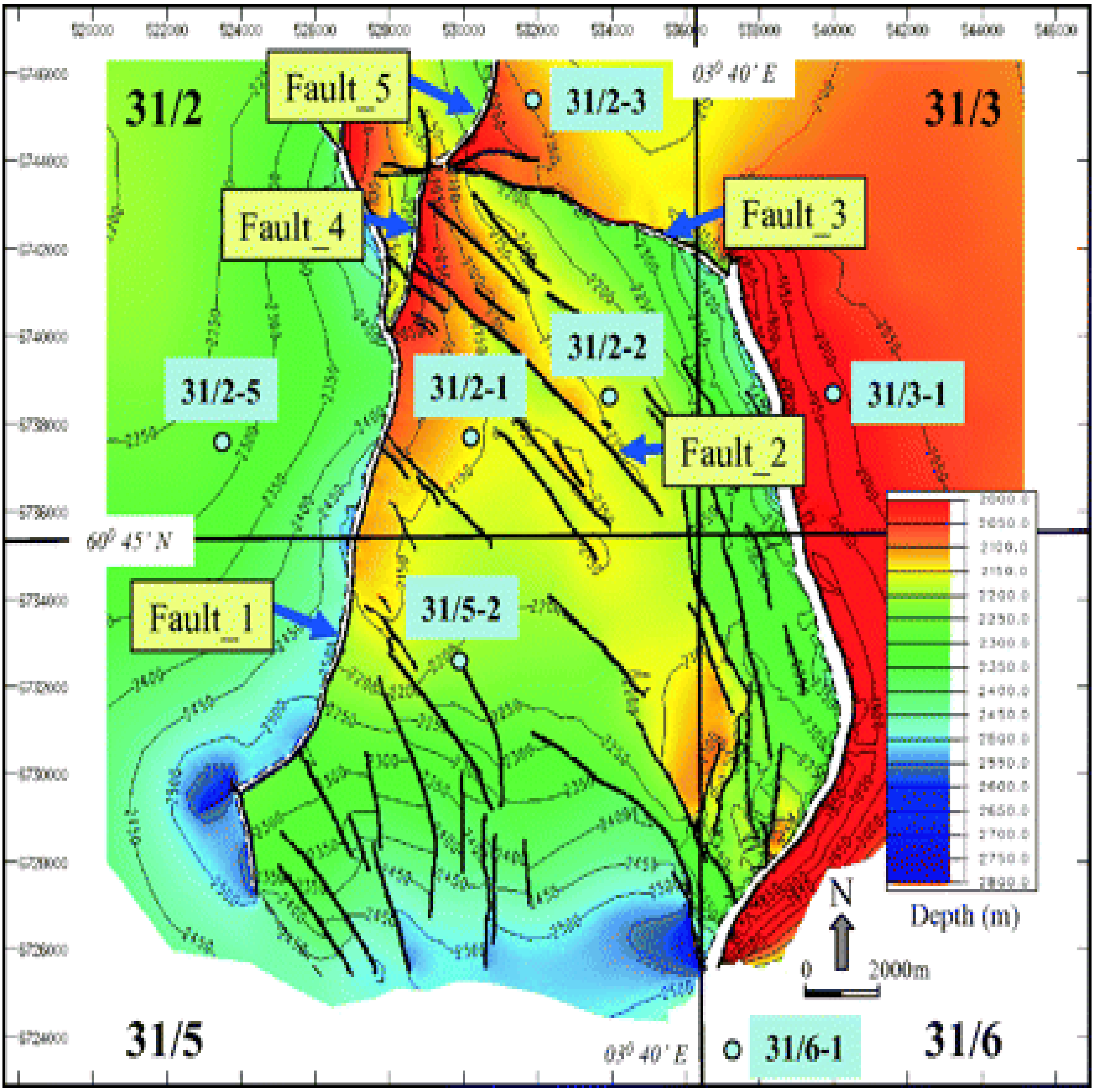


Fig 4.4. **Structural map of the Johansen Fm showing top faults [Fraser et al., 1993]**

Data Source 2. (**Tarbet Formation**)

The data used for this thesis was obtained from the Tarbet Formation (Fm) in Norway.

4.2.2 Geological Setting of Tarbet Formation

The Tarbert Formation is geologically a sandstone formation. The base of the Tarbet formation is stratigraphically considered to be at the base of the last fining upward unit of the Ness Formation. Its depositional environment is a marginal marine environment. Thickness in the typical area varies between 14 and 45 m.

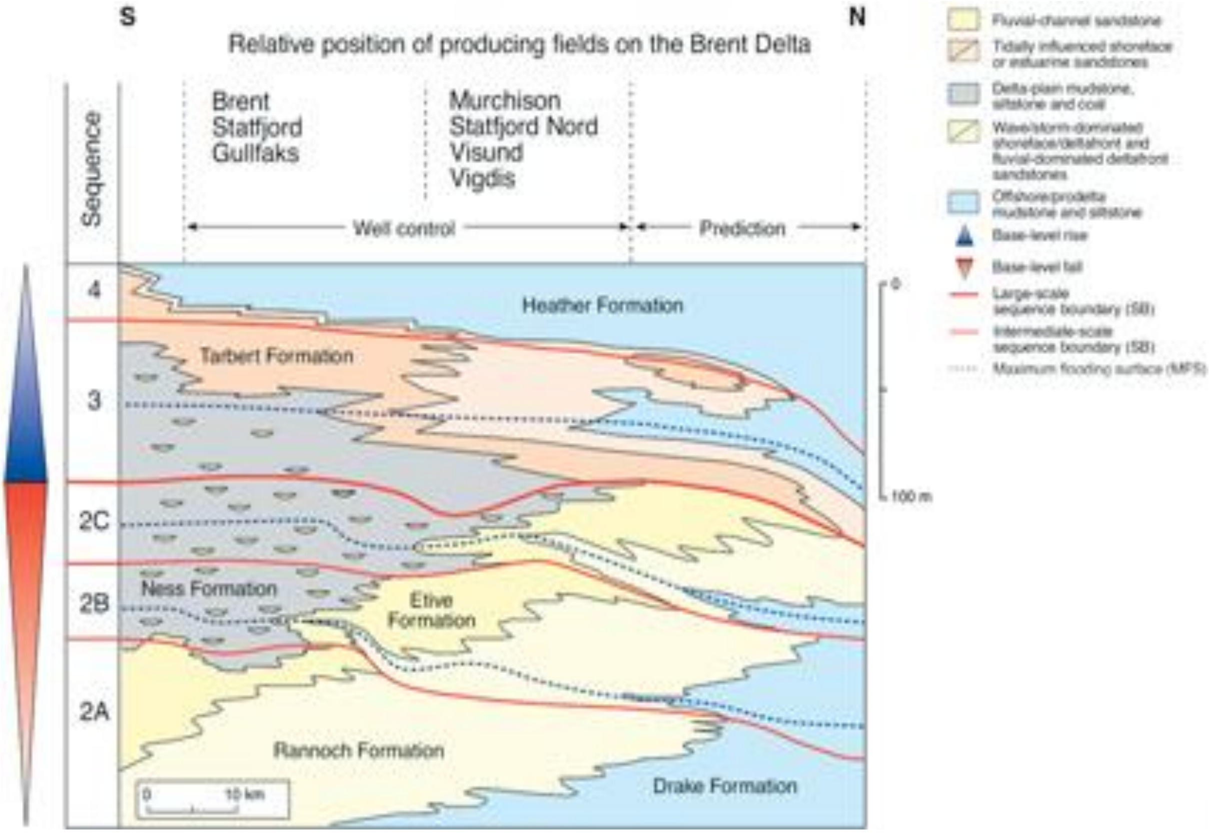


Fig 4.5: Geological setting of the Tarbet Formation

4.3 Research Method.

For the purpose of performing a conformance verification to the FDL of permeability data from the Tarbet and Johansen Formation, 1 statistical test is used. This is the chi-squared test (CST).

4.3.1 Research Hypotheses. In analyzing the datasets and drawing conclusions, two hypothesis are considered; these are the Null Hypothesis and the Alternative Hypothesis.

4.3.1.1 Null Hypothesis; the hypothesis that there is a good resemblance between observed trend in sample population and expected trends in another sample population. It is a statement that elements in the sample space will be of a certain value or follow a certain trend. In this thesis, it is stated as;

Ho: Permeability distribution in oilfields is a non- random natural geological occurrence which conforms to the Benford′s FDL.

4.3.1.2 Alternative Hypothesis: This describes the conclusion that is arrived at if the sample data provides evidence that the null hypothesis is false. This is also called the research hypothesis and denoted as H_1.In this thesis, it is stated as;

H_1: Permeability distribution in oilfield is a non- random natural geological process that does not conform to Benford's First-Digit Law (The Alternative Hypothesis).

This study includes permeability data from the Tarbet and Johansen formations. Two data subsets are analyzed for the Tarbert Formation (TFm and TFm.), and three data subsets for Johansen Formation (JFm1, JFm2, and JFm3) to establish the usefulness of the FDL as a permeability distribution quality control tool.

The Chi-Square (χ^2) test is used to make a decision and conclude if two data sets, at a certain significance level, match each other. In this thesis, this test has been performed in checking whether the sample permeability datasets conform to Benford's law curve.

The objective is to compare practical usefulness in representability of permeability data and note the differences between these conformity tests in the Petroleum Industry. Another objective is to provide possible reasons why certain permeability distribution datasets may not conform to the FDL and to call on the reservoir engineer or any user of such data to question various aspects of the data acquisition, transmission and storage process.

4.4. The Chi-Squared Test (CST)

This statistical test is used herein to determine if there is a significant difference between expected frequencies from field permeability data and those predicted by the FDL. This will enable us evaluate how likely it is that the null hypothesis is accepted or rejected, given the observed values of permeability from the Tarbet Formation (TFm) and the Johansen Formation (JFm).

The Chi-Square statistic is defined as;

$$\boldsymbol{\chi 2} = \sum(\boldsymbol{F_{OP}} - \boldsymbol{F_{EP}})^2/\boldsymbol{F_{EP}} \text{ ------------------------------------ } (4.4)$$

$$where\ F_{OP} = Observed\ percentage\ of\ permeability\ \ occurence\ from\ data$$

$$F_{EP} =$$
$$Expected\ percentage\ of permeability\ occurence\ according\ to\ FDL.$$

4.4.1 Statistical Significance Level (SSL).

In statistical analysis a level of significance for interpreting test results is chosen. The SSL is defined simply as how likely a given trend in observed data is true. It can be interpreted as the risk we assume of rejecting the null hypothesis when it is actually true. This risk is expressed in terms of a probability. The higher the probability, the higher the likelihood that the observed trend is true. The most common level, used to mean something is good enough to be believed, is 0.95.This means that the finding has a 95% chance of being true. It can conversely be said that the probability that the event is false is 5 %(0.05). The SSL for this thesis has been chosen to be **0.05**.

4.4.2 The p-value.

The p-value is a statistical parameter which provides significant deviation or some degree of evidence against the null hypothesis.

4.5 Data Samples

Three samples are pulled out from the Johansen data set and named JH SET 1, JH SET 2, and JH SET 3. (See Appendix B, C, and D respectively)

Two samples are equally pulled out of the Tarbet dataset and named TFm1 and TFm2(See Appendix E and F respectively).The chi-square tests are performed for each of these sets with the results found in the contingency tables below. The percentage of each first digit is from the data sets is counted by using the online dcode.fr"s algorithm. (www.dcode.fr).

Table 4. **Johansen Formation (JFm) Set 1 Chi-Square Analysis**

LD	**FO%**	**FOP**	**FE%**	**FEP**	**FOP- FEP**	**(FOP- FEP)^2**	**(FOP- FEP)^2/ FEP**
1	29.9	974	30.12	981.3096	7.3096	53.430	0.0544
2	16.3	531	17.61	573.7338	-42.7338	1826.177	3.1829
3	12.3	401	12.5	407.25	-6.25	39.0625	0.0959
4	9.9	323	9.69	315.7002	7.2998	53.2870	0.1687
5	7.7	251	7.92	258.0336	-7.0336	49.4715	0.1917
6	6.6	216	6.69	217.9602	-1.9602	3.8423	0.0176
7	6.5	212	5.8	188.964	23.036	530.6572	2.8082
8	5.2	169	5.11	166.4838	2.5162	6.3312	0.0380
9	5.6	181	4.58	149.2164	31.7838	1010.1972	6.7700
Total	**100%**	**3258**	**100%**	**3258**			**13.3272**

Degrees of freedom = 8 **p= 0.1** **χ^2 = 13.3272**

Sample space = 3258 data points.

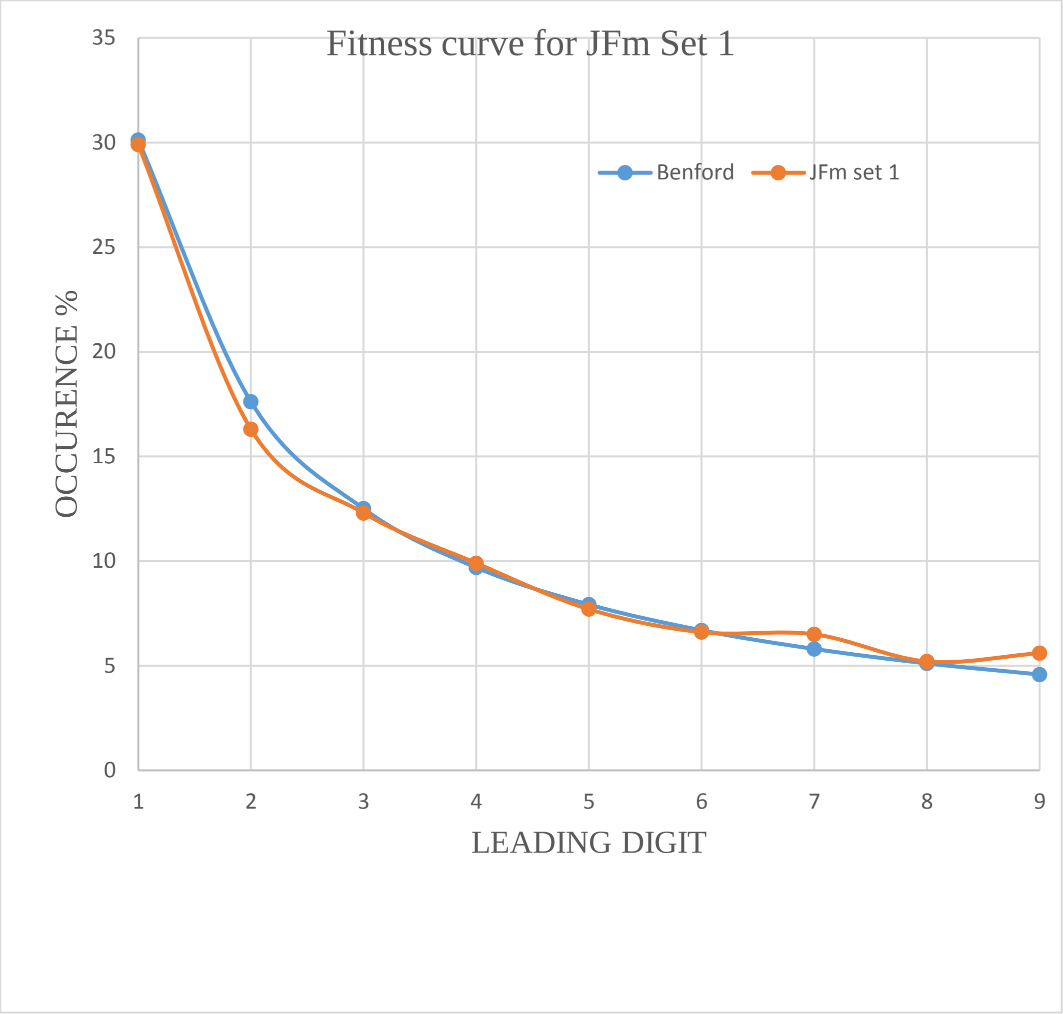


Fig 4.6: Graph of First Digit distribution of Johansen Formation set 1 on the Benford's FDL curve

Table 5. Contingency Table for JH SET 2. Chi-Square Analysis

LD	FO%	FOP	FE%	FEP	FOP- FEP	(FOP- FEP)	(FOP-FEP)^2/ FEP
1	29.5	1753	30.12	1787.622	-34.622	1198.6828	0.6705
2	18.1	1073	17.61	1045.1535	27.8465	775.4275	0.7419
3	12.7	752	12.5	741.875	10.125	102.5156	0.1381
4	10.5	622	9.69	575.1015	46.8985	2199.4693	3.8244
5	7.9	471	7.92	470.052	1.052	1.106	0.002354
6	6.6	392	6.69	397.0515	-5.05	25.5025	0.0642
7	6.1	362	5.8	344.23	17.77	315.7729	0.9173
8	4.9	290	5.11	303.2785	-13.2785	176.318	0.5813
9	3.7	220	4.58	271.823	-51.823	2685.6233	9.8800
Total	100%		**100%**				**16.8200**

Degrees of freedom (DF) = 8 **Chi-Square = 16.8200**

Sample data points = 5935. **P= 0.0329**

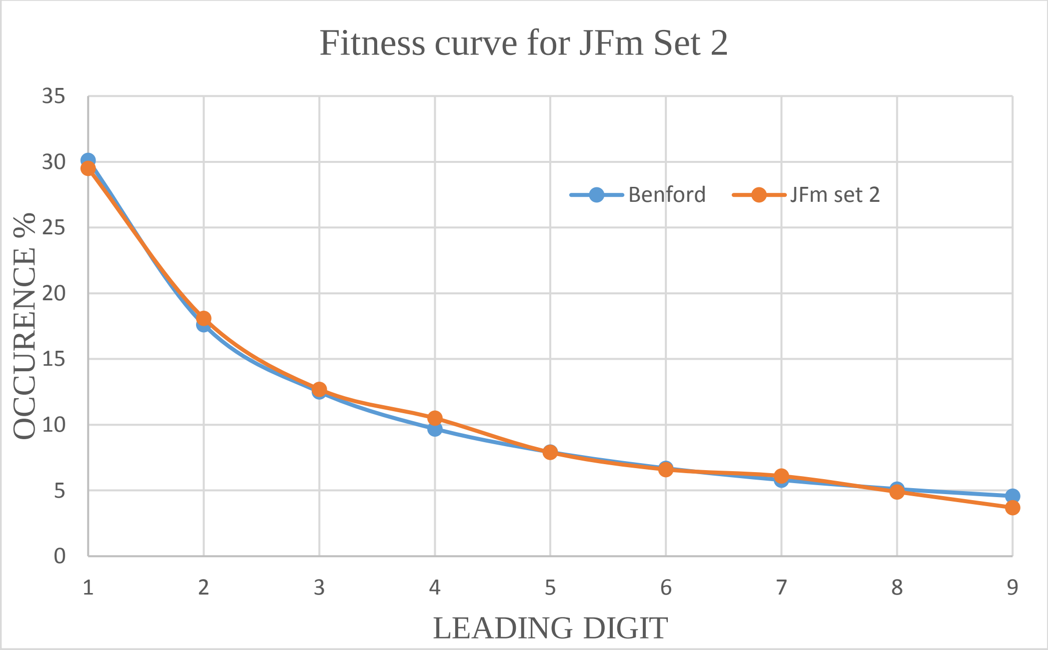


Fig 4.7: Graph of First Digit distribution of Johansen Formation set 2 on the Benford's FDL curve.

Table 6: Contingency Table for JH SET 3.Chi-Square Analysis

LD	**FO%**	**FOP**	**FE%**	**FEP**	**FOP- FEP**	**(FOP- FEP)^2**	**(FOP-FEP)^2/ FEP**
1	28.2	776	30.12	829.50	-53.5	2862.25	3.45
2	17.0	469	17.61	485	-16	256	0.52
3	12.7	351	12.5	344.25	6.75	45.56	0.132
4	11.0	304	9.69	266.86	37.14	1379.379	5.169
5	7.9	219	7.92	218.11	0.89	0.7921	0.00363
6	7.0	192	6.69	184.24	7.76	60.21	0.326
7	6.6	183	5.8	159.732	23.26	541.399	3.389
8	5.3	143	5.11	140.72	2.28	5.198	0.036
9	4.2	117	4.58	126.133	-9.133	83.41	0.6612
Total	**100%**	**2754**	**100%**	2754			**13.6869**

Degrees of freedom (DF) = 8 p= 0.09 chi-square = 13.6869

Sample Space = 2754

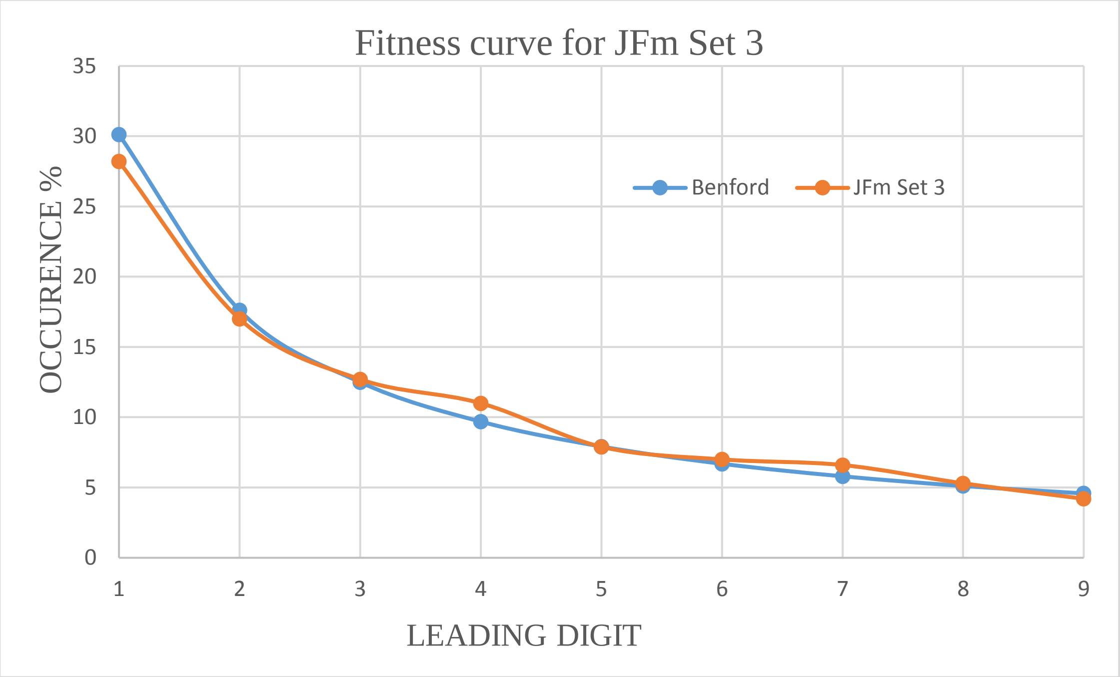


Fig 4.8: Graph of First Digit distribution of Johansen Formation set 3 on the Benford's FDL curve.

TARBET SET 1

Table 7: Contingency Table for TARBET SET 1.Chi-Square Analysis

LD	**FO%**	**FOP**	**FE%**	**FEP**	**FOP- FEP**	**(FOP- FEP)^2**	**(FOP- FEP)^2/ FEP**
1	28.9	460	30.12	478.9	-18.9	357.21	0.74
2	15.8	252	17.61	280	-28	784	2.8
3	12.3	196	12.5	198.75	-2.75	7.5625	0.038
4	10.5	167	9.69	154.1	12.9	166.41	1.07
5	7.7	123	7.92	126	-3	9	0.071
6	6.9	110	6.69	106.371	3.629	13.169	0.124
7	6.7	107	5.8	92.22	14.78	218.45	2.368
8	5.6	89	5.11	81.249	7.751	60.07	0.739
9	5.4	86	4.58	72.822	13.178	173.66	2.384
Total	100%	1590	**100%**	1590			**10.3347**

Degrees of freedom (DF) = 8 p= 0.2423 chi-square = 10.3347

Sample Space = 1590

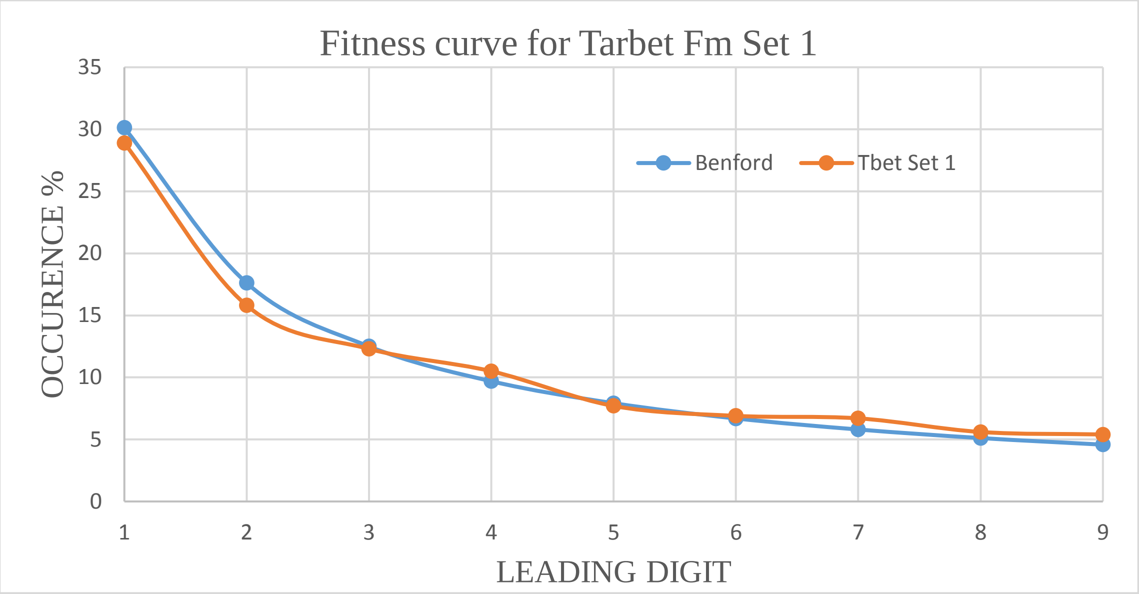


Fig 4.9: Graph of First Digit distribution of Tarbert Formation set 1 on the Benford's FDL curve

TARBET SET 2

Table 8: Contingency Table for TARBET SET 1.Chi-Square Analysis

LD	**Fo%**	**Fop**	**Fe%**	**Fep**	**Fop- Fep**	**(Fop- Fep)^2**	**(Fop-Fep)^2/ Fep**
1	29.8	451	30.12	455.41	-4.41	19.44	0.043
2	16.7	252	17.61	266.26	-14.26	203.34	0.764
3	12.6	191	12.5	189	2	4	0.02
4	10	151	9.69	146.51	4.48	20.135	0.137
5	8.2	124	7.92	119.75	-4.25	18.06	0.150
6	6.5	98	6.69	101.15	-3.153	9.94	0.098
7	5.1	77	5.8	87.696	-10.696	114.4044	1.304
8	5.8	87	5.11	77.26	9.7368	94.805	1.227
9	5.4	81	4.58	69.25	11.75	138	1.99
Total	100%		**100%**				**5.7366**

DF = 8 **P= 0.6762** **χ^2 = 5.7366**

SS = 1512.

