THE UNIVERSITY OF ZAMBIA

SCHOOL OF MINES

DEPARTMENT OF MINING ENGINEERING

Application of High Precision Mining as a way of optimizing loading and hauling operations at Kansanshi Mining Plc, Zambia.

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"A Thesis submitted to the University of Zambia in partial fulfilment of the requirements for the award of degree of Masters of Engineering in Mining Engineering."

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2021

DECLARATION

I, Kangwa Katongo, do declare that the work presented in this thesis is my original research work with exception of quotes and citation of other authors' work, which has been duly referenced and acknowledged herein. No part of this dissertation has been presented or published for pursuit of any degree in this or any other university or college.

I, therefore, declare that this dissertation was written and presented according to the rules and regulations governing the award the of Master of Mineral Sciences degree of the University of Zambia.

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APPROVAL

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ABSTRACT

Mining at Kansanshi is currently conducted in two pits namely Main and North West pit. Mining at both pits is conducted by conventional open pit methods involving 18 hydraulic excavators and a mining fleet of haul 86 trucks.There has a been a general concern on the mined material tonnes (BCMs)/reconciliation and misplacements of material at Kansanshi Mining site which has led to increased mining costs as a result of: reduced truck deployment, increased truck and shovel waiting time, reduced production and reduced grade/quality of ore delivered to crushers**.**With the in-pit haulage distance increasing from 1335 RL to 1195 RL, there is need to address the issues causing the increase in mining cost which currently stands at US$12.4/BCMs as a matter of priority. The other problem has been on the inconsistencies of reporting fleet performances in terms of Availability and Utilisation. This has resulted into manipulation of figures by some operators. This study therefore seeks to monitor and compare the application of high precision mining through optimised loading and hauling operations. The study focuses on the optimization of haulage using High Precision Mining (HPM) through use of Wenco's dispatching algorithm, which is designed to automatically assign trucks in order to achieve the best utilization of all mining equipment and maximize production. In order to accomplish the set objectives, the study involved establishing the precise bucket positioning, determining production rates and monitoring the material type and quality /grade of ore delivered to the crushers. With the tolerance of X=0.5m, Y=0.5m and Z=0.5m, it was noted that the events of a bucket mining out of the assigned polygon were reduced to a few cent meters in distance from 34% to 15% and from 10% to 8% in terms of mismatches and cannot reconcile bucket loads respectively. This entails a reduced mining dilution in the X and Y axis of about 85% based on the quality of ore delivered to the crushers. In terms of mining to correct elevations, a tolerance in the Z axis of ±0.3m was achieved based on the bucket size of the loading equipment. The X and Y axis tolerance was also reduced to ±0.3m for improved accuracy in between boundaries of various material types. The use of precision mining has therefore resulted in reduced mining cost of about US$10.3/BCM, improved fleet/production reporting, high grade of the material delivered to the crushers of about 75% from the previous 65%.

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ACRONYMS

HPM		High Precision Mining
KMP		Kansanshi Mining PLC
FQMO		First Quantum Mining Operation
FQML		First Quantum Minerals Limited
KPI		Key Performance Indicator
M7		Main 7
M4		Main 4
HP		High Precision
M5		Main 5
NW		North West Pit
RDT		Rigid dump truck
ADT		Articulated dump truck
GPS		Global positioning system
k_{80}		80% passing size
USD		United States Dollar
BCM		Bank Cubic meters
GAC		Gangue acid consumption
ROM		Run of mine
SX-EW		Solvent extraction-Electro wining
ZCCM		Zambia Consolidated copper Mine
UM		Upper marble
LM		Lower marble
LCS		Lower calcareous sequence
MMC		Middle mixed clastics

CHAPTER 1 INTRODUCTION

1.0 Introduction

This chapter discusses the history of mining, general geology, mining and processing routes at Kansanshi mine. Mining is conducted in two pits using hydraulic excavators and a mining fleet of haul trucks. To improve productivity and optimise operations, the mine is currently implementing High precession mining (HPM). This technology uses high precision GPS on fleet (shovels/Trucks) to improve both bench elevation and ore quality control.

1.0.1 Mine background

Zambia has a long history of copper mining and associated industries. The copper deposit at Kansanshi mine is considered the oldest known mine, with the smelting of copper dating back to the fourth century AD. Rediscovery of the old workings in 1898 resulted in renewed mining activity when George Gray again started mining copper and paid royalties to the local Chief. Underground mining of selected copper from high-grade veins occurred during the period 1903 until the beginning of the First World War in 1914. Mining activities again commenced about 1927, but with the onset of the world depression, these activities ceased in 1932. During the period 1952 to 1986, the Kansanshi mine went through a period of intermittent mining activity. Initially, underground mining and exploration activities increased with concentrate being shipped to the Copperbelt for direct smelting until 1957. In 1969 Zambia Consolidated Copper Mines (ZCCM) initiated open cut mining at Kansanshi with on-site leaching. Although this new venture commenced in 1974, low copper prices forced the project to close in 1975. A mining only operation was re-commenced in 1977 at Kansanshi with ore sent to Nchanga for processing. This operation continued until 1986 when low copper prices again resulted in mine closure. In 1988, ZCCM again commenced operations at Kansanshi with the construction of a small Sulphide flotation concentrator and open cut mining. The concentrate produced at Kansanshi was then shipped to the Copperbelt for smelting. This operation continued until January 1998, at which time, ZCCM ceased operations and initiated formal mine closure and rehabilitation activities. In January 1997, Cyprus Amax Minerals Company entered into an agreement with ZCCM and the Government of the Republic of Zambia as part of ZCCM's privatization program. Cyprus Amax initiated geological investigation activities aimed at developing reserves capable of supporting a major copper mining project. During the preliminary feasibility work, Cyprus Amax became a part of Phelps Dodge which, following completion of the study determined that the project did not satisfy corporate objectives and tendered the project for sale. FQM took management control of the project in 2001. First Quantum Minerals advised its mining strategy by developing the project using a suitable qualified and experienced mining contractor, Kansanshi Mine PLC. This approach has minimised overall capital and operational costs associated with the project development, also allowed the application of funds on large, capital efficiency processing facility and reduced front risk, in long term, after all the mining parameters are known.

1.0.2 Ownership structure and project location

The Kansanshi mine, the largest copper mine in Africa, is owned and operated by Kansanshi Mining PLC which is 80% owned by a First Quantum subsidiary. The remaining 20% is owned by Zambia Consolidated Copper Mines Investment Holding (ZCCM-IH). The mine is located approximately 10 kilometers north of the town of Solwezi and 180 Kilometers to the northwest of the Copperbelt town of Chingola in North Western Province of Zambia. The Province lies within the Central African Plateau at an elevation of approximately 1,400 m above sea level, has an area of approximately 125,800 km^2. The Province is bounded to the north by the Democratic Republic of Congo and to the west by Angola. Project location is shown in Appendix 2

1.0.3 Mine Stratigraphy

The deposit occurs within the northwest-trending Kansanshi Antiform, which exposes rocks of the Kansanshi Mine Formation in its core. The Kansanshi Antiform hosts four major units (Appendix 3 and 4) which, from structural top to bottom, are herein termed the Upper Dolomite Formation, the Upper Pebble Schist Formation, the Kansanshi Mine Formation and the Lower Pebble Schist Formation (GRD Minproc – Vol 2).

1.0.3.1 Upper Dolomite Formation (UD)

Structurally the highest unit in the Kansanshi Antiform, UD comprises a sequence of dolomite and dolomitic marble that can be traced around the Antiform. The unit tends to form low ground and dambos (swampy ground). It consists of pale brown-grey to medium grey, fine grained, saccharoidal, iron-free dolomite, quite different from the coarsely crystalline, impure, ferroan marbles and dolomites of the Kansanshi Mine Formation.

1.0.3.2 Upper Pebble Schist Formation (UPS)

The Upper Pebble Schist lies between the Upper Dolomite Formation and the upper member of the Kansanshi Mine Formation – the Upper Mixed Clastics. It comprises a relatively monotonous sequence of non-bedded, biotitic, commonly calcareous and in places garnet-bearing ("knotted") schist, with one or two percent exotic Clastics. Clastics types include dolomite, siltstone, sandstone, massive quartz, quartzite, and rare granite, and the clasts are variably – often strongly – flattened and folded within the schistosity. The unit is characterized by low sulphide content (generally <1% pyrrhotite) and low vein abundance.

1.0.3.3 Kansanshi Mine Formation

The Kansanshi Mine Formation consists of interlayered phyllites, schist, marbles and calcareous schist that have been subdivided into five members (A). From top to bottom these are the Upper Mixed Clastics (UMC), Upper Marble (UM), Middle Mixed Clastics (MMC), Lower Calcareous Sequence (LCS), and Lower Marble (LM) (GRD Minproc – Vol 2).

i) Upper Mixed Clastics (UMC)

This sequence of phyllites, shales, knotted schists and calcareous beds forms the upper portion of the Kansanshi Mine Formation and has been recumbently folded. The fold strikes at approximately 290^{o} and closes to the northwest. Much of the UMC stratigraphy is eroded around the ZCCM pit and in the Northwest Zone (NWZ), where local doming has brought the underlying Upper Marble to surface. The UMC is subdivided into up to 12 units in the Fish Ponds area, where a repeated sequence occurs due to a second, southward-closing recumbent fold. The contact between the UMC and the underlying Upper Marble is placed at the base of the phyllite-dominant part of the sequence, which is usually at the top of a thick marble bed.

ii) Upper Marble (UM)

The Upper Marble comprises a thick (10-80m) marble layer underlain by a transitional sequence of intercalated marble and phyllite. Some or all of the Marble may be weathered to a brownish, often micaceous "residual", within which crude relict mineralogical banding is preserved. The UM is subdivided into two subunits, the uppermost marble-dominant UM1 and the lower phyllite-dominant UM2 (GRD Minproc – Vol 2).

iii) Middle Mixed Clastics (MMC)

The MMC member consists of a 30-80m thick sequence of knotted schist, biotite schist, and phyllite (sometimes carbonaceous). It is thickest in the NWZ and thinnest to the southeast, in the Fish Ponds area. The MMC is divided into five units in the NWZ, whereas only three units can be recognized further to the southeast.

iv) Lower Calcareous Sequence (LCS)

The LCS comprises a 20-40 m thick sequence of calcareous schist, calcareous biotite schist, marble, knotted schist and phyllite. It is subdivided into an uppermost strongly calcareous section, LCS1, and a lowermost weakly calcareous section, LCS2 (GRD Minproc – Vol 2).

v) Lower Marble (LM)

The top of the LM is defined as the top of the first thick marble bed below the calcareous schists of the LCS. The LM ranges from 50-100 m thick throughout most of the Main Zone, and is subdivided into three units. However, LM2 is absent in the NWZ and the western part of the Main Zone (GRD Minproc – Vol 2).

1.0.3.4 Lower Pebble Schist Formation

The LPS is a calcareous biotite schist, locally garnetiferous, that contains up to 10% of exotic clasts. Its contact with the LM varies from sharp to gradational over centimetres', and is typically a locus of albite-ferroan dolomite alteration. Although there are minor differences between the pebble schists of the UPS and LPS, overall their similarities would allow them to be interpreted as the same unit (GRD Minproc – Vol 2).

1.0.3.5 Structure

The Kansanshi deposit occurs along the crest of a northwest trending, northwest closing broad Antiform, which trends approximately 310^{o} and can be traced for approximately 12 km. On the flanks of the Antiform, the rocks dip away to the NE and SW, generally at 10^{o} to 30^{o} (GRD Minproc – Vol 2).

1.0.3.6 Deposit outline

The deposit outlines a well mineralized, north-south striking zone. The zone is characterised by complicated faulting, abundant injection vein networks, development of brecciate units and down-dropped rock structures.

Vein-specific copper mineralisation that is either stratiform or concordant is hosted within and directly adjacent to mesoscopic veins, in thin bands and veinlets oriented parallel to rock bedding or foliation. It also occurs as disseminated mineralisation related with albite-carbonate alteration. The main veins and vein swarms plunge sub-vertically, perpendicular to the fold axis.

Mineralisation within the brecciate zones occurs within oxidized and supergene enriched layers. Secondary copper minerals are distributed in a complex manner across these layers. The primary copper sulphide mineralisation is chalcopyrite-dominated, and is associated with trace amounts of bornite, minor pyrite and pyrrhotite.

The oxide mineralisation is largely dominated by chrysocolla. It also hosts malachite, limonite and cupriferous goethite. The mixed zone, a combination of both oxide and primary-style mineralisation, also hosts significant amounts of chalcocite, minor local copper and tenorite.

1.1.4 Mining and processing

Mining at Kansanshi is currently conducted in two pits namely Main and North West pit. Mining at both pits is done by conventional open pit methods involving hydraulic excavators and a mining fleet of haul trucks.

Processing of the three ore types, namely leached ore, mixed float and sulphide, is through either an oxide circuit or a sulphide and transitional ore mixed float circuit. Treatment of the sulphide ore involves crushing, milling and flotation to produce copper in concentrate.

1.1.5 Mining Fleet

The expansion and streamlining of the mining fleet commenced during 2010, and reflect the move towards the application of an electrically powered mining fleet at KMP comprising the following.

Table1.1 Kansanshi Mining Fleet

Fleet Item	Make/Model	Number
Shovels/excavators	Hitachi EX2500 BE	2
	Liebherr R9250D BH (250 t)	3
	Liebherr R9350D BH (330 t)	4
	Liebherr R9350D ER (330 t)	4
	Liebherr R984C ER (120 t)	5
Trucks	Caterpillar 777D	2
	Caterpillar 785D (150 t)	42
	Hitachi EH3500ACii (170t)	40

In addition to the earth-moving equipment ancillary mining equipment (track and wheel dozers, graders, service trucks etc.), the primary haulage fleet will be progressively by the year 2024 replaced with diesel/AC drive electric units that will be operated in conjunction with a trolley assist (TA) system which will allow for high speed, low cost, and up-ramp haulage.

High precision mining is a smart way of mining technology that uses high precision GPS on fleet (shovels/Trucks) to improve both bench elevation and ore quality control. Kansanshi mine is currently implementing High Precision Mining. The High Precision Mining system is in its early stages of implementation at Kansanshi Mine. Given that there are many stakeholders involved in the system, there are various learning points being discovered while running the system. This research will focus on investigating issues surrounding mining (Loading and hauling of blasted material), and use of High Precision System in optimising loading and hauling operations.

Kansanshi mine recently migrated from Modular Dispatch system to WENCO with a view to improving its production tracking system through mined tonnes/BCM's and fleet management. WENCO is a fleet management system that determines equipment activity, location, time and production information. It offers fleet control, a mine management solution to interface various mine activities; optimise truck deployment and ore grade control; and track equipment location, status, and operators. It offers BenchManager, a GPS solution for precise graphical actual-vs-design feedback and system integration; tracking elevation, gradient, cut/fill, and safety information for dozers and tractors; and elevation monitoring, safety, ore quality control, and digging limits for excavators, backhoes, etc. This change has affected various stakeholders and has demanded for changes to some standard operating procedures. Chief among the stakeholders affected is the load and haul team.

In the past, in-situ mark-outs were surveyed on the pit floor for mining; however after the introduction of blast movement monitoring moved polygons were surveyed on the pit floor for mining. Despite that, change in-situ polygons were published to Modular Dispatch system for production tracking while the Shift engineers and shift Geologists controlled moved polygons on the pit floor. This created many reconciliation challenges for the Geology team.

The introduction of High Precision Mining (WENCO) will seek to eliminate most human controlled aspects in the Dispatch of various types of materials to predetermined destinations. Figure 1.1 illustrates the basic process flow of the mining operation.

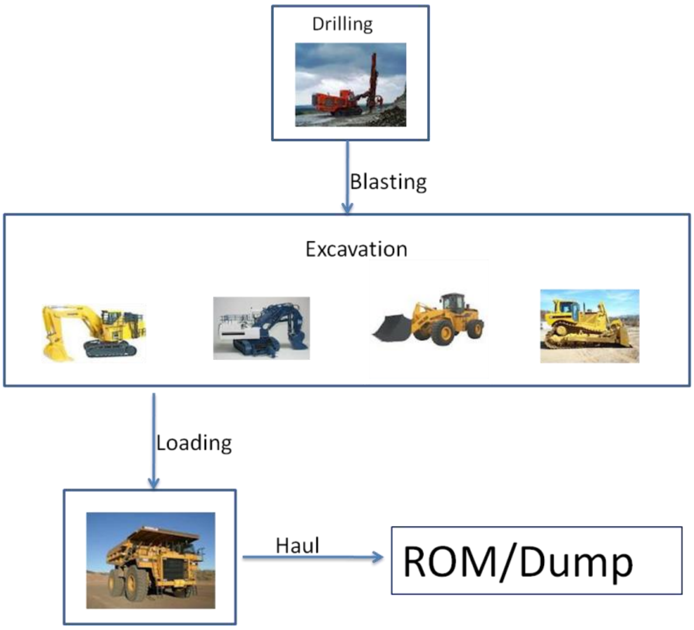


Figure 1. 1 Basic operation process

Drilling is critical in a mining operation, and needs to be measured and monitored. There are several factors that can affect the quality of drilling, and these are important to the mine decision makers as part of mine management. Currently drill operators and shift supervisors are the major source of the drill data used to generate reports to monitor the drill efficiencies, utilisation, quality, and final cost of drilling. However, many irregularities have been observed since most of this data is manually entered into the system at the end of every shift, and there is no time to make major changes.

With mining being dynamic, mine management, supervisors and engineers need to be proactive and challenge the current 'reactive' state.

1.1 Problem statement

There has been a general concern on the reconciliation of mined material tonnes (BCMs) n and misplacements of material at Kansanshi Mining site which has led to increased mining costs to 4.0%. The increased costs are a result of

1. reduced truck deployment, increased truck and shovel waiting time by 42%,

2. reduced production by -6.0%,
3. and reduced Grade/Quality of ore delivered to crushers**.**

With the in-pit haulage distance increasing day by day, there is need to address the issues causing the increase in mining cost as shown in figure 1.2 and 1.3. With major elevation fluctuations while hauling in-pit, this would pause risk to trucks since clearance is compromised. The other challenge is that there are some inconsistences on the reporting of the fleet performances.

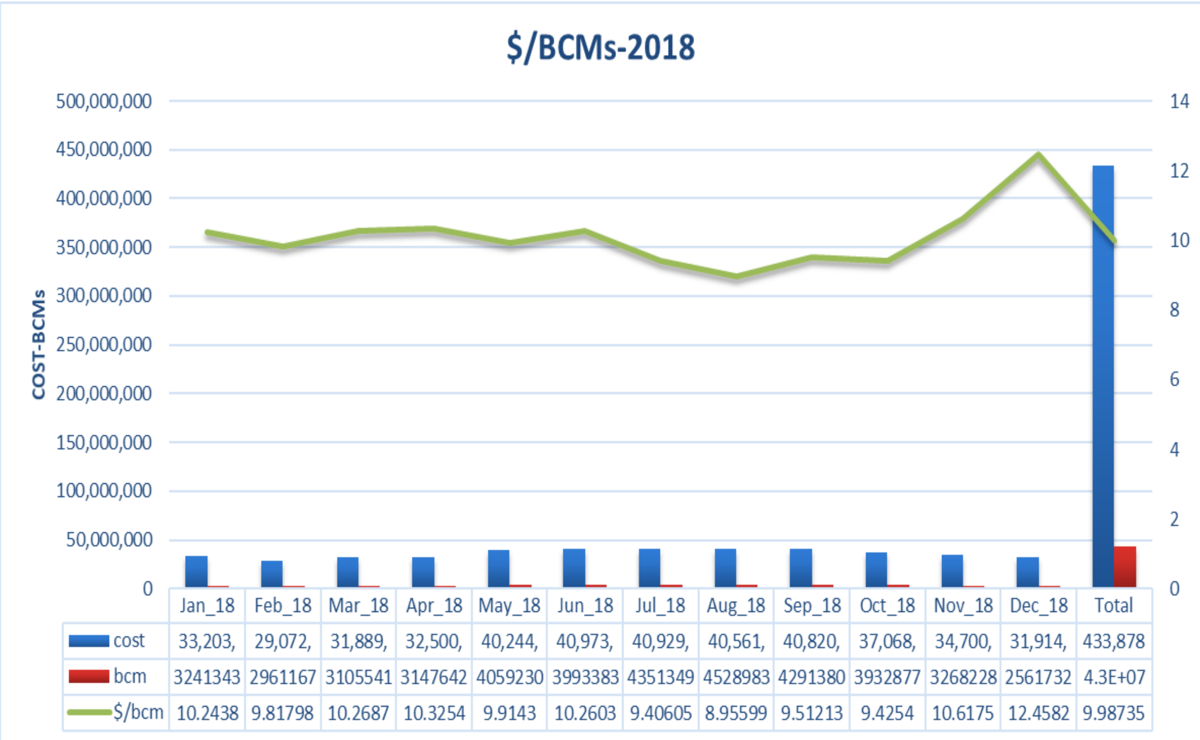
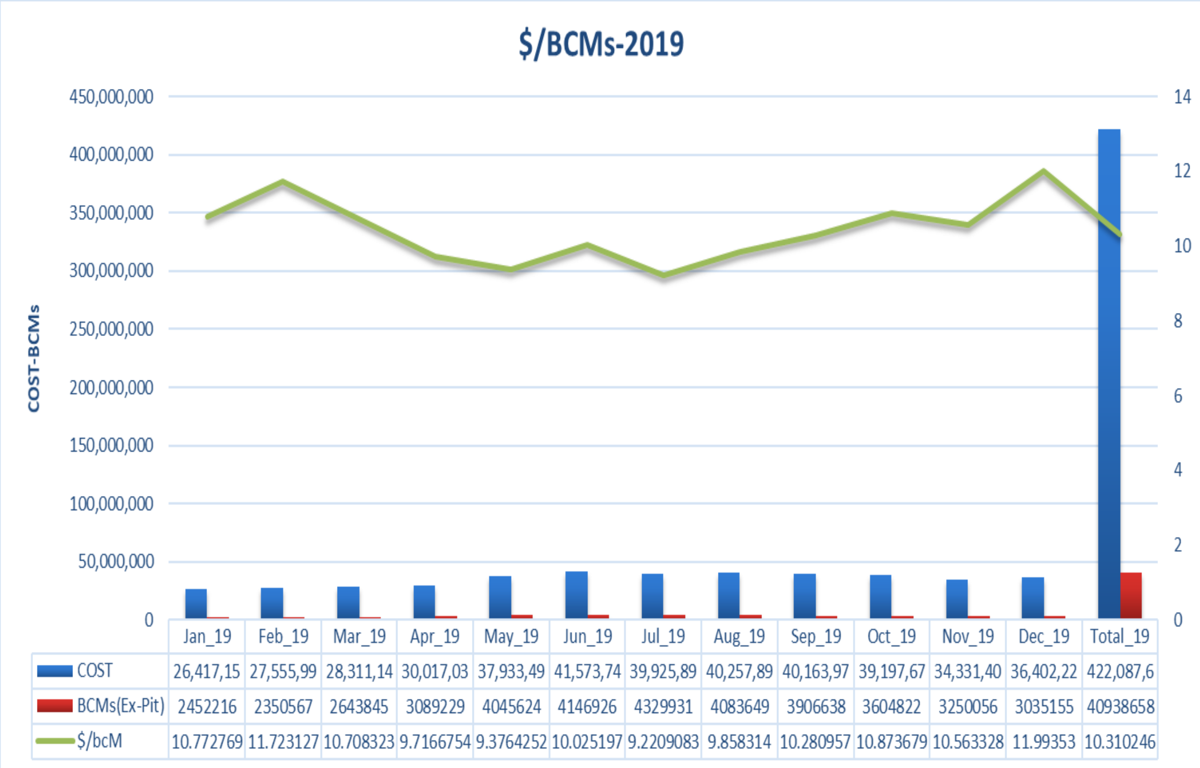


Figure 1. 2 Cost Per BCM for 2018



	Jan_19	Feb_19	Mar_19	Apr_19	May_19	Jun_19	Jul_19	Aug_19	Sep_19	Oct_19	Nov_19	Dec_19	Total_19
COST	26,417,15	27,555,99	28,311,14	30,017,03	37,933,49	41,573,74	39,925,89	40,257,89	40,163,97	39,197,67	34,331,40	36,402,22	422,087,6
BCMs(Ex-Pit)	2452216	2350567	2643845	3089229	4045624	4146926	4329931	4083649	3906638	3604822	3250056	3035155	40938658
$/bcM	10.772769	11.723127	10.708323	9.7166754	9.3764252	10.025197	9.2209083	9.858314	10.280957	10.873679	10.563328	11.99353	10.310246

Figure 1. 3 Cost Per BCM for 2019

1.2 Objectives

The main objective of this research will be to evaluate and compare the application of high precision mining through optimised loading and hauling operations.

1.2.1 Sub-Objectives

a) Establish the precise bucket positioning and track elevation on an actively mined block/polygon through physical and BenchView inspections.

b) Determine production rates through optimised loading and hauling cycle times (truck shovel waiting times) and fleet performance.

c) Monitor the material type and quality /grade of ore delivered to the crushers/BCM reconciliation.

d) Recommend any improvements based on the highlighted items above.

1.3 Research Questions

The key questions which will be investigated in this research are:

a) What is the precise bucket position for an excavator, and how is the elevation tracked on an actively mined polygon/block that has been published to dispatch?

b) How are production rates measured in relation to cycle times and fleet performance?

c) How much material (i.e quality/grade) is delivered to the crushers as per feed plan?

d) How is the trend in reconciliation in terms of mined BCMs Vs Actual, mined grade vs plant grades etc?

e) What instruments are currently used to consistently improve on tracking production?

The purpose of this research is to utilize the available technologies to determine and optimize the load and haul strategy at Kansanshi Mine Site Using HPM in real time. It is well known that the niche in mining is to combine operational experience with the advancement of technologies.

This HPM is being used in most mining operations such as Quintette coal mine in northeast British columbia, which has eliminated the use of survey teams to stake out blast patters, significantly reducing the amount of paper work and data entry.

1.4 Scope of the study

The scope of this research will be limited to loading and hauling, geology, Survey and Dispatch Teams. It will focus on creation of moved polygons from in-situ polygons, surveying of the moved polygons on the pit floor and how the High Precision Mining System (WENCO) mines these polygons.

1.5 Significance of the study

The significance of this research will be based on the implementation of Wenco's dispatching algorithm, which is designed to automatically assign trucks in order to achieve the best utilization of all mining equipment, and maximize production. Once fully implemented it will minimise shovel wait, truck wait, and truck empty travel time. Benefits of the system include, improved truck deployment, reduced truck and shovel waiting time, increased production and improved grade of ore delivered to crushers.

1.6 Methodology

To accomplish the objectives of this research, the following methods were used.

1. Comprehensive literature review from: the web, Mining literature, and interviewing Stake holders.
2. Establishing the precise bucket positioning and track elevation on an actively mined block/polygon through physical and BenchView inspections.
3. Determining production rates through optimised loading and hauling cycle times (truck shovel waiting times) and fleet performance.
4. Monitoring the material type and quality /grade of ore delivered to the crushers/Bcms reconciliation

Chapter 1 discusses Kansanshi Mine location, geology and ownership. The objectives of the study and methodology are summarized in chapter 1.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

This chapter discusses the Fleet management techniques for transport optimisation that is used in the management of mining vehicles for hauling. Fleet Management Systems (FMS) are applications that help to automate the management of trucks and shovels, allowing production supervisors to increase the productivity of the haulage process by maximising the utilisation of the equipment, thus lowering operation costs. A computer in every vehicle is the provider of mobile data to the FMS. The main literature reviewed include categories of FMS and Truck Cycle Time (TCT) prediction Modelling.

The Application of High Precision Mining

There are many companies in the world providing mine fleet management systems (Askari-Nasab, 2017). Some of the more popular ones are: Modular Mining Systems; Jigsaw; WENCO, Dynamine Micromine Pitram system and Caterpillar with CAT® MINESTAR™ FLEET are the next leaders of mine fleet management systems (Askari-Nasab, 2017). Peculiar features of automatic control systems used in mining transportation include the fact that they were developed with a wide use of computer aids, and computer-based solutions of tasks bound to the theory of linear and dynamic programming, an algorithm of optimal control of transportation (Semykina, 2018)

Modular mining fleet management system - The system leverages three mathematical programming models; Linear Programming (LP), Dynamic Programming (DP) and Best Path (BP) to maximise overall truck productivity by maintaining and updating a real-time model of the mine equipment, locations, and haulage roads (Modular Mining, 2021). The modular model studies allow controlling shift turnaround and implementing the strategy of dump trucks distribution along all pit sites, modeling trips to loading terminals with changing the transportation route (Semykina, 2018)

Jigsaw hexagon mining's fleet management system- Jigsaw Jmineops - This system is used commonly to optimise the real-time scheduling and dispatch of mobile mining equipment.

Information provided by the fleet management system (FMS) gives greater control of operations and production. Jmineops optimises and centralises equipment tracking, dispatching and diagnostics, ensuring that activities and operators can be directed, material movement can be confirmed, and machine health can be monitored (Hexagon, 2021). Jmineops has the following characteristics: independence, universal software platform; ability to harness any industry standard IP-based wireless network; identical on-board SQL databases & office server that replicate in real-time; distributed database architecture; instantaneous data relay; real-time compliance control and automated cycle logic (Askari-Nasab, 2017).

Micromine pitram - pitram is a fleet management and mine control solution that records manage and processes mine site data in real-time. As a scalable solution, it is suitable for underground and surface mine construction, development and production. Pitram records data related to equipment, personnel and materials, providing an overview of the current mine status, and therefore enabling improved control over operations. Greater control allows sites to increase production, reduce costs and improve safety and business intelligence. Pitram's sophisticated yet intuitive functionality makes it ideal for any mining environment. It has been implemented at more underground sites than any competitor product, and is increasingly popular with sites using automated practices (Pitram, 2021). Pitram also has enhanced 3D visualizations and integrates with tagging and positioning system to provide control room operators with "near real –time information", reducing reliance on radio communication (Dean, 2021).

Caterpillar's MineStar-MineStar® is an integrated mining information system, developed by Caterpillar, Inc. and its alliance partners. The system allows for tracking of machine health, productivity, machine and material movement, and drill management. It also includes Computer Aided Earth Moving System, CAES® and an advanced truck assignment program. MineStar® has the capability of linking machines in the field to MineStar® office systems, as well as to other mine information systems. Caterpillar's alliance partners, Mincom and Trimble Navigation, have provided office software, radio infrastructure software and GPS technology, respectively (Ataman, 2001)

In this research, the algorithms behind the commercial mine fleet management systems mentioned above have not been compared to establish which one works better than others. (Askari-Nasab, 2017), observed that the algorithms behind many commercial mine fleet management systems are proprietary information, and therefore the companies do not typically disclose the logics to the public domain. Consequently, a comparison of the optimality of the fleet management solutions has not been made in the present study.

2.1 Fleet Management Systems (FMS)

All FMS are based on tracking the position and status of vehicles. This system is usually based on the Global Positioning System (GPS), although in some circumstances it can work over a General Packet Radio Service (GPRS) platform. The process is shown in Figure 2.1. When the system determines the location, speed and course of the vehicle, this information is transmitted to a software application. Data transmission can be made using a combination of satellite signals and terrestrial re-transmitters(Gu et al.., 2008).

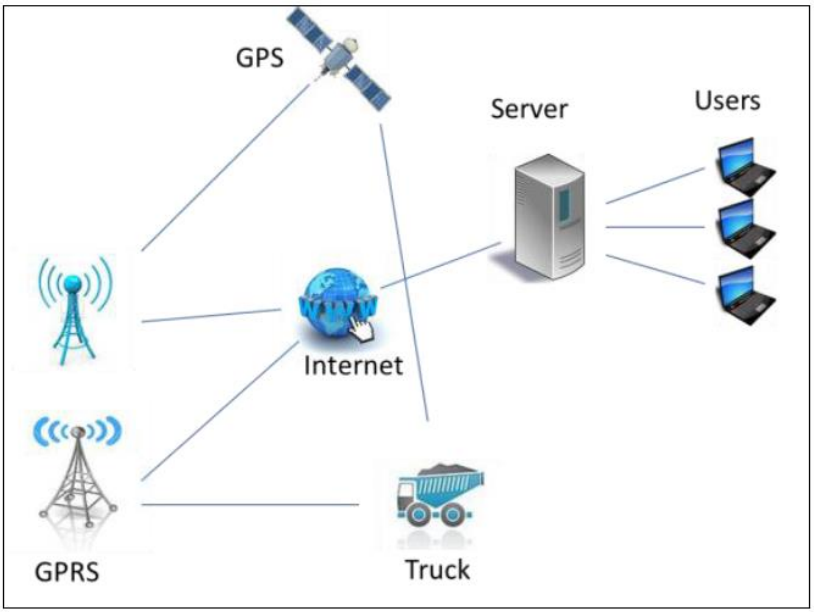


Figure 2. 1 Operation fleet monitoring and management

2.1.1 WENCO specifications

Event Monitor

Event Monitor is a real-time application that displays messages generated from the Wenco system. When an event is generated, a message describing the event displays in Event Monitor with event information such as the time, source, and severity of the event.

Events are raised throughout the Dispatcher's shift. Many events are routine and simply indicate the regular functioning of the system. Other events are raised when something has occurred that the Dispatcher must be aware of and may need to address. Events can be configured to display differently depending on the event type (for example, alarms or informational only events).

Fleet Control

Fleet Control is a powerful tool that assists mine personnel with daily operations. The program is used most often by the dispatcher and field supervisors. It provides real-time screens that display data equipment information and current location, and grade quality of ore.

Fleet Control can be used on its own or alongside MineVision to get a complete picture of mine activity. Fleet Control allows you to:

- Monitor the current position of equipment in the mine.
- Control dispatching.
- View the current state of production of the mine.
- View and print status and summary reports.

Mobile Data Terminal

Mobile Data Terminals (MDTS) are in-vehicle units that are installed on hauling units, loading units and other equipment to provide equipment operators access to the Wenco system. The **MDT5** is Wenco’s 5th generation Mobile Data Terminal application.

The Wenco Mobile Data Terminal (MDT) has several key components which are described in detail as follows.

i. Octagon mobile computer.

The mobile computer contains a processor, memory, data storage, GPS receiver, and wireless network card. It uses the Windows XPe (embedded) operating system and hosts the Wenco

MDT5 dispatch software. The Octagon communicates via several types of interfaces. For example, RS232, USB, and Ethernet (10BaseT). The MDT uses these components to collect data about the activity of the vehicle for the dispatch system, and to provide the operator with dispatch information such as assignment, alarms, and messaging.

ii. Touch screen display

The screen is a VGA (800x600) LCD (Liquid Crystal) color display that allows the host computer to send messages or instructions to the operator. Users touch the surface to select the different operating options of the MDT5 mobile software.

iii. GPS antenna

The GPS antenna is an active patch antenna. The GPS receiver sends 5 VDC to the antenna through the coaxial cable. Masts are required so that the antenna has an unrestricted view of the sky. For the GPS system, restricting the horizon will adversely affect the number of satellites the receiver is able to use to calculate a position. Also, obstructions can cause an issue known as multipath, which affects the accuracy of the GPS. It is therefore important to place antennas in good locations.

After an MDT is configured for a site, the touch screen provides an interface between the operator and Wenco's communications equipment. The MDT also interfaces with onboard OEM modules (if installed) to provide any or all of the following:

a) **Payload data**. A payload system is a third party system that a mine site may use to acquire more accurate information about the amount of material moved rather than using a default payload for each hauling unit type. Examples of payload systems are the Caterpillar TPMS (Truck Payload Monitoring System), and Komatsu PLM (Payload Monitoring)

b) **Vital signs**. A mine may use third party equipment to report on vital signs such as voltages, fuel readings, and digital inputs. An example of an OEM vital signs module is the Caterpillar VIMS (Vital Information Management System).

iv. Mobile Diagnostics Utility

The **Mobile Diagnostics Utility** (MDU) is a tool that allows technical staff to review diagnostic messages from Wenco MDT5 mobile units. The MDU has the following functions**:**

a) display a list of mobile units that are connected to the Wenco system.

b) allow the user to request specific diagnostic messages from a mobile unit. The types of diagnostics messages include GPS, HCM, HSM, RADIO, PLM, TPMS, URIG, and VIMS. A request may be repeated multiple times during a session.

c) monitor connections between the **Mobile Diagnostics Utility** and the mobile unit by sending a regular heartbeat message to the mobile units. If a mobile unit does not receive the heartbeat message, it stops sending out diagnostic messages. This is designed to limit network traffic: when the connection is lost, the mobile unit stops sending information.

It should be noted that as part of the diagnostics, on each MDT's process log, the MDT also writes the diagnostic messages it is sending to the Mobile Diagnostics Unit.

v. Radio Traffic Monitor (RTM)

The RTM monitors real-time radio traffic. RTM can also be used as an offline tool to allow the user to analyze historical radio traffic.

vi. Wenco Configuration Manager

The Wenco Configuration Manager application allows the Wenco system administrator to customize system parameters to meet the mine's requirements.

vii. **Wenco Control Center (WCC)**

WCC allows the Wenco system administrator to control and monitor Wenco services and database jobs from one location. It supports both the **Two Server Model** and the **Four Server Model**.

WencoDB Database

WencoDB database works together with Microsoft SQL Server to provide customized mine management support. The WencoDB database stores configuration and operating information for the mine. WencoDB database is installed on the Wenco server.

WencoDB Home

WencoDB Home is the client application that is used to work with the Wenco database. WencoDB Home can be installed anywhere on the network (on a client machine or on the Wenco server), as long as there is a working network connection to the database. Normally WencoDB Home is installed in the Dispatch Office, and on the Wenco System Administrator’s workstation. WencoDB Home provides utilities for reporting, database editing, and transaction record editing.

Wenco Reporting

Wenco Reporting is an online reporting application that consists of a series of dashboards, widgets, reports, and information about System Health. These enable various mine personnel to make the right operational decisions to improve mine production, productivity, and efficiency, as well as reduce maintenance and delay costs.

i. **Wenco Reporting – Dashboard**

A dashboard can be described as a summarized snapshot of various performance metrics. It provides quick and relevant information to the end user that can be obtained at a glance. Dashboards can include a variety of charts (e.g., bar, column, pie, scatter, etc.), as well as tables of summarized data.

ii. **Wenco Reporting – Reports**

Reports are useful documents that provide details on the operations of a mine. While dashboards only provide a snapshot summary of what goes on, reports add extra details for improved analysis capability. Wenco reports are created and rendered with SQL Server Reporting Service (SSRS). SSRS is a component of SQL Server that provides comprehensive reporting functionality for a variety of data sources to manage reports in a proper manner.

ii. **Wenco Reporting – System Health**

System Health enables the easy monitoring of various key indicators of system health, to assist with system administration. It displays a summary of the state of each server (including health information about Data Archiving, Database, Wenco Services, Wenco Queues, and Hardware), and information about the health of MDT5 units. It also allows the user to set up alerts for when resources go above or below specified levels, and configure what these levels are.

Wenco User Manager

The **Wenco User Manager** application is used to create user profiles for all Wenco system users and to define each user's Wenco program privileges.

Bench Manager is a high-precision GNSS equipment-tracking system that provides bench elevation monitoring and ore quality control for loading and grading units. Bench Manager uses onboard graphical real-time displays that show equipment orientation over the mine plan.

Map files, Dig Block Map files, and digital terrain model files (DTM) are sent to Bench Manager from the host computer system, and work performance data is returned from Bench Manager.

BenchView

BenchView connects office users to the roving Bench Manager units operating in the pit areas of the mine. As loading units work to complete a digging job, the BenchView application receives data from the Bench Manager units, and displays the information on the graphical map display. BenchView is in constant communication with Bench Manager units.

Maintenance Monitor

Maintenance Monitor allows users to access real-time information associated with equipment health, specifically in the areas of down equipment management, onboard-generated event management, and equipment vital sign parameters. **Maintenance Monitor** tracks the "critical path" of equipment from the initial “Down” status until the equipment is made operational again, allowing mine personnel to see the time and labor spent for each maintenance activity.

Mobile Software Distributor

i. Mobile Software Distributor Administrator (MSD Admin). This is installed on a client machine in the dispatch office and is used by a system administrator or dispatcher to track the versions of Wenco software installed on mobile units, and to schedule and apply software updates from the central office.
ii. Mobile Software Distributor Agent (MSD Agent). This is a stand-alone executable that is installed on each mobile unit. It communicates with MSD Admin, and also carries out the install or uninstall of the software updates.

Mobile Supervisor Terminal

Mobile Supervisor Terminal (MST) is a touch screen application that provides mobile access to real-time mine data via the MST XP. From the MST, mobile personnel can view and modify loading, hauling and auxiliary equipment information; view current events which have been generated; and view system-wide KPI data.

Categories of FMS

Lizotte (1987) has provided descriptions of the different FMS categories including manual, semi-automated, and fully automated dispatching. The details of each of these categories are as follows.

Manual FMS

Manual FMS assigns trucks to shovels for every shift based on production requirements, fleet availability, shovel location, and ore blending goals. Typically, the assignment is fixed (locked); this implies that a truck is assigned to a shovel or dump destination during the whole shift, unless a modification in the production plan requires changing this setting. The FMS supervisor can visually follow the truck position, observing a real time display, and can reassign destinations after each travel if necessary.

Semi-automated FMS

Preprogrammed optimization algorithms help the FMS supervisor to recommend the most adequate truck allocation to meet production goals. Some authors affirm this semi-automated FMS is a passive system because it only records information and recommends an optimal system. (Swain et al.., 1979)Lizotte (1987) recommends changing this system to fully automatic, because it does not work efficiently in real time with a fleet of 9 shovels and 44 trucks as it occurs in Bougainville Copper, Ltd.

Fully automated dispatching FMS

Fully automated dispatching FMS sends and receives information from drivers using display panels, trucks, or located tactical points in the operation. Fully automated dispatching is able to record the performance and management of truck routes for a smooth shift change. The reduces expenses and improves user experience because it automatically accepts customer requests via telephone and the Web, without operator action. However, a fully automated system requires a high capital expenditure, ranging from $0.5 M to $3.6 M(Lizotte, 1987).

2.1.1 Examples of FMS

JigSaw360™

JIgSaw360 is a fleet management and production optimization system which minimizes dead times, maximizes performances and provides production data and real time positing based on GPS technology and a combination of movable and fixed stations that offer a network of high precision positioning of mine equipment.

Dispatch®

Dispatch is a fleet management solution developed by Modular Mining Systems, Inc. for underground and surface mines. It manages a diversity of mine processes in the operation which are: haul truck dispatching, crew rotation, and optimizing the designation of equipment in real time. The system uses accumulated data to anticipate and suggest actions to optimize productivity.

Pitram®

Pitram is a software tool developed by Micromine which is based on recording real-time events, utilizing the collected data for providing a mapped representation of people and equipment in the mine operation, displaying the location and status in specially designed Fleet Management screens. This information permits supervisors to reallocate resources and make production adjustments in order to accomplish production goals.

Wenco®

The Wenco system is a comprehensive suite of mine management hardware and software that maximises productivity, and allows you to stay on top of events in your mine at all times. Using the Wenco system, you can monitor and control dispatching of mine equipment, the grading of material, and analysis of production. A typical mine site includes the components shown in Figure 2.2.

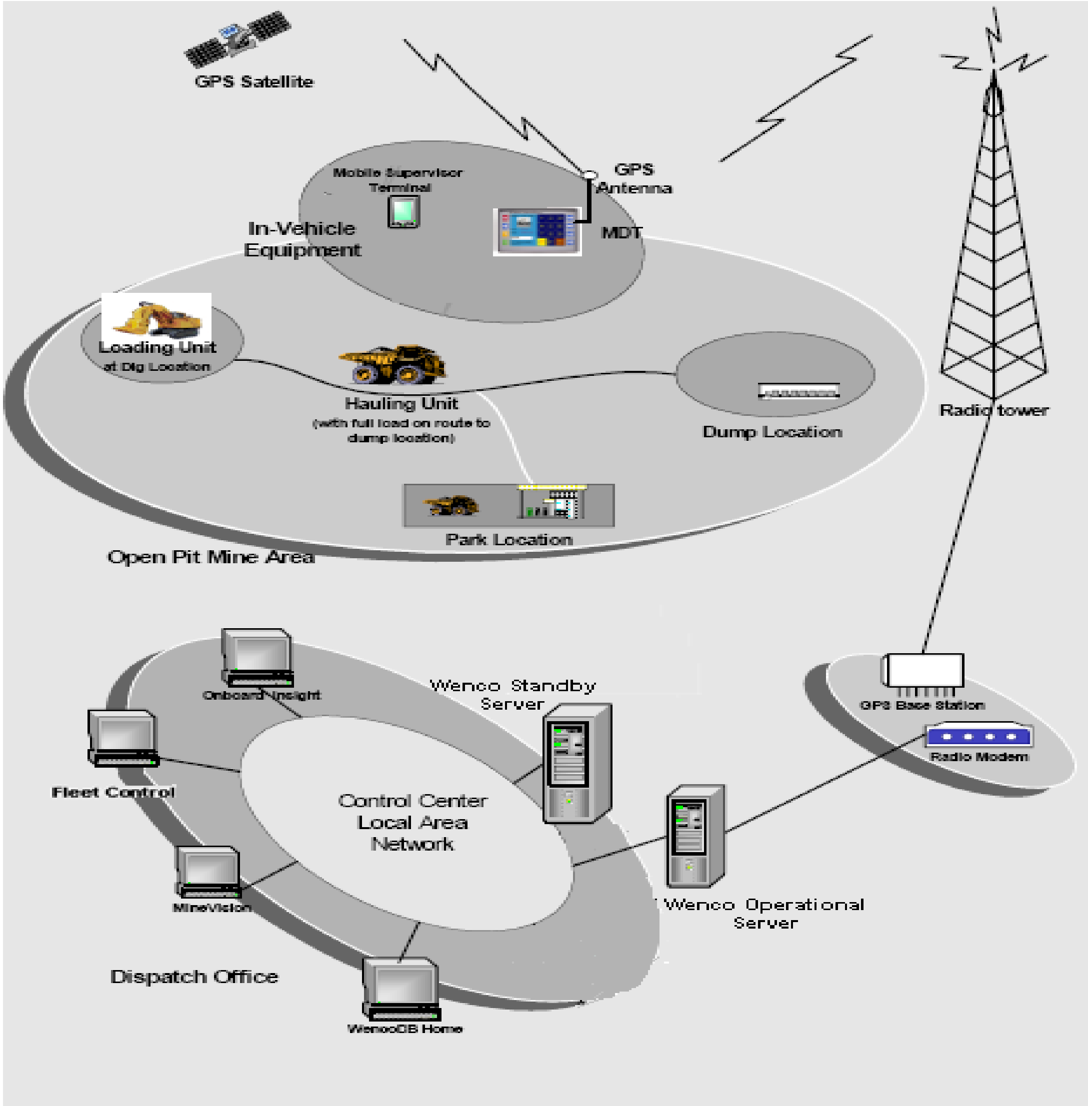


Figure 2. 2 Typical mine Site layout for monitoring and control of mine equipment, grading of material, and analysis of production (Reference???)

The Wenco system features include fleet management, automatic dispatching, blend and stockpile management, automatic data collection, reporting, hardware and software, dispatch office computers, in-vehicle computers, and communication equipment.

a) Fleet management

A real-time mine map shows the position of equipment at all times identifying areas of congestion, waiting hauling units, and waiting loading units. The foreman or supervisors can take immediate action to redistribute the equipment, and minimize lost production.

b) Automatic dispatching

Wenco's Automatic Dispatching allows for better utilization of equipment, resulting in greater productivity. Automatic Dispatching determines which loading unit a hauling unit should go to, based on other recent hauling unit assignments, loading unit status, loading unit loading times and travel times to the loading units.

The dispatching algorithm maximizes production while meeting operational constraints by continuously analyzing the number of required hauling units, and indicating to the dispatcher whether an over-trucked or under-trucked situation is present.

To assist with the best hauling / loading unit balance, the system continuously displays the optimum number of hauling units required for each loading unit. If the loading units have been placed into a dispatch group, the system displays the number of hauling units required for the group. These numbers are dynamically updated to reflect the "minute-to-minute" mining conditions.

c) Blend and stockpile management

Based on quality parameters from the mine plan or laboratory analysis, the system can determine which material has been taken to the crusher or deposited on the stockpiles; or even an area within a stockpile. The system maintains and displays the real time ore grade average for each dump location upto 10 quality parameters. The figures are adjusted with each load dumped or load removed. Hauling Units can be dispatched automatically to meet grade range targets

.

d) Automated data collection

The system automatically collects details about daily operations, eliminating the need to rely on records created manually. Most manual records were done in Modular.

e) Reporting

The Wenco system automatically collects details about daily operations. Wenco's built in reports, or created custom reports can be used to report on all aspects of a mine's activity and production. These activities include, current mine topography, loading times, travel distance time, hung time etc.

f) Hardware and Software

The Wenco system is includes both hardware and software components as highlighted in figure 2.2. below is the list of these hardware and software components.

1. **Dispatch Office Computers:**
2. Two Microsoft Windows servers
3. Workstations
4. **In Vehicle computers**

In-vehicle computers consist of MDTs (Mobile Data Terminals) such as the Octagon RMB-C2. The specific communications equipment required depends on the mine's requirements. Communication equipment may include GPS and Radio Antennas, GPS Base Station, Radio Modems, Repeaters and Wireless Network Communications such as Motorola MESHA. The Wenco System Software Components include Microsoft SQL Server, Wenco applications (for example: Fleet Control, MineVision, TireMax), and Wenco services to provide connections between Wenco applications and the real-time system.

2.1.2 Truck Cycle Time Prediction Models

Nowadays, there are several methods that predict truck cycle times, which are accepted by current mining(Doig, 2013). These methods include computer simulation, multiple regressions, and Artificial Neural Networks.

Computer Simulation

a. Talpac© (Runge Software)

Talpac® is a simulation and evaluation software of mining equipment in haulage based in a Monte Carlo-type simulation that determines the truck/loader productivities in bank cubic meters (BCM) per hour. The initial parameters to start the haulage simulation are the bucket capacity of the shovel, and both load and haul units, the power ratings, and capital and operating costs. The road parameters (length, slope, rolling resistance) also have to be defined(Chanda, 2010). With these parameters, the simulation is executed. Results of productivity in the same period of time can be compared, along with travel time, loading and waiting times, fuel use, wear, average operating costs, and other costs to explore different network scenarios, make changes in ramp levels, road surfaces and other features(Finning LTD, 2014).To generate a simulated haulage system,Talpac® uses scholastic variables that describe the haulage environments, which include Truck Travel Time, Truck Dumping Time, Truck Availability, Loader Cycle Time, and Loader Bucket Load.

b. Caterpillar FPC

Fleet Production and Cost Analysis (FPC) is a computer tool developed by Caterpillar to estimate cost, productivity, time required for a variety of earthmoving or other material handling fleet, to move and transport ore/waste from one place to another through one or more ways. FPC is widely used as a method for establishing the requirements of the fleet of a customer. FPC is used as an input to Equipment Investment Analysis (EIA),(Krause, 2006).The tool predicts long-term productivity; time needed to remove the material, the amount of equipment to complete the job and costs associated. This tool can compare different fleets, estimate production, and generate an operating budget. In this instance, FPC can be applied to improve truck-loader matching (Gove, 1994). Input factors for FPC(Finning LTD, 2014) include Site speed limits, Haul road condition - Gradients/Rolling resistance/distances, Waiting times, Machine - Availability/Bucket Fill Factor/Cycle times, Site – Material Density, Required Volumes, and Operator Efficiency.

(Krause, 2006) describes the FPC process as shown in Figure 2.3. The simulation begins by selecting the machine characteristics from Caterpillar equipment (database seller), and other input specifications from manufacturer’s handbooks, or assumed equipment features. The system requires further haul road characteristics, material specifications, production hour distributions, and costing components. Maintenance and repair cost values can be entered in the tools as well. The objective is to calculate the cash flow based on the best selection of equipment. Input values for FPC are programmed inside the EIA and consider discount rates, insurance rates, and other financial parameters.

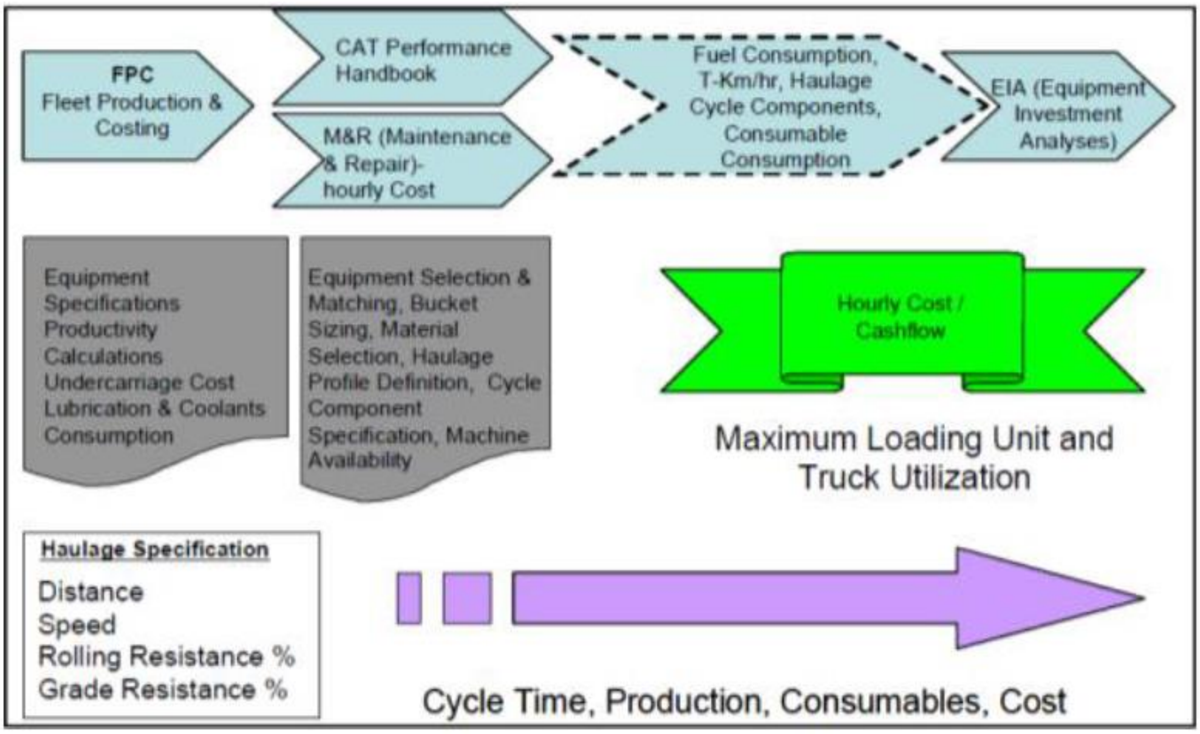


Figure 2. 3 FPC and EIA simulation process (Krause, 2006).

Fleet matching involves the proportion between trucks and shovels based on the cycle times (Gove, 1994). Equation 1 shows the Fleet Match calculation.

$$\text{Fleet Match} = \text{loader cycle time} * \text{Number of trucks/Truck Cycle Time} \qquad (1)$$

FPC gives the relation between cost and production to managers, and simulates choices about truck-loader matching to maintain adequate levels of production, and cost in the mining operations.

c. Arena® (Rockwell Software)

Arena® is a simulation software that helps measuring, predicting and testing whether a schema or the layout/equipment configuration is proficient, functional, and optimum with the application of a Monte Carlo-type simulation procedure. This tool is utilized to simulate mining activities such as the mine haulage system that reflects how the equipment works in an open pit operation.

Arena® uses visual representations of trucks and loaders as entities. while assimilation process is running. This allows the visualization of the simulation process that can be used in scenario analysis in comparison with other scenarios. It works with different types of building blocks that may represent trucks, shovels, crushers, waste dump location, and dynamic processes such as loading, traveling and dumping. Highly accurate results are obtained with graphical representations to support project goals. In addition, the functionality of the software allows analyzing cycle times because the probability distribution based on field data is shaped to scholastic variables. Arena® is able to record and track every activity of cycle times per truck during the simulation to study the impact of this cycle in production and performance(Krause, 2006).

Multiple Regression

Multiple Regression is a statistical method for finding the values of a dependent variable by its relation to a set of independent variables. The independent variables comprise a factor that symbolizes the impact of the dependent variable. This factor is called the coefficient of variation, creating a formula based on the data where the values of the variables are known (Chanda, 2010).

Artificial Neural Networks

The principle of artificial neural networks is based on the human brain in which hundreds of millions of neurons interact putting their contributions (weights) to get the best and fastest way of results. This concept is used to predict the transport cycle time from the combination of input variables(Chanda, 2010).

2.2 Modeling

Mining operations are studied by experimentation. Simulations are used to represent real life operations in a model. This enables to test different scenarios and their results can be analyzed for decision-making.(Kelton et al.., 2007)Simulation refers to a broad collection of methods and applications to mimic the behavior of real systems, usually on a computer with appropriate software. With the enhanced calculation capacity of digital computers, it is possible to simulate complex operations in open pit mines. This has great potential for allowing research, analysis and comparison of extraction systems in an accurate way, quickly and at low cost(Touwen et al, 1972). Touwens work is used to generate data for a copper open pit mine. Ataeepour (1999) proposed to optimize the production process, taking for the first time the decreasing wait time of trucks to be loaded for an available shovel. This resulted in improved production and equipment utilization. The algorithm calculates the time it takes for trucks from the moment they are loaded to return for a new load, the free time that shovels have while waiting for a truck, and the waiting time of a truck to be loaded. After running the algorithm, it was observed that as the number of trucks increased, also did the productivity of the shovels; but consequently the waiting time of the trucks became greater. To obtain equilibrium between the numbers of units and the productivity expected, operators and managers can analyze alternatives produced by the simulator. This helps dispatchers send the trucks to shovels that have the shortest waiting time. A practical assumption is to consider that all equipment units are equal, i.e. same model, capacity, utilization, etc.

To test the efficiency of haulage and transportation processes, it is possible to use simulation software to recreate different configurations and scenarios, identifying variables that need to be adjusted. In conducting this simulation, different algorithms are used.(Tan et al.., 2012) For example Tan et al. (2012) presents an algorithm to determine the best allocation of trucks to meet a particular grade with a stable production.

As-Is Model

Models are important to estimate how the nature of operations in open pit mining will be, understanding the operation, identifying problems and looking for the solutions. For Business Process Improvement (BPI), an As-Is model is a prerequisite to understand how processes are executed in the current system. Unlike most object-oriented design models, where for development, several technical aspects are considered, an As-Is model acts as a bench mark for analysts and a significant starting model for understanding and for the improvement of business processes (Lodhi et al.., 2010). The As-Is model is relevant to the present research because it allows to understand how the open pit works, representing in a simplified way, the operation of the mine, analyzing the results and identifying the potential bottlenecks (Tan et al.., 2012).

To-Be Model

The To-Be model is the result after incorporating the improvements found on the As-Is model. The To-Be model has the same structure of an As-Is model, therefore any adjustment can be applied directly without major modifications to the original configuration (Tan et al.., 2012).The application of the As-Is and To-Be modeling is currently part of the simulation of operations in open pit mining. Tan et al. (2012) used the As-Is and To-Be models in simulations for operations management support in an open pit in Mongolia. They used real GPS tracking data from the mine and presented three models for production optimization. First, they created the As-Is model to evaluate the current state of operations. Then, the To-Be model was built in order to propose an improvement based on the results and evaluation of the As-Is model. Finally, the maximum rate of extraction of the mine is calculated. In this case, the percentage of utilization of the shovel increased, whereas truck utilization was decreased. Any improvement is based on the previous evaluation; if there is no good basis, the process optimization will not be conclusive. The optimal number of trucks required to maintain the optimal production levels is identified, thus adjusting the To-Be model with the applied changes.

2.2.1 Queue Theory

May (2012) applied queuing theory to explain an open pit operation. The functionality of this theory reflects how haulage works in an open pit operation. This theory is to develop a model where customers arrive to a server in order to be served., If not treated immediately, the customers go to another server to receive the attention or leave the system. Applying to the case of mining, trucks are the customers and shovels are the servers. Empty trucks arrive to the loading area expecting to be served with ore or waste. If they are not loaded, they move to the next available shovel that can load them. Otherwise, they will be referred to another place. To maintain order until the arrival of the trucks, the following terms are defined:

- FCFS: First come, first served;
- FIFO: First in, first out;
- LCFS: Last come, first served;
- RSS: Random selection of service;
- PR: Priority; and
- SIRO: Service in random order.

In mining, four routes are defined, whose basic components are: loading, loaded travel time, dumping of materials, and unloaded travel time that is repeated every shift. A typical queuing system with a load and haul operation is shown in Figure 2.4, where trucks are coming to an available shovel to be loaded into FIFO mode. When the truck is loaded, it goes to the crusher and the cycle repeats.

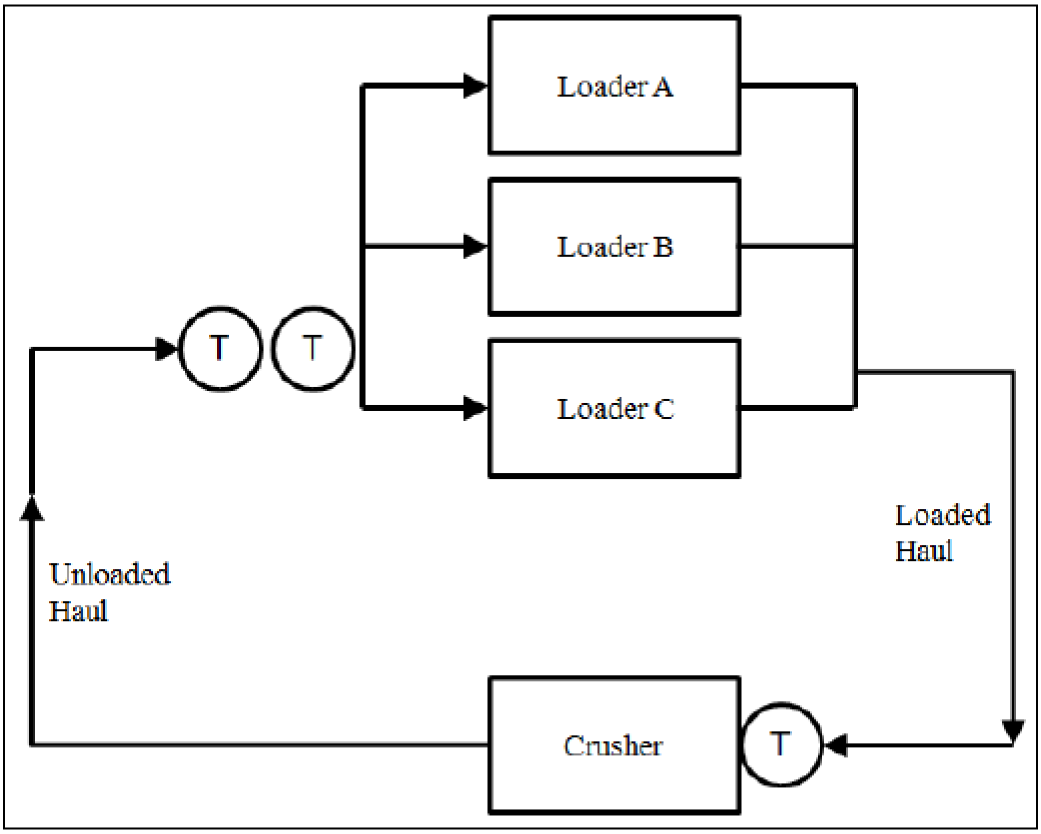


Figure 2. 4: Cyclic queuing system with parallel loaders (May, 2012).

2.2.2 Cycle Time

Cycle Time is defined as the time spent by any equipment to complete one cycle of operation. For a truck, cycle time includes the time to spot and load, travel to the dumpsite; maneuver, spotting, dump and drive back to the loading point, also predictable delays, unpredictable and wait times are all included in the cycle (Lineberry G T, 1985).Storage of loading times, travel time, queues and unloading times in a database are required to define the sequence of operation with the theories presented. Ercelebi (2009) based the theories on the proper calculation of trucks per shovel with the aim of decreasing the cost of material movement. Finally, different equations are presented whose parameters should be extracted from a database. Equation 2 shows the components of a typical cycle time in an open pit mine.

Cycle time = load time + dump time + queuing time at the shovel

+ Queuing time at the dump + loaded haul time + empty haul time.

(2)

Nel et al. (2011) presented a structure of a time model where the different time components relate among themselves. Figure 2.5 helps to better understand how this time structure is compounded.

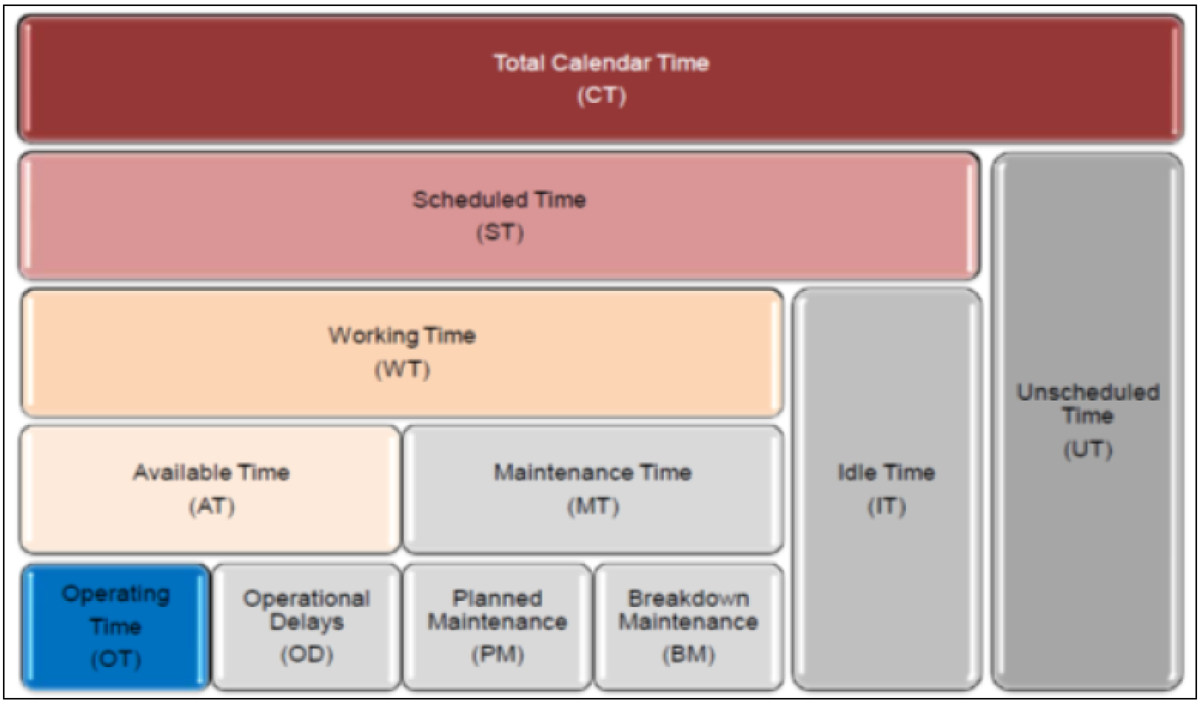


Figure 2. 5Typical time usage model (Nel et al., 2011).

Standard time definitions of this model are the following:

CT: Calendar Time represents the total available time;

ST: Scheduled Time represents the time during which an item is scheduled to perform its required production function;

UT: Unscheduled Time represents the time during which an item is not scheduled to perform its required production function;

WT: Working Time represents the scheduled timeless idle time;

IT: Idle Time represents the time during which equipment is available but not utilized due to internal and external factors;

AT: Available Time represents the working timeless maintenance time;

MT: Maintenance Time represents the time allocated for equipment maintenance;

OT: Operating Time represents the time during which an item is performing its required production function;

OD: Operating Time represents the time when equipment is operating but not in a productive mode;

PM: Planned Maintenance represents the scheduled component of maintenance time; and

BM: Breakdown maintenance represents the unscheduled component of maintenance time.

2.2.3 Standard Time Nomenclature at Kansanshi Mining Plc

The recording and reporting of time for equipment performance measurement is conducted in accordance with the model defined below.

FQMO - TIME CATEGORY							
SCHEDULED HOUR (SH)							
Available Time				Down Time			Excluded
Operating Hour (OT)		Operating Delay (OD)		Maintenance Hour (MD)			
Ready (PT)	Work Delay (WD)	Production Delay (PD)	Standby (SB)	Break Down (BD)	Planned Maint (PM)	Other Down (DN)	Exclude
TC 01	TC 02		TC 03	TC 04	TC 05	TC 06	TC 07
PRODUCTION DAYWORK REHANDLING ROM FEED TOP LOADING TROLLEY SYSTEM PRE-SPLIT BOULDER SAMPLE RE-DRILL WALL CONTROL EXTRA HOLES PROD WITH PANTO FAULT	FLOOR CLEAN-UP CHOP NON PRODUCTION DRILL ROD STUCK TRAMMING WAITING ON OTHERS BOGGED WAIT TO DUMP ROAD CLOSED REPOSITIONING WATER TOP UP CHANGE CONSUMABLES WAIT FOR SHOVEL CRUSHER BIN FULL PRESPLIT SETUP PAN SCRATCH NON-PRODUCTION DAYWORK	REFUELING BLASTING FLOOR CLEAN-UP CABLE MOVEMENT GOING TO TOILET SHORT SERVICE TRAMMING WAITING ON OTHERS SHIFTCHANGE REFILLING DUST NO BLOCK WAIT TO DUMP ROAD CLOSED REPOSITIONING WATER TOP UP CONSUMABLES WAIT FOR SHOVEL OPERATOR FATIGUE FATIGUE BREAK CRUSHER BIN FULL EMERGENCY CALL WAITING FOR TRUCKS PRESPLIT SETUP	NO OPERATOR NOT REQUIRED RELEASE BY WORKSHOP NO TRUCK CRUSHER PLANT DOWN DIGGER DOWN WEATHER NO DIGGING AREA NO SUPPORT EQUIPMENT MEETING CONSUMABLES WAITING FOR CONSUMABLES CRUSHER STANDBY RAIN CLEAN-UPS OPERATOR FATIGUE LOW FUEL WAITING FOR FUEL INCIDENT INVESTIGATIONS POWER FAILURE INDUSTRIAL ACTION SITE ABUSE NO DRILLING AREA WAITING FOR LOWBED NO WATER WAITING FOR WATER DRILL BOGGED PARKED UP CHOP CABLE MOVEMENT SHORT SERVICE WAITING ON OTHERS BOGGED OPERATOR FATIGUE EMERGENCY CALL	ENGINE AIR SYSTEM BRAKES ELECTRICAL GET HYDRAULICS STEERING STRUCTURAL DRIVE TRAIN WORK EQUIPMENT UNDERCARRIAGE SUSPENSIONS LUBES CRUSHER DOWN MECHANICAL FIRE SUPPRESSION SYSTEM DRILL SYSTEMS MAST REWORKS	PM SERVICES	INDUSTRIAL ACTION ACCIDENT DAMAGE COMMUNICATION TYRES NOT COMMISSIONED SITE ABUSE WAITING FOR WASHING MODIFICATION CHANGE OUT OPERATOR ABUSE OPERATIONAL DAMAGE INCIDENT INVESTIGATIONS TRIDENT PARKED UP MODIFICATION CHANGE OUT POWER FAILURE	

Operating Hour (OT) :
PT + WD

Operating Delay (OD) :
PD + SB

Maintenance Hour (MD) :
BD + PM + DN

PHYSICAL AVAILABILITY (PA) :
(OT + OD) / SH * 100

UTILIZATION (UT) :
OT / (OT + OD) * 100

USE OF AVAILABILITY (UOA) :
PT / OT * 100

MAINTENANCE AVAILABILITY (MA) :
OT + OD + DN) / SH * 100

Figure 2. 6 Mining time categories at Kansanshi Mining Plc (Courtesy of FQMO)

2.2.3.1 Definitions

Scheduled Hour (SH)

Scheduled Hours is the total time over which the period is being measured (e.g. one year = 365 days or 8,760 hours; one week = 7 days or 168 hours). Scheduled hour is utilized in the calculation of Annual Use (Operating Time / Calendar Time) to indicate overall asset utilization. This time includes Available Time, Down Time and Exclude.

Available Time

Available Time is the period equipment or a process is resourced from maintenance, and is capable of working, or the total time that equipment is mechanically capable of production. Delays occurring during the Working Time are directly related to the equipment or process being monitored, and hence performance of that equipment or process. Analysis against Available Time enables performance of individual systems, equipment or processes to be compared within an operation or across a group of operations. This would exclude any time the equipment is not physically available, or when the equipment is not being scheduled to be used.

Down Time

Down Time is the period when equipment is not available to operate, and this is a function of Break Down (Unplanned Maintenance), Planned Maintenance (PM) and Other Down (time). Within this category the equipment cannot be used and is therefore unavailable for use.

Exclude Time

Exclude Time is the period equipment is not scheduled to operate. The machine might be required to be maintained, but will not impact on availability or utilisation calculations.

Ready (Operating Time)

Operating time is the period during which the equipment performs the primary assigned task. This represents a portion of production time when ore or waste is being produced, and is generating value for the operations.

Operating Standby and Production Delays

Operating Standby represents the durations that cause disturbances to the production cycle and are typically outside the control of the production cycle (Table 2.1). These are typically long duration events that result in the machine completely being turned off, and not operated in any manner.

Production Delays represent delay durations that occur due to the production sequence, and are typically short duration events less than 30 minutes. For example, replacement/replenishment of mining consumables, or fuelling. Delay and Standby as a function is the most efficient time category for optimising through Dispatch.

Table 2. 1: Operating Standby and Production Delays

Waiting for equipment or system	Typically, where a piece of equipment is non-productive due to the other system components being temporarily unavailable or committed to another equipment or process e.g. Under trucked/ over trucked
No Digging/ Drilling Area	This is when equipment is non- productive due to upstream process. This should be addressed through critical planning process
Refuel / Replenishment / Inspection	Typically refuelling of equipment, replenishment of process consumables (drill bits, excavator teeth), inspections and checks, including pre shift.
Blocked / stuck	Would include equipment bogged down, blocked crushers, chutes and pipes, overloaded, etc. The cleaning of carry back would be included here.
No Operator	Typically, when a piece of equipment is not in use due to the lack of an operator or when an operators fatigue reaches level 3.

Substandard operating conditions	Typically, where production is halted due to inclement weather, or to rectify poor conditions i.e. loading or dumping areas, dozing and grading, cleaning of spillage, pumping of water, e.t.c.

Maintenance Hours (Time)

Maintenance down time is when equipment is unable to be directed towards production due to maintaining functionality for a short term and as well over long term either Planned Maintenance or Unplanned Maintenance. The exception to this is Operational Accident Damage and Zesco Power Outages (Capacity Loss) or any High Voltage infrastructure down time which are categorised as **other down**.

Planned Maintenance

Planned Maintenance (Table 2.2) is the period equipment is stopped according to a pre-defined plan to perform a routine service, maintenance task, or change a component according to an approved maintenance schedule prior to commencement of the schedule time frame.

Table 2. 2 Activities in Planned Maintenance

PM Services	Generally, any maintenance work Orders on equipment that have been identified, planned and included on an approved maintenance schedule
Scheduled component replacement	The replacement of rotable spares or major componentry where the component is removed, and a replacement component is installed according to an approved replacement schedule. This would include motors, engines, gearboxes, tyres, pumps, screen,s etc.

Unplanned Maintenance

Unplanned Maintenance is the period a process or equipment is stopped or is unable to operate due to a functional breakdown as shown in Table 2.3. This is normally preceded by equipment failure.

