EFFECT OF PIPELINE PIGGING ON RAW WATER PIPELINE FLOW RATE AND ENERGY CONSUMPTION

By

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ABSTRACT

Pipeline pigging is a widely used method of pipeline cleaning to improve the hydraulic efficiency of a pipeline system, reduce deposits within a pipeline, reduce operational costs and improve water quality. With insufficient pipe cleaning, pipeline deposits accumulate within the pipeline which reduces the cross-sectional flow area of the pipeline and increases the friction losses in the pipeline. This subsequently reduces the operating flow rate, increases the pumping cost of the system, and reduces the water supply to the surrounding area. Therefore, the study aimed to investigate the hydraulic improvements and operational cost savings of a pipeline system after pigging and to determine when pigging should be done. A case study of the Tayside high lift pumpstation in South Africa was used for this investigation. Results indicate that pigging removes deposits and sediments from the pipelines thereby increasing the flow rate while reducing the cost of pumping substantially. The increase in flow rate calculated from the case study was 23.9% after one of the pigging operations in 2016. In addition, the pigging operations completed yearly also indicated a flow rate increase after pigging. The study showed that the increase in sediment levels of the raw water in the rainy season led to a reduction in the hydraulic capacity of the pipeline indicating an increase in sediment deposition in the pipeline.

Life cycle cost analysis of the case study system obtained annual cost savings of R 991,800.59 over a 50-year period.

Based on the findings, a flexible routine for pigging based on the reduction in the hydraulic capacity of the pipeline is proposed to cater for the variability in levels of sediment in the raw water in alignment to the rainfall and streamflow patterns. This allows the pipeline to operate at the lowest energy cost and at the highest possible flow rate.

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List of Abbreviations, Symbols and Units

Symbol	SI Unit	Description
H_L	m	Total headloss
f	Unitless	Friction factor
L	m	Length
V	m/s	Velocity
D	m	Diameter
g	m/s^2	Gravity
K	mm	Pipe roughness
Re	Unitless	Reynolds number
Q	m^3/s	Flow rate
C	Unitless	Hazen-Willaims roughness coefficient
P_f	Unitless	Power factor
S	KVa	Apparent power
P	KW	Actual power
I	A	Current
V	V	Voltage
P_{LL}	KW	3-phase actual power
V_{LN}	V	Line to neutral voltage
ø	m	Pipe diameter
PV	R	Present value
PMT	R	Annuity payments per period
r	%	Discount rate
i	%	Inflation rate
t	years	Time
h_L	M	Minor loss
K_L	Mm	Loss coefficient
H_f	m	Friction loss

Chapter 1: Introduction

1.1 Background

The utilisation of pigs for pipe cleaning has been carried out in the pipeline industry for approximately 90 years (Bubar, 2011). However, pigs were only commonly used after the year 1940 when major pipelines were constructed. The first pigs used for pipe cleaning consisted of bundles of rags tied together with baler twine. These pigs were pushed through pipelines for cleaning purposes which made a loud ‘squealing’ noise (hence the name ‘pigs’).

Pigging of pipelines was mainly focused and utilised in the oil and gas industry but is now being commonly used for water and raw water pipelines. The main reasons for pigging of a pipeline are to improve the pipeline flow rates, reduce internal corrosion, increase the lifespan of the pipeline, and reduce risks due to pipe failures. For existing pipeline infrastructure, pigging is usually done without interrupting the operations of the pipeline. The pig material typically used for cleaning are polyurethane open cell foam, cast polyurethane and rubber (Bubar, 2011).

According to Van der Werff (2006), the two main aims of pipeline pigging in potable water or raw water pipelines are to reduce pipeline failures as well as reduce or remove deposit formation on the pipe walls. Pipeline failures include but are not limited to, environmental impacts, increased maintenance cost, increased risk to workers and the public and unscheduled downtime due to repairs and maintenance. Deposit formation occurs on the walls of a pipe and is dependent on the composition of the pipe material and quality of the water. Examples of these deposits include, bacteria, iron sulphate, mineral scales, paraffin, sediments, calcium carbonate, manganese iron, asphaltene and other contaminants (Solken, 2021). In addition to the two above-mentioned issues, deposits within a pipeline significantly decrease the design flow rates and increase pumping energy requirements and costs. With the use of pigging, these issues can be reduced significantly.

Furthermore, there are three commonly used pipe cleaning methods, namely, mechanical cleaning, advanced chemical cleaning, and hydraulic cleaning. Pigging is

a form of mechanical cleaning and is a much more commonly used method. A ‘pig’ is repeatedly launched into a pipeline which removes deposits on the pipe walls.

The second type is advanced chemical cleaning. This method in conjunction with mechanical cleaning removes deposits on the pipe walls with fewer pipe pig runs (Van der Werff, 2006). Thirdly, hydraulic cleaning involves high velocity flushing of the pipeline which lifts and cleans away sediments.

1.2 Aim

The aim of this research is to find the optimal interval of the internal cleaning of an existing pipeline by pigging. This will be based on the hydraulic characteristics of the pipeline including flow rate and head losses and the savings in energy consumption of pumping and improved water supply in relation to the overall cost of cleaning the pipeline.

1.3 Research Objectives

- To determine the hydraulic improvement of the case study pipeline as a result of pigging.
- To determine the pumping cost savings before and after as a result of pigging.
- To determine how often the case study pipeline should be cleaned using pigging methods.

1.4 Hypothesis

Internal pipe cleaning by pigging improves hydraulic characteristics and reduces pumping costs. In order to determine the appropriate frequency of cleaning, the improvement in hydraulic characteristics and energy savings needs to be compared with the costs incurred in cleaning the pipeline.

1.5 Structure of the Report

This research report will be detailed in the following structure:

- Chapter 1 will include the introduction to the topic as well as focus on the aims, objectives, and hypothesis of the research topic.
- Chapter 2 includes the literature review which provides a theoretical framework to support and justify the results obtained from the research.
- Chapter 3 includes the methodology which provides the specific procedures to analyse the information from the case study. Flow rate data, energy consumption and hydraulic data is analysed in accordance with the methodology outlined in this chapter.
- Chapter 4 includes the Tayside high lift pump station case study. This provides a real-life context on the effect of pipeline pigging on raw water pipeline flow rate and energy consumption.
- Chapter 5 includes the flow rate analyses and discussions of the case study pipeline. The data received from the case study in chapter 4 is analysed using the methodology described in chapter 3. The chapter focuses on the hydraulic improvement before and after the pigging procedure.
- Chapter 6 discusses the optimal pigging interval which is the objective of the report.
- Chapter 7 includes the conclusion of the research report. Combining the results obtained in chapters 4 to chapters 6, a final conclusion is provided.

Chapter 2: Literature Review

This chapter details information and explores previous pipeline cleaning methods. The literature review also provides an analytical approach to determining the benefit of pipeline cleaning. Whilst exhibiting this information, it serves as a theoretical framework to support and justify the methodological approach and outcomes resulting from the research.

2.1 The Need for Pipeline Cleaning

The cleaning of pipes within a network has often been neglected throughout South Africa and across the world. Neglecting pipe cleaning, be it in gas pipelines, raw water and potable water systems could significantly affect the operations of the pipe network. Pipeline maintenance throughout the life cycle of the pipeline ensures that the system works safely and efficiently as well as increase the life span of a pipeline. The conditional assessment of bulk pipelines is a vital component in infrastructure management for aiding the sustainability of water infrastructure. A good understanding of the pipeline condition helps operations and maintenance, reduces structural and hydraulic failure, and minimises life-cycle costs.

From a municipal perspective, the pipeline conditions affect the following key aspects (Ellison, 2003):

- Water quality to end uses.
- Conformity to water regulations and standards.
- The cost of delivering water. (Pumping costs)
- Life cycle of the pipeline.
- Adequacy of water supply in relation to the demand.
- Availability for fire flows.

Currently, there is a significant focus on the treatment and process of water treatment at Water Treatment Plants and Wastewater Treatment Plants. It is to ensure that water leaving a treatment plant is as per the water quality regulations of the country. Although water leaving the treatment plant is of a satisfactory standard, the pipeline condition within a reticulation or rising main network will affect the quality (i.e., colour, taste, and

odour) if the reticulation network is not cleaned adequately (Ellison, 2003). Due to this occurrence, the focus has now shifted towards pipeline cleaning within the reticulation network.

2.2 Pipe Cleaning Methods

There are a number of pipe cleaning techniques that have been developed over the years of which each has its specific uses. These pipe cleaning techniques include mechanical, hydraulic and chemical cleaning. Each of the cleaning methods is detailed and described below:

2.2.1 Hydraulic Cleaning

1) Flushing / Scouring – The most commonly used as well as the oldest and most effective pipe cleaning technique is simply hydrant flushing or scouring of a pipeline. This method relies on high velocity water to clean and flush out debris and accumulation on pipe walls (Ellison, 2003). Although this method can help remove loose sediments, flushing a pipeline cannot remove hard scales that form on the pipe walls.
2) Air scouring – This method involves letting volumes of air and water into the pipeline through hydrants. By allowing air and water alternatively into the pipeline, turbulence is created which scours debris and removes sediments within the pipeline (Ellison, 2003).
3) Jetting – High pressure jetting is the process of utilising high-pressure water to clean pipe walls. This method helps in cleaning and removing debris deposits, grease and loose sediments. Jet cleaning is a safe and reliable method and has a high cleaning efficiency as well as a low cleaning cost (Siringi et al., 2014).
4) Scooter – The scooter method of cleaning is suitable for sewer and stormwater pipelines. This cleaning method is effective in removing heavy and solid debris in larger pipelines. The scooter is made up of a steel frame and is controlled by a spring system and has a metal shield on one end of the device. This metal shield acts as a plug which builds up pressure. As the pressure increases the

shield moves the device through the pipeline and cleans the pipe walls. (Siringi et al., 2014).

2.2.2 Mechanical Cleaning

1) Pipeline pigging – This method involves inserting a 'pig' of different sizes and material through a pipe length with water to physically clean pipe walls. Pipeline cleaning by means of a pipe pig which is in the shape of a spherical or cylindrical pig is an effective method of cleaning a pipeline. With the installation of a pig launcher and pig receiver, a pig can be inserted into a pipeline. With the use of a kicker pipeline (as per Figure 2-1 below), inserting the pig into the pipeline without interrupting the flow is possible (Ellison, 2003). Pipe pigs effectively clean the interior pipe walls which push out debris that may be stuck within the pipeline. Any deposit formation and large objects within a pipeline significantly reduces the cross-sectional area of a pipeline and subsequently decreases flow rate and increases friction within the pipeline. There exist various types of pigs with different uses which will be further discussed in chapter 2.5.

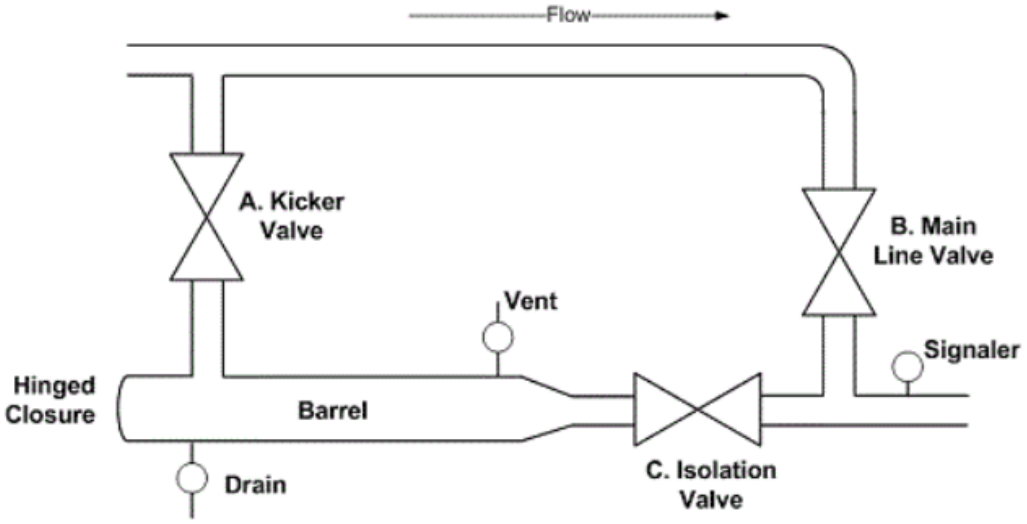

Figure 2-1: Pig Launching – Typical Schematic of Launcher (Sutton, 2017)

2) Rodding – Rodding is a method of utilising rodding equipment which applies torque to a steel rod. This steel rod is push through the pipeline and rotates as it cleans the pipeline. This method is used in cleaning out grease and loose

debris and is commonly used when doing routine preventative maintenance (Siringi et al., 2014).

3) Balling – This method is mainly used in sewer pipelines and consists of inserting sewer balls into a sewer pipeline. This sewer ball is a rubber ball that spins and brushes the pipeline interior walls. Figure 2-2 below, illustrates a rubber sewer ball. The sewer balls pass through a pipeline with high pressure and velocity to clean heavy grease build-up, sand accumulation and rocks (Siringi et al., 2014).

Figure 2-2: Rubber Sewer Ball (Sacramento Area Sewer District, 2022)

4) Power Bucket – The power bucket is another method of cleaning sewer pipes. The method involves the use of a bucket machine that pulls a bucket through a pipeline which collects accumulated sediments. Power buckets are commonly utilised when removing large quantities of debris and sediment accumulation (Siringi et al., 2014).

2.2.3 Chemical Cleaning

1) Chemical cleaning – This involves circulating an acid / chemical into a closed pipe system. Various types of chemicals are available such as: hydroxides, biocides, enzymes, caustics, and neutralisers (Siringi et al., 2014). The chemical dissolves mineral scales, biofilm growth and corrosive by-products within a pipeline. Chemical cleaning is an expensive process and can be

hazardous to the environment and employees; therefore, qualified personnel should always be utilised for this method. This method also requires the pipeline to be completely flushed, disinfected and filled with clean water prior to placing the pipeline back into operation.

Pipe cleaning over the years has developed significantly as this greatly improves the operations of a pipe network and extends the service life of the network. The selection of different cleaning methods depends on the type of pipe, type of equipment available, nature of the problem and budget (Ellison, 2003). When selecting a pipe cleaning method, it is important to consider the above aspects as these yield better results in terms of increased flow rates, lower maintenance costs and reduction of corrosion.

2.3 When is Pipeline Cleaning Required?

All potable water and raw water pipelines should be cleaned to prevent the accumulation of sediments and biofilm growth. It is often considered a minimum to undertake yearly flushing or scouring of a pipeline although this may not be adequate (Ellison, 2003).

There are various aspects that should be considered when determining when a pipeline should be cleaned and selecting the cleaning method. Data such as water quality, customer complaints, hydraulics, and pipeline failures and pipe leak data are required to determine the frequency of pipe cleaning (Ellison, 2003).

According to Van Zyl (2014), there are three areas to focus when considering the integrity of a pipe network or system. The three types of integrity include the following:

- Physical Integrity – This is defined as the system components. A functioning system allows for a distribution network to handle stresses such that its components do not fail. Components of a system include pipes, fittings, valves, pumps etc., and it is vital to maintain the physical integrity. Monitoring the condition of a system and understanding when repair, refurbishment (i.e., Cleaning), replacement, and corrosion control is important in minimising and preventing failures within a network.

- Hydraulic Integrity – This is defined as the ability of a water network to meet all user demands, whilst also meeting the required water pressures and velocity. Not meeting the hydraulic integrity of a pipeline can have severe consequences such as inability to meet the user demand, damage to pipe lining, contamination due to negative pressures and accumulation of sediments. The flow rate, water pressure and energy consumption should also be collected and compared to the original hydraulic analysis. Where significant differences occur, it is an indication that scales, biofilm or sediments are constricting the pipeline and effecting the hydraulic integrity of the system. By conducting regular pipe cleaning methods, the accumulation of sediments in the pipeline is prevented and the network can operate as intended.
- Water Quality Integrity – This is defined as the ability for a system to deliver water of acceptable quality to consumers. Water quality is dependent on the water it receives from its source or water treatment plant. Although water quality is dependent on its source, the internal pipe condition often affects the water quality as it is travels from a treatment plant to the consumer. By removing biofilm growth and sediments within the water, the water quality delivered to consumers is more likely to meet acceptable standards.

When commencing with pipe cleaning, it is common to use pipe flushing or scouring first as this is inexpensive and can be easily implemented (Ellison, 2003). Flushing or scouring is quite effective if done regularly; however, this can also spread contamination throughout the network. The benefits however of flushing a pipe network is not long-term and therefore other methods of pipe cleaning are required. Where removal of hard scales, biofilm growth and excess sediments build up is required, methods such as pigging, chemical cleaning or lining rehabilitation are necessary.

Pipeline replacement is also a method that can be considered; however, is most likely the last resort option due to the high costs involved. A good understanding of the pipe network is therefore required to ensure that the correct method is being utilised and implemented. For example, where excessive biofilm growth and sedimentation exists, flushing may not be the optimum method. Understanding the physical integrity, hydraulic integrity and water quality integrity ensures that time or money are not wasted on an inappropriate cleaning method.

It is therefore not an easy task in determining when a pipeline should be cleaned and what cleaning method should be utilised. To determine this, data such as water quality, customer complaints, hydraulics, and pipeline failures and pipe leak data are required. The data needs to be analysed to determine the appropriate cleaning method/s (Van Zyl, 2014).

2.4 The Benefits of Pipeline Pigging

There are a number of reasons to undertake pipeline pigging which are beneficial for any pipe system. Over the years pipeline pigs have evolved and consequently pigging serves multiple functions. Pipeline pigging includes the following functions and including those functions for oil and gas pipelines (Tiratsoo, 1992):

- Cleaning out accumulated deposits and debris
- Separation of products
- Gauging the internal bore
- Liquid and gas removal
- Location of obstructions
- Meter loop calibration
- Pipe geometry measurements
- Improving flow efficiency
- Corrosion inhibition

The above pigging functions can be done at different phases of the infrastructure life cycle. Pigging of a pipeline during construction, after construction and during operation and maintenance is important to ensure the longevity of the infrastructure. Pigging of a pipeline for water and raw water pipelines at different phases is detailed below:

1. Debris removal – It is common that during the construction, after construction and during operations, soil, rubbish, stones etc., enter into the pipeline. This debris has adverse effects on the flow rate, velocity and could damage pump impellers and in-line valves. The utilisation of pigs to remove this debris is important to prevent these occurrences (Tiratsoo, 1992).

2. Gauging the internal bore – The function of a gauging pig is to identify sections of the pipeline where dents and buckles exist. Typically, a pig with an aluminium disc is installed at the front of the pig. This disc is pulled through the pipeline with the pig and the disc inspected for marks and scratches. These marks and scratches indicate that there are dents and buckles on the pipeline (Tiratsoo, 1992).
3. Calliper pigging – These pig types are utilised for measuring the internal geometry of a pipeline. Calliper pigs are mounted with multiple levers on the body of the pig. The pig is then pulled through a section of a pipe and deflections of the levers are recorded. These recordings detail the pipe ovality, pipe diameter and any dents that may exist. (Tiratsoo, 1992)

Figure 2-3 below provides a breakdown of pigging functions at different phases of a pipeline's life cycle.

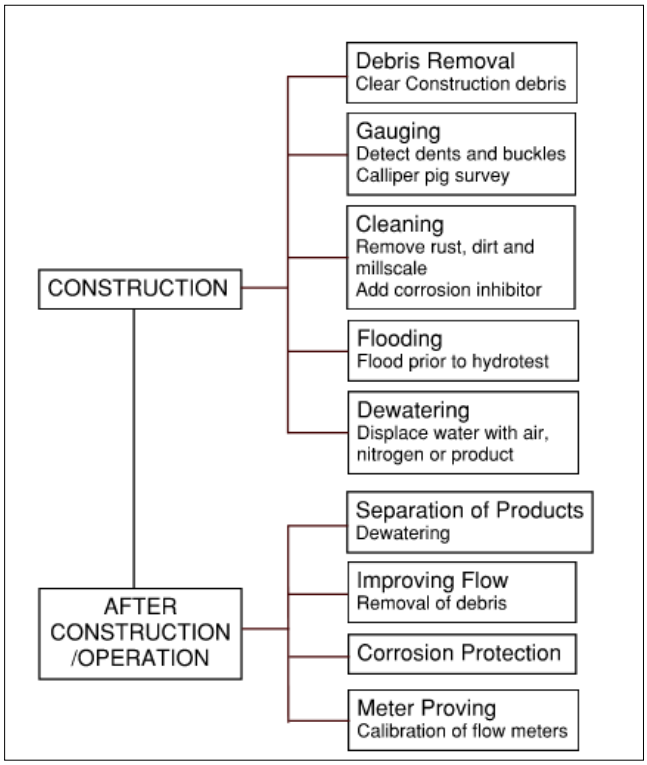

Figure 2-3: Pigging at Different Phases (Tiratsoo, 1992)

2.5 Pig Classification

Pigs are used for several tasks including cleaning of rust and dirt, removal of debris from construction, dewatering, hydrotesting and detection of leaks and other physical damages to the pipeline. Based on these, pigs can therefore be classified into 3 categories:

1. Utility pigs – These types of pigs are primarily utilised for cleaning and sealing of pipelines. Cleaning pigs are equipped with brushes and/or blades which remove accumulation of dirt on pipe walls. Sealing pigs are utilised during hydrostatic testing and are used for the separation of two different products within the pipeline (EnggCyclopedia, 2022). There are different types of utility pigs and are classified into 4 different forms (Cordell and Vanzant, 2003):
    a. Mandrel pigs – Are pigs which consist of a number of different component parts. The mandrel pig comprises a steel body, cups, discs and brushes. As the pig travels the pipeline, the cups, discs and brushes attached to the steel body collects and pushes debris out of the pipeline. These component parts can easily be replaced once they completely wear out.
    b. Foam pigs – These are developed and moulded with polyurethane foam material. Foam pigs are disposable, low cost and maintenance free and is typically used when cleaning, drying and swabbing a pipeline as well as for product removal. Since they are lightweight and flexible, they are able to traverse through pipe bends and fittings without getting stuck.
    c. Solid cast pigs – Are mainly used as sealing pigs and is made up of polyurethane material. Sealing pigs are commonly utilised to provide a boundary between different products within the pipeline and to push liquid out of the pipeline. Solid cast pigs are also used for product removal, hydrostatic testing, and removal of debris.
    d. Sphere pigs – Are primarily used as sealing pigs which provide a boundary between different products within the pipeline and to push liquid out of the pipeline. These pigs are made up of different material types such as polyurethane, neoprene and rubber. Sphere pigs are

extremely versatile as they can travel through pipelines with complex configuration.

2. Intelligent or Smart pigs – These types of pigs are used to collect information regarding the internal condition of the pipeline. The smart pigs are equipped with sensors to gather information as it traverses the pipeline. Information such as leakage, crack defects, corrosion, weld defects and wall thickness are recorded. This information is then used for rehabilitation and maintenance of the pipeline. (EnggCyclopedia, 2022)
3. Fluid pigs / Gel pigs– These types of pigs are used mainly for debris removal, dewatering, fluid separation and the recovery of mechanical pigs. Gel pigs are utilised when mechanical pigs cannot be deployed as gel pigs are more versatile and have a minimal risk of blockage. (EnggCyclopedia, 2022).

Table 2-1 summarises the different pig types and describes its uses and disadvantages.

Table 2-1: Pipe pig uses and disadvantages

Pig Type	Uses	Disadvantages
Mandrel	Pipe Cleaning	Pigs are heavy and require manual loading
Foam	Pipe clearing and cleaning, product separation	Single use pigs
Cast	Pipe scouring and cleaning	Heavier pigs and limited ability to deform. Difficulty passing through bends and restrictions
Sphere	Batching and clearing. Separation of dissimilar products	Inefficient. Commonly gets stuck within the pipeline
Smart	Data analysis, bend detection, pipe location and mapping, pipe thickness measurements, defect detection and assesses pipe wall condition	High costs, complex devices which require maintenance, data analysis is sometimes inaccurate
Gel	Batching and clearing. Separation of dissimilar products and assists with corrosion protection	Complex to launch

2.6 How a Pig is Inserted into a Pipeline

Typically, a pig is inserted into a launch chamber. This launch chamber is of a larger diameter than the main pipeline and is then reduced to the normal diameter. The launch chamber houses the pipeline pig and since it is oversized, inserting, and removing the pig is much easier. Table 2-2 below indicates a basic guideline on the sizing of the pig launcher and pig receiver pipework (Cordell and Vanzant, 2003).

Table 2-2: Guideline for the Sizing of the Pig Launching and Receiving Pipework (Cordell and Vanzant, 2003)

Nominal Diameter of Pipeline (mm)	Oversized pipe (mm) – *i.e., amount oversized from the main size of pipeline*
Up to 250 mm	50 mm
250 mm – 650 mm	100 mm
650 mm – 700 mm	150 mm

The launch chamber is pressurised which allows for the pig to enter the pipeline. The pig travels through the pipeline which is driven by the flow inside the pipeline. As the pig traverses through the pipeline, it cleans the walls of the pipe by physically removing and scraping debris and deposits. The pig will continue to travel the length of the pipeline and is caught at the receiver. The pig receiver is the point where the pig is removed and where debris from the pipeline is removed. This process is repeated a number of times with different pig types and sizes (Cordell and Vanzant, 2003). Figure 2-4 below illustrates a typical launch chamber and receiver.

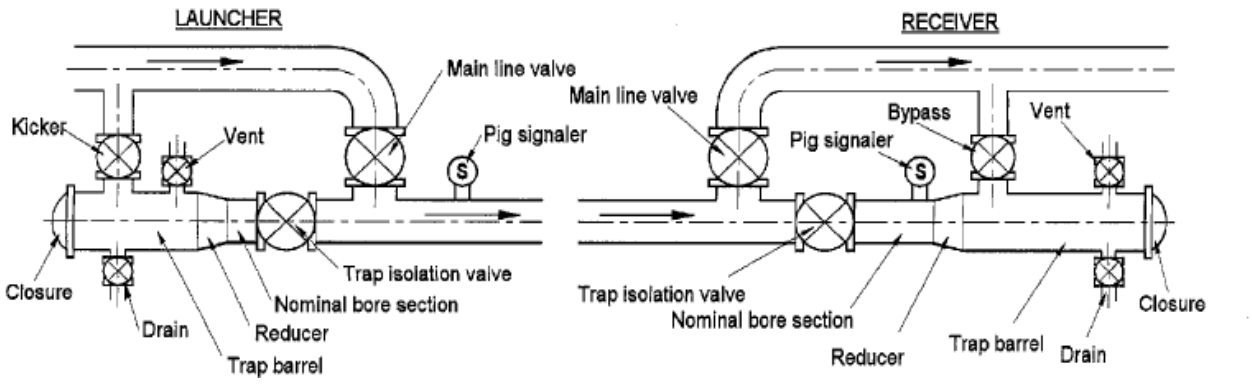

Figure 2-4: Typical Pig Launcher and Receiver (Cordell and Vanzant, 2003)

2.7 Impact of Pipe Deposition on Pipe Roughness

As previously mentioned, with increased pipe deposition the hydraulic performance can be significantly reduced. With the presence of pipe deposition on the internal surface of pipe walls, the pipe roughness will increase. This is a basic problem with pipe deposition, and this results in increased headloss and reduction of flow. This problem is especially critical with pipelines carrying water containing nutrients in the water (i.e., raw water pipelines).

Pipe deposition has been an issue for several years and there has been various pipelines studied to assess the hydraulic performance. According to Barton et al., (2008), pipeline deposition affects all hydraulic conduits as bacteria, organisms, fungi and algae attaches to the pipe walls. Barton et al., (2008), studied three pipelines which were located in Tasmania, Australia. The study investigated the Wilmot Penstock pipeline, Poatina Penstock pipeline and the Tarraleah Hilltop Pipeline.

The above pipelines were cleaned and tested to determine the change in headloss. The pipelines were tested prior to cleaning and post cleaning and the data compared. The headloss equations was utilised to evaluate the total headloss from field measurements. The minor losses through valves, bends, pipe transitions, etc., was estimated and this was subtracted from the total headloss to determine the friction loss. The Darcy Weisbach equation was then used to determine the friction factor and the Colebrook-White equation was used to determine the pipe roughness.

With the use of field measurements and the above equations, the friction loss and pipe roughness were calculated. The preclean and post clean results of each pipeline by Barton et al., (2008), is presented in Table 2-3.

Table 2-3: Summary of Results (Barton et al., 2008)

Wilmot Penstock Pipeline				
	Flow (m^3/s)	Headloss (m)	Friction Factor (f)	Pipe Roughness, k (mm)
Preclean	12,49	1,83	0,0127	0,24
Post Clean	12,54	1,45	0,0099	0,04
Poatina Penstock Pipeline				
	Flow (m^3/s)	Headloss (HL)	Friction Factor (f)	Pipe Roughness, k (mm)
Preclean	24,4	3,56	0,0181	2.15
Post Clean	24,8	2,03	0,0094	0,05
Tarraleah Hilltop Pipeline				
	Flow (m^3/s)	Headloss (HL)	Friction Factor (f)	Pipe Roughness, k (mm)
Preclean	21,18	4,37	0,0128	0,34
Post Clean	20,58	2,95	0,0091	0,02

Based on the above, we see a major decrease on the pipe roughness for all of the tested pipelines. For a similar flow rate, the headloss decreases due to the decrease in the pipe roughness. The results clearly indicate the importance of pipe cleaning and how a pipeline can deteriorate over time. From the results for a similar flow rate, there is an 83% decrease in pipe roughness for the Wilmot Penstock pipeline, a 97% decrease for the Poatina Penstock pipeline and a 94% decrease for the Terraleah Hilltop pipeline. These results indicate that if a pipelines wall surface is good/smooth, improvements from cleaning can be seen in terms of hydraulic efficiency.

Lambert et al., (2008), conducted experiments on pipe roughness for various small pipelines using raw water. Changes in pipe roughness were recorded over time and it was found that pipe deposits can grow quickly depending on the pipe velocity. The study on the Morgan to Whyalla pipeline in Australia, revealed that there can be a 36% increase in the friction after approximately 10 years (Lambert et al., 2008). This pipeline was found to have 9,5 mm thick growth on the inner walls of the pipeline. Due to the pipe growth, the abstracted water from the river is treated prior to pumping into the system.

Another example of the effect on deposition on pipe roughness is the Renmark raw water pumping main (Lambert et al., 2008). In 2005, the 650-meter pumping main was tested due to the reduced flow rate. The study utilised the Hazen-Williams equation to determine the roughness coefficient of the pipe. The Hazen-Williams is another method of calculating the pipe roughness and depends on the internal pipe wall conditions. The Hazen Williams equation is illustrated below:

$$C = \sqrt[1.85]{\frac{10.583 \times L \times Q^{1.85}}{H \times D^{4.87}}}$$

Equation 2-1: Hazen-Williams Equation

Where: C is the roughness coefficient, Q is the flow rate in m^3/sec, D is the diameter in meters, H is the headloss in meters and L is the pipe length in meters.

It was noted that for a new pipeline, the Hazen-Williams roughness coefficient C, is typically between 130-140. However, the Renmark pipeline was operating at a C value of 86 although it was installed in 2005. The below table indicates the estimated C values based on the condition of a pipeline:

Table 2-4: Hazen-Williams Roughness Coefficient (Pipeline Renewal Methods, 2014)

Pipeline Internal Condition	C
New pipe	130-140
Fair to Normal	100
Significant reduction in pipe capacity	70
Severe reduction in pipe capacity	30-50

Based on Table 2-4, although being a newly installed line, the Renmark pipeline had between a fair to normal and a significant reduction in pipe capacity in terms of its internal condition.

The above past studies inform that the condition of the internal pipe walls significantly affects the efficiency of a pipe system. Pipe depositions greatly increase the headloss and reduce the flow rate of a pipeline. Due to the composition of raw water, growth on pipe walls will occur which affect the hydraulic characteristics of the pipeline. If a pipeline is not regularly cleaned, the hydraulic efficiencies can be affected in both aged and newly installed pipelines.

Another reason for the decreased flow rate could be due to trapped air within the pipeline. Air pockets within a pipeline can disrupt the flow of water and should be removed. Although pigging is primarily used to clean a pipeline, it can however remove air in a pipeline. As a pig moves through the pipeline, it can also displace air and push it out the pipeline. Air removal is not the primary function of pigging however does assist in removing trapped air.

2.8 Effect on Pump Duty Point due to Pipe Deposition

Pipe systems and pump selections is based on the operating characteristics of the pipe system. A pump is selected based on the operating range at the design period and may not necessarily consider the pipe deposition over time. If pipe deposition is ignored, a pump will not be operating as intended or efficiently. At design period, the system curve which represents the increase in head with increasing flow through pipework intersects the pump curve. This intersection indicates the pumps duty point or the flow rate and head that the pump will operate (Pipeline Renewal Methods 2014). With increased pipe growth, a pump will operate outside of the duty point. This means that the pump is now operating inefficiently due to pipe depositions. If the pipeline is not maintained or cleaned regularly, the pump would need to operate longer in order to supply the required amount of water. Figure 2-6 below illustrates how the duty point of a system changes over time. Intersection point A is the operating point of a newly installed system, A' is the operating point of an older system and A'' is the operating point when pipe deposition is ignored or when a pipeline is not well maintained (Pipeline Renewal Methods, 2014).

This further illustrates the importance of pipe cleaning as pipe deposition significantly effects the hydraulic performance of a pipeline. Pipe cleaning by pigging is thus necessary to ensure that the selected pump of a system continues to operate efficiently and as close to the design duty point as possible.

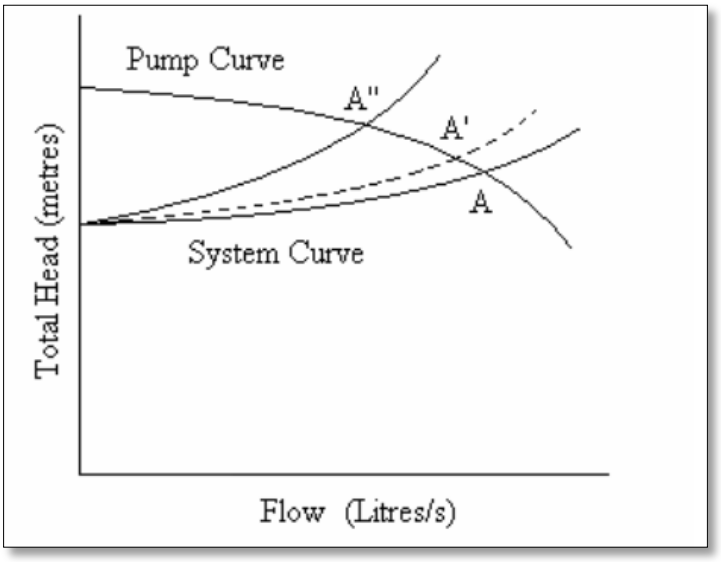

Figure 2-5: Change in Duty Due to Pipe Deposition (Pipeline Renewal Methods, 2014)

2.9 Risks and Challenges of Pipeline Pigging

Although pigging of a pipeline may seem like a simple operation, there still exist multiple hazards and risks that should be identified and properly mitigated to ensure a safe pigging operation and to avoid any possible accidents. Necessary planning and analysis is required to ensure that a pig runs successfully and effectively. The following are some risks and challenges that may occur during the cleaning process:

1. For any pigging operation, the pressure is a major hazard and is classified as a physical hazard. The cleaning process involves a pig travelling through the pipeline which cleans the internal wall of the pipe. The flow rate of the fluid or product drives the pig through the length of the pipeline using the differential pressure between the pig launcher and pig receiver. It is therefore important to ensure a continuous flow to guarantee a safe pipeline pigging procedure (Enggcyclopedia, 2012).
2. Unsuitable pipelines – Mechanical pigging and foam pig types are regularly utilised for pipe cleaning although they may not be the most suitable for many pipelines. Pipelines which include sharp bends, corrugated pipe walls or variable diameters cannot be cleaned safely and effectively using pigging. Alternatives to mechanical pigs or foam pigs would need to be considered in these cases as the cleaning effectiveness will be greatly reduced and may cause a pig to get stuck in the pipeline (Collins, 2022).
3. As previously mentioned, mechanical pigs pose a higher risk of getting stuck in a pipeline when they are deployed in an unsuitable pipeline or when there is excessive sediment build-up. Furthermore, it is not uncommon for water / fluid to travel over the top of a pig and slow it down. A stuck pig will restrict flow and will need to be removed. Removing a stuck pig from a pipeline may be very expensive and, in some cases, is time consuming and can become a big operation due to cutting or removal of pipes to remove the stuck pig. Some options of pig removal include the following (Collins, 2022):
    a. Extensive pumping and flushing to remove the pig.
    b. Physically cutting a section of pipe to remove the pig.
    c. Constructing a bypass section for the pig to travel.

4. Varying diameters and sharp bends – Although foam pigs may be flexible, it may still be impossible to pig pipelines of varying diameters. The most suitable case for pipeline pigging is to have a continuous pipe diameter with very slight changes (i.e., reducers) and no sharp bends. Pigs of different types and material would need to be considered when dealing with pipelines of varying diameters and consisting of multiple bends along its route. (Collins, 2022).
5. Construction of pig launchers and receivers – Pigging requires the construction of pig launchers and pig receivers. It can become relatively expensive when pigging is required, and these chambers are then required to be constructed (Collins, 2022).
6. Build-up of deposits / wax – In extreme cases excessive build-up can occur in front of the pig as it travels and removes deposits on the pipe walls. The deposits build up to a critical level and hardens in front of the pig. Eventually, the pressure behind the pig is not sufficient to move the build-up and causes the pig to get stuck (O'Donoghue, 2022).
7. Excessive Wear to the pig – As a pig travels through a pipeline, the scrubbing and wiping action of the pig can damage and wear the pig material and seals after some time. This occurs more commonly in smaller pipeline diameters and when there is a rough internal pipe surface. In these cases, pigs of higher tear resistance and abrasiveness would need to be utilised. In addition, lubricants can be added to a pipeline to avoid excessive wear to a pig (O'Donoghue, 2022).

There are multiple reasons as to why pipeline pigs get stuck or damaged. However, this can be mitigated with sufficient planning, design and testing. It is important to gather all relevant data at design stage as well as undertake the appropriate testing when additional information is required.

The following is a general guideline when planning a pipe pigging procedure which help prevent failure (O'Donoghue, 2022):

- Gather all relevant data and information.
- Define the reason for the pigging procedure.
- Complete the necessary designs.
- Select the correct pipe pig material and type.

- Test the pipeline using designed test programs. This includes modelling the pipeline through computer software and revise the design where necessary.
- Implement the pigging procedure.

Based on the literature review there are various studies available detailing and indicating the importance of pipeline pigging. Various pipe cleaning and pipe pigging methods are readily available which can effectively clean the internal pipe walls. Previous studies indicate the uses of pipeline pigging and provide a methodology for the installation of pigging facilities on new and existing pipeline infrastructure. Different pig types have their specific uses which depend on the pipe material and the type of sediments/deposition. It is also evident that various studies show the hydraulic improvement from pipe cleaning. However, the provision of the optimal pigging interval has not been concluded. Determining an optimal pigging interval will assist in increasing the hydraulic improvement by cleaning at the optimal time. In addition, it is stated in past studies that energy consumption can be reduced after pipeline pigging however evidence of this has not been well researched. This study seeks to provide further evidence in the importance of pipeline pigging by evaluating the hydraulic improvements, energy savings, and providing an optimal pipe pigging interval.

Chapter 3: Methodology

3.1: Introduction

This Chapter presents the methodological approach undertaken in attempting to meet the study objective; determining the appropriate interval of internal pipe cleaning. The case study of the Tayside high lift rising main, that is selected for the study, is first described.

In order to achieve the aims and objectives outlined in Chapter 1, appropriate research techniques need to be used. For this study, the computational analysis and data analysis applied are described in various sections of this Chapter. The case study of the Tayside high lift rising main is used as a benchmark to determine the hydraulic improvements of the system as well as determine the pumping cost saving before and after pigging. The effect of the quality of the raw water on deposition of sediments in the pipeline is also assessed. By integrating the above-mentioned analyses, an attempt to determine the optimal interval of the internal cleaning of pipelines by pigging is made.

3.2 Case Study

The case study is the Tayside high lift rising main to the Biggarsberg water treatment works and is described in detail in Chapter 4. The Tayside high lift rising main is suitable for this study since it has been recorded that the flow rate throughout the years has significantly decreased from its original design flow rate. By utilising pigging as a cleaning technique, this would determine whether this method of cleaning would be beneficial. This case study will provide the necessary operational data such as flow rates, power consumption and the cost of operation before and after the cleaning of the pipeline. The analysis will be carried out in the following two phases.

The first phase will involve the conditional assessment of the existing infrastructure of the Tayside pipeline and will determine the condition of the internal pipe build-up of silt, mud, and slime on the pipe walls. Data such as flow rate, power consumption and cost of operations will be determined prior to the pigging process.

The second phase will discuss the method used in cleaning the internal pipe walls. The pigging process will involve the launching of the pig under pressure from the beginning of the pipeline to the outlet. New flow rates, power consumption and cost of operations can be determined and compared to the initial results prior to pigging. Based on the data it will be determined whether the pipeline cleaning significantly improved the operation of the pipeline and an assessment of the appropriate frequency of cleaning will be made. Data will then be collected for any improvements during and after the cleaning process. Improvements such as the flow rate increase will be recorded. The cost of the cleaning process will also be determined. This cost will include the cost of the pipe installation to allow for pigging and the actual pig cost. This cost will be compared to the cost saving after pigging. Using the cost savings and the flow rate increase, the optimal interval of the internal cleaning of an existing pipeline by pigging will be determined.

3.3 Flow Data

In order to evaluate the data from the Tayside high lift rising main, flow data readings and energy consumptions readings will be used to evaluate the effect of pipeline pigging on the network. The evaluation of this data will provide a baseline to assess whether pigging on other water and raw water networks is beneficial and what frequency of pigging would be suitable.

From the case study of the Tayside high lift rising main, flow rate data will be collected from the existing pump sets. This flow rate data was collected before and after the planned pigging procedure. The data will be compared to determine the effect of pipeline pigging of the pipe system's flow rate. The collection of flow data was recorded every minute from the existing ultrasonic flow meter which was installed on the delivery side of the high lift pumps. The collection of data was recorded throughout the pigging procedure. An additional data logger was utilised to accurately record the instantaneous flow data every minute. Raw data for the flow readings extracted from the data logger are presented in Appendix A of this study.

Utilising the raw flow data extracted from the data logger, the flow rate throughout each pig run will be plotted graphically. This graphical representation will show the

instantaneous flow rate vs time over each pig run. Graphical representation of data in appropriate formats assists in effectively displaying results. The graphical representation of the flow rate vs time is illustrated and discussed in detail in Chapter 5. To determine the actual increase in the flow rate after each pig run, an average of the instantaneous flow readings will be recorded over a 1-hour period before and after each pig run. This increase will be tabulated, and a total flow rate increase will be determined after the complete cleaning procedure. This total flow rate increase will indicate the hydraulic improvements of the system.

3.4 Energy Consumptions

Once the flow rate comparison is completed, the actual electrical demand will be calculated to determine the energy savings and cost savings to the Local Municipality. Similar to the data logger on the flow meter, a power data logger was also installed in the motor control centre for the high lift pumps. This recorded the average single phase power demand in kW (real/actual power) and kVA (apparent power) as well as the line voltage on each phase.

The actual power (P) of a system is defined as the actual amount of power consumed and converted into useful output. The actual power is measured in Watts and is the power drawn from an electrical circuit. The apparent power (S) is defined as the total amount of power which is being used in an electrical system. The apparent power is measured in volt-ampere and is the power being drawn from an electrical main supply (Sunpower, 2022). However, the power that outputs useful work is calculated from the actual power. Although both the apparent power and actual power are a measurement of power, the actual power is what generates work and the apparent power is the total power of the system (i.e., used to size electrical wires). In electrical circuits, the closer the value of the actual power to the apparent power, the more efficient is the system (Sunpower, 2022). However, electrical systems are never 100% efficient as there is always a phase shift between the system voltage and current. This will be explained further in equation 3-1 and Figure 3-1 below.

The single-phase apparent power, single phase actual power and line voltage for the Tayside pumps were recorded every 30 minutes for the duration of the pigging

process. Raw data for the electrical demands extracted from the data logger can be seen in Appendix B of this study. Again, graphical representation of the electrical demand (kVA) for the high lift pumps versus time for the duration of the pigging will be done. Graphical representation of data in appropriate formats assists in effectively displaying the calculated results.

Since the extracted data was recorded as single-phase power and voltage, the power will therefore need to be converted to three-phase power and voltage. The reason for this is that the Tayside pumps are industrial motors and can only operate using a three-phase power supply. The three-phase readings represent the peak power and usage in an electrical system. The three-phase apparent power calculated will represent the electricity demand for the Tayside pumps. The below equations will be utilised to convert the single-phase data to three-phase readings. (McFadyen, 2022):

1. The first step is to determine the power factor. The power factor is defined as the ratio of actual power and apparent power. Figure 3-1 below, graphically represents the relationship between apparent power, actual power, and the power factor (commonly known as the power triangle). Equation 3-1 is therefore used to determine the power factor of a system (McFadyen, 2022).

$$Pf = S/P$$

Equation 3-1: The Power Triangle Equation (Sunpower, 2022)

Where *S* is the apparent power in kVA, *P* is the actual power in kW and *Pf* is the power factor.

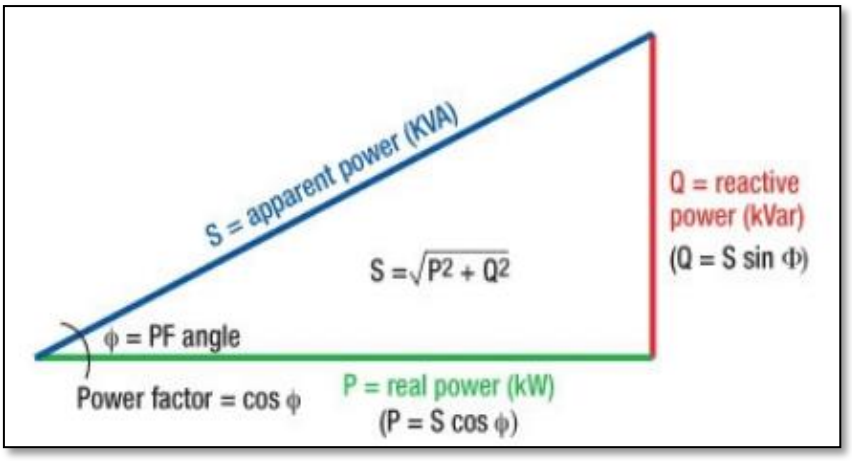

Figure 3-1: Power Triangle - Vector Diagram (Subramanian and Tandon, 2018)

2. Secondly, the current which is measured in amperes is determined. The equation for the current can be easily derived from the apparent power since its unit is in volt-amperes ('VA'). Therefore, the current is the apparent power divided by the voltage and is represented in Equation 3-2 below. The current is then used in Equation 3-3 to determine the 3-phase electrical demand.

$$I = \frac{S}{V}$$

Equation 3-2: Current Equation (McFadyen, 2022)

Where *I* is the current in amps, *S* is the apparent power in kVA and *V* is the voltage.

3. The power of an electrical system is the product of voltage and current. However, for a three-phase system, the actual power of the system is given by Equation 3-3 below (McFadyen, 2022). The three-phase actual power is the actual amount of power being used by the Tayside pumps.

$$P_{LL} = \sqrt{3} \times V_{LN} \times I \times Pf$$

Equation 3-3: Three-phase Apparent Power Equation (McFadyen, 2022)

Where:

P_{LL} is the three-phase actual power, V_{LN} is the Line to neutral Voltage (As extracted from the data logger), I is the current (As calculated from equation 3-2) and Pf is the Power Factor (As calculated from equation 3-1)

4. Lastly, the three-phase apparent power is calculated using Equation 3-1. By changing the subject of the formula, the final apparent power is determined. The apparent power of the pumps will be plotted since this is the power drawn from the main supply. The apparent power calculated will be graphically illustrated in Chapter 5. The apparent power is the electrical demand, and this is measured to determine the Eskom electricity bill or cost to the municipality. The apparent power will be determined before and after the pigging operation to determine the pumping cost saving.

3.5 Tayside Pumping Costs

In addition to the above electrical demand calculations, the cost per year and cost per kilolitre will be calculated before and after the pigging procedure. Utilising the apparent power calculated in section 3.4, the pumping cost is determined. This cost refers to the electrical usage or electrical pumping cost of the Tayside pumps. The pumping costs or electrical usage are based on Eskom's Rural Flex tariffs (Tariffs for the Tayside area). The Eskom Rural Flex tariffs can be seen in Appendix C of this report. The pumping cost is then translated to a cost per kilolitre of supplying water to the water treatment works. The reason for this, is to determine the cost savings to the Municipality for supplying a fixed volume of water based on the original design flow rate.

Based on the Eskom Rural Flex charges, the Eskom charges below will be calculated. The summation of the below charges is the total electrical cost for operating and supplying water using the Tayside pumps.

- Service charge (Rand/Account/day) – The service charge refers to the service-related cost per property/account. To determine the service cost per annum in Rands, the service charge taken from the Eskom tariff booklet is multiplied by 365 days.

- Administration charge (Rand/POD/day) – The administration charge refers to the administration cost which is due to Eskom for undertaking meter readings, billing, and meter capital. This cost is a daily fixed charge for each household/customer. To determine the administration cost per annum in Rands, the administration charge taken from the Eskom tariff booklet is multiplied by 365 days per year.
- Distribution network demand charge (cent/kWhr) – The distribution network demand charge is a monthly variable cost and is the actual demand measured. This charge covers the cost of the installation and maintenance of the distribution network. To determine the distribution network demand cost per annum in Rands, the demand charge taken from the Eskom tariff booklet is multiplied by 24 hours per day and by 365 days per year and then multiplied by the calculated real power as outlined in section 3.4 and determined in Chapter 6.
- Distribution network capacity charge (Rand/kVA/month) – The distribution network access charge is a fixed charge to recover the distribution network costs. To determine the distribution network access cost per annum in Rands, the access charge taken from the Eskom tariff booklet is multiplied by 12 months per year and then multiplied by the calculated apparent power as outlined in section 3.4 and determined in Chapter 6.
- Active energy charge in the low and high demand season (cent/kWhr)
    - This is defined as the cost for the actual energy consumed from the system.
    - According to the Eskom Tariff booklets, the low demand season is the period from the 1st September to the 31st May. This therefore means the lowest electricity usage is in the summer months.
    - According to the Eskom Tariff booklets, the high demand season is the period from the 1st June to the 31st August. This therefore means the lowest electricity usage is in the winter months.
    - To determine the active energy cost per annum in Rands, the energy charge taken from the Eskom tariff booklet is multiplied by the number of hours in the peak, standard or off-peak periods of the day and then by 365 days per year and then multiplied by the calculated real power as

outlined in section 3.4 and determined in Chapter 6. (Low and high demand seasons as well as the peak, standard and off-peak hours are taken from the Eskom tariff booklets)

- Reactive energy charge (cent/kWhr) – This charge is based on the power factor of the consumer. To determine the reactive energy cost per annum in Rands, the energy charge taken from the Eskom tariff booklet is multiplied by 24 hours per day and by 365 days per year and then multiplied by the calculated real power as outlined in section 3.4 and determined in Chapter 6.
- Ancillary service charge (cent/kWhr) – This charge covers the cost of providing ancillary services by the system operator. To determine the ancillary cost per annum in Rands, the energy charge taken from the Eskom tariff booklet is multiplied by 24 hours per day and by 365 days per year and then multiplied by the calculated real power as outlined in section 3.4 and determined in Chapter 6.

The above annual pumping costs are calculated before and after the pigging procedure in Chapter 6. By simply calculating the difference between the annual cost before and after the pigging procedure, the cost savings will be determined.

3.6 Pipe Roughness Calculation and Comparison

Once the flow rate prior to pigging and post pigging has been determined, the pipe roughness will then be calculated. This will provide a good indication of the effect of pigging on pipe roughness.

As detailed in Section 2.8, there are two methods to calculate pipe wall roughness. These methods include the utilisation of the Darcy Weishbach equation or the Hazen-Williams equation. For the calculation of the pipe wall roughness, the Hazen-Williams equation will be used. The Hazen-Williams equation is selected as it is suitable for use in municipal water supply systems where the flow of water is steady. This will be the case for the uThukela Water supply network. The Hazen-Williams equation is shown below whereby the Hazen Williams roughness coefficient, C can be determined:

$$C = \sqrt[1.85]{\frac{10.583 \times L \times Q^{1.85}}{H \times D^{4.87}}}$$

Equation 3-4: Hazen-Williams Equation (Pipeline Renewal Methods, 2014)

Where: C is the roughness coefficient, Q is the flow rate in m^3/sec, D is the diameter in meters, H is the headloss due to friction in meters and L is the pipe length in meters.

Flow rate data will be taken from the data loggers installed on the Tayside pumps (as detailed in Section 3.3). The total headloss values will then be determined from the Tayside pump curves based on the flow rate. The Tayside pump curves have been included in Appendix D. The headloss due to friction will be calculated by subtracting the estimated minor losses due to pipe fittings/bends and subtracting the static head from the total headloss.

Once the Hazen-Williams roughness coefficient is determined, the C values before and after pigging can be compared. Table 2-5 provided in Section 2.8 of Chapter 2 indicates the estimated C values based on the internal pipe condition. The C values will provide an indication of the degree of pipe deposition within the pipe and will indicate that the cross-sectional area of the pipe has been reduced. However, for the Tayside pipeline calculation, the effective diameter and therefore cross-sectional area of flow are assumed not to change significantly after pigging.

Chapter 4: Case study of the Tayside High Lift Rising Main to Biggarsberg Water Treatment Works

4.1: Overview of Case Study

The Tayside high lift rising main to Biggarsberg Water Treatment Works (WTW) is located between the abstraction works on the Buffalo River and the discharge point at the Biggarsberg WTW of the Buffalo River raw water supply scheme in Kwa-Zulu Natal. The abstraction works is located approximately 30 km northeast of Dundee town. Figure 4-1 below shows the project locality in relation to the towns of Dundee and Glencoe as well as the location of the Biggarsberg WTW and the Tayside abstraction works.