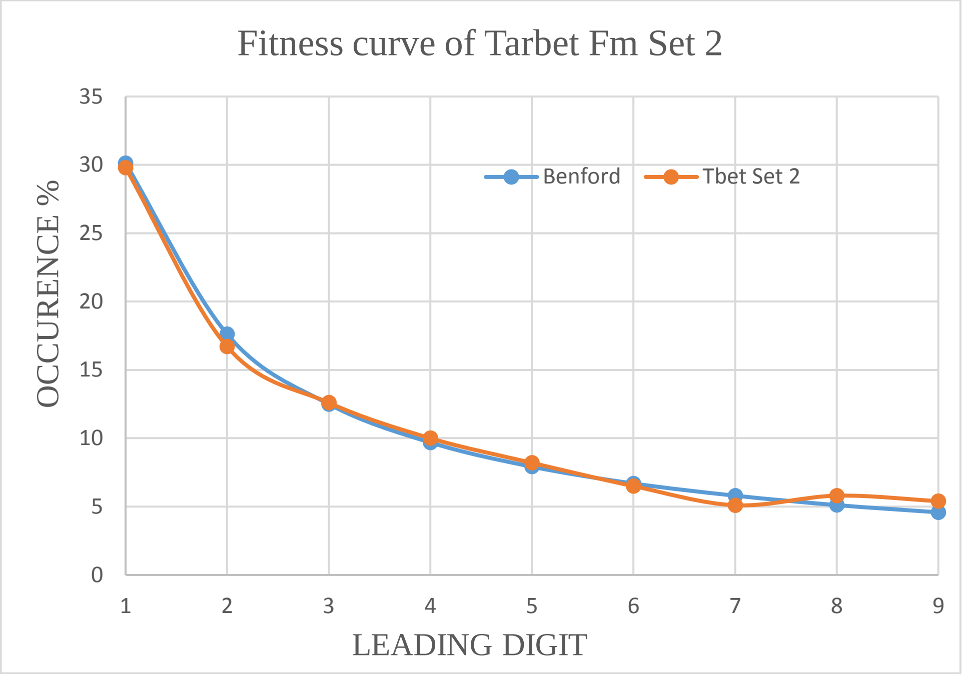


Fig 5.10: Graph of First Digit distribution of Tarbert Formation set 2 on the Benford's FDL curve

4.6 INTERPRETATION OF RESULTS

4.6.1 JH SET 1

In order to test the quality of permeability distribution data from this sample, the chi-square goodness-of-fit test has been performed. In the test, a chi-square value of **13.32** has been obtained. This value is compared to the critical for chi-square distribution for eight degrees of freedom. In the table, the critical value is **15.507**(see appendix A).This is greater than the value of 13.32 in our data. Hence there exist a good fit between the Benford's law distribution and the first digit distribution from our dataset.

Upon comparing the p-value from our data set (**p= 0.1**) with the critical p-value of **0.05**(assuming a 95% confidence level) we note that p –value generated from the data set is greater than the critical p-value for 8 degrees of freedom on the p-value table. Hence there is at least a 95% confidence level stating that the two distributions match each other as evidenced by the chi-square test above. The Null Hypothesis is thus accepted.

4.6.2 JH SET 2

In order to test the quality of permeability distribution data from this sample, the chi-square goodness-of-fit test has been performed. In the test, a chi-square value of **16.82** has been obtained. This value is compared to the critical for chi-square distribution for eight degrees of freedom. In the table, the critical value is **15.507**(see appendix A).This is greater than the value of **16.82** in our data. Hence there is **no fit** between the Benford's law distribution and the first digit distribution from our dataset. Upon comparing the p-value from our data set (**p= 0.033**) with the critical p-value of **0.05**(assuming a 95% confidence level) we note that p –value generated from the data subset is less than the critical p-value for 8 degrees of freedom on the p-value table. Hence there is just a 3.3% chance that the two data distributions are a match. This is confirmed by the failed chi-square test above. The Null Hypothesis is thus rejected in favor of the Alternative Hypothesis.

4.6.3 JH SET 3

In order to test the quality of permeability distribution data from this sample, the chi-square goodness-of-fit test has been performed. In the test, a chi-square value of **13.68** has been obtained. This value is compared to the critical for chi-square distribution for eight degrees of freedom. In the table, the critical value is **15.507**(see appendix A).This is greater than the value of **13.68** in our data. Hence there exist a good fit between the Benford's law distribution and the first digit distribution from this data subset.

Upon comparing the p-value from our data set (**p= 0.09**) with the critical p-value of **0.05**(assuming a 95% confidence level) we note that p –value generated from the data set is greater than the critical p-value for 8 degrees of freedom on the p-value table. Hence there is at least a 95% confidence level in stating that the two distributions match each other as evidenced by the chi-square test above. The Null Hypothesis is thus accepted.

4.6.4 TARBET SET 1

In order to test the quality of permeability distribution data from this sample, the chi-square goodness-of-fit test has been performed. In the test, a chi-square value of **10.33** has been obtained. This value is compared to the critical for chi-square distribution for eight degrees of freedom. In the table, the critical value is **15.507**(see appendix A).This is greater than the value of **10.33** from our data. Hence there exist a good fit between the Benford's law distribution and the first digit distribution from this data subset.

Upon comparing the p-value from our data set (**p= 0.2423**) with the critical p-value of **0.05**(assuming a 95% confidence level) we note that p –value generated from the data set is greater than the critical p-value for 8 degrees of freedom on the p-value table. Hence there is at least a 95% confidence level in stating that the two distributions match each other as evidenced by the chi-square test above. The Null Hypothesis is thus accepted.

4.6.5 TARBET SET 2

In order to test the quality of permeability distribution data from this sample, the chi-square goodness-of-fit test has been performed. In the test, a chi-square value of **5.737** has been obtained. This value is compared to the critical for chi-square distribution for eight degrees of freedom. In the table, the critical value is **15.507**(see appendix A).This is greater than the value of **5.737** from our data. Hence there exist a good fit between the Benford's law distribution and the first digit distribution from data subset.

Upon comparing the p-value from our data set (**p= 0.67**) with the critical p-value of **0.05**(assuming a 95% confidence level) we note that p –value generated from the data set is greater than the critical p-value for 8 degrees of freedom on the p-value table. Hence there is at least a 95% confidence level stating that the two distributions match each other as evidenced by the chi-square test above. The Null Hypothesis is thus accepted.

CONCLUSION/RECOMMENDATIONS

The objectives of this study was to demonstrate that permeability distribution in oil and gas fields is controlled by natural geological processes which conform to the Benford's FDL.By virtue of this conformance, it is possible to infer if permeability distribution data actually reflect what obtains in the field. The law avails us with a method to flag non-conformed permeability distribution datasets and provides an invitation to question why the dataset is non-conformed. In this manner, the applicability of the FDL as a tool to probe the quality of permeability distribution data is established. This probing is of utmost importance if such data is used as the basis for any petroleum engineering calculation.

Non-conformance might be brought about by significant deviations of certain first digit distributions.eg. In Johansen Set 2 where a failed conformance test is encountered, it should be realized that permeability values beginning with digit 4 show the most deviation from the FDL curve. This involves permeabilities ranging from **400-499** and **4000-4999**.This calls upon the Petrophysicist or reservoir engineer interested or using this data to question amongst other things the following;

-The geology of the region turning in these values i.e. the depositional model involved and the environment of deposition, acquisition of the data, transmission, and storage of such data. These play a vital role in permeability distribution data quality and representativity.

- Methods used in measuring the data (i.e. direct methods like core analysis, and indirect methods like the use of empirical models, well testing, well logging, and ANN) etc.

The findings in this thesis are important in that, the FDL can be successfully applied to describe permeability distributions in oil and gas fields and that, deviations from this law can be linked to geological factors and permeability measurement techniques. This approach is therefore simpler and more specific than the Dykstra-Parsons equation (DPE) which assesses heterogeneity in oil and gas fields and reservoirs only from the coefficient of variability. The DPE neither describes the details of this heterogeneity, nor does it detect the possibility of low quality or unrepresentative data, i.e., "***Geological or Petrophysical fraud.***"

Limitations of the study.

It is important to stress that, data used for this thesis is limited to two fields in the North Sea as described above. The chi-square conformance test and p-values were used as statistical parameters to accept or reject the Null Hypothesis herein. The 5 sample subsets used for the analysis were limited to subsets comprising a few thousand data points drawn from a huge dataset from both fields comprising above a hundred thousand data points each.

However I do not state categorically that one non-conformant FDL dataset subset of permeability distributions will invalidate the rest of the data present in the field data. Non-conformant data sets are a pointer or an invitation for a more detailed integrated study of the methods used in obtaining such data. Application of the FDL has been established as far as distribution of permeability is concerned in these two fields.

Implications of the study.

The results of this thesis have clearly demonstrated that, Benford's FDL can be successfully used as a quality control tool for permeability distribution data and as an alert signal for questioning such data. It therefore reinforces the need for reporting permeability distribution data together with the methodology and assumptions by means of which the data was obtained. This is important for the purpose of quality control and validation. For example, if a given data set does not obey the FDL, permeability measurements from the well test can be questioned. Since electronic recorders are the primary devices for pressure recording in well tests, the Reservoir Engineer may wish to know if during the well testing, the following was taken into account in order for him to validate the data in question.

- If at least one electronic recorder was run above the chokes(or above the tester if chokes are used).

- If at least one recorder was ported so as to record the annulus pressure
- If at least two sets of electronic recorders were run below the tester valve if the testing was done offshore.
- If at least each electronic recorder had a mechanical recorder for back-up.Also if at least one temperature recorder was used during the test for back-up.
- If one recorder set,consisting of electronic pressure/temperature recorder and a mechanical pressure recorder, was run as close to the perforations as possible.
- That time delay or pressure-switch start was not relied upon for all electronic recorders.
- That recorder operating times(mechanical clocks and sampling frequencies) were selected to allow for the total running-in time plus the total of all anticipated flow and shut-in times.Running-in times should be based on similar tests from offsetting wells.
- That one recorder set consisting of electronic pressure/temperature recorder and a mechanical pressure recorder were run approximately midway between the tester valve and the perforations,if that distance was significant.
- That the Pressure and Temperature elements were selected such that formation pressure and temperature fell within the applicable range and the recorders and the recorder survived bull-heading if that was required.
- If the recorder operating times(mechanical clocks and sampling frequencies) were selected to allow for the total running-in time plus the total of all anticipated flow and shut-in times.

Recommendations

An efficient method that divides the dataset into a number of subsets probably of the same size should be obtained. This will enable a subset-by-subset FDL conformance evaluation to be made to allow for sectorial evaluations. Then an algorithm to combine these subsets should also be developed so that conformance of combined subsets can be evaluated rapidly to have a general assessment of the field.

Permeability distribution data from more fields should be investigated for FDL conformance to help strengthen the evidence provided in this thesis and any other potential applications.

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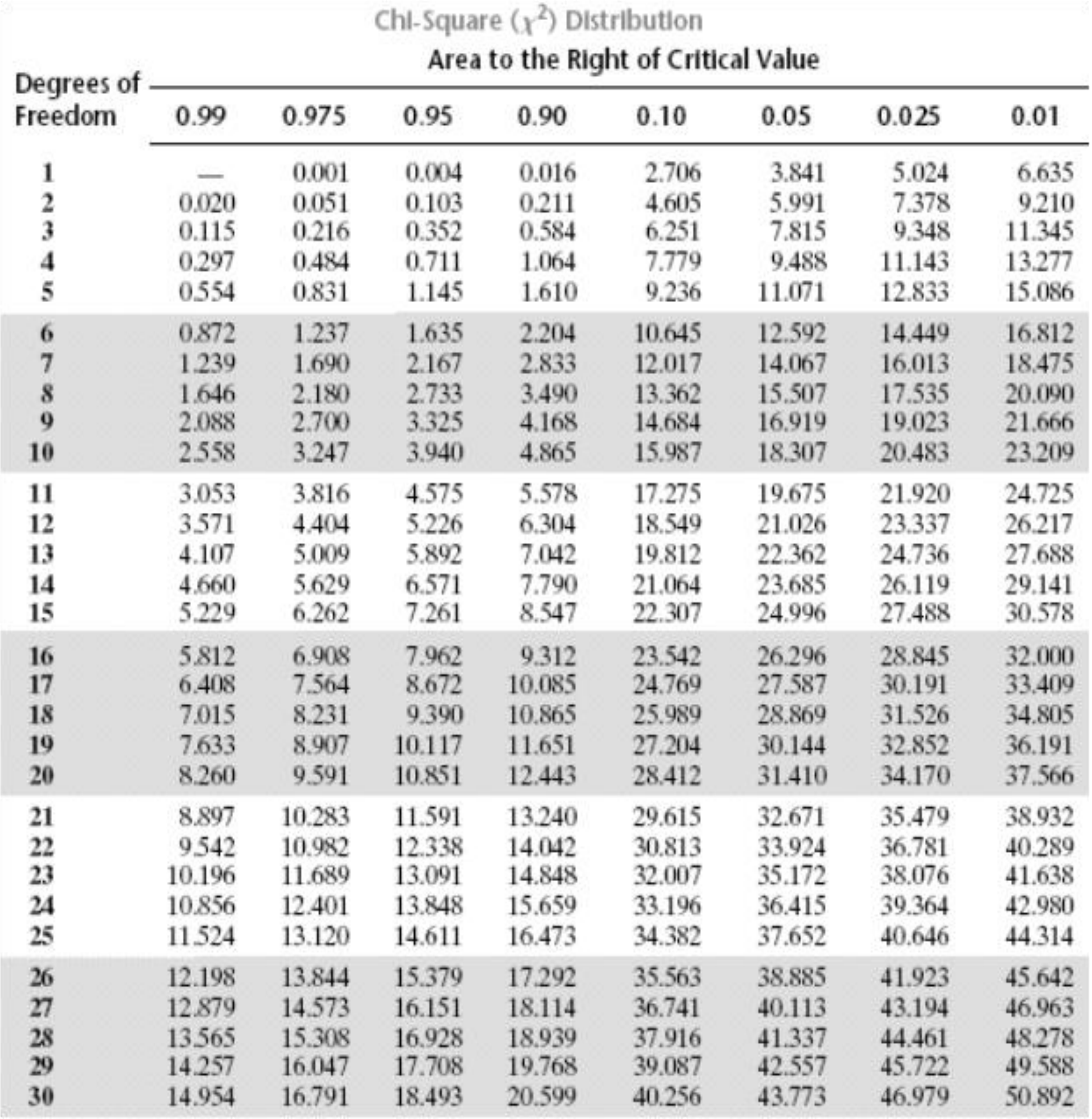
APPENDIX A



Chi-Square (χ^2) Distribution

Degrees of Freedom	Area to the Right of Critical Value							
	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01
1	—	0.001	0.004	0.016	2.706	3.841	5.024	6.635
2	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210
3	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345
4	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277
5	0.554	0.831	1.145	1.610	9.236	11.071	12.833	15.086
6	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812
7	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475
8	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090
9	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666
10	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209
11	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725
12	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217
13	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688
14	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141
15	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578
16	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000
17	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409
18	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805
19	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191
20	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566
21	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932
22	9.542	10.982	12.338	14.042	30.813	33.924	36.781	40.289
23	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638
24	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980
25	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314
26	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642
27	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963
28	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278
29	14.257	16.047	17.708	19.768	39.087	42.557	45.722	49.588
30	14.954	16.791	18.493	20.599	40.256	43.773	46.979	50.892

APPENDIX B

JOHANSEN SET 1(Permeability, mD)

18.2808	28.5927	23.8922	30.6373	10.7137	5.35088
6.44345	3.92864	5.04162	2.53339	10.5132	23.0809
9.60578	4.01875	7.7874	6.85716	72.3463	106.534
47.8931	61.1933	24.2839	32.545	7.24853	10.6236
50.5391	73.136	25.8289	12.1451	5.81114	7.76407
23.7305	16.8749	4.2084	10.1343	7.63875	35.2815
68.601	78.12	367.132	93.3577	44.0379	91.4481
45.0656	101.47	433.608	278.211	270.36	951.295
1086.06	1307.99	352.696	430.092	329.046	962.831
1135.89	294.556	182.889	76.6371	122.083	143.608
30.0745	47.3696	34.6528	38.802	5.35597	7.59105
9.26743	8.51926	4.56565	4.71611	3.33902	12.0588
12.0147	2.37447	4.42392	9.27369	5.85606	7.53995
20.8392	34.6219	55.891	25.7888	15.0891	19.9788
12.8086	61.7994	12.0113	18.0745	9.84804	11.7674
5.21774	11.9947	8.83255	8.25041	15.4516	19.3725
45.1739	89.5667	252.921	153.872	108.911	115.656
96.7443	71.5535	167.107	274.464	504.315	3316.12
1660.44	1994.33	469.504	1043.22	1117.25	1370.79
1702.03	475.397	179.975	166.961	80.0047	121.913
36.6004	38.3106	18.5334	46.6524	13.3315	7.87857
6.40553	9.48926	6.95112	5.42787	2.29742	2.4784
2.12551	2.62131	3.45982	4.70184	2.69407	6.60707
4.90993	3.54429	11.493	12.0014	15.6692	9.81506
4.34157	12.6171	19.7792	10.1616	8.4493	7.59847
5.20408	8.53728	9.21744	18.4357	20.007	27.2087
19.4738	169.791	130.478	58.0261	50.2235	327.883
246.356	150.442	280.167	347.397	377.891	2203.84
2709.17	2615.81	1011.91	1567.75	1741.92	1167.18
1051.68	662.854	625.695	284.233	294.164	166.647
77.339	148.049	26.6173	41.6934	10.3014	5.36533

9.97435	8.9277	7.24694	2.29576	2.78555	1.71715
0.803372	1.68358	0.919366	1.40978	5.29637	3.88776
1.21072	1.41659	3.51416	5.74454	4.55022	5.49859
5.42212	8.74507	19.0854	40.8071	20.6651	25.9012
15.0398	12.7375	10.7757	18.5963	17.5469	18.0971
64.4457	69.1334	95.6192	52.9022	65.9273	85.2677
96.669	71.3689	443.724	345.25	1127.48	781.757
3713.45	1582.46	1518.88	566.364	959.828	1325.22
561.286	653.387	222.946	122.559	295.442	167.765
162.524	40.0015	36.6113	21.0429	5.7633	6.29798
8.3885	4.90155	6.97135	4.06777	0.789033	2.21575
0.988049	1.90491	1.33897	1.07562	7.73795	7.68939
2.30512	4.87346	9.28257	3.5917	3.28353	6.77681
16.1987	11.7676	16.8794	34.5907	25.0763	21.481
6.89775	14.8391	27.5043	13.7502	35.7102	39.9586
44.2431	80.2785	127.62	296.41	148.299	246.788
516.625	86.0163	147.597	164.098	235.14	397.552
2524.33	2022.56	367.048	935.462	895.308	1205.32
614.279	296.665	87.7067	165.24	150.511	224.903
189.922	74.0678	53.0323	20.8125	7.16885	5.2604
5.29002	9.0663	16.5364	3.25101	1.2138	1.3417
2.16068	0.673024	1.44564	1.66915	0.671277	2.36493
6.97076	10.6774	7.93484	6.45699	4.58111	5.60406
4.13442	11.0964	8.42633	23.0823	16.2977	31.1835
9.46865	20.5059	24.8539	68.569	40.7179	161.133
99.2517	27.1349	91.2376	99.7845	68.8749	103.909
137.368	346.897	229.404	33.7054	99.2643	353.5
499.285	743.861	1427.56	762.315	488.011	327.116
828.87	263.213	319.831	264.604	55.4389	103.138
319.595	33.669	39.0111	17.0689	8.62176	5.8724
4.68938	1.36036	3.91879	3.95633	2.27879	1.9001
1.45525	1.01861	0.582322	0.543903	0.639367	0.604248
3.88849	5.4165	6.6167	4.63713	3.31185	2.01783
8.57734	22.6059	19.5785	29.2816	12.6885	21.4287

38.2764	69.0598	38.0745	68.6041	109.056	49.0007
60.6678	23.3705	34.7444	118.518	57.6713	137.965
221.459	99.6629	82.0887	35.3327	47.6947	364.625
287.378	240.21	887.203	431.946	344.46	581.718
317.3	167.848	398.182	133.075	19.6266	54.7041
130.487	132.4	51.4492	23.7576	15.5526	7.72077
4.92497	2.92735	4.88634	4.82584	2.29089	0.856368
0.302606	0.32514	0.083738	0.214301	0.445887	0.954663
0.795346	2.53781	2.02511	3.23398	2.4047	2.28996
5.47822	29.6678	20.6781	12.6059	11.1003	24.6581
26.4511	36.3869	131.73	147.479	51.0539	112.495
64.2112	24.4887	75.1148	63.5158	84.7207	69.3179
117.031	94.8269	84.8969	111.489	139.339	121.829
71.3381	329.013	1619.73	509.781	710.229	640.113
399.418	144.863	271.272	28.8719	38.8953	37.0047
43.4254	24.6768	32.2811	35.4096	30.2768	7.58335
3.80521	3.37532	2.18346	0.553644	0.917163	1.09313
0.271254	0.092585	0.090096	0.103747	0.130736	0.298734
0.477529	1.21479	0.985342	1.55184	1.67876	1.51324
0.991233	5.72755	13.5524	6.53594	14.1261	25.9475
37.0729	50.2694	126.293	56.208	85.9201	90.5065
92.6517	58.4189	31.2229	57.4298	66.0355	19.9045
36.7279	109.96	75.1311	121.208	115.614	127.462
72.0333	303.879	65.8253	176.62	157.286	253.967
361.346	70.7341	42.0494	57.4556	26.4591	15.2422
38.7829	14.3139	46.2924	80.9089	15.9377	2.54309
18.2513	15.4026	2.30633	0.665779	1.49548	1.99371
0.233009	0.12659	0.268481	0.142833	0.140435	0.146062
0.651237	1.02866	1.0319	0.787907	0.973494	1.14034
0.971316	2.37613	7.48101	13.9967	25.0471	25.6881
42.3074	30.2936	26.9816	31.8238	77.4064	123.799
82.6417	44.9437	39.2051	55.2738	109.209	36.3917
35.7262	41.8029	71.6553	74.0303	192.052	76.0849
142.739	152.224	61.9146	90.9193	511.085	359.248

459.867	161.411	95.2092	101.811	15.3003	12.4357
13.009	14.4758	16.8694	21.0962	6.57672	1.95847
7.96978	11.6048	1.47478	1.27281	0.597921	0.869001
0.849188	0.751324	0.315796	0.266221	0.560545	0.736985
0.309799	0.487124	0.863795	0.897987	0.898623	2.26293
1.17993	2.69988	3.50327	6.25343	17.5032	20.4588
27.7757	68.0809	14.6412	28.3057	40.7452	70.3034
57.9588	46.4148	37.9839	52.731	76.6225	82.832
77.1676	142.633	109.314	44.3344	43.6147	307.627
235.669	361.755	197.217	146.367	302.839	339.325
296.876	135.445	190.378	89.7614	27.8183	18.877
7.16022	8.65765	3.99874	14.2514	4.86356	1.95534
5.07195	7.8621	2.4718	0.583518	1.00351	1.47197
0.57635	0.641664	0.376292	0.379603	0.680301	0.455142
0.335713	0.367982	0.753276	2.31936	2.98244	3.9244
1.29662	5.6414	12.7969	8.61734	53.9919	37.4596
15.0313	21.4736	26.0104	42.0061	103.613	48.719
119.319	108.62	35.1752	45.8971	93.9579	23.2149
42.4154	120.087	47.3769	27.8511	55.9139	126.111
81.8879	151.432	54.9595	157.348	377.474	204.117
346.179	513.958	237.665	91.2358	61.8422	91.6277
1.80104	6.82593	3.40612	4.00803	2.24549	3.56666
6.30063	7.73962	2.62968	4.33189	1.36498	1.49733
2.64295	1.14146	1.71042	0.476769	0.218049	0.459348
1.06877	0.676214	0.661597	1.58771	5.36033	4.64649
1.49418	1.43577	3.51303	10.9976	3.7347	25.7559
36.338	19.2705	17.0346	77.9965	58.7439	124.564
56.1203	61.2544	26.4241	39.8895	30.3064	89.7634
34.2672	82.4096	48.5993	124.5	45.876	110.422
67.1363	136.596	37.9908	262.319	560.899	512.414
450.496	411.31	65.278	176.562	41.701	26.0362
0.609576	2.86513	2.87828	2.16688	2.71788	5.72251
5.13744	5.28518	1.79955	0.875289	1.53656	2.2197
1.76954	0.649883	1.33097	1.29779	0.42621	0.568769