Table 2. 3: Activities in unplanned maintenance

Fault finding/Tripped /diagnostic	Generally, unplanned downtime of short duration that does not require spares to correct. This would include re-setting of trips, fault finding, adjustment, adding of fluids, pressure adjustment, testing, etc.
Unplanned Repairs and Corrective Work	Generally, downtime required to correct a failure, leaks, or sub-standard performance that requires materials and spares but does not extend to replacing the component in its entirety. This would include structural repair work, piping, wear parts replacement, cabling, welding, machine guarding etc.
Unplanned Component replacement	The replacement of rotable spares or major componentry after an unplanned failure. This would include motors, engines, gearboxes, earth moving tyres, pumps, screens etc.

Other Down

"Other Down" is when equipment or a process is down for reasons not related to maintenance functionality (i.e. unplanned or planned maintenance), or due to management decisions. This includes Modifications, Operational/Accident damage, and Capacity Loss and Power failure. **Operational damage** is when the equipment is unavailable to operate due to damage caused by operator negligence or misjudgement while **Accident damage** is when equipment was unavailable to operate due to damage caused by component failure or other maintenance related damages determined and agreed based off safety investigation outcome.

Capacity Loss is the period of time that the equipment is unavailable to operate due to insufficient power being supplied to the mining operations site. **Power failure** is the period of time that the equipment or asset is unavailable to operate due to electrical failure, or trip where the source of the fault is not on the equipment, but rather an external fault such as cables, substation, or power line

2.2.4 Key Performance Indicators

Recording and reporting of performance was completed in accordance with the measures set out below. These KPI's (Table 2.4) typically include Annual Use (AU), Availability (A), Mechanical Availability (MA), Utilisation (UA), Mean Time between Failure (MTBF), Mean Time to Repair (MTTR_BD), Mean Time to Repair (MTTR_SD), Planned/ Unplanned Ratio, Productivity.

Table 2 4: Key Performance Indicators

Key Performance Indicator	**Definition**	**Description**
Annual Use (AU)	(Operating Time) / (Scheduled Time)	Provides an indication of total asset utilisation and schedule efficiency
Availability (A)	(Available Time) / (Scheduled Time-Exclude Time)	Provides an indication of how often the equipment or system was made available to operate
Mechanical Availability (MA)	(total time – Mechanical – PM - exclude)/(total time – excluded)	Provides an indication of how often the equipment or system was made available to operate exclusive of aspects out of maintenances control
Utilisation (UA)	(Operating Time) / (Available Time)	Provides an indication of the efficiency of the process when resources are allocated and the system is available to operate
Mean Time Between Failure (MTBF)	(Operating Time) / (# Maintenance Delays)	Provides an indication of the reliability of the equipment
Mean Time To Repair (MTTR_BD)	Mechanical down/BD	Average time to fix breakdowns excluding other down and PM
Mean Time to Repair (MTTR_SD)	(Mechanical down + PM + other down)/SD	All maintenance time divided by total shutdowns
Mean time between shutdown (MTBS)	(Operating hours + operational delay + production delay)/ SD	All Operational time divided by total shutdowns
Planned / Unplanned ratio	(Planned Maintenance)/ (Maintenance Time)	Provides an indication of the effectiveness of the maintenance effort

Productivity	(Output) / (Operating Time (in hours))	Provides an indication of the productivity of the equipment or system when it is operating

Generally, corrective maintenance that can be deferred and planned for completion during a normal non-productive period can be recorded as Planned Maintenance. A notification period needs to be honoured in order for equipment to be classified as planned.

An open-pit truck-shovel system is characterised by a complex haulage system. According to Temeng (1997) the features of a truck-shovel haulage system are as follows:

1. The varying topography of a pit and the associated network of haul routes affect Truck cycle times. The route length, grade and rolling resistance, route condition, Traffic infrastructure, speed limits, traffic conditions, and the truck performance all influence the travelling time along a haul route. The traffic network associated with the haulage system may also take trucks to different destinations for different tasks.
2. The varying status of the operating equipment influences the system performance. The breakdowns of shovels, trucks, ore crushers or waste dumps, including scheduled and unscheduled breakdowns, further result in various delays in the system.
3. The capacities of shovels, ore crushers and waste dumps limit the maximum numbers of trucks being allocated. Delays are caused when extra trucks are allocated to these loading sites and/or dumping sites.
4. The ore quality management requires the truck-allocation to take into account the loading sites with varied ore quality attributes.

2.2.5 Truck-allocation models

For a truck-shovel system in an open-pit mine, the truck haulage costs have been reported to exceed half of the total direct operating costs (Lizotte, 1987). Although efforts have been made in the past to reduce haulage costs by improving the capacity and operating performance of the mining equipment, the same cost reduction can be attained by more efficient utilisation of the haulage system (Ataeepour, 1999). In general, the efficient utilisation of the truck-shovel system is limited by the waiting times of both trucks and shovels, and other variable delays in the system. The waiting times of trucks increase when the system is over-trucked, and the idle time for shovels increase when the haulage system is under-trucked. Some segments of the haul roads may be blocked due to various variable delays, such as haulage road maintenance. How trucks respond to the change of system states (e.g., shovel's state, queue length and route blockage) influences the productivity and efficiency of the system. Truck dispatching strategies have been applied to improve productivity and/or reduce operating costs by considering alternative truck-shovel assignments in real time to increase utilisation of system resources. By allocating the optimal number of trucks to shovels, the waiting times of trucks in an over-trucked system as well as the idle times for shovels in an under trucked system can be minimised (Ataeepour, 1999). Further, by rerouting trucks when traffic congestion occurs, costs associated with variable delays can be minimised (Jaoua et al.., 2012b).

A truck dispatching system is an interactive system used by the fleet controller to find the most appropriate destination for a truck so as to meet the production rate. The primary objective of the truck dispatching system is to achieve efficient utilisation of the available truck resources by careful consideration of truck-shovel assignment alternatives and determination of assignment decisions in real time. The truck dispatching systems evolved from manual dispatching systems to semi-automated dispatching systems in the early 1970s. A manual dispatching system depends on the judgment of a dispatcher who keeps track of the status of the various resources visually and/or through radio communications. In semi-automated dispatching systems, the status of all trucks and shovels are recorded and truck assignments are suggested by minicomputers with the dispatcher still in control and manually making assignments. Since the late 1970's, fully-automated computer based dispatching systems have been applied to directly assign trucks to tasks solely based on computer algorithms. With modern truck dispatching systems, the term "dispatching" consists of two basic components: the first component is the data communications between trucks hauling in a mine site and a central computer; the second component is the computer program that generates truck assignments based on the information gained through the data communications. In this thesis, only the applications relating to truck assignments are considered; a truck assignment model developed does not include the field data communications. The term "dispatching" that appeared in the literature, such as "dispatching strategies" or "dispatching points", is used in this research only in terms of truck assignments/allocations.

According to (Alarie, 2002), Alarie (2002) the main forms of truck-allocation are the single stage and multistage systems. The single stage approach assigns trucks to shovels according to one or several heuristic rules, such as "minimising truck waiting time" and "minimising shovel idle time", without taking into account the specific production targets or constraints, hence a heuristic rule-driven system. The multistage approach, on the other hand, consists of several stages or sub-problems (Afrapoli, 2017), which can be usually reduced to an upper stage (a production optimisation problem) and a lower stage (a real-time dispatching problem). The upper stage aims to set production targets for every shovel according to specific operational constraints, while the lower stage assigns trucks to shovels to minimise the deviation from the production targets set by the upper stage.

2.2.6 Single stage approaches

The single stage truck dispatching strategy assigns trucks to shovels based on one or several criteria without considering any specific production targets or constraints. They are usually heuristic methods based on rules of thumb (Alarie, 2002).

Some heuristic rules for truck dispatching are listed as follows:

1. **Fixed truck assignment** (Lizotte, 1987)**.** Each truck is assigned to a shovel in a fixed manner. This strategy can serve as a baseline by which to measure the effectiveness of other dispatching strategies. Minimising truck-waiting time has been used by Kolonja et al., (1993). By minimising the difference between the shovel-ready-time and the truckready-time, the truck is assigned to the shovel that is expected to provide the least possible waiting time for the truck. The shovel-ready-time includes the expected loading time for the truck being loaded, the expected queuing time for all the waiting trucks in the queue, and the expected travelling time for the hauling truck. The truck-ready-time represents the expected arrival time for the hauling truck. This strategy may lead to underutilisation of shovels located far from the location of the truck, making it difficult to fulfill the operational targets.
2. **Minimising shovel waiting time** (Kolonja et al.., 1993) **and** (Lizotte, 1987)**.** By maximising the difference between the shovel-ready-time and the truckready- time, the truck is assigned to the shovel that has been waiting the longest. In this case, some trucks may be assigned to the shovel located the furthest, which has waited the longest, even though there is an idle shovel nearby.
3. **Maximising truck momentary productivity** (Kolonja et al.., 1993)**.** Truck momentary productivity is defined as the ratio between truck capacity and truck cycle time. In the case of the trucks with homogeneous capacity, minimising truck cycle time results in the maximum truck momentary productivity. The truck assigned to a shovel that is nearby may have a lesser cycle time, thus greater truck momentary productivity. This strategy may lead to undesirable queues at the nearby shovels (Munirathinam, 1994).

4. **Minimising shovel saturation** (Kolonja et al.., 1993) The degree of shovel saturation is defined as the ratio of the actual number of trucks that have been assigned to the shovel compared to the desired number. The desired number is given by the ratio of the average travelling time compared to the average loading time. A truck should be assigned to a shovel with the least degree of saturation.

2.2.7 Comments on single stage approaches

The rules aimed at minimising shovel idle times have been reported to perform better than minimising truck waiting times in an under-trucked system (Ataeepour, 1999). However, in an over-trucked system, the rules based on minimising truck waiting times work better than minimising shovel idle times. In general, the above dispatching criteria, except for the fixed truck assignment, all have potential to increase the productivity, but no single criterion can dominate all others (Munirathinam, 1994). According to Munirathinam (1994), the single stage dispatching methods based on heuristic rules are easy to implement since much computation is avoided when making dispatching decisions. The heuristic rules may serve as a better basis for a very large and complex mining operation. However, there are two major disadvantages of the above five single stage dispatching methods:

I. The single stage dispatching rules based on heuristic rules are applied to one truck- at-a-time. The current and further dispatching decisions are not made collectively. When a truck is ready to be assigned to a shovel or route, according to the one-truck-at-a-time dispatching method, the destination is determined without considering future assignments of trucks. The possible assignments of these trucks are ignored when the dispatching decision for the current truck is made. Referring to Figure 2.7, suppose travelling time between Shovel 1 and Dump 1 is 5 minutes, that between Shovel 1 and Dump 2 is 6 minutes, and Shovel 1 is the neediest shovel at present.

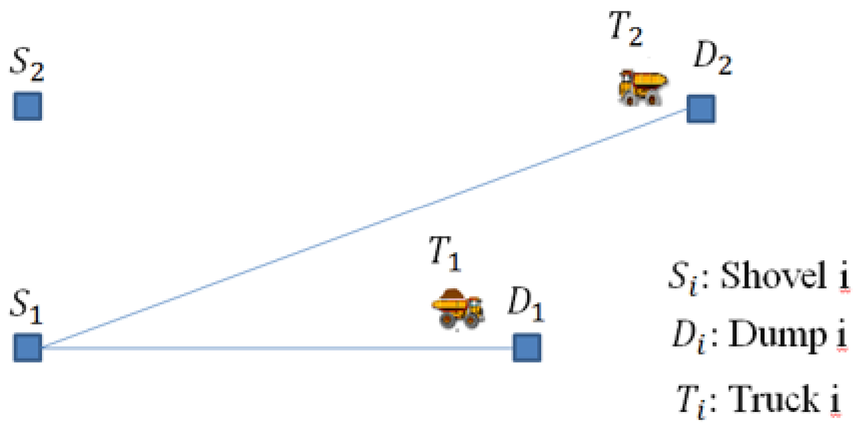


Figure 2. 7: dispatching trucks collectively

Truck 2 has just completed dumping at Dump 2 and is ready to be dispatched, and Truck 1 will complete dumping in 30 seconds. If Truck 2 is dispatched without considering Truck 1, Shovel 1 would be the destination for Truck 2, and Truck 2 would supposedly get loaded in 6 minutes without any delay. However, if Truck 1 is considered, then it is clear that Truck 1 would arrive at Shovel 1 before Truck 2, thus causing Truck 2 to wait at Shovel 1. In this case, Shovel 2 might be an option for Truck 2. This implies that the dispatching decision should be made considering other trucks that may have a future impact on the truck concerned.

II. The single stage dispatching rules only consider actual system performance and ignore operational constraints, such as ore quality and blending requirements.

2.2.8 Multistage approaches

Most of the truck-shovel dispatching algorithms and models using multistage approaches deal with two major problems: the production optimisation problem, and the real-time dispatching problem.

2.2.8.1 The production optimisation problem

The approaches used to solve the production optimisation problem in the truck shovel dispatching models can be divided into Linear Programming (LP) approach, Non-Linear Programming (NLP) approach, Goal Programming (GP) approach, and stochastic programming approach.

2.2.8.2 Linear Programming approach

White (1986) proposed a short-term production planning system which consisted of two Linear Programming (LP) models. The solution to the first LP model determines the optimum production rate of the shovels, which is then used to link the first LP model with the second. The solution to the second LP model allocates the volumes of the haulage capacity to all available haulage routes by maximising production per unit of haulage resources. The allocated haulage capacity of all paths serving a shovel should be no less than the shovel production rate given by the first LP model, assuming that excess production is stockpiled. The models are re-solved for re-planning if there are major changes in the operation (e.g., shovel breakdown, changes in haulage routes, changes in blending requirement), or if a grade control interval is triggered.

The objective function of the first LP model minimises the sum of various pseudo costs. The pseudo-costs are judgment-based weighting factors depending on the relative importance determined by mine management. The first LP model presents the shovel's production with the consideration of the maximum digging rate for a shovel, the maximum plant capacity, and the lower and upper limits of the ore quality. The objective of the second LP model is to maximise production by allocating minimum material flows along all feasible paths while satisfactorily serving all operating shovels.

The advantages of the model by White (1986) can include real-time data to reflect the status of the mine, and the optimum production rate of a route is based on the volume of material instead of the number of trucks. However, the model fails to consider stripping ratio, and the predefined upper and lower quality limits may influence the short-term plant output and input.

(Lizotte, 1987)proposed a linear programming formulation as a part of their semi-automated system to solve the production rates of all the shovels in order to reach maximum production. Their LP model is run once a shift. The objective of their LP model is to maximise the production rate of all shovels working in ore and waste taking into account the ore grade requirements and the stripping ratio. The model also assumes the shovels' relative priority of working on ore faces. The major drawback of their model is the assumption that the shovels' production increases linearly with the increasing number of trucks. In addition, stockpiling and rehandling operations are ignored in the objective function.

(Li, 1990)Proposed an LP formulation to allocate the optimal number of trucks to a route to meet the required productivity rate. The objective of the model is to yield the optimum truck flows by minimising total transportation work. Transportation work is defined as the product of transported weight and hauled distance. This LP model considers all the loading points, ore discharging points, stockpiling points and waste disposing points as well as variables such as ore quality requirements, road length and resistance factor. However, this model fails to consider a heterogeneous fleet in the operational plan, and equipment breakdowns are ignored as well.

Gurgur (2011) proposed a LP model, which helps to minimise deviation of the operation from the long-term planning generated from a mixed integer programming (MIP) model. The MIP model determines the life of mine, production requirement in each period by considering economic factors. The LP model determines the truck allocation to shovels in each period to achieve the required production, and takes into account the attributes of different types of trucks and shovels and the haul route profiles in each period. In addition, the model considers the stochastic uncertainties of the input parameters including load and travel times and ore grades. The major advantage of their model is a multi-period optimisation model that takes into account the effects of current operations on the next ones. However, their model uses continuous variables, i.e., the flow rate of transported material, which fails to provide a precise value of the number of truck trips required.

Ta *et al*. (2013) proposed a mixed integer linear programming (MILP) model to assign trucks to loading units based on the probability of the shovels' idle time. The objective of their model is to minimise the total number of trucks assigned to each shovel by considering throughput and ore grade constraints. Based on the theory of finite source queues, the relationship between a shovel's idle probability and the number of trucks assigned to the shovel is determined via a simple approximation and is incorporated into the MILP model. The model proposed by Ta *et al*. (2013) is able to consider a heterogeneous fleet in a truck-shovel system.

Mena et al., (2013) proposed a multiple integer knapsack problem to obtain the maximum cumulative fleet production in a fixed time frame. The objective of their model is to assign available trucks to the route requesting trucks according to their operating performance in a truck-shovel system. The equipment availability is incorporated into the objective function of their model so that the stochastic characteristics of the equipment behavior and environment can be considered. However, the major disadvantage of their model is that when a certain number of trucks are in the state of maintenance repair, the optimiser fails to find an optimal solution. In addition, the blending requirement of the plant is not taken into account in their model.

Chang et al. (2015) proposed a MILP model that aims to maximise transportation revenue. A heuristic rule is implemented to solve the model and schedule trucks over a shift. Their model is based on a homogenous truck fleet and does not consider the grade distribution and stripping ratio as well as plant capacity.

Zhang (2015) proposed an MILP model that determines the trip numbers of trucks hauling between loading sites and dump sites. The objective of their model is to achieve the production target with minimum total truck operating costs in a shift by taking into account operational and ore grade constraints. A heterogeneous truck fleet is considered in their model.

The above LP models generally assume that the productivity of a shovel is proportional to the number of trucks allocated to this shovel. However, as the haulage allocation level increases, waiting times increase as well due to the nature of haulage, loading, and dumping operations.

2.2.9 Algorithms and implementation

2.2.9.1 Overview

DISPATCH is a large scale, computer-based mine management system which controls the dispatching of all haul trucks in any open pit mine (Figure.2.8). When increased production is important, DISPATCH gets the needed production increase with fewer new or decommissioned trucks. DISPATCH also helps operations meet its blending objectives while minimizing Rehandles and maintaining production. Furthermore, DISPATCH includes a powerful, event driven simulation subsystem. With the simulator mine management can pose "what if” situations and observe the predicted effects on production.

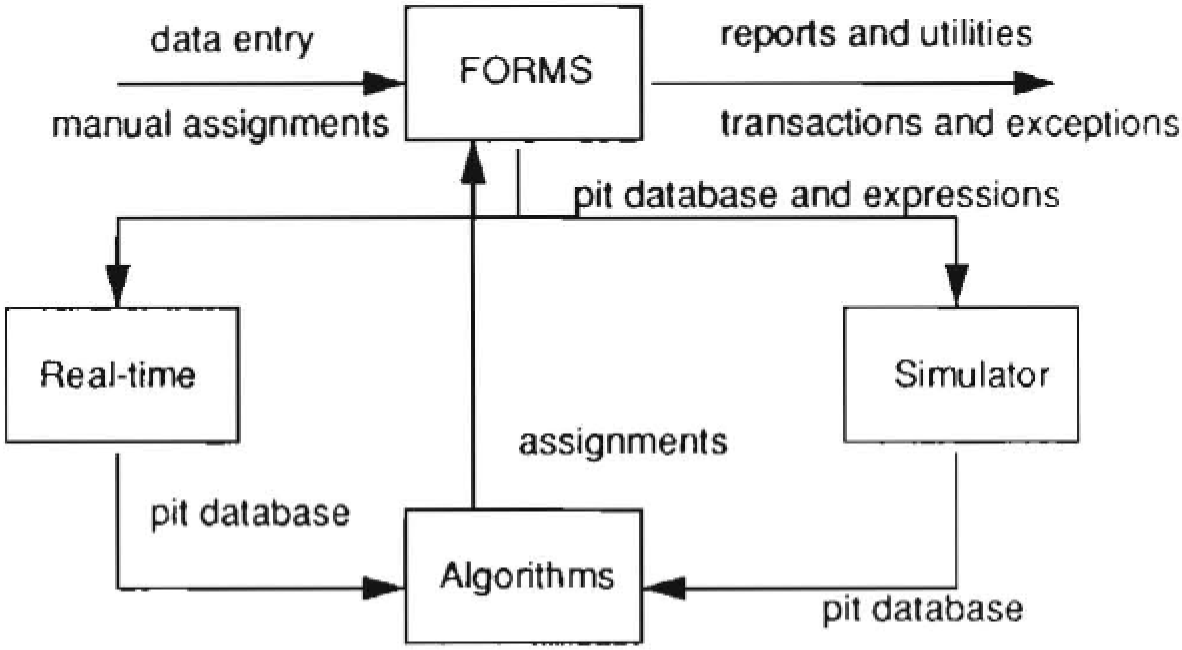


Figure 2. 8: Typical block diagram of the dispatch system

The primary objectives of DISPTACH are to maximize production, minimize Rehandles, supply the plant, and meet the blending objectives. Efficient algorithms that dispatch trucks in an open pit mine must manipulate a variety of raw data to produce intelligent assignments in all situations. Such raw data include:

- a haul road network containing locations, elevations, roads and distances;
- travel times gathered between shovels, dumps, and intermediate signposts;
- loading intervals of trucks at shovels;
- dumping intervals of trucks at waste dumps and crushers;
- material grade information dug at the face and blending targets at dumps;
- operational status of trucks and shovels; and
- miscellaneous mining constraints such as shovel priorities, dump capacities, truck capacities, and scheduled operator breaks.

Given that the operation of the mine depends on timely response from the central computer, these algorithms must operate quickly to generate assignments within fractions of a second. Rather than depend on simple algorithms and heuristics to generate such assignments, a realistic approach to truck dispatching should incorporate several rigorous algorithms to provide different parts of the solution.

DISPATCH consists of three subsystems: Best Path (BP) determination for each change in topography, Linear Programming (LP) for each significant change in a time-dependent variable, and Dynamic Programming (DP) for assignment in real-time (Figure.2.9). The BP subsystem generates the shortest paths between all pairs of locations in the mine road network. The LP subsystem takes travel times and optimal routing from BP, as well as information concerning the current pit configuration such as number of ready shovels and trucks, loading and dumping intervals at shovels and dumps, respectively, blending requirements at dumps and crushers, and shovel priorities. The system then sets up the LP constraints.

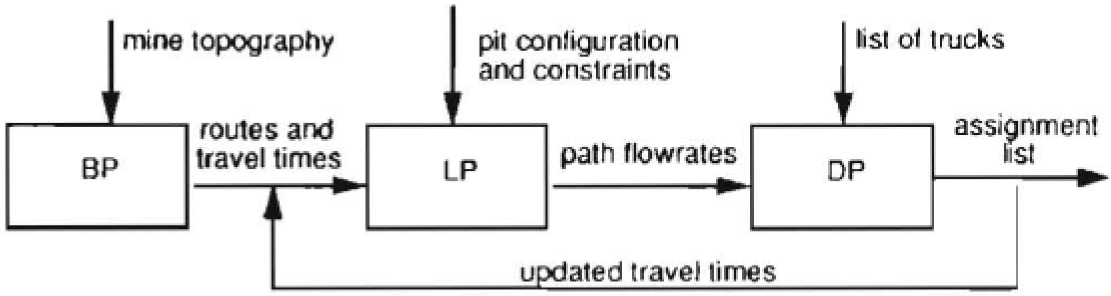


Figure 2. 9: Dispatch Algorithm

Solution of the LP model generates the optimal path flow rates in tonnes per hour to minimize haulage requirements for the given pit configuration. Finally, the DP subsystem uses these optimal path flow rates, the list of trucks needing an assignment from a dump to a shovel, and the current travel times and distances to produce an optimal list of assignments for each truck. DP, called each time a truck requests assignment, produces a list of paths from dumps to shovels ordered by need and assigns trucks to paths. Finally, the system updates travel times using a moving average.In the rest of this section, each of these subsystems is explained in detail, as well as a brief description of the FORMS Management Subsystem.

2.2.9.2 Determination of Best Paths

The DISPATCH Best-Path (BP) algorithm uses a well-known path algorithm (Dykstra's Shortest Paths Algorithm) to determine the paths of minimum travel time throughout the mine haul road network (White,1986). The user enters the raw mine topology of locations, elevations, roads and distances. To add a new location to the haul road network, one must only enter the coordinates of the location and the distance to its nearest location in the network. After a user modifies the road network database, BP computes a directed tree data structure for each location which describes the minimum travel time path from this location to every other location in the network. This directed tree is a vector in which each node has a unique predecessor.

Initially, BP uses a travel time correlation function to translate haul grades (slopes) and distances to travel times. As trucks travel the haul roads, DISPATCH measures the actual time required to traverse each haul route and proportionately divides the actual time among the roads along the haul route. From the raw haul road network, BP provides DP with the following information:

- total *minimum* distance for each haul;
- estimated travel time for each haul; and
- intermediate locations and call-points the truck should pass.

2.2.9.3 The Linear Programming (LP) Model

The DISPATCH Linear Programming algorithm uses the Simplex method to minimize prioritized truck haulage functional subject to several constraints. The LP model variables are the target flow rates in tonnes (or m^3) per hour for each path from dump to shovel to dump, LP computes those flow rates which minimize the total trucks required to cover the operating shovels, subject to the following mining constraints:

- continuity at each shovel and dump;
- maximum digging rate at each shovel;
- maximum capacity at limited dumps;
- total available trucks;
- material grade blending limits; and
- Material category blending targets.

Because the LP computed flow rates optimize mine production subject to mining constraints, DISPATCH uses the LP solution in real-time as a template for optimal truck assignments.

Programming Considerations although many Linear Programming problems can require much CPU time, the mining constraints shown above typically execute in under a tenth of a second or so, on a 16-MIPS microprocessor. Two factors contribute to this fast execution time:

1. DISPATCH carefully creates the LP constraint matrix, eliminating unnecessary constraints and ensuring a well-conditioned solution.
2. The Simplex Algorithm, as well as the entire DISPATCH system, is coded in the C programming language (White, 1986). C provides programming constructs, not available in most languages, which double the speed of the Simplex Algorithm. Consider the following loop which performs matrix norma1ization/reduction coded in two different styles:

a) Using conventional array references:

```
for (i = 0; i < nc; i++)
{
if (i! = iZ)
I
float aij2p = ali] [j2]/pivot;
for (j = 0; j < nnonb; j++)
if (j! = j2 && active [j])
ali] [j] = ali] [j] - a[iZ] [j]"aij2p;
b[i] = b[i] - b[iZ]*aij2p;
J
```

b) Using pointers to access array elements sequentially:

```
for (i = nc; i- ;)
[
if (i! = iZ)
l
register float "pij = &a [i) [nnonb];
register float "piZj = &a [iz] [nnonb];
float aij2p = ali] [j2]1pivot;
for (j = nnonb; j-;)
[
pij-; piZj--;
if (j! = j2 && active Ii l)
"pij - = "piZj " aij2p;
I
b(i] - = b[iZ) "aij2p;
I
I
```

Code section (b) uses pointers and pointer arithmetic which are available in C but not in FORTRAN, PASCAL or other commonly used scientific languages. It exploits the fact that matrix norma1ization/reduction steps access adjacent array elements each iteration through the loop. By eliminating the overhead of subscripting two-dimensional arrays in much of the Simplex Algorithm, C can double the speed of LP calculations compared with other languages. It should be noted at this point, that LP must be called whenever any major disturbance occurs

- not "once per shift" as stated by some workers (White, 1986). Thus, DISPATCH precomputes the LP solution each time a crusher, dump, or shovel DOWNs or READYs; each time a *haul* road segment is added, deleted, closed, opened, or made one-way; each time global travel times change by a specified amount; each time blending requirements change; each time shovel priorities change; each time crusher digestion rates or dump capacities change; each time the number of trucks required differs from the number of trucks available by a specified number; and at a User selected time interval. Such a high LP call frequency is feasible because execution time is so rapid.

2.2.9.4 The Dynamic Programming (DP) Model

Linear Programming yields a solution in terms of path flow rates in tonnes (or m^3) per hour. However, the problem of assigning available haul trucks to shovels to obtain the desired material flow rates must be faced. In the simplest case, as each truck requests an assignment, a scan is made for the neediest shovel, and that assignment is then made. This, however, is inadvisable as such, a shovel might be far removed from the current truck location and such assignments would not follow the optimal LP selected path flow rates. Instead, the problem is solved by using a DynamicProgramming (DP) strategy, an optimization procedure based on Bellman's Principle (White,1 986) of Optimality, which states: "An optimal policy has the property that, whatever the initial state and initial decision, the remaining decisions must constitute an optimal policy with regard to the state resulting from the first decision." A constraint equation,A5 governing the number of ready trucks adjusts for under trucked operation by reducing the flowrate of trucks to low priority or long haul shovels until the trucks required to cover operating shovels matches the actual ready trucks in the pit. If all shovels have equal priority, the longest *haul* shovels are starved to maximize overall shovel coverage; if shovels have different priorities, the lowest priority shovels are starved to accommodate specific mining objectives. In this constraint (and in all other LP constraints) the path flowrates are independent variables, which are adjusted to find an optimum pit configuration. Instead of assigning the current truck to the neediest shovel, DISPATCH matches the best trucks to the neediest shovels whenever any truck requests a truck assignment. In this assignment process, DISPATCH creates a list of LP-selected paths, ordered by need time, and a list of trucks soon to request a shovel assignment, ordered by the expected assignment time. The purpose of DP is to match needy paths optimally with those trucks soon to need a shovel assignment. Therefore, two assignment lists are maintained, one for trucks and one for paths. The truck list includes all trucks currently dumping at a dump, stockpile, or crusher, as well as all trucks currently en route from a shovel to a dump. The path list contains the haulage allocation for each path feeding an operating shovel, the time of last allocation of a truck to that path, and the optimal path haulage rate for that path as determined by LP.

An LP formulation that can be used to model any mining operation. Specifically, one wishes to: **MINIMIZE the prioritized truck haulage function, T_{opt}, (tonnes total haulage):**

$$T_{opt} \geq \sum_{i=1}^{i=N_s} (P_i \times (T_i - Z_i)) + \sum_{j=1}^{j=N_d} (P_j \times (T_j + D_j + Z_j)) \ldots\ldots (A1)$$

where:

Pi [=] i'th path rate feeding shovel, tonnes/hr. or BCM /hr.

T, [=] i'th path travel time, hours

z, [=] i'th Shovel Priority Coeff, hours:

Prior 0 [=] 2 hours

Prior I [=] 20 hours

Prior 2 [=] 200 hours

Prior 3 [=] 2000 hours

Prior 4 [=] 20000 hours

Prior 5 [=] 200000 hours

Ns [=] Number of feasible paths from dumps to shovels

P j [= 1j'th path rate feeding dump, tonnes/hr. or BCM/hr.

Tj [=] j'th path travel time, hours

Dj [=] Dumping time at j'th dump, hours

Zj [= 1Rehandle Penalty Coeff, hours; (Z- I) for shovels feeding stockpiles, zero for all other shovels

Nd [=] Total number of ready dumps

Note that the shovel priority coefficient, Zj, being much larger than any travel time Tj, causes all coefficients in the linear optimization function to be negative. These negative coefficients force the largest possible path rates consistent with all other constraints, and maximize flowrates to high priority shovels, in this way, the digging rate constraint equation s may use”:5" inequalities to solve solutions with limited trucks and dump capacity but not achieve a trivial solution with all flow rates equal to zero (White,1986)

The rehandle cost coefficient, Zj' penalizes feeding stockpiles; however, because it is one hour smaller than the priority coefficient of the shovel, it still feeds the shovel if all other constraints are met.

SUBJECT to continuity at each shovel and dump.

$$0 = \sum_{i=1}^{i=N_{pi}} P_i - \sum_{i=1}^{i=N_{po}} P_j \text{ .... (A2)}$$

where:

Pi [=] i'th path rate into shovel or dump, tonnes/hr. or BCM /hr.'

Npi [=] Number of paths going into this shovel or dump

Pj [=] j 'th path rate out of shovel or dump, tonnes/hr. or BCM /hr.

Npo [= 1Number of paths going out t of th is shovel or dump

SUBJECT to the maximum digging rate at each shovel:

$$R_j \geq \sum_{k=1}^{k=N_p} P_k \text{ .... (A3)}$$

where:

Rj [=] Dig rate of shovel, tonnes/hr. or BCM /hr. adjusted for spotting time

P k [=] k 'th path rate from shovel, tonnes/hr. or BCM/hr.

Np [=] Number of paths from shovel

SUBJECT to the maximum flowrate at each dump:

$$D_j \geq \sum_{k=1}^{k=N_p} P_k \text{ .... (A4)}$$

where:

Dj [=] Maximum processing rate of dump, tonnes/hr. or BCM/hr.'; no constraint created for unlimited capacity dumps

P k [=] k 'th path rate into dump, tonnes/hr. or BCM/hr.

N_P [=] Number of paths into dump

SUBJECT to current ready trucks if actual and required trucks are to match:

$$T_{act} \geq \sum_{i=1}^{i=N_p} (P_i \times T_i) + \sum_{j=1}^{j=N_d} (P_j \times D_j) + \sum_{k=1}^{k=N_c} (P_k \times L_k) \ldots\ldots\ (A5)$$

where:

T_{act} [=] Actual trucks currently operating, tonnes or BCM

P, [=] i'th path rate, tonnes/hr. or BCM /hr.

T, [= 1i'th path travel time, hours

Np [=] Total number shove / dump and dump/ shovel paths

Pj [=] Path rate into j'th dump, tonnes/hr. or BCM /hr.

Dj [=] Dumping time at j'th dump, hours

Nd [=] Total number of ready dumps

P k [=] k 'th path rate into shovel, tonnes /hr. or BCM /hr.

Lk [=] Target queue time at shovels, hours; value adjusted to provide the desired amount of truck queuing at shovels.

N, [=] Number of paths into shovels

Constraint Equation (A5) adjusts for under trucked operations by reducing the flowrate of trucks to low priority or long haul shovels until the trucks required to cover operating shovels match the actual ready trucks in the pit. If all shovels are equal priority, DISPATCH starves the longest haul shovels to maximize over-all shovel coverage; if shovels have different priorities, DISPATCH starves the lowest priority shovels to accommodate specific mining objectives. Note that in this constraint (and in all other LP constraints) the path flowrates (Pj,

P_j and P_k) are independent variables which are adjusted to find the optimum pit haulage solution.

SUBJECT to each blending parameter, k, at each plant j:

$$X_{jkL} \leq X_{jkA} + \sum_{i=1}^{i=N_{pj}} (X_{ik} - X_{jkA}) \times P_i \times (T_c/M_{cj}) \leq X_{jkU} \text{ ..... (A6)}$$

where:

X_{jkL} [=] Lower limit of k' th blending parameter at the j'th plant

X_{jkA} [=] Current running average value of k 'th blending parameter

Xik [=] Value of k 'th blend parameter for i'th path

Pi [=] Flowrate of i'th path to plant, tonnes/hr. or BCM /hr.

Tc [=] Blending control interval, hours

Mcj [=] Blending control mass of j'th plant, tonnes or BCM

Npj [=] Number of paths into j ' th plant

X_{jkU} [=] Upper limit of k 'th blending parameter at the j 'th plant

Note that each constraint Equation (A6) creates two separate LP inequalities. These constraints force the composition of material into a plant to be between desired limits. Such a blending formulation is useful where grades are measured at the face before the material is dug, and plant performance is directly influenced by these grades.

SUBJECT to each blending category, j, at each plant, k:

$$0 = \sum_{i=1}^{i=N_k} (X_{jk} \times P_i) \text{ .... (A7)}$$

where:

X_{jk} [=] Target composition, Xj, if path i is category j; -(1- Xj) if path i is not category j

Pi [=] Flowrate of i' th path to plant, tonnes/hr. or BCM/hr.

N_k [=] Number paths into k' th plant

When assay data are not available before material is dug or the assay data are not directly related to plant performance, DISPATCH provides the alternative blending formulation shown in constraint Equation (A7). These constraints allow the mine to categorize each material being dug and specify desired percentages of each category at each plant. If, for instance, the mine has material in categories A, B, and C, one plant may accept *20070 tonnes* of A, *35070 tonnes* of B, and 45% of C, while another plant may accept 40% of A, 45% of B, and 15% of C.

Blast hole drilling has been found to have a direct impact on the downstream mining KPIs such as blasting, loading, hauling and processing (Academy-Blasting Website, 2018). Mining is comprised of interdependent operations which include drilling, blasting, loading, hauling, crushing and processing. Each of these steps has an impact on a subsequent operation. The entire mining process is very much dependent on the effectiveness of drilling and blasting operations. The resulting improvement of drill and blast include: pit floors on grade, good fragmentation and digability leading to reduced loading times, haulage cycles improved, and the crushing and milling operations will be more efficient and saving on the energy used (White J. , 1982).

Drilling is the first step of operations in an open pit mine, and therefore runs parallel with blasting. Since drilling is the initial step, accuracy needs to be practiced in to achieve adequate fragmentation and right levels in the pit (Manmit R, 2007). Poor drilling will result in uneven pit floors and high boulders which will increase post rock breaking costs, higher digging rates and high haulage fleet cost.

Once drilling has been accomplished, explosives are used to reduce the ore into crushable material (Gaula M, 2015). While movement of blasted rock should be minimized, some movement is necessary to ensure good fragmentation of the muck pile (D La Rosa, 2011). Monitoring of blast movement can allow actions to modify the ore mark out. The effect of not taking into account the blast movement will result in ore loss, dilution and misclassification of ore. The Blast Movement Monitor (BMM®) System consists of directional transmitters placed within the blast volume prior to blasting, which are then located after the blast with a special detector. The data is then processed with purpose-designed software. Each BMM® is activated, programmed and installed before blasting. A special detector is used to locate each BMM® after the blast. Data is downloaded to accompanying software that calculates the movement vectors, and then summarizes and archives the results. Ore boundaries can then be redefined to reflect the measured movement of the blast and therefore enable accurate ore control. The two main reasons for monitoring blast movement are to improve grade control and to understand blast movement dynamics (Harris G W, 2001). In practice, the objective of many blasts is a combination of both. The data requirement of each of the two objectives is different, therefore the decision process of where to install the BMM®s will also be different. Regardless of the main reason for monitoring, there are operational constraints that must always be followed. When planning the location of BMM®s specifically for the purposes of grade control, it is important to plan ahead to what will be critical for translating the ore polygons. The main aim is to locate the BMM®s as close as possible to the ore boundaries, to reduce the error associated with interpolating the ore is translated away from the measured vector (BMT website, 2019). This, therefore, reduces the overall ore loss and dilution. It is at this stage that the processed mark out is published to dispatch for loading and hauling.

The Wenco system combines GPS, radio communication, computer technology and software applications to track and improve the activity and performance of equipment in surface mines. Wenco uses Windows CE OS for mobile computing applications. Oracle is used for data organization and Crystal Reports is used to access the information. Wenco has become the world's leading supplier of PC/Windows based Mine Management Systems.

Wenco offers a wide range of applications that build together a state-of-the-art computerized mine management system. The list of applications includes: high precision GPS, fleet management, dispatching, ore quality control, stockpile management, MineVision, bench elevation and bucket positioning, dozer guidance, drill navigation and sensor monitoring, TireMax, payload management, condition monitoring, alarm management, maintenance management, auto cycling, WencoDB, Wenco Inquires, reporting and SAMS – System Availability Measurement Software. The overall capabilities of WENCO System are comparable to the Minestar system offered by Caterpillar (Wenco website, 2019).

Wenco got its start in the late 1980s as an engineering firm spun off from a now defunct coal mining company. Today's Wenco system comprises the field hardware (the mobile data terminals – MDTs installed on the equipment), the radio infrastructure, the base station, the host computer system, Wenco software, and turnkey commissioning with training and installation. MDTs communicate in real time back to the host software through a dedicated radio link. Using GPS, Wenco can track the progress of the truck as it moves throughout the mine (Bristol V, 2000).

The system implementation increases productivity by more than 20%, based on tonne/km/hr. For example, De Beers Venetia Mine in South Africa realized the savings on the purchase of one truck in 1999 and delayed the purchase of the other. This diamond mine, despite its relatively small fleet, is now doing the same amount of work as before with essentially two fewer trucks. Payback was instantaneous; there was a huge savings immediately. Mine management systems are not Plug-and Play programs that run by them. They are only as good as the information put into them (Bristol V, 2000).

Wenco's high precision GPS application, Bench Manager provides precise graphical actual-vs-design operator feedback and system integration (Trainor G F, 2012).

Chapter 2 discusses application of high precision mining used in various fleet management systems based on the queuing theories, cycle time and algorithms used to determine best paths to maximize production (linear programming and dynamic Programming)

CHAPTER 3 METHODOLOGY

3.0 Introduction

This chapter gives a description of the type of study undertaken, and data collection techniques employed. A non-intervention study was carried out by employing a quantitative research study in which numerical data was collected to determine the behavior of the loader-truck system. Parameters such as shovel loading time, haul cycle time, capacities of trucks and shovels were determined and quantitatively analyzed to determine their contribution to trucks queuing at the loading site. To accomplish the objectives of this research, several methods were used which are now described in detail below.

3.1 Sub objective 1: Establishing the precise bucket positioning and track elevation on an actively mined block/polygon through physical and BenchView inspections.

Subobjective 1 was accomplished by using BenchManager which relies on the motion of the GPS antenna scribing an arc as the excavator is rotated to determine the equipment's centre of rotation. The centre is determined by placing the bucket with the teeth flat on the ground, and taking the rover and measuring left and right tooth on the outside of the teeth, and taking note of the coordinates, first eastings then northings and lastly the elevation. The coordinates so obtained were entered in an Excel spreadsheet, and then verified to ensure that the distance between surveyed point and the selected point on the screen in the excavator was less than 50cm to achieve a ±0.3m tolerance. If the distance was over the tolerance, recalibration had to be made.

Purpose of establishing precise bucket positioning?

The purpose of establishing bucket positioning was to allow an automated system to identify the blast, flitch, polygon, and dispatch material automatically to an agreed destination as per the mining plan.

3.1.1 Control Measures

a) **Short listing of a block**

i. A blast was chosen where pre and post-blast surveys were captured to determine movement and swell factors.
ii. Polygons were then adjusted and published into Wenco.

b) Scheduling of a block in the mining plan and allocation of diggers. The plan should allow for the shortlisted block to be mined with the following verified:

i. One backhoe was to be used on that mining block and was to have the high precision auto dispatching functionality turned on (or multiple excavators that have been agreed upon).

ii. Calibration checks were madee on this/these excavators/s – accuracy to be within 0.5m?

c) Control Measures

The mining plan required that the following control measures were put in place.

i. The Dig-plan surveyed on the pit floor and used by the KMP field assistant was the adjusted one and the same as the digital data used to control the Wenco HP process.

ii. The Operator utilizing the HP digger was to adhere to the polygon boundaries, and cut/fill data were displayed on the Bench Manager screen. Operator was to focus on avoiding loading trucks with buckets from different materials.

iii. The Trainer was to be available across shifts to ensure operators followed floor/boundary rules.

iv. The PIC was to ensure dozer did not push in material from adjacent blocks into the block which was being mined.

v. If the digger floor required sheeting, Mining Engineer was to be consulted and number of loads to be tracked.

d) Automatic material dispatching validation checks

i. The high precision system auto detected the material and polygon.

ii. Destinations for the materials was obtained from the Shift Engineers, and configured in the system by Dispatch.

iii. As the digger began to load and/or changed material – the Dispatcher validated that the trucks received the right assignments. The data was then reviewed by the Shift Engineer when required.

e) Exceptions raised while mining

i. **Real Time High Precision Exception Report** – This report flagged events when the digger operator mined outside the blast boundary, or over mines D flitch(bottom Flitch). It also provided information when the digger crossed polygon boundaries, and when a truck was loaded with two different material types (mixed load). The material changes flagged in the report were supposed to match the data that were being provided by the grade controller to Dispatch.

ii. Items that were reviewed before start of trial – toe crest buffer, toe crest slope, dig block damping factor.

iii. Hardware issues – the real time exceptions report flags hardware faults, this needed to be monitored and the digger was to be stopped if a persistent issue was observed.

iv. When a digger broke down, no other digger was to be used other than the preselected ones.

f) Mining Validation checks

If the polygon depletion report reaches 100% for any polygon within that blast, mining operations are to stop until the area is surveyed. This check would show if the load factors being used needed to be adjusted.

g) Weighing of trucks

i. A calibration check of the weigh bridge was conducted, a rated payload was loaded onto a truck and it was then weighed. Results ideally had to match the rated payload. If there was no match, alternative options had to be sought.

ii. Each truck coming from this block was to be weighed, to remove any truck size restriction that was needed to be imposed, especially during the rainy season where CAT trucks get into Production faster.

iii. No other trucks from any other blocks were weighed reflecting the priority of this trial, and thus reducing the error margin.

h) Checks when B flitch is mined out

Once B flitch is mined out, the mining of that block was to be stopped, and the following checks were carried out:

i. Polygon depletion report needed to be aligned.

ii. Dirty loads dispatching needed to be validated.

i) Post Mining Survey

Once the polygons were mined out according to the Polygon/Block Depletion Report, a survey was carried out to see how much material was left in the polygon/block, before continuing to mine it. This provides a better understanding of truck factors being used. The remaining material, if any should not be mined until the "Control Report" are run, and data analyzed before further mining continues.

3.2 Sub-objective 2: determining production rates through optimised loading and hauling cycle times (truck shovel waiting times) and fleet performance.

Determining production rates was conducted by tracking production performance through cycle time, utilisation, availability and overall productivity of the machines. This took into consideration the queue, load and hanging times. Truck performance/ productivity was determined per truck type inclusive of excavator performance. Use of excel spread sheet was utilised to compile and compute all relevant KPIs under loading and hauling.

3.2.1 Overview

Accurate spotting data can be used to check that the loading unit is loading efficiently with minimal waiting time. It can also indicate where there may be problems that cause the hauling units to take longer than expected to move into position at the loading unit.

When several hauling units arrive at a loading unit at near the same time, determining the spotting time is challenging. This is because the hauling units are not necessarily loaded in the order that they arrive at the loading unit. When the loading unit finishes loading one hauling unit and is available and waiting for the next hauling unit, any one of the queued hauling units could be the next to be loaded. It is only when the next hauling unit goes into loading status that it is known which hauling unit was spotting (moving into position) at the loading unit. Therefore, the spotting time is most accurately determined only after the spotting has been completed.

Because of this, in real-time, there is no spotting status displayed. This means that neither the vehicle Operators nor the Dispatcher will be able to observe a vehicle in the Spotting status. In particular, a hauling unit will move from Queue at Loading Unit to loading seemingly without an intermediate Spotting status. However, there will still be a spotting status: this status will be calculated after the system sees which hauling unit starts loading, and can then calculate how much time that hauling unit spent moving into position before loading. The calculated spotting time will be saved to the Equipment Status Trans table. This will provide more accurate spotting status time records.

3.2.2 Operating Status during a Haul Cycle

Table 3.1 Shows hauling unit cycles through the following operating conditions during each haul cycle:

***Table 2.3: Operating* status during each haul cycle**

Status	Description	Trigger
Empty	The hauling unit is empty and is traveling towards a loading unit.	Hauling unit has sent an OEM/DIO Empty message.
Empty/Stopped	The hauling unit is empty and stopped	Hauling unit has sent a GPS Stopped message while in Empty status.
Queue at loading unit OR Wait at loading unit	The hauling unit is waiting at the loading unit.	Hauling unit has stopped in the wait zone of a loading unit.
Loading	The hauling unit is currently being loaded by loading unit.	Hauling unit has entered the loading zone of the loading unit and has stopped. This can also be an OEM status.
Full or Hauling	The hauling unit has finished loading and is traveling towards a dump location.	Hauling unit has been in loading status for at least half the average loading time, and has sent a GPS moving message. Or, the hauling unit has sent an out of range beacon message. This can also be an OEM status.
Full/Stopped	The hauling unit is full and stopped.	Hauling unit has sent a GPS Stopped message while in Full status.
Wait at Dump	The hauling unit is waiting at a dump.	Hauling unit has entered the dump location and stops.
Dumping	The hauling unit is dumping	Hauling unit has sent an OEM/DIO dumping message.

As the hauling unit cycles through the operating statuses, the loading unit status are changed automatically based on the location of the hauling units assigned to the loading unit.

A typical haul cycle is as follows:

a. After a hauling unit dumps the material load, the hauling unit's status is **EMPTY**.

   In its database, the MDT has the coordinates of all active route beacons in the system and will report any beacon when it is in range. Based on which beacon is reported, the system determines if the hauling unit is or is not on the nominal route to the loading unit.

b. When the hauling unit arrives at the loading unit, the system puts the hauling unit into a **QUEUEING** status or **LOADING** status.

The status in which the hauling unit enters depends on where the hauling unit comes to a halt. If there is a wait time for loading, the operator stops the hauling unit in the waiting zone, and the status is changed to QUEUING. When the loading unit is available, the hauling unit moves into the loading unit's loading zone. When a hauling unit stops in the loading zone, the status changes to LOADING as shown in Figure.3.10

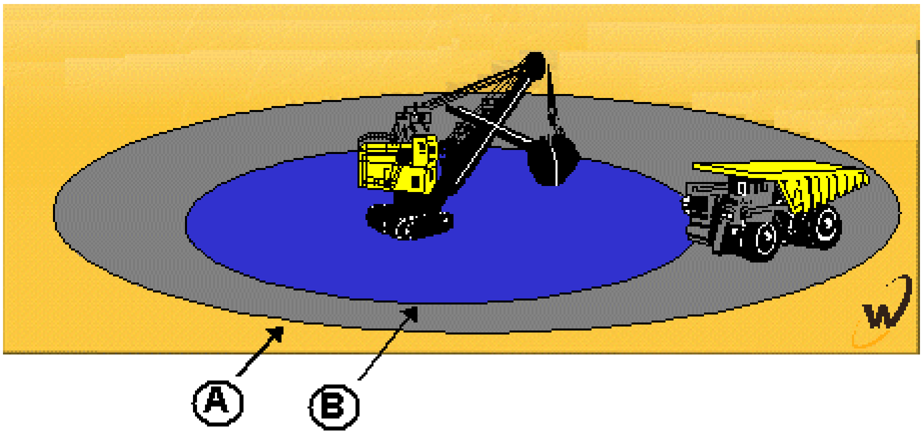


Figure 3: 1 hauling unit stops in the loading zone

A. Waiting Zone; B. Loading Zone

c) When loading is complete, the hauling unit leaves the loading location. Once the hauling unit moves out of the loading zone and reaches a certain speed, a signal is sent to the system ending the loading phase. The hauling unit is placed into **FULL** or **HAULING** status.

The coordinates of the first virtual beacon the hauling unit will encounter are sent to the hauling unit. When the hauling unit arrives within the beacon's range, a message is sent to the host computer indicating arrival, and the next virtual beacon's coordinates are downloaded. This process continues until the hauling unit arrives at the dumping location.

d) When the hauling unit arrives at its dump destination it transmits its location to the host. If the hauling unit stops for a specified period of time inside the dump area, it will be put into **WAIT AT DUMP** status.
e) Finally, when the operator raises the box and dumps the material, a dump switch is triggered and a message is transmitted to the host. The production information is recorded and the hauling unit's status is changed back to **EMPTY**.

A loading unit assignment is then downloaded to the hauling unit's MDT along with the coordinates for the first virtual beacon on route to the loading destination.

An OEM interface can also provide hauling unit status change messages in the absence of GPS.

3.3 Sub-Objective 3: Monitor the material type and quality /grade of ore delivered to the crushers/BCMs reconciliation.

Bench Manager was utilised in line with dispatch and the physical inspection assisted by the grade controllers to ensure the right polygon/block matches what has been published on Wenco system as mining progresses. Once material has been crushed there is need to reconcile on the Grade/ BCMs mined as per feed plan per day (3 shifts rotation) to the crushers/stockpiles.

3.4 Bucket positioning

To determine the bucket position, Bench Manager relied on the motion of the GPS antenna scribing an arc as the shovel rotated to determine the equipment's Center of Rotation (CoR). However, the nature of the digging at KMP had the operators advancing to the face during the loading cycle to pick into the face at a particular dig location. It was during this advance that the system would purposefully drop the CoR A system design was activated if a shovel traveled over a certain distance under the assumption that the shovel was relocating. During the next swing the CoR would be recalculated and used for that location and the next set of buckets for loading.

However, because the KMP shovels were advancing far enough to drop CoR during the loading cycle the bucket position could not be calculated and thus would cause loss of bucket position data.

A simple solution was to maintain CoR during loading status, and this was achieved through some simple changes in the code, but to increase the overall product reliability and the system's ability to determine the equipment's true heading and therefore bucket position Wenco added in the ability to support a GPS/Glonass based azimuth orientation system, namely; the NovAtel ALIGN product. This product makes use of two receivers and two antennas to form a short baseline from which orientation can be maintained. An accuracy of 0.4 degrees is achieved based on a minimum 1-meter baseline; the longer the baseline, the more accurate the azimuth. Therefore Wenco's Bench Manager application employs two methods to calculate and maintain orientation; CoR and ALIGN, with the ability to automatically switch between the two. The system monitors the performance of the two systems, by default using the ALIGN calculations, and if one method is outperforming the other it switches to that mode to perform the orientation calculations and bucket positions.

The bucket dig locations within the 10m x 10m Dig Blocks are then compared to the plan to determine the ore grade for each bucket. With this information the blended ore grade for each truck is determined.

3.5 ARM geometry system

A third party arm geometry system provided by Motion Metrics has been used by Wenco's BM application prior to implementation at KMP, but the layered ore and split bench digging did not allow for the typical approach of calculating the dig point at the face. The Arm Geometry System (AGS) digging algorithm was modified to allow for split bench digging. This allows the operator to dig in layers of constant elevation. This differs from typical face digging where the bucket starts somewhere near the bottom of the face, and drags through an arc to the top of the face.

3.6 System integration

Wenco's Bench Manager and Fleet Management System have always had a high level of integration with information Bench Manager used in FMS and vice versa. With this set-up the MDT software application (the onboard software application for FMS) runs on the same hardware simultaneously alongside the BM application, with the two applications having tabs built in to facilitate easy switching.

While loading, the BM application displays FMS information to the shovel operator. Current truck identification number and incremental payload is displayed to the operator. Material types and qualities of the load are determined from the BM application and sent to the FMS for truck assignment decisions, based on ore quality at the blend points.

Greater integration still was required by KMP, again for the purposes of bucket processing. At the time of installation BM did not use the truck location in the process to determine dig location. With bucket activity occurring at or near the region of the trucks for purposes of face cleanup, KMP needed to ensure that this activity, or a simple error in transposing dig direction with dump direction, was not providing false dig locations. Typically, bucket positions are based on heading knowledge, the movement of the shovel, and timers, and provides accuracies over 90% when detecting that the shovel is digging.

To improve upon these accuracies, BenchView Service (BVS), the office side application of the BM system, then sends the truck loading coordinates to BM. Knowing where the truck is during loading helps BM filter out erroneous bucket locations in the region of the truck.

3.7 Algorithm changes

Even after all of these additional processes and checks to determine as accurately possible a valid dig location, each dig location is only considered a "candidate" until it is verified by an algorithm within BM called the Bucket Processing model. All bucket positions start as candidate bucket,s and need to be confirmed by one of the following methods:

• Dump bucket switch (DIO) – a digital interface to the dump bucket switch confirms that the bucket was delivered or dumped into the truck.

• Angle of Rotation - BM monitors the angle of rotation from the bucket location. This is defined in the configuration file, and is typically 20 to 30 degrees. Once this value is exceeded the bucket position is confirmed.

Operator manual override. The operator has 10 seconds (time is configurable) to manually cancel an erroneous bucket position. Note: DIO confirmation is given higher priority than swing angle confirmation, and operator has highest priority.

Chapter 3 discusses the purpose of establishing precise bucket positioning, Automated material dispatching, determination of production rates and monitoring of material delivered to the crushers.

CHAPTER 4: DATA COLLECTION AND RESULTS

4.0 Introduction

This chapter describes the data collected and results obtained**.** Data collection was conducted according to the research methodology outlined in Chapter 3. The data were recorded on Microsoft excel sheets, and at times with models that could automatically make all required calculations. Analysis then followed using tools mentioned again in Chapter 3.

4.1 Summary

The following data were collected:

a) Wenco system specifications(hardware/software)
b) EX-PIT Material Mined
c) Hauling unit cycle time (large-small truck activities); loading time, hauling loaded, dumping time, spotting at the dump, travel time empty, spotting at the digger, queuing at the digger, Queuing at the crusher.
d) Digger rates
e) Traffic rules
f) Match factors
g) Loading unit and hauling unit capacities
h) Fill factors
i) Material density
j) Equipment
    - Availability
    - Utilization
    - Reliability
k) Roster (how the movement of material was affected depending on shifts, whether 2 shifts or 3 shifts per day)

4.1.1 Sub objective 1: Establishing the precise bucket positioning and track elevation on an actively mined block/polygon through physical and BenchView inspections.

4.1.1.1 Exception report upgrade

The production exception report was modified to gather real time information about the minimum elevation a digger has reached (worst value) and a count of the number of times the digger has broken the floor level it is meant to mine to.

4. 1.1.2 HP-validation SOP

Weekly validation for all 13 diggers that means 2 per day was carried out

4.1.1.3 General

Validation had to occur once a week for each HP digger during testing stage.To minimize production, delay the validation was done during shift change or short service. After testing stage or when confidence in accuracy, the interval between validations was increased.

4.1.1.4 Backhoes

The bucket was to be positioned with the teeth flat on the ground (anywhere) as shown below.

Figure 4. 1Bucket Position

The rover was then taken to measure left and right tooth on the outside of the teeth. The coordinates were taken note of. Easting's first, then Northing's last elevation as seen in Figure 4.2.

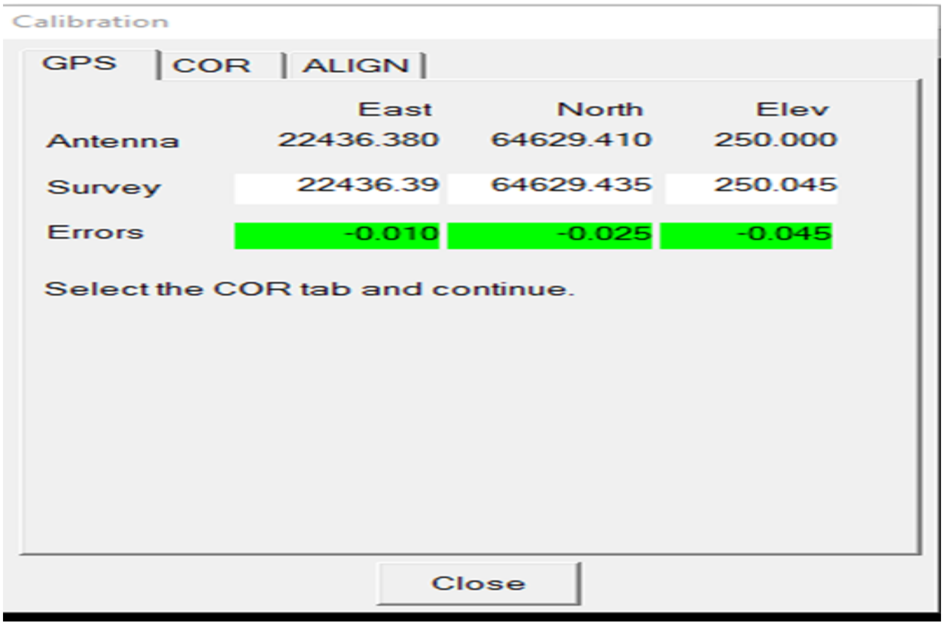


Figure 4. 2 : Calibration of results for Ex 74

If there was no operator logged on to the WENCO system, own global id number was used to log on. Zoomed in on the digger and dragged it so that the bucket was on the screen. Selected the toolbox and clicked on the info icon. Clicked on the left tooth so the coordinates appear in the screen. Took photo of the screen (with coordinates) and digger name. The same procedure above was done for the right tooth. When back at the office, used to fill the coordinates in the accuracy excel file. Verified that the distance between surveyed point and the selected point on the screen was less than 50cm. If it's over, recalibration was required. Copied the cell with the accuracy into the progress tracker sheet. Inserted the graph with the survey and WENCO coordinates into the progress tracker sheet as a comment.

4.1.1.5 Shovels

Because the shovel calculates where it should be digging (based on track elevation, roll and pitch) instead of where the teeth actually are, the surveyed points cannot be compared to where the digger thinks the teeth are. The best the operator can do is to ensure that the surveyed line is parallel to the teeth on the screen.

The bucket was positioned on the floor in an extended position as if you're about to dig with the teeth flat on the floor. (This tried to get the line where the teeth on the screen will be). The rover was taken to measure left and right tooth on the outside of the teeth. The coordinates were taken note of. First Easting's then Northing's last elevation. If there were no operator logged on to the WENCO system, own global id number was used to log on. Zoomed in on the digger and dragged it so that the bucket is on the screen. Selected the toolbox and clicked on the info icon. Clicked on the left tooth so the coordinates appear in the screen. Photo of the screen was taken (with coordinates) and digger name. The same was done for right tooth. When back at the office, used to fill the coordinates in the accuracy excel file. Verified that the distance between surveyed point and the selected point on the screen was less than 50cm. If it's over, recalibration was required. Copied the cell with the accuracy into the progress tracker sheet. Inserted the graph with the survey and WENCO coordinates into the progress tracker sheet as a comment.

Including the graph as a comment

On the accuracy calculation sheet, the coordinates from both Survey and WENCO were automatically shown in the graph. To include the graph as a comment in the Progress tracker sheet there was need to save it first. The following steps were undertaken:

Right click on the boundary of the graph and select copy. Open up the program Paint on your computer and click paste in the top left corner. The graph will appear; it might be smaller than the white canvas of paint. If so hover over the bottom right corner of the canvas until you see a two-way arrow. Click and drag the canvas until it matches the graphs size. Go to file and select save as. Give the file a name such as EX51_27/7.png for future reference and save in your validation folder. Now back to the progress tracker excel sheet. Hover, over the cell you just pasted the accuracy in until you see the plus sign. Right click and select Insert Comment. A yellow box will appear. Hover over the edge of the box until you see the four-way arrow icon. Right click and select Format Comment. On the top of the window select the tab "Colors and Lines". Under fill, there is Color, click on the dropdown menu and select, at the bottom, fill effects. Go to the Picture tab on the new window. Click on select picture and find the right picture. Click ok, The comment can now be enlarged and it will show when the cell is hovered.

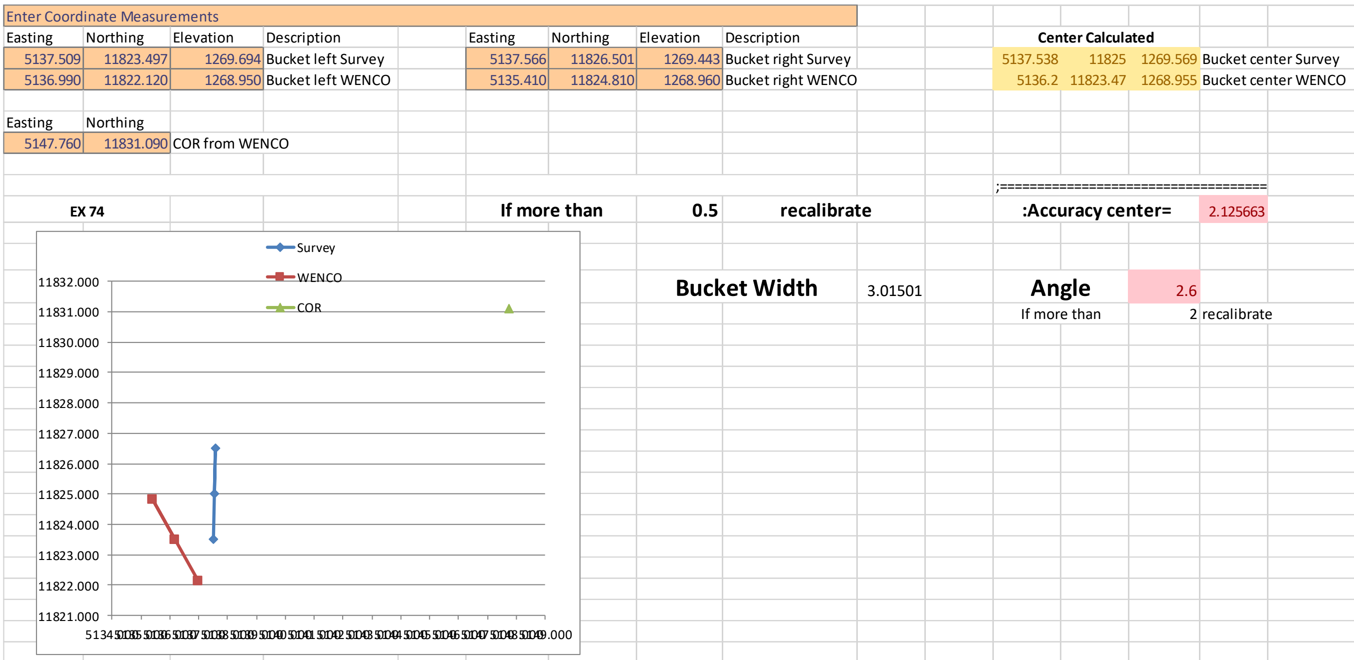


Figure 4. 3: EX 74 Validation Results Initial

From Figure 4.3, File Ex 74 was due for calibration. These initial results indicate that the accuracy center was 2.12 cm, and was above tolerance by 324%. Once calibrated, an accuracy center value was noticed to be within tolerance. Figure 4.4 shows Final Validation results.

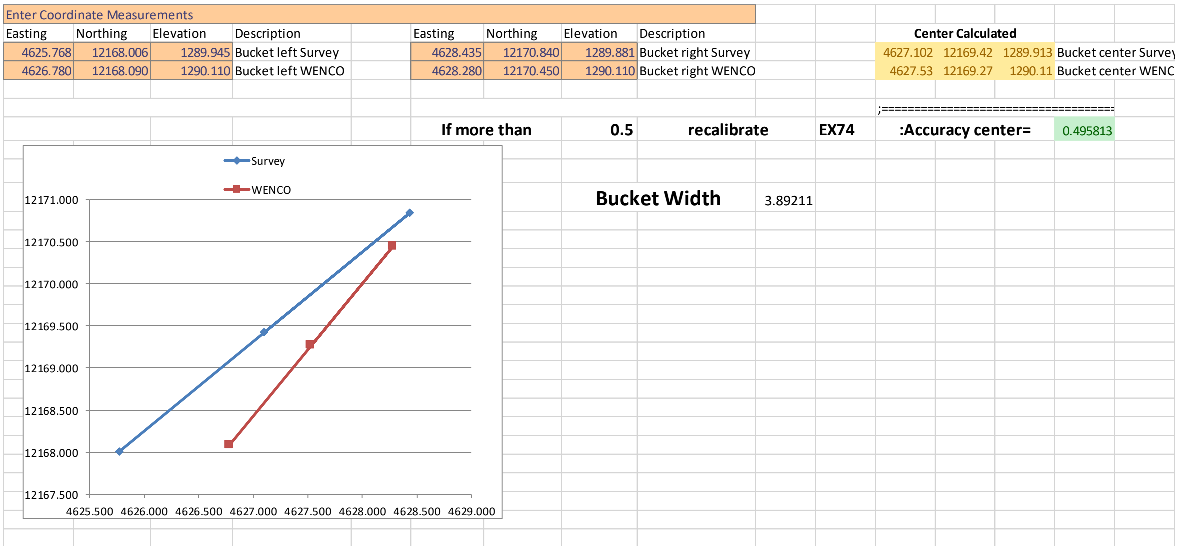


Figure 4: 4EX 74 Validation Results final.

Figures 4.5 and 4.6 show initial reading and final readings respectively.

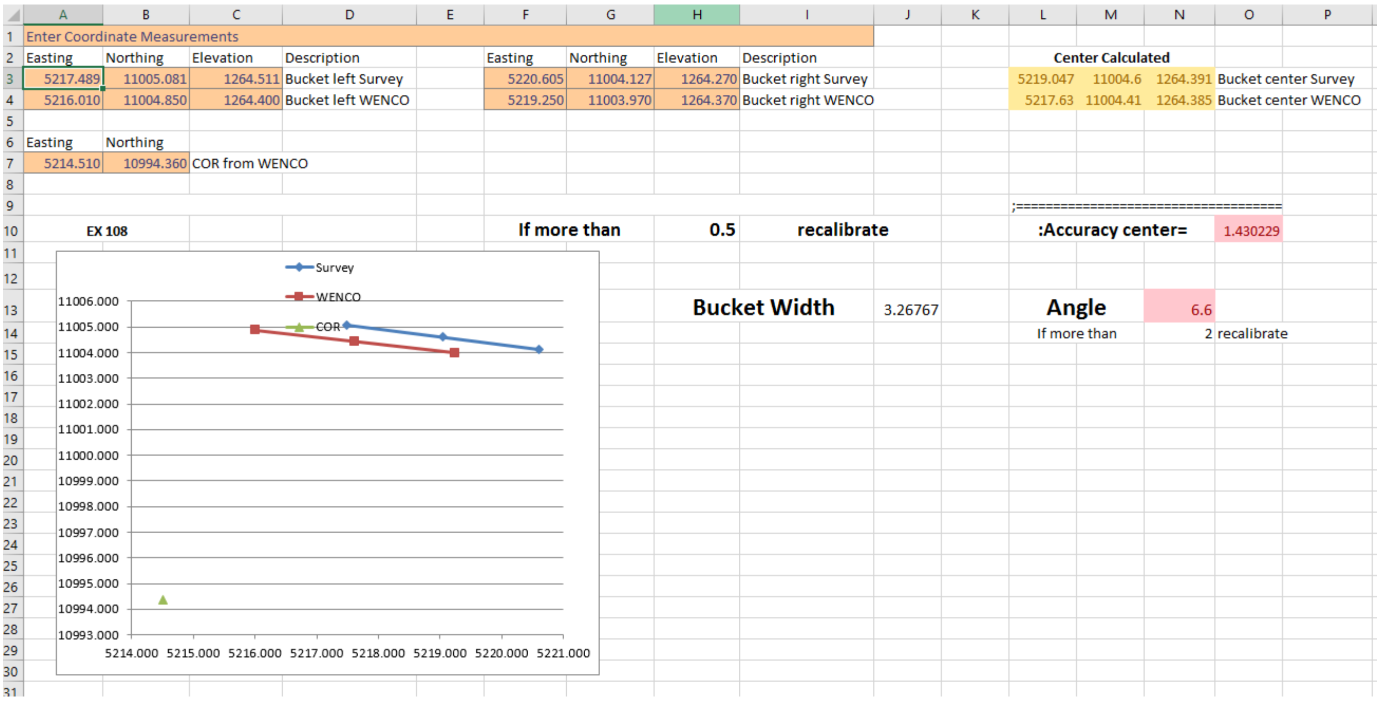


Figure 4: 5Ex108 initial readings

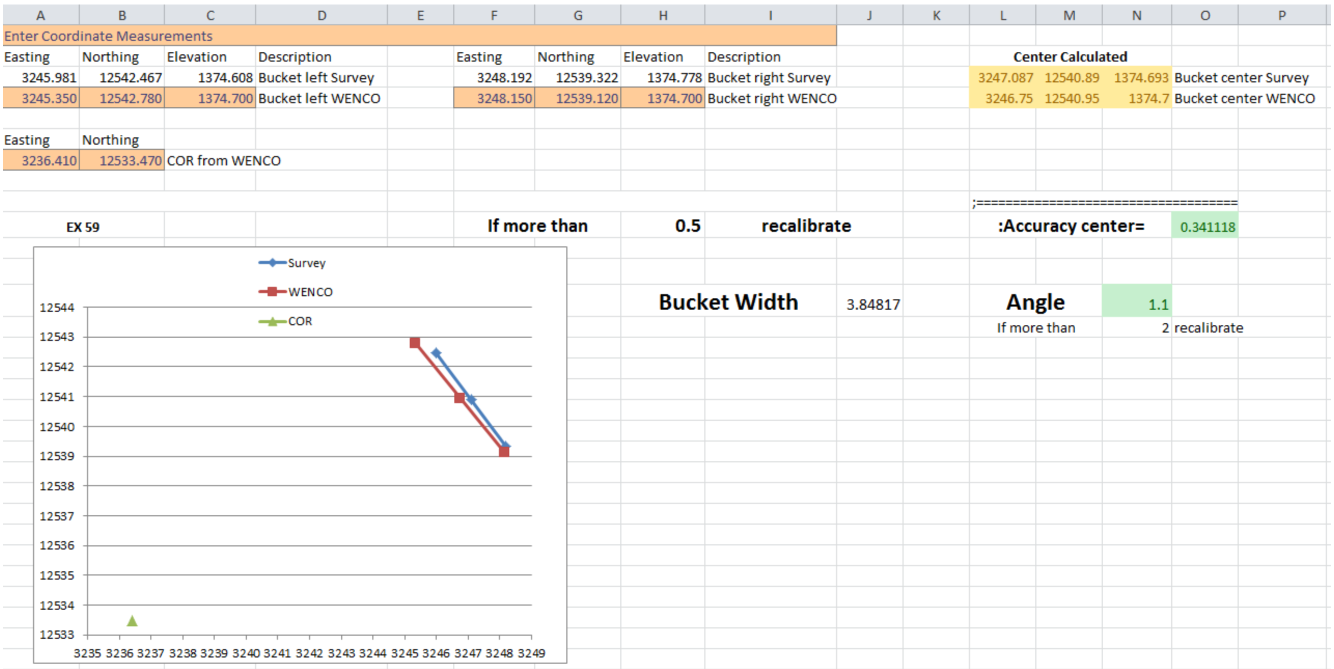


Figure 4: 6EX 108 after calibration results.

4.1.2 Sub-objective 2: Determine production rates through optimised loading and hauling cycle times (truck shovel waiting times) and fleet performance

4.1.2.1 Spotting Formula

The formula that is used to calculate the spot time is different depending on the status of the loading unit when a hauling unit arrives in the loading unit's wait zone.

Loading Unit is in waiting status:

Spot Time = (The time the hauling unit went into loading status)- (the time the hauling unit first stopped at the loading unit's wait range)

Note: To be considered stopped, the hauling unit must slow to a speed of **Speed Threshold Moving/Stopped** (configured in **WencoDB Home**'s **Equipment Type** editor) for Min Stop Time at LU seconds.

Loading Unit is in loading status (for a different hauling unit):

Spot Time = (The time the hauling unit went into loading status)- (the time the previous hauling unit went into Hauling status).

Limitations:

- The algorithm used to determine Spotting status requires that both the loading unit and the hauling unit be in network range when the hauling unit enters loading status, otherwise no spotting time will be detected.

Notes:

- A loading unit can only have one hauling unit at a time in Spotting status.
- All hauling units that arrive in the wait zone automatically go to Queue at LU status (even if there is only one hauling unit arriving and the loading unit is already in Wait status).
- If the loading unit finishes loading the previous hauling unit after the hauling unit enters the load range, there will be no spotting time for the hauling unit.
- Spotting is only determined algorithmically; it is not possible for the MDT5 operators or the dispatcher to manually set a hauling unit or a loading unit to Spotting.

4.1.3 Simulation of different Scenarios

In the following scenarios, the **WencoDB Home Equipment Status** record updates for the Hauling Unit, Loading Unit, or both, depending on the setting of the **Wenco Configuration Manager Enable MDT5 Spotting** parameter.

4.1.3.1 Scenario 1: One Hauling Unit Arrives at a Loading Unit that is waiting

In this scenario (Figure 4.7), Loading Unit #0111 is in **waiting** status when Hauling Unit #0203 arrives in the Waiting Zone.

- At 7:00:10, when Hauling Unit #0203 enters the Waiting Zone, its status changes to **Queue at LU**. Loading Unit #0111 remains in **waiting** status while the Hauling Unit positions itself for a load.
- At 7:00:40, Hauling Unit #0203 starts loading. Both the Loading Unit and the Hauling Unit change to **loading** status.

