MOSAIC POTASH
COLONSAY EXPANSION PROJECT

POWER SYSTEM SHORT CIRCUIT AND LOAD FLOW STUDIES

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1. Executive Summary

The purpose of this report is to present the results of the load flow and short circuit studies for Mosaic Colonsay Expansion Project.

The short circuit study is performed to assess the short circuit rating of all current carrying equipment and to check the capability of equipment to withstand mechanical and thermal stress during the fault condition.

The load flow study is performed to validate the equipment ratings, investigate voltage variation for different operating conditions, and to check the performance aspects such as power factor and reactive power compensation.

2. Introduction

To accommodate the increase in production capacity at Mosaic Colonsay facility from 1.9 MTPY to 3.0 MTPY (1.1 MTPY expansion), the electrical systems at Mosaic Colonsay require significant upgrades.

The system expansion will take place in two phases. Phase 1 would increase the plant capacity to 2.5 MTPY and would be operational in Q2 2012. Phase 2 would further increase capacity to 3.0 MTPY and would be operational in 2015. For the purpose of the study, both expansion phases (1 and 2) are taken into consideration.

The electrical system upgrades include constructing a new 138/230 kV Gas Insulated Substation (GIS). The station will be energized initially from the SaskPower 138 kV system via a tap from Q1W line section between the Wolverine and Elstow stations, and ultimately from the SaskPower 230 kV system via a tap from the proposed 230 kV line between the Wolverine and Aberdeen stations as shown in plant single line diagrams 19000\94\5001 and 19000\94\5002. The new GIS substation consists of two 42/56/70 MVA, ONAN/ONAF/ONAF transformers. In addition to the GIS substation, Mosaic Colonsay facility requires a new building to house two new 13/17/22 MVA, ONAN/ONAF/ONAF, 13.8/4.16 kV transformers and 13.8 and 4.16 kV switchgears.

As a part of this study, the electrical systems expansion requirements are studied and examined.

The study focused on the following five (5) key areas:

1. Update the existing Mosaic Colonsay Model based on the latest load list generated by Mosaic Colonsay Expansion Project and the new underground distribution, as shown in Appendix B;
2. Calculate the maximum 3-phase fault current on surface and underground 13.8, and 4.16 kV switchgears;
3. Determine nominal Ampacity ratings for electrical equipment;
4. Examine voltage profile during normal and contingency operations;
5. Determine optimal Reactive Power (VAR) compensation on 13.8 kV switchgears.

The following studies were excluded from the scope:

- The system operation under standby generation;
- Voltage and power factor improvement in underground to ensure that voltage drop issues during motor starting do not affect equipment operability.

The model was developed using Hatch computer base software (ETAP) to carry out short circuit, load flow analysis and will be further utilized in separate studies for protection coordination and arc flash analysis for the existing and new equipment.

2.1 Requirements

The main objective of the study is introduced below:

- Short circuit current on existing and new equipment is not exceeding the equipment rating.
- Maintain the site power factor on SaskPower side within the acceptable limit (0.95 pu) based on project Design Criteria.
- Maintain voltage at acceptable levels at major buses (0.95 pu to 1.05 pu) and voltage drop limited to 3%.

2.2 Short Circuit Study

The short circuit studies included:

- Calculation of the 3-phase short circuit levels at the 13.8 kV switchgears;
- Calculation of the 3-phase short circuit levels at the 4.16 kV switchgears and MCCs;
- Calculation of the 3-phase short circuit levels at the 600 V MCCs.

2.3 Load Flow Study

The load flow study included:

- Evaluation of transformers loading on 13.8, 4.16 and 0.6 kV systems;
- Evaluation of voltage levels on the major 13.8, 4.16 and 0.6 kV buses;
- Evaluation of Power Factor (PF) on the major 13.8, 4.16 and 0.6 kV branches;
- Determine the optimal reactive power compensation requirements at the 13.8 kV switchgear on surface, in order to maintain the Power Factor (PF) as a minimum at 95% at the utility point of connection.

3. Standards and Guidelines

The fault and load flow studies are performed based on the following standards/guidelines:

- IEEE Std. 141-1986/1993, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book).
- IEEE Std. 242-1986/2001, IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book).
- IEEE Std. 399-1980/1997, IEEE Recommended Practice for Power System Analysis (IEEE Brown Book).
- IEEE Std. C37.010-1999, IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
- IEEE Std. C37.20.1-1999, IEEE Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.
- IEEE Std. C57.12.10-1997, ANSI Standard for Transformers – 230 kV and Below.
- IEEE Std. C37.20.2-1999, IEEE Standard for Metal-Clad Switchgear.
- IEEE Std. C37.20.3-2001, IEEE Standard for Metal-Enclosed Interrupter Switchgear.
- CSA – C22.1-09 - 2009, Canadian Electrical Code.

4. Disclaimers

The results of the power system analysis are based on the latest demand information, SaskPower point of connection fault level, and underground mine expansion. Any change to the system may significantly affect the results provided in this report. It is recommended that all network changes be entered into the model and the analysis rerun.

5. Methodology

The power system studies have been completed on the basis of the latest design information and vendor data for the power system equipment (generator, transformers, switchgear, motors, etc).

5.1 Software

Modeling and analysis have been carried out using the Electrical Transient and Analysis Program (ETAP) software version 7.1, leading industrial software for power system studies.

5.2 Definitions

Table 5-1: Definitions

Term	Definition
Demand Factor (DF)	The ratio of the "Maximum Power Demand" (kW) to the "Connected Load" (kW). Demand factor values range from 0.0 to 1.0. Applicable to all loads.
Efficiency (EFF)	Electrical motor efficiency is the ratio between the shaft output power and the electrical input power.
Power Factor (PF)	The ratio of "Active Power" (kW) to "Apparent Power" (kVA). Power factor values range from 0.0 to 1.0.
Short Circuit Interrupting Rating	This is the ability of a circuit-opening device to open a circuit under fault conditions without damage to itself.
Diversity Factor (DivF):	The ratio of the "Sum of Feeder Maximum Power Demands" (kW) to the "Total Maximum Power Demand" (kW). Equal to or less than 1.0. Applicable to all feeders and buses.

5.3 Connectivity and Operations

The existing Mosaic Colonsay ETAP model was upgraded using the most recent data, existing single line diagrams available for Mosaic Colonsay facility, the expansion project single line diagram and the load information. Further assumptions have been made on the loads in operation under different operating conditions as noted herein. Refer to Appendix A for the ETAP single line diagrams.

5.3.1 Reference Drawings and Lists

The following table outlines the reference drawings and lists that have been utilized to update the facility in ETAP. The drawings are included in Appendix B.

Table 5-2: Reference Drawings and Lists for ETAP Model

Drawing Name	Drawing Number
New Substation Two 4.16 kV Switchgear Single Line Diagram	19000\94\5003
New Substation Two 13.8 kV Switchgear Single Line Diagram	19000\94\5002
General Mine Site 15 kV Main Power Distribution Single Line Diagram	19000\10\5005
General Mine Site 5 kV Main Power Distribution Single Line Diagram	19000\10\5001
New Substation Two GIS and 230/138-13.8 Transformers Single Line Diagram	19000\94\5001
Underground Distribution Single Line Diagram	19500\11\5005
Mosaic Colonsay 13.8 kV current readings	N/A
MCC List	H328668-0000-70-144-0001

5.3.2 230 kV Utility Connection Information

Mosaic Colonsay new Gas Insulated Substation (GIS) is dual rated (i.e. 138 and 230 kV). In either case, the power system model "utility" bus was considered to be the interconnection of the Mosaic Colonsay substation to SaskPower.

Since the short circuit current on the 230 kV system provided by SaskPower is higher than the 3-phase fault current at 138 kV system, the analysis presented in this report assumed that the voltage at the utility point of connection is 230 kV. The assumption is made that Mosaic Colonsay facility will be connected to the 230 kV Aberdeen Switching Station via SaskPower Transmission line. The 3-phase and L-G fault levels at the 230 kV SaskPower point of connection to Mosaic Colonsay facility are included in Appendix C and taken into consideration +50% safety margin requested by SaskPower.

The following are utility fault levels on 230 kV systems utilized in the ETAP model for carrying out all calculations and analysis in this report.

5.3.2.1 Maximum Utility Fault Levels

The maximum expected 230 kV utility fault levels report is summarized as follows:

- Pre-fault voltage: 242.88 kV
- 3-phase (sym. Rms) +50% safety margin: 8kA
- X/R ratio: 4.985

5.3.3 Transformer Data

5.3.3.1 HV Transformer Data

The GIS consists of two 42/56/70MVA, ONAN/ONAF/ONAF, 138 or 230/13.8 kV, Load Tap Changer (LTC) transformers. The transformer impedance as shown on the SLD is 12% (see Appendix B). The taps are assumed to automatically regulate the Main Power House switchgear voltage to 13.8 kV. Appendix D shows transformer ratings used for analysis presented in this report.

5.3.3.2 MV Transformer Data

The surface medium voltage system consists of two main 13/17/22MVA, ONAN/ONAF/ONAF, 13.8/4.16 kV, De-energized Tap Changer (DETC) transformers and 13.8/0.6 kV transformers. The main transformer impedance as shown on the SLD is 7%. All taps are assumed to be set on their neutral position. Tap positions consist of two (2) 2.5% full capacity taps above and two (2) 2.5% full capacity taps below the nominal voltage.

Typical impedances and X/R ratios for 13.8 kV/600 V transformers were used for new transformers as published in the IEEE Std. 242-1986/2001 and IEEE std. C37-010-1979. All distribution taps are assumed to be set on their neutral position. Appendix D shows transformer data used for analysis presented in this report.

5.3.4 *Generator*

The generator is modeled on the basis of latest data shown on the single line diagrams. Typical ETAP generator characteristic data available in ETAP library was used to model the generator as shown below.

The generator is modeled as an emergency generator that will not be at any time synchronized with the utility.

Table 5-3: Generator Data

Generator Parameter	Rating
Rated kV	4.16
Rated MW	2.4
Power Factor	0.8
Saturated Transient Reactance (X'd)	23%
Saturated Sub transient Reactance (X''d)	12%
Neutral grounding arrangement	25 Amp grounding resistor

5.3.5 *Cable Data*

The following assumptions/cable configurations were made for the modeling of cables:

- Cable bus systems, from 230/13.8 kV transformers to the 13.8 kV switchgear and from 13.8/4.16 kV transformers to 4.16 kV switchgear are modeled based on the cable sizes shown on the SLDs and the cable length was assumed to be 100 m for every run of the cable bus.
- Cables from 13.8 and 4.16 kV switchgears to the 13.8 kV capacitor banks, generator, 4.16 and 0.6 kV Motor Control Centers (MCCs) and load centers (LCs) are modeled using cable sizes shown on the single line diagrams. Cables from LCs and MCCs, to individual motor/static loads are ignored.
- All cables on surface are modeled as a TECK cable with 90°C maximum operating temperature. The shaft feeders are modeled as Airguard cables and rated at 105°C. Cable impedances were obtained from the ETAP cable library. The values were also verified against the IEEE Std. 242-1986/2001 (Buff Book).

5.3.6 *Switchgear*

For the various voltage levels at the Mosaic Colonsay facility, the switchgear ratings modeled in ETAP are summarized in Appendix E.

5.3.7 *Medium Voltage (MV) (4.16 kV) Loads*

The MV (4.16 kV) new loads comprise 4 kV new motors. The new motors were modeled in accordance with the latest electrical load list shown in Appendix B. Where the vendor data was not available, the motors were modeled in accordance with the sizes indicated on the list and typical motor datasheet in ETAP Quick Library.

Appendix F summarizes the motor data and their estimated operating ampacity as a percent of full Ampacity.

5.3.8 *Low Voltage (LV) (600 V) Loads*

The LV loads were modeled on the basis of the latest load list and the single line diagrams available at the time of this study (see Appendix B). All motors 50 HP or above are modeled individually and the smaller motors grouped or lumped. All motors driven by VFD are modeled individually to help performing harmonic study in the future.

Appendix F summarizes the motor data and their estimated operating Ampacity as a percent of full Ampacity.

5.3.9 *Normal Operating Conditions*

Under normal conditions, the plant operates with 13.8 and 4.16 kV surface switchgear tie breakers opened. Transformers T1 and T2, each 42/56/70 MVA, on 13.8 kV switchgear and both transformers T10 and T20, each 13/17/22 MVA, on 4.16 kV switchgear in operation.

Underground 13.8 kV switchgears (at locations N3W3, W7S49, and W7S108) operate with all tie breakers closed. Underground feeders UGF1, 2, 3, and 4 are all sharing loads. All underground belts and miner machine # 501 are operating at 60% of their full load Ampacity. Miner machines # 503, 504, 506, 510 and 511 are operating at 100% of their full load Ampacity with miner machine # 502 out of service.

Refer to main single line diagrams19500\11\5005, 19000\94\5001, 19000\94\5002 and 19000\94\5003.

5.3.10 *Worst Case Scenario Condition for Short Circuit Study*

Under the worst case scenario for the short circuit study, the plant operates with all tie breakers on 13.8 and 4.16 kV surface and underground switchgears closed and both 42/56/70 MVA transformers on 13.8 kV switchgear in parallel operation and both 13/17/22 MVA transformers on 4.16 kV switchgear are sharing loads.

Refer to main single line diagrams19500\11\5005, 19000\94\5001, 19000\94\5002 and 19000\94\5003.

5.3.11 Worst Case Scenario Condition for Load Flow Study

Under the worst case scenario for the load flow study, the plant operates with the 13.8 and 4.16 kV surface and underground switchgear tie breakers closed. The plant loads are fed from one transformer on 13.8 kV (42/56/70 MVA) system, (T1 or T2) and one transformer (13/17/22MVA) on 4.16 kV system, (T10 or T20). The SaskPower supply is considered at 1.0 pu.

Refer to main single-line diagrams19500\11\5005, 19000\94\5001, 19000\94\5002 and 19000\94\5003.

5.4 Short Circuit Study

A 3-phase short circuit study was conducted to evaluate the short circuit levels on the major 13.8, 4.16, and 0.6 kV buses under a worst case scenario when main transformers in parallel operation, T1 with T2, and T10 with T20 are sharing loads. The short circuit results used to verify that the designed and existing equipment is sufficiently rated for the application.

The interrupting short circuit currents are used to evaluate the interrupting capability of the switchgear and all current carrying equipment such as circuit breakers. These breakers typically interrupt fault current in 3-9 cycles (50-150ms). The short circuit analysis presented in this report takes into consideration all motors fault current contribution above 50 HP.

5.5 Load Flow Study

The aim of load flow study was to investigate the performance of the tap changer and to identify overloaded equipment within the plant for all possible voltage variation under normal operation and worst case scenario. Note that the calculated load flows may vary in comparison to the eventual metered load flows in the plant, once the new facilities are constructed and placed in service. Any differences between these data sets would be attributed to the diversity factor (determined by how the plant is operated) and variances between the model and the actual plant electrical equipment.

The load flow study was also performed to determine the optimal VAR compensation requirements on 13.8 kV surface switchgear in order to improve system performance. The aim of the VAR support is to increase the utility power factor from 0.87 pu to 0.95 – 0.98 pu. The exact requirement for a VAR support was determined in Appendix G.

VAR support (i.e. capacitive compensation) for improved system performance was calculated for the worst load flow case scenario presented in section 5.3.11 and consisted of 6.6 MVAR capacitor bank (s) installed at each main 13.8 kV surface switchgear (15B1&B2) . Note that capacitor bank VAR injection will be 6.6 MVAR at nominal voltage only, VAR injection reduces proportionally to the bus voltage squared.

5.5.1 *Load Demand Factors*

The load flow study takes into account the different loads throughout the system which are characterized by their ratings, the corresponding power factors (PF) and the demand factors (DF).

The load factor of the existing loads is adjusted to match the actual current readings on the main feeders obtained from Mosaic Colonsay. Ammeter reading was taken for the beginning of the month of October 2010 on the main 13.8 kV feeders (see Appendix B). The load demand factor for underground loads was justified to meet underground's operation requirement as per Colonsay recommendations.

Also, if a load is listed as standby in the load list, it is de-energized (or not connected) under normal operating conditions.

5.5.2 *Voltage Limits*

The following table overviews the basic voltage regulation design requirements listed in Electrical Design Criteria 0000-DC-008, Revision 4.

Table 5-4: Summary of Design Targets for Voltage Regulations

	Description	Requirement
1.	MV Distribution	
	Maximum Allowable Under Voltage	3%
2.	LV Distribution	
	Maximum Allowable Under Voltage	5%

The acceptable voltage level limits for the 4 kV and 575 V motors are presented in the following table:

Table 5-5: Typical Voltage Limits for 4 kV and 575 V Motors

Conditions	Motor Load/ Motor Voltage (kV)	Bus Voltage (kV)	Motor Voltage Limits (P.U.)	Corresponding Bus Voltage Limits (P.U.)
Maximum Voltage Running	4	4.16	1.10	1.058
	0.575	0.6	1.10	1.054
Minimum Voltage Running	4	4.16	0.95	0.913
	0.575	0.6	0.95	0.91

5.6 Emergency Generator Supply

The Mosaic Colonsay facility also has an emergency generator for its essential services loads. The generator will not be synchronized with the utility at any time, for this reason, the generator contribution was excluded from the short circuit study.

5.7 Studies Result

After the ETAP model was completed and the connectivity verified, several cases were run for each study, and the results are described in the following sections.

5.7.1 Short Circuit Study Results

The following sections describe the short circuit cases and the resulting fault levels at the major buses studied for the facility.

In all short circuit cases, the 230 kV utility is modeled according to the maximum available fault levels as indicated in section 5.3.2.1.

5.7.1.1 Short Circuit Cases

The worst case scenario presented in section 5.3.10 has been considered.

Short circuit current contributions for all motors on 13.8, and 4.16 kV systems, and all motors greater than 50HP on 0.6 kV systems were taken into consideration in this study.

To ensure the worst case fault values were obtained for the worst case scenario, pre-fault bus voltages obtained from the results of a power flow were ignored (i.e. higher driven point voltages).

5.7.1.2 Short Circuit Results

The results for the worst case scenario described in section 5.3.10 are tabulated and summarized in the following tables. The results are separated based on the voltage level i.e. the 230 kV, the 13.8 kV and, the 4.16 kV, and the 600 V service areas.

Table 5-6: Short Circuit Results – 230 kV Substation

Switchgear/Bus	Voltage Rating (kV)	Int. (kA)
230 kV	230	8.2

The following table shows the 3-phase short circuit levels on the 13.8 kV major buses.

Table 5-7: Short Circuit Results – 13.8 kV Buses

Switchgear/Bus	Rating Int. (kA)	Calculated Int. (kA)	Switchgear/Bus	Rating Int. (kA)	Calculated Int. (kA)
13.8KV-15B1	50	29.2	U/G SWGR at W7S108 Bus 2	50	11.2
13.8 kV -15B2	50	29.2	U/G SWGR at W7S49 Bus 1	Unknown[1]	14.4
U/G SWGR at W3N3 Bus 1	50	22.3	U/G SWGR at W7S49 Bus 2	Unknown[1]	14.4
U/G SWGR at W3N3 Bus 2	50	22.3			
U/G SWGR at W3N3 Bus 3	50	22.3			
U/G SWGR at W3N3 Bus 4	50	22.3			
U/G SWGR at W7S108 Bus 1	50	11.2			

Note 1: Mosaic Colonsay to verify the short circuit rating (KA) on the highlighted switchgears.

The following table shows the 3-phase short circuit levels for the 4.16 kV buses

Table 5-8: Short Circuit Levels for the 4.16 kV Buses

Switchgear/Bus	Rating Int. (kA)	Calculated Int. (kA)	Switchgear/Bus	Rating Int. (kA)	Calculated Int. (kA)
4.16 kV-5B1	50	41.1	MCC 43.11	50	34.8
4.16 kV-5B2	50	41.1			
LC 32.1	35[1]	37.0			
LC 32.2	35[1]	37.0			
LC 33.1	35[1]	33.9			
LC 36.1	35[1]	34.8			
LC 37.1	35[1]	37.5			
LC 41.1	40	35.0			
MCC 67-72148-FUTURE	40	35.0			

Note 1: Interruption kA rating on highlighted equipment obtained from power system study – Existing Plant report H328668-0000-70-124-0002 Revision B, Colonsay to field verify the short circuit ratings on highlighted equipment.

The following table shows the 3-phase short circuit levels for the 600 V main buses.

Table 5-9: Short Circuit Results – 600 V

Switchgear/ Bus	Rating Int. (kA)	Int. (kA)	Switchgear/ Bus	Rating Int. (kA)	Int. (kA)	Switchgear/ Bus	Rating Int. (kA)	Int. (kA)
LC 15.1	25	23.5	LC 19.2	25	15.8	MCC 22.21	27	21.7
LC 15.2	25	21.6	LC 19.3	25	24.6	MCC 22.31	27	25.5
LC 15.3	25	25.2	LC 19.4	25	23.3	MCC 23.11	27	24.9
LC 15.4	27	25.5	MCC 19.43	25	23.3	MCC 23.31	27	21.5
LC 17.1	25	16.3	LC 20.1	25	18.6	MCC 24.11	27	22.9
LC 17.2	25	17.7	MCC 20.13	25	18.6	MCC 24.21	27	21.2
LC 17.3	25	21.7	LC 20.2	25	20.0	MCC 25.11	27	22.0
LC 17.4	25	21.9	LC 20.4	25	21.0	MCC 25.21	27	21.4
MCC 18.12	25	17.5	LC 20.3	25	24.5	MCC 25.31	27	22.9
LC 18.2	25	26.7	MCC 21.21	25	23.6	MCC 31.11	25	19.7
LC 18.4	25	24.4	LC 35.2	25	24.1	LC 31.2	25	21.1
LC18.31	25	26.5	MCC 21.22	25	23.6	MCC 42.11	27	21.1
LC 19.1	25	19.6	LC 21.3	25	22.1	LC 34.1	25	18.5
MCC 19.12	25	19.6	MCC 22.11	27	24.5	LC 35.1	25	20.5

Note: Short circuit interruption kA on the existing 600V circuit breakers, LCs and MCCs are 25 kA based on information presented in power system study – Existing Plant Report H328668-0000-70-124-0002, Revision B, Colonsay to field verify the short circuit ratings on highlighted equipment.

5.7.2 Load Flow Study Results

5.7.2.1 Load Flow Cases

The circuit cases presented in sections 5.3.9 and 0 have been considered.

5.7.2.2 Load Flow Results

The results for each of the cases described in sections 5.3.9 and 0 have been tabulated and are provided in the following tables.

Table 5-10: Load Flow Results on 13.8 kV Systems – LF Normal Operation Case (without VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
13.8KV-15B1	1068.4	94.5	99.50
13.8KV-15B2	1042.0	93.0	99.28
U/G SWGR at W3N3 Bus 1&2	166.5	85.7	98.34
U/G SWGR at W3N3 Bus 3&4	164.1	92.8	98.34
U/G SWGR at W7S108 Bus 1&2	164.1	93	96.61
U/G SWGR at W7S49 Bus 1&2	65.2	93.5	97.96

Note: Under Load Tap Changer (ULTC) on T1 and T2 regulates the voltage level on 13.8 kV switchgear. KVAR support shall be added to improve power quality on highlighted equipment.

Table 5-11: Load Flow Results on 4.16 kV Systems – LF Normal Operation Case (without VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
4.16 kV-5B1	1293.2	94.8	97.47	Miner 501	98.1	91.6	89.28
4.16 kV-5B2	827.3	91.8	97.72	Miner 503	162.8	91.6	89.65
MCC 32.1	144.4	96.2	97.36	Miner 504	162.9	91.6	89.60
MCC 32.2	244.1	94.5	97.33	Miner 506	175.6	91.6	83.09
MCC 33.1	524.7	93.9	97.07	Miner 510	162.7	91.6	89.70
MCC 36.1	445.0	92.0	97.70	Miner 511	175.4	91.6	83.20
MCC 37.1	89.1	92.0	97.71				
MCC 41.1	161.6	92.0	97.65				
LC 67-72148-FUTURE	355.9	92.0	97.65				
MCC 43.11	105.2	92.2	97.70				

Note: Highlighted buses need local KVAR compensation to improve the voltage profile and power factor. On Miners 501, 503, 504 and 506, 510 and 511, in addition to KVAR support, transformer tap changer need to be set at maximum of 5% on the secondary size to improve voltage profile.

Table 5-12: Load Flow Results on 0.6 kV Systems – LF Normal Operation Case (without VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
LC 15.1	305.1	98.5	99.02	LC 20.3	424.4	97.0	98.41
MCC 15.21	103.9	99.2	99.36	MCC 21.12	413.9	98.4	97.82
LC 15.3	261.3	95.6	98.95	MCC 21.21	822.8	98.6	96.92
LC 15.4	1158.4	91.1	96.41	MCC 21.22	247.7	97.7	96.92
LC 17.1	522.1	96.4	97.37	LC 21.3	437.5	90.0	97.78
LC 17.2	188.3	99.7	99.16	MCC 22.11	809.2	89.4	97.01
LC 17.3	404.9	99.1	98.89	MCC 22.21	694.5	90.1	97.38
LC 17.4	465.9	99.3	98.78	MCC 22.31	1083.0	88.8	96.17
MCC 18.12	275.1	99.9	99.10	MCC 23.11	884.2	88.9	96.76
LC 18.2	522.9	94.4	98.19	MCC 23.31	567.5	89.2	97.69
LC 18.4	409.7	99.1	98.87	MCC 24.11	868.4	88.6	96.79
LC18.31	1082.7	94.3	96.85	MCC 24.21	861.5	90.9	96.99
LC 19.1	791.9	97.3	97.27	MCC 25.11	694.0	91.0	97.45
MCC 19.12	285.2	95.2	97.27	MCC 25.21	738.2	89.8	97.25
LC 19.2	367.2	96.9	98.36	MCC 25.31	994.1	87.6	96.34
				MCC 31.11	341.8	99.0	96.86
LC 19.3	695.6	99.1	98.43	MCC 31.21	378.5	96.5	96.40
LC 19.4	1200.1	94.4	96.21	MCC 42.11	492.6	90.1	96.38
MCC 19.43	835.7	90.6	96.21	LC 34.1	172.0	93.4	96.73
LC 20.1	563.2	93	97.12	LC 35.1	232.4	99.7	97.15
MCC 20.13	324.0	90	97.12	LC 35.2	287.2	96.4	96.80
LC 20.2	217.2	99.3	98.94				
LC 20.4	364.4	99.8	98.83				

Table 5-13: Load Flow Results – Worst Scenario Case (without VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
13.8KV-15B1&2	2109.1	93.4	99.9
U/G SWGR at W3N3 Bus 1,2, 3 and 4	152.1	92.2	98.9
U/G SWGR at W7S108 Bus 1&2	163.0	93	97.18
U/G SWGR at W7S49 Bus 1&2	64.9	93.6	98.52

Note 1: Under Load Tap Changer (ULTC) on T1 and T2 regulates the voltage level on 13.8 kV switchgears. Highlighted buses need local KVAR compensation to improve the power factor.

Table 5-14: Load Flow Results on 4.16 kV Systems – Worst Scenario Case (without VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
4.16 kV-5B1&2	2150.8	93.7	96.07	Miner 501	97.4	91.6	89.9
MCC 32.1	146.6	96.1	96.033	Miner 503	161.6	91.6	90.3
MCC 32.2	247.6	94.4	96.0	Miner 504	161.7	91.6	90.2
MCC 33.1	532.3	93.9	95.74	Miner 506	174.1	91.6	83.8
MCC 36.1	45.3	92.0	96.05	Miner 510	161.5	91.6	90.3
MCC 37.1	90.6	92.0	96.06	Miner 511	173.9	91.6	83.9
MCC 41.1	164.4	92.0	96.01				
LC 67-72148-FUTURE	362.0	92.0	96.01				
MCC 43.11	107.0	92.2	96.06				

Note: Highlighted buses need local KVAR compensation to improve the voltage profile and power factor. On Miners 501, 503, 504 and 506, 510 and 511, in addition to KVAR support, transformer tap changer need to be set at maximum of 5% on the secondary size to improve voltage profile.

Table 5-15: Load Flow Results on 0.6 kV Systems – Worst Scenario Case (without VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
LC 15.1	308.8	98.5	99.4	LC 20.3	422.1	97.0	99.0
MCC 15.21	103.5	99.2	99.8	MCC 21.12	411.7	98.4	98.4
LC 15.3	260.3	95.6	99.4	MCC 21.21	818.1	98.6	97.6
LC 15.4	1153.2	91.1	96.8	MCC 21.22	246.1	97.8	97.6
LC 17.1	519.7	96.4	97.8	LC 21.3	434.8	90.0	98.4
LC 17.2	187.7	99.7	99.6	MCC 22.11	804.4	89.4	97.6
LC 17.3	403.2	99.1	99.3	MCC 22.21	690.3	90.1	98.05
LC 17.4	404.4	99.3	99.2	MCC 22.31	1076.7	88.8	96.8
MCC 18.12	274.1	99.9	99.5	MCC 23.11	879.2	88.8	97.4
LC 18.2	520.7	94.4	98.6	MCC 23.31	564.4	89.2	98.3
LC 18.4	407.8	99.1	99.3	MCC 24.11	863.6	88.6	97.4
LC18.31	1077.6	94.3	97.3	MCC 24.21	856.1	90.9	97.6
LC 19.1	788.6	97.3	97.7	MCC 25.11	698.5	91.0	98.1
MCC 19.12	284.1	95.2	97.7	MCC 25.21	733.8	89.8	97.9
LC 19.2	365.4	96.9	98.8	MCC 25.31	988.7	87.6	97.0
				MCC 31.11	354.4	99.0	95.5
LC 19.3	692.7	99.1	98.8	LC 31.2	528.8	98.2	95.0
LC 19.4	1195.2	94.4	96.6	MCC 42.11	500.2	90.1	94.7
MCC 19.43	832.1	90.6	96.6	LC 34.1	174.3	93.4	95.3
LC 20.1	559.5	93	97.7	LC 35.1	234.7	99.7	95.8
MCC 20.13	322.0	90.0	97.8	LC 35.2	290.5	96.4	95.4
LC 20.2	216.0	99.4	99.6				
LC 20.4	362.0	99.8	99.4				

Table 5-16: Load Flow Results on 13.8 kV systems – LF Normal Operation Case (with VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
13.8KV-15B1	1011.2	99.7	99.62
13.8KV-15B2	973.5	99.4	99.40
U/G SWGR at W3N3 Bus 1&2	166.3	97.3	98.47
U/G SWGR at W3N3 Bus 3&4	143.0	97.0	98.47
U/G SWGR at W7S108 Bus 1&2	163.8	93.0	96.74
U/G SWGR at W7S49 Bus 1&2	65.2	93.5	98.09

Note 1: Under Load Tap Changer (ULTC) on T1 and T2 regulates the voltage level on 13.8 kV switchgear.