0.539426	0.489671	0.471227	1.24699	2.48325	1.11821
1.82417	2.02753	5.87194	12.0176	3.46524	11.2173
12.535	21.5821	21.7714	36.0311	26.8494	41.922
27.3714	18.4454	15.1332	9.49732	79.5755	75.501
94.1935	123.455	199.008	47.2681	87.9056	58.5484
129.107	83.0788	93.5221	382.939	720.044	1155.59
985.12	454.544	289.211	71.3822	99.3684	29.1986
3.46407	1.60899	1.66237	4.08678	3.24948	5.31374
5.0152	6.02608	8.1359	8.17809	5.62494	1.63173
2.64293	0.589669	1.99005	0.479159	0.204634	0.277022
0.234314	1.07952	6.65081	2.68224	3.09476	1.94003
2.51055	3.25179	3.00282	1.85132	1.81878	4.08087
12.3795	12.8537	33.3407	35.7048	17.6613	43.5555
28.9049	9.06454	11.0035	23.9752	22.7461	43.1903
102.569	70.9187	89.2653	23.6589	117.871	18.6867
141.229	247.607	90.988	69.8726	235.067	848.649
488.96	338.538	74.3821	37.582	50.0983	14.112
0.89211	1.53401	3.0655	1.55236	3.03634	1.12324
1.96764	4.35268	1.24489	2.02082	2.35103	1.91956
0.401634	0.18744	0.269334	0.125156	0.183524	0.183411
0.348872	1.27184	4.70033	1.58355	2.11024	7.50597
9.61662	6.87923	3.48241	1.32702	0.908726	1.9181
7.55562	25.6775	20.4908	16.2542	31.7129	16.3394
13.3048	14.5299	7.89904	19.4676	16.906	56.0159
56.1426	94.2546	86.5729	29.786	22.5841	24.2401
32.5854	54.7387	38.3557	59.1524	41.9087	34.1913
49.4245	56.9277	45.2245	47.5583	55.5736	18.7721
0.353126	1.1445	0.877545	2.41623	3.36285	1.61287
3.77013	2.39442	0.821404	2.57573	4.49786	1.38931
0.484356	0.251368	0.249305	0.220747	0.088644	0.125861
1.13259	4.4243	3.19911	3.0325	3.22646	6.93991
11.3692	7.12884	3.11969	3.23544	1.23964	2.36275
2.86212	10.0608	6.29822	16.8733	12.9916	15.3628
9.59965	11.7686	20.7106	15.047	14.7194	43.1164

15.6924	91.8649	99.1909	26.6804	9.78927	30.5342
12.3733	38.5338	29.3815	29.823	63.337	17.4486
12.7539	20.1188	16.0321	14.8462	34.4922	5.07363
0.352919	0.399583	0.757314	2.25368	1.16524	0.995091
1.88367	1.38887	0.77747	2.71467	1.4055	1.2226
0.791267	0.412373	0.278495	0.213733	0.349244	0.728259
1.26656	3.88174	4.1941	2.9681	3.014	19.7848
2.3196	4.86141	4.80156	1.95423	2.30967	1.71657
1.44978	2.65759	4.28942	4.60691	16.5056	20.7458
10.2642	7.37269	16.9184	12.3989	14.4696	12.8348
57.9434	60.3357	43.5795	39.0121	11.0922	15.6216
15.6949	9.1618	33.5953	41.8466	45.0605	9.42314
8.86049	7.03909	3.66833	5.14718	5.62935	3.60567
0.72422	0.559671	0.969849	1.10466	0.542068	0.416059
0.202618	1.36261	1.79218	1.62289	2.97798	0.966263
0.407688	0.315155	0.158103	0.172103	0.52355	0.203431
0.783274	1.55818	2.66241	4.10763	7.53398	6.16072
7.76617	2.78464	3.23712	1.73442	1.0629	0.815451
0.610006	0.894467	1.66536	4.16322	6.59761	8.73706
8.2343	9.71095	6.90321	10.8176	19.1048	17.7074
40.0796	29.5045	19.6389	12.6278	4.75389	4.54142
4.07279	11.6695	8.89013	11.5058	22.677	8.45942
2.07818	4.8014	7.05566	4.17208	10.7748	1.78675
0.590055	0.708255	0.7802	0.941384	0.343624	0.152662
0.25477	0.390052	0.652424	0.898535	1.8342	1.458
2.48094	0.251103	0.151576	0.055344	0.111175	0.203306
0.573933	0.820197	2.44519	6.02729	6.44207	3.78151
3.37588	4.36127	0.764075	0.637477	0.761745	1.29291
0.839048	0.269847	0.166293	1.29743	1.34723	1.97676
2.50659	3.92914	4.35277	7.90658	23.7314	38.4535
32.1438	19.9763	18.3284	8.39348	3.83613	1.81263
1.76351	1.97555	3.6143	6.2476	7.49525	4.40424
1.36049	0.923704	1.8086	3.16607	4.03983	4.25536
0.474935	0.418091	0.807575	1.14937	0.428535	0.448888

0.229544	0.610092	0.458425	0.70324	2.30129	1.4906
4.51242	0.531065	0.171146	0.068955	0.135919	0.177182
0.105534	0.272632	1.05435	0.787925	2.60986	2.85002
1.99887	3.19146	1.9299	1.11901	0.289045	0.380987
0.996919	0.376418	0.260397	0.512121	1.05967	1.48717
0.793544	1.88823	1.97142	6.59163	5.55659	29.117
12.9619	5.21699	7.65936	4.72932	1.26117	1.09991
1.19732	1.32971	1.90857	3.11145	0.857903	0.674268
1.2287	0.819264	0.831301	2.29829	6.18341	8.9794
0.365173	0.520217	3.90425	1.37641	1.36366	0.381085
0.199293	0.431205	0.246693	0.767637	0.609456	0.385506
0.903268	0.356505	0.299041	0.078414	0.126439	0.259904
0.188593	0.053349	0.205726	0.428609	0.917965	1.2382
1.95771	2.5494	1.433	1.15779	0.419013	0.300466
0.30561	0.735156	0.230977	0.118901	0.324758	0.755213
0.849568	0.90408	1.48454	1.75167	2.81652	6.96241
4.01005	4.68217	1.43464	1.83824	0.796961	0.340671
0.89277	1.37302	1.7513	2.13243	0.333177	0.286353
0.92677	1.38974	2.93356	0.831011	0.93838	1.76312
0.426686	0.761455	2.62609	2.5829	0.617749	0.334515
0.20501	0.2816	0.57042	0.51273	0.33018	0.339738
0.592225	0.120547	0.17393	0.06082	0.031481	0.139797
0.225908	0.090303	0.154463	0.752918	0.221096	0.636281
0.858859	1.70525	3.31887	1.92844	0.138208	0.494132
0.35152	0.178525	0.098638	0.072887	0.07228	0.207636
0.303782	0.424182	1.10825	0.943481	1.88622	0.463224
0.289601	1.40444	0.469652	0.535554	0.240284	0.11115
0.182729	0.148102	1.27126	0.416609	0.160231	0.36038
0.246796	0.862215	0.778564	0.558497	0.411477	2.00192
0.584886	1.60379	1.88657	0.670178	0.509708	0.221842
0.217102	0.16603	0.167852	0.147791	0.164061	0.102624
0.070004	0.048447	0.233067	0.077317	0.045135	0.054647
0.199763	0.439835	0.321942	0.768127	0.626337	0.976077
0.266467	0.243307	0.282279	0.665987	0.486905	0.334245

0.211624	0.251081	0.213459	0.030042	0.052294	0.129217
0.271542	0.184718	0.185396	0.541355	0.440413	0.101781
0.171978	0.999303	0.470895	0.217414	0.211281	0.129945
0.287757	0.157568	0.121372	0.220171	0.21208	0.170253
0.239202	0.337386	0.264819	0.204824	0.685666	0.665656
0.167686	0.466463	1.02762	0.651685	0.63025	0.149974
0.840716	1.59291	0.166913	0.216937	0.141255	0.035694
0.036474	0.06265	0.101747	0.055308	0.042332	0.029719
0.105012	0.326777	0.526441	0.310816	0.36599	0.48579
0.142512	0.166317	0.199187	0.106955	0.116694	0.129869
0.156855	0.165738	0.068222	0.040308	0.06062	0.090654
0.049007	0.063147	0.156584	0.159386	0.120407	0.065318
0.213789	0.390441	0.253612	0.114294	0.20045	0.140985
0.113927	0.061694	0.098983	0.191936	0.377485	0.462647
0.10819	0.37713	0.466736	0.21697	0.412613	0.507793
0.244401	0.588184	1.54462	0.897694	0.383388	0.244689
1.20414	0.643572	0.568522	0.152512	0.045175	0.037836
0.060595	0.09578	0.077799	0.06143	0.065217	0.05007
0.167385	0.318655	0.521898	0.132168	0.486193	0.196947
0.122703	0.102049	0.123016	0.141707	0.062654	0.106862
0.191399	0.088722	0.190277	0.039141	0.113107	0.075957
0.036455	0.032477	0.025407	0.043204	0.10682	0.081017
0.207339	0.531314	0.201115	0.144023	0.137418	0.046428
0.062274	0.118929	0.049903	0.062352	0.275537	0.304709
0.399102	0.299944	0.479111	0.120007	0.388141	0.349341
0.632301	0.899053	1.35651	2.10922	0.897559	0.279691
0.934744	0.928293	0.48697	0.124517	0.388997	0.064589
0.052096	0.074739	0.06333	0.074754	0.069535	0.098179
0.136918	0.125633	0.107797	0.295167	0.288474	0.078273
0.090334	0.096941	0.072013	0.072022	0.094721	0.086536
0.314068	0.09024	0.093889	0.04928	0.091927	0.08108
0.039359	0.018399	0.008992	0.039678	0.034436	0.044408
0.168195	0.280247	0.059519	0.079622	0.088277	0.072633
0.070539	0.087143	0.099387	0.182244	0.139688	0.42198

0.417049	0.414144	0.234302	0.219315	0.162743	0.198993
0.779377	2.35863	1.11758	2.34682	0.92993	0.451152
0.84068	0.381828	0.470558	0.346813	0.195727	0.090251
0.043191	0.032815	0.094702	0.064304	0.067679	0.073472
0.081727	0.081964	0.099063	0.17387	0.124268	0.181012
0.075702	0.019765	0.026846	0.100987	0.057569	0.102052
0.064978	0.074939	0.061742	0.068075	0.084432	0.084995
0.057111	0.004291	0.006263	0.019324	0.01635	0.033026
0.075787	0.079404	0.162243	0.03825	0.039807	0.081081
0.074983	0.056221	0.062298	0.095707	0.319044	0.542189
0.756566	0.550974	0.141069	0.672353	0.139164	0.10873
1.06014	2.41947	5.9638	2.71306	1.38461	0.917554
1.38034	2.11844	0.440653	0.876353	0.295874	0.057204
0.01578	0.040163	0.027675	0.057417	0.133607	0.081341
0.092705	0.086269	0.078401	0.065295	0.09406	0.059243
0.026434	0.020593	0.007314	0.058549	0.057769	0.137626
0.195908	0.039532	0.0799	0.207255	0.116706	0.091674
0.036893	0.006564	0.012074	0.0287	0.030447	0.037968
0.055228	0.0299	0.026968	0.008935	0.042373	0.040022
0.025446	0.026854	0.094735	0.073353	0.183607	0.190153
0.451874	0.393157	0.187629	0.736622	0.191405	0.129485
3.10178	4.9148	3.72919	2.13265	1.22734	0.566235
1.08884	0.358749	0.257256	0.161787	0.213387	0.0485
0.047346	0.047657	0.079588	0.027495	0.047499	0.04567
0.045658	0.048553	0.092063	0.068284	0.071268	0.137698
0.079528	0.063967	0.032753	0.068267	0.040122	0.105537
0.06454	0.063571	0.072713	0.095023	0.056879	0.054216
0.014583	0.004934	0.009829	0.007795	0.015729	0.02172
0.010778	0.012186	0.007053	0.007867	0.008753	0.027752
0.0083	0.024717	0.078739	0.090545	0.135984	0.252012
0.184971	0.17802	0.408238	0.527371	0.241761	0.426785
7.76936	4.617	2.40348	1.47536	0.553726	0.343734
1.01435	0.394341	0.181115	0.187738	0.056556	0.04091
0.103109	0.209572	0.028216	0.009989	0.023276	0.012827

0.006	0.028838	0.049951	0.087765	0.103309	0.394611
0.272744	0.100117	0.192849	0.074223	0.054072	0.065815
0.070772	0.044667	0.063049	0.066441	0.104091	0.122193
0.038573	0.005301	0.006347	0.008731	0.00622	0.012177
0.018259	0.012052	0.006197	0.010061	0.012142	0.01287
0.006938	0.009056	0.018501	0.196066	0.170672	0.160517
0.127246	0.190537	0.513991	0.311494	0.521222	0.392839
1.70241	1.305	0.514734	1.16974	0.574972	0.869229
0.468002	0.234664	0.165219	0.106118	0.056173	0.08636
0.056484	0.070354	0.040285	0.051183	0.028749	0.009111
0.012703	0.008716	0.013318	0.081071	0.054589	0.225497
0.259114	0.101326	0.110236	0.065146	0.061294	0.037301
0.039084	0.050218	0.022723	0.018243	0.080772	0.073148
0.015249	0.003636	0.009754	0.008197	0.004742	0.016262
0.02517	0.005771	0.004294	0.00546	0.006204	0.006957
0.008486	0.010247	0.068039	0.221546	0.362242	0.245801
0.136571	0.220667	0.360723	0.412171	0.472555	0.390941
2.13074	0.464472	0.244723	0.954856	0.347141	0.803887
0.453533	0.188557	0.620573	0.445637	0.058534	0.175067
0.037545	0.054324	0.095681	0.04255	0.013105	0.011927
0.011483	0.020316	0.022481	0.142856	0.080144	0.238881
0.052884	0.06397	0.101781	0.02162	0.056448	0.090206
0.024222	0.018427	0.012357	0.01522	0.031152	0.017851
0.009136	0.003842	0.023748	0.013309	0.003033	0.003969
0.015531	0.018846	0.006035	0.005866	0.00688	0.00848
0.004681	0.01037	0.141674	0.317675	1.03439	0.600756
0.482827	0.819408	0.300304	0.335605	0.64013	0.938427
0.371712	0.733941	0.211423	0.404825	0.360448	0.359086
0.290065	0.262591	0.245752	0.143171	0.117183	0.099806
0.04189	0.106717	0.050424	0.048593	0.017269	0.026303
0.01978	0.010777	0.018342	0.031808	0.02896	0.086645
0.032895	0.053226	0.053758	0.066139	0.040248	0.029644
0.011859	0.021326	0.009276	0.005963	0.013183	0.018223
0.021617	0.015027	0.015405	0.016491	0.003712	0.013544

0.023201	0.020413	0.030594	0.004814	0.008126	0.020285
0.020674	0.034535	0.096213	0.173626	0.709564	0.340584
0.263671	0.600195	0.722212	1.05868	0.797379	1.20655
0.364408	0.401107	0.135304	0.742703	0.273121	0.563512
0.128266	0.257332	0.42196	0.415205	0.153647	0.04458
0.041385	0.092133	0.055289	0.095564	0.040151	0.028328
0.038944	0.012953	0.012127	0.019267	0.028559	0.044118
0.033488	0.050705	0.036369	0.070792	0.025996	0.075598
0.031365	0.019524	0.004632	0.010627	0.009313	0.030326
0.010281	0.010389	0.019983	0.004471	0.011215	0.015914
0.023969	0.033959	0.028226	0.01749	0.005438	0.014469
0.045522	0.060959	0.134421	0.374832	0.419492	0.342488
0.13882	0.759532	1.81177	1.08914	0.388958	1.51708
0.584396	0.413933	0.21229	0.586517	0.173235	0.194875
0.172373	0.085195	0.162349	0.277187	0.322674	0.058484
0.056545	0.051574	0.11568	0.090387	0.096298	0.075159
0.093969	0.024466	0.04364	0.013893	0.011768	0.023776
0.062456	0.028043	0.010305	0.006751	0.01915	0.071975
0.041372	0.023385	0.012438	0.01907	0.006832	0.011746
0.017512	0.028707	0.013054	0.014134	0.033575	0.043449
0.037965	0.023683	0.031549	0.021341	0.006437	0.016613
0.060878	0.130807	0.58503	0.462886	1.49054	0.740353
0.186352	0.231641	0.426055	0.425169	0.356675	0.894577
0.559626	0.335835	0.105267	0.552586	0.13675	0.101494
0.069291	0.055272	0.077246	0.191381	0.077412	0.098772
0.126577	0.043956	0.187495	0.12017	0.130582	0.093815
0.055088	0.031798	0.022611	0.020149	0.010709	0.015813
0.041821	0.034695	0.01087	0.01223	0.010515	0.031317
0.025469	0.007513	0.00938	0.022244	0.011952	0.023627
0.017652	0.023887	0.060262	0.028079	0.055069	0.062929
0.038683	0.029301	0.057448	0.021388	0.062284	0.072433
0.139635	0.263893	0.538012	0.666707	1.72019	2.47704
1.21271	0.93732	0.713766	0.546371	0.286585	0.745908
1.30617	1.43339	0.328941	0.178337	0.10907	0.033872

0.023117	0.051746	0.195444	0.073146	0.08158	0.086263
0.141281	0.078352	0.107535	0.04812	0.054691	0.12866
0.061164	0.030582	0.070871	0.027467	0.026373	0.044983
0.016653	0.017568	0.008712	0.047945	0.020616	0.013738
0.012755	0.011269	0.006655	0.012616	0.019275	0.045061
0.100028	0.037066	0.029163	0.041515	0.034422	0.065443
0.049622	0.096191	0.051664	0.100254	0.072789	0.043442
0.08725	0.147305	0.380918	0.4713	0.985606	3.95406
0.900935	2.23805	1.7633	1.23895	0.940876	0.949925
2.20937	1.63818	0.849642	0.352709	0.180568	0.03348
0.024418	0.021412	0.127077	0.082217	0.121167	0.194481
0.14461	0.094649	0.112668	0.09325	0.061416	0.193546
0.031644	0.026318	0.026632	0.032875	0.016995	0.006577
0.015282	0.013106	0.010125	0.012745	0.030288	0.014739
0.015909	0.048522	0.043826	0.051799	0.022467	0.059105
0.088797	0.0809	0.135009	0.074	0.068734	0.052773
0.076975	0.062084	0.167909	0.204622	0.105146	0.486726
0.134238	0.132606	0.137079	0.827541	1.10682	1.35569
3.88191	2.61542	2.52138	5.84935	2.01236	1.18993
3.40955	0.6638	1.06263	0.220405	0.107497	0.078525
0.07859	0.083427	0.083543	0.082102	0.244002	0.437667
0.123675	0.121642	0.242394	0.108989	0.075438	0.374809
0.047067	0.036873	0.012026	0.01313	0.007789	0.007051
0.005239	0.003969	0.007034	0.021771	0.040991	0.058062
0.126757	0.079266	0.064114	0.118017	0.118757	0.162358
0.161277	0.111223	0.286204	0.182781	0.144428	0.082604
0.066302	0.050135	0.179408	0.179804	0.102163	0.265335
0.320176	0.226607	0.291405	0.724906	1.89788	2.0013
2.9398	1.37112	1.95651	3.03187	2.57657	3.50885
4.70159	0.676191	0.290414	0.416545	0.241501	0.076841
0.176839	0.124264	0.0994	0.24561	0.247302	0.433379
0.244435	0.186356	0.242763	0.095721	0.13723	0.30503
0.11212	0.084644	0.022322	0.036896	0.011265	0.00913
0.017573	0.015345	0.006926	0.0552	0.134818	0.215677

0.090374	0.086273	0.101386	0.274069	0.157513	0.097486
0.169369	0.333038	0.512702	0.303072	0.19506	0.119037
0.152425	0.044856	0.110643	0.147648	0.142171	0.602935
0.177149	0.276772	1.59164	1.4814	4.98088	1.46708
1.01573	4.18133	6.82962	4.91487	5.94875	2.99901
3.23094	1.28553	0.915831	0.663109	0.426218	0.199739
0.293674	0.315796	0.110534	0.364457	0.324051	0.383501
0.258592	0.144705	0.09687	0.827859	0.204823	0.545929
0.314338	0.076743	0.057008	0.0193	0.003886	0.005066
0.011137	0.024398	0.028077	0.040366	0.136008	0.162463
0.398573	0.223921	0.27803	0.222076	0.133925	0.152259
0.136449	0.611456	0.801238	0.364162	0.259668	0.119528
0.106579	0.08488	0.131248	0.168967	0.076498	0.229202
0.101162	0.509756	1.49025	1.49282	4.12652	5.25457
2.74702	3.74096	6.71635	2.60024	1.37872	3.13391
3.01625	2.08367	1.3281	0.650718	0.728521	0.294194
0.30516	0.195622	0.268915	1.0857	0.929126	0.362828
0.231344	0.781961	0.122638	0.409351	0.909853	0.709418
0.596793	0.407693	0.285959	0.037048	0.025151	0.025942
0.021528	0.025617	0.029495	0.141822	0.259155	0.425122
0.401269	0.393711	0.506696	1.0096	0.1344	0.276922
0.271083	1.01203	0.636265	0.343927	0.457694	0.23734
0.203327	0.116095	0.116142	0.252505	0.064491	0.239248
0.437118	0.466673	4.23354	4.59969	4.99912	6.64525
7.6599	3.11505	4.9699	2.96337	0.754992	4.28195
9.3233	1.19897	1.67198	0.999094	0.911752	0.46011
0.392429	0.709544	0.483141	0.865273	1.02108	0.510971
0.754754	1.99436	1.00799	0.992961	1.14916	1.73648
0.762121	0.610068	0.576079	0.073396	0.158132	0.045782
0.033176	0.074586	0.104044	0.125198	0.267266	1.23502
0.41854	0.801302	0.627336	0.563618	1.0703	1.11161
1.5617	1.49418	0.739645	0.872967	0.991838	1.1014
0.21113	0.082331	0.139847	0.057329	0.231826	0.274036
0.559368	0.874351	2.46898	4.8714	6.73537	3.42234

11.184	9.30186	4.99577	4.89917	3.34106	6.60942
3.61214	2.70737	1.81914	0.756285	0.537676	1.28914
0.769382	0.761733	0.879781	1.29308	1.38689	0.856694
0.329569	1.69114	4.01964	1.48014	0.977246	0.728009
1.21435	0.945642	0.326542	0.127176	0.135996	0.063729
0.024332	0.154458	0.100429	0.135253	0.099626	0.421167
0.505603	0.221827	0.597448	1.00441	1.09732	3.69578
4.14089	3.57013	4.07894	4.61053	0.742399	0.38064
0.208979	0.228813	0.101246	0.200426	0.588483	0.524571
0.623512	1.39762	2.13519	3.65423	2.6139	2.53527
3.62892	5.62756	11.9479	4.67443	12.8273	10.1322
5.45852	3.8094	0.731505	0.915195	1.18044	1.48613
0.455127	1.42517	0.879296	1.60984	1.24756	0.58074
2.76374	1.63065	3.77532	4.03481	3.72612	1.50641
2.37755	1.42943	1.47919	0.355408	0.304512	0.401924
0.147726	0.188266	0.205307	0.166803	0.291347	0.559888
0.79874	0.793997	0.208633	1.64934	6.89615	29.1636
20.7668	5.22597	5.53109	5.31561	1.63802	0.815941
0.419724	0.326511	0.418504	0.325375	0.98863	0.592437
0.618448	0.485211	1.8398	1.50914	4.72934	4.43763
3.38293	7.9657	13.7693	7.36123	8.54789	2.97783
7.38158	3.63148	1.78202	1.89985	1.70829	3.3607
1.68679	1.53088	2.39421	7.73708	2.11585	3.04436
1.34116	2.68594	6.57614	5.57227	1.20423	0.938187
1.54881	1.19278	1.99315	0.56351	0.945454	0.731548
0.620571	0.63599	0.374362	1.03527	0.735916	0.392967
1.7939	0.985463	1.0195	0.891352	10.3886	23.6572
27.0175	7.05892	7.98235	3.25489	1.74009	0.996775
0.429099	1.28694	1.94534	1.09334	1.14284	1.1354
1.34318	1.89908	0.972198	2.35069	10.0534	7.1946
11.4829	9.42967	15.7182	6.11131	4.22349	1.46183
6.95007	5.7542	4.80518	4.02958	2.10001	2.85204
3.36796	3.52033	3.13384	11.7714	6.35537	2.26459
2.65492	1.85803	6.91497	3.5968	5.85242	3.96518