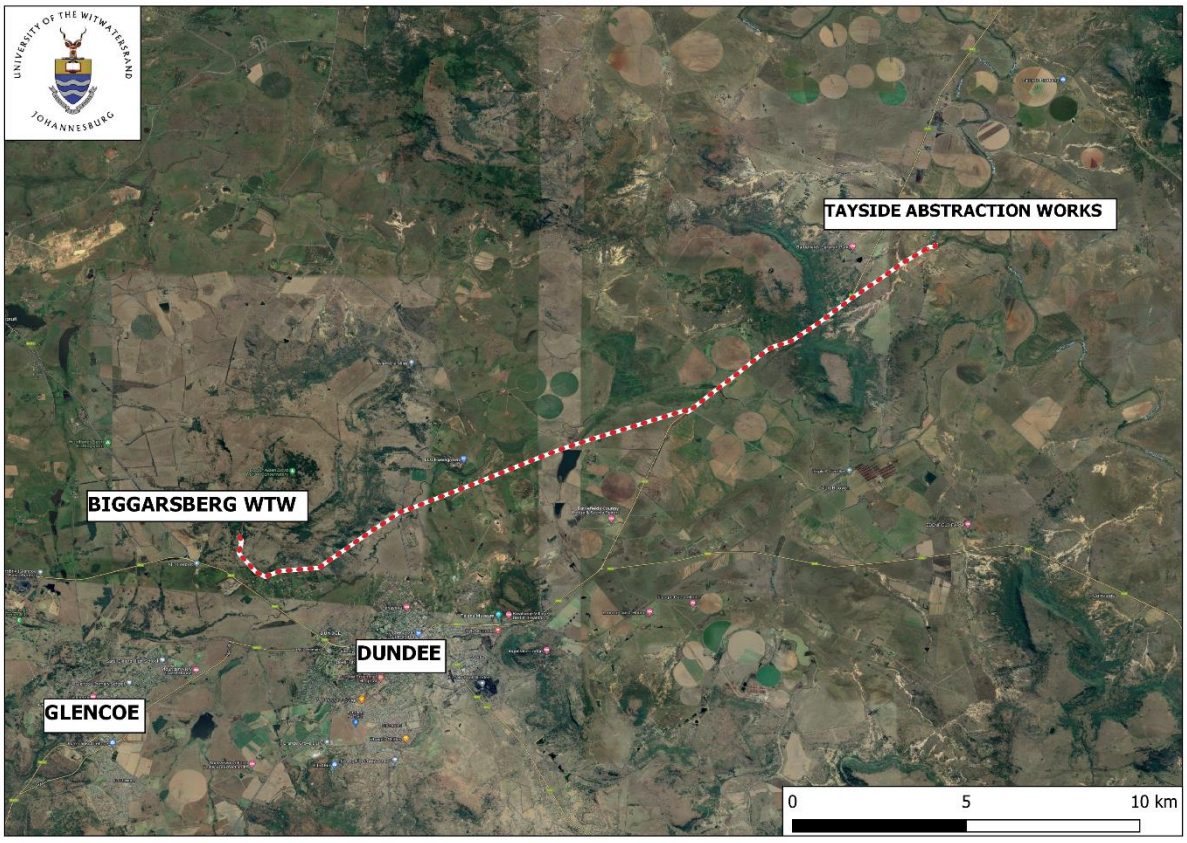

Figure 4-1: Project Locality Plan

The rising main is a cement mortar lined, 450 mm ductile iron pipeline and has been in operation since 1985. The pipeline is approximately 21 kilometres long with a design flow rate of 730 m^3/hour.

The Water Service Provider noted that the flow rate over the years has decreased significantly and was not meeting the water demands of the area. After some investigation, it was determined that the rising main had a layer of fine clay and silt build-up / accumulation of between 8 - 15 mm thick attached to the inside of the pipeline. This build-up increased the friction factor of the pipe and therefore decreased the flow rate. Several photos were taken of the internal condition of the pipeline at various points along the length of the pipeline during refurbishment and maintenance operations. Figure 4-2 below shows the layer of clay and silt build-up inside the pipeline which lead to an increase in the friction factor of the pipeline.

UWP Consulting (Pty) Ltd (now Mariswe (Pty) Ltd) was appointed in 2016 to undertake construction, monitoring and supervision of pigging of the rising main. In April 2016, Kantech Services (Pty) Ltd was appointed as the main contractor for the project. The scope of works included the fabrication and installation of purpose-made pipework to facilitate the cleaning of the raw water rising main.

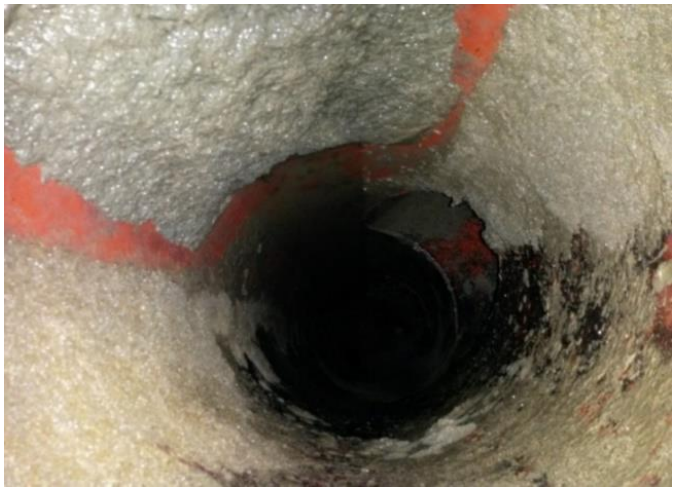

Figure 4-2: Evidence of Clay and Silt Build-up

4.2 Closed-Circuit TV (CCTV) Inspection

It is difficult to determine the internal condition, internal pipe damage and the location of pipe damage without the use of inspection cameras. Closed-Circuit TV (CCTV) pipe inspections allow for the inspections of water, sewer and drain pipelines for reporting purposes. CCTV inspections involve the operation of a robot camera (i.e., camera mounted on a tractor/remote control which is controlled by an operator) inside a pipeline which records visual defects of the pipeline. The CCTV inspections can be

done in any type of pipe and can identify defects in the pipeline such as: breaks, cracks, and blockages. CCTV inspections is one of the most widely utilised technique which make a conditional assessment of a pipeline more efficient and reliable (Lampola, 2022).

In sewer and raw water pipelines, defects of a pipeline can be classified into structural defects, construction defects and operation and maintenance defects. Figure 4-3 below outlines the common pipeline defects (Moradi et al., 2019):

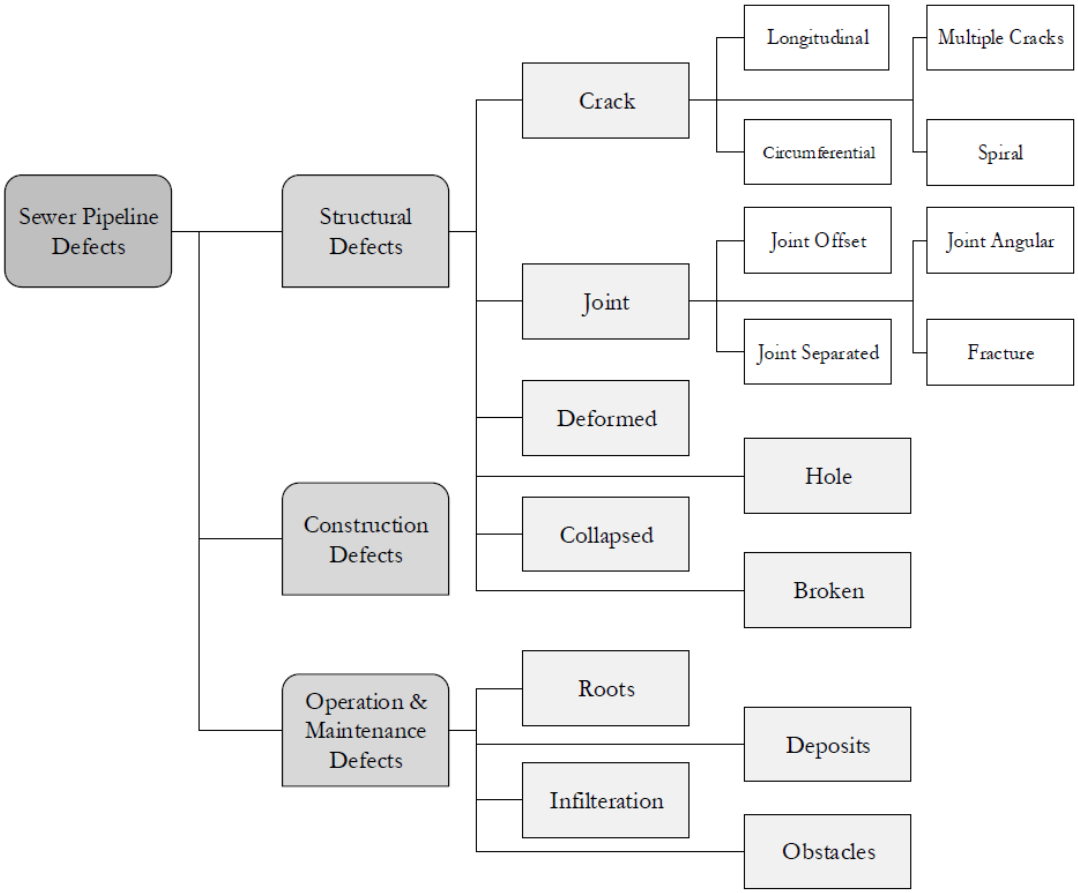

Figure 4-3: Common Pipeline Defect Classification (Moradi et al., 2019)

The CCTV inspection method is a cost-effective method that provides efficient data which can be used in a conditional assessment report. For the Tayside high lift rising main, the main concern was the operation and maintenance defects (i.e., deposits and obstacles in the pipeline which effect flow rate). The CCTV inspection method was utilised for the Tayside high lift rising main and the findings are outlined in the following section.

4.3 Conditional Assessment of the Tayside High Lift Rising Main

CCTV inspections can be done on a pipeline diameter range from 100mm to 1000mm. Since the Tayside high lift rising main is a 450 mm ductile iron pipeline, CCTV inspections was possible.

The CCTV robot camera / remote controlled camera was inserted into the Tayside high lift rising main at multiple sections of the pipeline through air valve tee pieces and access tee pieces. Once the camera entered the pipeline, approximately 50 to 100 meters of pipe was surveyed. Various photographs were taken as the camera traversed through the pipeline. Photographic evidence such as structural defects, cracking, deposits and blockages were taken. This data was utilised to determine whether the pipeline required pipeline pigging.

Figures 4-4 to 4-7 provide a summary of the observations recorded with photographic evidence.

Figure 4-4 illustrates the deposit build-up within the pipeline. This settled deposits accumulated throughout the pipeline. The deposits were reported to be of a fine and slimy texture which reduced the cross-sectional area of the pipeline by approximately 5%. With the reduced cross-sectional area of the pipeline, it subsequently increased the flow velocity within the pipeline and therefore increased the frictional head of the system. Although the deposits are not particularly thick, it would have a huge impact on the friction factor of the pipeline. As the deposits continue to accumulate, the possibility of low flow situations and low water pressure may occur.

Figure 4-4: Photographic Evidence of Deposit Build-up

Similarly, to Figure 4-4, Figure 4-5 illustrates further deposit build-up within the pipeline. This build-up can be seen at air valve connections and increased deposits will gradually cause the air valve to clog and become inoperable. The deposits seen above is yellow in colour, indicating that there is high levels of calcium and magnesium. Overtime, the calcium and magnesium can solidify into scales / flakes (Supremepipe, 2022). Again, the deposits seen were reported to be of a fine and slimy texture which reduced the cross-sectional area of the pipeline by approximately 5%.

Figure 4-5: Photographic Evidence of Deposit Build-up at Air Valve Connection

Figure 4-6 illustrates a deposit accumulation that has settled at a low point of the pipeline. It was noted the deposits were of a fine and slimy / muddy texture which reduced the cross-sectional area of the pipeline by approximately 75%. This obstructed flow significantly and was a major cause of not meeting flow demands of the area. Considering the photographic evidence seen in Figures 4-4 to 4-6, pigging of the pipeline was required to remove the silt build-up and subsequently increase the flow rate and meet flow demands. According to Cordell and Vanzant (2003), sane, stone, debris, buckets, construction skids and even wild animals can be removed by pigging. Therefore, the removal of the above fine and soft material can be achieved.

Figure 4-6: Photographic Evidence of Deposit Build-up (Accumulation of Deposits)

Figure 4-7 illustrates the deposit build-up within the old pig launcher pipework. The condition of the existing launcher was poor and required replacement. Since the launcher was not in use for many years, the deposit accumulation caused the valves and fittings to be inoperable.

Figure 4-7: Deposit Build-up Inside the Old Pig Launcher Pipework

Based on the findings seen from Figure 4-4 to Figure 4-7, it was decided that a pipe cleaning / pipe pigging procedure should be undertaken to remove the build-up within the pipeline. The main reason for the pigging procedure was to remove sediment build-up and obstructions that has reduced the flow and the cross-sectional area of the pipeline. In addition, with silt and mud accumulation in the pipeline, this will increase the friction head of the pipeline and further reduce the flow rate. According to Farshad and Rieke (2006), average roughness factors and data utilised should only be applied to new and clean pipelines. In aged pipelines and piping systems, surface roughness increases, and this will be the case for the Tayside high lift rising main. The friction factors of a pipeline are dependent on deterioration over time and the quality of the pipe material (Farshad and Rieke, 2006).

4.4 Existing Scheme and Infrastructure

The existing scheme was designed and constructed between 1982 and 1985 and forms a key component of the potable water supply to the bulk of the Endumeni Municipal area.

The existing infrastructure at the Tayside high lift pumping station consists of the following key components:

- 2 No. Sulzer high lift pump sets 750 kW
- 300 – 450 discharge pipework (40 bar rated)
- 450mm DI Rising main (approximately 21km in length)
- 450mm Pig launcher and associated pipework which is not operational.

The existing scheme was designed and constructed with the ability to pig the high lift rising main. However, the existing pig launcher seized due to a lack of use. The existing pig launcher was also required to be increased in size as it was not designed for the use of oversized pigs. Details of the new pig launcher and receiving pipework is discussed in Section 4.5 and Section 4.6 below.

4.5 New Pig Launcher Pipework at the Tayside Pumpstation in 2016

The rising main had been designed to accommodate a pig launcher, however, some modifications and additions were required to allow the use of oversize pigs.

For the pigging to be possible, the following work was required prior to pigging:

The existing launcher was replaced, extended, and was increased from 450 mm nominal bore to a 500 mm nominal bore. This will allow for the launching of pigs greater than 450mm in diameter.

Figure 4-8: Installation of New Pig Launcher

In addition, a new 200 mm kicker / booster line was installed from the delivery main line in the high lift pump station (Refer to Figure 4-9 below). The new pig launcher and kicker line material was of carbon steel and connected to the existing ductile iron pipeline. This allowed for the pressurising of the pig launching line and for the pig to enter the 450 mm ductile iron (DI) pipeline.

Figure 4-9: Installation of New 200 mm Launching Kicker Line

4.6 New Pig Receiving / Catching Pipework at the Biggarsberg Water Treatment Works in 2016

The rising main at the Biggarsberg WTW (discharge point) required alteration to facilitate the diversion of the pigs into the balancing dam to avoid them getting stuck in the valve chambers at the WTW. New bypass pipework was required which allowed for the pipeline to continue operating whilst the pig travelled through the pipeline.

For the pigging operation to be possible, the following work was required at the discharge point prior to pigging:

In order to enable retrieval of the pigs at the discharge point, a new branched tee was installed in place of a bend where the rising main entered into the Biggarsberg WTW. This enabled the diversion of the flow while the cleaning operation was undertaken directly into the raw water dam at the works via approximately 70m of new 450mm DI pipe. Figure 4-10 below shows the new tee installed in place of the existing bend with Figure 4-11 illustrating the guide bars which prevent the pigs from entering the works. The new tee was of carbon steel material and connected to the existing ductile iron pipeline. The guide bars allow for the raw water to be supplied to the treatment works without interrupting the operations of the works. This means that the water supply to the area will also not be interrupted during the pigging process. This is further evident during the pigging procedure and will be illustrated in Chapter 5 as it shows an increase in flow rate whilst the pig is still in the pipeline. This allowed for the pressurising of the pig launching line and for the pig to enter the 450 mm ductile iron (DI) pipeline. The new pig launcher was installed in carbon steel and is connected to the existing 450 mm ductile iron pipeline.

Figure 4-10: Installation of New Branched Tee Piece

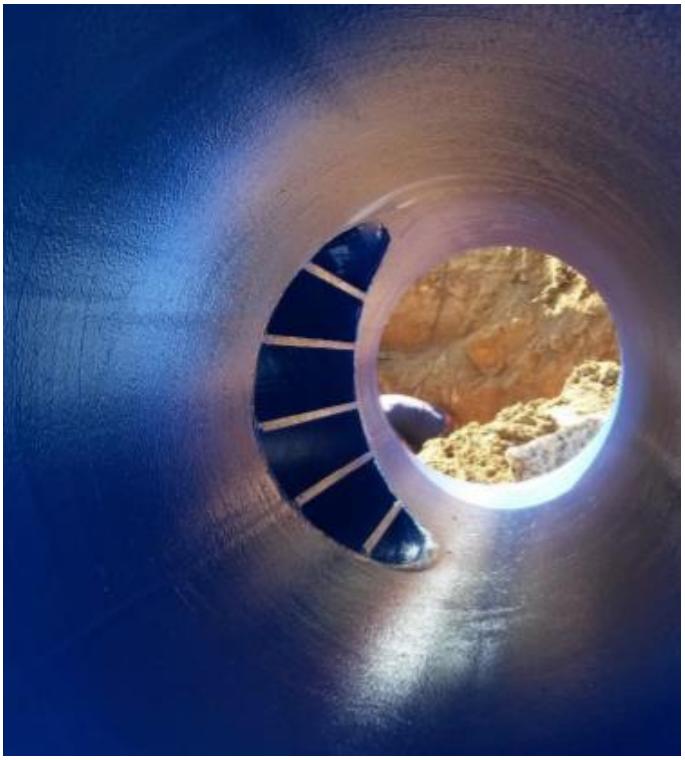

Figure 4-11: Guide Bars Inside the Branched Tee

Reviewing the current pumping volumes versus the design duty point was done in order to determine the decrease in flow rate over the years. It was determined that the design duty point for the pumps was 730m³/hr at 250m total head while the operational duty point was between 540m³/hr and 560m³/hr at 270m total head. This is an average of 24.66% reduction in flow rate from the original design duty point. For this reason, it was

decided that a pigging procedure was required to remove the build-up of silt and organic growth from the pipeline to decrease pipeline friction and to improve the flow rate in the pipeline. The cleaning operation consisted of seven (7) pigs of various sizes and type. Considering that the rising main nominal internal diameter is 453mm, the following 7 pigs were utilised during the pigging process:

- 435 mm Ø polyurethane medium duty foam swab
- 440 mm Ø polyurethane medium duty foam swab
- 460 mm Ø polyurethane medium duty foam swab
- 470 mm Ø polyurethane medium duty foam swab
- 445 mm Ø polyurethane medium duty Red Criss Cross (RCC) foam swab (RCC pigs are polyurethane elastomer coated which is more durable and resistant to damage than the standard foam pig)
- 2 No. 460 mm Ø polyurethane medium duty Red Criss Cross (RCC) foam swab

The seven pigs are shown in Figure 4-12 after the pigging.

Figure 4-12: All Pigs Utilised Post Pigging

The order of the pigging procedure began from a smaller diameter of 435 mm and gradually increased to 460 mm. Commencing the procedure with a pig of smaller diameter to the pipeline internal diameter ensured that the initial pigs did not get stuck. It is recommended to undertake a progressive pigging procedure that consists of a series of pigs that progressively increase in size in order to remove deposits from a pipeline during each pig run (Gibson Applied Technology and Engineering, 2013).

Each pig travelled through approximately 21 km of pipeline with an average run time of 5,5 hours. Each of the above pig runs will be discussed in further detail in Chapter 5.

Chapter 5: Flow Rate Analysis and Discussions

This chapter analyses the data available from the pigging exercise of 2016 to assess the effect of pigging on pipe flow rates. The summarized flow rate data available from 2017 to 2020 is thereafter used to further assess the effect of pigging and to infer whether the expected seasonal variations of sediment loading in the raw water impact on the hydraulic efficiency of the pipeline.

As mentioned in the previous chapter, the pigging procedure began from a smaller diameter of 435 mm and gradually increased to 460 mm. The pigging process comprised a total of eight (8) pig runs. A data logger was installed on the existing ultrasonic flow meter of the Tayside high lift pump station. During the complete pigging operation, the data logger recorded the instantaneous flow rate once every minute.

Sections 5.1 to section 5.7 provide a breakdown of each individual run. The breakdown includes the analysis of the flow data readings and debris removal.

5.1 Pig Run Number 1 – 435 mm Ø Polyurethane Medium Duty Foam Swab

The first pig selected was a 435 mm diameter polyurethane medium duty foam pig. The rising main has a nominal internal diameter of 453 mm and the first pig was 18 mm undersized. The reason for this is that the first pig was intended to be used as a gauging pig. This meant that the undersized pig was used to determine whether there were any partly closed in line valves and whether there were any large obstructions within the pipeline. If the 435 mm foam pig collided with any large obstructions or any partly closed valves, the pig would break up against the force of the water flowing behind it. The pig breaking under pressure would indicate a problem within the pipeline and since the pig breaks up, this would not cause any further blockage or cause the pig from getting stuck within the pipeline.

According to Ellison (2003), simple polyurethane foam pigs are utilised more commonly in water distributions networks and bulk water pipelines. This is because foam pigs are effective in removing loose silt build-up and soft sediment. As previously discussed in Chapter 4, the conditional assessment of the Tayside high lift rising main

showed mostly soft and fine sediment build-up. For this reason, a polyurethane medium duty foam pig was utilised for the cleaning of the Tayside pipeline.

Flow data reading for pig run number 1 were recorded and plotted as illustrated in Figure 5-1. Figure 5-1 includes the flow readings 1 hour prior to the pig entering the pipeline as well as 1 hour flow readings after the pig has exited the pipeline. Several large rocks, stones and wooden logs were discharged from the pipeline. Figure 5-2 below displays 3 rocks and a wooden log being discharged from the pipeline along with the foam pig.

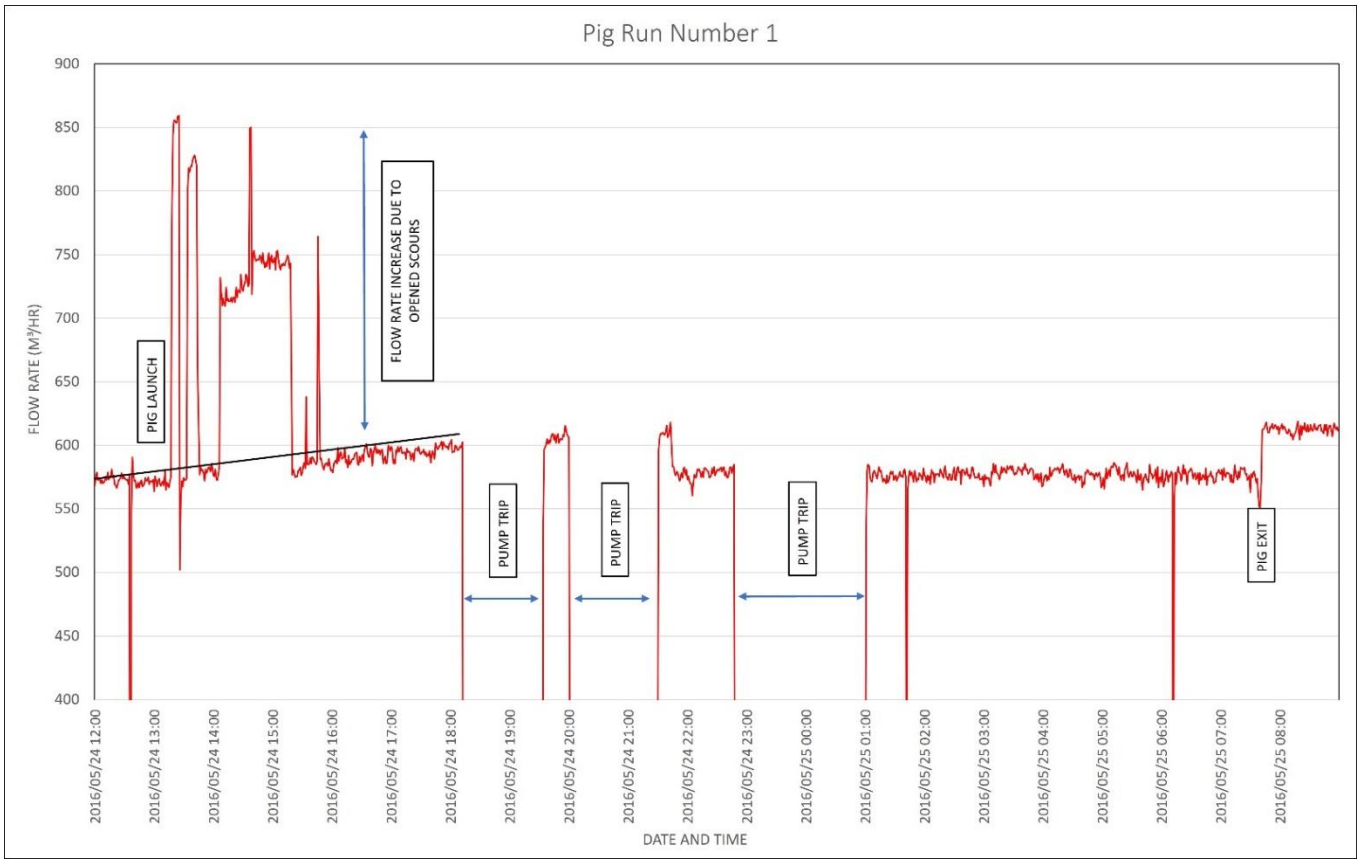

Figure 5-1: Flow Data for Pig Run Number 1

Figure 5-2: Exit of the 435 mm Ø Medium Duty Foam Pig and the Removal of Debris

The pigging process already proves the effectiveness of pigging and the ability that pigs have to clear and remove large foreign object from a pipeline. Furthermore, there is an increase in the flow rate with just a single pig run and therefore improves the hydraulic efficiency of the pipeline. We observe an increased flow rate of approximately 8.83% from the original flow rate.

Based on the flow data extracted from the data logger, an average of the instantaneous flow readings was recorded over a 1-hour period before and after the first pig run. The time taken for the first pig run was recorded to be approximately 7-hours long. Table 5-1 below summarises the flow readings for pig run number 1:

Table 5-1: Summary of Pig Run Number 1

Pig Run Number 1	
Average flow rate one hour prior to pig enter	562.78 m^3/hr
Average flow rate one hour after pig exit	612.49 m^3/hr
Flow rate increase	49.71 m^3/hr or 8.83 %

5.2 Pig Run Number 2 – 440 mm Ø Polyurethane Medium Duty Foam Swab

The second pig selected was a 440 mm diameter polyurethane medium duty foam pig. The second pig selected was 13 mm undersized. Figure 5-3 below illustrate the change in flow rate as the pig travels through the pipeline route. The gradual increase in flow rate can clearly be seen as the pig travels through the pipeline and continues to clean and scrap out deposits on the pipe wall.

Similarly, flow data readings 1 hour prior to the pig entering the pipeline as well as 1 hour flow readings after the pig exited the pipeline pig run number 2 were recorded and plotted as illustrated in Figure 5-3 below:

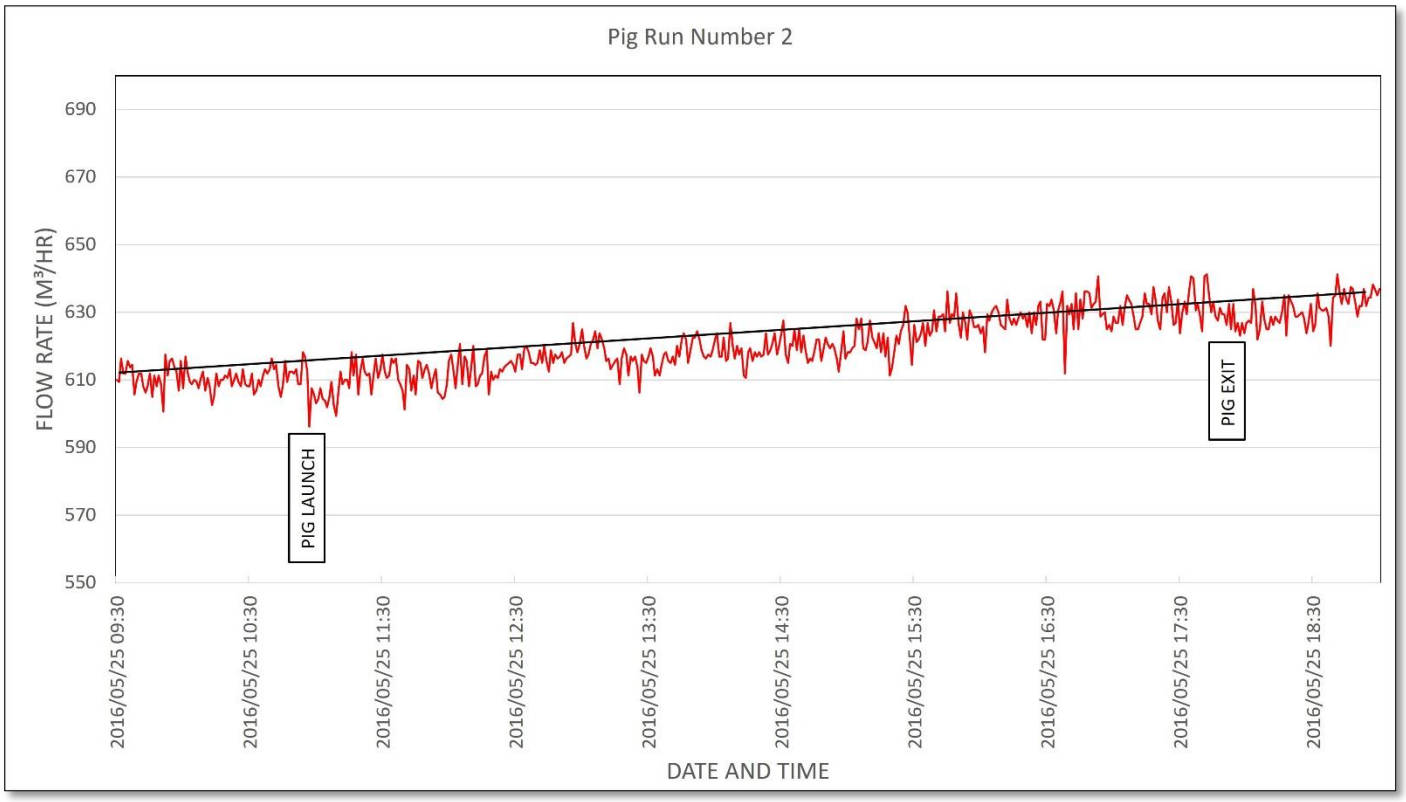

Figure 5-3: Flow Data for Pig Run Number 2

Several large rocks, stones and wooden logs were discharged from the pipeline. Figure 5-4 below shows the exit of the 440 mm Ø medium duty foam pig with the large wooden log. The hydraulic improvement is evident in each pig run and is clear with the increased flow rate. Following pig run number 1 and 2, it is evident that the large objects would reduce the flow rate in the pipeline. Trash screens are currently installed at the Tayside abstraction and should assist with the removal of large objects. In addition, a clarifier is installed between the abstraction and the high lift pump station which would also remove sediments. The screens however should be replaced and upgraded to ensure that further large objects do not enter the line before being pumped to the treatment plant. It is to note, that smaller sediments or silt is the major factor in the flow reduction since further pig runs were required to increase the flow rate. The pigging procedure is therefore vital in cleaning the pipeline and improving the system characteristics.

Figure 5-4: Exit of the 440 mm Ø Medium Duty Foam Pig and the Removal of Debris

Based on the flow data extracted from the data logger, again the average of the instantaneous flow readings was recorded over a 1-hour period before and after the second pig run. The time taken for the second pig run was recorded to be approximately 6 hours and 35 minutes long.

Table 5-2 below summarises the flow readings for pig run number 2:

Table 5-2: Summary of Pig Run Number 2

Pig Run Number 2	
Average flow rate one hour prior to pig enter	610.32 m^3/hr
Average flow rate one hour after pig exit	630.95 m^3/hr
Flow rate increase	20.62 m^3/hr or 3.38 %
Accumulated flow rate increase	68.17 m^3/hr or 12.12 %

5.3 Pig Run Number 3 – 460 mm Ø Polyurethane Medium Duty Foam Swab

The third pig selected was a 460 mm diameter polyurethane medium duty foam pig. This was the first pig that was oversized as compared to nominal internal diameter of the pipeline (453 mm diameter). The third pig selected was 7 mm oversized.

Flow data reading for pig run number 3 were recorded and plotted as illustrated in Figure 5-5. Based on Figure 5-5, it can be seen that there is a significant increase in

the flow rate as the pig travels through the pipeline. With the use of an oversized pig, it can be concluded that this pig dislodged and removed a far larger amount of silt and mud from the pipeline as compared to pig run number 1 and pig run number 2. The reason for this increase in flow is due to the silt being removed from the pipeline walls and additional water was required to fill this void as the pig travelled through the pipeline. The hydraulic improvement on pig run number 3 is calculated to be an increase of 21.58 % from the original flow rate.

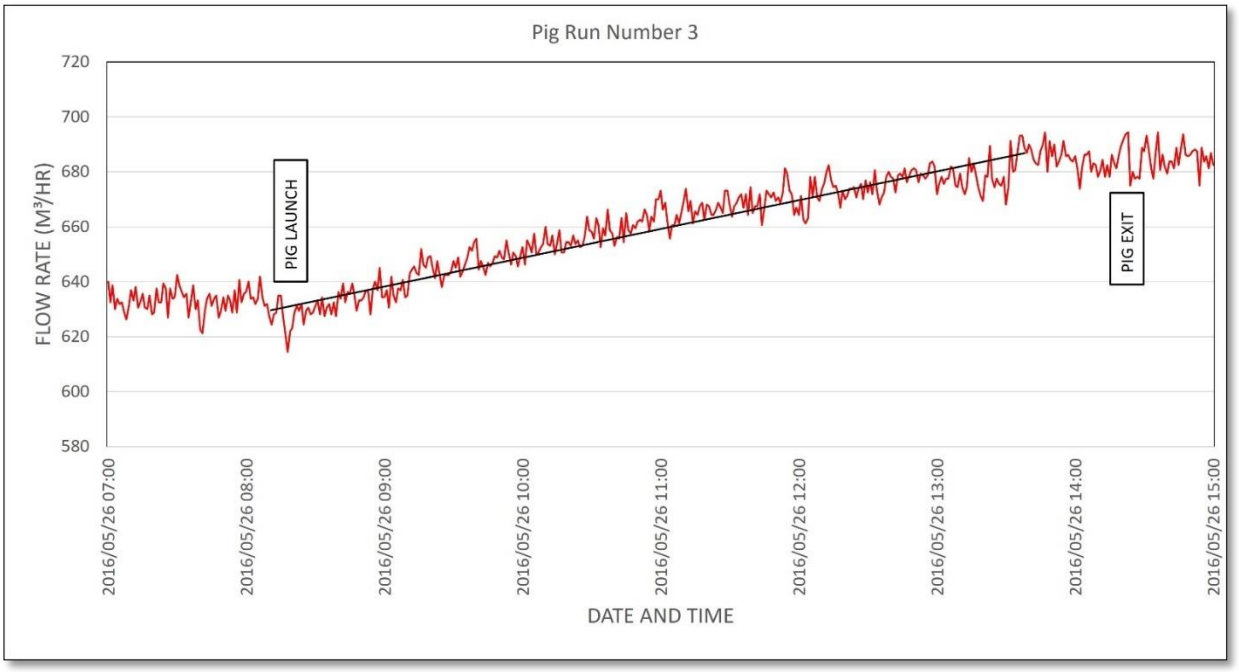

Figure 5-5: Flow Data for Pig Run Number 3

Based on the flow data extracted from the data logger, and again the average of the instantaneous flow readings was recorded over a 1-hour period before and after the third pig run. The time taken for the third pig run was recorded to be approximately 5 hours and 14 minutes long.

Table 5-3 below summarises the flow readings for pig run number 3:

Table 5-3: Summary of Pig Run Number 3

Pig Run Number 3	
Average flow rate one hour prior to pig enter	633.06 m^3/hr
Average flow rate one hour after pig exit	684.20 m^3/hr
Flow rate increase	51.15 m^3/hr or 8.10 %
Accumulated flow rate increase	121.42 m^3/hr or 21.58 %

5.4 Pig Run Number 4 – 470 mm Ø Polyurethane Medium Duty Foam Swab

The fourth pig selected was a 470 mm diameter polyurethane medium duty foam pig. This was the second pig that was oversized as compared to nominal internal diameter of the pipeline. The third pig selected was 17 mm oversized.

Flow data reading for pig run number 4 were recorded and plotted as illustrated in Figure 5-6. It can be seen in Figure 5-6, that there still is an increase in the flow rate. Previous pig runs have removed a significant amount of silt build-up and therefore subsequent pig runs will not have a drastic increase in the flow rate (Although a flow rate increase is still observed). The hydraulic improvement on pig run number 4 is calculated to be an increase of 24.33 % from the original flow rate.

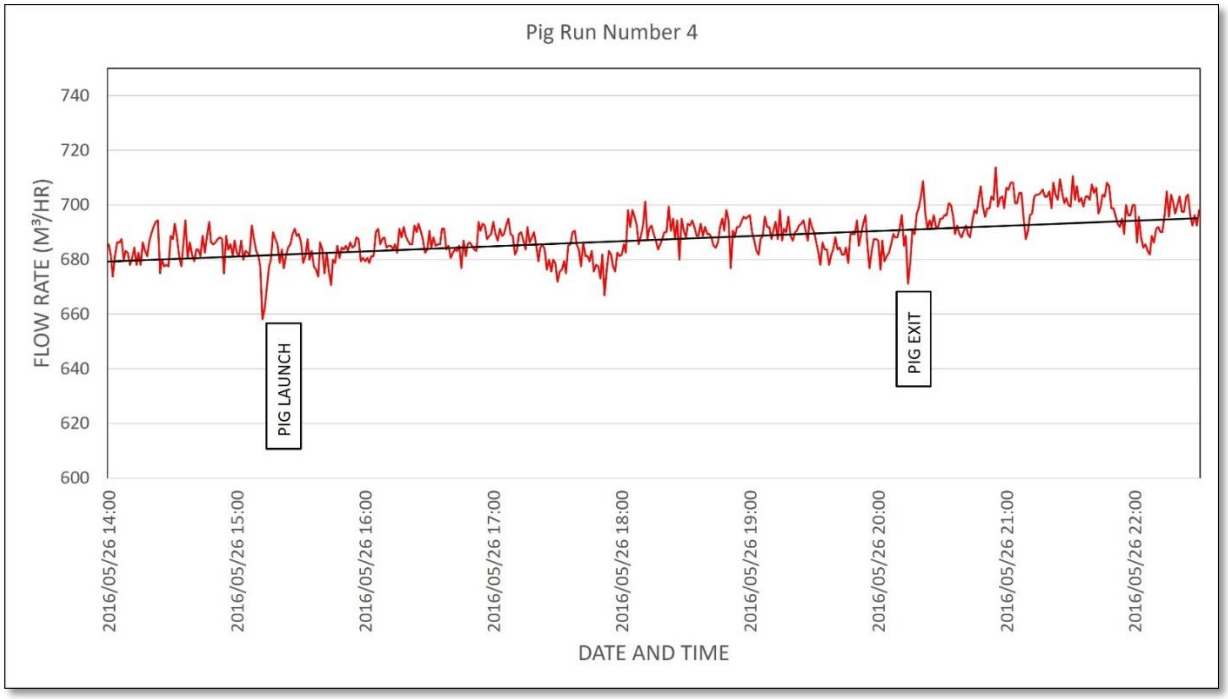

Figure 5-6: Flow Data for Pig Run number 4

The time taken for the fourth pig run was recorded to be approximately 5 hours and 3 minutes long. Table 5-4 below summarises the flow readings for pig run number 4:

Table 5-4: Summary of Pig Run Number 4

Pig Run Number 4	
Average flow rate one hour prior to pig enter	684.20 m^3/hr
Average flow rate one hour after pig exit	699.71 m^3/hr
Flow rate increase	15.50 m^3/hr or 2.27 %
Accumulated flow rate increase	136.93 m^3/hr or 24.33 %

5.5 Pig Run Number 5 – Second Run of the 470 mm Ø Polyurethane Medium Duty Foam Swab

The fifth pig used was a re-run of the 470 mm diameter polyurethane medium duty foam pig and was 17 mm oversized. The reason to re-enter the 470 mm diameter foam pig into the pipeline was because there were still small and large objects such as rocks and stones being discharged from the pipeline. If an RCC pig which is more abrasive enters the pipeline, it will damage the pipe lining. The damage of the pipe lining may occur if the RCC pig becomes stuck within the pipeline and wedges stones and rocks between the pipe and the pig. This is further supported according to Ellison (2003), as it states that abrasive pigs may damage the pipe walls and lining. Aggressive cleaning of the pipeline can expose the pipe walls and cause severe corrosion after some time (Ellison, 2003). Once the stones and rocks are removed, more abrasive pig types can be used.

Flow data reading for pig run number 5 were recorded and plotted as illustrated in Figure 5-7 below:

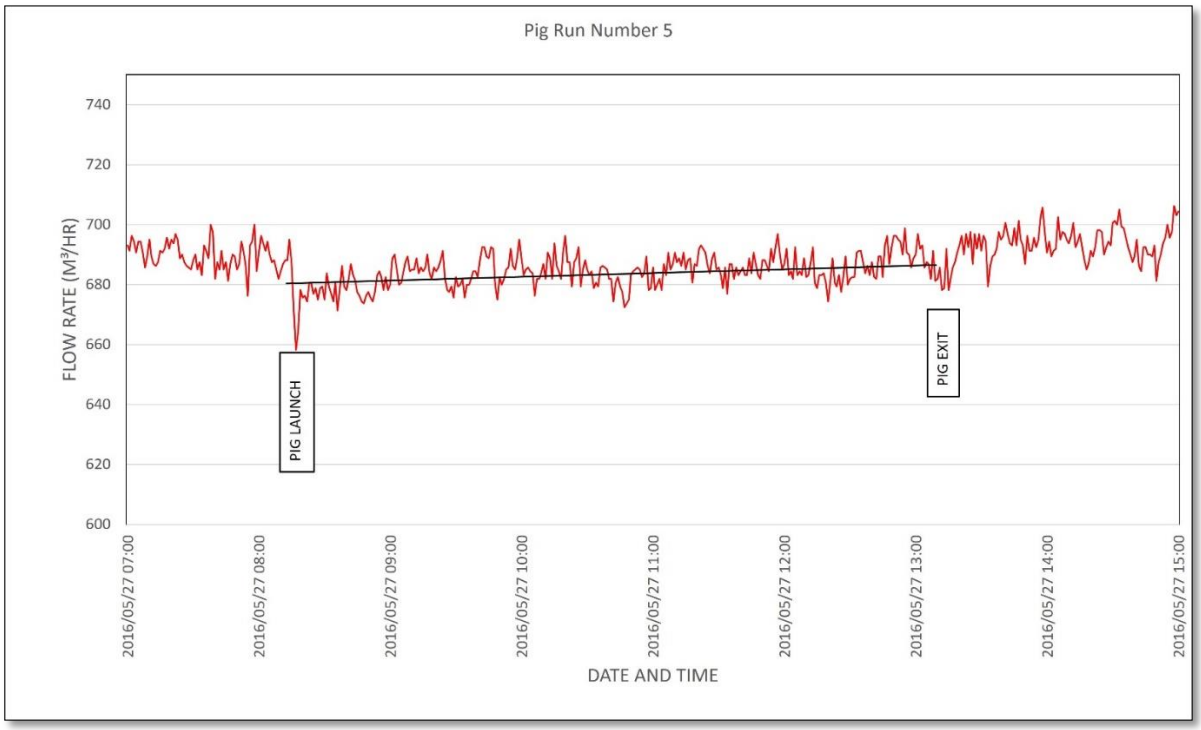

Figure 5-7: Flow Data for Pig Run number 5

The hydraulic improvement on pig run number 5 is calculated to be an increase of 23.32 % from the original flow rate. The time taken for the fifth pig run was recorded

to be approximately 5 hours and 4 minutes long. Table 5-5 below summarises the flow readings for pig run number 5:

Table 5-5: Summary of Pig Run Number 5

Pig Run Number 5	
Average flow rate one hour prior to pig enter	689.89 m^3/hr
Average flow rate one hour after pig exit	694.04 m^3/hr
Flow rate increase	4.15 m^3/hr or 0.60 %
Accumulated flow rate increase	131.26 m^3/hr or 23.32 %

5.6 Pig Run Number 6 – 445 mm Ø Polyurethane Medium Duty Criss Cross (RCC) Pig

The sixth pig selected was a 445 mm diameter polyurethane medium duty Criss cross pig. This was the first RCC pig used and was 8 mm undersized.

More abrasive pigs can be utilised where harder scales and sediments exist within the pipeline. When using more abrasive pigs, caution must be taken as the abrasive pig may damage the pipe walls and lining (Ellison, 2003). In the case of the Tayside rising main, minor hard scales were encountered. These hard scales typically include calcium, sediments or iron sulphides which are more difficult to remove (Cordell and Vanzant, 2003). Therefore, RCC pigs were utilised to remove the minor hard scales.

A coated foam pig is utilised to remove any hard scales and where extra abrasion is required. The RCC foam pig is coated with elastomer coatings. However this is still flexible enough to pass through any minor pipe reductions and bends.

Flow data reading for pig run number 6 were recorded and plotted as illustrated in Figure 5-8 below:

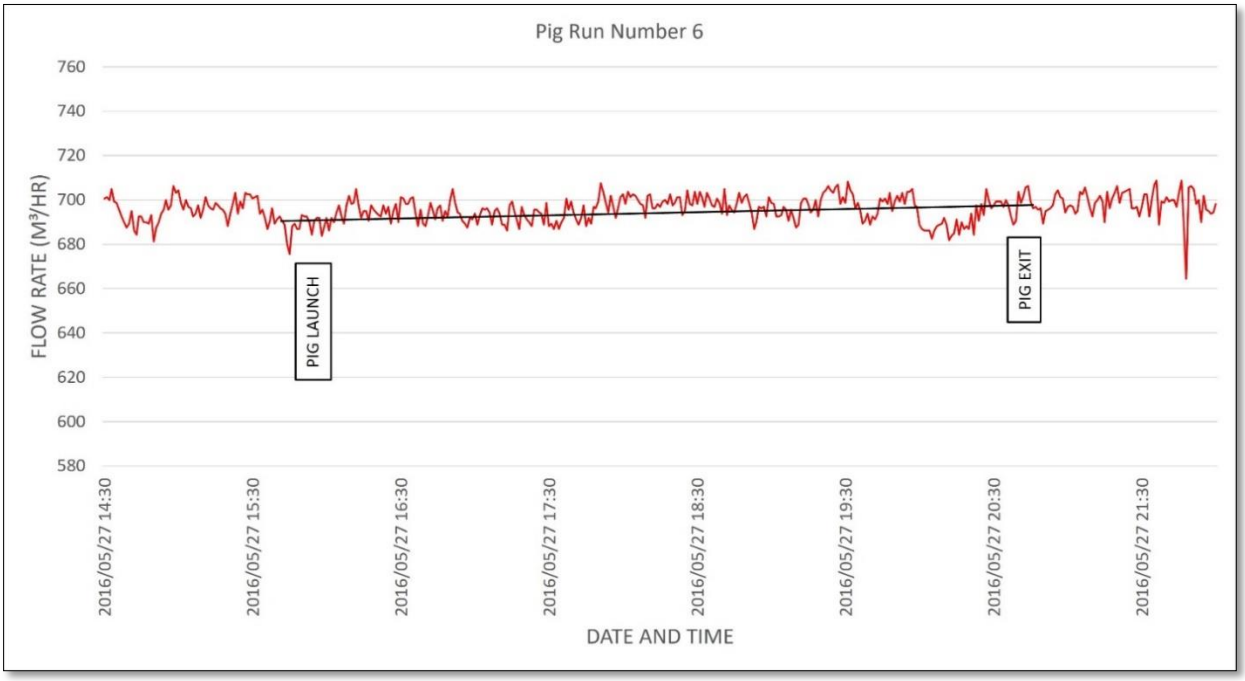

Figure 5-8: Flow Data for Pig Run Number 6

As the pipe is cleaned and silt removed for the pipeline after each pig run, the flow rate increase reaches a baseline and reaches close to the design flow rate (However taking into consideration normal wear and tear after time). The hydraulic improvement on pig run number 3 is calculated to be an increase of 24.23 % from the original flow rate. The time taken for the fifth pig run was recorded to be approximately 4 hours and 59 minutes long. Table 5-6 below summarises the flow readings for pig run number 6:

Table 5-6: Summary of Pig Run Number 6

Pig Run Number 6	
Average flow rate one hour prior to pig enter	695.75 m^3/hr
Average flow rate one hour after pig exit	699.14 m^3/hr
Flow rate increase	3.39 m^3/hr or 0.5 %
Accumulated flow rate increase	136.36 m^3/hr or 24.23 %

5.7 Pig Run Number 7 and 8 – 2 X 460 mm Ø Polyurethane Medium Duty Criss Cross (RCC) Pig

The final pig run was done as a pig train. A pig train refers to inserting two of more pigs into a pipeline at different time intervals. The seventh pipe pig and eighth pipe pig was a 460 mm diameter polyurethane medium duty Criss cross pig. The two pigs

however were entered at approximately 4 hours apart. Both the pigs were of the same diameter and type and was 7 mm oversized.

Entering two pigs during the same pig run is proven to be more effective than running two pigs separately. The reason for this is that the initial pig scrapes off accumulation from the pipe walls and the following pig pushes this debris out of the pipeline before it settles down again (Tiratsoo, 1992). At the start of the 7th and 8th pig run, it is noted that the flow rate had dropped following the 6th pig run. The reasoning behind this is not known for certain however the flow rate drop is assumed to be due to the result of mobilising silt and sediment which then settle within the pipeline without exiting. The settled silt and sediment will therefore reduce the flow rate. Another reason is due to the release of trapped air within the pipeline. During the pigging process, air is pushed through the pipe and will escape at one end of the pipeline (Apache Pipeline Products, 2017).

Flow data reading for pig run number 7 and pig run number 8 were recorded and plotted as illustrated in Figure 5-9 below:

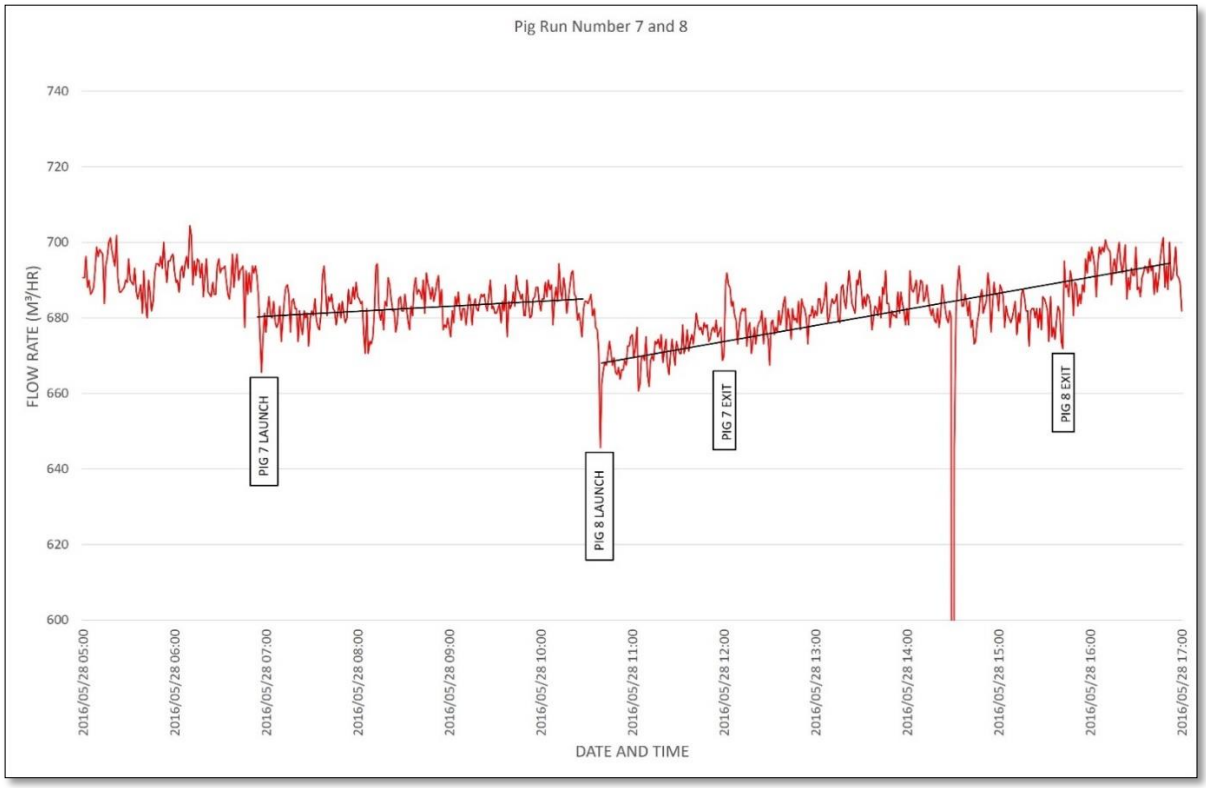

Figure 5-9: Flow Data for Pig Run Number 7 and Pig Run Number 8

The time taken for the final pig run was recorded to be approximately 4 hours and 59 minutes long. Table 5-7 below summarises the flow readings for pig run number 7 and 8:

Table 5-7: Summary of Pig Run Number 7 and 8

Pig Run Number 7 and 8	
Average flow rate one hour prior to pig enter	691.61 m^3/hr
Average flow rate one hour after pig exit	693.23 m^3/hr
Flow rate increase	1.62 m^3/hr or 0.2 %
Accumulated flow rate increase	136.36 m^3/hr or 24.23 %

5.8 Flow Data Summary of the Pigging Procedure

Figure 5-10 below illustrates the change in flow rate over the durations of the pigging procedure. The change in flow rate for each pig is highlighted and indicates the period in which the pigs entered and exited the pipeline. It is clearly seen from Figure 5-10 that there is a significant flow rate increase from the beginning of the pigging procedure to the end of the procedure. It is however noted that a slight decrease is seen immediately after pig run number 8. Again, the reason for this is not know for certain however it is assumed to be due to the result of mobilising silt and sediment which then settle within the pipeline without exiting. The settled silt and sediment will therefore reduce the flow rate.

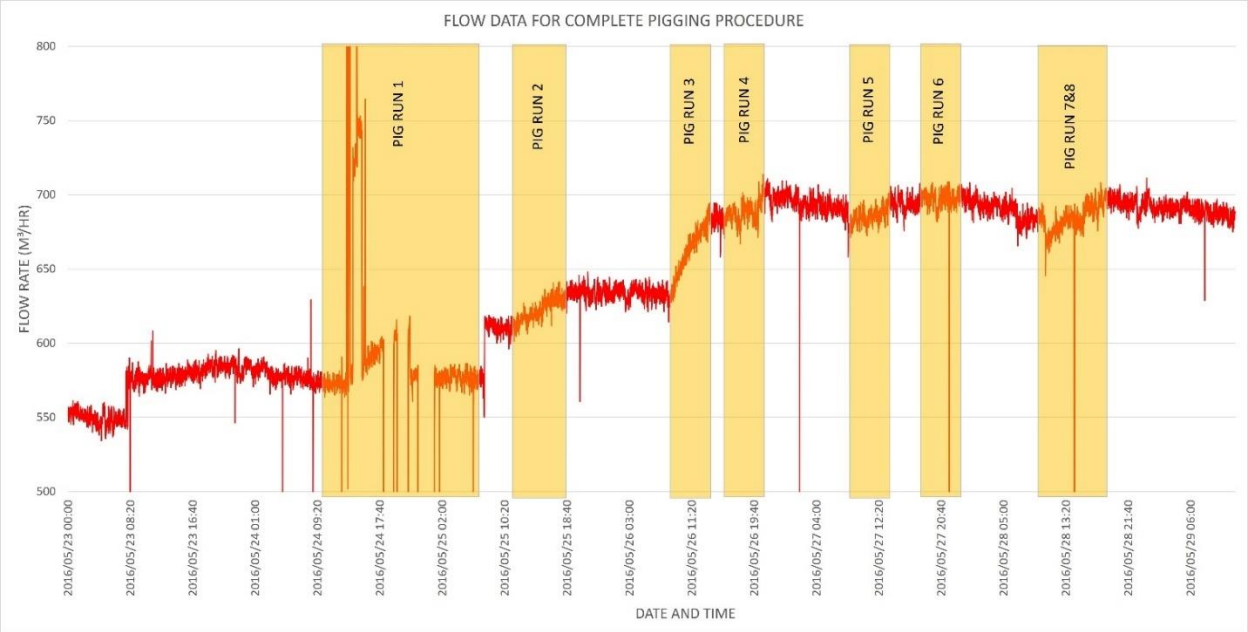

Figure 5-10: Flow Data for Complete Pigging Procedure

Table 5-8 below shows the summary of the flow rate increase for each pig. It can be concluded that the result of the pigging procedure is a net flow increase of 130 m^3/hr which is a resultant supply increase of 3120 kℓ/day or 3,12 Mℓ/day. This gives a significant total improvement in flow rate of 23.9 %.