Table 5-17: Load Flow Results on 4.16 kV systems – LF Normal Operation Case (with VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
4.16 kV-5B1	1291.4	94.8	97.538	Miner 501	97.9	91.6	89.43
4.16 kV-5B2	826.2	91.8	97.84	Miner 503	162.5	91.6	89.80
MCC 32.1	144.2	96.	97.49	Miner 504	162.6	91.6	89.75
MCC 32.2	243.8	94.5	97.46	Miner 506	175.3	91.6	83.25
MCC 33.1	523.9	93.9	97.20	Miner 510	162.4	91.6	89.85
MCC 36.1	44.5	92.0	97.83	Miner 511	175.1	91.6	83.37
MCC 37.1	88.9	92.0	97.83				
MCC 41.1	161.4	92.0	97.78				
LC 67-72148-FUTURE	355.4	92.0	97.78				
MCC 43.11	105.1	92.2	97.83				

Note: Highlighted buses need local KVAR compensation to improve the voltage profile and power factor. On Miners 501, 503, 504 and 506, 510 and 511, in addition to KVAR support, transformer tap changer need to be set at maximum of 5% on the secondary size to improve voltage profile.

Table 5-18: Load Flow Results on 0.6 kV Systems – LF Normal Operation Case (with VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
LC 15.1	304.7	98.5	99.15	LC 20.3	424.0	97.0	98.54
MCC 15.21	103.8	99.2	99.48	MCC 21.12	413.4	98.4	97.95
LC 15.3	261.0	95.6	99.08	MCC 21.21	821.9	98.6	97.05
LC 15.4	1156.9	91.1	96.54	MCC 21.22	247.4	97.7	97.05
LC 17.1	521.4	96.4	97.50	LC 21.3	436.9	90.0	97.91
LC 17.2	188.1	99.7	99.29	MCC 22.11	808.3	89.4	97.14
LC 17.3	404.8	99.1	99.02	MCC 22.21	693.7	90.1	97.51
LC 17.4	465.5	99.3	98.91	MCC 22.31	1081.8	88.8	96.302
MCC 18.12	274.8	99.9	99.24	MCC 23.11	883.3	88.8	96.89
LC 18.2	522.3	94.4	98.31	MCC 23.31	566.9	89.2	97.82
LC 18.4	409.1	99.1	99.00	MCC 24.11	867.5	88.6	96.92
LC18.31	1081.2	94.3	96.99	MCC 24.21	860.5	90.9	97.11
LC 19.1	791.0	97.3	97.40	MCC 25.11	693.1	91	97.57
MCC 19.12	284.9	95.2	97	MCC 25.21	737.3	89.8	97.37
LC 19.2	366.7	96.9	98.49	MCC 25.31	993.0	87.6	96.47
				MCC 31.11	341.5	99.0	96.99
LC 19.3	694.7	99.1	98.56	LC 31.2	522.3	98.2	96.53
LC 19.4	1198.7	94.4	96.34	MCC 42.11	492.1	90.1	96.51
MCC 19.43	834.6	90.6	96.34	LC 34.1	171.8	93.4	96.86
LC 20.1	562.4	93.0	97.25	LC 35.1	232.2	99.7	97.28
MCC 20.13	323.6	90.0	97.25	LC 35.2	286.8	96.4	96.93
LC 20.2	216.9	99.4	99.07				
LC 20.4	364.0	99.8	98.96				

Note: Highlighted buses need local KVAR compensation to improve the power factor.

Table 5-19: Load Flow Results – Worst Scenario Case (with VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
13.8KV-15B1&2	1974.2	99.5	100.2
U/G SWGR at W3N3 Bus 1,2, 3 and 4	151.6	92.2	99.1
U/G SWGR at W7S108 Bus 1&2	162.4	93.0	97.45
U/G SWGR at W7S49 Bus 1&2	64.7	93.6	98.7

Note 1: Under Load Tap Changer (ULTC) on T1 and T2 regulates the voltage level on 13.8 kV switchgear. Highlighted buses need local KVAR compensation to improve the power factor.

Table 5-20: Load Flow Results on 4.16 kV systems – Worst Scenario Case (with VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
4.16 kV-5B1&2	2144.5	93.7	96.36	Miner 501	97.0	91.6	90.255
MCC 32.1	146.1	96.1	96.3	Miner 503	161.0	91.6	90.6
MCC 32.2	246.9	94.4	96.2	Miner 504	161.0	91.6	90.5
MCC 33.1	530.7	93.9	96.0	Miner 506	173.4	91.6	84.1
MCC 36.1	45.2	92.0	96.3	Miner 510	161.0	91.6	90.6
MCC 37.1	90.3	92.0	96.3	Miner 511	173.2	91.6	84.2
MCC 41.1	163.9	92.0	96.2				
LC 67-72148-FUTURE	360.9	92.0	96.2				
MCC 43.11	106.7	92.2	96.3				

Note: Highlighted buses need local KVAR compensation to improve the voltage profile and power factor. On Miners 501, 503, 504 and 506, 510 and 511, in addition to KVAR support, transformer tap changer need to be set at maximum of 5% on the secondary size to improve voltage profile.

Table 5-21: Load Flow Results on 0.6 kV Systems – Worst Scenario Case (with VAR compensation)

Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)	Switchgear/Bus	Current (A)	Power Factor (%)	Voltage (%)
LC 15.1	303.1	98.5	99.73	LC 20.3	421.1	97.0	99.3
LC 15.21	103.3	99.2	100.0	MCC 21.12	410.9	98.4	98.04
LC 15.3	259.6	95.7	99.6	MCC 21.21	821.3	98.6	98.7
LC 15.4	1150.0	91.1	97.1	MCC 21.22	245.4	97.8	97.8
LC 17.1	518.3	96.4	98.1	LC 21.3	433.7	90.0	98.7
LC 17.2	187.3	99.7	99.8	MCC 22.11	802.5	89.4	97.9
LC 17.3	402.3	99.1	99.6	MCC 22.21	688.6	90.1	98.3
LC 17.4	476463.6	99.3	99.4	MCC 22.31	1074.2	88.7	97.1
MCC 18.12	273.5	99	99.8	MCC 23.11	877.2	88.8	97.7
LC 18.2	519.4	94.4	98.9	MCC 23.31	563.2	89.2	98.6
LC 18.4	406.7	99.2	99.6	MCC 24.11	861.7	88.6	97.7
LC18.31	1074.6	94.3	97.6	MCC 24.21	854.0	90.9	97.9
LC 19.1	786.7	97.4	98	MCC 25.11	687.7	91.0	98.3
MCC 19.12	283.4	95.2	98	MCC 25.21	732.0	89.8	89.1
LC 19.2	364.4	96.9	99.0	MCC 25.31	986.5	87.6	97.2
				MCC 31.11	344.6	99.0	95.8
LC 19.3	690.9	99.1	99.1	LC 31.2	527.5	98.2	95.3
LC 19.4	1192.3	94.4	96.9	MCC 42.11	498.9	90.1	95.0
MCC 19.43	829.9	90.6	96.9	LC 34.1	173.8	93.4	95.6
LC 20.1	558.0	93.0	98.0	LC 35.1	234.2	99.7	96.1
MCC 20.13	321.1	90.0	98.0	LC 35.2	290.1	96.4	95.7
LC 20.2	215.5	99.4	99.8				
LC 20.4	361.0	99.9	99.7				

Note: Highlighted buses need local KVAR compensation to improve the power factor.

As shown in Tables 18, 19, 20, and 21, the combination of ULTC on T1 and T2 transformers and KVAR capacitor banks on 13.8 switchgears are able to regulate voltage and power factor within acceptable limits. In addition of power quality improvement, using KVAR support reduces overall Colonsay MVA load demand under normal and worst case situations.

6. Conclusion, Recommendations and Future Work

The results of the power system studies indicate that all the electrical power distribution equipment as specified for the Mosaic Colonsay facility has been rated to accommodate all foreseen normal and worst case scenario.

Minor modifications to the ETAP model may be required periodically as the Mosaic Colonsay loads are modified. However, these changes are expected to have only a minimal effect on the results of the power system studies.

Further comments on the power system studies and results are summarized and discussed herein.

6.1 Short Circuit Study

Based on the results obtained from the short circuit study, it is noted that for worst case conditions when T1 & T2, and T10 & T20 are in parallel operation, the maximum 3-phase fault levels on the following buses exceed or are very close to the interrupted short circuit rating of the equipment. To ensure safe operation, Mosaic shall implement a scheme to avoid parallel operation of T1 with T2 and T10 with T20 transformers.

Switchgear/Bus	Voltage Class (kV)	Interrupted rating (kA)	Calculated Int. (kA)
LC 32.1	4.16	35	37
LC 32.2	4.16	35	37
LC 37.1	4.16	35	37.5
LC 33.1	4.16	35	33.9
LC 36.1	4.16	35	34.8
LC 19.3	0.6	25	24.6
LC 15.3	0.6	25	25.2
LC 18.2	0.6	25	26.7
LC 18.31	0.6	25	26.5
LC 35.2	0.6	25	24.1
MCC 21.22	0.6	25	23.6

Note that the 13.8 and 4.16 kV systems in the Mosaic Colonsay facility are resistance grounded to limit ground fault currents to 105 Amp on 13.8 kV systems and to 25 Amp on 4.16 kV systems. The existing 600 V systems are isolated from ground on surface. The underground 600 V are 15 Amp resistance grounded. New surface 600V systems are 5 Amp resistance grounded.

6.2 Load Flow Study

The purpose of the load flow study was to determine equipment ratings and to ensure that power quality is within acceptable limits identified by project Design Criteria.

The results of the load flow study indicate that the main 13.8, 4.16 and 0.6 kV transformers are sufficiently sized to accommodate all Mosaic Colonsay loads under all foreseen operating conditions. Harmonic distortion caused by variable frequency drives and soft starters were neglected in this study.

The combination of ULTC transformer tap changers and VAR support on 13.8 kV switchgear will ensure that voltage throughout the surface distribution network will be maintained within acceptable limit for normal operation and worst case scenario. It is noticeable that the voltage profile on underground buses is lower than the required level to support mining machines (500HP) motor starting. To support the motor starting and improve the voltage profile and power factor in underground, local KVAR compensation should be considered in addition to the voltage increase caused by setting secondary side of the transformers tap changers to the maximum (+5%) on the miners substation.

As described in Section 5.5, the VAR support system was simplified by designing two (2), 6.6 MVAR capacitor banks. One (1) 6.6 MVAR capacitor bank installed at each main 13.8 kV switchgear bus. However, it is recognized that the optimum location for VAR compensation is close to the major load centers. The major load centers are on 4.16 kV switchgears and underground mining machine substations.

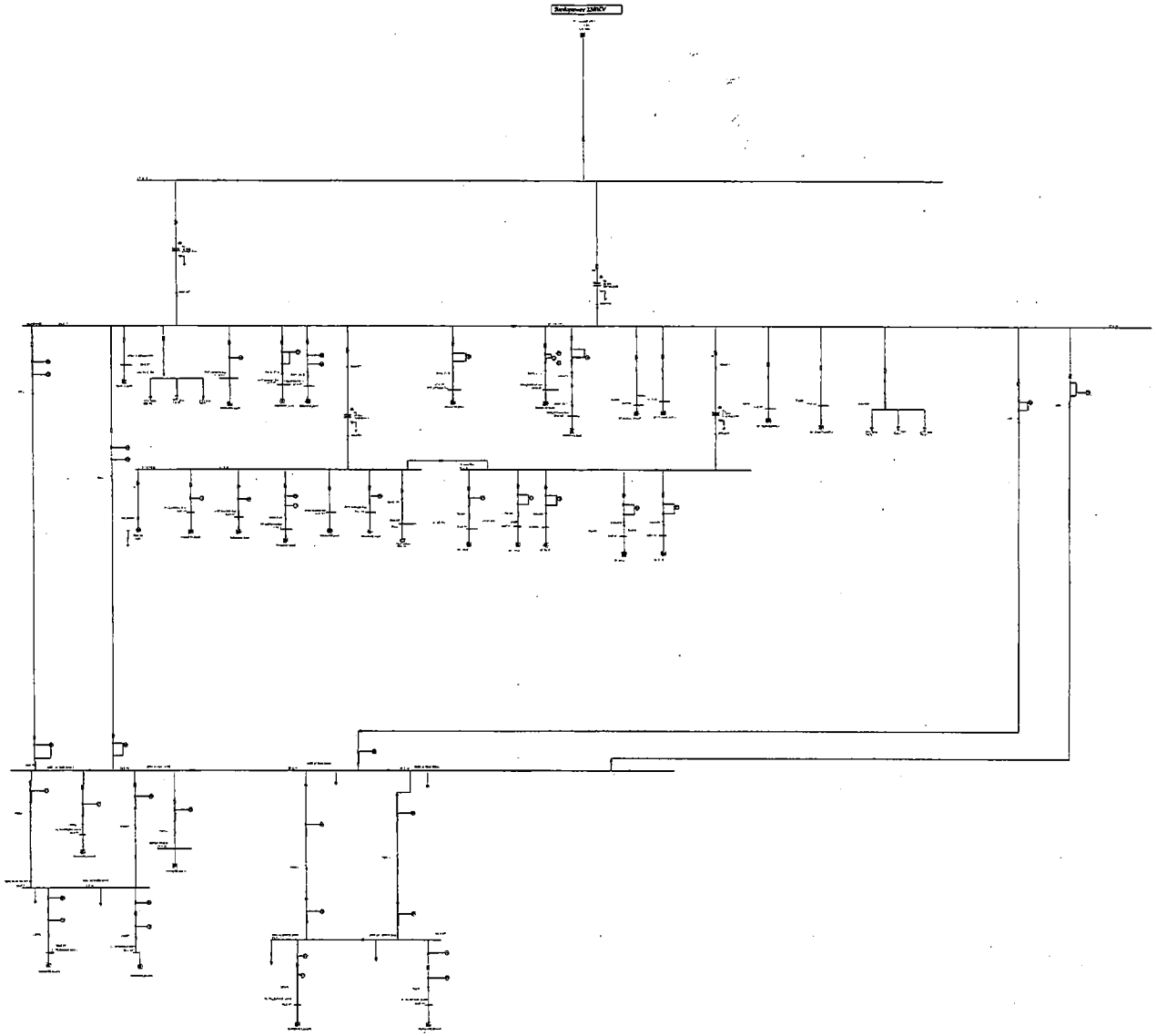
6.3 Recommendations

Hatch recommends interlocking T1 with T2 transformers and T10 with T20 transformers to avoid transformers parallel operation.

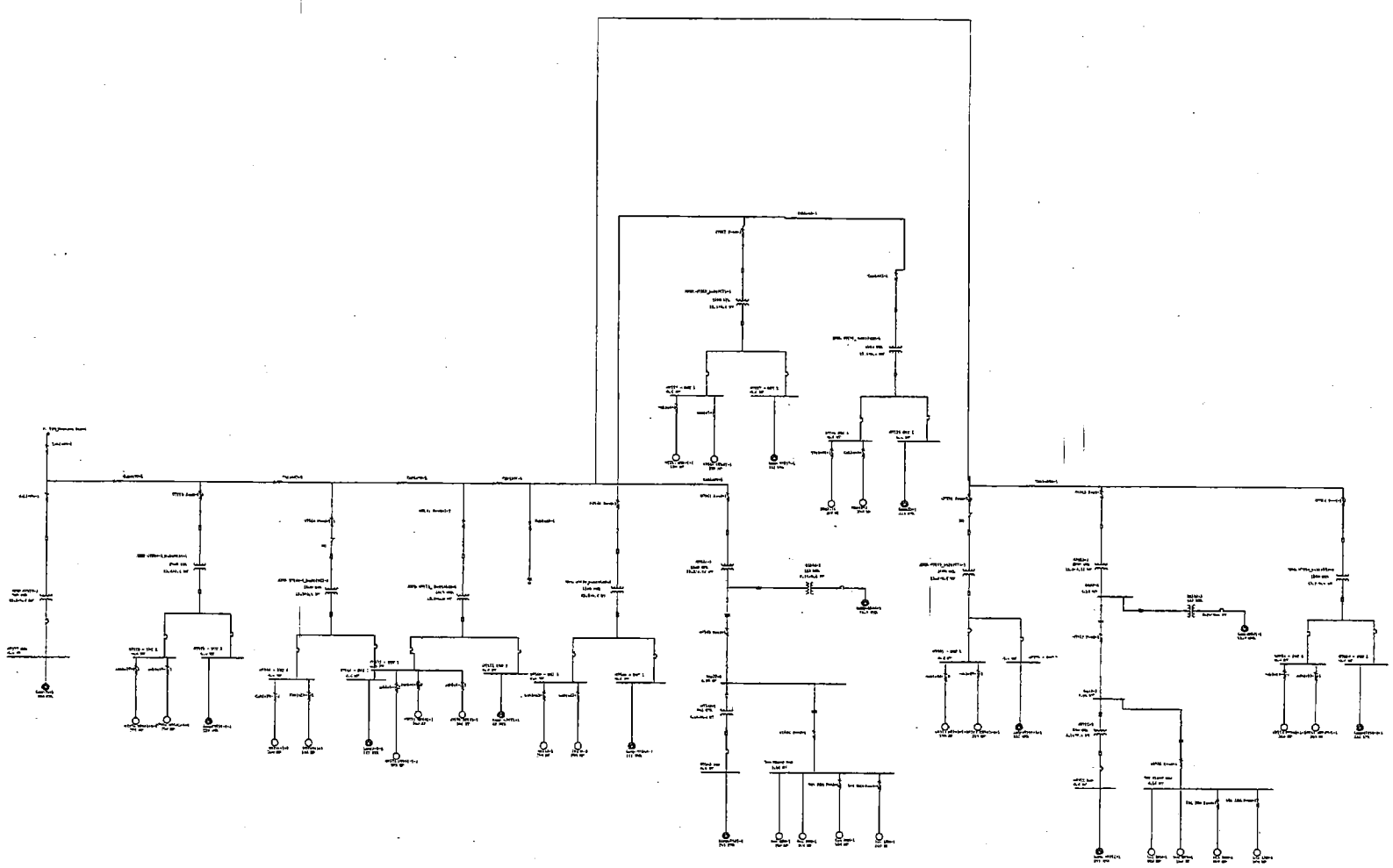
6.4 Future Work

- Relay setting and coordination study;
- Issue arc flash labels.

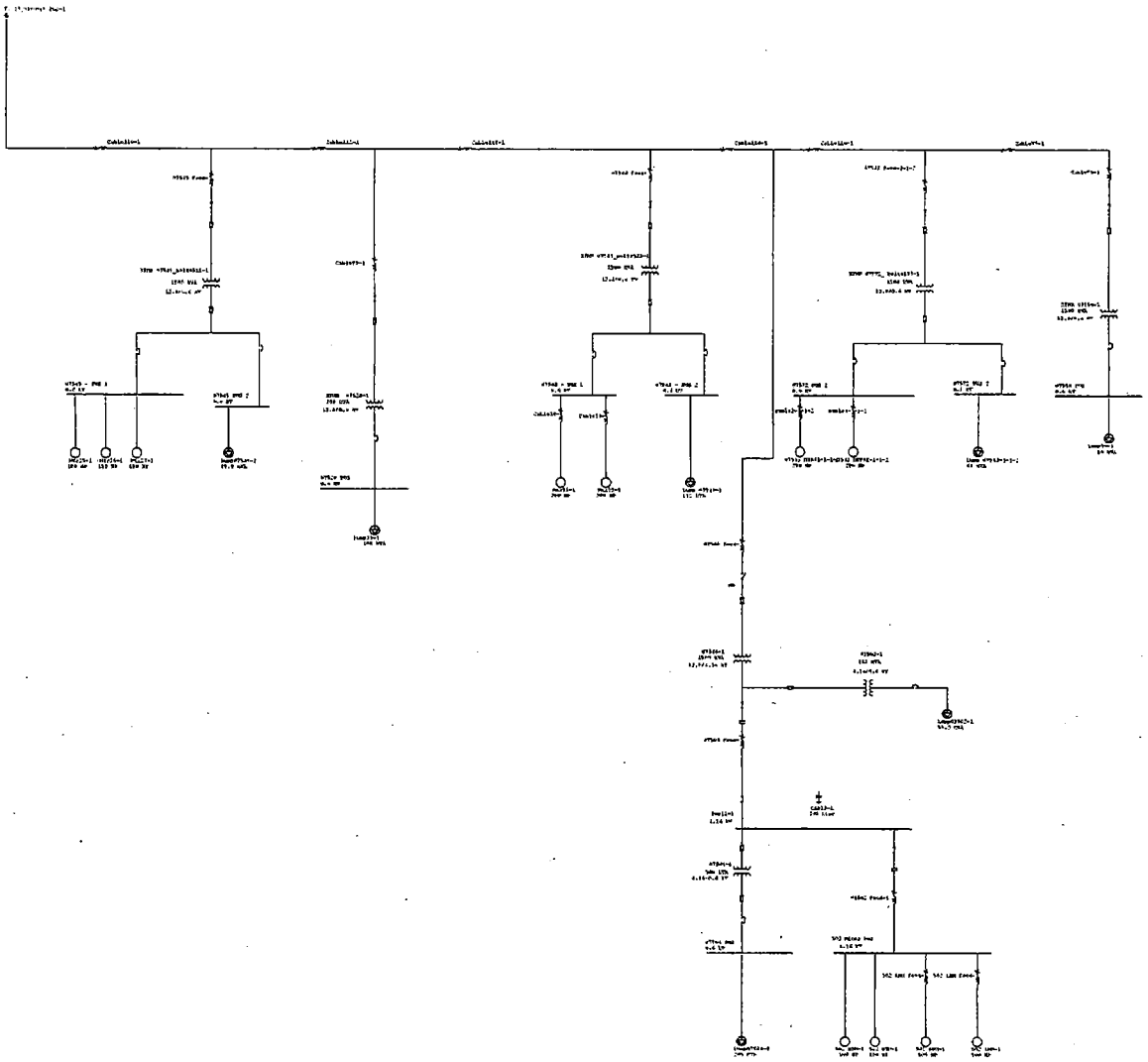
Appendix A:
ETAP Single Line Diagrams



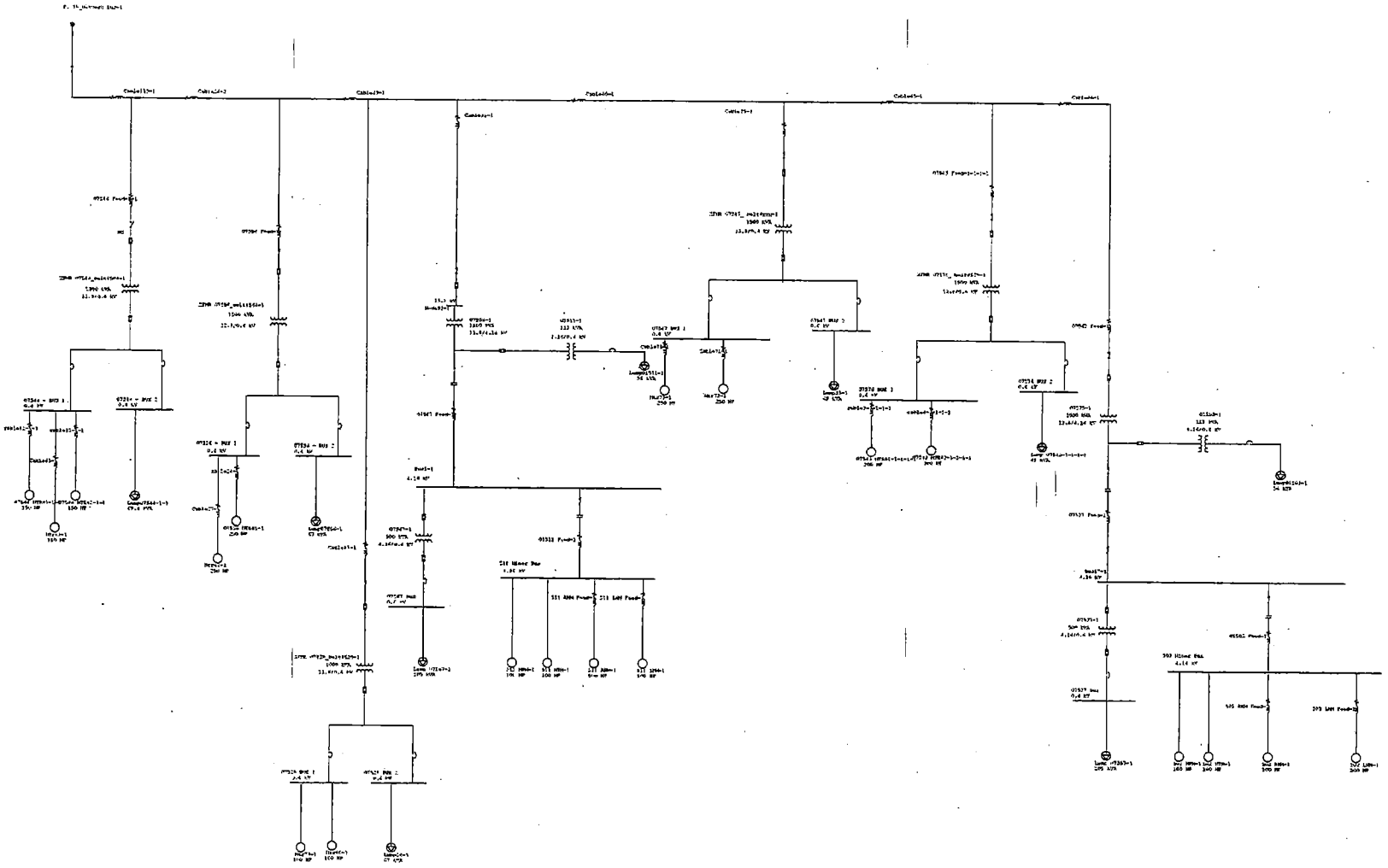
One-Line Diagram - OLV1=>Feeder-T10_Load-1 (Edit Mode)



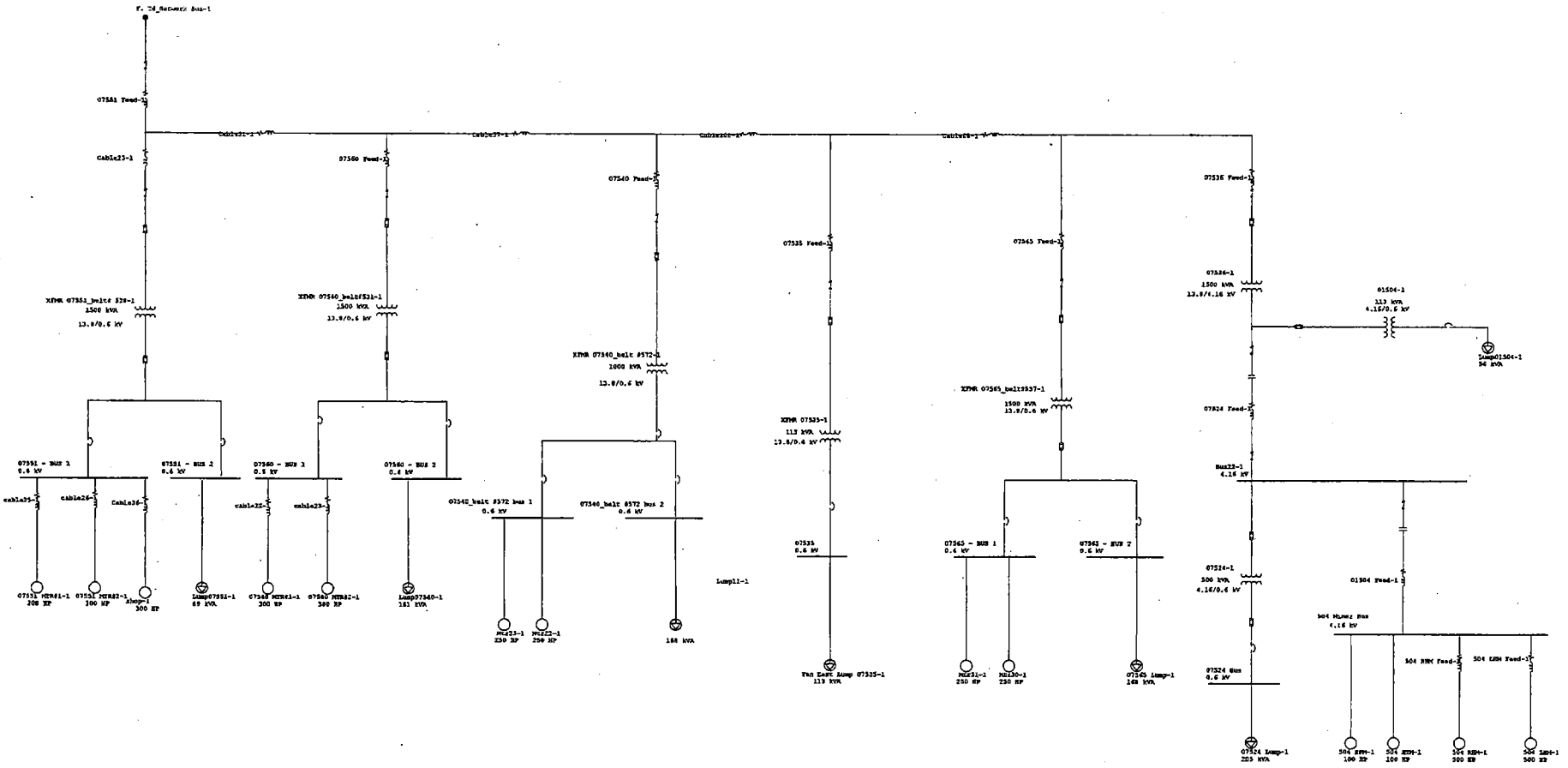
One-Line Diagram - OLV1=>Feeder-T9_Load-1 (Edit Mode)