2.88601	0.764366	0.885358	0.894516	3.14131	2.81548
2.28078	1.33326	4.53409	4.97508	2.2236	3.84524
6.33884	1.83626	2.15053	3.76155	15.055	38.0407
18.3089	18.8918	16.4823	10.2222	2.8077	1.82502
2.53756	2.19926	0.727777	1.37023	1.19392	0.747192
1.69036	2.28767	3.53085	12.2947	15.9443	9.03724
12.7964	9.4407	10.3025	4.702	8.58551	4.17795
4.98752	2.28327	1.77287	6.75357	5.90923	2.95505
12.076	6.52717	3.84206	5.21305	6.2018	8.36147
24.6636	11.0197	3.58944	6.79691	8.98147	4.12826
5.61436	2.9553	3.52666	1.09914	2.06052	5.04073
5.07821	3.64379	4.91656	2.29739	0.973385	3.09922
1.61864	4.50114	2.27988	7.58608	18.1691	22.2581
21.7501	16.709	30.8754	13.1919	2.75965	1.87831
4.15642	1.61768	0.892908	0.84625	2.61606	2.98494
1.94247	4.52373	2.15564	3.47909	19.1537	14.6819
31.5632	30.8697	18.5544	4.32322	5.68233	4.49425
4.26776	1.21257	5.22447	7.07793	3.56085	5.64386
2.96094	5.96981	1.99973	3.4263	19.8077	35.8592
19.243	5.05705	7.04744	6.61727	2.92959	3.8394
3.71063	5.62518	1.42025	4.09232	3.40937	7.58296
1.95857	1.43655	1.41289	1.53521	3.72352	1.0502
2.63704	5.86621	6.64069	8.01959	10.4431	25.2095
28.2681	21.4354	17.3227	9.63822	2.32025	2.62908
6.14597	1.81018	0.888852	0.557937	2.08132	2.97378
3.9921	5.2548	4.30777	13.0817	9.87862	15.3012
11.8909	15.3894	64.5202	11.1635	8.39593	6.69447
4.91046	3.72149	3.6119	9.67133	6.41468	7.86254
4.06857	1.94727	4.30129	6.35617	9.90374	22.2252
26.3851	7.74449	4.90643	8.73455	5.8879	7.99928
3.18722	1.55304	2.22338	3.00161	1.91347	0.544466
1.48897	0.892285	0.496921	0.964297	1.65949	2.74846
6.46474	9.49342	11.7617	6.06411	9.16852	30.9685
25.509	10.3371	8.05282	6.1641	3.44012	7.2195

3.13366	2.5322	0.876828	1.87314	2.29575	3.75339
2.98038	7.04699	7.69404	13.2743	11.5185	7.12905
5.60968	20.9894	25.2615	20.8526	9.2033	5.86897
1.57054	5.29722	4.37372	13.0568	3.47215	3.10386
1.5496	4.1238	5.27066	10.8433	10.6002	10.0085
11.7067	4.85077	2.0994	3.93133	6.03795	4.27508
2.91149	2.08012	1.51269	0.857817	0.872231	3.32393
1.13275	1.84763	0.737703	1.81238	1.07497	2.54897
3.29995	1.70976	1.90845	8.4806	9.54832	29.966
14.9634	11.8045	13.0447	4.47897	3.49963	8.9824
3.62377	3.10953	3.56332	5.42342	3.43629	4.31018
2.45657	2.21044	6.14072	6.26454	11.4959	10.5758
6.34497	20.1746	13.4505	17.8174	16.3942	7.14687
6.24503	7.88753	11.3095	5.394	3.33619	2.2077
1.40201	3.15409	2.7101	3.42483	10.8823	6.57128
5.2958	2.87186	2.08769	6.67326	12.2855	4.14846
4.42955	1.62355	1.35847	1.42767	1.61015	1.80451
1.07268	0.818337	1.34105	2.03342	1.14482	4.4085
1.53566	1.15445	2.12107	4.96879	5.12187	12.9481
87.0144	29.7397	15.0767	23.7587	16.5956	10.3375
5.01346	1.81432	2.21602	2.62766	5.85577	6.74692
14.6267	9.75329	6.51135	5.42998	8.71761	13.6714
11.1845	41.7932	18.3965	22.1037	18.1271	13.987
2.71612	4.22458	2.13075	2.60234	2.27362	5.29879
3.87391	4.34485	3.56734	3.19664	8.49907	4.42823
8.48272	6.55021	2.04835	5.09192	1.57178	1.87356
1.32547	1.08743	0.945129	0.975726	0.987356	1.38234
0.994848	3.1081	2.01499	1.18733	1.09472	1.97033
0.965365	1.51101	3.27	3.02895	9.03353	27.7852
97.0372	55.1423	21.4056	13.6889	24.289	19.4481
10.702	4.50626	3.93159	6.19571	8.16189	19.1437
26.8278	33.2293	14.4816	19.8584	33.4859	11.5022
73.5705	30.4232	81.7847	41.1946	30.2069	5.68
1.17154	1.28257	2.41643	2.40858	1.71774	0.83042

9.48452	4.51612	1.96207	7.11937	9.85022	9.12055
11.4535	11.0685	3.40356	5.78387	2.97641	1.13549

APPENDIX C

JOHANSEN SET 2 (Permeability, mD)

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66.9459	118.351	59.3201	146.426	60.9918	59.5161
78.7704	251.271	262.598	58.5175	58.2167	13.5296
9.32829	8.05043	11.031	25.3497	31.4368	35.3255
26.0303	46.7441	15.051	24.801	22.356	14.8476
6.84601	20.2744	17.9762	53.9287	11.2133	18.9681
22.1251	35.5995	18.9091	46.8902	46.6496	48.6458
1.50626	5.25916	3.77055	2.22048	0.844546	0.931457
0.639247	0.311411	0.164649	0.043511	0.018582	0.045287
0.074734	0.177741	1.16752	1.36126	4.37027	18.2813
13.4589	19.846	15.0244	100.677	37.7485	42.1254
96.9973	177.949	165.512	357.607	27.503	10.2178
48.2896	79.4788	70.6932	61.3413	25.0586	12.8442
19.5677	12.483	10.1162	7.38746	17.4121	11.7957
14.6871	29.164	16.6282	30.8407	16.7391	11.5349
4.50619	6.05294	14.9037	26.3188	12.6735	32.1166

15.1929	13.4076	32.2922	36.3722	18.8429	12.3946
1.3284	0.988866	0.31756	0.803655	0.408963	0.238662
0.393291	0.127102	0.072624	0.068934	0.117446	0.193491
0.175618	0.260894	1.33693	1.57794	8.7616	13.3256
32.145	13.3977	5.09274	36.0927	44.1856	58.579
120.662	203.451	284.4	206.228	184.572	37.7931
11.9757	19.6626	31.7776	9.18522	11.2477	21.4461
10.3759	2.77278	2.78391	3.29341	3.59927	3.55747
8.42417	18.4207	12.5117	9.30329	17.4707	22.3082
2.56027	13.0345	36.4172	30.8467	48.7193	82.5814
21.7189	20.8233	26.5651	29.7459	16.2728	15.3839
1.49933	4.25526	2.70763	1.31443	0.674884	0.548688
0.440829	0.151203	0.07586	0.095873	0.381763	0.256789
0.227229	0.662722	2.60623	4.29499	4.14351	7.52532
11.8104	15.6155	23.798	22.7739	40.8911	102.104
165.25	72.5267	101.838	90.9164	46.777	76.1403
16.5586	8.45341	12.4321	17.0872	37.6154	37.4929
14.4701	7.91279	4.3561	11.2481	7.231	3.89775
4.07295	6.22578	4.86688	11.6937	8.64673	9.08345
4.15649	13.8615	44.5158	35.4269	76.0565	23.1484
25.5575	12.1978	9.01572	12.9164	21.3462	32.7257
17.4718	20.0491	6.35456	1.63934	1.62117	1.61303
0.391389	0.145287	0.107543	0.136328	0.873362	0.673772
0.354911	0.922418	2.61354	4.78921	2.47191	3.34131
5.7055	30.2572	19.9312	32.7616	54.8038	33.2417
23.3677	40.5804	32.5195	25.4897	24.6771	19.1931
12.396	6.94958	13.8756	27.4135	29.1429	46.0274
27.8028	18.8225	8.29653	8.71059	10.4627	1.59749
2.83452	3.80194	3.15928	2.92782	5.31244	3.68697
10.1853	11.5813	51.8904	53.9832	59.3917	28.2455
11.4959	7.20406	21.7619	8.77971	26.1105	82.3407
11.5904	10.7593	3.30701	5.33571	1.62563	1.38071
0.778923	0.273998	0.426133	0.334948	0.342809	1.43658
0.735712	0.818519	3.29636	3.05156	1.06924	2.16664

8.98825	16.8327	24.7259	16.6804	30.4479	24.4773
69.0561	69.6565	53.7101	17.1915	29.9147	15.5075
6.06967	18.5821	40.8034	37.3582	36.5385	45.0444
41.2412	21.0228	27.3658	14.4356	8.0172	1.84871
1.44171	1.58576	1.51259	2.30203	0.958485	2.09216
12.4879	14.3565	20.3754	40.4803	41.1668	6.66012
9.39936	30.1405	59.1297	22.1777	50.4512	34.0324
9.2276	19.3983	11.3059	24.2068	2.83301	3.33916
1.18239	0.423778	0.248405	0.26996	0.422949	1.0883
1.52775	2.07804	3.0671	1.02407	0.576157	1.30657
7.04126	31.7286	67.05	37.6809	41.4506	35.4199
40.8064	29.7125	40.1724	34.258	36.1654	16.4508
10.8915	40.0686	29.9446	25.1977	26.7312	49.8528
30.9842	10.5002	23.9711	6.76213	2.85264	1.41607
0.940825	1.6441	1.08891	0.350737	1.44434	1.53509
6.25685	6.02223	7.61943	10.9986	16.4153	13.8654
23.6526	40.5138	109.358	90.1471	27.2837	82.513
5.72468	14.3727	11.5138	7.63003	1.77357	2.37928
1.61794	1.54222	0.332201	0.524474	0.764695	0.283774
0.221338	0.91527	1.96688	0.641886	0.619565	1.68665
2.50067	34.9122	57.7274	29.2879	70.0858	59.3765
35.5491	50.8098	30.4041	28.3681	24.5131	43.2153
17.6737	69.3654	40.0517	8.53332	19.6632	37.0973
28.0397	16.4125	4.66596	3.64391	1.38423	0.595145
1.60572	2.70408	0.630421	0.255298	1.84117	2.30553
6.22653	14.8101	5.91242	8.65268	13.4693	13.2433
35.8976	35.4715	56.2254	119.133	27.0326	23.9135
4.83486	6.40333	11.0529	12.6272	2.83721	1.82936
1.13568	7.49658	1.24483	0.921833	0.510751	0.260123
0.158776	0.259219	0.587865	1.10778	3.36513	3.81915
2.79453	4.36089	4.49253	9.93902	27.2055	37.2929
53.8509	140.481	100.133	45.0463	40.3945	18.7198
15.6935	17.1087	15.9281	30.0428	36.8625	49.2813
13.6588	3.57839	2.86738	1.92192	2.47715	0.842471

0.786649	0.631969	0.282836	0.59569	2.24501	5.39188
13.8204	8.1699	4.50441	7.99299	7.98904	9.38497
15.6573	43.0278	23.846	40.7817	72.3571	60.8822
10.4125	10.2826	13.2084	14.7293	6.39435	17.7782
5.33201	8.23759	4.19536	0.611196	0.241298	0.347038
0.209718	0.151704	0.831073	1.79964	1.9018	1.85491
1.10544	2.9885	11.6631	7.11665	15.0244	4.17779
11.1755	17.1727	16.6961	35.2791	20.2724	17.0494
15.9973	16.2705	47.5604	31.2396	37.8306	26.727
3.68423	2.21273	4.48928	4.95538	1.45809	1.14541
0.475148	0.567939	1.13958	1.61796	1.84643	2.93174
8.56425	14.2784	6.68339	4.05377	5.11074	5.12229
11.2304	15.269	22.4626	23.6749	12.1741	38.8414
2.85272	7.2362	16.4827	8.90488	34.6704	32.0822
12.1495	8.93558	4.37264	0.348568	0.194064	0.199765
0.517966	0.331532	1.77759	4.90251	1.71027	1.1883
1.69427	3.5893	5.52837	3.39211	3.30267	1.76198
1.62125	2.29117	2.63228	12.025	11.0233	20.0503
23.6806	24.2766	21.3954	49.4656	29.1132	9.48433
5.31381	1.76206	4.63189	3.08516	0.801136	0.584808
0.551132	0.40114	0.386072	0.863747	6.30348	4.94293
4.06483	10.5537	10.1459	7.10493	12.1628	14.5374
7.93078	10.5414	9.34407	11.2801	23.4031	51.791
5.76358	7.55496	19.4134	11.4532	22.3463	33.0903
11.5667	3.51171	1.09005	1.05548	0.447517	0.632261
0.672562	1.03952	0.883367	0.635744	1.17805	0.988402
3.369	10.4558	2.46731	7.19256	2.78773	1.4447
1.45346	3.02836	1.82588	2.24253	5.15721	10.3079
15.6186	79.8873	30.0208	27.4602	27.4471	5.33098
4.35032	4.15548	3.82917	1.14828	0.687248	0.338156
0.278328	0.232465	0.312903	1.44583	3.65015	5.52371
4.53089	14.0735	3.81832	6.09756	13.9518	6.82903
8.7922	21.4912	13.384	19.8888	16.9317	10.2903
28.3068	11.8226	15.422	19.8725	49.1141	21.1653

39.6179	6.33724	2.80862	4.55904	2.17391	1.5353
3.90153	3.08986	3.47209	1.61938	0.949894	1.28027
1.81884	8.79981	5.11612	3.13713	3.29795	2.00764
3.41792	9.70252	5.52762	6.69322	9.53512	36.3854
19.8623	77.4709	11.2187	19.3513	4.41668	2.16165
3.17156	5.22865	10.0835	1.70122	0.206052	0.218813
0.228633	0.780256	1.84172	2.21428	6.06002	7.2701
3.45345	11.6617	8.74816	5.0151	9.58271	7.60721
34.6145	21.9623	34.4698	24.9814	11.6925	10.6149
12.581	41.8076	83.3939	44.4244	52.3091	16.2086
17.6927	37.2894	8.13094	7.55312	2.77525	0.987652
4.02457	2.20715	1.02391	1.84187	1.32051	0.631019
1.58724	8.0059	3.05997	3.08713	4.43155	4.79332
11.6232	11.8583	10.9173	4.99903	6.28938	14.1496
18.7034	17.8081	20.736	10.7373	9.13971	5.30505
2.75114	2.66563	4.12035	1.6216	0.486943	0.329354
0.225199	0.675746	1.57057	0.745019	2.64094	1.50727
2.47908	3.58006	19.5867	23.3117	18.0024	10.0713
15.6701	12.6828	34.8666	74.7305	32.7431	16.2803
19.7563	21.3004	98.661	129.702	44.211	33.7736
41.695	44.5033	38.957	12.6372	6.00747	4.67969
7.85719	1.80469	0.780002	0.759104	0.777047	0.310851
0.756246	1.75104	7.84654	17.9737	7.57844	8.23831
4.02404	18.3177	13.4422	6.63383	5.40944	15.1548
23.9295	30.2404	17.6396	22.0971	7.96004	8.63455
8.67056	4.3742	4.42723	1.87496	1.43705	0.514713
0.543762	0.52149	1.22506	0.836292	1.86214	2.40544
4.27451	10.0237	14.1698	10.9831	13.2556	35.5546
34.8997	19.6985	28.1922	95.3636	30.0544	20.0326
14.3482	23.5245	45.893	46.8448	38.35	58.3862
38.0936	41.0726	7.71213	4.15602	8.31765	11.1209
4.52757	1.49965	0.676604	0.445764	0.581215	0.317702
1.23497	2.85554	2.8177	5.68452	4.81618	2.1353
1.06303	3.1133	2.10153	5.62106	3.12631	2.60876

4.21493	6.21966	5.48803	8.90166	2.37243	3.87946
4.41538	5.58352	3.64788	0.92317	1.87369	0.259645
0.618345	0.517019	0.901911	1.36976	1.77379	2.70041
7.50859	18.3125	5.21931	2.83371	11.1373	10.3604
12.5536	36.4905	40.4545	21.8467	43.1439	41.8492
23.1023	57.7908	30.7277	48.0998	40.3893	19.9686
28.7395	10.3526	6.22887	5.17192	7.26164	18.1686
8.66381	2.49536	0.765295	0.320495	0.641565	0.660731
0.624603	0.715299	1.20215	2.15729	3.41596	1.09795
1.42573	1.69945	0.829938	0.991705	0.70316	1.03208
4.31116	2.08691	2.86888	3.48764	5.21035	2.19947
4.10659	2.6587	1.99132	6.77167	2.12138	0.496079
0.469196	1.22515	1.77515	1.12566	1.7324	3.81269
12.7191	9.834	8.21319	4.47249	7.27248	2.69584
13.1814	14.9316	37.1091	36.8961	67.4768	47.346
10.9325	10.1095	8.69448	19.7672	53.674	30.7901
26.8563	18.1819	7.14083	4.063	8.17771	32.6954
4.60912	1.25258	1.02273	0.243048	0.131213	0.717623
0.851079	0.640209	0.749504	0.497946	0.376089	0.19834
0.135483	0.587668	0.535074	0.51201	1.15679	2.34584
2.6918	3.15704	6.51323	6.54593	6.04935	1.98633
3.35192	2.45589	4.45147	3.49229	5.76261	2.02171
1.38368	1.15833	1.82832	3.4255	3.46118	5.13592
5.32539	19.5	14.5269	4.75949	3.02687	5.57392
22.6699	18.8114	38.7427	31.0305	21.2899	46.381
7.66815	4.78003	4.61672	16.3421	41.9428	34.7816
9.99377	7.48629	25.2602	14.3116	9.49357	8.16668
1.9836	1.12605	0.654611	0.192987	0.243105	0.542199
0.588156	0.299162	0.23552	0.106274	0.153383	0.081581
0.343295	0.119464	0.287084	0.427409	0.76259	1.20524
0.815194	3.68708	4.7511	5.76218	2.97678	2.78611
1.64786	8.26642	13.0701	10.6621	7.75948	8.10253
1.22669	1.43176	1.26998	5.04912	5.62505	6.95862
6.81556	3.33793	8.50799	1.89059	0.822693	2.16291

12.0391	10.1864	7.64758	9.30795	3.8103	13.5795
1.68762	2.31364	8.3797	9.64229	18.4204	15.2741
11.5374	11.5304	9.32395	13.1078	13.627	10.6532
1.60286	0.711896	1.0706	0.567741	0.468821	0.661992
0.505089	0.180762	0.046715	0.020659	0.073161	0.076348
0.036492	0.053542	0.070154	0.262388	0.682993	0.926523
0.858026	2.20359	3.99576	3.08718	2.31955	5.31342
8.27789	8.8428	47.8156	11.9557	7.34488	6.07752
4.11464	3.25037	6.32193	2.99931	6.38891	4.56243
4.15445	5.41989	5.8875	2.41951	2.63253	7.14112
8.69308	9.7724	8.24152	4.22057	2.01587	2.82641
1.27668	2.01079	4.22297	8.02866	7.34502	7.46468
7.50756	8.32823	6.86997	9.6808	10.147	14.3813
2.32891	1.75575	3.00959	1.12726	0.996493	0.892322
0.465177	0.314598	0.310227	0.020145	0.031612	0.04861
0.07937	0.091971	0.081266	0.060747	0.137923	0.653648
1.03951	1.29553	10.4323	7.77516	10.0504	7.463
14.7938	39.3625	19.7329	9.80361	12.6268	5.06353
5.85026	5.22612	19.0914	37.9768	11.3516	7.45052
17.9335	3.87966	1.66476	1.5207	8.40872	16.8634
26.6652	16.0576	5.18231	3.65736	3.25566	2.43064
1.97115	4.65111	6.04128	6.34115	13.9719	10.2963
5.55165	13.5494	6.50297	15.5777	9.21706	5.56045
1.29822	4.57798	1.14036	2.10596	0.613557	0.852919
0.556517	0.205317	0.141595	0.026526	0.027914	0.063539
0.077626	0.076509	0.038966	0.09998	0.228675	1.08583
0.708879	4.3093	7.48137	10.53	14.4091	20.5574
52.5017	138.357	36.6164	14.5956	5.15631	10.6586
13.9413	10.1541	27.634	17.4569	17.1725	20.7955
10.762	2.94542	6.35249	4.5134	10.7938	24.0025
14.4024	11.6807	3.11445	5.67381	3.54323	4.3177
5.92556	5.71337	6.0602	21.3262	9.47462	4.46787
11.752	8.24039	22.6362	19.4305	27.3072	11.4357
5.16661	4.43309	1.37274	0.568779	0.374445	0.119082

0.06529	0.091141	0.137196	0.080636	0.103658	0.192751
0.140186	0.182089	0.230815	0.34297	0.262277	0.882301
1.19888	9.95141	7.15709	15.5415	15.2408	31.4203
51.1461	151.722	34.705	5.40051	10.7571	5.20971
9.13612	3.20946	8.57228	6.12498	13.7553	18.1718
15.2823	6.84892	15.9027	35.3286	16.9762	9.27104
7.14144	8.88393	3.79283	6.47168	5.90401	2.69286
8.34326	10.5277	20.9189	9.03998	9.01392	4.60068
8.02557	28.4544	11.2148	20.9504	23.4705	6.91509
5.61841	4.17089	0.827637	0.212285	0.136626	0.069493
0.118628	0.092449	0.158825	0.088074	0.16738	0.237719
0.445011	0.11953	0.420084	0.572247	0.178389	0.214347
0.678884	3.95648	3.96642	6.22281	8.31734	66.0747
51.0401	99.7756	48.6533	7.65396	8.50028	15.0985
6.60006	9.9514	29.9056	16.2545	30.4912	19.7513
9.41376	14.092	17.458	22.557	7.58708	36.3006
14.5112	12.7839	5.37372	3.15706	3.10875	5.74062
18.1836	12.9327	14.7099	16.4606	17.3757	13.5048
19.5885	24.7141	29.5194	22.0334	41.1281	4.00266
1.94756	2.31499	0.770269	0.278701	0.165466	0.220584
0.217893	0.060427	0.071118	0.127621	0.105639	0.226502
0.366123	0.139124	0.176082	0.283055	0.310044	0.152121
0.324133	1.09124	1.41815	1.75245	18.4371	22.7737
27.9135	35.5972	70.2144	27.0028	26.2254	18.7758
28.5257	22.5055	19.2657	23.8445	55.7617	25.8875
13.3507	30.2587	23.8971	39.6004	22.2003	42.8566
12.1881	23.606	11.2402	3.51224	3.78923	5.52577
14.3849	45.244	45.6213	70.4428	75.4972	19.8071
35.4969	47.461	53.2214	5.25883	6.24649	3.42093
3.31131	1.85355	1.02082	0.673247	0.280068	0.285745
0.06717	0.059478	0.107332	0.092671	0.059433	0.132118
0.174731	0.138895	0.117989	0.155262	0.093505	0.289901
0.224331	0.87355	2.76208	12.5	4.0652	5.99394
14.9065	31.9223	43.1066	16.2601	15.7865	8.18981

20.7701	35.0823	44.5817	30.7955	37.1108	8.72755
16.1795	24.1098	8.40758	17.9117	68.4907	30.5897
33.6628	21.2557	28.2079	24.5518	19.3284	1.8366
29.1467	85.2177	68.4314	45.7322	24.2996	98.5917
62.7893	121.242	13.5157	4.05639	2.69163	3.26223
2.72767	1.48723	0.379361	0.397758	0.275936	0.115627
0.071668	0.047131	0.087152	0.050574	0.136941	0.043244
0.035625	0.090093	0.155526	0.742068	0.280503	0.20065
0.427256	0.945475	1.4273	2.49577	1.88563	7.72845
10.7115	19.5723	23.0804	12.183	6.4987	4.42295
9.29608	8.2374	10.748	13.3129	6.24597	9.16256
21.3179	35.1443	9.02908	15.8928	15.3348	38.1471
33.6705	25.4282	15.7593	35.8603	27.6323	8.87022
68.471	72.2813	199.493	33.8317	13.1342	81.1167
45.1386	37.3223	21.0009	6.45852	4.32164	3.58674
5.16055	1.18065	3.36302	1.26403	0.441235	0.124507
0.175307	0.109344	0.054615	0.161391	0.114203	0.076271
0.090023	0.427983	0.463304	0.345933	0.247385	0.532117
0.733408	0.776043	2.01196	3.12408	2.49514	4.56172
5.40982	3.278	12.5817	12.4914	2.46017	11.6895
13.4678	15.9879	7.99749	8.38642	5.05409	12.4061
7.93278	11.4811	19.9444	24.8455	19.4861	37.5066
49.6674	14.5573	8.75186	15.0252	17.5415	7.30877
29.1249	20.5806	48.1466	38.3288	48.2211	35.4273
23.8561	16.4382	11.8755	8.83834	8.63865	3.56595
2.14106	2.56287	4.95545	8.42091	1.55687	1.0344
0.822139	0.210833	0.605672	0.683846	0.5108	0.371372
0.235162	0.675941	0.368164	0.229296	0.776452	0.541867
0.768164	2.86349	4.49085	7.80176	3.30866	5.60543
4.76451	6.22872	7.17394	4.53473	11.6317	13.2291
18.6018	8.87575	11.7287	14.2983	5.64226	1.68185
4.6889	3.45178	8.25325	7.96023	10.1543	16.1182
79.5062	27.0078	12.5097	19.7477	6.59717	4.16737
20.1542	8.10246	11.244	23.8269	22.2537	6.88899