Table 5-8: Summary of Flow Increases

	m^3/hr	m^3/hr	m^3/hr	%	%
Pig 1 before	562.78	49.71	130.45	8.83%	23.9%
Pig 1 after	612.49				
Pig 2 before	610.32	20.63		3.38%	
Pig 2 after	630.95				
Pig 3 before	633.06	51.14		8.10%	
Pig 3 after	684.20				
Pig 4 before	684.20	15.51		2.27%	
Pig 4 after	699.71				
Pig 5 before	689.89	4.15		0.6%	
Pig 5 after	694.04				
Pig 6 before	695.75	3.39		0.5%	
Pig 6 after	699.14				
Pig 7&8 before	691.61	1.62		0.2%	
Pig 7&8 after	693.23				

5.9 The Effect of Seasonal Flow Rate Variation on Pumping Performance Flow Data Summary from 2017 to 2020

Following the pigging procedures completed in 2016 on the Tayside High lift pipeline, uThukela Water continued to record flow rate readings monthly. This data was requested from uThukela Water to determine the change in flow rate throughout the year and to determine the effect of pigging on the pipeline. The additional data would assist in understanding the system flow rates. Flow rate raw data from 2017 to 2020 can be seen in Appendix D. uThukela Water also decided to undertake their own internal pigging procedures of which will be discussed below for each year. The flow rate data received however did not include the instantaneous flow rate as the pig travelled through the pipeline. The flow rates recorded was a cumulative monthly flow for each month throughout the year and was utilised to assess the optimal interval of the cleaning.

Figure 5-11 below illustrates the change in monthly flow rate throughout the year 2017. It is noted that since the initial pigging procedure done in May 2016, the flow rate decreased from 693,23 m3/hr to 552,48 m3/hr in January 2017. This is a decrease of 140,75 m3/hr in 7 months. It is evident that there is a significant decrease in flow rate during the summer months (i.e., December to March) due to stormwater discharge into the river during the rainy periods which subsequently increases the silt build-up in the pipeline. This is confirmed in Figure 5-12 which illustrates the 2017 river flow in the Buffalo River.

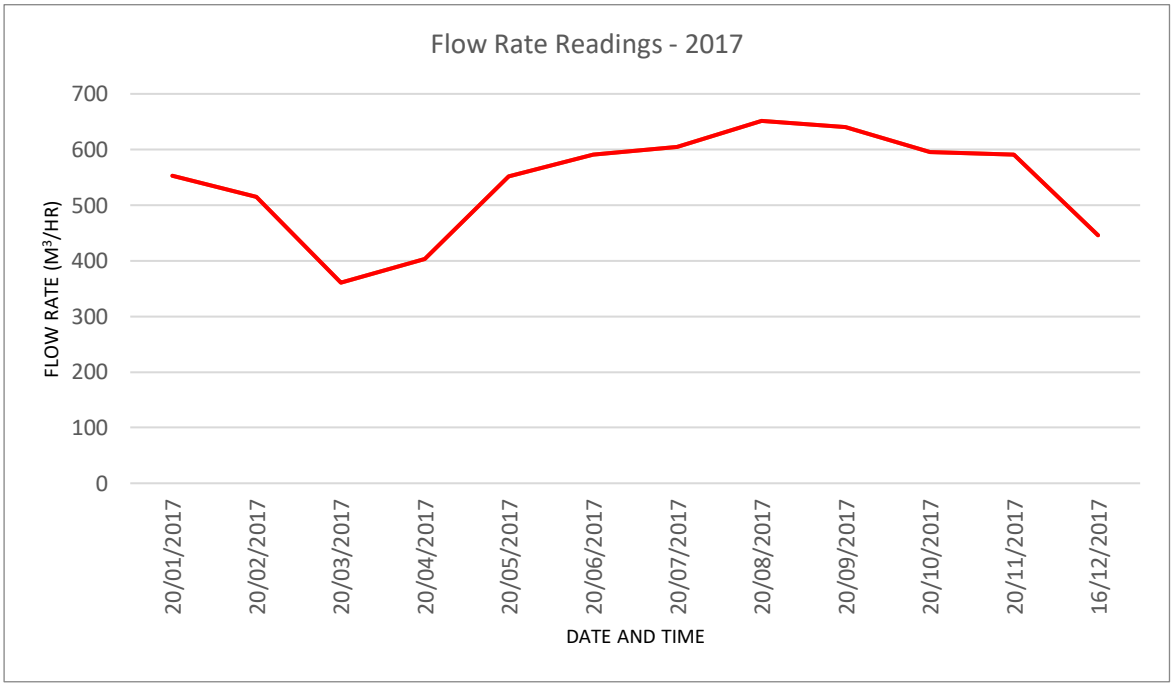

Figure 5-11: Flow Rate Readings – 2017

Based on river flow data from the Department of Water and Sanitation for the Buffalo River at Tayside, the highest flows are in the summer months. This proves that increased stormwater discharge into the river during the rainy periods effects the flow rate within the pipeline due to increased silt build-up.

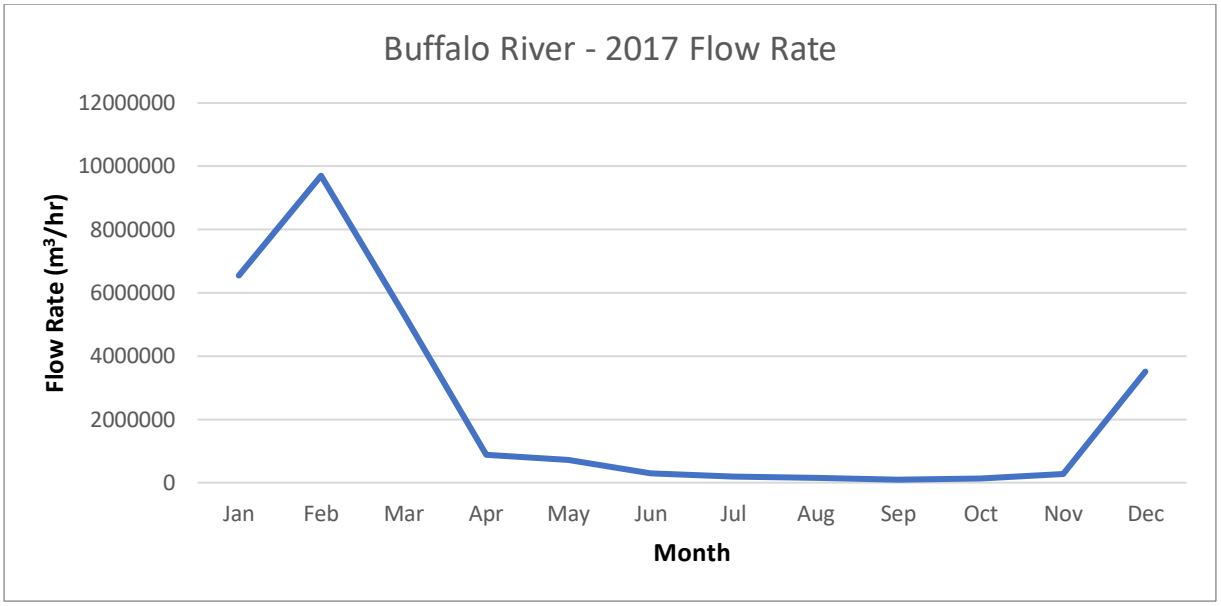

Figure 5-12: Buffalo River Flow Rates 2017 (DWS, 2023)

In May 2017, a single pigging operation to increase the flow rate to meet the design flow rate of the pipeline was done. After the pigging operation, the flow rate increased to approximately 591,03 m3/hr. This flow rate is the rate recorded the month after the pigging procedure was completed. No available flow rate data was available to determine the flow rate directly before and directly after the pigging procedure.

Reviewing the flow rates received from 2017, a pigging operation would have been more beneficial in the month of March since this was recorded as the lowest monthly flow rate.

Figure 5-13 below illustrates the change in flow rate monthly throughout the year 2018. The flow rate throughout the year 2018 was relatively consistent. No additional pigging procedures were completed during 2018. Although the flow rate was recorded to be relatively constant, it is to be noted that flow rates throughout 2018 did not reach the peak flow rates as recorded in 2017, 2019 and 2020. This suggests that a pigging procedure would have been beneficial to the operations of the pipeline. Figure 5-14 illustrates the yearly river flow rate for the Buffalo River in 2018. Again, the river flows confirms that the highest flows are during the summer/rainy periods of the year.

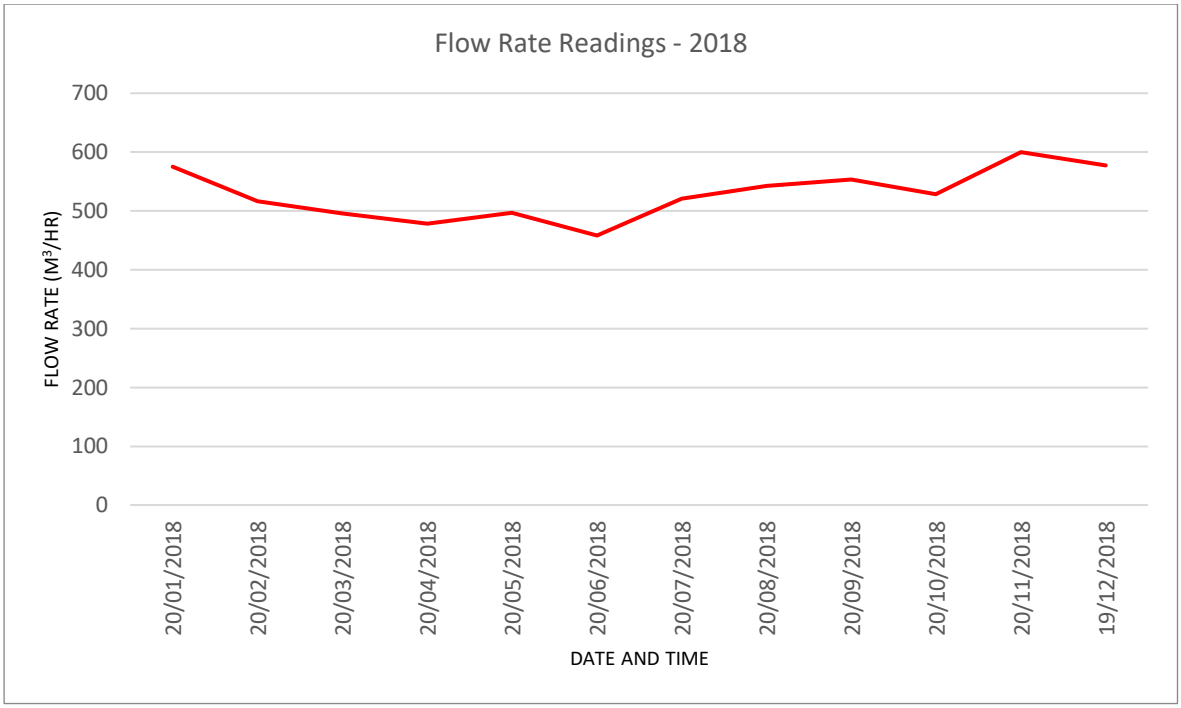

Figure 5-13: Flow Rate Reading - 2018

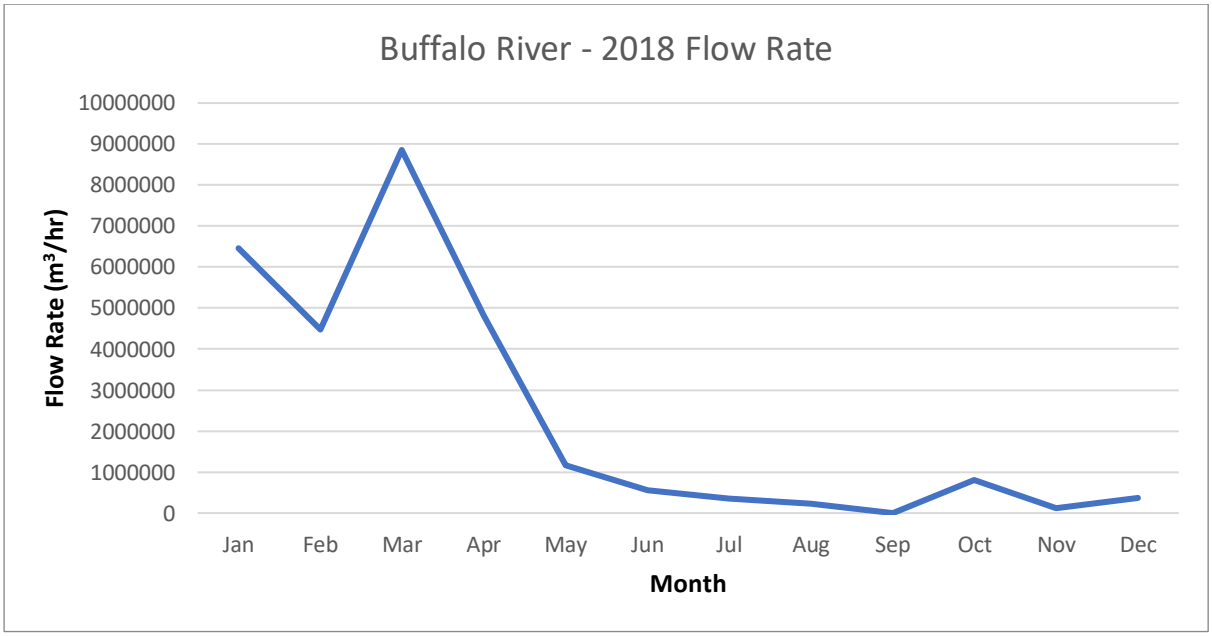

Figure 5-14: Buffalo River Flow Rates 2018 (DWS, 2023)

Figure 5-15 below illustrates the change in flow rate monthly throughout the year 2019. The flow rate readings, once again the most significant flow rate decrease is during the summer rainy months. There is a decrease from 580,07 m^3/hr in January 2019 to 468,87 m^3/hr in March 2019. This is a decrease of 111,20 m^3/hr in approximately 3

months. Figure 5-16 confirm that the highest river flow rate is during the summer rainy months.

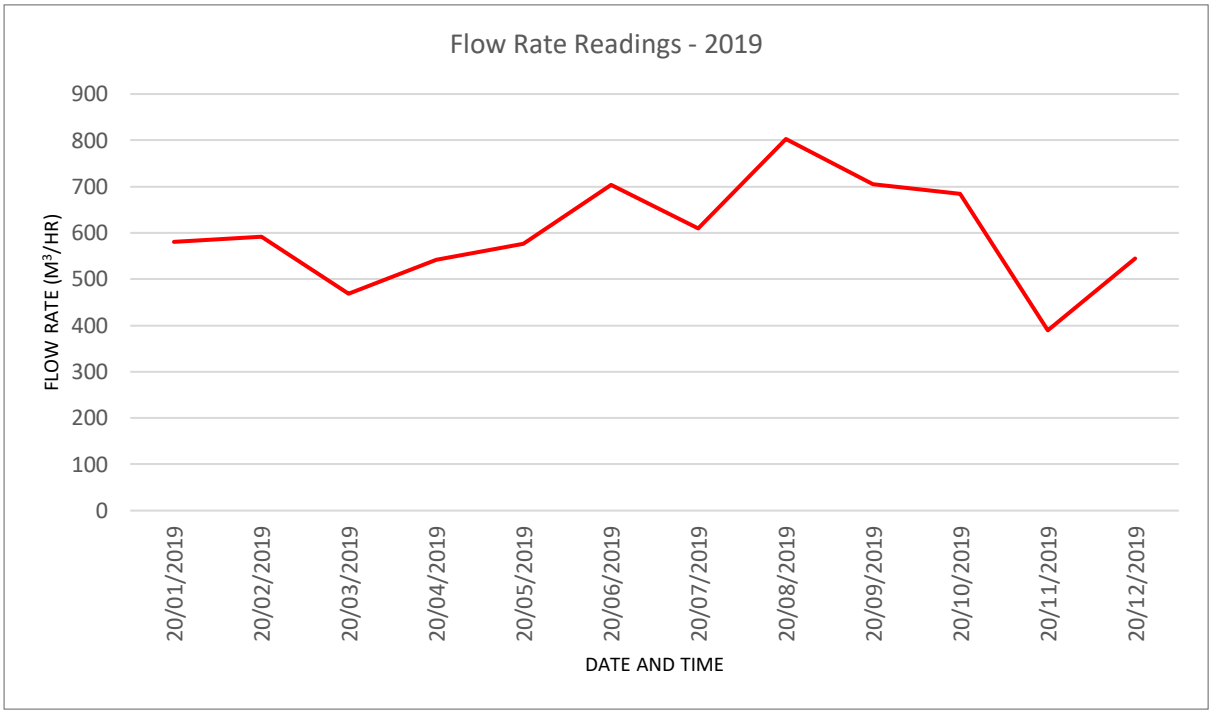

Figure 5-15: Flow Rate Readings - 2019

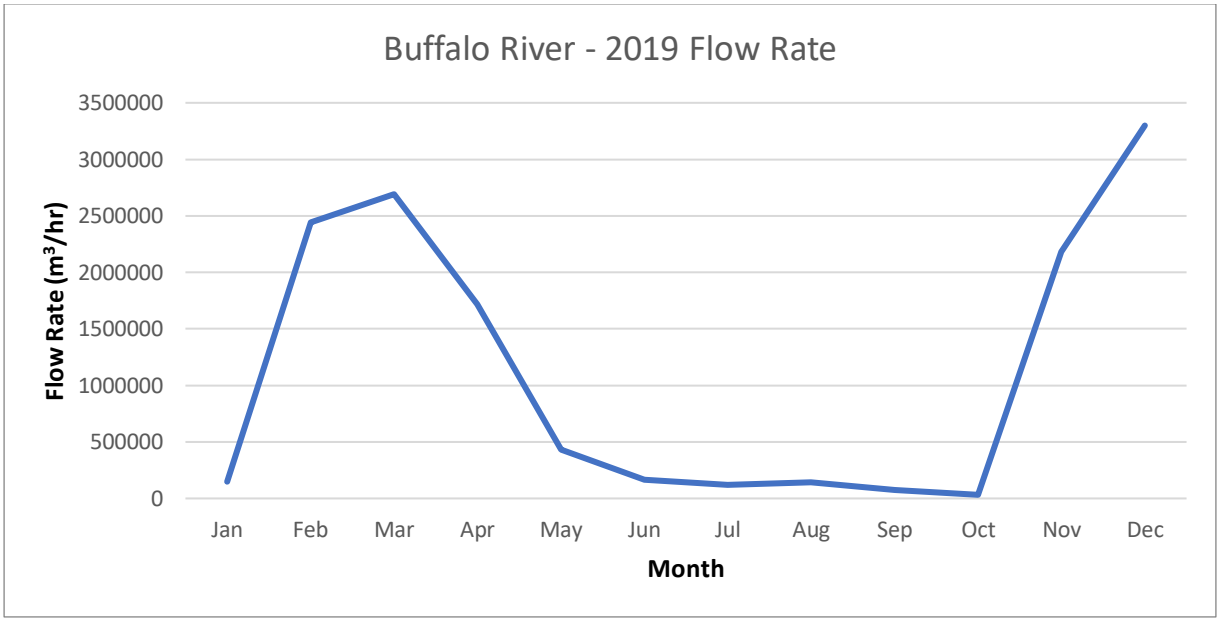

Figure 5-16: Buffalo River Flow Rates 2019 (DWS, 2023)

In May 2019, a single pigging operation to increase the flow rate to meet the design flow rate of the pipeline was done. After the pigging operation, the flow rate increased to approximately 704,31 m3/hr. Reviewing the 2019 flow rate data, it is noted that there is an irregular flow rate decrease from June to July. The reason for this is

unknown although it could likely be attributed to pump faults, electrical failures or general pump and pipeline maintenance.

Figure 5-17 below illustrates the change in flow rate monthly throughout the year 2020. Based on the flow rate readings, again and similarly to the years 2017 and 2019, the most significant flow rate decrease is during the summer rainy months. Figure 5-18 confirms the highest river flow rates are during the summer months.

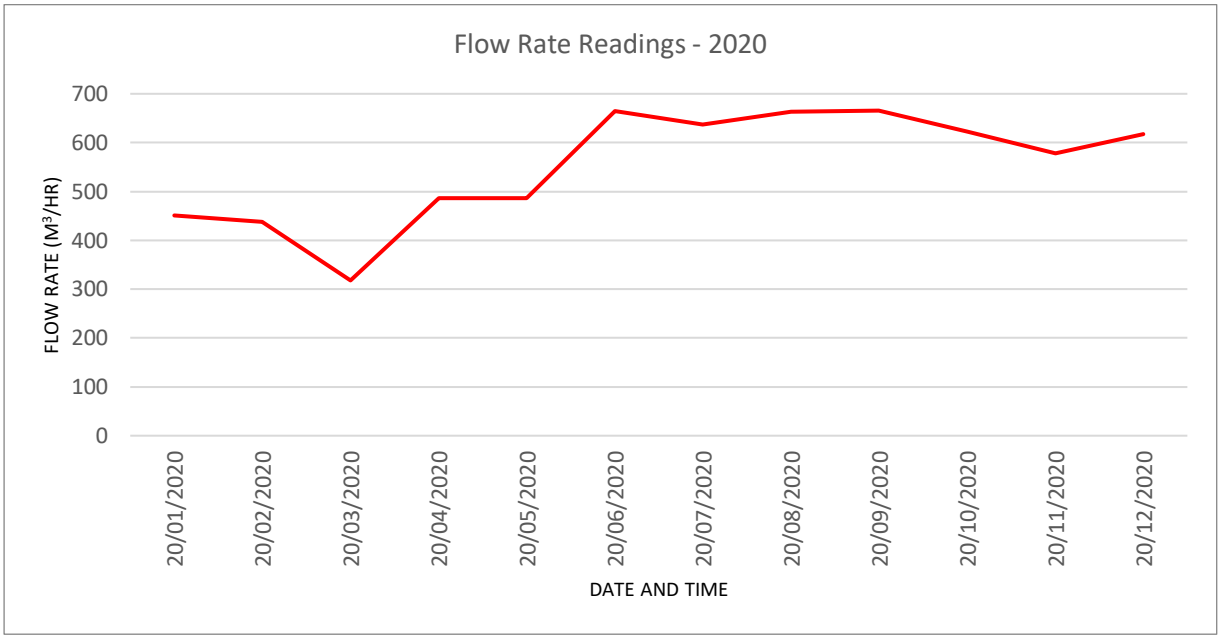

Figure 5-17: Flow Rate Readings - 2020

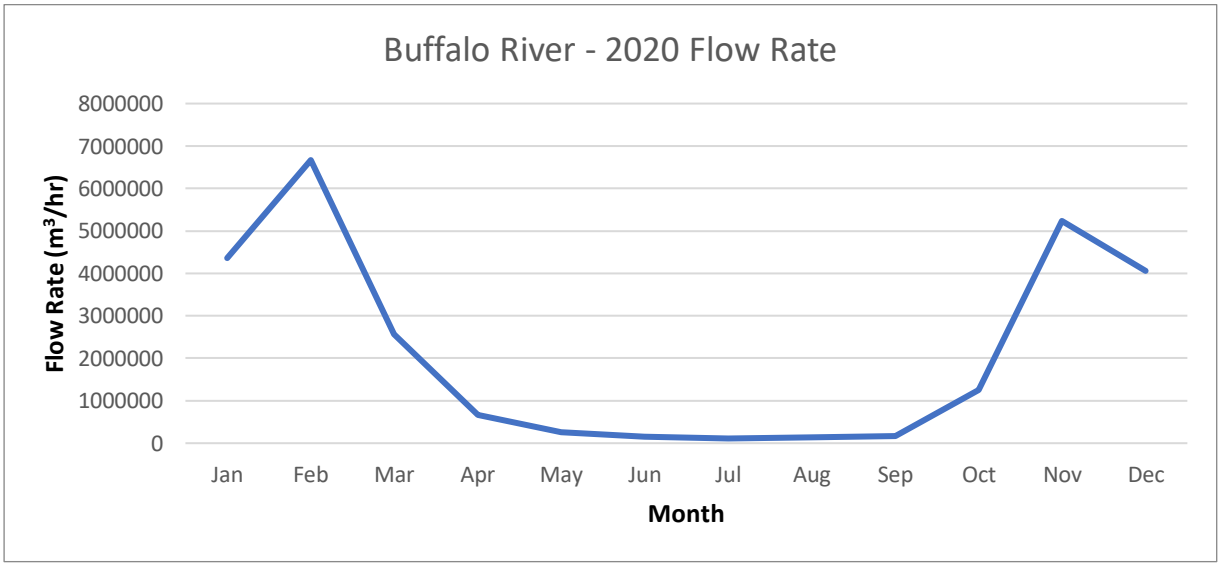

Figure 5-18: Buffalo River Flow Rates 2020 (DWS, 2023)

There is a decrease from 450,61 m^3/hr in January 2020 to 317,88 m^3/hr in March 2020. This is a decrease of 132,73 m^3/hr in approximately 3 months. In May 2020, uThukela Water decided to undertake a single pigging operation to increase the flow rate to meet the design flow rate of the pipeline. After the pigging operation, the flow rate increased to approximately 663,95 m^3/hr. After the pigging procedure, the flow rate was recorded to be relatively consistent throughout the year until December 2020. Once again, it is to be noted that a pigging procedure done during the month of March would have been more beneficial since the lowest monthly flow rate is recorded in March. This would therefore improve the monthly flow rates for the remainder of the year as it would remove sedimentation and improve the operation of the pipeline.

Based on the data received from uThukela Water from 2017, 2019 and 2020, it is evident that yearly cleaning/pigging is necessary to improve the flow rate, increase the flow rate and to ensure that the supply meets the demand throughout the year. Although pigging was not required in the year 2018, it is noted that the average yearly flow rate from 2017 to 2020 was calculated to be the lowest during 2018. A pigging operation done during the year would have therefore increased the average yearly flow rate. The average yearly flow rates are summarised in Table 5-9 below:

Table 5-9: Summary of Average Yearly Flow Rates from 2017 to 2020

Year	Average Yearly Flow Rate (m^3/hr)
2017	542,01
2018	528,53
2019	599,88
2020	552,29

Table 5-10 below summarises the flow rate changes from 2017 to 2020 before and after each pigging procedure. The flow rates summarised is from the month the pigging operation was undertaken and the flow rate recorded for the following month.

Table 5-10: Summary of Flow Rates from 2017 to 2020

Year	Flow Rate Before pigging (m^3/hr)	Flow Rate After pigging (m^3/hr)
2017	551,74	591,03
2018	Pigging not done	
2019	576,54	704,31
2020	486,11	663,95

The data from 2017 to 2020 provides further backing in determining the optimal pigging interval. Reviewing the data suggests that the river flow rate must be considered when determining the optimal pigging interval.

Chapter 6: Determining the Appropriate interval for Pigging

To determine the optimal pigging interval, the hydraulic improvements and economic viability of pigging would need to be analysed. Utilising the electrical demands of the Tayside pumps, the pumping cost savings are calculated and compared to the cost of constructing and operating the pigging infrastructure using life cycle costing analysis. The flow rate improvements and pipe roughness factors are calculated to determine the hydraulic improvements. Utilising both the hydraulic improvements and life cycle costing analysis, an approach for determining the appropriate pigging interval is proposed.

6.1 Average Electrical Demands

Following the flow rate data analysis in the previous Chapter, it was determined that there was a 23.9% increase from the original design flow rate from the 8 pigging runs made from 23 May 2016 to 29 May 2016. This means that the sediment build-up within the pipeline was significantly reduced, and this consequently improved the hydraulic efficiency, reducing the friction loss and thus decreasing the pressure loss of the pipeline and the operation costs of pumping water through the pipeline.

Power consumption in pumping was monitored using a power data logger installed in the motor control centre for the high lift pumps. This recorded the average single phase power demand in kW (real/actual power) and kVA (apparent power) as well as the line voltage on each phase. Since the extracted data was recorded as single-phase power and voltage, the power will therefore need to be converted to three-phase power and voltage. The reason for this is that the Tayside pumps are industrial motors and can only operate using a three-phase power supply. The three-phase readings represent the peak power and usage in an electrical system. The three-phase apparent power calculated will represent the electricity demand for the Tayside pumps. Utilising the method and equations as described in Chapter 3, the single-phase power is converted to three-phase power. The actual data for this process are presented in Appendix E.

The calculated electrical demand in kVA for the Tayside high lift pumps versus time for the duration of the pigging is illustrated in Figure 6-1 below:

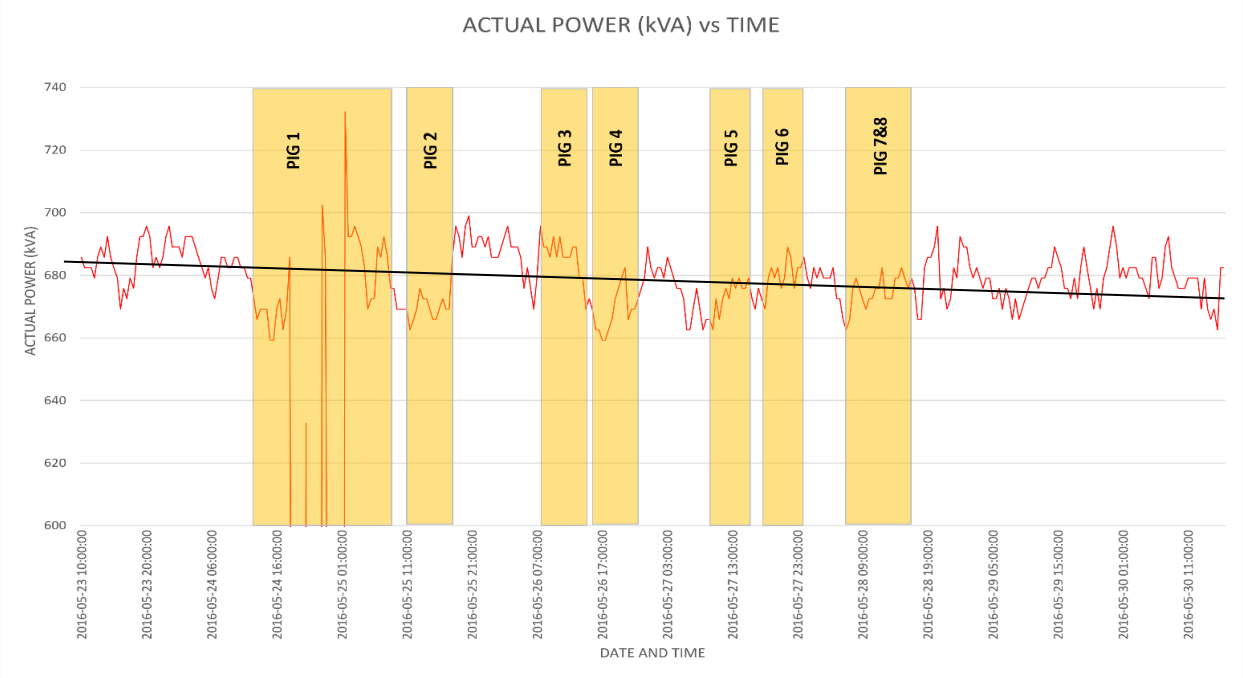

Figure 6-1: Actual Power (kVA) vs Time

Utilising the calculated actual power, the average electrical demand is calculated before and after the pigging process. A 24-hour period prior to the pigging and a 24-hour period after the pigging was used for this. This would provide an understanding of the electrical demand increase or decrease. The averages and the changes in electrical demands are summarised in Table 6.1. According to Table 6-1, there is a decrease in the actual power of 4.10 kVA. This means that the Tayside pumps were operating with a slightly less electrical demand. Although there was an increase in the water delivery from the pumps, the net electrical consumption decreased.

Table 6-1: Summary of Electrical Demand Difference Before and After Pigging

Description	Actual Power (kVA)	Actual Power difference (kVA)	Percentage difference
24 hours prior to pigging	684.66	-4.10	-0.6 %
24 hours after pigging	680.56		

6.2 Cost of Operating the Tayside High Lift Pumps

To further assess the benefits of pipeline pigging, the estimated cost of operating the pumps before and after pigging were calculated. Utilising the actual power required to operate the pumps as calculated in Table 6-1, the cost per year is calculated. This cost is further translated as a cost in delivering water per kilolitre since there is a significant increase in the flow rate after pigging.

The costs calculation is based on the Eskom Tariffs for the Tayside area, which is Rural Flex Tariffs as described in Section 3.5 of Chapter 3. The pumping costs are calculated based on an actual power of 684.66 kVA (before pigging) and an actual power of 680.56 kVA (after pigging). The below computation utilises the average flow rate prior to pigging and assumes that the flow rate after is maintained for a year. Table 6-2 below breaks down the annual cost and cost per kilolitre before and after the pigging process:

Table 6-2: Estimated Energy Costs of the Tayside High Lift Pumps

Estimated Energy Costs of the Tayside High Lift Pumps				
Eskom Tariff description	**Period (Peak/Standard/Off-Peak)**	**Rate (Rands)**	**Pumping Cost requirements before pigging**	**Pumping Cost requirements after pigging**
Service Charge (R/Account/day)	All	R 155,12	R 56 618,80	R 56 618,80
Administration Charge (R/POD/day)	All	R 35,87	R 13 092,55	R 13 092,55
Distribution Network Demand Charge (cent/kWhr)	All	R 0,19	R 1 003 330,12	R 997 321,81
Distribution Network Capacity Charge (R/kVA/month)	All	R 13,96	R 114 694,24	R 114 007,41
Active Energy Charge - Low Season (cent/kWhr)	Peak	R 0,86	R 142 618,94	R 141 764,89
	Standard	R 0,59	R 882 927,87	R 877 640,57
	Off-peak	R 0,38	R 871 217,51	R 866 000,34
Active Energy Charge - High Season (cent/kWhr)	Peak	R 2,65	R 145 708,72	R 144 836,16
	Standard	R 0,80	R 397 277,96	R 394 898,91
	Off-peak	R 0,44	R 335 509,95	R 333 500,79
Reactive Energy Charge - High Season (cent/kVa)	All	R 0,07	R 108 257,07	R 107 608,79
Ancillary Service Charge (cent/kWhr)	All	R 0,33	R 1 741 709,31	R 1 731 279,31
Average Electrical Cost per Annum			R 5 812 963,05	R 5 778 570,31
Average Electrical Cost per Month			R 484 413,59	R 481 547,53
Average Cost to deliver 1 kiloliter			R 1,20 Flow rate = 562.78 m3/hr	R 0,96 Flow rate = 693,23 m3/hr

Based on the Eskom tariff, the average electrical cost per annum is R 5 812 963,05 before the pigging process and the average electrical cost per annum is R 5 778 570,31 after the pigging process. This is a cost saving of R 34 392,74 per annum on the Eskom electrical supply for the Tayside pumps. Although there is a minor cost saving, the calculated amounts however are not a true reflection of the cost saving since the flow rate has significantly increased after pigging. Therefore, a cost to deliver a certain volume of water should be determined and will be discussed in the following section.

6.3 Cost Savings for the Tayside Pumps

Utilising the above average costs to deliver 1 kilolitre as shown in Table 6-2, the total cost of delivering the original flow rate of 562.78 m^3/hr is calculated. Although the required flow rate is slightly more than 562.78 m^3/hr, this value is used as a baseline for comparison purposes. Since the pipeline is restricted prior to pigging, it is not possible for the system to reach higher flows without cleaning the pipeline. Before pigging, the cost to deliver 562.78 m^3/hr is calculated to be R 484,413.59 per month. After pigging, the cost to deliver 562.78 m^3/hr is calculated to be R 390,413.59 per month. There is therefore a saving of R 93,482.27 per month and R 1,121,787.25 saving per annum. There is therefore a significant saving when determining the cost saving based on the volume of water being supplied. This cost saving however is still not a reasonable or accurate measure of the savings over a one-year period since the pipeline would have had sediments accumulated which subsequently effect the flow rate and pumping cost. Although several factors that affect the average monthly flow rates may occur, it is evident in Section 5.9, the flow rates decrease monthly during the rainy months of the year. Using the historic flow rate data and the flow rate trend throughout each year, it is a more accurate assumption to state that the saving of R 93,482.27 would apply for only the first month after pigging and therefore an electrical consumption should be calculated monthly thereafter to determine an accurate yearly pumping cost saving. It is however evident that the pigging procedure is still beneficial due to the increase in flow rate. Unfortunately, electrical consumption data were not available and were not recorded monthly by the municipality and thus the actual cost

savings based on the delivery of water could not be accurately calculated throughout the year after the pigging procedure.

6.4 Life Cycle Costing Analysis

It has already been determined in section 6.1 through to section 6.3 that there is an increased flow rate and a decreased electrical consumption as a result of pigging. However, to determine the optimal interval of the internal cleaning of an existing pipeline by pigging, the actual cost of implementing pigging is required.

It is to be noted that the actual construction cost to allow for pigging which includes labour, time and material is a one-time cost since the pigging infrastructure can then be utilised for pigging throughout the lifecycle of the pipeline. The pigging infrastructure on a pipeline consists of the pig launcher and pig receiver as discussed in detail in Chapter 4. The recurring cost per pigging procedure involves the purchasing of the actual pig. Ongoing operational and maintenance cost will also occur during the life cycle of the pipeline and pigging infrastructure.

In addition, and another benefit of pipeline pigging, the operations and water supply of the pipeline is not interrupted since the pig receiver is diverted away from the actual outlet of the pipeline (The Tayside receiving pipework is also discussed in Chapter 4). The flow rate remains the same whilst the pig is travelling in the pipeline, and this is evident in the figures shown in Chapter 5 which illustrate the flow rate whilst the pigs are still within the pipeline. In fact, the flow rate gradually increases whilst the pig travels and cleans the pipeline. According to Ellison (2003) and as previously mentioned within the literature review, the use of a kicker pipeline (as is the case with the Tayside pipeline) makes it possible to insert a pig into the pipeline without interrupting the flow. This therefore means that there would be no standing time cost for the pipeline since the pipeline is still in operation. Table 6-3 below summarises the direct cost/construction cost for the pigging infrastructure and pigs for the Tayside high lift pump station pipeline in 2016. The construction cost was made available by UWP Consulting and uThukela Water (D.Wing, personal communication, June, 2021)

Based on Table 6-3, the cost of the Tayside pigging amounted to R 752,854.00. Since 2016, uThukela Water typically undertook pigging procedures once per year as

described in Chapter 5. It can be seen from the pigging procedures completed by uThukela Water, that a single pig run would increase the flow rate to approximately the original design flow rate, and the flow rate would then decrease from January to May. As mentioned previously, electrical consumption was not available and were not recorded monthly by the municipality and thus the actual cost savings based on the delivery of water could not be accurately calculated throughout the year after the pigging procedure.

Table 6-3: Pigging Construction Cost

Construction Costs		Actual Construction Cost
Section 1	Pipe Launcher and Pig Receiving pipework	R 671,046.00
Section 2	Cost of pigs (7 No. @ R11,686.86 each)	R 81,808.00
	Total Construction Costs	**R 752,854.00**

However, since the construction is not a yearly cost, a life cycle costing (LCC) approach would need to be adopted which includes interest rates and inflation rates for South Africa. The LCC approach can be utilised in various project stages such as planning, design, construction, operation and disposal stages (Lee et al., 2017). The life cycle cost is the total cost of ownership of an asset and evaluates the total cost of the infrastructure over its lifespan. This includes the capital cost, the cost to operate and maintain the asset, refurbishment, or repair and lastly disposal. The most common method of calculating the life cycle cost is using the present value (PV) method. Over the life cycle of a pipeline, repairs, refurbishments and the cost of additional pigs will be a recurring cost. Therefore, the annuity present value equation will be applicable (Petrović, 2021). The annuity present value equation including inflation is as follows:

$$PV = \frac{PMT \times (1 - (1 + r - i)^{-t})}{(r - i)}$$

Equation 6-1: Annuity Present Value Equation (Petrovic, 2021)

Where:

PV is the present value, *PMT* is the annuity payments per period, *r* is the discount rate, *i* is the inflation rate and *t* is the time in years.

Utilising equation 6-1 above, the present value of the pigging infrastructure is calculated. According to Francisque (2016), typical discount rates for water pipelines ranges from 3% to 5%. A discount rate of 3% is used for the calculation of the Tayside pigging infrastructure. According to Stats SA (2016), the inflation or consumer price index for South Africa is 4.7%. According to Shand (2012), the desired design service life of municipal pipelines in South Africa is 50 years. For the cost of additional pigs, a value of R12,000.00 for each pig which is slightly higher than that given in Table 6-3 was assumed. Since the shelf life a polyurethane pig is approximately one year, the LCC analysis includes this cost yearly (Quinn-Reese, 2020). Based on the above, the life cycle cost of the pigging infrastructure using the present value is shown in Table 6-4 below:

Table 6-4: Life Cycle Cost Analysis

Life Cycle Cost Analysis		
Description of Costs	**Cost**	**Present Value**
Construction Cost	R 752,854.00	R 752,854.00
Repairs per year (Estimated)	R 60,000.00	R 4,788,732.29
Purchasing of additional pigs per year (Estimated)	R 12,000.00	R 957,746.46
Total 50 year Life Cycle Cost		R 6,499,332.75
Yearly Cost		**R 129,986.66**

Table 6-5 compares the pumping cost saving as calculated in Section 6.3 and the life cycle cost as calculated in Table 6-4:

Table 6-5: Comparison of Life Cycle Cost and Cost Savings

Description	Cost
Life Cycle Cost per year	R 129,986.66
Electrical Cost Saving per year	R 1,121,787.25
Difference	**R 991,800.59**

According to Table 6-5, the cost savings is still greater than that of the life cycle cost of the pigging infrastructure. Although additional pigging would ensure that a pipeline operates efficiently, it should be determined whether it is financially viable to do so.

From the difference of the cost of the infrastructure and the electrical cost saving, multiple pigging procedures can be done.

6.5 Effect of Pigging on Pipe Roughness

As determined in Chapter 5, we now know that the pipeline flow rate increases once it has been cleaned. The main reason for the decreased flow rate is due to deposition on the pipe internal walls. The change in the wall roughness due to this deposition will be studied using the methods outlined in Section 3.6 To understand how the pipe roughness is affected, the Hazen-Williams equation will be used to calculate the pipe roughness before and after pigging.

The Tayside pipeline characteristics (length and diameter) as well as the flow rates in 2016 obtained in Section 5.8 will be used in the Hazen-Willaims equation. For the calculation, the effective diameter and therefore cross-sectional area of flow are assumed not to change significantly after pigging. Based on the before and after pigging flow rate, the total headloss will be determined from the Tayside pump curves. Tayside pump curves have been included in Appendix F of which includes guideline indicating the total headloss before and after pigging. Estimated minor head losses through bends, valves, and other pipe fitting will then be subtracted from the total headloss to determine the headloss due to friction. The minor loss equation below will be utilised to calculate the minor losses through each fitting:

$$h_L = K_L \times \frac{V^2}{2g}$$

Equation 6-2: Minor Loss Equation (Cengel & Cimbala, 2014)

Where:

h_L is the headloss in meters, K_L is the loss coefficient (loss coefficient is taken from Cengel & Cimbala (2014) based on the type of fitting/valve), V is the velocity in m/s and g is the acceleration due to gravity in m/s^2

Table 6-6 below indicates the Hazen-Williams pipe roughness factors before and after pigging.

Table 6-6: Summary of headloss and Pipe Roughness

Flow (m3/hr)	Total Headloss - HL (m)	Static Head (m)	Headloss - HL (m)	Minor Loss - Hl (m)	Friction Loss - Hf (m)	C
562.78	282	190	92	1.13	90.87	85.39
693.23	256	190	66	1.71	64.29	126.82

The C value of 85.39 before pigging indicates that the pipeline has reduction in pipe capacity based on Table 3-1 (Pipeline Renewal Methods, 2014). The C value of 126.82 after indicates that the pipeline has been cleaned effectively and is at an almost new internal condition. It is clearly seen that the Hazen-Williams C value increases significantly after pigging and further illustrates the importance of pigging.

Alternatively, the Darcy Weisbach equation and the Colebrook-White equation can be utilised to calculate the friction factor (f) and the absolute roughness (k). The method outlined in Chapter 2.8 and in accordance with the study by Barton et al., (2008) has been utilised to determine the pipe roughness. Determining the friction factor and absolute roughness before and after pigging will indicate the pipe roughness improvements. Table 6-7 below indicates the absolute pipe roughness before and after pigging:

Table 6-7: Summary of Absolute Roughness using Darcy Weisbach and Colebrook-White equation

Flow (m3/hr)	Total Headloss - HL (m)	Static Head (m)	Headloss - HL (m)	Minor Loss - Hl (m)	Friction Loss - Hf (m)	f	k (mm)
562.78	282	190	92	1.13	90.87	0.041	5.52
693.23	256	190	66	1.71	64.29	0.019	0.33

Similarly, to the Hazen William C factor improvements, the absolute roughness of the pipe improves significantly after pigging. This correlates well with the study by Barton et al., (2008) which indicates pipe roughness improvements after pipe cleaning and further indicates the importance of pigging.

6.5.1 Effect of Pigging on the Hydraulic Grade Line

Following the determination of the Hazen-Williams C values before and after pigging, the hydraulic grade line is determined to understand the total head available in the pipeline as the water flows. According to Cengel & Cimbala (2014), if the hydraulic grade line is above the pipe long section, the pressure or head in the pipeline is positive and therefore the pumps operate according to the design pumping curve. However, if there are pipe roughness changes, the pump operating point shifts to cater for the increased head. This means that the pumps are running inefficiently and not according to the design duty point. Figure 6-2 below illustrates the hydraulic grade line of the Tayside pipeline before and after pigging. As can be seen in Figure 6-2, the hydraulic grade line before pigging requires increased pumping head and thus increased energy to pump to the treatment plant. To reduce the increased energy requirements, the cleaning operation was required. After the pigging operation, the hydraulic grade line requires lower pumping head at the start as compared to before pigging. This suggests that the Tayside pumps are running more efficiently after pigging and the cost of pigging is reduced. This is further confirmed in Section 6.2 of Chapter 6 which indicate a lower cost of pumping after the pigging procedure. The hydraulic grade line analyse further indicates the success of pipeline pigging and indicates the importance of maintaining a pipeline throughout its life cycle. Although the Tayside pipeline is approximately 50 years old, the effect of pipe cleaning by pigging maintains the flow rate to almost the original/design flow rate.

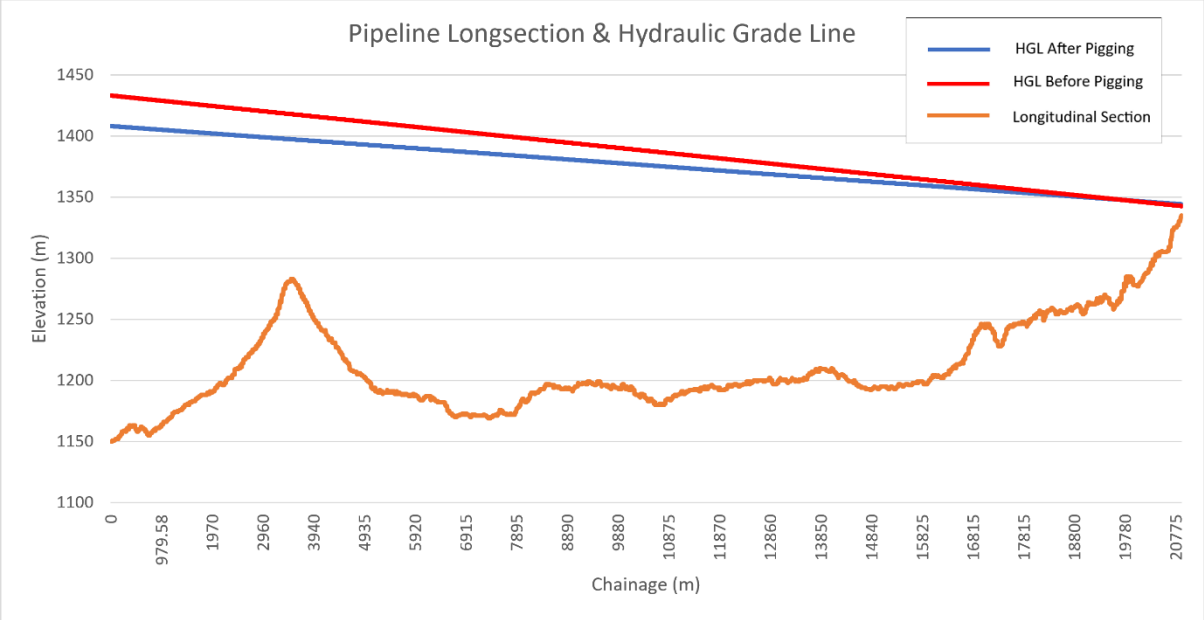

Figure 6-2: Hydraulic Grade Line Before and After Pigging

6.6 Optimal Pigging Interval

Based on the historic flow data from 2016 to 2020, a fixed pigging period is not recommended since the sedimentation deposition patterns within the pipeline are highly dependent on the rainfall and the streamflow patterns. This is also evident since no pigging procedure was undertaken in 2018 as the flow rate throughout the year was relatively constant. A flexible routine for pigging based on the reduction in the hydraulic capacity of the pipeline is proposed to cater for the variability in levels of sediment in the raw water pipeline, which will align to the rainfall and streamflow patterns. The optimal pigging interval would therefore be varied since erratic rainfall patterns continuously occur over the years due to climate change/increased climatic variability. The flexible pigging intervals based on the actual condition (i.e., the level of sedimentation based on hydraulic capacity) would be more appropriate than selecting a fixed cleaning interval. This flexible pigging interval would also be more responsive to other factors that could also impact on the pipeline's hydraulic efficiency. The measurements of the flow rate must be recorded in short periods as this will assess the impact of accumulation of sediments and thereby inform when pigging needs to be done.

Furthermore, the Hazen-Williams pipe roughness coefficient calculated before and after pigging provide an understanding of the internal pipe condition. From the analysis of the Hazan-Williams roughness factor and the effects on the hydraulic grade line, a flexible routine for pigging based on the reduction in the hydraulic capacity of the pipeline is appropriate and would ensure that a pipeline operates efficiently.

The optimal interval for running the pigging process on an existing pipeline would be determined based on monitoring the flow rate throughout the year. Once the pipeline system flow rate decreases significantly from the design flow rate and when the system is not able to meet the demand, a pigging procedure would then be required.

Chapter 7: Conclusion

Pipeline pigging is a widely used method of pipeline cleaning to improve the hydraulic efficiency of a pipeline system, reduce deposits within a pipeline, reduce operational costs and improve water quality. With insufficient pipe cleaning, pipeline deposits accumulate within the pipeline which increases the friction losses in the pipeline. This subsequently reduces the operating flow rate, increases the pumping cost of the system, and reduces the capacity of water supply of the system. Although a significantly old technique, pigging is currently still being utilised. Pipeline maintenance throughout the life cycle of the pipeline ensures that a pipeline system operates safely and efficiently as well as increase the life span of a pipeline Therefore, the study aimed to investigate the hydraulic improvements and operational cost savings of a pipeline system after pigging and to determine when pigging should be done. The reason for investigating pigging procedures was to determine the benefits of pigging and to determine the optimal pigging interval. A case study of the Tayside high lift pump station in South Africa, for which flow data and electrical consumption data prior and after a pigging operation in 2016 were available, was used for this.

It was found that there was a 23.9% flow rate increase in flow rate after the pigging operation in 2016. Using life cycle cost analysis, the cost saving as a result of pigging was estimated as R 991,800.59 per year. Based on the investigations and the data analysed from the case study, a flexible routine for pigging based on the reduction in the hydraulic capacity of the pipeline is proposed to cater for the variability in levels of sediments in the raw water pipeline which is expected to align to the seasonal rainfall and streamflow patterns. A constant optimal pigging interval was therefore not obtained and may not be appropriate considering variability of the sediment load of the raw water. The flexible pigging intervals based on the actual condition would be the most appropriate rather than selecting a fixed cleaning interval. It is noted that working air valves are installed at various locations on the Tayside pipeline and therefore trapped air would have been removed from the pipeline. It is therefore certain that air did not play a role in reducing the flow rate as this would have been removed during the filling of the line.

The Hazen-Williams pipe roughness coefficient calculated before and after pigging provide an understanding of the internal pipe condition. The pipe roughness coefficient

changed from 85.39 before pigging to 126.82 after pigging indicates that the pipe condition improved from having a reduced pipe capacity to an almost new internal condition. In addition, with utilising the Darcy Weisbach and Colebrook-White equation, the absolute roughness of the pipe changed from 5.52 before pigging to 0.33 after pigging.

This reveals that with continuous maintenance and pigging, the hydraulic characteristics and electrical operational costs of pumping may not significantly change from those of the original design of a pumped pipeline system.

Based purely on the increased volume of water supplied after pigging and taking into consideration the associated electrical cost savings and electrical demand reduction, pigging of raw water pipeline is an important aspect in pipeline maintenance to ensure high hydraulic efficiency and to minimise pumping/operational costs. Undertaking pigging yearly will also remove pipe deposits which subsequently reduce corrosion and increase the life of the pipeline infrastructure.

For further studies on when pigging needs to be done, it is recommended that the change in electrical power consumption of pumping over short periods (e.g. 1 hour) be incorporated into the analysis in addition to the consideration of the change in flow rates over the same periods. In addition, flow rate and electrical energy consumption directly before and directly after pigging should be recorded to determine an exact flow rate and power consumption improvement after each pigging procedure and enable a more detailed hydraulic and cost analysis of pigging.