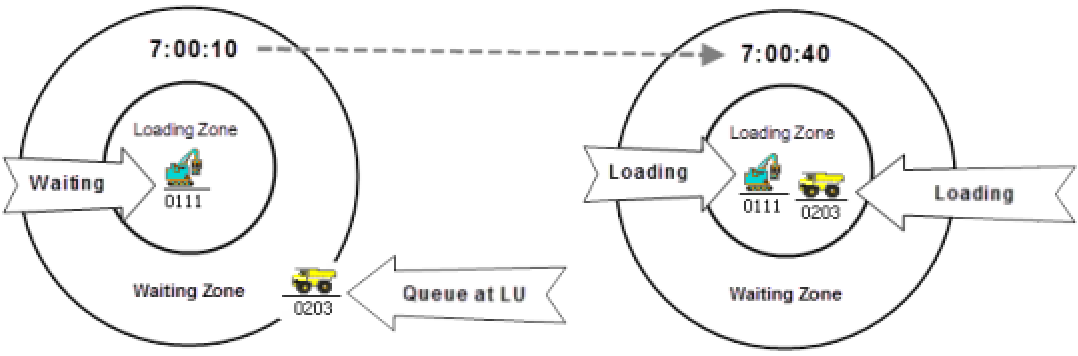


Figure 4. 7: One Hauling Unit arrives at a Loading Unit that is waiting

When the Hauling Unit goes into loading status (Figure 4.8), the equipment record updates based on the Spotting Formula.

Loading Unit #0111: At 7:00:10, the record starts for spotting. The record ends at 7:00:40.

Hauling Unit #0203: At 7:00:10, the record starts for spotting. The record ends at 7:00:40.

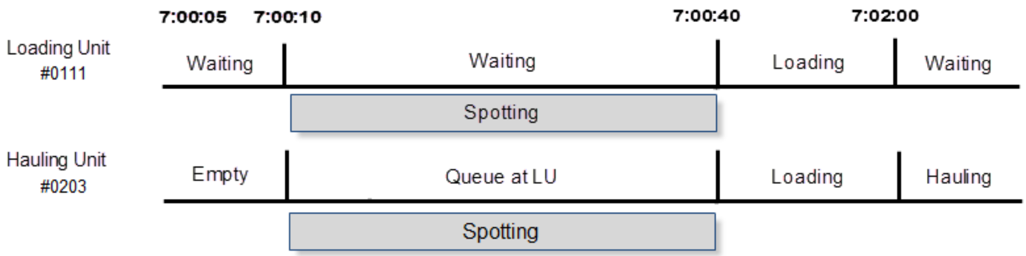


Figure 4. 8: Hauling Unit goes into loading status

4.1.3.2 Scenario 2: One Hauling Unit arrives at a Loading Unit that is Busy

In this scenario (Figure 4.9), Loading Unit #0111 is in **Face Prep** when Hauling Unit #0203 arrives in the Waiting Zone.

- At 7:00:10, when Hauling Unit #0203 enters the Waiting Zone, its status changes to **Queue at LU**.
- At 7:00:20, the Loading Unit becomes available and changes to **waiting** status.
- At 7:00:40, Hauling Unit #0203 changes to **loading** status.

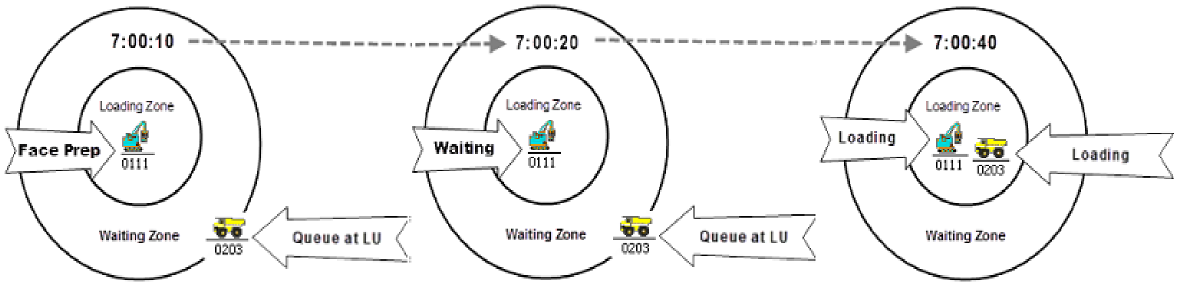


Figure 4. 9: One Hauling Unit arrives at a Loading Unit that is Busy

When Hauling Unit #0203 goes into loading status (Figure 4.10), the equipment record updates based on the Spotting Formula.

Loading Unit #0111: At 7:00:20, the record starts for spotting. The record ends at 7:00:40.

Hauling Unit #0203: At 7:00:20, the record for Hauling Unit #0203 starts for spotting. The record ends at 7:00:40.

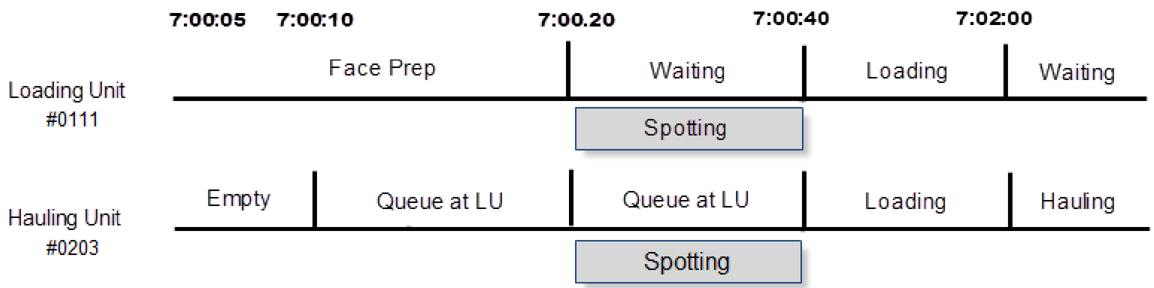


Figure 4. 10 Hauling Unit #0203 goes into loading status

4.1.3.3 Scenario 3: One Hauling Unit Arrives at a Loading Unit that is loading another Hauling Unit.

In Scenario 3(Figure 4.11), the Loading Unit is loading Hauling Unit #0201 when Hauling Unit #0203 arrives in the Waiting Zone.

- At 7:00:10, when Hauling Unit #0203 enters the Waiting Zone, its status changes to **Queue at LU**. Hauling Unit #0201 is loading so the Loading Unit is not available.
- At 7:00:20, Hauling Unit #0201 completes loading. The Loading Unit becomes available and changes to **waiting** status.
- At 7:00:40, Hauling Unit #0203 changes to **loading** status.

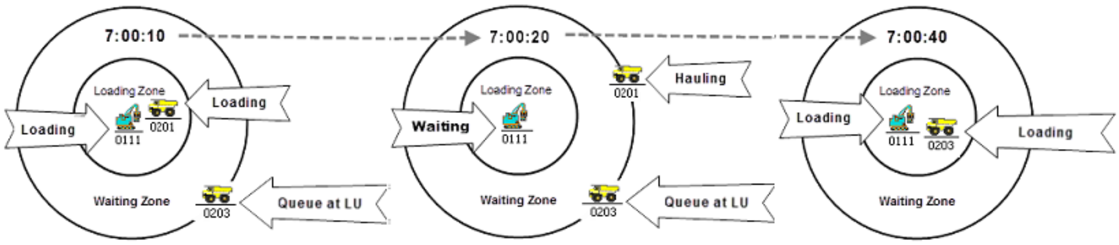


Figure 4. 11: One Hauling Unit Arrives at a Loading Unit that is loading another Hauling Unit

When Hauling Unit #0203 goes into loading status (Figure 4.12), the equipment record updates based on the Spotting Formula.

Loading Unit #0111: At 7:00:20, the record starts for spotting. The record ends at 7:00:40.

Hauling Unit #0203: At 7:00:20, the record for Hauling Unit #0203 starts for spotting. The record ends at 7:00:40.

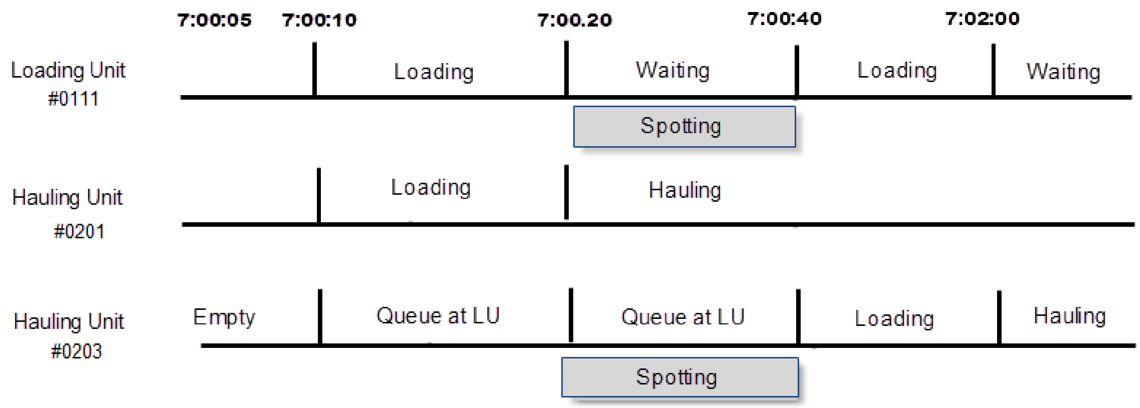


Figure 4. 12: Hauling Unit #0203 goes into loading status

4.1.3.4 Scenario 4: Loading is cancelled for Previous Loading Unit

In this Scenario 4 (Figure 4.13), the Loading Unit is loading Hauling Unit #0201 when Hauling Unit #0203 arrives in the Waiting Zone.

- At 7:00:10, when Hauling Unit #0203 enters the Waiting Zone, its status changes to **Queue at LU**. Hauling Unit #0201 is loading so the Loading Unit is not available.
- At 7:00:20, Hauling Unit #0201 cancels loading. The Loading Unit becomes available and changes to **waiting** status.
- At 7:00:40, the Hauling Unit #0203 changes to **loading** status.

When the Hauling Unit goes into loading status, the equipment record updates based on the Spotting Formula.

Loading Unit #0111: At 7:00:20, the record starts for spotting. The record ends at 7:00:40.

Hauling Unit #0203: At 7:00:20, the record for Hauling Unit #0203 starts for spotting. The record ends at 7:00:40.

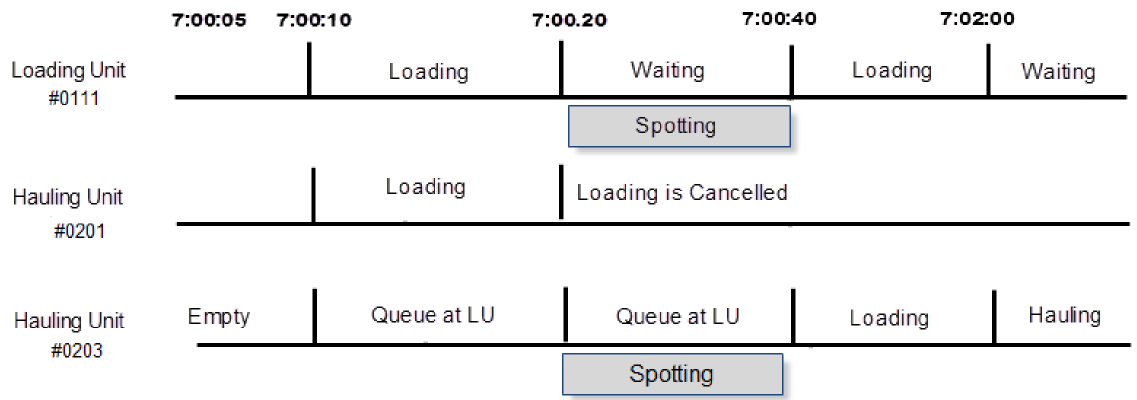


Figure 4. 13: Loading is cancelled for Previous Loading Unit

4.1.3.5 Hauling unit cycle time

Cycle time = load time + dump time + queuing time at the shovel + queuing time at the dump + loaded haul time + empty haul time.

Therefore, **cycle time = Travel time + Non- Travel time**

The Summary of Cycle Time (Actual) is shown in Appendix 6. Table 4.1 shows a summarised calculated cycle time from January- December 2019 with various KPIs.

Table 4. 1: Calculated cycle times from January- December 2019 with various KPIs.

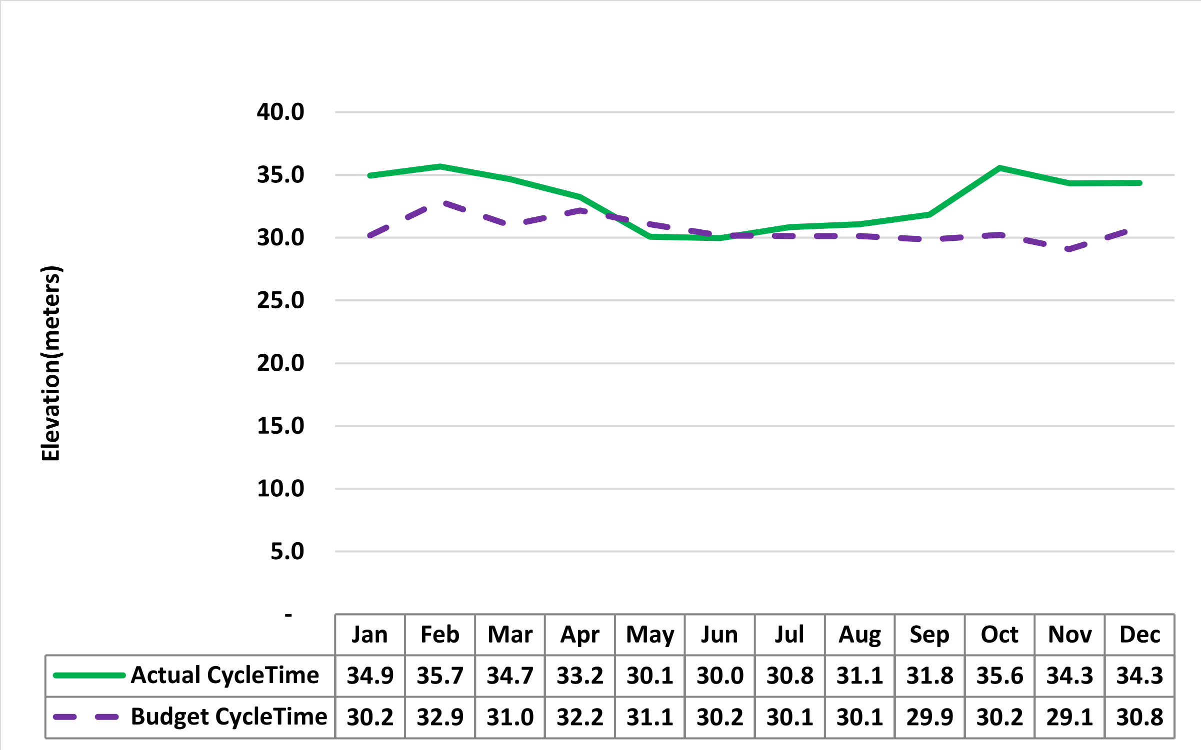
				Queue Time	Load Time			Hang Time	
Month	Cycle Time	Cycle Target	Avg HD	Avg QT	Avg LT	Avg ST	Avg WD	Avg HT	Avg DT
Jan	34.95	30.19	4.14	2.55	3.91	0.50	0.72	2.41	0.72
Feb	35.67	32.88	4.27	2.72	3.93	0.61	0.77	2.31	0.71
Mar	34.67	31.00	4.20	2.21	3.94	0.48	0.64	2.08	0.72
Apr	33.23	32.16	3.99	2.12	3.71	0.51	0.66	2.24	0.73
May	30.09	31.08	3.53	2.05	3.64	0.48	0.66	2.07	0.73
Jun	29.97	30.17	3.63	2.16	3.60	0.49	0.66	1.92	0.71

Jul	30.83	30.12	3.79	2.17	3.67	0.56	0.63	2.04	0.68
Aug	31.06	30.12	3.96	2.35	3.56	0.56	0.61	1.97	0.68
Sep	31.84	29.85	4.15	2.33	3.33	0.60	0.67	1.95	0.67
Oct	35.55	30.23	4.33	3.26	3.72	0.71	0.73	1.94	0.73
Nov	34.32	29.09	4.11	3.04	3.66	0.76	0.72	1.89	0.68
Dec	34.35	30.82	4.03	2.93	3.61	0.65	0.53	2.05	0.71
Grand Total	33.03	30.63	4.01	2.49	3.69	0.57	0.67	2.07	0.71

Based on the Cycle time, it was noticed that the month of May was 3.0% below budget as shown in Table 4.2.

Table 4. 2: Summary of Actual Cycle Times vs Budget Cycle Times

Month	Actual Cycle Time(Min)	Budget Cycle Time(Min)	Actual Elevation(mRL))	Budget Elevation(mRL)	Haul Distance (m)
Jan	34.9	30.2	1332	1338	4.1
Feb	35.7	32.9	1318	1326	4.3
Mar	34.7	31.0	1323	1339	4.2
Apr	33.2	32.2	1334	1356	4.0
May	30.1	31.1	1342	1366	3.5
Jun	30.0	30.2	1344	1354	3.6
Jul	30.8	30.1	1347	1357	3.8
Aug	31.1	30.1	1335	1364	4.0
Sep	31.8	29.9	1335	1369	4.1
Oct	35.6	30.2	1326	1367	4.3
Nov	34.3	29.1	1338	1372	4.1
Dec	34.3	30.8	1327	1351	4.0



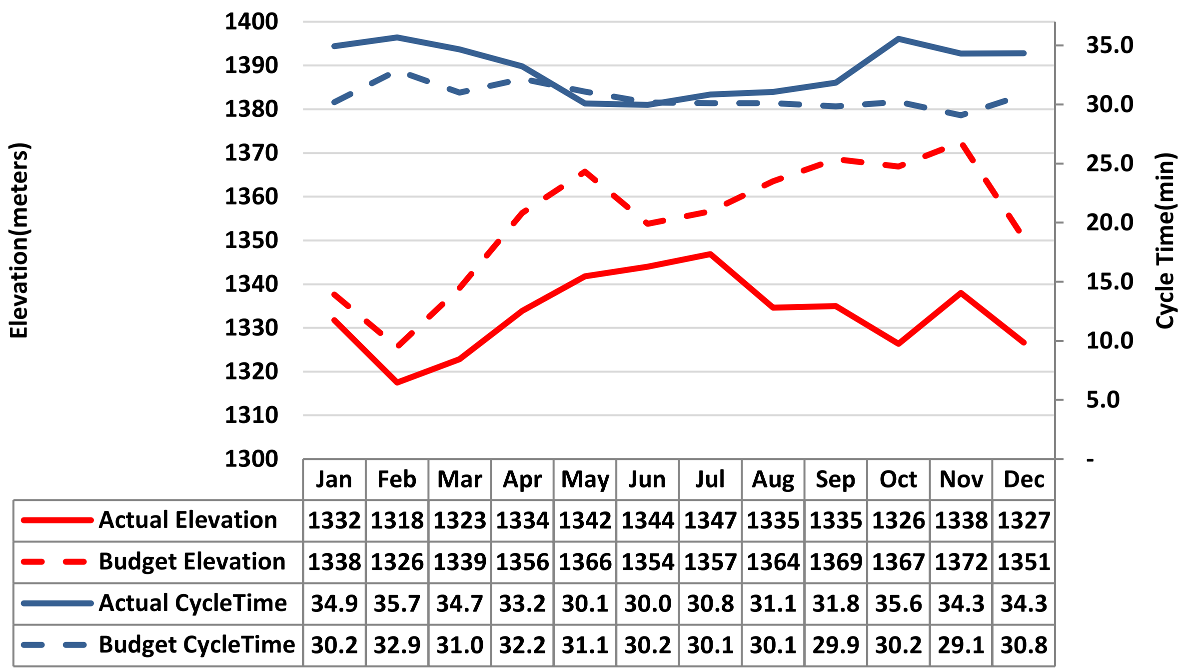
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Actual CycleTime	34.9	35.7	34.7	33.2	30.1	30.0	30.8	31.1	31.8	35.6	34.3	34.3
Budget CycleTime	30.2	32.9	31.0	32.2	31.1	30.2	30.1	30.1	29.9	30.2	29.1	30.8

Figure 4.14: Actual Vs Budget Cycle Time

The following was noticed from Figure 4.14:

1. Actual cycle time was higher than budgeted because for most part of the year except for May and June.
2. Actual cycle time substantially improved from September to December. The improvement was attributed to introduction of an ore bearing cutback, M7, which is the lowest point in the Main Pit. Most mining activities were then undertaken after September.

Figure 4.15 shows Cycle time vs Elevation



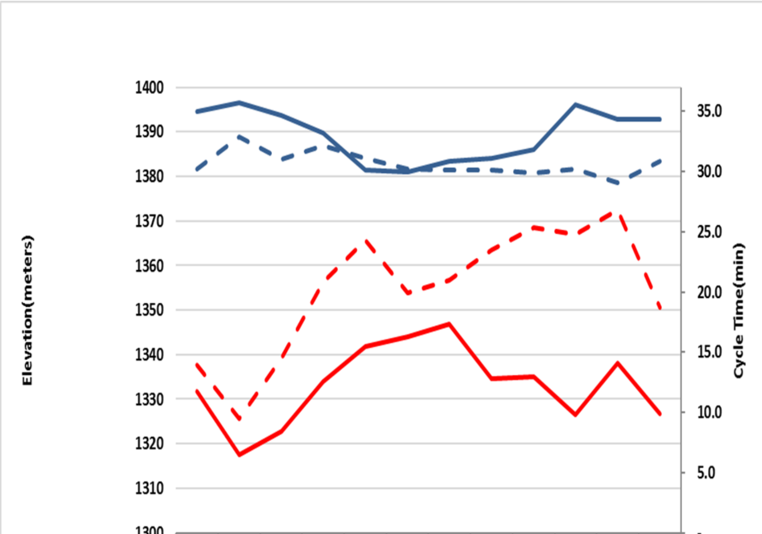
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Actual Elevation	1332	1318	1323	1334	1342	1344	1347	1335	1335	1326	1338	1327
Budget Elevation	1338	1326	1339	1356	1366	1354	1357	1364	1369	1367	1372	1351
Actual CycleTime	34.9	35.7	34.7	33.2	30.1	30.0	30.8	31.1	31.8	35.6	34.3	34.3
Budget CycleTime	30.2	32.9	31.0	32.2	31.1	30.2	30.1	30.1	29.9	30.2	29.1	30.8

Figure 4. 15: Cycle time Vs Elevations

The following are worth noting from Figure 4.15:

- From January to December, the actual elevation was below budget for all the months because of mining out of sequence and exposing of ore bearing cutbacks at various elevations based on the demand for ore to the crushers. This is one of the current challenges at Kansanshi mine were they are robbing the plans in future based on Annual copper target. Mining more BCMs to open up certain cutbacks as per plan and overachieving in certain areas.
- From January to December, Cycle times were above budget except between May and July. The below budget during the period under review is attributed to short haulage distances to dumping areas/destinations, improved loading time based on fragmentation in certain cutbacks such M13 and M14 where there is currently free digging in those areas, as well as the improved trolley load via a trolley assist, which increases the efficiency of trucks.

The above trend is also similar for Figure 4.16



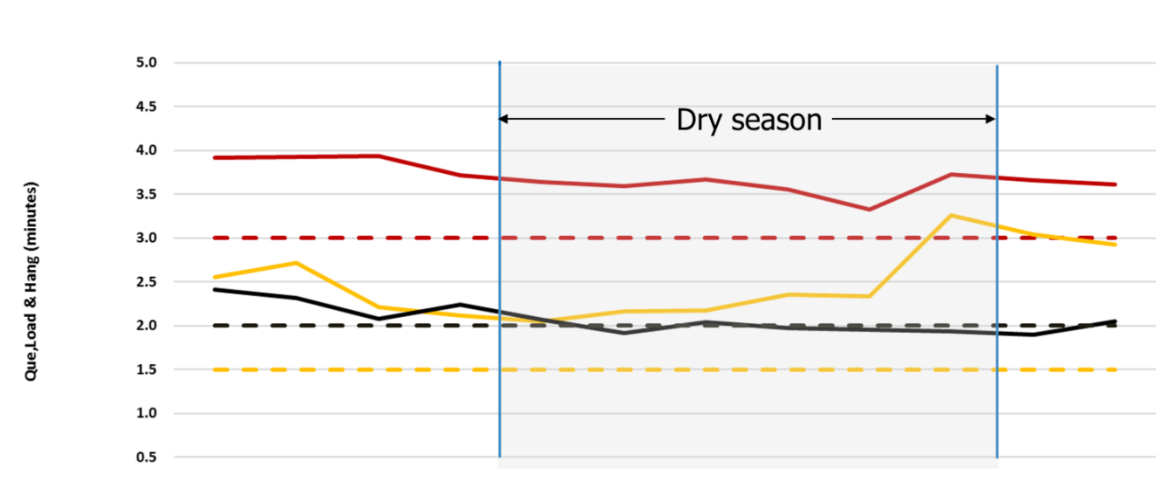
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Actual Elevation	1332	1318	1323	1334	1342	1344	1347	1335	1335	1326	1338	1327
Budget Elevation	1338	1326	1339	1356	1366	1354	1357	1364	1369	1367	1372	1351
Actual CycleTime	34.9	35.7	34.7	33.2	30.1	30.0	30.8	31.1	31.8	35.6	34.3	34.3
Budget CycleTime	30.2	32.9	31.0	32.2	31.1	30.2	30.1	30.1	29.9	30.2	29.1	30.8

Cutback	Budget	Forcast	Actual BCM	Budget Elev	Actual Elev
m7		104,000	35,695		1230
m11	310,000	891,000	857,898	1308	1308
m12	514,600	775,000	712,490	1257	1252
m13	372,000	364,000	302,654	1419	1449
m14	930,000	315,000	425,254	1375	1394
n9	372,000		41,225	1417	1445
s3		279,000	250,950		1301
s4	372,000	248,000	219,564	1355	1361
w2	372,000	279,000	189,425	1315	1330
Total	**3,242,600**	**3,255,000**	**3,035,155**	**1351**	**1327**

2019	
Budget Cycle Time	Actual Cycle Time
30.6	33.0

Figure 4. 16: Elevation: budget against mined

Figures 4.17 shows season comparison of load time actual vs target in dry and wet season cycle time parameters vs loading while and Figure 4.18 shows excavator loading time variations from Jan 2017 to Dec 2019.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Load Time	3.9	3.9	3.9	3.7	3.6	3.6	3.7	3.6	3.3	3.7	3.7	3.6
Load Target	3	3	3	3	3	3	3	3	3	3	3	3
Queue Time	2.6	2.7	2.2	2.1	2.1	2.2	2.2	2.4	2.3	3.3	3.0	2.9
Queue Target	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Hang Time	2.4	2.3	2.1	2.2	2.1	1.9	2.0	2.0	2.0	1.9	1.9	2.1
Hang Target	2	2	2	2	2	2	2	2	2	2	2	2

Figure 4. 17: load time actual vs target in dry and wet season comparison.

From Figure 4.17 it can be noted that loading time was higher than load target for most of the year. This is due to the presence of different material structures/lithology' in different cutbacks.

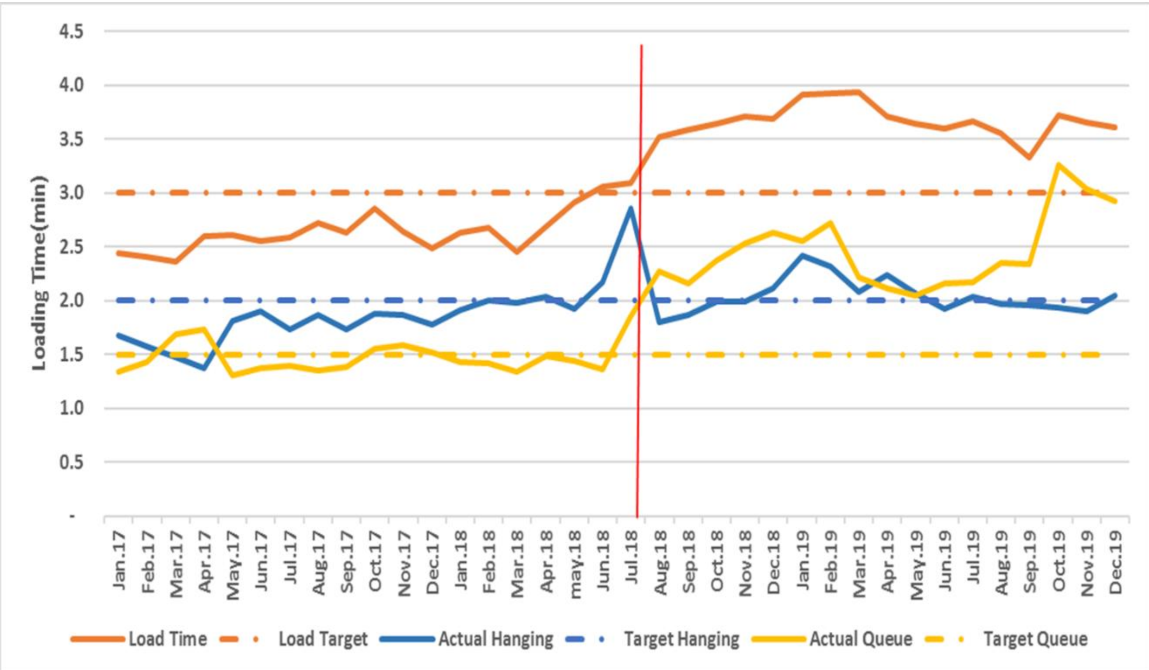


Figure 4. 18: excavator loading time 2017-2019

In Figure 4.18, the excavator loading times were less than load target for the entire period between January 2017 and May 2018. However, the loading times for the rest of the period from June 2018 to December 2019 were higher than the load target. From January 2017 to May 2018, a different fleet management system, MODULAR, was used as a dispatch tool with different configuration settings and data-capturing methods for the cycle time KPIs, especially on the loading times. During this period, dispatch would manually enter information based on the operator response (via touch screens); however, this information was not as accurate. In July 2018, the WENCO dispatching tool was then initiated to eliminate such manual entries to get results which were as accurate as possible. It was during this time when the cycle time KPIs were revised. Many changes were noted to get more precise results. This is still an on-going study(in relation to loading and waiting status with the radius of the excavator).

4.1.3.6 Digger rates

The average dig rates, Dig Rates per Cutback, and Match factors for various fleet are shown in Tables 4.3 and 4.4 respectively.

Table 4. 3: Dig Rates for various fleet

FLEET ID	MODEL	CUTBACK ID	Average of DIG RATE (BCM/HOUR)
EX108	LIEBHERR 9350	M7	805.57
EX109	LIEBHERR 9350	M11	936.74
EX72	LIEBHERR 9350	M12	835.19
EX74	LIEBHERR 9350	M13	1085.90
EX29	LIEBHERR 9350 E	M14	965.78
EX30	LIEBHERR 9350 E	S3	851.13
EX58	LIEBHERR 9350 E	S4	847.14
EX59	LIEBHERR 9350 E	W2	767.07
EX66	LIEBHERR 9250	Grand Total	886.78
EX69	LIEBHERR 9250		
EX70	LIEBHERR 9250		
EX51	EX2500-6		
EX57	EX2500-6		

Table 4. 4: Dig Rates Per Cutback

Cutbacks	Dig Rate(BCM/Hr.)
M7	
LIEBHERR 9250	399.4603016
LIEBHERR 9350	813.1619716
M11	
LIEBHERR 9350	1028.807973
LIEBHERR 9350 E	873.2062294
M12	
LIEBHERR 9250	758.659445
LIEBHERR 9350	892.1737567
M13	
LIEBHERR 9350 E	1129.543601
M14	
LIEBHERR 9250	1033.984109
LIEBHERR 9350	1076.944252
LIEBHERR 9350 E	961.2039169
S3	
EX2500-6	852.9622372
LIEBHERR 9250	848.3719351
S4	
EX2500-6	849.2819831
LIEBHERR 9250	930.414855
LIEBHERR 9350	813.4736842
W2	
EX2500-6	773.2547198
LIEBHERR 9250	806.9831475

4.1.3.7 Match factors

For truck match factors, ADT use 13, 100 Tonners use 33.3, 150 tonners use 51.3 and 180 tonners use 64.4. The 100 tonners carrying stockpile use a truck factor of 38.

Table 4. 5: Truck Match Factors. The table consists of fixed Fleet factors currently used on site

		Unit	**Values**		
		Blast		**Stockpile**	

Eqmttype	Truck	Truck Factor	Total Load	Truck Factor	Total Load
Cat 777D	RD20	33.3	1,865	38.0	304
	RD22	33.3	633	38.0	1,520
	RD23	33.3	766	38.0	1,672
	RD24	33.3	999	38.0	2,052
	RD25	33.3	1,632		
Cat 777F	RD46	33.3	2,432		
	RD48	33.3	533		
	RD61	33.3	1,332		
	RD63	33.3	2,032		
	RD64	33.3	2,065		
Cat 785	RD122	51.3	3,281		
	RD123	51.3	3,383		
	RD124	51.3	3,639		
	RD126	51.3	1,743		
	RD127	51.3	2,409		
	RD128	51.3	1,640		
	RD129	51.3	4,356		
	RD130	51.3	3,024		
	RD131	51.3	3,485		
	RD50	51.3	2,819		
	RD51	51.3	2,973		
	RD53	51.3	2,819		
	RD54	51.3	3,126		
	RD55	51.3	3,280		
	RD56	51.3	3,383		
	RD57	51.3	2,460		
	RD58	51.3	3,485		
	RD59	51.3	2,563		
	RD60	51.3	3,690		
	RD65	51.3	3,280		
Hitachi EH3500	RD100	64.4	1,932		
	RD101	64.4	3,284		
	RD102	64.4	1,739		
	RD103	64.4	3,284		
	RD104	64.4	837		
	RD105	64.4	386		
	RD118	64.4	3,027		
	RD119	64.4	3,413		
	RD120	64.4	3,671		
	RD121	64.4	3,478		
	RD70	64.4	3,156		

	RD71	64.4	3,735		
	RD72	64.4	3,156		
	RD74	64.4	2,962		
	RD75	64.4	3,800		
	RD76	64.4	3,671		
	RD77	64.4	3,156		
	RD80	64.4	2,125		
	RD81	64.4	3,349		
	RD82	64.4	2,640		
	RD83	64.4	3,220		
	RD84	64.4	3,349		
	RD85	64.4	2,962		
	RD86	64.4	966		
	RD87	64.4	3,864		
	RD89	64.4	3,156		
	RD90	64.4	4,186		
	RD91	64.4	2,898		
	RD92	64.4	3,993		
	RD93	64.4	2,125		
	RD94	64.4	3,606		
	RD95	64.4	1,288		
	RD96	64.4	3,156		
	RD97	64.4	4,250		
	RD98	64.4	1,610		
	RD99	64.4	2,254		
Komatsu HD1500	RD67	51.3	3,741		
	RD68	51.3	2,306		
	RD69	51.3	1,486		
Komatsu HD785	RD33	33.3	400		
	RD37	33.3	2,065		
	RD39	33.3	1,199		
	RD40	33.3	1,799		
	RD41	33.3	1,932		
	RD43	33.3	33		
	RD44	33.3	1,899		
Volvo A40D	ADT89	13.0	10,907		

4.1.3.8 Fill factors

The calculated actual fill factor based on the SI is 80% for all material types and is given by

0.80*bucket size (m^2) = Actual volume scooped

This will affect the loading time based on fill factor which is a function of fragmentation.

4.1.3.9 Material density

- Densities – In situ densities and not bulk densities are applied resulting in increased tonnages

4.1.3.10 Equipment Availability& Utilization.

Table 4.6 shows availability and utilization for trucks and excavators- Actual vs budget.

Assuming a shift = (8hrs)

Available hours

If 8hrs, availability=100%

Breakdown (PM/other-physical/mechanical) 5hrs in a shift

- Physical Ava= (shift hours (available)-PM-Other breakdowns)/ (shift hrs.) *100%
- Utilisation= (available hrs. –delays and standbys)/available hours*100

Actual availability, Actual Utilisation, Budget availability and Utilisation obtained are shown in Figure 4.7

Table 4. 6 : Availability/Utilisation for Trucks & Excavators

	Actual Availability	Actual Utilisation	Budget Availability	Budget Utilisation
CAT785C				
Jan	77%	67%	75%	70%
Feb	74%	74%	75%	70%
Mar	74%	75%	75%	70%
Apr	75%	80%	80%	85%
May	73%	85%	80%	85%
Jun	79%	85%	80%	85%
Jul	81%	85%	80%	85%
Aug	83%	84%	80%	85%
Sep	86%	82%	80%	85%
Oct	83%	83%	80%	85%
Nov	86%	77%	75%	70%
Dec	84%	74%	75%	70%
EH3500				
Jan	75%	58%	75%	70%
Feb	77%	67%	75%	70%
Mar	74%	67%	75%	70%
Apr	72%	77%	80%	85%
May	74%	84%	80%	85%
Jun	76%	85%	80%	85%
Jul	79%	84%	80%	85%

Aug	79%	83%	80%	85%
Sep	81%	82%	80%	85%
Oct	80%	81%	80%	85%
Nov	80%	69%	75%	70%
Dec	82%	60%	75%	70%
EX2500-6				
Jan	80%	71%	75%	70%
Feb	80%	70%	75%	70%
Mar	80%	74%	75%	70%
Apr	84%	76%	80%	85%
May	82%	85%	80%	85%
Jun	81%	82%	80%	85%
Jul	85%	80%	80%	85%
Aug	88%	81%	80%	85%
Sep	82%	80%	80%	85%
Oct	73%	82%	80%	85%
Nov	78%	76%	75%	70%
Dec	74%	60%	75%	70%
LIEBHERR 9250				
Jan	70%	58%	75%	70%
Feb	78%	63%	75%	70%
Mar	75%	64%	75%	70%
Apr	81%	77%	80%	85%
May	69%	82%	80%	85%
Jun	78%	84%	80%	85%
Jul	75%	85%	80%	85%
Aug	85%	80%	80%	85%
Sep	81%	79%	80%	85%
Oct	64%	81%	80%	85%
Nov	82%	74%	75%	70%
Dec	83%	70%	75%	70%
LIEBHERR 9350				
Jan	89%	56%	75%	70%
Feb	83%	64%	75%	70%
Mar	76%	63%	75%	70%
Apr	83%	75%	80%	85%
May	83%	83%	80%	85%
Jun	86%	84%	80%	85%
Jul	85%	82%	80%	85%
Aug	85%	81%	80%	85%
Sep	88%	81%	80%	85%
Oct	84%	82%	80%	85%
Nov	86%	72%	75%	70%

Dec	88%	65%	75%	70%
LIEBHERR 9350 E				
Jan	86%	55%	75%	70%
Feb	86%	62%	75%	70%
Mar	90%	63%	75%	70%
Apr	83%	67%	80%	85%
May	89%	82%	80%	85%
Jun	86%	83%	80%	85%
Jul	90%	84%	80%	85%
Aug	88%	82%	80%	85%
Sep	85%	83%	80%	85%
Oct	79%	84%	80%	85%
Nov	85%	72%	75%	70%
Dec	80%	64%	75%	70%

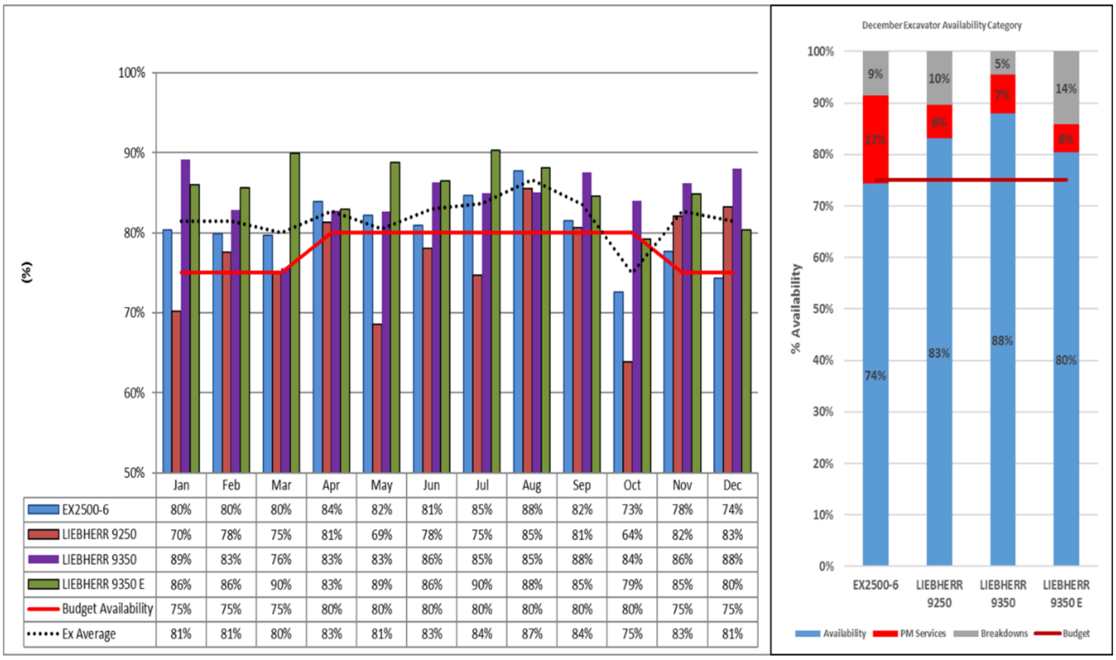


Figure 4. 19 : Excavator physical availability

Figure 4.19 shows that Excavator availability across Year 2019 was above budget except for the month of October. This was due to planned maintenances as well as increases breakdowns on LIEBHERR 9250s. During this period, frequent power surges affected electrics shovels LIEBHERR 9350 E too.

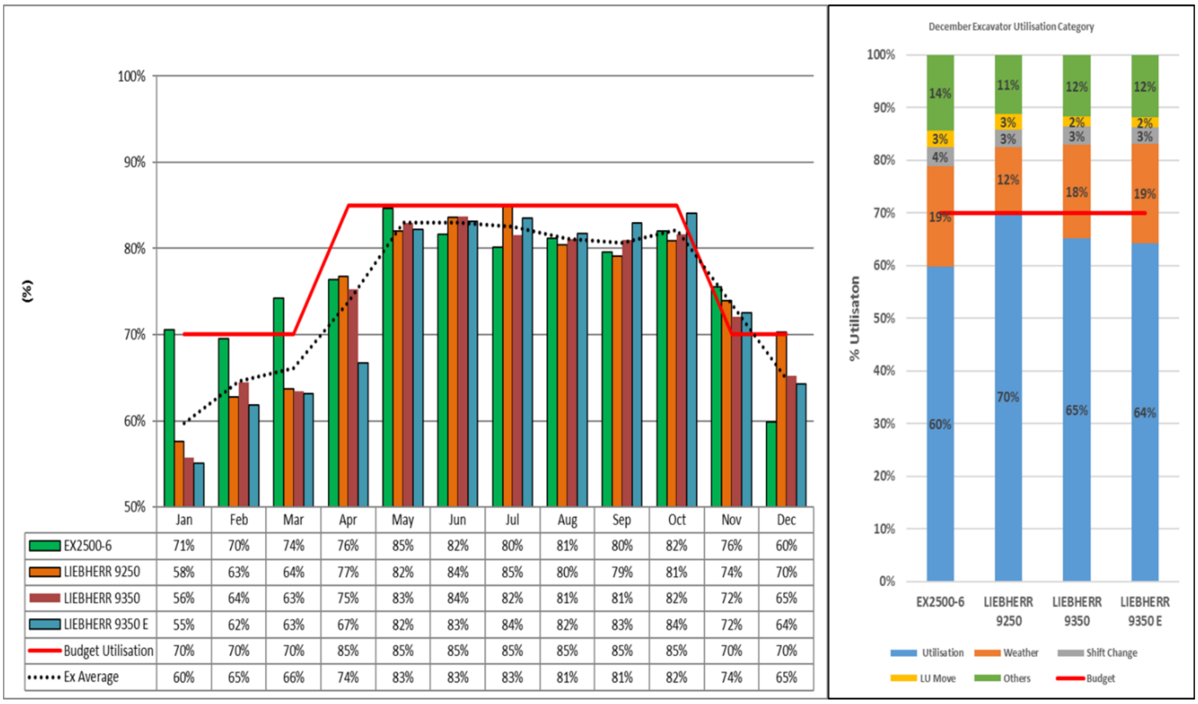


Figure 4. 20: Excavator utilisation for 2019

In Figure 4.20, it can be noticed that utilization of excavators especially during the wet season is usually reduced as they are on standby due to the wet conditions. In this case, excavators are especially on standby during January, February, March, November and December. Other factors included shift change on operators, movement of loading units during blasting times and long trams. these factors for the month of November were reduced.

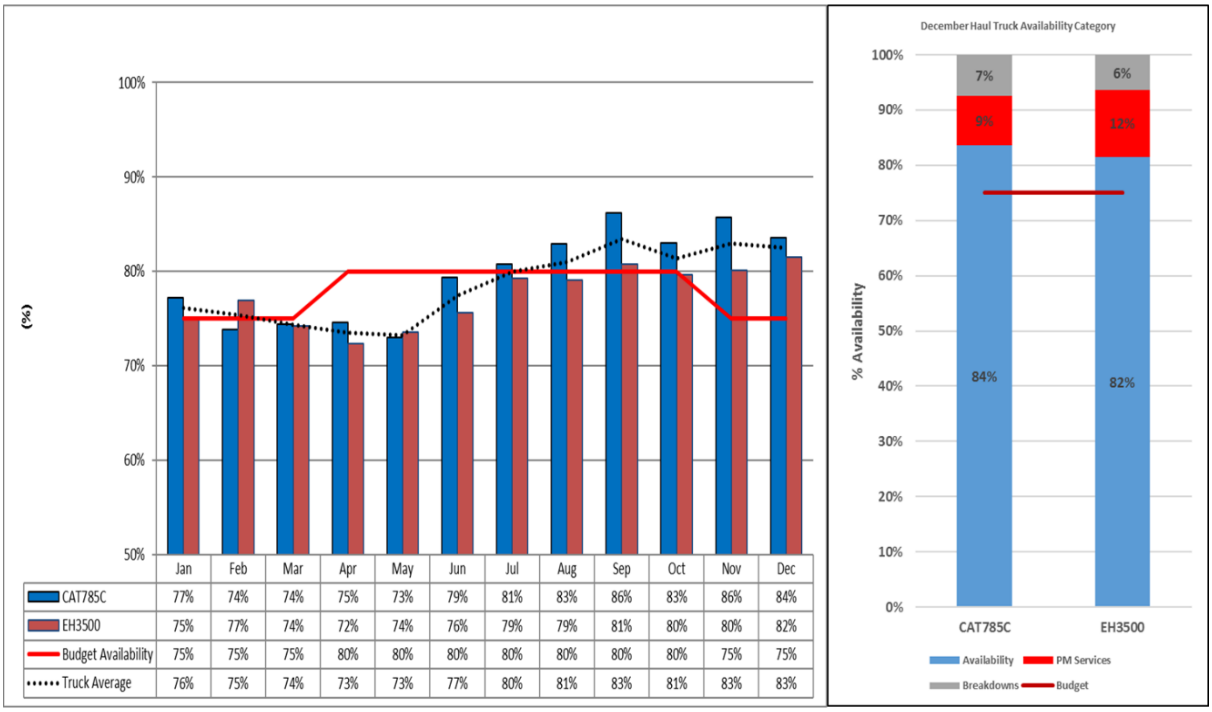


Figure 4. 21: Haul truck availability for 2019

Figure 4.21 shows that from January to February, the availability budget for both CAT 785C and EH 3500 was 75%. Relatively high availability during this period was achieved except for March, this was highly affected by both the wet weather and the breakdowns. From May to October, the budget was increased to 80% bearing in mind the period was the Dry season.

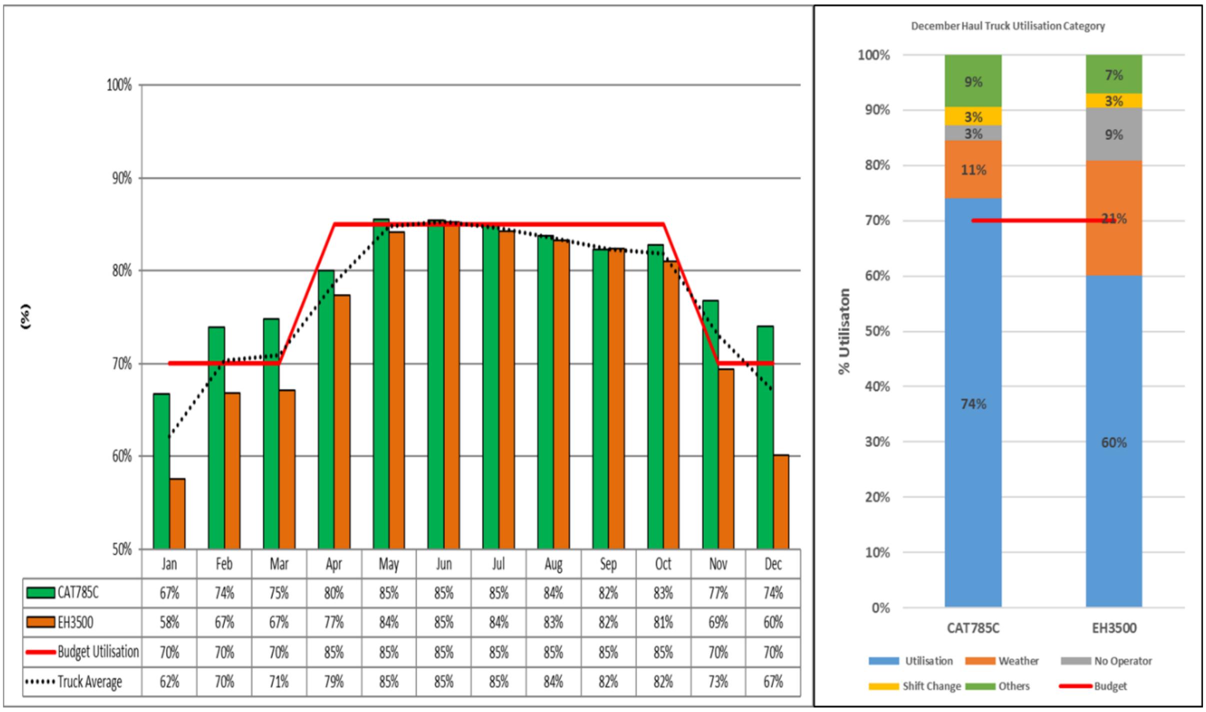
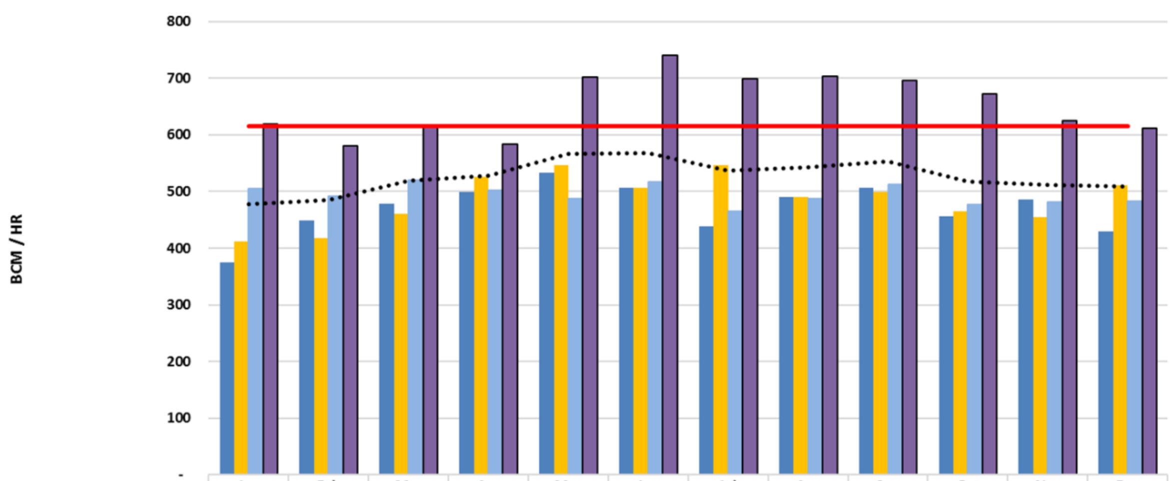


Figure 4. 22:Haul truck utilisation for 2019

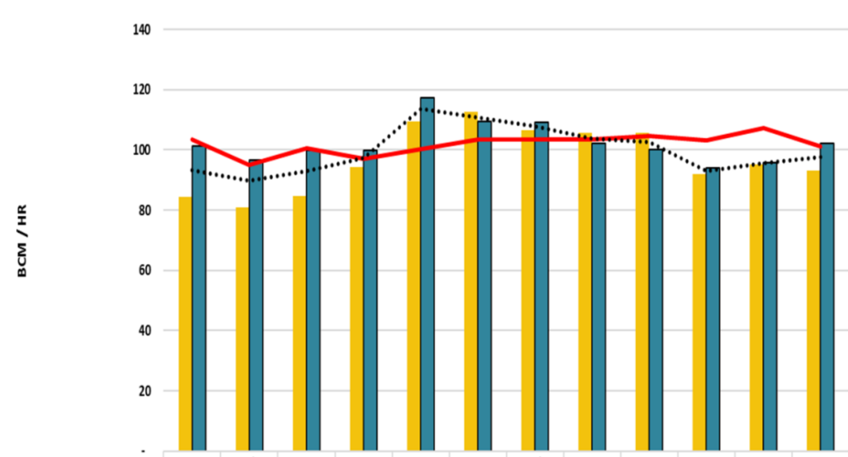
Figure 4.22 indicates that the budget Haul truck utilisation between January and March remained constant at 70%. From March to May it increased to 85%. Later budget utilisation remained constant at 85 % between May and October and later reduced to 70% in November and December. Low utilisation of about 70 % was attributed to the rainy season, and to some extent non availability of operators and shift change.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EX2500-6	376	449	478	499	533	507	438	491	506	456	486	430
LIEBHERR 9250	411	419	461	526	546	507	547	491	499	466	455	511
LIEBHERR 9350	506	491	520	503	488	517	466	487	513	477	482	483
LIEBHERR 9350 E	618	581	617	583	702	740	699	703	696	673	625	612
Budget Productivity	616	616	616	616	616	616	616	616	616	616	616	616
Average Productivity	478	485	519	528	567	568	537	543	553	518	512	509

Figure 4. 23: Excavator productivity performance

Figure 4.23, overall productivity on the electric 9350E shovel was on the higher side across the months based on the mining areas/cutbacks with favorable fragmentation and shorter cycle times.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CAT 785C2	84	81	85	94	110	113	107	106	106	92	95	93
EH3500	101	97	100	100	117	109	109	102	100	94	96	102
Budget Productivity	103	95	101	97	100	103	104	104	105	103	107	101
Average Productivity	93	90	93	97	114	111	108	104	103	93	95	98

Cutbacks	Cycle Time	% Material Moved
M7	44.8	1%
CAT785C	42	
EH3500	46	
M11	36.3	28%
CAT785C	36	
EH3500	36	
M12	43.3	23%
CAT785C	44	
EH3500	43	
M13	24.0	10%
CAT785C	24	
M14	25.1	14%
CAT785C	25	
EH3500	25	
N9	25.2	1%
CAT785C	27	
EH3500	25	
S3	35.4	8%
CAT785C	35	
EH3500	36	
S4	32.8	7%
CAT785C	33	
EH3500	34	
W2	30.9	6%
CAT785C	30	
EH3500	34	

Figure 4. 24bHaul truck productivity

Figure 4.24 shows Haul Truck performance in terms of productivity. EH3500 trucks utilise the trolley assist, which contributes to a higher performance. Cycle time varies based on different lithology's in various cutbacks. The percentage of material moved per cutback indicates that the actual mined material is more than the planned material to be mined, for that specific cutback. Therefore M11 recorded a larger percentage as this was a high priority cut back to mine out the lower grades while exposing the high-grade material on the lower benches.

4.1.3.11 Ex-pit material mined budget vs actual-2019

The total Actual mined Ex-pit BCMs for the Year 2019 were 6.0% below budget indicating a shortfall of 2.67M, BCMs as highlighted on Figure 4.25. The cumulative monthly variances are highlighted on Figure 4.26. The month of February was the only month for the entire year with a positive variance, where targeted budgets were attained..

Poor Utilization and reduced productivity of equipment contributed largely to budget shortfalls for the targeted BCMs. This also resulted in increased cost/BCM to 4.0% as shown in Figure 4.27 and 4.28 respectively.

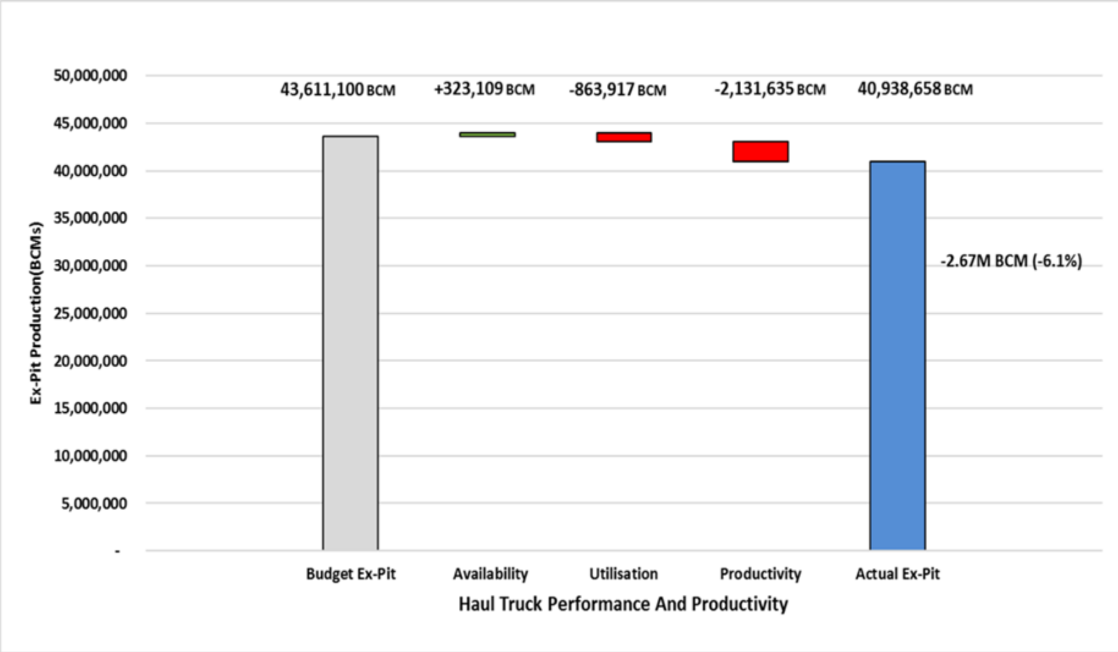


Figure 4. 25:Actual Ex-pit mined Bcms vs budget

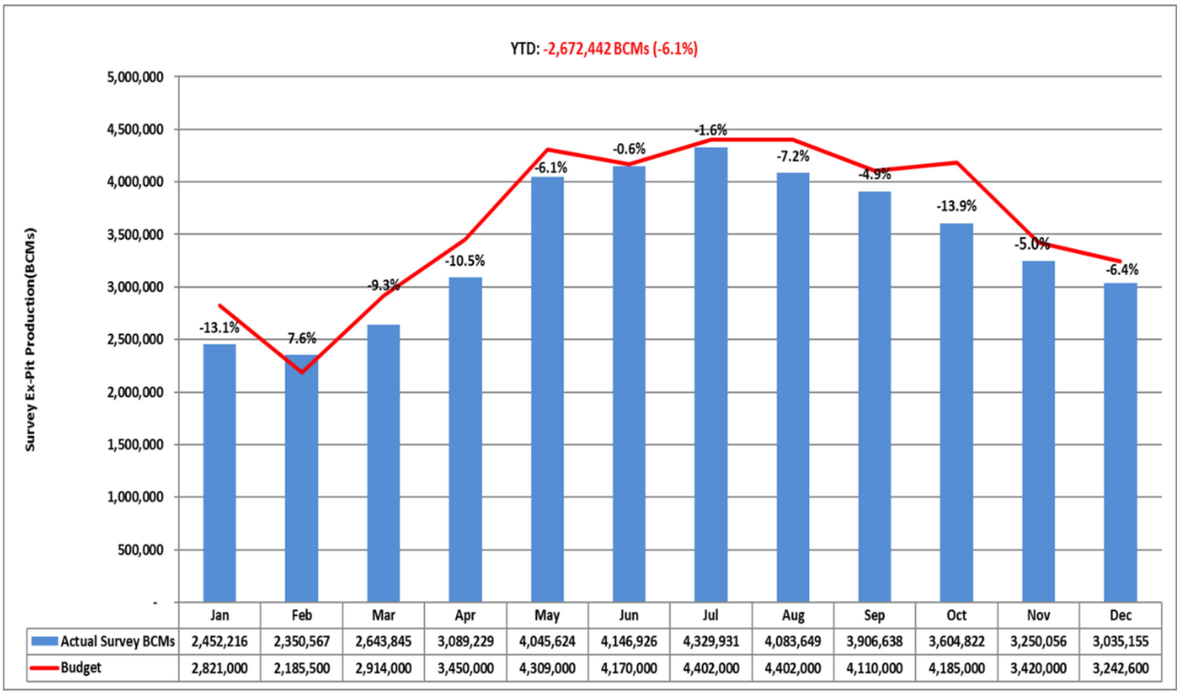


Figure 4. 26: Cumulative BCM Variances January-December 2019

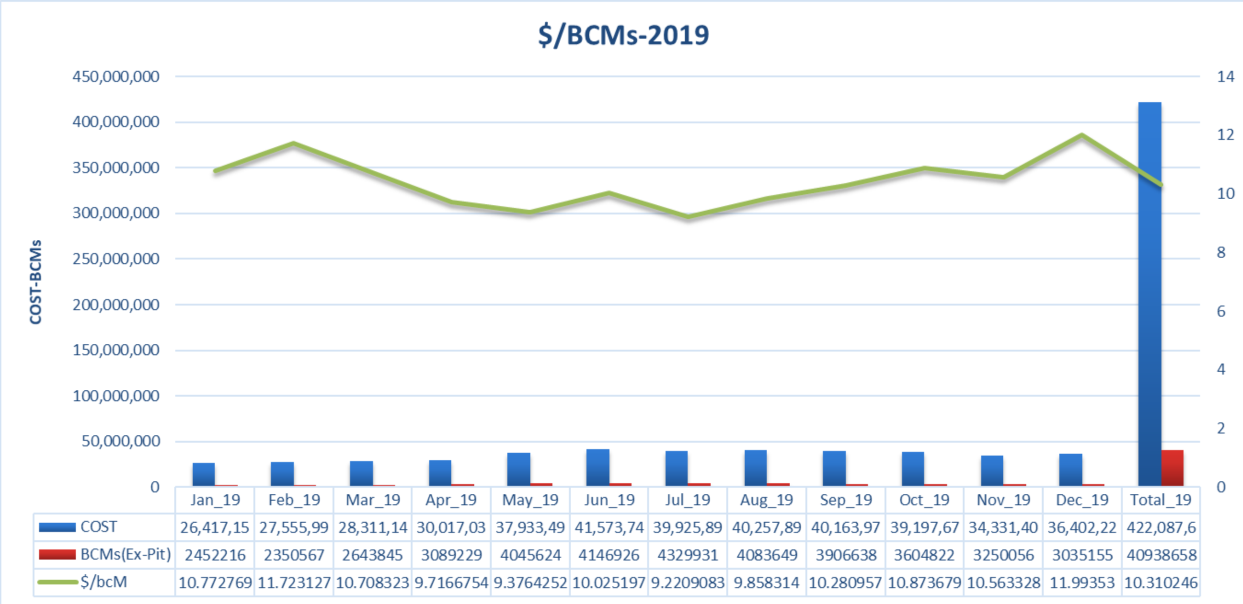


Figure 4. 27: Cost/bcm_2019 (Courtesy of KMP)

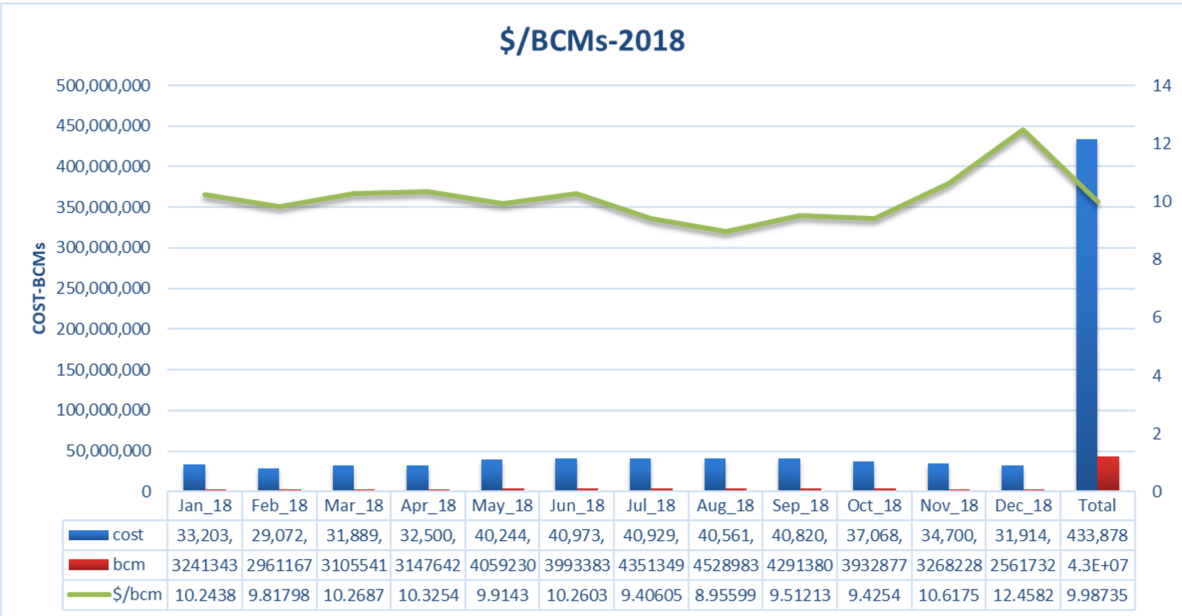


Figure 4. 28: Cost/bcm_2018 (Courtesy of KMP)

Figure 4.29 shows poor utilization as a result of poor weather, lack of operators, delayed shift change, refueling of units, fatigue breaks, etc. For the Year 2019, poor weather highly contributed to poor utilization of equipment by 0.65% (i.e. 264,453BCMs) of the total BCMs mined.

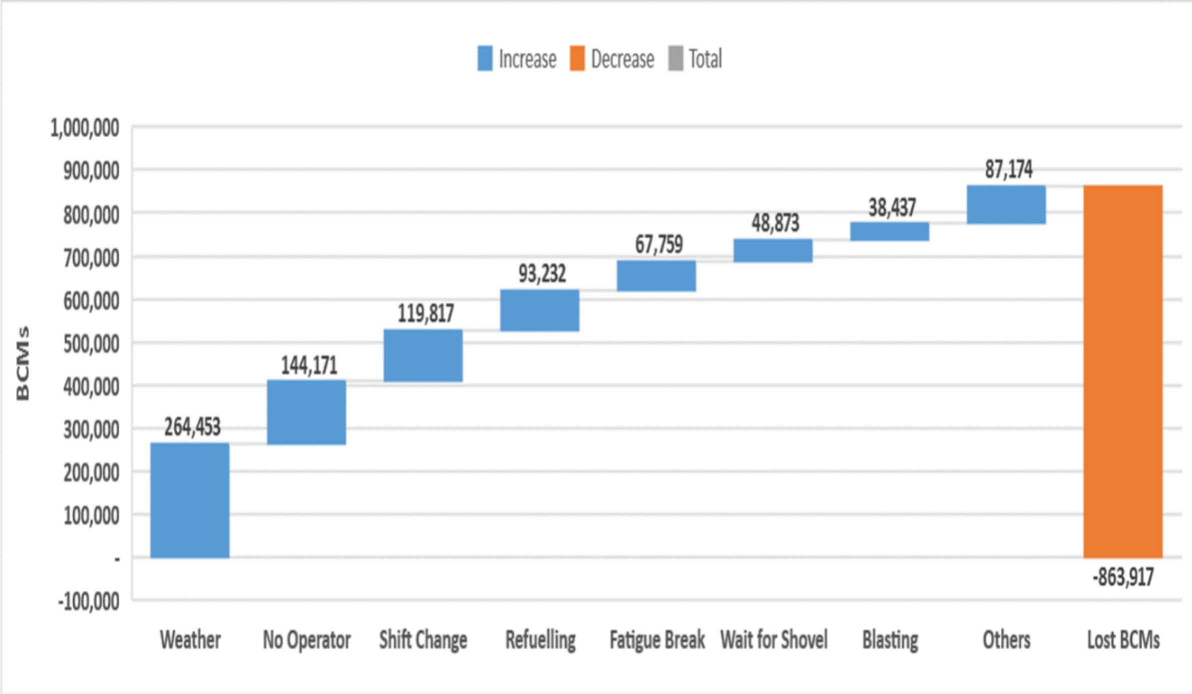


Figure 4. 29: Poor Utilisation categories

In terms of productivity loss, Truck Cycle Time played a critical role. This observation was made based on increased Truck Cycle Non-travel times (Queuing, spotting, Dumping, waiting on digger times, etc.), compared to the Truck Cycle speeds as shown in Figure 4.30. This resulted in 2.1M BCMs lost

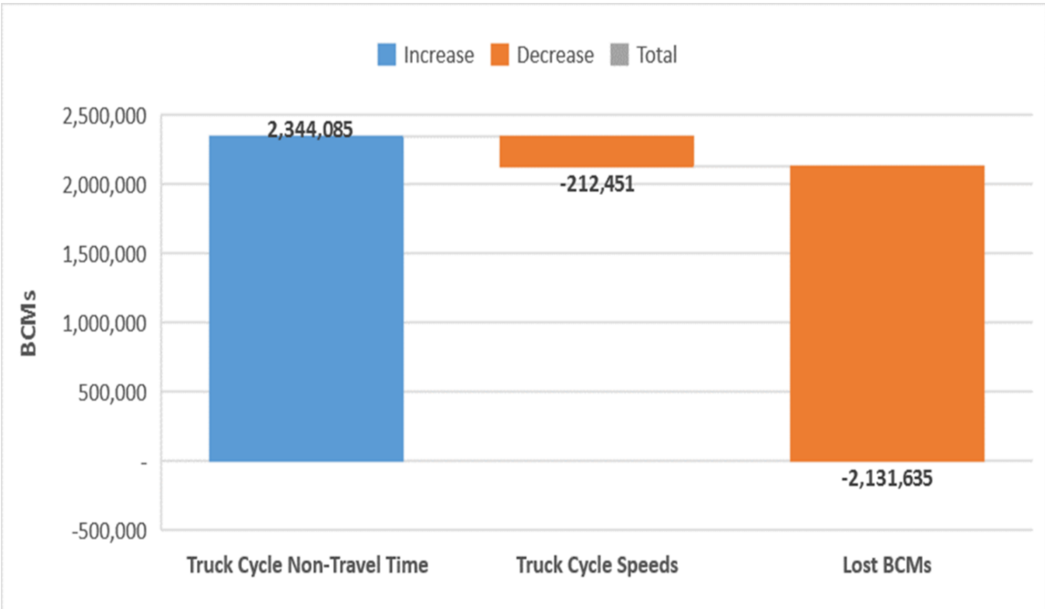


Figure 4. 30. Productivity loss in BC

Ms

Figure 4.31 shows a group of truck cycle non-travel elements with queuing at digger as the largest contributor of lost BCMs by 1.2M BCMs.

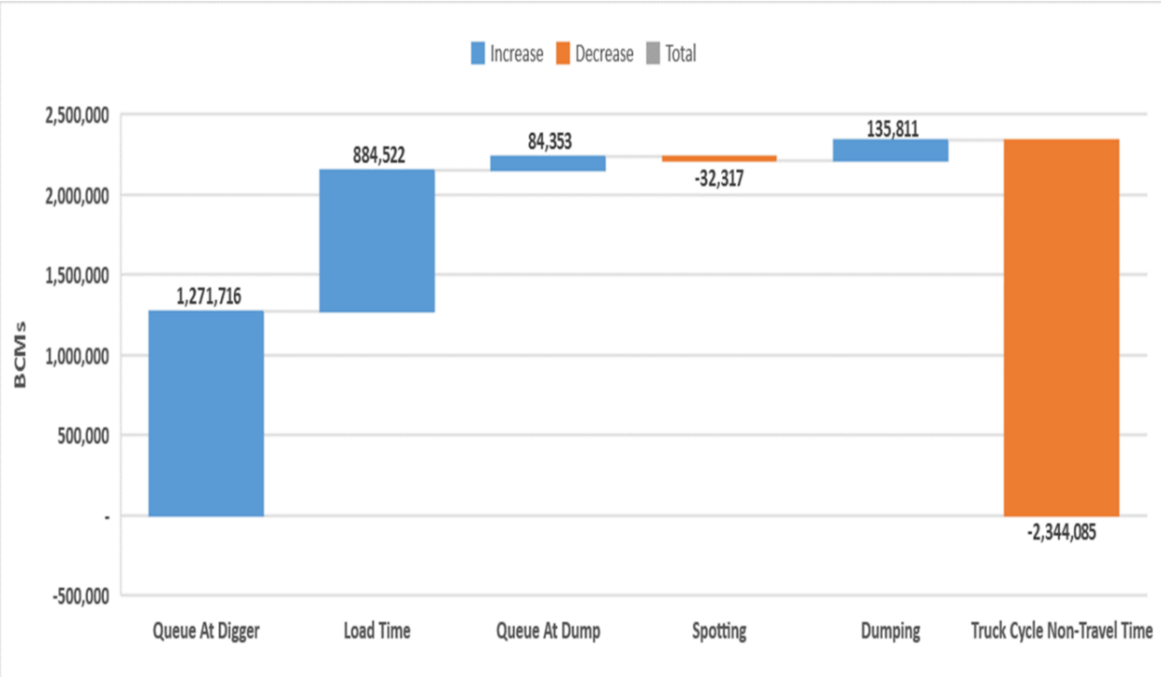


Figure 4. 31. Truck non-cycle travel time

4.1.4 Sub-objective 3 Monitor the material type and quality /grade of ore delivered to the crushers/BCMs reconciliation

Once the dig-plans had been processed from the geological section as shown in Figure 4.32, the Block information was published to WENCO with all the information on grade, elevation and the in-situ tonnes in specific polygons. Once this information is in the Wenco database (DB), a particular Loading unit is then assigned to mine that particular block.