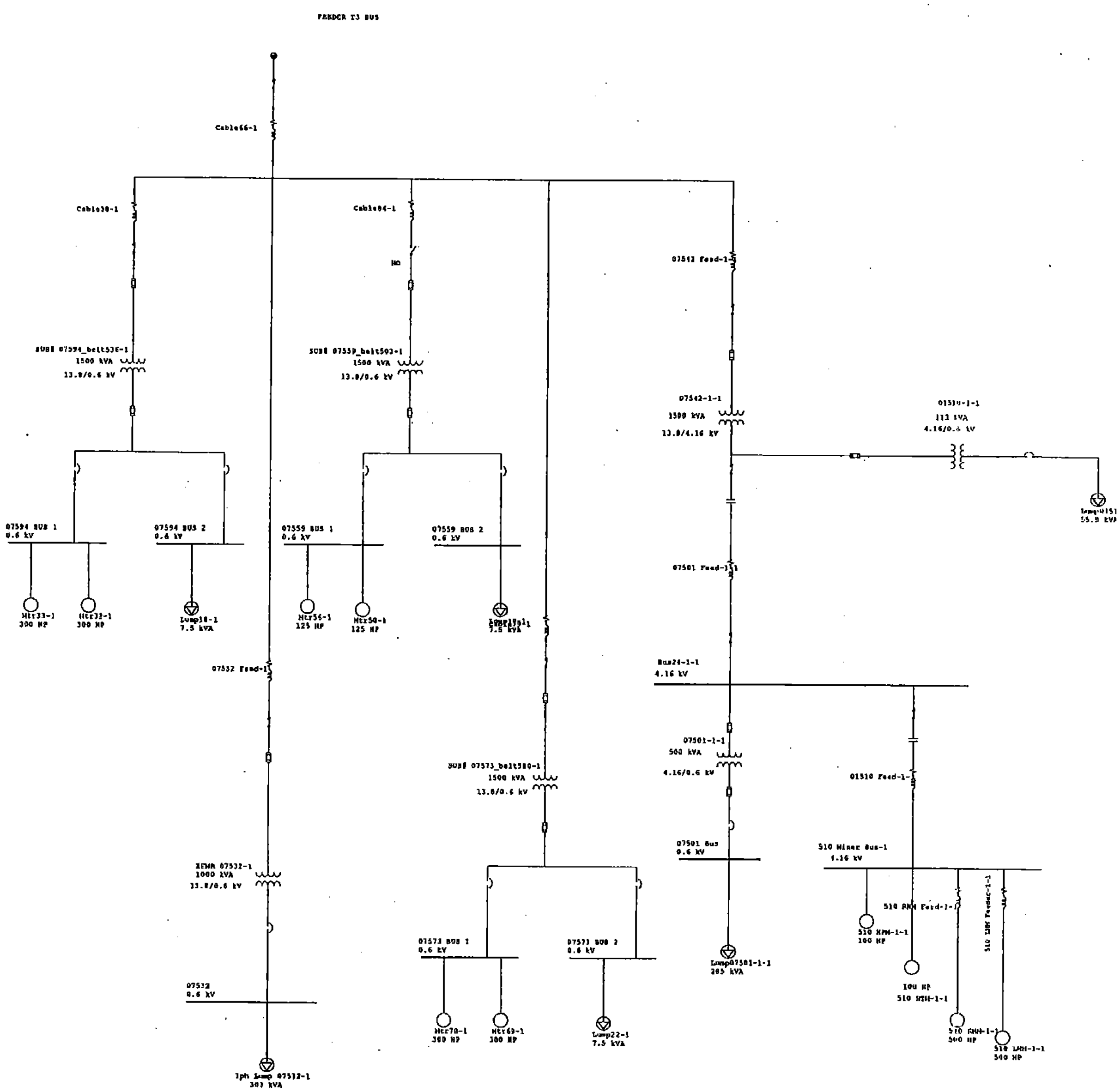
One-Line Diagram - OLV1=>Feeder-T8_Load-1 (Edit Mode)



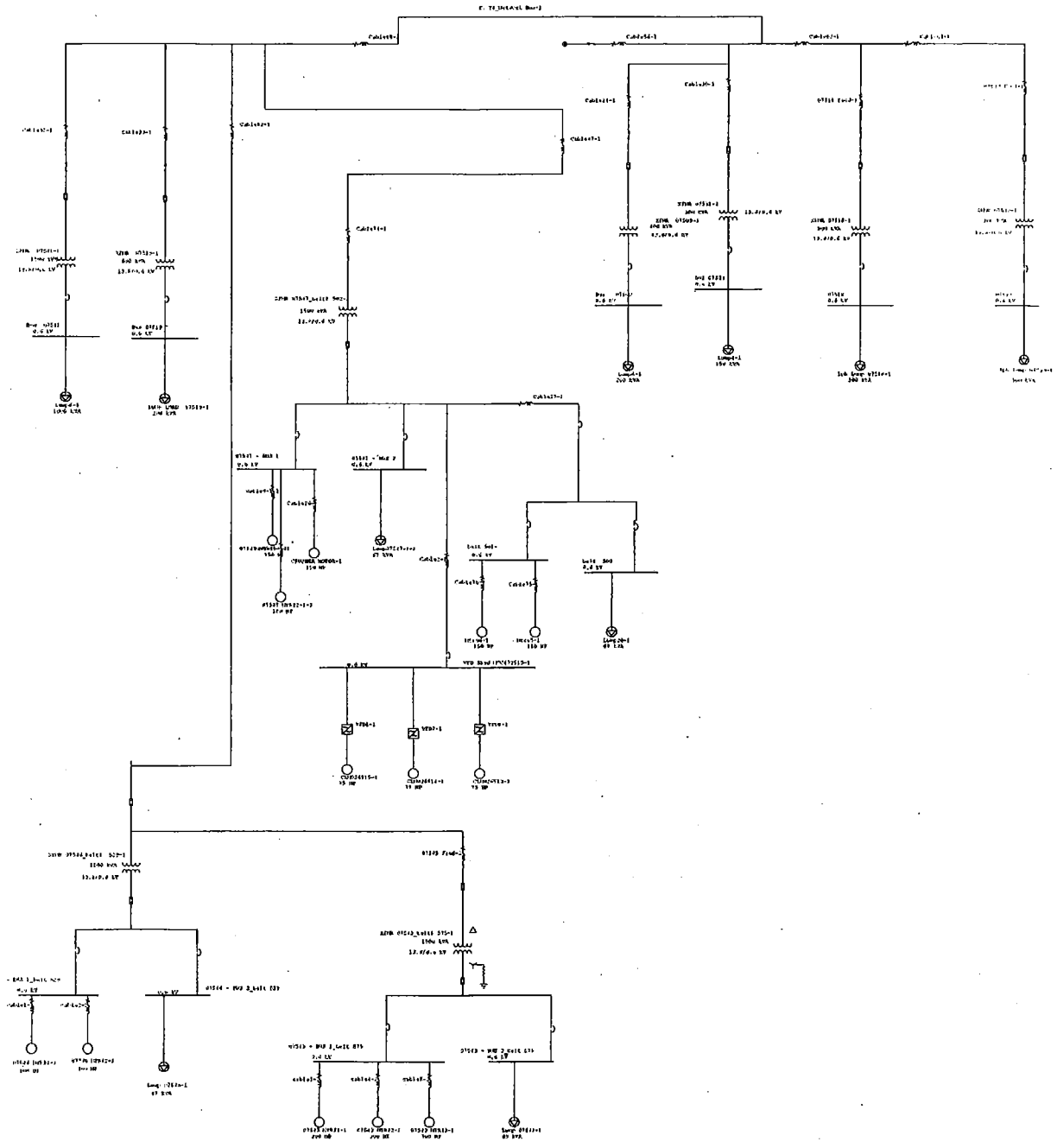
One-Line Diagram - OLV1=>Feeder-T6_Load-1 (Edit Mode)



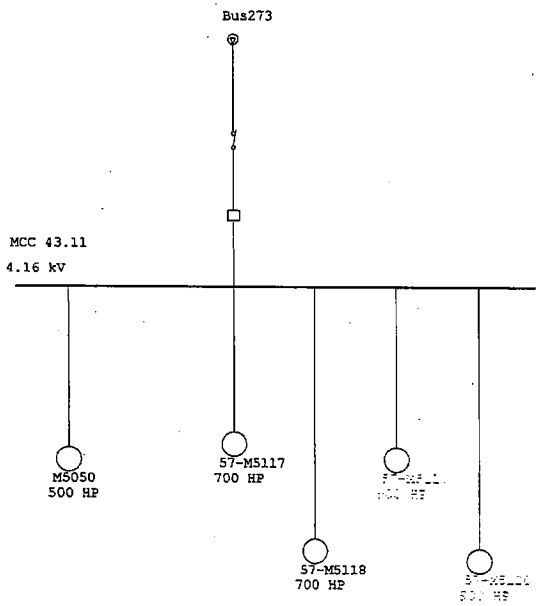
One-Line Diagram - OLV1=>Feeder-T3_Load-1 (Edit Mode)



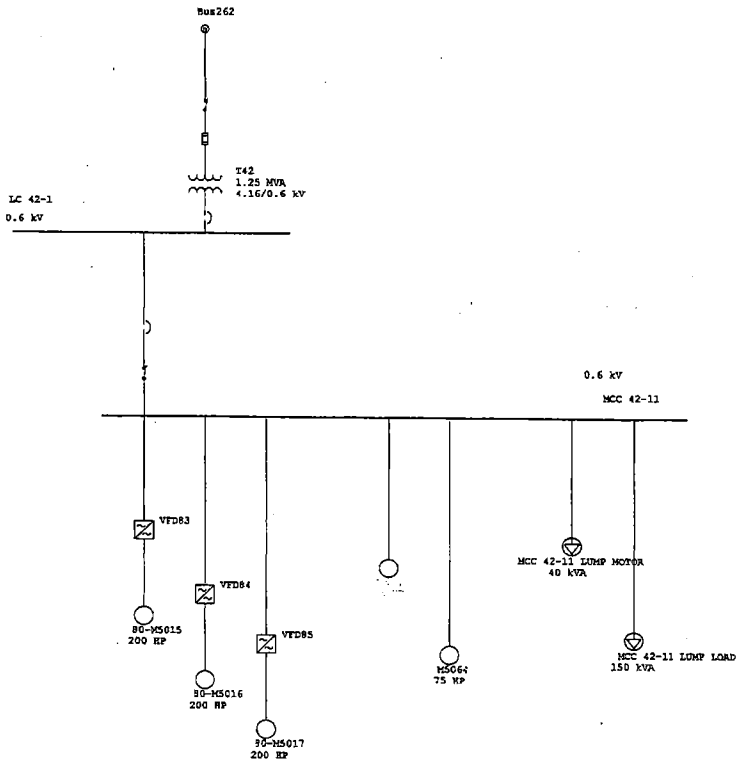
One-Line Diagram - OLV1=>Feeder-T4_Load-1 (Edit Mode)



One-Line Diagram - OLV1=>LC 43.1 (Edit Mode)



One-Line Diagram - OLV1=>LC 42.2 (Edit Mode)



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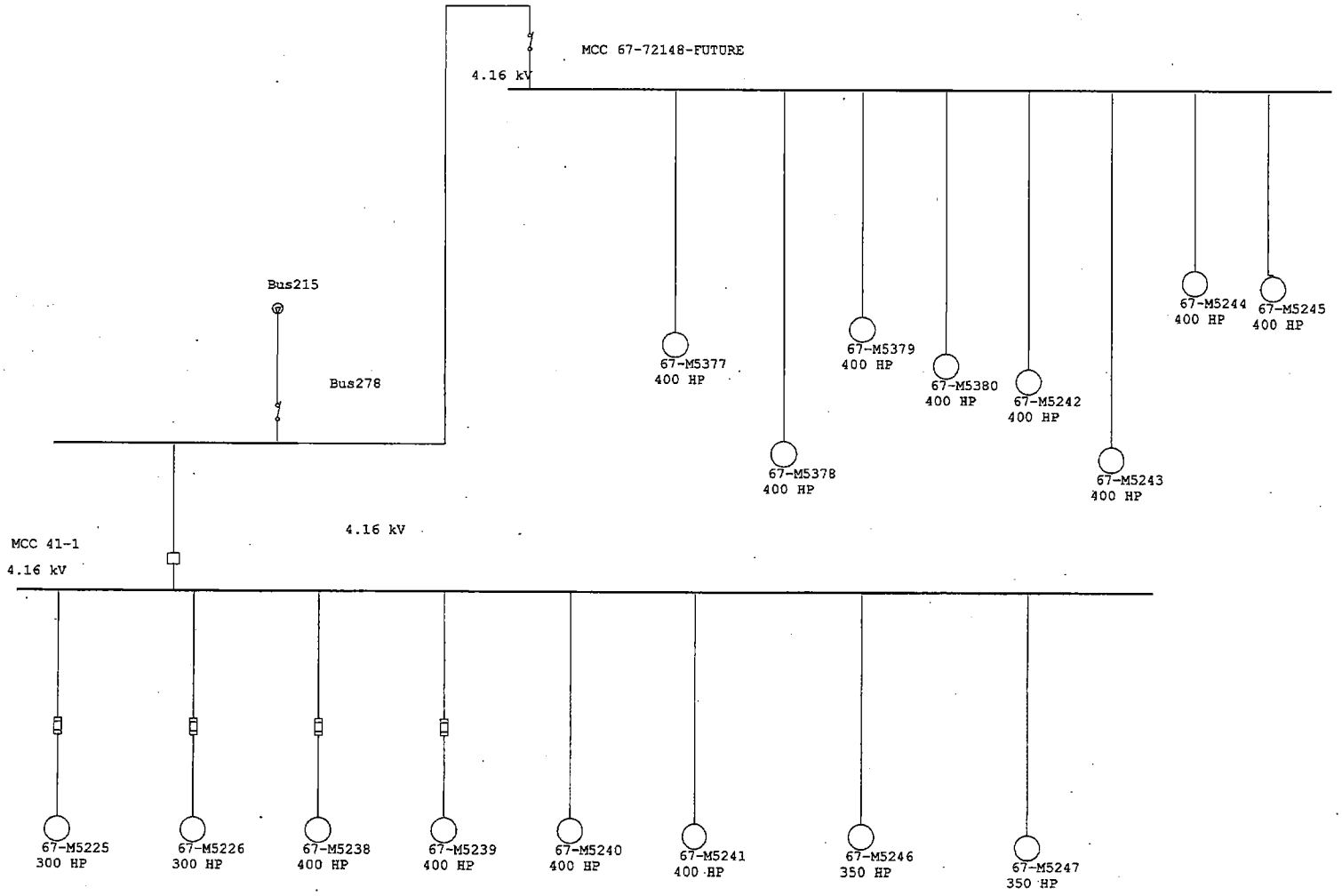

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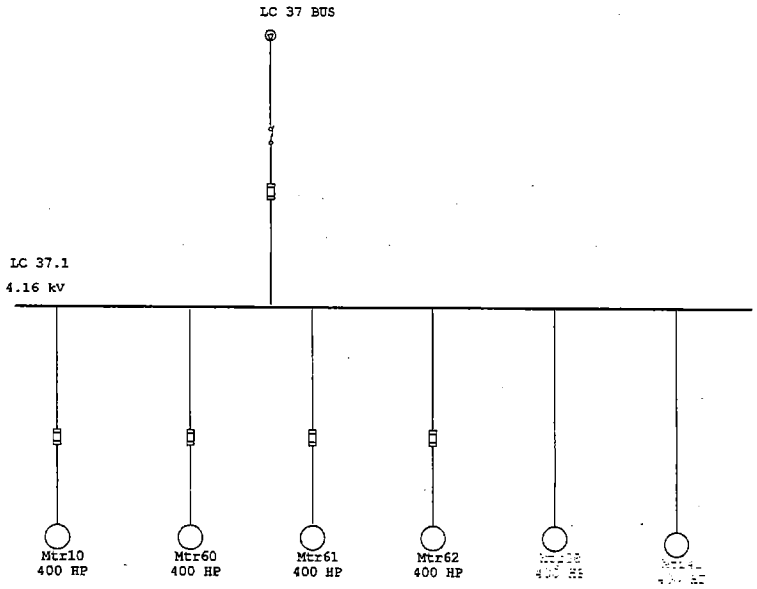

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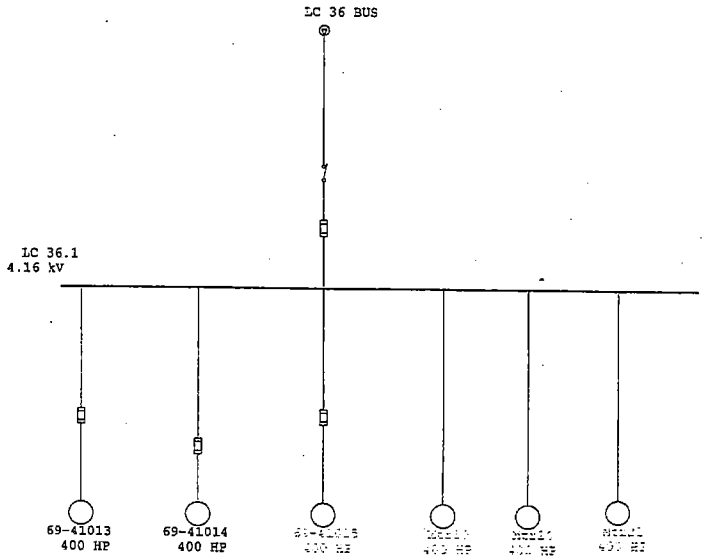
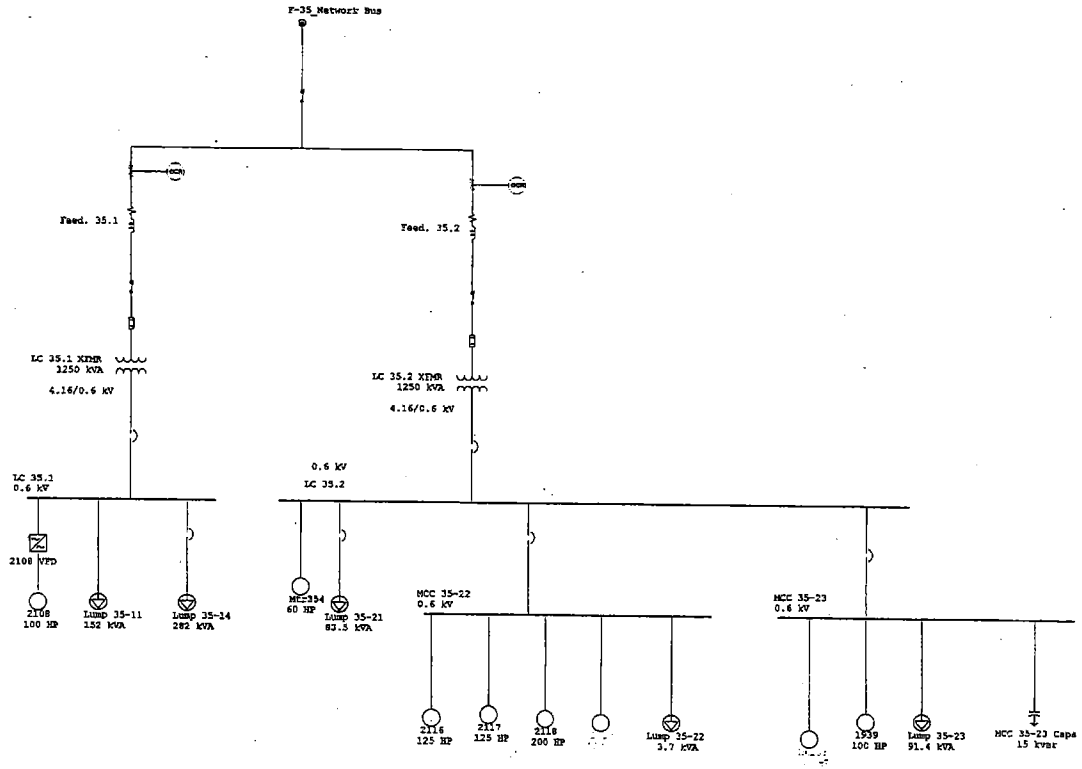
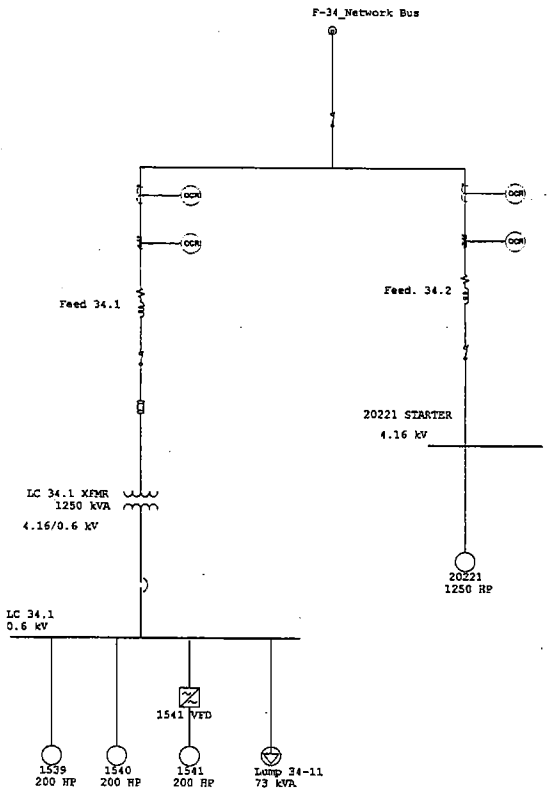


One-Line Diagram - OLV1=>Feeder-35_Load (Edit Mode)



One-Line Diagram - OLV1=>Feeder-34 Load (Edit Mode)



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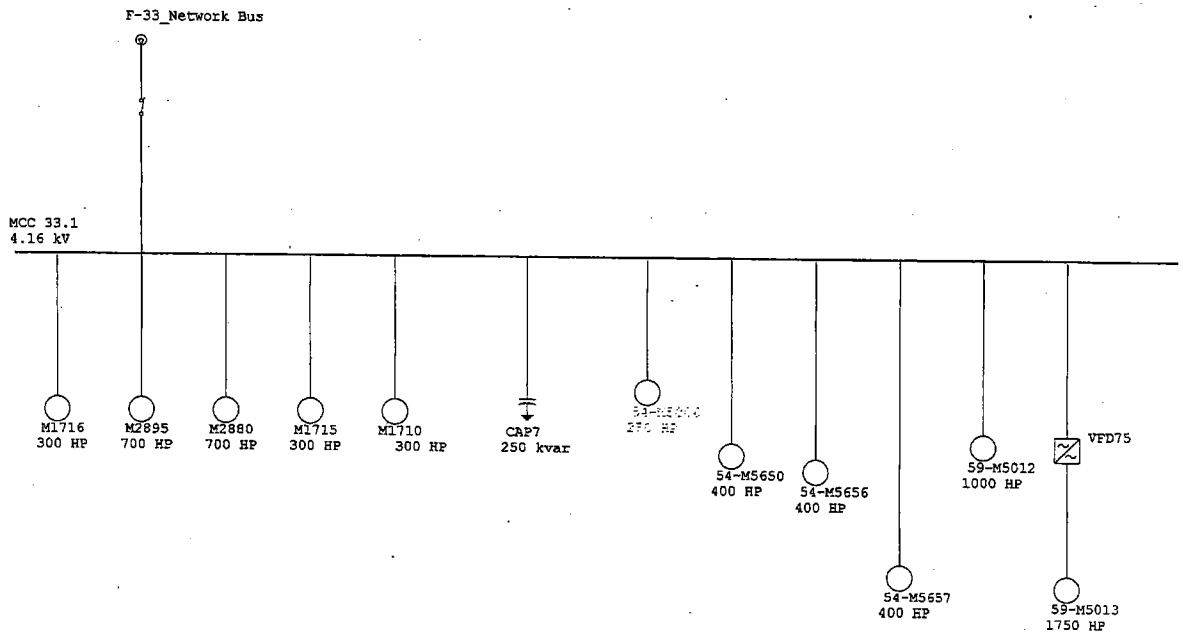
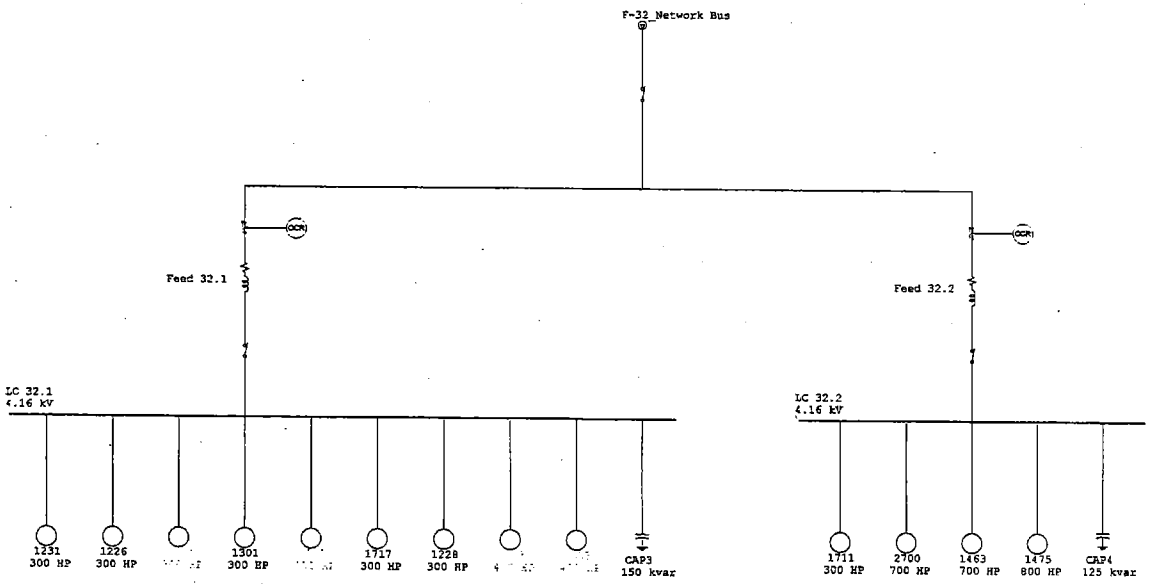
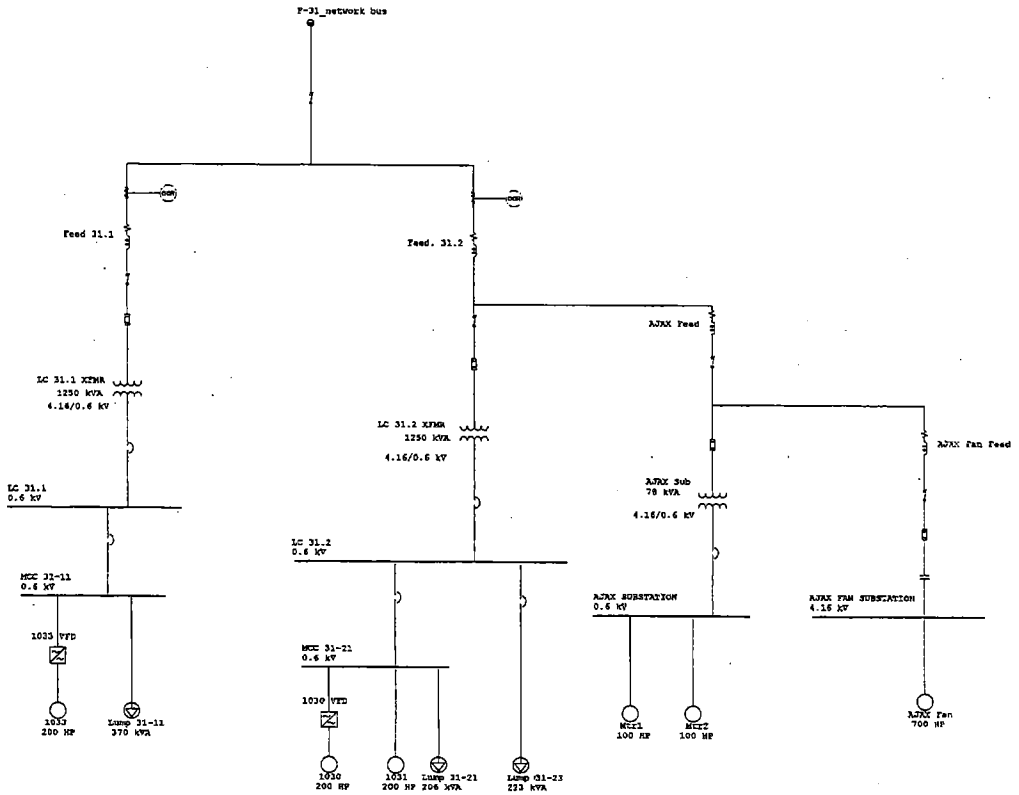