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Appendix A: Flow Data Extracted from Data Logger

Refer to Appendix A - Separate PDF

Appendix B: Electrical Demand Data Extracted from Data Logger

Refer to Appendix B - Separate PDF

Appendix C: Eskom Tariff – 2016

Rural tariffs *continued...*

RURAFLEX – Local authority rates

Trans-mission zone	Voltage	Active energy charge (c/kWh)						Network capacity charges (R/kVA/m)	
		High demand season (Jun-Aug)			Low demand season (Sep-May)				
		Peak	Standard	Off Peak	Peak	Standard	Off Peak		
		VAT excl. VAT incl.	VAT excl. VAT incl.	VAT excl. VAT incl.	VAT excl. VAT incl.	VAT excl. VAT incl.	VAT excl. VAT incl.	VAT excl. VAT incl.	
≤ 300km	< 500V	267.69 305.17	81.09 92.44	44.04 50.21	87.33 99.56	60.10 68.51	38.12 43.46	R 15.22 R 17.35	
	≥ 500V & ≤ 22kV	265.03 302.13	80.29 91.53	43.59 49.69	86.47 98.58	59.48 67.81	37.73 43.01	R 13.96 R 15.91	
> 300km and ≤ 600km	< 500V	270.36 308.21	81.91 93.38	44.46 50.68	88.19 100.54	60.70 69.20	38.51 43.90	R 15.29 R 17.43	
	≥ 500V & ≤ 22kV	267.68 305.16	81.08 92.43	44.04 50.21	87.33 99.56	60.09 68.50	38.12 43.46	R 14.05 R 16.02	
> 600km and ≤ 900km	< 500V	273.07 311.30	82.71 94.29	44.92 51.21	89.07 101.54	61.29 69.87	38.90 44.35	R 15.37 R 17.52	
	≥ 500V & ≤ 22kV	270.35 308.20	81.90 93.37	44.46 50.68	88.19 100.54	60.70 69.20	38.51 43.90	R 14.11 R 16.09	
> 900km	< 500V	275.80 314.41	83.56 95.26	45.35 51.70	89.95 102.54	61.92 70.59	39.28 44.78	R 15.42 R 17.58	
	≥ 500V & ≤ 22kV	273.06 311.29	82.71 94.29	44.92 51.21	89.07 101.54	61.29 69.87	38.90 44.35	R 14.12 R 16.10	

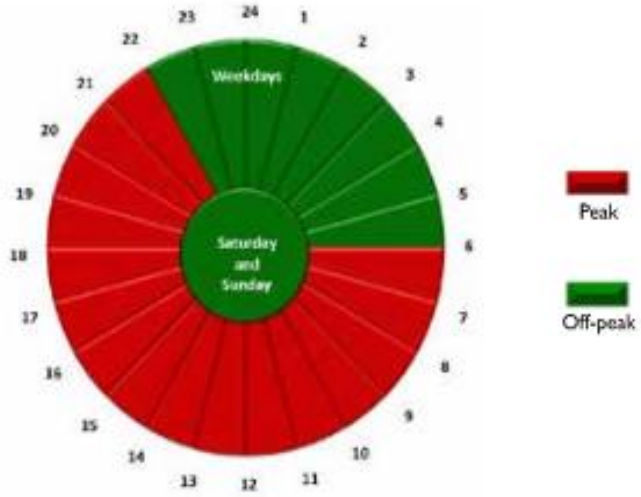
Customer categories	Service charge (R/Account/day)		Administration charge (R/POD/day)	
	VAT excl.	VAT incl.	VAT excl.	VAT incl.
≤ 100kVA	R 14.79	R 16.86	R 4.20	R 4.79
> 100kVA & ≤ 500kVA	R 50.43	R 57.49	R 23.37	R 26.64
> 500kVA & ≤ 1MVA	R 155.12	R 176.84	R 35.87	R 40.89
>1MVA	R 155.12	R 176.84	R 66.58	R 75.90
Key customers	R 3 039.93	R 3 465.52	R 66.58	R 75.90

Voltage	Ancillary service charge (c/kWh)		Network demand charge (c/kWh) (All time of use periods)	
	VAT excl.	VAT incl.	VAT excl.	VAT incl.
< 500V	0.33	0.38	21.71	24.75
≥ 500V & ≤ 22kV	0.33	0.38	19.01	21.67

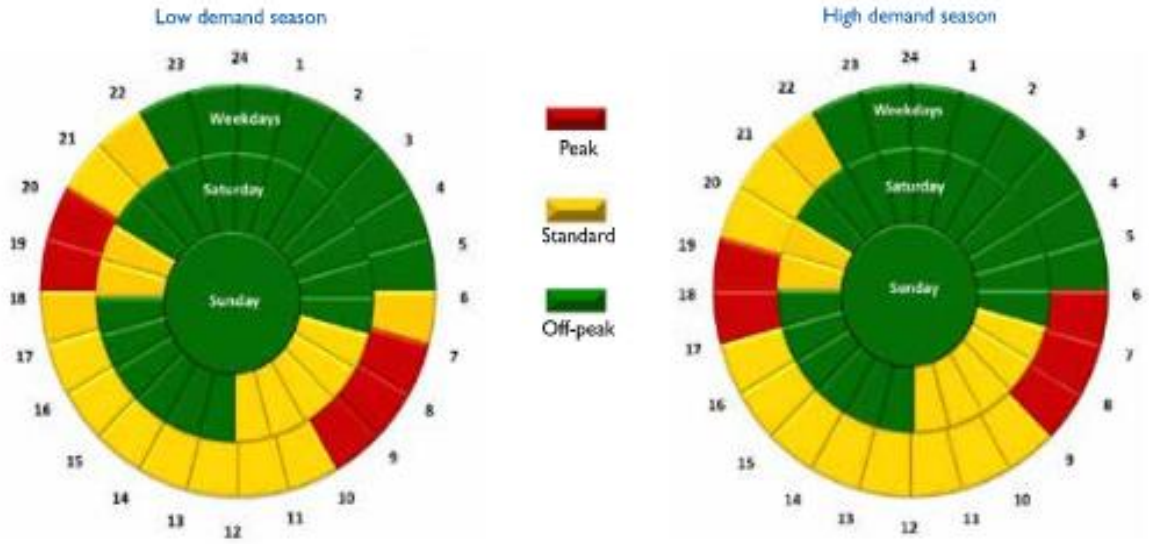
Reactive energy charge (c/kVarh)			
High season		Low season	
VAT excl.	VAT incl.	VAT excl.	VAT incl.
7.22	8.23	0.00	0.00

Appendix C – Eskom's Defined Time Periods

NIGHTSAVE Urban Large, NIGHTSAVE Urban Small and NIGHTSAVE Rural



WEPS, MEGAFLEX, MINIFLEX, Megaflex Gen, Ruraflex Gen and RURAFLEX



Appendix D: Flow Data Recorded from 2017 to 2020

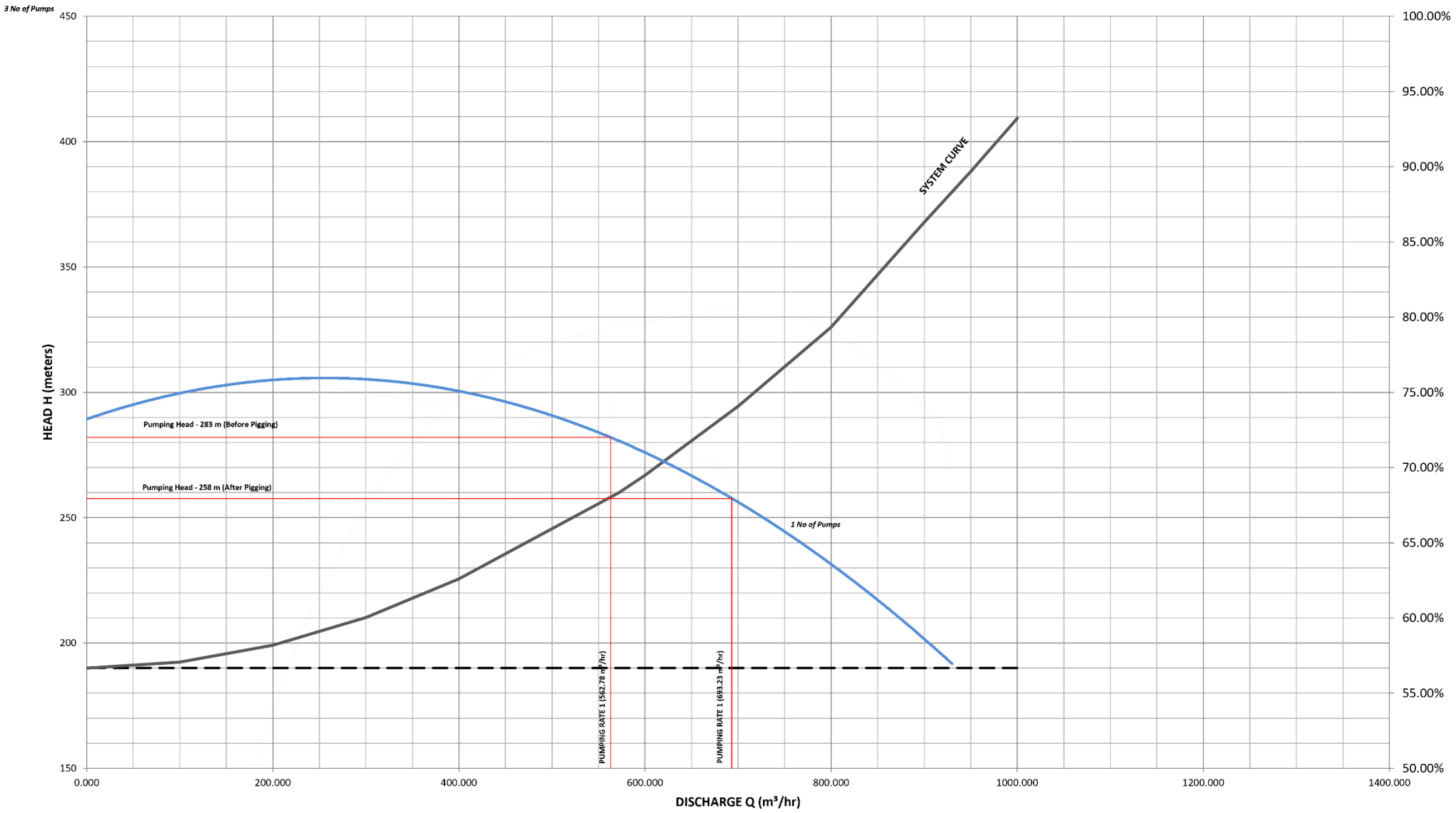
Date	Meter Reading	Consumption m^3	Flow Rate (m^3/hr)
20/01/2017	13,225,172.00	397,785.00	552.48
20/02/2017	13,596,250.00	371,078.00	515.39
20/03/2017	13,855,924.00	259,674.00	360.66
20/04/2017	14,146,370.00	290,446.00	403.40
20/05/2017	14,543,620.00	397,250.00	551.74
20/06/2017	14,969,163.00	425,543.00	591.03
20/07/2017	15,404,856.00	435,693.00	605.13
20/08/2017	15,873,891.00	469,035.00	651.44
20/09/2017	16,335,271.00	461,380.00	640.81
20/10/2017	16,764,295.00	429,024.00	595.87
20/11/2017	17,189,454.00	425,159.00	590.50
16/12/2017	17,510,358.00	320,904.00	445.70
20/01/2018	17,924,141.00	413,783.00	574.70
20/02/2018	18,295,930.00	371,789.00	516.37
20/03/2018	18,652,457.00	356,527.00	495.18
20/04/2018	18,996,979.00	344,522.00	478.50
20/05/2018	19,354,985.00	358,006.00	497.23
20/06/2018	19,684,856.00	329,871.00	458.15
20/07/2018	59,638.00	374,782.00	520.53
20/08/2018	450,340.00	390,702.00	542.64
20/09/2018	848,732.00	398,392.00	553.32
20/10/2018	1,229,406.00	380,674.00	528.71
20/11/2018	1,661,305.00	431,899.00	599.86
19/12/2018	2,076,894.00	415,589.00	577.21

Date	Meter Reading	Consumption m^3	Flow Rate (m^3/hr)
20/01/2019	2,494,550.00	417,656.00	580.08
20/02/2019	2,921,006.00	426,456.00	592.30
20/03/2019	3,258,589.00	337,583.00	468.87
20/04/2019	3,648,490.00	389,901.00	541.53
20/05/2019	4,063,600.00	415,110.00	576.54
20/06/2019	4,570,704.00	507,104.00	704.31
20/07/2019	5,009,218.00	438,514.00	609.05
20/08/2019	5,587,245.00	578,027.00	802.82
20/09/2019	6,094,471.00	507,226.00	704.48
20/10/2019	6,587,329.00	492,858.00	684.53
20/11/2019	6,867,753.00	280,424.00	389.48
20/12/2019	7,259,870.00	392,117.00	544.61
20/01/2020	7,584,311.00	324,441.00	450.61
20/02/2020	7,899,850.00	315,539.00	438.25
20/03/2020	8,128,725.00	228,875.00	317.88
20/04/2020	8,478,721.00	349,996.00	486.11
20/05/2020	12,070,726.00	349,996.00	486.11
20/06/2020	12,548,767.00	478,041.00	663.95
20/07/2020	13,007,082.00	458,315.00	636.55
20/08/2020	13,484,637.00	477,555.00	663.27
20/09/2020	13,963,834.00	479,197.00	665.55
20/10/2020	14,412,029.00	448,195.00	622.49
20/11/2020	14,828,702.00	416,673.00	578.71
20/12/2020	15,273,686.00	444,984.00	618.03

Appendix E: Single-Phase Power Converted to Three-Phase Power

Refer to Appendix E – Separate PDF

Appendix F: Tayside Pump Curves


3 No of Pumps
HEAD H (meters)
DISCHARGE Q (m³/hr)
SYSTEM CURVE
1 No of Pumps
Pumping Head - 283 m (Before Pigging)
Pumping Head - 258 m (After Pigging)
PUMPING RATE 1 (562.78 m³/hr)
PUMPING RATE 1 (693.23 m³/hr)
450
400
350
300
250
200
150
100.00%
95.00%
90.00%
85.00%
80.00%
75.00%
70.00%
65.00%
60.00%
55.00%
50.00%
0.000
200.000
400.000
600.000
800.000
1000.000
1200.000
1400.000

APPENDIX A

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 12:00	568.13
24/05/2016 12:01	576.25
24/05/2016 12:02	578.75
24/05/2016 12:03	572.50
24/05/2016 12:04	573.13
24/05/2016 12:05	574.38
24/05/2016 12:06	570.00
24/05/2016 12:07	572.50
24/05/2016 12:08	570.00
24/05/2016 12:09	570.63
24/05/2016 12:10	571.88
24/05/2016 12:11	575.63
24/05/2016 12:12	572.50
24/05/2016 12:13	578.75
24/05/2016 12:14	573.13
24/05/2016 12:15	575.63
24/05/2016 12:16	574.38
24/05/2016 12:17	581.25
24/05/2016 12:18	574.38
24/05/2016 12:19	576.25
24/05/2016 12:20	569.38
24/05/2016 12:21	568.75
24/05/2016 12:22	566.25
24/05/2016 12:23	568.75
24/05/2016 12:24	572.50
24/05/2016 12:25	573.13
24/05/2016 12:26	574.38
24/05/2016 12:27	578.13
24/05/2016 12:28	573.75
24/05/2016 12:29	576.88
24/05/2016 12:30	573.75
24/05/2016 12:31	573.75
24/05/2016 12:32	572.50
24/05/2016 12:33	573.13
24/05/2016 12:34	569.38
24/05/2016 12:35	576.25
24/05/2016 12:36	-3.13
24/05/2016 12:37	546.25
24/05/2016 12:38	590.63
24/05/2016 12:39	576.25
24/05/2016 12:40	571.88
24/05/2016 12:41	572.50
24/05/2016 12:42	566.25
24/05/2016 12:43	566.88

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 12:44	570.63
24/05/2016 12:45	566.88
24/05/2016 12:46	570.63
24/05/2016 12:47	572.50
24/05/2016 12:48	567.50
24/05/2016 12:49	568.13
24/05/2016 12:50	570.00
24/05/2016 12:51	574.38
24/05/2016 12:52	571.88
24/05/2016 12:53	572.50
24/05/2016 12:54	575.00
24/05/2016 12:55	569.38
24/05/2016 12:56	571.88
24/05/2016 12:57	571.88
24/05/2016 12:58	571.25
24/05/2016 12:59	573.13
24/05/2016 13:00	563.75
24/05/2016 13:01	575.63
24/05/2016 13:02	571.88
24/05/2016 13:03	567.50
24/05/2016 13:04	571.88
24/05/2016 13:05	573.75
24/05/2016 13:06	569.38
24/05/2016 13:07	568.13
24/05/2016 13:08	570.63
24/05/2016 13:09	571.88
24/05/2016 13:10	568.13
24/05/2016 13:11	580.00
24/05/2016 13:12	565.00
24/05/2016 13:13	570.63
24/05/2016 13:14	568.75
24/05/2016 13:15	566.88
24/05/2016 13:16	572.50
24/05/2016 13:17	575.00
24/05/2016 13:18	772.50
24/05/2016 13:19	843.75
24/05/2016 13:20	855.63
24/05/2016 13:21	855.63
24/05/2016 13:22	853.75
24/05/2016 13:23	853.75
24/05/2016 13:24	858.75
24/05/2016 13:25	859.38
24/05/2016 13:26	501.88
24/05/2016 13:27	556.88

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 13:28	571.88
24/05/2016 13:29	567.50
24/05/2016 13:30	574.38
24/05/2016 13:31	572.50
24/05/2016 13:32	572.50
24/05/2016 13:33	573.75
24/05/2016 13:34	802.50
24/05/2016 13:35	818.13
24/05/2016 13:36	815.00
24/05/2016 13:37	819.38
24/05/2016 13:38	819.38
24/05/2016 13:39	823.75
24/05/2016 13:40	826.88
24/05/2016 13:41	828.13
24/05/2016 13:42	825.00
24/05/2016 13:43	820.00
24/05/2016 13:44	661.88
24/05/2016 13:45	611.25
24/05/2016 13:46	576.88
24/05/2016 13:47	583.13
24/05/2016 13:48	580.00
24/05/2016 13:49	580.63
24/05/2016 13:50	578.75
24/05/2016 13:51	571.88
24/05/2016 13:52	581.25
24/05/2016 13:53	578.13
24/05/2016 13:54	580.00
24/05/2016 13:55	582.50
24/05/2016 13:56	582.50
24/05/2016 13:57	579.38
24/05/2016 13:58	585.63
24/05/2016 13:59	582.50
24/05/2016 14:00	576.25
24/05/2016 14:01	575.63
24/05/2016 14:02	581.25
24/05/2016 14:03	573.13
24/05/2016 14:04	572.50
24/05/2016 14:05	576.88
24/05/2016 14:06	583.75
24/05/2016 14:07	731.88
24/05/2016 14:08	721.25
24/05/2016 14:09	710.00
24/05/2016 14:10	715.63
24/05/2016 14:11	711.88

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 14:12	709.38
24/05/2016 14:13	724.38
24/05/2016 14:14	713.75
24/05/2016 14:15	715.00
24/05/2016 14:16	713.13
24/05/2016 14:17	713.13
24/05/2016 14:18	716.25
24/05/2016 14:19	712.50
24/05/2016 14:20	716.25
24/05/2016 14:21	716.25
24/05/2016 14:22	712.50
24/05/2016 14:23	724.38
24/05/2016 14:24	716.25
24/05/2016 14:25	721.88
24/05/2016 14:26	721.88
24/05/2016 14:27	720.00
24/05/2016 14:28	734.38
24/05/2016 14:29	723.13
24/05/2016 14:30	721.25
24/05/2016 14:31	725.63
24/05/2016 14:32	728.13
24/05/2016 14:33	734.38
24/05/2016 14:34	733.13
24/05/2016 14:35	725.00
24/05/2016 14:36	726.88
24/05/2016 14:37	849.38
24/05/2016 14:38	850.00
24/05/2016 14:39	718.75
24/05/2016 14:40	750.63
24/05/2016 14:41	753.13
24/05/2016 14:42	748.13
24/05/2016 14:43	745.00
24/05/2016 14:44	745.63
24/05/2016 14:45	746.25
24/05/2016 14:46	745.63
24/05/2016 14:47	749.38
24/05/2016 14:48	747.50
24/05/2016 14:49	743.13
24/05/2016 14:50	751.25
24/05/2016 14:51	745.00
24/05/2016 14:52	740.00
24/05/2016 14:53	743.75
24/05/2016 14:54	740.63
24/05/2016 14:55	746.25

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 14:56	751.25
24/05/2016 14:57	738.75
24/05/2016 14:58	747.50
24/05/2016 14:59	749.38
24/05/2016 15:00	743.75
24/05/2016 15:01	744.38
24/05/2016 15:02	747.50
24/05/2016 15:03	738.13
24/05/2016 15:04	752.50
24/05/2016 15:05	753.13
24/05/2016 15:06	746.88
24/05/2016 15:07	740.63
24/05/2016 15:08	738.13
24/05/2016 15:09	742.50
24/05/2016 15:10	741.25
24/05/2016 15:11	743.13
24/05/2016 15:12	741.25
24/05/2016 15:13	744.38
24/05/2016 15:14	745.63
24/05/2016 15:15	749.38
24/05/2016 15:16	747.50
24/05/2016 15:17	739.38
24/05/2016 15:18	743.13
24/05/2016 15:19	656.88
24/05/2016 15:20	576.88
24/05/2016 15:21	580.63
24/05/2016 15:22	577.50
24/05/2016 15:23	575.00
24/05/2016 15:24	575.63
24/05/2016 15:25	575.63
24/05/2016 15:26	580.00
24/05/2016 15:27	580.63
24/05/2016 15:28	582.50
24/05/2016 15:29	576.25
24/05/2016 15:30	578.75
24/05/2016 15:31	583.75
24/05/2016 15:32	586.25
24/05/2016 15:33	581.88
24/05/2016 15:34	638.13
24/05/2016 15:35	585.00
24/05/2016 15:36	585.63
24/05/2016 15:37	585.00
24/05/2016 15:38	590.00
24/05/2016 15:39	585.63

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 15:40	590.63
24/05/2016 15:41	590.00
24/05/2016 15:42	587.50
24/05/2016 15:43	586.88
24/05/2016 15:44	585.00
24/05/2016 15:45	587.50
24/05/2016 15:46	764.38
24/05/2016 15:47	658.75
24/05/2016 15:48	589.38
24/05/2016 15:49	590.00
24/05/2016 15:50	585.00
24/05/2016 15:51	582.50
24/05/2016 15:52	580.63
24/05/2016 15:53	585.63
24/05/2016 15:54	585.00
24/05/2016 15:55	586.25
24/05/2016 15:56	583.75
24/05/2016 15:57	589.38
24/05/2016 15:58	584.38
24/05/2016 15:59	580.00
24/05/2016 16:00	580.63
24/05/2016 16:01	578.75
24/05/2016 16:02	585.63
24/05/2016 16:03	586.88
24/05/2016 16:04	588.13
24/05/2016 16:05	585.63
24/05/2016 16:06	598.13
24/05/2016 16:07	587.50
24/05/2016 16:08	593.13
24/05/2016 16:09	595.00
24/05/2016 16:10	589.38
24/05/2016 16:11	590.00
24/05/2016 16:12	590.63
24/05/2016 16:13	598.13
24/05/2016 16:14	586.25
24/05/2016 16:15	588.75
24/05/2016 16:16	582.50
24/05/2016 16:17	591.88
24/05/2016 16:18	585.00
24/05/2016 16:19	586.25
24/05/2016 16:20	588.13
24/05/2016 16:21	589.38
24/05/2016 16:22	589.38
24/05/2016 16:23	592.50

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 16:24	593.75
24/05/2016 16:25	594.38
24/05/2016 16:26	585.63
24/05/2016 16:27	584.38
24/05/2016 16:28	591.25
24/05/2016 16:29	586.88
24/05/2016 16:30	590.00
24/05/2016 16:31	592.50
24/05/2016 16:32	587.50
24/05/2016 16:33	596.25
24/05/2016 16:34	598.75
24/05/2016 16:35	601.25
24/05/2016 16:36	594.38
24/05/2016 16:37	591.25
24/05/2016 16:38	590.63
24/05/2016 16:39	597.50
24/05/2016 16:40	596.25
24/05/2016 16:41	583.75
24/05/2016 16:42	595.00
24/05/2016 16:43	596.88
24/05/2016 16:44	600.63
24/05/2016 16:45	593.75
24/05/2016 16:46	596.88
24/05/2016 16:47	593.75
24/05/2016 16:48	596.25
24/05/2016 16:49	592.50
24/05/2016 16:50	595.63
24/05/2016 16:51	596.88
24/05/2016 16:52	585.63
24/05/2016 16:53	588.13
24/05/2016 16:54	591.25
24/05/2016 16:55	585.63
24/05/2016 16:56	586.25
24/05/2016 16:57	600.00
24/05/2016 16:58	598.13
24/05/2016 16:59	595.63
24/05/2016 17:00	598.75
24/05/2016 17:01	597.50
24/05/2016 17:02	585.63
24/05/2016 17:03	588.75
24/05/2016 17:04	585.63
24/05/2016 17:05	596.25
24/05/2016 17:06	594.38
24/05/2016 17:07	598.75

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 17:08	595.00
24/05/2016 17:09	597.50
24/05/2016 17:10	598.75
24/05/2016 17:11	593.75
24/05/2016 17:12	593.75
24/05/2016 17:13	594.38
24/05/2016 17:14	594.38
24/05/2016 17:15	589.38
24/05/2016 17:16	597.50
24/05/2016 17:17	594.38
24/05/2016 17:18	595.00
24/05/2016 17:19	595.00
24/05/2016 17:20	588.75
24/05/2016 17:21	591.88
24/05/2016 17:22	593.75
24/05/2016 17:23	587.50
24/05/2016 17:24	595.63
24/05/2016 17:25	597.50
24/05/2016 17:26	597.50
24/05/2016 17:27	595.63
24/05/2016 17:28	598.75
24/05/2016 17:29	593.75
24/05/2016 17:30	593.13
24/05/2016 17:31	595.00
24/05/2016 17:32	594.38
24/05/2016 17:33	596.88
24/05/2016 17:34	592.50
24/05/2016 17:35	594.38
24/05/2016 17:36	591.25
24/05/2016 17:37	593.13
24/05/2016 17:38	591.88
24/05/2016 17:39	595.63
24/05/2016 17:40	586.25
24/05/2016 17:41	591.25
24/05/2016 17:42	595.63
24/05/2016 17:43	592.50
24/05/2016 17:44	589.38
24/05/2016 17:45	601.88
24/05/2016 17:46	598.75
24/05/2016 17:47	596.88
24/05/2016 17:48	597.50
24/05/2016 17:49	600.00
24/05/2016 17:50	600.00
24/05/2016 17:51	603.13

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 17:52	596.88
24/05/2016 17:53	602.50
24/05/2016 17:54	600.00
24/05/2016 17:55	599.38
24/05/2016 17:56	598.13
24/05/2016 17:57	599.38
24/05/2016 17:58	596.88
24/05/2016 17:59	601.25
24/05/2016 18:00	601.88
24/05/2016 18:01	604.38
24/05/2016 18:02	594.38
24/05/2016 18:03	595.00
24/05/2016 18:04	595.00
24/05/2016 18:05	600.00
24/05/2016 18:06	598.75
24/05/2016 18:07	596.25
24/05/2016 18:08	596.25
24/05/2016 18:09	598.13
24/05/2016 18:10	599.38
24/05/2016 18:11	598.13
24/05/2016 18:12	602.50
24/05/2016 18:13	160.63
24/05/2016 18:14	-2.50
24/05/2016 18:15	-2.50
24/05/2016 18:16	-2.50
24/05/2016 18:17	-1.88
24/05/2016 18:18	-2.50
24/05/2016 18:19	-2.50
24/05/2016 18:20	-1.88
24/05/2016 18:21	-1.88
24/05/2016 18:22	-1.25
24/05/2016 18:23	-2.50
24/05/2016 18:24	-1.25
24/05/2016 18:25	-1.25
24/05/2016 18:26	-2.50
24/05/2016 18:27	-1.88
24/05/2016 18:28	-2.50
24/05/2016 18:29	-1.88
24/05/2016 18:30	-1.88
24/05/2016 18:31	-0.63
24/05/2016 18:32	-1.25
24/05/2016 18:33	-2.50
24/05/2016 18:34	-1.88
24/05/2016 18:35	-1.25

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 18:36	-1.88
24/05/2016 18:37	-1.25
24/05/2016 18:38	-1.25
24/05/2016 18:39	-2.50
24/05/2016 18:40	-1.25
24/05/2016 18:41	-1.25
24/05/2016 18:42	-1.25
24/05/2016 18:43	-1.25
24/05/2016 18:44	-1.25
24/05/2016 18:45	-1.25
24/05/2016 18:46	-1.88
24/05/2016 18:47	-1.88
24/05/2016 18:48	-1.88
24/05/2016 18:49	-1.88
24/05/2016 18:50	-1.25
24/05/2016 18:51	-1.88
24/05/2016 18:52	-1.25
24/05/2016 18:53	-1.88
24/05/2016 18:54	-1.88
24/05/2016 18:55	-1.25
24/05/2016 18:56	-1.25
24/05/2016 18:57	-1.88
24/05/2016 18:58	-1.88
24/05/2016 18:59	-0.63
24/05/2016 19:00	-1.88
24/05/2016 19:01	-1.88
24/05/2016 19:02	-1.25
24/05/2016 19:03	-0.63
24/05/2016 19:04	-0.63
24/05/2016 19:05	-0.63
24/05/2016 19:06	-1.88
24/05/2016 19:07	-0.63
24/05/2016 19:08	-0.63
24/05/2016 19:09	307.50
24/05/2016 19:10	150.00
24/05/2016 19:11	-0.63
24/05/2016 19:12	-1.88
24/05/2016 19:13	-1.25
24/05/2016 19:14	-0.63
24/05/2016 19:15	-0.63
24/05/2016 19:16	-1.25
24/05/2016 19:17	-1.25
24/05/2016 19:18	-1.25
24/05/2016 19:19	0.00

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 19:20	-0.63
24/05/2016 19:21	0.00
24/05/2016 19:22	-1.25
24/05/2016 19:23	-1.25
24/05/2016 19:24	-0.63
24/05/2016 19:25	-1.88
24/05/2016 19:26	-1.25
24/05/2016 19:27	-1.25
24/05/2016 19:28	-1.25
24/05/2016 19:29	-1.25
24/05/2016 19:30	-1.25
24/05/2016 19:31	-1.25
24/05/2016 19:32	-1.25
24/05/2016 19:33	123.75
24/05/2016 19:34	540.63
24/05/2016 19:35	596.88
24/05/2016 19:36	598.75
24/05/2016 19:37	601.25
24/05/2016 19:38	605.00
24/05/2016 19:39	601.25
24/05/2016 19:40	603.75
24/05/2016 19:41	601.88
24/05/2016 19:42	606.88
24/05/2016 19:43	608.75
24/05/2016 19:44	608.75
24/05/2016 19:45	604.38
24/05/2016 19:46	608.13
24/05/2016 19:47	601.88
24/05/2016 19:48	607.50
24/05/2016 19:49	608.75
24/05/2016 19:50	601.88
24/05/2016 19:51	605.00
24/05/2016 19:52	605.00
24/05/2016 19:53	604.38
24/05/2016 19:54	608.13
24/05/2016 19:55	606.88
24/05/2016 19:56	615.63
24/05/2016 19:57	613.13
24/05/2016 19:58	608.75
24/05/2016 19:59	606.88
24/05/2016 20:00	606.25
24/05/2016 20:01	361.88
24/05/2016 20:02	-1.88
24/05/2016 20:03	-1.25

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 20:04	-0.63
24/05/2016 20:05	-0.63
24/05/2016 20:06	-1.25
24/05/2016 20:07	-0.63
24/05/2016 20:08	-1.25
24/05/2016 20:09	-1.25
24/05/2016 20:10	-0.63
24/05/2016 20:11	-1.25
24/05/2016 20:12	-1.88
24/05/2016 20:13	-1.25
24/05/2016 20:14	-1.25
24/05/2016 20:15	-1.25
24/05/2016 20:16	-1.25
24/05/2016 20:17	-0.63
24/05/2016 20:18	0.00
24/05/2016 20:19	-1.25
24/05/2016 20:20	-0.63
24/05/2016 20:21	-1.25
24/05/2016 20:22	-0.63
24/05/2016 20:23	-0.63
24/05/2016 20:24	-1.25
24/05/2016 20:25	-1.25
24/05/2016 20:26	0.00
24/05/2016 20:27	-0.63
24/05/2016 20:28	-0.63
24/05/2016 20:29	0.00
24/05/2016 20:30	-1.25
24/05/2016 20:31	0.00
24/05/2016 20:32	-1.25
24/05/2016 20:33	-0.63
24/05/2016 20:34	-0.63
24/05/2016 20:35	-1.25
24/05/2016 20:36	-0.63
24/05/2016 20:37	-0.63
24/05/2016 20:38	-0.63
24/05/2016 20:39	-1.25
24/05/2016 20:40	-0.63
24/05/2016 20:41	0.00
24/05/2016 20:42	0.00
24/05/2016 20:43	0.00
24/05/2016 20:44	-1.25
24/05/2016 20:45	-1.88
24/05/2016 20:46	-1.25
24/05/2016 20:47	0.00

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 20:48	-1.25
24/05/2016 20:49	0.00
24/05/2016 20:50	-0.63
24/05/2016 20:51	-1.25
24/05/2016 20:52	-1.25
24/05/2016 20:53	-0.63
24/05/2016 20:54	0.00
24/05/2016 20:55	-1.25
24/05/2016 20:56	-1.25
24/05/2016 20:57	0.00
24/05/2016 20:58	-0.63
24/05/2016 20:59	0.00
24/05/2016 21:00	-1.25
24/05/2016 21:01	-0.63
24/05/2016 21:02	-1.25
24/05/2016 21:03	-0.63
24/05/2016 21:04	0.00
24/05/2016 21:05	-0.63
24/05/2016 21:06	0.00
24/05/2016 21:07	-1.25
24/05/2016 21:08	-1.25
24/05/2016 21:09	0.63
24/05/2016 21:10	0.63
24/05/2016 21:11	-0.63
24/05/2016 21:12	-1.25
24/05/2016 21:13	0.00
24/05/2016 21:14	0.63
24/05/2016 21:15	-0.63
24/05/2016 21:16	-0.63
24/05/2016 21:17	-0.63
24/05/2016 21:18	-0.63
24/05/2016 21:19	-0.63
24/05/2016 21:20	-0.63
24/05/2016 21:21	0.00
24/05/2016 21:22	-1.25
24/05/2016 21:23	-0.63
24/05/2016 21:24	-1.25
24/05/2016 21:25	0.00
24/05/2016 21:26	-1.25
24/05/2016 21:27	-0.63
24/05/2016 21:28	-0.63
24/05/2016 21:29	-1.25
24/05/2016 21:30	359.38
24/05/2016 21:31	596.88

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 21:32	607.50
24/05/2016 21:33	609.38
24/05/2016 21:34	608.75
24/05/2016 21:35	610.00
24/05/2016 21:36	608.75
24/05/2016 21:37	608.13
24/05/2016 21:38	610.63
24/05/2016 21:39	615.63
24/05/2016 21:40	606.25
24/05/2016 21:41	608.13
24/05/2016 21:42	613.13
24/05/2016 21:43	618.13
24/05/2016 21:44	598.13
24/05/2016 21:45	583.13
24/05/2016 21:46	583.13
24/05/2016 21:47	578.75
24/05/2016 21:48	576.25
24/05/2016 21:49	579.38
24/05/2016 21:50	578.75
24/05/2016 21:51	576.25
24/05/2016 21:52	571.88
24/05/2016 21:53	574.38
24/05/2016 21:54	578.13
24/05/2016 21:55	574.38
24/05/2016 21:56	581.88
24/05/2016 21:57	582.50
24/05/2016 21:58	576.88
24/05/2016 21:59	580.63
24/05/2016 22:00	573.13
24/05/2016 22:01	575.63
24/05/2016 22:02	571.88
24/05/2016 22:03	570.00
24/05/2016 22:04	569.38
24/05/2016 22:05	560.63
24/05/2016 22:06	569.38
24/05/2016 22:07	576.88
24/05/2016 22:08	575.63
24/05/2016 22:09	574.38
24/05/2016 22:10	581.25
24/05/2016 22:11	580.00
24/05/2016 22:12	581.25
24/05/2016 22:13	578.75
24/05/2016 22:14	575.00
24/05/2016 22:15	579.38

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 22:16	575.00
24/05/2016 22:17	581.88
24/05/2016 22:18	581.88
24/05/2016 22:19	581.25
24/05/2016 22:20	580.00
24/05/2016 22:21	579.38
24/05/2016 22:22	575.00
24/05/2016 22:23	575.00
24/05/2016 22:24	576.25
24/05/2016 22:25	581.88
24/05/2016 22:26	578.13
24/05/2016 22:27	583.13
24/05/2016 22:28	576.25
24/05/2016 22:29	578.13
24/05/2016 22:30	580.63
24/05/2016 22:31	580.63
24/05/2016 22:32	580.00
24/05/2016 22:33	581.88
24/05/2016 22:34	582.50
24/05/2016 22:35	579.38
24/05/2016 22:36	582.50
24/05/2016 22:37	582.50
24/05/2016 22:38	576.25
24/05/2016 22:39	579.38
24/05/2016 22:40	575.00
24/05/2016 22:41	574.38
24/05/2016 22:42	577.50
24/05/2016 22:43	582.50
24/05/2016 22:44	582.50
24/05/2016 22:45	578.13
24/05/2016 22:46	581.88
24/05/2016 22:47	585.00
24/05/2016 22:48	297.50
24/05/2016 22:49	-1.88
24/05/2016 22:50	-1.25
24/05/2016 22:51	-1.25
24/05/2016 22:52	-0.63
24/05/2016 22:53	0.00
24/05/2016 22:54	-1.25
24/05/2016 22:55	0.00
24/05/2016 22:56	-0.63
24/05/2016 22:57	-0.63
24/05/2016 22:58	0.00
24/05/2016 22:59	-0.63

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 23:00	-1.25
24/05/2016 23:01	0.00
24/05/2016 23:02	-0.63
24/05/2016 23:03	-1.25
24/05/2016 23:04	-1.88
24/05/2016 23:05	-1.25
24/05/2016 23:06	-0.63
24/05/2016 23:07	-1.25
24/05/2016 23:08	-0.63
24/05/2016 23:09	-0.63
24/05/2016 23:10	-0.63
24/05/2016 23:11	-1.25
24/05/2016 23:12	0.00
24/05/2016 23:13	-1.25
24/05/2016 23:14	0.00
24/05/2016 23:15	0.00
24/05/2016 23:16	-0.63
24/05/2016 23:17	-0.63
24/05/2016 23:18	0.00
24/05/2016 23:19	0.63
24/05/2016 23:20	-1.25
24/05/2016 23:21	0.00
24/05/2016 23:22	-1.25
24/05/2016 23:23	0.00
24/05/2016 23:24	-1.25
24/05/2016 23:25	-0.63
24/05/2016 23:26	-0.63
24/05/2016 23:27	0.00
24/05/2016 23:28	0.00
24/05/2016 23:29	-0.63
24/05/2016 23:30	-1.25
24/05/2016 23:31	-1.25
24/05/2016 23:32	0.00
24/05/2016 23:33	0.00
24/05/2016 23:34	-0.63
24/05/2016 23:35	0.00
24/05/2016 23:36	0.00
24/05/2016 23:37	0.00
24/05/2016 23:38	-1.25
24/05/2016 23:39	0.63
24/05/2016 23:40	-1.25
24/05/2016 23:41	-0.63
24/05/2016 23:42	-1.25
24/05/2016 23:43	0.00

Pig Run Number 1	
Date and Time	Flow Rate
24/05/2016 23:44	-1.25
24/05/2016 23:45	-0.63
24/05/2016 23:46	-0.63
24/05/2016 23:47	-0.63
24/05/2016 23:48	0.00
24/05/2016 23:49	-0.63
24/05/2016 23:50	0.00
24/05/2016 23:51	-0.63
24/05/2016 23:52	0.00
24/05/2016 23:53	-1.25
24/05/2016 23:54	-0.63
24/05/2016 23:55	-1.25
24/05/2016 23:56	0.00
24/05/2016 23:57	0.00
24/05/2016 23:58	-0.63
24/05/2016 23:59	-0.63
25/05/2016 0:00	0.00
25/05/2016 0:01	-0.63
25/05/2016 0:02	0.63
25/05/2016 0:03	0.00
25/05/2016 0:04	0.63
25/05/2016 0:05	0.00
25/05/2016 0:06	0.00
25/05/2016 0:07	-0.63
25/05/2016 0:08	-0.63
25/05/2016 0:09	0.63
25/05/2016 0:10	-0.63
25/05/2016 0:11	0.00
25/05/2016 0:12	-0.63
25/05/2016 0:13	-0.63
25/05/2016 0:14	-0.63
25/05/2016 0:15	-1.25
25/05/2016 0:16	0.00
25/05/2016 0:17	0.00
25/05/2016 0:18	-0.63
25/05/2016 0:19	0.63
25/05/2016 0:20	0.63
25/05/2016 0:21	0.63
25/05/2016 0:22	0.00
25/05/2016 0:23	0.00
25/05/2016 0:24	-0.63
25/05/2016 0:25	0.63
25/05/2016 0:26	-0.63
25/05/2016 0:27	0.00

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 0:28	0.00
25/05/2016 0:29	0.00
25/05/2016 0:30	0.00
25/05/2016 0:31	-0.63
25/05/2016 0:32	-0.63
25/05/2016 0:33	-0.63
25/05/2016 0:34	0.63
25/05/2016 0:35	0.00
25/05/2016 0:36	0.63
25/05/2016 0:37	-0.63
25/05/2016 0:38	-0.63
25/05/2016 0:39	-0.63
25/05/2016 0:40	-0.63
25/05/2016 0:41	-0.63
25/05/2016 0:42	-0.63
25/05/2016 0:43	0.00
25/05/2016 0:44	0.63
25/05/2016 0:45	-0.63
25/05/2016 0:46	0.00
25/05/2016 0:47	0.63
25/05/2016 0:48	-0.63
25/05/2016 0:49	0.00
25/05/2016 0:50	-0.63
25/05/2016 0:51	0.00
25/05/2016 0:52	0.63
25/05/2016 0:53	-0.63
25/05/2016 0:54	0.63
25/05/2016 0:55	-0.63
25/05/2016 0:56	-1.25
25/05/2016 0:57	0.63
25/05/2016 0:58	0.00
25/05/2016 0:59	0.00
25/05/2016 1:00	163.75
25/05/2016 1:01	538.13
25/05/2016 1:02	580.00
25/05/2016 1:03	585.00
25/05/2016 1:04	583.75
25/05/2016 1:05	575.00
25/05/2016 1:06	571.88
25/05/2016 1:07	571.25
25/05/2016 1:08	578.13
25/05/2016 1:09	580.00
25/05/2016 1:10	578.13
25/05/2016 1:11	576.25

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 1:12	573.75
25/05/2016 1:13	578.75
25/05/2016 1:14	583.13
25/05/2016 1:15	579.38
25/05/2016 1:16	580.00
25/05/2016 1:17	575.63
25/05/2016 1:18	571.25
25/05/2016 1:19	573.75
25/05/2016 1:20	573.13
25/05/2016 1:21	570.00
25/05/2016 1:22	576.25
25/05/2016 1:23	570.63
25/05/2016 1:24	572.50
25/05/2016 1:25	576.88
25/05/2016 1:26	579.38
25/05/2016 1:27	577.50
25/05/2016 1:28	579.38
25/05/2016 1:29	572.50
25/05/2016 1:30	574.38
25/05/2016 1:31	576.25
25/05/2016 1:32	571.88
25/05/2016 1:33	574.38
25/05/2016 1:34	575.63
25/05/2016 1:35	579.38
25/05/2016 1:36	575.63
25/05/2016 1:37	576.25
25/05/2016 1:38	575.00
25/05/2016 1:39	580.00
25/05/2016 1:40	581.25
25/05/2016 1:41	575.63
25/05/2016 1:42	260.63
25/05/2016 1:43	563.75
25/05/2016 1:44	575.63
25/05/2016 1:45	580.00
25/05/2016 1:46	576.25
25/05/2016 1:47	578.75
25/05/2016 1:48	575.63
25/05/2016 1:49	571.25
25/05/2016 1:50	580.00
25/05/2016 1:51	576.88
25/05/2016 1:52	571.25
25/05/2016 1:53	573.75
25/05/2016 1:54	573.13
25/05/2016 1:55	578.13

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 1:56	576.25
25/05/2016 1:57	575.63
25/05/2016 1:58	572.50
25/05/2016 1:59	581.88
25/05/2016 2:00	576.25
25/05/2016 2:01	575.63
25/05/2016 2:02	570.63
25/05/2016 2:03	576.25
25/05/2016 2:04	572.50
25/05/2016 2:05	575.63
25/05/2016 2:06	569.38
25/05/2016 2:07	580.63
25/05/2016 2:08	578.13
25/05/2016 2:09	578.75
25/05/2016 2:10	570.63
25/05/2016 2:11	577.50
25/05/2016 2:12	576.88
25/05/2016 2:13	577.50
25/05/2016 2:14	577.50
25/05/2016 2:15	575.63
25/05/2016 2:16	581.25
25/05/2016 2:17	578.75
25/05/2016 2:18	577.50
25/05/2016 2:19	574.38
25/05/2016 2:20	580.63
25/05/2016 2:21	583.75
25/05/2016 2:22	575.00
25/05/2016 2:23	575.00
25/05/2016 2:24	572.50
25/05/2016 2:25	577.50
25/05/2016 2:26	576.88
25/05/2016 2:27	572.50
25/05/2016 2:28	573.13
25/05/2016 2:29	578.75
25/05/2016 2:30	582.50
25/05/2016 2:31	573.13
25/05/2016 2:32	572.50
25/05/2016 2:33	581.88
25/05/2016 2:34	583.13
25/05/2016 2:35	578.75
25/05/2016 2:36	579.38
25/05/2016 2:37	569.38
25/05/2016 2:38	580.63
25/05/2016 2:39	580.63

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 2:40	579.38
25/05/2016 2:41	576.88
25/05/2016 2:42	578.75
25/05/2016 2:43	581.88
25/05/2016 2:44	576.25
25/05/2016 2:45	576.88
25/05/2016 2:46	573.75
25/05/2016 2:47	575.63
25/05/2016 2:48	582.50
25/05/2016 2:49	582.50
25/05/2016 2:50	578.75
25/05/2016 2:51	574.38
25/05/2016 2:52	575.00
25/05/2016 2:53	574.38
25/05/2016 2:54	575.00
25/05/2016 2:55	578.13
25/05/2016 2:56	573.13
25/05/2016 2:57	573.75
25/05/2016 2:58	573.13
25/05/2016 2:59	575.63
25/05/2016 3:00	567.50
25/05/2016 3:01	576.88
25/05/2016 3:02	573.13
25/05/2016 3:03	575.00
25/05/2016 3:04	573.75
25/05/2016 3:05	574.38
25/05/2016 3:06	570.63
25/05/2016 3:07	568.13
25/05/2016 3:08	579.38
25/05/2016 3:09	577.50
25/05/2016 3:10	585.63
25/05/2016 3:11	578.75
25/05/2016 3:12	584.38
25/05/2016 3:13	578.75
25/05/2016 3:14	577.50
25/05/2016 3:15	576.25
25/05/2016 3:16	573.13
25/05/2016 3:17	577.50
25/05/2016 3:18	583.13
25/05/2016 3:19	578.75
25/05/2016 3:20	581.88
25/05/2016 3:21	581.88
25/05/2016 3:22	579.38
25/05/2016 3:23	578.13

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 3:24	583.75
25/05/2016 3:25	581.25
25/05/2016 3:26	581.88
25/05/2016 3:27	583.75
25/05/2016 3:28	580.63
25/05/2016 3:29	583.75
25/05/2016 3:30	579.38
25/05/2016 3:31	576.88
25/05/2016 3:32	578.13
25/05/2016 3:33	577.50
25/05/2016 3:34	580.00
25/05/2016 3:35	583.13
25/05/2016 3:36	581.88
25/05/2016 3:37	580.00
25/05/2016 3:38	580.63
25/05/2016 3:39	576.88
25/05/2016 3:40	582.50
25/05/2016 3:41	581.25
25/05/2016 3:42	585.63
25/05/2016 3:43	580.63
25/05/2016 3:44	581.25
25/05/2016 3:45	577.50
25/05/2016 3:46	578.75
25/05/2016 3:47	581.25
25/05/2016 3:48	581.88
25/05/2016 3:49	581.25
25/05/2016 3:50	580.00
25/05/2016 3:51	573.13
25/05/2016 3:52	574.38
25/05/2016 3:53	577.50
25/05/2016 3:54	573.13
25/05/2016 3:55	577.50
25/05/2016 3:56	571.25
25/05/2016 3:57	575.63
25/05/2016 3:58	578.13
25/05/2016 3:59	567.50
25/05/2016 4:00	568.75
25/05/2016 4:01	573.75
25/05/2016 4:02	575.63
25/05/2016 4:03	576.88
25/05/2016 4:04	571.88
25/05/2016 4:05	575.63
25/05/2016 4:06	573.13
25/05/2016 4:07	582.50

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 4:08	575.63
25/05/2016 4:09	576.88
25/05/2016 4:10	580.00
25/05/2016 4:11	580.00
25/05/2016 4:12	581.88
25/05/2016 4:13	581.25
25/05/2016 4:14	580.63
25/05/2016 4:15	582.50
25/05/2016 4:16	581.25
25/05/2016 4:17	578.13
25/05/2016 4:18	581.88
25/05/2016 4:19	581.88
25/05/2016 4:20	585.63
25/05/2016 4:21	579.38
25/05/2016 4:22	576.88
25/05/2016 4:23	580.00
25/05/2016 4:24	580.63
25/05/2016 4:25	575.00
25/05/2016 4:26	575.63
25/05/2016 4:27	581.25
25/05/2016 4:28	580.63
25/05/2016 4:29	574.38
25/05/2016 4:30	573.13
25/05/2016 4:31	572.50
25/05/2016 4:32	576.88
25/05/2016 4:33	570.63
25/05/2016 4:34	575.00
25/05/2016 4:35	575.00
25/05/2016 4:36	576.25
25/05/2016 4:37	572.50
25/05/2016 4:38	575.63
25/05/2016 4:39	575.63
25/05/2016 4:40	566.88
25/05/2016 4:41	571.25
25/05/2016 4:42	569.38
25/05/2016 4:43	578.75
25/05/2016 4:44	578.13
25/05/2016 4:45	580.63
25/05/2016 4:46	580.00
25/05/2016 4:47	577.50
25/05/2016 4:48	576.88
25/05/2016 4:49	578.75
25/05/2016 4:50	576.88
25/05/2016 4:51	577.50

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 4:52	573.13
25/05/2016 4:53	576.88
25/05/2016 4:54	578.13
25/05/2016 4:55	575.63
25/05/2016 4:56	576.88
25/05/2016 4:57	578.75
25/05/2016 4:58	574.38
25/05/2016 4:59	566.88
25/05/2016 5:00	568.75
25/05/2016 5:01	574.38
25/05/2016 5:02	565.63
25/05/2016 5:03	573.13
25/05/2016 5:04	581.88
25/05/2016 5:05	573.75
25/05/2016 5:06	578.13
25/05/2016 5:07	580.63
25/05/2016 5:08	575.63
25/05/2016 5:09	583.13
25/05/2016 5:10	583.75
25/05/2016 5:11	582.50
25/05/2016 5:12	586.25
25/05/2016 5:13	585.00
25/05/2016 5:14	583.75
25/05/2016 5:15	580.63
25/05/2016 5:16	576.88
25/05/2016 5:17	583.13
25/05/2016 5:18	576.88
25/05/2016 5:19	572.50
25/05/2016 5:20	576.25
25/05/2016 5:21	576.88
25/05/2016 5:22	571.88
25/05/2016 5:23	580.63
25/05/2016 5:24	583.13
25/05/2016 5:25	586.25
25/05/2016 5:26	578.13
25/05/2016 5:27	575.00
25/05/2016 5:28	578.13
25/05/2016 5:29	579.38
25/05/2016 5:30	575.63
25/05/2016 5:31	575.63
25/05/2016 5:32	579.38
25/05/2016 5:33	576.88
25/05/2016 5:34	575.63
25/05/2016 5:35	570.63

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 5:36	580.63
25/05/2016 5:37	573.13
25/05/2016 5:38	572.50
25/05/2016 5:39	577.50
25/05/2016 5:40	571.25
25/05/2016 5:41	565.00
25/05/2016 5:42	574.38
25/05/2016 5:43	575.00
25/05/2016 5:44	577.50
25/05/2016 5:45	573.13
25/05/2016 5:46	572.50
25/05/2016 5:47	570.63
25/05/2016 5:48	585.00
25/05/2016 5:49	578.13
25/05/2016 5:50	577.50
25/05/2016 5:51	573.75
25/05/2016 5:52	575.63
25/05/2016 5:53	576.88
25/05/2016 5:54	581.25
25/05/2016 5:55	570.63
25/05/2016 5:56	583.13
25/05/2016 5:57	566.88
25/05/2016 5:58	574.38
25/05/2016 5:59	575.00
25/05/2016 6:00	570.63
25/05/2016 6:01	580.63
25/05/2016 6:02	567.50
25/05/2016 6:03	570.00
25/05/2016 6:04	573.75
25/05/2016 6:05	580.00
25/05/2016 6:06	576.25
25/05/2016 6:07	571.25
25/05/2016 6:08	576.88
25/05/2016 6:09	575.63
25/05/2016 6:10	579.38
25/05/2016 6:11	577.50
25/05/2016 6:12	144.38
25/05/2016 6:13	555.00
25/05/2016 6:14	578.75
25/05/2016 6:15	569.38
25/05/2016 6:16	578.13
25/05/2016 6:17	583.13
25/05/2016 6:18	578.75
25/05/2016 6:19	577.50

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 6:20	571.88
25/05/2016 6:21	576.25
25/05/2016 6:22	584.38
25/05/2016 6:23	577.50
25/05/2016 6:24	581.25
25/05/2016 6:25	576.88
25/05/2016 6:26	569.38
25/05/2016 6:27	578.75
25/05/2016 6:28	579.38
25/05/2016 6:29	580.63
25/05/2016 6:30	581.88
25/05/2016 6:31	579.38
25/05/2016 6:32	573.75
25/05/2016 6:33	576.25
25/05/2016 6:34	578.13
25/05/2016 6:35	573.13
25/05/2016 6:36	575.00
25/05/2016 6:37	578.13
25/05/2016 6:38	569.38
25/05/2016 6:39	578.13
25/05/2016 6:40	572.50
25/05/2016 6:41	573.75
25/05/2016 6:42	576.88
25/05/2016 6:43	575.00
25/05/2016 6:44	573.13
25/05/2016 6:45	581.88
25/05/2016 6:46	568.75
25/05/2016 6:47	575.63
25/05/2016 6:48	575.63
25/05/2016 6:49	576.88
25/05/2016 6:50	579.38
25/05/2016 6:51	575.00
25/05/2016 6:52	575.63
25/05/2016 6:53	570.00
25/05/2016 6:54	571.25
25/05/2016 6:55	571.25
25/05/2016 6:56	578.13
25/05/2016 6:57	578.75
25/05/2016 6:58	580.63
25/05/2016 6:59	578.13
25/05/2016 7:00	577.50
25/05/2016 7:01	580.63
25/05/2016 7:02	572.50
25/05/2016 7:03	581.88

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 7:04	577.50
25/05/2016 7:05	575.00
25/05/2016 7:06	578.75
25/05/2016 7:07	578.13
25/05/2016 7:08	578.13
25/05/2016 7:09	576.88
25/05/2016 7:10	571.25
25/05/2016 7:11	576.88
25/05/2016 7:12	570.63
25/05/2016 7:13	570.63
25/05/2016 7:14	584.38
25/05/2016 7:15	579.38
25/05/2016 7:16	575.63
25/05/2016 7:17	573.13
25/05/2016 7:18	579.38
25/05/2016 7:19	574.38
25/05/2016 7:20	582.50
25/05/2016 7:21	581.88
25/05/2016 7:22	581.25
25/05/2016 7:23	581.25
25/05/2016 7:24	582.50
25/05/2016 7:25	577.50
25/05/2016 7:26	577.50
25/05/2016 7:27	572.50
25/05/2016 7:28	573.75
25/05/2016 7:29	576.25
25/05/2016 7:30	563.13
25/05/2016 7:31	577.50
25/05/2016 7:32	575.00
25/05/2016 7:33	578.75
25/05/2016 7:34	579.38
25/05/2016 7:35	574.38
25/05/2016 7:36	570.63
25/05/2016 7:37	573.75
25/05/2016 7:38	559.38
25/05/2016 7:39	551.88
25/05/2016 7:40	550.00
25/05/2016 7:41	571.88
25/05/2016 7:42	611.88
25/05/2016 7:43	613.13
25/05/2016 7:44	613.13
25/05/2016 7:45	615.63
25/05/2016 7:46	618.13
25/05/2016 7:47	613.75