7.51279	8.78096	6.98907	5.23022	6.73787	1.03759
2.55956	2.1135	6.98518	14.0755	4.94621	1.33447
2.68466	1.31594	0.653328	0.641007	0.873763	1.77641
1.02411	0.342289	0.460516	0.741183	0.213383	0.58258
1.45413	2.91141	7.82514	8.41216	9.47502	15.2543
8.89371	8.11146	6.73345	7.2724	8.41399	8.35319
25.6556	7.60942	5.50776	2.94847	2.10837	5.76941
4.21812	7.86389	19.251	9.57768	10.4304	8.87004
15.9078	11.5012	12.3461	10.3928	8.80863	6.96278
8.24561	5.54619	4.97921	18.6577	25.4161	17.3156
7.49285	15.7594	6.89364	6.01556	4.06296	2.50528
2.37107	5.67068	3.93268	6.00466	2.20338	2.95152
2.40007	1.20404	0.228667	0.600065	1.34553	2.05576
0.278633	0.221429	1.09197	0.813748	0.141944	0.141797
0.340666	1.91375	5.22207	14.4736	3.21011	16.5975
7.06803	10.259	9.5876	29.5743	40.8689	39.9372
25.6532	10.6315	6.44673	4.14301	4.19818	12.876
5.97093	7.42044	16.6971	7.52299	7.8508	2.05292
3.80975	3.18805	5.1924	6.96576	5.83844	7.07942
3.75706	6.92477	5.42532	14.2929	10.1833	3.79367
5.38448	10.5783	6.08539	6.99337	3.0681	7.50465
2.45164	12.8241	3.31289	3.13919	1.1942	0.876339
4.36937	1.65079	1.02083	1.24742	1.13066	0.458883
0.263614	0.112079	0.642536	0.252187	0.348899	0.601545
0.827882	1.11726	1.15882	3.01903	4.97091	5.18883
16.212	7.57726	7.30308	29.6765	36.4973	44.3498
16.7029	16.3943	5.23724	10.078	15.5259	11.0506
5.8525	8.12725	5.69683	11.4393	9.4312	3.12612
3.73231	2.54625	4.32947	3.76276	6.20206	3.93065
3.64304	2.58216	2.47811	7.21275	1.50565	1.11352
3.46737	2.38135	6.61036	17.5861	15.194	10.1933
6.57207	7.55242	5.06746	3.98043	1.69458	0.871547
2.00307	0.599009	0.390817	1.48054	0.361569	0.236422
0.117314	0.293278	0.405029	0.294377	0.356694	0.852638

0.610278	5.18707	3.01906	4.85578	2.05362	2.71284
5.05085	8.19447	42.4627	8.39946	10.2519	15.0729
31.2004	11.3797	9.3086	15.2404	14.1815	15.2342
5.13156	1.75977	3.603	3.93075	3.69126	3.14039
0.779609	1.24729	5.59112	2.85518	10.5582	1.20394
1.11501	2.20056	1.55489	1.07476	2.37816	3.44154
3.45644	9.54901	5.1219	4.72028	7.94659	20.4853
11.6794	7.15101	3.86218	1.00028	1.23265	2.36872
1.38343	0.262348	0.468584	3.12871	1.55245	0.707954
0.42765	0.460547	0.316649	0.365056	0.656076	1.64847
1.50375	2.85775	5.08974	7.31429	3.02738	2.90796
5.28143	7.00022	9.38279	14.7088	32.5494	28.1147
29.481	15.4992	13.6527	7.21792	6.35894	17.2041
4.33672	2.26181	4.78266	3.90682	2.74363	5.11843
1.0388	0.814408	1.46143	2.94728	5.89521	1.70001
3.2885	2.97652	1.39413	0.381912	0.70519	2.27617
1.46549	10.2535	6.64288	3.37051	3.4346	4.1501
3.50828	4.1826	4.94978	1.85155	1.99882	5.341
1.14341	0.172317	0.314086	0.343937	0.347589	0.890409
1.11646	0.77031	0.953464	0.465372	0.693334	0.787679
0.678373	2.48305	3.55019	10.6498	5.19958	3.52823
3.26893	5.52177	5.10971	17.5778	24.5821	16.5416
26.9495	11.3699	9.93007	10.4642	2.328	2.50624
2.48612	1.49853	1.70225	1.46854	5.32727	2.30515
2.17689	0.816642	1.06484	1.00045	5.80227	6.33016
5.5499	2.05409	1.7374	0.958025	1.97516	1.41868
1.44421	5.30053	5.63063	4.31824	3.07082	1.99075
1.89672	1.55062	2.59545	1.31624	0.224744	0.490278
0.276832	0.069947	0.305056	0.318141	0.619805	0.904327
1.38401	1.22323	0.52895	0.283275	0.361703	0.337197
0.397145	0.698774	1.3896	5.47865	4.71866	1.70484
7.98694	8.07838	15.8186	24.5687	29.0704	28.5174
73.3058	9.87273	16.4114	5.84803	5.76291	6.62113
2.36753	2.36016	2.25441	1.37783	2.52054	3.77783

2.76622	0.491357	6.02683	2.29443	1.56885	4.37885
2.74876	2.20032	3.3321	1.66216	1.41996	0.54846
3.22086	3.67813	5.67762	1.28572	0.680008	0.727387
0.460214	0.494131	0.551254	0.858324	0.784426	0.329319
0.289216	0.065353	0.144415	0.40281	0.301069	1.1834
0.944177	1.0906	0.29875	0.113466	0.243198	0.282751
0.4622	0.77864	2.2822	6.13404	5.03898	1.77148
4.05627	11.1685	22.2003	55.1426	50.0369	31.0501
38.6269	18.9938	7.57397	5.03896	6.10189	3.9241
6.07799	1.48894	1.76977	1.17775	3.71655	3.12063
1.64637	0.675952	2.40666	3.15567	2.35632	1.5691
0.894063	1.57851	0.91154	0.911158	0.879294	0.282264
2.23761	1.05431	2.84812	0.749107	0.498342	2.08283
0.681892	1.38666	1.344	0.26453	0.417457	0.936722
0.177397	0.066741	0.198748	0.49595	0.280752	1.01853
0.598449	0.267862	0.290345	0.114773	0.070308	0.194796
0.131441	0.582935	0.596203	0.783705	4.36329	8.36151
23.3086	32.2888	24.0444	14.6992	15.5466	22.1848
31.1052	8.16394	4.44706	3.14033	2.89415	2.94763
3.21778	1.42623	1.54092	1.48936	1.45348	2.0961
0.937386	0.474274	0.854004	1.34776	1.98586	0.736404
0.433311	0.699453	1.25833	0.944197	0.459599	0.415891
0.795244	1.27521	1.34409	1.63441	2.69596	1.40537
0.591881	0.441851	0.968474	0.313837	0.210879	0.52533
0.441618	0.265977	0.831353	0.381152	0.497453	0.25449
0.186987	0.04795	0.101434	0.026283	0.007351	0.051503
0.258907	0.7374	0.215611	1.22886	2.24104	2.39653
11.4928	55.8381	70.4876	32.3415	25.7811	22.215
19.0936	6.83219	2.47393	1.98757	4.29647	3.76341
11.4945	1.45053	2.22885	1.92334	1.16094	0.909154
0.693241	0.551747	0.314352	0.900343	0.476775	0.254539
0.371918	0.757848	0.755266	1.08095	0.578642	0.488633
0.433426	0.711695	0.618501	1.02763	0.491383	0.350189
0.611197	0.450795	0.516472	0.408892	0.399986	0.221053

0.466856	0.221692	0.269816	0.549818	0.232267	0.182324
0.194183	0.26575	0.328782	0.114845	0.055318	0.068966
0.237663	1.2034	1.77313	1.56269	2.21989	2.50417
6.68049	23.2436	50.9083	19.9077	24.6548	26.9266
5.01384	6.7093	4.73089	3.08275	5.702	7.22298
7.80186	1.8211	1.62616	2.07756	1.75115	1.29343
2.60727	0.655082	1.01544	0.778349	0.685817	0.208107
0.344963	0.521756	0.159921	0.607709	0.501763	0.398093
0.43652	0.180245	0.324357	0.439138	0.283419	0.284733
0.252603	0.397205	0.539616	0.189175	0.567242	0.43756
0.320736	0.172604	0.520903	0.25073	0.102539	0.3261
0.631751	0.379463	0.439473	0.401315	0.189111	0.235035
0.868772	1.04229	1.12338	0.694807	1.19315	1.11834
7.84101	27.4771	11.7768	27.8378	12.9206	10.953
8.6162	4.44166	2.34969	3.08493	7.35033	5.05001
6.32004	1.21279	1.74388	3.939	1.50343	0.998342
4.39673	3.1633	2.80815	1.79773	1.09409	1.07733
0.34943	0.406659	0.20073	0.653501	0.590757	0.294959
0.195632	0.035319	0.182298	0.225628	0.250501	0.139897
0.216246	0.269167	0.239805	0.19224	0.86285	0.8873
0.283697	0.157572	0.15417	0.225633	0.194649	0.259567
0.448915	0.294426	1.00106	0.433364	0.357728	1.7617
0.830944	1.96208	1.46756	1.21218	1.92881	2.45361
10.2791	16.1615	14.5165	7.66925	5.11193	2.93672
4.79787	5.37771	1.59074	6.65511	3.98909	6.63241
7.60024	1.59937	4.11695	2.09107	0.897772	0.868364
1.0205	2.63497	1.44354	1.62628	0.881719	2.27863
0.353501	0.435614	0.611421	1.28531	1.47012	0.522834
0.232187	0.257031	0.256777	0.81794	0.439778	0.255005
0.112063	0.064069	0.05677	0.090415	0.277339	0.110716
0.240938	0.153517	0.19153	0.296639	0.208176	0.066271
0.501326	0.241306	0.171203	0.284606	0.557961	2.11611
5.80767	2.20835	2.06868	2.28152	1.8171	4.2078
6.11429	19.2913	10.2168	9.58371	9.7589	3.07593

7.59068	18.4274	3.13169	21.5224	6.14805	5.05454
2.30198	1.58763	1.23325	0.911136	0.515731	0.581842
0.399688	0.771143	2.16267	1.78243	2.46609	7.10811
0.352593	0.30822	0.298224	0.412153	0.592422	0.253261
0.236963	0.264545	0.365885	0.504974	0.283885	0.287828
0.137352	0.258035	0.139978	0.154145	0.34888	0.371514
0.616174	0.21974	0.123685	0.796839	0.290648	0.243234
0.602538	0.638447	0.549156	0.435905	2.29122	1.81736
0.826792	0.677078	1.57035	1.04203	2.81239	2.47588
6.62909	5.54539	5.65106	9.98615	8.1784	9.27243
13.4058	17.1345	5.72082	19.1659	20.3314	10.3627
7.45285	2.79347	1.087	1.47791	1.29395	1.98233
0.277878	0.189535	0.940102	2.58382	1.66446	2.51351
0.367965	0.11943	0.362381	0.616217	0.193865	0.462884
0.610943	0.542892	0.991502	1.06431	1.33983	0.504546
0.214551	0.223019	0.459606	0.803448	1.047	1.5083
0.689608	0.155396	0.765848	1.75209	1.65187	1.45083
1.62003	6.13174	1.14604	1.15021	2.70099	4.03208
2.56318	1.04422	0.848817	0.773497	1.30967	4.56298
3.37734	4.51722	5.34357	4.40693	7.44356	7.65554
13.9621	50.3064	79.3548	130.57	46.9426	15.5974
4.30088	2.36074	0.98857	0.836064	0.854135	2.66475
1.7936	0.788586	0.818713	2.61308	3.3744	3.65142
0.212141	0.220892	0.64173	0.197276	0.125009	0.262118
0.505629	1.42597	1.37471	2.56192	1.24258	0.552356
0.803822	0.257755	0.190204	0.351008	0.268441	0.204009
0.520082	0.627254	1.41258	2.22989	3.30375	2.31045
2.19681	2.69744	2.18956	3.09303	1.099	2.29388
4.21142	1.45298	5.30279	2.92919	1.57453	0.979819
2.45442	4.57998	7.07028	6.88181	8.10638	49.2133
24.4135	14.0309	11.7082	24.0903	18.9364	7.58221
3.37816	2.70395	1.4504	0.465482	1.05122	2.08413
4.33621	1.78509	2.62592	1.71953	6.27679	12.1653
0.203437	0.208515	0.694997	0.40623	0.586083	0.515612

1.14611	1.51025	2.59668	2.51065	0.633421	0.435516
0.282923	0.243418	0.416041	0.215944	0.081768	0.547606
0.470562	2.03987	1.42667	3.91667	2.17189	1.78722
1.69037	2.04355	3.65864	2.99749	2.27767	3.81757
8.21955	4.72237	16.4649	3.89609	2.25508	0.707272
3.69557	11.0285	15.2127	11.0851	5.31953	33.2672
34.9502	27.3798	24.576	12.7141	5.20068	2.8529
3.00545	7.09135	7.67527	4.89986	4.65939	6.32673
4.44376	4.81792	5.42058	2.76328	8.25848	19.2034
0.211904	0.47653	0.919327	2.09604	0.96138	0.656428
6.21024	9.5136	2.64868	1.06088	0.853863	0.367985
0.218899	0.356707	0.330655	0.211803	0.208849	0.153891
0.440203	0.545224	0.700936	1.01967	1.22894	1.26941
3.86429	1.75303	1.17732	2.52006	1.45462	3.40016
4.5933	8.72635	10.5608	6.31702	5.58799	1.18956
1.6103	4.84911	8.38231	11.5117	7.47516	23.0461
59.1773	64.119	80.4718	58.401	13.3283	7.79118
3.90536	8.72063	8.93115	5.89873	7.07538	2.74748
3.08647	2.27167	3.18147	4.59006	7.15499	16.2179
0.795284	0.681177	2.16886	1.27644	1.58696	1.37705
2.69618	5.7049	2.16119	1.20276	0.563279	0.470448
0.208959	0.193766	0.198132	0.131126	0.283368	0.458863
0.791697	1.21391	1.42322	2.16589	2.93784	2.13983
4.43278	5.07238	4.92831	2.6175	1.73807	4.32298
3.65556	5.6907	4.62825	7.64821	9.25212	3.50083
4.60572	8.07813	7.26693	7.94185	29.7479	25.541
14.6391	42.2554	204.734	268.897	35.2408	10.6387
4.75492	18.8059	36.3372	26.4046	11.3069	5.89091
2.99712	4.23159	10.8884	11.9788	14.2387	25.5405
0.888776	2.52262	3.49263	5.15187	1.92391	2.38132
4.33374	5.27927	1.40269	1.06493	0.808777	0.228755
0.156609	0.192307	0.220093	0.201653	0.296601	0.169766
0.739361	1.12942	4.54681	10.5196	4.90633	1.17785
4.98977	3.88074	1.64959	1.62943	2.0771	2.17345

8.52015	13.9838	14.6458	5.49333	7.70348	7.01658
12.286	4.89571	10.5015	9.81638	17.9226	9.41496
20.6844	37.6639	80.1198	50.9367	25.1344	19.1315
34.4856	17.1328	26.7854	5.77525	6.55799	13.6884
7.74723	13.4221	26.0625	18.7454	27.5593	19.2001
9.05453	6.66773	10.0829	9.79432	9.78261	7.61187
7.91497	11.1504	6.02636	2.23092	1.56237	0.324227
0.052112	0.041966	0.037711	0.071229	0.194869	0.301214
0.470472	7.58862	11.1266	6.38471	6.68609	5.19085
3.86641	3.77152	5.25356	2.89874	4.02045	7.61322
6.1964	6.66086	21.1394	11.1223	6.80991	6.86057
9.27882	8.56148	23.5072	21.3382	17.77	18.8572
35.5057	26.4798	20.5706	39.1618	18.6868	47.4834
70.2794	15.6773	6.39083	2.1387	12.9156	4.46275
7.28286	14.4263	17.3084	24.7652	22.8189	41.0509
4.36744	8.67869	8.76635	11.5468	12.2093	13.2668
7.86404	6.89921	3.83186	1.23947	0.978116	0.186045
0.050506	0.104546	0.117382	0.030239	0.125919	0.268975
1.06921	3.32298	3.18744	3.88198	8.97054	11.5917
5.39442	3.75286	8.72827	8.76888	3.77773	7.27099
3.56065	4.38308	12.864	11.6706	10.3742	22.4002
17.018	9.52062	22.5726	16.138	16.9346	22.931
63.2145	72.3344	34.3728	38.8166	16.5866	11.5314
36.7209	12.3261	4.64418	5.62726	14.7429	9.95119
12.7104	28.0505	17.2722	17.3714	61.2137	43.1718
2.32224	9.92573	3.34616	2.73793	6.34319	11.2382
4.41871	4.64287	3.6976	2.89226	0.972928	0.805247
0.207242	0.128577	0.169493	0.121613	0.072615	0.873047
2.75431	4.67183	4.48188	4.45014	6.39737	14.5403
5.199	9.9372	8.44902	3.31744	4.9262	8.6605
2.96789	7.87211	14.6743	23.3697	15.8433	15.6966
24.7058	77.9654	101.473	35.0692	28.252	39.0209
34.4371	32.6978	38.2115	27.651	31.6147	6.74614
6.12415	2.10713	2.84017	3.77565	4.31023	6.69631

12.7787	29.1341	50.1069	17.4851	51.2336	72.6801
2.35736	11.2861	8.32331	10.526	5.41263	6.35592
16.9019	15.055	0.945876	1.06217	0.460624	0.677156
0.241776	0.09841	0.188898	0.36926	0.145585	0.535304
1.08962	4.0206	10.2078	17.3741	15.3703	15.1685
6.88916	9.01154	11.3888	16.893	5.93188	3.24663
2.82131	15.4559	20.157	24.3679	9.48614	12.289
11.4626	18.6832	75.9265	84.1113	57.2884	87.908
44.6458	25.3953	13.7823	4.56465	5.07345	6.91134
1.67896	2.92918	1.9197	1.30228	4.7573	4.50947
14.0318	10.0437	21.9015	24.948	47.3021	258.098
6.54618	6.31195	10.2337	5.75605	15.9649	59.8405
14.2433	11.4259	3.71972	1.68919	1.958	3.40168
0.739781	0.354691	0.322667	0.612161	0.551856	1.18006
4.79585	2.3593	14.6953	28.1686	21.5019	14.9738
13.1602	6.39795	6.29945	14.4963	8.80386	7.49562
1.93874	12.3848	8.41551	12.4337	13.9634	35.0058
22.1121	22.7968	19.2003	58.8626	23.2463	19.8813
14.3238	16.3881	3.96999	2.81757	3.69765	4.26634
1.35639	5.70159	2.3804	2.8413	2.25906	6.88112
8.75944	14.6304	17.4123	46.2249	309.98	280.931
2.71315	2.89683	6.02311	3.95621	8.3149	29.4982
22.8251	11.0465	8.83311	7.1907	1.82334	4.75742
0.842688	0.31119	0.365823	0.400659	0.354342	0.400727
4.35519	7.09269	6.5396	7.6996	5.26053	6.20877
4.52709	6.56526	14.5556	8.50688	5.87736	3.18871
2.60753	3.72063	14.3422	21.5377	20.7353	18.8441
11.3775	21.7255	36.4879	16.5279	12.7882	15.4012
5.31238	6.82236	3.91458	3.78873	5.97762	1.34931
3.47454	2.85934	3.1357	4.36718	4.60241	3.17344
4.25094	4.27347	38.8076	65.532	238.314	193.965
0.662007	1.38036	1.28771	4.38279	7.46516	10.7251
18.3398	11.4118	8.37053	9.41235	3.9648	3.79659
2.37174	0.197291	0.167746	0.145834	0.345615	0.385591

1.73084	2.82513	2.44829	2.99807	1.80904	0.840245
0.288489	2.14162	13.8146	14.4716	4.55146	4.56756
6.50435	1.98267	8.48391	19.8139	9.28653	23.7152
40.6459	56.1461	37.4509	15.174	47.3672	9.44842
10.0183	12.8689	2.95423	5.93377	2.724	0.986149
0.851398	1.10544	3.37383	6.42828	3.73569	3.14816
3.8368	4.50472	13.7841	32.4923	96.9916	126.769
0.44715	1.49255	2.63589	18.5557	5.45187	5.26074
16.1133	24.696	3.77478	8.92587	4.48456	3.12822
1.27995	1.36331	0.217495	0.168046	0.483695	0.647001
1.23247	2.0463	1.13497	3.34385	2.38954	0.803047
0.724555	3.52966	4.15119	2.42805	6.80832	4.99248
5.34905	2.82394	5.53862	13.0699	7.86649	15.4561
28.6177	35.0185	27.1158	15.8121	22.457	19.2062
26.2974	30.47	4.46639	4.39107	1.81924	0.438673
1.47834	2.35208	3.2164	5.46752	3.2749	4.07644
6.75832	4.26934	7.01061	70.7403	142.188	163.616
2.14292	6.42953	6.01947	11.6749	12.6732	9.59277
4.40827	3.67812	3.71478	5.67731	1.30451	1.1823
1.78323	0.74624	0.644861	0.234159	1.41528	1.39792
1.99358	1.42657	2.13211	2.36989	1.2005	2.69553
5.09066	2.22937	3.20515	5.33566	7.60418	1.2392
3.20143	4.53695	3.93069	11.1361	23.9966	20.3234
99.382	76.1631	12.6605	10.4512	27.0902	16.4202
21.2234	6.26558	8.65093	2.5499	3.39579	1.21894
2.04245	5.94818	5.1179	4.09544	3.33077	4.25378
8.67365	10.8391	27.1037	86.6722	122.76	249.195
1.72093	2.50289	5.38078	3.42821	3.3631	13.2146
10.5995	2.15264	2.96639	4.19317	2.32843	2.0444
2.82458	1.06254	1.16147	1.34052	2.66175	2.06553
1.01898	0.61803	0.735007	1.36912	1.10704	2.29472
4.31204	2.22966	3.7598	2.19466	0.653865	0.711515
4.16022	2.74984	7.99465	16.7676	23.4753	8.39992
15.5726	50.6654	22.2199	19.8654	11.1144	8.17272

5.76308	1.91142	2.71549	0.944464	5.11288	6.77918
9.13237	6.94331	5.85318	10.1166	45.762	12.8393
11.5362	11.5941	62.1307	88.2114	116.813	111.311
6.39215	3.37344	3.41201	3.33943	1.40005	6.86642
11.9382	5.07936	4.21126	6.97838	2.90776	1.57442
1.17248	1.08192	1.43489	2.05889	8.60172	2.73197
2.42658	1.28293	1.35166	0.902652	2.74748	1.0726
2.24677	2.78029	5.74037	0.877255	0.387803	0.423696
1.36761	2.61649	14.8025	6.43869	9.88326	17.7131
8.10214	7.1204	10.1787	11.4325	11.7598	4.91308
2.11299	4.5514	2.34964	1.16151	2.36996	13.6839
15.6493	11.1836	5.76793	23.5725	22.5975	35.9422
18.4941	24.3075	65.1565	123.598	43.2602	62.661
5.26377	6.93545	5.51089	3.75376	6.34478	5.74871
10.7535	2.1537	2.56112	4.878	0.928997	3.49285
3.05226	1.77356	1.00789	3.16328	3.28561	2.04392
1.92575	1.79274	1.53904	1.05486	2.11677	3.31232
3.01484	2.97293	3.4353	0.276784	0.360307	1.31297
6.13412	3.65948	3.90633	4.02815	11.4059	11.5264
7.64643	7.38241	7.22697	4.42685	3.63058	4.15261
6.45415	6.82751	3.54934	3.36134	6.92549	18.1728
21.6677	15.9999	8.08604	14.9719	14.5986	14.3806
12.3895	18.7389	22.4429	70.3422	21.5116	24.2785
8.73612	9.93645	6.51723	7.50828	7.00308	5.75917
1.58976	1.19307	3.0824	3.50652	1.77445	1.64917
1.82211	5.44227	6.95259	4.58648	3.81634	2.43634
1.12363	0.934749	0.538618	1.6118	3.47668	2.07237
3.56771	10.3676	1.27497	1.6591	1.57465	4.76735
4.89469	7.32595	2.82879	3.29299	7.5119	14.6017
7.34023	5.16017	8.16861	4.01505	3.58186	4.29901
7.38165	6.20348	1.92965	1.98523	10.9332	9.15396
22.4101	12.8395	5.64001	18.2978	20.2425	13.9498
11.5452	6.31086	8.51369	18.1027	32.9499	14.286
30.7336	6.63662	8.94437	4.80827	6.71107	11.3296

2.15104	1.00161	1.46162	3.13618	4.6901	1.65191
3.74	8.0874	9.7324	5.3141	1.7862	1.84706
0.697084	0.800864	1.9349	2.00187	1.33891	1.63754
2.38185	2.89744	4.75127	2.04806	5.48882	7.46931
4.37602	2.18556	4.54876	3.69152	6.09569	4.50952
6.26682	2.88111	6.55126	6.64862	3.0014	10.8849
3.46107	9.44525	4.99456	5.11572	6.12163	7.76312
6.56866	16.1329	5.6611	2.57029	7.11769	12.1217
18.7435	23.5514	6.01694	28.2332	61.903	25.5781
6.23794	4.48868	6.75683	11.0514	23.4903	16.0078
4.36754	4.16551	2.78618	1.18289	4.30422	6.12964
8.36473	8.7997	2.70882	5.61362	1.60151	1.34495
1.29043	0.947829	0.410835	0.526738	0.626768	1.01931
1.66	1.54549	4.88971	1.03216	2.65577	4.85942
2.29593	1.36639	3.36255	8.37264	3.161	2.35677
6.82164	6.00238	11.0221	15.515	17.454	12.1669
20.3638	24.2235	4.16853	11.8655	8.4131	4.7476
7.28842	7.55531	4.05489	2.04957	2.94081	6.6371
12.5586	12.0883	2.49936	8.6565	19.2455	25.1418
7.62835	4.03885	6.60116	3.7738	3.62271	7.16426
7.46622	9.49406	8.1349	5.99188	3.91344	8.10727
2.97128	8.49466	11.7895	7.764	6.50457	9.85067
53.8854	35.7084	27.9736	7.66287	1.25903	1.55166
0.930796	0.51217	1.24489	0.857816	3.08811	3.07213
1.5914	0.742461	0.800607	3.02238	1.43723	0.879817
2.23832	5.84761	6.56044	5.43538	17.6731	13.5297
41.1362	33.0614	158.458	82.6664	164.996	130.187
47.612	14.6368	7.44249	4.84485	3.65651	2.77773
2.18182	1.33768	2.78478	7.03112	6.51472	20.7407
10.7052	1.98132	2.89136	2.85825	6.54055	5.98921
16.9096	17.6733	6.80342	7.56764	4.18937	13.5948
7.95662	18.4594	9.81836	26.3655	55.0767	41.0184
47.3872	41.2232	19.925	3.288	1.33063	1.04085
0.441781	1.41446	1.06714	1.27202	3.88435	2.86352