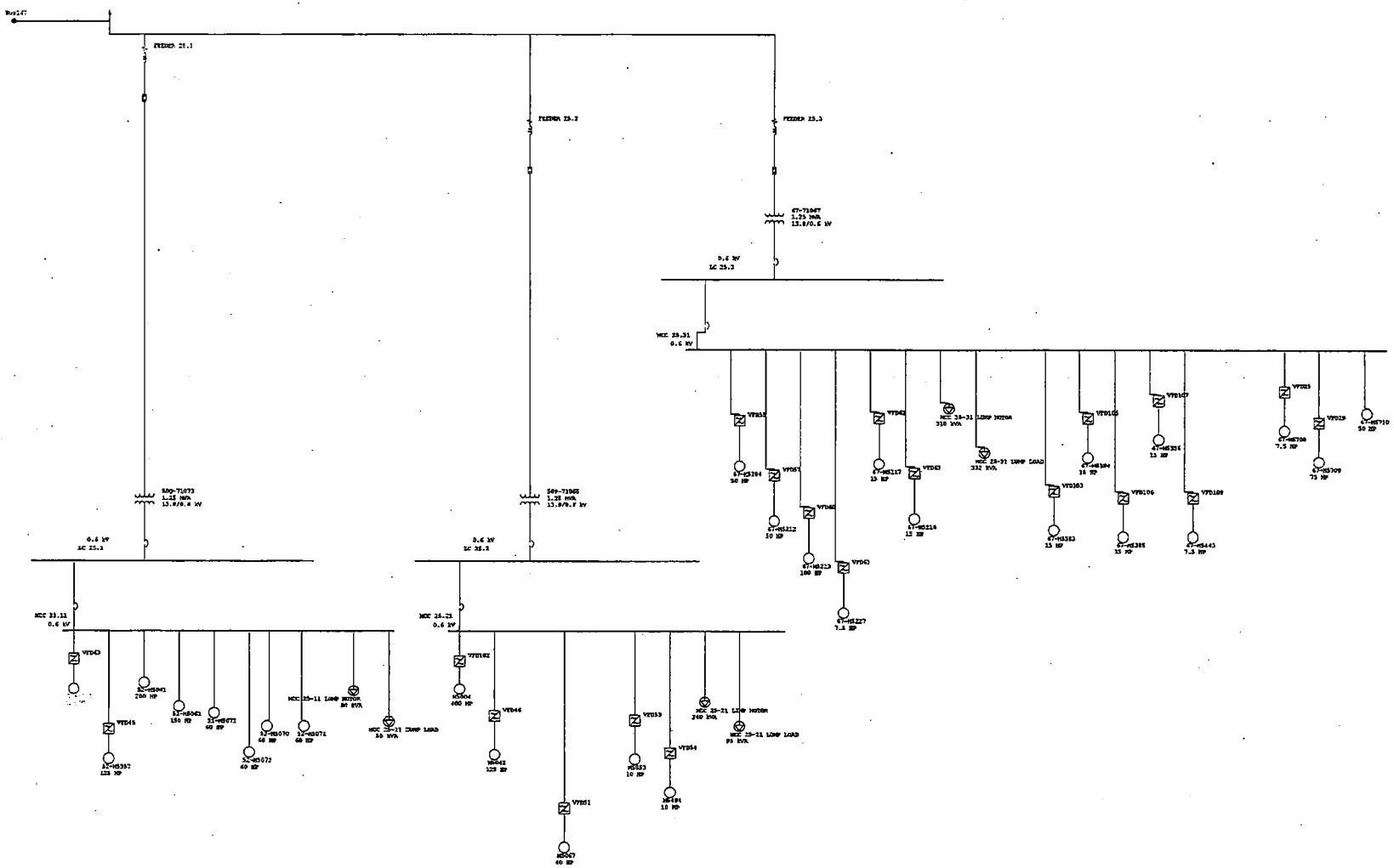
One-Line Diagram - OLV1=>Feeder-32 Load (Edit Mode)

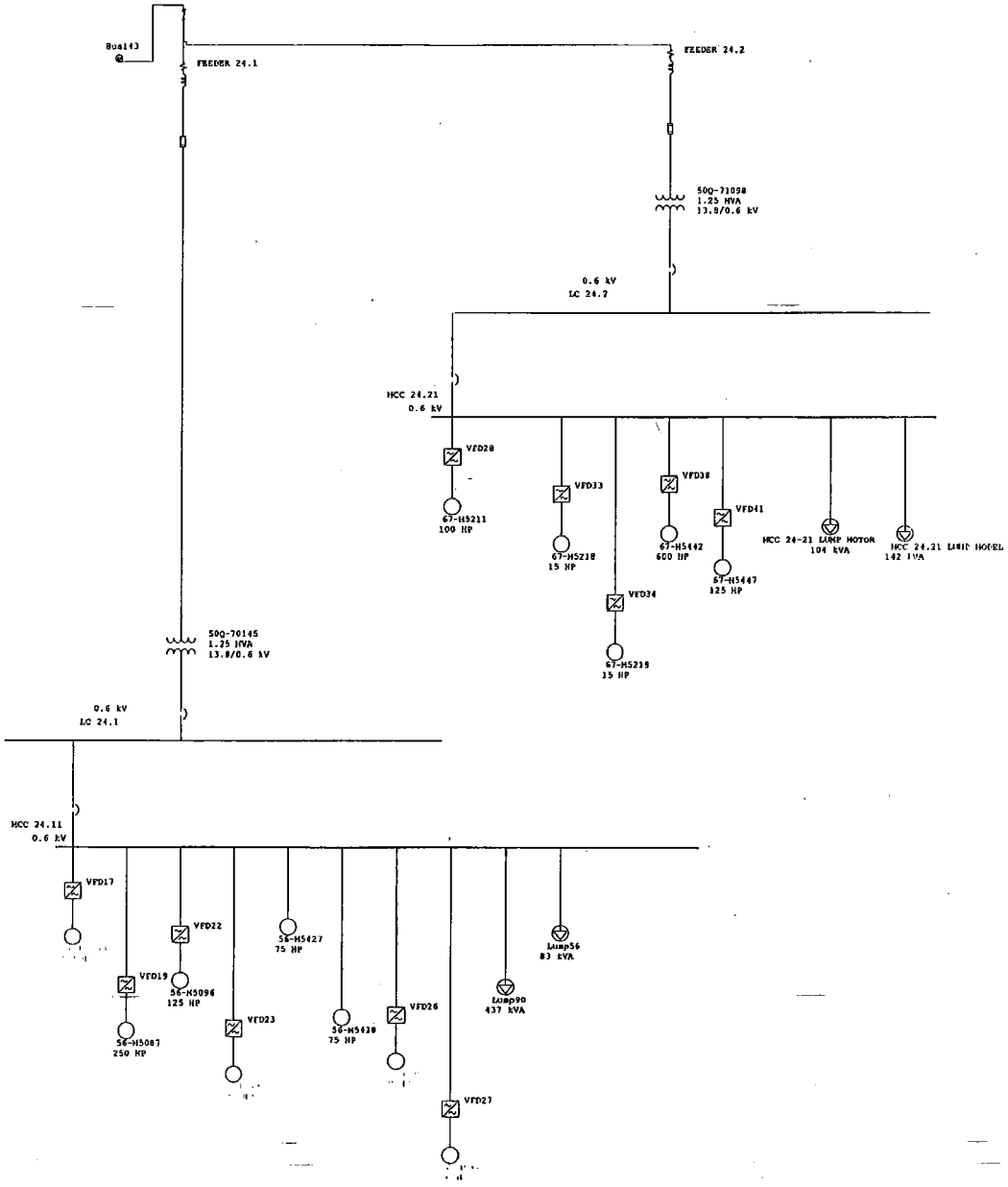


One-Line Diagram - OLV1=>Feeder-31 Load (Edit Mode)

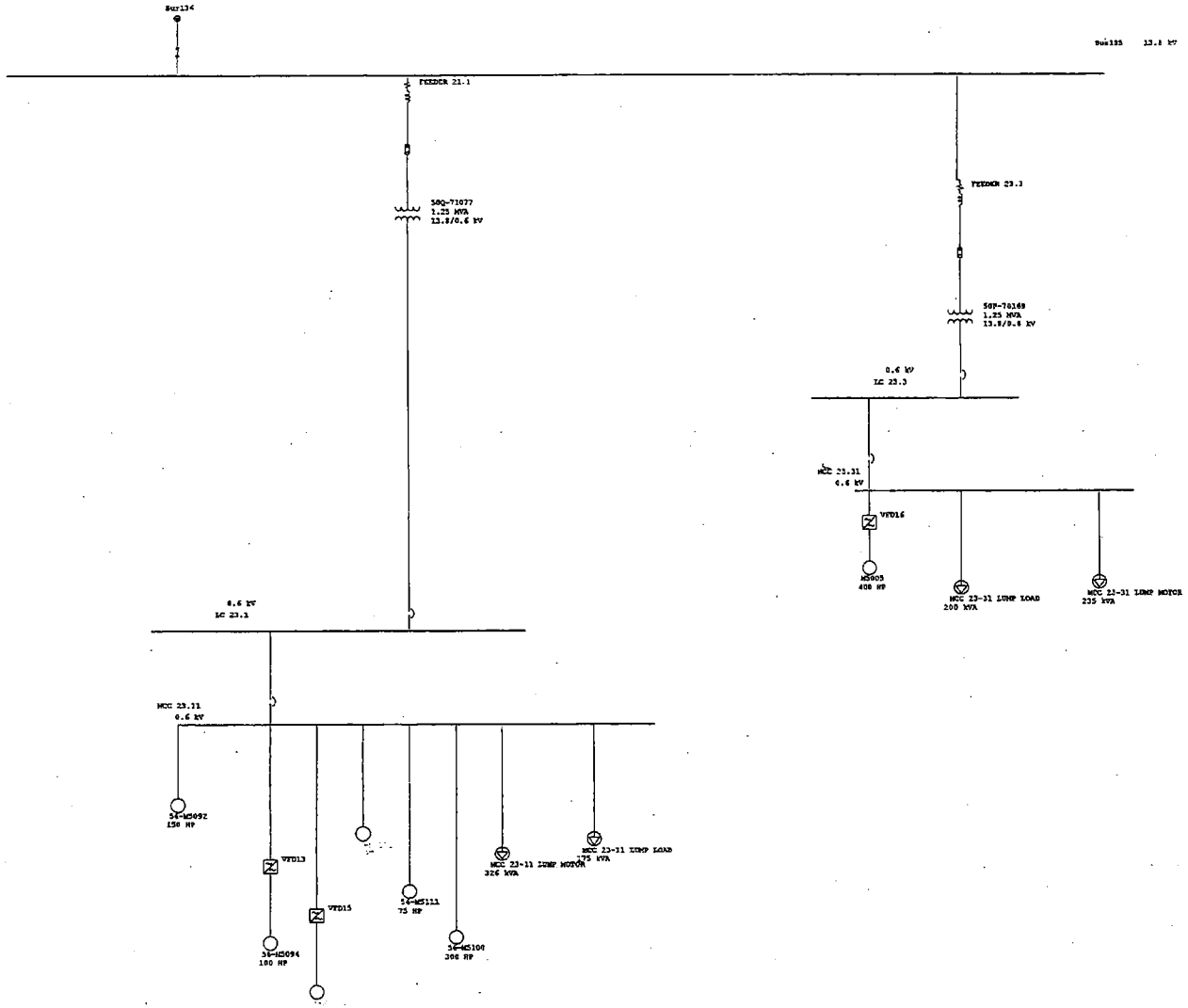


One-Line Diagram - OLV1=>LC 25.1-25.2-25.3 (Edit Mode)

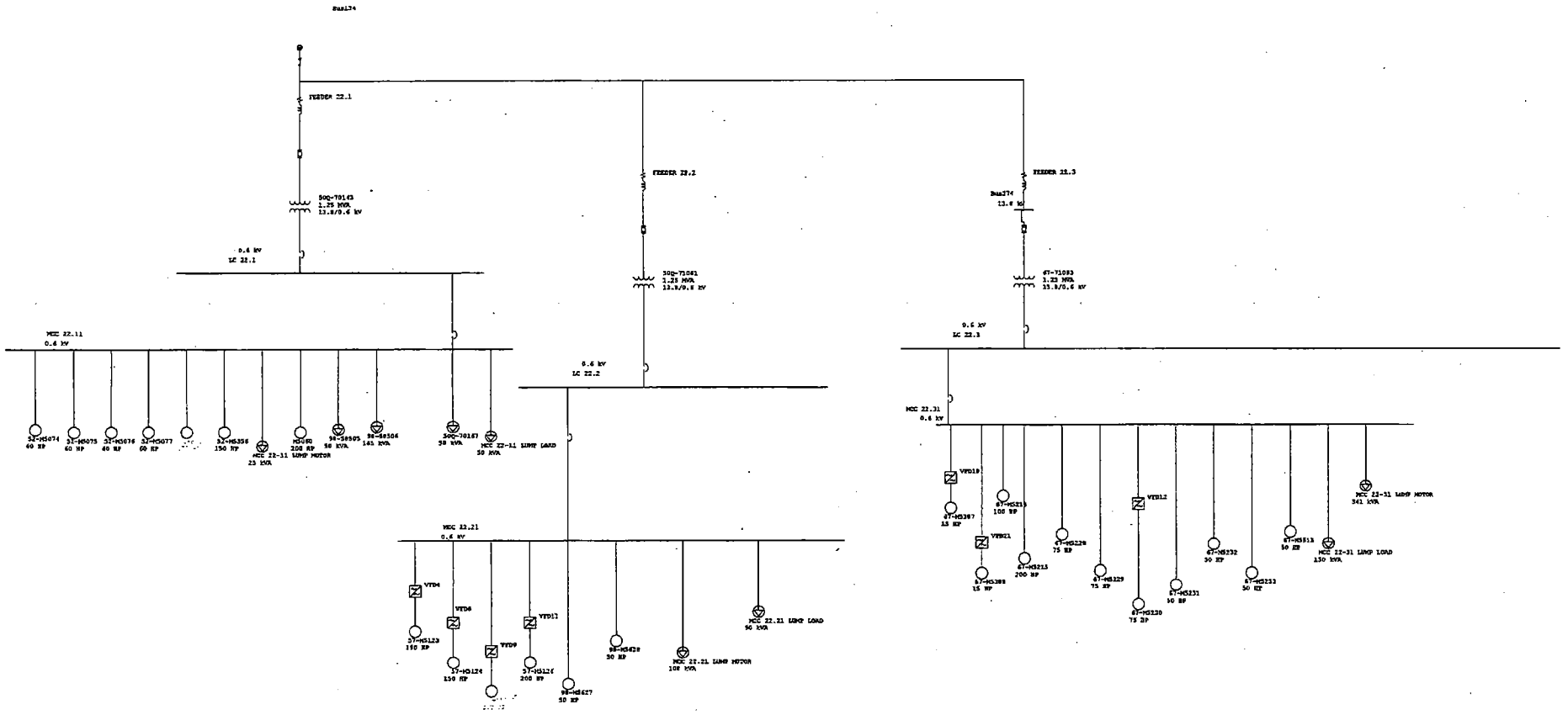



Bus143
FEEDER 24.1
FEEDER 24.2
50Q-71038
1.25 MVA
13.8/0.6 kV
0.6 kV
LC 24.2
MCC 24.21
0.6 kV
VFD28
67-M5211
100 HP
VFD33
67-M5218
15 HP
VFD38
67-M5442
600 HP
VFD41
67-M5447
125 HP
MCC 24-21 LAMP MOTOR
104 kVA
MCC 24.21 LAMP MODEL
142 kVA
VFD34
67-M5219
15 HP
50Q-70145
1.25 MVA
13.8/0.6 kV
0.6 kV
LC 24.1
MCC 24.11
0.6 kV
VFD17
VFD22
56-M5427
75 HP
Lamp36
83 kVA
VFD19
56-M5096
125 HP
56-M5087
250 HP
VFD23
56-M5430
75 HP
VFD26
Lamp90
437 kVA
VFD27

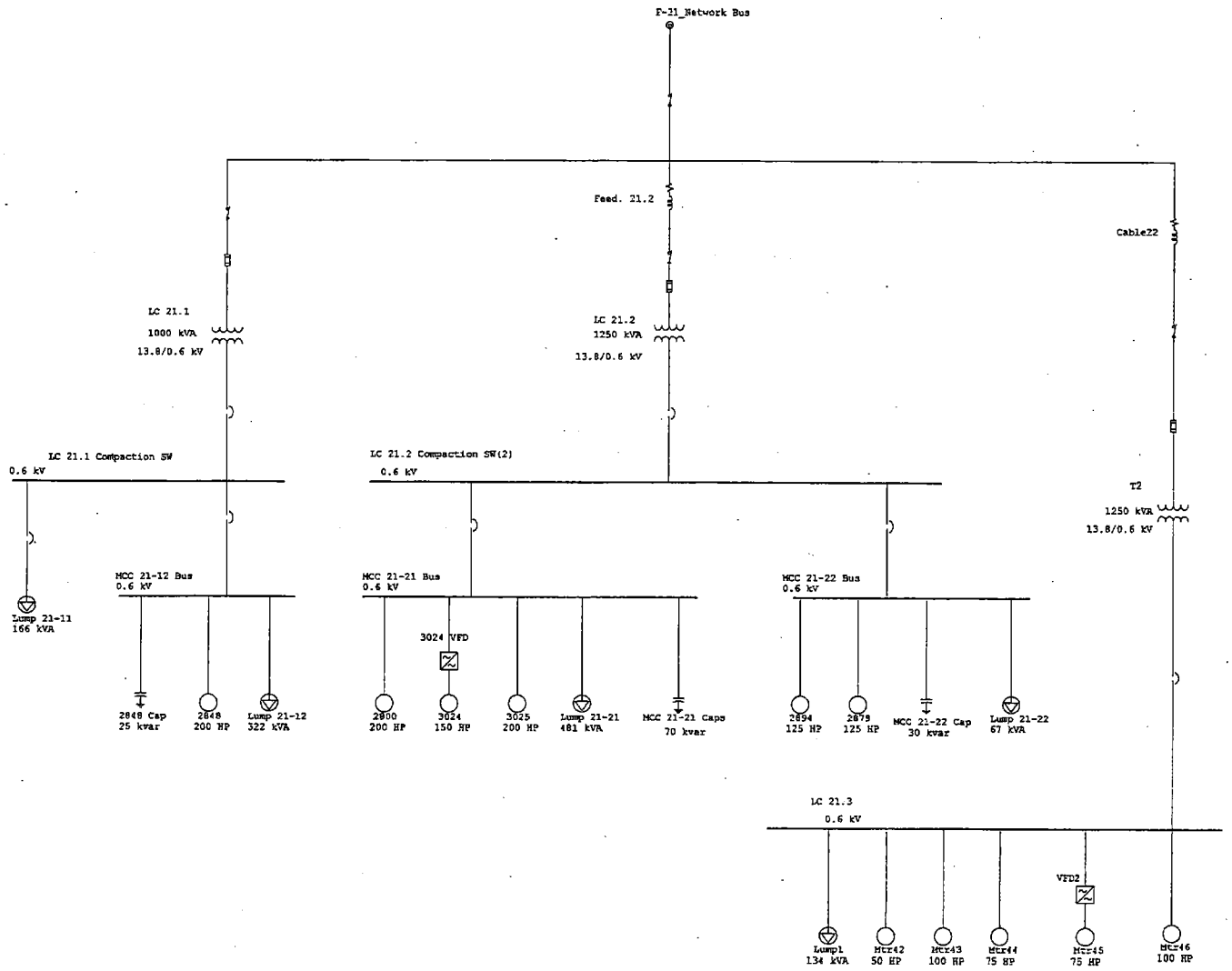
One-Line Diagram - OLV1=>LC 23.1-23.2-23.3 (Edit Mode)



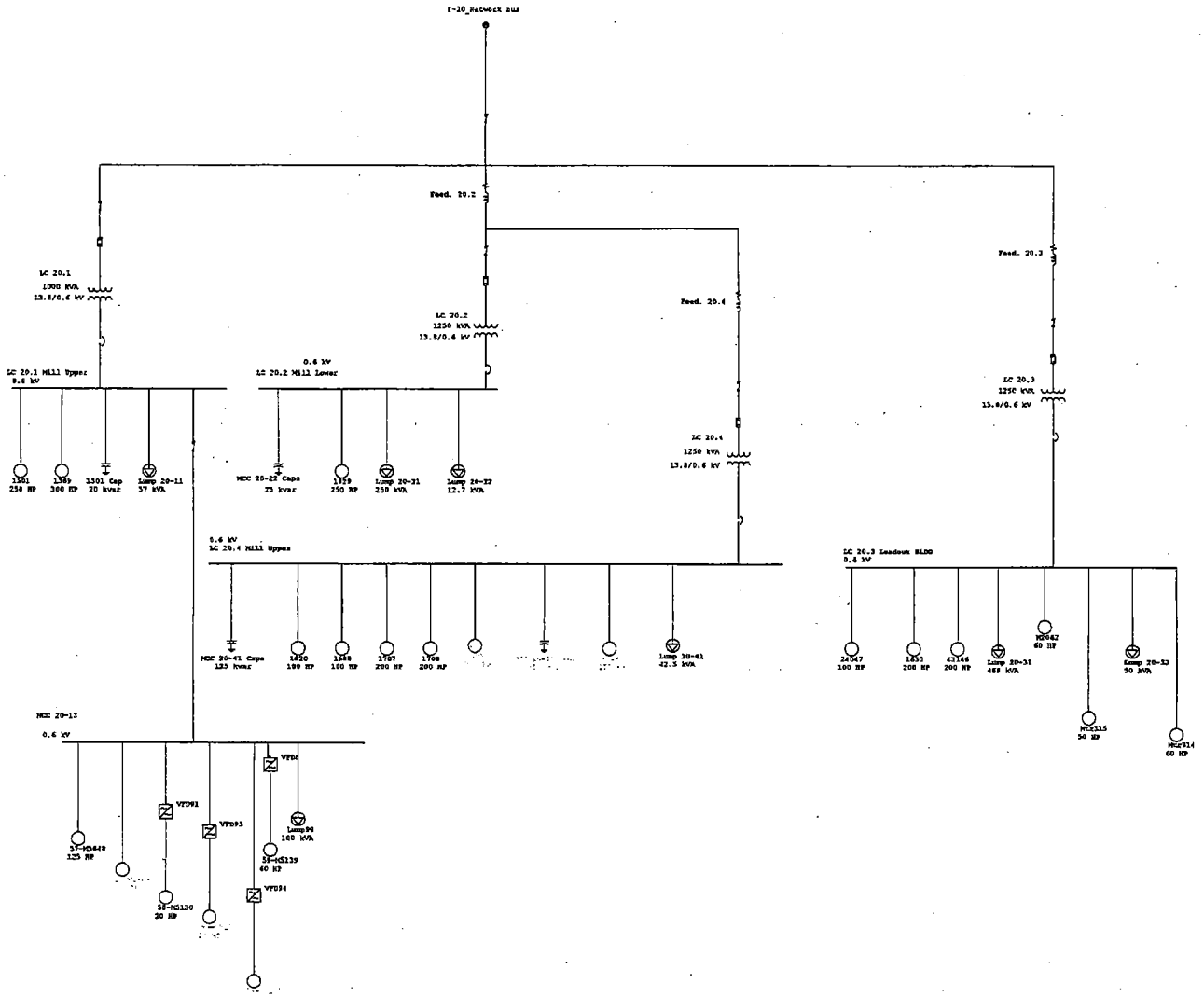
One-Line Diagram - OLV1=>LC 22.1-22.2-22.3 (Edit Mode)



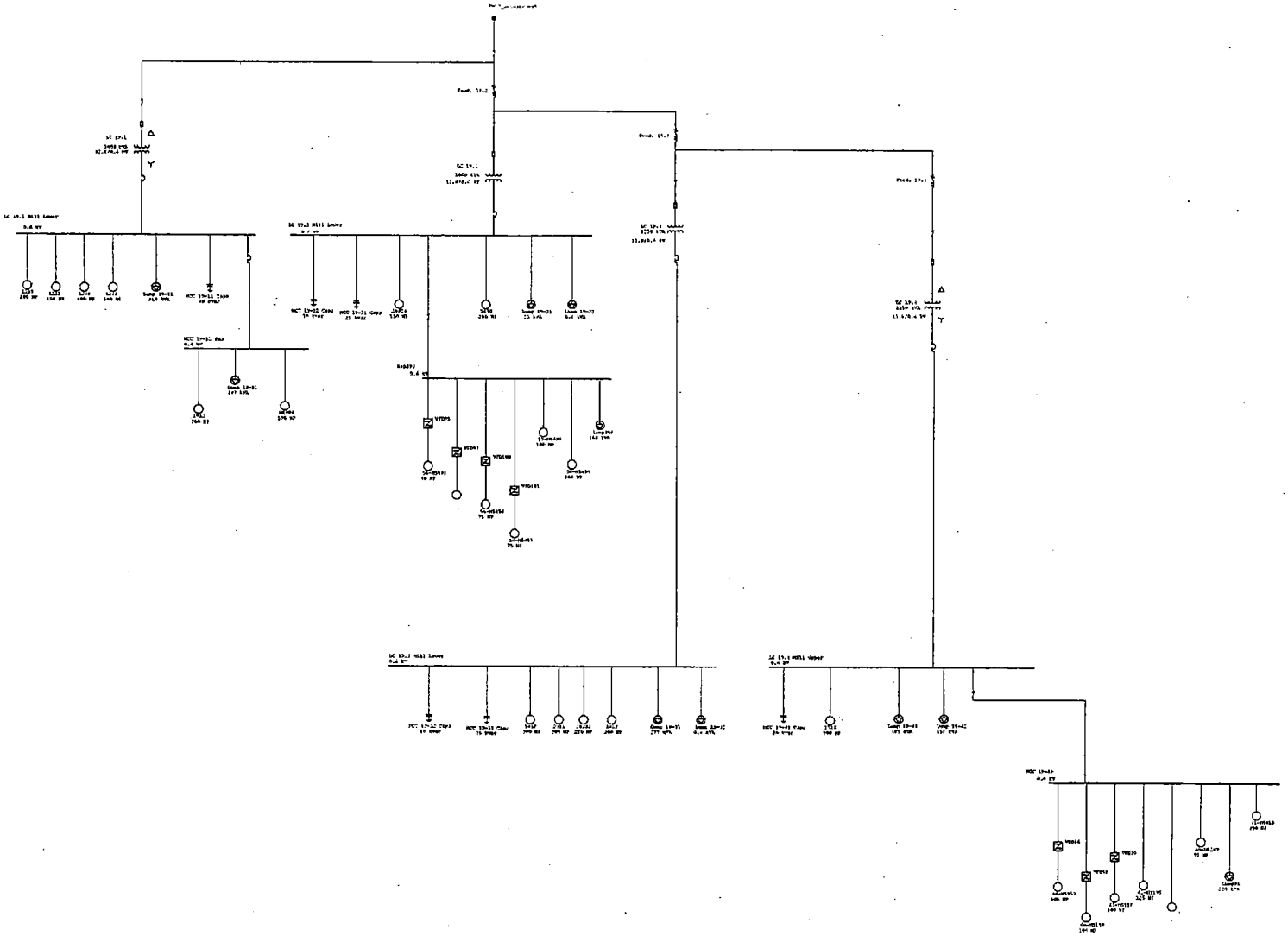
One-Line Diagram - OLV1=>Feeder-21_Load (Edit Mode)



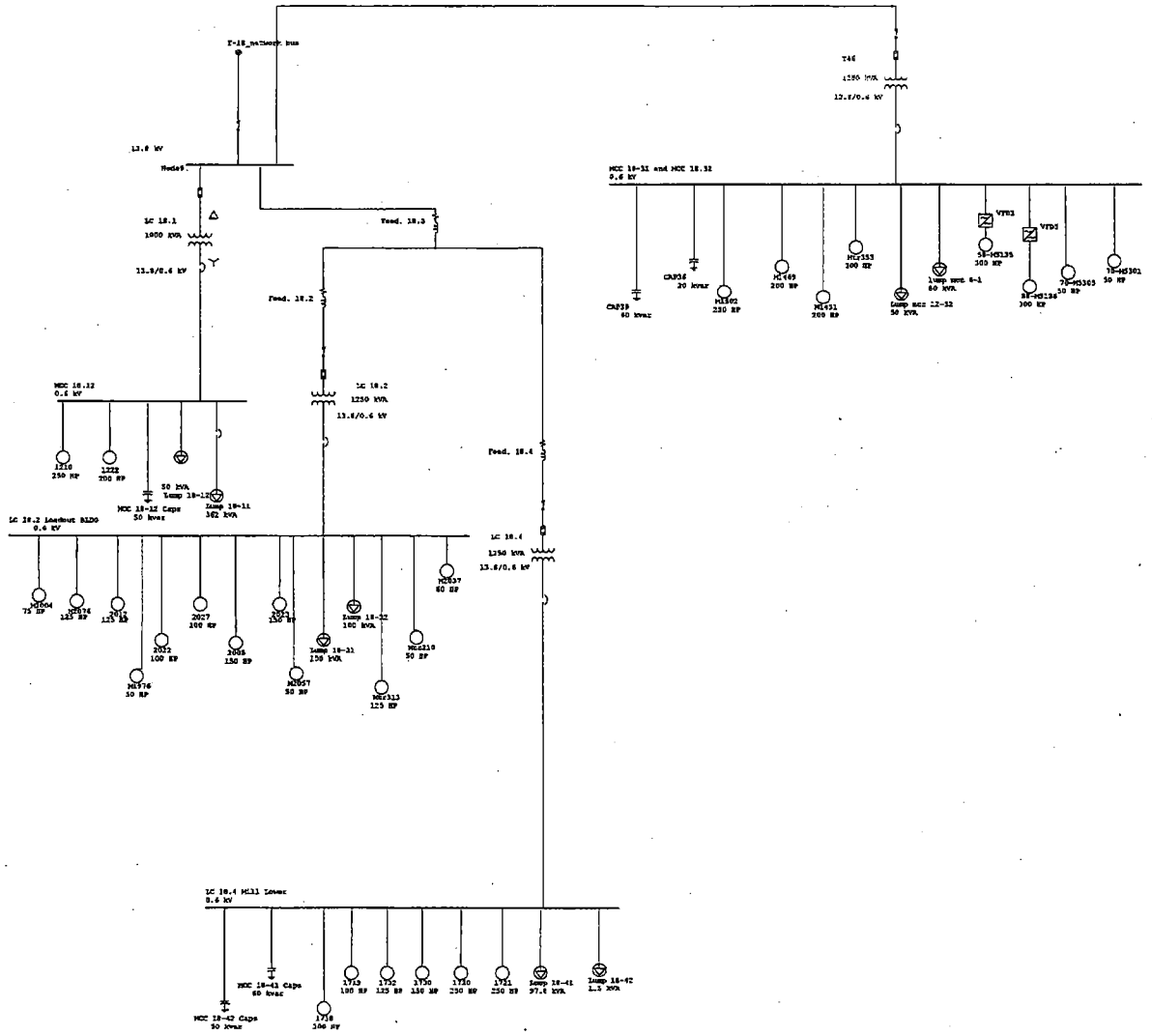
One-Line Diagram - OLV1=>Feeder-20_Load (Edit Mode)