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 7:48	610.00
25/05/2016 7:49	610.00
25/05/2016 7:50	614.38
25/05/2016 7:51	613.75
25/05/2016 7:52	616.88
25/05/2016 7:53	613.13
25/05/2016 7:54	613.75
25/05/2016 7:55	616.25
25/05/2016 7:56	615.00
25/05/2016 7:57	612.50
25/05/2016 7:58	615.00
25/05/2016 7:59	608.75
25/05/2016 8:00	613.75
25/05/2016 8:01	613.75
25/05/2016 8:02	616.88
25/05/2016 8:03	612.50
25/05/2016 8:04	615.00
25/05/2016 8:05	613.75
25/05/2016 8:06	611.88
25/05/2016 8:07	609.38
25/05/2016 8:08	609.38
25/05/2016 8:09	612.50
25/05/2016 8:10	611.25
25/05/2016 8:11	607.50
25/05/2016 8:12	608.75
25/05/2016 8:13	604.38
25/05/2016 8:14	606.88
25/05/2016 8:15	609.38
25/05/2016 8:16	610.63
25/05/2016 8:17	614.38
25/05/2016 8:18	618.75
25/05/2016 8:19	611.88
25/05/2016 8:20	604.38
25/05/2016 8:21	615.63
25/05/2016 8:22	608.13
25/05/2016 8:23	615.00
25/05/2016 8:24	612.50
25/05/2016 8:25	617.50
25/05/2016 8:26	611.88
25/05/2016 8:27	610.63
25/05/2016 8:28	616.25
25/05/2016 8:29	610.63
25/05/2016 8:30	611.88
25/05/2016 8:31	616.25

Pig Run Number 1	
Date and Time	Flow Rate
25/05/2016 8:32	612.50
25/05/2016 8:33	611.25
25/05/2016 8:34	613.75
25/05/2016 8:35	616.88
25/05/2016 8:36	612.50
25/05/2016 8:37	613.75
25/05/2016 8:38	611.88
25/05/2016 8:39	615.63
25/05/2016 8:40	615.63
25/05/2016 8:41	616.25
25/05/2016 8:42	611.25
25/05/2016 8:43	611.25
25/05/2016 8:44	609.38
25/05/2016 8:45	616.25
25/05/2016 8:46	611.88
25/05/2016 8:47	616.25
25/05/2016 8:48	607.50
25/05/2016 8:49	612.50
25/05/2016 8:50	615.63
25/05/2016 8:51	615.63
25/05/2016 8:52	611.88
25/05/2016 8:53	606.88
25/05/2016 8:54	613.13
25/05/2016 8:55	617.50
25/05/2016 8:56	613.75
25/05/2016 8:57	612.50
25/05/2016 8:58	614.38
25/05/2016 8:59	611.25

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 9:30	610.00
25/05/2016 9:31	609.38
25/05/2016 9:32	616.25
25/05/2016 9:33	611.88
25/05/2016 9:34	611.88
25/05/2016 9:35	615.63
25/05/2016 9:36	613.75
25/05/2016 9:37	614.38
25/05/2016 9:38	605.63
25/05/2016 9:39	609.38
25/05/2016 9:40	611.88
25/05/2016 9:41	611.88
25/05/2016 9:42	608.13
25/05/2016 9:43	606.25
25/05/2016 9:44	608.13
25/05/2016 9:45	611.88
25/05/2016 9:46	605.00
25/05/2016 9:47	611.25
25/05/2016 9:48	608.13
25/05/2016 9:49	611.25
25/05/2016 9:50	608.75
25/05/2016 9:51	600.63
25/05/2016 9:52	617.50
25/05/2016 9:53	611.25
25/05/2016 9:54	615.63
25/05/2016 9:55	616.25
25/05/2016 9:56	613.75
25/05/2016 9:57	612.50
25/05/2016 9:58	606.88
25/05/2016 9:59	615.63
25/05/2016 10:00	607.50
25/05/2016 10:01	616.88
25/05/2016 10:02	612.50
25/05/2016 10:03	609.38
25/05/2016 10:04	608.75
25/05/2016 10:05	610.00
25/05/2016 10:06	609.38
25/05/2016 10:07	607.50
25/05/2016 10:08	610.63
25/05/2016 10:09	612.50
25/05/2016 10:10	606.88
25/05/2016 10:11	610.63
25/05/2016 10:12	608.13
25/05/2016 10:13	602.50

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 10:14	605.00
25/05/2016 10:15	611.88
25/05/2016 10:16	608.13
25/05/2016 10:17	610.00
25/05/2016 10:18	610.00
25/05/2016 10:19	611.25
25/05/2016 10:20	610.63
25/05/2016 10:21	613.13
25/05/2016 10:22	608.13
25/05/2016 10:23	610.00
25/05/2016 10:24	611.88
25/05/2016 10:25	609.38
25/05/2016 10:26	608.13
25/05/2016 10:27	613.13
25/05/2016 10:28	608.75
25/05/2016 10:29	608.13
25/05/2016 10:30	608.13
25/05/2016 10:31	611.88
25/05/2016 10:32	605.63
25/05/2016 10:33	606.88
25/05/2016 10:34	610.00
25/05/2016 10:35	608.13
25/05/2016 10:36	611.25
25/05/2016 10:37	613.13
25/05/2016 10:38	611.88
25/05/2016 10:39	613.13
25/05/2016 10:40	616.25
25/05/2016 10:41	613.13
25/05/2016 10:42	614.38
25/05/2016 10:43	608.13
25/05/2016 10:44	605.00
25/05/2016 10:45	608.13
25/05/2016 10:46	615.63
25/05/2016 10:47	609.38
25/05/2016 10:48	612.50
25/05/2016 10:49	612.50
25/05/2016 10:50	611.88
25/05/2016 10:51	613.13
25/05/2016 10:52	608.75
25/05/2016 10:53	608.75
25/05/2016 10:54	618.13
25/05/2016 10:55	616.88
25/05/2016 10:56	612.50
25/05/2016 10:57	596.25

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 10:58	607.50
25/05/2016 10:59	605.63
25/05/2016 11:00	603.13
25/05/2016 11:01	604.38
25/05/2016 11:02	607.50
25/05/2016 11:03	604.38
25/05/2016 11:04	603.75
25/05/2016 11:05	601.88
25/05/2016 11:06	605.00
25/05/2016 11:07	609.38
25/05/2016 11:08	602.50
25/05/2016 11:09	599.38
25/05/2016 11:10	605.63
25/05/2016 11:11	612.50
25/05/2016 11:12	608.75
25/05/2016 11:13	610.00
25/05/2016 11:14	610.00
25/05/2016 11:15	607.50
25/05/2016 11:16	618.13
25/05/2016 11:17	611.25
25/05/2016 11:18	617.50
25/05/2016 11:19	605.63
25/05/2016 11:20	612.50
25/05/2016 11:21	616.25
25/05/2016 11:22	612.50
25/05/2016 11:23	611.25
25/05/2016 11:24	611.88
25/05/2016 11:25	605.63
25/05/2016 11:26	611.88
25/05/2016 11:27	616.25
25/05/2016 11:28	610.63
25/05/2016 11:29	613.13
25/05/2016 11:30	617.50
25/05/2016 11:31	612.50
25/05/2016 11:32	610.63
25/05/2016 11:33	611.25
25/05/2016 11:34	616.25
25/05/2016 11:35	615.00
25/05/2016 11:36	616.25
25/05/2016 11:37	610.00
25/05/2016 11:38	608.75
25/05/2016 11:39	606.88
25/05/2016 11:40	601.25
25/05/2016 11:41	614.38

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 11:42	613.13
25/05/2016 11:43	606.88
25/05/2016 11:44	611.25
25/05/2016 11:45	605.63
25/05/2016 11:46	615.63
25/05/2016 11:47	615.00
25/05/2016 11:48	610.63
25/05/2016 11:49	613.13
25/05/2016 11:50	614.38
25/05/2016 11:51	611.88
25/05/2016 11:52	607.50
25/05/2016 11:53	610.63
25/05/2016 11:54	613.13
25/05/2016 11:55	606.25
25/05/2016 11:56	605.63
25/05/2016 11:57	604.38
25/05/2016 11:58	605.00
25/05/2016 11:59	608.75
25/05/2016 12:00	615.63
25/05/2016 12:01	617.50
25/05/2016 12:02	612.50
25/05/2016 12:03	607.50
25/05/2016 12:04	615.00
25/05/2016 12:05	620.63
25/05/2016 12:06	608.75
25/05/2016 12:07	616.88
25/05/2016 12:08	615.63
25/05/2016 12:09	608.13
25/05/2016 12:10	613.13
25/05/2016 12:11	620.00
25/05/2016 12:12	608.13
25/05/2016 12:13	608.75
25/05/2016 12:14	611.25
25/05/2016 12:15	611.88
25/05/2016 12:16	616.88
25/05/2016 12:17	618.75
25/05/2016 12:18	605.63
25/05/2016 12:19	612.50
25/05/2016 12:20	610.00
25/05/2016 12:21	611.25
25/05/2016 12:22	610.63
25/05/2016 12:23	613.13
25/05/2016 12:24	612.50
25/05/2016 12:25	613.75

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 12:26	614.38
25/05/2016 12:27	615.00
25/05/2016 12:28	615.63
25/05/2016 12:29	614.38
25/05/2016 12:30	612.50
25/05/2016 12:31	617.50
25/05/2016 12:32	617.50
25/05/2016 12:33	613.13
25/05/2016 12:34	619.38
25/05/2016 12:35	620.00
25/05/2016 12:36	618.13
25/05/2016 12:37	615.00
25/05/2016 12:38	615.00
25/05/2016 12:39	614.38
25/05/2016 12:40	615.00
25/05/2016 12:41	618.75
25/05/2016 12:42	615.00
25/05/2016 12:43	620.00
25/05/2016 12:44	615.63
25/05/2016 12:45	612.50
25/05/2016 12:46	618.75
25/05/2016 12:47	615.00
25/05/2016 12:48	617.50
25/05/2016 12:49	616.25
25/05/2016 12:50	616.88
25/05/2016 12:51	618.13
25/05/2016 12:52	615.00
25/05/2016 12:53	616.25
25/05/2016 12:54	616.88
25/05/2016 12:55	617.50
25/05/2016 12:56	626.88
25/05/2016 12:57	620.63
25/05/2016 12:58	618.13
25/05/2016 12:59	620.63
25/05/2016 13:00	625.00
25/05/2016 13:01	620.00
25/05/2016 13:02	616.25
25/05/2016 13:03	617.50
25/05/2016 13:04	620.63
25/05/2016 13:05	621.88
25/05/2016 13:06	624.38
25/05/2016 13:07	619.38
25/05/2016 13:08	623.75
25/05/2016 13:09	621.88

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 13:10	619.38
25/05/2016 13:11	615.63
25/05/2016 13:12	616.25
25/05/2016 13:13	613.13
25/05/2016 13:14	614.38
25/05/2016 13:15	615.63
25/05/2016 13:16	616.25
25/05/2016 13:17	608.75
25/05/2016 13:18	616.25
25/05/2016 13:19	619.38
25/05/2016 13:20	617.50
25/05/2016 13:21	611.25
25/05/2016 13:22	616.88
25/05/2016 13:23	615.63
25/05/2016 13:24	616.88
25/05/2016 13:25	613.75
25/05/2016 13:26	606.25
25/05/2016 13:27	617.50
25/05/2016 13:28	615.63
25/05/2016 13:29	615.00
25/05/2016 13:30	616.88
25/05/2016 13:31	619.38
25/05/2016 13:32	616.88
25/05/2016 13:33	611.25
25/05/2016 13:34	613.13
25/05/2016 13:35	611.25
25/05/2016 13:36	614.38
25/05/2016 13:37	617.50
25/05/2016 13:38	618.13
25/05/2016 13:39	615.63
25/05/2016 13:40	615.00
25/05/2016 13:41	616.88
25/05/2016 13:42	614.38
25/05/2016 13:43	620.00
25/05/2016 13:44	616.88
25/05/2016 13:45	621.88
25/05/2016 13:46	623.75
25/05/2016 13:47	621.88
25/05/2016 13:48	615.00
25/05/2016 13:49	618.75
25/05/2016 13:50	622.50
25/05/2016 13:51	622.50
25/05/2016 13:52	624.38
25/05/2016 13:53	621.88

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 13:54	618.75
25/05/2016 13:55	616.88
25/05/2016 13:56	616.25
25/05/2016 13:57	617.50
25/05/2016 13:58	616.88
25/05/2016 13:59	618.75
25/05/2016 14:00	621.88
25/05/2016 14:01	623.75
25/05/2016 14:02	616.88
25/05/2016 14:03	616.88
25/05/2016 14:04	622.50
25/05/2016 14:05	615.63
25/05/2016 14:06	616.25
25/05/2016 14:07	626.88
25/05/2016 14:08	620.00
25/05/2016 14:09	616.25
25/05/2016 14:10	620.00
25/05/2016 14:11	617.50
25/05/2016 14:12	619.38
25/05/2016 14:13	611.25
25/05/2016 14:14	610.63
25/05/2016 14:15	618.13
25/05/2016 14:16	619.38
25/05/2016 14:17	615.63
25/05/2016 14:18	618.13
25/05/2016 14:19	616.88
25/05/2016 14:20	618.13
25/05/2016 14:21	616.88
25/05/2016 14:22	617.50
25/05/2016 14:23	623.75
25/05/2016 14:24	617.50
25/05/2016 14:25	618.75
25/05/2016 14:26	620.63
25/05/2016 14:27	623.75
25/05/2016 14:28	617.50
25/05/2016 14:29	620.00
25/05/2016 14:30	623.75
25/05/2016 14:31	627.50
25/05/2016 14:32	617.50
25/05/2016 14:33	615.00
25/05/2016 14:34	620.63
25/05/2016 14:35	620.00
25/05/2016 14:36	625.00
25/05/2016 14:37	618.75

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 14:38	625.00
25/05/2016 14:39	618.13
25/05/2016 14:40	623.13
25/05/2016 14:41	618.75
25/05/2016 14:42	615.00
25/05/2016 14:43	616.25
25/05/2016 14:44	615.63
25/05/2016 14:45	618.75
25/05/2016 14:46	621.88
25/05/2016 14:47	621.88
25/05/2016 14:48	615.63
25/05/2016 14:49	618.75
25/05/2016 14:50	622.50
25/05/2016 14:51	620.63
25/05/2016 14:52	619.38
25/05/2016 14:53	620.63
25/05/2016 14:54	619.38
25/05/2016 14:55	616.25
25/05/2016 14:56	612.50
25/05/2016 14:57	618.13
25/05/2016 14:58	624.38
25/05/2016 14:59	616.25
25/05/2016 15:00	618.13
25/05/2016 15:01	618.13
25/05/2016 15:02	619.38
25/05/2016 15:03	620.00
25/05/2016 15:04	628.13
25/05/2016 15:05	625.00
25/05/2016 15:06	628.13
25/05/2016 15:07	619.38
25/05/2016 15:08	618.75
25/05/2016 15:09	621.25
25/05/2016 15:10	627.50
25/05/2016 15:11	622.50
25/05/2016 15:12	621.25
25/05/2016 15:13	619.38
25/05/2016 15:14	623.75
25/05/2016 15:15	618.13
25/05/2016 15:16	623.75
25/05/2016 15:17	616.88
25/05/2016 15:18	622.50
25/05/2016 15:19	611.25
25/05/2016 15:20	613.75
25/05/2016 15:21	618.75

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 15:22	623.13
25/05/2016 15:23	620.63
25/05/2016 15:24	624.38
25/05/2016 15:25	626.25
25/05/2016 15:26	631.88
25/05/2016 15:27	630.00
25/05/2016 15:28	621.88
25/05/2016 15:29	614.38
25/05/2016 15:30	626.25
25/05/2016 15:31	621.25
25/05/2016 15:32	621.88
25/05/2016 15:33	623.75
25/05/2016 15:34	626.88
25/05/2016 15:35	620.00
25/05/2016 15:36	626.88
25/05/2016 15:37	623.13
25/05/2016 15:38	624.38
25/05/2016 15:39	630.63
25/05/2016 15:40	624.38
25/05/2016 15:41	628.75
25/05/2016 15:42	628.75
25/05/2016 15:43	629.38
25/05/2016 15:44	624.38
25/05/2016 15:45	636.25
25/05/2016 15:46	626.88
25/05/2016 15:47	629.38
25/05/2016 15:48	628.75
25/05/2016 15:49	635.63
25/05/2016 15:50	626.88
25/05/2016 15:51	622.50
25/05/2016 15:52	630.00
25/05/2016 15:53	626.88
25/05/2016 15:54	621.88
25/05/2016 15:55	630.63
25/05/2016 15:56	628.75
25/05/2016 15:57	625.63
25/05/2016 15:58	625.63
25/05/2016 15:59	626.25
25/05/2016 16:00	623.75
25/05/2016 16:01	625.63
25/05/2016 16:02	618.13
25/05/2016 16:03	629.38
25/05/2016 16:04	627.50
25/05/2016 16:05	630.00

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 16:06	631.25
25/05/2016 16:07	631.88
25/05/2016 16:08	630.00
25/05/2016 16:09	626.25
25/05/2016 16:10	625.63
25/05/2016 16:11	625.00
25/05/2016 16:12	633.75
25/05/2016 16:13	628.13
25/05/2016 16:14	626.25
25/05/2016 16:15	628.13
25/05/2016 16:16	626.25
25/05/2016 16:17	628.13
25/05/2016 16:18	630.00
25/05/2016 16:19	628.13
25/05/2016 16:20	629.38
25/05/2016 16:21	625.63
25/05/2016 16:22	630.00
25/05/2016 16:23	623.75
25/05/2016 16:24	630.00
25/05/2016 16:25	626.25
25/05/2016 16:26	631.88
25/05/2016 16:27	633.13
25/05/2016 16:28	621.88
25/05/2016 16:29	621.88
25/05/2016 16:30	632.50
25/05/2016 16:31	631.88
25/05/2016 16:32	633.75
25/05/2016 16:33	630.63
25/05/2016 16:34	623.75
25/05/2016 16:35	630.63
25/05/2016 16:36	633.13
25/05/2016 16:37	636.25
25/05/2016 16:38	611.88
25/05/2016 16:39	631.88
25/05/2016 16:40	629.38
25/05/2016 16:41	632.50
25/05/2016 16:42	625.00
25/05/2016 16:43	635.63
25/05/2016 16:44	625.00
25/05/2016 16:45	633.75
25/05/2016 16:46	628.13
25/05/2016 16:47	636.25
25/05/2016 16:48	636.25
25/05/2016 16:49	635.63

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 16:50	631.25
25/05/2016 16:51	632.50
25/05/2016 16:52	633.13
25/05/2016 16:53	640.63
25/05/2016 16:54	628.75
25/05/2016 16:55	629.38
25/05/2016 16:56	630.00
25/05/2016 16:57	625.00
25/05/2016 16:58	626.25
25/05/2016 16:59	624.38
25/05/2016 17:00	628.75
25/05/2016 17:01	626.88
25/05/2016 17:02	626.88
25/05/2016 17:03	631.88
25/05/2016 17:04	626.25
25/05/2016 17:05	631.25
25/05/2016 17:06	635.00
25/05/2016 17:07	633.75
25/05/2016 17:08	632.50
25/05/2016 17:09	628.75
25/05/2016 17:10	625.00
25/05/2016 17:11	625.00
25/05/2016 17:12	626.88
25/05/2016 17:13	628.75
25/05/2016 17:14	635.63
25/05/2016 17:15	632.50
25/05/2016 17:16	632.50
25/05/2016 17:17	629.38
25/05/2016 17:18	637.50
25/05/2016 17:19	633.13
25/05/2016 17:20	627.50
25/05/2016 17:21	625.00
25/05/2016 17:22	634.38
25/05/2016 17:23	635.63
25/05/2016 17:24	630.00
25/05/2016 17:25	637.50
25/05/2016 17:26	633.13
25/05/2016 17:27	626.25
25/05/2016 17:28	626.88
25/05/2016 17:29	633.75
25/05/2016 17:30	623.75
25/05/2016 17:31	630.00
25/05/2016 17:32	633.13
25/05/2016 17:33	629.38

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 17:34	636.25
25/05/2016 17:35	640.63
25/05/2016 17:36	640.00
25/05/2016 17:37	630.63
25/05/2016 17:38	632.50
25/05/2016 17:39	628.75
25/05/2016 17:40	624.38
25/05/2016 17:41	640.63
25/05/2016 17:42	641.25
25/05/2016 17:43	635.63
25/05/2016 17:44	630.00
25/05/2016 17:45	633.13
25/05/2016 17:46	628.75
25/05/2016 17:47	627.50
25/05/2016 17:48	631.25
25/05/2016 17:49	629.38
25/05/2016 17:50	629.38
25/05/2016 17:51	626.25
25/05/2016 17:52	632.50
25/05/2016 17:53	625.00
25/05/2016 17:54	632.50
25/05/2016 17:55	624.38
25/05/2016 17:56	626.88
25/05/2016 17:57	623.13
25/05/2016 17:58	626.88
25/05/2016 17:59	623.75
25/05/2016 18:00	626.88
25/05/2016 18:01	627.50
25/05/2016 18:02	626.88
25/05/2016 18:03	636.88
25/05/2016 18:04	631.88
25/05/2016 18:05	621.88
25/05/2016 18:06	625.00
25/05/2016 18:07	633.13
25/05/2016 18:08	628.13
25/05/2016 18:09	625.00
25/05/2016 18:10	625.00
25/05/2016 18:11	628.75
25/05/2016 18:12	626.25
25/05/2016 18:13	628.75
25/05/2016 18:14	627.50
25/05/2016 18:15	626.88
25/05/2016 18:16	630.00
25/05/2016 18:17	635.00

Pig Run Number 2	
Date and Time	Flow Rate
25/05/2016 18:18	623.13
25/05/2016 18:19	635.00
25/05/2016 18:20	633.13
25/05/2016 18:21	631.88
25/05/2016 18:22	628.75
25/05/2016 18:23	628.75
25/05/2016 18:24	629.38
25/05/2016 18:25	630.00
25/05/2016 18:26	628.13
25/05/2016 18:27	623.75
25/05/2016 18:28	626.88
25/05/2016 18:29	632.50
25/05/2016 18:30	624.38
25/05/2016 18:31	626.25
25/05/2016 18:32	635.63
25/05/2016 18:33	631.25
25/05/2016 18:34	630.63
25/05/2016 18:35	630.63
25/05/2016 18:36	631.25
25/05/2016 18:37	628.75
25/05/2016 18:38	620.00
25/05/2016 18:39	634.38
25/05/2016 18:40	635.00
25/05/2016 18:41	641.25
25/05/2016 18:42	635.63
25/05/2016 18:43	632.50
25/05/2016 18:44	636.88
25/05/2016 18:45	633.75
25/05/2016 18:46	632.50
25/05/2016 18:47	637.50
25/05/2016 18:48	636.88
25/05/2016 18:49	633.13
25/05/2016 18:50	628.75
25/05/2016 18:51	631.88
25/05/2016 18:52	631.88
25/05/2016 18:53	636.88
25/05/2016 18:54	631.88
25/05/2016 18:55	634.38
25/05/2016 18:56	634.38
25/05/2016 18:57	638.13
25/05/2016 18:58	636.88
25/05/2016 18:59	635.00
25/05/2016 19:00	636.88

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 7:00	640.00
26/05/2016 7:01	632.50
26/05/2016 7:02	638.75
26/05/2016 7:03	630.00
26/05/2016 7:04	633.75
26/05/2016 7:05	631.88
26/05/2016 7:06	632.50
26/05/2016 7:07	628.75
26/05/2016 7:08	626.25
26/05/2016 7:09	631.25
26/05/2016 7:10	636.88
26/05/2016 7:11	633.13
26/05/2016 7:12	638.13
26/05/2016 7:13	630.63
26/05/2016 7:14	632.50
26/05/2016 7:15	635.63
26/05/2016 7:16	630.63
26/05/2016 7:17	630.00
26/05/2016 7:18	635.00
26/05/2016 7:19	628.13
26/05/2016 7:20	628.75
26/05/2016 7:21	637.50
26/05/2016 7:22	632.50
26/05/2016 7:23	632.50
26/05/2016 7:24	639.38
26/05/2016 7:25	637.50
26/05/2016 7:26	626.88
26/05/2016 7:27	637.50
26/05/2016 7:28	633.75
26/05/2016 7:29	634.38
26/05/2016 7:30	642.50
26/05/2016 7:31	638.75
26/05/2016 7:32	636.25
26/05/2016 7:33	634.38
26/05/2016 7:34	635.63
26/05/2016 7:35	626.88
26/05/2016 7:36	633.13
26/05/2016 7:37	638.75
26/05/2016 7:38	630.00
26/05/2016 7:39	633.13
26/05/2016 7:40	622.50
26/05/2016 7:41	621.25
26/05/2016 7:42	629.38
26/05/2016 7:43	633.75

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 7:44	635.63
26/05/2016 7:45	631.25
26/05/2016 7:46	633.75
26/05/2016 7:47	635.00
26/05/2016 7:48	626.88
26/05/2016 7:49	629.38
26/05/2016 7:50	634.38
26/05/2016 7:51	629.38
26/05/2016 7:52	635.00
26/05/2016 7:53	633.13
26/05/2016 7:54	628.75
26/05/2016 7:55	636.88
26/05/2016 7:56	628.75
26/05/2016 7:57	640.63
26/05/2016 7:58	632.50
26/05/2016 7:59	635.63
26/05/2016 8:00	636.25
26/05/2016 8:01	640.00
26/05/2016 8:02	633.75
26/05/2016 8:03	634.38
26/05/2016 8:04	631.88
26/05/2016 8:05	633.75
26/05/2016 8:06	641.88
26/05/2016 8:07	634.38
26/05/2016 8:08	631.25
26/05/2016 8:09	631.88
26/05/2016 8:10	627.50
26/05/2016 8:11	624.38
26/05/2016 8:12	628.13
26/05/2016 8:13	628.75
26/05/2016 8:14	635.00
26/05/2016 8:15	635.00
26/05/2016 8:16	627.50
26/05/2016 8:17	620.63
26/05/2016 8:18	614.38
26/05/2016 8:19	621.88
26/05/2016 8:20	623.13
26/05/2016 8:21	628.75
26/05/2016 8:22	631.25
26/05/2016 8:23	629.38
26/05/2016 8:24	631.88
26/05/2016 8:25	624.38
26/05/2016 8:26	629.38
26/05/2016 8:27	630.63

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 8:28	628.13
26/05/2016 8:29	628.75
26/05/2016 8:30	631.25
26/05/2016 8:31	633.13
26/05/2016 8:32	628.13
26/05/2016 8:33	634.38
26/05/2016 8:34	627.50
26/05/2016 8:35	630.63
26/05/2016 8:36	631.88
26/05/2016 8:37	628.13
26/05/2016 8:38	632.50
26/05/2016 8:39	627.50
26/05/2016 8:40	636.25
26/05/2016 8:41	633.75
26/05/2016 8:42	639.38
26/05/2016 8:43	632.50
26/05/2016 8:44	636.25
26/05/2016 8:45	635.63
26/05/2016 8:46	639.38
26/05/2016 8:47	635.00
26/05/2016 8:48	629.38
26/05/2016 8:49	633.13
26/05/2016 8:50	633.13
26/05/2016 8:51	634.38
26/05/2016 8:52	636.88
26/05/2016 8:53	636.25
26/05/2016 8:54	628.13
26/05/2016 8:55	637.50
26/05/2016 8:56	640.00
26/05/2016 8:57	636.88
26/05/2016 8:58	645.00
26/05/2016 8:59	634.38
26/05/2016 9:00	634.38
26/05/2016 9:01	636.88
26/05/2016 9:02	630.63
26/05/2016 9:03	641.88
26/05/2016 9:04	635.00
26/05/2016 9:05	632.50
26/05/2016 9:06	637.50
26/05/2016 9:07	636.88
26/05/2016 9:08	640.63
26/05/2016 9:09	634.38
26/05/2016 9:10	635.00
26/05/2016 9:11	643.13

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 9:12	644.38
26/05/2016 9:13	645.63
26/05/2016 9:14	643.13
26/05/2016 9:15	642.50
26/05/2016 9:16	651.88
26/05/2016 9:17	646.25
26/05/2016 9:18	645.00
26/05/2016 9:19	648.75
26/05/2016 9:20	649.38
26/05/2016 9:21	645.00
26/05/2016 9:22	641.25
26/05/2016 9:23	647.50
26/05/2016 9:24	642.50
26/05/2016 9:25	638.13
26/05/2016 9:26	642.50
26/05/2016 9:27	642.50
26/05/2016 9:28	642.50
26/05/2016 9:29	643.75
26/05/2016 9:30	647.50
26/05/2016 9:31	645.00
26/05/2016 9:32	648.75
26/05/2016 9:33	641.88
26/05/2016 9:34	643.75
26/05/2016 9:35	646.25
26/05/2016 9:36	648.75
26/05/2016 9:37	652.50
26/05/2016 9:38	651.25
26/05/2016 9:39	654.38
26/05/2016 9:40	655.63
26/05/2016 9:41	644.38
26/05/2016 9:42	647.50
26/05/2016 9:43	645.00
26/05/2016 9:44	642.50
26/05/2016 9:45	646.88
26/05/2016 9:46	645.63
26/05/2016 9:47	646.88
26/05/2016 9:48	649.38
26/05/2016 9:49	648.75
26/05/2016 9:50	651.25
26/05/2016 9:51	648.75
26/05/2016 9:52	648.13
26/05/2016 9:53	655.00
26/05/2016 9:54	650.63
26/05/2016 9:55	646.25

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 9:56	650.63
26/05/2016 9:57	649.38
26/05/2016 9:58	645.63
26/05/2016 9:59	649.38
26/05/2016 10:00	652.50
26/05/2016 10:01	646.25
26/05/2016 10:02	655.00
26/05/2016 10:03	653.13
26/05/2016 10:04	650.63
26/05/2016 10:05	657.50
26/05/2016 10:06	650.00
26/05/2016 10:07	650.63
26/05/2016 10:08	652.50
26/05/2016 10:09	653.75
26/05/2016 10:10	660.00
26/05/2016 10:11	653.75
26/05/2016 10:12	653.13
26/05/2016 10:13	656.88
26/05/2016 10:14	650.00
26/05/2016 10:15	653.75
26/05/2016 10:16	658.75
26/05/2016 10:17	650.63
26/05/2016 10:18	650.63
26/05/2016 10:19	654.38
26/05/2016 10:20	654.38
26/05/2016 10:21	653.13
26/05/2016 10:22	656.88
26/05/2016 10:23	653.75
26/05/2016 10:24	655.00
26/05/2016 10:25	652.50
26/05/2016 10:26	653.13
26/05/2016 10:27	656.25
26/05/2016 10:28	663.75
26/05/2016 10:29	658.75
26/05/2016 10:30	658.13
26/05/2016 10:31	655.63
26/05/2016 10:32	663.13
26/05/2016 10:33	660.63
26/05/2016 10:34	652.50
26/05/2016 10:35	659.38
26/05/2016 10:36	656.88
26/05/2016 10:37	666.25
26/05/2016 10:38	658.75
26/05/2016 10:39	657.50

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 10:40	653.13
26/05/2016 10:41	656.25
26/05/2016 10:42	655.63
26/05/2016 10:43	663.13
26/05/2016 10:44	654.38
26/05/2016 10:45	665.00
26/05/2016 10:46	658.75
26/05/2016 10:47	657.50
26/05/2016 10:48	660.63
26/05/2016 10:49	659.38
26/05/2016 10:50	661.88
26/05/2016 10:51	662.50
26/05/2016 10:52	661.88
26/05/2016 10:53	666.25
26/05/2016 10:54	664.38
26/05/2016 10:55	658.75
26/05/2016 10:56	663.75
26/05/2016 10:57	661.88
26/05/2016 10:58	670.00
26/05/2016 10:59	670.00
26/05/2016 11:00	673.13
26/05/2016 11:01	666.25
26/05/2016 11:02	668.75
26/05/2016 11:03	661.88
26/05/2016 11:04	655.63
26/05/2016 11:05	660.63
26/05/2016 11:06	660.63
26/05/2016 11:07	664.38
26/05/2016 11:08	661.25
26/05/2016 11:09	665.00
26/05/2016 11:10	669.38
26/05/2016 11:11	673.75
26/05/2016 11:12	665.63
26/05/2016 11:13	669.38
26/05/2016 11:14	661.25
26/05/2016 11:15	665.63
26/05/2016 11:16	664.38
26/05/2016 11:17	667.50
26/05/2016 11:18	668.75
26/05/2016 11:19	662.50
26/05/2016 11:20	668.13
26/05/2016 11:21	667.50
26/05/2016 11:22	664.38
26/05/2016 11:23	664.38

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 11:24	666.25
26/05/2016 11:25	668.75
26/05/2016 11:26	666.88
26/05/2016 11:27	665.00
26/05/2016 11:28	673.13
26/05/2016 11:29	673.13
26/05/2016 11:30	668.13
26/05/2016 11:31	663.75
26/05/2016 11:32	667.50
26/05/2016 11:33	668.75
26/05/2016 11:34	670.63
26/05/2016 11:35	671.88
26/05/2016 11:36	666.88
26/05/2016 11:37	671.88
26/05/2016 11:38	664.38
26/05/2016 11:39	674.38
26/05/2016 11:40	665.00
26/05/2016 11:41	667.50
26/05/2016 11:42	667.50
26/05/2016 11:43	671.88
26/05/2016 11:44	660.63
26/05/2016 11:45	666.88
26/05/2016 11:46	673.13
26/05/2016 11:47	671.88
26/05/2016 11:48	670.63
26/05/2016 11:49	672.50
26/05/2016 11:50	669.38
26/05/2016 11:51	670.63
26/05/2016 11:52	668.75
26/05/2016 11:53	672.50
26/05/2016 11:54	681.25
26/05/2016 11:55	679.38
26/05/2016 11:56	673.13
26/05/2016 11:57	671.88
26/05/2016 11:58	664.38
26/05/2016 11:59	666.88
26/05/2016 12:00	664.38
26/05/2016 12:01	671.25
26/05/2016 12:02	662.50
26/05/2016 12:03	661.25
26/05/2016 12:04	663.13
26/05/2016 12:05	678.13
26/05/2016 12:06	671.25
26/05/2016 12:07	678.13

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 12:08	670.63
26/05/2016 12:09	669.38
26/05/2016 12:10	673.75
26/05/2016 12:11	675.63
26/05/2016 12:12	680.00
26/05/2016 12:13	682.50
26/05/2016 12:14	676.88
26/05/2016 12:15	674.38
26/05/2016 12:16	675.00
26/05/2016 12:17	672.50
26/05/2016 12:18	666.88
26/05/2016 12:19	673.13
26/05/2016 12:20	670.00
26/05/2016 12:21	671.25
26/05/2016 12:22	673.75
26/05/2016 12:23	673.75
26/05/2016 12:24	674.38
26/05/2016 12:25	670.63
26/05/2016 12:26	673.75
26/05/2016 12:27	675.63
26/05/2016 12:28	670.00
26/05/2016 12:29	676.88
26/05/2016 12:30	672.50
26/05/2016 12:31	676.25
26/05/2016 12:32	671.88
26/05/2016 12:33	680.63
26/05/2016 12:34	673.13
26/05/2016 12:35	668.13
26/05/2016 12:36	670.63
26/05/2016 12:37	672.50
26/05/2016 12:38	678.13
26/05/2016 12:39	680.00
26/05/2016 12:40	678.13
26/05/2016 12:41	677.50
26/05/2016 12:42	672.50
26/05/2016 12:43	678.75
26/05/2016 12:44	679.38
26/05/2016 12:45	678.13
26/05/2016 12:46	681.25
26/05/2016 12:47	676.25
26/05/2016 12:48	678.75
26/05/2016 12:49	680.63
26/05/2016 12:50	681.25
26/05/2016 12:51	680.63

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 12:52	676.25
26/05/2016 12:53	679.38
26/05/2016 12:54	678.75
26/05/2016 12:55	677.50
26/05/2016 12:56	678.75
26/05/2016 12:57	683.13
26/05/2016 12:58	683.75
26/05/2016 12:59	681.88
26/05/2016 13:00	671.88
26/05/2016 13:01	675.63
26/05/2016 13:02	678.13
26/05/2016 13:03	675.63
26/05/2016 13:04	677.50
26/05/2016 13:05	677.50
26/05/2016 13:06	681.88
26/05/2016 13:07	681.25
26/05/2016 13:08	675.00
26/05/2016 13:09	674.38
26/05/2016 13:10	679.38
26/05/2016 13:11	674.38
26/05/2016 13:12	671.88
26/05/2016 13:13	674.38
26/05/2016 13:14	685.00
26/05/2016 13:15	680.00
26/05/2016 13:16	683.13
26/05/2016 13:17	678.75
26/05/2016 13:18	674.38
26/05/2016 13:19	671.25
26/05/2016 13:20	669.38
26/05/2016 13:21	678.75
26/05/2016 13:22	678.13
26/05/2016 13:23	689.38
26/05/2016 13:24	677.50
26/05/2016 13:25	674.38
26/05/2016 13:26	677.50
26/05/2016 13:27	675.63
26/05/2016 13:28	675.00
26/05/2016 13:29	678.13
26/05/2016 13:30	668.13
26/05/2016 13:31	674.38
26/05/2016 13:32	691.25
26/05/2016 13:33	680.00
26/05/2016 13:34	680.63
26/05/2016 13:35	687.50

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 13:36	693.13
26/05/2016 13:37	693.13
26/05/2016 13:38	688.75
26/05/2016 13:39	686.88
26/05/2016 13:40	690.00
26/05/2016 13:41	688.13
26/05/2016 13:42	684.38
26/05/2016 13:43	683.13
26/05/2016 13:44	682.50
26/05/2016 13:45	687.50
26/05/2016 13:46	690.00
26/05/2016 13:47	694.38
26/05/2016 13:48	680.00
26/05/2016 13:49	691.25
26/05/2016 13:50	685.63
26/05/2016 13:51	690.00
26/05/2016 13:52	681.88
26/05/2016 13:53	683.75
26/05/2016 13:54	686.25
26/05/2016 13:55	691.25
26/05/2016 13:56	685.63
26/05/2016 13:57	686.25
26/05/2016 13:58	684.38
26/05/2016 13:59	683.75
26/05/2016 14:00	685.63
26/05/2016 14:01	681.25
26/05/2016 14:02	673.75
26/05/2016 14:03	681.25
26/05/2016 14:04	686.25
26/05/2016 14:05	686.25
26/05/2016 14:06	687.50
26/05/2016 14:07	680.00
26/05/2016 14:08	683.13
26/05/2016 14:09	682.50
26/05/2016 14:10	678.13
26/05/2016 14:11	680.63
26/05/2016 14:12	684.38
26/05/2016 14:13	678.13
26/05/2016 14:14	682.50
26/05/2016 14:15	678.13
26/05/2016 14:16	686.25
26/05/2016 14:17	683.13
26/05/2016 14:18	681.25
26/05/2016 14:19	686.25

Pig Run Number 3	
Date and Time	Flow Rate
26/05/2016 14:20	689.38
26/05/2016 14:21	691.88
26/05/2016 14:22	693.75
26/05/2016 14:23	694.38
26/05/2016 14:24	675.00
26/05/2016 14:25	680.00
26/05/2016 14:26	677.50
26/05/2016 14:27	678.13
26/05/2016 14:28	677.50
26/05/2016 14:29	688.75
26/05/2016 14:30	687.50
26/05/2016 14:31	693.13
26/05/2016 14:32	688.13
26/05/2016 14:33	681.25
26/05/2016 14:34	677.50
26/05/2016 14:35	686.25
26/05/2016 14:36	694.38
26/05/2016 14:37	680.63
26/05/2016 14:38	686.25
26/05/2016 14:39	681.88
26/05/2016 14:40	679.38
26/05/2016 14:41	683.75
26/05/2016 14:42	683.75
26/05/2016 14:43	681.25
26/05/2016 14:44	688.75
26/05/2016 14:45	682.50
26/05/2016 14:46	688.75
26/05/2016 14:47	693.75
26/05/2016 14:48	686.25
26/05/2016 14:49	685.63
26/05/2016 14:50	686.25
26/05/2016 14:51	687.50
26/05/2016 14:52	688.13
26/05/2016 14:53	687.50
26/05/2016 14:54	675.00
26/05/2016 14:55	688.75
26/05/2016 14:56	683.75
26/05/2016 14:57	685.63
26/05/2016 14:58	681.25
26/05/2016 14:59	686.88
26/05/2016 15:00	682.50

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 14:00	685.63
26/05/2016 14:01	681.25
26/05/2016 14:02	673.75
26/05/2016 14:03	681.25
26/05/2016 14:04	686.25
26/05/2016 14:05	686.25
26/05/2016 14:06	687.50
26/05/2016 14:07	680.00
26/05/2016 14:08	683.13
26/05/2016 14:09	682.50
26/05/2016 14:10	678.13
26/05/2016 14:11	680.63
26/05/2016 14:12	684.38
26/05/2016 14:13	678.13
26/05/2016 14:14	682.50
26/05/2016 14:15	678.13
26/05/2016 14:16	686.25
26/05/2016 14:17	683.13
26/05/2016 14:18	681.25
26/05/2016 14:19	686.25
26/05/2016 14:20	689.38
26/05/2016 14:21	691.88
26/05/2016 14:22	693.75
26/05/2016 14:23	694.38
26/05/2016 14:24	675.00
26/05/2016 14:25	680.00
26/05/2016 14:26	677.50
26/05/2016 14:27	678.13
26/05/2016 14:28	677.50
26/05/2016 14:29	688.75
26/05/2016 14:30	687.50
26/05/2016 14:31	693.13
26/05/2016 14:32	688.13
26/05/2016 14:33	681.25
26/05/2016 14:34	677.50
26/05/2016 14:35	686.25
26/05/2016 14:36	694.38
26/05/2016 14:37	680.63
26/05/2016 14:38	686.25
26/05/2016 14:39	681.88
26/05/2016 14:40	679.38
26/05/2016 14:41	683.75
26/05/2016 14:42	683.75
26/05/2016 14:43	681.25

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 14:44	688.75
26/05/2016 14:45	682.50
26/05/2016 14:46	688.75
26/05/2016 14:47	693.75
26/05/2016 14:48	686.25
26/05/2016 14:49	685.63
26/05/2016 14:50	686.25
26/05/2016 14:51	687.50
26/05/2016 14:52	688.13
26/05/2016 14:53	687.50
26/05/2016 14:54	675.00
26/05/2016 14:55	688.75
26/05/2016 14:56	683.75
26/05/2016 14:57	685.63
26/05/2016 14:58	681.25
26/05/2016 14:59	686.88
26/05/2016 15:00	682.50
26/05/2016 15:01	681.25
26/05/2016 15:02	686.88
26/05/2016 15:03	680.00
26/05/2016 15:04	683.13
26/05/2016 15:05	682.50
26/05/2016 15:06	681.88
26/05/2016 15:07	692.50
26/05/2016 15:08	687.50
26/05/2016 15:09	683.13
26/05/2016 15:10	681.25
26/05/2016 15:11	677.50
26/05/2016 15:12	658.13
26/05/2016 15:13	661.88
26/05/2016 15:14	670.00
26/05/2016 15:15	677.50
26/05/2016 15:16	680.00
26/05/2016 15:17	690.00
26/05/2016 15:18	687.50
26/05/2016 15:19	685.63
26/05/2016 15:20	678.75
26/05/2016 15:21	683.75
26/05/2016 15:22	676.88
26/05/2016 15:23	681.25
26/05/2016 15:24	684.38
26/05/2016 15:25	685.63
26/05/2016 15:26	689.38
26/05/2016 15:27	691.25

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 15:28	688.75
26/05/2016 15:29	689.38
26/05/2016 15:30	686.25
26/05/2016 15:31	678.75
26/05/2016 15:32	681.25
26/05/2016 15:33	687.50
26/05/2016 15:34	680.00
26/05/2016 15:35	683.13
26/05/2016 15:36	677.50
26/05/2016 15:37	676.25
26/05/2016 15:38	673.75
26/05/2016 15:39	686.25
26/05/2016 15:40	683.75
26/05/2016 15:41	675.00
26/05/2016 15:42	682.50
26/05/2016 15:43	675.63
26/05/2016 15:44	670.63
26/05/2016 15:45	680.00
26/05/2016 15:46	678.75
26/05/2016 15:47	685.00
26/05/2016 15:48	680.63
26/05/2016 15:49	684.38
26/05/2016 15:50	683.75
26/05/2016 15:51	685.00
26/05/2016 15:52	683.13
26/05/2016 15:53	686.25
26/05/2016 15:54	684.38
26/05/2016 15:55	685.00
26/05/2016 15:56	688.13
26/05/2016 15:57	687.50
26/05/2016 15:58	679.38
26/05/2016 15:59	680.63
26/05/2016 16:00	679.38
26/05/2016 16:01	680.63
26/05/2016 16:02	678.75
26/05/2016 16:03	681.25
26/05/2016 16:04	681.25
26/05/2016 16:05	690.00
26/05/2016 16:06	691.25
26/05/2016 16:07	685.63
26/05/2016 16:08	687.50
26/05/2016 16:09	688.13
26/05/2016 16:10	684.38
26/05/2016 16:11	685.00

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 16:12	685.00
26/05/2016 16:13	683.75
26/05/2016 16:14	685.63
26/05/2016 16:15	682.50
26/05/2016 16:16	691.25
26/05/2016 16:17	688.13
26/05/2016 16:18	691.88
26/05/2016 16:19	688.75
26/05/2016 16:20	686.88
26/05/2016 16:21	685.63
26/05/2016 16:22	685.63
26/05/2016 16:23	692.50
26/05/2016 16:24	690.00
26/05/2016 16:25	693.13
26/05/2016 16:26	690.63
26/05/2016 16:27	687.50
26/05/2016 16:28	682.50
26/05/2016 16:29	683.75
26/05/2016 16:30	690.63
26/05/2016 16:31	684.38
26/05/2016 16:32	688.13
26/05/2016 16:33	685.00
26/05/2016 16:34	685.63
26/05/2016 16:35	685.63
26/05/2016 16:36	691.25
26/05/2016 16:37	691.25
26/05/2016 16:38	683.75
26/05/2016 16:39	685.00
26/05/2016 16:40	680.63
26/05/2016 16:41	682.50
26/05/2016 16:42	683.75
26/05/2016 16:43	683.13
26/05/2016 16:44	685.00
26/05/2016 16:45	676.88
26/05/2016 16:46	686.88
26/05/2016 16:47	681.25
26/05/2016 16:48	685.63
26/05/2016 16:49	686.25
26/05/2016 16:50	685.00
26/05/2016 16:51	683.75
26/05/2016 16:52	683.13
26/05/2016 16:53	693.75
26/05/2016 16:54	690.63
26/05/2016 16:55	693.13

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 16:56	692.50
26/05/2016 16:57	687.50
26/05/2016 16:58	688.75
26/05/2016 16:59	689.38
26/05/2016 17:00	693.75
26/05/2016 17:01	689.38
26/05/2016 17:02	686.88
26/05/2016 17:03	691.25
26/05/2016 17:04	688.75
26/05/2016 17:05	689.38
26/05/2016 17:06	692.50
26/05/2016 17:07	695.00
26/05/2016 17:08	689.38
26/05/2016 17:09	688.75
26/05/2016 17:10	681.88
26/05/2016 17:11	683.13
26/05/2016 17:12	689.38
26/05/2016 17:13	690.00
26/05/2016 17:14	686.88
26/05/2016 17:15	683.75
26/05/2016 17:16	691.88
26/05/2016 17:17	686.25
26/05/2016 17:18	688.13
26/05/2016 17:19	690.00
26/05/2016 17:20	685.00
26/05/2016 17:21	679.38
26/05/2016 17:22	684.38
26/05/2016 17:23	685.63
26/05/2016 17:24	683.75
26/05/2016 17:25	676.25
26/05/2016 17:26	680.00
26/05/2016 17:27	675.63
26/05/2016 17:28	680.00
26/05/2016 17:29	678.75
26/05/2016 17:30	671.88
26/05/2016 17:31	675.63
26/05/2016 17:32	676.25
26/05/2016 17:33	679.38
26/05/2016 17:34	675.00
26/05/2016 17:35	685.00
26/05/2016 17:36	685.63
26/05/2016 17:37	690.00
26/05/2016 17:38	690.63
26/05/2016 17:39	685.63

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 17:40	683.75
26/05/2016 17:41	677.50
26/05/2016 17:42	686.25
26/05/2016 17:43	681.25
26/05/2016 17:44	681.25
26/05/2016 17:45	679.38
26/05/2016 17:46	683.13
26/05/2016 17:47	675.63
26/05/2016 17:48	678.13
26/05/2016 17:49	677.50
26/05/2016 17:50	673.13
26/05/2016 17:51	681.88
26/05/2016 17:52	666.88
26/05/2016 17:53	676.25
26/05/2016 17:54	683.13
26/05/2016 17:55	681.88
26/05/2016 17:56	677.50
26/05/2016 17:57	675.63
26/05/2016 17:58	682.50
26/05/2016 17:59	681.25
26/05/2016 18:00	681.88
26/05/2016 18:01	685.63
26/05/2016 18:02	682.50
26/05/2016 18:03	698.13
26/05/2016 18:04	691.88
26/05/2016 18:05	698.13
26/05/2016 18:06	695.63
26/05/2016 18:07	692.50
26/05/2016 18:08	685.63
26/05/2016 18:09	688.75
26/05/2016 18:10	692.50
26/05/2016 18:11	701.25
26/05/2016 18:12	687.50
26/05/2016 18:13	691.25
26/05/2016 18:14	692.50
26/05/2016 18:15	689.38
26/05/2016 18:16	686.88
26/05/2016 18:17	683.75
26/05/2016 18:18	685.63
26/05/2016 18:19	687.50
26/05/2016 18:20	690.00
26/05/2016 18:21	690.00
26/05/2016 18:22	699.38
26/05/2016 18:23	690.63

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 18:24	695.00
26/05/2016 18:25	687.50
26/05/2016 18:26	694.38
26/05/2016 18:27	680.00
26/05/2016 18:28	695.00
26/05/2016 18:29	690.63
26/05/2016 18:30	688.13
26/05/2016 18:31	693.13
26/05/2016 18:32	692.50
26/05/2016 18:33	694.38
26/05/2016 18:34	691.88
26/05/2016 18:35	688.75
26/05/2016 18:36	688.75
26/05/2016 18:37	693.13
26/05/2016 18:38	688.75
26/05/2016 18:39	691.88
26/05/2016 18:40	689.38
26/05/2016 18:41	689.38
26/05/2016 18:42	688.13
26/05/2016 18:43	685.00
26/05/2016 18:44	684.38
26/05/2016 18:45	686.25
26/05/2016 18:46	691.88
26/05/2016 18:47	695.00
26/05/2016 18:48	690.63
26/05/2016 18:49	698.13
26/05/2016 18:50	694.38
26/05/2016 18:51	676.88
26/05/2016 18:52	690.63
26/05/2016 18:53	688.13
26/05/2016 18:54	691.88
26/05/2016 18:55	691.88
26/05/2016 18:56	693.75
26/05/2016 18:57	695.63
26/05/2016 18:58	695.00
26/05/2016 18:59	695.63
26/05/2016 19:00	696.25
26/05/2016 19:01	690.00
26/05/2016 19:02	686.88
26/05/2016 19:03	683.13
26/05/2016 19:04	681.88
26/05/2016 19:05	687.50
26/05/2016 19:06	688.75
26/05/2016 19:07	695.63

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 19:08	691.88
26/05/2016 19:09	691.88
26/05/2016 19:10	687.50
26/05/2016 19:11	690.63
26/05/2016 19:12	693.75
26/05/2016 19:13	687.50
26/05/2016 19:14	698.13
26/05/2016 19:15	686.88
26/05/2016 19:16	691.25
26/05/2016 19:17	690.00
26/05/2016 19:18	695.63
26/05/2016 19:19	688.75
26/05/2016 19:20	686.88
26/05/2016 19:21	690.00
26/05/2016 19:22	690.63
26/05/2016 19:23	692.50
26/05/2016 19:24	693.13
26/05/2016 19:25	694.38
26/05/2016 19:26	690.63
26/05/2016 19:27	686.88
26/05/2016 19:28	695.00
26/05/2016 19:29	691.88
26/05/2016 19:30	690.00
26/05/2016 19:31	686.25
26/05/2016 19:32	682.50
26/05/2016 19:33	678.13
26/05/2016 19:34	686.25
26/05/2016 19:35	683.75
26/05/2016 19:36	683.75
26/05/2016 19:37	678.13
26/05/2016 19:38	681.88
26/05/2016 19:39	683.75
26/05/2016 19:40	688.13
26/05/2016 19:41	683.75
26/05/2016 19:42	684.38
26/05/2016 19:43	681.88
26/05/2016 19:44	681.88
26/05/2016 19:45	684.38
26/05/2016 19:46	678.75
26/05/2016 19:47	689.38
26/05/2016 19:48	689.38
26/05/2016 19:49	689.38
26/05/2016 19:50	694.38
26/05/2016 19:51	685.00

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 19:52	689.38
26/05/2016 19:53	693.13
26/05/2016 19:54	696.25
26/05/2016 19:55	684.38
26/05/2016 19:56	676.88
26/05/2016 19:57	683.13
26/05/2016 19:58	687.50
26/05/2016 19:59	687.50
26/05/2016 20:00	686.88
26/05/2016 20:01	676.25
26/05/2016 20:02	686.88
26/05/2016 20:03	679.38
26/05/2016 20:04	681.25
26/05/2016 20:05	682.50
26/05/2016 20:06	685.63
26/05/2016 20:07	689.38
26/05/2016 20:08	688.13
26/05/2016 20:09	688.13
26/05/2016 20:10	691.25
26/05/2016 20:11	696.25
26/05/2016 20:12	685.00
26/05/2016 20:13	688.75
26/05/2016 20:14	671.25
26/05/2016 20:15	678.75
26/05/2016 20:16	690.63
26/05/2016 20:17	689.38
26/05/2016 20:18	696.88
26/05/2016 20:19	698.75
26/05/2016 20:20	703.13
26/05/2016 20:21	708.75
26/05/2016 20:22	696.88
26/05/2016 20:23	691.25
26/05/2016 20:24	694.38
26/05/2016 20:25	691.88
26/05/2016 20:26	696.25
26/05/2016 20:27	691.88
26/05/2016 20:28	691.88
26/05/2016 20:29	695.00
26/05/2016 20:30	695.00
26/05/2016 20:31	696.25
26/05/2016 20:32	696.25
26/05/2016 20:33	700.63
26/05/2016 20:34	700.00
26/05/2016 20:35	695.63

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 20:36	689.38
26/05/2016 20:37	692.50
26/05/2016 20:38	689.38
26/05/2016 20:39	688.13
26/05/2016 20:40	690.63
26/05/2016 20:41	692.50
26/05/2016 20:42	689.38
26/05/2016 20:43	688.13
26/05/2016 20:44	693.75
26/05/2016 20:45	698.13
26/05/2016 20:46	696.88
26/05/2016 20:47	702.50
26/05/2016 20:48	706.88
26/05/2016 20:49	699.38
26/05/2016 20:50	695.63
26/05/2016 20:51	698.75
26/05/2016 20:52	698.75
26/05/2016 20:53	703.13
26/05/2016 20:54	701.88
26/05/2016 20:55	713.75
26/05/2016 20:56	699.38
26/05/2016 20:57	702.50
26/05/2016 20:58	703.13
26/05/2016 20:59	698.75
26/05/2016 21:00	706.25
26/05/2016 21:01	705.63
26/05/2016 21:02	708.13
26/05/2016 21:03	708.13
26/05/2016 21:04	700.63
26/05/2016 21:05	700.63
26/05/2016 21:06	704.38
26/05/2016 21:07	704.38
26/05/2016 21:08	695.00
26/05/2016 21:09	687.50
26/05/2016 21:10	690.63
26/05/2016 21:11	696.25
26/05/2016 21:12	696.88
26/05/2016 21:13	703.13
26/05/2016 21:14	703.75
26/05/2016 21:15	703.75
26/05/2016 21:16	704.38
26/05/2016 21:17	705.63
26/05/2016 21:18	703.13
26/05/2016 21:19	703.13