1.07586	1.70383	1.53114	2.91754	1.3743	1.57718
5.76377	13.288	2.93138	1.54702	13.6285	56.1573
55.8542	47.2602	47.3255	51.3887	49.5131	139.215
37.3332	7.58039	0.878371	3.2175	1.37109	1.17399
3.99426	2.48068	8.7924	8.76781	26.4615	19.6632
17.7106	5.21732	6.19582	10.5918	12.982	5.15694
34.0681	19.4456	15.9205	16.1767	17.7631	18.9632
26.1688	12.3118	21.0407	21.805	47.2189	47.7633
62.7921	19.937	5.96551	4.14878	2.14718	2.17136
2.0632	0.581669	1.63302	4.53838	6.34386	2.82886
3.85838	3.9528	7.72059	2.82408	5.59676	6.04127
18.1715	7.00465	5.33083	2.88615	20.8794	22.282
38.7581	132.927	98.261	85.1158	79.9747	41.9596
11.3935	4.66163	5.04229	2.44032	0.894884	2.3036
2.97532	3.35976	4.52944	12.2364	17.1831	22.7871
9.58388	11.0824	15.3216	29.4705	5.82498	6.62098
22.3158	47.7343	51.5742	14.1274	43.3329	21.2919
17.1293	39.6214	42.6539	22.2342	50.9284	48.8042
24.2238	7.84365	7.91384	7.20806	4.22001	2.18575
2.74395	1.2935	3.41521	2.97109	2.62745	1.85031
4.37508	2.21569	7.08233	3.21111	4.1221	3.9141
5.91004	5.16409	13.6926	4.88277	12.9693	55.9875
147.922	128.725	181.837	73.3471	102.138	48.7785
24.6031	25.3573	5.93578	2.04273	1.54671	5.51415
8.07565	4.09397	7.72781	9.17309	45.7992	66.9998
35.117	11.5585	10.6273	18.3173	5.93028	4.46334
46.3816	68.4905	36.3205	43.2853	27.989	4.99397
15.167	38.4752	27.9342	26.6518	31.4401	14.7005
9.5276	11.2106	12.5568	5.45445	2.19931	1.65944
2.17792	1.84364	2.57007	3.26733	5.8106	2.10224
1.52309	4.47007	3.65979	4.79062	11.0209	3.33614
4.78544	6.41861	3.39625	7.69099	57.4435	61.8919
97.253	186.253	132.099	98.9139	218.949	66.7055
34.6857	12.8601	3.7641	5.31032	3.92004	5.13374

4.95139	6.50453	6.7495	14.4293	39.4397	41.1245
20.1856	4.5578	7.15487	8.29941	59.8848	9.67495
9.95057	19.9662	8.64997	9.66465	10.0591	9.65032
38.68	16.3553	40.82	30.793	24.8883	13.1601
6.48218	13.2503	21.1232	11.8212	4.32496	3.78951
5.41236	2.43943	2.61484	1.98122	3.00627	2.24703
2.0488	5.55844	5.09769	7.09221	11.2569	6.04015
12.5018	19.0564	8.73149	22.3956	20.2501	76.712
92.3479	200.801	95.8014	216.139	154.411	134.089
48.4537	7.76506	9.38466	8.5251	18.1113	13.4201
12.7564	10.7767	6.96351	19.668	25.644	47.9086
36.7366	16.2034	7.99347	6.14896	30.1729	16.0259
10.3094	9.797	3.54067	4.70457	12.1397	12.7788
33.601	28.5505	27.0398	12.6101	7.76588	9.13266
32.7103	20.6781	36.2045	14.5871	6.16043	4.15687
8.57666	2.32032	2.52943	3.72705	3.83927	3.55414
2.35995	4.50693	2.57774	9.7328	7.0609	5.85894
15.3599	13.9357	7.20296	14.7977	27.8341	64.5637
37.2131	97.5577	90.2531	315.395	466.917	310.714
38.0354	13.6568	7.15633	13.8062	18.851	36.89
26.143	32.0667	18.787	15.0812	43.5712	42.4669
35.2843	23.1947	21.8008	25.0348	29.8865	11.556
26.3402	5.64492	4.04891	2.53338	7.81086	29.4304
17.3356	117.201	40.7035	55.7175	27.55	15.7276
82.7414	14.7918	7.52954	3.72065	7.00457	4.79215
5.98537	14.1591	3.41908	4.35597	4.01701	9.06687
7.24602	20.7625	5.46266	7.01385	14.1368	5.55641
6.9742	13.3336	8.06251	15.6466	24.551	45.4061
75.9871	80.2355	37.6621	154.612	219.777	135.033
99.4995	29.9368	9.86667	5.14481	14.1317	41.1717
42.7507	69.938	70.3933	35.3459	67.4666	79.0923
91.4847	40.6305	15.0065	44.5453	61.5374	41.7214
24.0839	5.98118	12.5148	8.70925	22.0323	27.0736
44.726	79.7024	80.3792	68.4281	108.625	55.3159

32.2337	35.0923	19.1645	17.0876	5.93077	4.04921
3.89318	4.74693	2.44717	11.1874	11.2212	8.30951
5.66603	7.27567	8.70484	6.20137	5.47108	15.0068
19.2071	12.8842	3.55109	12.7625	39.4981	84.7635
28.8318	38.0359	31.5786	68.969	109.677	25.882
36.0534	17.5694	11.2541	4.82554	22.1748	31.5197
58.0877	52.2838	30.4774	27.0311	102.734	57.778
64.6858	53.3158	16.836	40.6083	27.1215	59.9799
37.8658	29.6063	9.82437	6.36677	16.707	17.77
9.08237	29.4895	34.0527	42.7992	174.732	54.9554
35.2315	35.3904	9.79062	6.8988	3.54242	4.4516
3.1142	2.40508	2.61942	4.48909	3.8002	18.7693
18.4975	11.8583	5.2845	11.7735	7.65626	54.5241
45.7104	17.8551	8.52231	23.0062	16.2128	46.6508
42.2073	48.1347	79.1977	130.936	122.531	74.32
30.7687	21.2208	12.5787	25.0309	23.7188	58.8289
37.8014	26.7907	34.3079	17.1487	104.337	62.5252
15.8061	86.0056	29.092	54.4416	85.5988	37.4374
27.4813	24.8733	30.8742	7.31761	7.72658	3.00643
3.06273	36.4814	27.2449	41.5327	56.4089	31.738
18.1265	17.3559	12.8923	11.6237	6.34235	2.20057
1.70642	1.36543	1.61989	3.23262	12.1015	21.6203
32.9737	14.0187	8.0373	14.6656	22.941	34.6594
17.4639	36.948	6.49647	15.9971	15.9983	28.3332
49.7788	42.192	123.888	282.595	401.113	106.337
61.9978	25.2464	15.5853	14.1999	19.2486	22.3512
13.2513	27.3713	27.3343	51.3722	53.4593	48.4271
4.6417	7.18294	18.1018	41.3806	26.4439	41.5644
62.3529	57.0328	75.8561	26.7039	36.9382	10.3085
18.2051	12.9271	50.8415	7.64391	9.56954	7.52674
13.4501	11.353	7.74768	3.94851	5.56901	3.10886
1.3877	3.71029	3.9522	1.94623	5.31905	45.5971
27.7281	34.9846	70.0204	27.2869	33.6694	21.3838
19.0672	9.73388	16.4058	9.9229	60.9817	72.1549

166.116	254.31	363.007	270.612	48.2968	112.602
28.9847	23.3959	14.03	23.387	19.2429	16.8056
13.109	37.0299	27.3088	34.0497	59.5686	14.434
6.73712	18.0502	32.8469	61.2883	22.2111	66.0106
61.0477	138.033	202.898	115.473	19.6627	20.9958
31.9412	23.2019	16.3984	19.6254	16.6568	12.8253
10.4205	11.0123	11.3672	9.0024	10.1004	3.92611
9.41976	7.61944	5.63683	8.20955	9.19557	20.1509
15.7337	41.9842	102.144	87.3574	37.869	76.8772
37.4562	47.7371	41.5986	21.1583	112.778	156.147
327.888	919.338	1781.26	162.73	103.358	48.3543
41.2832	20.8211	16.9892	24.2653	65.2473	30.8788
40.9808	6.33752	37.0348	33.6987	48.3644	51.4478
23.989	53.1914	31.8355	32.4404	35.1574	49.2055
225.128	181.809	475.665	94.8362	21.0259	20.2326
17.6654	55.2818	101.236	26.9223	12.2561	20.3814
14.6504	18.0476	14.5448	11.1547	7.19099	4.21683
9.66141	5.36894	9.90163	9.71096	17.0372	74.1882
107.196	75.5865	142.082	65.2354	88.5305	71.0443
152.021	72.9442	69.0625	63.7102	140.839	487.549
2031.27	512.263	1386.97	157.978	102.688	32.6682
30.9009	52.2245	21.7307	21.2284	79.3485	96.8616
61.4248	9.19567	31.3197	40.7983	38.8721	31.0897
33.4725	54.6652	105.306	50.9404	62.2254	131.987
229.275	138.758	248.005	105.855	29.6013	14.8923
19.7204	26.7524	29.4115	19.3771	5.04387	10.0754
20.0918	13.4489	5.8373	5.82501	4.69965	1.53771
6.54862	6.18703	6.65574	11.9414	14.9412	104.391
101.333	207.479	336.071	251.569	331.811	407.216
143.428	155.422	160.456	329.63	204.574	740.147
1325.45	911.62	398.157	158.143	120.81	48.8267
31.7811	16.0533	12.5108	15.8319	45.2642	49.4197
58.2082	42.081	46.5278	34.6259	36.7423	17.0381
134.961	79.5661	71.5765	41.7057	89.7811	105.005

101.42	132.53	47.181	24.0716	37.2307	21.0792
32.155	77.3623	26.2176	6.70934	12.7293	12.5178
7.62103	7.34655	3.04009	3.77578	3.02227	4.55362
4.45918	6.35058	8.64894	21.2632	24.3743	87.7754
59.0663	89.5302	78.4706	178.51	604.818	484.753
580.491	261.078	335.142	292.319	310.162	278.345
1044.6	281.296	149.643	151.662	136.738	35.9167
20.5044	14.4723	13.1928	9.95167	28.4697	124.436
247.195	97.4723	50.8905	42.6615	40.5261	25.9182
148.145	75.36	89.6543	26.8006	71.8864	114.842
176.547	107.018	34.8678	16.5891	14.4471	12.5064
48.7672	14.6538	30.8512	7.8305	12.1775	7.36201
4.46343	6.26901	5.25972	3.67915	10.3437	11.5134
4.28181	7.20139	2.81055	6.55014	17.5583	19.9688
61.2471	14.5167	40.1379	301.072	1562.14	1196.54
363.194	199.827	194.176	405.628	298.945	736.024
405.914	185.533	111.587	131.645	77.1014	53.7973
18.5777	12.9576	6.61679	18.3496	23.3575	27.8718
65.6302	57.1992	46.7138	13.3754	5.20161	10.3814
186.927	84.0731	45.0741	11.7242	59.8537	82.6033
101.12	104.737	24.7717	7.94419	16.9677	20.6013
27.7082	20.8393	37.6449	31.776	10.4782	16.5774
22.013	10.2945	27.0622	13.0981	14.5024	10.3983
3.58376	10.8591	12.2233	14.6486	9.19856	13.4818
66.0026	25.9823	136.904	875.947	2660.82	1283.26
400.882	466.67	399.061	180.522	439.59	521.783
374.751	159.76	37.1957	85.9656	49.1792	38.8989
26.1765	24.9595	5.83116	28.0691	27.3036	20.9041
29.9232	34.2015	19.7702	6.1003	12.0461	11.2985
116.738	28.1134	57.4146	40.5643	79.3388	116.711
157.083	57.1732	14.524	10.3766	9.22906	13.9452
22.797	29.3146	13.647	12.9773	11.6009	11.2544
7.68994	15.1663	61.0763	36.2997	38.3239	15.8576
13.8692	14.9138	14.6006	26.2173	23.0019	43.6342

30.4911	55.7396	90.3904	1044.76	3095.53	3221.08
1582.15	419.797	56.4722	132.56	198.972	629.682
103.017	88.8928	25.8543	153.995	157.003	41.6463
11.8086	15.6281	13.2363	11.0644	9.40354	39.7515
47.5643	49.4556	10.4057	12.5083	4.9052	8.79519
230.156	94.7533	77.3578	34.491	73.0107	84.3087
34.0118	65.8741	12.3291	17.5722	11.7005	23.6475
16.9362	14.3865	22.9279	14.8241	7.02213	13.9286
24.6411	26.9962	31.7861	67.3671	19.9985	28.2531
9.20859	19.7001	11.5479	14.675	38.9477	40.3528
54.8535	63.0194	450.918	3512.48	1738.82	400.265
343.493	310.934	156.03	158.099	315.133	331.473
330.261	110.875	104.454	147.66	81.7812	91.545
38.1661	42.4143	6.63923	12.8856	11.9823	48.1425
31.9221	19.6013	14.6306	1.84626	6.26632	3.34762
47.4155	50.4427	81.2703	124.308	85.9079	27.4487
30.897	29.1462	17.0207	9.5643	11.2067	27.0668
27.5925	19.3068	24.7847	23.5962	7.4973	11.081
8.38782	58.4262	50.094	32.9277	33.0137	9.32571
7.4527	21.7957	56.8861	42.1461	115.322	85.237
48.6209	143.832	114.649	294.719	1647.31	504.475
210.151	384.534	322.501	589.984	397.692	418.766
1753.5	659.375	357.536	738.961	281.077	82.507
136.193	76.4737	45.7249	33.4299	18.8194	17.5521
11.8923	7.47905	4.34838	3.94375	3.25485	1.91034
63.5406	46.0423	85.2997	131.251	24.2001	24.1181
28.5711	16.0767	6.1607	8.54552	5.06676	24.2608
18.4471	45.8946	41.2866	17.6425	13.4543	15.12
29.4587	77.7877	92.4495	101.533	12.4231	40.5942
11.4035	32.9241	30.4445	38.9273	57.6072	302.446
83.1299	241.616	219.72	238.054	300.847	422.524
286.823	1199.96	421.484	596.515	254.359	349.791
1725.89	588.8	598.664	721.311	482.425	238.898
140.626	125.418	52.455	21.1256	10.3769	5.58853

13.4824	7.84461	2.96352	4.2878	4.01529	6.10125
17.523	57.1667	92.6087	119.855	53.8962	6.98471
12.8539	8.17506	2.62537	4.66473	11.5381	16.5737
15.9564	39.1949	12.7064	20.3379	28.2765	23.9116
35.57	82.5992	40.1316	57.5629	25.7224	20.5747
11.8236	13.0254	13.3414	36.4756	76.6234	531.985
132.745	215.349	521.783	529.206	87.6431	251.767
445.352	239.932	364.005	383.513	397.565	307.335
1099.46	393.164	833.884	1139.2	1483.81	770.901
357.344	230.146	93.1352	21.7076	12.5533	11.3716
5.60296	9.81726	11.2922	9.78065	1.55667	3.04504
64.942	17.1216	42.9336	30.8089	92.7698	44.2148
13.6206	5.95012	2.05807	2.50923	4.0192	31.3432
22.1777	22.2923	32.0989	13.2944	14.9987	16.3734
26.4271	52.0306	26.1269	19.4514	24.4363	45.6109
25.5835	42.9299	38.2265	60.3007	140.925	297.4
266.327	120.31	779.539	801.412	410.839	201.066
183.508	375.736	381.385	478.965	163.587	183.797
357.063	559.799	765.989	799.894	2239.57	2758.98
482.087	162.218	171.198	87.0324	38.3781	15.3789
13.0404	23.4676	13.5287	9.58327	7.56764	2.39579
58.6734	25.7932	56.7211	132.361	48.6129	45.1323
60.1066	43.8161	12.5016	22.4973	15.9752	44.4668
29.0194	45.0352	43.3355	67.637	13.7419	9.24848
28.6359	7.32442	14.8388	10.4146	11.7061	27.6984
84.9773	168.474	119.709	182.036	314.654	279.592
288.656	177.201	691.07	398.873	312.344	415.029
149.058	704.637	351.246	461.66	336.44	288.714
247.338	914.541	993.322	2698.58	1885.49	4350.01
813.676	440.254	323.094	99.7385	18.9376	19.5556
23.7139	44.2356	25.4798	18.8305	4.13107	5.02941
60.7497	157.459	76.335	104.298	122.762	70.3756
32.0248	24.599	50.7013	33.1244	19.2807	38.5755
17.0223	40.7046	5.65697	15.6211	6.58651	4.59868

8.4437	8.0631	6.88562	3.28204	21.7924	50.0245
260.841	526.859	366.871	335.611	217.364	199.618
117.321	192.739	455.729	961.172	272.09	332.581
402.512	524.967	538.656	311.181	533.867	834.679
396.458	600.22	1584.46	4453.45	7390.52	2400.19
987.162	343.233	297.62	34.8298	74.4899	36.7625
15.9296	29.9259	83.5701	6.01778	11.4812	27.3864
19.0226	20.3761	53.1204	137.945	108.145	68.6525
42.0512	31.3044	23.0771	24.255	22.2642	20.9311
67.9241	73.239	53.8714	41.9482	12.0574	1.83108
6.00862	7.92371	1.3362	3.12371	9.80245	19.7313
143.15	372.061	501.036	333.791	171.836	129.703
133.885	135.379	449.324	1183.75	1652.2	693.424
615.234	499.388	445.131	140.913	514.459	826.466
407.213	304.622	1103.13	3101.91	4122.76	1468.49
984.402	366.395	340.609	100.019	33.0732	41.5703
46.3072	65.1916	35.7001	34.7666	23.1718	36.4678
6.8137	7.49272	20.7957	56.9207	34.1	76.3356
53.3856	31.4498	33.7088	15.7	18.369	23.8568
64.6649	44.6325	18.3383	20.0351	12.4614	13.9178
16.353	17.5401	9.16951	10.5219	20.7633	38.1621
112.61	366.393	559.052	407.082	144.845	132.435
234.662	135.777	154.824	2011.11	1321.37	1244.53
618.307	430.419	325.457	184.887	232.776	663.049
849.269	886.41	2422.25	2424.52	3131.51	2220.84
2083.93	637.89	482.518	776.392	105.819	62.7651
85.8146	33.1698	18.3317	23.677	23.5924	43.2612
6.54525	40.0621	29.0539	57.2709	31.8827	23.5939
18.5076	12.4999	19.395	12.0417	28.5613	29.073
25.5129	11.7861	10.7726	49.1129	109.708	47.75
18.6599	14.2543	16.238	13.7341	41.9462	54.5257
135.109	191.43	402.165	157.998	398.029	294.041
188.351	531.853	341.18	736.8	1123.44	1071.81
557.393	319.797	258.529	307.859	400.174	999.117

452.486	981.499	1511.6	3966.42	1396.04	1036.93
988.687	365.344	253.577	749.191	180.14	69.426
59.8888	59.6393	19.7172	16.481	15.1066	29.5791
5.1572	11.1076	14.9242	55.9548	16.5485	6.86473
8.39603	11.8425	12.7216	18.3218	17.8062	37.441
18.0001	2.73054	15.5209	36.0339	78.6859	41.682
46.8437	53.9565	39.887	104.267	63.3217	65.3043
157.417	99.8131	195.06	138.609	390.166	679.61
527.949	646.846	1769.9	673.976	1367.5	551.832
245.715	668.301	342.247	271.407	874.071	1334.39
849.49	1414.87	738.026	1203.53	768.187	243.877
566.068	292.408	404.453	128.107	86.0268	186.784
97.4967	103.94	12.2344	31.5909	30.5202	41.3129
12.5248	8.30477	52.5087	47.853	5.56032	6.19903
2.64132	2.2065	5.87085	11.6981	21.8809	19.573
12.8304	11.5763	25.4171	41.2547	50.5742	52.5979
26.6371	46.0102	92.3795	41.4795	75.9157	163.504
236.302	263.051	455.272	363.471	222.58	302.826
435.962	317.966	355.301	152.257	566.434	370.4
716.597	481.83	237.285	416.388	547.323	1134.65
1172.3	3265.02	1519.52	878.538	340.847	223.255
225.173	229.544	198.559	226.028	163.319	198.14
125.101	44.1147	44.5977	73.4195	16.0422	19.3293
25.7064	12.5655	16.7692	46.1288	13.062	8.32068
1.81363	3.38145	6.96019	5.26844	13.53	9.65994
13.4378	28.5921	34.4531	46.4427	78.3776	37.5988
63.059	49.1531	101.239	411.887	496.222	409.533
560.365	274.766	344.521	291.867	165.594	631.208
202.944	92.8656	229.032	335.246	172.666	205.436
162.487	502.175	221.123	412.134	685.55	1205.75
1839.58	3099.22	1534.88	388.395	408.901	162.274
160.489	215.063	214.526	160.391	53.4702	80.5949
50.0597	31.2767	52.0651	69.5388	16.0093	10.5106
81.1095	48.8423	59.7896	25.5577	8.73746	8.86782

4.95859	5.59971	9.30181	4.03129	22.928	11.9531
70.5172	79.695	85.0521	45.3572	99.1302	59.6629
45.0417	23.417	87.2399	332.872	644.029	166.23
110.989	182.281	239.355	403.675	293.542	359.507
218.587	203.982	160.069	344.561	472.623	404.219
146.941	434.741	354.294	246.767	2312.88	3387.59
2412.48	1049.18	2670.87	406.116	637.39	77.8054
239.936	122.202	68.5951	109.872	405.209	42.8197
20.8	21.294	22.8641	26.4032	11.5871	11.9402
90.9514	47.1228	76.8672	27.0838	7.4393	5.58469
4.81539	5.30697	8.28522	10.3655	33.2928	23.4499
73.952	71.4277	57.1311	139.377	19.6212	41.7756
24.9511	33.9181	30.2865	184.136	209.812	469.27
251.281	266.422	282.916	248.001	504.344	456.421
418.901	554.784	150.841	167.878	302.603	294.199
210.82	260.03	367.148	657.269	1723.75	1161.19
2166.84	791.063	753.253	913.99	585.76	201.392
78.1263	40.695	84.6779	68.6113	143.673	153.987
51.4197	24.6421	33.9362	41.5747	21.6275	8.50753
75.2005	110.481	66.5923	22.3083	5.72575	6.41388
4.33347	2.62914	5.48634	11.8036	7.57154	7.89273
77.7472	104.302	87.0509	50.9045	44.5834	78.34

APPENDIX D

JOHANSEN SET 3(Permeability, mD**)**

4.72e-06	1.18487e-05	1.17139e-05	4.31004e-05	4.78833e-05	1.01481e-05
4.1694e-06	5.57489e-05	4.2839e-06	0.00671094	0.0341072	0.00621475
0.00171472	0.000350393	0.000727259	0.00302132	2.54002	0.0655549
0.0346486	0.0688441	0.0915068	0.28837	0.120085	0.0398561

0.077654 0.0267131 0.00088244 0.00340578 0.00225465 12.1404

33.183 855.78 0.21491 0.0916223 0.0138142 1.80748e-05

1.61586e-05 6.2681e-06 2.0755e-06 5.085e-07 1.8034e-06 3.812e-07

2.9752e-06 1.5764e-06 9.308e-07 2.5487e-06 3.7723e-06 1.8104e-06

1.7234e-06 1.9778e-06 2.6112e-06 1.5752e-06 1.0142e-06 3.2778e-06

4.88079e-05 5.0427e-05 7.26302e-05 3.64235e-05 3.73541e-05 2.83252e-05

5.4573e-06 2.6784e-06 9.8241e-06 3.77672e-05 3.46917e-05 6.4863e-06

1.9219e-05 6.54645e-05 0.00387569 0.00407998 0.0114527 0.0117973

0.00366091 0.00095739 0.00247765 0.00367355 0.0216017 0.0769677

0.0433791 0.0922334 0.244408 0.257755 285.323 0.00583581

0.00277931 0.000712456 0.000586939 0.00422069 0.00206443 0.00963181

0.0126881 428.97 0.191017 0.129409 0.0351769 8.1648e-05

5.6295e-06 4.8841e-06 4.4829e-06 6.327e-07 1.9852e-06 1.4719e-06

2.6029e-06 3.7001e-06 1.8005e-06 1.1293e-06 6.0838e-06 1.6281e-06

8.031e-07 9.579e-07 2.4927e-06 1.5363e-06 2.1472e-06 6.2499e-06

2.18608e-05 5.52422e-05 9.4672e-05 6.44895e-05 2.25585e-05 4.7135e-06

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	0.0203994	0.0469772

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	0.0128848	0.011795

0.00151695	0.000323744	0.000448431	0.00348428	9.04545
	0.00740752

0.0145001	27.849	0.186579	470.949	9.6349e-06
	5.2158e-06

7.2694e-06	2.84457e-05	7.4433e-06	1.7058e-06	5.6576e-
06	2.3541e-06

4.1714e-06	2.02408e-05	1.00211e-05	4.6153e-06	4.5502e-
06	7.022e-07

3.615e-07	4.9882e-06	2.34314e-05	2.1196e-06
	1.20998e-05	1.60761e-05

2.48695e-05	9.32128e-05	6.06958e-05	4.80603e-05	3.4554e-
05	1.61747e-05

1.24952e-05	4.01969e-05	7.9656e-06	3.0998e-06	2.8055e-
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4.6117e-06	0.00549031	0.00974271	0.00543689
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	0.0315039	0.0319177