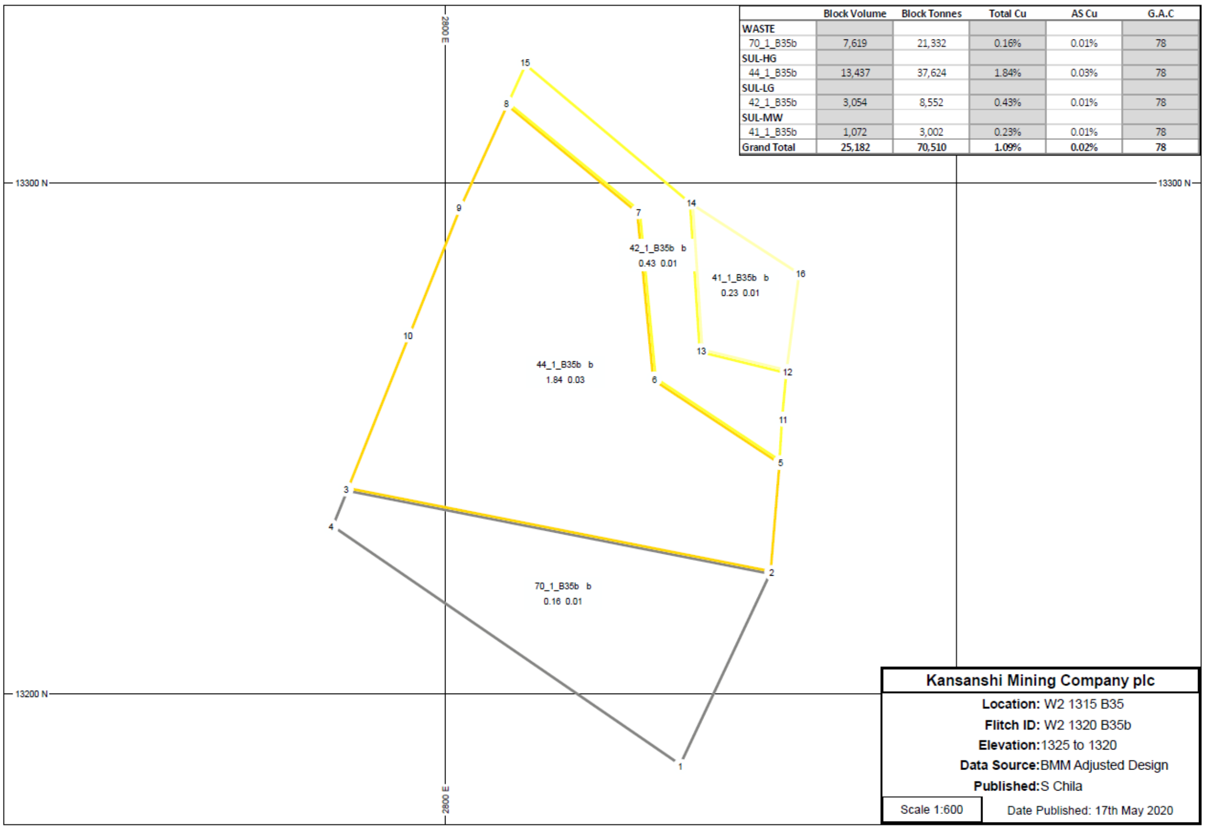


Figure 4. 32 W2_1315_b35_b Dig-plan

In this case, Ex 66 was assigned to mine w2_1315_b35_b. in BenchManager. A dispatcher can monitor the elevation Ex 66 is mining to, as shown in Figure 4.33. BenchManager highlights the current truck that is being loaded, Next truck to be loaded, Targeted Payload, Material Being Mined, Position of the track chains, position of the bucket if mining to correct RL and a 3-D Motion of the bucket reach. This information is also available in an operators' cabin. There is also a tab were the operator is able to communicate to Dispatch, in case two-way radio communication is congested.

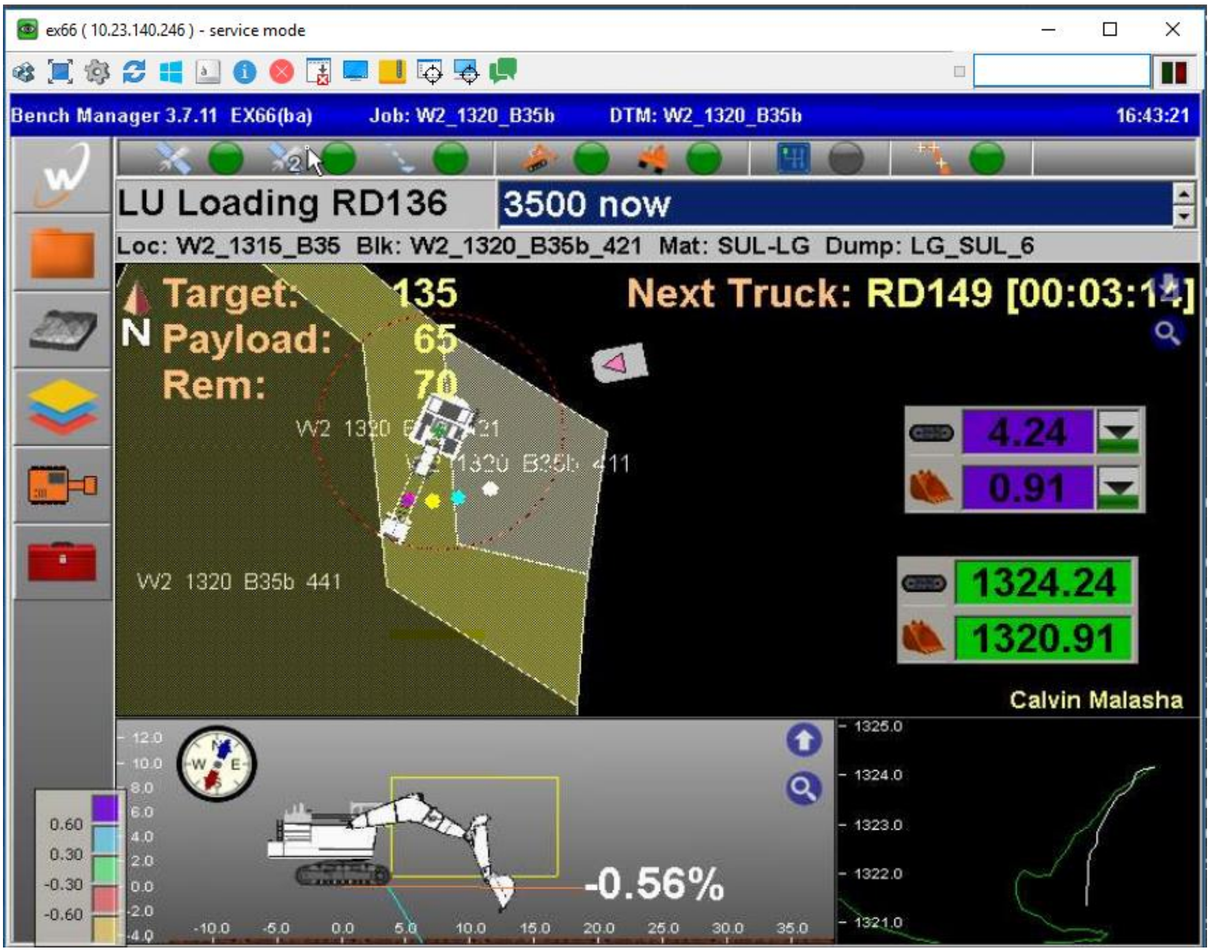


Figure 4. 33: w2_1315_b35_b BenchManager-2D

In BenchView, 2-D view is utilised specifically to trace/view the bucket counts in a particular polygon in a specific time as shown in Figure 4.34.

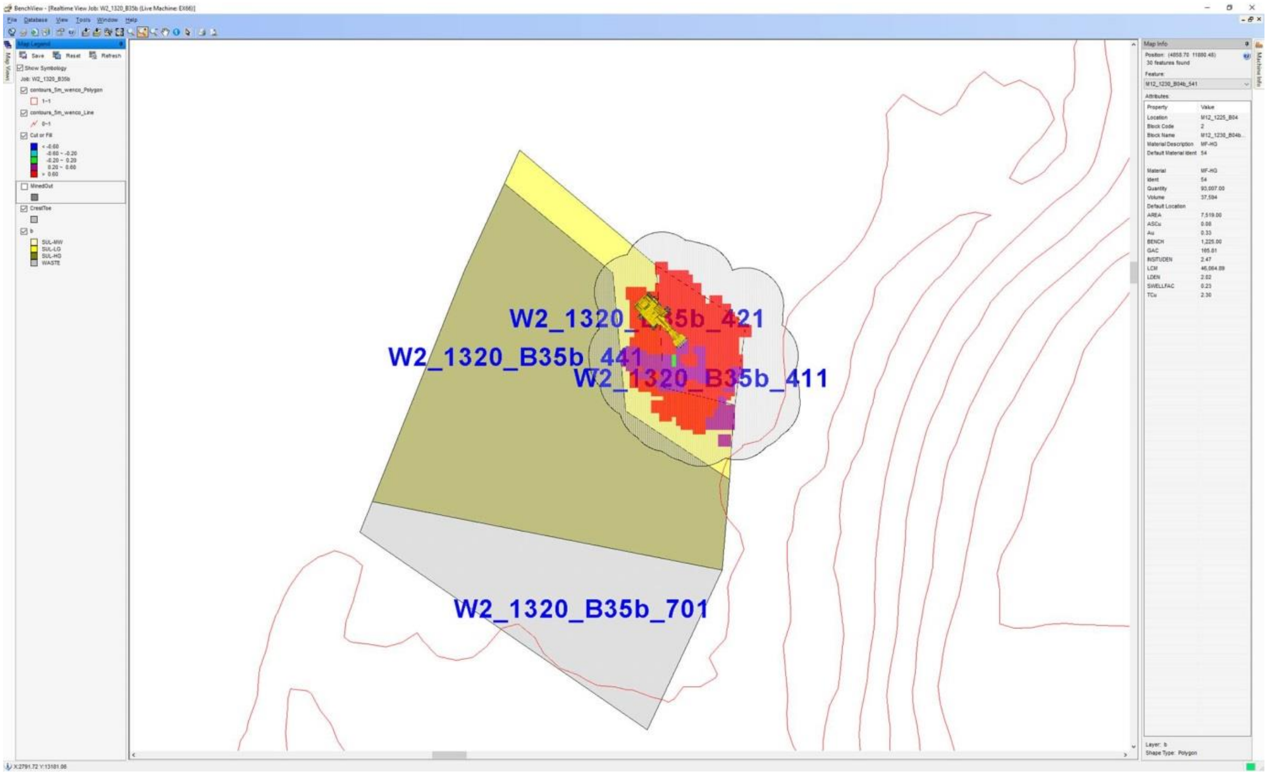


Figure 4. 34: BenchView to check on specific load counts.

As mining progresses, alerts are sent out hourly to monitor compliance as shown in Figure 4.35 on all Excavator, whether mining to correct RL or not. This then sends an alert to all operations, and they are then cautioned to adjust their mining accordingly.

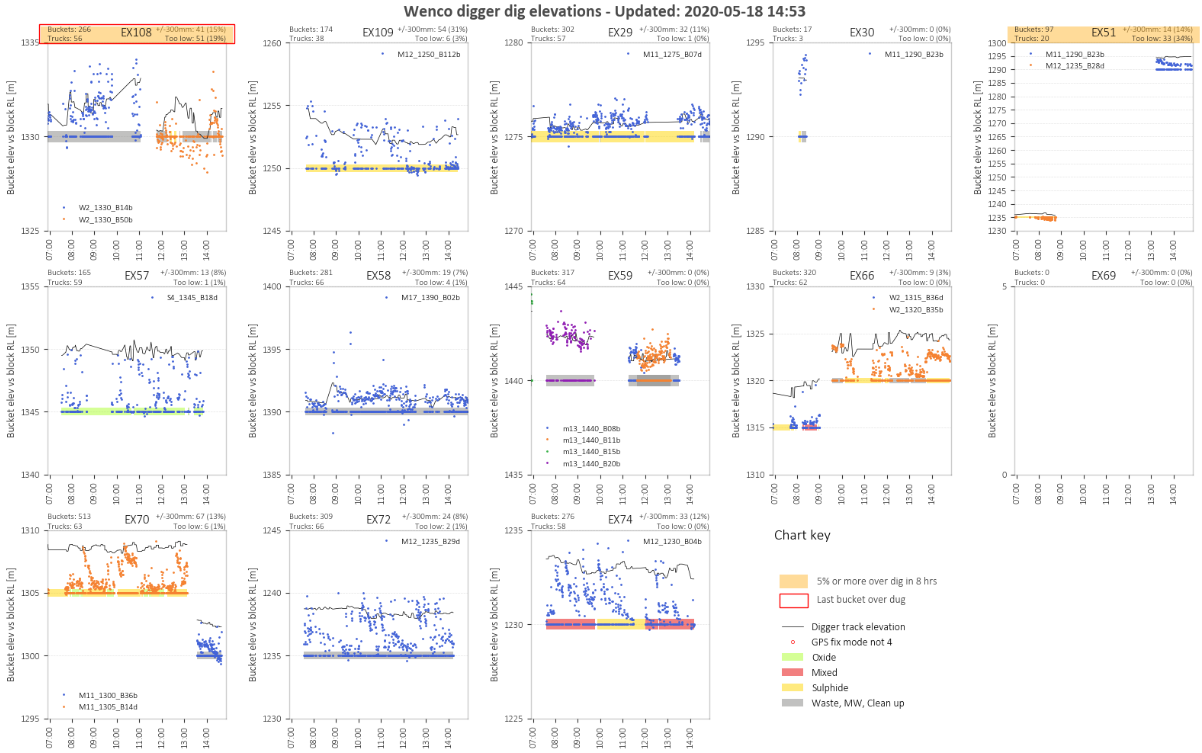
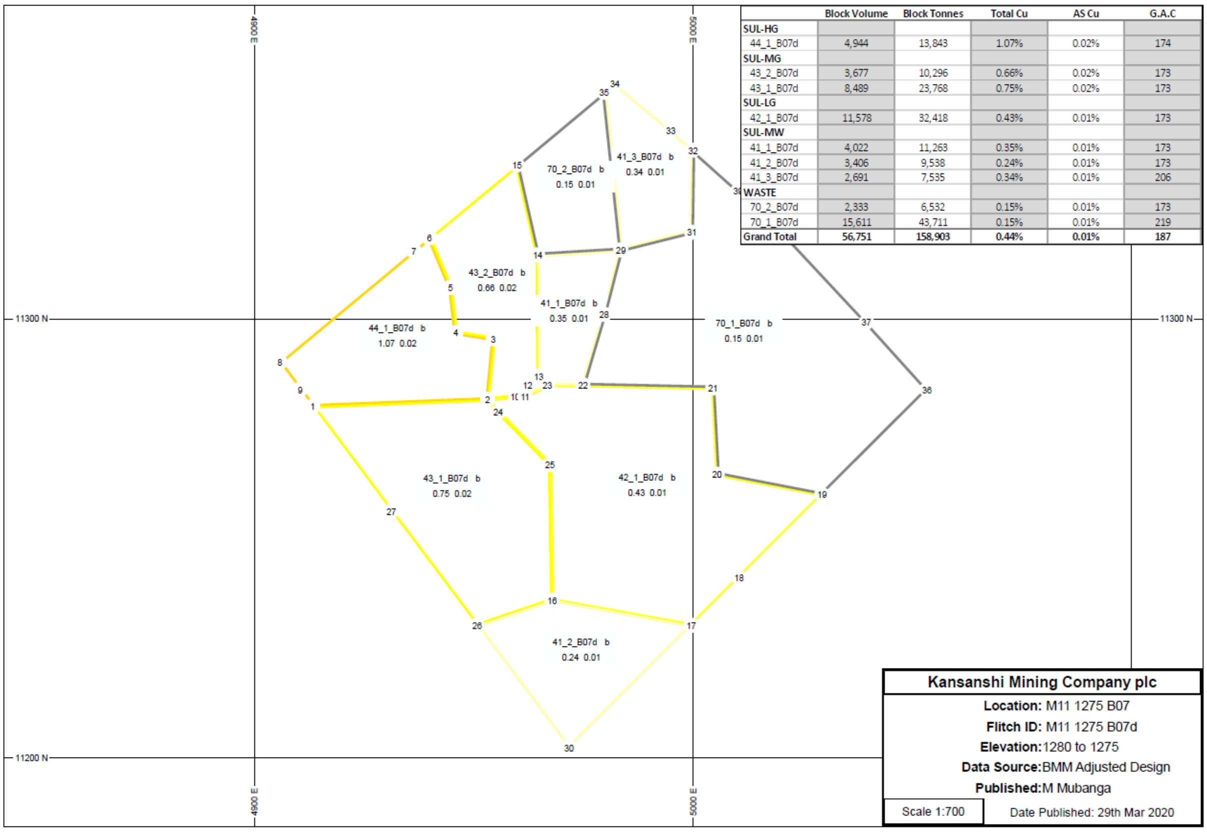


Figure 4. 35 Wenco Digger Elevation Compliance (Overmining/Under Mining)

Figures 4.36 and 4.37 shows a dig plan and BenchManager view of a shovel (Ex 29) respectively. Figure 4.38 and 4.39 show BenchView Active Mining and BenchView Ex 29(Bucket Loads) respectively.



	Block Volume	Block Tonnes	Total Cu	AS Cu	G.A.C
SUL-HG					
44_1_B07d	4,944	13,843	1.07%	0.02%	174
SUL-MG					
43_2_B07d	3,677	10,296	0.66%	0.02%	173
43_1_B07d	8,489	23,768	0.75%	0.02%	173
SUL-LG					
42_1_B07d	11,578	32,418	0.43%	0.01%	173
SUL-MW					
41_1_B07d	4,022	11,263	0.35%	0.01%	173
41_2_B07d	3,406	9,538	0.24%	0.01%	173
41_3_B07d	2,691	7,535	0.34%	0.01%	206
WASTE					
70_2_B07d	2,333	6,532	0.15%	0.01%	173
70_1_B07d	15,611	43,711	0.15%	0.01%	219
Grand Total	**56,751**	**158,903**	**0.44%**	**0.01%**	**187**

Figure 4. 36 Dig-Plan for m11_1275_b07_d with different material types

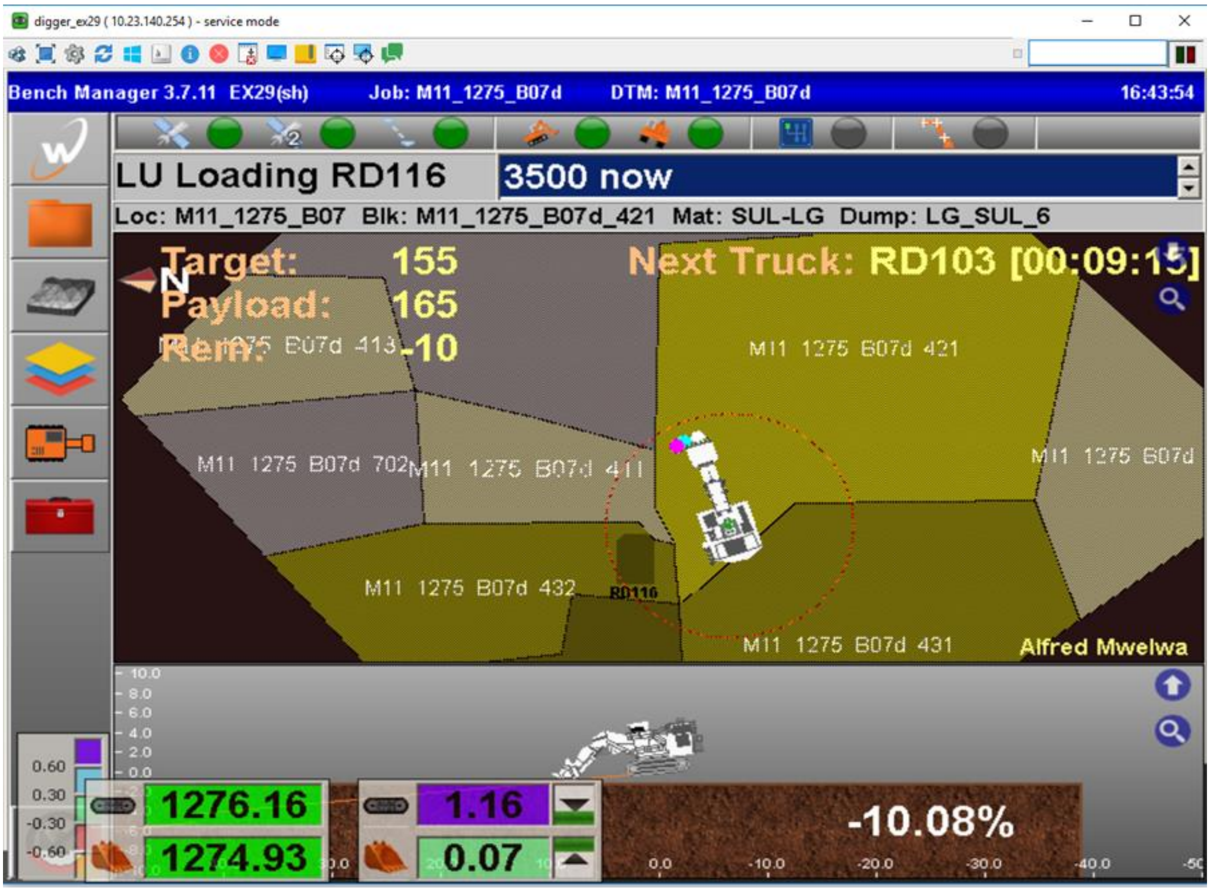


Figure 4. 37 BenchManager view of a shovel (Ex 29)

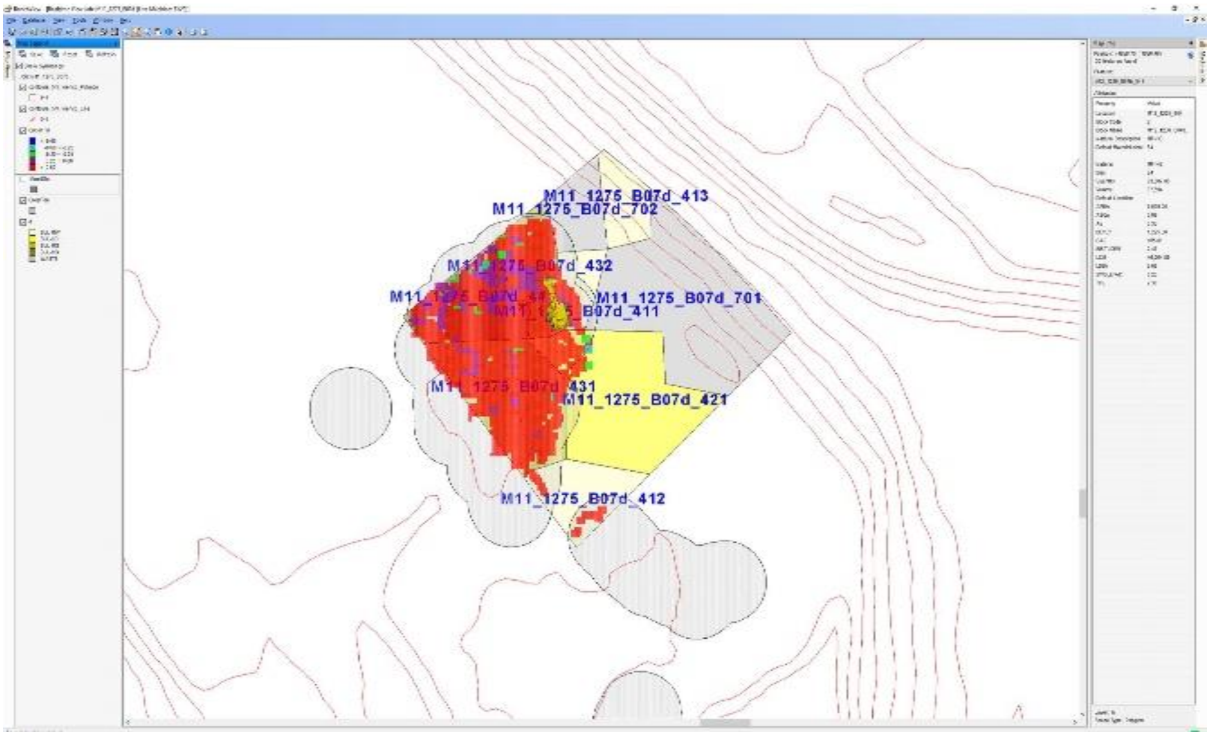


Figure 4. 38: BenchView Active Mining

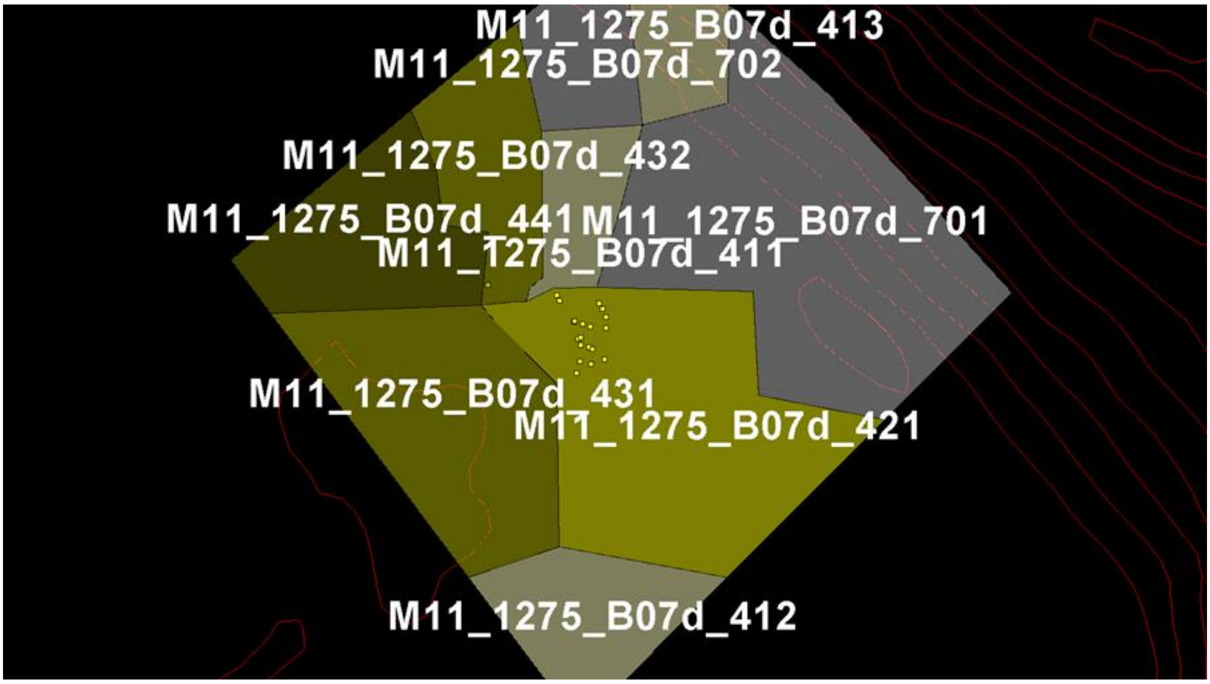


Figure 4. 39: BenchView Ex 29(Bucket Loads)

Once all the above have been observed, Cycle time is then tracked using Wenco Fleet Control tool to monitor real time dispatching as shown below in Figure 4.40. This was recorded on Ex 66 which was mining high grade sulphide material to the crusher.

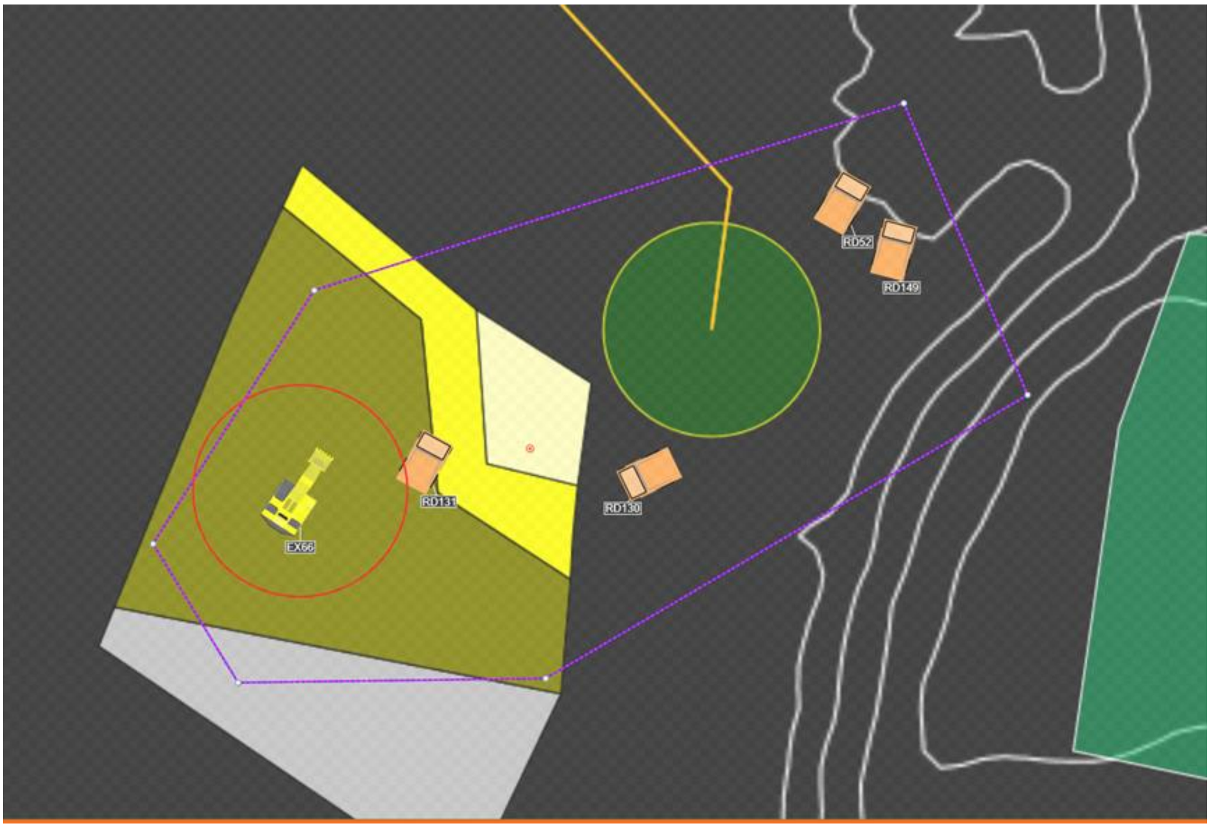


Figure 4. 40 Fleet Control on Ex 66 real time cycle time observation showing….?

Haul Cycle Time Averages Real Time Report [Shift to Date]

Grouped by: HaulCycle

Haul Cycle	Dig Location	Dump Location	Loading Equipment	Total Time	Average Time	Count
M12_1225_B04 - FINGER_8 Average Time: 0:39:00						
M12_1225_B04 - FINGER_8	M12_1225_B04	FINGER_8	EX74	7:09:04	0:39:00	11
M12_1225_B04 - GYRO_1 Average Time: 0:39:54						
M12_1225_B04 - GYRO_1	M12_1225_B04	GYRO_1	EX74	4:39:20	0:39:54	7
M12_1245_B112 - LG_SUL_6 Average Time: 0:55:15						
M12_1245_B112 - LG_SUL_6	M12_1245_B112	LG_SUL_6	EX109	1:50:30	0:55:15	2
M12_1245_B37 - CONGO_DUMP1 Average Time: 0:45:18						
M12_1245_B37 - CONGO_DUMP1	M12_1245_B37	CONGO_DUMP1	EX72	9:48:55	0:45:18	13
M12_1245_B37 - M13_SHEETING Average Time: 0:47:21						
M12_1245_B37 - M13_SHEETING	M12_1245_B37	M13_SHEETING	EX72	0:47:21	0:47:21	1
m13_1435_B05 - IN_PIT_DUMP Average Time: 0:33:54						
m13_1435_B05 - IN_PIT_DUMP	m13_1435_B05	IN_PIT_DUMP	EX61	2:15:39	0:33:54	4
m13_1435_B05 - NE_DUMP Average Time: 0:39:49						
m13_1435_B05 - NE_DUMP	m13_1435_B05	NE_DUMP	EX61	2:39:16	0:39:49	4
m13_1435_B10 - NE_DUMP Average Time: 0:22:15						
m13_1435_B10 - NE_DUMP	m13_1435_B10	NE_DUMP	EX59	10:23:23	0:22:15	28
M14_1385_B63 - NE_DUMP Average Time: 0:47:27						
M14_1385_B63 - NE_DUMP	M14_1385_B63	NE_DUMP	EX58	2:22:21	0:47:27	3
S4_1345_B17 - FINGER_8 Average Time: 0:26:09						
S4_1345_B17 - FINGER_8	S4_1345_B17	FINGER_8	EX70	1:44:39	0:26:09	4
S4_1345_B17 - GYRO_1 Average Time: 0:28:32						
S4_1345_B17 - GYRO_1	S4_1345_B17	GYRO_1	EX70	0:57:04	0:28:32	2
S4_1345_B17 - LG_OX_4 Average Time: 0:51:10						
S4_1345_B17 - LG_OX_4	S4_1345_B17	LG_OX_4	EX70	3:24:40	0:51:10	4
S4_1345_B17 - MMD_1 Average Time: 0:43:18						
S4_1345_B17 - MMD_1	S4_1345_B17	MMD_1	EX70	0:43:18	0:43:18	1
S4_1345_B18 - CONGO_DUMP1 Average Time: 0:39:50						
S4_1345_B18 - CONGO_DUMP1	S4_1345_B18	CONGO_DUMP1	EX57	1:59:30	0:39:50	3
W2_1315_B35 - GYRO_2 Average Time: 0:34:43						
W2_1315_B35 - GYRO_2	W2_1315_B35	GYRO_2	EX66	5:12:28	0:34:43	9
W2_1315_B35 - HG_RED_6 Average Time: 0:29:54						
W2_1315_B35 - HG_RED_6	W2_1315_B35	HG_RED_6	EX66	7:28:34	0:29:54	15
W2_1325_B66 - GYRO_2 Average Time: 0:15:16						
W2_1325_B66 - GYRO_2	W2_1325_B66	GYRO_2	EX67	0:30:33	0:15:16	2
WWD - JAW_1 Average Time: 0:19:55						
WWD - JAW_1	WWD	JAW_1	EX73	1:59:30	0:19:55	6
WWD - MMD_1 Average Time: 0:47:31						

Figure 4. 41 Cycle Time Monitoring in Real time on Ex 66

Figure 4.41 shows Cycle Time Monitoring in Real time on Ex 66. This digger was mining on W2_1315_B35 as the dig location. It was mining high grade mixed material, whose destination was the Mixed Circuit,. During this time the the crusher was on breakdown and the alternative dump was the stockpile(HGRED_6), as indicated on Figure 4.41. On the real time report, it was noticed that the total Cycle time was an average of 29 minutes during this shift.

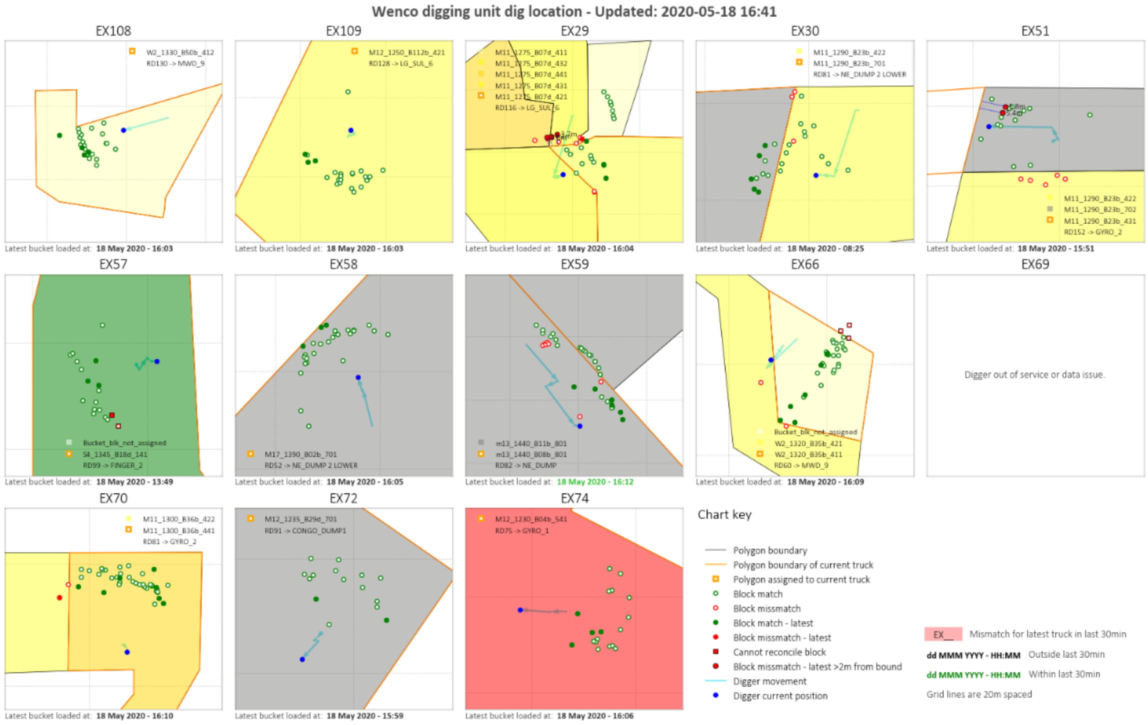


Figure 4. 42 Wenco digger dig location By Material Type.

Figure 4.42 shows Wenco digger dig location by Material Type. This chart indicates all the current diggers in production in real time that are fitted with WENCO HP. It shows the fleet number, material type being mined, the dig location, and the destination of the material. As can be seen for example, EX 74 is mining at M12_1230_B04_b, 54_1 (ore code-Mixed High Grade,) and its destination is GYRO_1 (mixed circuit). With this information, it's easy to track what material a particular excavater is mining.

Table 4. 7 Summary by crew of locations and material destinations.

SUMMARY BY CREW						
	From : 01-05-2020 **To :** 17-05-2020					**MTD**
CREW	**ORE TO WASTE**	**WASTE TO ORE**	**SAME DUMP AND LOAD LOCATION**	**INCORRECT ORE**	**TOTAL**	**TOTAL**
2	0	0	4	46	50	589
4	0	0	2	41	43	374
3	0	0	3	38	41	399
1	0	0	0	0	0	404
TOTAL	**0**	**0**	**9**	**125**	**134**	**1766**

SHIFT DATE	DESTINATION	GRADE	LOAD	BCM	TCU	ASCU	TONNES
17 May 2020	FINGER_2	W2_1325_B65d_441/SUL-HG	SUL-HG	2,616	1.31	0.02	7,326
		TOTAL		**2,616**	**1.31**	**0.02**	**7,326**
	FINGER_8	M11_1305_B14d_141/OX-HG-LGAC	OX-HG-LGAC	747	0.80	0.46	2,090
		M11_1305_B14d_142/OX-HG-LGAC	OX-HG-LGAC	129	2.06	1.42	334
		M11_1305_B14d_431/SUL-MG	SUL-MG	116	0.70	0.04	320
		M12_1230_B04b_441/SUL-HG	SUL-HG	513	1.00	0.04	1,324
		M12_1240_B34b_241/OX-HG-HGAC	OX-HG-HGAC	451	1.92	1.30	1,262
		TOTAL		**1,955**	**1.19**	**0.59**	**5,330**
	GYRO_1	M11_1305_B14d_141/OX-HG-LGAC	OX-HG-LGAC	1,082	0.80	0.46	3,029
		M11_1305_B14d_431/SUL-MG	SUL-MG	64	0.70	0.04	178
		M12_1230_B04b_441/SUL-HG	SUL-HG	564	1.00	0.04	1,456
		M12_1240_B34b_241/OX-HG-HGAC	OX-HG-HGAC	708	1.92	1.30	1,984
		W2_1315_B36d_431/SUL-MG	SUL-MG	51	0.69	0.01	144
		TOTAL		**2,470**	**1.17**	**0.59**	**6,790**

As can be seen from Table 4.7, highlights indicate the destination, dig location, material type, grades and tonnes mined.

Figure 4.43 shows the three crushing routes which are the Jaw, Mixed and sulphide crusher

DAILY ROMPAD REPORT 2020-05-17

COPPER PRODUCTION SUMMARY												
Year	**Month**	**Yesterday**	**Target (Yesterday)**	**MTD**	**Monthly Target Remaining**	**Days Remaining**	**MTD Avg Per Shift**	**Monthly Target per Shift**	**YTD Copper Produced**	**Yearly Target Remaining**	**YTD Avg Per Shift**	**Yearly Target per Shift**
2020	5	645	633	9,416	10,203	14	185	211	82,817	148,809	200	2,491

TONNES CRUSHED SUMMARY												
Year	**Month**	**Yesterday**	**Target (Yesterday)**	**MTD Tonnes Crushed**	**Monthly Target Remaining**	**Days Remaining**	**MTD Avg Per Shift**	**Monthly Target per Shift**	**YTD Tonnes Crushed**	**Yearly Target Remaining**	**YTD Avg Per Shift**	**Yearly Target per Shift**
2020	5	94,690	87,380	1,487,140	1,221,640	14	29,160	29,127	11,115,552	20,865,528	26,849	343,883

The Chart Below Shows a 30 Day Trend of Crushed Tonnes

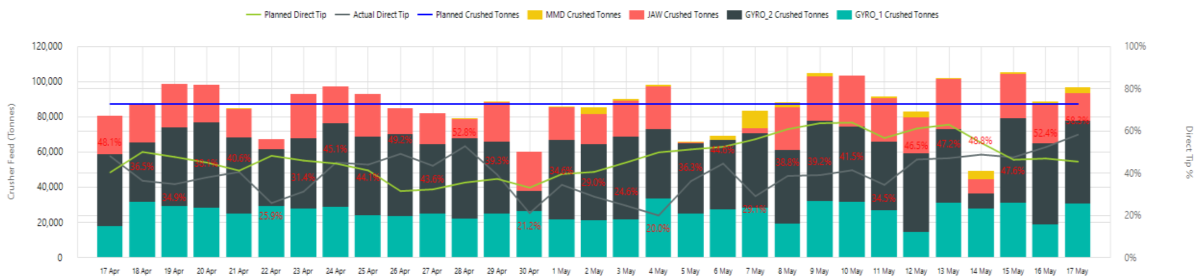


Figure 4. 43: Three crushing routes for the Jaw, Mixed and sulphide crusher

Figure 4.43 shows KPIs in relation to the direct tip feed and the planned crushed tonnes in a 30 days' trend with various ore types. The variability in the trends was based on the daily crusher performances.

In utilising Wenco across various stakeholders in the mining value chain, reports on ore sources and plant grade performance were tracked on a two-hourly basis to ensure quality mining from respective mining units as per feed plan to various circuits as shown in Figures 4.44 - 4.46.

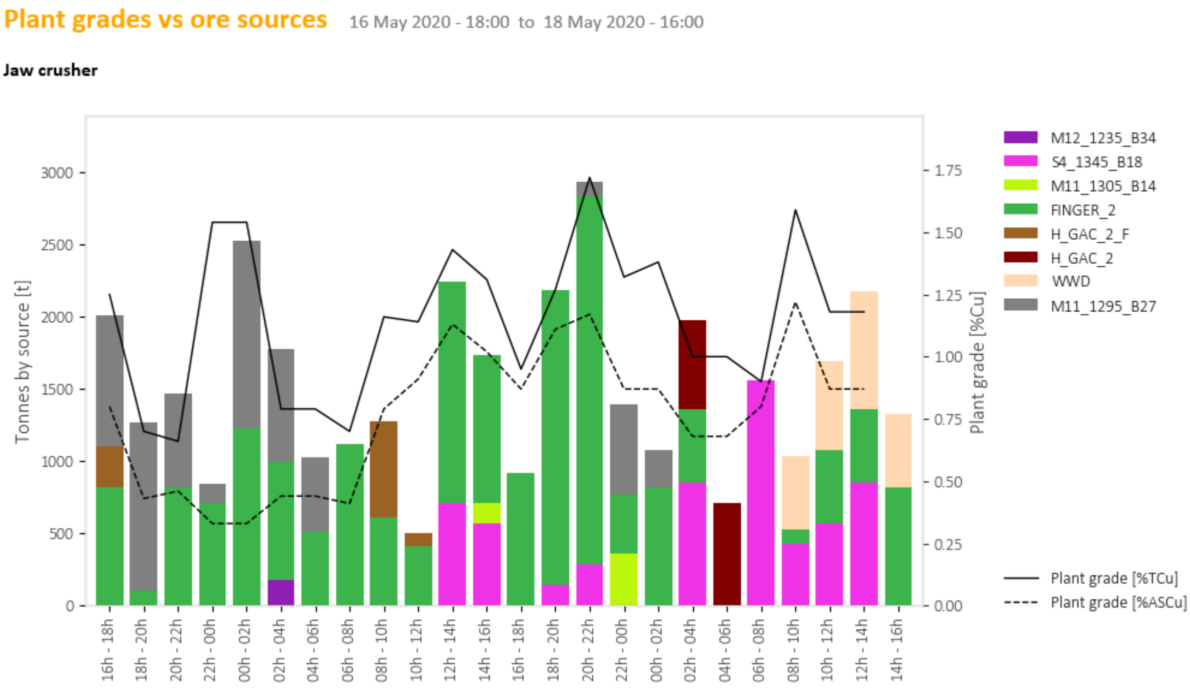


Figure 4. 44: Plant Grades Vs Ore sources at Jaw Crusher

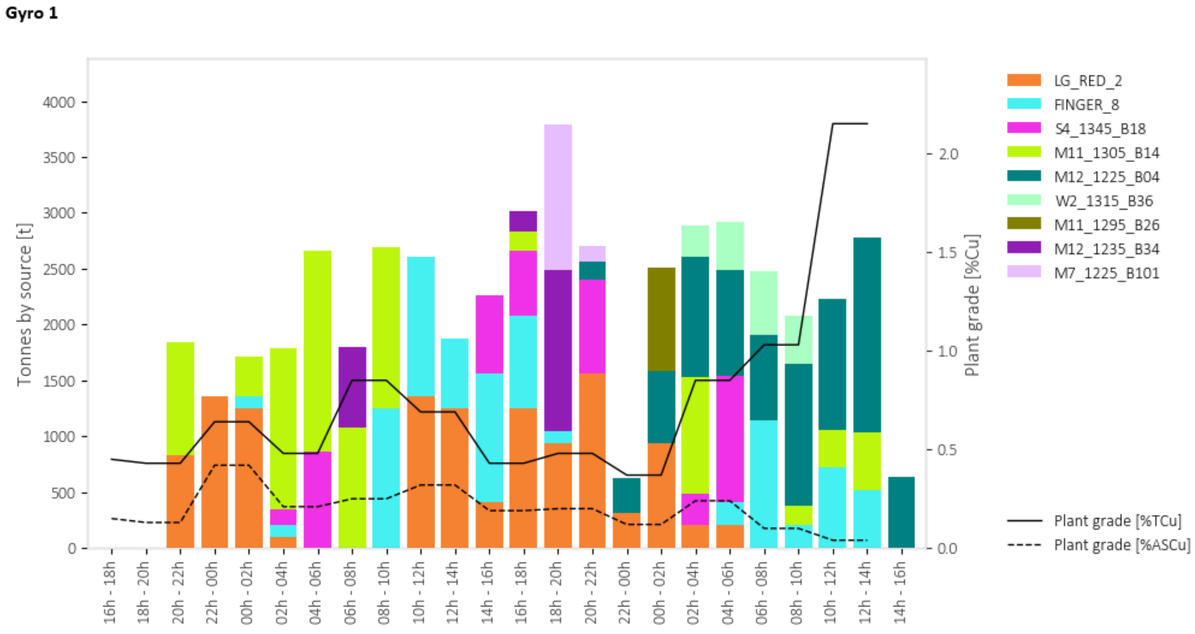


Figure 4. 45 : Vs Ore sources at Mixed Crusher

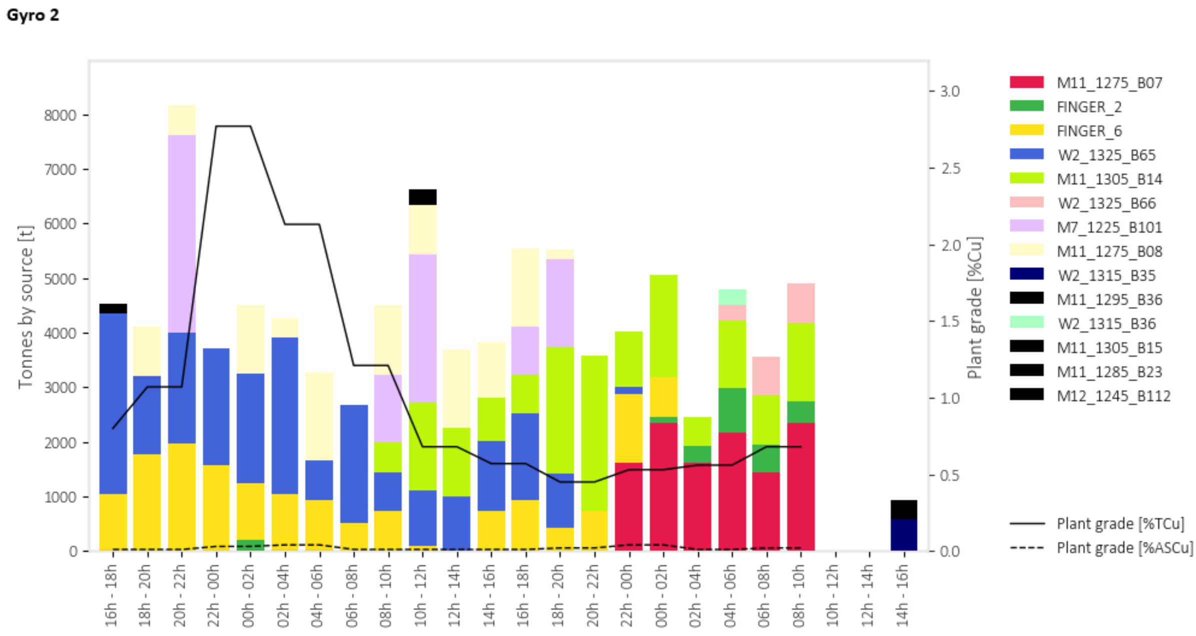


Figure 4. 46: Plant Grades Vs Ore sources at Sulphide Crusher

Chapter 4 discusses the data collected and presented results from chapter 3.

CHAPTER 5 DISCUSSION OF RESULTS

5.0 Introduction

This Chapter discusses the findings of Chapter 4 where collection of data and results were reported. Following the analysis of results, in this chapter, various options are weighed and a financial bearing tagged to each option before conclusions can be drawn. The significance of the findings is further interpreted and discussed in relation to the study objectives.

5.1 Effects of Precise Bucket positioning

Bench Manager adds GNSS-Powered precision to the entire mining fleet. In Precise Bucket positioning, primary excavators can match designs to the smallest detail. This is made possible by Centimeter precise satellite guidance, which sends second by second updates to equipment's onboard touch screens. Hence, Operators simply follow the onscreen guidelines as they cut and fill to design. Previously, lengthy surveys and grade staking were wasting hours of productive time. Hence the introduction of Bench Manager gives operators the power to cut and fill to design.

Figure 4.33, shows a typical example of a Backhoe bucket and track chain location based on a particular cut back mining to a targeted elevation.

Mining information:

- Block ID W2_1315_B35
- Cutback W2
- Blast No. 35
- Target Elevation 1315
- Flitches: b
- Material: LG_SUL
- Equipment. EX 66

The current mining tolerance on the either flitch is +/-0.5m. Ex 66 in Figure 4.33 shows that the bucket location during that period of mining was at 1320.91RL. Target elevation to the b-flitch is 1320RL.

Variance= Actual RL –Target RL

= (1320.91-1320) RL

=0.91m.

This shows that the digger in this area was over mining the cut by 0.41m. Over mining should be closely monitored because it affects many downstream processes such as ore dilution/loss, reconciliation of mined material being overestimated from planned volumes, etc. Achieving the correct RL is very vital in mining. WENCO is currently being utilized to reduce over mining, and mining to correct RLs. The lower the tolerance in the Z-direction, the more precise the RL.

Figure 4.37 shows a typical example of a Shove bucket and track chain location, based on a particular cut back mining to a targeted elevation.

Mining information:

- Block ID M11_1275_B07
- Cutback M11
- Blast No. 07
- Target Elevation 1275
- Flitches: b and d
- Material: LG_SUL
- Equipment. EX 29

The Bucket location in this case should be almost at the same elevation as the track chains, based on the mining location.

Actual Bucket Location was at 1274.93RL. Target Elevation is 1275RL.

Variance = Actual RL – Target RL

= (1274.93-1275) RL

=-0.07m

This shows that the shovel was under mining by 0.43m. Under-mining affects other downstream process along the mine value chain such as reconciliation of mined BCMs and toe that eventually require secondary drilling.

5.2 Cycle times and Fleet performance

The dispatching algorithm is designed to automatically assign trucks in order to achieve the best utilisation of all mining equipment and maximize production. This minimizes shovel wait, truck wait, and truck empty travel times.

Using linear programming that examines multiple iterations of equipment configurations, WENCO determines the best plan, and then dynamically dispatches trucks to meet plan.

For every assignment, there are two calculations:

a) Schedule
b) Dispatch

Schedule

The schedule incorporates the mine configurations; Dump location, shovel location, material destination, cycle times and available trucks, as well as any constraints such as maximum crusher dump rate. Using these inputs, the schedule calculates the maximum production achievable. This is expressed in terms of shovel rates, or the number of loads per hour the shovels can be achieved based on the current mine conditions and setup.

Dispatch

The dispatch allocates the trucks in order to best meet the mining plan.On Figure 4.16, variations in Cycle time between Actual and Budget time were generally higher except for the month of May. The variations are attributed to different cutbacks, which have different material configurations and dump locations. On the figure, Budget elevations/cycle times relates to the schedule. Actual elevations/cycle time relates to dispatch.

The variations in Cycle time are dependent on exposure of ore, based on various cutbacks and on which areas in a particular month have considerable amounts of ore to feed to the crushers. Additional challenges such as boulders, or mining in boggy areas can increase the loading times. Increased hauling distances to the prescribed dumping location based on the type of material can considerably increase the Cycle times. The increase in Cycle times for the period under review also led to corresponding reduction in productivity.

5.3 Material Quality Delivered to the Crushers

Within the algorithm is the ability to specify the ore quality targets that are to be achieved at a certain location. Multiple locations are supported, and each can have different requirements.

The algorithm identifies which shovels are digging in what material types, and what qualities are expected at each location. The algorithm will use these values in the two calculations to schedule and dispatch, as described earlier. The schedule calculation determines the rates required for each shovel so that the best material grade can be achieved. Then the dispatch calculation makes its decision to best meet that plan. The end result is the delivery of material coming as close to the middle of the grade ranges as possible. Results obtained from material delivered to the crusher (Figures 4.44, 4.45and 4.46) indicate that various dig locations have specific grades and tonnes allocated, which requires certain grades to either be blended down or improved by selecting grades to be fed to the crushers. The system currently requires blending configuration settings to improve on the blend requirements for crusher feed. This study has not yet commenced.

The specific benefits for Kansashi are several, and can be compared to the benefits reported at a different mine. Assarel-Medet which is one of the biggest open-pit copper mine in Bulgaria and one of the largest in Europe realized has reported several benefits from the implementation of Wenco's fleet which include:

Monitoring (high precision mining tool-HPM) and dispatch system leading to:

1. Improved productivity of personnel and equipment, within three months of the implementation of the system. The company observed that the average load size of the haul trucks increased by 4.5% (without overloading the trucks);productivity of the haul tuck operators increased by 3.5% per shift; the excavation rate of shovels increased by 10.5% per hour; and productivity of shovel operators increased by 5.5% per shift.
2. Improved content consistency of the material feeding the ore enrichment plant.
3. Increased throughput of the crusher and conveyor system.
4. Availability of statistical data to enabled continuous improvement.
5. Accountability of mobile equipment operators.

By implementing Wenco's fleet monitoring and dispatch system, Assarel-Medet was able to realize significant savings in its excavation, transportation, and crushing operations. At the same time, the amount of mined material was increased by 16% and reached an all-time high. These results indicate that there is a strong business case for the implementation of a Wenco fleet monitoring and dispatch solution at any mine actively looking to improve the productivity of its personnel and equipment such as Kansashi, while reducing the cost of its mining (Wenco International Mining Systems, 2015).

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The main objective of this research was to evaluate the application of high precision mining through optimised loading and hauling operations so as to reduce mining cost associated with misplacements of material, reduced truck deployment, increased truck and shovel waiting times, reduced productivity and reduced Grade/Quality of ore delivered to crushers**.**

In order to address above the challenges mentioned above, KMP and Wenco are implementing High Precision Mining
to accurately determine each bucket dig location in the face, and determine that each bucket has been dumped in the truck. The system takes the data associated with the origin of each bucket load and calculates the blend of the ore in each truck. There is an average of 4 to 5 buckets for each Cat 785 haul truck loaded. This information is then used in Wenco's Fleet Management System to assign the vehicle to the appropriate dump location in order to maintain a constant delivery of a predetermined blend of ore to the plant.

However, the use of WENCO at Kansashi mine has also encountered the following practical difficulties: activating the dispatching tool has been found unsuitable for the complex Kansanshi vein hoisted ore-body, which has 13 material types. On a particular blast, there can be a minimum of five different material classes that require various dump locations. The major challenge is to mine along boundaries of these material classes. If the dispatch system is put into dynamic dispatching, it picks on the last bucket count irresoective of whether it is waste or ore, thereby increasing mining dilution. This observation is very significant for Kansanshi Mine and for other deposits elsewhere in the world with complex geology wishing to use this tool. In Zambia, this is the first time that WENCO as a dispatching tool has been used and evaluated. The other practical difficulty which was encountered was that the WENCO system is fully dependant on satellite network. This made data capturing difficult if there was interference with satellite network

Based on the study finding the following conclusions can be drawn:

1. Establishing precise bucket position with the assistance of the survey team was the most critical in determining the accuracy of mining. The X, Y and Z coordinates used as a benchmark improved on tracking both the mining elevations and material boundaries to avoid mining dilution as much as possible. With the tolerance of X=0.5m, Y=0.5m and Z=0.5m, it can be noted that events of a bucket mining out of the assigned polygon was reduced to a few centimetres in distance, and an alert had to show to rectify this on the X and Y direction.

2. The loading times became more accurate in terms of measurement and reporting. This was defined based on the status of the loading unit, and the prescribed load and wait zone by the operator. The loading time in this case was almost in the same network range of 30m distance for both the loading unit and the hauling unit. The interference of dispatch played a huge role as well. With the use of WENCO, the excavator cycle

time at KPI was more accurate based on the sensor fittings on an excavator. However, the target load time of three minutes from the time WENCO was implemented was not ideal even though the loading time had been accurate.

3. Reconciliation of the mined BCMs has largely improved as misplacement of material (wrong dumping) has dropped drastically from 35% to 10%. The use of WENCO has played a major role, as the information is accessible to both the operator and dispatchers with the updated topographies. The shortcoming is that the material delivered to crushers is not as accurate since the bucket loads are fixed.

4. The following challenges, however, continue to be experienced with WENCO: activating the dispatching tool has been found unsuitable for the Kansanshi vein hoisted ore-body which has 13 material types. If the dispatch system is put into dynamic dispatching, it picks on the last bucket count irrespective of whether it is waste or ore thereby increasing mining dilution. Additionally, since the WENCO system fully depends on satellite network, the mine has in certain instances faced challenges in data capturing once there is interference with satellite network especially during the wet season.

6.2 Recommendations

1. Excavator bucket tolerance should be reviewed on the X, Y and Z-axis for results that are more accurate. Preferably, the tolerance should be within +/-0.3< on the Z-Axis to achieve correct results which is, reduced mining dilution, over mining and undermining.
2. Budget cycle time against actual should be revised based on a real time study of various mining locations and dumping locations. Determining of optimal waiting and loading zones on each particular digger will be required. There is need to recalculate the target load time since Wenco implementation.
3. Reconciliation tools should be refined based on Actual against truck tally's(Factors).

References

AFRAPOLI, A. M. and ASKARI-NASAB, H. 2017. Mining fleet management systems: a review of models and algorithms. *International Journal of Surface Mining, Reclamation and Environment*, DOI: 10.1080/17480930.2017.1336607, 1-19.

ALARIE, S. and GAMACHE, M. 2002. Overview of solution strategies used in truck dispatching systems for open pit mines. *International Journal of Surface Mining, Reclamation and Environment*, *16*(1), 59-76.

Askari-Nasab, A. M. (2017). Mining fleet management systems: A review of models and algorithms. *International Journal of Mining, Reclamation and Environment; Taylor and Francis*, 1-19.

Ataeepour, N., & Baafi, E. Y. (1999). ARENA simulation model for truck-shovel operation in dispatching and non-dispatching modes. *International Journal of Surface Mining, Reclamation and Environment*, 13, 3, 125-129.

Ataman, I. G. (2001). Knowledge Discovery in Mining Truck Condition and Performance. *International Mining Congress and Exhibition of Turkey* (pp. 231-235). Turkey: - IMCET 2001.

BRISTOL. V, "Wenco software based dispatching technology across the Globe" world mining equipment p36-p42, April. 2000.

Byles, R. D. (1984). The installation of a fully automatic truck dispatch system at Bougainville Copper Limited. Joint Meeting of the Australias. Inst. Min. and Metall., Bougainville, Papua, New Guinear (October 1984).

Chanda, E. K., & Gardiner, S. (2010). A comparative study of truck cycle time prediction methods in open-pit mining. Engineering, Construction and Architectural Management, 17(5), 446-460.

CHANGE, Y., REN, H. and WANG, S. 2015. Modelling and optimizing an open-pit truck scheduling problem. Discrete Dyn. Nat. Soc., 1-8.

Dean, G. (2021, January 12). *Mining Journal.* Retrieved from Mining Journal: https://www.mining-journal.com/partners/partner-content/1348425/integration-the-key-to-improving-our-mining-future

D LA ROSA and D THORNTON, ‘’ Blast Movement Modelling and Measurement.’’ 35th apcom symposium / wollongong, nsw, 24 - 30 September 2011.

Doig, P., & Kizil, M. S. (2013). Improvements in truck requirement estimations using detailed haulage analysis. Research Online.

Ercelebi, S. G., & Bascetin, A. (2009). Optimization of shovel-truck system for surface mining. Journal of the South African Institute of Mining and Metallurgy, 109(7), 433-439.

Finning Ltd. (2014.). Finning UK News RSS. Retrieved from http://www.finning.co.uk/equipment_management/technology/fleet_production/default.aspx

Gove, D., & Morgan, W. (1994). Optimizing truck-loader matching. Transactions- Society for Mining Metallurgy and Exploration Incorporated, 296, 1179-1185.

GURGUR, C.Z., DAGDELEN, K. and ARTITTONG, S. 2011. Optimisation of a real-time multi-period truck dispatching system in mining operations. Int. J. Applied Decision Sciences, 4(1), 57-79.

GAULA. M ‘’ Explosives utilization at a Witwatersrand gold mine’’ J. S. Afr. Inst. Min. Metall. vol.115 n.4 Johannesburg Apr. 2015

Gu, Q., C. Lu, F. Li, & C. Wan. (2008). Monitoring Dispatch Information System of Trucks and Shovels in an Open Pit Based on Gis/gps/gprs. Journal of China University of Mining and Technology, 18(2): 288-292.

HARRIS, GW & MOUSSET-JONES, PIERRE & DAEMEN, J. “Blast movement measurement to control dilution in surface mines”. CIM Bulletin. 94. 52-55. 2001

Hexagon. (2021, January 12). Retrieved from Hexagon, Leica-Geosystem: https://leica-geosystems.com/case-studies/mining/turning-data-in-knowledge-with-jigsaw

JAOUA, A., RIOPEL, D. and GAMACHE, M. 2012b. A simulation framework for real-time fleet management in internal transport systems. Simulation Modelling Practice and Theory, 21(1), 78-90.

KOLONJA, B., KALASKY, D. R. and MUTMANSKY, J. M. 1993. Optimization of dispatching criteria for open-pit truck haulage system design using multiple comparisons with the best and common random numbers. In: Proceeding of the 1993 Winter Simulation Conference, 1993 Piscataway, New Jersey. IEEE, 393-401.

KRAUSE, A. J. 2006. Shovel-truck cycle simulation methods in surface mining. Ph.D. Dissertation, University of The Witwatersrand. Keating, D. M. (2008). Modular Mining Systems Unveils the Latest in Mining Technology. VIEWS, 4, 12-13.

Kelton, W. D., Sadowski, R. P., & Sadowski, D. A. (2007). Simulation with Arena. Boston, Mass: WCB/McGraw-Hill.

Li, Z. (1990). A methodology for the optimum control of shovel and truck operations in open-pit mining. Mining Science and Technology, 10, 3, 337-340.

Lineberry, G. T. (December 01, 1985). Optimizing off-highway truck characteristics for minimum haulage cost. International Journal of Mining Engineering, 3, 4, 295-297

Lizotte, Y., & Bonates, E. (1987). Truck and shovel dispatching rules assessment using simulation. Mining Science and Technology, 5(1), 45-58.

Lodhi, A., Kassem, G., Köppen, V., & Saake, G. (2010, December). Building AS-IS process models from task descriptions. In Proceedings of the 8th International Conference on Frontiers of Information Technology (p. 14). ACM.

MANMIT ROUT & CHINMAY KUMAR PARIDA ‘’ optimization of blasting parameters in opencast mines’’ department of mining engineering national institute of technology rourkela-769008, 2007.

May, M. A. (2012). Applications of Queuing Theory for Open-Pit Truck/Shovel Haulage Systems (Doctoral dissertation, Virginia Polytechnic Institute and State University).

MENA, R., ENRICO, Z., FREDY, K. and ADOLFO, A. 2013. Availability-based simulation and optimization modeling framework for open-pit mine truck allocation under dynamic constraints. Int. J. Min. Sci. Techno. 23(1), 113-119.

Munirathinam, M., & Yingling, J. C. (1994). A review of computer-based truck dispatching strategies for surface mining operations. International Journal of Surface Mining and Reclamation, 8(1), 1-15.

Nel, S., Kizil, M. S., & Knights, P. (2011). Improving truck-shovel matching. In35th APCOM Symposium (pp. 381-391). Australasian Institute of Mining and Metallurgy.

Pitram. (2021, january 12). Retrieved from Micromine.com: https://www.micromine.com/pitram-mining-software/

Semykina, A. S. (2018). Aspects of transport system management within mining complex using information and telecommunication System. *Journal of Physics: Conference series*, 5

SWAIN, H.D. Bougainville’s EDP techniques up mine productivity, simplify planning. Mining Engineering, March 1979. Pp. 265-268.

Tan, Y., Miwa, K., Chinbat, U., Takakuwa, S., & 2012 Winter Simulation Conference, WSC 2012. (December 01, 2012). Operations modeling and analysis of open pit copper mining using GPS tracking data. Proceedings - Winter Simulation Conference.

TEMENG, V. A. 1997. A computerized model for truck dispatching in open pit mines. Ph.D. Dissertation, Michigan Technological University.

Touwen, F. H., & Joughin, N. C. (1972). The simulation of underground stoping and transport operations in gold mining. In APCOM (Vol. 10, pp. 231-236).

TRAINOR. G. F, D. OLSEN and L. WHEATING "Using high precision GNSS applications to meet truck level ore blending requirements in the KMP" a case study on machine guidance, 2012.

WHITE, J.W., ARNOLD, M.J. and CLEVENGER, J.G., Automated Open-Pit Truck Dispatching at Tyrone, Engineering and Mining Journal, Vol. 183, No.6, pp. 76-84, June 1982.

WHITE, J. W. and OLSON, J. P. 1986. Computer-Based Dispatching in Mines with Concurrent Operating Objectives. Mining Engineering, 38(11), 1045-1054.

ZHANG, L. and XIA, X. 2015. An integer programming approach for truck-shovel dispatching problem in open-pit mines. Energy Proc. 75(2015), 1779-1784.