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 21:20	705.00
26/05/2016 21:21	698.75
26/05/2016 21:22	708.13
26/05/2016 21:23	703.75
26/05/2016 21:24	701.88
26/05/2016 21:25	709.38
26/05/2016 21:26	704.38
26/05/2016 21:27	700.63
26/05/2016 21:28	702.50
26/05/2016 21:29	700.00
26/05/2016 21:30	699.38
26/05/2016 21:31	710.63
26/05/2016 21:32	701.88
26/05/2016 21:33	706.88
26/05/2016 21:34	701.25
26/05/2016 21:35	702.50
26/05/2016 21:36	699.38
26/05/2016 21:37	703.13
26/05/2016 21:38	703.13
26/05/2016 21:39	701.88
26/05/2016 21:40	707.50
26/05/2016 21:41	704.38
26/05/2016 21:42	706.25
26/05/2016 21:43	696.88
26/05/2016 21:44	699.38
26/05/2016 21:45	703.75
26/05/2016 21:46	703.13
26/05/2016 21:47	708.13
26/05/2016 21:48	706.88
26/05/2016 21:49	698.75
26/05/2016 21:50	698.75
26/05/2016 21:51	696.25
26/05/2016 21:52	693.13
26/05/2016 21:53	691.88
26/05/2016 21:54	695.00
26/05/2016 21:55	689.38
26/05/2016 21:56	700.00
26/05/2016 21:57	696.25
26/05/2016 21:58	696.25
26/05/2016 21:59	700.00
26/05/2016 22:00	700.00
26/05/2016 22:01	686.25
26/05/2016 22:02	695.63
26/05/2016 22:03	688.13

Pig Run Number 4	
Date and Time	Flow Rate
26/05/2016 22:04	684.38
26/05/2016 22:05	685.63
26/05/2016 22:06	683.13
26/05/2016 22:07	681.88
26/05/2016 22:08	688.75
26/05/2016 22:09	686.25
26/05/2016 22:10	691.25
26/05/2016 22:11	691.88
26/05/2016 22:12	690.00
26/05/2016 22:13	690.00
26/05/2016 22:14	696.25
26/05/2016 22:15	705.00
26/05/2016 22:16	695.63
26/05/2016 22:17	703.75
26/05/2016 22:18	700.63
26/05/2016 22:19	696.88
26/05/2016 22:20	700.00
26/05/2016 22:21	703.13
26/05/2016 22:22	697.50
26/05/2016 22:23	697.50
26/05/2016 22:24	703.13
26/05/2016 22:25	703.75
26/05/2016 22:26	696.25
26/05/2016 22:27	692.50
26/05/2016 22:28	696.25
26/05/2016 22:29	692.50
26/05/2016 22:30	698.13

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 7:00	693.13
27/05/2016 7:01	691.25
27/05/2016 7:02	696.25
27/05/2016 7:03	694.38
27/05/2016 7:04	690.63
27/05/2016 7:05	694.38
27/05/2016 7:06	694.38
27/05/2016 7:07	690.63
27/05/2016 7:08	685.63
27/05/2016 7:09	689.38
27/05/2016 7:10	695.00
27/05/2016 7:11	689.38
27/05/2016 7:12	686.88
27/05/2016 7:13	686.25
27/05/2016 7:14	687.50
27/05/2016 7:15	691.25
27/05/2016 7:16	690.63
27/05/2016 7:17	691.88
27/05/2016 7:18	695.63
27/05/2016 7:19	691.88
27/05/2016 7:20	695.00
27/05/2016 7:21	693.75
27/05/2016 7:22	696.88
27/05/2016 7:23	695.00
27/05/2016 7:24	688.75
27/05/2016 7:25	690.00
27/05/2016 7:26	687.50
27/05/2016 7:27	686.25
27/05/2016 7:28	685.63
27/05/2016 7:29	685.00
27/05/2016 7:30	688.13
27/05/2016 7:31	690.00
27/05/2016 7:32	685.00
27/05/2016 7:33	687.50
27/05/2016 7:34	683.13
27/05/2016 7:35	693.13
27/05/2016 7:36	691.25
27/05/2016 7:37	688.75
27/05/2016 7:38	700.00
27/05/2016 7:39	697.50
27/05/2016 7:40	681.88
27/05/2016 7:41	687.50
27/05/2016 7:42	685.00
27/05/2016 7:43	691.25

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 7:44	685.00
27/05/2016 7:45	687.50
27/05/2016 7:46	681.25
27/05/2016 7:47	686.88
27/05/2016 7:48	690.00
27/05/2016 7:49	689.38
27/05/2016 7:50	685.00
27/05/2016 7:51	686.88
27/05/2016 7:52	694.38
27/05/2016 7:53	691.25
27/05/2016 7:54	686.88
27/05/2016 7:55	676.25
27/05/2016 7:56	693.13
27/05/2016 7:57	694.38
27/05/2016 7:58	700.00
27/05/2016 7:59	684.38
27/05/2016 8:00	690.63
27/05/2016 8:01	696.25
27/05/2016 8:02	693.75
27/05/2016 8:03	691.25
27/05/2016 8:04	694.38
27/05/2016 8:05	690.00
27/05/2016 8:06	687.50
27/05/2016 8:07	688.13
27/05/2016 8:08	685.00
27/05/2016 8:09	681.88
27/05/2016 8:10	684.38
27/05/2016 8:11	686.88
27/05/2016 8:12	688.13
27/05/2016 8:13	688.13
27/05/2016 8:14	695.00
27/05/2016 8:15	687.50
27/05/2016 8:16	671.25
27/05/2016 8:17	658.13
27/05/2016 8:18	664.38
27/05/2016 8:19	678.13
27/05/2016 8:20	675.63
27/05/2016 8:21	676.25
27/05/2016 8:22	674.38
27/05/2016 8:23	680.63
27/05/2016 8:24	680.63
27/05/2016 8:25	676.88
27/05/2016 8:26	678.75
27/05/2016 8:27	675.00

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 8:28	678.75
27/05/2016 8:29	679.38
27/05/2016 8:30	675.00
27/05/2016 8:31	683.75
27/05/2016 8:32	679.38
27/05/2016 8:33	676.88
27/05/2016 8:34	674.38
27/05/2016 8:35	680.63
27/05/2016 8:36	671.25
27/05/2016 8:37	678.13
27/05/2016 8:38	686.25
27/05/2016 8:39	679.38
27/05/2016 8:40	678.13
27/05/2016 8:41	681.88
27/05/2016 8:42	686.88
27/05/2016 8:43	683.13
27/05/2016 8:44	681.25
27/05/2016 8:45	677.50
27/05/2016 8:46	676.25
27/05/2016 8:47	674.38
27/05/2016 8:48	673.75
27/05/2016 8:49	676.25
27/05/2016 8:50	677.50
27/05/2016 8:51	675.63
27/05/2016 8:52	674.38
27/05/2016 8:53	677.50
27/05/2016 8:54	683.13
27/05/2016 8:55	684.38
27/05/2016 8:56	682.50
27/05/2016 8:57	678.13
27/05/2016 8:58	682.50
27/05/2016 8:59	678.13
27/05/2016 9:00	680.00
27/05/2016 9:01	688.75
27/05/2016 9:02	690.00
27/05/2016 9:03	685.00
27/05/2016 9:04	680.00
27/05/2016 9:05	680.63
27/05/2016 9:06	683.75
27/05/2016 9:07	687.50
27/05/2016 9:08	689.38
27/05/2016 9:09	684.38
27/05/2016 9:10	685.00
27/05/2016 9:11	685.00

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 9:12	688.75
27/05/2016 9:13	683.75
27/05/2016 9:14	685.63
27/05/2016 9:15	684.38
27/05/2016 9:16	685.63
27/05/2016 9:17	690.00
27/05/2016 9:18	683.75
27/05/2016 9:19	681.88
27/05/2016 9:20	685.63
27/05/2016 9:21	684.38
27/05/2016 9:22	685.63
27/05/2016 9:23	688.13
27/05/2016 9:24	691.25
27/05/2016 9:25	681.88
27/05/2016 9:26	678.13
27/05/2016 9:27	677.50
27/05/2016 9:28	679.38
27/05/2016 9:29	675.63
27/05/2016 9:30	682.50
27/05/2016 9:31	679.38
27/05/2016 9:32	680.00
27/05/2016 9:33	681.88
27/05/2016 9:34	675.63
27/05/2016 9:35	680.00
27/05/2016 9:36	680.00
27/05/2016 9:37	681.88
27/05/2016 9:38	684.38
27/05/2016 9:39	684.38
27/05/2016 9:40	682.50
27/05/2016 9:41	688.13
27/05/2016 9:42	692.50
27/05/2016 9:43	692.50
27/05/2016 9:44	689.38
27/05/2016 9:45	688.75
27/05/2016 9:46	692.50
27/05/2016 9:47	691.88
27/05/2016 9:48	680.00
27/05/2016 9:49	675.00
27/05/2016 9:50	682.50
27/05/2016 9:51	680.00
27/05/2016 9:52	681.88
27/05/2016 9:53	685.00
27/05/2016 9:54	685.63
27/05/2016 9:55	691.88

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 9:56	686.25
27/05/2016 9:57	685.00
27/05/2016 9:58	688.75
27/05/2016 9:59	695.00
27/05/2016 10:00	688.75
27/05/2016 10:01	683.13
27/05/2016 10:02	685.00
27/05/2016 10:03	685.63
27/05/2016 10:04	684.38
27/05/2016 10:05	683.75
27/05/2016 10:06	676.25
27/05/2016 10:07	681.88
27/05/2016 10:08	681.88
27/05/2016 10:09	683.75
27/05/2016 10:10	686.88
27/05/2016 10:11	681.88
27/05/2016 10:12	690.63
27/05/2016 10:13	688.75
27/05/2016 10:14	681.88
27/05/2016 10:15	693.75
27/05/2016 10:16	686.25
27/05/2016 10:17	684.38
27/05/2016 10:18	681.88
27/05/2016 10:19	690.63
27/05/2016 10:20	696.25
27/05/2016 10:21	687.50
27/05/2016 10:22	687.50
27/05/2016 10:23	679.38
27/05/2016 10:24	687.50
27/05/2016 10:25	688.75
27/05/2016 10:26	692.50
27/05/2016 10:27	679.38
27/05/2016 10:28	685.00
27/05/2016 10:29	688.13
27/05/2016 10:30	685.00
27/05/2016 10:31	683.13
27/05/2016 10:32	684.38
27/05/2016 10:33	678.75
27/05/2016 10:34	680.63
27/05/2016 10:35	679.38
27/05/2016 10:36	685.63
27/05/2016 10:37	686.25
27/05/2016 10:38	685.63
27/05/2016 10:39	685.00

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 10:40	681.88
27/05/2016 10:41	681.88
27/05/2016 10:42	674.38
27/05/2016 10:43	680.63
27/05/2016 10:44	682.50
27/05/2016 10:45	679.38
27/05/2016 10:46	677.50
27/05/2016 10:47	672.50
27/05/2016 10:48	673.75
27/05/2016 10:49	675.00
27/05/2016 10:50	683.13
27/05/2016 10:51	684.38
27/05/2016 10:52	685.00
27/05/2016 10:53	685.63
27/05/2016 10:54	685.00
27/05/2016 10:55	682.50
27/05/2016 10:56	683.75
27/05/2016 10:57	689.38
27/05/2016 10:58	678.13
27/05/2016 10:59	678.75
27/05/2016 11:00	685.63
27/05/2016 11:01	678.13
27/05/2016 11:02	680.00
27/05/2016 11:03	681.88
27/05/2016 11:04	678.13
27/05/2016 11:05	686.88
27/05/2016 11:06	683.13
27/05/2016 11:07	690.63
27/05/2016 11:08	685.00
27/05/2016 11:09	686.88
27/05/2016 11:10	690.63
27/05/2016 11:11	687.50
27/05/2016 11:12	688.75
27/05/2016 11:13	686.25
27/05/2016 11:14	690.63
27/05/2016 11:15	685.00
27/05/2016 11:16	688.13
27/05/2016 11:17	688.75
27/05/2016 11:18	680.63
27/05/2016 11:19	686.88
27/05/2016 11:20	686.25
27/05/2016 11:21	691.88
27/05/2016 11:22	693.13
27/05/2016 11:23	691.88

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 11:24	690.63
27/05/2016 11:25	686.25
27/05/2016 11:26	683.75
27/05/2016 11:27	688.75
27/05/2016 11:28	690.63
27/05/2016 11:29	685.00
27/05/2016 11:30	685.63
27/05/2016 11:31	683.13
27/05/2016 11:32	678.75
27/05/2016 11:33	685.63
27/05/2016 11:34	676.88
27/05/2016 11:35	686.88
27/05/2016 11:36	686.88
27/05/2016 11:37	681.88
27/05/2016 11:38	685.63
27/05/2016 11:39	683.13
27/05/2016 11:40	684.38
27/05/2016 11:41	685.63
27/05/2016 11:42	683.13
27/05/2016 11:43	683.13
27/05/2016 11:44	688.75
27/05/2016 11:45	683.75
27/05/2016 11:46	690.63
27/05/2016 11:47	686.88
27/05/2016 11:48	683.13
27/05/2016 11:49	681.88
27/05/2016 11:50	688.13
27/05/2016 11:51	688.13
27/05/2016 11:52	686.25
27/05/2016 11:53	684.38
27/05/2016 11:54	691.88
27/05/2016 11:55	687.50
27/05/2016 11:56	692.50
27/05/2016 11:57	696.88
27/05/2016 11:58	690.00
27/05/2016 11:59	685.00
27/05/2016 12:00	686.88
27/05/2016 12:01	691.88
27/05/2016 12:02	683.13
27/05/2016 12:03	684.38
27/05/2016 12:04	681.88
27/05/2016 12:05	692.50
27/05/2016 12:06	683.13
27/05/2016 12:07	684.38

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 12:08	683.13
27/05/2016 12:09	688.75
27/05/2016 12:10	682.50
27/05/2016 12:11	683.13
27/05/2016 12:12	687.50
27/05/2016 12:13	692.50
27/05/2016 12:14	680.63
27/05/2016 12:15	678.75
27/05/2016 12:16	683.13
27/05/2016 12:17	683.13
27/05/2016 12:18	683.75
27/05/2016 12:19	680.63
27/05/2016 12:20	674.38
27/05/2016 12:21	681.25
27/05/2016 12:22	688.75
27/05/2016 12:23	680.63
27/05/2016 12:24	679.38
27/05/2016 12:25	683.13
27/05/2016 12:26	677.50
27/05/2016 12:27	682.50
27/05/2016 12:28	689.38
27/05/2016 12:29	680.00
27/05/2016 12:30	681.88
27/05/2016 12:31	682.50
27/05/2016 12:32	682.50
27/05/2016 12:33	690.63
27/05/2016 12:34	691.25
27/05/2016 12:35	691.25
27/05/2016 12:36	687.50
27/05/2016 12:37	683.75
27/05/2016 12:38	686.25
27/05/2016 12:39	683.13
27/05/2016 12:40	687.50
27/05/2016 12:41	682.50
27/05/2016 12:42	681.88
27/05/2016 12:43	689.38
27/05/2016 12:44	689.38
27/05/2016 12:45	682.50
27/05/2016 12:46	693.13
27/05/2016 12:47	696.25
27/05/2016 12:48	686.88
27/05/2016 12:49	692.50
27/05/2016 12:50	696.25
27/05/2016 12:51	696.25

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 12:52	695.00
27/05/2016 12:53	694.38
27/05/2016 12:54	690.00
27/05/2016 12:55	698.75
27/05/2016 12:56	690.63
27/05/2016 12:57	690.00
27/05/2016 12:58	685.63
27/05/2016 12:59	688.75
27/05/2016 13:00	690.00
27/05/2016 13:01	696.88
27/05/2016 13:02	691.88
27/05/2016 13:03	693.13
27/05/2016 13:04	685.63
27/05/2016 13:05	687.50
27/05/2016 13:06	686.88
27/05/2016 13:07	681.88
27/05/2016 13:08	691.25
27/05/2016 13:09	681.25
27/05/2016 13:10	681.88
27/05/2016 13:11	685.63
27/05/2016 13:12	678.13
27/05/2016 13:13	678.75
27/05/2016 13:14	691.88
27/05/2016 13:15	678.13
27/05/2016 13:16	682.50
27/05/2016 13:17	685.63
27/05/2016 13:18	687.50
27/05/2016 13:19	690.63
27/05/2016 13:20	693.13
27/05/2016 13:21	696.25
27/05/2016 13:22	690.00
27/05/2016 13:23	696.88
27/05/2016 13:24	692.50
27/05/2016 13:25	697.50
27/05/2016 13:26	686.88
27/05/2016 13:27	696.88
27/05/2016 13:28	691.88
27/05/2016 13:29	696.88
27/05/2016 13:30	691.25
27/05/2016 13:31	696.25
27/05/2016 13:32	694.38
27/05/2016 13:33	679.38
27/05/2016 13:34	686.25
27/05/2016 13:35	689.38

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 13:36	690.00
27/05/2016 13:37	691.88
27/05/2016 13:38	697.50
27/05/2016 13:39	695.00
27/05/2016 13:40	696.25
27/05/2016 13:41	700.63
27/05/2016 13:42	696.88
27/05/2016 13:43	693.75
27/05/2016 13:44	693.13
27/05/2016 13:45	698.75
27/05/2016 13:46	693.13
27/05/2016 13:47	701.25
27/05/2016 13:48	695.00
27/05/2016 13:49	693.13
27/05/2016 13:50	686.88
27/05/2016 13:51	696.25
27/05/2016 13:52	691.25
27/05/2016 13:53	691.25
27/05/2016 13:54	695.63
27/05/2016 13:55	692.50
27/05/2016 13:56	695.00
27/05/2016 13:57	702.50
27/05/2016 13:58	705.63
27/05/2016 13:59	697.50
27/05/2016 14:00	690.63
27/05/2016 14:01	694.38
27/05/2016 14:02	689.38
27/05/2016 14:03	691.25
27/05/2016 14:04	691.88
27/05/2016 14:05	702.50
27/05/2016 14:06	695.00
27/05/2016 14:07	697.50
27/05/2016 14:08	696.88
27/05/2016 14:09	695.00
27/05/2016 14:10	693.75
27/05/2016 14:11	696.25
27/05/2016 14:12	700.63
27/05/2016 14:13	692.50
27/05/2016 14:14	694.38
27/05/2016 14:15	696.88
27/05/2016 14:16	692.50
27/05/2016 14:17	688.13
27/05/2016 14:18	685.00
27/05/2016 14:19	686.88

Pig Run Number 5	
Date and Time	Flow Rate
27/05/2016 14:20	691.25
27/05/2016 14:21	689.38
27/05/2016 14:22	692.50
27/05/2016 14:23	698.13
27/05/2016 14:24	698.13
27/05/2016 14:25	697.50
27/05/2016 14:26	690.00
27/05/2016 14:27	692.50
27/05/2016 14:28	694.38
27/05/2016 14:29	693.13
27/05/2016 14:30	700.63
27/05/2016 14:31	701.25
27/05/2016 14:32	700.00
27/05/2016 14:33	705.00
27/05/2016 14:34	699.38
27/05/2016 14:35	698.75
27/05/2016 14:36	695.63
27/05/2016 14:37	692.50
27/05/2016 14:38	690.00
27/05/2016 14:39	687.50
27/05/2016 14:40	689.38
27/05/2016 14:41	695.00
27/05/2016 14:42	686.25
27/05/2016 14:43	684.38
27/05/2016 14:44	692.50
27/05/2016 14:45	692.50
27/05/2016 14:46	690.00
27/05/2016 14:47	690.00
27/05/2016 14:48	689.38
27/05/2016 14:49	693.13
27/05/2016 14:50	681.25
27/05/2016 14:51	687.50
27/05/2016 14:52	690.00
27/05/2016 14:53	693.75
27/05/2016 14:54	695.63
27/05/2016 14:55	700.00
27/05/2016 14:56	695.63
27/05/2016 14:57	697.50
27/05/2016 14:58	706.25
27/05/2016 14:59	703.13
27/05/2016 15:00	704.38

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 14:30	700.63
27/05/2016 14:31	701.25
27/05/2016 14:32	700.00
27/05/2016 14:33	705.00
27/05/2016 14:34	699.38
27/05/2016 14:35	698.75
27/05/2016 14:36	695.63
27/05/2016 14:37	692.50
27/05/2016 14:38	690.00
27/05/2016 14:39	687.50
27/05/2016 14:40	689.38
27/05/2016 14:41	695.00
27/05/2016 14:42	686.25
27/05/2016 14:43	684.38
27/05/2016 14:44	692.50
27/05/2016 14:45	692.50
27/05/2016 14:46	690.00
27/05/2016 14:47	690.00
27/05/2016 14:48	689.38
27/05/2016 14:49	693.13
27/05/2016 14:50	681.25
27/05/2016 14:51	687.50
27/05/2016 14:52	690.00
27/05/2016 14:53	693.75
27/05/2016 14:54	695.63
27/05/2016 14:55	700.00
27/05/2016 14:56	695.63
27/05/2016 14:57	697.50
27/05/2016 14:58	706.25
27/05/2016 14:59	703.13
27/05/2016 15:00	704.38
27/05/2016 15:01	698.75
27/05/2016 15:02	695.63
27/05/2016 15:03	700.00
27/05/2016 15:04	696.88
27/05/2016 15:05	696.25
27/05/2016 15:06	692.50
27/05/2016 15:07	693.75
27/05/2016 15:08	697.50
27/05/2016 15:09	691.88
27/05/2016 15:10	695.63
27/05/2016 15:11	701.25
27/05/2016 15:12	697.50
27/05/2016 15:13	696.25

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 15:14	695.63
27/05/2016 15:15	698.75
27/05/2016 15:16	697.50
27/05/2016 15:17	696.25
27/05/2016 15:18	695.63
27/05/2016 15:19	693.75
27/05/2016 15:20	688.13
27/05/2016 15:21	693.75
27/05/2016 15:22	698.13
27/05/2016 15:23	703.13
27/05/2016 15:24	693.75
27/05/2016 15:25	699.38
27/05/2016 15:26	696.25
27/05/2016 15:27	703.13
27/05/2016 15:28	702.50
27/05/2016 15:29	702.50
27/05/2016 15:30	700.63
27/05/2016 15:31	701.25
27/05/2016 15:32	701.88
27/05/2016 15:33	693.75
27/05/2016 15:34	695.63
27/05/2016 15:35	691.88
27/05/2016 15:36	686.88
27/05/2016 15:37	690.63
27/05/2016 15:38	696.25
27/05/2016 15:39	689.38
27/05/2016 15:40	691.25
27/05/2016 15:41	692.50
27/05/2016 15:42	690.63
27/05/2016 15:43	688.75
27/05/2016 15:44	680.00
27/05/2016 15:45	675.63
27/05/2016 15:46	688.13
27/05/2016 15:47	689.38
27/05/2016 15:48	686.88
27/05/2016 15:49	686.88
27/05/2016 15:50	693.13
27/05/2016 15:51	692.50
27/05/2016 15:52	692.50
27/05/2016 15:53	690.00
27/05/2016 15:54	684.38
27/05/2016 15:55	690.63
27/05/2016 15:56	691.88
27/05/2016 15:57	691.88

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 15:58	683.75
27/05/2016 15:59	688.13
27/05/2016 16:00	691.88
27/05/2016 16:01	686.25
27/05/2016 16:02	691.88
27/05/2016 16:03	690.00
27/05/2016 16:04	694.38
27/05/2016 16:05	697.50
27/05/2016 16:06	692.50
27/05/2016 16:07	689.38
27/05/2016 16:08	697.50
27/05/2016 16:09	701.88
27/05/2016 16:10	698.13
27/05/2016 16:11	698.75
27/05/2016 16:12	705.00
27/05/2016 16:13	697.50
27/05/2016 16:14	691.88
27/05/2016 16:15	695.00
27/05/2016 16:16	695.00
27/05/2016 16:17	690.63
27/05/2016 16:18	697.50
27/05/2016 16:19	695.63
27/05/2016 16:20	694.38
27/05/2016 16:21	693.13
27/05/2016 16:22	692.50
27/05/2016 16:23	697.50
27/05/2016 16:24	693.75
27/05/2016 16:25	696.88
27/05/2016 16:26	689.38
27/05/2016 16:27	695.00
27/05/2016 16:28	698.13
27/05/2016 16:29	690.00
27/05/2016 16:30	701.25
27/05/2016 16:31	700.63
27/05/2016 16:32	698.13
27/05/2016 16:33	698.13
27/05/2016 16:34	700.63
27/05/2016 16:35	701.25
27/05/2016 16:36	693.75
27/05/2016 16:37	688.13
27/05/2016 16:38	695.63
27/05/2016 16:39	689.38
27/05/2016 16:40	688.13
27/05/2016 16:41	693.13

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 16:42	698.75
27/05/2016 16:43	695.00
27/05/2016 16:44	691.25
27/05/2016 16:45	696.25
27/05/2016 16:46	697.50
27/05/2016 16:47	690.63
27/05/2016 16:48	695.00
27/05/2016 16:49	692.50
27/05/2016 16:50	700.00
27/05/2016 16:51	705.00
27/05/2016 16:52	698.75
27/05/2016 16:53	694.38
27/05/2016 16:54	693.75
27/05/2016 16:55	690.63
27/05/2016 16:56	689.38
27/05/2016 16:57	687.50
27/05/2016 16:58	691.88
27/05/2016 16:59	691.25
27/05/2016 17:00	693.75
27/05/2016 17:01	688.75
27/05/2016 17:02	693.13
27/05/2016 17:03	696.25
27/05/2016 17:04	695.63
27/05/2016 17:05	696.25
27/05/2016 17:06	694.38
27/05/2016 17:07	688.75
27/05/2016 17:08	695.00
27/05/2016 17:09	696.25
27/05/2016 17:10	693.75
27/05/2016 17:11	688.75
27/05/2016 17:12	688.75
27/05/2016 17:13	686.25
27/05/2016 17:14	697.50
27/05/2016 17:15	699.38
27/05/2016 17:16	695.00
27/05/2016 17:17	691.25
27/05/2016 17:18	686.88
27/05/2016 17:19	696.88
27/05/2016 17:20	693.13
27/05/2016 17:21	691.25
27/05/2016 17:22	690.00
27/05/2016 17:23	688.13
27/05/2016 17:24	695.63
27/05/2016 17:25	695.63

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 17:26	694.38
27/05/2016 17:27	693.75
27/05/2016 17:28	688.75
27/05/2016 17:29	698.75
27/05/2016 17:30	688.13
27/05/2016 17:31	689.38
27/05/2016 17:32	686.88
27/05/2016 17:33	690.63
27/05/2016 17:34	686.88
27/05/2016 17:35	690.00
27/05/2016 17:36	691.88
27/05/2016 17:37	700.63
27/05/2016 17:38	695.63
27/05/2016 17:39	699.38
27/05/2016 17:40	694.38
27/05/2016 17:41	691.25
27/05/2016 17:42	688.75
27/05/2016 17:43	691.88
27/05/2016 17:44	697.50
27/05/2016 17:45	688.13
27/05/2016 17:46	691.88
27/05/2016 17:47	689.38
27/05/2016 17:48	696.88
27/05/2016 17:49	696.25
27/05/2016 17:50	699.38
27/05/2016 17:51	707.50
27/05/2016 17:52	703.75
27/05/2016 17:53	698.75
27/05/2016 17:54	694.38
27/05/2016 17:55	701.88
27/05/2016 17:56	696.88
27/05/2016 17:57	691.88
27/05/2016 17:58	696.88
27/05/2016 17:59	701.25
27/05/2016 18:00	702.50
27/05/2016 18:01	698.13
27/05/2016 18:02	703.75
27/05/2016 18:03	701.25
27/05/2016 18:04	702.50
27/05/2016 18:05	701.88
27/05/2016 18:06	700.00
27/05/2016 18:07	698.13
27/05/2016 18:08	697.50
27/05/2016 18:09	691.88

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 18:10	701.88
27/05/2016 18:11	702.50
27/05/2016 18:12	696.25
27/05/2016 18:13	696.25
27/05/2016 18:14	698.13
27/05/2016 18:15	696.88
27/05/2016 18:16	699.38
27/05/2016 18:17	700.00
27/05/2016 18:18	698.13
27/05/2016 18:19	702.50
27/05/2016 18:20	697.50
27/05/2016 18:21	698.75
27/05/2016 18:22	701.25
27/05/2016 18:23	701.25
27/05/2016 18:24	693.13
27/05/2016 18:25	695.00
27/05/2016 18:26	704.38
27/05/2016 18:27	698.13
27/05/2016 18:28	697.50
27/05/2016 18:29	703.75
27/05/2016 18:30	698.13
27/05/2016 18:31	703.75
27/05/2016 18:32	701.25
27/05/2016 18:33	696.88
27/05/2016 18:34	703.13
27/05/2016 18:35	700.63
27/05/2016 18:36	697.50
27/05/2016 18:37	696.88
27/05/2016 18:38	700.63
27/05/2016 18:39	698.75
27/05/2016 18:40	693.75
27/05/2016 18:41	705.00
27/05/2016 18:42	693.13
27/05/2016 18:43	697.50
27/05/2016 18:44	695.63
27/05/2016 18:45	694.38
27/05/2016 18:46	698.13
27/05/2016 18:47	703.13
27/05/2016 18:48	698.75
27/05/2016 18:49	701.25
27/05/2016 18:50	702.50
27/05/2016 18:51	698.75
27/05/2016 18:52	694.38
27/05/2016 18:53	686.88

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 18:54	690.00
27/05/2016 18:55	696.88
27/05/2016 18:56	696.25
27/05/2016 18:57	696.88
27/05/2016 18:58	692.50
27/05/2016 18:59	701.25
27/05/2016 19:00	698.75
27/05/2016 19:01	698.13
27/05/2016 19:02	692.50
27/05/2016 19:03	692.50
27/05/2016 19:04	693.13
27/05/2016 19:05	696.88
27/05/2016 19:06	695.63
27/05/2016 19:07	690.63
27/05/2016 19:08	695.63
27/05/2016 19:09	691.88
27/05/2016 19:10	687.50
27/05/2016 19:11	688.75
27/05/2016 19:12	698.75
27/05/2016 19:13	700.63
27/05/2016 19:14	700.63
27/05/2016 19:15	698.13
27/05/2016 19:16	694.38
27/05/2016 19:17	695.63
27/05/2016 19:18	700.00
27/05/2016 19:19	692.50
27/05/2016 19:20	700.00
27/05/2016 19:21	703.13
27/05/2016 19:22	704.38
27/05/2016 19:23	706.25
27/05/2016 19:24	704.38
27/05/2016 19:25	703.13
27/05/2016 19:26	705.63
27/05/2016 19:27	706.88
27/05/2016 19:28	698.13
27/05/2016 19:29	701.25
27/05/2016 19:30	698.75
27/05/2016 19:31	708.13
27/05/2016 19:32	704.38
27/05/2016 19:33	702.50
27/05/2016 19:34	696.25
27/05/2016 19:35	698.75
27/05/2016 19:36	695.00
27/05/2016 19:37	689.38

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 19:38	690.63
27/05/2016 19:39	693.75
27/05/2016 19:40	688.75
27/05/2016 19:41	692.50
27/05/2016 19:42	691.25
27/05/2016 19:43	693.75
27/05/2016 19:44	700.63
27/05/2016 19:45	699.38
27/05/2016 19:46	700.63
27/05/2016 19:47	698.13
27/05/2016 19:48	703.13
27/05/2016 19:49	695.00
27/05/2016 19:50	699.38
27/05/2016 19:51	701.88
27/05/2016 19:52	699.38
27/05/2016 19:53	703.13
27/05/2016 19:54	698.13
27/05/2016 19:55	703.75
27/05/2016 19:56	703.75
27/05/2016 19:57	705.00
27/05/2016 19:58	697.50
27/05/2016 19:59	696.88
27/05/2016 20:00	688.75
27/05/2016 20:01	686.88
27/05/2016 20:02	686.25
27/05/2016 20:03	686.25
27/05/2016 20:04	686.25
27/05/2016 20:05	682.50
27/05/2016 20:06	686.25
27/05/2016 20:07	688.13
27/05/2016 20:08	688.75
27/05/2016 20:09	689.38
27/05/2016 20:10	691.88
27/05/2016 20:11	688.75
27/05/2016 20:12	681.88
27/05/2016 20:13	683.75
27/05/2016 20:14	685.00
27/05/2016 20:15	691.25
27/05/2016 20:16	684.38
27/05/2016 20:17	690.00
27/05/2016 20:18	686.88
27/05/2016 20:19	688.13
27/05/2016 20:20	686.88
27/05/2016 20:21	693.75

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 20:22	684.38
27/05/2016 20:23	697.50
27/05/2016 20:24	690.63
27/05/2016 20:25	698.13
27/05/2016 20:26	693.13
27/05/2016 20:27	705.00
27/05/2016 20:28	700.00
27/05/2016 20:29	696.25
27/05/2016 20:30	697.50
27/05/2016 20:31	699.38
27/05/2016 20:32	699.38
27/05/2016 20:33	699.38
27/05/2016 20:34	696.88
27/05/2016 20:35	700.00
27/05/2016 20:36	697.50
27/05/2016 20:37	692.50
27/05/2016 20:38	688.75
27/05/2016 20:39	690.63
27/05/2016 20:40	703.75
27/05/2016 20:41	698.75
27/05/2016 20:42	701.25
27/05/2016 20:43	705.63
27/05/2016 20:44	706.25
27/05/2016 20:45	699.38
27/05/2016 20:46	696.25
27/05/2016 20:47	696.88
27/05/2016 20:48	695.63
27/05/2016 20:49	696.25
27/05/2016 20:50	689.38
27/05/2016 20:51	695.00
27/05/2016 20:52	695.63
27/05/2016 20:53	696.25
27/05/2016 20:54	697.50
27/05/2016 20:55	702.50
27/05/2016 20:56	704.38
27/05/2016 20:57	701.25
27/05/2016 20:58	700.63
27/05/2016 20:59	694.38
27/05/2016 21:00	696.88
27/05/2016 21:01	697.50
27/05/2016 21:02	696.88
27/05/2016 21:03	693.75
27/05/2016 21:04	695.00
27/05/2016 21:05	703.75

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 21:06	702.50
27/05/2016 21:07	705.63
27/05/2016 21:08	701.25
27/05/2016 21:09	696.25
27/05/2016 21:10	692.50
27/05/2016 21:11	698.75
27/05/2016 21:12	700.00
27/05/2016 21:13	701.88
27/05/2016 21:14	699.38
27/05/2016 21:15	690.00
27/05/2016 21:16	703.75
27/05/2016 21:17	696.25
27/05/2016 21:18	700.63
27/05/2016 21:19	703.13
27/05/2016 21:20	706.25
27/05/2016 21:21	698.75
27/05/2016 21:22	703.13
27/05/2016 21:23	703.75
27/05/2016 21:24	704.38
27/05/2016 21:25	705.00
27/05/2016 21:26	696.25
27/05/2016 21:27	696.25
27/05/2016 21:28	696.88
27/05/2016 21:29	692.50
27/05/2016 21:30	696.88
27/05/2016 21:31	702.50
27/05/2016 21:32	702.50
27/05/2016 21:33	692.50
27/05/2016 21:34	700.63
27/05/2016 21:35	706.88
27/05/2016 21:36	708.75
27/05/2016 21:37	688.75
27/05/2016 21:38	699.38
27/05/2016 21:39	698.75
27/05/2016 21:40	701.25
27/05/2016 21:41	699.38
27/05/2016 21:42	700.00
27/05/2016 21:43	700.00
27/05/2016 21:44	696.88
27/05/2016 21:45	703.13
27/05/2016 21:46	708.75
27/05/2016 21:47	690.00
27/05/2016 21:48	664.38
27/05/2016 21:49	705.63

Pig Run Number 6	
Date and Time	Flow Rate
27/05/2016 21:50	706.25
27/05/2016 21:51	705.00
27/05/2016 21:52	698.13
27/05/2016 21:53	700.00
27/05/2016 21:54	690.00
27/05/2016 21:55	701.88
27/05/2016 21:56	695.63
27/05/2016 21:57	695.00
27/05/2016 21:58	693.75
27/05/2016 21:59	694.38
27/05/2016 22:00	698.13

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 5:00	690.63
28/05/2016 5:01	690.63
28/05/2016 5:02	696.25
28/05/2016 5:03	688.13
28/05/2016 5:04	690.00
28/05/2016 5:05	686.25
28/05/2016 5:06	686.88
28/05/2016 5:07	688.13
28/05/2016 5:08	692.50
28/05/2016 5:09	698.75
28/05/2016 5:10	696.25
28/05/2016 5:11	698.13
28/05/2016 5:12	697.50
28/05/2016 5:13	696.88
28/05/2016 5:14	683.75
28/05/2016 5:15	693.75
28/05/2016 5:16	696.25
28/05/2016 5:17	700.00
28/05/2016 5:18	701.25
28/05/2016 5:19	698.13
28/05/2016 5:20	695.63
28/05/2016 5:21	693.75
28/05/2016 5:22	701.88
28/05/2016 5:23	690.63
28/05/2016 5:24	686.88
28/05/2016 5:25	686.88
28/05/2016 5:26	687.50
28/05/2016 5:27	688.13
28/05/2016 5:28	690.00
28/05/2016 5:29	689.38
28/05/2016 5:30	695.63
28/05/2016 5:31	690.00
28/05/2016 5:32	689.38
28/05/2016 5:33	688.75
28/05/2016 5:34	693.13
28/05/2016 5:35	686.88
28/05/2016 5:36	685.00
28/05/2016 5:37	686.88
28/05/2016 5:38	688.75
28/05/2016 5:39	681.25
28/05/2016 5:40	692.50
28/05/2016 5:41	684.38
28/05/2016 5:42	680.00
28/05/2016 5:43	690.00

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 5:44	686.88
28/05/2016 5:45	681.88
28/05/2016 5:46	684.38
28/05/2016 5:47	691.25
28/05/2016 5:48	694.38
28/05/2016 5:49	694.38
28/05/2016 5:50	693.75
28/05/2016 5:51	696.25
28/05/2016 5:52	693.13
28/05/2016 5:53	700.00
28/05/2016 5:54	693.75
28/05/2016 5:55	689.38
28/05/2016 5:56	695.00
28/05/2016 5:57	695.00
28/05/2016 5:58	696.25
28/05/2016 5:59	696.88
28/05/2016 6:00	692.50
28/05/2016 6:01	689.38
28/05/2016 6:02	690.00
28/05/2016 6:03	686.88
28/05/2016 6:04	692.50
28/05/2016 6:05	693.75
28/05/2016 6:06	690.63
28/05/2016 6:07	694.38
28/05/2016 6:08	696.25
28/05/2016 6:09	693.13
28/05/2016 6:10	704.38
28/05/2016 6:11	701.88
28/05/2016 6:12	688.75
28/05/2016 6:13	695.00
28/05/2016 6:14	691.25
28/05/2016 6:15	695.63
28/05/2016 6:16	695.00
28/05/2016 6:17	690.63
28/05/2016 6:18	694.38
28/05/2016 6:19	685.63
28/05/2016 6:20	691.25
28/05/2016 6:21	695.63
28/05/2016 6:22	686.88
28/05/2016 6:23	686.25
28/05/2016 6:24	685.63
28/05/2016 6:25	689.38
28/05/2016 6:26	686.25
28/05/2016 6:27	686.25

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 6:28	693.75
28/05/2016 6:29	695.63
28/05/2016 6:30	691.88
28/05/2016 6:31	693.13
28/05/2016 6:32	693.13
28/05/2016 6:33	693.75
28/05/2016 6:34	690.00
28/05/2016 6:35	686.25
28/05/2016 6:36	685.00
28/05/2016 6:37	689.38
28/05/2016 6:38	696.88
28/05/2016 6:39	688.13
28/05/2016 6:40	694.38
28/05/2016 6:41	696.88
28/05/2016 6:42	690.00
28/05/2016 6:43	692.50
28/05/2016 6:44	693.13
28/05/2016 6:45	693.75
28/05/2016 6:46	677.50
28/05/2016 6:47	692.50
28/05/2016 6:48	686.25
28/05/2016 6:49	691.88
28/05/2016 6:50	686.88
28/05/2016 6:51	693.75
28/05/2016 6:52	691.88
28/05/2016 6:53	693.75
28/05/2016 6:54	691.25
28/05/2016 6:55	685.63
28/05/2016 6:56	676.25
28/05/2016 6:57	665.63
28/05/2016 6:58	674.38
28/05/2016 6:59	681.25
28/05/2016 7:00	676.25
28/05/2016 7:01	682.50
28/05/2016 7:02	685.63
28/05/2016 7:03	680.63
28/05/2016 7:04	680.00
28/05/2016 7:05	684.38
28/05/2016 7:06	678.75
28/05/2016 7:07	677.50
28/05/2016 7:08	678.75
28/05/2016 7:09	683.13
28/05/2016 7:10	673.75
28/05/2016 7:11	679.38

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 7:12	685.00
28/05/2016 7:13	688.13
28/05/2016 7:14	688.75
28/05/2016 7:15	686.25
28/05/2016 7:16	676.25
28/05/2016 7:17	684.38
28/05/2016 7:18	685.00
28/05/2016 7:19	682.50
28/05/2016 7:20	682.50
28/05/2016 7:21	673.75
28/05/2016 7:22	681.88
28/05/2016 7:23	677.50
28/05/2016 7:24	675.63
28/05/2016 7:25	681.88
28/05/2016 7:26	680.00
28/05/2016 7:27	681.25
28/05/2016 7:28	672.50
28/05/2016 7:29	680.00
28/05/2016 7:30	681.88
28/05/2016 7:31	680.63
28/05/2016 7:32	685.00
28/05/2016 7:33	679.38
28/05/2016 7:34	677.50
28/05/2016 7:35	676.88
28/05/2016 7:36	681.25
28/05/2016 7:37	691.25
28/05/2016 7:38	693.75
28/05/2016 7:39	688.13
28/05/2016 7:40	680.63
28/05/2016 7:41	685.63
28/05/2016 7:42	684.38
28/05/2016 7:43	686.25
28/05/2016 7:44	682.50
28/05/2016 7:45	681.88
28/05/2016 7:46	678.13
28/05/2016 7:47	681.88
28/05/2016 7:48	683.75
28/05/2016 7:49	680.00
28/05/2016 7:50	684.38
28/05/2016 7:51	680.63
28/05/2016 7:52	678.75
28/05/2016 7:53	680.00
28/05/2016 7:54	687.50
28/05/2016 7:55	683.75

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 7:56	683.75
28/05/2016 7:57	688.13
28/05/2016 7:58	685.00
28/05/2016 7:59	689.38
28/05/2016 8:00	685.63
28/05/2016 8:01	685.00
28/05/2016 8:02	683.75
28/05/2016 8:03	684.38
28/05/2016 8:04	675.63
28/05/2016 8:05	670.63
28/05/2016 8:06	682.50
28/05/2016 8:07	670.63
28/05/2016 8:08	673.75
28/05/2016 8:09	673.13
28/05/2016 8:10	675.00
28/05/2016 8:11	681.25
28/05/2016 8:12	693.75
28/05/2016 8:13	694.38
28/05/2016 8:14	681.88
28/05/2016 8:15	679.38
28/05/2016 8:16	681.88
28/05/2016 8:17	676.88
28/05/2016 8:18	684.38
28/05/2016 8:19	683.13
28/05/2016 8:20	690.63
28/05/2016 8:21	688.75
28/05/2016 8:22	685.00
28/05/2016 8:23	681.88
28/05/2016 8:24	681.88
28/05/2016 8:25	676.25
28/05/2016 8:26	678.75
28/05/2016 8:27	685.00
28/05/2016 8:28	685.63
28/05/2016 8:29	681.88
28/05/2016 8:30	681.88
28/05/2016 8:31	686.25
28/05/2016 8:32	682.50
28/05/2016 8:33	679.38
28/05/2016 8:34	676.88
28/05/2016 8:35	683.13
28/05/2016 8:36	680.63
28/05/2016 8:37	688.13
28/05/2016 8:38	690.63
28/05/2016 8:39	686.25

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 8:40	687.50
28/05/2016 8:41	686.88
28/05/2016 8:42	685.00
28/05/2016 8:43	690.00
28/05/2016 8:44	681.25
28/05/2016 8:45	691.88
28/05/2016 8:46	689.38
28/05/2016 8:47	687.50
28/05/2016 8:48	685.00
28/05/2016 8:49	688.13
28/05/2016 8:50	684.38
28/05/2016 8:51	686.88
28/05/2016 8:52	689.38
28/05/2016 8:53	691.25
28/05/2016 8:54	683.13
28/05/2016 8:55	687.50
28/05/2016 8:56	676.88
28/05/2016 8:57	678.13
28/05/2016 8:58	677.50
28/05/2016 8:59	680.00
28/05/2016 9:00	677.50
28/05/2016 9:01	675.00
28/05/2016 9:02	681.88
28/05/2016 9:03	678.75
28/05/2016 9:04	685.63
28/05/2016 9:05	683.13
28/05/2016 9:06	686.88
28/05/2016 9:07	682.50
28/05/2016 9:08	679.38
28/05/2016 9:09	682.50
28/05/2016 9:10	682.50
28/05/2016 9:11	678.13
28/05/2016 9:12	681.88
28/05/2016 9:13	686.25
28/05/2016 9:14	684.38
28/05/2016 9:15	678.13
28/05/2016 9:16	683.13
28/05/2016 9:17	685.00
28/05/2016 9:18	682.50
28/05/2016 9:19	681.88
28/05/2016 9:20	684.38
28/05/2016 9:21	686.25
28/05/2016 9:22	685.63
28/05/2016 9:23	686.25

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 9:24	683.13
28/05/2016 9:25	681.88
28/05/2016 9:26	686.25
28/05/2016 9:27	690.00
28/05/2016 9:28	682.50
28/05/2016 9:29	683.13
28/05/2016 9:30	681.25
28/05/2016 9:31	681.25
28/05/2016 9:32	682.50
28/05/2016 9:33	683.75
28/05/2016 9:34	678.75
28/05/2016 9:35	684.38
28/05/2016 9:36	681.88
28/05/2016 9:37	688.75
28/05/2016 9:38	675.00
28/05/2016 9:39	684.38
28/05/2016 9:40	682.50
28/05/2016 9:41	683.75
28/05/2016 9:42	686.88
28/05/2016 9:43	683.13
28/05/2016 9:44	691.25
28/05/2016 9:45	687.50
28/05/2016 9:46	686.88
28/05/2016 9:47	685.00
28/05/2016 9:48	686.25
28/05/2016 9:49	680.63
28/05/2016 9:50	680.63
28/05/2016 9:51	690.00
28/05/2016 9:52	683.13
28/05/2016 9:53	680.00
28/05/2016 9:54	680.63
28/05/2016 9:55	685.00
28/05/2016 9:56	685.63
28/05/2016 9:57	688.13
28/05/2016 9:58	688.13
28/05/2016 9:59	684.38
28/05/2016 10:00	681.88
28/05/2016 10:01	685.00
28/05/2016 10:02	685.00
28/05/2016 10:03	689.38
28/05/2016 10:04	685.63
28/05/2016 10:05	690.00
28/05/2016 10:06	687.50
28/05/2016 10:07	688.75

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 10:08	678.13
28/05/2016 10:09	685.00
28/05/2016 10:10	688.13
28/05/2016 10:11	684.38
28/05/2016 10:12	694.38
28/05/2016 10:13	686.88
28/05/2016 10:14	685.00
28/05/2016 10:15	690.63
28/05/2016 10:16	688.13
28/05/2016 10:17	681.25
28/05/2016 10:18	684.38
28/05/2016 10:19	688.13
28/05/2016 10:20	691.88
28/05/2016 10:21	692.50
28/05/2016 10:22	686.25
28/05/2016 10:23	685.63
28/05/2016 10:24	679.38
28/05/2016 10:25	681.25
28/05/2016 10:26	678.75
28/05/2016 10:27	675.00
28/05/2016 10:28	682.50
28/05/2016 10:29	684.38
28/05/2016 10:30	684.38
28/05/2016 10:31	683.75
28/05/2016 10:32	685.00
28/05/2016 10:33	686.25
28/05/2016 10:34	680.63
28/05/2016 10:35	682.50
28/05/2016 10:36	677.50
28/05/2016 10:37	676.88
28/05/2016 10:38	671.25
28/05/2016 10:39	645.63
28/05/2016 10:40	662.50
28/05/2016 10:41	666.25
28/05/2016 10:42	668.13
28/05/2016 10:43	667.50
28/05/2016 10:44	670.00
28/05/2016 10:45	673.75
28/05/2016 10:46	671.25
28/05/2016 10:47	667.50
28/05/2016 10:48	669.38
28/05/2016 10:49	665.63
28/05/2016 10:50	665.00
28/05/2016 10:51	666.88

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 10:52	663.75
28/05/2016 10:53	666.25
28/05/2016 10:54	666.25
28/05/2016 10:55	668.75
28/05/2016 10:56	667.50
28/05/2016 10:57	672.50
28/05/2016 10:58	672.50
28/05/2016 10:59	675.00
28/05/2016 11:00	675.63
28/05/2016 11:01	669.38
28/05/2016 11:02	671.88
28/05/2016 11:03	677.50
28/05/2016 11:04	660.63
28/05/2016 11:05	662.50
28/05/2016 11:06	669.38
28/05/2016 11:07	670.00
28/05/2016 11:08	668.75
28/05/2016 11:09	675.00
28/05/2016 11:10	665.00
28/05/2016 11:11	661.88
28/05/2016 11:12	668.75
28/05/2016 11:13	670.00
28/05/2016 11:14	668.75
28/05/2016 11:15	673.75
28/05/2016 11:16	673.13
28/05/2016 11:17	674.38
28/05/2016 11:18	671.88
28/05/2016 11:19	675.63
28/05/2016 11:20	668.13
28/05/2016 11:21	671.25
28/05/2016 11:22	674.38
28/05/2016 11:23	668.13
28/05/2016 11:24	665.00
28/05/2016 11:25	670.00
28/05/2016 11:26	674.38
28/05/2016 11:27	671.25
28/05/2016 11:28	667.50
28/05/2016 11:29	673.75
28/05/2016 11:30	671.88
28/05/2016 11:31	670.63
28/05/2016 11:32	670.63
28/05/2016 11:33	678.13
28/05/2016 11:34	670.63
28/05/2016 11:35	672.50

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 11:36	676.88
28/05/2016 11:37	671.25
28/05/2016 11:38	673.75
28/05/2016 11:39	675.63
28/05/2016 11:40	673.13
28/05/2016 11:41	676.88
28/05/2016 11:42	681.25
28/05/2016 11:43	678.13
28/05/2016 11:44	676.88
28/05/2016 11:45	677.50
28/05/2016 11:46	675.63
28/05/2016 11:47	678.75
28/05/2016 11:48	677.50
28/05/2016 11:49	678.13
28/05/2016 11:50	673.75
28/05/2016 11:51	674.38
28/05/2016 11:52	676.88
28/05/2016 11:53	677.50
28/05/2016 11:54	676.25
28/05/2016 11:55	679.38
28/05/2016 11:56	675.00
28/05/2016 11:57	676.25
28/05/2016 11:58	677.50
28/05/2016 11:59	668.75
28/05/2016 12:00	670.00
28/05/2016 12:01	688.75
28/05/2016 12:02	691.88
28/05/2016 12:03	688.75
28/05/2016 12:04	688.13
28/05/2016 12:05	683.13
28/05/2016 12:06	684.38
28/05/2016 12:07	680.63
28/05/2016 12:08	679.38
28/05/2016 12:09	673.13
28/05/2016 12:10	677.50
28/05/2016 12:11	681.25
28/05/2016 12:12	682.50
28/05/2016 12:13	681.88
28/05/2016 12:14	682.50
28/05/2016 12:15	672.50
28/05/2016 12:16	677.50
28/05/2016 12:17	678.75
28/05/2016 12:18	670.63
28/05/2016 12:19	673.75

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 12:20	677.50
28/05/2016 12:21	673.13
28/05/2016 12:22	677.50
28/05/2016 12:23	678.75
28/05/2016 12:24	679.38
28/05/2016 12:25	681.88
28/05/2016 12:26	673.13
28/05/2016 12:27	680.00
28/05/2016 12:28	676.25
28/05/2016 12:29	674.38
28/05/2016 12:30	667.50
28/05/2016 12:31	678.75
28/05/2016 12:32	679.38
28/05/2016 12:33	675.63
28/05/2016 12:34	677.50
28/05/2016 12:35	676.25
28/05/2016 12:36	681.88
28/05/2016 12:37	678.13
28/05/2016 12:38	680.00
28/05/2016 12:39	683.75
28/05/2016 12:40	685.63
28/05/2016 12:41	676.88
28/05/2016 12:42	682.50
28/05/2016 12:43	680.00
28/05/2016 12:44	674.38
28/05/2016 12:45	682.50
28/05/2016 12:46	679.38
28/05/2016 12:47	680.00
28/05/2016 12:48	678.75
28/05/2016 12:49	684.38
28/05/2016 12:50	676.88
28/05/2016 12:51	685.00
28/05/2016 12:52	683.13
28/05/2016 12:53	682.50
28/05/2016 12:54	680.00
28/05/2016 12:55	673.13
28/05/2016 12:56	680.63
28/05/2016 12:57	680.63
28/05/2016 12:58	683.13
28/05/2016 12:59	680.00
28/05/2016 13:00	681.88
28/05/2016 13:01	680.63
28/05/2016 13:02	685.00
28/05/2016 13:03	685.00

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 13:04	681.25
28/05/2016 13:05	683.13
28/05/2016 13:06	685.00
28/05/2016 13:07	689.38
28/05/2016 13:08	678.75
28/05/2016 13:09	680.00
28/05/2016 13:10	683.13
28/05/2016 13:11	685.00
28/05/2016 13:12	683.75
28/05/2016 13:13	684.38
28/05/2016 13:14	686.25
28/05/2016 13:15	679.38
28/05/2016 13:16	678.75
28/05/2016 13:17	688.13
28/05/2016 13:18	688.75
28/05/2016 13:19	684.38
28/05/2016 13:20	682.50
28/05/2016 13:21	687.50
28/05/2016 13:22	692.50
28/05/2016 13:23	687.50
28/05/2016 13:24	683.75
28/05/2016 13:25	682.50
28/05/2016 13:26	681.25
28/05/2016 13:27	690.00
28/05/2016 13:28	688.75
28/05/2016 13:29	692.50
28/05/2016 13:30	688.13
28/05/2016 13:31	682.50
28/05/2016 13:32	685.63
28/05/2016 13:33	683.13
28/05/2016 13:34	686.25
28/05/2016 13:35	685.63
28/05/2016 13:36	683.13
28/05/2016 13:37	676.88
28/05/2016 13:38	680.00
28/05/2016 13:39	683.13
28/05/2016 13:40	682.50
28/05/2016 13:41	680.63
28/05/2016 13:42	685.63
28/05/2016 13:43	680.00
28/05/2016 13:44	688.13
28/05/2016 13:45	686.25
28/05/2016 13:46	692.50
28/05/2016 13:47	683.75