0.0242908	0.0445351	127.653	0.0183673
	0.016705	0.00805747

0.00154377	0.000689943	0.000591711	37.0035	15.3547
	0.00734921

0.00720515	7.45848	2.32982e-05	8.0569e-06
	1.02172e-05	2.99353e-05

2.67022e-05	1.92263e-05	3.43927e-05	9.7588e-06	3.2636e-
06	5.7594e-06

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5.291e-06	3.37277e-05	7.4944e-06	4.3227e-06	1.32255e-05	9.3868e-06

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0.00471077	0.00291687	0.00777698	0.00512344	0.0302312	0.027758

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0.00334411	0.000944932	0.0627416	0.0129606	25.1997	0.00267276

0.00422766	0.00292143	0.00332672	1.4949e-05	1.26786e-05	1.70973e-05

1.04372e-05	1.76152e-05	1.13614e-05	6.2911e-06	2.8049e-06	5.742e-07

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4.8192e-06	3.9701e-06	1.4682e-05	6.7226e-06	1.5761e-06	4.0245e-06

9.2806e-06	1.14935e-05	4.3705e-06	8.1338e-06	1.24255e-05	3.96227e-05

4.709e-06	2.2717e-06	2.88277e-05	1.18335e-05	0.0206972	0.00664854

0.00310562	0.00469268	0.00406502	0.00353412	0.0045563	0.0119368

0.0256984	0.00457839	0.0115882	0.00234875	0.0218026	0.0247234

0.0157169	27.0725	38.4846	53.9757	0.0108651	0.00820109

0.00392923	0.00161339	0.00255379	0.140772	21.3991	7.95168
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2.44e-06	7.7428e-06	1.10524e-05	7.9635e-06	8.05119e-05	4.31909e-05
6.157e-06	4.7539e-06	4.9037e-06	1.1229e-06	1.6241e-06	1.8313e-06
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9.06087e-05	7.2071e-06	3.52914e-05	0.00795846	0.0100609	0.00359424
0.00371726	28.1731	0.00407947	0.00268942	0.0327548	0.0379809
0.0165158	0.00617796	0.0184789	0.00321068	0.0106263	0.0142647
0.0196767	26.438	23.0991	57.2628	0.015298	0.0107847
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0.00302332	0.00285864	0.00672932	0.0250221	0.0274309	0.0195467
1.06937e-05	8.8516e-06	5.20282e-05	8.21139e-05	1.93564e-05	2.7211e-06
1.4605e-06	6.23037e-05	4.04315e-05	2.18849e-05	4.57501e-05	0.000153777
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3.9889e-06	1.6897e-06	1.91982e-05	4.1604e-06	1.63831e-05	2.04083e-05
4.06865e-05	0.0118564	0.0316214	0.00545377	0.00858882	0.00239606
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1.55219e-05	2.95947e-05	3.68145e-05	3.10878e-05	9.1304e-06	8.15e-06
1.00957e-05	6.8814e-06	8.2415e-06	2.89573e-05	8.6763e-06	4.16558e-05
1.85586e-05	1.89701e-05	3.32197e-05	7.4594e-06	2.05704e-05	3.58e-06
2.63157e-05	3.2619e-06	8.096e-06	1.257e-05	1.4636e-06	3.4185e-06
4.4502e-06	0.010838	0.0059428	27.9741	0.0151859	1.91691e-05
4.6627e-06	2.03136e-05	3.2199e-06	157.196	0.0729497	0.0334383
79.1808	105.038	0.026218	0.0261072	0.0766522	0.0870595
3.16443e-05	11.8138	0.00193007	0.00248301	0.0685	0.067653
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0.00688683	3.8654e-06	1.1969e-06	7.255e-06	7.0969e-06	1.97938e-05
1.09052e-05	1.51965e-05	6.914e-06	9.8011e-06	2.06409e-05	3.8819e-06
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     0.0569426       0.143019

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0.0201976       105.856         0.00327165      0.00377757
        0.00444552      0.00366846

0.0076129       0.00194444      0.059456        0.00688644      13.8475
        18.3316
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0.157896	0.209603	515.175	0.461372	0.0796518	0.113879

0.0322297	0.0534418	0.0374305	2.28524e-05	7.2617e-06	8.1709e-06

8.1773e-06	2.77464e-05	3.95255e-05	6.99592e-05	0.000248995	7.87776e-05

1.25029e-05	2.41973e-05	3.33913e-05	6.28273e-05	9.82937e-05	3.96404e-05

2.4474e-06	4.1099e-06	2.6818e-06	2.5193e-06	5.956e-07	4.569e-07

97.8168	39.8604	25.2203	15.9417	2.7007e-06	2.7896e-06

36.6072	81.204	19.7163	0.0209275	135.14	0.0498304

0.00183409	3.26462e-05	0.139352	0.0767155	0.0225314	0.095607

51.3924	8.32518	0.00311345	0.00346193	0.0077409	0.00581497

0.00647361	0.00111166	31.4463	19.7659	23.4981	9.95382

5.86017	7.46955	6.83628	6.2268	0.0965766	0.0953339

0.0361453	0.0294988	0.0217877	0.0413473	1.50316e-05	8.5539e-06

4.86269e-05	2.45851e-05	3.00547e-05	3.55786e-05	9.83866e-05	9.79679e-05

3.21039e-05	4.9385e-06	2.09325e-05	4.55209e-05	4.06848e-05	1.66425e-05

4.9848e-06	5.3385e-06	8.036e-07	1.2905e-06	2.436e-06	1.0198e-06

0.012732	30.1521	20.9892	51.5442	6.5795e-06	1.66034e-05

57.7344	57.474	27.2839	0.0228533	197.827	0.0404516
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74.4447 98.859 4.52619 0.00240842 0.00599579 0.00755807

0.000931354 0.00175364 0.0257718 32.6916 39.0162 14.4589

4.28226 7.62336 7.19736 0.0667409 0.321261 0.0798345

0.0363842 137.504 123.003 0.046511 0.0161174 0.0767331

2.59235e-05 2.57518e-05 1.30022e-05 2.68982e-05 4.71067e-05 1.60708e-05

6.2983e-06 1.58238e-05 1.05425e-05 3.82227e-05 0.000119706 2.09534e-05

9.9302e-06 1.35647e-05 5.7634e-06 3.6541e-06 1.05892e-05 2.5259e-06

57.0951 0.00704321 12.029 33.5544 1.09751e-05 1.86568e-05

55.6359 36.5049 22.7316 17.2886 688.974 0.0243219

0.00284072 0.00409032 0.00876679 0.022551 0.041549 0.0323735

0.0537486 76.0983 8.43513 0.0032664 0.00799231 15.4504

0.0136496 0.000337288 34.2534 16.1312 48.5769 18.5783

7.88001 13.8386 208.053 0.101776 0.148261 0.0455652

0.0436447 0.0658735 0.0727959 0.0462769 0.0774205 0.0813085

0.0473587 0.0438933 5.1621e-06 1.28536e-05 7.4442e-06 1.9453e-06

6.42635e-05 1.34216e-05 1.51075e-05 0.000105273 0.000130891 1.83066e-05

1.73282e-05 2.16032e-05 6.9321e-06 6.5699e-06 1.24707e-05 9.3218e-06

33.3033 0.00866962 27.0957 26.8373 4.07e-06 7.0136e-06

29.5508 24.1094 0.00997808 19.8561 0.00348429 0.0237425

0.00270424 0.00221295 0.00971733 0.0103228 0.0742646 0.043976

0.0852276 49.9107 4.99857 0.00247288 0.00523414 0.00284269

0.00091729 0.00327576 0.0135787 45.6363 74.6232 59.4537

4.14996 4.46088 0.0477069 0.0571725 0.115876 0.0649997

87.5829 260.021 0.0518943 2.22553e-05 7.99747e-05 0.0992123

0.0767603 0.154566 0.25718 0.223194 2.32138e-05 1.05402e-05

9.8866e-06 1.25681e-05 1.47681e-05 0.000117535 7.0406e-05 5.5587e-05

3.99761e-05 2.43802e-05 6.3394e-06 1.34423e-05 1.84587e-05 1.49945e-05

29.9312 0.00478439 16.738 3.5409e-06 1.5368e-06 2.6157e-06

14.0329 36.0528 0.00784783 0.00223932 1.10519e-05 5.18008e-05

0.00421768 0.00142808 0.00786406 0.0350574 0.0498805 0.0117412

27.7952 0.0137412 0.00252022 0.00196448 0.00168486 0.00296705

0.00201966 0.00291048 166.727 68.907 117.844 54.4428

5.47965 9.21402 8.4723 0.0621435 0.12335 0.0901797

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7.1233e-06	2.50065e-05	1.3113e-05	1.27131e-05	6.6712e-05	2.03776e-05

8.1445e-06	9.6016e-06	4.1667e-06	8.2087e-06	1.57145e-05	99.993

0.00812788	1.4334e-06	6.3336e-06	3.06521e-05	1.21631e-05	6.6302e-06

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0.0184421	0.0750511	0.00782122	0.04099	0.0143525	0.0165649

0.00584603	0.0193654	0.0326979	0.00299144	0.00065514	0.00162819

1.76539	0.00149508	0.019697	59.8734	195.653	72.3543

22.9966	8.07825	0.0716364	449.262	0.0726106	0.0561925

0.0190686	0.018043	0.045491	2.63859e-05	5.49282e-05	4.6651e-05

1.1193e-05	0.203937	0.548887	0.224663	0.126638	0.15789

1.29526e-05	2.47707e-05	4.26567e-05	4.44262e-05	8.42617e-05	2.29232e-05

1.4904e-05	8.4547e-06	4.9667e-06	5.4801e-06	8.56452e-05	7.368e-06

7.9879e-06	1.16894e-05	5.3714e-06	1.93129e-05	2.00003e-05	3.9061e-06

13.9967	90.0405	0.0154093	0.0157433	126.358	0.0501244

0.0110324	0.0792568	0.0228458	0.0493414	0.0364842	0.013873
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0.0137365 0.00734792 0.0260327 0.035148 0.000890154 0.00105718

1.3868 3.19947 0.0250941 25.0877 176.359 101.425

61.0791 12.213 0.0619461 0.08184 0.070178 222.925

31.6143 0.0088697 0.0894748 4.5734e-06 2.33394e-05 4.45714e-05

0.0409864 0.124853 0.959338 0.588973 0.122692 0.139414

0.150487 4.7069e-05 1.44807e-05 1.71519e-05 9.2922e-06 2.06901e-05

6.3911e-06 6.2521e-06 1.02429e-05 2.7046e-06 7.4135e-06 1.42195e-05

7.8503e-06 5.9215e-06 6.5734e-06 2.41288e-05 6.7334e-06 7.5823e-06

13.6677 30.0471 0.0168275 0.0132062 0.0159793 0.0448668

0.0321695 0.0970762 0.02233 0.0792115 0.846011 0.0340748

0.0154324 0.0118689 0.00794936 0.0329711 0.00104158 0.00124977

0.915012 2.72097 0.0215808 12.8945 179.524 60.9255

67.7592 24.2681 183.156 0.0968868 0.0759033 261.072

18.7331 0.0159171 6.584e-07 2.7167e-06 1.7366e-05 1.82537e-05

0.0503189 0.166941 0.487384 0.391939 0.263705 0.157501

0.261093 5.0531e-06 5.4696e-06 3.70252e-05 1.70332e-05 2.30584e-05

1.48566e-05 2.96918e-05 2.75028e-05 3.5211e-06 2.6283e-06 7.737e-06

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1.253e-06	6.9812e-06	7.1206e-06	3.2404e-06	1.05742e-05	1.44517e-05

24.21	21.6278	0.0292725	0.0159756	0.0641267	0.0373042

0.0306405	0.0106416	0.039252	0.102982	1.2931e-05	0.0262882

0.00783327	0.0102053	0.013268	0.00833887	0.029507	0.00141134

2.32522	6.93978	35.4681	0.0151779	121.539	56.7072

68.1615	30.8406	0.0198219	0.069959	66.8067	156.309

2.058e-06	0.00308523	0.00342827	0.00914872	0.0813137	0.0410394

0.0702291	0.133168	0.394746	0.316727	0.279355	3.5968e-06

2.55462e-05	5.547e-06	1.3802e-05	2.75821e-05	9.1934e-06	2.61088e-05

6.45354e-05	0.000136582	1.93425e-05	3.11037e-05	6.9359e-06	3.2641e-06

1.31101e-05	5.341e-07	2.6155e-06	3.9981e-06	6.5734e-06	1.41693e-05

21.3516	30.3654	0.0262316	54.4734	206.11	0.0234548

0.0673067	0.00925074	0.070353	0.0727834	0.112761	0.0625801

0.0329324	0.0289997	0.0240036	9.98185e-05	0.000211354	0.00698324

5.50329	19.173	38.2386	18.6926	0.00670472	52.7751

107.911	119.43	0.0243788	0.0383527	6.29687e-05	2.31541e-05

1.12953e-05	0.00663641	0.00461027	0.00396128	0.0244251	0.0149351
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3.64707e-05         9.8138e-06          3.98282e-05         0.106706
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4.48773e-05         1.54456e-05         3.4448e-06          3.68265e-05
        2.32109e-05         4.1815e-05

2.63206e-05         1.1759e-05          2.27318e-05         2.3059e-06          4.2767e-
06          5.3263e-06

1.8786e-06          1.103e-06           3.2634e-06          5.299e-06           8.3478e-
06          2.34088e-05

28.726      17.8936             0.0087031           0.00868008          0.151187
        0.049101

0.0110392           0.0131699           0.0711104           0.129792
        0.00631475          0.0370823

0.0208758           0.0421937           0.000207442         0.0126671
        0.0228892           0.0462503

0.000556302         31.7244             41.8134             12.8036             194.591
        0.021663

140.631             113.278             0.078097            0.0373675
        0.0198102           2.4403e-06

3.6255e-06          1.04379e-05         0.00427248          0.00381653
        0.0136115           0.0142182

4.55125e-05         4.73895e-05         8.69919e-05         1.9964e-05
        5.69808e-05         8.3678e-06

2.07225e-05         7.7993e-06          2.2871e-06          4.0961e-06
        3.05003e-05         2.27853e-05

8.0063e-06          2.61451e-05         2.21633e-05         1.6929e-05
        2.83253e-05         5.28119e-05