Appendix 1: Formulae's

FORMULAS;

ProfitMargin	= (Revenue-TOTAL_COST)/TOTAL_COST
Elevation1	=ROUND(vBENCH/vBENCh_Count,0)
Elev2	= ROUND(Load_Loc_Elev/Load_Loc_Elev_Count,0)
TargetTravel	=MAX(IF(TRAVEL_TIME>PERCENTILE(TRAVEL_TIME,0.5),TRAVEL_TIME))
TRSpeed	= (HAUL_DISTANCE+EMPTY_DISTANCE)/ (TRAVEL_TIME/60)
CycSpeed	= (EMPTY_DISTANCE+HAUL_DISTANCE)/((TRAVEL_TIME+NON_TRAVEL_TIME)/60)
CstPBCM	=TOTAL_COST/Total_FQMO_Expit
TrckCostPBCM	=HAULER_COST/Total_FQMO_Expit
FullDist	=(EMPTY_DISTANCE+HAUL_DISTANCE)/VALID_LOAD
DigCstPBCM	=LOADER_COST/Total_FQMO_Expit
HaulDist	=HAUL_DISTANCE/VALID_LOAD
EmptyDist	=EMPTY_DISTANCE/VALID_LOAD
CycTime	=CYCLE_TIME/VALID_LOAD
TR_Time	=TRAVEL_TIME/VALID_LOAD
Non_TR_Time	=NON_TRAVEL_TIME/VALID_LOAD
Q_Time	=HU_Queue_at_LU/VALID_LOAD
SptTime	=HU_Spot_At_LU/VALID_LOAD
WaitDumpTime	=HU_Wait_for_Dump/VALID_LOAD
LdTime	=HU_HU_Loading/VALID_LOAD
DumpTime	=HU_DUMPING/VALID_LOAD
HngTime	=LU_HANGING/VALID_LOAD
FtravelPercent	=HAUL_DISTANCE/ (HAUL_DISTANCE+EMPTY_DISTANCE)
InPitDumps	= IF(DUMP_LOCATION_SNAME= "IN_PIT_DUMP",QUANTITY_REPORTING,0)
RL_Delta	=RL-Load_Loc_Elev
DirecTip	=IFERROR(All_Direct_Tip/All_TippedinCrusher, 0)
HPROD2	=Total_FQMO_Expit/HU_PROD_HRS
LU_PROD	=Total_FQMO_Expit/LU_PROD_HRS

Appendix 2: Location

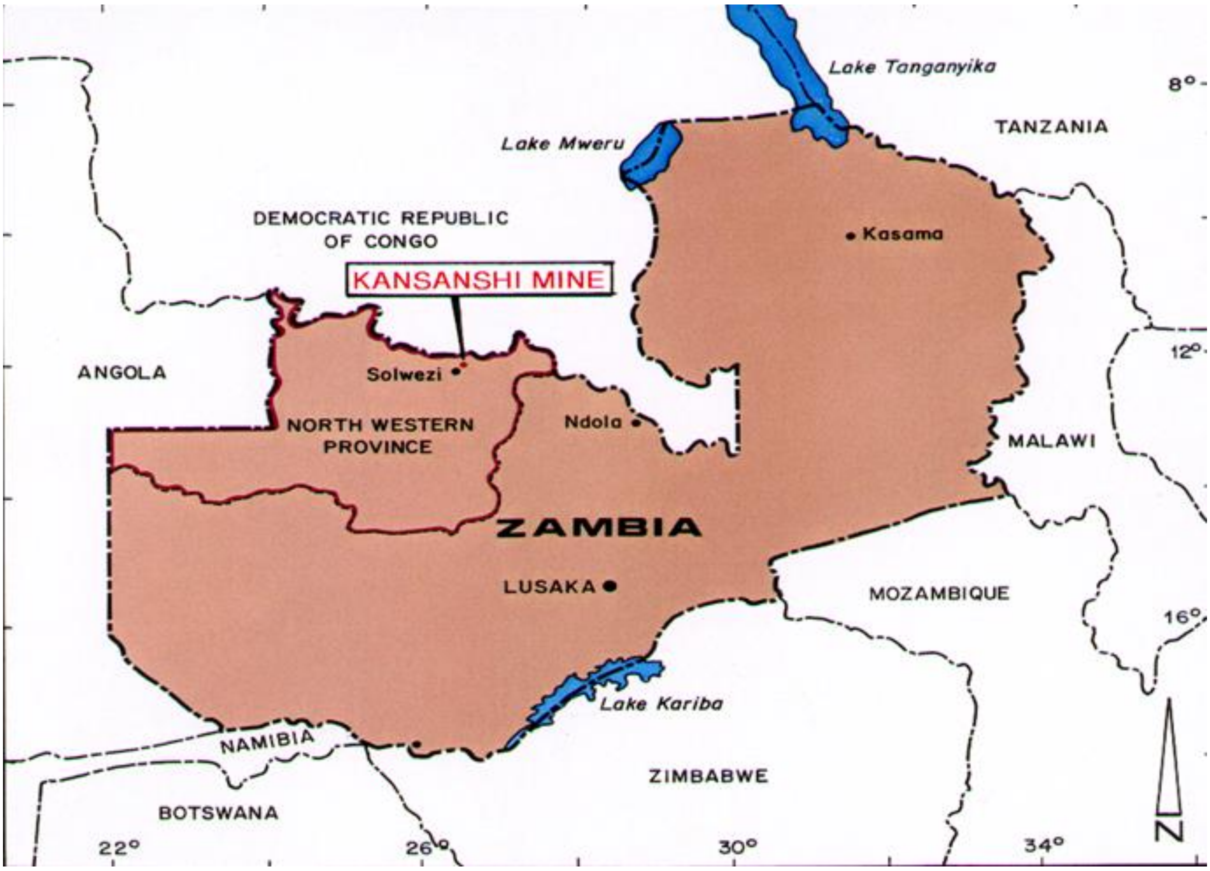


Figure: A1- Kansanshi mine project location (Google Maps)

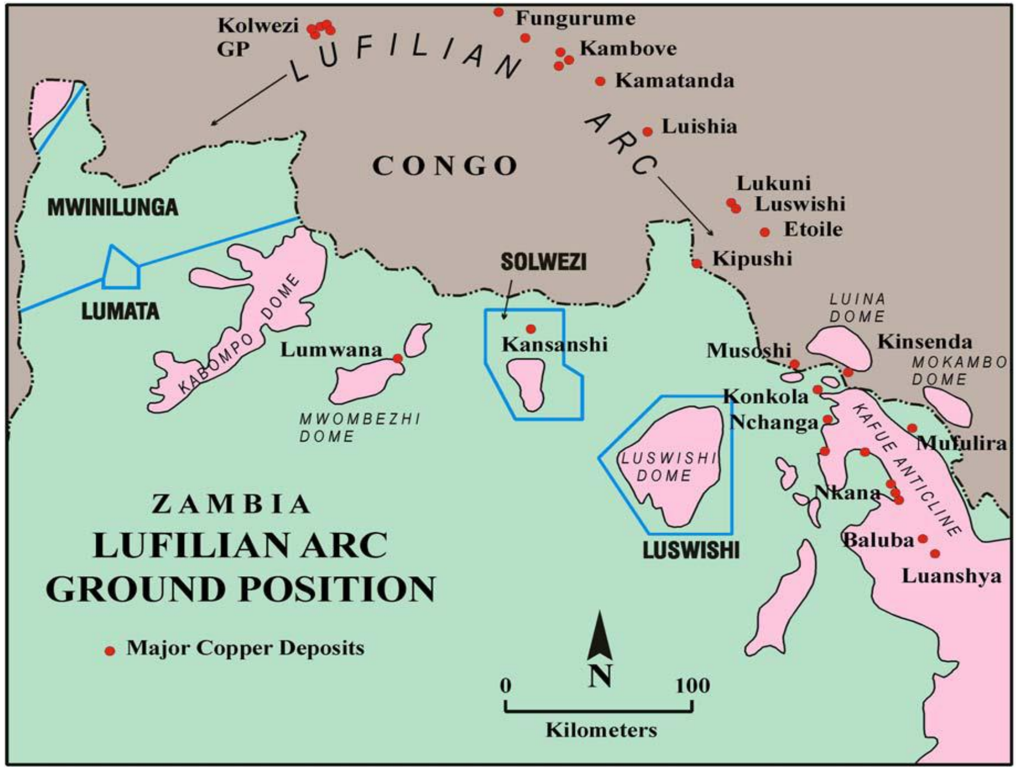


Figure: A2- Kansanshi geological setting

Appendix 3: Geological Sections

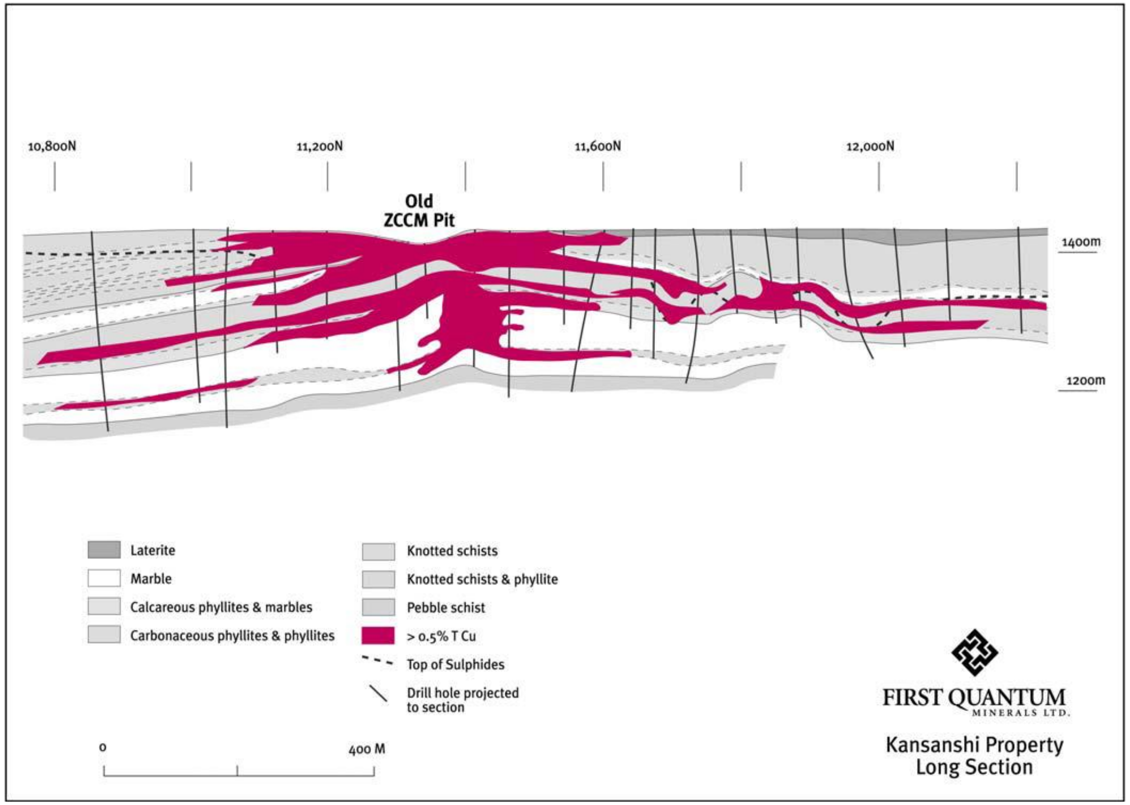


Figure: A3- Kansanshi long section showing two flat lying ore bodies separated by barren marble unit (Modified after Kansanshi geological section)

Appendix 4: Geological Sections

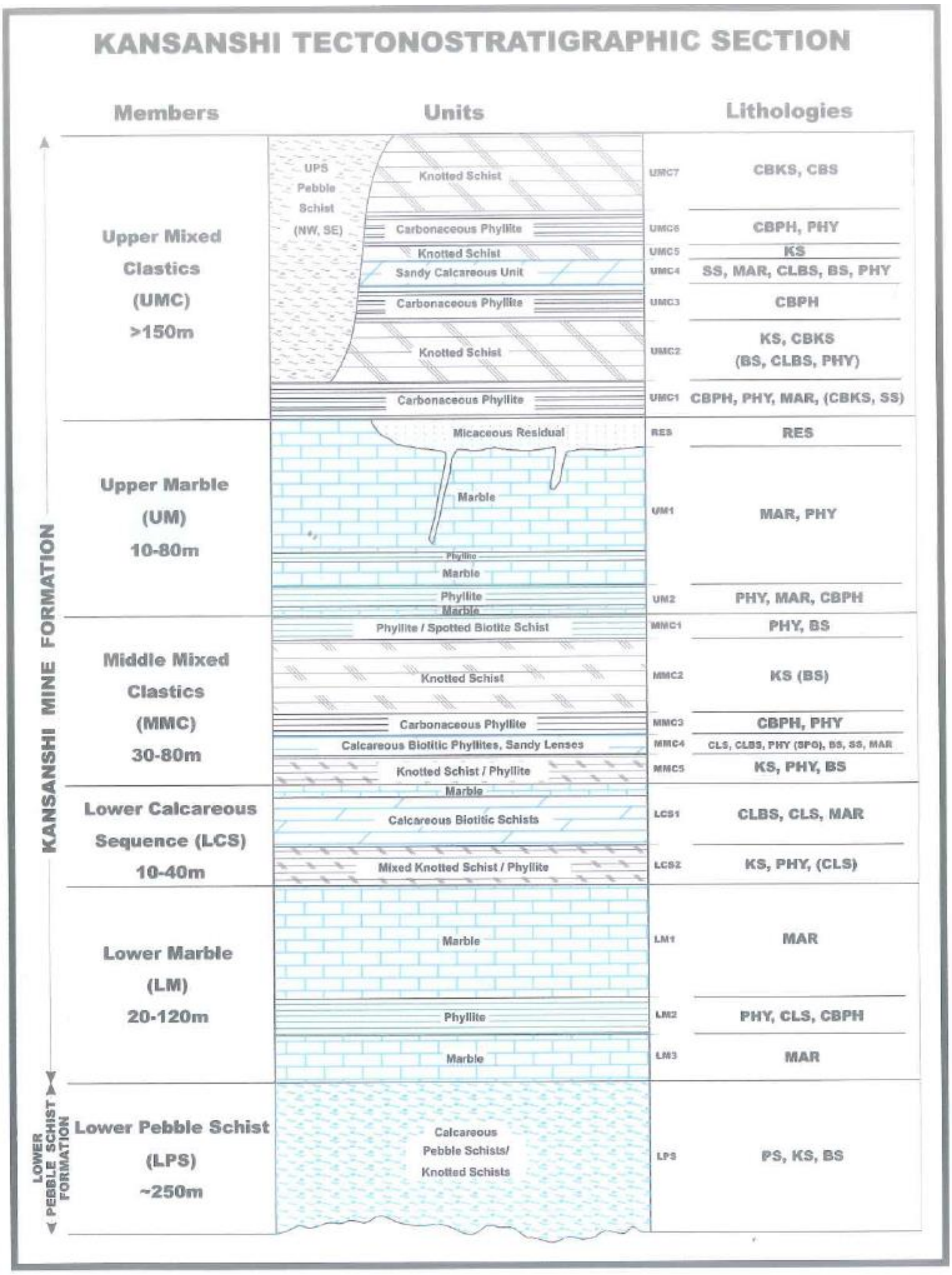


Figure: A4- Sectional column view of Kansanshi Mine Stratigraphy

Appendix 5: Pit sections

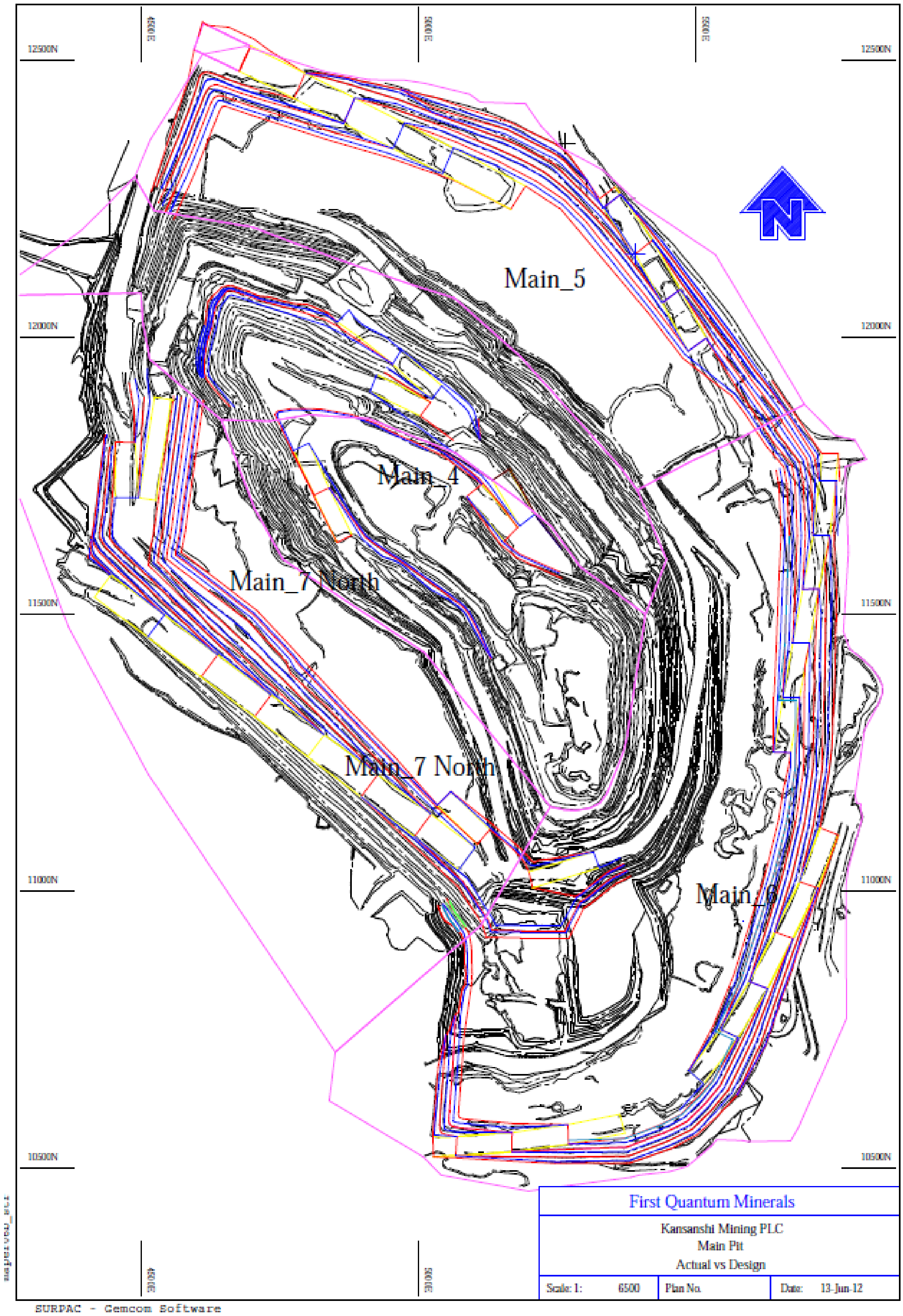


Figure: A5 - Main Pit

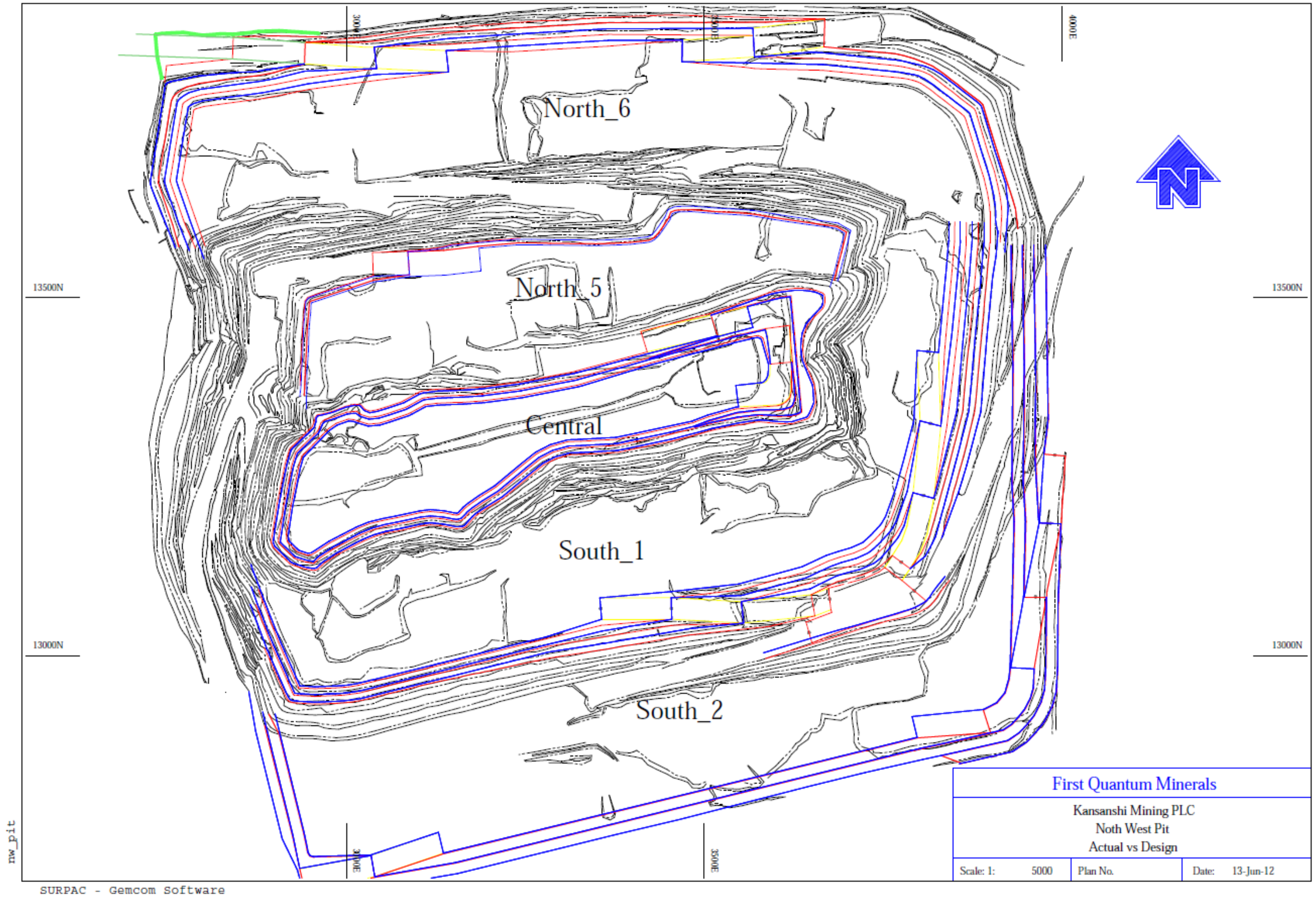


Figure: A6 – North West Pit

Appendix 6: Cycle Times

Table A1. CYCLE TIME

TD	HD	ED	CS	TS	CT	TT	NTT	QT	ST	WD	LT	DT	HT	FT	Month
8.06	3.97	4.10	14.05	19.10	34.45	25.33	9.11	3.28	0.61	0.76	3.76	0.71	1.82	0.49	Jan
7.85	3.84	4.01	13.69	18.34	34.39	25.68	8.72	2.93	0.56	0.64	3.86	0.71	2.20	0.49	Jan
7.74	3.81	3.93	13.05	17.24	35.61	26.94	8.66	2.82	0.51	0.81	3.85	0.68	2.25	0.49	Jan
8.80	4.35	4.45	14.98	19.36	35.24	27.26	7.98	2.40	0.54	0.73	3.56	0.74	2.03	0.49	Jan
8.53	4.20	4.33	14.63	18.97	34.97	26.97	8.00	2.16	0.60	0.89	3.66	0.68	2.55	0.49	Jan
8.51	4.15	4.36	14.51	18.87	35.18	27.05	8.13	2.47	0.52	0.85	3.60	0.68	2.16	0.49	Jan
8.15	4.00	4.15	14.32	19.28	34.16	25.36	8.80	2.61	0.49	0.70	4.27	0.72	2.41	0.49	Jan
8.40	4.17	4.23	14.64	18.98	34.41	26.54	7.87	2.08	0.46	0.70	3.92	0.71	2.78	0.50	Jan
8.00	3.98	4.03	15.41	19.81	31.17	24.24	6.93	1.67	0.37	0.61	3.58	0.71	2.70	0.50	Jan
8.18	4.00	4.18	15.22	19.65	32.24	24.96	7.28	1.71	0.37	0.46	4.03	0.70	2.92	0.49	Jan
8.12	3.96	4.16	14.68	19.27	33.18	25.28	7.90	2.28	0.38	0.65	3.88	0.71	2.23	0.49	Jan
7.51	3.68	3.83	12.11	16.56	37.20	27.19	10.00	3.30	0.50	1.24	4.21	0.74	2.59	0.49	Jan
8.35	4.06	4.29	11.93	15.95	41.96	31.39	10.57	3.46	0.54	1.06	4.50	1.01	2.59	0.49	Jan
8.65	4.24	4.41	14.68	19.82	35.37	26.19	9.19	3.19	0.51	0.90	3.87	0.70	2.37	0.49	Jan
9.45	4.71	4.75	16.00	20.15	35.46	28.14	7.31	2.01	0.43	0.55	3.60	0.73	2.64	0.50	Jan
9.29	4.59	4.70	16.25	20.28	34.31	27.49	6.82	1.78	0.50	0.51	3.37	0.67	2.89	0.49	Jan
8.18	4.04	4.14	12.77	16.76	38.43	29.28	9.15	2.54	0.53	1.22	4.08	0.78	2.45	0.49	Jan
8.44	4.20	4.24	13.65	18.01	37.10	28.12	8.98	2.99	0.61	0.78	3.93	0.66	2.39	0.50	Jan
8.51	4.18	4.33	14.17	18.34	36.02	27.83	8.19	2.42	0.59	0.73	3.73	0.72	2.49	0.49	Jan
8.49	4.21	4.28	14.61	19.43	34.85	26.20	8.64	2.81	0.67	0.61	3.85	0.71	2.50	0.50	Jan
8.19	4.04	4.16	14.53	19.55	33.84	25.14	8.70	2.97	0.41	0.57	4.05	0.69	1.95	0.49	Jan
7.92	3.87	4.05	14.03	19.05	33.88	24.96	8.92	2.76	0.57	0.91	3.97	0.70	2.55	0.49	Jan
8.82	4.35	4.48	15.45	20.06	34.27	26.39	7.88	1.99	0.45	0.74	3.97	0.72	2.92	0.49	Jan
8.68	4.28	4.40	15.38	20.00	33.87	26.03	7.83	2.29	0.42	0.61	3.77	0.73	2.31	0.49	Jan
8.39	4.10	4.29	14.91	19.80	33.78	25.43	8.34	2.68	0.43	0.49	4.05	0.69	2.18	0.49	Jan

8.75	4.32	4.43	14.98	19.90	35.03	26.38	8.65	2.74	0.52	0.63	4.04	0.72	2.57	0.49	Jan
8.76	4.32	4.44	15.75	20.67	33.37	25.43	7.94	2.41	0.38	0.48	3.95	0.72	2.36	0.49	Jan
8.97	4.37	4.59	16.10	21.35	33.43	25.21	8.22	2.35	0.45	0.42	4.27	0.74	2.34	0.49	Jan
8.67	4.23	4.44	15.11	19.66	34.44	26.47	7.97	2.53	0.57	0.43	3.74	0.71	2.12	0.49	Jan
8.67	4.13	4.53	15.05	20.17	34.55	25.78	8.78	2.97	0.53	0.36	4.21	0.72	2.01	0.48	Jan
8.42	4.10	4.32	13.59	17.81	37.16	28.35	8.81	2.45	0.33	1.18	4.14	0.69	2.54	0.49	Jan
8.43	4.12	4.31	14.12	19.04	35.83	26.56	9.27	3.25	0.56	0.66	4.10	0.70	2.21	0.49	Feb
8.46	4.14	4.32	14.23	19.36	35.69	26.24	9.45	3.39	0.61	0.59	4.18	0.68	2.17	0.49	Feb
9.03	4.49	4.54	15.13	20.17	35.81	26.88	8.94	2.80	0.62	0.63	4.17	0.71	2.43	0.50	Feb
8.95	4.44	4.51	15.45	20.45	34.76	26.25	8.51	2.60	0.41	0.63	4.15	0.71	2.50	0.50	Feb
8.92	4.38	4.54	15.17	19.88	35.27	26.93	8.35	2.61	0.49	0.54	4.01	0.69	2.48	0.49	Feb
8.23	4.05	4.18	14.62	19.55	33.79	25.27	8.52	2.48	0.51	0.51	4.31	0.71	2.56	0.49	Feb
8.38	4.09	4.29	14.59	19.40	34.45	25.92	8.53	2.58	0.56	0.44	4.23	0.71	2.93	0.49	Feb
8.95	4.50	4.45	12.97	16.69	41.40	32.16	9.24	2.57	0.64	1.03	4.28	0.71	3.23	0.50	Feb
8.52	4.24	4.28	14.61	19.16	35.00	26.68	8.32	2.47	0.78	0.64	3.72	0.71	2.76	0.50	Feb
8.56	4.25	4.31	15.09	19.27	34.04	26.65	7.38	2.15	0.66	0.44	3.44	0.69	2.01	0.50	Feb
8.63	4.29	4.34	14.83	19.38	34.89	26.71	8.18	2.45	0.59	0.75	3.69	0.70	2.33	0.50	Feb
9.02	4.49	4.54	15.32	19.71	35.35	27.46	7.88	1.99	0.68	0.56	3.97	0.68	2.70	0.50	Feb
9.27	4.56	4.71	14.78	19.06	37.65	29.19	8.46	2.44	0.66	0.75	3.82	0.77	2.32	0.49	Feb
8.73	4.31	4.42	14.13	19.17	37.09	27.33	9.77	3.43	0.69	1.18	3.74	0.71	1.84	0.49	Feb
8.36	4.18	4.18	14.31	19.16	35.07	26.19	8.88	2.87	0.75	0.73	3.87	0.67	2.15	0.50	Feb
8.01	3.97	4.05	14.48	19.75	33.19	24.34	8.85	2.66	0.53	0.98	3.98	0.70	2.28	0.50	Feb
8.52	4.20	4.32	14.74	19.78	34.68	25.84	8.84	3.09	0.60	0.72	3.75	0.67	2.32	0.49	Feb
7.72	3.82	3.91	13.36	18.49	34.69	25.07	9.62	3.46	0.72	0.69	4.07	0.68	1.80	0.49	Feb
8.39	4.16	4.23	14.61	19.07	34.46	26.39	8.07	2.31	0.58	0.81	3.60	0.76	1.92	0.50	Feb
8.56	4.30	4.27	14.38	18.98	35.75	27.07	8.68	2.34	0.59	1.10	3.93	0.72	2.31	0.50	Feb
8.77	4.42	4.35	13.26	17.63	39.66	29.83	9.83	3.31	0.83	1.08	3.88	0.72	2.09	0.50	Feb
8.67	4.33	4.34	14.39	19.15	36.14	27.16	8.98	3.34	0.52	0.67	3.75	0.69	1.96	0.50	Feb
8.85	4.43	4.42	14.80	19.57	35.88	27.13	8.75	2.54	0.51	1.15	3.83	0.73	2.42	0.50	Feb

8.37	4.16	4.21	14.92	19.60	33.65	25.62	8.03	2.14	0.63	0.86	3.68	0.72	2.59	0.50	Feb
8.79	4.31	4.48	13.65	17.92	38.62	29.42	9.20	2.90	0.76	0.83	3.98	0.72	2.58	0.49	Feb
8.61	4.26	4.35	14.76	19.71	35.01	26.21	8.80	2.67	0.53	0.74	4.12	0.74	1.91	0.49	Feb
8.82	4.38	4.44	14.90	19.96	35.54	26.52	9.01	2.89	0.58	0.91	3.93	0.71	1.90	0.50	Feb
8.89	4.42	4.46	15.02	19.63	35.49	27.16	8.33	2.29	0.49	1.01	3.78	0.74	2.08	0.50	Feb
8.63	4.26	4.37	15.02	19.59	34.46	26.42	8.03	2.39	0.52	0.58	3.82	0.73	1.98	0.49	Mar
8.41	4.15	4.26	14.89	19.72	33.89	25.58	8.31	2.74	0.47	0.40	3.95	0.74	1.59	0.49	Mar
8.39	4.17	4.22	14.68	19.43	34.30	25.90	8.39	2.31	0.52	0.55	4.30	0.71	1.99	0.50	Mar
8.31	4.11	4.20	14.01	18.93	35.58	26.33	9.26	2.55	0.53	0.85	4.60	0.72	1.91	0.49	Mar
9.00	4.43	4.57	14.55	19.17	37.11	28.17	8.94	2.44	0.52	0.55	4.71	0.72	2.70	0.49	Mar
8.67	4.32	4.36	14.00	18.45	37.17	28.21	8.96	2.61	0.46	0.70	4.48	0.72	2.20	0.50	Mar
9.19	4.56	4.63	15.11	19.19	36.50	28.74	7.76	2.00	0.53	0.65	3.86	0.71	2.76	0.50	Mar
8.54	4.30	4.24	14.89	19.38	34.41	26.44	7.97	2.05	0.59	0.62	4.00	0.71	2.06	0.50	Mar
8.11	3.99	4.12	13.90	18.07	34.98	26.92	8.07	2.37	0.48	0.60	3.91	0.70	2.01	0.49	Mar
8.73	4.37	4.36	15.06	19.36	34.77	27.06	7.72	2.19	0.47	0.58	3.80	0.69	1.65	0.50	Mar
8.96	4.52	4.44	14.48	18.74	37.15	28.70	8.45	2.34	0.42	0.76	4.19	0.73	2.26	0.50	Mar
8.46	4.19	4.27	14.13	18.09	35.92	28.05	7.87	1.86	0.38	0.66	4.28	0.70	2.66	0.50	Mar
8.40	4.06	4.34	13.60	16.76	37.07	30.06	7.01	1.74	0.34	0.47	3.77	0.69	2.09	0.48	Mar
7.92	3.95	3.96	14.31	18.53	33.20	25.63	7.57	1.74	0.34	0.80	3.90	0.79	2.11	0.50	Mar
8.01	3.99	4.02	14.43	18.83	33.28	25.50	7.77	2.04	0.39	0.73	3.88	0.73	1.81	0.50	Mar
8.24	4.12	4.12	14.94	19.15	33.10	25.83	7.27	1.85	0.47	0.53	3.73	0.69	2.12	0.50	Mar
8.34	4.12	4.22	14.73	18.96	33.98	26.39	7.58	2.33	0.48	0.41	3.67	0.68	1.72	0.49	Mar
8.60	4.27	4.33	14.52	19.07	35.52	27.05	8.47	2.48	0.49	0.73	4.06	0.71	2.17	0.50	Mar
8.69	4.30	4.39	14.25	18.91	36.58	27.57	9.01	2.99	0.56	0.75	4.00	0.71	2.07	0.50	Mar
8.54	4.26	4.27	14.93	19.49	34.29	26.27	8.02	2.17	0.49	0.78	3.87	0.71	2.15	0.50	Mar
8.65	4.36	4.29	15.09	19.39	34.38	26.77	7.62	2.08	0.48	0.64	3.73	0.69	2.10	0.50	Mar
8.52	4.26	4.26	15.28	19.63	33.45	26.05	7.41	1.95	0.45	0.56	3.77	0.67	2.04	0.50	Mar
8.25	4.11	4.14	15.00	19.25	33.00	25.72	7.29	1.98	0.52	0.51	3.57	0.70	2.13	0.50	Mar
8.19	4.07	4.13	14.91	19.49	32.96	25.22	7.74	2.00	0.54	0.71	3.80	0.67	2.22	0.50	Mar

8.91	4.46	4.45	14.81	19.20	36.10	27.86	8.24	2.30	0.47	0.81	3.93	0.73	2.18	0.50	Mar
8.53	4.27	4.26	14.18	18.89	36.10	27.09	9.01	2.57	0.44	0.88	3.97	1.15	1.99	0.50	Mar
8.68	4.31	4.37	14.48	18.91	35.94	27.52	8.42	2.57	0.60	0.77	3.80	0.67	1.92	0.50	Mar
7.69	3.82	3.87	14.28	18.88	32.31	24.43	7.88	2.15	0.45	0.68	3.87	0.72	1.82	0.50	Mar
8.12	4.05	4.07	14.79	19.06	32.93	25.55	7.38	1.97	0.46	0.55	3.66	0.75	2.08	0.50	Mar
8.03	3.97	4.06	15.45	20.05	31.20	24.04	7.17	1.88	0.54	0.60	3.44	0.71	1.82	0.49	Mar
8.36	4.17	4.19	15.08	19.44	33.25	25.79	7.46	1.95	0.51	0.59	3.70	0.71	2.13	0.50	Mar
8.37	4.17	4.21	15.11	19.54	33.24	25.70	7.54	1.95	0.49	0.68	3.72	0.70	2.10	0.50	Apr
7.83	3.90	3.93	14.78	19.29	31.78	24.35	7.43	2.03	0.60	0.59	3.51	0.69	1.69	0.50	Apr
7.87	3.90	3.97	14.17	18.68	33.33	25.27	8.06	2.32	0.56	0.65	3.80	0.73	2.01	0.50	Apr
8.55	4.22	4.34	15.25	19.80	33.66	25.92	7.74	2.39	0.53	0.56	3.54	0.71	1.91	0.49	Apr
8.27	4.03	4.24	14.60	19.20	33.99	25.85	8.14	2.47	0.65	0.60	3.72	0.70	2.06	0.49	Apr
8.04	3.99	4.05	14.59	19.21	33.04	25.10	7.94	2.46	0.55	0.53	3.71	0.69	1.67	0.50	Apr
8.41	4.18	4.23	14.95	19.58	33.75	25.77	7.98	2.51	0.52	0.61	3.63	0.71	1.74	0.50	Apr
8.15	4.00	4.15	14.90	19.55	32.80	25.01	7.80	2.25	0.51	0.65	3.66	0.72	1.83	0.49	Apr
8.15	4.02	4.12	14.54	19.14	33.62	25.53	8.09	2.24	0.47	0.77	3.88	0.72	1.95	0.49	Apr
8.52	4.21	4.31	14.44	19.04	35.41	26.86	8.55	2.77	0.56	0.67	3.82	0.73	1.95	0.49	Apr
8.53	4.21	4.32	13.13	17.34	38.97	29.51	9.46	3.39	0.48	0.73	4.08	0.78	1.60	0.49	Apr
8.44	4.18	4.26	14.22	18.79	35.59	26.95	8.64	2.51	0.51	0.66	4.13	0.84	2.10	0.50	Apr
8.45	4.18	4.26	14.81	19.23	34.21	26.35	7.87	2.09	0.51	0.63	3.93	0.71	2.07	0.50	Apr
8.32	4.09	4.23	14.44	18.59	34.55	26.85	7.70	2.09	0.48	0.61	3.81	0.71	2.06	0.49	Apr
8.75	4.31	4.43	14.92	19.04	35.17	27.57	7.60	1.94	0.45	0.62	3.85	0.73	2.27	0.49	Apr
8.38	4.20	4.18	13.54	17.14	37.12	29.33	7.79	2.07	0.50	1.00	3.50	0.71	2.85	0.50	Apr
7.73	3.85	3.88	12.23	16.13	37.95	28.77	9.17	2.85	0.64	0.98	3.96	0.73	2.18	0.50	Apr
7.27	3.58	3.69	13.79	18.06	31.63	24.16	7.47	2.07	0.54	0.54	3.58	0.73	2.05	0.49	Apr
7.36	3.64	3.72	14.76	19.00	29.91	23.24	6.67	1.65	0.44	0.61	3.24	0.73	2.16	0.49	Apr
7.75	3.83	3.92	14.55	19.26	31.97	24.15	7.82	2.41	0.56	0.48	3.66	0.71	1.77	0.49	Apr
7.68	3.75	3.92	14.74	19.47	31.23	23.65	7.58	2.05	0.44	0.61	3.74	0.73	2.33	0.49	Apr
7.97	3.94	4.03	15.53	19.74	30.79	24.23	6.56	1.30	0.34	0.68	3.52	0.72	2.69	0.49	Apr

8.11	3.99	4.12	15.46	19.77	31.48	24.61	6.86	1.49	0.40	0.61	3.62	0.74	2.87	0.49	Apr
8.55	4.18	4.37	14.65	18.85	35.00	27.21	7.79	2.07	0.48	0.63	3.88	0.72	3.01	0.49	Apr
8.30	4.04	4.26	15.38	19.87	32.38	25.07	7.31	1.84	0.56	0.54	3.63	0.74	2.59	0.49	Apr
7.82	3.83	3.99	15.34	19.72	30.58	23.79	6.79	1.50	0.47	0.57	3.52	0.73	2.81	0.49	Apr
7.60	3.72	3.88	14.93	19.48	30.53	23.40	7.13	1.64	0.47	0.65	3.65	0.71	2.83	0.49	Apr
7.85	3.85	4.01	15.22	19.73	30.96	23.89	7.07	1.59	0.50	0.63	3.63	0.72	2.65	0.49	Apr
8.12	4.01	4.11	15.56	20.55	31.30	23.70	7.60	1.77	0.52	0.86	3.74	0.72	2.80	0.49	Apr
7.70	3.78	3.92	14.95	19.82	30.92	23.32	7.60	1.73	0.45	0.93	3.74	0.74	2.59	0.49	Apr
8.50	4.20	4.30	15.04	20.09	33.93	25.40	8.54	2.35	0.47	1.05	3.89	0.77	2.47	0.49	May
8.53	4.20	4.33	15.29	20.10	33.45	25.45	8.01	2.24	0.47	0.74	3.84	0.71	2.11	0.49	May
7.93	3.90	4.03	15.15	19.67	31.40	24.18	7.22	1.82	0.30	0.82	3.54	0.74	2.15	0.49	May
7.34	3.56	3.77	14.59	19.50	30.17	22.57	7.61	1.78	0.35	1.08	3.68	0.73	2.18	0.49	May
8.54	3.96	4.58	13.74	17.62	37.29	29.08	8.21	2.19	0.47	1.25	3.54	0.76	4.71	0.46	May
7.26	3.56	3.70	13.97	18.66	31.17	23.35	7.83	1.93	0.67	0.88	3.60	0.75	2.49	0.49	May
6.98	3.40	3.58	14.32	19.22	29.26	21.81	7.45	1.84	0.44	0.70	3.73	0.74	2.37	0.49	May
7.25	3.53	3.72	14.84	19.49	29.32	22.33	6.99	1.63	0.34	0.73	3.59	0.71	2.39	0.49	May
7.08	3.44	3.63	14.91	20.09	28.47	21.13	7.34	1.94	0.34	0.66	3.69	0.72	1.99	0.49	May
6.82	3.30	3.52	15.13	20.20	27.07	20.27	6.80	1.73	0.35	0.63	3.38	0.70	2.11	0.48	May
7.00	3.36	3.64	14.52	19.61	28.93	21.42	7.51	1.90	0.29	0.70	3.88	0.74	2.18	0.48	May
6.82	3.29	3.53	14.64	19.80	27.96	20.67	7.28	2.19	0.42	0.44	3.54	0.69	2.01	0.48	May
7.17	3.44	3.74	14.65	19.48	29.37	22.09	7.27	1.82	0.48	0.58	3.67	0.72	1.91	0.48	May
7.07	3.43	3.64	14.74	19.20	28.79	22.10	6.69	1.59	0.44	0.41	3.51	0.74	2.46	0.48	May
7.62	3.72	3.90	15.04	19.54	30.41	23.40	7.01	1.74	0.41	0.51	3.63	0.72	2.13	0.49	May
7.22	3.50	3.72	14.86	19.57	29.14	22.13	7.01	1.64	0.57	0.56	3.52	0.72	2.20	0.48	May
6.87	3.31	3.56	14.82	19.86	27.81	20.75	7.06	1.84	0.48	0.53	3.48	0.73	1.83	0.48	May
6.82	3.31	3.50	14.69	19.36	27.84	21.12	6.72	1.73	0.54	0.46	3.28	0.72	1.90	0.49	May
7.82	3.79	4.03	14.93	19.43	31.41	24.14	7.27	1.90	0.64	0.45	3.58	0.70	2.09	0.48	May
7.47	3.65	3.82	14.00	18.85	32.00	23.77	8.23	2.51	0.71	0.60	3.68	0.73	1.79	0.49	May
7.49	3.69	3.80	14.67	19.43	30.64	23.13	7.51	1.92	0.46	0.52	3.89	0.73	2.17	0.49	May

7.37	3.57	3.80	13.59	18.37	32.55	24.08	8.48	2.65	0.47	0.55	4.11	0.70	1.93	0.48	May
7.11	3.45	3.66	14.26	19.29	29.91	22.11	7.80	2.32	0.54	0.51	3.69	0.74	1.73	0.49	May
6.07	2.92	3.15	13.42	18.28	27.14	19.92	7.22	2.07	0.52	0.41	3.47	0.74	1.61	0.48	May
6.94	3.34	3.60	14.04	19.09	29.68	21.82	7.86	2.45	0.56	0.62	3.48	0.74	1.55	0.48	May
7.38	3.60	3.78	14.48	19.88	30.57	22.27	8.29	2.69	0.61	0.55	3.67	0.76	1.63	0.49	May
7.16	3.47	3.69	14.92	20.19	28.79	21.27	7.51	2.28	0.43	0.43	3.64	0.72	1.47	0.48	May
7.13	3.49	3.64	14.66	20.13	29.18	21.25	7.93	2.23	0.49	0.75	3.69	0.76	1.66	0.49	May
6.73	3.30	3.42	14.27	19.43	28.29	20.76	7.52	1.96	0.56	0.74	3.53	0.73	1.68	0.49	May
7.06	3.42	3.64	13.46	18.49	31.48	22.92	8.56	2.67	0.56	0.93	3.68	0.71	1.53	0.48	May
6.95	3.37	3.58	14.24	19.41	29.30	21.50	7.79	2.03	0.50	0.70	3.82	0.74	1.74	0.48	May
7.34	3.56	3.78	14.25	19.42	30.92	22.68	8.24	2.34	0.57	0.75	3.88	0.70	1.95	0.49	Jun
6.94	3.38	3.56	14.58	19.75	28.55	21.08	7.48	1.73	0.47	0.84	3.69	0.75	2.11	0.49	Jun
7.10	3.48	3.62	14.70	20.02	28.97	21.28	7.69	2.18	0.39	0.68	3.73	0.71	1.68	0.49	Jun
6.69	3.24	3.46	14.60	20.30	27.51	19.78	7.73	2.42	0.42	0.52	3.63	0.73	1.35	0.48	Jun
7.60	3.71	3.90	15.26	20.32	29.88	22.45	7.44	2.12	0.48	0.65	3.46	0.73	1.62	0.49	Jun
7.35	3.60	3.75	15.57	20.46	28.33	21.56	6.77	1.69	0.43	0.57	3.35	0.72	1.97	0.49	Jun
7.55	3.68	3.87	15.37	20.61	29.45	21.97	7.48	2.04	0.52	0.73	3.45	0.74	1.77	0.49	Jun
7.45	3.64	3.81	14.83	20.08	30.15	22.27	7.88	2.49	0.54	0.68	3.45	0.72	1.56	0.49	Jun
7.67	3.77	3.90	15.49	20.61	29.72	22.34	7.38	2.08	0.42	0.65	3.52	0.71	1.88	0.49	Jun
7.39	3.60	3.79	15.16	20.50	29.27	21.64	7.63	2.10	0.53	0.63	3.63	0.74	1.86	0.49	Jun
7.26	3.56	3.70	14.94	20.02	29.17	21.76	7.41	2.11	0.55	0.61	3.41	0.74	1.90	0.49	Jun
7.88	3.83	4.05	15.15	19.69	31.20	24.01	7.19	1.82	0.56	0.78	3.29	0.74	2.20	0.49	Jun
7.50	3.65	3.85	14.38	19.13	31.31	23.53	7.78	2.27	0.55	0.70	3.47	0.79	1.93	0.49	Jun
7.72	3.78	3.94	15.03	19.98	30.81	23.16	7.64	2.22	0.48	0.78	3.42	0.74	2.06	0.49	Jun
7.77	3.77	4.00	14.31	19.16	32.60	24.35	8.25	2.61	0.65	0.74	3.52	0.72	2.05	0.48	Jun
7.58	3.68	3.91	14.30	19.20	31.83	23.70	8.13	2.53	0.54	0.59	3.72	0.74	1.67	0.48	Jun
7.68	3.77	3.91	14.71	19.79	31.32	23.28	8.04	2.44	0.49	0.64	3.75	0.72	1.86	0.49	Jun
7.49	3.64	3.85	14.49	19.88	31.01	22.60	8.40	2.53	0.50	0.77	3.88	0.73	2.14	0.49	Jun
7.63	3.68	3.96	14.80	19.69	30.95	23.26	7.69	2.16	0.58	0.60	3.63	0.71	2.29	0.48	Jun

7.33	3.57	3.76	14.76	19.83	29.80	22.18	7.62	2.13	0.44	0.62	3.67	0.76	2.30	0.49	Jun
7.31	3.61	3.70	15.14	19.81	28.99	22.15	6.84	1.64	0.39	0.52	3.60	0.68	2.23	0.49	Jun
7.26	3.55	3.71	15.46	20.40	28.19	21.36	6.83	1.67	0.33	0.58	3.59	0.66	2.12	0.49	Jun
7.50	3.63	3.87	15.34	20.60	29.33	21.83	7.50	2.08	0.50	0.58	3.69	0.65	1.69	0.48	Jun
7.66	3.72	3.95	15.34	20.12	29.97	22.86	7.11	1.80	0.35	0.62	3.68	0.67	2.15	0.48	Jun
7.61	3.73	3.88	15.38	20.15	29.71	22.67	7.05	1.65	0.43	0.71	3.58	0.67	2.16	0.49	Jun
7.62	3.70	3.92	15.27	19.94	29.95	22.94	7.01	1.72	0.41	0.75	3.46	0.67	2.52	0.49	Jun
7.72	3.79	3.93	14.74	19.76	31.43	23.45	7.98	2.56	0.54	0.63	3.57	0.68	1.84	0.49	Jun
7.56	3.71	3.85	14.75	20.05	30.76	22.63	8.12	2.58	0.58	0.71	3.58	0.67	1.48	0.49	Jun
7.11	3.49	3.62	15.30	21.06	27.88	20.25	7.63	2.30	0.47	0.57	3.62	0.67	1.56	0.49	Jun
7.12	3.47	3.65	14.24	20.04	30.01	21.32	8.69	2.87	0.63	0.58	3.94	0.67	1.65	0.49	Jun
7.66	3.76	3.90	14.81	20.01	31.02	22.95	8.07	2.24	0.66	0.61	3.89	0.67	2.05	0.49	Jul
7.53	3.70	3.84	14.62	19.75	30.91	22.88	8.03	2.18	0.62	0.63	3.91	0.68	2.04	0.49	Jul
7.67	3.79	3.88	14.93	19.83	30.85	23.22	7.62	2.16	0.58	0.64	3.56	0.68	2.04	0.49	Jul
8.20	4.04	4.16	15.99	20.72	30.78	23.74	7.03	1.73	0.49	0.68	3.44	0.69	2.28	0.49	Jul
7.79	3.85	3.94	14.70	19.85	31.79	23.55	8.25	2.37	0.72	0.80	3.68	0.67	1.99	0.49	Jul
7.90	3.87	4.03	14.98	20.17	31.64	23.51	8.14	2.38	0.56	0.61	3.92	0.67	1.95	0.49	Jul
9.00	4.43	4.57	15.15	19.95	35.66	27.07	8.59	2.36	0.77	0.80	3.95	0.71	2.52	0.49	Jul
8.12	3.95	4.17	15.36	20.38	31.73	23.91	7.82	2.04	0.59	0.64	3.84	0.70	2.22	0.49	Jul
8.51	4.21	4.30	15.68	19.97	32.58	25.58	7.01	1.34	0.62	0.65	3.66	0.73	2.94	0.49	Jul
8.58	4.25	4.33	15.59	20.15	33.03	25.56	7.47	1.83	0.53	0.61	3.77	0.72	2.65	0.49	Jul
8.26	4.07	4.19	14.94	19.38	33.16	25.56	7.61	1.96	0.54	0.64	3.79	0.69	2.40	0.49	Jul
7.92	3.86	4.05	15.42	20.24	30.80	23.46	7.34	1.88	0.52	0.64	3.60	0.70	2.29	0.49	Jul
7.22	3.47	3.75	14.50	20.10	29.89	21.56	8.33	2.79	0.61	0.66	3.57	0.69	1.39	0.48	Jul
7.42	3.63	3.79	15.44	20.79	28.82	21.41	7.41	2.03	0.45	0.58	3.68	0.67	1.90	0.49	Jul
7.89	3.84	4.05	14.99	20.46	31.58	23.14	8.44	2.74	0.58	0.61	3.83	0.69	2.02	0.49	Jul
7.07	3.39	3.69	14.37	19.55	29.54	21.71	7.83	2.55	0.53	0.64	3.39	0.72	1.55	0.48	Jul
6.82	3.34	3.48	13.75	19.14	29.77	21.39	8.38	2.73	0.60	0.74	3.63	0.69	1.57	0.49	Jul
7.15	3.51	3.64	14.56	19.88	29.45	21.58	7.88	2.27	0.77	0.53	3.62	0.69	1.72	0.49	Jul

7.13	3.51	3.63	14.69	19.89	29.13	21.51	7.62	2.10	0.64	0.55	3.65	0.67	1.89	0.49	Jul
7.39	3.62	3.77	16.13	21.19	27.50	20.93	6.57	1.64	0.46	0.51	3.30	0.66	1.91	0.49	Jul
7.13	3.49	3.64	14.96	19.93	28.60	21.47	7.13	1.79	0.55	0.54	3.54	0.71	2.03	0.49	Jul
7.30	3.58	3.71	14.14	19.12	30.96	22.90	8.06	2.45	0.66	0.59	3.66	0.70	1.79	0.49	Jul
7.70	3.74	3.96	15.10	20.04	30.61	23.06	7.55	2.05	0.52	0.55	3.74	0.68	2.04	0.49	Jul
7.75	3.80	3.95	15.45	20.25	30.09	22.96	7.13	1.91	0.49	0.55	3.50	0.68	1.91	0.49	Jul
7.77	3.84	3.93	15.18	20.13	30.69	23.14	7.55	2.15	0.54	0.56	3.64	0.65	1.72	0.49	Jul
8.21	4.07	4.15	15.74	20.33	31.32	24.24	7.07	1.74	0.52	0.60	3.54	0.67	2.54	0.50	Jul
7.84	3.86	3.97	14.90	19.88	31.55	23.66	7.90	2.43	0.52	0.53	3.77	0.65	1.99	0.49	Jul
7.64	3.75	3.89	14.95	20.15	30.68	22.76	7.92	2.40	0.53	0.73	3.60	0.66	1.90	0.49	Jul
7.71	3.77	3.94	15.02	20.07	30.81	23.06	7.75	2.20	0.43	0.78	3.67	0.67	2.10	0.49	Jul
7.57	3.71	3.85	15.02	20.51	30.23	22.14	8.09	2.57	0.45	0.71	3.67	0.70	1.92	0.49	Jul
7.64	3.75	3.89	14.99	20.24	30.59	22.65	7.94	2.41	0.45	0.70	3.72	0.66	1.90	0.49	Jul
7.48	3.66	3.82	15.17	20.22	29.57	22.18	7.39	2.10	0.50	0.73	3.37	0.69	1.98	0.49	Aug
7.79	3.83	3.96	15.07	19.99	31.02	23.39	7.63	2.25	0.54	0.64	3.53	0.66	1.92	0.49	Aug
7.96	3.89	4.06	15.60	20.28	30.59	23.53	7.05	2.03	0.53	0.63	3.18	0.68	2.10	0.49	Aug
7.54	3.70	3.84	14.39	19.64	31.44	23.04	8.39	2.73	0.74	0.61	3.62	0.70	1.74	0.49	Aug
7.62	3.73	3.89	15.31	20.69	29.89	22.11	7.77	2.57	0.55	0.55	3.42	0.68	1.61	0.49	Aug
7.81	3.86	3.95	15.32	20.63	30.60	22.72	7.87	2.49	0.57	0.60	3.52	0.69	1.82	0.49	Aug
8.14	3.99	4.15	14.66	20.19	33.32	24.20	9.12	3.33	0.85	0.61	3.66	0.67	1.78	0.49	Aug
8.05	3.95	4.10	15.37	20.80	31.42	23.23	8.20	2.59	0.58	0.63	3.73	0.66	2.09	0.49	Aug
8.42	4.15	4.27	15.59	21.03	32.41	24.03	8.39	2.69	0.64	0.66	3.73	0.67	1.95	0.49	Aug
8.47	4.15	4.33	15.43	20.79	32.97	24.46	8.50	2.82	0.65	0.62	3.76	0.66	1.93	0.49	Aug
8.43	4.17	4.27	15.47	20.55	32.70	24.61	8.08	2.45	0.65	0.60	3.70	0.68	2.11	0.49	Aug
8.44	4.12	4.32	15.79	20.84	32.08	24.31	7.77	2.13	0.48	0.60	3.88	0.68	2.31	0.49	Aug
7.60	3.73	3.87	15.51	20.79	29.40	21.93	7.48	2.13	0.40	0.61	3.63	0.70	1.96	0.49	Aug
7.93	3.89	4.03	14.72	19.86	32.30	23.95	8.35	2.70	0.63	0.59	3.75	0.68	1.94	0.49	Aug
8.03	3.92	4.10	15.34	20.82	31.39	23.13	8.25	2.50	0.47	0.63	3.96	0.69	2.09	0.49	Aug
7.82	3.85	3.97	15.53	21.08	30.23	22.27	7.96	2.29	0.50	0.64	3.84	0.69	1.96	0.49	Aug

7.94	3.88	4.06	15.50	20.60	30.74	23.13	7.60	2.14	0.52	0.59	3.67	0.68	2.23	0.49	Aug
7.94	3.92	4.03	15.41	20.55	30.93	23.19	7.73	2.41	0.57	0.61	3.46	0.69	2.00	0.49	Aug
7.93	3.92	4.01	15.70	20.64	30.31	23.05	7.26	1.78	0.51	0.68	3.58	0.70	2.26	0.49	Aug
8.34	4.10	4.23	16.10	21.29	31.07	23.49	7.58	2.13	0.54	0.60	3.63	0.68	2.39	0.49	Aug
7.82	3.83	3.99	15.94	21.54	29.45	21.79	7.66	2.28	0.44	0.61	3.66	0.67	1.77	0.49	Aug
8.32	4.09	4.23	15.88	21.29	31.45	23.45	8.00	2.49	0.58	0.63	3.56	0.74	1.68	0.49	Aug
8.21	4.04	4.17	15.76	20.88	31.26	23.60	7.67	2.20	0.57	0.68	3.52	0.70	1.94	0.49	Aug
7.66	3.72	3.94	15.84	21.40	29.01	21.48	7.54	2.37	0.52	0.49	3.51	0.65	1.45	0.49	Aug
7.96	3.88	4.08	15.65	21.50	30.52	22.21	8.31	2.89	0.54	0.53	3.71	0.65	1.38	0.49	Aug
8.36	4.12	4.23	15.26	20.42	32.85	24.55	8.30	2.89	0.70	0.50	3.56	0.66	1.62	0.49	Aug
8.82	4.42	4.41	16.52	21.17	32.06	25.01	7.05	2.01	0.54	0.58	3.26	0.66	2.17	0.50	Aug
8.27	4.07	4.20	16.54	21.11	29.99	23.51	6.48	1.60	0.53	0.57	3.11	0.67	2.50	0.49	Aug
8.32	4.14	4.18	16.12	20.78	30.96	24.03	6.93	1.92	0.54	0.61	3.21	0.66	2.27	0.50	Aug
8.09	4.00	4.09	15.97	20.52	30.40	23.66	6.75	1.81	0.41	0.57	3.29	0.67	2.31	0.49	Aug
8.28	4.08	4.20	16.19	21.14	30.68	23.49	7.18	2.14	0.53	0.62	3.22	0.67	1.84	0.49	Aug
8.09	4.02	4.08	16.94	21.89	28.67	22.18	6.49	1.69	0.48	0.69	2.99	0.63	1.82	0.50	Sep
8.02	3.99	4.03	17.19	21.95	27.99	21.92	6.07	1.48	0.41	0.56	2.96	0.65	1.94	0.50	Sep
7.86	3.92	3.94	16.02	21.08	29.45	22.38	7.07	1.98	0.59	0.67	3.19	0.64	2.01	0.50	Sep
8.29	4.11	4.18	16.27	21.28	30.59	23.39	7.20	2.16	0.45	0.63	3.29	0.66	2.28	0.50	Sep
8.38	4.13	4.25	16.07	20.89	31.30	24.07	7.23	1.97	0.49	0.63	3.49	0.66	2.18	0.49	Sep
7.69	3.80	3.89	16.22	21.36	28.45	21.61	6.84	1.95	0.47	0.69	3.04	0.69	1.66	0.49	Sep
8.17	4.00	4.17	16.17	21.40	30.32	22.91	7.42	2.44	0.57	0.64	3.10	0.66	1.72	0.49	Sep
7.87	3.84	4.03	15.51	21.09	30.45	22.39	8.05	2.62	0.55	0.65	3.50	0.72	1.73	0.49	Sep
8.21	4.03	4.18	16.10	21.70	30.59	22.70	7.89	2.68	0.57	0.58	3.41	0.65	1.91	0.49	Sep
8.79	4.33	4.46	16.27	21.04	32.42	25.08	7.35	2.05	0.50	0.67	3.48	0.64	1.92	0.49	Sep
8.60	4.23	4.37	16.78	21.48	30.77	24.03	6.74	1.74	0.50	0.61	3.24	0.65	2.07	0.49	Sep
8.30	4.08	4.22	15.78	20.85	31.57	23.90	7.67	2.51	0.52	0.52	3.46	0.67	1.78	0.49	Sep
8.43	4.16	4.27	16.02	20.83	31.58	24.28	7.29	2.01	0.67	0.66	3.24	0.72	2.25	0.49	Sep
8.49	4.17	4.32	15.96	21.06	31.92	24.19	7.73	2.38	0.54	0.67	3.47	0.67	2.03	0.49	Sep

8.65	4.28	4.38	16.12	21.40	32.22	24.27	7.95	2.61	0.61	0.74	3.33	0.66	1.89	0.49	Sep
9.29	4.57	4.72	15.83	20.39	35.21	27.33	7.88	2.29	0.63	0.86	3.40	0.69	2.23	0.49	Sep
9.52	4.70	4.82	16.31	20.57	35.01	27.77	7.24	1.99	0.52	0.75	3.31	0.67	2.30	0.49	Sep
9.42	4.65	4.77	16.97	21.39	33.30	26.42	6.88	1.69	0.49	0.70	3.30	0.70	2.52	0.49	Sep
8.70	4.31	4.39	15.08	19.88	34.60	26.25	8.35	2.83	0.61	0.70	3.55	0.66	1.95	0.50	Sep
8.28	4.09	4.20	15.55	20.43	31.96	24.33	7.63	2.41	0.51	0.67	3.36	0.68	1.93	0.49	Sep
8.57	4.22	4.34	15.23	20.30	33.75	25.32	8.43	2.94	0.69	0.66	3.48	0.67	1.49	0.49	Sep
8.67	4.29	4.38	15.43	20.15	33.70	25.81	7.89	2.57	0.68	0.57	3.41	0.65	1.63	0.50	Sep
8.09	3.99	4.10	15.09	19.86	32.19	24.46	7.73	2.43	0.63	0.59	3.40	0.68	2.00	0.49	Sep
8.13	3.99	4.14	14.96	20.07	32.60	24.29	8.31	2.86	0.96	0.58	3.24	0.67	1.56	0.49	Sep
8.04	3.97	4.07	15.33	20.66	31.45	23.33	8.12	2.54	0.81	0.73	3.34	0.70	1.81	0.49	Sep
8.14	4.01	4.13	15.58	20.89	31.34	23.38	7.97	2.68	0.72	0.68	3.23	0.67	1.65	0.49	Sep
8.56	4.25	4.31	15.35	20.43	33.46	25.13	8.33	2.72	0.64	0.75	3.54	0.68	1.73	0.50	Sep
8.28	4.06	4.22	15.80	20.82	31.45	23.87	7.58	2.35	0.71	0.69	3.14	0.68	2.12	0.49	Sep
8.35	4.10	4.25	14.96	20.18	33.48	24.82	8.66	2.92	0.78	0.76	3.51	0.68	2.02	0.49	Sep
8.37	4.13	4.24	15.02	19.83	33.46	25.33	8.13	2.52	0.62	0.77	3.51	0.70	2.41	0.49	Sep
8.63	4.25	4.39	15.46	20.20	33.50	25.64	7.86	2.24	0.49	0.80	3.61	0.71	2.36	0.49	Oct
8.42	4.19	4.24	15.83	21.21	31.92	23.83	8.09	2.50	0.58	0.68	3.63	0.71	1.85	0.50	Oct
8.13	4.06	4.07	15.89	21.36	30.71	22.84	7.87	2.70	0.60	0.71	3.16	0.71	1.48	0.50	Oct
7.43	3.68	3.75	15.80	21.55	28.21	20.69	7.52	2.41	0.59	0.70	3.10	0.72	1.60	0.50	Oct
7.91	3.90	4.01	15.13	21.06	31.36	22.53	8.83	3.13	0.62	0.69	3.67	0.72	1.65	0.49	Oct
8.30	4.10	4.21	15.30	20.69	32.56	24.08	8.48	2.88	0.53	0.68	3.65	0.73	1.57	0.49	Oct
7.95	3.92	4.04	14.08	19.74	33.90	24.18	9.72	3.92	0.70	0.68	3.69	0.73	1.51	0.49	Oct
8.69	4.32	4.37	14.17	19.86	36.79	26.25	10.54	4.22	0.85	0.78	4.00	0.70	1.58	0.50	Oct
8.58	4.27	4.31	14.54	19.32	35.40	26.64	8.76	3.13	0.75	0.68	3.52	0.67	1.84	0.50	Oct
9.33	4.63	4.70	13.57	18.51	41.24	30.25	10.99	4.55	0.95	0.85	3.94	0.70	1.42	0.50	Oct
9.08	4.54	4.53	14.21	19.39	38.32	28.09	10.23	3.91	0.77	0.78	4.07	0.70	1.37	0.50	Oct
9.13	4.46	4.67	12.58	17.23	43.57	31.79	11.77	4.16	0.67	0.81	4.64	1.50	2.69	0.49	Oct
8.74	4.36	4.38	14.38	19.26	36.46	27.21	9.25	3.25	0.88	0.77	3.64	0.70	2.29	0.50	Oct

9.46	4.70	4.76	14.45	19.69	39.28	28.83	10.45	4.27	0.85	0.68	3.92	0.73	1.94	0.50	Oct
9.17	4.53	4.64	14.76	20.12	37.28	27.34	9.94	3.64	0.79	0.78	4.03	0.70	2.08	0.49	Oct
9.47	4.71	4.76	13.67	18.64	41.58	30.50	11.08	4.39	0.93	0.69	4.35	0.71	1.99	0.50	Oct
8.99	4.45	4.54	14.91	19.69	36.19	27.40	8.79	2.90	0.82	0.75	3.63	0.69	2.20	0.50	Oct
9.27	4.48	4.79	14.83	19.59	37.51	28.40	9.11	3.05	0.76	0.85	3.72	0.72	2.36	0.48	Oct
8.47	4.17	4.30	15.46	20.69	32.87	24.55	8.32	2.72	0.64	0.69	3.56	0.70	1.95	0.49	Oct
8.46	4.20	4.25	15.43	20.71	32.89	24.49	8.39	2.77	0.54	0.81	3.59	0.70	2.01	0.50	Oct
8.63	4.27	4.36	15.87	21.07	32.61	24.56	8.05	2.59	0.58	0.70	3.48	0.70	1.83	0.49	Oct
9.58	4.69	4.88	15.38	20.21	37.35	28.43	8.91	3.25	0.49	0.70	3.74	0.73	1.93	0.49	Oct
8.83	4.34	4.50	15.62	20.86	33.91	25.40	8.51	3.04	0.51	0.69	3.57	0.68	1.80	0.49	Oct
8.91	4.40	4.51	15.06	20.18	35.49	26.48	9.01	3.16	0.56	0.74	3.86	0.68	2.17	0.49	Oct
8.73	4.34	4.39	15.67	20.81	33.43	25.17	8.26	2.78	0.63	0.68	3.48	0.68	1.97	0.50	Oct
9.04	4.47	4.56	15.71	21.01	34.50	25.81	8.70	3.10	0.65	0.75	3.51	0.68	2.07	0.50	Oct
8.91	4.45	4.46	15.43	20.14	34.63	26.54	8.09	2.50	0.71	0.69	3.53	0.67	2.52	0.50	Oct
8.57	4.33	4.24	13.52	17.67	38.03	29.10	8.93	2.81	0.86	0.71	3.86	0.69	3.17	0.51	Oct
9.41	4.67	4.74	15.05	20.01	37.50	28.21	9.29	3.25	0.86	0.79	3.72	0.67	1.68	0.50	Oct
9.17	4.51	4.67	14.65	19.83	37.56	27.75	9.81	3.70	0.97	0.73	3.73	0.68	1.72	0.49	Oct
8.18	3.98	4.20	13.77	19.18	35.65	25.59	10.06	4.11	0.85	0.67	3.73	0.70	1.52	0.49	Oct
7.96	3.88	4.08	13.54	18.85	35.26	25.33	9.93	3.99	0.80	0.70	3.75	0.69	1.52	0.49	Nov
8.32	4.08	4.24	15.29	20.60	32.62	24.22	8.41	2.75	0.87	0.74	3.38	0.67	1.94	0.49	Nov
8.08	3.98	4.10	15.14	20.46	32.01	23.69	8.32	2.91	0.67	0.71	3.37	0.67	1.60	0.49	Nov
8.19	4.03	4.16	14.61	19.69	33.63	24.96	8.67	2.83	0.70	0.70	3.78	0.66	2.26	0.49	Nov
8.05	3.98	4.07	13.90	18.64	34.76	25.92	8.85	2.75	0.79	0.72	3.90	0.68	2.35	0.49	Nov
8.37	4.13	4.25	14.63	19.26	34.33	26.08	8.26	2.40	0.74	0.70	3.74	0.67	2.59	0.49	Nov
8.12	3.98	4.14	14.93	19.86	32.63	24.53	8.10	2.32	0.68	0.70	3.72	0.68	2.58	0.49	Nov
9.20	4.51	4.69	14.97	20.38	36.86	27.09	9.77	3.70	0.82	0.69	3.84	0.72	1.78	0.49	Nov
9.32	4.53	4.79	15.40	20.52	36.32	27.24	9.08	3.06	0.79	0.71	3.79	0.73	2.17	0.49	Nov
8.93	4.32	4.61	15.18	20.43	35.29	26.22	9.07	3.50	0.86	0.65	3.36	0.69	1.42	0.48	Nov
8.14	3.93	4.21	14.15	19.31	34.50	25.29	9.21	3.21	0.92	0.72	3.64	0.72	1.67	0.48	Nov

7.37	3.56	3.81	13.90	19.34	31.81	22.86	8.95	3.16	0.71	0.58	3.82	0.68	1.63	0.48	Nov
8.03	3.92	4.11	15.03	20.04	32.06	24.05	8.01	2.43	0.70	0.65	3.54	0.68	2.20	0.49	Nov
8.31	4.08	4.23	14.42	19.90	34.57	25.06	9.52	3.51	0.81	0.66	3.86	0.68	1.58	0.49	Nov
8.74	4.29	4.45	15.08	19.86	34.77	26.41	8.36	2.77	0.75	0.63	3.54	0.67	1.75	0.49	Nov
8.60	4.27	4.33	15.25	20.58	33.83	25.07	8.76	2.90	0.74	0.86	3.60	0.66	1.67	0.50	Nov
8.58	4.22	4.36	14.28	19.56	36.06	26.32	9.74	3.57	0.82	0.79	3.88	0.68	1.98	0.49	Nov
8.55	4.15	4.40	15.41	20.18	33.28	25.42	7.86	2.17	0.62	0.71	3.67	0.67	2.15	0.49	Nov
9.03	4.47	4.55	15.72	20.72	34.46	26.15	8.31	2.77	0.65	0.69	3.50	0.70	1.81	0.50	Nov
8.20	4.00	4.20	15.24	20.21	32.28	24.34	7.94	2.32	0.65	0.68	3.59	0.69	2.03	0.49	Nov
8.98	4.39	4.59	15.20	20.34	35.43	26.48	8.96	2.88	0.78	0.62	4.01	0.66	2.48	0.49	Nov
8.77	4.21	4.55	15.57	20.94	33.77	25.12	8.65	2.98	0.88	0.60	3.51	0.69	1.99	0.48	Nov
8.48	4.23	4.25	14.31	19.42	35.56	26.20	9.36	3.71	0.93	0.61	3.45	0.65	1.52	0.50	Nov
8.45	4.13	4.32	14.34	19.46	35.35	26.05	9.30	3.31	0.94	0.74	3.52	0.79	1.78	0.49	Nov
8.33	4.07	4.26	14.26	18.73	35.05	26.68	8.37	2.82	0.72	0.78	3.40	0.64	1.74	0.49	Nov
8.07	3.97	4.11	14.43	19.50	33.57	24.83	8.74	2.93	0.88	0.66	3.60	0.66	1.82	0.49	Nov
8.35	4.15	4.21	14.56	19.55	34.43	25.64	8.79	2.73	0.66	0.84	3.88	0.67	2.03	0.50	Nov
8.15	4.01	4.14	14.20	19.16	34.45	25.53	8.92	3.26	0.72	0.66	3.59	0.69	1.65	0.49	Nov
8.31	4.07	4.24	13.44	18.41	37.09	27.08	10.01	4.19	0.74	0.73	3.66	0.69	1.63	0.49	Nov
7.58	3.69	3.89	13.53	18.96	33.60	23.98	9.62	3.36	0.58	1.22	3.82	0.64	1.50	0.49	Nov
7.81	3.77	4.05	13.11	18.35	35.76	25.55	10.21	4.45	0.74	0.62	3.75	0.66	1.14	0.48	Dec
8.26	4.06	4.20	14.56	19.45	34.02	25.47	8.55	3.10	0.82	0.47	3.49	0.67	1.63	0.49	Dec
7.62	3.67	3.95	13.55	18.46	33.71	24.75	8.96	3.41	0.71	0.53	3.62	0.69	1.53	0.48	Dec
8.00	3.88	4.11	14.20	18.92	33.78	25.35	8.43	2.90	0.74	0.41	3.67	0.70	2.02	0.49	Dec
7.52	3.66	3.85	13.81	18.64	32.65	24.19	8.46	2.73	0.82	0.52	3.58	0.80	2.01	0.49	Dec
7.99	3.91	4.07	14.30	19.09	33.52	25.10	8.42	2.60	0.90	0.54	3.67	0.71	2.20	0.49	Dec
8.39	4.17	4.22	12.96	17.28	38.87	29.15	9.72	3.84	0.81	0.57	3.82	0.69	2.55	0.50	Dec
8.26	4.07	4.19	14.41	19.18	34.39	25.83	8.56	2.95	0.69	0.53	3.72	0.67	1.77	0.49	Dec
8.66	4.25	4.42	14.09	18.17	36.89	28.61	8.28	2.85	0.60	0.56	3.54	0.73	2.66	0.49	Dec
7.94	3.88	4.07	13.90	18.71	34.28	25.47	8.82	3.40	0.58	0.46	3.70	0.67	1.71	0.49	Dec

7.96	3.85	4.10	14.45	18.61	33.03	25.65	7.38	2.14	0.62	0.52	3.42	0.68	2.29	0.48	Dec
8.36	4.14	4.22	13.80	18.47	36.34	27.15	9.18	3.48	0.66	0.44	3.94	0.67	1.95	0.50	Dec
8.23	4.02	4.21	13.83	18.29	35.72	27.00	8.72	3.14	0.65	0.45	3.79	0.69	2.29	0.49	Dec
7.93	3.91	4.02	14.18	19.27	33.56	24.69	8.87	3.21	0.74	0.50	3.71	0.70	1.70	0.49	Dec
7.70	3.76	3.93	13.97	18.92	33.06	24.42	8.64	2.73	0.72	0.60	3.92	0.67	1.85	0.49	Dec
8.22	4.02	4.20	15.45	19.86	31.91	24.83	7.08	1.98	0.46	0.49	3.37	0.78	2.46	0.49	Dec
8.39	4.11	4.28	14.56	18.94	34.56	26.57	7.99	2.64	0.49	0.61	3.61	0.64	1.90	0.49	Dec
8.25	4.05	4.20	13.15	18.40	37.66	26.91	10.74	4.90	0.70	0.51	3.92	0.71	1.30	0.49	Dec
7.92	3.89	4.03	14.28	18.93	33.29	25.12	8.17	2.71	0.55	0.51	3.67	0.72	2.17	0.49	Dec
7.72	3.72	4.00	14.32	19.03	32.34	24.35	7.99	2.44	0.55	0.51	3.75	0.74	1.97	0.48	Dec
7.86	3.85	4.01	14.15	19.01	33.33	24.80	8.53	3.17	0.50	0.55	3.60	0.71	2.02	0.49	Dec
8.41	4.09	4.32	15.74	20.18	32.08	25.01	7.07	2.03	0.52	0.43	3.38	0.71	2.05	0.49	Dec
8.52	4.17	4.35	15.59	20.42	32.78	25.02	7.76	2.49	0.57	0.48	3.45	0.77	1.84	0.49	Dec
8.32	4.10	4.22	15.20	20.30	32.84	24.58	8.25	2.86	0.55	0.59	3.54	0.71	1.87	0.49	Dec
9.24	4.57	4.67	14.84	19.27	37.35	28.77	8.58	3.01	0.69	0.71	3.48	0.69	1.84	0.49	Dec
9.33	4.58	4.76	14.76	19.40	37.94	28.86	9.08	3.44	0.80	0.56	3.56	0.71	2.14	0.49	Dec
8.60	4.24	4.36	15.78	20.55	32.71	25.11	7.60	2.44	0.65	0.48	3.29	0.75	2.28	0.49	Dec
8.78	4.36	4.42	15.39	19.82	34.24	26.59	7.65	2.15	0.61	0.56	3.58	0.75	2.89	0.50	Dec
8.23	3.96	4.26	13.81	18.05	35.75	27.34	8.40	3.07	0.63	0.53	3.45	0.72	2.19	0.48	Dec
8.53	4.22	4.31	16.39	20.76	31.23	24.66	6.57	1.53	0.44	0.53	3.39	0.68	3.08	0.49	Dec
8.39	4.07	4.32	14.26	18.59	35.28	27.07	8.22	2.90	0.49	0.53	3.53	0.75	2.27	0.49	Dec

APPENDIX 6: Digger Rates

Table A2 Digger Rates

SHIFT DATE	LOAD LOCATION	MODEL	EXCAVATOR	LOADING TIME (MINUTES)	BCM	TOTAL LOADING TIME (MINUTES)	DIG RATE (BCM/HOUR)	Cutback	EX_MODEL
2019-11-01	M14_1385_B65	CAT785C	EX105	8.34	769.5	125.12	369.0	M14	0
2019-11-01	M14_1385_B65	CAT785C	EX105	7.92	153.9	23.77	388.5	M14	0
2019-11-01	M14_1385_B65	CAT785C	EX105	7.72	615.6	92.63	398.7	M14	0
2019-11-01	M12_1265_B05	EH3500	EX108	6.15	772.8	73.80	628.3	M12	LIEBHERR 9350
2019-11-01	M12_1265_B06	CAT785C	EX108	3.56	153.9	10.68	864.3	M12	LIEBHERR 9350
2019-11-01	M12_1265_B06	EH3500	EX108	4.38	2511.6	170.75	882.6	M12	LIEBHERR 9350
2019-11-01	M12_1245_B33	EH3500	EX108	4.31	3670.8	245.60	896.8	M12	LIEBHERR 9350
2019-11-01	M12_1245_B33	EH3500	EX108	4.21	3155.6	206.18	918.3	M12	LIEBHERR 9350
2019-11-01	M11_1295_B09	EH3500	EX109	3.89	128.8	7.78	992.9	M11	LIEBHERR 9350
2019-11-01	M11_1295_B12	EH3500	EX109	4.29	3477.6	231.72	900.5	M11	LIEBHERR 9350
2019-11-01	M11_1295_B08	EH3500	EX109	5.26	1481.2	121.05	734.2	M11	LIEBHERR 9350
2019-11-01	M11_1295_B12	EH3500	EX109	5.34	1867.6	154.97	723.1	M11	LIEBHERR 9350
2019-11-01	M11_1295_B08	CAT785C	EX109	3.87	205.2	15.48	795.2	M11	LIEBHERR 9350
2019-11-01	M11_1295_B08	EH3500	EX109	4.73	3670.8	269.78	816.4	M11	LIEBHERR 9350
2019-11-01	M14_1375_B02	CAT785C	EX29	2.40	3129.3	146.58	1280.9	M14	LIEBHERR 9350 E
2019-11-01	M14_1375_B02	CAT785C	EX29	2.26	769.5	33.90	1361.9	M14	LIEBHERR 9350 E
2019-11-01	W2_1345_B215	CAT785C	EX57	3.63	2308.5	163.22	848.6	W2	EX2500-6
2019-11-01	W2_1345_B223	CAT785C	EX57	5.20	718.2	72.80	591.9	W2	EX2500-6
2019-11-01	W2_1335_B27	CAT785C	EX57	4.05	2975.4	235.12	759.3	W2	EX2500-6
2019-11-01	W2_1345_B223	CAT785C	EX57	3.52	102.6	7.03	875.3	W2	EX2500-6
2019-11-01	W2_1335_B27	CAT785C	EX57	3.92	2513.7	192.22	784.6	W2	EX2500-6

2019-11-01	M11_1305_B16	CAT785C	EX58	3.80	2052.0	152.03	809.8	M11	LIEBHERR 9350 E
2019-11-01	M11_1305_B16	EH3500	EX58	5.65	1803.2	158.08	684.4	M11	LIEBHERR 9350 E
2019-11-01	M11_1305_B16	CAT785C	EX58	2.88	615.6	34.60	1067.5	M11	LIEBHERR 9350 E
2019-11-01	M11_1305_B16	EH3500	EX58	4.59	3348.8	238.70	841.8	M11	LIEBHERR 9350 E
2019-11-01	M11_1305_B16	CAT785C	EX58	3.43	102.6	6.87	896.5	M11	LIEBHERR 9350 E
2019-11-01	M11_1305_B16	EH3500	EX58	4.58	3606.4	256.52	843.5	M11	LIEBHERR 9350 E
2019-11-01	M13_1445_D02	CAT785C	EX59	2.80	2308.5	126.20	1097.5	M13	LIEBHERR 9350 E
2019-11-01	M13_1445_D03	CAT785C	EX59	2.64	2770.2	142.72	1164.6	M13	LIEBHERR 9350 E
2019-11-01	M13_1455_D03	CAT785C	EX59	2.92	51.3	2.92	1055.3	M13	LIEBHERR 9350 E
2019-11-01	M13_1445_D03	CAT785C	EX59	2.70	4514.4	237.23	1141.8	M13	LIEBHERR 9350 E
2019-11-01	M13_1445_D03	CAT785C	EX59	2.47	2462.4	118.45	1247.3	M13	LIEBHERR 9350 E
2019-11-01	S4_1365_B15	CAT785C	EX66	3.29	461.7	29.60	935.9	S4	LIEBHERR 9250
2019-11-01	S4_1365_B15	EH3500	EX66	4.79	1223.6	91.08	806.0	S4	LIEBHERR 9250
2019-11-01	S4_1355_B16	CAT785C	EX66	2.49	2154.6	104.72	1234.5	S4	LIEBHERR 9250
2019-11-01	S4_1365_B15	CAT785C	EX66	2.93	923.4	52.70	1051.3	S4	LIEBHERR 9250
2019-11-01	S4_1365_B15	EH3500	EX66	4.19	837.2	54.52	921.4	S4	LIEBHERR 9250
2019-11-01	S4_1355_B16	CAT785C	EX66	2.73	3180.6	169.20	1127.9	S4	LIEBHERR 9250
2019-11-01	W2_1325_B05	CAT785C	EX69	3.69	2821.5	202.93	834.2	W2	LIEBHERR 9250
2019-11-01	W2_1325_B05	EH3500	EX69	4.43	1223.6	84.13	872.6	W2	LIEBHERR 9250
2019-11-01	W2_1325_B06	CAT785C	EX69	3.13	410.4	25.05	983.0	W2	LIEBHERR 9250
2019-11-01	W2_1325_B05	CAT785C	EX69	4.95	359.1	34.63	622.1	W2	LIEBHERR 9250
2019-11-01	W2_1325_B06	CAT785C	EX69	4.59	3385.8	302.77	671.0	W2	LIEBHERR 9250
2019-11-01	W2_1325_B06	CAT785C	EX69	4.27	1641.6	136.75	720.3	W2	LIEBHERR 9250