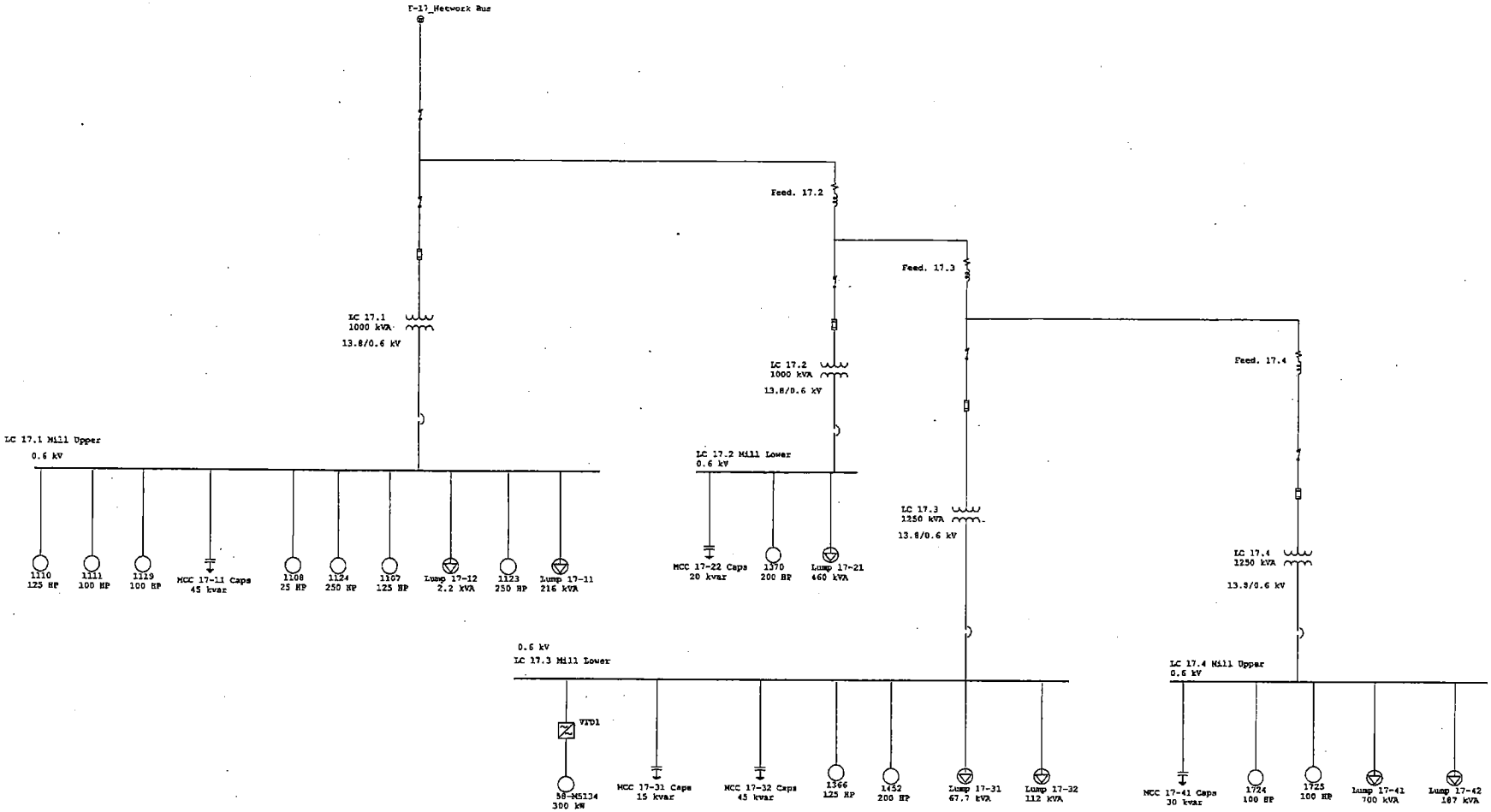
One-Line Diagram - OLV1=>Feeder-19_Load (Edit Mode)



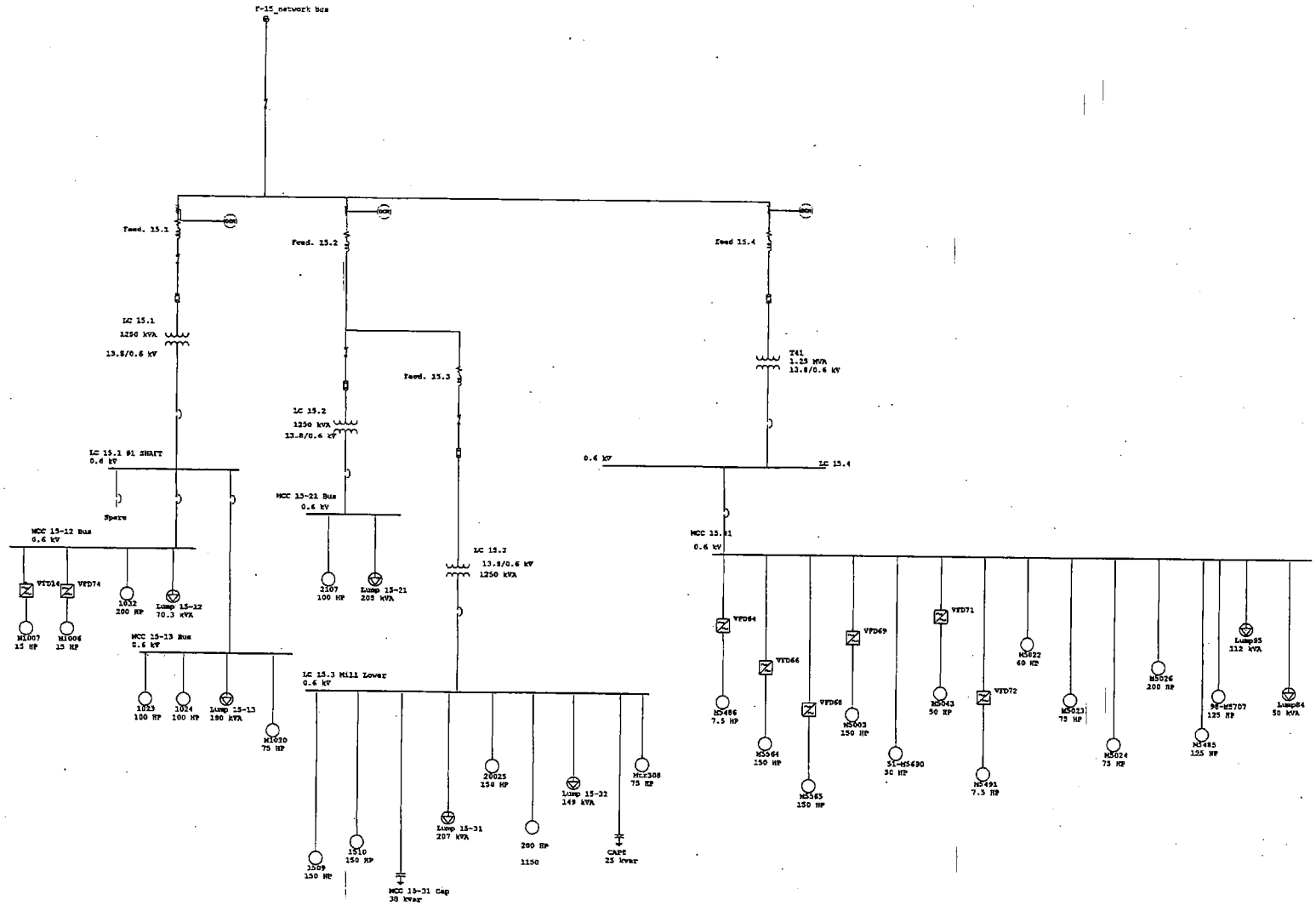
One-Line Diagram - OLV1=>Feeder-18_Load (Edit Mode)



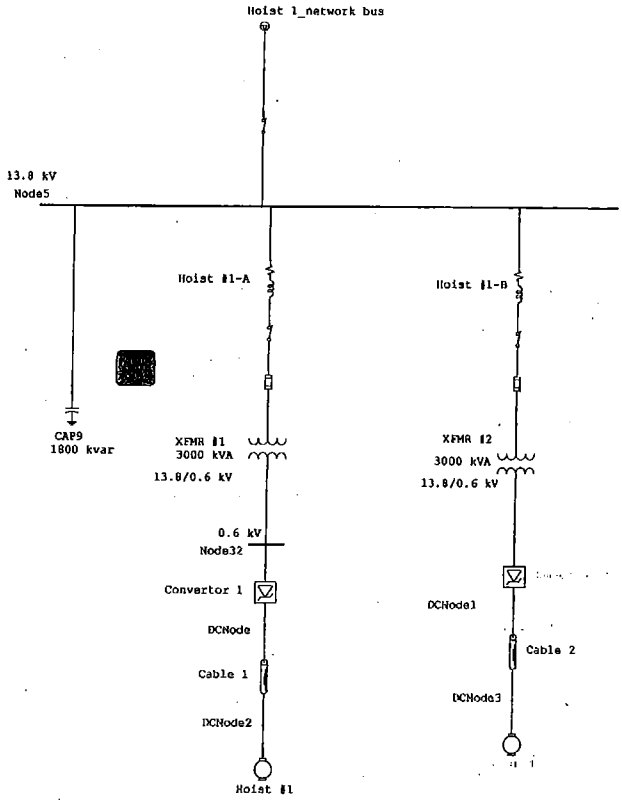
One-Line Diagram - OLV1=>Feeder-17 Load (Edit Mode)



One-Line Diagram - OLV1=>Feeder-15 Load (Edit Mode)



One-Line Diagram - OLV1=>Hoist 1 Load (Edit Mode)



Appendix B:
Reference Drawings and Lists

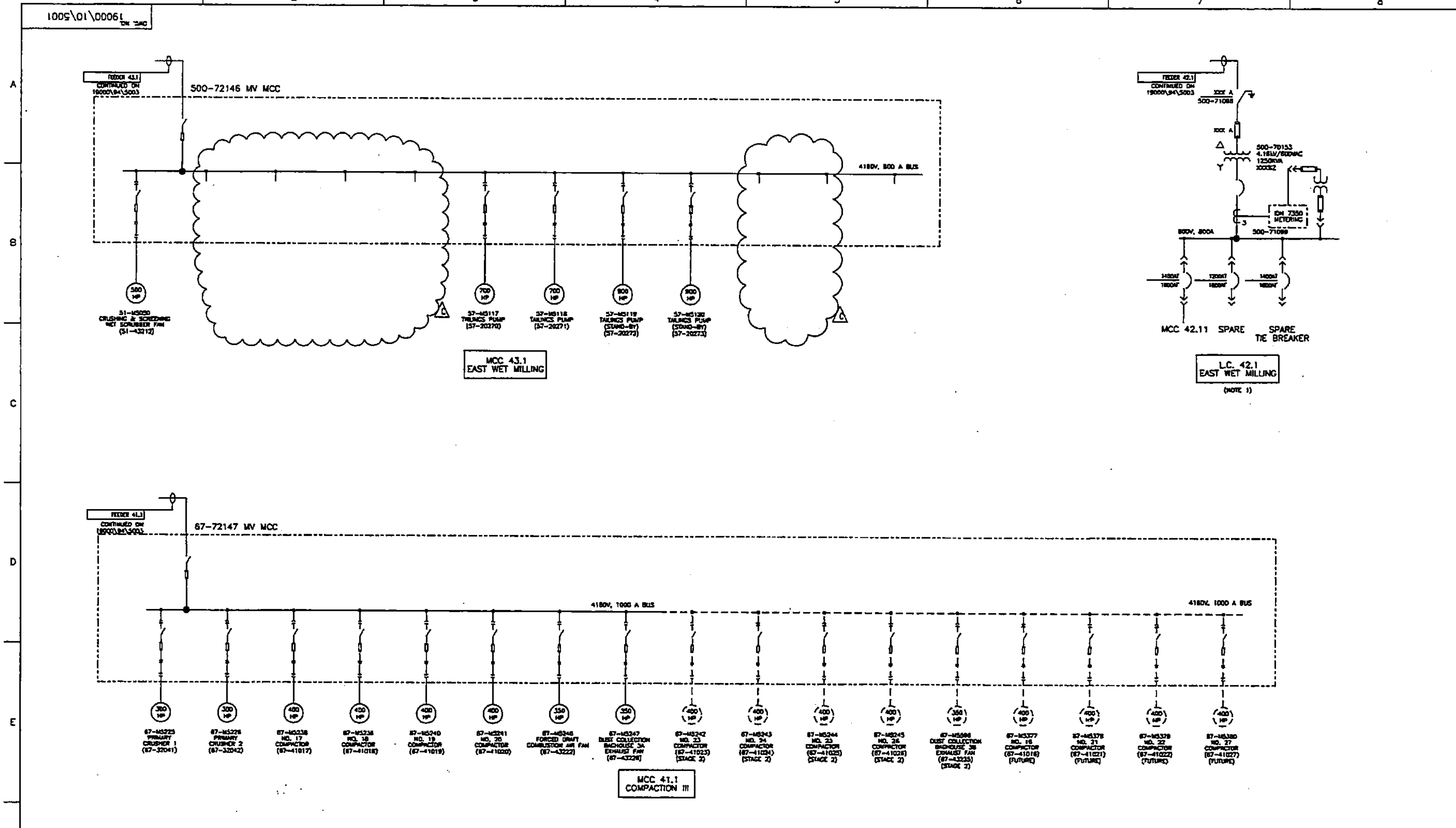
Send to: Tyler Kabatof Date 10/13/2010

Readings for the month of:	Oct-10		
READ AT 8 AM ON THE FIRST DAY OF EACH MONTH			
"ZERO" Peak ammeter arm after reading the meter			
DESCRIPTION	**HR WATTMETER**	**DEMAND AMMETER**	
Main 72 kV	0	196	
#31 Feeder	0	195	
#32 Feeder	0	395	
#33 Feeder	0	200	
#34 Feeder	0	50	
#35 Feeder	0	75	
#2 Hoist	0	45	
#21 Feeder	0	0	
#10 Feeder	0	215	
#11 Feeder	0	225	
#1 Hoist	0	165	
#15 Feeder	0	10	
#17 Feeder	0	0	
#18 Feeder	0	50	
#19 Feeder	0	95	
#20 Feeder	0	45	

Note: Demand Ammeter readings to be taken the 1st day of each month

File name: K:\Rptdata\POWERHSE.XLS (Demand Ammeter)

19000\10\5001



NOTES:

1. L.C. 42.2 IS FOR BUILDING 500 AND 50P EMERGENCY

DRAWING NO.	DRAWING TITLE
19000\10\0002	ELECTRICAL SINGLE LINE DIAGRAM STANDARD SYMBOLS
19000\67\5182	MCC 41.1 SINGLE LINE DIAGRAM
19000\67\5181	MCC 41.1 SINGLE LINE DIAGRAM
19000\500\5182	MCC 43.1 SINGLE LINE DIAGRAM
19000\500\5181	MCC 43.1 SINGLE LINE DIAGRAM
19000\50P\5181	MCC 42.1 SINGLE LINE DIAGRAM
19000\84\5003	4.16 kV SWITCHGEAR SINGLE LINE DIAGRAM

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
C	MOVE MOTORS TO AREA 50C				
C	UPDATE TITLE AND MOSAIC DWG NO.				
	UPDATE 5 kV FEEDER DISTRIBUTION				
B	UPDATE FEEDERS/LOADS/STARTERS		J.B.	D.M.	2009-05-27
A	NEW DRAWING		J.B.	D.M.	2009-04-08

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
C	INTERNAL REVIEW (FEL 4)		
B	BUDGET PRICING		2009-05-27
A	INTERNAL REVIEW		2009-01-14

ISSUE AUTHORIZATION

HATCH

HA DWG. NO. H328668-0400-70-082-5000

DESIGNED BY V.KURZMAUL DATE 2009-01-14	DRAWN BY A.KESELJOV DATE 2009-01-14
CHECKED BY A.AHMED DATE 2009-09-04	DISCIP. ENGR. J.BUENAVENTURA DATE 2009-09-04
PROJ. DES. COORD. D.MACINTYRE DATE 2009-09-04	PROJ. ENGR. DATE
PROJ. MGR. DATE	

Mosaic

Potash Colonsay

Mosaic Potash Colonsay Expansion Project

MINE GENERAL
MAIN POWER DISTRIBUTON
SINGLE LINE DIAGRAM

SCALE NTS OR AS NOTED | DWG. NO. 19000\10\5001 | REV. C

H328668-0400-70-082-5000.dgn 10/6/2010 2:23:35 PM

MCC 15-12 #1 HEAD FRAME

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
26001	1006	Pan Feeder (Shaft #1)	15		15		VFD			
26002	1007	Pan Feeder (Shaft #1)	15		15		VFD			
43015	*1032*	*Mine Exhaust Fan*	***200***							*has startco soft start 600V, 200HP*
44001	1004	Dust Collector Fan (Shaft #1)	24							
98001		O/H Door								
98002		O/H Door								
		Small Hp	54							
		Total Hp	254							
	Total new connected HP (demolished loads have been taken into account)				**254**					
		Total demanded HP			**203.2**					
		Total Current KA			**0.182**					

MCC 15-13 RAW ORE

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
21005	1041	Sump Pump Raw Ore	10							
24002	1018	Belt Conveyor Drive	15		30					
24003	1020	Tripper Belt Drive (Raw Ore)	40		[redacted]				Intermittent	
24003	1022	Tripper Positioning Drive (Raw Ore)	10							
24003	1028	Tripper Rail Clamps (Raw Ore)	3							
24004	1023	Chain Drag, Conv. Drive 4A (Raw Ore)	**100**							
24004	*1024*	*Chain Drag Conveyor 3D (Raw Ore)*	***100***							
43135		Fume Exhaust Fan Anti-Cake Room								
58002		Unit Heater								
58003		Unit Heater								
98020		North O/H Door (Raw Ore Ext.)								
98034		South O/H Door (Raw Ore Inner)								
		Small Hp	78							
		Total Hp	278							
	Total new connected HP (demolished loads have been taken into account)				**328**					
		Total demanded HP			**262.4**					
		Total Current KA			**0.235**					
		Total Metered Load On LC 15.1	***519.6KW***							

MCC 15-21 POWERHOUSE

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20131	2103	Boiler Feed Pump	40							
20132		Boiler Feed Pump	40							
46006	2107	Air Compressor	**100**							
46007	2108	Air Compressor (Sullair)	**100**							
46008	2109	Instrument Air Compres	60							
47003										
47004		Boiler Blower No.3								
58047	2132	Power House Unit Heater								
58048	2133	Power House Unit Heater								
58049	2134	Power House Unit Heater								
		Small Hp	140							
		Total Hp	340							
	Total new connected HP (demolished loads have been taken into account)				**340**					
		Total demanded HP			**272**					
		Total Current KA			**0.244**					

MCC 15-23 LOADOUT

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
33030	2323	Tyr. Screen	30					Demolish		
		Small Hp	30							
		Total Hp	30							
	Total new connected HP (demolished loads have been taken into account)				**30**					
		Total demanded HP			**30**					
		Total Current KA			**0.027**					
		Total Metered Load On LC 15.2	***280KW***							

MCC 15-31 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20032	1509	Tails Cyclone Feed Pump	**150**	15						
20033	1510	Tails Cyclone Feed Pump	**150**	15						
35007		Flotation Tank Agitator								
37018		Slimes Rougher Flot. Cell								
35049		Tails Filter Cake Probe Tank Agitator								
35062		C.S. Thickener U/F Sample Tank Agitator								
37001	1204	Primary Scrubber Cell #1	60	10						
37001	1205	Primary Scrubber Cell #2	60	10						
37001	1206	Primary Scrubber Cell #3	60	10						
37001	1207	Primary Scrubber Cell #4	60	10						
37004	1303	Flotation Rough Cell Agitator #1 (South)	10							
37004	1304	Flotation Rough Cell Agitator #2 (Center)	10							
37004	1305	Flotation Rough Cell Agitator #3 (North)	10							
37004	1309	Flotation Rough Cell Skimmer A1 (West)	1							
37004	1349	Flotation Rough Cell Skimmer B1 (East)	1							
43158	*1150*	*Crushing Wet Scrubber Fan*	***200***							
43171		Staff Dry Exh. Fan								
46000		Portable Air Compressor, Crushing								
		Small Hp	272							
		Total Hp	772	70						
	Total new connected HP (demolished loads have been taken into account)				**772**					
		Total demanded HP			**617.6**					
		Total Current KA			**0.554**					

MCC 15-32 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20025		Reg. Flt. Fd.Pump	150							
20220	*1472*	*Air Sep Auto Lube*	0.75							*Not In Service*
23008	1212	Ribbon Conveyor	75	10						
23009	1213	Ribbon Conveyor	75	10						
37020	1413	Cent. Effluent Flot. Cell								
35001	1357	Prod. Cent. Feed Agitator	40	25						
43158	1150	Crushing Wet Scrubber Fan	**200**							
90116	1371	Rod Mill Loader								
		Small Hp	190							
		Total Hp	540	45						
	Total new connected HP (demolished loads have been taken into account)				**540.75**					
		Total demanded HP			**432.6**					
		Total Current KA			**0.388**					
		Total Metered Load On LC 15.3	***803.7KW***							

MCC 17-11 CRUSHING

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20180	*1151*	*Crushing Scrubber Slurry Pump*	*30*							*Not In Service*
21007	1135	Sump Pump	10							
21028	1136	Sump Pump Surge Bin House	15							
23001	1110	Screw Conveyor	**125**	15						
23002	1111	Screw Conveyor	**100**	15						

23003	1118	Screw Conveyor	75	10						
23004	1119	Screw Conveyor	100	15						
23006	1125	Screw Conveyor	30							
23098	1137	Screw Conveyor	10							*Not In Service*
23138	1154	Screw Conveyor	75							
24006	1107	42" Belt Conveyor Drive	125	15						
24007	1126	36" Belt Conveyor	50	5						*Not In Service*
26004	1127	Variable Frequency Drive Pan Feeder	15							*Not In Service*
33001	1108	Screen (Crusher Room)	250							
33002	1109	Screen (Crusher Room)	25							
33003	1112	Screen (Crusher Room)	10							
33004	1113	Screen (Crusher Room)	10							
33005	1114	SCREEN	10							
33006	1115	Screen (Crusher Room)	10							
33007	1116	Screen (Crusher Room)	10							
33008	1117	Screen	10							
54065		#8 Belt Weightometer Hoist								*Not In Service*
50001		Magnet Trolley								
54081		5T Mill Crushing Area Liftwell Crane								
		Small Hp	290							
		Total Hp	990	75						
	Total new connected HP (demolished loads have been taken into account)				**1085**					
		Total demanded HP			**868**					
		Total Current KA			**0.779**					

MCC 17-12 CRUSHING

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20327		#1,2,3 Impactor Lube Pump, North	1.5							
20328		#1,2,3 Impactor Lube Pump, South	1.5							
32001	1123	Impactor	250							has startco soft start 600V, 250HP
32001	1138	Impactor Oil Pump								*Not In Service*
32002	1124	Impactor	250							has startco soft start 600V, 250HP
32002	1139	Impactor Oil Pump								*Not In Service*
50001	1128	15A TM BRKR Magnet								
		Small Hp	3							
		Total Hp	503							
	Total new connected HP (demolished loads have been taken into account)				**503**					
		Total demanded HP			**402.4**					
		Total Current KA			**0.361**					
		Total Metered Load On LC 17.1	***831.4KW***							

MCC 17-21 MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20029		EFF. FD. Pump.	60							
37006	1319	Flotation Rougher Cells Agitator #1	15							
37006	1320	Flotation Rougher Cells Agitator #2	25							
37006	1321	Flotation rougher Cells Agitator #3	25							
37006	1322	Skimmer Cell A	1							
37006	1323	Skimmer Cell B	1							
37007	1324	Agitator Cell #1	15							
37007	1325	Agitator cell #2	25							
37007	1326	Agitator Cell #3	25							
37007	1327	Skimmer Cell A	1							
37007	1328	Skimmer Cell B	1							
37008	1329	Agitator Cell #1	15							
37008	1330	Flotation Rougher Cells Agitator #2	25							
37008	1331	Agitator Cell #3	25							
37008	1332	Skimmer Cell A	1							
37008	1333	Skimmer Cell B	1							
37012	1380	Agitator Cell #1	15							
37012	1381	Agitator Cell #2	25							
37012	1383	Skimmer Cell A	1							
37012	1382	Skimmer Cell B	1							
37013	1384	Agitator Cell #1	15							
37013	1385	Agitator Cell #2	25							
37013	1386	Skimmer Cell B	1							
37013	1387	Skimmer Cell A	1							
37015	1392	Agitator Cell #1	25							
37015	1393	Recleaner Cell Agitator #2	25							
37015	1394	Skimmer Cell A	25							
37015	1395	Skimmer Cell B	25							
37016	1396	Agitator Cell #1	25							
37016	1397	Agitator Cell #2	25							
37016	1398	Skimmer Cell A	1							
37016	1399	Skimmer Cell B	1							
37017	1400	Agitator Cell #1	25							
37017	1401	Agitator Cell #2	25							
20379		*Slimes Disposal Pump*	100							
37017	1402	Skimmer Cell A	1							*Not In Service Yet, But has a VFD, Siemens 100Hp, 600V, 25KA RMS Symmetrical, Ser#6SE72-06-0626-1*
37017	1403	Skimmer Cell B	1							
43035	2259	#1 Cooling Fan (4160V Motor Cooling System)	30							*NIS*
43036	2261	#2 Cooling Fan								
43078	2274	Roof Vent Fan	8							*NIS*
58138		Unit Heater #1								*NIS*
58139		Unit Heater #2								*NIS*
58140		Unit Heater #4								*NIS*
58143		Unit Heater #3								*NIS*
58141		Steam Heating Unit #4 North CST								
58142		Steam Heating Unit #5 South CST								
		Small Hp	587							
		Total Hp	587							
	Total new connected HP (demolished loads have been taken into account)				**687**					
		Total demanded HP			**549.6**					
		Total Current KA			**0.493**					

MCC 17-22 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20022	1370	Rod Mill Discharge Pump	200	20						
		Small Hp	200							
		Total Hp	200							
	Total new connected HP (demolished loads have been taken into account)				**200**					
		Total demanded HP			**200**					
		Total Current KA			**0.179**					
		Total Metered Load On LC 17.2	***607.9KW***							

MCC 17-31 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20021	1335	Cleaner Flot. Feed Pump Lube Oil	0.333					Demolish		
20021	1366	Cleaner Flotation Feed Pump	125	15						
20178	1491	Scrubber Disch Pump			25			Demolish		
20370		Primary Feed Pump Knife Gate Acutator Pump	1.5							
23021	1466	Dryer Discharge Screw Conveyor	60	10						
20095	1519	Tails Booster Pump	200							*Not In Service*
43040	2236	Vent Fan	8							
43041	2235	Vent Fan	8							*Not In Service*
43111	1714	Wall Fan								
43116		Wall Fan Portable								
43117		Wall Fan								*Not In Service*