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 13:48	683.75
28/05/2016 13:49	677.50
28/05/2016 13:50	681.88
28/05/2016 13:51	680.63
28/05/2016 13:52	680.63
28/05/2016 13:53	680.00
28/05/2016 13:54	686.88
28/05/2016 13:55	681.25
28/05/2016 13:56	686.88
28/05/2016 13:57	683.75
28/05/2016 13:58	681.88
28/05/2016 13:59	678.13
28/05/2016 14:00	682.50
28/05/2016 14:01	678.13
28/05/2016 14:02	692.50
28/05/2016 14:03	687.50
28/05/2016 14:04	686.88
28/05/2016 14:05	688.13
28/05/2016 14:06	690.00
28/05/2016 14:07	683.75
28/05/2016 14:08	686.88
28/05/2016 14:09	690.00
28/05/2016 14:10	689.38
28/05/2016 14:11	684.38
28/05/2016 14:12	685.63
28/05/2016 14:13	688.75
28/05/2016 14:14	685.00
28/05/2016 14:15	682.50
28/05/2016 14:16	680.63
28/05/2016 14:17	682.50
28/05/2016 14:18	679.38
28/05/2016 14:19	678.75
28/05/2016 14:20	682.50
28/05/2016 14:21	677.50
28/05/2016 14:22	680.63
28/05/2016 14:23	688.75
28/05/2016 14:24	685.63
28/05/2016 14:25	682.50
28/05/2016 14:26	680.00
28/05/2016 14:27	678.75
28/05/2016 14:28	681.88
28/05/2016 14:29	680.00
28/05/2016 14:30	-4.38
28/05/2016 14:31	645.63

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 14:32	681.25
28/05/2016 14:33	688.13
28/05/2016 14:34	693.75
28/05/2016 14:35	689.38
28/05/2016 14:36	683.13
28/05/2016 14:37	683.13
28/05/2016 14:38	686.25
28/05/2016 14:39	684.38
28/05/2016 14:40	680.63
28/05/2016 14:41	684.38
28/05/2016 14:42	677.50
28/05/2016 14:43	679.38
28/05/2016 14:44	673.13
28/05/2016 14:45	673.75
28/05/2016 14:46	678.75
28/05/2016 14:47	681.25
28/05/2016 14:48	685.63
28/05/2016 14:49	687.50
28/05/2016 14:50	681.25
28/05/2016 14:51	683.13
28/05/2016 14:52	684.38
28/05/2016 14:53	691.88
28/05/2016 14:54	688.75
28/05/2016 14:55	676.25
28/05/2016 14:56	682.50
28/05/2016 14:57	689.38
28/05/2016 14:58	686.25
28/05/2016 14:59	686.25
28/05/2016 15:00	681.88
28/05/2016 15:01	688.75
28/05/2016 15:02	687.50
28/05/2016 15:03	685.63
28/05/2016 15:04	677.50
28/05/2016 15:05	683.13
28/05/2016 15:06	680.63
28/05/2016 15:07	680.00
28/05/2016 15:08	678.75
28/05/2016 15:09	680.00
28/05/2016 15:10	682.50
28/05/2016 15:11	684.38
28/05/2016 15:12	675.63
28/05/2016 15:13	681.25
28/05/2016 15:14	678.75
28/05/2016 15:15	686.25

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 15:16	687.50
28/05/2016 15:17	685.00
28/05/2016 15:18	681.88
28/05/2016 15:19	681.88
28/05/2016 15:20	672.50
28/05/2016 15:21	681.88
28/05/2016 15:22	682.50
28/05/2016 15:23	682.50
28/05/2016 15:24	680.00
28/05/2016 15:25	682.50
28/05/2016 15:26	677.50
28/05/2016 15:27	682.50
28/05/2016 15:28	676.88
28/05/2016 15:29	685.63
28/05/2016 15:30	685.00
28/05/2016 15:31	683.75
28/05/2016 15:32	681.88
28/05/2016 15:33	673.75
28/05/2016 15:34	685.63
28/05/2016 15:35	675.00
28/05/2016 15:36	677.50
28/05/2016 15:37	674.38
28/05/2016 15:38	680.00
28/05/2016 15:39	683.13
28/05/2016 15:40	681.88
28/05/2016 15:41	673.75
28/05/2016 15:42	671.88
28/05/2016 15:43	695.00
28/05/2016 15:44	688.13
28/05/2016 15:45	688.75
28/05/2016 15:46	685.63
28/05/2016 15:47	692.50
28/05/2016 15:48	690.00
28/05/2016 15:49	680.63
28/05/2016 15:50	689.38
28/05/2016 15:51	688.75
28/05/2016 15:52	683.13
28/05/2016 15:53	686.25
28/05/2016 15:54	683.75
28/05/2016 15:55	688.75
28/05/2016 15:56	686.88
28/05/2016 15:57	695.63
28/05/2016 15:58	691.88
28/05/2016 15:59	697.50

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 16:00	695.00
28/05/2016 16:01	698.75
28/05/2016 16:02	696.25
28/05/2016 16:03	693.75
28/05/2016 16:04	685.63
28/05/2016 16:05	693.75
28/05/2016 16:06	698.75
28/05/2016 16:07	696.88
28/05/2016 16:08	698.75
28/05/2016 16:09	697.50
28/05/2016 16:10	700.63
28/05/2016 16:11	698.75
28/05/2016 16:12	698.13
28/05/2016 16:13	697.50
28/05/2016 16:14	688.75
28/05/2016 16:15	693.75
28/05/2016 16:16	695.63
28/05/2016 16:17	691.88
28/05/2016 16:18	696.88
28/05/2016 16:19	700.00
28/05/2016 16:20	695.00
28/05/2016 16:21	691.88
28/05/2016 16:22	694.38
28/05/2016 16:23	699.38
28/05/2016 16:24	685.00
28/05/2016 16:25	690.63
28/05/2016 16:26	687.50
28/05/2016 16:27	693.13
28/05/2016 16:28	691.25
28/05/2016 16:29	691.25
28/05/2016 16:30	698.75
28/05/2016 16:31	687.50
28/05/2016 16:32	688.13
28/05/2016 16:33	685.63
28/05/2016 16:34	690.63
28/05/2016 16:35	691.88
28/05/2016 16:36	693.75
28/05/2016 16:37	693.13
28/05/2016 16:38	691.88
28/05/2016 16:39	695.63
28/05/2016 16:40	692.50
28/05/2016 16:41	693.75
28/05/2016 16:42	686.25
28/05/2016 16:43	691.88

Pig Run Number 7&8	
Date and Time	Flow Rate
28/05/2016 16:44	686.88
28/05/2016 16:45	690.63
28/05/2016 16:46	695.63
28/05/2016 16:47	699.38
28/05/2016 16:48	701.25
28/05/2016 16:49	688.13
28/05/2016 16:50	693.75
28/05/2016 16:51	687.50
28/05/2016 16:52	700.00
28/05/2016 16:53	690.00
28/05/2016 16:54	690.63
28/05/2016 16:55	693.13
28/05/2016 16:56	698.75
28/05/2016 16:57	691.25
28/05/2016 16:58	690.63
28/05/2016 16:59	689.38
28/05/2016 17:00	681.88

APPENDIX B

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-21 11:30:00	49.0000	56.0000	7043.30	7058.70	7153.30
2016-05-21 11:59:15	118.0000	137.0000	7022.40	7122.50	7236.90
2016-05-21 12:01:39	118.0000	137.0000	7022.40	7122.50	7236.90
2016-05-21 12:30:00	53.0000	59.0000	7120.30	7126.90	7208.30
2016-05-21 13:00:00	3.0000	4.0000	7110.40	7132.40	7251.20
2016-05-21 13:30:00	164.0000	187.0000	7001.50	7034.50	7133.50
2016-05-21 14:00:00	179.0000	207.0000	6912.40	6919.00	6994.90
2016-05-21 14:30:00	177.0000	203.0000	6853.00	6872.80	6942.10
2016-05-21 15:00:00	178.0000	204.0000	6859.60	6895.90	6961.90
2016-05-21 15:30:00	181.0000	208.0000	6932.20	6952.00	7020.20
2016-05-21 16:00:00	180.0000	207.0000	6908.00	6935.50	6997.10
2016-05-21 16:30:00	179.0000	207.0000	6913.50	6943.20	6999.30
2016-05-21 17:00:00	177.0000	203.0000	6856.30	6898.10	6958.60
2016-05-21 17:30:00	177.0000	203.0000	6840.90	6871.70	6947.60
2016-05-21 18:00:00	179.0000	206.0000	6904.70	6931.10	7022.40
2016-05-21 18:30:00	167.0000	192.0000	7103.80	7152.20	7200.60
2016-05-21 19:00:00	0.0000	0.0000	7109.30	7152.20	7236.90
2016-05-21 19:30:00	1.0000	1.0000	7000.40	7043.30	7134.60
2016-05-21 20:00:00	149.0000	171.0000	6925.60	6952.00	7025.70
2016-05-21 20:30:00	181.0000	209.0000	6927.80	6958.60	7024.60
2016-05-21 21:00:00	181.0000	209.0000	6933.30	6965.20	7023.50
2016-05-21 21:30:00	180.0000	207.0000	6916.80	6939.90	6983.90
2016-05-21 22:00:00	179.0000	206.0000	6889.30	6933.30	6975.10
2016-05-21 22:30:00	184.0000	211.0000	6976.20	7019.10	7059.80
2016-05-21 23:00:00	182.0000	211.0000	6970.70	7008.10	7051.00
2016-05-21 23:30:00	184.0000	211.0000	6978.40	7014.70	7066.40
2016-05-22 00:00:00	180.0000	208.0000	6919.00	6947.60	7004.80
2016-05-22 00:30:00	182.0000	209.0000	6943.20	6976.20	7035.60
2016-05-22 01:00:00	182.0000	210.0000	6970.70	6991.60	7041.10
2016-05-22 01:30:00	184.0000	212.0000	6980.60	7002.60	7057.60
2016-05-22 02:00:00	183.0000	211.0000	6983.90	7010.30	7063.10
2016-05-22 02:30:00	184.0000	212.0000	6981.70	7020.20	7073.00
2016-05-22 03:00:00	184.0000	212.0000	6998.20	7019.10	7056.50
2016-05-22 03:30:00	184.0000	212.0000	6991.60	7018.00	7066.40
2016-05-22 04:00:00	183.0000	211.0000	6972.90	7012.50	7057.60
2016-05-22 04:30:00	183.0000	210.0000	6964.10	6998.20	7040.00
2016-05-22 05:00:00	182.0000	210.0000	6960.80	6989.40	7046.60
2016-05-22 05:30:00	182.0000	210.0000	6960.80	6986.10	7042.20
2016-05-22 06:00:00	184.0000	212.0000	6990.50	7010.30	7066.40
2016-05-22 06:30:00	181.0000	208.0000	6924.50	6959.70	7010.30
2016-05-22 07:00:00	179.0000	206.0000	6881.60	6917.90	6988.30
2016-05-22 07:30:00	177.0000	204.0000	6860.70	6872.80	6946.50
2016-05-22 08:00:00	178.0000	204.0000	6858.50	6899.20	6964.10

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-22 08:30:00	178.0000	206.0000	6882.70	6911.30	6966.30
2016-05-22 09:00:00	180.0000	207.0000	6913.50	6933.30	7007.00
2016-05-22 09:30:00	180.0000	207.0000	6890.40	6934.40	6999.30
2016-05-22 10:00:00	179.0000	207.0000	6889.30	6926.70	6998.20
2016-05-22 10:30:00	180.0000	208.0000	6913.50	6942.10	7020.20
2016-05-22 11:00:00	181.0000	208.0000	6924.50	6948.70	7019.10
2016-05-22 11:30:00	178.0000	205.0000	6893.70	6912.40	6990.50
2016-05-22 12:00:00	179.0000	206.0000	6880.50	6909.10	6972.90
2016-05-22 12:30:00	178.0000	205.0000	6892.60	6913.50	6964.10
2016-05-22 13:00:00	178.0000	206.0000	6891.50	6920.10	6990.50
2016-05-22 13:30:00	181.0000	208.0000	6931.10	6968.50	7024.60
2016-05-22 14:00:00	181.0000	208.0000	6930.00	6960.80	7029.00
2016-05-22 14:30:00	180.0000	208.0000	6919.00	6964.10	7019.10
2016-05-22 15:00:00	181.0000	208.0000	6941.00	6981.70	7026.80
2016-05-22 15:30:00	181.0000	209.0000	6952.00	6992.70	7047.70
2016-05-22 16:00:00	180.0000	208.0000	6928.90	6955.30	7024.60
2016-05-22 16:30:00	179.0000	205.0000	6872.80	6928.90	6991.60
2016-05-22 17:00:00	177.0000	204.0000	6871.70	6900.30	6949.80
2016-05-22 17:30:00	176.0000	204.0000	6858.50	6883.80	6964.10
2016-05-22 18:00:00	178.0000	204.0000	6854.10	6908.00	6998.20
2016-05-22 18:30:00	180.0000	208.0000	6913.50	6941.00	7025.70
2016-05-22 19:00:00	182.0000	209.0000	6945.40	6964.10	7044.40
2016-05-22 19:30:00	181.0000	209.0000	6946.50	6979.50	7052.10
2016-05-22 20:00:00	182.0000	209.0000	6928.90	6974.00	7045.50
2016-05-22 20:30:00	182.0000	209.0000	6957.50	6976.20	7054.30
2016-05-22 21:00:00	181.0000	209.0000	6946.50	6968.50	7042.20
2016-05-22 21:30:00	183.0000	211.0000	6980.60	7007.00	7069.70
2016-05-22 22:00:00	182.0000	210.0000	6970.70	6998.20	7054.30
2016-05-22 22:30:00	183.0000	211.0000	6982.80	7007.00	7070.80
2016-05-22 23:00:00	183.0000	210.0000	6964.10	7002.60	7042.20
2016-05-22 23:30:00	181.0000	209.0000	6944.30	6968.50	7030.10
2016-05-23 00:00:00	181.0000	209.0000	6941.00	6972.90	7032.30
2016-05-23 00:30:00	183.0000	210.0000	6965.20	7001.50	7041.10
2016-05-23 01:00:00	183.0000	212.0000	6979.50	7014.70	7057.60
2016-05-23 01:30:00	184.0000	212.0000	6986.10	7009.20	7068.60
2016-05-23 02:00:00	183.0000	211.0000	6969.60	7008.10	7058.70
2016-05-23 02:30:00	184.0000	211.0000	6990.50	7020.20	7067.50
2016-05-23 03:00:00	184.0000	211.0000	6979.50	7002.60	7068.60
2016-05-23 03:30:00	182.0000	211.0000	6978.40	7004.80	7044.40
2016-05-23 04:00:00	179.0000	206.0000	6905.80	6920.10	6959.70
2016-05-23 04:30:00	178.0000	205.0000	6881.60	6913.50	6966.30
2016-05-23 05:00:00	179.0000	206.0000	6888.20	6920.10	6969.60
2016-05-23 05:30:00	179.0000	206.0000	6892.60	6912.40	6991.60

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-23 06:00:00	179.0000	206.0000	6867.30	6900.30	6980.60
2016-05-23 06:30:00	178.0000	206.0000	6879.40	6901.40	6981.70
2016-05-23 07:00:00	179.0000	205.0000	6879.40	6900.30	6965.20
2016-05-23 07:30:00	180.0000	208.0000	6913.50	6931.10	6991.60
2016-05-23 08:00:00	179.0000	206.0000	6888.20	6922.30	6979.50
2016-05-23 08:30:00	178.0000	205.0000	6860.70	6900.30	6954.20
2016-05-23 09:00:00	177.0000	203.0000	6840.90	6869.50	6935.50
2016-05-23 09:30:00	179.0000	207.0000	6898.10	6923.40	6977.30
2016-05-23 10:00:00	180.0000	207.0000	6895.90	6935.50	7000.40
2016-05-23 10:30:00	179.0000	206.0000	6895.90	6924.50	6987.20
2016-05-23 11:00:00	179.0000	206.0000	6883.80	6919.00	6972.90
2016-05-23 11:30:00	178.0000	206.0000	6880.50	6910.20	6963.00
2016-05-23 12:00:00	179.0000	205.0000	6887.10	6915.70	6976.20
2016-05-23 12:30:00	180.0000	207.0000	6908.00	6932.20	6985.00
2016-05-23 13:00:00	180.0000	208.0000	6923.40	6950.90	6993.80
2016-05-23 13:30:00	180.0000	207.0000	6910.20	6955.30	7022.40
2016-05-23 14:00:00	181.0000	209.0000	6932.20	6958.60	7016.90
2016-05-23 14:30:00	180.0000	207.0000	6931.10	6953.10	7000.40
2016-05-23 15:00:00	179.0000	206.0000	6906.90	6930.00	6976.20
2016-05-23 15:30:00	178.0000	205.0000	6861.80	6912.40	6952.00
2016-05-23 16:00:00	176.0000	202.0000	6838.70	6880.50	6921.20
2016-05-23 16:30:00	176.0000	204.0000	6854.10	6882.70	6934.40
2016-05-23 17:00:00	177.0000	203.0000	6851.90	6891.50	6965.20
2016-05-23 17:30:00	178.0000	205.0000	6878.30	6909.10	6969.60
2016-05-23 18:00:00	177.0000	204.0000	6870.60	6889.30	6969.60
2016-05-23 18:30:00	180.0000	207.0000	6901.40	6935.50	7004.80
2016-05-23 19:00:00	181.0000	209.0000	6928.90	6954.20	7041.10
2016-05-23 19:30:00	182.0000	209.0000	6942.10	6974.00	7042.20
2016-05-23 20:00:00	182.0000	210.0000	6961.90	6983.90	7047.70
2016-05-23 20:30:00	182.0000	209.0000	6942.10	6974.00	7047.70
2016-05-23 21:00:00	179.0000	206.0000	6898.10	6916.80	6975.10
2016-05-23 21:30:00	179.0000	207.0000	6912.40	6927.80	6990.50
2016-05-23 22:00:00	179.0000	206.0000	6889.30	6921.20	6979.50
2016-05-23 22:30:00	180.0000	207.0000	6909.10	6934.40	6988.30
2016-05-23 23:00:00	182.0000	209.0000	6961.90	6977.30	7037.80
2016-05-23 23:30:00	182.0000	210.0000	6957.50	6996.00	7043.30
2016-05-24 00:00:00	180.0000	208.0000	6928.90	6954.20	7002.60
2016-05-24 00:30:00	181.0000	208.0000	6928.90	6947.60	6999.30
2016-05-24 01:00:00	180.0000	208.0000	6925.60	6956.40	7000.40
2016-05-24 01:30:00	180.0000	207.0000	6920.10	6954.20	6998.20
2016-05-24 02:00:00	182.0000	209.0000	6935.50	6957.50	7014.70
2016-05-24 02:30:00	181.0000	209.0000	6938.80	6977.30	7024.60
2016-05-24 03:00:00	182.0000	209.0000	6941.00	6982.80	7020.20

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-24 03:30:00	180.0000	208.0000	6927.80	6955.30	7001.50
2016-05-24 04:00:00	180.0000	207.0000	6923.40	6946.50	6998.20
2016-05-24 04:30:00	179.0000	206.0000	6910.20	6937.70	6985.00
2016-05-24 05:00:00	177.0000	205.0000	6861.80	6895.90	6944.30
2016-05-24 05:30:00	180.0000	206.0000	6894.80	6919.00	6994.90
2016-05-24 06:00:00	177.0000	204.0000	6862.90	6880.50	6957.50
2016-05-24 06:30:00	176.0000	203.0000	6851.90	6877.20	6947.60
2016-05-24 07:00:00	179.0000	205.0000	6866.20	6901.40	6976.20
2016-05-24 07:30:00	179.0000	207.0000	6903.60	6932.20	6992.70
2016-05-24 08:00:00	180.0000	207.0000	6906.90	6944.30	7007.00
2016-05-24 08:30:00	179.0000	206.0000	6899.20	6920.10	6981.70
2016-05-24 09:00:00	179.0000	206.0000	6890.40	6923.40	6983.90
2016-05-24 09:30:00	179.0000	207.0000	6914.60	6938.80	6997.10
2016-05-24 10:00:00	180.0000	207.0000	6919.00	6928.90	7005.90
2016-05-24 10:30:00	179.0000	206.0000	6899.20	6924.50	6994.90
2016-05-24 11:00:00	179.0000	206.0000	6899.20	6927.80	6987.20
2016-05-24 11:30:00	178.0000	205.0000	6886.00	6912.40	6971.80
2016-05-24 12:00:00	178.0000	205.0000	6876.10	6901.40	6954.20
2016-05-24 12:30:00	176.0000	203.0000	6849.70	6881.60	6931.10
2016-05-24 13:00:00	175.0000	201.0000	6823.30	6848.60	6903.60
2016-05-24 13:30:00	175.0000	202.0000	6842.00	6862.90	6923.40
2016-05-24 14:00:00	176.0000	202.0000	6834.30	6857.40	6920.10
2016-05-24 14:30:00	175.0000	202.0000	6842.00	6859.60	6911.30
2016-05-24 15:00:00	173.0000	199.0000	6785.90	6818.90	6877.20
2016-05-24 15:30:00	173.0000	199.0000	6792.50	6827.70	6887.10
2016-05-24 16:00:00	176.0000	202.0000	6858.50	6868.40	6903.60
2016-05-24 16:30:00	175.0000	203.0000	6838.70	6859.60	6923.40
2016-05-24 17:00:00	174.0000	200.0000	6795.80	6845.30	6886.00
2016-05-24 17:30:00	175.0000	202.0000	6826.60	6859.60	6941.00
2016-05-24 18:00:00	181.0000	207.0000	6932.20	6963.00	7045.50
2016-05-24 18:30:00	81.0000	94.0000	7027.90	7054.30	7133.50
2016-05-24 19:00:00	0.0000	0.0000	7025.70	7060.90	7141.20
2016-05-24 19:28:50	5.0000	5.0000	6985.00	7014.70	7092.80
2016-05-24 19:32:30	5.0000	5.0000	6985.00	7014.70	7092.80
2016-05-24 20:00:00	166.0000	191.0000	6919.00	6955.30	7021.30
2016-05-24 20:30:00	10.0000	11.0000	7071.90	7126.90	7164.30
2016-05-24 20:45:21	1.0000	2.0000	7071.90	7120.30	7186.30
2016-05-24 21:16:25	1.0000	2.0000	7071.90	7120.30	7186.30
2016-05-24 21:30:00	9.0000	10.0000	7025.70	7065.30	7128.00
2016-05-24 22:00:00	184.0000	212.0000	6915.70	6931.10	6980.60
2016-05-24 22:30:00	180.0000	207.0000	6908.00	6922.30	6976.20
2016-05-24 23:00:00	113.0000	129.0000	6991.60	7022.40	7060.90
2016-05-24 23:30:00	1.0000	1.0000	7089.50	7123.60	7164.30

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-25 00:00:00	2.0000	2.0000	7091.70	7158.80	7195.10
2016-05-25 00:30:00	17.0000	20.0000	7077.40	7108.20	7143.40
2016-05-25 01:00:00	1.0000	1.0000	7075.20	7099.40	7137.90
2016-05-25 01:30:00	192.0000	221.0000	6926.70	6945.40	6996.00
2016-05-25 02:00:00	182.0000	209.0000	6946.50	6956.40	7019.10
2016-05-25 02:30:00	181.0000	209.0000	6950.90	6974.00	7011.40
2016-05-25 03:00:00	182.0000	210.0000	6954.20	6969.60	7023.50
2016-05-25 03:30:00	182.0000	209.0000	6946.50	6969.60	7021.30
2016-05-25 04:00:00	181.0000	208.0000	6916.80	6942.10	6998.20
2016-05-25 04:30:00	179.0000	206.0000	6892.60	6917.90	6966.30
2016-05-25 05:00:00	175.0000	202.0000	6833.20	6858.50	6902.50
2016-05-25 05:30:00	176.0000	203.0000	6832.10	6859.60	6924.50
2016-05-25 06:00:00	177.0000	203.0000	6847.50	6876.10	6938.80
2016-05-25 06:30:00	181.0000	208.0000	6922.30	6948.70	7003.70
2016-05-25 07:00:00	180.0000	207.0000	6905.80	6938.80	6999.30
2016-05-25 07:30:00	181.0000	209.0000	6925.60	6957.50	7012.50
2016-05-25 08:00:00	181.0000	207.0000	6916.80	6937.70	6999.30
2016-05-25 08:30:00	177.0000	204.0000	6845.30	6884.90	6933.30
2016-05-25 09:00:00	176.0000	204.0000	6843.10	6870.60	6921.20
2016-05-25 09:30:00	176.0000	202.0000	6831.00	6858.50	6909.10
2016-05-25 10:00:00	176.0000	202.0000	6823.30	6853.00	6905.80
2016-05-25 10:30:00	175.0000	202.0000	6822.20	6845.30	6904.70
2016-05-25 11:00:00	175.0000	202.0000	6818.90	6843.10	6906.90
2016-05-25 11:30:00	175.0000	200.0000	6794.70	6831.00	6886.00
2016-05-25 12:00:00	174.0000	201.0000	6811.20	6835.40	6879.40
2016-05-25 12:30:00	176.0000	202.0000	6838.70	6851.90	6903.60
2016-05-25 13:00:00	177.0000	204.0000	6849.70	6882.70	6932.20
2016-05-25 13:30:00	176.0000	203.0000	6821.10	6867.30	6923.40
2016-05-25 14:00:00	176.0000	203.0000	6843.10	6878.30	6921.20
2016-05-25 14:30:00	176.0000	202.0000	6826.60	6856.30	6915.70
2016-05-25 15:00:00	175.0000	201.0000	6820.00	6851.90	6895.90
2016-05-25 15:30:00	175.0000	201.0000	6811.20	6839.80	6890.40
2016-05-25 16:00:00	175.0000	202.0000	6832.10	6868.40	6910.20
2016-05-25 16:30:00	177.0000	203.0000	6855.20	6877.20	6928.90
2016-05-25 17:00:00	175.0000	202.0000	6817.80	6854.10	6923.40
2016-05-25 17:30:00	175.0000	202.0000	6817.80	6838.70	6915.70
2016-05-25 18:00:00	180.0000	207.0000	6922.30	6936.60	7020.20
2016-05-25 18:30:00	183.0000	210.0000	6967.40	6992.70	7071.90
2016-05-25 19:00:00	181.0000	209.0000	6947.60	6958.60	7044.40
2016-05-25 19:30:00	181.0000	207.0000	6917.90	6925.60	7013.60
2016-05-25 20:00:00	182.0000	210.0000	6957.50	6976.20	7051.00
2016-05-25 20:30:00	183.0000	211.0000	6969.60	6986.10	7059.80
2016-05-25 21:00:00	181.0000	208.0000	6937.70	6954.20	7020.20

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-25 21:30:00	180.0000	208.0000	6935.50	6952.00	7012.50
2016-05-25 22:00:00	182.0000	209.0000	6953.10	6971.80	7029.00
2016-05-25 22:30:00	181.0000	209.0000	6956.40	6977.30	7032.30
2016-05-25 23:00:00	181.0000	208.0000	6937.70	6958.60	7013.60
2016-05-25 23:30:00	182.0000	209.0000	6957.50	6983.90	7032.30
2016-05-26 00:00:00	179.0000	207.0000	6917.90	6934.40	6982.80
2016-05-26 00:30:00	180.0000	207.0000	6922.30	6942.10	6981.70
2016-05-26 01:00:00	179.0000	207.0000	6919.00	6947.60	6982.80
2016-05-26 01:30:00	181.0000	208.0000	6936.60	6966.30	7018.00
2016-05-26 02:00:00	182.0000	209.0000	6936.60	6969.60	7026.80
2016-05-26 02:30:00	182.0000	210.0000	6966.30	6988.30	7030.10
2016-05-26 03:00:00	181.0000	208.0000	6945.40	6967.40	7008.10
2016-05-26 03:30:00	180.0000	208.0000	6935.50	6956.40	7009.20
2016-05-26 04:00:00	181.0000	208.0000	6930.00	6953.10	7010.30
2016-05-26 04:30:00	180.0000	207.0000	6911.30	6930.00	6985.00
2016-05-26 05:00:00	177.0000	204.0000	6877.20	6892.60	6939.90
2016-05-26 05:30:00	179.0000	206.0000	6888.20	6906.90	6958.60
2016-05-26 06:00:00	177.0000	204.0000	6858.50	6878.30	6953.10
2016-05-26 06:30:00	177.0000	202.0000	6833.20	6861.80	6924.50
2016-05-26 07:00:00	178.0000	205.0000	6879.40	6897.00	6955.30
2016-05-26 07:30:00	182.0000	210.0000	6959.70	6971.80	7045.50
2016-05-26 08:00:00	180.0000	208.0000	6922.30	6958.60	7002.60
2016-05-26 08:30:00	181.0000	208.0000	6934.40	6955.30	7013.60
2016-05-26 09:00:00	180.0000	207.0000	6910.20	6946.50	7000.40
2016-05-26 09:30:00	181.0000	209.0000	6944.30	6965.20	7016.90
2016-05-26 10:00:00	181.0000	207.0000	6928.90	6952.00	7015.80
2016-05-26 10:30:00	181.0000	209.0000	6937.70	6952.00	7018.00
2016-05-26 11:00:00	180.0000	207.0000	6928.90	6943.20	6996.00
2016-05-26 11:30:00	179.0000	207.0000	6909.10	6939.90	6993.80
2016-05-26 12:00:00	180.0000	207.0000	6914.60	6943.20	6988.30
2016-05-26 12:30:00	181.0000	208.0000	6942.10	6957.50	7008.10
2016-05-26 13:00:00	180.0000	208.0000	6922.30	6953.10	7016.90
2016-05-26 13:30:00	179.0000	205.0000	6894.80	6935.50	6975.10
2016-05-26 14:00:00	178.0000	205.0000	6876.10	6890.40	6945.40
2016-05-26 14:30:00	175.0000	202.0000	6840.90	6875.00	6923.40
2016-05-26 15:00:00	177.0000	203.0000	6845.30	6877.20	6934.40
2016-05-26 15:30:00	175.0000	202.0000	6835.40	6851.90	6917.90
2016-05-26 16:00:00	174.0000	200.0000	6791.40	6822.20	6891.50
2016-05-26 16:30:00	173.0000	200.0000	6787.00	6814.50	6869.50
2016-05-26 17:00:00	174.0000	199.0000	6792.50	6811.20	6868.40
2016-05-26 17:30:00	172.0000	199.0000	6778.20	6793.60	6855.20
2016-05-26 18:00:00	174.0000	200.0000	6804.60	6815.60	6893.70
2016-05-26 18:30:00	175.0000	201.0000	6814.50	6828.80	6914.60

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-26 19:00:00	176.0000	203.0000	6828.80	6860.70	6924.50
2016-05-26 19:30:00	177.0000	204.0000	6871.70	6878.30	6942.10
2016-05-26 20:00:00	179.0000	205.0000	6894.80	6905.80	6985.00
2016-05-26 20:30:00	178.0000	206.0000	6893.70	6909.10	6985.00
2016-05-26 21:00:00	175.0000	201.0000	6827.70	6843.10	6905.80
2016-05-26 21:30:00	176.0000	202.0000	6838.70	6855.20	6902.50
2016-05-26 22:00:00	175.0000	202.0000	6833.20	6846.40	6895.90
2016-05-26 22:30:00	176.0000	203.0000	6840.90	6865.10	6922.30
2016-05-26 23:00:00	177.0000	204.0000	6872.80	6883.80	6941.00
2016-05-26 23:30:00	179.0000	205.0000	6899.20	6910.20	6966.30
2016-05-27 00:00:00	180.0000	208.0000	6917.90	6939.90	6991.60
2016-05-27 00:30:00	179.0000	206.0000	6908.00	6924.50	6974.00
2016-05-27 01:00:00	178.0000	205.0000	6890.40	6913.50	6958.60
2016-05-27 01:30:00	179.0000	206.0000	6892.60	6920.10	6961.90
2016-05-27 02:00:00	179.0000	206.0000	6893.70	6922.30	6976.20
2016-05-27 02:30:00	178.0000	205.0000	6903.60	6920.10	6977.30
2016-05-27 03:00:00	179.0000	207.0000	6911.30	6924.50	6986.10
2016-05-27 03:30:00	179.0000	206.0000	6903.60	6926.70	6977.30
2016-05-27 04:00:00	179.0000	205.0000	6893.70	6912.40	6959.70
2016-05-27 04:30:00	177.0000	204.0000	6873.90	6882.70	6937.70
2016-05-27 05:00:00	177.0000	204.0000	6858.50	6873.90	6927.80
2016-05-27 05:30:00	176.0000	203.0000	6854.10	6868.40	6936.60
2016-05-27 06:00:00	175.0000	200.0000	6802.40	6818.90	6891.50
2016-05-27 06:30:00	173.0000	200.0000	6793.60	6809.00	6876.10
2016-05-27 07:00:00	176.0000	202.0000	6828.80	6844.20	6910.20
2016-05-27 07:30:00	177.0000	204.0000	6849.70	6879.40	6932.20
2016-05-27 08:00:00	175.0000	202.0000	6826.60	6862.90	6919.00
2016-05-27 08:30:00	174.0000	200.0000	6800.20	6832.10	6889.30
2016-05-27 09:00:00	175.0000	201.0000	6807.90	6833.20	6882.70
2016-05-27 09:30:00	174.0000	201.0000	6807.90	6834.30	6875.00
2016-05-27 10:00:00	174.0000	200.0000	6799.10	6815.60	6883.80
2016-05-27 10:30:00	177.0000	203.0000	6839.80	6870.60	6916.80
2016-05-27 11:00:00	175.0000	201.0000	6814.50	6854.10	6902.50
2016-05-27 11:30:00	175.0000	203.0000	6831.00	6857.40	6904.70
2016-05-27 12:00:00	178.0000	204.0000	6870.60	6880.50	6934.40
2016-05-27 12:30:00	176.0000	203.0000	6851.90	6877.20	6920.10
2016-05-27 13:00:00	178.0000	205.0000	6881.60	6902.50	6944.30
2016-05-27 13:30:00	177.0000	204.0000	6865.10	6901.40	6946.50
2016-05-27 14:00:00	178.0000	205.0000	6882.70	6913.50	6955.30
2016-05-27 14:30:00	178.0000	204.0000	6880.50	6904.70	6960.80
2016-05-27 15:00:00	177.0000	204.0000	6867.30	6894.80	6944.30
2016-05-27 15:30:00	178.0000	205.0000	6871.70	6897.00	6948.70
2016-05-27 16:00:00	176.0000	203.0000	6850.80	6887.10	6933.30

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-27 16:30:00	176.0000	202.0000	6846.40	6861.80	6912.40
2016-05-27 17:00:00	177.0000	204.0000	6873.90	6884.90	6945.40
2016-05-27 17:30:00	176.0000	203.0000	6834.30	6875.00	6934.40
2016-05-27 18:00:00	176.0000	202.0000	6848.60	6855.20	6942.10
2016-05-27 18:30:00	178.0000	205.0000	6872.80	6880.50	6966.30
2016-05-27 19:00:00	179.0000	206.0000	6900.30	6914.60	6989.40
2016-05-27 19:30:00	178.0000	205.0000	6884.90	6893.70	6964.10
2016-05-27 20:00:00	179.0000	206.0000	6898.10	6916.80	6977.30
2016-05-27 20:30:00	177.0000	204.0000	6875.00	6892.60	6945.40
2016-05-27 21:00:00	178.0000	205.0000	6886.00	6916.80	6981.70
2016-05-27 21:30:00	181.0000	208.0000	6925.60	6958.60	7022.40
2016-05-27 22:00:00	180.0000	207.0000	6912.40	6935.50	6985.00
2016-05-27 22:30:00	177.0000	204.0000	6876.10	6895.90	6933.30
2016-05-27 23:00:00	179.0000	206.0000	6892.60	6916.80	6977.30
2016-05-27 23:30:00	179.0000	206.0000	6895.90	6936.60	6972.90
2016-05-28 00:00:00	180.0000	207.0000	6923.40	6935.50	6982.80
2016-05-28 00:30:00	178.0000	205.0000	6880.50	6901.40	6968.50
2016-05-28 01:00:00	177.0000	204.0000	6880.50	6890.40	6947.60
2016-05-28 01:30:00	179.0000	206.0000	6893.70	6905.80	6963.00
2016-05-28 02:00:00	178.0000	205.0000	6905.80	6913.50	6970.70
2016-05-28 02:30:00	179.0000	206.0000	6900.30	6922.30	6965.20
2016-05-28 03:00:00	178.0000	205.0000	6900.30	6916.80	6950.90
2016-05-28 03:30:00	178.0000	205.0000	6884.90	6902.50	6957.50
2016-05-28 04:00:00	178.0000	205.0000	6881.60	6906.90	6964.10
2016-05-28 04:30:00	179.0000	206.0000	6888.20	6908.00	6958.60
2016-05-28 05:00:00	176.0000	203.0000	6867.30	6881.60	6931.10
2016-05-28 05:30:00	176.0000	203.0000	6842.00	6856.30	6911.30
2016-05-28 06:00:00	175.0000	201.0000	6820.00	6833.20	6884.90
2016-05-28 06:30:00	174.0000	200.0000	6805.70	6823.30	6870.60
2016-05-28 07:00:00	175.0000	201.0000	6801.30	6828.80	6884.90
2016-05-28 07:30:00	177.0000	204.0000	6861.80	6881.60	6945.40
2016-05-28 08:00:00	178.0000	205.0000	6879.40	6904.70	6966.30
2016-05-28 08:30:00	177.0000	204.0000	6855.20	6870.60	6941.00
2016-05-28 09:00:00	176.0000	203.0000	6833.20	6856.30	6932.20
2016-05-28 09:30:00	176.0000	202.0000	6828.80	6843.10	6901.40
2016-05-28 10:00:00	176.0000	203.0000	6844.20	6859.60	6915.70
2016-05-28 10:30:00	177.0000	203.0000	6856.30	6873.90	6930.00
2016-05-28 11:00:00	177.0000	204.0000	6864.00	6884.90	6937.70
2016-05-28 11:30:00	177.0000	204.0000	6876.10	6894.80	6941.00
2016-05-28 12:00:00	178.0000	206.0000	6879.40	6901.40	6960.80
2016-05-28 12:30:00	177.0000	203.0000	6862.90	6884.90	6942.10
2016-05-28 13:00:00	176.0000	203.0000	6842.00	6864.00	6920.10
2016-05-28 13:30:00	177.0000	203.0000	6867.30	6873.90	6936.60

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-28 14:00:00	177.0000	205.0000	6864.00	6895.90	6954.20
2016-05-28 14:30:00	179.0000	205.0000	6898.10	6909.10	6974.00
2016-05-28 15:00:00	178.0000	206.0000	6895.90	6909.10	6976.20
2016-05-28 15:30:00	178.0000	205.0000	6888.20	6914.60	6965.20
2016-05-28 16:00:00	178.0000	204.0000	6891.50	6903.60	6952.00
2016-05-28 16:30:00	178.0000	205.0000	6882.70	6902.50	6974.00
2016-05-28 17:00:00	177.0000	204.0000	6856.30	6891.50	6948.70
2016-05-28 17:30:00	174.0000	201.0000	6822.20	6834.30	6905.80
2016-05-28 18:00:00	176.0000	201.0000	6818.90	6855.20	6934.40
2016-05-28 18:30:00	178.0000	206.0000	6891.50	6909.10	6994.90
2016-05-28 19:00:00	180.0000	207.0000	6897.00	6912.40	6997.10
2016-05-28 19:30:00	180.0000	207.0000	6922.30	6934.40	7010.30
2016-05-28 20:00:00	180.0000	208.0000	6923.40	6943.20	7032.30
2016-05-28 20:30:00	183.0000	210.0000	6957.50	6978.40	7049.90
2016-05-28 21:00:00	176.0000	203.0000	6871.70	6880.50	6937.70
2016-05-28 21:30:00	177.0000	204.0000	6856.30	6869.50	6944.30
2016-05-28 22:00:00	176.0000	202.0000	6854.10	6866.20	6916.80
2016-05-28 22:30:00	176.0000	203.0000	6850.80	6866.20	6915.70
2016-05-28 23:00:00	179.0000	206.0000	6897.00	6914.60	6961.90
2016-05-28 23:30:00	178.0000	205.0000	6893.70	6916.80	6974.00
2016-05-29 00:00:00	182.0000	209.0000	6952.00	6971.80	7032.30
2016-05-29 00:30:00	181.0000	208.0000	6927.80	6942.10	7001.50
2016-05-29 01:00:00	180.0000	208.0000	6919.00	6939.90	6989.40
2016-05-29 01:30:00	179.0000	206.0000	6923.40	6936.60	6983.90
2016-05-29 02:00:00	178.0000	205.0000	6895.90	6904.70	6961.90
2016-05-29 02:30:00	178.0000	206.0000	6892.60	6910.20	6944.30
2016-05-29 03:00:00	179.0000	205.0000	6891.50	6899.20	6958.60
2016-05-29 03:30:00	177.0000	204.0000	6862.90	6888.20	6947.60
2016-05-29 04:00:00	178.0000	205.0000	6882.70	6901.40	6938.80
2016-05-29 04:30:00	178.0000	205.0000	6884.90	6889.30	6944.30
2016-05-29 05:00:00	177.0000	203.0000	6840.90	6872.80	6922.30
2016-05-29 05:30:00	176.0000	203.0000	6848.60	6864.00	6910.20
2016-05-29 06:00:00	177.0000	204.0000	6853.00	6868.40	6908.00
2016-05-29 06:30:00	175.0000	202.0000	6836.50	6845.30	6888.20
2016-05-29 07:00:00	178.0000	204.0000	6855.20	6895.90	6945.40
2016-05-29 07:30:00	177.0000	203.0000	6855.20	6869.50	6927.80
2016-05-29 08:00:00	174.0000	201.0000	6804.60	6812.30	6889.30
2016-05-29 08:30:00	176.0000	203.0000	6832.10	6844.20	6923.40
2016-05-29 09:00:00	175.0000	201.0000	6793.60	6842.00	6908.00
2016-05-29 09:30:00	176.0000	202.0000	6838.70	6846.40	6920.10
2016-05-29 10:00:00	176.0000	203.0000	6844.20	6839.80	6921.20
2016-05-29 10:30:00	176.0000	204.0000	6866.20	6871.70	6934.40
2016-05-29 11:00:00	179.0000	205.0000	6890.40	6899.20	6969.60

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-29 11:30:00	177.0000	205.0000	6879.40	6883.80	6963.00
2016-05-29 12:00:00	178.0000	204.0000	6884.90	6903.60	6952.00
2016-05-29 12:30:00	178.0000	205.0000	6871.70	6901.40	6958.60
2016-05-29 13:00:00	178.0000	205.0000	6884.90	6913.50	6978.40
2016-05-29 13:30:00	178.0000	206.0000	6904.70	6919.00	6980.60
2016-05-29 14:00:00	180.0000	206.0000	6911.30	6939.90	6989.40
2016-05-29 14:30:00	180.0000	208.0000	6927.80	6953.10	7011.40
2016-05-29 15:00:00	180.0000	207.0000	6923.40	6947.60	7014.70
2016-05-29 15:30:00	179.0000	206.0000	6905.80	6919.00	6977.30
2016-05-29 16:00:00	177.0000	204.0000	6872.80	6890.40	6955.30
2016-05-29 16:30:00	177.0000	204.0000	6862.90	6894.80	6952.00
2016-05-29 17:00:00	176.0000	203.0000	6849.70	6869.50	6932.20
2016-05-29 17:30:00	178.0000	205.0000	6879.40	6910.20	6987.20
2016-05-29 18:00:00	177.0000	203.0000	6855.20	6873.90	6957.50
2016-05-29 18:30:00	179.0000	206.0000	6897.00	6908.00	6993.80
2016-05-29 19:00:00	180.0000	208.0000	6941.00	6943.20	7037.80
2016-05-29 19:30:00	179.0000	206.0000	6901.40	6902.50	6990.50
2016-05-29 20:00:00	178.0000	204.0000	6862.90	6879.40	6960.80
2016-05-29 20:30:00	175.0000	202.0000	6837.60	6855.20	6925.60
2016-05-29 21:00:00	177.0000	204.0000	6853.00	6869.50	6926.70
2016-05-29 21:30:00	175.0000	202.0000	6844.20	6860.70	6915.70
2016-05-29 22:00:00	179.0000	205.0000	6900.30	6925.60	6970.70
2016-05-29 22:30:00	178.0000	206.0000	6889.30	6925.60	6964.10
2016-05-29 23:00:00	181.0000	208.0000	6927.80	6946.50	7002.60
2016-05-29 23:30:00	182.0000	210.0000	6965.20	6980.60	7033.40
2016-05-30 00:00:00	181.0000	208.0000	6936.60	6955.30	7007.00
2016-05-30 00:30:00	178.0000	205.0000	6888.20	6916.80	6960.80
2016-05-30 01:00:00	179.0000	206.0000	6890.40	6913.50	6956.40
2016-05-30 01:30:00	178.0000	205.0000	6892.60	6916.80	6969.60
2016-05-30 02:00:00	179.0000	206.0000	6897.00	6928.90	6968.50
2016-05-30 02:30:00	179.0000	206.0000	6909.10	6912.40	6969.60
2016-05-30 03:00:00	179.0000	206.0000	6887.10	6921.20	6960.80
2016-05-30 03:30:00	178.0000	205.0000	6893.70	6915.70	6957.50
2016-05-30 04:00:00	178.0000	205.0000	6893.70	6894.80	6969.60
2016-05-30 04:30:00	177.0000	204.0000	6845.30	6868.40	6928.90
2016-05-30 05:00:00	177.0000	203.0000	6856.30	6870.60	6928.90
2016-05-30 05:30:00	179.0000	207.0000	6898.10	6909.10	6985.00
2016-05-30 06:00:00	180.0000	207.0000	6905.80	6913.50	6993.80
2016-05-30 06:30:00	178.0000	204.0000	6848.60	6866.20	6956.40
2016-05-30 07:00:00	178.0000	205.0000	6872.80	6890.40	6974.00
2016-05-30 07:30:00	181.0000	208.0000	6920.10	6941.00	7004.80
2016-05-30 08:00:00	181.0000	209.0000	6923.40	6946.50	7007.00
2016-05-30 08:30:00	179.0000	206.0000	6897.00	6906.90	6971.80

Time Clock	[kW] Last average demand	[kVA] Last average demand	[V] Voltage L1	[V] Voltage L2	[V] Voltage L3
2016-05-30 09:00:00	178.0000	205.0000	6876.10	6888.20	6944.30
2016-05-30 09:30:00	177.0000	204.0000	6867.30	6871.70	6930.00
2016-05-30 10:00:00	178.0000	204.0000	6872.80	6878.30	6932.20
2016-05-30 10:30:00	177.0000	204.0000	6869.50	6875.00	6934.40
2016-05-30 11:00:00	178.0000	205.0000	6876.10	6887.10	6943.20
2016-05-30 11:30:00	178.0000	205.0000	6872.80	6890.40	6954.20
2016-05-30 12:00:00	178.0000	205.0000	6872.80	6882.70	6941.00
2016-05-30 12:30:00	178.0000	205.0000	6883.80	6897.00	6954.20
2016-05-30 13:00:00	176.0000	202.0000	6854.10	6856.30	6913.50
2016-05-30 13:30:00	178.0000	205.0000	6860.70	6893.70	6938.80
2016-05-30 14:00:00	176.0000	202.0000	6847.50	6878.30	6910.20
2016-05-30 14:30:00	174.0000	201.0000	6820.00	6836.50	6884.90
2016-05-30 15:00:00	176.0000	202.0000	6832.10	6860.70	6911.30
2016-05-30 15:30:00	174.0000	200.0000	6791.40	6825.50	6892.60
2016-05-30 16:00:00	179.0000	206.0000	6890.40	6930.00	6994.90
2016-05-30 16:30:00	178.0000	206.0000	6898.10	6912.40	6974.00
2016-05-30 17:00:00	178.0000	204.0000	6872.80	6897.00	6965.20
2016-05-30 17:30:00	175.0000	202.0000	6826.60	6845.30	6924.50
2016-05-30 18:00:00	177.0000	203.0000	6873.90	6879.40	6965.20
2016-05-30 18:30:00	179.0000	206.0000	6906.90	6911.30	6998.20
2016-05-30 19:00:00	181.0000	209.0000	6946.50	6955.30	7041.10
2016-05-30 19:30:00	181.0000	208.0000	6931.10	6947.60	7023.50
2016-05-30 20:00:00	178.0000	206.0000	6903.60	6908.00	6980.60
2016-05-30 20:30:00	181.0000	207.0000	6938.80	6944.30	7021.30
2016-05-30 21:00:00	180.0000	208.0000	6927.80	6942.10	7015.80
2016-05-30 21:30:00	177.0000	204.0000	6856.30	6872.80	6932.20
2016-05-30 22:00:00	177.0000	204.0000	6870.60	6884.90	6945.40
2016-05-30 22:30:00	178.0000	204.0000	6868.40	6887.10	6939.90
2016-05-30 23:00:00	178.0000	206.0000	6898.10	6912.40	6969.60
2016-05-30 23:30:00	178.0000	204.0000	6880.50	6897.00	6944.30
2016-05-31 00:00:00	178.0000	206.0000	6904.70	6913.50	6967.40

APPENDIX E

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-21 11:30:00	49.00	56.00	7043.30	7058.70	7153.30	0.88	7.95	84.87	96.99	185.53
2016-05-21 11:59:15	118.00	137.00	7022.40	7122.50	7236.90	0.86	19.51	204.38	237.29	453.90
2016-05-21 12:01:39	118.00	137.00	7022.40	7122.50	7236.90	0.86	19.51	204.38	237.29	453.90
2016-05-21 12:30:00	53.00	59.00	7120.30	7126.90	7208.30	0.90	8.29	91.80	102.19	195.47
2016-05-21 13:00:00	3.00	4.00	7110.40	7132.40	7251.20	0.75	0.56	5.20	6.93	13.25
2016-05-21 13:30:00	164.00	187.00	7001.50	7034.50	7133.50	0.88	26.71	284.06	323.89	619.55
2016-05-21 14:00:00	179.00	207.00	6912.40	6919.00	6994.90	0.86	29.95	310.04	358.53	685.81
2016-05-21 14:30:00	177.00	203.00	6853.00	6872.80	6942.10	0.87	29.62	306.57	351.61	672.56
2016-05-21 15:00:00	178.00	204.00	6859.60	6895.90	6961.90	0.87	29.74	308.31	353.34	675.87
2016-05-21 15:30:00	181.00	208.00	6932.20	6952.00	7020.20	0.87	30.00	313.50	360.27	689.13
2016-05-21 16:00:00	180.00	207.00	6908.00	6935.50	6997.10	0.87	29.97	311.77	358.53	685.81
2016-05-21 16:30:00	179.00	207.00	6913.50	6943.20	6999.30	0.86	29.94	310.04	358.53	685.81
2016-05-21 17:00:00	177.00	203.00	6856.30	6898.10	6958.60	0.87	29.61	306.57	351.61	672.56
2016-05-21 17:30:00	177.00	203.00	6840.90	6871.70	6947.60	0.87	29.67	306.57	351.61	672.56
2016-05-21 18:00:00	179.00	206.00	6904.70	6931.10	7022.40	0.87	29.83	310.04	356.80	682.50
2016-05-21 18:30:00	167.00	192.00	7103.80	7152.20	7200.60	0.87	27.03	289.25	332.55	636.12
2016-05-21 19:00:00	0.00	0.00	7109.30	7152.20	7236.90	0.00	0.00	0.00	0.00	0.00
2016-05-21 19:30:00	1.00	1.00	7000.40	7043.30	7134.60	1.00	0.14	1.73	1.73	3.31
2016-05-21 20:00:00	149.00	171.00	6925.60	6952.00	7025.70	0.87	24.69	258.08	296.18	566.54
2016-05-21 20:30:00	181.00	209.00	6927.80	6958.60	7024.60	0.87	30.17	313.50	362.00	692.44
2016-05-21 21:00:00	181.00	209.00	6933.30	6965.20	7023.50	0.87	30.14	313.50	362.00	692.44
2016-05-21 21:30:00	180.00	207.00	6916.80	6939.90	6983.90	0.87	29.93	311.77	358.53	685.81
2016-05-21 22:00:00	179.00	206.00	6889.30	6933.30	6975.10	0.87	29.90	310.04	356.80	682.50
2016-05-21 22:30:00	184.00	211.00	6976.20	7019.10	7059.80	0.87	30.25	318.70	365.46	699.07
2016-05-21 23:00:00	182.00	211.00	6970.70	7008.10	7051.00	0.86	30.27	315.23	365.46	699.07
2016-05-21 23:30:00	184.00	211.00	6978.40	7014.70	7066.40	0.87	30.24	318.70	365.46	699.07
2016-05-22 00:00:00	180.00	208.00	6919.00	6947.60	7004.80	0.87	30.06	311.77	360.27	689.13

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-22 00:30:00	182.00	209.00	6943.20	6976.20	7035.60	0.87	30.10	315.23	362.00	692.44
2016-05-22 01:00:00	182.00	210.00	6970.70	6991.60	7041.10	0.87	30.13	315.23	363.73	695.75
2016-05-22 01:30:00	184.00	212.00	6980.60	7002.60	7057.60	0.87	30.37	318.70	367.19	702.38
2016-05-22 02:00:00	183.00	211.00	6983.90	7010.30	7063.10	0.87	30.21	316.97	365.46	699.07
2016-05-22 02:30:00	184.00	212.00	6981.70	7020.20	7073.00	0.87	30.37	318.70	367.19	702.38
2016-05-22 03:00:00	184.00	212.00	6998.20	7019.10	7056.50	0.87	30.29	318.70	367.19	702.38
2016-05-22 03:30:00	184.00	212.00	6991.60	7018.00	7066.40	0.87	30.32	318.70	367.19	702.38
2016-05-22 04:00:00	183.00	211.00	6972.90	7012.50	7057.60	0.87	30.26	316.97	365.46	699.07
2016-05-22 04:30:00	183.00	210.00	6964.10	6998.20	7040.00	0.87	30.15	316.97	363.73	695.75
2016-05-22 05:00:00	182.00	210.00	6960.80	6989.40	7046.60	0.87	30.17	315.23	363.73	695.75
2016-05-22 05:30:00	182.00	210.00	6960.80	6986.10	7042.20	0.87	30.17	315.23	363.73	695.75
2016-05-22 06:00:00	184.00	212.00	6990.50	7010.30	7066.40	0.87	30.33	318.70	367.19	702.38
2016-05-22 06:30:00	181.00	208.00	6924.50	6959.70	7010.30	0.87	30.04	313.50	360.27	689.13
2016-05-22 07:00:00	179.00	206.00	6881.60	6917.90	6988.30	0.87	29.93	310.04	356.80	682.50
2016-05-22 07:30:00	177.00	204.00	6860.70	6872.80	6946.50	0.87	29.73	306.57	353.34	675.87
2016-05-22 08:00:00	178.00	204.00	6858.50	6899.20	6964.10	0.87	29.74	308.31	353.34	675.87
2016-05-22 08:30:00	178.00	206.00	6882.70	6911.30	6966.30	0.86	29.93	308.31	356.80	682.50
2016-05-22 09:00:00	180.00	207.00	6913.50	6933.30	7007.00	0.87	29.94	311.77	358.53	685.81
2016-05-22 09:30:00	180.00	207.00	6890.40	6934.40	6999.30	0.87	30.04	311.77	358.53	685.81
2016-05-22 10:00:00	179.00	207.00	6889.30	6926.70	6998.20	0.86	30.05	310.04	358.53	685.81
2016-05-22 10:30:00	180.00	208.00	6913.50	6942.10	7020.20	0.87	30.09	311.77	360.27	689.13
2016-05-22 11:00:00	181.00	208.00	6924.50	6948.70	7019.10	0.87	30.04	313.50	360.27	689.13
2016-05-22 11:30:00	178.00	205.00	6893.70	6912.40	6990.50	0.87	29.74	308.31	355.07	679.19
2016-05-22 12:00:00	179.00	206.00	6880.50	6909.10	6972.90	0.87	29.94	310.04	356.80	682.50
2016-05-22 12:30:00	178.00	205.00	6892.60	6913.50	6964.10	0.87	29.74	308.31	355.07	679.19
2016-05-22 13:00:00	178.00	206.00	6891.50	6920.10	6990.50	0.86	29.89	308.31	356.80	682.50
2016-05-22 13:30:00	181.00	208.00	6931.10	6968.50	7024.60	0.87	30.01	313.50	360.27	689.13