2019-11-01	M12_1245_B18	CAT785C	EX70	4.20	51.3	4.20	732.9	M12	LIEBHERR 9250
2019-11-01	M12_1245_B18	EH3500	EX70	6.19	837.2	80.47	624.3	M12	LIEBHERR 9250
2019-11-01	M12_1245_B18	EH3500	EX70	6.99	3026.8	328.72	552.5	M12	LIEBHERR 9250
2019-11-01	M12_1245_B18	CAT785C	EX70	3.64	513.0	36.45	844.4	M12	LIEBHERR 9250
2019-11-01	M12_1245_B18	EH3500	EX70	4.96	2318.4	178.60	778.9	M12	LIEBHERR 9250
2019-11-01	M7_1225_B07	EH3500	EX72	4.27	4121.6	273.22	905.1	M7	LIEBHERR 9350
2019-11-01	M7_1225_B07	EH3500	EX72	4.05	3670.8	230.60	955.1	M7	LIEBHERR 9350
2019-11-01	M7_1225_B07	CAT785C	EX72	3.96	410.4	31.68	777.2	M7	LIEBHERR 9350
2019-11-01	M7_1225_B07	EH3500	EX72	4.15	2640.4	170.07	931.5	M7	LIEBHERR 9350
2019-11-01	M12_1245_B04	CAT785C	EX74	3.49	359.1	24.45	881.2	M12	LIEBHERR 9350
2019-11-01	M12_1245_B04	EH3500	EX74	5.47	901.6	76.60	706.2	M12	LIEBHERR 9350
2019-11-01	M12_1245_B04	CAT785C	EX74	6.11	102.6	12.22	503.9	M12	LIEBHERR 9350
2019-11-01	M12_1245_B04	EH3500	EX74	7.97	2125.2	262.87	485.1	M12	LIEBHERR 9350
2019-11-01	M12_1245_B04	CAT785C	EX74	3.79	564.3	41.67	812.6	M12	LIEBHERR 9350
2019-11-01	M12_1245_B04	EH3500	EX74	5.16	2060.8	165.12	748.9	M12	LIEBHERR 9350
2019-11-02	M14_1385_B65	CAT785C	EX105	6.01	2308.5	270.57	511.9	M14	0
2019-11-02	M14_1385_B65	CAT785C	EX105	8.90	256.5	44.48	346.0	M14	0
2019-11-02	M14_1385_B65	CAT785C	EX105	9.02	205.2	36.10	341.1	M14	0
2019-11-02	M12_1245_B33	CAT785C	EX108	2.67	615.6	32.08	1151.3	M12	LIEBHERR 9350
2019-11-02	M12_1245_B33	EH3500	EX108	3.50	1674.4	91.12	1102.6	M12	LIEBHERR 9350
2019-11-02	M12_1245_B33	CAT785C	EX108	2.72	1692.9	89.92	1129.6	M12	LIEBHERR 9350
2019-11-02	M12_1245_B33	EH3500	EX108	3.76	1223.6	71.47	1027.3	M12	LIEBHERR 9350
2019-11-02	M12_1245_B33	CAT785C	EX108	2.00	51.3	2.00	1539.0	M12	LIEBHERR 9350
2019-11-02	M12_1245_B33	EH3500	EX108	3.73	3026.8	175.12	1037.1	M12	LIEBHERR 9350
2019-11-02	M11_1295_B08	EH3500	EX109	5.32	3864.0	319.37	725.9	M11	LIEBHERR 9350
2019-11-02	M11_1295_B08	EH3500	EX109	4.65	2640.4	190.72	830.7	M11	LIEBHERR 9350
2019-11-02	M11_1295_B12	CAT785C	EX109	2.77	410.4	22.15	1111.7	M11	LIEBHERR 9350
2019-11-02	M11_1295_B09	CAT785C	EX109	3.45	51.3	3.45	892.2	M11	LIEBHERR 9350
2019-11-02	M11_1295_B09	EH3500	EX109	6.70	257.6	26.82	576.4	M11	LIEBHERR 9350

2019-11-02	M11_1295_B12	CAT785C	EX109	2.71	410.4	21.67	1136.5	M11	LIEBHERR 9350
2019-11-02	M11_1295_B12	EH3500	EX109	5.52	772.8	66.22	700.2	M11	LIEBHERR 9350
2019-11-02	M14_1375_B02	CAT785C	EX29	2.42	2565.0	120.83	1273.7	M14	LIEBHERR 9350 E
2019-11-02	M14_1375_B01	CAT785C	EX29	2.55	564.3	28.10	1204.9	M14	LIEBHERR 9350 E
2019-11-02	M14_1375_B02	CAT785C	EX29	2.38	2513.7	116.50	1294.6	M14	LIEBHERR 9350 E
2019-11-02	M14_1375_B02	CAT785C	EX29	2.40	2205.9	103.35	1280.6	M14	LIEBHERR 9350 E
2019-11-02	S4_1355_B06	CAT785C	EX51	4.02	359.1	28.15	765.4	S4	EX2500-6
2019-11-02	S4_1355_B06	EH3500	EX51	4.85	128.8	9.70	796.7	S4	EX2500-6
2019-11-02	S4_1355_B18	CAT785C	EX51	2.87	1231.2	68.78	1074.0	S4	EX2500-6
2019-11-02	S4_1355_B06	CAT785C	EX51	3.26	3334.5	211.95	943.9	S4	EX2500-6
2019-11-02	W2_1335_B27	CAT785C	EX57	3.33	2924.1	189.53	925.7	W2	EX2500-6
2019-11-02	W2_1335_B27	CAT785C	EX57	3.86	2718.9	204.32	798.4	W2	EX2500-6
2019-11-02	W2_1325_B48	EH3500	EX57	7.98	322.0	39.90	484.2	W2	EX2500-6
2019-11-02	W2_1335_B27	CAT785C	EX57	3.99	461.7	35.95	770.6	W2	EX2500-6
2019-11-02	W2_1335_B27	EH3500	EX57	5.99	837.2	77.85	645.2	W2	EX2500-6
2019-11-02	M11_1305_B16	EH3500	EX58	4.79	2382.8	177.17	807.0	M11	LIEBHERR 9350 E
2019-11-02	M11_1305_B16	EH3500	EX58	3.57	3284.4	181.95	1083.1	M11	LIEBHERR 9350 E
2019-11-02	M11_1305_B16	CAT785C	EX58	2.99	102.6	5.98	1028.9	M11	LIEBHERR 9350 E
2019-11-02	M11_1305_B16	EH3500	EX58	4.12	3477.6	222.37	938.3	M11	LIEBHERR 9350 E
2019-11-02	M13_1445_D03	CAT785C	EX59	2.42	2821.5	132.92	1273.7	M13	LIEBHERR 9350 E
2019-11-02	M13_1445_D03	CAT785C	EX59	2.75	3129.3	167.47	1121.2	M13	LIEBHERR 9350 E
2019-11-02	M13_1445_D03	CAT785C	EX59	2.43	1077.3	51.07	1265.8	M13	LIEBHERR 9350 E
2019-11-02	S4_1355_B16	CAT785C	EX66	2.63	1231.2	63.15	1169.8	S4	LIEBHERR 9250

2019-11-02	S4_1355_B16	EH3500	EX66	3.57	2318.4	128.45	1082.9	S4	LIEBHERR 9250
2019-11-02	S4_1355_B16	CAT785C	EX66	3.46	256.5	17.32	888.7	S4	LIEBHERR 9250
2019-11-02	S4_1355_B16	EH3500	EX66	3.74	2898.0	168.32	1033.1	S4	LIEBHERR 9250
2019-11-02	S4_1355_B16	CAT785C	EX66	3.78	410.4	30.22	814.9	S4	LIEBHERR 9250
2019-11-02	S4_1355_B16	EH3500	EX66	4.20	2640.4	172.10	920.5	S4	LIEBHERR 9250
2019-11-02	W2_1325_B05	CAT785C	EX69	5.47	1539.0	164.08	562.8	W2	LIEBHERR 9250
2019-11-02	W2_1325_B06	CAT785C	EX69	4.00	1128.6	88.05	769.1	W2	LIEBHERR 9250
2019-11-02	W2_1325_B05	CAT785C	EX69	4.08	2000.7	158.93	755.3	W2	LIEBHERR 9250
2019-11-02	W2_1325_B06	CAT785C	EX69	2.95	51.3	2.95	1043.4	W2	LIEBHERR 9250
2019-11-02	W2_1325_B05	CAT785C	EX69	3.11	2052.0	124.38	989.8	W2	LIEBHERR 9250
2019-11-02	W2_1325_B05	EH3500	EX69	4.41	966.0	66.20	875.5	W2	LIEBHERR 9250
2019-11-02	M12_1245_B18	CAT785C	EX70	2.88	51.3	2.88	1067.5	M12	LIEBHERR 9250
2019-11-02	M12_1245_B18	EH3500	EX70	4.48	3606.4	250.78	862.8	M12	LIEBHERR 9250
2019-11-02	M12_1245_B18	CAT785C	EX70	4.19	359.1	29.33	734.5	M12	LIEBHERR 9250
2019-11-02	M12_1245_B18	EH3500	EX70	5.20	2640.4	213.00	743.8	M12	LIEBHERR 9250
2019-11-02	M12_1245_B18	CAT785C	EX70	3.88	205.2	15.50	794.3	M12	LIEBHERR 9250
2019-11-02	M12_1245_B18	EH3500	EX70	5.32	2318.4	191.43	726.6	M12	LIEBHERR 9250
2019-11-02	M7_1225_B07	EH3500	EX72	4.54	3864.0	272.50	850.8	M7	LIEBHERR 9350
2019-11-02	M7_1225_B07	EH3500	EX72	4.51	3155.6	220.82	857.4	M7	LIEBHERR 9350
2019-11-02	M7_1225_B07	EH3500	EX72	3.39	2382.8	125.55	1138.7	M7	LIEBHERR 9350
2019-11-02	M12_1245_B01	CAT785C	EX74	6.87	51.3	6.87	448.3	M12	LIEBHERR 9350
2019-11-02	M12_1245_B01	EH3500	EX74	5.18	1416.8	113.90	746.3	M12	LIEBHERR 9350
2019-11-02	M12_1245_B04	EH3500	EX74	4.59	1030.4	73.52	841.0	M12	LIEBHERR 9350
2019-11-02	M12_1245_B01	CAT785C	EX74	4.29	153.9	12.87	717.7	M12	LIEBHERR 9350
2019-11-02	M12_1245_B01	EH3500	EX74	4.49	1803.2	125.68	860.8	M12	LIEBHERR 9350
2019-11-02	M12_1245_B04	EH3500	EX74	10.84	322.0	54.18	356.6	M12	LIEBHERR 9350
2019-11-02	M12_1245_B04	CAT785C	EX74	3.61	718.2	50.55	852.5	M12	LIEBHERR 9350
2019-11-02	M12_1245_B04	EH3500	EX74	6.82	257.6	27.30	566.2	M12	LIEBHERR 9350
2019-11-02	M12_1245_B17	CAT785C	EX74	6.62	718.2	92.62	465.3	M12	LIEBHERR 9350

2019-11-02	M12_1245_B17	EH3500	EX74	8.03	64.4	8.03	481.0	M12	LIEBHERR 9350
2019-11-03	M14_1385_B65	CAT785C	EX105	6.09	256.5	30.47	505.1	M14	0
2019-11-03	M12_1245_B33	EH3500	EX108	4.09	3348.8	212.65	944.9	M12	LIEBHERR 9350
2019-11-03	M12_1245_B33	CAT785C	EX108	3.16	102.6	6.32	974.6	M12	LIEBHERR 9350
2019-11-03	M12_1245_B33	EH3500	EX108	4.28	2640.4	175.53	902.5	M12	LIEBHERR 9350
2019-11-03	M12_1255_B24	EH3500	EX108	3.96	386.4	23.73	976.9	M12	LIEBHERR 9350
2019-11-03	M12_1245_B33	CAT785C	EX108	2.24	102.6	4.48	1373.1	M12	LIEBHERR 9350
2019-11-03	M12_1245_B33	EH3500	EX108	3.67	1610.0	91.82	1052.1	M12	LIEBHERR 9350
2019-11-03	M11_1285_B07	EH3500	EX109	5.29	2189.6	179.88	730.3	M11	LIEBHERR 9350
2019-11-03	M11_1295_B09	EH3500	EX109	7.77	257.6	31.07	497.5	M11	LIEBHERR 9350
2019-11-03	M11_1285_B06	EH3500	EX109	3.43	1867.6	99.42	1127.1	M11	LIEBHERR 9350
2019-11-03	M11_1285_B07	EH3500	EX109	3.48	1159.2	62.72	1109.0	M11	LIEBHERR 9350
2019-11-03	M11_1285_B06	EH3500	EX109	3.25	128.8	6.50	1188.9	M11	LIEBHERR 9350
2019-11-03	M11_1285_B07	CAT785C	EX109	2.71	102.6	5.42	1136.5	M11	LIEBHERR 9350
2019-11-03	M11_1285_B07	EH3500	EX109	4.05	2769.2	174.17	954.0	M11	LIEBHERR 9350
2019-11-03	M14_1375_B01	CAT785C	EX29	2.08	359.1	14.58	1477.4	M14	LIEBHERR 9350 E
2019-11-03	M14_1375_B02	CAT785C	EX29	2.28	1641.6	73.00	1349.3	M14	LIEBHERR 9350 E
2019-11-03	M14_1375_B02	CAT785C	EX29	2.61	4668.3	237.15	1181.1	M14	LIEBHERR 9350 E
2019-11-03	M14_1375_B01	CAT785C	EX29	2.18	820.8	34.82	1414.5	M14	LIEBHERR 9350 E
2019-11-03	M14_1375_B02	CAT785C	EX29	2.57	461.7	23.12	1198.4	M14	LIEBHERR 9350 E
2019-11-03	S4_1355_B06	CAT785C	EX51	3.03	1026.0	60.70	1014.2	S4	EX2500-6
2019-11-03	S4_1365_B14	CAT785C	EX51	2.80	2462.4	134.47	1098.7	S4	EX2500-6
2019-11-03	S4_1365_B14	EH3500	EX51	3.81	966.0	57.08	1015.4	S4	EX2500-6
2019-11-03	S4_1365_B14	CAT785C	EX51	2.56	2924.1	145.68	1204.3	S4	EX2500-6
2019-11-03	S4_1365_B14	EH3500	EX51	3.53	644.0	35.25	1096.2	S4	EX2500-6
2019-11-03	S4_1365_B14	CAT785C	EX51	3.15	2821.5	173.15	977.7	S4	EX2500-6

2019-11-03	W2_1325_B48	CAT785C	EX57	5.32	1744.2	180.87	578.6	W2	EX2500-6
2019-11-03	W2_1325_B48	EH3500	EX57	5.95	64.4	5.95	649.4	W2	EX2500-6
2019-11-03	W2_1325_B48	CAT785C	EX57	4.74	2616.3	241.55	649.9	W2	EX2500-6
2019-11-03	W2_1325_B05	EH3500	EX57	6.43	837.2	83.58	601.0	W2	EX2500-6
2019-11-03	W2_1325_B48	CAT785C	EX57	6.78	51.3	6.78	453.8	W2	EX2500-6
2019-11-03	M11_1305_B16	EH3500	EX58	4.31	4443.6	297.62	895.8	M11	LIEBHERR 9350 E
2019-11-03	M11_1305_B16	EH3500	EX58	3.85	4379.2	261.65	1004.2	M11	LIEBHERR 9350 E
2019-11-03	M11_1305_B16	CAT785C	EX58	2.77	102.6	5.55	1109.2	M11	LIEBHERR 9350 E
2019-11-03	M11_1305_B16	EH3500	EX58	4.70	3606.4	263.32	821.8	M11	LIEBHERR 9350 E
2019-11-03	M13_1445_D03	CAT785C	EX59	2.52	3796.2	186.33	1222.4	M13	LIEBHERR 9350 E
2019-11-03	M13_1445_D03	CAT785C	EX59	2.78	3744.9	202.92	1107.3	M13	LIEBHERR 9350 E
2019-11-03	M13_1445_D03	CAT785C	EX59	2.57	1692.9	84.68	1199.5	M13	LIEBHERR 9350 E
2019-11-03	W2_1325_B05	CAT785C	EX69	5.22	2154.6	219.10	590.0	W2	LIEBHERR 9250
2019-11-03	W2_1325_B05	EH3500	EX69	4.16	772.8	49.88	929.5	W2	LIEBHERR 9250
2019-11-03	W2_1325_B05	CAT785C	EX69	3.41	3847.5	255.92	902.1	W2	LIEBHERR 9250
2019-11-03	W2_1325_B05	CAT785C	EX69	3.77	2154.6	158.27	816.8	W2	LIEBHERR 9250
2019-11-03	W2_1325_B48	CAT785C	EX69	3.74	1436.4	104.73	822.9	W2	LIEBHERR 9250
2019-11-03	M12_1245_B18	EH3500	EX70	5.99	2962.4	275.57	645.0	M12	LIEBHERR 9250
2019-11-03	M12_1245_B18	CAT785C	EX70	4.42	872.1	75.22	695.7	M12	LIEBHERR 9250
2019-11-03	M12_1245_B18	EH3500	EX70	5.69	1352.4	119.53	678.8	M12	LIEBHERR 9250
2019-11-03	M12_1245_B18	CAT785C	EX70	4.95	615.6	59.35	622.3	M12	LIEBHERR 9250
2019-11-03	M12_1245_B18	EH3500	EX70	6.30	1996.4	195.35	613.2	M12	LIEBHERR 9250
2019-11-03	S4_1355_B16	CAT785C	EX71	6.84	1026.0	136.88	449.7	S4	0
2019-11-03	S4_1355_B16	CAT785C	EX71	8.09	1385.1	218.47	380.4	S4	0
2019-11-03	M7_1225_B07	EH3500	EX72	4.25	2833.6	186.87	909.8	M7	LIEBHERR 9350

2019-11-03	M7_1225_B07	EH3500	EX72	4.82	966.0	72.37	800.9	M7	LIEBHERR 9350
2019-11-03	M7_1225_B102	EH3500	EX72	4.36	1481.2	100.35	885.6	M7	LIEBHERR 9350
2019-11-03	M7_1225_B102	EH3500	EX72	4.14	3348.8	215.13	934.0	M7	LIEBHERR 9350
2019-11-03	M12_1245_B01	EH3500	EX74	5.15	450.8	36.03	750.6	M12	LIEBHERR 9350
2019-11-03	M12_1245_B04	CAT785C	EX74	4.25	1282.5	106.35	723.6	M12	LIEBHERR 9350
2019-11-03	M12_1245_B04	EH3500	EX74	8.07	515.2	64.53	479.0	M12	LIEBHERR 9350
2019-11-03	S4_1365_B14	EH3500	EX74	4.75	64.4	4.75	813.5	S4	LIEBHERR 9350
2019-11-03	M12_1245_B01	EH3500	EX74	4.03	3542.0	221.88	957.8	M12	LIEBHERR 9350
2019-11-03	M12_1245_B01	EH3500	EX74	3.57	3091.2	171.28	1082.8	M12	LIEBHERR 9350
2019-11-04	M14_1385_B65	CAT785C	EX105	7.86	1077.3	165.12	391.5	M14	0
2019-11-04	M12_1245_B33	CAT785C	EX108	2.37	153.9	7.12	1297.5	M12	LIEBHERR 9350
2019-11-04	M12_1245_B33	EH3500	EX108	3.76	2060.8	120.18	1028.8	M12	LIEBHERR 9350
2019-11-04	M12_1245_B33	CAT785C	EX108	2.32	205.2	9.27	1328.6	M12	LIEBHERR 9350
2019-11-04	M12_1245_B33	EH3500	EX108	3.69	708.4	40.62	1046.5	M12	LIEBHERR 9350
2019-11-04	M12_1245_B33	EH3500	EX108	4.66	901.6	65.20	829.7	M12	LIEBHERR 9350
2019-11-04	M12_1255_B135	EH3500	EX108	5.32	450.8	37.27	725.8	M12	LIEBHERR 9350
2019-11-04	M12_1255_B34	EH3500	EX108	4.61	1481.2	105.95	838.8	M12	LIEBHERR 9350
2019-11-04	M11_1285_B06	EH3500	EX109	4.26	1094.8	72.43	906.9	M11	LIEBHERR 9350
2019-11-04	M11_1285_B07	CAT785C	EX109	2.57	513.0	25.75	1195.3	M11	LIEBHERR 9350
2019-11-04	M11_1285_B07	EH3500	EX109	3.64	1610.0	90.97	1061.9	M11	LIEBHERR 9350
2019-11-04	M11_1285_B06	EH3500	EX109	3.70	515.2	29.57	1045.5	M11	LIEBHERR 9350
2019-11-04	M11_1295_B08	EH3500	EX109	5.37	2511.6	209.37	719.8	M11	LIEBHERR 9350
2019-11-04	M11_1295_B08	EH3500	EX109	6.50	2576.0	259.95	594.6	M11	LIEBHERR 9350
2019-11-04	M14_1375_B01	CAT785C	EX29	2.27	1231.2	54.58	1353.4	M14	LIEBHERR 9350 E
2019-11-04	M14_1375_B02	CAT785C	EX29	2.50	256.5	12.50	1231.2	M14	LIEBHERR 9350 E
2019-11-04	M14_1375_B02	CAT785C	EX29	2.95	3283.2	189.00	1042.3	M14	LIEBHERR 9350 E
2019-11-04	M14_1375_B02	CAT785C	EX29	3.13	2462.4	150.18	983.8	M14	LIEBHERR 9350 E

2019-11-04	M11_1315_B33	EH3500	EX30	6.16	386.4	36.97	627.2	M11	LIEBHERR 9350 E
2019-11-04	M11_1315_B33	EH3500	EX30	5.21	3477.6	281.27	741.8	M11	LIEBHERR 9350 E
2019-11-04	M11_1315_B33	EH3500	EX30	5.69	1481.2	130.78	679.5	M11	LIEBHERR 9350 E
2019-11-04	M11_1315_B34	EH3500	EX30	4.75	1610.0	118.78	813.2	M11	LIEBHERR 9350 E
2019-11-04	S4_1365_B14	CAT785C	EX51	3.49	2462.4	167.32	883.0	S4	EX2500-6
2019-11-04	S4_1365_B14	CAT785C	EX51	4.02	1846.8	144.73	765.6	S4	EX2500-6
2019-11-04	S4_1365_B14	CAT785C	EX51	3.46	1795.5	121.17	889.1	S4	EX2500-6
2019-11-04	W2_1325_B05	CAT785C	EX57	4.34	1231.2	104.13	709.4	W2	EX2500-6
2019-11-04	W2_1325_B05	EH3500	EX57	6.63	193.2	19.90	582.5	W2	EX2500-6
2019-11-04	W2_1325_B42	CAT785C	EX57	4.40	615.6	52.83	699.1	W2	EX2500-6
2019-11-04	W2_1325_B05	CAT785C	EX57	3.56	2359.8	163.60	865.5	W2	EX2500-6
2019-11-04	W2_1325_B42	CAT785C	EX57	3.93	872.1	66.77	783.7	W2	EX2500-6
2019-11-04	W2_1325_B42	EH3500	EX57	4.80	64.4	4.80	805.0	W2	EX2500-6
2019-11-04	W2_1325_B05	CAT785C	EX57	4.01	153.9	12.03	767.4	W2	EX2500-6
2019-11-04	W2_1325_B42	CAT785C	EX57	4.98	2359.8	229.22	617.7	W2	EX2500-6
2019-11-04	M11_1305_B16	EH3500	EX58	4.57	3220.0	228.43	845.8	M11	LIEBHERR 9350 E
2019-11-04	M11_1305_B16	CAT785C	EX58	3.21	359.1	22.50	957.6	M11	LIEBHERR 9350 E
2019-11-04	M11_1305_B16	EH3500	EX58	3.85	1352.4	80.95	1002.4	M11	LIEBHERR 9350 E
2019-11-04	M11_1305_B16	CAT785C	EX58	3.67	205.2	14.68	838.5	M11	LIEBHERR 9350 E
2019-11-04	M11_1305_B16	EH3500	EX58	4.96	1416.8	109.03	779.7	M11	LIEBHERR 9350 E
2019-11-04	M13_1445_D03	CAT785C	EX59	2.48	1898.1	91.67	1242.4	M13	LIEBHERR 9350 E
2019-11-04	M13_1445_D03	EH3500	EX59	3.07	1416.8	67.52	1259.1	M13	LIEBHERR 9350 E

2019-11-04	M13_1445_D03	CAT785C	EX59	2.46	2205.9	105.63	1253.0	M13	LIEBHERR 9350 E
2019-11-04	M13_1445_D03	EH3500	EX59	3.10	3155.6	151.75	1247.7	M13	LIEBHERR 9350 E
2019-11-04	M13_1445_D03	CAT785C	EX59	2.65	4001.4	206.63	1161.9	M13	LIEBHERR 9350 E
2019-11-04	M13_1445_D03	EH3500	EX59	3.66	901.6	51.28	1054.8	M13	LIEBHERR 9350 E
2019-11-04	W2_1325_B48	CAT785C	EX69	3.69	3437.1	247.40	833.6	W2	LIEBHERR 9250
2019-11-04	W2_1325_B45	CAT785C	EX69	3.18	820.8	50.92	967.2	W2	LIEBHERR 9250
2019-11-04	W2_1325_B48	CAT785C	EX69	3.35	2052.0	133.87	919.7	W2	LIEBHERR 9250
2019-11-04	W2_1325_B45	CAT785C	EX69	4.67	1179.9	107.45	658.9	W2	LIEBHERR 9250
2019-11-04	W2_1325_B48	CAT785C	EX69	3.85	1436.4	107.75	799.9	W2	LIEBHERR 9250
2019-11-04	M12_1245_B18	CAT785C	EX70	5.67	1898.1	209.83	542.7	M12	LIEBHERR 9250
2019-11-04	M12_1245_B18	EH3500	EX70	7.28	579.6	65.53	530.7	M12	LIEBHERR 9250
2019-11-04	M12_1245_B18	EH3500	EX70	8.20	1352.4	172.15	471.4	M12	LIEBHERR 9250
2019-11-04	M12_1245_B18	CAT785C	EX70	5.37	51.3	5.37	573.5	M12	LIEBHERR 9250
2019-11-04	M12_1245_B18	EH3500	EX70	6.33	2189.6	215.05	610.9	M12	LIEBHERR 9250
2019-11-04	S4_1355_B06	CAT785C	EX71	8.11	513.0	81.07	379.7	S4	0
2019-11-04	S4_1355_B16	CAT785C	EX71	6.79	615.6	81.45	453.5	S4	0
2019-11-04	S4_1365_B14	CAT785C	EX71	5.25	153.9	15.75	586.3	S4	0
2019-11-04	S4_1355_B06	CAT785C	EX71	6.58	359.1	46.05	467.9	S4	0
2019-11-04	S4_1365_B14	CAT785C	EX71	6.86	513.0	68.63	448.5	S4	0
2019-11-04	S4_1365_B14	CAT785C	EX71	5.70	1179.9	131.00	540.4	S4	0
2019-11-04	M7_1225_B102	EH3500	EX72	4.45	3026.8	209.02	868.9	M7	LIEBHERR 9350
2019-11-04	M7_1225_B102	EH3500	EX72	3.79	2769.2	162.88	1020.1	M7	LIEBHERR 9350
2019-11-04	M7_1225_B102	EH3500	EX72	4.52	2640.4	185.27	855.1	M7	LIEBHERR 9350
2019-11-04	M12_1245_B01	EH3500	EX74	4.13	2962.4	190.10	935.0	M12	LIEBHERR 9350
2019-11-04	M12_1245_B01	EH3500	EX74	3.55	2704.8	149.03	1088.9	M12	LIEBHERR 9350
2019-11-04	M12_1245_B01	CAT785C	EX74	2.99	153.9	8.98	1027.9	M12	LIEBHERR 9350
2019-11-04	M12_1245_B01	EH3500	EX74	4.25	1352.4	89.28	908.8	M12	LIEBHERR 9350

2019-11-05	M12_1245_B126	EH3500	EX108	3.70	1610.0	92.53	1043.9	M12	LIEBHERR 9350
2019-11-05	M12_1255_B135	EH3500	EX108	4.74	837.2	61.68	814.4	M12	LIEBHERR 9350
2019-11-05	M12_1255_B34	EH3500	EX108	6.20	193.2	18.60	623.2	M12	LIEBHERR 9350
2019-11-05	M12_1245_B126	EH3500	EX108	3.97	1996.4	123.17	972.5	M12	LIEBHERR 9350
2019-11-05	M12_1245_B126	CAT785C	EX108	3.11	410.4	24.92	988.3	M12	LIEBHERR 9350
2019-11-05	M12_1245_B126	EH3500	EX108	4.27	257.6	17.08	904.7	M12	LIEBHERR 9350
2019-11-05	M11_1295_B08	EH3500	EX109	5.39	3413.2	285.55	717.2	M11	LIEBHERR 9350
2019-11-05	M11_1285_B06	EH3500	EX109	3.06	1223.6	58.17	1262.2	M11	LIEBHERR 9350
2019-11-05	M11_1295_B08	EH3500	EX109	5.24	579.6	47.12	738.1	M11	LIEBHERR 9350
2019-11-05	M11_1285_B06	EH3500	EX109	3.94	579.6	35.48	980.1	M11	LIEBHERR 9350
2019-11-05	M14_1375_B01	CAT785C	EX29	2.47	513.0	24.67	1247.8	M14	LIEBHERR 9350 E
2019-11-05	M14_1375_B02	CAT785C	EX29	2.82	4206.6	230.95	1092.9	M14	LIEBHERR 9350 E
2019-11-05	M14_1375_B02	CAT785C	EX29	2.60	2616.3	132.83	1181.8	M14	LIEBHERR 9350 E
2019-11-05	M11_1315_B33	EH3500	EX30	4.60	64.4	4.60	840.0	M11	LIEBHERR 9350 E
2019-11-05	M11_1315_B34	CAT785C	EX30	2.59	1231.2	62.25	1186.7	M11	LIEBHERR 9350 E
2019-11-05	M11_1315_B34	EH3500	EX30	3.95	1867.6	114.68	977.1	M11	LIEBHERR 9350 E
2019-11-05	M11_1315_B34	CAT785C	EX30	2.53	410.4	20.22	1218.0	M11	LIEBHERR 9350 E
2019-11-05	M11_1315_B34	EH3500	EX30	4.53	1674.4	117.78	853.0	M11	LIEBHERR 9350 E
2019-11-05	M11_1315_B34	CAT785C	EX30	2.92	307.8	17.52	1054.3	M11	LIEBHERR 9350 E
2019-11-05	M11_1315_B34	EH3500	EX30	4.62	644.0	46.23	835.8	M11	LIEBHERR 9350 E
2019-11-05	S4_1365_B14	CAT785C	EX51	3.62	1692.9	119.47	850.2	S4	EX2500-6
2019-11-05	S4_1365_B14	CAT785C	EX51	3.77	1641.6	120.57	816.9	S4	EX2500-6
2019-11-05	S4_1365_B14	EH3500	EX51	4.40	322.0	21.98	878.8	S4	EX2500-6

2019-11-05	S4_1365_B14	CAT785C	EX51	4.92	102.6	9.85	625.0	S4	EX2500-6
2019-11-05	W2_1325_B05	CAT785C	EX57	6.13	1026.0	122.53	502.4	W2	EX2500-6
2019-11-05	W2_1325_B42	CAT785C	EX57	5.12	1385.1	138.28	601.0	W2	EX2500-6
2019-11-05	W2_1325_B05	CAT785C	EX57	4.17	1282.5	104.13	739.0	W2	EX2500-6
2019-11-05	W2_1325_B06	CAT785C	EX57	4.08	872.1	69.43	753.6	W2	EX2500-6
2019-11-05	W2_1325_B06	CAT785C	EX57	6.24	872.1	106.13	493.0	W2	EX2500-6
2019-11-05	W2_1325_B42	CAT785C	EX57	4.29	205.2	17.17	717.2	W2	EX2500-6
2019-11-05	M11_1305_B16	CAT785C	EX58	3.45	256.5	17.23	893.0	M11	LIEBHERR 9350 E
2019-11-05	M11_1305_B16	EH3500	EX58	4.11	3220.0	205.28	941.1	M11	LIEBHERR 9350 E
2019-11-05	M11_1295_B08	CAT785C	EX58	3.15	51.3	3.15	977.1	M11	LIEBHERR 9350 E
2019-11-05	M11_1295_B08	EH3500	EX58	5.90	1223.6	112.17	654.5	M11	LIEBHERR 9350 E
2019-11-05	M11_1295_B08	EH3500	EX58	9.38	386.4	56.30	411.8	M11	LIEBHERR 9350 E
2019-11-05	M13_1445_D03	CAT785C	EX59	2.24	1436.4	62.68	1374.9	M13	LIEBHERR 9350 E
2019-11-05	M13_1445_D03	EH3500	EX59	3.26	1288.0	65.20	1185.3	M13	LIEBHERR 9350 E
2019-11-05	M13_1445_D03	EH3500	EX59	3.69	3413.2	195.82	1045.8	M13	LIEBHERR 9350 E
2019-11-05	W2_1325_B48	CAT785C	EX69	3.50	3744.9	255.22	880.4	W2	LIEBHERR 9250
2019-11-05	W2_1325_B48	EH3500	EX69	5.83	64.4	5.83	662.4	W2	LIEBHERR 9250
2019-11-05	W2_1325_B06	CAT785C	EX69	3.71	102.6	7.42	830.0	W2	LIEBHERR 9250
2019-11-05	W2_1325_B45	CAT785C	EX69	3.52	974.7	66.83	875.0	W2	LIEBHERR 9250
2019-11-05	W2_1325_B48	CAT785C	EX69	3.68	1590.3	114.03	836.8	W2	LIEBHERR 9250
2019-11-05	W2_1325_B45	CAT785C	EX69	2.78	153.9	8.33	1108.1	W2	LIEBHERR 9250
2019-11-05	M12_1245_B18	CAT785C	EX70	5.50	1744.2	186.98	559.7	M12	LIEBHERR 9250
2019-11-05	M12_1245_B18	EH3500	EX70	7.72	128.8	15.43	500.7	M12	LIEBHERR 9250
2019-11-05	M12_1245_B17	CAT785C	EX70	8.52	205.2	34.10	361.1	M12	LIEBHERR 9250

2019-11-05	M12_1245_B18	CAT785C	EX70	4.19	102.6	8.38	734.3	M12	LIEBHERR 9250
2019-11-05	M12_1245_B18	EH3500	EX70	6.50	966.0	97.48	594.6	M12	LIEBHERR 9250
2019-11-05	M12_1245_B17	CAT785C	EX70	6.80	51.3	6.80	452.6	M12	LIEBHERR 9250
2019-11-05	S4_1355_B06	CAT785C	EX71	5.07	513.0	50.67	607.5	S4	0
2019-11-05	S4_1355_B11	CAT785C	EX71	6.72	1128.6	147.80	458.2	S4	0
2019-11-05	S4_1355_B11	CAT785C	EX71	5.08	410.4	40.60	606.5	S4	0
2019-11-05	S4_1355_B11	CAT785C	EX71	5.66	718.2	79.20	544.1	S4	0
2019-11-05	M7_1225_B102	EH3500	EX72	4.44	2125.2	146.40	871.0	M7	LIEBHERR 9350
2019-11-05	M7_1225_B102	EH3500	EX72	4.83	901.6	67.60	800.2	M7	LIEBHERR 9350
2019-11-05	M7_1225_B102	CAT785C	EX72	2.40	410.4	19.18	1283.6	M7	LIEBHERR 9350
2019-11-05	M7_1225_B102	EH3500	EX72	3.81	257.6	15.25	1013.5	M7	LIEBHERR 9350
2019-11-05	M12_1245_B01	CAT785C	EX74	4.78	51.3	4.78	643.5	M12	LIEBHERR 9350
2019-11-05	M12_1245_B01	EH3500	EX74	5.12	2318.4	184.35	754.6	M12	LIEBHERR 9350
2019-11-05	M12_1245_B01	EH3500	EX74	5.92	644.0	59.17	653.1	M12	LIEBHERR 9350
2019-11-05	M12_1265_B17	CAT785C	EX74	4.78	102.6	9.55	644.6	M12	LIEBHERR 9350
2019-11-05	M12_1265_B17	EH3500	EX74	5.73	837.2	74.55	673.8	M12	LIEBHERR 9350
2019-11-05	M12_1265_B17	EH3500	EX74	4.41	128.8	8.82	876.5	M12	LIEBHERR 9350
2019-11-06	M12_1245_B126	CAT785C	EX108	2.77	872.1	47.08	1111.3	M12	LIEBHERR 9350
2019-11-06	M12_1245_B126	EH3500	EX108	3.78	1416.8	83.23	1021.3	M12	LIEBHERR 9350
2019-11-06	M12_1245_B126	CAT785C	EX108	3.58	51.3	3.58	859.0	M12	LIEBHERR 9350
2019-11-06	M12_1245_B126	EH3500	EX108	3.49	2189.6	118.78	1106.0	M12	LIEBHERR 9350
2019-11-06	M12_1245_B126	EH3500	EX108	4.54	1803.2	127.03	851.7	M12	LIEBHERR 9350
2019-11-06	M11_1285_B06	EH3500	EX109	3.07	901.6	42.98	1258.5	M11	LIEBHERR 9350
2019-11-06	M11_1285_B07	EH3500	EX109	3.72	1481.2	85.55	1038.8	M11	LIEBHERR 9350
2019-11-06	M11_1285_B07	EH3500	EX109	3.27	3606.4	183.23	1180.9	M11	LIEBHERR 9350
2019-11-06	M11_1285_B07	EH3500	EX109	3.46	2189.6	117.72	1116.0	M11	LIEBHERR 9350
2019-11-06	M14_1385_B19	CAT785C	EX29	2.73	2154.6	114.70	1127.1	M14	LIEBHERR 9350 E
2019-11-06	M14_1385_B65	CAT785C	EX29	2.42	615.6	29.10	1269.3	M14	LIEBHERR 9350 E

2019-11-06	M14_1385_B19	CAT785C	EX29	2.38	3334.5	154.75	1292.9	M14	LIEBHERR 9350 E
2019-11-06	M14_1385_B65	CAT785C	EX29	2.57	256.5	12.83	1199.2	M14	LIEBHERR 9350 E
2019-11-06	M14_1385_B19	CAT785C	EX29	2.51	2770.2	135.28	1228.6	M14	LIEBHERR 9350 E
2019-11-06	M14_1385_B65	CAT785C	EX29	2.65	1590.3	82.22	1160.6	M14	LIEBHERR 9350 E
2019-11-06	M11_1315_B34	EH3500	EX30	4.72	2511.6	183.98	819.1	M11	LIEBHERR 9350 E
2019-11-06	M11_1315_B33	EH3500	EX30	5.51	257.6	22.03	701.5	M11	LIEBHERR 9350 E
2019-11-06	M11_1315_B34	CAT785C	EX30	3.01	615.6	36.17	1021.3	M11	LIEBHERR 9350 E
2019-11-06	M11_1315_B34	EH3500	EX30	4.71	3091.2	225.93	820.9	M11	LIEBHERR 9350 E
2019-11-06	M11_1315_B33	EH3500	EX30	5.90	193.2	17.70	654.9	M11	LIEBHERR 9350 E
2019-11-06	M11_1315_B34	EH3500	EX30	4.16	2704.8	174.68	929.0	M11	LIEBHERR 9350 E
2019-11-06	S4_1355_B06	CAT785C	EX51	3.89	2308.5	174.95	791.7	S4	EX2500-6
2019-11-06	S4_1355_B06	EH3500	EX51	5.72	64.4	5.72	675.9	S4	EX2500-6
2019-11-06	S4_1365_B14	CAT785C	EX51	5.08	205.2	20.33	605.5	S4	EX2500-6
2019-11-06	S4_1355_B06	CAT785C	EX51	4.54	872.1	77.20	677.8	S4	EX2500-6
2019-11-06	S4_1355_B11	CAT785C	EX51	2.91	1026.0	58.27	1056.5	S4	EX2500-6
2019-11-06	S4_1355_B11	CAT785C	EX51	5.19	1846.8	186.93	592.8	S4	EX2500-6
2019-11-06	W2_1325_B42	CAT785C	EX57	5.55	102.6	11.10	554.6	W2	EX2500-6
2019-11-06	W2_1325_B45	CAT785C	EX57	5.21	2205.9	224.20	590.3	W2	EX2500-6
2019-11-06	W2_1325_B42	CAT785C	EX57	3.86	2872.8	215.93	798.2	W2	EX2500-6
2019-11-06	W2_1325_B45	CAT785C	EX57	3.41	102.6	6.82	903.1	W2	EX2500-6
2019-11-06	W2_1325_B42	CAT785C	EX57	3.42	2872.8	191.65	899.4	W2	EX2500-6
2019-11-06	M11_1295_B08	EH3500	EX58	5.96	2511.6	232.33	648.6	M11	LIEBHERR 9350 E

2019-11-06	M11_1295_B08	EH3500	EX58	5.11	2576.0	209.37	738.2	M11	LIEBHERR 9350 E
2019-11-06	M11_1295_B08	EH3500	EX58	6.83	2769.2	293.58	565.9	M11	LIEBHERR 9350 E
2019-11-06	M13_1445_D03	CAT785C	EX59	2.53	2462.4	121.25	1218.5	M13	LIEBHERR 9350 E
2019-11-06	M13_1445_D03	CAT785C	EX59	2.50	2205.9	107.62	1229.9	M13	LIEBHERR 9350 E
2019-11-06	M13_1445_D03	EH3500	EX59	3.17	257.6	12.70	1217.0	M13	LIEBHERR 9350 E
2019-11-06	M12_1265_B07	CAT785C	EX66	3.59	256.5	17.97	856.6	M12	LIEBHERR 9250
2019-11-06	M12_1245_B25	CAT785C	EX66	4.42	615.6	53.00	696.9	M12	LIEBHERR 9250
2019-11-06	M12_1265_B07	CAT785C	EX66	3.93	666.9	51.15	782.3	M12	LIEBHERR 9250
2019-11-06	M12_1265_B07	EH3500	EX66	5.85	772.8	70.22	660.4	M12	LIEBHERR 9250
2019-11-06	M12_1245_B25	CAT785C	EX66	3.67	359.1	25.67	839.5	M12	LIEBHERR 9250
2019-11-06	M12_1245_B25	EH3500	EX66	6.02	1223.6	114.30	642.3	M12	LIEBHERR 9250
2019-11-06	M12_1245_B34	CAT785C	EX66	4.28	153.9	12.85	718.6	M12	LIEBHERR 9250
2019-11-06	M12_1245_B34	EH3500	EX66	5.04	644.0	50.43	766.2	M12	LIEBHERR 9250
2019-11-06	W2_1325_B45	CAT785C	EX69	3.57	3744.9	260.42	862.8	W2	LIEBHERR 9250
2019-11-06	W2_1325_B45	CAT785C	EX69	3.89	3539.7	268.72	790.4	W2	LIEBHERR 9250
2019-11-06	M12_1265_B07	CAT785C	EX70	5.33	51.3	5.33	577.1	M12	LIEBHERR 9250
2019-11-06	M12_1265_B07	EH3500	EX70	6.75	322.0	33.73	572.7	M12	LIEBHERR 9250
2019-11-06	S4_1355_B11	CAT785C	EX71	6.53	923.4	117.52	471.5	S4	0
2019-11-06	S4_1355_B11	CAT785C	EX71	6.12	923.4	110.10	503.2	S4	0
2019-11-06	S4_1365_B14	CAT785C	EX71	8.35	51.3	8.35	368.6	S4	0
2019-11-06	S4_1365_B14	CAT785C	EX71	11.25	51.3	11.25	273.6	S4	0
2019-11-06	M7_1225_B102	CAT785C	EX72	2.66	461.7	23.97	1155.9	M7	LIEBHERR 9350
2019-11-06	M7_1225_B102	EH3500	EX72	4.04	2254.0	141.32	957.0	M7	LIEBHERR 9350
2019-11-06	M7_1225_B102	EH3500	EX72	4.51	3091.2	216.67	856.0	M7	LIEBHERR 9350
2019-11-06	M7_1225_B102	EH3500	EX72	8.02	64.4	8.02	482.0	M7	LIEBHERR 9350
2019-11-06	M7_1225_B205	EH3500	EX72	3.59	2576.0	143.60	1076.3	M7	LIEBHERR 9350

2019-11-06	M12_1265_B17	CAT785C	EX74	2.57	51.3	2.57	1199.2	M12	LIEBHERR 9350
2019-11-06	M12_1265_B17	EH3500	EX74	5.21	1610.0	130.25	741.7	M12	LIEBHERR 9350
2019-11-06	M12_1265_B17	CAT785C	EX74	3.66	256.5	18.32	840.2	M12	LIEBHERR 9350
2019-11-06	M12_1265_B17	EH3500	EX74	4.70	3026.8	220.70	822.9	M12	LIEBHERR 9350
2019-11-06	M12_1265_B17	EH3500	EX74	4.57	2382.8	169.15	845.2	M12	LIEBHERR 9350
2019-11-07	M12_1245_B126	EH3500	EX108	4.61	2318.4	166.02	837.9	M12	LIEBHERR 9350
2019-11-07	M12_1245_B126	CAT785C	EX108	3.97	102.6	7.93	776.0	M12	LIEBHERR 9350
2019-11-07	M12_1245_B126	EH3500	EX108	4.43	2125.2	146.08	872.9	M12	LIEBHERR 9350
2019-11-07	M12_1245_B126	CAT785C	EX108	3.25	1795.5	113.62	948.2	M12	LIEBHERR 9350
2019-11-07	M12_1245_B126	EH3500	EX108	4.09	450.8	28.62	945.2	M12	LIEBHERR 9350
2019-11-07	M11_1285_B06	EH3500	EX109	3.43	3220.0	171.28	1128.0	M11	LIEBHERR 9350
2019-11-07	M11_1285_B07	EH3500	EX109	2.37	64.4	2.37	1632.7	M11	LIEBHERR 9350
2019-11-07	M11_1285_B05	CAT785C	EX109	2.45	51.3	2.45	1256.3	M11	LIEBHERR 9350
2019-11-07	M11_1285_B05	EH3500	EX109	4.09	2382.8	151.48	943.8	M11	LIEBHERR 9350
2019-11-07	M11_1285_B06	CAT785C	EX109	2.95	51.3	2.95	1043.4	M11	LIEBHERR 9350
2019-11-07	M11_1285_B06	EH3500	EX109	3.31	966.0	49.70	1166.2	M11	LIEBHERR 9350
2019-11-07	M11_1285_B05	EH3500	EX109	4.81	2254.0	168.47	802.8	M11	LIEBHERR 9350
2019-11-07	M14_1375_B01	CAT785C	EX29	2.44	820.8	39.03	1261.7	M14	LIEBHERR 9350 E
2019-11-07	M14_1375_B02	CAT785C	EX29	2.99	1436.4	83.78	1028.7	M14	LIEBHERR 9350 E
2019-11-07	M14_1385_B19	CAT785C	EX29	2.77	1385.1	74.72	1112.3	M14	LIEBHERR 9350 E
2019-11-07	M14_1375_B01	CAT785C	EX29	2.63	974.7	49.95	1170.8	M14	LIEBHERR 9350 E
2019-11-07	M14_1375_B02	CAT785C	EX29	3.42	2616.3	174.43	899.9	M14	LIEBHERR 9350 E
2019-11-07	M14_1375_B01	CAT785C	EX29	2.45	872.1	41.67	1255.8	M14	LIEBHERR 9350 E
2019-11-07	M14_1375_B02	CAT785C	EX29	2.77	1385.1	74.83	1110.5	M14	LIEBHERR 9350 E

2019-11-07	M11_1315_B34	CAT785C	EX30	3.72	461.7	33.45	828.2	M11	LIEBHERR 9350 E
2019-11-07	M11_1315_B34	EH3500	EX30	4.25	1996.4	131.85	908.5	M11	LIEBHERR 9350 E
2019-11-07	M11_1315_B34	EH3500	EX30	4.45	3864.0	266.98	868.4	M11	LIEBHERR 9350 E
2019-11-07	M11_1315_B34	EH3500	EX30	3.79	3606.4	212.32	1019.2	M11	LIEBHERR 9350 E
2019-11-07	S4_1355_B11	CAT785C	EX51	2.97	153.9	8.90	1037.5	S4	EX2500-6
2019-11-07	S4_1355_B18	CAT785C	EX51	3.65	3026.7	215.63	842.2	S4	EX2500-6
2019-11-07	S3_1275_B101	CAT785C	EX51	3.63	872.1	61.68	848.3	S3	EX2500-6
2019-11-07	S4_1355_B18	CAT785C	EX51	2.78	1282.5	69.38	1109.1	S4	EX2500-6
2019-11-07	S4_1355_B18	EH3500	EX51	3.81	644.0	38.10	1014.2	S4	EX2500-6
2019-11-07	S3_1275_B101	CAT785C	EX51	4.66	872.1	79.23	660.4	S3	EX2500-6
2019-11-07	S3_1315_B03	CAT785C	EX51	4.46	1385.1	120.33	690.6	S3	EX2500-6
2019-11-07	S3_1315_B03	EH3500	EX51	5.46	128.8	10.92	707.9	S3	EX2500-6
2019-11-07	W2_1325_B05	CAT785C	EX57	5.40	51.3	5.40	570.0	W2	EX2500-6
2019-11-07	W2_1325_B42	CAT785C	EX57	4.52	2821.5	248.48	681.3	W2	EX2500-6
2019-11-07	W2_1325_B103	CAT785C	EX57	4.52	820.8	72.32	681.0	W2	EX2500-6
2019-11-07	W2_1325_B42	CAT785C	EX57	4.26	1333.8	110.82	722.2	W2	EX2500-6
2019-11-07	W2_1325_B103	CAT785C	EX57	4.20	1590.3	130.13	733.2	W2	EX2500-6
2019-11-07	W2_1325_B103	EH3500	EX57	6.20	708.4	68.20	623.2	W2	EX2500-6
2019-11-07	M11_1295_B08	EH3500	EX58	5.77	1932.0	173.13	669.5	M11	LIEBHERR 9350 E
2019-11-07	M11_1295_B08	CAT785C	EX58	4.69	2308.5	211.23	655.7	M11	LIEBHERR 9350 E
2019-11-07	M11_1295_B08	EH3500	EX58	4.70	193.2	14.10	822.1	M11	LIEBHERR 9350 E
2019-11-07	M11_1295_B08	CAT785C	EX58	4.16	2411.1	195.57	739.7	M11	LIEBHERR 9350 E
2019-11-07	M11_1295_B08	EH3500	EX58	4.84	128.8	9.68	798.1	M11	LIEBHERR 9350 E

2019-11-07	M13_1445_D03	CAT785C	EX59	2.74	5078.7	271.63	1121.8	M13	LIEBHERR 9350 E
2019-11-07	M13_1445_D03	CAT785C	EX59	2.80	4463.1	243.20	1101.1	M13	LIEBHERR 9350 E
2019-11-07	M13_1445_D03	EH3500	EX59	3.95	193.2	11.85	978.2	M13	LIEBHERR 9350 E
2019-11-07	M13_1445_D03	CAT785C	EX59	3.08	666.9	40.03	999.5	M13	LIEBHERR 9350 E
2019-11-07	M13_1445_D03	EH3500	EX59	3.81	4057.2	240.22	1013.4	M13	LIEBHERR 9350 E
2019-11-07	M12_1245_B25	EH3500	EX66	6.14	386.4	36.85	629.1	M12	LIEBHERR 9250
2019-11-07	M12_1265_B07	CAT785C	EX66	4.05	256.5	20.23	760.6	M12	LIEBHERR 9250
2019-11-07	M12_1265_B07	EH3500	EX66	5.74	1030.4	91.92	672.6	M12	LIEBHERR 9250
2019-11-07	M12_1265_B07	CAT785C	EX66	3.79	102.6	7.58	811.8	M12	LIEBHERR 9250
2019-11-07	M12_1265_B07	EH3500	EX66	5.35	2704.8	224.75	722.1	M12	LIEBHERR 9250
2019-11-07	M12_1265_B07	EH3500	EX66	5.13	1996.4	159.15	752.6	M12	LIEBHERR 9250
2019-11-07	W2_1325_B45	CAT785C	EX69	4.85	3334.5	315.57	634.0	W2	LIEBHERR 9250
2019-11-07	W2_1325_B45	CAT785C	EX69	3.83	4206.6	313.67	804.7	W2	LIEBHERR 9250
2019-11-07	W2_1325_B45	CAT785C	EX69	5.05	2103.3	207.25	608.9	W2	LIEBHERR 9250
2019-11-07	W2_1325_B48	CAT785C	EX69	6.32	205.2	25.28	487.0	W2	LIEBHERR 9250
2019-11-07	M7_1225_B07	EH3500	EX72	5.21	1030.4	83.33	741.9	M7	LIEBHERR 9350
2019-11-07	M7_1225_B205	EH3500	EX72	3.93	1223.6	74.73	982.4	M7	LIEBHERR 9350
2019-11-07	M7_1225_B07	CAT785C	EX72	3.02	51.3	3.02	1020.3	M7	LIEBHERR 9350
2019-11-07	M7_1225_B07	EH3500	EX72	4.05	2189.6	137.67	954.3	M7	LIEBHERR 9350
2019-11-07	M7_1225_B07	EH3500	EX72	4.15	1674.4	108.02	930.1	M7	LIEBHERR 9350
2019-11-07	M7_1225_B205	EH3500	EX72	3.68	772.8	44.12	1051.0	M7	LIEBHERR 9350
2019-11-07	M7_1235_B01	CAT785C	EX72	3.61	102.6	7.22	853.0	M7	LIEBHERR 9350
2019-11-07	M7_1235_B17	CAT785C	EX72	6.22	51.3	6.22	495.1	M7	LIEBHERR 9350
2019-11-07	M12_1265_B17	EH3500	EX74	5.61	2060.8	179.42	689.2	M12	LIEBHERR 9350
2019-11-07	M12_1265_B17	EH3500	EX74	4.67	2898.0	210.17	827.3	M12	LIEBHERR 9350
2019-11-07	M12_1265_B17	EH3500	EX74	4.52	2576.0	180.77	855.0	M12	LIEBHERR 9350

2019-11-08	M12_1245_B126	CAT785C	EX108	2.94	923.4	52.87	1048.0	M12	LIEBHERR 9350
2019-11-08	M12_1265_B07	EH3500	EX108	5.06	1674.4	131.55	763.7	M12	LIEBHERR 9350
2019-11-08	M12_1265_B07	CAT785C	EX108	3.32	359.1	23.23	927.4	M12	LIEBHERR 9350
2019-11-08	M12_1265_B07	EH3500	EX108	4.57	2898.0	205.63	845.6	M12	LIEBHERR 9350
2019-11-08	M12_1265_B07	CAT785C	EX108	3.82	51.3	3.82	806.5	M12	LIEBHERR 9350
2019-11-08	M12_1265_B07	EH3500	EX108	4.89	3284.4	249.27	790.6	M12	LIEBHERR 9350
2019-11-08	M11_1285_B05	CAT785C	EX109	2.56	205.2	10.25	1201.2	M11	LIEBHERR 9350
2019-11-08	M11_1285_B05	EH3500	EX109	3.86	1674.4	100.42	1000.5	M11	LIEBHERR 9350
2019-11-08	M11_1295_B08	EH3500	EX109	4.29	1094.8	72.85	901.7	M11	LIEBHERR 9350
2019-11-08	M11_1285_B05	CAT785C	EX109	2.71	513.0	27.08	1136.5	M11	LIEBHERR 9350
2019-11-08	M11_1285_B05	EH3500	EX109	3.86	2447.2	146.70	1000.9	M11	LIEBHERR 9350
2019-11-08	M11_1295_B08	EH3500	EX109	3.94	386.4	23.65	980.3	M11	LIEBHERR 9350
2019-11-08	M11_1285_B05	EH3500	EX109	3.57	2833.6	157.13	1082.0	M11	LIEBHERR 9350
2019-11-08	M14_1375_B02	CAT785C	EX29	2.61	2975.4	154.18	1157.9	M14	LIEBHERR 9350 E
2019-11-08	M14_1375_B02	CAT785C	EX29	2.76	3231.9	173.78	1115.8	M14	LIEBHERR 9350 E
2019-11-08	M14_1375_B02	CAT785C	EX29	2.73	4104.0	218.68	1126.0	M14	LIEBHERR 9350 E
2019-11-08	M11_1315_B34	CAT785C	EX30	3.61	307.8	21.67	852.4	M11	LIEBHERR 9350 E
2019-11-08	M11_1315_B34	EH3500	EX30	4.90	3799.6	289.28	788.1	M11	LIEBHERR 9350 E
2019-11-08	M11_1315_B34	CAT785C	EX30	3.32	564.3	36.50	927.6	M11	LIEBHERR 9350 E
2019-11-08	M11_1315_B34	EH3500	EX30	4.52	4057.2	284.75	854.9	M11	LIEBHERR 9350 E
2019-11-08	M11_1315_B34	EH3500	EX30	5.01	2962.4	230.63	770.7	M11	LIEBHERR 9350 E
2019-11-08	S3_1275_B101	CAT785C	EX51	5.34	410.4	42.75	576.0	S3	EX2500-6
2019-11-08	S3_1315_B03	CAT785C	EX51	4.28	1846.8	154.18	718.7	S3	EX2500-6
2019-11-08	S3_1275_B101	CAT785C	EX51	6.02	1128.6	132.40	511.5	S3	EX2500-6

2019-11-08	S3_1275_B101	CAT785C	EX51	5.35	2359.8	245.95	575.7	S3	EX2500-6
2019-11-08	W2_1325_B103	CAT785C	EX57	3.64	3129.3	221.92	846.1	W2	EX2500-6
2019-11-08	W2_1325_B103	CAT785C	EX57	3.58	1949.4	135.90	860.7	W2	EX2500-6
2019-11-08	W2_1325_B103	CAT785C	EX57	3.76	3334.5	244.65	817.8	W2	EX2500-6
2019-11-08	M11_1295_B08	EH3500	EX58	5.29	2833.6	232.93	729.9	M11	LIEBHERR 9350 E
2019-11-08	M11_1295_B08	CAT785C	EX58	3.70	51.3	3.70	831.9	M11	LIEBHERR 9350 E
2019-11-08	M11_1295_B08	EH3500	EX58	4.40	3735.2	255.05	878.7	M11	LIEBHERR 9350 E
2019-11-08	M11_1295_B08	EH3500	EX58	5.03	3091.2	241.63	767.6	M11	LIEBHERR 9350 E
2019-11-08	M13_1445_D03	EH3500	EX59	3.05	4765.6	225.73	1266.7	M13	LIEBHERR 9350 E
2019-11-08	M13_1445_D03	EH3500	EX59	3.34	5538.4	287.57	1155.6	M13	LIEBHERR 9350 E
2019-11-08	M13_1445_D03	EH3500	EX59	3.25	5860.4	295.65	1189.3	M13	LIEBHERR 9350 E
2019-11-08	M12_1265_B07	EH3500	EX66	4.43	257.6	17.72	872.4	M12	LIEBHERR 9250
2019-11-08	M12_1245_B25	CAT785C	EX66	4.68	307.8	28.07	658.0	M12	LIEBHERR 9250
2019-11-08	M12_1265_B17	CAT785C	EX66	2.75	205.2	11.02	1117.6	M12	LIEBHERR 9250
2019-11-08	M12_1265_B17	EH3500	EX66	3.98	772.8	47.80	970.0	M12	LIEBHERR 9250
2019-11-08	M12_1245_B17	CAT785C	EX66	4.34	1179.9	99.88	708.8	M12	LIEBHERR 9250
2019-11-08	M12_1245_B17	EH3500	EX66	6.80	193.2	20.40	568.2	M12	LIEBHERR 9250
2019-11-08	M12_1245_B25	CAT785C	EX66	5.17	51.3	5.17	595.7	M12	LIEBHERR 9250
2019-11-08	S4_1365_B14	CAT785C	EX69	2.63	923.4	47.35	1170.1	S4	LIEBHERR 9250
2019-11-08	W2_1335_B27	CAT785C	EX69	4.00	205.2	15.98	770.3	W2	LIEBHERR 9250
2019-11-08	W2_1335_B27	EH3500	EX69	5.56	193.2	16.68	694.8	W2	LIEBHERR 9250
2019-11-08	S4_1365_B14	CAT785C	EX69	3.52	3437.1	235.93	874.1	S4	LIEBHERR 9250
2019-11-08	S4_1365_B14	EH3500	EX69	4.62	64.4	4.62	837.0	S4	LIEBHERR 9250
2019-11-08	S4_1365_B14	CAT785C	EX69	3.12	923.4	56.22	985.5	S4	LIEBHERR 9250
2019-11-08	S4_1365_B14	EH3500	EX69	4.73	2189.6	160.85	816.8	S4	LIEBHERR 9250

2019-11-08	W2_1325_B45	CAT785C	EX69	5.47	51.3	5.47	563.0	W2	LIEBHERR 9250
2019-11-08	M12_1265_B17	EH3500	EX70	7.65	515.2	61.17	505.4	M12	LIEBHERR 9250
2019-11-08	M7_1235_B01	CAT785C	EX72	7.65	1282.5	191.30	402.2	M7	LIEBHERR 9350
2019-11-08	M7_1235_B17	CAT785C	EX72	7.58	205.2	30.33	405.9	M7	LIEBHERR 9350
2019-11-08	M7_1235_B17	CAT785C	EX72	4.49	461.7	40.40	685.7	M7	LIEBHERR 9350
2019-11-08	M7_1235_B01	CAT785C	EX72	6.85	666.9	89.05	449.3	M7	LIEBHERR 9350
2019-11-08	M7_1235_B17	CAT785C	EX72	7.08	1026.0	141.55	434.9	M7	LIEBHERR 9350
2019-11-09	M12_1265_B07	CAT785C	EX108	3.46	769.5	51.93	889.0	M12	LIEBHERR 9350
2019-11-09	M12_1265_B07	EH3500	EX108	5.17	2318.4	186.15	747.3	M12	LIEBHERR 9350
2019-11-09	M12_1265_B07	CAT785C	EX108	3.44	461.7	31.00	893.6	M12	LIEBHERR 9350
2019-11-09	M12_1265_B07	EH3500	EX108	4.39	3220.0	219.47	880.3	M12	LIEBHERR 9350
2019-11-09	M12_1265_B07	EH3500	EX108	3.64	3026.8	171.00	1062.0	M12	LIEBHERR 9350
2019-11-09	M11_1285_B05	EH3500	EX109	3.76	2511.6	146.72	1027.1	M11	LIEBHERR 9350
2019-11-09	M11_1285_B06	EH3500	EX109	3.42	1288.0	68.43	1129.3	M11	LIEBHERR 9350
2019-11-09	M11_1285_B05	EH3500	EX109	3.34	2254.0	116.77	1158.2	M11	LIEBHERR 9350
2019-11-09	M11_1285_B06	CAT785C	EX109	2.37	51.3	2.37	1300.6	M11	LIEBHERR 9350
2019-11-09	M11_1285_B06	EH3500	EX109	3.46	1223.6	65.75	1116.6	M11	LIEBHERR 9350
2019-11-09	M11_1285_B05	EH3500	EX109	3.65	2640.4	149.73	1058.0	M11	LIEBHERR 9350
2019-11-09	M11_1295_B08	EH3500	EX109	4.13	64.4	4.13	934.8	M11	LIEBHERR 9350
2019-11-09	M14_1375_B02	CAT785C	EX29	2.78	410.4	22.22	1108.4	M14	LIEBHERR 9350 E
2019-11-09	M14_1375_B02	EH3500	EX29	2.86	5216.4	231.95	1349.4	M14	LIEBHERR 9350 E
2019-11-09	M14_1375_B01	CAT785C	EX29	2.45	1539.0	73.53	1255.8	M14	LIEBHERR 9350 E
2019-11-09	M14_1375_B02	CAT785C	EX29	3.03	205.2	12.13	1014.7	M14	LIEBHERR 9350 E
2019-11-09	M14_1375_B02	EH3500	EX29	2.59	1288.0	51.82	1491.4	M14	LIEBHERR 9350 E
2019-11-09	M14_1375_B01	CAT785C	EX29	2.32	718.2	32.52	1325.2	M14	LIEBHERR 9350 E

2019-11-09	M14_1375_B02	CAT785C	EX29	2.65	153.9	7.95	1161.5	M14	LIEBHERR 9350E
2019-11-09	M14_1385_B19	CAT785C	EX29	2.53	564.3	27.87	1215.0	M14	LIEBHERR 9350E
2019-11-09	M14_1385_B19	EH3500	EX29	3.44	1030.4	54.97	1124.8	M14	LIEBHERR 9350E
2019-11-09	M11_1315_B34	EH3500	EX30	5.11	128.8	10.22	756.4	M11	LIEBHERR 9350E
2019-11-09	M11_1315_B37	EH3500	EX30	4.65	3091.2	223.32	830.5	M11	LIEBHERR 9350E
2019-11-09	M11_1315_B37	CAT785C	EX30	3.27	51.3	3.27	942.2	M11	LIEBHERR 9350E
2019-11-09	M11_1315_B37	EH3500	EX30	4.44	3542.0	244.32	869.9	M11	LIEBHERR 9350E
2019-11-09	M11_1315_B37	EH3500	EX30	5.64	2189.6	191.63	685.6	M11	LIEBHERR 9350E
2019-11-09	S3_1275_B101	CAT785C	EX51	6.14	769.5	92.10	501.3	S3	EX2500-6
2019-11-09	S3_1315_B03	CAT785C	EX51	4.62	1179.9	106.27	666.2	S3	EX2500-6
2019-11-09	S3_1315_B03	CAT785C	EX51	3.15	1846.8	113.28	978.1	S3	EX2500-6
2019-11-09	S3_1315_B03	CAT785C	EX51	4.17	1641.6	133.50	737.8	S3	EX2500-6
2019-11-09	W2_1325_B103	CAT785C	EX57	3.29	3488.4	223.45	936.7	W2	EX2500-6
2019-11-09	W2_1325_B103	CAT785C	EX57	4.70	2667.6	244.65	654.2	W2	EX2500-6
2019-11-09	W2_1325_B103	EH3500	EX57	7.78	128.8	15.57	496.4	W2	EX2500-6
2019-11-09	W2_1325_B103	CAT785C	EX57	4.96	1744.2	168.70	620.3	W2	EX2500-6
2019-11-09	M11_1295_B08	CAT785C	EX58	2.92	51.3	2.92	1055.3	M11	LIEBHERR 9350E
2019-11-09	M11_1295_B08	EH3500	EX58	4.98	2898.0	224.27	775.3	M11	LIEBHERR 9350E
2019-11-09	M11_1295_B08	CAT785C	EX58	4.06	307.8	24.33	759.0	M11	LIEBHERR 9350E
2019-11-09	M11_1295_B08	EH3500	EX58	4.54	2189.6	154.42	850.8	M11	LIEBHERR 9350E
2019-11-09	M11_1295_B08	CAT785C	EX58	4.20	51.3	4.20	732.9	M11	LIEBHERR 9350E

2019-11-09	M11_1295_B08	EH3500	EX58	5.15	3026.8	242.12	750.1	M11	LIEBHERR 9350 E
2019-11-09	M13_1445_D03	CAT785C	EX59	3.03	4001.4	236.03	1017.2	M13	LIEBHERR 9350 E
2019-11-09	M13_1445_D03	EH3500	EX59	3.63	579.6	32.68	1064.0	M13	LIEBHERR 9350 E
2019-11-09	M13_1445_D03	CAT785C	EX59	2.70	4411.8	232.03	1140.8	M13	LIEBHERR 9350 E
2019-11-09	M13_1445_D03	CAT785C	EX59	2.99	2462.4	143.53	1029.3	M13	LIEBHERR 9350 E
2019-11-09	M12_1245_B126	CAT785C	EX66	3.09	1128.6	68.05	995.1	M12	LIEBHERR 9250
2019-11-09	M12_1245_B25	CAT785C	EX66	4.37	102.6	8.73	704.9	M12	LIEBHERR 9250
2019-11-09	M12_1265_B17	EH3500	EX66	4.15	322.0	20.77	930.3	M12	LIEBHERR 9250
2019-11-09	M12_1265_B17	EH3500	EX66	6.68	515.2	53.42	578.7	M12	LIEBHERR 9250
2019-11-09	M12_1265_B37	EH3500	EX66	5.04	1094.8	85.72	766.3	M12	LIEBHERR 9250
2019-11-09	M12_1265_B37	EH3500	EX66	4.91	1545.6	117.77	787.5	M12	LIEBHERR 9250
2019-11-09	S4_1365_B14	CAT785C	EX69	3.32	1539.0	99.55	927.6	S4	LIEBHERR 9250
2019-11-09	S4_1365_B14	EH3500	EX69	4.15	1674.4	108.00	930.2	S4	LIEBHERR 9250
2019-11-09	S4_1355_B08	CAT785C	EX69	4.20	872.1	71.38	733.0	S4	LIEBHERR 9250
2019-11-09	S4_1355_B08	EH3500	EX69	4.20	2447.2	159.43	921.0	S4	LIEBHERR 9250
2019-11-09	S4_1365_B14	CAT785C	EX69	3.98	307.8	23.88	773.3	S4	LIEBHERR 9250
2019-11-09	S4_1365_B14	EH3500	EX69	4.72	193.2	14.17	818.3	S4	LIEBHERR 9250
2019-11-09	S4_1355_B08	EH3500	EX69	4.25	966.0	63.72	909.7	S4	LIEBHERR 9250
2019-11-09	M12_1245_B126	CAT785C	EX70	2.63	51.3	2.63	1168.9	M12	LIEBHERR 9250
2019-11-09	M12_1245_B126	EH3500	EX70	3.43	128.8	6.87	1125.4	M12	LIEBHERR 9250
2019-11-09	M12_1245_B24	CAT785C	EX70	3.55	51.3	3.55	867.0	M12	LIEBHERR 9250
2019-11-09	M12_1245_B24	EH3500	EX70	4.42	1223.6	84.07	873.3	M12	LIEBHERR 9250
2019-11-09	M12_1245_B33	CAT785C	EX70	4.88	205.2	19.52	630.8	M12	LIEBHERR 9250
2019-11-09	M12_1245_B33	EH3500	EX70	3.78	193.2	11.35	1021.3	M12	LIEBHERR 9250
2019-11-09	M12_1245_B24	CAT785C	EX70	2.81	153.9	8.42	1097.1	M12	LIEBHERR 9250
2019-11-09	M12_1245_B24	EH3500	EX70	3.81	386.4	22.83	1015.4	M12	LIEBHERR 9250

2019-11-09	M12_1245_B33	CAT785C	EX70	5.87	974.7	111.47	524.7	M12	LIEBHERR 9250
2019-11-09	M12_1245_B33	EH3500	EX70	6.67	64.4	6.67	579.6	M12	LIEBHERR 9250
2019-11-09	M7_1235_B01	CAT785C	EX72	8.88	1077.3	186.53	346.5	M7	LIEBHERR 9350
2019-11-09	M7_1235_B01	CAT785C	EX72	5.78	1795.5	202.17	532.9	M7	LIEBHERR 9350
2019-11-09	M7_1225_B07	CAT785C	EX72	5.30	205.2	21.18	581.2	M7	LIEBHERR 9350
2019-11-09	M7_1235_B01	CAT785C	EX72	7.48	820.8	119.67	411.5	M7	LIEBHERR 9350
2019-11-10	M12_1265_B07	EH3500	EX108	5.03	1094.8	85.58	767.5	M12	LIEBHERR 9350
2019-11-10	M12_1265_B17	CAT785C	EX108	3.63	102.6	7.27	847.2	M12	LIEBHERR 9350
2019-11-10	M12_1265_B17	EH3500	EX108	4.14	2254.0	144.78	934.1	M12	LIEBHERR 9350
2019-11-10	M12_1265_B17	EH3500	EX108	5.54	193.2	16.62	697.6	M12	LIEBHERR 9350
2019-11-10	M11_1285_B05	CAT785C	EX109	2.28	51.3	2.28	1348.0	M11	LIEBHERR 9350
2019-11-10	M11_1285_B05	EH3500	EX109	3.38	4765.6	250.23	1142.7	M11	LIEBHERR 9350
2019-11-10	M11_1285_B05	CAT785C	EX109	2.08	51.3	2.08	1477.4	M11	LIEBHERR 9350
2019-11-10	M11_1285_B05	EH3500	EX109	3.28	4186.0	213.20	1178.0	M11	LIEBHERR 9350
2019-11-10	M11_1285_B05	CAT785C	EX109	3.38	102.6	6.77	909.8	M11	LIEBHERR 9350
2019-11-10	M11_1285_B05	EH3500	EX109	4.16	2511.6	162.22	929.0	M11	LIEBHERR 9350
2019-11-10	M14_1385_B19	CAT785C	EX29	2.54	4155.3	205.38	1213.9	M14	LIEBHERR 9350 E
2019-11-10	M14_1395_B17	EH3500	EX29	2.49	2962.4	114.72	1549.4	M14	LIEBHERR 9350 E
2019-11-10	M14_1395_B17	CAT785C	EX29	2.48	2565.0	124.20	1239.1	M14	LIEBHERR 9350 E
2019-11-10	M14_1395_B17	EH3500	EX29	3.56	772.8	42.77	1084.2	M14	LIEBHERR 9350 E
2019-11-10	M14_1395_B38	CAT785C	EX29	2.43	2205.9	104.33	1268.6	M14	LIEBHERR 9350 E
2019-11-10	M14_1395_B38	EH3500	EX29	3.67	386.4	22.02	1053.0	M14	LIEBHERR 9350 E
2019-11-10	M11_1315_B37	CAT785C	EX30	3.01	153.9	9.02	1024.1	M11	LIEBHERR 9350 E
2019-11-10	M11_1315_B37	EH3500	EX30	4.40	515.2	35.20	878.2	M11	LIEBHERR 9350 E

2019-11-10	M11_1315_B37	EH3500	EX30	5.08	4314.8	340.58	760.1	M11	LIEBHERR 9350E
2019-11-10	M11_1315_B37	EH3500	EX30	4.27	3155.6	209.42	904.1	M11	LIEBHERR 9350E
2019-11-10	S3_1315_B03	CAT785C	EX51	3.36	2821.5	184.83	915.9	S3	EX2500-6
2019-11-10	S3_1315_B03	CAT785C	EX51	3.26	359.1	22.80	945.0	S3	EX2500-6
2019-11-10	S3_1315_B03	EH3500	EX51	4.04	3477.6	218.22	956.2	S3	EX2500-6
2019-11-10	S3_1315_B03	EH3500	EX51	4.18	3864.0	250.97	923.8	S3	EX2500-6
2019-11-10	W2_1325_B103	CAT785C	EX57	2.92	2924.1	166.30	1055.0	W2	EX2500-6
2019-11-10	W2_1325_B103	CAT785C	EX57	3.16	3129.3	192.92	973.3	W2	EX2500-6
2019-11-10	W2_1325_B103	EH3500	EX57	2.80	64.4	2.80	1380.0	W2	EX2500-6
2019-11-10	W2_1325_B103	CAT785C	EX57	3.48	3591.0	243.82	883.7	W2	EX2500-6
2019-11-10	M11_1295_B08	CAT785C	EX58	3.73	102.6	7.47	824.5	M11	LIEBHERR 9350E
2019-11-10	M11_1295_B08	EH3500	EX58	5.12	3992.8	317.48	754.6	M11	LIEBHERR 9350E
2019-11-10	M11_1295_B08	CAT785C	EX58	4.07	205.2	16.27	756.9	M11	LIEBHERR 9350E
2019-11-10	M11_1295_B08	EH3500	EX58	5.39	3606.4	301.60	717.5	M11	LIEBHERR 9350E
2019-11-10	M11_1295_B08	EH3500	EX58	7.31	2254.0	256.00	528.3	M11	LIEBHERR 9350E
2019-11-10	M13_1445_D03	CAT785C	EX59	2.38	1333.8	61.82	1294.6	M13	LIEBHERR 9350E
2019-11-10	M13_1445_D02	CAT785C	EX59	2.38	1231.2	57.07	1294.5	M13	LIEBHERR 9350E
2019-11-10	M13_1445_D03	CAT785C	EX59	2.31	1898.1	85.57	1331.0	M13	LIEBHERR 9350E
2019-11-10	M13_1445_D02	CAT785C	EX59	2.53	615.6	30.32	1218.3	M13	LIEBHERR 9350E
2019-11-10	M13_1445_D02	EH3500	EX59	2.98	2447.2	113.38	1295.0	M13	LIEBHERR 9350E
2019-11-10	M13_1445_D03	CAT785C	EX59	2.22	615.6	26.58	1389.4	M13	LIEBHERR 9350E