44031		Vacuum Cleaner Blower								
44031		Vacuum Cleaner Rotary Valve								
54023	2272	5 Ton Elec. Hoist	20							
57001	1474	Dryer Air Sep.	60							*Not In Service*
58015	2227	Unit Heaters								
58016	2227	Unit Heaters								
58017	2227	Unit Heaters								
58024	2230	Unit Heaters								
58025	2230	Unit Heaters								
58026	2232	Unit Heaters								
58028	2241	Unit Heaters								
58020		Unit Heaters								
66019		Pedestal Grinder								
39006	58-M5134	Product Centrifuge No. 6 Motor			300		SS			
		Small Hp	89.833							
		Total Hp	*514.833*	25						
	Total new connected HP (demolished loads have been taken into account)				**482.5**					
		Total demanded HP			**386**					
		Total Current KA			**0.348**					
		MCC 17-32 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20059	*1503*	*Brine Distribution Pump*	***250***							*Not In Service*
20233		A/C Comp. Oil Fill Pump								
32018	1678	Cage Paktor (North)	75							-Has a Siemens VFD, 600V, 100A, 100Hp, Ser#:6SE86-5-1765-1
32019	1684	Cage Paktor (North)	75							-Has a Siemens VFD, 600V, 100A, 100Hp, Ser#:6SE72-7-6DAB-1
39003	1452	Product Centrifuge	**200**	45						
39003	1482	Product Centrifuge Lube Oil Pump	0.5							
54031		2 Ton Chain Hoist								
		Small Hp	150.5							
		Total Hp	350.5							
	Total new connected HP (demolished loads have been taken into account)				**600.5**					
		Total demanded HP			**480.4**					
		Total Current KA			**0.431**					
		Total Metered Load On LC 17.3	***415.7KW***							
		MCC 17-41 UPPER MCC								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
23023	1615	Screw Conveyor (Rev)	5							
23024	1621	Screw Conveyor	40	*5*						
23035	1726	Screw Conveyor	75	*10*						
23036	1727	Screw Conveyor	75	*10*						
23044	1767	Screw Conveyor	40	*5*						
23045	1765	Screw Conveyor	40	*5*						
23053	1736	Screw Conveyor	40	*5*						
23058	1778	Screw Conveyor	30							*Not In Service*
23087	1609	Screw Conveyor	10							
23088	1610	Screw Conveyor	10							
23097	1768	Screw Conveyor	20							
23101	1644	Screw Conveyor	50	*5*				Demolish		
24021	1737	Belt Conveyor	5							
24021	1738	Belt Brush	3							
24036	1739	Belt Conv.	10							
24038	1641	Belt Conv.	10	*15*						
24042	1763	Belt Conveyor	10	*5*						
24049	1673	#42 & 43 Screen to #50 Belt Conveyor	10							
24050	1674	#44 Screen & #49 Belt to #26 Screw Belt Conv.	10							
24056	1689	AC Compactor Feed Bucket Drag Conveyor	75							
25001	1619	Bucket Elev.	60	*10*						
25003	1724	Bucket Elevator	**100**	*15*						
25004	1725	Bucket Elevator	**100**	*15*						
25005	1735	Compactor Bucket Elevator	60							
33016	1756	Hummer Screen Compacting	8	*10*						
43005	1600	Dust Collector Fan	60	*10*						
43006	1601	Dust Collector Fan	60	*10*						
43007	1602	Dust Collector Fan	60	*10*						
43050	2263	Axial Flow Fan 1 MCC Cooling	50							
43051	2264	Axial Flow Fan 2 MCC Cooling	50							
43081	0	Wall Fan								
44006	1603	Bag. Coll. Sonic Horn #1								
44006	1604	Bag. Coll. Sonic Horn #2								
44006	1605	Bag. Coll. Sonic Horn #3								
44006	1606	Bag. Coll. Sonic Horn #4								
44006	1607	Bag. Coll. Sonic Horn #5								
44006	1608	Bag. Coll. Sonic Horn #6								
44006	1611	Bag. Coll. Sonic Horn #7								
44006		Bag. Coll. Sonic Horn #8								
44006	1613	Damper #1								
44006	1614	Damper #2								
44006	1632	Damper #3								
44006	1633	Damper #4								
44006	1634	Damper #5								
44006	1635	Damper #6								
44006	1636	Damper #7								
44006	1637	Damper #8								
54089		Compaction I Liftwell Crane								
43127		Wall Fan								
		Small Hp	946							
		Total Hp	1146	145						
	Total new connected HP (demolished loads have been taken into account)				**1126**					
		Total demanded HP			**900.8**					
		Total Current KA			**0.808**					
		MCC 17-42 UPPER MCC								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
33009	2717	Hummer Screen	8		20			Demolish		
33010	1639	Screen	8					Demolish		
33011	1640	Screen	8					Demolish		
33012	1645	Screen	8					Demolish		
33013	1646	Screen	8					Demolish		
33014	1647	Screen	8					Demolish		
33015	1755	Hummer Screen Compacting	8							
58364		A/C, For new Mill Mech Offices								
58365		A/C, Mill Training Room								
33016	*1756*	*Hummer Screen Compacting*	*8*							
33009	*2717*	*Hummer Screen*	*8*							
		Small Hp	72							
		Total Hp	72							
	Total new connected HP (demolished loads have been taken into account)				**24**					
		Total demanded HP			**19.2**					
		Total Current KA			**0.017**					
		Total Metered Load On LC 17.4	***1105KW***							
		MCC 18-11 MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
37002	1214	Secondary Scrubber Cells #1 (West)	40							
37002	1215	Secondary Scrubber Cells #2 (West)	40							
37002	1216	Secondary Scrubber Cells #3 (West)	40							
37002	1217	Sec. Scrubber Cells #4 (West)	40							

37003	1218	Secondary Scrubber Cells #1 (East)	40							
37003	1219	Secondary Scrubber Cells #2 (East)	40							
37003	1220	Secondary Cells #3 (East)	40							
37003	1221	Secondary Scrubber Cell 4 (East)	40							
37005	1311	Flotation rough Cells Agitator #1 (South)	10							
37005	1312	Flotation Rougher Cells Agitator #2 (Center)	10							
37005	1313	Flotation Rough Cells Agitator #3 (North)	10							
37010	1372	Clean Cell Agitator #1	15							*Not In Service*
37010	1373	Clean Cell Agitator #2	25							*Not In Service*
37010	1374	Clean Cell Skimmer A	1							
37010	1375	Cleaner Cell Skimmer B	1							*Not In Service*
37019	*1410*	*Slime Clean Flotation Agitator*								
37021	1417	Tails Rough Flotation Agitator #1	15							
37021	1418	Tails Rough Flotation Agitator #2	25							
37021	1419	Tails Rough Flotation Agitator #3	25							
37021	1420	Tails Rough Flot. Skimmer A	1							
37021	1421	Tails Rough Flot. Skimmer B	1							
37023	1427	Tails Clean Flot. Agitator #1	15							
37023	1428	Tails Clean Flot. Agitator #2	25							
37023	1429	Tails Clean Flot. Agitator #3	25							
37023	1430	Tails Clean Flot. Skimmer A	1							
37023	1431	Tails Clean Flotation Agitator B	1							
54019	2268	Two Ton Bridge Cran (west)								
54020	2268	Two Ton Bridge Cran (east)								
54021	2270	Ten Ton Bridge Crane (BIRDS)								
		Small Hp	485							
		Total Hp	485							
	Total new connected HP (demolished loads have been taken into account)				**528**					
		Total demanded HP			**420.8**					
		Total Current KA			**0.378**					

MCC 18-12 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20005	1210	Primary Deslime Feed Pump	250	25						
20007	1222	Secondary Feed Pump	200	25						
37005	1317	Flotation Rougher Cell Skimmer A1 (West)	1							*Not In Service*
37005	1350	Flotation Rougher Cell Skimmer B1 (East)	1							*Not In Service*
37022	1422	Tails Rough Flotation Agitator #1	15							
37022	1423	Tails Rough Flotation Agitator #2	25							
37022	1424	Tails Rough Flot. Skimmer #3	25							
37022	1425	Tails Rough. Skim A	1							
37022	1426	Tails Rough. Skim B	1							
		Small Hp	67							
		Total Hp	517	50						
	Total new connected HP (demolished loads have been taken into account)				**519**					
		Total demanded HP			**415.2**					
		Total Current KA			**0.373**					
		Total Metered Load On LC 18.1	***306.6KW***							

MCC 18-21 LOADOUT

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20057	2016	Loadout Dust Slurry Pump	30							
20236	2094	HT 95 Amine Bulk Transfer Pump (loadout)	0.5							
20237	2095	HT 95 Amine Mix Distribution Pump (Loadout)	5							
20238	2096	HT 95 Amine Mix Distribution Pump (Loadout)	5							
21016	2039	Sump Pump (Loadout)								
23055	2004	Rev. Screw Conveyor	75							
23059	2019	Screw Conveyor, Loading	50					Demolish		
23060	2020	Screw Conveyor, Loading	40		100			Demolish		
23061	2021	Screw Conveyor, Loading	50					Demolish		
23062	2022	Screw Conveyor, Loading	100					Demolish		
23063	2027	Screw Conveyor, Loading	100					Demolish		
23064	2028	Screw Conveyor Coarse Product Loadout	50					Demolish		
24011	2037	Tripper Belt Conveyor	5		60					
24053		Loadout Cross Conveyor	25							
24054		Loadout Cross Conveyor	25							
25007		Bucket Elevator			50					
33035	2314	T Y Rocket Screen	30					Demolish		
35020	2015	Agitator (loadout)	10							
35061	2093	HT 95 Amine Mix Tank Agit. (Loadout)								
43010	*2008*	*Gran Bin De-dusting Fan (Loadout)*	60							
43140		Fume Exhaust Fan Anti-Cake Room	1.5							
44009	2030	Sonic Horn #1 (loadout)								
44009	2031	Sonic Horn #2 (loadout)								
44009	2032	Sonic Horn #3 (loadout)								
44009		Sonic Horn #4 (loadout)								
44009		Sonic Horn #5 (loadout)								
58039		Anti-Cake Oil Heater								
58066		Unit Heater								
58068		Unit Heater								
58070		Unit Heater								
58073		Unit Heater								
58077		Unit Heater								
		Small Hp	462							
		Total Hp	662							
	Total new connected HP (demolished loads have been taken into account)				**347**					
		Total demanded HP			**277.6**					
		Total Current KA			**0.249**					

MCC 18-22 LOADOUT

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20331		Loadout North Wax Distribution Pump	10							
23071	2035	Reclaim Screw Conveyor (Loadout)	30							
23100	2011	Screw Conveyor	3							
23126	*0*	*Portable Screw Conveyor Auger*	5							
24012	2057	Reclaim Screw Conveyor (Loadout)	40		50					
24014	2005	Belt Conveyor Drive	150							
24017	2076	Gran. Reclaim Tran. Belt Conv.	60		125					
24018	2023	Product Loadout Conveyor	150							
35060	2092	HT 95 Amine Bulk Tank Agit. (Loadout)								
43009	2012	Exhaust Fan (Loadout)	*125*							
43161		Loadout Screening N. Fan								
43162		Loadout Screening S. Fan								
58092		Unit Heater								
58093		Unit Heater								
58338		A/C Unit, Loadout MCC								
		Small Hp	148							
		Total Hp	573							
	Total new connected HP (demolished loads have been taken into account)				**648**					
		Total demanded HP			**518.4**					
		Total Current KA			**0.465**					

MCC 18-23 LOADOUT

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20181		Loadout Scrubber Slurry Pump	30							
33030		*Tyrocket Screen*	30							
23103	2301	Screw Conveyor			40			Demolish		
23104	1975	Screw Conveyor (Loadout)	30					Demolish		
23105	2310	Screw Conveyor	30					Demolish		
23106	2312	Screw Conveyor	25					Demolish		

23107	2318	Screw Conveyor			40			Demolish		
24023	1980	Belt Conv.						Demolish		
25006	1976	Bucket Elev (Loadout)	60		50					
33029	2302	Tyr. Screen	30		50			Demolish		
33036	2315	Tyr. Screen	30		50			Demolish		
		Small Hp	265							
		Total Hp	265							
		Total new connected HP (demolished loads have been taken into account)			**110**					
		Total demanded HP			**88**					
		Total Current KA			**0.079**					
		Total Metered Load On LC 18.2	***1267.9 KW***							

MCC 18-31 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20020	1334	Cleaner Flotation Feed Pump	125	15				Demolish		
20337	1493	Lube Pump for #1 Fan	1.5							
21013	1643	Sump Pump	15							
23020	1461	Screw Conveyor	40							
23029	1618	Screw Conveyor	75	10						
23048	1722	Bucket Elev. Screw Conveyor	75	10						
24039	1454	Belt Conveyor	5							
24040	1476	Belt Conveyor	5							
24041	1460	Belt Conveyor	10							
49001	1464	Rotary Valve	1							
49043	1686	East Cyclone Rotary Valve	1							
49044	1687	West Cyclone Rotary Valve	1							
	58-M5135	Product Centrifuge No. 7 Motor (58-39007)			300		SS			
	70-M5305	Drop Box Motor (70-27030)			50					
	70-M5332	Sampler Motor (70-56056)			5					
	70-M5333	Sampler Motor (70-56057)			5					
	70-M5296	Loading Screw Conveyor Motor (70-23185)			40					
	70-M5297	Truck Screw Conveyor Motor (70-23187)			40					
	70-M5298	Loading Screw Conveyor Motor (70-23186)			40					
	70-M5301	Bucket Elevator Motor (70-25029)			50					
	70-M5316	Reclaim Screens Motor (70-33081)			20					
	70-M5317	Reclaim Screens Motor (70-33082)			20					
	70-M5318	Reclaim Screens Motor (70-33083)			20					
	70-M5319	Reclaim Screens Motor (70-33084)			20					
	70-M5326	Sampler Motor (70-56050)			5				Intermittent	
	70-M5327	Sampler Motor (70-56051)			5				Intermittent	
	70-M5328	Sampler Motor (70-56052)			5				Intermittent	
	70-M5331	Sampler Motor (70-56055)			5					
		Small Hp	229.5							
		Total Hp	354.5	35						
		Total new connected HP (demolished loads have been taken into account)			**859.5**					
		Total demanded HP			**687.6**					
		Total Current KA			**0.617**					

MCC 18-32 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20030	*1469*	*Dissolver Feed Pump*	***200***							
20058	1502	Brine Distribution Pump	**250**	*20*				Demolish		
39002	1451	Product Centrifuge	**200**	40						-has a Startco Soft Start 200Hp, 600v
39002	1481	Product Centrifuge Lube Pump	0.5							
58028	2241	Unit Heater								
	58-M5136	Product Centrifuge No. 8 Motor (58-39008)			300		SS			
		Small Hp	0.5							
		Total Hp	650.5	60						
		Total new connected HP (demolished loads have been taken into account)			**700.5**					
		Total demanded HP			**560.4**					
		Total Current KA			**0.503**					
		Total Metered Load On LC 18.3	***582KW***							

MCC 18-41 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20085	1823	Transfer Pump	30							*Not In Service*
20086	1824	Transfer Pump	25							*Not In Service*
20087	1825	Transfer Pump	40	5						*Not In Service*
20307	1790	Water Recirc. Pump South (9 & 10 Comp)	10							
23046	1718	Screw Conveyor	100	10						
23047	1719	Comp. Discharge Screw Conveyor	100	15						
23049	1723	Bucket Elevator Screw Conveyor	60	5						
23066	1777	Screw Conveyor	50							*Not In Service*
23136	1682	F.S. Dryer to 48 Screw Dust Screw Conveyor	15							*Not In Service*
40002	1732	Dryer Drive	125	15						
40002	1620	Rotary Dryer Lube System								
40002	1673	Dryer Knocker								
43008	1730	Compactor Dryer Exhaust Fan	150	20						- main mcc - Has Soft Start, Relcon, 150Hp, 200A, Ser#AFR7-2-6968
43037	*2254*	*Vent Fan*	*8*							
43038	*2253*	*Vent Fan*	*8*							
43039	2252	Vent Fan	8							*Not In Service*
43061	1741	Rotary Dryer Air Fan (Quench Air)								
43062	1733	Rotary Dryer Comb. Air Fan								
43070		Vent Fan East Wall								*Not In Service*
43133		XLR Portable Fan								
43141		Fan (Reagents West Wall)	10							
43141		*Reagent Area East Wall Exh*	*10*							
43157		Mil Shop Fume Fan	10							
46013	1840	Vacuum Pump	15							
54026	2276	20 Ton Crane Compaction Area								
58027	2240	Unit Heaters								*Not In Service*
58029	2242	Unit Heater								
58030	2242	Unit Heater								
58031	2244	Unit Heater								
58032	2245	Unit Heater								
58033	2245	Unit Heater								
58034	2247	Unit Heater								
58036	2249	Unit Heater								
58037	2249	Unit Heater								
58038	2245	Unit Heater								
58039		Unit Heater								
66129		Radial Arm Drill, Sumit								
66131		IMA Drill Press								
23067		Screw Conveyor								
41010		Force Feeder #3								
		Small Hp	131							
		Total Hp	606	70						
		Total new connected HP (demolished loads have been taken into account)			**774**					
		Total demanded HP			**619.2**					
		Total Current KA			**0.558**					

MCC 18-42 MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
32004	1720	Compacting Impactor	250	25					
32005	1721	Compacting Impactor	250	25					
43049		Lab Pulverizer Exhaust Fan	2						
		Small Hp	2						

		Total Hp	502	50						
		Total new connected HP (demolished loads have been taken into account)			502					
		Total demanded HP			401.6					
		Total Current KA			0.360					
		Total Metered Load On LC 18.4	***631.4KW***							
		MCC 19-11 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20008	1223	Secondary Feed Pump	200							
20011	1233	Secondary DSM Cyclone Feed Pump	150	20						
24008	1202	Belt Conveyor	50							
34044	1244	Wet Screen								
34045	1245	Wet Screen								
34046	1246	Wet Screen								
35008		#2 Regrind Agitator								
35021	1339	Agitator	3							
37011	1376	Cleaner Cell Agitator	15							
37011	1377	Cleaner Cell Agitator	25							
37011	1378	Flot. Cell (Skimmer A)	5							
37011	1379	Flot. Cell (Skimmer B)	5							
43004	1347	Flot. Cell Blower	100	10						
43017	1348	Flot. Cell Blower	100	10						
43114		Fan, Portable 5-1/2 Floor Flot.								*Not In Service*
54016	1230	Deslime Elevator								*Not In Service*
37011	*1477*	*Agitator #11*	*25*							
58360		Flot. Office AC condensor								
58361		Flot. Office AC Air Handler								
90136		Froth Paddle	1							
98018		North Mill O/H Door								
		Small Hp	129							
		Total Hp	679							
		Total new connected HP (demolished loads have been taken into account)		40	679					
		Total demanded HP			543.2					
		Total Current KA			0.487					
		MCC 19-12 CRUSHING								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
23005	1120	Screw Conveyor (Crusher Room)	50	5						
23137	1165	Screw Conveyor	60							
24001	1012	Belt Conveyor Drive	200		300		SS			has startco soft start 600V, 200HP
24005	1008	Belt Conveyor (Crusher Room)	50	5	100		SS			
26009	1201	Variable Frequency Drive Pan Feeder	15							
26004	*1127*	*VFS Pan Feeder*	*15*							
58004	2200	Unit Heater (Crusher Room)								
58005	2201	Unit Heater (Crusher Room)								
58007	2202	Unit Heater (Crusher Room)								
		Small Hp	190							
		Total Hp	390							
		Total new connected HP (demolished loads have been taken into account)			540					
		Total demanded HP			432					
		Total Current KA			0.388					
		Total Metered Load On LC 19.1	***1018KW***							
		MCC 19-21 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20024		Regrind Flot. Feed Pump	150							
20094	1548	Tailing Pump	200	25				Demolish		
20371		Product Bird Cent. Conservation Water Boost. Pump	5							
23131	1484	Screw Conveyor	10							
43044	2224	Vent Fan	8							*Not In Service*
43045	*2223*	*Vent Fan*	*8*							
43047	2221	Vent Fan	8							
43182		Deslime Area 2nd Floor Wall Fan								
43183		Deslime Area 4th Floor Wall Fan								
58010	2210	Unit Heater								
58011	2211	Unit Heater								
58012	2212	Unit Heater								
58013	2213	Unit Heater								
58018	2215	Unit Heater								
58019	2215	Unit Heater								
58021	2217	Unit Heater								
58022	2219	Unit Heater								
		Small Hp	31							
		Total Hp	381							
		Total new connected HP (demolished loads have been taken into account)			189					
		Total demanded HP			351.2					
		Total Current KA			0.315					
		MCC 19-22 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20042	1500	Brine Distribution Pump	250	30				Demolish		- has soft start, Startco, 600V, 250HP
39001	1450	Prod. Centrifuge	200							
39001	1480	Prod. Centrifuge Lube Oil Pump	0.5							
		Small Hp	0.5							
		Total Hp	450.5							
		Total new connected HP (demolished loads have been taken into account)			200.5					
		Total demanded HP			410.4					
		Total Current KA			0.388					
		Total Metered Load On LC 19.2	***623.5KW***							
		MCC 19-31 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20028	1457	Feed Pump (Fine Cyl.)	200	35						
20336	1670	East Leach Brine Collection Pump	10							
23089	1650	Screw Conveyor	7.5					Demolish		
23090	2712	Screw Conveyor	75	10						
25008	2713	Bucket Elevator	60	10						
25009	2719	Bucket Elevator	10					Demolish		
32010	2711	Impactor	200	40						
32018	1677	Cage Paktor (South)	50							
32019	1685	Cage Paktor - Comp I Pollsher Screen O/S	50							
41008A	1680	North Force Feeder (VFD)	7.5							
41008B	1681	South Force Feeder (VFD)	7.5							
41007A	1692	North Force Feeder (VFD)	7.5							
41007B	1693	South Force Feeder (VFD)	7.5							
41009	2701	#9 Comp. Hydr. Pump	2							
41009	2707	Jackshaft #9 Comp.	1							
43002	1462	Dryer Comb Air Fan	75	5						
54017	0	Comp. Elevator								Not In Service
54088		3 Ton Monorail, Compactor Crane								
98040		Bird O/H Door								
		Small Hp	370.5							
		Total Hp	770.5	100						
		Total new connected HP (demolished loads have been taken into account			753					

		Total demanded HP			**602.4**					
		Total Current KA			**0.541**					
		MCC 19-32 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20232		Regrind Cyclone Feed Pump	**250**	25						
39004	1453	Product Centrifuge	**200**	30						
39004	1483	Product Centrifuge Lube Pump	0.5							
		Small Hp	0.5							
		Total Hp	450.5							
		Total new connected HP (demolished loads have been taken into account)			**450.5**					
		Total demanded HP			**360.4**					
		Total Current KA			**0.323**					
		Total Metered Load On LC 19.3	***831.4KW***							
		MCC 19-41 UPPER MCC								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20098	1800	Dissolver Circ. Pump	**100**	15						*Not In Service*
20099	1801	Dissolver Circ. Pump	**100**							*Not In Service*
20209	1795	Hydraulic Pump	20							
20210	1796	Hydr. Pump	20							
23026	1764	Screw Conveyer	75	10						
23027	1651	Screw Conveyer	25					Demolish		
23030	1624	Screw Conveyer	50	10				Demolish		
23037	1728	Screen Disch. Screw Conveyer	**100**							
23050	1731	Screw Conveyer	15	15						
23068	1629	Screw Conveyer	**125**	20				Demolish		
24037	1625	Belt Conv.	10					Demolish		
24055	1779	SGN 300 Dispatch Belt	10					Demolish		
26016	*1675*	*Salt Anticake Metering Mill Feeder*	*1*							
33028	1775	Screen	8							
41001	1748	Lube Oil Motor	*1*							
41002	1749	Lube Oil Motor	*1*							
41003	1750	Compactor #3 Lube Oil Motor	*1*							
41004	1751	Lube Oil Motor	*1*							
41005	1752	Compactor #5 Lube Oil Motor	*1*							
41006	1753	Compactor #6 Lube Oil Motor	*1*							
41007	1791	Compactor #7 Lube Oil Pump	*1*							
41008	1792	Compactor #8 Lube Oil Pump	*1*							
43083	1701	Wall Fan								
43084	1702	Wall Fan								
43085	1703	Wall Fan			10					
43086	1704	South Wall Fan								
49045		Rotary Valve	2							
54100		Portable 1/2 ton Hoist (Lube Room)								
		Small Hp	244							
		Total Hp	469	70						
		Total new connected HP (demolished loads have been taken into account)			**459**					
		Total demanded HP			**367.2**					
		Total Current KA			**0.329**					
		MCC 19-42 UPPER MCC								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
33019	1759	Screen	8							
33020	1760	Screen	8							
33021	1770	Hummer Screen Compacting	8							
33022	1771	Screen	8							
33025	1772	Hummer Screen	8							*Not In Service*
33026	1773	Screen	8							
33027	1774	Screen	8							
		Small Hp	48							
		Total Hp	48							
		Total new connected HP (demolished loads have been taken into account)			**56**					
		Total demanded HP			**44.8**					
		Total Current KA			**0.040**					
		Total Metered Load On LC 19.4	***511KW***							
		MCC 20-11 MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20177	1489	Scrubber Slurry Pump	25					Demolish		
20338	1494	Lube pump for #1 Fan (north)	1.5							
20360	1495	(East) Bearing Lube Pump # 115 Fan								
20361	1496	(West) Bearing Lube Pump # 115 Fan								
21008	1237	Sump Pump	15							
21027	1549	Tails Disposal Pump	15							
23016		Screw Conveyor								
23132	1490	Mobile Conveyor Feed Screws	5							
24022	1487	Mobile Conveyor	15							
43131	1516	Fan								
		Small Hp	76.5							
		Total Hp	76.5							
		Total new connected HP (demolished loads have been taken into account)			**51.5**					
		Total demanded HP			**41.2**					
		Total Current KA			**0.037**					
		MCC 20-12 - MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20031	1492	Dissolver Feed Pump	200							*Not In Service*
20043	1501	Brine Distribution Pump	**250**	20				Demolish		
22001	1369	Rod Mill Drive	**300**							
		Small Hp	0							
		Total Hp	550							
		Total new connected HP (demolished loads have been taken into account)			**500**					
		Total demanded HP			**400**					
		Total Current KA			**0.359**					
		Total Metered Load On LC 20.1	***312KW***							
		MCC 20-21 MILL MAIN								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20062	*1900*	*Trans Pump*	*10*							
20064	1902	Oil Distribution Pump	2							
20065	1903	Oil Distribution Pump	1.5							
20092		Crystal Tails Pump								
20068	1915	Flocculant Day Tank Pump	10							
44030		Depressant Mix Tank Fan								
20070	1911	Mix Pump	10							
20071	1912	Mix Pump	10							
20072	*1918*	*West Dep. Tank Transfer Pump*	*5*							
20074	1922	Distribution Pump	15							
20075	1923	Distribution Pump	15							
20080	1933	Distribution Pump	10							
20089	1828	Crystallizer Prod Pump	75	*10*						
20096	1802	Cryst. Feed Pump	75	*10*				Demolish		
44030		Wet Dust Collector Scrubber								

20141	2255	Condensate Return Pump	20							
20142	2256	Condensate Return Pump	20							
20359		Flocculant Distribution Pump								
20175	1925	Amine Dist. Pump	10							
20358		Flocculant Transfer Pump								
20313		HFD Amine Bulk Metering Pump.	0.5							
20314	1918	HT 97 Amine Tank Metering Pump	0.5							
20332		Mill Dust Scrubber Brine Supply Pump	30							
20335	1843	West Leach Brine Collection Pump	10							
21012	1831	Sump Pump Dry Well	15							
21025	1818	Sump Pump	10							
21026	1924	Sump Pump	10							
21056	1942	Sump Pump Basement	1							
21057		Sewage Pump								
35024	1909	Agitator Depressant Mix	15							
35025	1910	Agitator	15							
35027	1914	Agitator	10							
35028	1906	Agitator Depressant Mix	10							
35029	1917	Agitator	10							
35063		HFD Mix Tank Agit.								
35064		HT97 Mix Tank Agit.								
43125	1048	Sandblasting Shed Fan								
43163		Blast & Paint Make Up Air Heater								
43164		Blast & Paint Exhaust Fan								
43165		Blast & Paint Exhaust Fan								
54022	2271	2 Ton Cran Reagents								
54092		S/B - Paint Facility								
58035	2248	Unit Heaters								
58445		Unit Heater Blast/Paint Shop N.E.								
58446		Unit Heater Blast/Paint Shop Paint Room								
58447		Unit Heater Blast/Paint Shop S.E.								
58448		Unit Heater Blast/Paint Shop S.W.								
98017		Mill South O/H Door								
98023		Mill Reagents N. O/H Door								
98037		Blast Paint South O/H door								
98038		Blast Paint North Inner O/H door								
98039		Blast Paint North Inner O/H door								
		Small Hp	425.5							
		Total Hp	425.5							
	Total new connected HP (demolished loads have been taken into account)				**350.5**					
		Total demanded HP			**280.4**					
		Total Current KA			**0.252**					

MCC 20-22 MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20081	1934	Distribution Pump	5							
20082	1935	Distribution Pump	10							
20107	1829	Crystallizer Brine Reclaim Pump	250	25						
20108	*1830*	*Crystallizer Brine Return Pump*	*250*							*Not In Service*
20326		North Frother Distribution Pump	2							
		Small Hp	17							
		Total Hp	267							
	Total new connected HP (demolished loads have been taken into account)				**517**					
		Total demanded HP			**413.6**					
		Total Current KA			**0.371**					
		Total Metered Load On LC 20.2	***312KW***							

MCC 20-31 LOADOUT

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20323		Loadout Bin Slide Gate Actuator Hyp.Pump	20							
20329		Loadout Outdoor to Indoor Wax Stor. Tank Trans Pump	10							
20330		Loadout South Wax Distribution Pump	10							
20334		HT95 Amine Metering Pump								
20368		Condensate (South) Pump								
23070	2048	Storage Reclaim Screw Feeder (Loadout)	30							
23072	2050	Storage Reclaim Screw Feeder (Loadout)	30							
23073	2051	Storage Reclaim Screw Feeder (Loadout)	30							
23074	2052	Storage Reclaim Screw Feeder (Loadout)	30							
23075	2053	Storage Reclaim Screw Feeder Standard	30							
23076	2054	Storage Reclaim Screw Feeder (Loadout)	30							
23077	2055	Storage Reclaim Screw Feeder (Loadout)	30							
23078	2056	Storage Reclaim Screw Feeder (Loadout)	30							
23079	2066	Gran Storage Screw Feeder (Loadout)	30							
23080	2067	Gran Storage Screw Feeder (Loadout)	30							
23081	2068	Gran Storage Screw Feeder (Loadout)	30							
23082	2069	General Storage Screw Feeder (Loadout)	30							
23083	2070	Gran Storage Screw Feeder (Loadout)	30							
23084	2071	Gran Storage Screw Feeder (Loadout)	30							
23085	2072	Gran Storage Screw Feeder (Loadout)	30							
23086	2073	Gran Storage Screw Feeder (Loadout)	30							
24015	2062	Tripper Belt Conveyor	25		60					
24015	2063	Conveyor Belt	25							
24015	3064	Belt Conveyor Belt Brush	25							
24015	2065	Tripper Drive (Loadout)	25							
24020	2043	Belt Conveyor Storage Trans.	7.5					Demolish		
24047		Sackett Loading Conveyor	100							
54018	1978	Elevator Power Loadout								
58067	0	Unit Heater								
58071	0	Unit Heater								
58072	0	Unit Heater								
58076	0	Unit Heater								
58078	0	Unit Heater								
58079	0	Unit Heater								
98033	0	South Main O/H Door (Loadout)								
		Small Hp	627.5							
		Total Hp	727.5							
	Total new connected HP (demolished loads have been taken into account)				**755**					
		Total demanded HP			**604**					
		Total Current KA			**0.542**					