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-22 14:00:00	181.00	208.00	6930.00	6960.80	7029.00	0.87	30.01	313.50	360.27	689.13
2016-05-22 14:30:00	180.00	208.00	6919.00	6964.10	7019.10	0.87	30.06	311.77	360.27	689.13
2016-05-22 15:00:00	181.00	208.00	6941.00	6981.70	7026.80	0.87	29.97	313.50	360.27	689.13
2016-05-22 15:30:00	181.00	209.00	6952.00	6992.70	7047.70	0.87	30.06	313.50	362.00	692.44
2016-05-22 16:00:00	180.00	208.00	6928.90	6955.30	7024.60	0.87	30.02	311.77	360.27	689.13
2016-05-22 16:30:00	179.00	205.00	6872.80	6928.90	6991.60	0.87	29.83	310.04	355.07	679.19
2016-05-22 17:00:00	177.00	204.00	6871.70	6900.30	6949.80	0.87	29.69	306.57	353.34	675.87
2016-05-22 17:30:00	176.00	204.00	6858.50	6883.80	6964.10	0.86	29.74	304.84	353.34	675.87
2016-05-22 18:00:00	178.00	204.00	6854.10	6908.00	6998.20	0.87	29.76	308.31	353.34	675.87
2016-05-22 18:30:00	180.00	208.00	6913.50	6941.00	7025.70	0.87	30.09	311.77	360.27	689.13
2016-05-22 19:00:00	182.00	209.00	6945.40	6964.10	7044.40	0.87	30.09	315.23	362.00	692.44
2016-05-22 19:30:00	181.00	209.00	6946.50	6979.50	7052.10	0.87	30.09	313.50	362.00	692.44
2016-05-22 20:00:00	182.00	209.00	6928.90	6974.00	7045.50	0.87	30.16	315.23	362.00	692.44
2016-05-22 20:30:00	182.00	209.00	6957.50	6976.20	7054.30	0.87	30.04	315.23	362.00	692.44
2016-05-22 21:00:00	181.00	209.00	6946.50	6968.50	7042.20	0.87	30.09	313.50	362.00	692.44
2016-05-22 21:30:00	183.00	211.00	6980.60	7007.00	7069.70	0.87	30.23	316.97	365.46	699.07
2016-05-22 22:00:00	182.00	210.00	6970.70	6998.20	7054.30	0.87	30.13	315.23	363.73	695.75
2016-05-22 22:30:00	183.00	211.00	6982.80	7007.00	7070.80	0.87	30.22	316.97	365.46	699.07
2016-05-22 23:00:00	183.00	210.00	6964.10	7002.60	7042.20	0.87	30.15	316.97	363.73	695.75
2016-05-22 23:30:00	181.00	209.00	6944.30	6968.50	7030.10	0.87	30.10	313.50	362.00	692.44
2016-05-23 00:00:00	181.00	209.00	6941.00	6972.90	7032.30	0.87	30.11	313.50	362.00	692.44
2016-05-23 00:30:00	183.00	210.00	6965.20	7001.50	7041.10	0.87	30.15	316.97	363.73	695.75
2016-05-23 01:00:00	183.00	212.00	6979.50	7014.70	7057.60	0.86	30.37	316.97	367.19	702.38
2016-05-23 01:30:00	184.00	212.00	6986.10	7009.20	7068.60	0.87	30.35	318.70	367.19	702.38
2016-05-23 02:00:00	183.00	211.00	6969.60	7008.10	7058.70	0.87	30.27	316.97	365.46	699.07
2016-05-23 02:30:00	184.00	211.00	6990.50	7020.20	7067.50	0.87	30.18	318.70	365.46	699.07
2016-05-23 03:00:00	184.00	211.00	6979.50	7002.60	7068.60	0.87	30.23	318.70	365.46	699.07

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-23 03:30:00	182.00	211.00	6978.40	7004.80	7044.40	0.86	30.24	315.23	365.46	699.07
2016-05-23 04:00:00	179.00	206.00	6905.80	6920.10	6959.70	0.87	29.83	310.04	356.80	682.50
2016-05-23 04:30:00	178.00	205.00	6881.60	6913.50	6966.30	0.87	29.79	308.31	355.07	679.19
2016-05-23 05:00:00	179.00	206.00	6888.20	6920.10	6969.60	0.87	29.91	310.04	356.80	682.50
2016-05-23 05:30:00	179.00	206.00	6892.60	6912.40	6991.60	0.87	29.89	310.04	356.80	682.50
2016-05-23 06:00:00	179.00	206.00	6867.30	6900.30	6980.60	0.87	30.00	310.04	356.80	682.50
2016-05-23 06:30:00	178.00	206.00	6879.40	6901.40	6981.70	0.86	29.94	308.31	356.80	682.50
2016-05-23 07:00:00	179.00	205.00	6879.40	6900.30	6965.20	0.87	29.80	310.04	355.07	679.19
2016-05-23 07:30:00	180.00	208.00	6913.50	6931.10	6991.60	0.87	30.09	311.77	360.27	689.13
2016-05-23 08:00:00	179.00	206.00	6888.20	6922.30	6979.50	0.87	29.91	310.04	356.80	682.50
2016-05-23 08:30:00	178.00	205.00	6860.70	6900.30	6954.20	0.87	29.88	308.31	355.07	679.19
2016-05-23 09:00:00	177.00	203.00	6840.90	6869.50	6935.50	0.87	29.67	306.57	351.61	672.56
2016-05-23 09:30:00	179.00	207.00	6898.10	6923.40	6977.30	0.86	30.01	310.04	358.53	685.81
2016-05-23 10:00:00	180.00	207.00	6895.90	6935.50	7000.40	0.87	30.02	311.77	358.53	685.81
2016-05-23 10:30:00	179.00	206.00	6895.90	6924.50	6987.20	0.87	29.87	310.04	356.80	682.50
2016-05-23 11:00:00	179.00	206.00	6883.80	6919.00	6972.90	0.87	29.93	310.04	356.80	682.50
2016-05-23 11:30:00	178.00	206.00	6880.50	6910.20	6963.00	0.86	29.94	308.31	356.80	682.50
2016-05-23 12:00:00	179.00	205.00	6887.10	6915.70	6976.20	0.87	29.77	310.04	355.07	679.19
2016-05-23 12:30:00	180.00	207.00	6908.00	6932.20	6985.00	0.87	29.97	311.77	358.53	685.81
2016-05-23 13:00:00	180.00	208.00	6923.40	6950.90	6993.80	0.87	30.04	311.77	360.27	689.13
2016-05-23 13:30:00	180.00	207.00	6910.20	6955.30	7022.40	0.87	29.96	311.77	358.53	685.81
2016-05-23 14:00:00	181.00	209.00	6932.20	6958.60	7016.90	0.87	30.15	313.50	362.00	692.44
2016-05-23 14:30:00	180.00	207.00	6931.10	6953.10	7000.40	0.87	29.87	311.77	358.53	685.81
2016-05-23 15:00:00	179.00	206.00	6906.90	6930.00	6976.20	0.87	29.83	310.04	356.80	682.50
2016-05-23 15:30:00	178.00	205.00	6861.80	6912.40	6952.00	0.87	29.88	308.31	355.07	679.19
2016-05-23 16:00:00	176.00	202.00	6838.70	6880.50	6921.20	0.87	29.54	304.84	349.87	669.25
2016-05-23 16:30:00	176.00	204.00	6854.10	6882.70	6934.40	0.86	29.76	304.84	353.34	675.87

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-23 17:00:00	177.00	203.00	6851.90	6891.50	6965.20	0.87	29.63	306.57	351.61	672.56
2016-05-23 17:30:00	178.00	205.00	6878.30	6909.10	6969.60	0.87	29.80	308.31	355.07	679.19
2016-05-23 18:00:00	177.00	204.00	6870.60	6889.30	6969.60	0.87	29.69	306.57	353.34	675.87
2016-05-23 18:30:00	180.00	207.00	6901.40	6935.50	7004.80	0.87	29.99	311.77	358.53	685.81
2016-05-23 19:00:00	181.00	209.00	6928.90	6954.20	7041.10	0.87	30.16	313.50	362.00	692.44
2016-05-23 19:30:00	182.00	209.00	6942.10	6974.00	7042.20	0.87	30.11	315.23	362.00	692.44
2016-05-23 20:00:00	182.00	210.00	6961.90	6983.90	7047.70	0.87	30.16	315.23	363.73	695.75
2016-05-23 20:30:00	182.00	209.00	6942.10	6974.00	7047.70	0.87	30.11	315.23	362.00	692.44
2016-05-23 21:00:00	179.00	206.00	6898.10	6916.80	6975.10	0.87	29.86	310.04	356.80	682.50
2016-05-23 21:30:00	179.00	207.00	6912.40	6927.80	6990.50	0.86	29.95	310.04	358.53	685.81
2016-05-23 22:00:00	179.00	206.00	6889.30	6921.20	6979.50	0.87	29.90	310.04	356.80	682.50
2016-05-23 22:30:00	180.00	207.00	6909.10	6934.40	6988.30	0.87	29.96	311.77	358.53	685.81
2016-05-23 23:00:00	182.00	209.00	6961.90	6977.30	7037.80	0.87	30.02	315.23	362.00	692.44
2016-05-23 23:30:00	182.00	210.00	6957.50	6996.00	7043.30	0.87	30.18	315.23	363.73	695.75
2016-05-24 00:00:00	180.00	208.00	6928.90	6954.20	7002.60	0.87	30.02	311.77	360.27	689.13
2016-05-24 00:30:00	181.00	208.00	6928.90	6947.60	6999.30	0.87	30.02	313.50	360.27	689.13
2016-05-24 01:00:00	180.00	208.00	6925.60	6956.40	7000.40	0.87	30.03	311.77	360.27	689.13
2016-05-24 01:30:00	180.00	207.00	6920.10	6954.20	6998.20	0.87	29.91	311.77	358.53	685.81
2016-05-24 02:00:00	182.00	209.00	6935.50	6957.50	7014.70	0.87	30.13	315.23	362.00	692.44
2016-05-24 02:30:00	181.00	209.00	6938.80	6977.30	7024.60	0.87	30.12	313.50	362.00	692.44
2016-05-24 03:00:00	182.00	209.00	6941.00	6982.80	7020.20	0.87	30.11	315.23	362.00	692.44
2016-05-24 03:30:00	180.00	208.00	6927.80	6955.30	7001.50	0.87	30.02	311.77	360.27	689.13
2016-05-24 04:00:00	180.00	207.00	6923.40	6946.50	6998.20	0.87	29.90	311.77	358.53	685.81
2016-05-24 04:30:00	179.00	206.00	6910.20	6937.70	6985.00	0.87	29.81	310.04	356.80	682.50
2016-05-24 05:00:00	177.00	205.00	6861.80	6895.90	6944.30	0.86	29.88	306.57	355.07	679.19
2016-05-24 05:30:00	180.00	206.00	6894.80	6919.00	6994.90	0.87	29.88	311.77	356.80	682.50
2016-05-24 06:00:00	177.00	204.00	6862.90	6880.50	6957.50	0.87	29.73	306.57	353.34	675.87

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-24 06:30:00	176.00	203.00	6851.90	6877.20	6947.60	0.87	29.63	304.84	351.61	672.56
2016-05-24 07:00:00	179.00	205.00	6866.20	6901.40	6976.20	0.87	29.86	310.04	355.07	679.19
2016-05-24 07:30:00	179.00	207.00	6903.60	6932.20	6992.70	0.86	29.98	310.04	358.53	685.81
2016-05-24 08:00:00	180.00	207.00	6906.90	6944.30	7007.00	0.87	29.97	311.77	358.53	685.81
2016-05-24 08:30:00	179.00	206.00	6899.20	6920.10	6981.70	0.87	29.86	310.04	356.80	682.50
2016-05-24 09:00:00	179.00	206.00	6890.40	6923.40	6983.90	0.87	29.90	310.04	356.80	682.50
2016-05-24 09:30:00	179.00	207.00	6914.60	6938.80	6997.10	0.86	29.94	310.04	358.53	685.81
2016-05-24 10:00:00	180.00	207.00	6919.00	6928.90	7005.90	0.87	29.92	311.77	358.53	685.81
2016-05-24 10:30:00	179.00	206.00	6899.20	6924.50	6994.90	0.87	29.86	310.04	356.80	682.50
2016-05-24 11:00:00	179.00	206.00	6899.20	6927.80	6987.20	0.87	29.86	310.04	356.80	682.50
2016-05-24 11:30:00	178.00	205.00	6886.00	6912.40	6971.80	0.87	29.77	308.31	355.07	679.19
2016-05-24 12:00:00	178.00	205.00	6876.10	6901.40	6954.20	0.87	29.81	308.31	355.07	679.19
2016-05-24 12:30:00	176.00	203.00	6849.70	6881.60	6931.10	0.87	29.64	304.84	351.61	672.56
2016-05-24 13:00:00	175.00	201.00	6823.30	6848.60	6903.60	0.87	29.46	303.11	348.14	665.93
2016-05-24 13:30:00	175.00	202.00	6842.00	6862.90	6923.40	0.87	29.52	303.11	349.87	669.25
2016-05-24 14:00:00	176.00	202.00	6834.30	6857.40	6920.10	0.87	29.56	304.84	349.87	669.25
2016-05-24 14:30:00	175.00	202.00	6842.00	6859.60	6911.30	0.87	29.52	303.11	349.87	669.25
2016-05-24 15:00:00	173.00	199.00	6785.90	6818.90	6877.20	0.87	29.33	299.64	344.68	659.31
2016-05-24 15:30:00	173.00	199.00	6792.50	6827.70	6887.10	0.87	29.30	299.64	344.68	659.31
2016-05-24 16:00:00	176.00	202.00	6858.50	6868.40	6903.60	0.87	29.45	304.84	349.87	669.25
2016-05-24 16:30:00	175.00	203.00	6838.70	6859.60	6923.40	0.86	29.68	303.11	351.61	672.56
2016-05-24 17:00:00	174.00	200.00	6795.80	6845.30	6886.00	0.87	29.43	301.38	346.41	662.62
2016-05-24 17:30:00	175.00	202.00	6826.60	6859.60	6941.00	0.87	29.59	303.11	349.87	669.25
2016-05-24 18:00:00	181.00	207.00	6932.20	6963.00	7045.50	0.87	29.86	313.50	358.53	685.81
2016-05-24 18:30:00	81.00	94.00	7027.90	7054.30	7133.50	0.86	13.38	140.30	162.81	311.43
2016-05-24 19:00:00	0.00	0.00	7025.70	7060.90	7141.20	0.00	0.00	0.00	0.00	0.00
2016-05-24 19:28:50	5.00	5.00	6985.00	7014.70	7092.80	1.00	0.72	8.66	8.66	16.57

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-24 19:32:30	5.00	5.00	6985.00	7014.70	7092.80	1.00	0.72	8.66	8.66	16.57
2016-05-24 20:00:00	166.00	191.00	6919.00	6955.30	7021.30	0.87	27.61	287.52	330.82	632.80
2016-05-24 20:30:00	10.00	11.00	7071.90	7126.90	7164.30	0.91	1.56	17.32	19.05	36.44
2016-05-24 20:45:21	1.00	2.00	7071.90	7120.30	7186.30	0.50	0.28	1.73	3.46	6.63
2016-05-24 21:16:25	1.00	2.00	7071.90	7120.30	7186.30	0.50	0.28	1.73	3.46	6.63
2016-05-24 21:30:00	9.00	10.00	7025.70	7065.30	7128.00	0.90	1.42	15.59	17.32	33.13
2016-05-24 22:00:00	184.00	212.00	6915.70	6931.10	6980.60	0.87	30.65	318.70	367.19	702.38
2016-05-24 22:30:00	180.00	207.00	6908.00	6922.30	6976.20	0.87	29.97	311.77	358.53	685.81
2016-05-24 23:00:00	113.00	129.00	6991.60	7022.40	7060.90	0.88	18.45	195.72	223.43	427.39
2016-05-24 23:30:00	1.00	1.00	7089.50	7123.60	7164.30	1.00	0.14	1.73	1.73	3.31
2016-05-25 00:00:00	2.00	2.00	7091.70	7158.80	7195.10	1.00	0.28	3.46	3.46	6.63
2016-05-25 00:30:00	17.00	20.00	7077.40	7108.20	7143.40	0.85	2.83	29.44	34.64	66.26
2016-05-25 01:00:00	1.00	1.00	7075.20	7099.40	7137.90	1.00	0.14	1.73	1.73	3.31
2016-05-25 01:30:00	192.00	221.00	6926.70	6945.40	6996.00	0.87	31.91	332.55	382.78	732.20
2016-05-25 02:00:00	182.00	209.00	6946.50	6956.40	7019.10	0.87	30.09	315.23	362.00	692.44
2016-05-25 02:30:00	181.00	209.00	6950.90	6974.00	7011.40	0.87	30.07	313.50	362.00	692.44
2016-05-25 03:00:00	182.00	210.00	6954.20	6969.60	7023.50	0.87	30.20	315.23	363.73	695.75
2016-05-25 03:30:00	182.00	209.00	6946.50	6969.60	7021.30	0.87	30.09	315.23	362.00	692.44
2016-05-25 04:00:00	181.00	208.00	6916.80	6942.10	6998.20	0.87	30.07	313.50	360.27	689.13
2016-05-25 04:30:00	179.00	206.00	6892.60	6917.90	6966.30	0.87	29.89	310.04	356.80	682.50
2016-05-25 05:00:00	175.00	202.00	6833.20	6858.50	6902.50	0.87	29.56	303.11	349.87	669.25
2016-05-25 05:30:00	176.00	203.00	6832.10	6859.60	6924.50	0.87	29.71	304.84	351.61	672.56
2016-05-25 06:00:00	177.00	203.00	6847.50	6876.10	6938.80	0.87	29.65	306.57	351.61	672.56
2016-05-25 06:30:00	181.00	208.00	6922.30	6948.70	7003.70	0.87	30.05	313.50	360.27	689.13
2016-05-25 07:00:00	180.00	207.00	6905.80	6938.80	6999.30	0.87	29.97	311.77	358.53	685.81
2016-05-25 07:30:00	181.00	209.00	6925.60	6957.50	7012.50	0.87	30.18	313.50	362.00	692.44
2016-05-25 08:00:00	181.00	207.00	6916.80	6937.70	6999.30	0.87	29.93	313.50	358.53	685.81

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-25 08:30:00	177.00	204.00	6845.30	6884.90	6933.30	0.87	29.80	306.57	353.34	675.87
2016-05-25 09:00:00	176.00	204.00	6843.10	6870.60	6921.20	0.86	29.81	304.84	353.34	675.87
2016-05-25 09:30:00	176.00	202.00	6831.00	6858.50	6909.10	0.87	29.57	304.84	349.87	669.25
2016-05-25 10:00:00	176.00	202.00	6823.30	6853.00	6905.80	0.87	29.60	304.84	349.87	669.25
2016-05-25 10:30:00	175.00	202.00	6822.20	6845.30	6904.70	0.87	29.61	303.11	349.87	669.25
2016-05-25 11:00:00	175.00	202.00	6818.90	6843.10	6906.90	0.87	29.62	303.11	349.87	669.25
2016-05-25 11:30:00	175.00	200.00	6794.70	6831.00	6886.00	0.88	29.43	303.11	346.41	662.62
2016-05-25 12:00:00	174.00	201.00	6811.20	6835.40	6879.40	0.87	29.51	301.38	348.14	665.93
2016-05-25 12:30:00	176.00	202.00	6838.70	6851.90	6903.60	0.87	29.54	304.84	349.87	669.25
2016-05-25 13:00:00	177.00	204.00	6849.70	6882.70	6932.20	0.87	29.78	306.57	353.34	675.87
2016-05-25 13:30:00	176.00	203.00	6821.10	6867.30	6923.40	0.87	29.76	304.84	351.61	672.56
2016-05-25 14:00:00	176.00	203.00	6843.10	6878.30	6921.20	0.87	29.66	304.84	351.61	672.56
2016-05-25 14:30:00	176.00	202.00	6826.60	6856.30	6915.70	0.87	29.59	304.84	349.87	669.25
2016-05-25 15:00:00	175.00	201.00	6820.00	6851.90	6895.90	0.87	29.47	303.11	348.14	665.93
2016-05-25 15:30:00	175.00	201.00	6811.20	6839.80	6890.40	0.87	29.51	303.11	348.14	665.93
2016-05-25 16:00:00	175.00	202.00	6832.10	6868.40	6910.20	0.87	29.57	303.11	349.87	669.25
2016-05-25 16:30:00	177.00	203.00	6855.20	6877.20	6928.90	0.87	29.61	306.57	351.61	672.56
2016-05-25 17:00:00	175.00	202.00	6817.80	6854.10	6923.40	0.87	29.63	303.11	349.87	669.25
2016-05-25 17:30:00	175.00	202.00	6817.80	6838.70	6915.70	0.87	29.63	303.11	349.87	669.25
2016-05-25 18:00:00	180.00	207.00	6922.30	6936.60	7020.20	0.87	29.90	311.77	358.53	685.81
2016-05-25 18:30:00	183.00	210.00	6967.40	6992.70	7071.90	0.87	30.14	316.97	363.73	695.75
2016-05-25 19:00:00	181.00	209.00	6947.60	6958.60	7044.40	0.87	30.08	313.50	362.00	692.44
2016-05-25 19:30:00	181.00	207.00	6917.90	6925.60	7013.60	0.87	29.92	313.50	358.53	685.81
2016-05-25 20:00:00	182.00	210.00	6957.50	6976.20	7051.00	0.87	30.18	315.23	363.73	695.75
2016-05-25 20:30:00	183.00	211.00	6969.60	6986.10	7059.80	0.87	30.27	316.97	365.46	699.07
2016-05-25 21:00:00	181.00	208.00	6937.70	6954.20	7020.20	0.87	29.98	313.50	360.27	689.13
2016-05-25 21:30:00	180.00	208.00	6935.50	6952.00	7012.50	0.87	29.99	311.77	360.27	689.13

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-25 22:00:00	182.00	209.00	6953.10	6971.80	7029.00	0.87	30.06	315.23	362.00	692.44
2016-05-25 22:30:00	181.00	209.00	6956.40	6977.30	7032.30	0.87	30.04	313.50	362.00	692.44
2016-05-25 23:00:00	181.00	208.00	6937.70	6958.60	7013.60	0.87	29.98	313.50	360.27	689.13
2016-05-25 23:30:00	182.00	209.00	6957.50	6983.90	7032.30	0.87	30.04	315.23	362.00	692.44
2016-05-26 00:00:00	179.00	207.00	6917.90	6934.40	6982.80	0.86	29.92	310.04	358.53	685.81
2016-05-26 00:30:00	180.00	207.00	6922.30	6942.10	6981.70	0.87	29.90	311.77	358.53	685.81
2016-05-26 01:00:00	179.00	207.00	6919.00	6947.60	6982.80	0.86	29.92	310.04	358.53	685.81
2016-05-26 01:30:00	181.00	208.00	6936.60	6966.30	7018.00	0.87	29.99	313.50	360.27	689.13
2016-05-26 02:00:00	182.00	209.00	6936.60	6969.60	7026.80	0.87	30.13	315.23	362.00	692.44
2016-05-26 02:30:00	182.00	210.00	6966.30	6988.30	7030.10	0.87	30.15	315.23	363.73	695.75
2016-05-26 03:00:00	181.00	208.00	6945.40	6967.40	7008.10	0.87	29.95	313.50	360.27	689.13
2016-05-26 03:30:00	180.00	208.00	6935.50	6956.40	7009.20	0.87	29.99	311.77	360.27	689.13
2016-05-26 04:00:00	181.00	208.00	6930.00	6953.10	7010.30	0.87	30.01	313.50	360.27	689.13
2016-05-26 04:30:00	180.00	207.00	6911.30	6930.00	6985.00	0.87	29.95	311.77	358.53	685.81
2016-05-26 05:00:00	177.00	204.00	6877.20	6892.60	6939.90	0.87	29.66	306.57	353.34	675.87
2016-05-26 05:30:00	179.00	206.00	6888.20	6906.90	6958.60	0.87	29.91	310.04	356.80	682.50
2016-05-26 06:00:00	177.00	204.00	6858.50	6878.30	6953.10	0.87	29.74	306.57	353.34	675.87
2016-05-26 06:30:00	177.00	202.00	6833.20	6861.80	6924.50	0.88	29.56	306.57	349.87	669.25
2016-05-26 07:00:00	178.00	205.00	6879.40	6897.00	6955.30	0.87	29.80	308.31	355.07	679.19
2016-05-26 07:30:00	182.00	210.00	6959.70	6971.80	7045.50	0.87	30.17	315.23	363.73	695.75
2016-05-26 08:00:00	180.00	208.00	6922.30	6958.60	7002.60	0.87	30.05	311.77	360.27	689.13
2016-05-26 08:30:00	181.00	208.00	6934.40	6955.30	7013.60	0.87	30.00	313.50	360.27	689.13
2016-05-26 09:00:00	180.00	207.00	6910.20	6946.50	7000.40	0.87	29.96	311.77	358.53	685.81
2016-05-26 09:30:00	181.00	209.00	6944.30	6965.20	7016.90	0.87	30.10	313.50	362.00	692.44
2016-05-26 10:00:00	181.00	207.00	6928.90	6952.00	7015.80	0.87	29.87	313.50	358.53	685.81
2016-05-26 10:30:00	181.00	209.00	6937.70	6952.00	7018.00	0.87	30.13	313.50	362.00	692.44
2016-05-26 11:00:00	180.00	207.00	6928.90	6943.20	6996.00	0.87	29.87	311.77	358.53	685.81

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-26 11:30:00	179.00	207.00	6909.10	6939.90	6993.80	0.86	29.96	310.04	358.53	685.81
2016-05-26 12:00:00	180.00	207.00	6914.60	6943.20	6988.30	0.87	29.94	311.77	358.53	685.81
2016-05-26 12:30:00	181.00	208.00	6942.10	6957.50	7008.10	0.87	29.96	313.50	360.27	689.13
2016-05-26 13:00:00	180.00	208.00	6922.30	6953.10	7016.90	0.87	30.05	311.77	360.27	689.13
2016-05-26 13:30:00	179.00	205.00	6894.80	6935.50	6975.10	0.87	29.73	310.04	355.07	679.19
2016-05-26 14:00:00	178.00	205.00	6876.10	6890.40	6945.40	0.87	29.81	308.31	355.07	679.19
2016-05-26 14:30:00	175.00	202.00	6840.90	6875.00	6923.40	0.87	29.53	303.11	349.87	669.25
2016-05-26 15:00:00	177.00	203.00	6845.30	6877.20	6934.40	0.87	29.66	306.57	351.61	672.56
2016-05-26 15:30:00	175.00	202.00	6835.40	6851.90	6917.90	0.87	29.55	303.11	349.87	669.25
2016-05-26 16:00:00	174.00	200.00	6791.40	6822.20	6891.50	0.87	29.45	301.38	346.41	662.62
2016-05-26 16:30:00	173.00	200.00	6787.00	6814.50	6869.50	0.87	29.47	299.64	346.41	662.62
2016-05-26 17:00:00	174.00	199.00	6792.50	6811.20	6868.40	0.87	29.30	301.38	344.68	659.31
2016-05-26 17:30:00	172.00	199.00	6778.20	6793.60	6855.20	0.86	29.36	297.91	344.68	659.31
2016-05-26 18:00:00	174.00	200.00	6804.60	6815.60	6893.70	0.87	29.39	301.38	346.41	662.62
2016-05-26 18:30:00	175.00	201.00	6814.50	6828.80	6914.60	0.87	29.50	303.11	348.14	665.93
2016-05-26 19:00:00	176.00	203.00	6828.80	6860.70	6924.50	0.87	29.73	304.84	351.61	672.56
2016-05-26 19:30:00	177.00	204.00	6871.70	6878.30	6942.10	0.87	29.69	306.57	353.34	675.87
2016-05-26 20:00:00	179.00	205.00	6894.80	6905.80	6985.00	0.87	29.73	310.04	355.07	679.19
2016-05-26 20:30:00	178.00	206.00	6893.70	6909.10	6985.00	0.86	29.88	308.31	356.80	682.50
2016-05-26 21:00:00	175.00	201.00	6827.70	6843.10	6905.80	0.87	29.44	303.11	348.14	665.93
2016-05-26 21:30:00	176.00	202.00	6838.70	6855.20	6902.50	0.87	29.54	304.84	349.87	669.25
2016-05-26 22:00:00	175.00	202.00	6833.20	6846.40	6895.90	0.87	29.56	303.11	349.87	669.25
2016-05-26 22:30:00	176.00	203.00	6840.90	6865.10	6922.30	0.87	29.67	304.84	351.61	672.56
2016-05-26 23:00:00	177.00	204.00	6872.80	6883.80	6941.00	0.87	29.68	306.57	353.34	675.87
2016-05-26 23:30:00	179.00	205.00	6899.20	6910.20	6966.30	0.87	29.71	310.04	355.07	679.19
2016-05-27 00:00:00	180.00	208.00	6917.90	6939.90	6991.60	0.87	30.07	311.77	360.27	689.13
2016-05-27 00:30:00	179.00	206.00	6908.00	6924.50	6974.00	0.87	29.82	310.04	356.80	682.50

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-27 01:00:00	178.00	205.00	6890.40	6913.50	6958.60	0.87	29.75	308.31	355.07	679.19
2016-05-27 01:30:00	179.00	206.00	6892.60	6920.10	6961.90	0.87	29.89	310.04	356.80	682.50
2016-05-27 02:00:00	179.00	206.00	6893.70	6922.30	6976.20	0.87	29.88	310.04	356.80	682.50
2016-05-27 02:30:00	178.00	205.00	6903.60	6920.10	6977.30	0.87	29.69	308.31	355.07	679.19
2016-05-27 03:00:00	179.00	207.00	6911.30	6924.50	6986.10	0.86	29.95	310.04	358.53	685.81
2016-05-27 03:30:00	179.00	206.00	6903.60	6926.70	6977.30	0.87	29.84	310.04	356.80	682.50
2016-05-27 04:00:00	179.00	205.00	6893.70	6912.40	6959.70	0.87	29.74	310.04	355.07	679.19
2016-05-27 04:30:00	177.00	204.00	6873.90	6882.70	6937.70	0.87	29.68	306.57	353.34	675.87
2016-05-27 05:00:00	177.00	204.00	6858.50	6873.90	6927.80	0.87	29.74	306.57	353.34	675.87
2016-05-27 05:30:00	176.00	203.00	6854.10	6868.40	6936.60	0.87	29.62	304.84	351.61	672.56
2016-05-27 06:00:00	175.00	200.00	6802.40	6818.90	6891.50	0.88	29.40	303.11	346.41	662.62
2016-05-27 06:30:00	173.00	200.00	6793.60	6809.00	6876.10	0.87	29.44	299.64	346.41	662.62
2016-05-27 07:00:00	176.00	202.00	6828.80	6844.20	6910.20	0.87	29.58	304.84	349.87	669.25
2016-05-27 07:30:00	177.00	204.00	6849.70	6879.40	6932.20	0.87	29.78	306.57	353.34	675.87
2016-05-27 08:00:00	175.00	202.00	6826.60	6862.90	6919.00	0.87	29.59	303.11	349.87	669.25
2016-05-27 08:30:00	174.00	200.00	6800.20	6832.10	6889.30	0.87	29.41	301.38	346.41	662.62
2016-05-27 09:00:00	175.00	201.00	6807.90	6833.20	6882.70	0.87	29.52	303.11	348.14	665.93
2016-05-27 09:30:00	174.00	201.00	6807.90	6834.30	6875.00	0.87	29.52	301.38	348.14	665.93
2016-05-27 10:00:00	174.00	200.00	6799.10	6815.60	6883.80	0.87	29.42	301.38	346.41	662.62
2016-05-27 10:30:00	177.00	203.00	6839.80	6870.60	6916.80	0.87	29.68	306.57	351.61	672.56
2016-05-27 11:00:00	175.00	201.00	6814.50	6854.10	6902.50	0.87	29.50	303.11	348.14	665.93
2016-05-27 11:30:00	175.00	203.00	6831.00	6857.40	6904.70	0.86	29.72	303.11	351.61	672.56
2016-05-27 12:00:00	178.00	204.00	6870.60	6880.50	6934.40	0.87	29.69	308.31	353.34	675.87
2016-05-27 12:30:00	176.00	203.00	6851.90	6877.20	6920.10	0.87	29.63	304.84	351.61	672.56
2016-05-27 13:00:00	178.00	205.00	6881.60	6902.50	6944.30	0.87	29.79	308.31	355.07	679.19
2016-05-27 13:30:00	177.00	204.00	6865.10	6901.40	6946.50	0.87	29.72	306.57	353.34	675.87
2016-05-27 14:00:00	178.00	205.00	6882.70	6913.50	6955.30	0.87	29.78	308.31	355.07	679.19

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-27 14:30:00	178.00	204.00	6880.50	6904.70	6960.80	0.87	29.65	308.31	353.34	675.87
2016-05-27 15:00:00	177.00	204.00	6867.30	6894.80	6944.30	0.87	29.71	306.57	353.34	675.87
2016-05-27 15:30:00	178.00	205.00	6871.70	6897.00	6948.70	0.87	29.83	308.31	355.07	679.19
2016-05-27 16:00:00	176.00	203.00	6850.80	6887.10	6933.30	0.87	29.63	304.84	351.61	672.56
2016-05-27 16:30:00	176.00	202.00	6846.40	6861.80	6912.40	0.87	29.50	304.84	349.87	669.25
2016-05-27 17:00:00	177.00	204.00	6873.90	6884.90	6945.40	0.87	29.68	306.57	353.34	675.87
2016-05-27 17:30:00	176.00	203.00	6834.30	6875.00	6934.40	0.87	29.70	304.84	351.61	672.56
2016-05-27 18:00:00	176.00	202.00	6848.60	6855.20	6942.10	0.87	29.50	304.84	349.87	669.25
2016-05-27 18:30:00	178.00	205.00	6872.80	6880.50	6966.30	0.87	29.83	308.31	355.07	679.19
2016-05-27 19:00:00	179.00	206.00	6900.30	6914.60	6989.40	0.87	29.85	310.04	356.80	682.50
2016-05-27 19:30:00	178.00	205.00	6884.90	6893.70	6964.10	0.87	29.78	308.31	355.07	679.19
2016-05-27 20:00:00	179.00	206.00	6898.10	6916.80	6977.30	0.87	29.86	310.04	356.80	682.50
2016-05-27 20:30:00	177.00	204.00	6875.00	6892.60	6945.40	0.87	29.67	306.57	353.34	675.87
2016-05-27 21:00:00	178.00	205.00	6886.00	6916.80	6981.70	0.87	29.77	308.31	355.07	679.19
2016-05-27 21:30:00	181.00	208.00	6925.60	6958.60	7022.40	0.87	30.03	313.50	360.27	689.13
2016-05-27 22:00:00	180.00	207.00	6912.40	6935.50	6985.00	0.87	29.95	311.77	358.53	685.81
2016-05-27 22:30:00	177.00	204.00	6876.10	6895.90	6933.30	0.87	29.67	306.57	353.34	675.87
2016-05-27 23:00:00	179.00	206.00	6892.60	6916.80	6977.30	0.87	29.89	310.04	356.80	682.50
2016-05-27 23:30:00	179.00	206.00	6895.90	6936.60	6972.90	0.87	29.87	310.04	356.80	682.50
2016-05-28 00:00:00	180.00	207.00	6923.40	6935.50	6982.80	0.87	29.90	311.77	358.53	685.81
2016-05-28 00:30:00	178.00	205.00	6880.50	6901.40	6968.50	0.87	29.79	308.31	355.07	679.19
2016-05-28 01:00:00	177.00	204.00	6880.50	6890.40	6947.60	0.87	29.65	306.57	353.34	675.87
2016-05-28 01:30:00	179.00	206.00	6893.70	6905.80	6963.00	0.87	29.88	310.04	356.80	682.50
2016-05-28 02:00:00	178.00	205.00	6905.80	6913.50	6970.70	0.87	29.69	308.31	355.07	679.19
2016-05-28 02:30:00	179.00	206.00	6900.30	6922.30	6965.20	0.87	29.85	310.04	356.80	682.50
2016-05-28 03:00:00	178.00	205.00	6900.30	6916.80	6950.90	0.87	29.71	308.31	355.07	679.19
2016-05-28 03:30:00	178.00	205.00	6884.90	6902.50	6957.50	0.87	29.78	308.31	355.07	679.19

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-28 04:00:00	178.00	205.00	6881.60	6906.90	6964.10	0.87	29.79	308.31	355.07	679.19
2016-05-28 04:30:00	179.00	206.00	6888.20	6908.00	6958.60	0.87	29.91	310.04	356.80	682.50
2016-05-28 05:00:00	176.00	203.00	6867.30	6881.60	6931.10	0.87	29.56	304.84	351.61	672.56
2016-05-28 05:30:00	176.00	203.00	6842.00	6856.30	6911.30	0.87	29.67	304.84	351.61	672.56
2016-05-28 06:00:00	175.00	201.00	6820.00	6833.20	6884.90	0.87	29.47	303.11	348.14	665.93
2016-05-28 06:30:00	174.00	200.00	6805.70	6823.30	6870.60	0.87	29.39	301.38	346.41	662.62
2016-05-28 07:00:00	175.00	201.00	6801.30	6828.80	6884.90	0.87	29.55	303.11	348.14	665.93
2016-05-28 07:30:00	177.00	204.00	6861.80	6881.60	6945.40	0.87	29.73	306.57	353.34	675.87
2016-05-28 08:00:00	178.00	205.00	6879.40	6904.70	6966.30	0.87	29.80	308.31	355.07	679.19
2016-05-28 08:30:00	177.00	204.00	6855.20	6870.60	6941.00	0.87	29.76	306.57	353.34	675.87
2016-05-28 09:00:00	176.00	203.00	6833.20	6856.30	6932.20	0.87	29.71	304.84	351.61	672.56
2016-05-28 09:30:00	176.00	202.00	6828.80	6843.10	6901.40	0.87	29.58	304.84	349.87	669.25
2016-05-28 10:00:00	176.00	203.00	6844.20	6859.60	6915.70	0.87	29.66	304.84	351.61	672.56
2016-05-28 10:30:00	177.00	203.00	6856.30	6873.90	6930.00	0.87	29.61	306.57	351.61	672.56
2016-05-28 11:00:00	177.00	204.00	6864.00	6884.90	6937.70	0.87	29.72	306.57	353.34	675.87
2016-05-28 11:30:00	177.00	204.00	6876.10	6894.80	6941.00	0.87	29.67	306.57	353.34	675.87
2016-05-28 12:00:00	178.00	206.00	6879.40	6901.40	6960.80	0.86	29.94	308.31	356.80	682.50
2016-05-28 12:30:00	177.00	203.00	6862.90	6884.90	6942.10	0.87	29.58	306.57	351.61	672.56
2016-05-28 13:00:00	176.00	203.00	6842.00	6864.00	6920.10	0.87	29.67	304.84	351.61	672.56
2016-05-28 13:30:00	177.00	203.00	6867.30	6873.90	6936.60	0.87	29.56	306.57	351.61	672.56
2016-05-28 14:00:00	177.00	205.00	6864.00	6895.90	6954.20	0.86	29.87	306.57	355.07	679.19
2016-05-28 14:30:00	179.00	205.00	6898.10	6909.10	6974.00	0.87	29.72	310.04	355.07	679.19
2016-05-28 15:00:00	178.00	206.00	6895.90	6909.10	6976.20	0.86	29.87	308.31	356.80	682.50
2016-05-28 15:30:00	178.00	205.00	6888.20	6914.60	6965.20	0.87	29.76	308.31	355.07	679.19
2016-05-28 16:00:00	178.00	204.00	6891.50	6903.60	6952.00	0.87	29.60	308.31	353.34	675.87
2016-05-28 16:30:00	178.00	205.00	6882.70	6902.50	6974.00	0.87	29.78	308.31	355.07	679.19
2016-05-28 17:00:00	177.00	204.00	6856.30	6891.50	6948.70	0.87	29.75	306.57	353.34	675.87

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-28 17:30:00	174.00	201.00	6822.20	6834.30	6905.80	0.87	29.46	301.38	348.14	665.93
2016-05-28 18:00:00	176.00	201.00	6818.90	6855.20	6934.40	0.88	29.48	304.84	348.14	665.93
2016-05-28 18:30:00	178.00	206.00	6891.50	6909.10	6994.90	0.86	29.89	308.31	356.80	682.50
2016-05-28 19:00:00	180.00	207.00	6897.00	6912.40	6997.10	0.87	30.01	311.77	358.53	685.81
2016-05-28 19:30:00	180.00	207.00	6922.30	6934.40	7010.30	0.87	29.90	311.77	358.53	685.81
2016-05-28 20:00:00	180.00	208.00	6923.40	6943.20	7032.30	0.87	30.04	311.77	360.27	689.13
2016-05-28 20:30:00	183.00	210.00	6957.50	6978.40	7049.90	0.87	30.18	316.97	363.73	695.75
2016-05-28 21:00:00	176.00	203.00	6871.70	6880.50	6937.70	0.87	29.54	304.84	351.61	672.56
2016-05-28 21:30:00	177.00	204.00	6856.30	6869.50	6944.30	0.87	29.75	306.57	353.34	675.87
2016-05-28 22:00:00	176.00	202.00	6854.10	6866.20	6916.80	0.87	29.47	304.84	349.87	669.25
2016-05-28 22:30:00	176.00	203.00	6850.80	6866.20	6915.70	0.87	29.63	304.84	351.61	672.56
2016-05-28 23:00:00	179.00	206.00	6897.00	6914.60	6961.90	0.87	29.87	310.04	356.80	682.50
2016-05-28 23:30:00	178.00	205.00	6893.70	6916.80	6974.00	0.87	29.74	308.31	355.07	679.19
2016-05-29 00:00:00	182.00	209.00	6952.00	6971.80	7032.30	0.87	30.06	315.23	362.00	692.44
2016-05-29 00:30:00	181.00	208.00	6927.80	6942.10	7001.50	0.87	30.02	313.50	360.27	689.13
2016-05-29 01:00:00	180.00	208.00	6919.00	6939.90	6989.40	0.87	30.06	311.77	360.27	689.13
2016-05-29 01:30:00	179.00	206.00	6923.40	6936.60	6983.90	0.87	29.75	310.04	356.80	682.50
2016-05-29 02:00:00	178.00	205.00	6895.90	6904.70	6961.90	0.87	29.73	308.31	355.07	679.19
2016-05-29 02:30:00	178.00	206.00	6892.60	6910.20	6944.30	0.86	29.89	308.31	356.80	682.50
2016-05-29 03:00:00	179.00	205.00	6891.50	6899.20	6958.60	0.87	29.75	310.04	355.07	679.19
2016-05-29 03:30:00	177.00	204.00	6862.90	6888.20	6947.60	0.87	29.73	306.57	353.34	675.87
2016-05-29 04:00:00	178.00	205.00	6882.70	6901.40	6938.80	0.87	29.78	308.31	355.07	679.19
2016-05-29 04:30:00	178.00	205.00	6884.90	6889.30	6944.30	0.87	29.78	308.31	355.07	679.19
2016-05-29 05:00:00	177.00	203.00	6840.90	6872.80	6922.30	0.87	29.67	306.57	351.61	672.56
2016-05-29 05:30:00	176.00	203.00	6848.60	6864.00	6910.20	0.87	29.64	304.84	351.61	672.56
2016-05-29 06:00:00	177.00	204.00	6853.00	6868.40	6908.00	0.87	29.77	306.57	353.34	675.87
2016-05-29 06:30:00	175.00	202.00	6836.50	6845.30	6888.20	0.87	29.55	303.11	349.87	669.25

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-29 07:00:00	178.00	204.00	6855.20	6895.90	6945.40	0.87	29.76	308.31	353.34	675.87
2016-05-29 07:30:00	177.00	203.00	6855.20	6869.50	6927.80	0.87	29.61	306.57	351.61	672.56
2016-05-29 08:00:00	174.00	201.00	6804.60	6812.30	6889.30	0.87	29.54	301.38	348.14	665.93
2016-05-29 08:30:00	176.00	203.00	6832.10	6844.20	6923.40	0.87	29.71	304.84	351.61	672.56
2016-05-29 09:00:00	175.00	201.00	6793.60	6842.00	6908.00	0.87	29.59	303.11	348.14	665.93
2016-05-29 09:30:00	176.00	202.00	6838.70	6846.40	6920.10	0.87	29.54	304.84	349.87	669.25
2016-05-29 10:00:00	176.00	203.00	6844.20	6839.80	6921.20	0.87	29.66	304.84	351.61	672.56
2016-05-29 10:30:00	176.00	204.00	6866.20	6871.70	6934.40	0.86	29.71	304.84	353.34	675.87
2016-05-29 11:00:00	179.00	205.00	6890.40	6899.20	6969.60	0.87	29.75	310.04	355.07	679.19
2016-05-29 11:30:00	177.00	205.00	6879.40	6883.80	6963.00	0.86	29.80	306.57	355.07	679.19
2016-05-29 12:00:00	178.00	204.00	6884.90	6903.60	6952.00	0.87	29.63	308.31	353.34	675.87
2016-05-29 12:30:00	178.00	205.00	6871.70	6901.40	6958.60	0.87	29.83	308.31	355.07	679.19
2016-05-29 13:00:00	178.00	205.00	6884.90	6913.50	6978.40	0.87	29.78	308.31	355.07	679.19
2016-05-29 13:30:00	178.00	206.00	6904.70	6919.00	6980.60	0.86	29.83	308.31	356.80	682.50
2016-05-29 14:00:00	180.00	206.00	6911.30	6939.90	6989.40	0.87	29.81	311.77	356.80	682.50
2016-05-29 14:30:00	180.00	208.00	6927.80	6953.10	7011.40	0.87	30.02	311.77	360.27	689.13
2016-05-29 15:00:00	180.00	207.00	6923.40	6947.60	7014.70	0.87	29.90	311.77	358.53	685.81
2016-05-29 15:30:00	179.00	206.00	6905.80	6919.00	6977.30	0.87	29.83	310.04	356.80	682.50
2016-05-29 16:00:00	177.00	204.00	6872.80	6890.40	6955.30	0.87	29.68	306.57	353.34	675.87
2016-05-29 16:30:00	177.00	204.00	6862.90	6894.80	6952.00	0.87	29.73	306.57	353.34	675.87
2016-05-29 17:00:00	176.00	203.00	6849.70	6869.50	6932.20	0.87	29.64	304.84	351.61	672.56
2016-05-29 17:30:00	178.00	205.00	6879.40	6910.20	6987.20	0.87	29.80	308.31	355.07	679.19
2016-05-29 18:00:00	177.00	203.00	6855.20	6873.90	6957.50	0.87	29.61	306.57	351.61	672.56
2016-05-29 18:30:00	179.00	206.00	6897.00	6908.00	6993.80	0.87	29.87	310.04	356.80	682.50
2016-05-29 19:00:00	180.00	208.00	6941.00	6943.20	7037.80	0.87	29.97	311.77	360.27	689.13
2016-05-29 19:30:00	179.00	206.00	6901.40	6902.50	6990.50	0.87	29.85	310.04	356.80	682.50
2016-05-29 20:00:00	178.00	204.00	6862.90	6879.40	6960.80	0.87	29.73	308.31	353.34	675.87

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-29 20:30:00	175.00	202.00	6837.60	6855.20	6925.60	0.87	29.54	303.11	349.87	669.25
2016-05-29 21:00:00	177.00	204.00	6853.00	6869.50	6926.70	0.87	29.77	306.57	353.34	675.87
2016-05-29 21:30:00	175.00	202.00	6844.20	6860.70	6915.70	0.87	29.51	303.11	349.87	669.25
2016-05-29 22:00:00	179.00	205.00	6900.30	6925.60	6970.70	0.87	29.71	310.04	355.07	679.19
2016-05-29 22:30:00	178.00	206.00	6889.30	6925.60	6964.10	0.86	29.90	308.31	356.80	682.50
2016-05-29 23:00:00	181.00	208.00	6927.80	6946.50	7002.60	0.87	30.02	313.50	360.27	689.13
2016-05-29 23:30:00	182.00	210.00	6965.20	6980.60	7033.40	0.87	30.15	315.23	363.73	695.75
2016-05-30 00:00:00	181.00	208.00	6936.60	6955.30	7007.00	0.87	29.99	313.50	360.27	689.13
2016-05-30 00:30:00	178.00	205.00	6888.20	6916.80	6960.80	0.87	29.76	308.31	355.07	679.19
2016-05-30 01:00:00	179.00	206.00	6890.40	6913.50	6956.40	0.87	29.90	310.04	356.80	682.50
2016-05-30 01:30:00	178.00	205.00	6892.60	6916.80	6969.60	0.87	29.74	308.31	355.07	679.19
2016-05-30 02:00:00	179.00	206.00	6897.00	6928.90	6968.50	0.87	29.87	310.04	356.80	682.50
2016-05-30 02:30:00	179.00	206.00	6909.10	6912.40	6969.60	0.87	29.82	310.04	356.80	682.50
2016-05-30 03:00:00	179.00	206.00	6887.10	6921.20	6960.80	0.87	29.91	310.04	356.80	682.50
2016-05-30 03:30:00	178.00	205.00	6893.70	6915.70	6957.50	0.87	29.74	308.31	355.07	679.19
2016-05-30 04:00:00	178.00	205.00	6893.70	6894.80	6969.60	0.87	29.74	308.31	355.07	679.19
2016-05-30 04:30:00	177.00	204.00	6845.30	6868.40	6928.90	0.87	29.80	306.57	353.34	675.87
2016-05-30 05:00:00	177.00	203.00	6856.30	6870.60	6928.90	0.87	29.61	306.57	351.61	672.56
2016-05-30 05:30:00	179.00	207.00	6898.10	6909.10	6985.00	0.86	30.01	310.04	358.53	685.81
2016-05-30 06:00:00	180.00	207.00	6905.80	6913.50	6993.80	0.87	29.97	311.77	358.53	685.81
2016-05-30 06:30:00	178.00	204.00	6848.60	6866.20	6956.40	0.87	29.79	308.31	353.34	675.87
2016-05-30 07:00:00	178.00	205.00	6872.80	6890.40	6974.00	0.87	29.83	308.31	355.07	679.19
2016-05-30 07:30:00	181.00	208.00	6920.10	6941.00	7004.80	0.87	30.06	313.50	360.27	689.13
2016-05-30 08:00:00	181.00	209.00	6923.40	6946.50	7007.00	0.87	30.19	313.50	362.00	692.44
2016-05-30 08:30:00	179.00	206.00	6897.00	6906.90	6971.80	0.87	29.87	310.04	356.80	682.50
2016-05-30 09:00:00	178.00	205.00	6876.10	6888.20	6944.30	0.87	29.81	308.31	355.07	679.19
2016-05-30 09:30:00	177.00	204.00	6867.30	6871.70	6930.00	0.87	29.71	306.57	353.34	675.87

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-30 10:00:00	178.00	204.00	6872.80	6878.30	6932.20	0.87	29.68	308.31	353.34	675.87
2016-05-30 10:30:00	177.00	204.00	6869.50	6875.00	6934.40	0.87	29.70	306.57	353.34	675.87
2016-05-30 11:00:00	178.00	205.00	6876.10	6887.10	6943.20	0.87	29.81	308.31	355.07	679.19
2016-05-30 11:30:00	178.00	205.00	6872.80	6890.40	6954.20	0.87	29.83	308.31	355.07	679.19
2016-05-30 12:00:00	178.00	205.00	6872.80	6882.70	6941.00	0.87	29.83	308.31	355.07	679.19
2016-05-30 12:30:00	178.00	205.00	6883.80	6897.00	6954.20	0.87	29.78	308.31	355.07	679.19
2016-05-30 13:00:00	176.00	202.00	6854.10	6856.30	6913.50	0.87	29.47	304.84	349.87	669.25
2016-05-30 13:30:00	178.00	205.00	6860.70	6893.70	6938.80	0.87	29.88	308.31	355.07	679.19
2016-05-30 14:00:00	176.00	202.00	6847.50	6878.30	6910.20	0.87	29.50	304.84	349.87	669.25
2016-05-30 14:30:00	174.00	201.00	6820.00	6836.50	6884.90	0.87	29.47	301.38	348.14	665.93
2016-05-30 15:00:00	176.00	202.00	6832.10	6860.70	6911.30	0.87	29.57	304.84	349.87	669.25
2016-05-30 15:30:00	174.00	200.00	6791.40	6825.50	6892.60	0.87	29.45	301.38	346.41	662.62
2016-05-30 16:00:00	179.00	206.00	6890.40	6930.00	6994.90	0.87	29.90	310.04	356.80	682.50
2016-05-30 16:30:00	178.00	206.00	6898.10	6912.40	6974.00	0.86	29.86	308.31	356.80	682.50
2016-05-30 17:00:00	178.00	204.00	6872.80	6897.00	6965.20	0.87	29.68	308.31	353.34	675.87
2016-05-30 17:30:00	175.00	202.00	6826.60	6845.30	6924.50	0.87	29.59	303.11	349.87	669.25
2016-05-30 18:00:00	177.00	203.00	6873.90	6879.40	6965.20	0.87	29.53	306.57	351.61	672.56
2016-05-30 18:30:00	179.00	206.00	6906.90	6911.30	6998.20	0.87	29.83	310.04	356.80	682.50
2016-05-30 19:00:00	181.00	209.00	6946.50	6955.30	7041.10	0.87	30.09	313.50	362.00	692.44
2016-05-30 19:30:00	181.00	208.00	6931.10	6947.60	7023.50	0.87	30.01	313.50	360.27	689.13
2016-05-30 20:00:00	178.00	206.00	6903.60	6908.00	6980.60	0.86	29.84	308.31	356.80	682.50
2016-05-30 20:30:00	181.00	207.00	6938.80	6944.30	7021.30	0.87	29.83	313.50	358.53	685.81
2016-05-30 21:00:00	180.00	208.00	6927.80	6942.10	7015.80	0.87	30.02	311.77	360.27	689.13
2016-05-30 21:30:00	177.00	204.00	6856.30	6872.80	6932.20	0.87	29.75	306.57	353.34	675.87
2016-05-30 22:00:00	177.00	204.00	6870.60	6884.90	6945.40	0.87	29.69	306.57	353.34	675.87
2016-05-30 22:30:00	178.00	204.00	6868.40	6887.10	6939.90	0.87	29.70	308.31	353.34	675.87
2016-05-30 23:00:00	178.00	206.00	6898.10	6912.40	6969.60	0.86	29.86	308.31	356.80	682.50

Time	[kW]	[kVA]	[V]	[V]	[V]	Power	Total	kW	kVA	Real
Clock	Last average demand	Last average demand	Voltage L1	Voltage L2	Voltage L3	Factor	Amps	L-L	L-L	Power
2016-05-30 23:30:00	178.00	204.00	6880.50	6897.00	6944.30	0.87	29.65	308.31	353.34	675.87
2016-05-31 00:00:00	178.00	206.00	6904.70	6913.50	6967.40	0.86	29.83	308.31	356.80	682.50