2019-11-10	M13_1445_D03	EH3500	EX59	2.72	708.4	29.87	1423.1	M13	LIEBHERR 9350 E
2019-11-10	M12_1265_B37	CAT785C	EX66	3.05	461.7	27.48	1008.0	M12	LIEBHERR 9250
2019-11-10	M12_1265_B37	EH3500	EX66	4.51	1674.4	117.13	857.7	M12	LIEBHERR 9250
2019-11-10	M12_1265_B37	CAT785C	EX66	3.23	3180.6	200.00	954.2	M12	LIEBHERR 9250
2019-11-10	M12_1265_B37	EH3500	EX66	4.51	128.8	9.02	857.1	M12	LIEBHERR 9250
2019-11-10	M12_1265_B37	CAT785C	EX66	3.82	2308.5	171.77	806.4	M12	LIEBHERR 9250
2019-11-10	M12_1245_B24	CAT785C	EX70	2.18	51.3	2.18	1409.8	M12	LIEBHERR 9250
2019-11-10	M12_1245_B24	EH3500	EX70	4.68	3413.2	247.97	825.9	M12	LIEBHERR 9250
2019-11-10	M12_1245_B24	CAT785C	EX70	3.06	256.5	15.28	1007.0	M12	LIEBHERR 9250
2019-11-10	M12_1245_B24	EH3500	EX70	4.31	1545.6	103.43	896.6	M12	LIEBHERR 9250
2019-11-10	M12_1245_B33	CAT785C	EX70	7.08	153.9	21.23	434.9	M12	LIEBHERR 9250
2019-11-10	M12_1245_B34	CAT785C	EX70	5.93	718.2	83.02	519.1	M12	LIEBHERR 9250
2019-11-10	M12_1245_B34	CAT785C	EX70	5.02	410.4	40.13	613.6	M12	LIEBHERR 9250
2019-11-10	M7_1235_B01	CAT785C	EX70	6.33	205.2	25.32	486.3	M7	LIEBHERR 9250
2019-11-10	M7_1225_B07	CAT785C	EX72	3.32	923.4	59.77	927.0	M7	LIEBHERR 9350
2019-11-10	M7_1225_B07	EH3500	EX72	4.68	644.0	46.78	825.9	M7	LIEBHERR 9350
2019-11-10	M7_1235_B102	CAT785C	EX72	3.95	359.1	27.63	779.7	M7	LIEBHERR 9350
2019-11-10	M7_1235_B102	EH3500	EX72	4.48	772.8	53.82	861.6	M7	LIEBHERR 9350
2019-11-10	M7_1235_B102	EH3500	EX72	6.09	322.0	30.47	634.1	M7	LIEBHERR 9350
2019-11-10	M12_1245_B24	CAT785C	EX74	2.31	461.7	20.75	1335.0	M12	LIEBHERR 9350
2019-11-10	M12_1245_B24	EH3500	EX74	3.04	1481.2	70.02	1269.3	M12	LIEBHERR 9350
2019-11-10	M12_1245_B33	CAT785C	EX74	5.70	307.8	34.22	539.7	M12	LIEBHERR 9350
2019-11-10	M12_1245_B33	EH3500	EX74	9.67	64.4	9.67	399.7	M12	LIEBHERR 9350
2019-11-10	M12_1245_B24	CAT785C	EX74	2.53	359.1	17.68	1218.4	M12	LIEBHERR 9350
2019-11-10	M12_1245_B24	EH3500	EX74	3.72	1996.4	115.28	1039.0	M12	LIEBHERR 9350
2019-11-11	M11_1285_B05	CAT785C	EX109	3.05	51.3	3.05	1009.2	M11	LIEBHERR 9350
2019-11-11	M11_1285_B05	EH3500	EX109	4.00	3477.6	215.85	966.7	M11	LIEBHERR 9350
2019-11-11	M11_1285_B05	EH3500	EX109	3.76	1545.6	90.33	1026.6	M11	LIEBHERR 9350

2019-11-11	M11_1285_B19	CAT785C	EX109	2.39	359.1	16.75	1286.3	M11	LIEBHERR 9350
2019-11-11	M11_1285_B19	EH3500	EX109	3.81	1352.4	80.05	1013.7	M11	LIEBHERR 9350
2019-11-11	M11_1285_B19	EH3500	EX109	3.59	3348.8	186.72	1076.1	M11	LIEBHERR 9350
2019-11-11	M14_1395_B17	EH3500	EX29	4.70	128.8	9.40	822.1	M14	LIEBHERR 9350 E
2019-11-11	M14_1395_B38	EH3500	EX29	3.72	3220.0	186.10	1038.2	M14	LIEBHERR 9350 E
2019-11-11	M14_1395_B17	EH3500	EX29	4.47	966.0	67.05	864.4	M14	LIEBHERR 9350 E
2019-11-11	M14_1395_B38	EH3500	EX29	3.07	3091.2	147.47	1257.7	M14	LIEBHERR 9350 E
2019-11-11	M14_1395_B17	EH3500	EX29	3.87	3606.4	216.92	997.5	M14	LIEBHERR 9350 E
2019-11-11	M14_1395_B38	EH3500	EX29	4.47	1738.8	120.80	863.6	M14	LIEBHERR 9350 E
2019-11-11	M11_1315_B37	EH3500	EX30	4.39	1932.0	131.80	879.5	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B37	CAT785C	EX30	3.68	205.2	14.73	835.7	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B37	EH3500	EX30	4.68	3220.0	233.83	826.2	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B37	CAT785C	EX30	2.72	51.3	2.72	1133.0	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B37	EH3500	EX30	4.87	3091.2	233.65	793.8	M11	LIEBHERR 9350 E
2019-11-11	S3_1315_B03	CAT785C	EX51	3.18	2667.6	165.32	968.2	S3	EX2500-6
2019-11-11	S3_1315_B03	EH3500	EX51	3.71	966.0	55.65	1041.5	S3	EX2500-6
2019-11-11	S3_1315_B03	CAT785C	EX51	3.25	1949.4	123.68	945.7	S3	EX2500-6
2019-11-11	S3_1315_B03	CAT785C	EX51	4.34	359.1	30.35	709.9	S3	EX2500-6
2019-11-11	S3_1315_B03	EH3500	EX51	4.66	966.0	69.93	828.8	S3	EX2500-6
2019-11-11	W2_1325_B103	CAT785C	EX57	2.97	3488.4	202.05	1035.9	W2	EX2500-6
2019-11-11	W2_1325_B103	CAT785C	EX57	3.14	3591.0	219.55	981.4	W2	EX2500-6
2019-11-11	W2_1325_B103	CAT785C	EX57	3.40	1026.0	67.93	906.2	W2	EX2500-6
2019-11-11	W2_1325_B33	CAT785C	EX57	5.22	1795.5	182.77	589.4	W2	EX2500-6

2019-11-11	M11_1295_B08	EH3500	EX58	6.74	450.8	47.18	573.3	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B33	EH3500	EX58	4.98	193.2	14.93	776.2	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B36	EH3500	EX58	4.26	966.0	63.97	906.1	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B36	EH3500	EX58	3.83	4250.4	252.77	1008.9	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B33	EH3500	EX58	4.69	515.2	37.55	823.2	M11	LIEBHERR 9350 E
2019-11-11	M11_1315_B36	EH3500	EX58	4.15	2511.6	161.97	930.4	M11	LIEBHERR 9350 E
2019-11-11	M13_1445_D02	CAT785C	EX59	2.50	1795.5	87.60	1229.8	M13	LIEBHERR 9350 E
2019-11-11	M13_1445_D02	CAT785C	EX59	2.29	1282.5	57.37	1341.4	M13	LIEBHERR 9350 E
2019-11-11	M13_1445_D02	CAT785C	EX59	2.50	2052.0	100.00	1231.2	M13	LIEBHERR 9350 E
2019-11-11	M13_1445_D02	EH3500	EX59	2.72	64.4	2.72	1422.3	M13	LIEBHERR 9350 E
2019-11-11	M12_1265_B37	CAT785C	EX66	3.30	1077.3	69.35	932.1	M12	LIEBHERR 9250
2019-11-11	M12_1265_B37	EH3500	EX66	4.94	772.8	59.27	782.4	M12	LIEBHERR 9250
2019-11-11	M12_1265_B37	CAT785C	EX66	3.18	2000.7	124.13	967.0	M12	LIEBHERR 9250
2019-11-11	M12_1265_B37	EH3500	EX66	4.15	966.0	62.28	930.6	M12	LIEBHERR 9250
2019-11-11	M12_1265_B05	CAT785C	EX66	3.70	615.6	44.43	831.3	M12	LIEBHERR 9250
2019-11-11	M12_1265_B06	CAT785C	EX66	2.53	51.3	2.53	1215.0	M12	LIEBHERR 9250
2019-11-11	M12_1265_B37	CAT785C	EX66	3.16	1487.7	91.53	975.2	M12	LIEBHERR 9250
2019-11-11	S4_1365_B14	CAT785C	EX67	7.14	1026.0	142.82	431.0	S4	0
2019-11-11	S4_1355_B08	CAT785C	EX67	5.52	2154.6	231.70	557.9	S4	0
2019-11-11	S4_1365_B14	CAT785C	EX67	5.88	153.9	17.65	523.2	S4	0
2019-11-11	S4_1355_B08	CAT785C	EX67	5.47	1179.9	125.90	562.3	S4	0
2019-11-11	S4_1355_B11	CAT785C	EX69	4.50	1898.1	166.37	684.5	S4	LIEBHERR 9250
2019-11-11	M7_1235_B01	CAT785C	EX70	9.85	718.2	137.85	312.6	M7	LIEBHERR 9250

2019-11-11	M12_1245_B116	EH3500	EX70	5.31	2060.8	169.78	728.3	M12	LIEBHERR 9250
2019-11-11	M12_1245_B116	CAT785C	EX70	5.52	666.9	71.70	558.1	M12	LIEBHERR 9250
2019-11-11	M12_1245_B116	EH3500	EX70	6.36	1288.0	127.10	608.0	M12	LIEBHERR 9250
2019-11-11	M12_1245_B24	EH3500	EX70	6.04	128.8	12.08	639.6	M12	LIEBHERR 9250
2019-11-11	M12_1245_B24	EH3500	EX74	3.12	3413.2	165.47	1237.7	M12	LIEBHERR 9350
2019-11-11	M12_1265_B37	EH3500	EX74	3.77	64.4	3.77	1025.8	M12	LIEBHERR 9350
2019-11-11	M12_1245_B24	CAT785C	EX74	2.93	102.6	5.85	1052.3	M12	LIEBHERR 9350
2019-11-11	M12_1245_B24	EH3500	EX74	4.12	2318.4	148.17	938.8	M12	LIEBHERR 9350
2019-11-11	M12_1245_B24	EH3500	EX74	4.58	1932.0	137.28	844.4	M12	LIEBHERR 9350
2019-11-12	M12_1265_B17	CAT785C	EX108	4.54	513.0	45.42	677.7	M12	LIEBHERR 9350
2019-11-12	M12_1265_B17	EH3500	EX108	6.25	64.4	6.25	618.2	M12	LIEBHERR 9350
2019-11-12	M12_1265_B18	CAT785C	EX108	4.21	615.6	50.57	730.4	M12	LIEBHERR 9350
2019-11-12	M12_1265_B18	EH3500	EX108	6.48	1159.2	116.57	596.7	M12	LIEBHERR 9350
2019-11-12	M12_1265_B18	EH3500	EX108	3.75	3606.4	209.93	1030.7	M12	LIEBHERR 9350
2019-11-12	M11_1285_B19	EH3500	EX109	4.63	3542.0	254.80	834.1	M11	LIEBHERR 9350
2019-11-12	M11_1285_B19	EH3500	EX109	3.78	4057.2	238.25	1021.8	M11	LIEBHERR 9350
2019-11-12	M14_1395_B17	EH3500	EX29	4.31	1674.4	112.03	896.7	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B38	EH3500	EX29	4.33	3284.4	221.05	891.5	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B17	CAT785C	EX29	2.90	153.9	8.70	1061.4	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B17	EH3500	EX29	4.39	4443.6	302.85	880.4	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B38	EH3500	EX29	4.96	322.0	24.80	779.0	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B16	EH3500	EX29	5.30	1159.2	95.42	728.9	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B17	EH3500	EX29	5.98	257.6	23.93	645.8	M14	LIEBHERR 9350 E
2019-11-12	M14_1395_B38	CAT785C	EX29	3.92	102.6	7.83	785.9	M14	LIEBHERR 9350 E

2019-11-12	M14_1395_B38	EH3500	EX29	5.39	2640.4	220.92	717.1	M14	LIEBHERR 9350 E
2019-11-12	M11_1315_B37	CAT785C	EX30	2.87	359.1	20.12	1071.1	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B37	EH3500	EX30	4.31	2060.8	137.83	897.1	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B37	EH3500	EX30	4.10	4443.6	282.75	942.9	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B37	CAT785C	EX30	2.52	153.9	7.57	1220.4	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B37	EH3500	EX30	3.93	2511.6	153.08	984.4	M11	LIEBHERR 9350 E
2019-11-12	S3_1315_B03	CAT785C	EX51	3.39	3950.1	260.87	908.5	S3	EX2500-6
2019-11-12	S3_1315_B03	CAT785C	EX51	3.13	820.8	50.12	982.7	S3	EX2500-6
2019-11-12	S4_1355_B11	CAT785C	EX51	4.78	1744.2	162.57	643.7	S4	EX2500-6
2019-11-12	S4_1355_B06	CAT785C	EX51	4.03	3591.0	282.13	763.7	S4	EX2500-6
2019-11-12	S4_1355_B11	CAT785C	EX51	7.36	205.2	29.43	418.3	S4	EX2500-6
2019-11-12	W2_1325_B33	CAT785C	EX57	3.61	4565.7	321.62	851.8	W2	EX2500-6
2019-11-12	W2_1325_B33	CAT785C	EX57	4.70	3385.8	310.32	654.6	W2	EX2500-6
2019-11-12	W2_1325_B33	CAT785C	EX57	4.65	3283.2	297.50	662.2	W2	EX2500-6
2019-11-12	M11_1315_B33	EH3500	EX58	3.95	1803.2	110.58	978.4	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B36	CAT785C	EX58	2.18	0.0	2.18	0.0	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B36	EH3500	EX58	3.50	1481.2	83.98	1058.2	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B33	EH3500	EX58	4.32	3992.8	267.78	894.6	M11	LIEBHERR 9350 E
2019-11-12	M11_1315_B33	EH3500	EX58	4.12	3864.0	247.05	938.4	M11	LIEBHERR 9350 E
2019-11-12	M13_1445_D02	CAT785C	EX59	3.17	564.3	34.90	970.1	M13	LIEBHERR 9350 E
2019-11-12	M13_1445_D03	CAT785C	EX59	2.66	205.2	10.65	1156.1	M13	LIEBHERR 9350 E

2019-11-12	M13_1445_D02	CAT785C	EX59	2.70	974.7	51.32	1139.6	M13	LIEBHERR 9350 E
2019-11-12	M13_1455_D02	CAT785C	EX59	2.89	3591.0	202.65	1063.2	M13	LIEBHERR 9350 E
2019-11-12	M13_1455_D02	CAT785C	EX59	2.79	3950.1	215.02	1102.3	M13	LIEBHERR 9350 E
2019-11-12	M12_1265_B05	CAT785C	EX66	5.53	153.9	16.58	556.8	M12	LIEBHERR 9250
2019-11-12	M12_1265_B05	EH3500	EX66	5.40	386.4	32.42	715.2	M12	LIEBHERR 9250
2019-11-12	M12_1265_B06	CAT785C	EX66	3.28	205.2	13.12	938.7	M12	LIEBHERR 9250
2019-11-12	M12_1265_B17	CAT785C	EX66	5.03	820.8	80.55	611.4	M12	LIEBHERR 9250
2019-11-12	M12_1265_B17	CAT785C	EX66	4.53	51.3	4.53	679.0	M12	LIEBHERR 9250
2019-11-12	M14_1375_B02	CAT785C	EX66	3.87	1179.9	88.98	795.6	M14	LIEBHERR 9250
2019-11-12	M14_1375_B01	CAT785C	EX66	2.60	923.4	46.82	1183.4	M14	LIEBHERR 9250
2019-11-12	M14_1375_B02	CAT785C	EX66	3.54	1641.6	113.28	869.5	M14	LIEBHERR 9250
2019-11-12	W2_1335_B27	CAT785C	EX68	8.87	51.3	8.87	347.1	W2	0
2019-11-12	W2_1335_B27	CAT785C	EX68	7.15	1333.8	185.93	430.4	W2	0
2019-11-12	W2_1345_B115	CAT785C	EX68	6.17	256.5	30.85	498.9	W2	0
2019-11-12	W2_1335_B27	CAT785C	EX68	9.72	1385.1	262.38	316.7	W2	0
2019-11-12	S4_1355_B08	CAT785C	EX69	3.34	1641.6	106.82	922.1	S4	LIEBHERR 9250
2019-11-12	S4_1355_B11	CAT785C	EX69	3.62	1333.8	94.20	849.6	S4	LIEBHERR 9250
2019-11-12	S4_1355_B08	CAT785C	EX69	2.94	2513.7	144.02	1047.3	S4	LIEBHERR 9250
2019-11-12	S4_1355_B08	CAT785C	EX69	2.88	1898.1	106.70	1067.3	S4	LIEBHERR 9250
2019-11-12	M12_1245_B116	CAT785C	EX70	3.36	256.5	16.82	915.2	M12	LIEBHERR 9250
2019-11-12	M12_1245_B116	EH3500	EX70	4.83	1867.6	139.98	800.5	M12	LIEBHERR 9250
2019-11-12	M12_1245_B24	CAT785C	EX70	3.27	1333.8	85.10	940.4	M12	LIEBHERR 9250
2019-11-12	M12_1255_B230	CAT785C	EX70	4.36	307.8	26.18	705.3	M12	LIEBHERR 9250
2019-11-12	M12_1245_B24	CAT785C	EX70	3.53	51.3	3.53	871.1	M12	LIEBHERR 9250
2019-11-12	M12_1255_B230	CAT785C	EX70	4.41	872.1	74.97	698.0	M12	LIEBHERR 9250
2019-11-12	M12_1255_B230	EH3500	EX70	8.05	966.0	120.68	480.3	M12	LIEBHERR 9250
2019-11-12	M11_1285_B19	EH3500	EX72	2.97	128.8	5.93	1302.5	M11	LIEBHERR 9350

2019-11-12	M11_1285_B19	CAT785C	EX72	2.82	153.9	8.45	1092.8	M11	LIEBHERR 9350
2019-11-12	M11_1285_B19	EH3500	EX72	3.02	2447.2	114.90	1277.9	M11	LIEBHERR 9350
2019-11-12	M12_1245_B24	CAT785C	EX74	3.30	205.2	13.20	932.7	M12	LIEBHERR 9350
2019-11-12	M12_1245_B24	EH3500	EX74	4.37	2125.2	144.17	884.5	M12	LIEBHERR 9350
2019-11-12	M12_1245_B116	CAT785C	EX74	2.17	51.3	2.17	1420.6	M12	LIEBHERR 9350
2019-11-12	M12_1245_B116	EH3500	EX74	3.46	3155.6	169.70	1115.7	M12	LIEBHERR 9350
2019-11-12	M12_1245_B116	CAT785C	EX74	3.50	51.3	3.50	879.4	M12	LIEBHERR 9350
2019-11-12	M12_1245_B116	EH3500	EX74	4.59	2833.6	202.10	841.2	M12	LIEBHERR 9350
2019-11-13	M12_1265_B18	CAT785C	EX108	2.85	359.1	19.98	1078.2	M12	LIEBHERR 9350
2019-11-13	M12_1265_B18	EH3500	EX108	3.75	2318.4	135.15	1029.3	M12	LIEBHERR 9350
2019-11-13	M12_1265_B18	CAT785C	EX108	2.66	769.5	39.92	1156.7	M12	LIEBHERR 9350
2019-11-13	M12_1265_B18	EH3500	EX108	3.50	2962.4	161.22	1102.5	M12	LIEBHERR 9350
2019-11-13	M12_1265_B18	CAT785C	EX108	2.55	718.2	35.68	1207.6	M12	LIEBHERR 9350
2019-11-13	M12_1265_B18	EH3500	EX108	3.31	3026.8	155.77	1165.9	M12	LIEBHERR 9350
2019-11-13	M7_1225_B202	EH3500	EX109	4.06	2382.8	150.15	952.2	M7	LIEBHERR 9350
2019-11-13	M14_1395_B17	CAT785C	EX29	3.62	102.6	7.23	851.1	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B17	EH3500	EX29	5.12	64.4	5.12	755.2	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B38	CAT785C	EX29	2.99	205.2	11.95	1030.3	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B38	EH3500	EX29	3.73	2060.8	119.47	1035.0	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B38	EH3500	EX29	5.21	3864.0	312.50	741.9	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B118	CAT785C	EX29	4.01	307.8	24.05	767.9	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B118	EH3500	EX29	4.73	1996.4	146.48	817.7	M14	LIEBHERR 9350 E
2019-11-13	M14_1395_B38	EH3500	EX29	5.63	1481.2	129.55	686.0	M14	LIEBHERR 9350 E
2019-11-13	M11_1315_B33	EH3500	EX30	4.88	64.4	4.88	791.3	M11	LIEBHERR 9350 E

2019-11-13	M11_1315_B36	EH3500	EX30	4.53	1223.6	86.00	853.7	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B37	CAT785C	EX30	2.73	51.3	2.73	1126.1	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B37	EH3500	EX30	4.75	1030.4	75.93	814.2	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B36	EH3500	EX30	3.67	1867.6	106.50	1052.2	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B37	EH3500	EX30	3.43	2576.0	137.03	1127.9	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B36	EH3500	EX30	3.56	322.0	17.82	1084.4	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B37	EH3500	EX30	3.95	2704.8	165.83	978.6	M11	LIEBHERR 9350 E
2019-11-13	S4_1355_B06	CAT785C	EX51	3.54	3437.1	237.37	868.8	S4	EX2500-6
2019-11-13	S4_1355_B06	CAT785C	EX51	3.77	3437.1	252.68	816.1	S4	EX2500-6
2019-11-13	S4_1355_B06	CAT785C	EX51	4.75	2411.1	223.10	648.4	S4	EX2500-6
2019-11-13	W2_1325_B33	CAT785C	EX57	5.60	2359.8	257.42	550.0	W2	EX2500-6
2019-11-13	W2_1325_B33	CAT785C	EX57	4.44	2308.5	200.00	692.5	W2	EX2500-6
2019-11-13	W2_1335_B27	CAT785C	EX57	4.46	564.3	49.07	690.0	W2	EX2500-6
2019-11-13	W2_1335_B27	CAT785C	EX57	4.48	2770.2	241.68	687.7	W2	EX2500-6
2019-11-13	M11_1285_B19	EH3500	EX58	3.70	64.4	3.70	1044.3	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B29	EH3500	EX58	3.77	837.2	49.03	1024.4	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B33	EH3500	EX58	3.53	2447.2	134.25	1093.7	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B36	EH3500	EX58	5.02	64.4	5.02	770.2	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B29	EH3500	EX58	4.08	64.4	4.08	946.3	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B33	EH3500	EX58	3.45	2447.2	130.95	1121.3	M11	LIEBHERR 9350 E
2019-11-13	M11_1315_B33	EH3500	EX58	3.92	3799.6	231.05	986.7	M11	LIEBHERR 9350 E

2019-11-13	M13_1455_D01	CAT785C	EX59	2.83	2359.8	130.12	1088.2	M13	LIEBHERR 9350 E
2019-11-13	M13_1455_D02	CAT785C	EX59	3.53	564.3	38.85	871.5	M13	LIEBHERR 9350 E
2019-11-13	M13_1455_D01	CAT785C	EX59	2.92	4822.2	274.82	1052.8	M13	LIEBHERR 9350 E
2019-11-13	M13_1455_D01	CAT785C	EX59	2.67	5335.2	277.87	1152.0	M13	LIEBHERR 9350 E
2019-11-13	M14_1375_B01	CAT785C	EX66	2.46	1077.3	51.63	1251.9	M14	LIEBHERR 9250
2019-11-13	M14_1375_B01	CAT785C	EX66	2.36	974.7	44.92	1302.0	M14	LIEBHERR 9250
2019-11-13	M14_1375_B01	EH3500	EX66	3.29	193.2	9.87	1174.9	M14	LIEBHERR 9250
2019-11-13	M14_1375_B02	CAT785C	EX66	2.53	1744.2	85.95	1217.6	M14	LIEBHERR 9250
2019-11-13	M14_1375_B02	CAT785C	EX66	2.90	1487.7	83.97	1063.1	M14	LIEBHERR 9250
2019-11-13	W2_1335_B27	CAT785C	EX68	8.42	102.6	16.85	365.3	W2	0
2019-11-13	S4_1355_B08	CAT785C	EX69	3.09	3334.5	200.53	997.7	S4	LIEBHERR 9250
2019-11-13	S4_1355_B08	CAT785C	EX69	3.76	1846.8	135.43	818.2	S4	LIEBHERR 9250
2019-11-13	S4_1355_B08	CAT785C	EX69	5.96	1692.9	196.72	516.3	S4	LIEBHERR 9250
2019-11-13	M12_1255_B230	EH3500	EX70	9.10	386.4	54.60	424.6	M12	LIEBHERR 9250
2019-11-13	M12_1265_B16	EH3500	EX70	6.33	257.6	25.30	610.9	M12	LIEBHERR 9250
2019-11-13	M12_1265_B17	CAT785C	EX70	5.67	51.3	5.67	543.2	M12	LIEBHERR 9250
2019-11-13	M12_1265_B17	EH3500	EX70	6.68	837.2	86.82	578.6	M12	LIEBHERR 9250
2019-11-13	M12_1265_B16	CAT785C	EX70	4.56	718.2	63.83	675.1	M12	LIEBHERR 9250
2019-11-13	M12_1265_B16	EH3500	EX70	5.17	64.4	5.17	747.9	M12	LIEBHERR 9250
2019-11-13	M12_1265_B17	CAT785C	EX70	4.58	1077.3	96.25	671.6	M12	LIEBHERR 9250
2019-11-13	M12_1265_B17	EH3500	EX70	5.27	64.4	5.27	733.7	M12	LIEBHERR 9250
2019-11-13	M12_1265_B16	CAT785C	EX70	4.52	1282.5	113.00	681.0	M12	LIEBHERR 9250
2019-11-13	M12_1265_B16	EH3500	EX70	6.84	193.2	20.53	564.5	M12	LIEBHERR 9250
2019-11-13	M12_1265_B17	CAT785C	EX70	3.47	205.2	13.90	885.8	M12	LIEBHERR 9250
2019-11-13	M11_1285_B19	CAT785C	EX72	2.60	205.2	10.42	1182.0	M11	LIEBHERR 9350
2019-11-13	M11_1285_B19	EH3500	EX72	3.33	3091.2	159.92	1159.8	M11	LIEBHERR 9350
2019-11-13	M11_1285_B19	EH3500	EX72	3.29	3735.2	191.02	1173.3	M11	LIEBHERR 9350

2019-11-13	M11_1285_B19	EH3500	EX72	3.42	3992.8	212.05	1129.8	M11	LIEBHERR 9350
2019-11-13	M12_1245_B116	EH3500	EX74	4.33	2189.6	147.23	892.3	M12	LIEBHERR 9350
2019-11-13	M12_1245_B116	EH3500	EX74	3.60	3477.6	194.28	1074.0	M12	LIEBHERR 9350
2019-11-13	M12_1245_B116	CAT785C	EX74	3.49	153.9	10.47	882.2	M12	LIEBHERR 9350
2019-11-13	M12_1245_B116	EH3500	EX74	4.85	2189.6	164.77	797.3	M12	LIEBHERR 9350
2019-11-14	M12_1265_B18	CAT785C	EX108	2.34	153.9	7.03	1312.9	M12	LIEBHERR 9350
2019-11-14	M12_1265_B18	EH3500	EX108	4.56	1803.2	127.62	847.8	M12	LIEBHERR 9350
2019-11-14	M12_1265_B18	CAT785C	EX108	2.99	102.6	5.98	1028.9	M12	LIEBHERR 9350
2019-11-14	M12_1265_B18	EH3500	EX108	3.86	2576.0	154.52	1000.3	M12	LIEBHERR 9350
2019-11-14	M12_1265_B18	CAT785C	EX108	3.13	2411.1	147.18	982.9	M12	LIEBHERR 9350
2019-11-14	M12_1265_B18	EH3500	EX108	4.31	772.8	51.68	897.2	M12	LIEBHERR 9350
2019-11-14	M7_1225_B202	EH3500	EX109	4.23	3864.0	253.83	913.4	M7	LIEBHERR 9350
2019-11-14	M7_1225_B202	CAT785C	EX109	14.03	51.3	14.03	219.3	M7	LIEBHERR 9350
2019-11-14	M7_1225_B202	EH3500	EX109	6.44	193.2	19.33	599.6	M7	LIEBHERR 9350
2019-11-14	M7_1235_B01	CAT785C	EX109	14.01	359.1	98.10	219.6	M7	LIEBHERR 9350
2019-11-14	M7_1235_B17	CAT785C	EX109	15.98	51.3	15.98	192.6	M7	LIEBHERR 9350
2019-11-14	M7_1225_B202	CAT785C	EX109	2.61	153.9	7.82	1181.3	M7	LIEBHERR 9350
2019-11-14	M7_1225_B202	EH3500	EX109	6.23	64.4	6.23	619.9	M7	LIEBHERR 9350
2019-11-14	M7_1235_B01	CAT785C	EX109	8.48	666.9	110.25	362.9	M7	LIEBHERR 9350
2019-11-14	M14_1395_B118	CAT785C	EX29	4.38	564.3	48.15	703.2	M14	LIEBHERR 9350 E
2019-11-14	M14_1395_B118	EH3500	EX29	4.69	2898.0	210.85	824.7	M14	LIEBHERR 9350 E
2019-11-14	M14_1395_B118	EH3500	EX29	5.02	4314.8	336.38	769.6	M14	LIEBHERR 9350 E
2019-11-14	M14_1395_B17	EH3500	EX29	7.57	64.4	7.57	510.7	M14	LIEBHERR 9350 E
2019-11-14	M14_1395_B38	EH3500	EX29	7.39	193.2	22.18	522.6	M14	LIEBHERR 9350 E
2019-11-14	M14_1395_B118	EH3500	EX29	5.19	3284.4	264.57	744.9	M14	LIEBHERR 9350 E

2019-11-14	M14_1395_B38	EH3500	EX29	7.82	64.4	7.82	494.3	M14	LIEBHERR 9350 E
2019-11-14	M11_1315_B36	EH3500	EX30	4.35	2125.2	143.57	888.2	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B37	EH3500	EX30	4.55	2125.2	150.03	849.9	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B36	EH3500	EX30	3.99	966.0	59.80	969.2	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B37	CAT785C	EX30	2.98	102.6	5.97	1031.7	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B37	EH3500	EX30	3.94	3091.2	188.93	981.7	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B37	CAT785C	EX30	2.98	102.6	5.97	1031.7	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B37	EH3500	EX30	4.33	3413.2	229.25	893.3	M11	LIEBHERR 9350 E
2019-11-14	S4_1355_B06	CAT785C	EX51	3.26	1385.1	88.13	943.0	S4	EX2500-6
2019-11-14	S4_1355_B11	CAT785C	EX51	3.53	1692.9	116.45	872.3	S4	EX2500-6
2019-11-14	S4_1355_B11	CAT785C	EX51	3.71	3642.3	263.50	829.4	S4	EX2500-6
2019-11-14	S4_1355_B11	CAT785C	EX51	4.33	1590.3	134.12	711.5	S4	EX2500-6
2019-11-14	S4_1355_B18	CAT785C	EX51	3.87	1744.2	131.73	794.4	S4	EX2500-6
2019-11-14	M11_1315_B29	EH3500	EX58	4.09	837.2	53.18	944.5	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B33	CAT785C	EX58	2.52	102.6	5.03	1223.0	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B33	EH3500	EX58	3.97	2060.8	127.03	973.4	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B33	EH3500	EX58	3.95	2962.4	181.72	978.1	M11	LIEBHERR 9350 E
2019-11-14	M11_1315_B33	EH3500	EX58	3.60	3799.6	212.25	1074.1	M11	LIEBHERR 9350 E
2019-11-14	M13_1455_D01	CAT785C	EX59	2.63	3078.0	157.63	1171.6	M13	LIEBHERR 9350 E
2019-11-14	M13_1455_D01	CAT785C	EX59	2.82	4770.9	262.67	1089.8	M13	LIEBHERR 9350 E

2019-11-14	M13_1455_D01	CAT785C	EX59	3.18	5181.3	321.35	967.4	M13	LIEBHERR 9350 E
2019-11-14	S4_1365_B25	CAT785C	EX66	3.07	4206.6	251.57	1003.3	S4	LIEBHERR 9250
2019-11-14	S4_1365_B25	EH3500	EX66	4.25	64.4	4.25	909.2	S4	LIEBHERR 9250
2019-11-14	M14_1375_B01	CAT785C	EX66	2.17	51.3	2.17	1420.6	M14	LIEBHERR 9250
2019-11-14	S4_1365_B25	CAT785C	EX66	3.08	3847.5	231.33	997.9	S4	LIEBHERR 9250
2019-11-14	S4_1365_B25	EH3500	EX66	6.00	64.4	6.00	644.0	S4	LIEBHERR 9250
2019-11-14	W2_1325_B103	CAT785C	EX68	7.51	1128.6	165.13	410.1	W2	0
2019-11-14	W2_1325_B103	CAT785C	EX68	9.14	1744.2	310.87	336.6	W2	0
2019-11-14	W2_1325_B103	CAT785C	EX68	6.86	256.5	34.28	448.9	W2	0
2019-11-14	S4_1355_B08	CAT785C	EX69	3.68	1436.4	102.93	837.3	S4	LIEBHERR 9250
2019-11-14	S4_1365_B25	EH3500	EX69	5.04	128.8	10.08	766.4	S4	LIEBHERR 9250
2019-11-14	W2_1335_B27	CAT785C	EX69	3.35	3642.3	237.85	918.8	W2	LIEBHERR 9250
2019-11-14	W2_1335_B27	EH3500	EX69	4.59	515.2	36.75	841.1	W2	LIEBHERR 9250
2019-11-14	W2_1335_B27	CAT785C	EX69	3.09	3437.1	207.35	994.6	W2	LIEBHERR 9250
2019-11-14	M12_1265_B16	CAT785C	EX70	4.78	256.5	23.88	644.4	M12	LIEBHERR 9250
2019-11-14	M12_1265_B16	EH3500	EX70	5.13	257.6	20.52	753.3	M12	LIEBHERR 9250
2019-11-14	M12_1265_B17	CAT785C	EX70	3.88	51.3	3.88	792.6	M12	LIEBHERR 9250
2019-11-14	M12_1265_B18	CAT785C	EX70	3.41	923.4	61.38	902.6	M12	LIEBHERR 9250
2019-11-14	M12_1265_B18	EH3500	EX70	4.46	1481.2	102.55	866.6	M12	LIEBHERR 9250
2019-11-14	M12_1245_B18	CAT785C	EX70	3.21	1487.7	93.15	958.3	M12	LIEBHERR 9250
2019-11-14	M12_1245_B18	EH3500	EX70	3.68	128.8	7.37	1049.0	M12	LIEBHERR 9250
2019-11-14	M12_1265_B18	CAT785C	EX70	3.60	205.2	14.42	854.0	M12	LIEBHERR 9250
2019-11-14	M12_1265_B18	EH3500	EX70	4.03	128.8	8.07	958.0	M12	LIEBHERR 9250
2019-11-14	M12_1245_B18	CAT785C	EX70	3.38	256.5	16.92	909.8	M12	LIEBHERR 9250
2019-11-14	M12_1245_B18	EH3500	EX70	7.54	1159.2	135.70	512.5	M12	LIEBHERR 9250
2019-11-14	M11_1285_B19	EH3500	EX72	4.06	1030.4	64.95	951.9	M11	LIEBHERR 9350
2019-11-14	M11_1285_B19	EH3500	EX72	3.77	2704.8	158.38	1024.7	M11	LIEBHERR 9350
2019-11-14	M11_1285_B19	EH3500	EX72	3.66	4186.0	237.97	1055.4	M11	LIEBHERR 9350

2019-11-14	M12_1245_B116	CAT785C	EX74	4.19	256.5	20.95	734.6	M12	LIEBHERR 9350
2019-11-14	M12_1245_B116	EH3500	EX74	5.88	1674.4	152.95	656.8	M12	LIEBHERR 9350
2019-11-14	M12_1245_B04	EH3500	EX74	3.88	386.4	23.30	995.0	M12	LIEBHERR 9350
2019-11-14	M12_1245_B116	CAT785C	EX74	2.78	51.3	2.78	1105.9	M12	LIEBHERR 9350
2019-11-14	M12_1245_B116	EH3500	EX74	4.03	2833.6	177.32	958.8	M12	LIEBHERR 9350
2019-11-14	M12_1245_B04	EH3500	EX74	4.68	837.2	60.85	825.5	M12	LIEBHERR 9350
2019-11-14	M12_1245_B17	CAT785C	EX74	5.55	1128.6	122.07	554.7	M12	LIEBHERR 9350
2019-11-14	M12_1245_B17	EH3500	EX74	8.02	386.4	48.10	482.0	M12	LIEBHERR 9350
2019-11-15	M12_1265_B05	CAT785C	EX108	6.45	359.1	45.12	477.6	M12	LIEBHERR 9350
2019-11-15	M12_1265_B06	CAT785C	EX108	7.52	51.3	7.52	409.5	M12	LIEBHERR 9350
2019-11-15	M12_1265_B07	CAT785C	EX108	5.71	820.8	91.28	539.5	M12	LIEBHERR 9350
2019-11-15	M12_1265_B18	CAT785C	EX108	3.96	923.4	71.32	776.9	M12	LIEBHERR 9350
2019-11-15	M12_1245_B07	CAT785C	EX108	3.15	1385.1	85.08	976.8	M12	LIEBHERR 9350
2019-11-15	M12_1265_B05	CAT785C	EX108	6.95	102.6	13.90	442.9	M12	LIEBHERR 9350
2019-11-15	M11_1285_B19	CAT785C	EX108	4.03	51.3	4.03	763.1	M11	LIEBHERR 9350
2019-11-15	M12_1245_B07	CAT785C	EX108	2.86	1949.4	108.62	1076.9	M12	LIEBHERR 9350
2019-11-15	M12_1245_B07	EH3500	EX108	4.45	128.8	8.90	868.3	M12	LIEBHERR 9350
2019-11-15	M7_1225_B202	CAT785C	EX109	3.33	51.3	3.33	923.4	M7	LIEBHERR 9350
2019-11-15	M7_1225_B202	EH3500	EX109	4.70	2447.2	178.78	821.3	M7	LIEBHERR 9350
2019-11-15	M7_1235_B01	CAT785C	EX109	9.85	153.9	29.55	312.5	M7	LIEBHERR 9350
2019-11-15	M7_1225_B105	CAT785C	EX109	3.78	205.2	15.12	814.5	M7	LIEBHERR 9350
2019-11-15	M7_1225_B105	EH3500	EX109	6.46	128.8	12.92	598.3	M7	LIEBHERR 9350
2019-11-15	M7_1225_B202	CAT785C	EX109	5.19	307.8	31.13	593.2	M7	LIEBHERR 9350
2019-11-15	M7_1225_B202	EH3500	EX109	6.47	1352.4	135.77	597.7	M7	LIEBHERR 9350
2019-11-15	M11_1315_B33	CAT785C	EX109	2.22	102.6	4.43	1388.6	M11	LIEBHERR 9350
2019-11-15	M11_1315_B33	EH3500	EX109	4.03	257.6	16.13	958.0	M11	LIEBHERR 9350
2019-11-15	M7_1225_B105	CAT785C	EX109	3.75	974.7	71.22	821.2	M7	LIEBHERR 9350
2019-11-15	M7_1225_B205	CAT785C	EX109	3.85	205.2	15.38	800.3	M7	LIEBHERR 9350

2019-11-15	M14_1395_B118	EH3500	EX29	5.63	2189.6	191.37	686.5	M14	LIEBHERR 9350 E
2019-11-15	M14_1395_B118	EH3500	EX29	5.53	3606.4	309.57	699.0	M14	LIEBHERR 9350 E
2019-11-15	M14_1395_B118	EH3500	EX29	5.17	4443.6	356.95	746.9	M14	LIEBHERR 9350 E
2019-11-15	M11_1315_B37	CAT785C	EX30	3.60	205.2	14.42	854.0	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B37	EH3500	EX30	5.79	2962.4	266.22	667.7	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B33	EH3500	EX30	3.65	3026.8	171.72	1057.6	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B37	EH3500	EX30	4.37	708.4	48.10	883.7	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B33	CAT785C	EX30	2.64	153.9	7.93	1163.9	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B33	EH3500	EX30	3.98	2898.0	178.88	972.0	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B37	CAT785C	EX30	3.68	51.3	3.68	835.7	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B37	EH3500	EX30	4.89	644.0	48.93	789.6	M11	LIEBHERR 9350 E
2019-11-15	S3_1315_B206	CAT785C	EX51	4.14	1949.4	157.28	743.7	S3	EX2500-6
2019-11-15	S3_1315_B206	CAT785C	EX51	3.34	2565.0	167.12	920.9	S3	EX2500-6
2019-11-15	S3_1315_B206	CAT785C	EX51	3.16	2718.9	167.50	973.9	S3	EX2500-6
2019-11-15	M11_1315_B33	EH3500	EX58	3.56	4572.4	252.42	1086.9	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B33	EH3500	EX58	3.90	3735.2	226.17	990.9	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B33	CAT785C	EX58	2.83	205.2	11.32	1088.0	M11	LIEBHERR 9350 E
2019-11-15	M11_1315_B33	EH3500	EX58	3.85	4186.0	250.47	1002.8	M11	LIEBHERR 9350 E
2019-11-15	M13_1455_D01	CAT785C	EX59	2.86	1744.2	97.12	1077.6	M13	LIEBHERR 9350 E
2019-11-15	M13_1455_D01	EH3500	EX59	3.57	2382.8	132.08	1082.4	M13	LIEBHERR 9350 E

2019-11-15	M13_1455_D01	CAT785C	EX59	2.67	1846.8	96.07	1153.4	M13	LIEBHERR 9350 E
2019-11-15	M13_1455_D01	EH3500	EX59	3.44	2060.8	109.95	1124.6	M13	LIEBHERR 9350 E
2019-11-15	M13_1455_D01	CAT785C	EX59	2.65	1487.7	76.83	1161.8	M13	LIEBHERR 9350 E
2019-11-15	S4_1365_B25	CAT785C	EX66	3.21	1949.4	122.00	958.7	S4	LIEBHERR 9250
2019-11-15	S4_1365_B25	CAT785C	EX66	3.21	1179.9	73.85	958.6	S4	LIEBHERR 9250
2019-11-15	S4_1365_B25	CAT785C	EX66	3.84	1846.8	138.23	801.6	S4	LIEBHERR 9250
2019-11-15	W2_1325_B103	CAT785C	EX69	4.08	820.8	65.27	754.6	W2	LIEBHERR 9250
2019-11-15	W2_1325_B45	CAT785C	EX69	4.44	359.1	31.08	693.2	W2	LIEBHERR 9250
2019-11-15	W2_1325_B48	CAT785C	EX69	4.10	1128.6	90.13	751.3	W2	LIEBHERR 9250
2019-11-15	W2_1335_B27	CAT785C	EX69	3.71	1282.5	92.67	830.4	W2	LIEBHERR 9250
2019-11-15	W2_1325_B45	CAT785C	EX69	3.63	974.7	69.00	847.6	W2	LIEBHERR 9250
2019-11-15	W2_1325_B48	CAT785C	EX69	4.11	307.8	24.67	748.7	W2	LIEBHERR 9250
2019-11-15	W2_1335_B28	CAT785C	EX69	4.34	1282.5	108.47	709.4	W2	LIEBHERR 9250
2019-11-15	W2_1335_B28	CAT785C	EX69	3.95	3231.9	249.05	778.6	W2	LIEBHERR 9250
2019-11-15	M12_1245_B04	EH3500	EX70	6.93	644.0	69.27	557.8	M12	LIEBHERR 9250
2019-11-15	M12_1245_B18	EH3500	EX70	6.73	1674.4	174.97	574.2	M12	LIEBHERR 9250
2019-11-15	M12_1245_B04	CAT785C	EX70	8.72	205.2	34.88	352.9	M12	LIEBHERR 9250
2019-11-15	M12_1245_B04	EH3500	EX70	7.67	193.2	23.02	503.6	M12	LIEBHERR 9250
2019-11-15	M12_1245_B07	CAT785C	EX70	3.04	205.2	12.15	1013.3	M12	LIEBHERR 9250
2019-11-15	M12_1245_B07	EH3500	EX70	4.06	1610.0	101.55	951.3	M12	LIEBHERR 9250
2019-11-15	M12_1245_B07	CAT785C	EX70	3.75	359.1	26.27	820.3	M12	LIEBHERR 9250
2019-11-15	M12_1245_B07	EH3500	EX70	4.32	3477.6	233.47	893.7	M12	LIEBHERR 9250
2019-11-15	M11_1285_B19	EH3500	EX72	4.65	3670.8	265.10	830.8	M11	LIEBHERR 9350
2019-11-15	M11_1285_B19	EH3500	EX72	4.96	2769.2	213.38	778.7	M11	LIEBHERR 9350
2019-11-15	M11_1285_B19	CAT785C	EX72	2.91	513.0	29.13	1056.5	M11	LIEBHERR 9350
2019-11-15	M11_1285_B19	EH3500	EX72	4.31	2962.4	198.08	897.3	M11	LIEBHERR 9350
2019-11-15	M12_1245_B04	CAT785C	EX74	5.19	359.1	36.35	592.7	M12	LIEBHERR 9350

2019-11-15	M12_1245_B33	CAT785C	EX74	4.01	1795.5	140.45	767.0	M12	LIEBHERR 9350
2019-11-15	M12_1245_B33	EH3500	EX74	4.41	128.8	8.82	876.5	M12	LIEBHERR 9350
2019-11-15	M12_1245_B07	CAT785C	EX74	2.95	307.8	17.70	1043.4	M12	LIEBHERR 9350
2019-11-15	M12_1245_B07	EH3500	EX74	3.75	128.8	7.50	1030.4	M12	LIEBHERR 9350
2019-11-15	M12_1245_B33	CAT785C	EX74	4.07	102.6	8.13	756.9	M12	LIEBHERR 9350
2019-11-16	M12_1245_B07	CAT785C	EX108	2.97	3591.0	207.77	1037.0	M12	LIEBHERR 9350
2019-11-16	M12_1245_B07	CAT785C	EX108	2.79	1231.2	66.87	1104.8	M12	LIEBHERR 9350
2019-11-16	M12_1245_B07	CAT785C	EX108	2.50	359.1	17.48	1232.4	M12	LIEBHERR 9350
2019-11-16	M11_1295_B20	EH3500	EX109	3.51	1867.6	101.68	1102.0	M11	LIEBHERR 9350
2019-11-16	M11_1315_B33	CAT785C	EX109	2.25	102.6	4.50	1368.0	M11	LIEBHERR 9350
2019-11-16	M11_1315_B33	EH3500	EX109	3.94	579.6	35.48	980.1	M11	LIEBHERR 9350
2019-11-16	M11_1315_B34	EH3500	EX109	3.22	1610.0	80.60	1198.5	M11	LIEBHERR 9350
2019-11-16	M11_1295_B20	CAT785C	EX109	3.22	820.8	51.53	955.7	M11	LIEBHERR 9350
2019-11-16	M11_1295_B20	EH3500	EX109	4.21	1481.2	96.88	917.3	M11	LIEBHERR 9350
2019-11-16	M11_1295_B20	EH3500	EX109	4.02	644.0	40.20	961.2	M11	LIEBHERR 9350
2019-11-16	M14_1395_B118	CAT785C	EX29	3.90	102.6	7.80	789.2	M14	LIEBHERR 9350 E
2019-11-16	M14_1395_B118	EH3500	EX29	5.67	3864.0	340.38	681.1	M14	LIEBHERR 9350 E
2019-11-16	M14_1395_B118	CAT785C	EX29	4.32	2513.7	211.67	712.5	M14	LIEBHERR 9350 E
2019-11-16	M14_1395_B118	EH3500	EX29	4.86	128.8	9.72	795.3	M14	LIEBHERR 9350 E
2019-11-16	M14_1395_B118	CAT785C	EX29	4.57	1179.9	105.03	674.0	M14	LIEBHERR 9350 E
2019-11-16	M11_1315_B33	EH3500	EX30	5.32	772.8	63.85	726.2	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B37	EH3500	EX30	5.11	2962.4	235.28	755.4	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B36	EH3500	EX30	5.37	322.0	26.87	719.1	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B37	EH3500	EX30	4.98	1867.6	144.53	775.3	M11	LIEBHERR 9350 E

2019-11-16	M11_1315_B36	EH3500	EX30	4.70	837.2	61.15	821.5	M11	LIEBHERR 9350 E
2019-11-16	S3_1315_B206	CAT785C	EX51	3.44	2975.4	199.80	893.5	S3	EX2500-6
2019-11-16	S3_1315_B206	EH3500	EX51	4.16	193.2	12.48	928.6	S3	EX2500-6
2019-11-16	S3_1315_B206	CAT785C	EX51	3.29	1795.5	115.13	935.7	S3	EX2500-6
2019-11-16	M11_1315_B33	EH3500	EX58	5.33	2769.2	229.35	724.4	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B33	EH3500	EX58	4.34	386.4	26.03	890.6	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B37	EH3500	EX58	3.58	2254.0	125.43	1078.2	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B33	EH3500	EX58	4.11	322.0	20.55	940.1	M11	LIEBHERR 9350 E
2019-11-16	M11_1315_B37	EH3500	EX58	4.43	386.4	26.58	872.1	M11	LIEBHERR 9350 E
2019-11-16	M13_1455_D01	CAT785C	EX59	2.54	2257.2	111.77	1211.7	M13	LIEBHERR 9350 E
2019-11-16	M13_1455_D01	EH3500	EX59	3.69	128.8	7.38	1046.7	M13	LIEBHERR 9350 E
2019-11-16	M13_1445_D01	CAT785C	EX59	2.56	1333.8	66.47	1204.0	M13	LIEBHERR 9350 E
2019-11-16	M13_1445_D02	CAT785C	EX59	2.46	153.9	7.37	1253.5	M13	LIEBHERR 9350 E
2019-11-16	M13_1445_D01	CAT785C	EX59	3.60	666.9	46.83	854.4	M13	LIEBHERR 9350 E
2019-11-16	S4_1355_B02	CAT785C	EX66	3.39	3437.1	227.25	907.5	S4	LIEBHERR 9250
2019-11-16	S4_1365_B25	CAT785C	EX66	5.39	153.9	16.17	571.2	S4	LIEBHERR 9250
2019-11-16	S4_1355_B02	CAT785C	EX66	2.87	820.8	45.98	1071.0	S4	LIEBHERR 9250
2019-11-16	S4_1355_B02	CAT785C	EX66	2.99	820.8	47.92	1027.8	S4	LIEBHERR 9250
2019-11-16	W2_1335_B28	CAT785C	EX69	5.10	2411.1	239.70	603.5	W2	LIEBHERR 9250
2019-11-16	M12_1245_B07	CAT785C	EX70	3.35	513.0	33.53	917.9	M12	LIEBHERR 9250
2019-11-16	M12_1245_B07	EH3500	EX70	4.04	1932.0	121.25	956.0	M12	LIEBHERR 9250
2019-11-16	M12_1245_B34	EH3500	EX70	4.38	1352.4	91.90	883.0	M12	LIEBHERR 9250
2019-11-16	M12_1245_B34	EH3500	EX70	3.66	2962.4	168.58	1054.3	M12	LIEBHERR 9250

2019-11-16	M12_1245_B34	EH3500	EX70	7.07	257.6	28.30	546.1	M12	LIEBHERR 9250
2019-11-16	M11_1285_B19	EH3500	EX72	3.79	4701.2	276.93	1018.6	M11	LIEBHERR 9350
2019-11-16	M11_1285_B19	EH3500	EX72	3.18	1996.4	98.52	1215.9	M11	LIEBHERR 9350
2019-11-16	M11_1285_B19	EH3500	EX72	3.34	322.0	16.68	1158.0	M11	LIEBHERR 9350
2019-11-16	M12_1245_B07	CAT785C	EX74	2.54	102.6	5.08	1211.0	M12	LIEBHERR 9350
2019-11-16	M12_1245_B07	EH3500	EX74	3.74	1996.4	115.95	1033.1	M12	LIEBHERR 9350
2019-11-16	M12_1245_B07	CAT785C	EX74	2.72	51.3	2.72	1133.0	M12	LIEBHERR 9350
2019-11-16	M12_1245_B07	EH3500	EX74	4.53	257.6	18.13	852.4	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	CAT785C	EX108	2.81	3129.3	171.60	1094.2	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	EH3500	EX108	3.64	193.2	10.92	1061.9	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	CAT785C	EX108	2.69	820.8	42.98	1145.7	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	EH3500	EX108	3.39	1030.4	54.30	1138.6	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	CAT785C	EX108	3.48	513.0	34.78	884.9	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	EH3500	EX108	4.29	1996.4	132.88	901.4	M12	LIEBHERR 9350
2019-11-17	M11_1295_B20	EH3500	EX109	4.32	3928.4	263.33	895.1	M11	LIEBHERR 9350
2019-11-17	M11_1295_B20	EH3500	EX109	4.31	3670.8	245.50	897.1	M11	LIEBHERR 9350
2019-11-17	M11_1295_B20	EH3500	EX109	4.25	3026.8	199.85	908.7	M11	LIEBHERR 9350
2019-11-17	M14_1395_B118	CAT785C	EX29	3.90	1179.9	89.62	790.0	M14	LIEBHERR 9350 E
2019-11-17	M14_1395_B118	EH3500	EX29	4.50	3091.2	216.08	858.3	M14	LIEBHERR 9350 E
2019-11-17	M14_1395_B118	EH3500	EX29	4.75	4186.0	308.63	813.8	M14	LIEBHERR 9350 E
2019-11-17	M14_1395_B118	EH3500	EX29	7.71	966.0	115.72	500.9	M14	LIEBHERR 9350 E
2019-11-17	M14_1395_B18	CAT785C	EX29	5.15	359.1	36.03	597.9	M14	LIEBHERR 9350 E
2019-11-17	M14_1395_B18	EH3500	EX29	5.41	1416.8	119.12	713.7	M14	LIEBHERR 9350 E
2019-11-17	M11_1315_B36	EH3500	EX30	4.34	3992.8	268.97	890.7	M11	LIEBHERR 9350 E

2019-11-17	M11_1315_B36	EH3500	EX30	4.20	772.8	50.37	920.6	M11	LIEBHERR 9350 E
2019-11-17	M11_1315_B36	EH3500	EX30	4.76	1610.0	118.98	811.9	M11	LIEBHERR 9350 E
2019-11-17	W2_1325_B04	CAT785C	EX57	3.51	2565.0	175.73	875.8	W2	EX2500-6
2019-11-17	W2_1325_B04	CAT785C	EX57	3.61	4668.3	328.50	852.7	W2	EX2500-6
2019-11-17	W2_1325_B04	CAT785C	EX57	3.09	3283.2	197.93	995.2	W2	EX2500-6
2019-11-17	M11_1315_B33	EH3500	EX58	3.83	3928.4	233.70	1008.6	M11	LIEBHERR 9350 E
2019-11-17	M11_1315_B33	EH3500	EX58	3.87	4250.4	255.53	998.0	M11	LIEBHERR 9350 E
2019-11-17	M11_1315_B29	CAT785C	EX58	2.70	51.3	2.70	1140.0	M11	LIEBHERR 9350 E
2019-11-17	M11_1315_B29	EH3500	EX58	3.64	1223.6	69.07	1063.0	M11	LIEBHERR 9350 E
2019-11-17	M11_1315_B33	CAT785C	EX58	2.74	153.9	8.23	1121.5	M11	LIEBHERR 9350 E
2019-11-17	M11_1315_B33	EH3500	EX58	3.73	1416.8	81.98	1036.9	M11	LIEBHERR 9350 E
2019-11-17	M13_1445_D01	CAT785C	EX59	2.87	3898.8	218.38	1071.2	M13	LIEBHERR 9350 E
2019-11-17	M13_1445_D01	CAT785C	EX59	2.89	4822.2	271.45	1065.9	M13	LIEBHERR 9350 E
2019-11-17	M13_1445_D01	CAT785C	EX59	3.04	3437.1	203.63	1012.7	M13	LIEBHERR 9350 E
2019-11-17	S4_1355_B02	CAT785C	EX66	2.84	4668.3	258.65	1082.9	S4	LIEBHERR 9250
2019-11-17	S4_1355_B02	EH3500	EX66	4.10	193.2	12.30	942.4	S4	LIEBHERR 9250
2019-11-17	S4_1355_B02	CAT785C	EX66	3.64	4514.4	320.72	844.6	S4	LIEBHERR 9250
2019-11-17	S4_1355_B02	CAT785C	EX66	4.30	2667.6	223.85	715.0	S4	LIEBHERR 9250
2019-11-17	M12_1245_B34	CAT785C	EX70	2.57	2205.9	110.70	1195.6	M12	LIEBHERR 9250
2019-11-17	M12_1245_B34	EH3500	EX70	3.24	1996.4	100.55	1191.3	M12	LIEBHERR 9250
2019-11-17	M12_1245_B34	CAT785C	EX70	4.05	2462.4	194.62	759.2	M12	LIEBHERR 9250
2019-11-17	M12_1245_B34	EH3500	EX70	5.38	901.6	75.37	717.8	M12	LIEBHERR 9250
2019-11-17	M12_1245_B34	CAT785C	EX70	5.01	2359.8	230.57	614.1	M12	LIEBHERR 9250

2019-11-17	M11_1285_B19	EH3500	EX72	2.95	2704.8	123.80	1310.9	M11	LIEBHERR 9350
2019-11-17	M11_1285_B19	EH3500	EX72	3.32	901.6	46.47	1164.2	M11	LIEBHERR 9350
2019-11-17	M11_1285_B19	EH3500	EX72	3.44	1932.0	103.30	1122.2	M11	LIEBHERR 9350
2019-11-17	M12_1245_B07	CAT785C	EX74	2.58	205.2	10.32	1193.4	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	EH3500	EX74	3.79	2447.2	143.85	1020.7	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	CAT785C	EX74	2.74	102.6	5.48	1122.7	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	EH3500	EX74	4.19	3477.6	226.40	921.6	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	CAT785C	EX74	3.11	769.5	46.60	990.8	M12	LIEBHERR 9350
2019-11-17	M12_1245_B07	EH3500	EX74	3.95	1610.0	98.68	978.9	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	EH3500	EX108	4.03	2318.4	145.13	958.5	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	CAT785C	EX108	3.58	51.3	3.58	859.0	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	EH3500	EX108	4.24	579.6	38.18	910.8	M12	LIEBHERR 9350
2019-11-18	M12_1245_B126	CAT785C	EX108	3.77	51.3	3.77	817.2	M12	LIEBHERR 9350
2019-11-18	M12_1245_B126	EH3500	EX108	4.64	1416.8	102.05	833.0	M12	LIEBHERR 9350
2019-11-18	M12_1245_B24	EH3500	EX108	3.74	257.6	14.95	1033.8	M12	LIEBHERR 9350
2019-11-18	M12_1245_B126	CAT785C	EX108	5.51	102.6	11.02	558.8	M12	LIEBHERR 9350
2019-11-18	M12_1245_B126	EH3500	EX108	5.15	3155.6	252.38	750.2	M12	LIEBHERR 9350
2019-11-18	M11_1285_B19	EH3500	EX109	3.93	64.4	3.93	982.4	M11	LIEBHERR 9350
2019-11-18	M11_1295_B20	EH3500	EX109	4.09	3606.4	229.23	943.9	M11	LIEBHERR 9350
2019-11-18	M11_1295_B20	EH3500	EX109	5.26	2833.6	231.63	734.0	M11	LIEBHERR 9350
2019-11-18	M11_1295_B20	EH3500	EX109	4.43	2704.8	186.07	872.2	M11	LIEBHERR 9350
2019-11-18	M14_1395_B18	CAT785C	EX29	3.31	5094.8	281.22	1087.0	M14	LIEBHERR 9350 E
2019-11-18	M14_1395_B18	CAT785C	EX29	2.38	2052.0	95.30	1291.9	M14	LIEBHERR 9350 E
2019-11-18	M14_1395_B18	EH3500	EX29	3.12	2318.4	112.17	1240.2	M14	LIEBHERR 9350 E
2019-11-18	M11_1315_B36	EH3500	EX30	4.89	2576.0	195.65	790.0	M11	LIEBHERR 9350 E
2019-11-18	M11_1315_B42	EH3500	EX30	4.37	837.2	56.83	883.8	M11	LIEBHERR 9350 E

2019-11-18	M11_1315_B42	EH3500	EX30	3.86	193.2	11.57	1002.2	M11	LIEBHERR 9350 E
2019-11-18	S3_1315_B206	CAT785C	EX51	4.33	564.3	47.67	710.3	S3	EX2500-6
2019-11-18	S3_1315_B206	CAT785C	EX51	3.40	3026.7	200.82	904.3	S3	EX2500-6
2019-11-18	S3_1315_B206	CAT785C	EX51	3.26	3231.9	205.58	943.2	S3	EX2500-6
2019-11-18	W2_1325_B04	CAT785C	EX57	3.13	3494.8	187.80	1116.5	W2	EX2500-6
2019-11-18	W2_1335_B28	CAT785C	EX57	4.23	153.9	12.70	727.1	W2	EX2500-6
2019-11-18	W2_1325_B04	CAT785C	EX57	4.77	666.9	61.98	645.6	W2	EX2500-6
2019-11-18	W2_1335_B229	CAT785C	EX57	5.54	153.9	16.63	555.2	W2	EX2500-6
2019-11-18	W2_1335_B28	CAT785C	EX57	5.95	1026.0	119.07	517.0	W2	EX2500-6
2019-11-18	W2_1325_B04	CAT785C	EX57	3.15	1898.1	116.50	977.6	W2	EX2500-6
2019-11-18	M11_1315_B29	EH3500	EX58	4.56	386.4	27.35	847.7	M11	LIEBHERR 9350 E
2019-11-18	M11_1315_B33	EH3500	EX58	4.61	708.4	50.68	838.6	M11	LIEBHERR 9350 E
2019-11-18	M11_1315_B29	EH3500	EX58	4.47	2833.6	196.60	864.8	M11	LIEBHERR 9350 E
2019-11-18	M11_1315_B33	EH3500	EX58	3.98	1481.2	91.48	971.5	M11	LIEBHERR 9350 E
2019-11-18	M11_1315_B29	EH3500	EX58	3.10	64.4	3.10	1246.5	M11	LIEBHERR 9350 E
2019-11-18	M11_1315_B33	EH3500	EX58	4.03	4250.4	265.70	959.8	M11	LIEBHERR 9350 E
2019-11-18	M13_1445_D01	CAT785C	EX59	2.96	5710.7	308.12	1112.1	M13	LIEBHERR 9350 E
2019-11-18	M13_1445_D01	CAT785C	EX59	2.88	4565.7	256.75	1067.0	M13	LIEBHERR 9350 E
2019-11-18	M13_1445_D01	CAT785C	EX59	3.11	3642.3	221.05	988.6	M13	LIEBHERR 9350 E
2019-11-18	S4_1355_B02	CAT785C	EX66	4.58	3763.2	297.85	758.1	S4	LIEBHERR 9250
2019-11-18	S4_1355_B02	CAT785C	EX66	4.31	1487.7	125.07	713.7	S4	LIEBHERR 9250
2019-11-18	S4_1355_B02	CAT785C	EX66	4.91	1641.6	156.98	627.4	S4	LIEBHERR 9250
2019-11-18	M12_1245_B34	CAT785C	EX70	3.79	3425.7	231.05	889.6	M12	LIEBHERR 9250

2019-11-18	M12_1245_B34	EH3500	EX70	3.70	64.4	3.70	1044.3	M12	LIEBHERR 9250
2019-11-18	M12_1245_B34	CAT785C	EX70	4.61	1846.8	165.97	667.7	M12	LIEBHERR 9250
2019-11-18	M12_1245_B34	EH3500	EX70	3.94	515.2	31.52	980.8	M12	LIEBHERR 9250
2019-11-18	M12_1245_B34	CAT785C	EX70	5.31	2565.0	265.58	579.5	M12	LIEBHERR 9250
2019-11-18	M12_1245_B34	EH3500	EX70	5.31	193.2	15.93	727.5	M12	LIEBHERR 9250
2019-11-18	M11_1285_B19	EH3500	EX72	3.00	3864.0	179.97	1288.2	M11	LIEBHERR 9350
2019-11-18	M11_1285_B19	EH3500	EX72	3.31	3155.6	162.18	1167.4	M11	LIEBHERR 9350
2019-11-18	M11_1285_B19	CAT785C	EX72	3.05	102.6	6.10	1009.2	M11	LIEBHERR 9350
2019-11-18	M11_1285_B19	EH3500	EX72	4.08	3413.2	220.05	930.7	M11	LIEBHERR 9350
2019-11-18	M12_1245_B07	CAT785C	EX74	4.13	102.6	8.27	744.7	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	EH3500	EX74	4.20	2576.0	168.02	919.9	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	CAT785C	EX74	2.49	153.9	7.47	1236.7	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	EH3500	EX74	4.63	3091.2	222.40	834.0	M12	LIEBHERR 9350
2019-11-18	M12_1245_B07	EH3500	EX74	5.52	322.0	27.58	700.4	M12	LIEBHERR 9350
2019-11-18	M12_1245_B126	EH3500	EX74	5.25	1996.4	162.63	736.5	M12	LIEBHERR 9350
2019-11-19	M12_1245_B126	CAT785C	EX108	4.26	307.8	25.53	723.3	M12	LIEBHERR 9350
2019-11-19	M12_1245_B126	EH3500	EX108	5.31	2382.8	196.38	728.0	M12	LIEBHERR 9350
2019-11-19	M12_1245_B126	CAT785C	EX108	4.69	102.6	9.38	656.1	M12	LIEBHERR 9350
2019-11-19	M12_1245_B126	EH3500	EX108	4.91	2576.0	196.47	786.7	M12	LIEBHERR 9350
2019-11-19	M12_1245_B126	EH3500	EX108	4.27	2640.4	175.05	905.0	M12	LIEBHERR 9350
2019-11-19	M11_1295_B20	CAT785C	EX109	2.57	51.3	2.57	1199.2	M11	LIEBHERR 9350
2019-11-19	M11_1295_B20	EH3500	EX109	5.04	3155.6	246.83	767.1	M11	LIEBHERR 9350
2019-11-19	M11_1295_B08	EH3500	EX109	6.29	772.8	75.48	614.3	M11	LIEBHERR 9350
2019-11-19	M11_1295_B20	EH3500	EX109	4.36	2125.2	143.82	886.6	M11	LIEBHERR 9350
2019-11-19	M11_1295_B08	EH3500	EX109	5.80	257.6	23.20	666.2	M11	LIEBHERR 9350
2019-11-19	M11_1295_B20	EH3500	EX109	4.51	2704.8	189.42	856.8	M11	LIEBHERR 9350
2019-11-19	M14_1395_B18	CAT785C	EX29	2.28	51.3	2.28	1348.0	M14	LIEBHERR 9350 E
2019-11-19	M14_1395_B18	EH3500	EX29	3.12	5087.6	246.65	1237.6	M14	LIEBHERR 9350 E

2019-11-19	M14_1395_B18	EH3500	EX29	3.28	2576.0	131.27	1177.5	M14	LIEBHERR 9350 E
2019-11-19	M14_1395_B18	CAT785C	EX29	2.60	410.4	20.78	1184.8	M14	LIEBHERR 9350 E
2019-11-19	M14_1395_B18	EH3500	EX29	2.94	2769.2	126.28	1315.7	M14	LIEBHERR 9350 E
2019-11-19	S3_1315_B206	CAT785C	EX51	3.82	2513.7	187.05	806.3	S3	EX2500-6
2019-11-19	S3_1315_B206	CAT785C	EX51	3.28	2975.4	190.02	939.5	S3	EX2500-6
2019-11-19	S3_1315_B206	CAT785C	EX51	4.15	2872.8	232.25	742.2	S3	EX2500-6
2019-11-19	W2_1325_B04	CAT785C	EX57	3.78	2872.8	211.80	813.8	W2	EX2500-6
2019-11-19	W2_1325_B04	CAT785C	EX57	3.78	3385.8	249.53	814.1	W2	EX2500-6
2019-11-19	W2_1325_B04	CAT785C	EX57	3.60	3437.1	241.38	854.4	W2	EX2500-6
2019-11-19	M11_1315_B33	EH3500	EX58	4.05	3799.6	239.03	953.7	M11	LIEBHERR 9350 E
2019-11-19	M11_1315_B29	EH3500	EX58	4.49	2125.2	148.32	859.7	M11	LIEBHERR 9350 E
2019-11-19	M11_1315_B33	EH3500	EX58	4.86	1610.0	121.47	795.3	M11	LIEBHERR 9350 E
2019-11-19	M11_1315_B33	EH3500	EX58	3.94	2511.6	153.50	981.7	M11	LIEBHERR 9350 E
2019-11-19	M13_1445_D01	CAT785C	EX59	3.01	5950.8	349.10	1022.8	M13	LIEBHERR 9350 E
2019-11-19	M13_1445_D01	CAT785C	EX59	2.96	4052.7	234.05	1038.9	M13	LIEBHERR 9350 E
2019-11-19	M13_1445_D01	EH3500	EX59	3.49	579.6	31.43	1106.3	M13	LIEBHERR 9350 E
2019-11-19	M13_1445_D01	CAT785C	EX59	2.75	4052.7	217.08	1120.1	M13	LIEBHERR 9350 E
2019-11-19	M13_1445_D01	EH3500	EX59	4.06	1159.2	73.17	950.6	M13	LIEBHERR 9350 E
2019-11-19	S4_1355_B02	CAT785C	EX66	5.11	1333.8	132.97	601.9	S4	LIEBHERR 9250
2019-11-19	S4_1355_B11	CAT785C	EX66	3.31	513.0	33.08	930.4	S4	LIEBHERR 9250
2019-11-19	S4_1355_B02	CAT785C	EX66	3.93	820.8	62.95	782.3	S4	LIEBHERR 9250
2019-11-19	S4_1355_B11	CAT785C	EX66	3.40	3334.5	221.30	904.1	S4	LIEBHERR 9250

2019-11-19	S4_1355_B02	CAT785C	EX66	3.12	2103.3	127.73	988.0	S4	LIEBHERR 9250
2019-11-19	S4_1355_B11	CAT785C	EX66	2.67	1385.1	72.05	1153.4	S4	LIEBHERR 9250
2019-11-19	M14_1395_B18	CAT785C	EX69	2.17	153.9	6.50	1420.6	M14	LIEBHERR 9250
2019-11-19	M14_1395_B18	EH3500	EX69	3.57	1738.8	96.30	1083.4	M14	LIEBHERR 9250
2019-11-19	M12_1245_B126	CAT785C	EX70	6.30	820.8	100.85	488.3	M12	LIEBHERR 9250
2019-11-19	M12_1245_B126	EH3500	EX70	7.95	450.8	55.67	485.9	M12	LIEBHERR 9250
2019-11-19	M12_1245_B34	CAT785C	EX70	4.60	1128.6	101.10	669.8	M12	LIEBHERR 9250
2019-11-19	M12_1245_B34	EH3500	EX70	4.61	128.8	9.22	838.5	M12	LIEBHERR 9250
2019-11-19	M12_1245_B126	CAT785C	EX70	4.29	564.3	47.20	717.3	M12	LIEBHERR 9250
2019-11-19	M12_1245_B126	EH3500	EX70	5.71	1159.2	102.70	677.2	M12	LIEBHERR 9250
2019-11-19	M12_1245_B126	CAT785C	EX70	6.11	615.6	73.33	503.7	M12	LIEBHERR 9250
2019-11-19	M12_1245_B126	EH3500	EX70	4.86	1352.4	102.12	794.6	M12	LIEBHERR 9250
2019-11-19	M11_1285_B19	CAT785C	EX72	2.43	51.3	2.43	1264.9	M11	LIEBHERR 9350
2019-11-19	M11_1285_B19	EH3500	EX72	3.79	3542.0	208.52	1019.2	M11	LIEBHERR 9350
2019-11-19	M11_1285_B19	EH3500	EX72	3.53	1738.8	95.25	1095.3	M11	LIEBHERR 9350
2019-11-19	M11_1285_B19	CAT785C	EX72	2.56	153.9	7.68	1201.8	M11	LIEBHERR 9350
2019-11-19	M11_1285_B19	EH3500	EX72	3.11	2898.0	139.83	1243.5	M11	LIEBHERR 9350
2019-11-19	M13_1445_D02	CAT785C	EX73	7.77	256.5	38.85	396.1	M13	0
2019-11-19	M13_1455_D03	CAT785C	EX73	6.16	410.4	49.32	499.3	M13	0
2019-11-19	M12_1245_B126	EH3500	EX74	4.81	966.0	72.17	803.1	M12	LIEBHERR 9350
2019-11-19	M12_1265_B38	CAT785C	EX74	3.30	1385.1	89.15	932.2	M12	LIEBHERR 9350
2019-11-19	M12_1265_B38	CAT785C	EX74	3.41	2359.8	156.68	903.7	M12	LIEBHERR 9350
2019-11-19	M12_1265_B38	EH3500	EX74	3.99	193.2	11.98	967.3	M12	LIEBHERR 9350
2019-11-19	M12_1265_B38	CAT785C	EX74	3.42	923.4	61.58	899.7	M12	LIEBHERR 9350
2019-11-19	M12_1265_B38	EH3500	EX74	3.85	1932.0	115.62	1002.6	M12	LIEBHERR 9350
2019-11-20	M12_1245_B126	CAT785C	EX108	3.45	1436.4	96.62	892.0	M12	LIEBHERR 9350
2019-11-20	M12_1245_B126	EH3500	EX108	3.61	1352.4	75.85	1069.8	M12	LIEBHERR 9350
2019-11-20	M12_1245_B126	EH3500	EX108	5.97	1223.6	113.42	647.3	M12	LIEBHERR 9350
2019-11-20	M12_1245_B17	EH3500	EX108	8.52	193.2	25.57	453.4	M12	LIEBHERR 9350