MCC 20-32 LOADOUT

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20169	2097	Anticake Oil. Transfer Pump	5							
20306	2720	Water Recirc. Pump	10							*Not In Service*
21021	*2093*	*Sump Pump P.S. South end*	*10*							*Not In Service*
24009	1630	Dispatch Belt Conveyor (Loadout)	125		200					
24016	2074	Reclaim Belt Conveyor (Loadout)	40		50					
24032		Belt Conv.								
33031	2304	Hummer Screen	8		50			Demolish		
33032	2305	Hummer Screen	8		50			Demolish		
33033	2306	Hummer Screen	8		50			Demolish		
33034	2307	Hummer Screen	8		50			Demolish		
33037	2316	Hummer Screen	8		50			Demolish		
33038	2317	Hummer Screen	8		50			Demolish		
43031	2079	Dust Collector Fan (Loadout)								*Not In Service*
43032	2081	Dust Collector Fan (Loadout)								*Not In Service*
43114		Fume Exhaust Fan								
43146		Loadout Wet Scrubber Fan	200							
44009	2089	Damper A (loadout) 1								
44009	2090	Damper B (loadout) 2								
44009	2091	Damper C (loadout) 3								
44009		Damper #4								
44009		Damper #5								

54082		Loadout Liftwell, 5 ton Hoist Crane								
20310		*Hyrdaulic Pump*	*1.5*							
		Small Hp	94.5							
		Total Hp	419.5							
	Total new connected HP (demolished loads have been taken into account)				**476.5**					
		Total demanded HP			**351.2**					
		Total Current KA			**0.342**					
		MCC 20-33 SALT BUILDING								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20320		Salt Scale Hydraulic	20							
24044		Salt Product Dispatch	60							
24046		Salt Prod. Shuttle In Storage	10							
26017		Salt Anticake Metering Storage Feeder	1							
		Small Hp	91							
		Total Hp	91							
	Total new connected HP (demolished loads have been taken into account)				**91**					
		Total demanded HP			**72.8**					
		Total Current KA			**0.065**					
		Total Metered Load On LC 20.3	??							
		MCC 20-41 - MILL UPPER								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20101	1820	Crystal Circ. Pump	**100**							
20103	1822	Crystal Circ. Pump	**100**	15						*Not In Service*
20310		Hydr. Pump (Truck Scale)	1.5							*Not In Service*
25002	1688	AC Compactor Feed Bucket Elevator	**100**	20						
20308	*2720*	*Water Recirculating Pump*	*10*							
33042	2714	Screen	15							
33043	2715	15KVA Transfer Screen	15							
33044	2716	Screen	15							
41002	1707	Compactor	**200**	35						
41003	1708	Compactor	**200**	35						
41004	1709	Compactor	**200**	35						
41006	2722	#9 Comp. Gear Box Pump	1							
41009	2723	#9 Comp. Lube Pump	1							
43087	1705	Wall Fan			10					
43088	1712	Wall Fan								
43089	1713	Wall Fan			10					
54100		3 Ton Crane, Compactor Gearbox Swing Beam								*Not In Service*
54104		Crane Over #9 Comp. North End								
		Small Hp	57							
		Total Hp	857	140						
	Total new connected HP (demolished loads have been taken into account)				**978.5**					
		Total demanded HP			**782.8**					
		Total Current KA			**0.702**					
		MCC 20-42 UPPER MCC								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
33017	1757	Screen	8							
33018	1758	Hummer Screen Compacting	8							
33039	1652	25KVA Hummer Screen	25					Demolish		
33040	1653	Hummer Screen	25					Demolish		
33041	1654	Screen	25					Demolish		
41001	1706	Compactor	*250*	35						
		Small Hp	91							
		Total Hp	341							
	Total new connected HP (demolished loads have been taken into account)				**341**					
		Total demanded HP			**272.8**					
		Total Current KA			**0.245**					
		Total Metered Load On LC 20.4	***520KW***							
		MCC 21-11 COMP II								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20223	2871	North Roll Coolant Pump	10							
20224	2874	South Roll Coolant Pump	10							
20319	3011	Salt Circuit Centrifuge Effluent Pump	50							
20333	3026	Salt Dust Slurry Pump South	75							
21086		Sump Pump, Comp II	10							
23113	2851	Mix Screw Conveyor	50	*15*						
40003	3004	Rotary Dryer Lube System								
40003	3021	Rotary Dryer Knocker								
43126	2944	Cooling Fan	10							*Not In Service*
43127	0	Exhaust Fan								*Not In Service*
44023A	2801	No. 2 Damper								
44023B	2802	No. 2 Sonic Horn	2							
44023C	2803	No. 1 Damper								
44023D	2804	No. 1 Sonic Horn	2							
44023E	2812	No. 5 Shaker (NIS)	2							
44023F	2805	No. 4 Damper								*Not In Service*
44023G	2813	No. 8 Damper (NIS)								
44023H	2807	No. 3 Damper								*Not In Service*
44023 I	2814	No. 8 Shaker (NIS)	2							
44023J	2809	No. 6 Damper (NIS)								
44023K	2811	No. 5 Damper (NIS)								*Not In Service*
44023L	2806	No. 4 Sonic Horn	2							
44023M	2808	No. 3 Sonic Horn	2							
44023N	2810	No. 6 Shaker (NIS)	2							
44023 O	2815	No. 7 Damper (NIS)								
44023P	2816	No. 7 Shaker (NIS)	2							*Not In Service*
49018	2830	Tipping Valves	1							
49019	2831	Tipping Valves	1							
49020	2832	Tipping Valves	1							
49021	2833	Tipping Valves	1							
49025	2837	Tipping Valves (NIS)	1							*Not In Service*
49041	3027	Rotary Valve								
54056	0	South East Door Hoist								
58321	2942	MCC Duct Heater	10							*Not In Service*
58322	2943	MCC Duct Heater	10							*Not In Service*
58334	2941	MCC Duct Heater	2							*Not In Service*
58357	0	Unit Heater S.W.								
		Small Hp	223							
		Total Hp	223							
	Total new connected HP (demolished loads have been taken into account)				**258**					
		Total demanded HP			**206.4**					
		Total Current KA			**0.185**					
		MCC 21-12 - COMP II								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
21075	2921	Sump Pump	15							
23112	2852	Mix Screw Conveyor	40	*5*						
23115	2896	Screw Conveyor	40							
23116	2893	Screw Conveyor	75	15						
23117	2878	Screw Conveyor	75	10						
23123	2910	Screw Conveyor	60	10						
32014	2848	Impactor	200	25						

40003	2911	Dryer	50	7.5						
41011	2902	#11 Compactor Roll Adj. Pump	3							
41011	2903	#11 Compactor Jack Shaft Lube Pump	1							
41011	2905	#11 Compactor Gear Box Pump	3							
41011	2906	#11 Compactor Lube Pump	30							
41012	2886	#12 Compactor Roll Adj. Pump	2							
41012	2887	#12 Compactor Jack Shaft Lube Pump	1							
41012	2889	#12 Compactor Gear Box Pump	1							
41012	2890	#12 Compactor Lube Pump	30							
43106	2912	Primary Combustion Air Fan	10							
58358		Unit Heater	0							
		Small Hp	436							
		Total Hp	636	72.5						
	Total new connected HP (demolished loads have been taken into account)				**636**					
		Total demanded HP			**508.8**					
		Total Current KA			**0.457**					
		MCC 21-13 COMP II								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
21045		Sump Pump, New Mech Shop								
43142		Mill Mtce Shop Makeup Air								
43150		Mill Mtce Shop South Wall Exh								
43153		Plasma Cutter								
44034		Tonit fan								
44039		Portable Fume Extractor for Hydraulic Hose Cutting Machine Mill Maint. Shop								
54066		Chain Hoist, Aisleway Doop SE								
54067		Mill Mtce. Shop Centre								
54068		Mill Mtce. Shop, South								
66041		Hyd. Press								
66041		Hyd. Press Bed Lift								
66090		Iron Worker								
66091		Band Saw								
66112		Band Saw								
98029		New Mill Mtce. Shop, East O/H door								
98035		Mill Mtce Shop, West O/H Door								
		Small Hp	0							
		Total Hp	0							
	Total new connected HP (demolished loads have been taken into account)				**0**					
		Total demanded HP			**0**					
		Total Current KA			**0.000**					
		Total Metered Load On LC 21.1	***520KW***							
		MCC 21-21 - COMP II								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
23110	2918	Screw Conveyor Feed to Belt Conv. #24	25					Demolish		
23111	2853	Mix Screw Conveyor to Comp. #11	50	7.5						
23114	2915	Screw Conveyor from Belt Conv. #25	75	15						
23121	2908	Screw Conveyor Pol. Screen to #14 IMP	20							
23122	2913	Mix Screw Conveyor to Dryer	25							
24024	2917	Belt Conveyor Feed to Belt Conv. #25	10							
24025	2916	Belt Conveyor Feed to Sc. Conv. #114	7.5							
24026	2860	Belt Conveyor	5							
24027	2859	Belt Conveyor	5							
24028	2858	Belt Conveyor	5							
24029	2857	Belt Conveyor	5							
24030	2856	Belt Conveyor	5							
24031	2855	Belt Conveyor to Gran. Bin	5							
24043	3013	Belt Conveyor to Screen D/C Feeding #27 Belt	15							
25010	2909	Bucket Elevator	40	5						
25011	2892	Bucket Elevator	60	10						
25012	2877	Bucket Elevator	60							
33051	2823	Granular Screen	10							
33052	2824	Granular Screen	10							
33053	2825	Granular Screen	10							
43092	2800	Dust Collector Fan	200	35						
43094	2922	Wall Fan	15							*Not In Service*
43095	2923	Wall Fan	15							
43096	2924	Wall Fan	15							
43097	2925	Wall Fan	15							
43098	2926	Wall Fan	15							
43099	2927	Wall Fan	15							
43100	2928	Wall Fan	15							
43101	2929	Wall Fan	15							
43102	2930	Wall Fan	15							
43103	2931	Wall Fan	15							
43159	3024	Compaction II Dryer Fan	150							- new expansion upper mcc - Has Siemens VFD, 600V, 150A, Ser#6SE86-6-3410-1
43160	3025	Compaction II Baghouse Fan	200	35						
49017	2919	Rotary Valve	1							
54033		5 Ton Hoist								
54054	2933	10 Ton Hoist	20							
54055	2934	20 Ton Hoist	40							
		Small Hp	643.5							
		Total Hp	1193.5	107.5						
	Total new connected HP (demolished loads have been taken into account)				**1183.5**					
		Total demanded HP			**946.8**					
		Total Current KA			**0.850**					
		MCC 21-22 - COMP II								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
32011	2894	Impactor for Compactor #11	125	15						
32012	2879	Impactor for Compactor #12	125	15						
32016	3109	Salt Circuit Ross Roles	20							
33045	2817	Polishing Screen	10							
33046	2818	Polishing Screen	10							
33047	2819	Polishing Screen	10							
33048	2820	Polishing Screen	10							
33049	2821	Polishing Screen	10							
33050	2822	Polishing Screen	10							
43093	2838	Dust Collector Fan	100	7.5						*Not In Service*
43104	2932	Axial Flow Fan #1	15							*Not In Service*
43105	2920	Axial Flow Fan #2	10							*Not In Service*
43185		Mill Vent Comb. Air Fan	7.5							
49028	2847	Rotary Valve	1							
49042	3028	Rotary Valve	1							
		Small Hp	89.5							
		Total Hp	339.5	37.5						
	Total new connected HP (demolished loads have been taken into account)				**464.5**					
		Total demanded HP			**371.6**					
		Total Current KA			**0.333**					
		Total Metered Load On LC 21.2	??							
		MCC 31-11 #1 HEAD FRAME								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
21001	1010	Sump Pump Shaft House #1	15							
21002	1011	Sump Pump Shaft House #1	15							
21190		Dust Scrubber Brine Return Pump								
21062		Basement Sump Pump								

43022		Control Room Fan								
46026		Aux. Air Compressor								
58055		Unit Heater								
58053		Unit Heater								
58054		Unit Heater								
58081		Unit Heater								
58056		Unit Heater								
58050		Unit Heater								
43018	*1033*	*Mine Exhaust Fan*	***200***							*has Relcon VFD, AF100-4806-2, 600V, 200HP*
		Small Hp	30							
		Total Hp	230							
	Total new connected HP (demolished loads have been taken into account)				**230**					
		Total demanded HP			**224**					
		Total Current KA			**0.201**					
		Total Metered Load On LC 31.1	***520KW***							

MCC 31-21 #2 HEAD FRAME

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
21003	1002	Sump Pump Shaft House #2	2							
21004	1003	Sump Pump Shaft House #2	15							
80000		Propane Controls								
98003		O/H Door								
58134		Unit Heater								
58136		Unit Heater								
58065		Unit Heater								
98004		O/H Door								
58135		Unit Heater								
54008		Crane								
58057		Unit Heater								
58084		Unit Heater								
58058		Unit Heater								
58059		Unit Heater								
43013	*1030*	*Mine Vent Fan #1*	*200*							*-has VFD, Relcon, Ser#AF100-4806-1, 200A, 600V*
43014	*1031*	*Mine Vent Fan #2*	*200*							*-has Startco Soft Start, 200A, 600V*
		Small Hp	417							
		Total Hp	417							
	Total new connected HP (demolished loads have been taken into account)				**417**					
		Total demanded HP			**333.6**					
		Total Current KA			**0.299**					

MCC 31-23 #2 HEAD FRAME

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20135	2147	Fuel Oil Unloading Pump	15							
20136	2148	Fuel Oil Unloading Pump	15							
20143	2149	Fuel Oil Distribution Pump	10							
		Small Hp	40							
		Total Hp	40							
	Total new connected HP (demolished loads have been taken into account)				**40**					
		Total demanded HP			**32**					
		Total Current KA			**0.029**					
		Total Metered Load On LC 31.2	***727KW***							

MCC 34-11 RECLAIM BRINE PUMP HOUSE

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20046	1539	Brine Reclaim pump	**200**							
20047	1540	Brine Reclaim pump	**200**							
20048	1541	Brine Reclaim pump	**200**							has VFD, Dandy VFDs, 600V, 200HP
20214		Reclaim Pumphouse Back Wash Pump								
20216	1534	Sala Priming Pump	50							
20305		West 6" Interior Dyke Pump	46							
20369		46, 47, 48 Reclaim Brine Pump D/C Hydr. Actu. Pump	1.5							
		Small Hp	97.5							
		Total Hp	697.5							
	Total new connected HP (demolished loads have been taken into account)				**697.5**					
		Total demanded HP			**558**					
		Total Current KA			**0.501**					

MCC 35-11 POWERHOUSE

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
? 20110 ?	2100	Water Conserv. Pump	10							
20119	2122	Brine Backwash Disposal Sump	5							
20129	2101	Boiler Feed Pump	40							
20130	2102	Boiler Feed Pump	40							
20133	2105	West Condensate Transfer Pump	15							
20134	2106	East Condensate Transfer Pump	15							
20137	2123	Boiler Fuel Oil Supply Pump South	15							
20138	2124	Fuel Oil Supply Pump North	15							
20139	2125	Fuel Oil Supply by Diesel	1							
20170		Softener Transfer Pump								
? 20171 ?		Softener Transfer Pump								
20353		Water Pumps								
20354		Water Pumps								
20356		Gen Fuel Pump								
20363		Sand Filter Pump								
21032	2104	Sump #2 at Softeners North	40							
43034	2139	Power House Switch Room Vent Fan 5								
43151		PH Basement Fume Fan								
46007	2108	Air Comp	**100**							- Siemens VFD, 600V, 100HP
46010		Gen Air Compressor								
46014		Sullair Plant Air Compressor								
47003		#2 Blower								
58051	2145	Heater Comb'tn Air Heater	8							
58060	2144	Unit Heater								
58111		Duct Heater								
58112		Duct Heater								
		Small Hp	204							
		Total Hp	304							
	Total new connected HP (demolished loads have been taken into account)				**304**					
		Total demanded HP			**243.2**					
		Total Current KA			**0.218**					

MCC 35-14 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20037	1532	Slimes Thickener Underflow Pump	50							
21009	2120	Sump Pump	10							
		Small Hp	60							
		Total Hp	60							
	Total new connected HP (demolished loads have been taken into account)				**60**					
		Total demanded HP			**58**					
		Total Current KA			**0.052**					
		Total Metered Load On LC 35.1	***509KW***							

MCC 35-21 MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20088	1827	Cryst Feed Pump	75							*Not In Service*
20091	1804	Hot Thickner U/F Pump	30							
20097	1803	Cryst. Feed Pump	75					Demolish		
20100	1819	Crystal First Stage Circ. Pump	100							*Not In Service*
20102	1821	Crystal Circ. Pump	100							*Not In Service*
38003	1833	Wash Water Clarifier Thick Drive	5							
38003	1834	Wash Water Clarifier Rake Lift	2							
20355		Brine Supply Pump			60					
		Small Hp	112							
		Total Hp	112							
	Total new connected HP (demolished loads have been taken into account)				**372**					
		Total demanded HP			**297.6**					
		Total Current KA			**0.267**					

MCC 35-22 FRESH WATER PUMP HOUSE

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
20111	2116	Process Water Pump	125						
20112	2117	Process Water Pump	125						
20115	2118	Fire Pump	200						
20116	2119	Fire Pump	200						
20117	2121	Fire Line Pressurinzing	5						
		Small Hp	5						
		Total Hp	655						
	Total new connected HP (demolished loads have been taken into account)				**655**				
		Total demanded HP			**524**				
		Total Current KA			**0.470**				

MCC 35-23 - MILL MAIN

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
20036	1531	Slimes Thickener Underflow Pump (East)	50	5					
20038	1522	Tailing Pump	200					Demolish	
20113	1939	Process Water Dist. Pump	100	15					
21010	1459	Sump Pump	20						
21011	1455	Dryer Sump Pump	10						
38001	1238	Hydro. Sep. Drive #1	7.5						
38001	1242	Hydro. Sep. Drive #2	8						
38001	1243	Hydro. Sep. Lift	2						
38002	1505	Slime Thickener Drive	20						
38002	1506	Slimes Thickener Lift	5						
58362		Flot. Office A/C Condensor							
58363		Flot. Office A/C Air Handler							
20114	1940	Process Water Distribution Pump			100				Stand By
		Small Hp	122.5						
		Total Hp	422.5						
	Total new connected HP (demolished loads have been taken into account)				**322.5**				
		Total demanded HP			**258**				
		Total Current KA			**0.232**				
		Total Metered Load On LC 35.2	???						

4160V LOADS

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
20008	1231	Primary DSM Feed Pump	300						
20009	1226	Primary DSM Cyclone Feed Pump	300						
20010	1227	Primary DSM Cyclone Feed Pump	300						
20018	1301	Flotation Feed Pump	300						
20019	1302	Flotation Feed Pump	300						
43138	1717	Comp I Wet Scrubber Fan	300						
20055	1228	Primary DSM Cyclone Feed Pump	300						
32003	1153	Impactor	400						
20039	1523	Tailing Pump	400					Demolish	Standby
		Total Load	2900						
	Total new connected HP (demolished loads have been taken into account)				**2900**				
		Total demanded HP			**2320**				
		Total Current KA			**0.300**				

4160V LOADS

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
41006	1711	Compactor	300						
41009	2700	Compactor #9	700						
43001	1463	Dryer Fluidizing Fan	700						
43115	1475	(Ducon) Scrubber Fan	800						
20221		Brine Injection Pump	1250						
		Total Hp	3750						
	Total new connected HP (demolished loads have been taken into account)				**3750**				
		Total demanded HP			**3000**				
		Total Current KA			**0.388**				

4160V LOADS

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
41008	1716	Compactor #8	300							-ABB LOADCENTER
41011	2895	Compactor #11	700							
41012	2880	Compactor #12	700							
41007	1715	Compactor #7	300							-ABB LOAD CENTER
41005	*1710*	*Compactor #5*	*300*							
	54-M5006	Brine Distribution Pump Motor (54-20468)			250				Stand By	
	54-M5650	Brine Distribution Pump Motor (54-20043)			400					
	54-M5656	Brine Distribution Pump Motor (54-20042)			400					
	54-M5657	Brine Distribution Pump Motor (54-20058)			400					
	59-M5012	Fluidizing Blower Motor (59-43214)			1000					
	59-M5013	Fluid Bed Dryer Wet Scrubber Fan Motor (59-43215)			1750		VFD			
		Total Hp	2300							
	Total new connected HP (demolished loads have been taken into account)				**6500**					
		Total demanded HP			**5200**					
		Total Current KA			**0.673**					

MCC 15-41

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
43211	5485	Transfer House Scrubber Fan Motor			125				
20241	5486	Transfer House Scrubber Discharge Pump Motor			7.5		VFD		
24254	5022	Transfer Conveyor Motor			60				
24253	5023	Auto Reclaimer Motor			75				
24251	5024	Belt Conveyor Motor			75				
24252	5025	Tripper Belt Conveyor Motor			40				Intermittent
24139	5026	Belt Conveyor Motor			200				
24004	5564	Reclaim Drag Conveyor Motor A			150		VFD		Intermittent
24004	5565	Reclaim Drag Conveyor Motor B			150		VFD		Intermittent
24252	5655	Tripper Belt Conveyor Tripper Motor			10				Intermittent
24257	5003	ROM Ore Belt Conveyor Motor			150		SS		
24256	5038	Transfer Conveyor Motor			15				
26021	5043	Surge Bin Apron Feeder Motor			50		VFD		
20242	5491	Surge Bin Scrubber Discharge Pump Motor			7.5		VFD		
24269	5652	Surge Bin Apron Feeder Dribble Conveyor Motor			7.5				
58510	98-M5523	Direct Fired Gas Heater Fan Motor			15				

58522	98-M5524	Direct Fired Gas Heater Fan Motor			3					
43251	98-M5525	Building Air Make-Up Fan Motor			10					
43252	98-M5526	Building Air Make-Up Fan Motor			10					
58531	98-M5619	Steam Heater Motor			1.5					
26023	51-M-5690	Surge Bin Apron Feeder			50					
43280	98-M5707	Building Exhaust Fan			10					
		Total HP>=50 +VFD+ 50KVA for future			1140	50				
		Total HP			1222					
		Total new connected HP (demolished loads have been taken into account)			**1222**					
		Total demanded HP			**977.6**					
		Total Current KA			**0.877**					
		MCC 19-23								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
	56-M5098	Effluent Flotation Feed Pump Motor (56-20456)			40		VFD			
	56-M5099	Effluent Flotation Feed Pump Motor (56-20457)			40		VFD		Stand By	
	56-M5103	Product Centrifuge Feed Tank Agitator Motor (56-35069)			20					
	56-M5430	Jameson Cell Re-Circ Pump Motor (56-20481)			100					
	56-M5456	Cleaner Flotation Feed Pump Motor (56-20483)			75		VFD			
	56-M5457	Cleaner Flotation Feed Pump Motor (56-20484)			75		VFD			
	59-M5141	Dryer Feed Screw Conveyer Motor (59-23141)			40					
	59-M5142	Dryer Discharge Drag Conveyor Motor (59-24261)			15					
	59-M5144	Rotary Valve Motor (59-49206)			5					
	59-M5492	Pressure Blower Motor (59-43239)			100					
	59-M5493	Rotary Valve Motor (59-49188)			1.5					
	59-M5659	Screw Conveyor Motor (59-23188)			5					
		Total HP>=50 +VFD+ 50KVA for future			430	50				
		Total HP			516.5					
		Total new connected HP (demolished loads have been taken into account)			**516.5**					
		Total demanded HP			**413.2**					
		Total Current KA			**0.371**					
		MCC 19-43								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
	60-M5157	Dust Bucket Elevator Motor (60-25018)			100		VFD			
	60-M5159	Standard Product Bucket Elevator Motor (60-25017)			100		VFD			
	60-M5168	Rotex Screen Motor (60-33065)			20					
	60-M5169	Rotex Screen Motor (60-33066)			20					
	60-M5170	Rotex Screen Motor (60-33067)			20					
	60-M5191	Rotary Valve Motor (60-49211)			3					
	60-M5207	Compaction III Feed Drag Conveyor 1 Motor (67-24263)			50					
	60-M5210	Compaction III Feed Drag Conveyor 2 Motor (67-24264)			30					
	61-M5158	Compaction I Feed Bucket Elevator Motor (61-25019)			100		VFD			
	61-M5189	Collection - Baghouse Medium Pulse Blower Motor (61-43229)			20					
	61-M5190	Baghouse Cleaning Arm Motor (61-44051)			0.75					
	61-M5483	Baghouse Vibrator Motor (61-44051)			0.333				Intermittent	
	61-M5658	Baghouse Vibrator Motor (61-44051)			0.333				Intermittent	
	62-M5195	Leach Brine Distribution Pump Motor (62-20435)			125					
	62-M5196	Leach Brine Distribution Pump Motor (62-20436)			125				Stand By	
	98-M5616	Building Air Makeup Fan Motor (98-43262)			10		R			
	98-M5617	Building Air Makeup Fan Motor (98-43263)			10		R			
	98-M5618	Building Air Makeup Fan Motor (98-43264)			10		R			
	61-M5014	Dust Collection Baghouse Exhaust Fan (61-43221)			350					
	60-54369	Penthouse EOT Crane				13				
	6054369	Penthouse EOT Crane Bridge Motor (60-54369)				12				
		Total HP>=50 +VFD+ 50KVA for future			950	75				
		Total HP			1094.416					
		Total new connected HP (demolished loads have been taken into account)			**1094.416**					
		Total demanded HP			**875.5328**					
		Total Current KA			**0.786**					
		MCC 20-13								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
	57-M5648	Tailings Pump Motor (57-20485)			125					
	57-M5649	Tailings Pump Motor (57-20486)			125				Stand By	
	58-M5130	Effluent Feed Pump Motor (58-20458)			20		VFD			
	58-M5131	Effluent Feed Pump Motor (58-20459)			20		VFD		Stand By	
	58-M5132	Centrifuge Discharge Drag Conveyor Motor (58-24259)			10					
	58-M5133	Dryer Reversible Feed Belt Conveyor Motor (58-24261)			10					
	58-M5487	trifuge Discharge Reversible Belt Conveyor Motor (58-24260)			10					
	58-M5660	rication Oil Pump for Product Centrifuge No 6 Motor (58-39006			2					
	58-M5661	rication Oil Pump for Product Centrifuge No 7 Motor (58-39007			2					
	59-M5139	Scrubber Discharge Pump Motor (59-20460)			60		VFD			
	59-M5140	Scrubber Discharge Pump Motor (59-20461)			60		VFD		Stand By	
	58-M5662	rication Oil Pump for Product Centrifuge No 8 Motor (58-39008			2					
	59-M-5692	Fluidizing Blower Lube System Motor (59-43214L1)			1.5					
	59-M-5693	Fluidizing Blower Lube System Motor (59-43214L1)			1.5					
	59-M-5695	Fluid Bed Dryer Wet Scrubber Lube System Motor (59-43215L1)			1.5					
	59-M-5696	Fluid Bed Dryer Wet Scrubber Lube System Motor (59-43215L1)			1.5					
		Total HP>=50 + VFD+50KVA for future			410	50				
		Total HP			452					
		Total new connected HP (demolished loads have been taken into account)			**452**					
		Total demanded HP			**361.6**					
		Total Current KA			**0.324**					
		MCC 22-11								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
20249	5060	Primary Cyclone Feed Pump Motor			200					
	52-M5074	Secondary Scrubber Agitator No.1 Motor (52-35074)			60					
	52-M5075	Secondary Scrubber Agitator No.2 Motor (52-35075)			60					
	52-M5076	Secondary Scrubber Agitator No.3 Motor (52-35076)			60					
	52-M5077	Secondary Scrubber Agitator No.4 Motor (52-35077)			60					
	52-M5355	Primary Deslime Screen Feed Pumps Motor (52-20245)			150					
	52-M5356	Primary Deslime Screen Feed Pumps Motor (52-20246)			150				Stand By	
	52-M5514	Automatic PSD Sampler Motor (52-56058)			5					
	52-M5668	orizontal Secondary Deslime Vibrating Screens Motor (52-34053			20					
	98-58505	Electrical Room HVAC Unit Fan Motors (98-58505)				50				
	98-58506	Electrical Room Condensing Unit Fan Motors (98-58506)				165				
	902-70161	Normal Instrument Transformer				75				
		Total HP>=50 + VFD + 50KVA for future			740	340				
		Total HP			765					
		Total new connected HP (demolished loads have been taken into account)			**765**					
		Total demanded HP			**612**					
		Total Current KA			**0.549**					
		MCC 22-21								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
	57-M5123	Tailings Cyclones Feed Pump Motor (57-20266)			150		VFD			
	57-M5124	Tailings Cyclones Feed Pump Motor (57-20267)			150		VFD			
	57-M5125	Cold Slimes Thickener Feed Pump Motor (57-20264)			200		VFD			
	57-M5126	Cold Slimes Thickener Feed Pump Motor (57-20265)			200		VFD		Stand By	
	57-M5128	Sump Pump Motor (57-21123)			240				Intermittent	
	57-M5129	Final Tailing Sample Tank Agitator Motor (57-35067)			20					
	57-M5425	Sump Pump Motor (57-21124)			40					
	57-M5426	Sump Pump Motor (57-21125)			40					
	57-M5534	Sump Pump Motor (57-21131)			40					
	57-M5535	Sump Pump Motor (57-21132)			40					