1.23872e-05         1.35269e-05
```

APPENDIX E

TARBET SET 1(Permeability, mD)

287.378 240.21 887.203 431.946 344.46 581.718
317.3 167.848 398.182 133.075 19.6266 54.7041
130.487 132.4 51.4492 23.7576 15.5526 7.72077
4.92497 2.92735 4.88634 4.82584 2.29089 0.856368
0.302606 0.32514 0.083738 0.214301 0.445887 0.954663
0.795346 2.53781 2.02511 3.23398 2.4047 2.28996
5.47822 29.6678 20.6781 12.6059 11.1003 24.6581
26.4511 36.3869 131.73 147.479 51.0539 112.495
64.2112 24.4887 75.1148 63.5158 84.7207 69.3179
117.031 94.8269 84.8969 111.489 139.339 121.829
71.3381 329.013 1619.73 509.781 710.229 640.113
399.418 144.863 271.272 28.8719 38.8953 37.0047
43.4254 24.6768 32.2811 35.4096 30.2768 7.58335
3.80521 3.37532 2.18346 0.553644 0.917163 1.09313
0.271254 0.092585 0.090096 0.103747 0.130736 0.298734
0.477529 1.21479 0.985342 1.55184 1.67876 1.51324
0.991233 5.72755 13.5524 6.53594 14.1261 25.9475
37.0729 50.2694 126.293 56.208 85.9201 90.5065
92.6517 58.4189 31.2229 57.4298 66.0355 19.9045
36.7279 109.96 75.1311 121.208 115.614 127.462
72.0333 303.879 65.8253 176.62 157.286 253.967
361.346 70.7341 42.0494 57.4556 26.4591 15.2422
38.7829 14.3139 46.2924 80.9089 15.9377 2.54309
18.2513 15.4026 2.30633 0.665779 1.49548 1.99371
0.233009 0.12659 0.268481 0.142833 0.140435 0.146062
0.651237 1.02866 1.0319 0.787907 0.973494 1.14034
0.971316 2.37613 7.48101 13.9967 25.0471 25.6881
42.3074 30.2936 26.9816 31.8238 77.4064 123.799
82.6417 44.9437 39.2051 55.2738 109.209 36.3917

35.7262	41.8029	71.6553	74.0303	192.052	76.0849
142.739	152.224	61.9146	90.9193	511.085	359.248
459.867	161.411	95.2092	101.811	15.3003	12.4357
13.009	14.4758	16.8694	21.0962	6.57672	1.95847
7.96978	11.6048	1.47478	1.27281	0.597921	0.869001
0.849188	0.751324	0.315796	0.266221	0.560545	0.736985
0.309799	0.487124	0.863795	0.897987	0.898623	2.26293
1.17993	2.69988	3.50327	6.25343	17.5032	20.4588
27.7757	68.0809	14.6412	28.3057	40.7452	70.3034
57.9588	46.4148	37.9839	52.731	76.6225	82.832
77.1676	142.633	109.314	44.3344	43.6147	307.627
235.669	361.755	197.217	146.367	302.839	339.325
296.876	135.445	190.378	89.7614	27.8183	18.877
7.16022	8.65765	3.99874	14.2514	4.86356	1.95534
5.07195	7.8621	2.4718	0.583518	1.00351	1.47197
0.57635	0.641664	0.376292	0.379603	0.680301	0.455142
0.335713	0.367982	0.753276	2.31936	2.98244	3.9244
1.29662	5.6414	12.7969	8.61734	53.9919	37.4596
15.0313	21.4736	26.0104	42.0061	103.613	48.719
119.319	108.62	35.1752	45.8971	93.9579	23.2149
42.4154	120.087	47.3769	27.8511	55.9139	126.111
81.8879	151.432	54.9595	157.348	377.474	204.117
346.179	513.958	237.665	91.2358	61.8422	91.6277
1.80104	6.82593	3.40612	4.00803	2.24549	3.56666
6.30063	7.73962	2.62968	4.33189	1.36498	1.49733
2.64295	1.14146	1.71042	0.476769	0.218049	0.459348
1.06877	0.676214	0.661597	1.58771	5.36033	4.64649
1.49418	1.43577	3.51303	10.9976	3.7347	25.7559
36.338	19.2705	17.0346	77.9965	58.7439	124.564

56.1203	61.2544	26.4241	39.8895	30.3064	89.7634
34.2672	82.4096	48.5993	124.5 45.876	110.422	
67.1363	136.596	37.9908	262.319	560.899	512.414
450.496	411.31	65.278	176.562	41.701	26.0362
0.609576	2.86513	2.87828	2.16688	2.71788	5.72251
5.13744	5.28518	1.79955	0.875289	1.53656	2.2197
1.76954	0.649883	1.33097	1.29779	0.42621	0.568769
0.539426	0.489671	0.471227	1.24699	2.48325	1.11821
1.82417	2.02753	5.87194	12.0176	3.46524	11.2173
12.535	21.5821	21.7714	36.0311	26.8494	41.922
27.3714	18.4454	15.1332	9.49732	79.5755	75.501
94.1935	123.455	199.008	47.2681	87.9056	58.5484
129.107	83.0788	93.5221	382.939	720.044	1155.59
985.12	454.544	289.211	71.3822	99.3684	29.1986
3.46407	1.60899	1.66237	4.08678	3.24948	5.31374
5.0152	6.02608	8.1359	8.17809	5.62494	1.63173
2.64293	0.589669	1.99005	0.479159	0.204634	0.277022
0.234314	1.07952	6.65081	2.68224	3.09476	1.94003
2.51055	3.25179	3.00282	1.85132	1.81878	4.08087
12.3795	12.8537	33.3407	35.7048	17.6613	43.5555
28.9049	9.06454	11.0035	23.9752	22.7461	43.1903
102.569	70.9187	89.2653	23.6589	117.871	18.6867
141.229	247.607	90.988	69.8726	235.067	848.649
488.96	338.538	74.3821	37.582	50.0983	14.112
0.89211	1.53401	3.0655	1.55236	3.03634	1.12324
1.96764	4.35268	1.24489	2.02082	2.35103	1.91956
0.401634	0.18744	0.269334	0.125156	0.183524	0.183411
0.348872	1.27184	4.70033	1.58355	2.11024	7.50597
9.61662	6.87923	3.48241	1.32702	0.908726	1.9181

7.55562	25.6775	20.4908	16.2542	31.7129	16.3394
13.3048	14.5299	7.89904	19.4676	16.906	56.0159
56.1426	94.2546	86.5729	29.786	22.5841	24.2401
32.5854	54.7387	38.3557	59.1524	41.9087	34.1913
49.4245	56.9277	45.2245	47.5583	55.5736	18.7721
0.353126	1.1445	0.877545	2.41623	3.36285	1.61287
3.77013	2.39442	0.821404	2.57573	4.49786	1.38931
0.484356	0.251368	0.249305	0.220747	0.088644	0.125861
1.13259	4.4243	3.19911	3.0325	3.22646	6.93991
11.3692	7.12884	3.11969	3.23544	1.23964	2.36275
2.86212	10.0608	6.29822	16.8733	12.9916	15.3628
9.59965	11.7686	20.7106	15.047	14.7194	43.1164
15.6924	91.8649	99.1909	26.6804	9.78927	30.5342
12.3733	38.5338	29.3815	29.823	63.337	17.4486
12.7539	20.1188	16.0321	14.8462	34.4922	5.07363
0.352919	0.399583	0.757314	2.25368	1.16524	0.995091
1.88367	1.38887	0.77747	2.71467	1.4055	1.2226
0.791267	0.412373	0.278495	0.213733	0.349244	0.728259
1.26656	3.88174	4.1941	2.9681	3.014	19.7848
2.3196	4.86141	4.80156	1.95423	2.30967	1.71657
1.44978	2.65759	4.28942	4.60691	16.5056	20.7458
10.2642	7.37269	16.9184	12.3989	14.4696	12.8348
57.9434	60.3357	43.5795	39.0121	11.0922	15.6216
15.6949	9.1618	33.5953	41.8466	45.0605	9.42314
8.86049	7.03909	3.66833	5.14718	5.62935	3.60567
0.72422	0.559671	0.969849	1.10466	0.542068	0.416059
0.202618	1.36261	1.79218	1.62289	2.97798	0.966263
0.407688	0.315155	0.158103	0.172103	0.52355	0.203431
0.783274	1.55818	2.66241	4.10763	7.53398	6.16072

7.76617	2.78464	3.23712	1.73442	1.0629	0.815451
0.610006	0.894467	1.66536	4.16322	6.59761	8.73706
8.2343	9.71095	6.90321	10.8176	19.1048	17.7074
40.0796	29.5045	19.6389	12.6278	4.75389	4.54142
4.07279	11.6695	8.89013	11.5058	22.677	8.45942
2.07818	4.8014	7.05566	4.17208	10.7748	1.78675
0.590055	0.708255	0.7802	0.941384	0.343624	0.152662
0.25477	0.390052	0.652424	0.898535	1.8342	1.458
2.48094	0.251103	0.151576	0.055344	0.111175	0.203306
0.573933	0.820197	2.44519	6.02729	6.44207	3.78151
3.37588	4.36127	0.764075	0.637477	0.761745	1.29291
0.839048	0.269847	0.166293	1.29743	1.34723	1.97676
2.50659	3.92914	4.35277	7.90658	23.7314	38.4535
32.1438	19.9763	18.3284	8.39348	3.83613	1.81263
1.76351	1.97555	3.6143	6.2476	7.49525	4.40424
1.36049	0.923704	1.8086	3.16607	4.03983	4.25536
0.474935	0.418091	0.807575	1.14937	0.428535	0.448888
0.229544	0.610092	0.458425	0.70324	2.30129	1.4906
4.51242	0.531065	0.171146	0.068955	0.135919	0.177182
0.105534	0.272632	1.05435	0.787925	2.60986	2.85002
1.99887	3.19146	1.9299	1.11901	0.289045	0.380987
0.996919	0.376418	0.260397	0.512121	1.05967	1.48717
0.793544	1.88823	1.97142	6.59163	5.55659	29.117
12.9619	5.21699	7.65936	4.72932	1.26117	1.09991
1.19732	1.32971	1.90857	3.11145	0.857903	0.674268
1.2287	0.819264	0.831301	2.29829	6.18341	8.9794
0.365173	0.520217	3.90425	1.37641	1.36366	0.381085
0.199293	0.431205	0.246693	0.767637	0.609456	0.385506
0.903268	0.356505	0.299041	0.078414	0.126439	0.259904

0.188593	0.053349	0.205726	0.428609	0.917965	1.2382
1.95771	2.5494	1.433 1.15779	0.419013	0.300466
0.30561	0.735156	0.230977	0.118901	0.324758	0.755213
0.849568	0.90408	1.48454	1.75167	2.81652	6.96241
4.01005	4.68217	1.43464	1.83824	0.796961	0.340671
0.89277	1.37302	1.7513	2.13243	0.333177	0.286353
0.92677	1.38974	2.93356	0.831011	0.93838	1.76312
0.426686	0.761455	2.62609	2.5829	0.617749	0.334515
0.20501	0.2816	0.57042	0.51273	0.33018	0.339738
0.592225	0.120547	0.17393	0.06082	0.031481	0.139797
0.225908	0.090303	0.154463	0.752918	0.221096	0.636281
0.858859	1.70525	3.31887	1.92844	0.138208	0.494132
0.35152	0.178525	0.098638	0.072887	0.07228	0.207636
0.303782	0.424182	1.10825	0.943481	1.88622	0.463224
0.289601	1.40444	0.469652	0.535554	0.240284	0.11115
0.182729	0.148102	1.27126	0.416609	0.160231	0.36038
0.246796	0.862215	0.778564	0.558497	0.411477	2.00192
0.584886	1.60379	1.88657	0.670178	0.509708	0.221842
0.217102	0.16603	0.167852	0.147791	0.164061	0.102624
0.070004	0.048447	0.233067	0.077317	0.045135	0.054647
0.199763	0.439835	0.321942	0.768127	0.626337	0.976077
0.266467	0.243307	0.282279	0.665987	0.486905	0.334245
0.211624	0.251081	0.213459	0.030042	0.052294	0.129217
0.271542	0.184718	0.185396	0.541355	0.440413	0.101781
0.171978	0.999303	0.470895	0.217414	0.211281	0.129945
0.287757	0.157568	0.121372	0.220171	0.21208	0.170253
0.239202	0.337386	0.264819	0.204824	0.685666	0.665656
0.167686	0.466463	1.02762	0.651685	0.63025	0.149974
0.840716	1.59291	0.166913	0.216937	0.141255	0.035694

0.036474	0.06265	0.101747	0.055308	0.042332	0.029719
0.105012	0.326777	0.526441	0.310816	0.36599	0.48579
0.142512	0.166317	0.199187	0.106955	0.116694	0.129869
0.156855	0.165738	0.068222	0.040308	0.06062	0.090654
0.049007	0.063147	0.156584	0.159386	0.120407	0.065318
0.213789	0.390441	0.253612	0.114294	0.20045	0.140985
0.113927	0.061694	0.098983	0.191936	0.377485	0.462647
0.10819	0.37713	0.466736	0.21697	0.412613	0.507793
0.244401	0.588184	1.54462	0.897694	0.383388	0.244689
1.20414	0.643572	0.568522	0.152512	0.045175	0.037836
0.060595	0.09578	0.077799	0.06143	0.065217	0.05007
0.167385	0.318655	0.521898	0.132168	0.486193	0.196947
0.122703	0.102049	0.123016	0.141707	0.062654	0.106862
0.191399	0.088722	0.190277	0.039141	0.113107	0.075957
0.036455	0.032477	0.025407	0.043204	0.10682	0.081017
0.207339	0.531314	0.201115	0.144023	0.137418	0.046428
0.062274	0.118929	0.049903	0.062352	0.275537	0.304709
0.399102	0.299944	0.479111	0.120007	0.388141	0.349341
0.632301	0.899053	1.35651	2.10922	0.897559	0.279691
0.934744	0.928293	0.48697	0.124517	0.388997	0.064589
0.052096	0.074739	0.06333	0.074754	0.069535	0.098179
0.136918	0.125633	0.107797	0.295167	0.288474	0.078273
0.090334	0.096941	0.072013	0.072022	0.094721	0.086536
0.314068	0.09024	0.093889	0.04928	0.091927	0.08108
0.039359	0.018399	0.008992	0.039678	0.034436	0.044408
0.168195	0.280247	0.059519	0.079622	0.088277	0.072633
0.070539	0.087143	0.099387	0.182244	0.139688	0.42198
0.417049	0.414144	0.234302	0.219315	0.162743	0.198993
0.779377	2.35863	1.11758	2.34682	0.92993	0.451152

0.84068	0.381828	0.470558	0.346813	0.195727	0.090251
0.043191	0.032815	0.094702	0.064304	0.067679	0.073472
0.081727	0.081964	0.099063	0.17387	0.124268	0.181012
0.075702	0.019765	0.026846	0.100987	0.057569	0.102052
0.064978	0.074939	0.061742	0.068075	0.084432	0.084995
0.057111	0.004291	0.006263	0.019324	0.01635	0.033026
0.075787	0.079404	0.162243	0.03825	0.039807	0.081081
0.074983	0.056221	0.062298	0.095707	0.319044	0.542189
0.756566	0.550974	0.141069	0.672353	0.139164	0.10873
1.06014	2.41947	5.9638	2.71306	1.38461	0.917554
1.38034	2.11844	0.440653	0.876353	0.295874	0.057204
0.01578	0.040163	0.027675	0.057417	0.133607	0.081341
0.092705	0.086269	0.078401	0.065295	0.09406	0.059243
0.026434	0.020593	0.007314	0.058549	0.057769	0.137626
0.195908	0.039532	0.0799	0.207255	0.116706	0.091674
0.036893	0.006564	0.012074	0.0287	0.030447	0.037968
0.055228	0.0299	0.026968	0.008935	0.042373	0.040022
0.025446	0.026854	0.094735	0.073353	0.183607	0.190153
0.451874	0.393157	0.187629	0.736622	0.191405	0.129485
3.10178	4.9148	3.72919	2.13265	1.22734	0.566235
1.08884	0.358749	0.257256	0.161787	0.213387	0.0485
0.047346	0.047657	0.079588	0.027495	0.047499	0.04567
0.045658	0.048553	0.092063	0.068284	0.071268	0.137698
0.079528	0.063967	0.032753	0.068267	0.040122	0.105537
0.06454	0.063571	0.072713	0.095023	0.056879	0.054216
0.014583	0.004934	0.009829	0.007795	0.015729	0.02172
0.010778	0.012186	0.007053	0.007867	0.008753	0.027752
0.0083	0.024717	0.078739	0.090545	0.135984	0.252012
0.184971	0.17802	0.408238	0.527371	0.241761	0.426785

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7.76936     4.617 2.40348     1.47536     0.553726    0.343734
1.01435     0.394341    0.181115    0.187738    0.056556    0.04091
0.103109    0.209572    0.028216    0.009989    0.023276    0.012827
0.006 0.028838    0.049951    0.087765    0.103309    0.394611
0.272744    0.100117    0.192849    0.074223    0.054072    0.065815
0.070772    0.044667    0.063049    0.066441    0.104091    0.122193
0.038573    0.005301    0.006347    0.008731    0.00622     0.012177
0.018259    0.012052    0.006197    0.010061    0.012142    0.01287
0.006938    0.009056    0.018501    0.196066    0.170672    0.160517
0.127246    0.190537    0.513991    0.311494    0.521222    0.392839
1.70241     1.305 0.514734    1.16974     0.574972    0.869229
0.468002    0.234664    0.165219    0.106118    0.056173    0.08636
0.056484    0.070354    0.040285    0.051183    0.028749    0.009111
0.012703    0.008716    0.013318    0.081071    0.054589    0.225497
0.259114    0.101326    0.110236    0.065146    0.061294    0.037301
0.039084    0.050218    0.022723    0.018243    0.080772    0.073148
0.015249    0.003636    0.009754    0.008197    0.004742    0.016262
0.02517     0.005771    0.004294    0.00546     0.006204    0.006957
0.008486    0.010247    0.068039    0.221546    0.362242    0.245801
0.136571    0.220667    0.360723    0.412171    0.472555    0.390941
2.13074     0.464472    0.244723    0.954856    0.347141    0.803887
0.453533    0.188557    0.620573    0.445637    0.058534    0.175067
0.037545    0.054324    0.095681    0.04255     0.013105    0.011927
0.011483    0.020316    0.022481    0.142856    0.080144    0.238881
0.052884    0.06397     0.101781    0.02162     0.056448    0.090206
0.024222    0.018427    0.012357    0.01522     0.031152    0.017851
0.009136    0.003842    0.023748    0.013309    0.003033    0.003969
0.015531    0.018846    0.006035    0.005866    0.00688     0.00848
0.004681    0.01037     0.141674    0.317675    1.03439     0.600756
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0.482827	0.819408	0.300304	0.335605	0.64013	0.938427
0.371712	0.733941	0.211423	0.404825	0.360448	0.359086
0.290065	0.262591	0.245752	0.143171	0.117183	0.099806
0.04189	0.106717	0.050424	0.048593	0.017269	0.026303

APPENDIX F

TARBET SET 2(Permeability, mD)

171.924	336.537	571.108	751.968	1566.96	1157.49
861.569	1661.11	898.121	473.889	298.098	508.982
365.145	277.744	379.993	121.555	120.07	140.685
127.191	73.3922	26.0922	37.4069	10.1274	7.19101
50.507	22.7756	19.6945	5.06337	4.00199	6.60162
3.79027	4.94392	7.93872	5.85916	3.29665	1.84123
4.90031	10.6523	3.62738	4.06202	2.72364	5.75246
1.66924	1.96128	2.3602	2.8145	14.9493	18.1288
12.3391	14.7324	11.5167	6.9232	13.0124	11.3512
21.6981	13.2491	13.4865	14.2129	93.2256	49.8506
167.526	196.562	272.048	1120.24	1506.58	1539.74
396.426	463.63	616.855	444.045	642.745	227.961
155.09	333.698	349.868	274.475	149.129	31.1823
17.124	19.0532	7.60013	14.3574	7.37898	6.76282
12.7897	14.1525	9.97929	11.3341	3.54568	6.31901
2.12823	5.27305	2.77533	3.8287	0.46021	1.1113
2.90449	9.52496	4.65746	1.99351	2.89477	4.5191
4.32378	0.564508	6.16625	12.5797	16.0646	31.5075
19.2957	21.2784	28.5695	25.7926	22.3752	13.6335
20.2212	9.3197	22.7606	86.7675	80.9386	54.3525

101.5	174.267	308.925	459.202	1164.68	547.021
393.374	398.628	244.657	435.198	341.799	340.299
96.1896	111.431	139.653	184.088	65.7475	24.1011
22.0754	15.1392	8.02757	3.08433	6.91132	7.4371
4.19079	14.9505	29.4574	15.3341	11.6077	12.9615
3.28937	1.24088	0.552718	1.21485	0.702961	0.40936
3.33181	2.75571	7.44337	13.2723	10.8814	14.5378
6.32948	6.12439	16.7427	16.5216	15.9618	29.1354
17.1682	9.24283	23.485	17.4671	17.9398	10.5277
12.1654	4.87102	6.41728	24.7301	25.668	39.9443
26.4542	118.637	464.487	390.54	568.771	426.086
100.319	238.003	128.048	120.33	120.126	117.408
26.0907	92.9785	40.2131	83.6804	16.575	20.6656
10.8111	18.0234	16.1417	13.9639	9.86679	33.3068
4.455	7.28208	12.9643	18.1785	8.14909	8.82983
5.88246	0.644031	1.11242	0.979374	1.26015	1.30949
1.67024	12.4876	9.07513	8.11849	10.3614	12.716
23.2593	9.76002	17.0626	14.0166	18.0728	28.7232
26.1329	27.9062	28.2843	24.6747	10.2675	8.29142
11.1339	8.92795	7.40987	31.2166	34.1404	120.496
38.5777	46.969	228.878	298.434	1092.95	955.151
151.242	137.326	51.7368	70.8149	62.7014	55.7378
62.4536	45.4316	16.4278	39.13	18.9312	19.5956
7.49203	17.9367	21.2273	9.44017	7.74847	3.78091
1.71021	1.72338	8.98491	8.14858	19.0865	5.47966
4.38482	0.965447	0.924434	1.70145	0.875974	1.33459
1.78384	6.5644	17.0267	7.71824	9.07395	10.0927
15.1601	13.3036	13.2439	8.96316	11.6677	14.8068
39.5453	20.7815	28.0961	25.813	13.3705	22.3996

29.9572	26.7798	8.73177	35.9545	56.3966	60.9139
96.7265	41.952	91.667	141.524	696.297	440.034
247.315	112.553	42.8983	116.448	161.253	76.4657
31.2643	46.1442	14.5643	47.4361	48.9807	21.9979
22.3373	34.3793	15.858	8.49973	6.53756	8.67138
1.49704	0.918017	1.51216	1.70053	4.3214	5.01521
5.51222	4.18351	3.64169	3.87426	4.57802	4.38962
3.48264	3.81124	0.871484	12.0755	9.74761	12.9525
11.3415	14.2229	6.95919	12.7301	12.4155	25.7625
10.6317	12.0687	27.7481	8.5731	3.83065	7.25366
15.5706	23.4389	28.774	36.5274	37.1128	41.0598
29.7915	59.9485	37.4806	42.5709	290.173	359.793
518.925	230.838	102.616	129.346	217.996	101.704
32.7328	34.1891	23.8338	24.988	23.6711	51.9545
17.316	27.1449	9.3947	8.64962	5.51226	6.94831
3.36499	1.67036	3.04552	2.30742	4.78279	5.84008
2.29345	1.79274	1.63097	6.32086	12.5215	4.48009
1.51134	2.25856	0.371108	1.79163	2.30132	0.46466
0.24283	0.435069	0.425252	0.638482	0.505045	0.389331
0.484369	1.78939	1.92577	8.68364	9.14234	10.4955
4.65191	3.56671	4.37596	14.9242	19.1582	7.99375
8.57997	12.4223	32.1646	59.9572	53.4607	13.7756
2.46158	15.0251	6.37373	3.71276	1.95485	1.64749
0.620574	3.24496	0.979895	1.61261	4.79247	3.61157
6.51025	16.0218	8.33697	23.6509	6.65024	11.3286
3.71	2.92839	2.49716	1.16272	3.77723	2.54529
3.61611	1.32574	2.02934	2.01347	3.13082	2.07998
3.0338	2.85806	1.06081	0.73728	0.669623	0.269943
0.39035	0.585745	0.60649	0.599534	0.341282	0.359313

1.27841	0.871839	1.12943	2.94041	5.26944	20.4399
10.7203	6.51413	17.7486	25.1902	14.7669	7.85644
21.4569	25.3861	42.1561	13.2227	23.4922	10.059
2.38847	6.23993	4.53733	0.902548	0.917879	1.36749
0.93354	1.17319	0.902162	3.16932	3.4309	3.98608
5.83353	9.11066	4.84078	9.29394	3.2348	11.8694
1.49273	2.31402	2.44071	3.26426	4.05026	7.84934
3.90433	2.91681	2.90102	1.38272	0.686435	1.7086
3.54072	2.24643	1.23037	0.40723	0.417487	0.296286
0.441562	0.964391	1.28812	3.37862	0.665223	0.289482
0.419163	0.353842	0.570797	3.34618	4.82977	5.69667
6.2659	10.7885	9.25875	6.31375	5.04763	4.34837
6.1176	13.0443	15.5834	12.8346	9.27737	22.2177
4.83451	3.20564	0.9637	0.770907	0.955375	0.571408
1.85993	3.9483	1.63946	6.79204	5.1913	9.14281
8.11516	5.66938	9.38702	7.44318	2.53085	19.2923
0.391878	1.11612	2.88521	3.24813	2.52884	2.98084
4.04707	2.16668	2.14961	0.716603	2.16155	5.63934
0.82248	0.367353	0.31254	0.171856	0.229975	0.363685
0.631304	1.93635	9.2022	8.71112	1.54491	0.422865
0.25039	0.460344	1.32039	3.33882	5.86865	12.0259
6.5127	15.7051	6.24087	3.19563	3.8338	1.75285
3.2254	13.5154	16.2795	9.9379	9.44173	8.80708
7.77576	2.9873	0.94027	1.81929	0.978894	0.888671
1.39253	5.69966	16.2927	15.7899	6.79595	5.03754
4.54006	7.07553	4.68801	6.77384	10.5703	11.9982
1.93213	4.83484	4.52711	9.31095	6.10376	3.35902
2.03809	1.2717	2.07314	1.70423	1.94029	1.14907
0.433285	0.240798	0.31757	0.475348	2.40615	0.549934

3.7936	6.86898	6.26931	3.67219	1.46109	0.792098
0.237967	2.02916	1.47056	6.33353	6.57232	5.15593
8.3966	16.206	15.0036	9.90378	5.36333	3.50158
5.4312	10.2002	15.1393	17.4509	7.62376	7.1485
4.23832	6.14209	0.547501	0.939307	1.11497	3.13545
9.74008	4.54464	10.3051	14.0221	22.2282	11.3564
20.1284	8.26875	22.3728	11.7769	20.5275	43.775
21.3452	11.1553	14.5565	13.213	12.1899	4.77959
1.04846	0.770225	0.813581	1.24338	1.43091	1.26409
0.309271	0.258046	0.749767	0.823618	2.20783	2.96303
6.50984	5.34829	2.83996	4.0053	0.702975	1.24406
0.473332	2.12855	1.95783	5.19157	7.9904	8.55513
13.7607	14.6674	10.5503	3.54147	2.70774	12.3764
2.91762	13.339	19.5767	18.8931	18.5239	3.72007
4.67393	3.4335	1.23273	0.442948	1.48608	8.95319
4.99053	7.53025	15.6815	62.0402	36.7897	22.0465
33.6669	30.4953	56.9423	61.1511	53.4186	97.9447
8.87904	8.43813	7.2534	11.5075	2.62448	4.18916
1.72837	1.02325	1.60316	2.62894	0.995309	1.163
1.2491	0.725175	0.36616	2.56376	2.77776	2.02571
3.37249	5.67701	2.71351	2.94921	3.15385	0.431088
1.99663	3.98354	2.36445	4.86925	9.12494	6.66497
9.81681	8.21264	2.09159	4.34776	3.34946	10.5295
9.69806	28.8234	19.3896	32.3419	6.81476	2.52932
5.12001	2.45126	1.56703	0.904201	1.07618	3.89192
5.0091	8.06579	9.93773	63.253	36.0821	27.9654
60.2495	116.565	53.2666	70.705	36.9689	41.0667
43.787	26.5306	6.48838	7.27151	4.13565	1.51442
4.25562	1.06872	3.08587	1.67857	3.42937	6.49314

7.97234	1.88746	1.92442	5.2714	3.89135	1.52005
1.99613	2.23851	4.95763	4.24514	2.07341	1.80241
1.41634	5.75316	3.84234	9.83388	4.74246	5.39647
4.1826	3.73777	8.98092	6.79947	7.25141	8.52544
10.2899	64.5695	33.5791	55.2148	19.3496	9.7443
5.58351	1.66507	0.846625	0.88222	1.77982	3.01187
3.48795	5.94575	11.367	4.88649	27.7112	39.1846
62.7807	128.864	152.129	57.7451	68.4238	91.7683
20.6075	10.4698	18.864	14.6181	5.85996	3.87674
2.57595	2.2586	1.03223	2.62151	11.304	15.1666
5.6268	3.15313	3.54752	7.45873	2.9977	2.23488
5.22131	0.745054	1.33928	0.887788	0.315663	0.494875
0.924614	1.30981	1.64108	2.89659	2.88482	1.90271
1.65782	1.30336	5.27988	4.67176	1.74227	5.57907
13.704	24.8542	25.3936	26.8569	13.1807	7.88683
16.8604	5.07156	1.96381	0.850745	1.36699	2.35922
3.89742	4.95701	3.36904	2.83676	5.94682	6.9992
38.0125	89.3322	263.191	169.017	262.97	163.617
15.6822	11.2114	19.0657	23.1426	20.9982	5.08828
4.69895	2.23855	2.06575	4.10079	4.31562	7.59007
4.20497	2.66709	4.7627	3.83927	6.14997	4.55981
3.18573	0.582893	0.337238	0.504201	0.201358	0.200332
0.335107	0.357051	0.454225	0.466327	0.644589	0.543759
1.06731	1.17402	2.09633	3.96312	2.37057	3.65029
12.2372	13.7263	16.7173	11.4547	5.73263	4.8472
11.0374	7.5325	1.7869	1.21389	1.67851	4.76285
3.39785	4.09607	4.53279	1.01142	5.64282	5.47899
15.0241	64.3123	168.004	328.984	323.636	345.073
9.66984	8.95355	9.12785	9.50256	7.48896	15.1605

5.54851	2.4097	7.15286	4.43089	2.53292	4.33208
4.40176	3.20919	4.2555	9.60437	10.3436	4.53834
4.10006	1.19517	0.576903	0.315107	0.102019	0.300039
1.55984	0.812609	0.519981	0.434271	0.618097	0.402705
0.614127	0.791842	1.1	2.89735	2.38555	1.78425
16.7071	7.52542	7.16168	5.52404	6.88261	3.64728
3.7277	9.52686	1.31847	0.918133	0.780573	3.5399
1.24484	0.87114	1.12384	2.1429	5.54092	3.7152
24.7478	167.424	316.173	910.524	269.565	608.023
6.45489	6.21624	4.8791	5.58868	4.48994	1.53316
1.33661	0.868668	4.61043	4.32161	3.39752	5.32189
5.57511	1.30804	2.14083	5.18543	3.27996	1.60167
1.58414	2.3273	0.587812	0.213165	0.140324	0.241601
0.424346	0.828232	0.615124	0.788055	1.4805	0.844483
1.00591	1.67568	3.62466	5.15682	21.4874	8.40581
9.92156	15.447	7.58149	9.9528	2.57078	3.24693
2.68908	0.623177	0.525749	0.503811	0.590657	1.43911
0.703848	0.715581	0.919291	1.03512	2.63983	13.1522
21.8717	198.492	133.459	168.269	235.123	246.814
4.06857	1.59772	3.0918	2.47707	5.24933	2.32298
1.02618	2.08121	2.75992	3.03647	3.55794	11.2491
5.77738	1.67135	1.98466	1.1672	1.48607	0.976147
2.22721	1.38904	0.88859	0.565995	0.343003	0.162439
0.192733	0.343929	0.39696	1.20544	0.593412	2.64703
0.649313	0.579356	1.0348	3.09996	5.03015	3.48669
3.95015	3.02535	4.61358	2.97307	1.47504	0.82114
0.820782	0.833319	0.704227	0.670763	0.745238	1.95115
1.42739	0.791061	1.3251	1.31175	1.33079	3.93177
12.1401	34.3652	83.7096	148.763	89.5002	281.309

1.12265	1.24324	0.820696	1.13631	1.05924	1.06683
2.33308	1.58035	2.58283	2.37456	2.53294	2.96797
6.37787	4.25395	2.66858	1.78463	2.05455	0.373979
0.705883	0.852303	0.657055	0.149023	0.161312	0.346705
0.254757	0.703222	1.1703	1.50746	1.64078	1.87135
1.09268	0.464763	0.8742	1.4941	1.9307	1.33802
3.11941	2.78763	1.14591	1.59249	0.555964	0.340581
0.290581	0.509728	2.45182	1.25933	1.40052	1.01943
0.770046	1.64242	2.51943	4.24569	3.06804	11.2889
16.1952	24.8801	51.3408	74.3945	85.5995	85.3667
1.23356	0.265327	0.918163	0.402434	1.20669	3.79458
3.53965	2.99706	1.80718	1.2422	1.54967	2.54515
2.60668	4.53865	6.22999	4.06217	1.59458	1.26638
0.198401	0.462358	0.19512	0.367007	0.114624	0.412924
0.444066	0.721463	1.74641	2.90915	0.574336	0.490029
0.479407	0.816171	1.07737	0.843635	1.32469	2.58897
2.75056	4.29275	3.24063	0.938674	0.642978	0.305504
0.574145	0.562163	1.76411	0.695889	2.75875	0.757539
0.675772	2.58844	1.49633	1.3398	1.81459	2.48363
6.79541	15.3308	34.7521	67.7269	76.132	59.0704
0.411573	0.313519	0.494951	1.10746	0.753444	1.77955
1.82175	1.0335	0.395695	0.555089	1.36557	9.37206
13.2915	7.1878	16.1348	12.6093	7.38354	3.41266
1.1575	0.391914	0.600188	0.348202	0.212118	0.801853
0.408971	0.526051	3.38621	3.80156	0.764727	2.14431
1.41433	2.15414	0.863276	0.480277	2.29817	1.72197
3.36164	2.27938	1.72845	0.488019	0.291139	0.349283
0.410623	0.256375	0.416711	1.18716	0.756653	0.430237
0.570339	0.977244	1.28833	0.670066	1.10737	9.079

10.587	17.6487	57.6801	82.0053	95.3906	84.3349
0.441368	0.235398	0.897513	2.9497	0.921239	2.44398
1.31202	1.38492	2.11879	4.64894	3.35463	14.6389
25.4582	12.785	7.24002	13.0435	8.38979	2.7628
0.876097	0.785124	0.57571	0.121283	0.561839	0.463805
0.34528	0.418212	1.24648	1.26664	0.660703	0.710472
0.864457	0.948794	0.561281	0.168681	0.349875	2.27289
2.92539	2.67474	0.671006	0.353714	0.181921	0.264351
0.604062	0.186841	0.259256	0.753581	0.486723	0.552301
0.584415	2.3338	1.93901	0.985849	5.6965	6.26127
6.7913	8.65536	16.1506	35.2491	51.0169	21.3257
0.145068	0.187301	0.918869	3.03762	3.44527	0.683354
0.532186	1.17044	5.09286	2.78719	4.44145	14.4534
15.9105	5.88761	8.18717	8.37567	1.41359	1.6103
1.01581	0.342258	0.281708	0.429535	0.205014	0.14667
0.258384	0.527607	0.885839	0.591235	0.887449	0.475171
0.406138	0.529193	0.303634	0.239198	0.28054	1.52082
3.04468	1.68605	0.5832	0.766332	0.609254	1.24448
0.523868	0.226605	0.475966	1.03021	0.743927	0.680539
0.852928	2.38131	0.813875	1.24422	3.8346	6.79961
2.57967	8.06558	12.6482	11.9327	8.21886	7.07562
0.460752	0.499831	0.314818	1.24336	0.85659	0.490299
0.63367	2.18015	3.47234	1.97145	2.62179	10.9942
16.3303	6.03532	8.27865	3.61495	1.80297	0.515322
0.518741	0.450249	0.200888	0.15976	0.126104	0.096825
0.090529	0.103034	0.166681	0.260226	0.064859	0.271288
0.204287	0.262068	0.224975	0.145255	0.129066	0.673463
1.11431	0.813854	1.44816	0.94539	0.962681	1.21918
0.181373	0.108841	0.215325	0.292002	0.563397	0.300749