2019-11-20	M12_1245_B34	EH3500	EX108	6.93	644.0	69.27	557.8	M12	LIEBHERR 9350
2019-11-20	M12_1245_B16	CAT785C	EX108	2.72	1026.0	54.47	1130.2	M12	LIEBHERR 9350
2019-11-20	M12_1245_B16	EH3500	EX108	3.57	64.4	3.57	1083.4	M12	LIEBHERR 9350
2019-11-20	M12_1245_B17	EH3500	EX108	5.49	1288.0	109.70	704.5	M12	LIEBHERR 9350
2019-11-20	M11_1295_B20	EH3500	EX109	5.95	708.4	65.42	649.7	M11	LIEBHERR 9350
2019-11-20	M11_1315_B16	EH3500	EX109	5.69	2189.6	193.33	679.5	M11	LIEBHERR 9350
2019-11-20	M11_1295_B08	EH3500	EX109	4.57	64.4	4.57	846.1	M11	LIEBHERR 9350
2019-11-20	M11_1315_B16	EH3500	EX109	4.61	3026.8	216.68	838.1	M11	LIEBHERR 9350
2019-11-20	M11_1295_B08	EH3500	EX109	4.07	3026.8	191.48	948.4	M11	LIEBHERR 9350
2019-11-20	M14_1395_B18	EH3500	EX29	2.30	128.8	4.60	1680.0	M14	LIEBHERR 9350 E
2019-11-20	S3_1315_B206	CAT785C	EX51	3.95	3026.7	232.88	779.8	S3	EX2500-6
2019-11-20	S3_1315_B206	CAT785C	EX51	2.82	3078.0	169.03	1092.6	S3	EX2500-6
2019-11-20	S3_1315_B03	CAT785C	EX51	2.59	359.1	18.13	1188.2	S3	EX2500-6
2019-11-20	S3_1315_B206	CAT785C	EX51	2.64	2462.4	126.78	1165.3	S3	EX2500-6
2019-11-20	W2_1325_B04	CAT785C	EX57	3.66	3334.5	237.93	840.9	W2	EX2500-6
2019-11-20	W2_1325_B04	CAT785C	EX57	2.96	4514.4	260.60	1039.4	W2	EX2500-6
2019-11-20	W2_1325_B04	CAT785C	EX57	2.87	2411.1	134.95	1072.0	W2	EX2500-6
2019-11-20	W2_1325_B04	EH3500	EX57	7.01	1094.8	119.10	551.5	W2	EX2500-6
2019-11-20	M11_1315_B33	EH3500	EX58	4.92	2189.6	167.12	786.1	M11	LIEBHERR 9350 E
2019-11-20	M11_1315_B42	EH3500	EX58	6.64	1094.8	112.80	582.3	M11	LIEBHERR 9350 E
2019-11-20	M11_1315_B42	CAT785C	EX58	2.17	51.3	2.17	1420.6	M11	LIEBHERR 9350 E
2019-11-20	M11_1315_B42	EH3500	EX58	5.24	3220.0	262.13	737.0	M11	LIEBHERR 9350 E
2019-11-20	M13_1445_D01	CAT785C	EX59	2.68	4463.1	232.77	1150.4	M13	LIEBHERR 9350 E
2019-11-20	M13_1445_D01	CAT785C	EX59	2.60	6104.7	309.43	1183.7	M13	LIEBHERR 9350 E

2019-11-20	M13_1445_D01	EH3500	EX59	4.71	128.8	9.42	820.7	M13	LIEBHERR 9350 E
2019-11-20	M13_1445_D01	CAT785C	EX59	3.45	4155.3	279.32	892.6	M13	LIEBHERR 9350 E
2019-11-20	M13_1445_D01	EH3500	EX59	5.58	193.2	16.73	692.7	M13	LIEBHERR 9350 E
2019-11-20	S4_1355_B02	CAT785C	EX66	2.91	1077.3	61.15	1057.0	S4	LIEBHERR 9250
2019-11-20	S4_1355_B11	CAT785C	EX66	2.73	2052.0	109.23	1127.1	S4	LIEBHERR 9250
2019-11-20	S4_1355_B02	CAT785C	EX66	3.37	4770.9	313.08	914.3	S4	LIEBHERR 9250
2019-11-20	S4_1355_B11	CAT785C	EX66	2.60	51.3	2.60	1183.8	S4	LIEBHERR 9250
2019-11-20	S4_1355_B02	CAT785C	EX66	3.15	1333.8	81.82	978.1	S4	LIEBHERR 9250
2019-11-20	S4_1355_B02	EH3500	EX66	3.92	2833.6	172.32	986.6	S4	LIEBHERR 9250
2019-11-20	M14_1395_B18	EH3500	EX69	3.69	4314.8	247.13	1047.6	M14	LIEBHERR 9250
2019-11-20	M14_1395_B18	EH3500	EX69	4.06	2769.2	174.60	951.6	M14	LIEBHERR 9250
2019-11-20	M14_1395_B16	EH3500	EX69	3.63	1094.8	61.68	1064.9	M14	LIEBHERR 9250
2019-11-20	M14_1395_B18	EH3500	EX69	3.64	3542.0	200.07	1062.2	M14	LIEBHERR 9250
2019-11-20	M12_1245_B126	CAT785C	EX70	4.05	1333.8	105.20	760.7	M12	LIEBHERR 9250
2019-11-20	M12_1245_B126	EH3500	EX70	5.22	1094.8	88.78	739.9	M12	LIEBHERR 9250
2019-11-20	M12_1265_B38	EH3500	EX70	3.94	966.0	59.10	980.7	M12	LIEBHERR 9250
2019-11-20	S3_1275_B201	CAT785C	EX70	3.28	153.9	9.85	937.5	S3	LIEBHERR 9250
2019-11-20	S3_1275_B201	CAT785C	EX70	3.72	2718.9	197.12	827.6	S3	LIEBHERR 9250
2019-11-20	M11_1285_B19	EH3500	EX72	3.69	4250.4	243.50	1047.3	M11	LIEBHERR 9350
2019-11-20	M11_1285_B19	EH3500	EX72	3.38	4186.0	219.82	1142.6	M11	LIEBHERR 9350
2019-11-20	M11_1285_B19	EH3500	EX72	3.12	3026.8	146.62	1238.7	M11	LIEBHERR 9350
2019-11-20	M13_1445_D03	CAT785C	EX73	6.03	564.3	66.28	510.8	M13	0
2019-11-20	M13_1455_D02	CAT785C	EX73	6.03	51.3	6.03	510.2	M13	0
2019-11-20	M13_1445_D03	CAT785C	EX73	6.13	1077.3	128.68	502.3	M13	0
2019-11-20	M13_1445_D03	CAT785C	EX73	6.04	1795.5	211.47	509.4	M13	0
2019-11-20	M12_1265_B38	EH3500	EX74	4.03	3477.6	217.53	959.2	M12	LIEBHERR 9350
2019-11-20	M12_1265_B38	EH3500	EX74	3.87	4379.2	263.18	998.4	M12	LIEBHERR 9350

2019-11-20	M12_1255_B08	CAT785C	EX74	3.75	102.6	7.50	820.8	M12	LIEBHERR 9350
2019-11-20	M12_1255_B09	CAT785C	EX74	4.39	615.6	52.63	701.8	M12	LIEBHERR 9350
2019-11-20	M12_1265_B38	CAT785C	EX74	2.84	102.6	5.68	1083.2	M12	LIEBHERR 9350
2019-11-20	M12_1265_B38	EH3500	EX74	4.49	1545.6	107.65	861.5	M12	LIEBHERR 9350
2019-11-21	M12_1245_B16	CAT785C	EX108	5.62	153.9	16.85	548.0	M12	LIEBHERR 9350
2019-11-21	M12_1265_B38	CAT785C	EX108	3.97	1026.0	79.40	775.3	M12	LIEBHERR 9350
2019-11-21	M12_1265_B38	EH3500	EX108	3.68	257.6	14.73	1049.0	M12	LIEBHERR 9350
2019-11-21	M12_1265_B38	CAT785C	EX108	3.60	615.6	43.20	855.0	M12	LIEBHERR 9350
2019-11-21	M12_1265_B33	CAT785C	EX108	2.99	102.6	5.98	1028.9	M12	LIEBHERR 9350
2019-11-21	M12_1265_B33	EH3500	EX108	4.66	2318.4	167.58	830.1	M12	LIEBHERR 9350
2019-11-21	M11_1295_B08	EH3500	EX109	3.90	2833.6	171.82	989.5	M11	LIEBHERR 9350
2019-11-21	M11_1295_B08	EH3500	EX109	4.83	1416.8	106.35	799.3	M11	LIEBHERR 9350
2019-11-21	M7_1225_B101	EH3500	EX109	4.53	1610.0	113.22	853.2	M7	LIEBHERR 9350
2019-11-21	M14_1395_B16	CAT785C	EX29	3.36	153.9	10.07	917.3	M14	LIEBHERR 9350 E
2019-11-21	M14_1395_B16	EH3500	EX29	5.33	579.6	48.00	724.5	M14	LIEBHERR 9350 E
2019-11-21	M14_1395_B18	CAT785C	EX29	2.94	1385.1	79.50	1045.4	M14	LIEBHERR 9350 E
2019-11-21	M14_1395_B18	EH3500	EX29	4.70	901.6	65.75	822.8	M14	LIEBHERR 9350 E
2019-11-21	M11_1305_B20	EH3500	EX30	7.29	386.4	43.77	529.7	M11	LIEBHERR 9350 E
2019-11-21	M11_1305_B21	EH3500	EX30	6.20	1288.0	124.05	623.0	M11	LIEBHERR 9350 E
2019-11-21	M11_1305_B20	EH3500	EX30	7.03	257.6	28.13	549.4	M11	LIEBHERR 9350 E
2019-11-21	M11_1305_B21	EH3500	EX30	4.98	1610.0	124.57	775.5	M11	LIEBHERR 9350 E
2019-11-21	M11_1305_B21	CAT785C	EX30	3.48	102.6	6.97	883.6	M11	LIEBHERR 9350 E
2019-11-21	M11_1305_B21	EH3500	EX30	6.25	2125.2	206.27	618.2	M11	LIEBHERR 9350 E

2019-11-21	S3_1315_B206	CAT785C	EX51	3.21	1846.8	115.60	958.5	S3	EX2500-6
2019-11-21	S3_1315_B206	EH3500	EX51	4.24	1932.0	127.28	910.7	S3	EX2500-6
2019-11-21	S3_1315_B03	CAT785C	EX51	3.57	256.5	17.87	861.4	S3	EX2500-6
2019-11-21	S3_1315_B03	EH3500	EX51	4.62	901.6	64.67	836.5	S3	EX2500-6
2019-11-21	S3_1315_B206	EH3500	EX51	3.88	193.2	11.63	996.4	S3	EX2500-6
2019-11-21	W2_1325_B04	CAT785C	EX57	2.58	102.6	5.17	1191.5	W2	EX2500-6
2019-11-21	W2_1325_B04	EH3500	EX57	4.88	3413.2	258.87	791.1	W2	EX2500-6
2019-11-21	W2_1325_B04	CAT785C	EX57	2.47	51.3	2.47	1247.8	W2	EX2500-6
2019-11-21	W2_1325_B04	EH3500	EX57	4.18	2704.8	175.48	924.8	W2	EX2500-6
2019-11-21	W2_1325_B04	EH3500	EX57	3.60	2833.6	158.58	1072.1	W2	EX2500-6
2019-11-21	M11_1315_B42	EH3500	EX58	5.01	3670.8	285.60	771.2	M11	LIEBHERR 9350 E
2019-11-21	M11_1315_B42	CAT785C	EX58	3.73	51.3	3.73	824.5	M11	LIEBHERR 9350 E
2019-11-21	M11_1315_B42	EH3500	EX58	5.53	1674.4	143.67	699.3	M11	LIEBHERR 9350 E
2019-11-21	M11_1315_B42	CAT785C	EX58	4.23	102.6	8.45	728.5	M11	LIEBHERR 9350 E
2019-11-21	M11_1315_B42	EH3500	EX58	8.01	708.4	88.07	482.6	M11	LIEBHERR 9350 E
2019-11-21	M13_1445_D01	CAT785C	EX59	2.89	3078.0	173.37	1065.3	M13	LIEBHERR 9350 E
2019-11-21	M13_1445_D01	CAT785C	EX59	2.75	3026.7	162.47	1117.8	M13	LIEBHERR 9350 E
2019-11-21	M13_1445_D01	CAT785C	EX59	2.65	2359.8	122.12	1159.4	M13	LIEBHERR 9350 E
2019-11-21	S4_1355_B02	EH3500	EX66	4.04	1223.6	76.85	955.3	S4	LIEBHERR 9250
2019-11-21	S4_1355_B08	CAT785C	EX66	3.81	2052.0	152.33	808.2	S4	LIEBHERR 9250
2019-11-21	S4_1355_B08	CAT785C	EX66	4.25	1744.2	144.43	724.6	S4	LIEBHERR 9250
2019-11-21	S4_1355_B08	CAT785C	EX66	2.82	51.3	2.82	1092.8	S4	LIEBHERR 9250
2019-11-21	S4_1355_B15	CAT785C	EX66	4.01	1590.3	124.17	768.5	S4	LIEBHERR 9250
2019-11-21	M14_1395_B18	CAT785C	EX69	4.49	2257.2	197.75	684.9	M14	LIEBHERR 9250

2019-11-21	M14_1395_B18	EH3500	EX69	4.98	708.4	54.77	776.1	M14	LIEBHERR 9250
2019-11-21	M14_1395_B18	CAT785C	EX69	3.85	1898.1	142.38	799.9	M14	LIEBHERR 9250
2019-11-21	M14_1385_B66	CAT785C	EX69	3.78	410.4	30.23	814.5	M14	LIEBHERR 9250
2019-11-21	M14_1395_B18	CAT785C	EX69	3.31	153.9	9.92	931.2	M14	LIEBHERR 9250
2019-11-21	S3_1275_B201	CAT785C	EX70	3.11	3693.6	224.08	989.0	S3	LIEBHERR 9250
2019-11-21	S3_1275_B201	CAT785C	EX70	4.06	2154.6	170.70	757.3	S3	LIEBHERR 9250
2019-11-21	S3_1275_B201	CAT785C	EX70	4.10	1949.4	155.68	751.3	S3	LIEBHERR 9250
2019-11-21	M11_1285_B19	EH3500	EX72	3.49	3864.0	209.25	1108.0	M11	LIEBHERR 9350
2019-11-21	M11_1285_B19	EH3500	EX72	4.04	2511.6	157.75	955.3	M11	LIEBHERR 9350
2019-11-21	M11_1285_B19	CAT785C	EX72	2.30	51.3	2.30	1338.3	M11	LIEBHERR 9350
2019-11-21	M11_1285_B19	EH3500	EX72	3.30	1803.2	92.37	1171.3	M11	LIEBHERR 9350
2019-11-21	M13_1445_D03	CAT785C	EX73	4.85	2616.3	247.55	634.1	M13	0
2019-11-21	M13_1445_D03	CAT785C	EX73	6.90	1077.3	144.87	446.2	M13	0
2019-11-21	M13_1445_D03	CAT785C	EX73	5.83	51.3	5.83	527.7	M13	0
2019-11-21	M12_1255_B09	CAT785C	EX74	5.09	1590.3	157.70	605.1	M12	LIEBHERR 9350
2019-11-21	M12_1255_B42	CAT785C	EX74	5.08	153.9	15.23	606.2	M12	LIEBHERR 9350
2019-11-21	M12_1255_B42	CAT785C	EX74	6.48	1026.0	129.65	474.8	M12	LIEBHERR 9350
2019-11-21	M12_1255_B42	CAT785C	EX74	4.82	718.2	67.45	638.9	M12	LIEBHERR 9350
2019-11-22	M12_1265_B33	EH3500	EX108	4.98	2576.0	199.15	776.1	M12	LIEBHERR 9350
2019-11-22	M12_1265_B33	CAT785C	EX108	2.82	51.3	2.82	1092.8	M12	LIEBHERR 9350
2019-11-22	M12_1265_B33	EH3500	EX108	4.45	2511.6	173.50	868.6	M12	LIEBHERR 9350
2019-11-22	M7_1225_B101	EH3500	EX109	4.34	708.4	47.70	891.1	M7	LIEBHERR 9350
2019-11-22	M7_1225_B101	CAT785C	EX109	2.27	153.9	6.80	1357.9	M7	LIEBHERR 9350
2019-11-22	M7_1225_B101	EH3500	EX109	3.60	2318.4	129.73	1072.2	M7	LIEBHERR 9350
2019-11-22	M14_1395_B16	EH3500	EX29	4.08	2447.2	154.85	948.2	M14	LIEBHERR 9350 E
2019-11-22	M14_1395_B18	EH3500	EX29	4.44	1738.8	119.90	870.1	M14	LIEBHERR 9350 E
2019-11-22	M14_1395_B16	EH3500	EX29	6.51	708.4	71.62	593.5	M14	LIEBHERR 9350 E

2019-11-22	M14_1395_B18	CAT785C	EX29	5.68	153.9	17.05	541.6	M14	LIEBHERR 9350 E
2019-11-22	M14_1395_B18	EH3500	EX29	6.99	386.4	41.93	552.9	M14	LIEBHERR 9350 E
2019-11-22	M11_1305_B21	EH3500	EX30	6.11	3091.2	293.35	632.3	M11	LIEBHERR 9350 E
2019-11-22	M11_1305_B21	EH3500	EX30	4.98	3155.6	243.98	776.0	M11	LIEBHERR 9350 E
2019-11-22	W2_1325_B04	CAT785C	EX57	3.19	1487.7	92.63	963.6	W2	EX2500-6
2019-11-22	W2_1325_B04	EH3500	EX57	3.72	1094.8	63.32	1037.5	W2	EX2500-6
2019-11-22	W2_1325_B57	CAT785C	EX57	4.19	718.2	58.70	734.1	W2	EX2500-6
2019-11-22	W2_1325_B57	CAT785C	EX57	3.64	2462.4	174.90	844.7	W2	EX2500-6
2019-11-22	W2_1325_B04	CAT785C	EX57	4.85	359.1	33.98	634.0	W2	EX2500-6
2019-11-22	W2_1325_B57	CAT785C	EX57	3.90	51.3	3.90	789.2	W2	EX2500-6
2019-11-22	M13_1445_D01	CAT785C	EX59	2.95	4155.3	239.12	1042.7	M13	LIEBHERR 9350 E
2019-11-22	M13_1445_D01	EH3500	EX59	3.43	1094.8	58.37	1125.4	M13	LIEBHERR 9350 E
2019-11-22	M13_1445_D101	CAT785C	EX59	2.76	102.6	5.52	1115.9	M13	LIEBHERR 9350 E
2019-11-22	M13_1445_D01	CAT785C	EX59	2.81	2616.3	143.15	1096.6	M13	LIEBHERR 9350 E
2019-11-22	M13_1445_D01	EH3500	EX59	3.04	1223.6	57.83	1269.4	M13	LIEBHERR 9350 E
2019-11-22	S4_1355_B15	CAT785C	EX66	3.32	513.0	33.23	926.2	S4	LIEBHERR 9250
2019-11-22	S4_1355_B15	EH3500	EX66	3.40	3477.6	183.78	1135.3	S4	LIEBHERR 9250
2019-11-22	S4_1355_B15	CAT785C	EX66	2.66	359.1	18.60	1158.4	S4	LIEBHERR 9250
2019-11-22	S4_1355_B15	EH3500	EX66	3.49	3735.2	202.37	1107.5	S4	LIEBHERR 9250
2019-11-22	M14_1385_B65	CAT785C	EX69	3.14	205.2	12.55	981.0	M14	LIEBHERR 9250
2019-11-22	M14_1385_B66	CAT785C	EX69	2.99	2975.4	173.27	1030.3	M14	LIEBHERR 9250
2019-11-22	M14_1385_B66	CAT785C	EX69	3.60	205.2	14.40	855.0	M14	LIEBHERR 9250
2019-11-22	S3_1275_B201	CAT785C	EX70	4.25	1590.3	131.65	724.8	S3	LIEBHERR 9250
2019-11-22	S3_1275_B201	CAT785C	EX70	4.41	1949.4	167.50	698.3	S3	LIEBHERR 9250

2019-11-22	S3_1275_B201	CAT785C	EX70	3.27	51.3	3.27	942.2	S3	LIEBHERR 9250
2019-11-22	M11_1285_B17	EH3500	EX72	3.87	1094.8	65.78	998.6	M11	LIEBHERR 9350
2019-11-22	M11_1285_B19	CAT785C	EX72	2.42	102.6	4.83	1273.7	M11	LIEBHERR 9350
2019-11-22	M11_1285_B19	EH3500	EX72	4.00	2833.6	176.05	965.7	M11	LIEBHERR 9350
2019-11-22	M11_1285_B17	EH3500	EX72	3.91	2769.2	168.10	988.4	M11	LIEBHERR 9350
2019-11-22	M14_1385_B13	CAT785C	EX74	2.35	102.6	4.70	1309.8	M14	LIEBHERR 9350
2019-11-22	M14_1385_B18	CAT785C	EX74	2.74	1077.3	57.57	1122.8	M14	LIEBHERR 9350
2019-11-22	M14_1385_B65	CAT785C	EX74	2.85	1179.9	65.47	1081.4	M14	LIEBHERR 9350
2019-11-22	M14_1385_B65	EH3500	EX74	4.04	386.4	24.27	955.4	M14	LIEBHERR 9350
2019-11-22	M14_1385_B19	CAT785C	EX74	2.36	461.7	21.25	1303.6	M14	LIEBHERR 9350
2019-11-22	M14_1385_B65	CAT785C	EX74	2.48	1077.3	52.08	1241.0	M14	LIEBHERR 9350
2019-11-22	M14_1385_B66	CAT785C	EX74	2.32	205.2	9.27	1328.6	M14	LIEBHERR 9350
2019-11-23	M12_1265_B33	CAT785C	EX108	2.92	513.0	29.18	1054.7	M12	LIEBHERR 9350
2019-11-23	M12_1265_B33	EH3500	EX108	3.63	3155.6	178.05	1063.4	M12	LIEBHERR 9350
2019-11-23	M12_1265_B33	CAT785C	EX108	3.98	153.9	11.93	773.8	M12	LIEBHERR 9350
2019-11-23	M12_1265_B33	EH3500	EX108	4.48	2318.4	161.23	862.7	M12	LIEBHERR 9350
2019-11-23	M12_1265_B33	EH3500	EX108	4.51	3348.8	234.70	856.1	M12	LIEBHERR 9350
2019-11-23	M7_1225_B101	CAT785C	EX109	3.02	974.7	57.30	1020.6	M7	LIEBHERR 9350
2019-11-23	M7_1225_B101	EH3500	EX109	3.65	1352.4	76.58	1059.6	M7	LIEBHERR 9350
2019-11-23	M7_1225_B101	EH3500	EX109	4.32	2254.0	151.37	893.5	M7	LIEBHERR 9350
2019-11-23	M7_1225_B103	EH3500	EX109	4.61	837.2	59.90	838.6	M7	LIEBHERR 9350
2019-11-23	M7_1225_B101	EH3500	EX109	3.43	64.4	3.43	1125.4	M7	LIEBHERR 9350
2019-11-23	M7_1225_B103	EH3500	EX109	5.08	1545.6	121.83	761.2	M7	LIEBHERR 9350
2019-11-23	M14_1395_B18	EH3500	EX29	5.24	3155.6	256.57	738.0	M14	LIEBHERR 9350 E
2019-11-23	M14_1395_B16	EH3500	EX29	9.33	450.8	65.30	414.2	M14	LIEBHERR 9350 E
2019-11-23	M14_1395_B18	EH3500	EX29	8.15	2125.2	268.97	474.1	M14	LIEBHERR 9350 E
2019-11-23	M14_1395_B16	EH3500	EX29	7.78	450.8	54.43	496.9	M14	LIEBHERR 9350 E

2019-11-23	M14_1395_B18	EH3500	EX29	8.07	1674.4	209.85	478.7	M14	LIEBHERR 9350 E
2019-11-23	M11_1305_B21	EH3500	EX30	6.31	193.2	18.93	612.3	M11	LIEBHERR 9350 E
2019-11-23	M11_1305_B21	CAT785C	EX30	2.51	513.0	25.15	1223.9	M11	LIEBHERR 9350 E
2019-11-23	M11_1305_B21	EH3500	EX30	4.13	1610.0	103.23	935.7	M11	LIEBHERR 9350 E
2019-11-23	M11_1305_B21	CAT785C	EX30	3.25	1744.2	110.67	945.7	M11	LIEBHERR 9350 E
2019-11-23	M11_1305_B21	EH3500	EX30	4.70	2189.6	159.92	821.5	M11	LIEBHERR 9350 E
2019-11-23	W2_1325_B04	CAT785C	EX57	4.42	974.7	84.03	695.9	W2	EX2500-6
2019-11-23	W2_1325_B33	CAT785C	EX57	4.70	1539.0	141.05	654.7	W2	EX2500-6
2019-11-23	W2_1325_B04	CAT785C	EX57	2.97	3744.9	216.67	1037.0	W2	EX2500-6
2019-11-23	W2_1325_B04	CAT785C	EX57	3.47	3693.6	249.90	886.8	W2	EX2500-6
2019-11-23	M13_1445_D01	CAT785C	EX59	2.52	2667.6	131.00	1221.8	M13	LIEBHERR 9350 E
2019-11-23	M13_1445_D01	CAT785C	EX59	2.73	3744.9	199.40	1126.9	M13	LIEBHERR 9350 E
2019-11-23	M13_1445_D01	CAT785C	EX59	2.88	3437.1	192.88	1069.2	M13	LIEBHERR 9350 E
2019-11-23	S4_1355_B15	CAT785C	EX66	2.38	102.6	4.77	1291.5	S4	LIEBHERR 9250
2019-11-23	S4_1355_B15	EH3500	EX66	2.76	3735.2	159.97	1401.0	S4	LIEBHERR 9250
2019-11-23	M12_1255_B20	CAT785C	EX69	3.44	820.8	55.00	895.4	M12	LIEBHERR 9250
2019-11-23	M12_1255_B20	EH3500	EX69	4.75	1159.2	85.52	813.3	M12	LIEBHERR 9250
2019-11-23	M12_1255_B20	CAT785C	EX69	3.70	153.9	11.10	831.9	M12	LIEBHERR 9250
2019-11-23	M12_1255_B20	EH3500	EX69	4.79	3220.0	239.28	807.4	M12	LIEBHERR 9250
2019-11-23	M12_1255_B20	CAT785C	EX69	3.23	564.3	35.57	952.0	M12	LIEBHERR 9250
2019-11-23	M12_1255_B20	EH3500	EX69	4.22	3220.0	210.98	915.7	M12	LIEBHERR 9250
2019-11-23	S3_1275_B201	CAT785C	EX70	5.28	1949.4	200.53	583.3	S3	LIEBHERR 9250
2019-11-23	S3_1275_B201	CAT785C	EX70	4.36	2462.4	209.18	706.3	S3	LIEBHERR 9250
2019-11-23	S3_1275_B201	CAT785C	EX70	5.76	923.4	103.60	534.8	S3	LIEBHERR 9250

2019-11-23	S3_1315_B206	CAT785C	EX70	3.43	1077.3	72.03	897.3	S3	LIEBHERR 9250
2019-11-23	M11_1285_B17	EH3500	EX72	3.01	4057.2	189.82	1282.5	M11	LIEBHERR 9350
2019-11-23	M11_1285_B17	CAT785C	EX72	3.98	51.3	3.98	772.7	M11	LIEBHERR 9350
2019-11-23	M11_1285_B17	EH3500	EX72	3.22	4186.0	209.23	1200.4	M11	LIEBHERR 9350
2019-11-23	M11_1285_B17	EH3500	EX72	2.66	3542.0	146.10	1454.6	M11	LIEBHERR 9350
2019-11-23	M14_1385_B65	CAT785C	EX74	3.14	256.5	15.72	979.2	M14	LIEBHERR 9350
2019-11-23	M14_1385_B66	CAT785C	EX74	3.52	923.4	63.35	874.6	M14	LIEBHERR 9350
2019-11-23	M14_1385_B23	CAT785C	EX74	2.41	2513.7	118.10	1277.1	M14	LIEBHERR 9350
2019-11-23	M14_1385_B66	CAT785C	EX74	2.81	461.7	25.25	1097.1	M14	LIEBHERR 9350
2019-11-23	M14_1385_B23	CAT785C	EX74	2.42	2205.9	104.03	1272.2	M14	LIEBHERR 9350
2019-11-24	M12_1265_B33	CAT785C	EX108	2.94	102.6	5.88	1046.3	M12	LIEBHERR 9350
2019-11-24	M12_1265_B33	EH3500	EX108	3.80	2125.2	125.38	1017.0	M12	LIEBHERR 9350
2019-11-24	M12_1255_B20	CAT785C	EX108	2.60	153.9	7.80	1183.8	M12	LIEBHERR 9350
2019-11-24	M12_1255_B20	EH3500	EX108	3.59	3670.8	204.73	1075.8	M12	LIEBHERR 9350
2019-11-24	M12_1265_B33	EH3500	EX108	4.53	193.2	13.58	853.4	M12	LIEBHERR 9350
2019-11-24	M12_1255_B20	CAT785C	EX108	3.27	410.4	26.13	942.2	M12	LIEBHERR 9350
2019-11-24	M12_1255_B20	EH3500	EX108	3.89	3091.2	186.50	994.5	M12	LIEBHERR 9350
2019-11-24	M7_1225_B103	EH3500	EX109	4.98	386.4	29.88	775.8	M7	LIEBHERR 9350
2019-11-24	M7_1225_B103	CAT785C	EX109	3.66	153.9	10.97	842.0	M7	LIEBHERR 9350
2019-11-24	M7_1225_B103	EH3500	EX109	4.35	2125.2	143.40	889.2	M7	LIEBHERR 9350
2019-11-24	M7_1225_B103	EH3500	EX109	4.00	2382.8	148.07	965.6	M7	LIEBHERR 9350
2019-11-24	M14_1395_B16	EH3500	EX29	6.03	193.2	18.08	641.0	M14	LIEBHERR 9350 E
2019-11-24	M14_1395_B18	EH3500	EX29	5.52	1352.4	115.92	700.0	M14	LIEBHERR 9350 E
2019-11-24	M14_1395_B18	EH3500	EX29	5.69	3155.6	278.88	678.9	M14	LIEBHERR 9350 E
2019-11-24	M14_1395_B18	CAT785C	EX29	4.11	153.9	12.33	748.7	M14	LIEBHERR 9350 E
2019-11-24	M14_1395_B18	EH3500	EX29	5.12	3284.4	261.12	754.7	M14	LIEBHERR 9350 E

2019-11-24	M11_1305_B21	CAT785C	EX30	3.64	461.7	32.78	845.0	M11	LIEBHERR 9350 E
2019-11-24	M11_1305_B21	EH3500	EX30	3.83	2576.0	153.37	1007.8	M11	LIEBHERR 9350 E
2019-11-24	M11_1305_B21	CAT785C	EX30	2.75	1539.0	82.65	1117.2	M11	LIEBHERR 9350 E
2019-11-24	M11_1305_B21	EH3500	EX30	4.10	3348.8	213.30	942.0	M11	LIEBHERR 9350 E
2019-11-24	M11_1305_B21	EH3500	EX30	4.03	3413.2	213.45	959.4	M11	LIEBHERR 9350 E
2019-11-24	W2_1325_B04	CAT785C	EX57	3.39	2667.6	176.40	907.3	W2	EX2500-6
2019-11-24	W2_1325_B04	CAT785C	EX57	3.99	2411.1	187.48	771.6	W2	EX2500-6
2019-11-24	W2_1325_B04	CAT785C	EX57	5.26	718.2	73.65	585.1	W2	EX2500-6
2019-11-24	W2_1335_B234	CAT785C	EX57	6.35	872.1	107.88	485.0	W2	EX2500-6
2019-11-24	M11_1315_B38	CAT785C	EX58	2.33	51.3	2.33	1319.1	M11	LIEBHERR 9350 E
2019-11-24	M11_1315_B38	EH3500	EX58	4.29	3026.8	201.83	899.8	M11	LIEBHERR 9350 E
2019-11-24	M13_1445_D01	CAT785C	EX59	2.75	923.4	49.53	1118.5	M13	LIEBHERR 9350 E
2019-11-24	M13_1445_D01	EH3500	EX59	3.52	128.8	7.05	1096.2	M13	LIEBHERR 9350 E
2019-11-24	M13_1445_D01	CAT785C	EX59	3.01	2103.3	123.27	1023.8	M13	LIEBHERR 9350 E
2019-11-24	M13_1445_D01	CAT785C	EX59	2.89	3796.2	213.95	1064.6	M13	LIEBHERR 9350 E
2019-11-24	S4_1355_B15	EH3500	EX66	3.56	2640.4	146.02	1085.0	S4	LIEBHERR 9250
2019-11-24	M12_1255_B20	CAT785C	EX69	3.56	1128.6	78.35	864.3	M12	LIEBHERR 9250
2019-11-24	M12_1255_B20	EH3500	EX69	4.24	1094.8	72.03	911.9	M12	LIEBHERR 9250
2019-11-24	M12_1255_B20	CAT785C	EX69	4.08	1898.1	150.97	754.4	M12	LIEBHERR 9250
2019-11-24	M12_1255_B20	EH3500	EX69	4.53	128.8	9.05	853.9	M12	LIEBHERR 9250
2019-11-24	M12_1255_B20	CAT785C	EX69	3.79	1949.4	144.02	812.2	M12	LIEBHERR 9250
2019-11-24	M12_1255_B20	EH3500	EX69	4.37	708.4	48.02	885.2	M12	LIEBHERR 9250
2019-11-24	S3_1315_B206	CAT785C	EX70	3.16	2513.7	154.90	973.7	S3	LIEBHERR 9250

2019-11-24	S3_1315_B206	CAT785C	EX70	5.00	1282.5	124.93	615.9	S3	LIEBHERR 9250
2019-11-24	S3_1315_B206	CAT785C	EX70	4.26	2667.6	221.70	721.9	S3	LIEBHERR 9250
2019-11-24	M11_1285_B17	EH3500	EX72	3.06	2447.2	116.23	1263.3	M11	LIEBHERR 9350
2019-11-24	M11_1285_B17	CAT785C	EX72	2.69	102.6	5.38	1143.5	M11	LIEBHERR 9350
2019-11-24	M11_1285_B17	EH3500	EX72	3.30	2447.2	125.30	1171.8	M11	LIEBHERR 9350
2019-11-24	M11_1285_B17	EH3500	EX72	3.97	2833.6	174.60	973.7	M11	LIEBHERR 9350
2019-11-24	M14_1385_B19	CAT785C	EX74	2.35	820.8	37.55	1311.5	M14	LIEBHERR 9350
2019-11-24	M14_1385_B23	CAT785C	EX74	2.41	410.4	19.28	1277.0	M14	LIEBHERR 9350
2019-11-24	M14_1385_B20	CAT785C	EX74	3.78	51.3	3.78	813.6	M14	LIEBHERR 9350
2019-11-24	M14_1395_B20	CAT785C	EX74	3.58	769.5	53.70	859.8	M14	LIEBHERR 9350
2019-11-24	M14_1385_B25	CAT785C	EX74	2.87	1026.0	57.38	1072.8	M14	LIEBHERR 9350
2019-11-24	M14_1385_B63	CAT785C	EX74	3.59	2718.9	190.50	856.3	M14	LIEBHERR 9350
2019-11-25	M12_1255_B20	CAT785C	EX108	3.20	2975.4	185.32	963.3	M12	LIEBHERR 9350
2019-11-25	M12_1255_B20	EH3500	EX108	4.29	322.0	21.43	901.4	M12	LIEBHERR 9350
2019-11-25	M12_1255_B20	CAT785C	EX108	3.80	1128.6	83.55	810.5	M12	LIEBHERR 9350
2019-11-25	M12_1255_B20	EH3500	EX108	4.24	1159.2	76.28	911.8	M12	LIEBHERR 9350
2019-11-25	M12_1255_B20	CAT785C	EX108	3.47	153.9	10.40	887.9	M12	LIEBHERR 9350
2019-11-25	M12_1255_B20	EH3500	EX108	4.69	322.0	23.45	823.9	M12	LIEBHERR 9350
2019-11-25	M7_1225_B103	EH3500	EX109	4.49	3284.4	228.90	860.9	M7	LIEBHERR 9350
2019-11-25	M7_1225_B103	EH3500	EX109	3.83	1610.0	95.67	1009.8	M7	LIEBHERR 9350
2019-11-25	M7_1225_B103	EH3500	EX109	4.17	644.0	41.70	926.6	M7	LIEBHERR 9350
2019-11-25	M14_1395_B18	EH3500	EX29	4.84	3864.0	290.42	798.3	M14	LIEBHERR 9350 E
2019-11-25	M14_1395_B16	EH3500	EX29	5.51	322.0	27.53	701.7	M14	LIEBHERR 9350 E
2019-11-25	M14_1395_B16	CAT785C	EX29	3.98	102.6	7.95	774.3	M14	LIEBHERR 9350 E
2019-11-25	M11_1305_B21	EH3500	EX30	6.05	1416.8	133.07	638.8	M11	LIEBHERR 9350 E
2019-11-25	M11_1305_B21	EH3500	EX30	4.77	193.2	14.32	809.7	M11	LIEBHERR 9350 E

2019-11-25	M11_1305_B21	EH3500	EX30	4.70	257.6	18.82	821.4	M11	LIEBHERR 9350 E
2019-11-25	W2_1335_B234	CAT785C	EX57	4.65	205.2	18.58	662.5	W2	EX2500-6
2019-11-25	W2_1335_B234	CAT785C	EX57	3.37	3078.0	201.95	914.5	W2	EX2500-6
2019-11-25	W2_1335_B234	CAT785C	EX57	4.79	1128.6	105.48	642.0	W2	EX2500-6
2019-11-25	M11_1315_B38	CAT785C	EX58	3.00	461.7	27.03	1024.7	M11	LIEBHERR 9350 E
2019-11-25	M11_1315_B38	EH3500	EX58	3.89	3284.4	198.40	993.3	M11	LIEBHERR 9350 E
2019-11-25	M11_1315_B38	EH3500	EX58	4.01	2125.2	132.32	963.7	M11	LIEBHERR 9350 E
2019-11-25	M11_1315_B38	EH3500	EX58	4.20	644.0	42.03	919.3	M11	LIEBHERR 9350 E
2019-11-25	M13_1445_D01	CAT785C	EX59	2.82	3693.6	202.82	1092.7	M13	LIEBHERR 9350 E
2019-11-25	M13_1445_D01	CAT785C	EX59	2.57	359.1	17.97	1199.2	M13	LIEBHERR 9350 E
2019-11-25	M13_1445_D01	CAT785C	EX59	3.15	513.0	31.50	977.1	M13	LIEBHERR 9350 E
2019-11-25	S4_1355_B15	CAT785C	EX66	2.64	359.1	18.48	1165.7	S4	LIEBHERR 9250
2019-11-25	S4_1355_B15	EH3500	EX66	3.97	2060.8	126.98	973.7	S4	LIEBHERR 9250
2019-11-25	S4_1355_B15	CAT785C	EX66	2.58	256.5	12.88	1194.6	S4	LIEBHERR 9250
2019-11-25	S4_1355_B15	EH3500	EX66	4.10	3864.0	246.00	942.4	S4	LIEBHERR 9250
2019-11-25	S4_1355_B15	CAT785C	EX66	4.51	153.9	13.52	683.2	S4	LIEBHERR 9250
2019-11-25	S4_1355_B15	EH3500	EX66	4.72	386.4	28.33	818.3	S4	LIEBHERR 9250
2019-11-25	M12_1255_B130	CAT785C	EX69	3.57	872.1	60.72	861.8	M12	LIEBHERR 9250
2019-11-25	M12_1255_B20	CAT785C	EX69	3.71	1436.4	103.93	829.2	M12	LIEBHERR 9250
2019-11-25	M12_1255_B20	CAT785C	EX69	3.48	1231.2	83.42	885.6	M12	LIEBHERR 9250
2019-11-25	M12_1255_B20	EH3500	EX69	4.37	579.6	39.33	884.1	M12	LIEBHERR 9250
2019-11-25	M12_1255_B12	CAT785C	EX69	3.68	102.6	7.37	835.7	M12	LIEBHERR 9250
2019-11-25	S3_1315_B03	CAT785C	EX70	2.94	2308.5	132.37	1046.4	S3	LIEBHERR 9250
2019-11-25	S3_1315_B206	CAT785C	EX70	3.94	359.1	27.55	782.1	S3	LIEBHERR 9250

2019-11-25	S3_1315_B03	CAT785C	EX70	2.87	2103.3	117.50	1074.0	S3	LIEBHERR 9250
2019-11-25	S3_1315_B206	CAT785C	EX70	3.24	1179.9	74.48	950.5	S3	LIEBHERR 9250
2019-11-25	S3_1315_B206	CAT785C	EX70	3.08	718.2	43.10	999.8	S3	LIEBHERR 9250
2019-11-25	M11_1285_B17	EH3500	EX72	3.59	3864.0	215.53	1075.7	M11	LIEBHERR 9350
2019-11-25	M11_1285_B17	EH3500	EX72	3.78	1159.2	68.03	1022.3	M11	LIEBHERR 9350
2019-11-25	M14_1385_B25	CAT785C	EX74	3.27	3129.3	199.30	942.1	M14	LIEBHERR 9350
2019-11-25	M14_1385_B63	CAT785C	EX74	3.46	410.4	27.65	890.6	M14	LIEBHERR 9350
2019-11-25	M14_1385_B07	CAT785C	EX74	3.08	205.2	12.33	998.3	M14	LIEBHERR 9350
2019-11-25	M14_1385_B07	CAT785C	EX74	3.13	102.6	6.25	985.0	M14	LIEBHERR 9350
2019-11-26	M12_1255_B19	CAT785C	EX108	3.02	51.3	3.02	1020.3	M12	LIEBHERR 9350
2019-11-26	M12_1255_B19	EH3500	EX108	5.49	2254.0	192.13	703.9	M12	LIEBHERR 9350
2019-11-26	M12_1255_B20	CAT785C	EX108	2.79	307.8	16.73	1103.7	M12	LIEBHERR 9350
2019-11-26	M12_1255_B20	EH3500	EX108	3.61	257.6	14.45	1069.6	M12	LIEBHERR 9350
2019-11-26	M12_1245_B03	CAT785C	EX108	4.33	923.4	77.92	711.1	M12	LIEBHERR 9350
2019-11-26	M12_1245_B03	EH3500	EX108	4.96	450.8	34.73	778.7	M12	LIEBHERR 9350
2019-11-26	M12_1255_B20	CAT785C	EX108	3.19	307.8	19.13	965.2	M12	LIEBHERR 9350
2019-11-26	M12_1255_B20	EH3500	EX108	4.62	837.2	60.12	835.6	M12	LIEBHERR 9350
2019-11-26	M12_1245_B03	CAT785C	EX108	3.76	769.5	56.35	819.3	M12	LIEBHERR 9350
2019-11-26	M12_1245_B03	EH3500	EX108	3.43	2640.4	140.77	1125.4	M12	LIEBHERR 9350
2019-11-26	M7_1225_B103	CAT785C	EX109	5.21	513.0	52.07	591.2	M7	LIEBHERR 9350
2019-11-26	M7_1225_B103	EH3500	EX109	5.74	837.2	74.60	673.4	M7	LIEBHERR 9350
2019-11-26	M7_1225_B103	EH3500	EX109	4.69	2060.8	149.93	824.7	M7	LIEBHERR 9350
2019-11-26	M7_1225_B103	CAT785C	EX109	3.04	256.5	15.22	1011.4	M7	LIEBHERR 9350
2019-11-26	M7_1225_B103	EH3500	EX109	4.32	2189.6	147.00	893.7	M7	LIEBHERR 9350
2019-11-26	M14_1395_B16	CAT785C	EX29	4.77	51.3	4.77	645.7	M14	LIEBHERR 9350 E
2019-11-26	M14_1395_B16	EH3500	EX29	4.89	4121.6	312.78	790.6	M14	LIEBHERR 9350 E
2019-11-26	M14_1395_B16	EH3500	EX29	3.93	5087.6	310.32	983.7	M14	LIEBHERR 9350 E

2019-11-26	M14_1395_B16	CAT785C	EX29	3.57	1026.0	71.32	863.2	M14	LIEBHERR 9350 E
2019-11-26	M14_1395_B16	EH3500	EX29	4.00	3477.6	216.12	965.5	M14	LIEBHERR 9350 E
2019-11-26	M11_1305_B20	EH3500	EX30	7.04	1352.4	147.93	548.5	M11	LIEBHERR 9350 E
2019-11-26	M11_1305_B21	EH3500	EX30	4.49	2189.6	152.57	861.1	M11	LIEBHERR 9350 E
2019-11-26	M11_1305_B21	EH3500	EX30	4.39	4379.2	298.30	880.8	M11	LIEBHERR 9350 E
2019-11-26	M11_1305_B21	EH3500	EX30	4.99	3670.8	284.57	774.0	M11	LIEBHERR 9350 E
2019-11-26	S4_1355_B07	CAT785C	EX51	3.35	1077.3	70.42	917.9	S4	EX2500-6
2019-11-26	S4_1355_B07	CAT785C	EX51	4.02	461.7	36.18	765.6	S4	EX2500-6
2019-11-26	W2_1335_B234	CAT785C	EX57	4.23	2770.2	228.18	728.4	W2	EX2500-6
2019-11-26	W2_1335_B234	CAT785C	EX57	3.10	3642.3	220.28	992.1	W2	EX2500-6
2019-11-26	W2_1335_B234	CAT785C	EX57	4.90	2513.7	239.93	628.6	W2	EX2500-6
2019-11-26	M11_1315_B38	CAT785C	EX58	2.98	1077.3	62.67	1031.5	M11	LIEBHERR 9350 E
2019-11-26	M11_1315_B38	EH3500	EX58	4.45	3091.2	213.72	867.8	M11	LIEBHERR 9350 E
2019-11-26	M11_1315_B38	EH3500	EX58	3.68	4314.8	246.83	1048.8	M11	LIEBHERR 9350 E
2019-11-26	M11_1315_B38	EH3500	EX58	4.70	3091.2	225.40	822.9	M11	LIEBHERR 9350 E
2019-11-26	M13_1445_D01	CAT785C	EX59	2.87	3334.5	186.53	1072.6	M13	LIEBHERR 9350 E
2019-11-26	M13_1445_D01	CAT785C	EX59	2.97	2308.5	133.77	1035.5	M13	LIEBHERR 9350 E
2019-11-26	M13_1445_D01	CAT785C	EX59	3.12	2103.3	128.05	985.5	M13	LIEBHERR 9350 E
2019-11-26	S4_1355_B15	CAT785C	EX66	4.82	51.3	4.82	639.0	S4	LIEBHERR 9250
2019-11-26	M12_1255_B12	CAT785C	EX69	4.21	1179.9	96.82	731.2	M12	LIEBHERR 9250
2019-11-26	M12_1255_B12	EH3500	EX69	4.85	64.4	4.85	796.7	M12	LIEBHERR 9250
2019-11-26	M12_1255_B13	CAT785C	EX69	4.35	51.3	4.35	707.6	M12	LIEBHERR 9250

2019-11-26	M12_1255_B42	CAT785C	EX69	4.90	666.9	63.65	628.7	M12	LIEBHERR 9250
2019-11-26	M12_1255_B12	CAT785C	EX69	4.71	307.8	28.25	653.7	M12	LIEBHERR 9250
2019-11-26	M12_1255_B14	CAT785C	EX69	3.85	359.1	26.95	799.5	M12	LIEBHERR 9250
2019-11-26	M12_1255_B20	CAT785C	EX69	4.74	1641.6	151.65	649.5	M12	LIEBHERR 9250
2019-11-26	M12_1255_B20	EH3500	EX69	6.06	193.2	18.18	637.5	M12	LIEBHERR 9250
2019-11-26	M12_1255_B20	CAT785C	EX69	4.22	3180.6	261.60	729.5	M12	LIEBHERR 9250
2019-11-26	S3_1315_B206	CAT785C	EX70	3.29	3642.3	233.28	936.8	S3	LIEBHERR 9250
2019-11-26	S3_1315_B206	CAT785C	EX70	2.96	2924.1	168.67	1040.2	S3	LIEBHERR 9250
2019-11-26	S3_1315_B206	CAT785C	EX70	3.35	2000.7	130.65	918.8	S3	LIEBHERR 9250
2019-11-26	M11_1285_B17	EH3500	EX72	3.53	3928.4	215.48	1093.8	M11	LIEBHERR 9350
2019-11-26	M11_1285_B17	EH3500	EX72	3.09	2962.4	142.12	1250.7	M11	LIEBHERR 9350
2019-11-26	M11_1285_B17	CAT785C	EX72	2.98	102.6	5.95	1034.6	M11	LIEBHERR 9350
2019-11-26	M11_1285_B17	EH3500	EX72	3.67	2576.0	146.62	1054.2	M11	LIEBHERR 9350
2019-11-26	M14_1385_B07	EH3500	EX74	4.22	64.4	4.22	916.4	M14	LIEBHERR 9350
2019-11-26	M14_1395_B14	CAT785C	EX74	2.36	256.5	11.78	1306.1	M14	LIEBHERR 9350
2019-11-26	M14_1395_B14	EH3500	EX74	4.04	1352.4	84.80	956.9	M14	LIEBHERR 9350
2019-11-26	M14_1405_FD	CAT785C	EX74	2.49	461.7	22.45	1233.9	M14	LIEBHERR 9350
2019-11-26	M14_1385_B07	CAT785C	EX74	2.98	153.9	8.95	1031.7	M14	LIEBHERR 9350
2019-11-26	M14_1405_FD	CAT785C	EX74	2.97	1179.9	68.20	1038.0	M14	LIEBHERR 9350
2019-11-26	M14_1405_FD	EH3500	EX74	3.78	515.2	30.25	1021.9	M14	LIEBHERR 9350
2019-11-27	M12_1245_B03	CAT785C	EX108	3.13	205.2	12.52	983.6	M12	LIEBHERR 9350
2019-11-27	M12_1245_B03	EH3500	EX108	3.78	2962.4	173.70	1023.3	M12	LIEBHERR 9350
2019-11-27	M12_1245_B03	CAT785C	EX108	2.86	153.9	8.57	1077.9	M12	LIEBHERR 9350
2019-11-27	M12_1245_B03	EH3500	EX108	4.20	2189.6	142.88	919.5	M12	LIEBHERR 9350
2019-11-27	M12_1245_B03	EH3500	EX108	3.45	2962.4	158.72	1119.9	M12	LIEBHERR 9350
2019-11-27	M7_1225_B103	EH3500	EX109	4.71	2447.2	178.98	820.4	M7	LIEBHERR 9350
2019-11-27	M7_1225_B103	EH3500	EX109	3.82	322.0	19.08	1012.4	M7	LIEBHERR 9350
2019-11-27	M7_1225_B205	EH3500	EX109	4.83	64.4	4.83	799.4	M7	LIEBHERR 9350
2019-11-27	M7_1225_B103	CAT785C	EX109	2.98	51.3	2.98	1031.7	M7	LIEBHERR 9350

2019-11-27	M7_1225_B103	EH3500	EX109	4.04	1030.4	64.67	956.0	M7	LIEBHERR 9350
2019-11-27	M14_1395_B16	EH3500	EX29	3.91	3542.0	215.25	987.3	M14	LIEBHERR 9350 E
2019-11-27	M14_1395_B16	EH3500	EX29	4.75	3542.0	260.98	814.3	M14	LIEBHERR 9350 E
2019-11-27	M14_1395_B16	EH3500	EX29	4.47	3799.6	263.45	865.3	M14	LIEBHERR 9350 E
2019-11-27	M11_1305_B21	EH3500	EX30	4.90	2511.6	191.17	788.3	M11	LIEBHERR 9350 E
2019-11-27	M11_1305_B21	CAT785C	EX30	4.92	51.3	4.92	626.0	M11	LIEBHERR 9350 E
2019-11-27	M11_1305_B21	EH3500	EX30	5.53	2318.4	199.13	698.5	M11	LIEBHERR 9350 E
2019-11-27	M11_1305_B21	EH3500	EX30	4.41	2640.4	180.70	876.7	M11	LIEBHERR 9350 E
2019-11-27	S4_1355_B06	CAT785C	EX51	5.38	820.8	86.10	572.0	S4	EX2500-6
2019-11-27	S4_1355_B07	CAT785C	EX51	4.49	1282.5	112.20	685.8	S4	EX2500-6
2019-11-27	S4_1355_B05	CAT785C	EX51	3.55	820.8	56.78	867.3	S4	EX2500-6
2019-11-27	S4_1355_B06	CAT785C	EX51	3.68	2359.8	169.15	837.1	S4	EX2500-6
2019-11-27	S4_1355_B05	CAT785C	EX51	3.67	2821.5	201.98	838.1	S4	EX2500-6
2019-11-27	W2_1335_B234	CAT785C	EX57	5.92	2052.0	236.97	519.6	W2	EX2500-6
2019-11-27	W2_1335_B234	CAT785C	EX57	4.57	3129.3	278.80	673.5	W2	EX2500-6
2019-11-27	W2_1335_B234	CAT785C	EX57	4.05	3026.7	239.15	759.4	W2	EX2500-6
2019-11-27	M11_1315_B34	CAT785C	EX58	3.57	307.8	21.42	862.3	M11	LIEBHERR 9350 E
2019-11-27	M11_1315_B34	EH3500	EX58	4.99	772.8	59.88	774.3	M11	LIEBHERR 9350 E
2019-11-27	M11_1315_B38	EH3500	EX58	4.64	966.0	69.58	833.0	M11	LIEBHERR 9350 E
2019-11-27	m11_1315_B43	EH3500	EX58	5.77	64.4	5.77	670.1	m11	LIEBHERR 9350 E
2019-11-27	M11_1315_B34	CAT785C	EX58	4.63	51.3	4.63	664.3	M11	LIEBHERR 9350 E
2019-11-27	M11_1315_B34	EH3500	EX58	4.37	1674.4	113.65	884.0	M11	LIEBHERR 9350 E

2019-11-27	M11_1315_B38	EH3500	EX58	5.02	1223.6	95.38	769.7	M11	LIEBHERR 9350 E
2019-11-27	M11_1315_B34	EH3500	EX58	4.90	515.2	39.20	788.6	M11	LIEBHERR 9350 E
2019-11-27	M11_1315_B38	EH3500	EX58	4.85	386.4	29.12	796.2	M11	LIEBHERR 9350 E
2019-11-27	m11_1315_B43	EH3500	EX58	4.06	1803.2	113.55	952.8	m11	LIEBHERR 9350 E
2019-11-27	M13_1445_D01	CAT785C	EX59	2.55	2000.7	99.27	1209.3	M13	LIEBHERR 9350 E
2019-11-27	M13_1445_D02	CAT785C	EX59	2.53	307.8	15.20	1215.0	M13	LIEBHERR 9350 E
2019-11-27	M12_1255_B20	CAT785C	EX69	4.14	1385.1	111.77	743.6	M12	LIEBHERR 9250
2019-11-27	M12_1255_B20	EH3500	EX69	7.24	322.0	36.18	533.9	M12	LIEBHERR 9250
2019-11-27	M12_1255_B42	CAT785C	EX69	5.13	51.3	5.13	599.6	M12	LIEBHERR 9250
2019-11-27	M12_1255_B12	CAT785C	EX69	4.79	410.4	38.32	642.6	M12	LIEBHERR 9250
2019-11-27	M12_1255_B230	EH3500	EX69	6.75	1352.4	141.85	572.0	M12	LIEBHERR 9250
2019-11-27	M12_1255_B42	CAT785C	EX69	3.24	102.6	6.48	949.5	M12	LIEBHERR 9250
2019-11-27	M12_1255_B230	CAT785C	EX69	4.06	1231.2	97.47	757.9	M12	LIEBHERR 9250
2019-11-27	M12_1255_B230	EH3500	EX69	5.87	1159.2	105.73	657.8	M12	LIEBHERR 9250
2019-11-27	S3_1315_B206	CAT785C	EX70	3.55	3488.4	241.12	868.1	S3	LIEBHERR 9250
2019-11-27	S3_1315_B206	CAT785C	EX70	3.47	4052.7	274.02	887.4	S3	LIEBHERR 9250
2019-11-27	S3_1315_B206	CAT785C	EX70	3.39	2718.9	179.70	907.8	S3	LIEBHERR 9250
2019-11-27	M11_1285_B17	CAT785C	EX72	2.57	51.3	2.57	1199.2	M11	LIEBHERR 9350
2019-11-27	M11_1285_B17	EH3500	EX72	3.21	3735.2	186.42	1202.2	M11	LIEBHERR 9350
2019-11-27	M11_1285_B17	EH3500	EX72	3.53	128.8	7.07	1093.6	M11	LIEBHERR 9350
2019-11-27	M11_1295_B08	CAT785C	EX72	3.03	256.5	15.13	1017.0	M11	LIEBHERR 9350
2019-11-27	M11_1295_B08	EH3500	EX72	4.21	1223.6	80.07	916.9	M11	LIEBHERR 9350
2019-11-27	M11_1295_B08	CAT785C	EX72	3.22	615.6	38.67	955.2	M11	LIEBHERR 9350
2019-11-27	M11_1295_B08	EH3500	EX72	4.06	1223.6	77.08	952.4	M11	LIEBHERR 9350
2019-11-27	M14_1385_B07	CAT785C	EX74	3.15	2718.9	166.92	977.3	M14	LIEBHERR 9350
2019-11-27	M14_1385_B07	CAT785C	EX74	3.06	2565.0	152.85	1006.9	M14	LIEBHERR 9350

2019-11-27	M14_1385_B07	CAT785C	EX74	2.74	2308.5	123.30	1123.4	M14	LIEBHERR 9350
2019-11-28	M12_1245_B03	CAT785C	EX108	3.15	1641.6	100.83	976.8	M12	LIEBHERR 9350
2019-11-28	M12_1245_B03	CAT785C	EX108	4.02	256.5	20.10	765.7	M12	LIEBHERR 9350
2019-11-28	M12_1245_B03	EH3500	EX108	3.92	64.4	3.92	986.6	M12	LIEBHERR 9350
2019-11-28	M12_1255_B230	CAT785C	EX108	3.20	461.7	28.77	963.0	M12	LIEBHERR 9350
2019-11-28	M12_1255_B230	EH3500	EX108	4.16	3413.2	220.67	928.1	M12	LIEBHERR 9350
2019-11-28	M12_1255_B230	EH3500	EX108	3.96	3799.6	233.38	976.8	M12	LIEBHERR 9350
2019-11-28	M7_1225_B103	EH3500	EX109	3.80	64.4	3.80	1016.8	M7	LIEBHERR 9350
2019-11-28	M7_1225_B103	CAT785C	EX109	4.22	256.5	21.08	730.0	M7	LIEBHERR 9350
2019-11-28	M7_1225_B103	EH3500	EX109	5.51	1159.2	99.27	700.7	M7	LIEBHERR 9350
2019-11-28	M7_1225_B103	EH3500	EX109	6.73	644.0	67.30	574.1	M7	LIEBHERR 9350
2019-11-28	M7_1225_B105	EH3500	EX109	4.85	966.0	72.68	797.4	M7	LIEBHERR 9350
2019-11-28	M14_1395_B16	EH3500	EX29	3.85	2511.6	150.25	1003.0	M14	LIEBHERR 9350 E
2019-11-28	M14_1395_B16	EH3500	EX29	3.46	6182.4	332.30	1116.3	M14	LIEBHERR 9350 E
2019-11-28	M14_1395_B16	EH3500	EX29	4.10	4958.8	315.97	941.6	M14	LIEBHERR 9350 E
2019-11-28	M11_1305_B21	EH3500	EX30	4.69	2318.4	168.82	824.0	M11	LIEBHERR 9350 E
2019-11-28	M11_1305_B21	EH3500	EX30	4.10	3992.8	253.92	943.5	M11	LIEBHERR 9350 E
2019-11-28	M11_1305_B21	EH3500	EX30	4.67	3155.6	228.70	827.9	M11	LIEBHERR 9350 E
2019-11-28	S4_1355_B05	CAT785C	EX51	3.09	2257.2	135.80	997.3	S4	EX2500-6
2019-11-28	S4_1355_B05	CAT785C	EX51	3.31	4514.4	291.13	930.4	S4	EX2500-6
2019-11-28	S4_1355_B05	CAT785C	EX51	3.07	3437.1	205.48	1003.6	S4	EX2500-6
2019-11-28	S4_1355_B05	EH3500	EX51	4.03	257.6	16.10	960.0	S4	EX2500-6
2019-11-28	W2_1335_B234	CAT785C	EX57	3.01	2770.2	162.62	1022.1	W2	EX2500-6
2019-11-28	W2_1335_B234	CAT785C	EX57	3.71	666.9	48.17	830.7	W2	EX2500-6
2019-11-28	M11_1315_B38	EH3500	EX58	4.59	1481.2	105.48	842.5	M11	LIEBHERR 9350 E

2019-11-28	m11_1315_B43	EH3500	EX58	4.25	579.6	38.28	908.4	m11	LIEBHERR 9350 E
2019-11-28	M11_1315_B38	EH3500	EX58	4.71	1481.2	108.32	820.5	M11	LIEBHERR 9350 E
2019-11-28	m11_1315_B43	EH3500	EX58	4.05	2189.6	137.73	953.8	m11	LIEBHERR 9350 E
2019-11-28	M11_1315_B38	EH3500	EX58	4.60	3928.4	280.32	840.8	M11	LIEBHERR 9350 E
2019-11-28	M13_1445_D01	CAT785C	EX59	2.70	3129.3	164.85	1139.0	M13	LIEBHERR 9350 E
2019-11-28	M13_1445_D01	CAT785C	EX59	2.88	3488.4	195.77	1069.2	M13	LIEBHERR 9350 E
2019-11-28	M13_1445_D02	CAT785C	EX59	2.65	1436.4	74.27	1160.5	M13	LIEBHERR 9350 E
2019-11-28	W2_1325_B29	CAT785C	EX66	3.16	1026.0	63.30	972.5	W2	LIEBHERR 9250
2019-11-28	M12_1255_B230	CAT785C	EX69	3.91	615.6	46.93	787.0	M12	LIEBHERR 9250
2019-11-28	M12_1245_B03	CAT785C	EX69	4.40	923.4	79.12	700.3	M12	LIEBHERR 9250
2019-11-28	M12_1245_B03	CAT785C	EX69	4.15	2462.4	199.15	741.9	M12	LIEBHERR 9250
2019-11-28	M12_1245_B03	EH3500	EX69	6.68	64.4	6.68	578.2	M12	LIEBHERR 9250
2019-11-28	S3_1315_B03	CAT785C	EX70	3.85	1231.2	92.50	798.6	S3	LIEBHERR 9250
2019-11-28	S3_1315_B206	CAT785C	EX70	3.32	1641.6	106.35	926.1	S3	LIEBHERR 9250
2019-11-28	S3_1315_B03	CAT785C	EX70	3.82	1898.1	141.48	804.9	S3	LIEBHERR 9250
2019-11-28	S4_1355_B05	CAT785C	EX70	3.66	974.7	69.47	841.9	S4	LIEBHERR 9250
2019-11-28	S4_1355_B05	CAT785C	EX70	3.56	2667.6	185.28	863.8	S4	LIEBHERR 9250
2019-11-28	M11_1285_B17	EH3500	EX72	3.26	1159.2	58.68	1185.2	M11	LIEBHERR 9350
2019-11-28	M11_1295_B08	CAT785C	EX72	2.65	51.3	2.65	1161.5	M11	LIEBHERR 9350
2019-11-28	M11_1295_B08	EH3500	EX72	6.19	128.8	12.38	624.1	M11	LIEBHERR 9350
2019-11-28	M11_1285_B17	EH3500	EX72	3.66	128.8	7.32	1056.2	M11	LIEBHERR 9350
2019-11-28	M11_1315_B22	CAT785C	EX72	2.97	1641.6	94.95	1037.3	M11	LIEBHERR 9350
2019-11-28	M11_1315_B22	EH3500	EX72	3.93	1352.4	82.43	984.4	M11	LIEBHERR 9350
2019-11-28	M11_1315_B22	CAT785C	EX72	3.32	2103.3	136.32	925.8	M11	LIEBHERR 9350
2019-11-28	M11_1315_B22	EH3500	EX72	5.91	579.6	53.17	654.1	M11	LIEBHERR 9350

2019-11-29	M12_1255_B230	EH3500	EX108	4.88	2382.8	180.38	792.6	M12	LIEBHERR 9350
2019-11-29	M12_1255_B230	CAT785C	EX108	3.08	2205.9	132.35	1000.0	M12	LIEBHERR 9350
2019-11-29	M12_1255_B230	EH3500	EX108	4.30	2189.6	146.22	898.5	M12	LIEBHERR 9350
2019-11-29	M12_1255_B230	CAT785C	EX108	3.59	513.0	35.85	858.6	M12	LIEBHERR 9350
2019-11-29	M12_1255_B230	EH3500	EX108	4.39	1738.8	118.57	879.9	M12	LIEBHERR 9350
2019-11-29	M7_1225_B07	CAT785C	EX109	2.63	205.2	10.50	1172.6	M7	LIEBHERR 9350
2019-11-29	M7_1225_B07	EH3500	EX109	4.57	128.8	9.13	846.1	M7	LIEBHERR 9350
2019-11-29	M7_1225_B103	CAT785C	EX109	3.01	153.9	9.02	1024.1	M7	LIEBHERR 9350
2019-11-29	M7_1225_B103	EH3500	EX109	4.89	322.0	24.43	790.7	M7	LIEBHERR 9350
2019-11-29	M7_1225_B105	EH3500	EX109	5.72	257.6	22.88	675.4	M7	LIEBHERR 9350
2019-11-29	M7_1225_B202	EH3500	EX109	5.38	64.4	5.38	717.8	M7	LIEBHERR 9350
2019-11-29	M7_1225_B103	EH3500	EX109	5.53	128.8	11.07	698.3	M7	LIEBHERR 9350
2019-11-29	M7_1225_B203	CAT785C	EX109	2.78	51.3	2.78	1105.9	M7	LIEBHERR 9350
2019-11-29	M7_1225_B203	EH3500	EX109	3.96	1867.6	114.92	975.1	M7	LIEBHERR 9350
2019-11-29	M7_1225_B203	EH3500	EX109	4.86	2318.4	174.90	795.3	M7	LIEBHERR 9350
2019-11-29	M14_1395_B16	EH3500	EX29	3.74	2189.6	127.12	1033.5	M14	LIEBHERR 9350 E
2019-11-29	M14_1395_B16	EH3500	EX29	5.13	3348.8	266.88	752.9	M14	LIEBHERR 9350 E
2019-11-29	M14_1395_B16	EH3500	EX29	4.23	3670.8	241.12	913.4	M14	LIEBHERR 9350 E
2019-11-29	M11_1305_B21	CAT785C	EX30	2.47	51.3	2.47	1247.8	M11	LIEBHERR 9350 E
2019-11-29	M11_1305_B21	EH3500	EX30	5.07	1674.4	131.90	761.7	M11	LIEBHERR 9350 E
2019-11-29	M11_1305_B21	EH3500	EX30	5.08	2640.4	208.37	760.3	M11	LIEBHERR 9350 E
2019-11-29	M11_1305_B21	EH3500	EX30	4.49	2640.4	184.00	861.0	M11	LIEBHERR 9350 E
2019-11-29	S4_1355_B05	CAT785C	EX51	3.44	1026.0	68.83	894.3	S4	EX2500-6
2019-11-29	S4_1355_B05	CAT785C	EX51	3.04	513.0	30.42	1011.9	S4	EX2500-6
2019-11-29	S4_1355_B05	CAT785C	EX51	4.16	3231.9	261.87	740.5	S4	EX2500-6

2019-11-29	M11_1315_B38	EH3500	EX58	4.30	515.2	34.37	899.5	M11	LIEBHERR 9350 E
2019-11-29	M11_1315_B38	EH3500	EX58	4.06	4121.6	259.70	952.2	M11	LIEBHERR 9350 E
2019-11-29	M11_1315_B38	EH3500	EX58	4.37	3928.4	266.62	884.1	M11	LIEBHERR 9350 E
2019-11-29	M13_1445_D01	CAT785C	EX59	3.86	205.2	15.43	797.8	M13	LIEBHERR 9350 E
2019-11-29	M13_1445_D02	CAT785C	EX59	2.54	359.1	17.75	1213.9	M13	LIEBHERR 9350 E
2019-11-29	M13_1445_D01	CAT785C	EX59	2.70	359.1	18.93	1138.0	M13	LIEBHERR 9350 E
2019-11-29	M13_1445_D02	CAT785C	EX59	2.66	2411.1	124.80	1159.2	M13	LIEBHERR 9350 E
2019-11-29	M13_1445_D01	CAT785C	EX59	2.47	1179.9	56.85	1245.3	M13	LIEBHERR 9350 E
2019-11-29	M13_1445_D02	CAT785C	EX59	2.51	2616.3	127.90	1227.3	M13	LIEBHERR 9350 E
2019-11-29	W2_1325_B29	CAT785C	EX66	3.02	2872.8	169.20	1018.7	W2	LIEBHERR 9250
2019-11-29	W2_1325_B06	CAT785C	EX66	3.78	769.5	56.63	815.2	W2	LIEBHERR 9250
2019-11-29	W2_1325_B29	CAT785C	EX66	2.85	2513.7	139.65	1080.0	W2	LIEBHERR 9250
2019-11-29	W2_1325_B06	CAT785C	EX66	3.84	2718.9	203.70	800.9	W2	LIEBHERR 9250
2019-11-29	M12_1245_B03	CAT785C	EX69	4.81	1692.9	158.58	640.5	M12	LIEBHERR 9250
2019-11-29	M12_1245_B03	CAT785C	EX69	4.25	1795.5	148.67	724.6	M12	LIEBHERR 9250
2019-11-29	M12_1245_B03	CAT785C	EX69	3.66	2205.9	157.40	840.9	M12	LIEBHERR 9250
2019-11-29	S4_1355_B05	CAT785C	EX70	3.26	2359.8	149.93	944.3	S4	LIEBHERR 9250
2019-11-29	S4_1355_B05	CAT785C	EX70	2.82	51.3	2.82	1092.8	S4	LIEBHERR 9250
2019-11-29	M11_1285_B17	CAT785C	EX72	2.85	51.3	2.85	1080.0	M11	LIEBHERR 9350
2019-11-29	M11_1285_B17	EH3500	EX72	3.88	2060.8	124.02	997.0	M11	LIEBHERR 9350
2019-11-29	M11_1285_B17	EH3500	EX72	3.14	1288.0	62.82	1230.2	M11	LIEBHERR 9350
2019-11-29	M11_1285_B17	EH3500	EX72	3.41	708.4	37.50	1133.4	M11	LIEBHERR 9350
2019-11-30	M12_1255_B230	CAT785C	EX108	5.20	153.9	15.60	591.9	M12	LIEBHERR 9350
2019-11-30	M12_1255_B230	EH3500	EX108	4.99	2769.2	214.43	774.8	M12	LIEBHERR 9350

2019-11-30	M12_1255_B230	CAT785C	EX108	2.23	51.3	2.23	1378.2	M12	LIEBHERR 9350
2019-11-30	M12_1255_B230	EH3500	EX108	5.06	1610.0	126.62	762.9	M12	LIEBHERR 9350
2019-11-30	M12_1265_B19	CAT785C	EX108	4.60	359.1	32.20	669.1	M12	LIEBHERR 9350
2019-11-30	M7_1225_B203	EH3500	EX109	5.11	2060.8	163.43	756.6	M7	LIEBHERR 9350
2019-11-30	M7_1225_B203	EH3500	EX109	4.61	1674.4	119.87	838.1	M7	LIEBHERR 9350
2019-11-30	M14_1395_B16	CAT785C	EX29	3.94	769.5	59.17	780.3	M14	LIEBHERR 9350 E
2019-11-30	M14_1395_B16	EH3500	EX29	5.08	1932.0	152.43	760.5	M14	LIEBHERR 9350 E
2019-11-30	M14_1395_B16	CAT785C	EX29	4.51	1898.1	166.83	682.6	M14	LIEBHERR 9350 E
2019-11-30	M14_1395_B16	CAT785C	EX29	4.76	1231.2	114.30	646.3	M14	LIEBHERR 9350 E
2019-11-30	M11_1305_B21	EH3500	EX30	5.71	1030.4	91.43	676.2	M11	LIEBHERR 9350 E
2019-11-30	M11_1315_B42	EH3500	EX30	4.88	1416.8	107.42	791.4	M11	LIEBHERR 9350 E
2019-11-30	M11_1315_B38	EH3500	EX30	4.82	579.6	43.40	801.3	M11	LIEBHERR 9350 E
2019-11-30	M11_1315_B42	EH3500	EX30	4.49	1288.0	89.80	860.6	M11	LIEBHERR 9350 E
2019-11-30	M11_1315_B38	EH3500	EX30	4.83	708.4	53.08	800.7	M11	LIEBHERR 9350 E
2019-11-30	S4_1355_B05	CAT785C	EX51	3.76	3078.0	225.35	819.5	S4	EX2500-6
2019-11-30	S4_1355_B05	CAT785C	EX51	3.96	2821.5	217.58	778.0	S4	EX2500-6
2019-11-30	S4_1355_B05	CAT785C	EX51	4.51	1436.4	126.17	683.1	S4	EX2500-6
2019-11-30	M11_1315_B38	EH3500	EX58	3.82	4443.6	263.33	1012.5	M11	LIEBHERR 9350 E
2019-11-30	M11_1315_B38	EH3500	EX58	3.90	2382.8	144.45	989.7	M11	LIEBHERR 9350 E
2019-11-30	M11_1315_B38	EH3500	EX58	4.64	386.4	27.87	832.0	M11	LIEBHERR 9350 E
2019-11-30	M13_1445_D01	CAT785C	EX59	2.68	3180.6	166.40	1146.9	M13	LIEBHERR 9350 E

2019-11-30	M13_1445_D02	CAT785C	EX59	2.69	1385.1	72.63	1144.2	M13	LIEBHERR 9350 E
2019-11-30	M13_1445_D01	CAT785C	EX59	2.49	1436.4	69.65	1237.4	M13	LIEBHERR 9350 E
2019-11-30	M13_1445_D02	CAT785C	EX59	2.70	307.8	16.18	1141.2	M13	LIEBHERR 9350 E
2019-11-30	W2_1325_B06	CAT785C	EX66	3.81	4001.4	297.47	807.1	W2	LIEBHERR 9250
2019-11-30	W2_1325_B06	CAT785C	EX66	4.47	718.2	62.55	688.9	W2	LIEBHERR 9250
2019-11-30	W2_1325_B29	CAT785C	EX66	3.24	2718.9	171.78	949.6	W2	LIEBHERR 9250
2019-11-30	W2_1325_B29	CAT785C	EX66	3.61	1487.7	104.77	852.0	W2	LIEBHERR 9250
2019-11-30	M12_1245_B03	CAT785C	EX69	4.50	2462.4	216.03	683.9	M12	LIEBHERR 9250
2019-11-30	M12_1245_B03	CAT785C	EX69	3.91	307.8	23.43	788.1	M12	LIEBHERR 9250
2019-11-30	M12_1265_B34	CAT785C	EX69	3.55	102.6	7.10	867.0	M12	LIEBHERR 9250
2019-11-30	M12_1265_B34	EH3500	EX69	6.23	64.4	6.23	619.9	M12	LIEBHERR 9250
2019-11-30	M11_1285_B17	EH3500	EX72	3.30	3091.2	158.55	1169.8	M11	LIEBHERR 9350
2019-11-30	M11_1285_B17	EH3500	EX72	3.48	322.0	17.42	1109.3	M11	LIEBHERR 9350
2019-11-30	M11_1285_B17	EH3500	EX74	3.42	1867.6	99.12	1130.5	M11	LIEBHERR 9350
2019-11-30	M11_1285_B17	EH3500	EX74	4.67	386.4	28.00	828.0	M11	LIEBHERR 9350
TOTALS				**4.2**	**2739637.8**	**187628.82**			0