	98-M5466	Building Makeup Air Fan Motor (98-43242)			10					
	98-M5495	Steam Condensate Recovery Pump Motor (98-21128)			1					
	98-M5499	Building Make-Up Air Fan Motor (98-43246)			10					
	98-M5500	Building Make-Up Air Fan Motor (98-43247)			10					
	98-M5501	Building Make-Up Air Fan Motor (98-43248)			10					
	98-M5502	Building Make-Up Air Fan Motor (98-43249)			10					
	98-M5503	Building Make-Up Air Fan Motor (98-43250)			10					
	98-M5516	Steam Heater Fan Motor (98-58511)			1.5					
	98-M5517	Steam Heater Fan Motor (98-58512)			1.5					
	98-M5518	Steam Heater Fan Motor (98-58513)			1.5					
	98-M5519	Steam Heater Fan Motor (98-58514)			1.5					
	98-M5622	Steam Heater Motor (98-58534)			1.5					
	98-M5627	Integrated HVAC Unit Motor (98-53535)			50					
	98-M5628	Integrated HVAC Unit Motor (98-53536)			50					
	98-M5633	Exhaust Fan Motor (98-43269)			10					
	98-M5638	Electric Baseboard Heater Motor (98-58543)			3					
	98-M5639	Electric Baseboard Heater Motor (98-58544)			3					
	98-M5684	ectrical Room Condensing Unit Compressor Motor (98-58548			0					
	98-M5685	Steam Heater Fan Motor (98-58549)			1.5					
	98-M5686	Steam Heater Fan Motor (98-58550)			1.5					
	98-M5687	Steam Heater Fan Motor (98-58551)			1.5					
	98-M5688	Steam Heater Fan Motor (98-58552)			1.5					
	98-M5689	Steam Heater Fan Motor (98-58553)			1.5					
		Total HP>=50 + VFD + 50KVA for future			800	50				
		Total HP								
		Total new connected HP (demolished loads have been taken into account)			1112					
		Total demanded HP			889.6					
		Total Current KA			0.798					

MCC 22-31

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	67-M5381	No. 16 Compactor Force Feeder Motor (67-41016F)			15				
	67-M5382	No. 16 Compactor Force Feeder Motor (67-41016F)			15				
	67-M5387	No. 21 Compactor Force Feeder Motor (67-41021F)			15		VFD		
	67-M5388	No. 21 Compactor Force Feeder Motor (67-41021F)			15		VFD		
	67-M5389	No. 22 Compactor Force Feeder Motor (67-41022F)			15				
	67-M5390	No. 22 Compactor Force Feeder Motor (67-41022F)			15				
	67-M5395	No. 27 Compactor Force Feeder Motor (67-41027F)			15				
	67-M5396	No. 27 Compactor Force Feeder Motor (67-41027F)			15				
	67-M5664	Primary Crusher 1 Hydraulic Unit Motor (67-32041H)			2				
	67-M5665	Primary Crusher 2 Hydraulic Unit Motor (67-32042H)			2				
	67-M5206	actor Circuit Phase 2 - Feed Screw Conveyor Motor (67-24266)			40				
	67-M5214	Compactor 3B Feed Bucket Elevator Motor (67-25022)			100				
	67-M5215	Primary Screens Bucket Elevator Motor (67-25023)			200				
	67-M5220	No. 23 Compactor Force Feeder Motor (67-41023F)			7.5				
	67-M5221	No. 24 Compactor Force Feeder Motor (67-41024F)			7.5				
	67-M5222	No. 25 Compactor Force Feeder Motor (67-41025F)			7.5				
	67-M5223	No. 26 Compactor Force Feeder Motor (67-41026F)			7.5				
	67-M5228	Primary Crusher 3 Motor (67-32045)			75				
	67-M5229	Primary Crusher 4 Motor (67-32046)			75				
	67-M5230	Secondary Crusher 3 Motor A (67-32047)			75		VFD		
	67-M5231	Granular Screen Motor (67-33071)			50				
	67-M5232	Granular Screen Motor (67-33072)			50				
	67-M5233	Polishing Screen Motor (67-33075)			50				
	67-M5391	No. 23 Compactor Force Feeder Motor (67-41023F)			15				
	67-M5392	No. 24 Compactor Force Feeder Motor (67-41024F)			15				
	67-M5393	No. 25 Compactor Force Feeder Motor (67-41025F)			15				
	67-M5394	No. 26 Compactor Force Feeder Motor (67-41026F)			15				
	67-M5510	Primary Crusher 3 Lube System Motor (67-32038)			2				
	67-M5511	Primary Crusher 4 Lube System Motor (67-32039)			2				
	67-M5513	Secondary Crusher 3 Motor B (67-32047)			50				
	67-M5567	st Collection Baghouse 3B Pulse Blower Motor (67-43236)			20				
	67-54042	Travelling Hoist Lifting Well (67-54042)			27				
	67-54361	Crane - Bridge Motor (67-54361)			28				
	67-54362	Crane - Bridge Motor (67-54362)			19				
	67-54363	Crane - Bridge Motor (67-54363)			27				
		Normal Lighting Transformer			75				
		Emergency Lighting Transformer			40				
		Normal Instrument Transformer			75				
	67-54042	Travelling Hoist Lifting Well (67-54042)				27			
	67-54361	Crane - Bridge Motor (67-54361)				28			
	67-54362	Crane - Bridge Motor (67-54362)				19			
	67-54363	Crane - Bridge Motor (67-54363)				27			
		Normal Lighting Transformer				75			
		Emergency Lighting Transformer				40			
		Normal Instrument Transformer				75			
		Total HP>=50 + VFD + 50KVA for future			875	341			
		Total HP							
		Total new connected HP (demolished loads have been taken into account)			1294				
		Total demanded HP			1035.2				
		Total Current KA			0.929				

MCC 23-11

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	56-M5092	Rod Mill Discharge Pumps Motor (56-20256)			150				
	56-M5093	Rod Mill Discharge Pumps Motor (56-20257)			40				Stand By
	56-M5094	Product Centrifuge Feed Pump Motor (56-20260)			100		VFD		
	56-M5095	Product Centrifuge Feed Pump Motor (56-20261)			100		VFD		Stand By
	56-M5100	Rod Mill Motor (56-22002)			300				
	56-M5101	Regrind Flotation Conditioner Agitator Motor (56-35065)			20				
	56-M5102	Regrind Flotation Conditioner Agitator Motor (56-35066)			20				
	56-M5104	Rougher Flotation Agitator No.1 Motor (56-35078)			30				
	56-M5105	Rougher Flotation Agitator No.2 Motor (56-35079)			30				
	56-M5106	Rougher Flotation Agitator No.3 Motor (56-35080)			30				
	56-M5107	Rougher Flotation Agitator No.4 Motor (56-35081)			30				
	56-M5111	Air Blower for Flotation Cell Motor (56-43231)			75				
	56-M5112	Air Blower for Flotation Cell Motor (56-43232)			75				Stand By
	56-M5401	tegrind Flotation Cell Skimmer drive motor # 1 (56-37054)			1				
	56-M5402	tegrind Flotation Cell Skimmer drive motor # 2 (56-37054)			1				
	56-M5407	tougher Flotation Cell Skimmer drive motor # 1 (56-37052)			1				
	56-M5408	tougher Flotation Cell Skimmer drive motor # 2 (56-37052)			1				
	56-M5415	Rougher Flotation Agitator No.1 Motor (56-35086)			30				
	56-M5416	Rougher Flotation Agitator No.2 Motor (56-35087)			30				
	56-M5417	Rougher Flotation Agitator No.3 Motor (56-35088)			30				
	56-M5418	Rougher Flotation Agitator No.4 Motor (56-35089)			30				
	56-M5409	tougher Flotation Cell Skimmer drive motor # 1 (56-37051)			1				
	56-M5410	tougher Flotation Cell Skimmer drive motor # 2 (56-37051)			1				
	56-M5431	Bridge Crane Motor (56-54344)							
	56-54365	Jib Crane Motor (56-54365)							
	50Q-70159	Normal Lighting Transformer				75			
		Total HP>=50 + VFD + 50KVA for future			800	125			
		Total HP							
		Total new connected HP (demolished loads have been taken into account)			1126				
		Total demanded HP			900.8				
		Total Current KA			0.808				

MCC 23-31

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
32024	5005	Impactor Motor (51-32024)			400		VFD		
21118	5035	shing and Screening Building Sump Pump Motor (51-21118)			40				Intermittent
33062	5048	Primary Vibrating Screen Motor			40				

33064	5049	Secondary Vibrating Screen Motor			40					
21130	5522	Sump Pump Motor			40					
24258	5066	Fine Ore Belt Conveyor Motor			40					
		Normal Lighting Transformer				75				
		Normal Instrument Transformer				75				
		Total HP>=50 + VFD + 50KVA for future			400	200				
		Total HP								
		Total new connected HP (demolished loads have been taken into account)			600					
		Total demanded HP			480					
		Total Current KA			0.431					

MCC 24-11

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	56-M5087	Flotation Feed Pump Motor (56-20252)			250		VFD		
	56-M5088	Flotation Feed Pump Motor (56-20253)			250		VFD		Stand By
	56-M5089	Cleaner Flotation Feed Pump Motor (56-20254)			30		VFD		Stand By
	56-M5090	Cleaner Flotation Feed Pump Motor (56-20255)			30		VFD		Stand By
	56-M5096	Regrind Flotation Feed Pumps Motor (56-20258)			125		VFD		
	56-M5097	Regrind Flotation Feed Pumps Motor (56-20259)			125		VFD		Stand By
	56-M5397	Regrind Flotation Agitator No.1 Motor (56-35094)			30				
	56-M5398	Regrind Flotation Agitator No.2 Motor (56-35095)			30				
	56-M5399	Regrind Flotation Agitator No.3 Motor (56-35096)			30				
	56-M5400	Regrind Flotation Agitator No.4 Motor (56-35097)			30				
	56-M5419	Rougher Flotation Cell Skimmer drive motor # 1 (56-37053)			1				
	56-M5420	Rougher Flotation Cell Skimmer drive motor # 2 (56-37053)			1				
	56-M5427	Jameson Cell Re-Circ Pump #1 Motor (56-20262)			75				
	56-M5428	Jameson Cell Re-Circ Pump #2 Motor (56-20263)			75				
	56-M5439	Liner Handler Motor (56-90214)			0				
	56-M5602	Rod Loader Motor (56-90213)			10				
	56-M5667	Rod Mill Hydraulic Unit for Trunnion Lub Motor (56-22002H1			5				
	56-M5668	Rod Mill Hydraulic Unit Power Pack for Jacking Sys Motor (56-22002H1			0				
	56-M5411	Rougher Flotation Agitator No. 1 Motor (56-35082)			30				
	56-M5412	Rougher Flotation Agitator No.2 Motor (56-35083)			30				
	56-M5413	Rougher Flotation Agitator No.3 Motor (56-35084)			30				
	56-M5414	Rougher Flotation Agitator No.4 Motor (56-35085)			30				
	56-M5711	Rod Mill Hyd Unit for Trunnion Low Pressure Lub Motor			5				
	56-54333	BRIDGE CRANE, FLOTATION AREA				33			
		Total HP>=50 + VFD + 50KVA for future			960	83			
		Total HP			1222				
		Total new connected HP (demolished loads have been taken into account)			1222				
		Total demanded HP			977.6				
		Total Current KA			0.877				

MCC 24-21

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	67-M5211	Compactor 3A Feed Bucket Elevator Motor (67-26020)			100		VFD		
	67-M5218	No. 19 Compactor Force Feeder Motor (67-41019F)			15		VFD		
	67-M5219	No. 20 Compactor Force Feeder Motor (67-41020F)			15		VFD		
	67-M5442	Compaction III Wet Scrubber Fan Motor (67-43240)			600		VFD		
	67-M5447	Rotary Conditioning Drum Drive Motor (67-22003)			125		VFD		
	67-M5448	Rotary Valve Motor (67-49190)			1.5				
	67-M5471	No. 17 Compactor Roll Bearing / Force Feeder Lube System Motor (67-41017L1)			3				
	98-M5467	Electrical Room HVAC Unit Motor A (98-58508)			7.5				
	98-M5470	Building Makeup Air Fan Motor (98-43243)			10				
	98-M5496	Steam Condensate Recovery Pump Motor (56-21129)			1.5				
	98-M5527	Building Air Make-Up Fan Motor (98-43253)			10				
	98-M5528	Building Air Make-Up Fan Motor (98-43254)			10				
	98-M5529	Building Air Make-Up Fan Motor (98-43255)			10				
	98-M5530	Building Air Make-Up Fan Motor (98-43256)	Existing HP	CAP	10				
20250	98-M5531	Building Air Make-Up Fan Motor (98-43257)			10				
20251	98-M5532	Building Air Make-Up Fan Motor (98-43258)			10				
21120	98-M5533	Building Air Make-Up Fan Motor (98-43259)			10				
	98-M5537	Steam Heater Fan Motor (98-58515)			1.5				
	98-M5538	Steam Heater Fan Motor (98-58516)			1.5				
	98-M5539	Steam Heater Fan Motor (98-58517)			1.5				
	98-M5540	Steam Heater Fan Motor (98-58518)			1.5				
	98-M5541	Steam Heater Fan Motor (98-58519)			1.5				
	98-M5542	Steam Heater Fan Motor (98-58520)			1.5				
	98-M5543	Steam Heater Fan Motor (98-58521)			1.5				
	67-54336	Travelling Hoist Lifting Well (67-54336)				32			
	98-58509	Electrical Room Condensing Unit Motor B (98-58509)				60			
		Total HP>=50 + VFD + 50KVA for future			855	142			
		Total HP			959				
		Total new connected HP (demolished loads have been taken into account)			959				
		Total demanded HP			767.2				
		Total Current KA			0.688407				

MCC 25-11

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	62-M5061	Secondary Cyclone Feed Pump Motor (62-20250)			200				
	62-M5062	Tertiary Cyclone Feed Pump Motor (62-20251)			150				
	52-M5063	Brine Recovery Sump Pump Motor (62-21120)			40				
	52-M5068	Wet Horizontal Secondary Deslime Vibrating Screens Motor (52-34051)			20				
	52-M5069	Wet Horizontal Secondary Deslime Vibrating Screens Motor (52-34052)			20				
	52-M5070	Primary Scrubber Agitator No.1 Motor (62-35070)			60				
	62-M5071	Primary Scrubber Agitator No.2 Motor (62-35071)			60				
	62-M5072	Primary Scrubber Agitator No.3 Motor (62-35072)			60				
	62-M5073	Primary Scrubber Agitator No.4 Motor (62-35073)			60				
	52-M5357	Secondary Deslime Screen Feed Pumps Motor (52-20247)			125		VFD		
	52-M5358	Secondary Deslime Screen Feed Pumps Motor (52-20248)			125		VFD		Stand By
		Total HP>=50 + VFD + 50KVA for future			840	50			
		Total HP			920				
		Total new connected HP (demolished loads have been taken into account)			920				
		Total demanded HP			736				
		Total Current KA			0.660				

MCC 25-21

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
32023	5004	Impactor Motor			400		VFD		
25016	5042	O/S Recycle Bucket Elevator Motor			125		VFD		
33061	5046	Primary Vibrating Screen Motor			40				
33063	5047	Secondary Vibrating Screen Motor			40				
20243	5053	Crushing and Screening Scrubber Discharge Pump Motor			10		VFD		
54368	5058	Chute Magnet Jib crane Motor			15				
20244	5494	Crushing and Screening Scrubber Discharge Pump Motor			10		VFD		
32034	5504	Impactor Lube System Motor			3				
32035	5505	Impactor Lube System Motor			2				
32023H	5663	Impactor Hydraulic Unit Motor			2				
20022	5067	Fine Ore Apron Feeder Motor			40		VFD		
	98-M5459	Electrical Room HVAC Unit Motor (98-58502)			7.5				
	98-M5461	Gas Heating System Motor (98-58504)			25				
	98-M5462	Building Makeup Air Fan Motor (98-43241)			10				
	98-M5497	Building Make-Up Air Fan Motor (98-43244)			10				
	98-M5498	Building Make-Up Air Fan Motor (98-43245)			10				
	98-M5620	Steam Heater Motor (98-58532)			1.5				
	98-M5621	Steam Heater Motor (98-58533)			1.5				
	98-M5629	Electric Unit Heater Motor (98-53537)			15				
	98-M5630	Electric Unit Heater Motor (98-53538)			15				
	98-M5631	Electric Unit Heater Motor (98-53539)			15				

	98-M5632	Electric Unit Heater Motor (98-53540)			15					
	98-M5634	Electric Baseboard Heater Motor (98-58541)			3					
	98-M5635	Electric Baseboard Heater Motor (98-58542)			3					
	98-58503	Electrical Room HVAC (98-58503)				45				
		Total HP>=50 + VFD + 50KVA for future			585	95				
		Total HP			818.5					
		Total new connected HP (demolished loads have been taken into account)			**818.5**					
		Total demanded HP			**654.8**					
		Total Current KA			**0.588**					

MCC 25-31

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	67-M5201	Pump Motor (67-20474)			20				
	67-M5202	Pump Motor (67-20475)			20				Intermittent
	67-M5203	Sump Motor (67-21122)			40				Intermittent
	67-M5204	)ector Circuit Phase 1- Feed Drag Conveyor Motor (67-24265)			50		VFD		
	67-M5209	Product Belt Conveyor Motor (67-24268)			10				
	67-M5212	Granular Screens Bucket Elevator No.1 Motor (67-25021)			200		VFD		
	67-M5213	olishing Screen Bucket Elevator Polishing Motor (67-25024)			100		VFD		
	67-M5216	No. 17 Compactor Force Feeder Motor (67-41017F)			15		VFD		
	67-M5217	No. 18 Compactor Force Feeder Motor (67-41018F)			15		VFD		
	67-M5227	Secondary Crusher 1 Motor A (67-32043)			75		VFD		
	67-M5234	Granular Screen Motor (67-33068)			20				
	67-M5235	Granular Screen 2 Motor (67-33069)			20				
	67-M5236	Polishing Screen Motor (67-33074)			20				
	67-M5248	Collection Baghouse 3A Medium Pulse Blower Motor (67-43228)			20				
	67-M5250	ust Collection Baghouse 3A Cleaning Arm Motor (67-44055)			0.75				
	67-M5263	ust Collection Baghouse 3A Rotary Valve Motor (67-49157)			3				
	67-M5373	Man Elevator Motor (67-54338)			25				
	67-M5383	No. 17 Compactor Force Feeder Motor (67-41017F)			15		VFD		
	67-M5384	No. 18 Compactor Force Feeder Motor (67-41018F)			15		VFD		
	67-M5385	No. 19 Compactor Force Feeder Motor (67-41019F)			15		VFD		
	67-M5386	No. 20 Compactor Force Feeder Motor (67-41020F)			15		VFD		
	67-M5443	Conditioning Drum Water Spray Pump Motor (67-20482)			7.5		VFD		
	67-M5444	Annealing Dryer Lump Crusher Motor (67-32049)			10				
	67-M5472	/ Compactor Pressure Roll Hydraulic System Motor (67-41017L2'			1.5				
	67-M5473	17 Compactor Gear Reducer Lube System Motor (67-41017L3)			3				
	67-M5474	mpactor Roll Bearing / Force Feeder Lub System Motor (67-41018L1)			3				
	67-M5475	) Compactor Pressure Roll Hydraulic System Motor (67-41018L2'			1.5				
	67-M5476	18 Compactor Gear Reducer Lube System Motor (67-41018L3)			3				
	67-M5477	mpactor Roll Bearing / Force Feeder Lub System Motor (67-41019L1)			3				
	67-M5478	) Compactor Pressure Roll Hydraulic System Motor (67-41019L2'			1.5				
	67-M5479	19 Compactor Gear Reducer Lube System Motor (67-41019L3)			3				
	67-M5480	mpactor Roll Bearing / Force Feeder Lub System Motor (67-41020L1)			3				
	67-M5481	) Compactor Pressure Roll Hydraulic System Motor (67-41020L2'			1.5				
	67-M5482	20 Compactor Gear Reducer Lube System Motor (67-41020L3)			3				
	67-M5484	Dust Collection Baghouse Vibrator Motor (61-44055)			0.4				
	67-M5488	Dryer Feed Belt Conveyor Motor (67-24267)			5				
	67-M5508	Primary Crusher 1 Lube System Motor (67-32036)			2				
	67-M5509	Primary Crusher 2 Lube System Motor (67-32037)			2				
	67-M5512	Secondary Crusher 1 Motor B (67-32043)			50				
	67-54358	Crane - Bridge Motor (67-54358)			34				
	67-54359	Crane - Bridge Motor (67-54359)			24				
	67-54360	Crane - Bridge Motor (67-54360)			34				
	98-M5642	Electric Baseboard Heater Motor (98-58545)			3				
	98-M5643	Electric Baseboard Heater Motor (98-58546)			3				
	98-M5644	Supply Fan Motor (98-43274)			10				
	98-M5645	Supply Fan Motor (98-43275)			10				
	98-M5647	Building Air Makeup Fan Motor (98-43279)			10				
	98-58547	Electrical Room HVAC Unit			0				
	67-M5669	Dust Collection Baghouse 3A Motor (67-44055)			0.4				
	67-M5670	Collection Baghouse 3B Medium Pulse Blower Motor (67-43236			20				
	67-M5671	ust Collection Baghouse 3B Cleaning Arm Motor (67-44056			0.75				
	67-M5672	Dust Collection Baghouse 3B Rotary Arm Motor (67-49156			3				
	67-M5673	Dust Collection Baghouse 3BVibrator Motor (61-44056)			0.5				
	67-M5674	Dust Collection Baghouse 3B Rotary Valve Motor (67-44056			0.5				
	67-M-5708	Conditioning Drum Water Spray Pump (67-20488)			7.5		VFD		
	67-M-5709	Secondary Crusher 2 Motor A (67-32044)			75		VFD		
	67-M-5710	Secondary Crusher 2 Motor B (67-32044)			50				
	67-54358	Crane - Bridge Motor (67-54358)				34			
	67-54359	Crane - Bridge Motor (67-54359)				24			
	67-54360	Crane - Bridge Motor (67-54360)				34			
	67-70163	Normal Lighting Transformer				75			
	67-74084	Emergency Lighting Transformer				40			
		Normal Instrument Transformer				75			
		Total HP>=50 + VFD + 50KVA for future			655	332			
		Total HP			1103.3				
		Total new connected HP (demolished loads have been taken into account)			**1103.3**				
		Total demanded HP			**882.64**				
		Total Current KA			**0.792**				

MCC 41-1

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	67-M5225	Primary Crusher 1 Motor (67-32041)			300				
	67-M5226	Primary Crusher 2 Motor (67-32042)			300				
	67-M5238	No. 17 Compactor Motor (67-41017)			400				
	67-M5239	No. 18 Compactor Motor (67-41018)			400				
	67-M5240	No. 19 Compactor Motor (67-41019)			400				
	67-M5241	No. 20 Compactor Motor (67-41020)			400				
	67-M5246	Supply Air Blower Motor (67-43222)			350				
	67-M5247	ust Collection Baghouse 3A Exhaust Fan Motor (67-43226)			350				
		Total HP>=50 + VFD + 50KVA for future			2900	50			
		Total HP			2900				
		Total new connected HP (demolished loads have been taken into account)			**2900**				
		Total demanded HP			**2320**				
		Total Current KA			**0.300**				

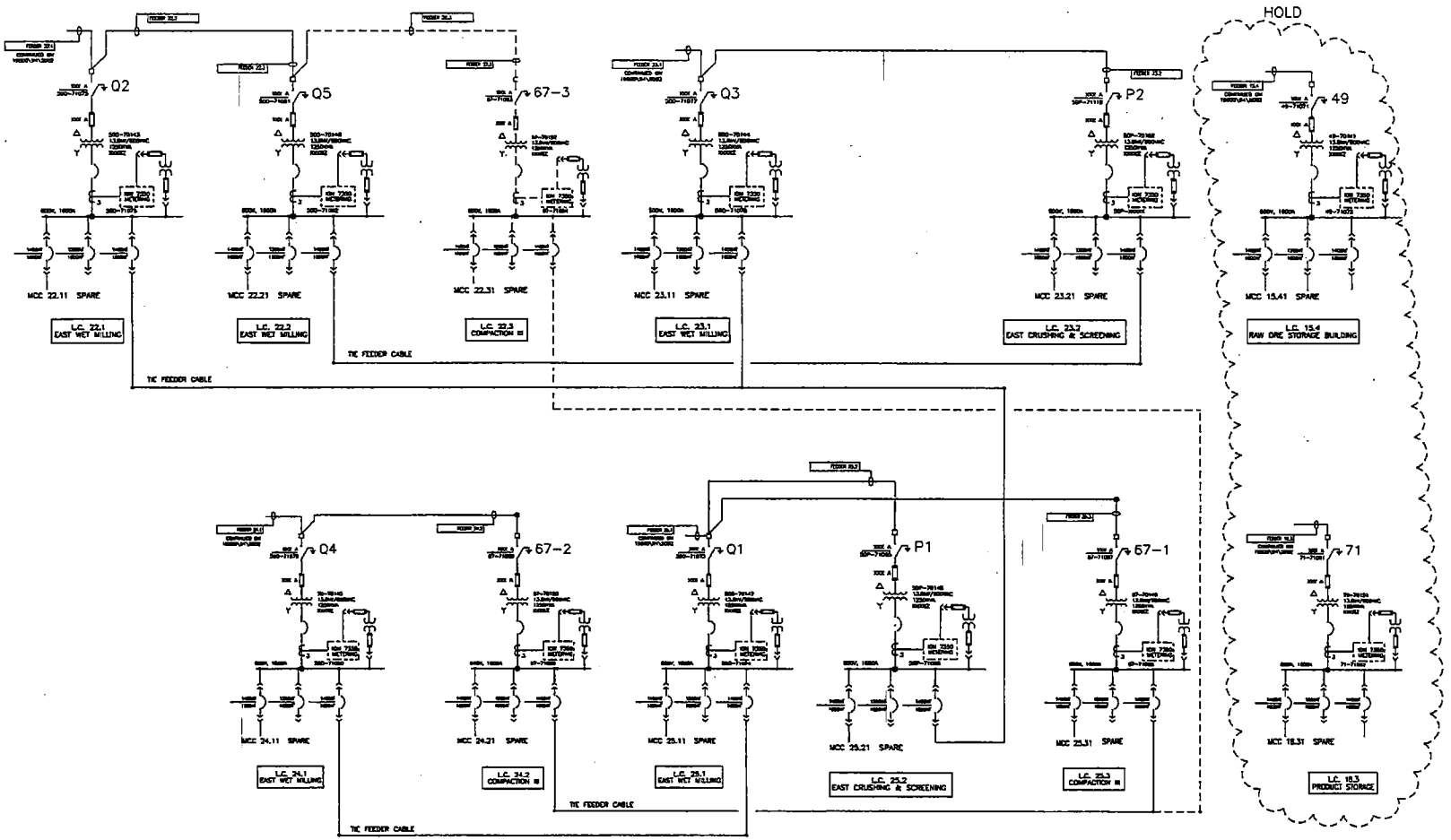
MCC 67-72148

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
	67-M5377	No. 16 Compactor Motor (67-41016)			400				
	67-M5378	No. 21 Compactor Motor (67-41021)			400				
	67-M5379	No. 22 Compactor Motor (67-41022)			400				
	67-M5380	No. 27 Compactor Motor (67-41027)			400				
	67-M5242	No. 23 Compactor Motor (67-41023)			400				
	67-M5243	No. 24 Compactor Motor (67-41024)			400				
	67-M5244	No. 25 Compactor Motor (67-41025)			400				
	67-M5245	No. 26 Compactor Motor (67-41026)			400				
		Total HP>=50 + VFD + 50KVA for future			3200	50			
		Total HP			3200				
		Total new connected HP (demolished loads have been taken into account)			**3200**				
		Total demanded HP			**2560**				
		Total Current KA			**0.331**				

MCC 42-11

Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status
54332	5359	Freight Elevator Motor			25				
	5064	Ribbon Conditioner Screw Conveyor Motor (52-23182)			75				
	5065	Ribbon Conditioner Screw Conveyor Motor (52-23183)			75				Stand By
	69-M5375	Man Elevator Motor (69-54341)			15				
	80-M5015	Compressor Motor (80-46037)			200		VFD		
	80-M5016	Compressor Motor (80-46038)			200		VFD		

	80-M5017	Compressor Motor (80-46039)			200		VFD			
	94-M5344	Air Dryer Motor (80-46040)								
	94-M5345	Air Dryer Motor (80-46041)								
		Emergency Lighting Transformer				40				
	90Q-70160	Emergency Lighting Transformer				40				
		Total HP>=50 + VFD + 50KVA for future			750	130				
		Total HP			790					
		Total new connected HP (demolished loads have been taken into account)			790					
		Total demanded HP			632					
		Total Current KA			0.082					
		MCC 43-1								
Equip #	Motor #	Description	Existing HP	CAP	New HP	KVA	Controller	Construction Type	Status	
43212	5050	Crushing and Screening Scrubber Fan Motor			500					
	57-M5117	Tailings Pump Motor (57-20270)			700					
	57-M5118	Tailings Pump Motor (57-20271)			700					
	57-M5119	Tailings Pump Motor (57-20272)			900				Stand By	
	57-M5120	Tailings Pump Motor (57-20273)			900				Stand By	
		Total HP>=50 + VFD + 50KVA for future			3700	50				
		Total HP			3700					
		Total new connected HP (demolished loads have been taken into account)			3700					
		Total demanded HP			2960					
		Total Current KA			0.383					



19000\10\0002	ELECTRICAL SINGLE LINE DIAGRAM STANDARD SYMBOLS
19000\71\5001	LOAD CENTER 23.3 SINGLE LINE DIAGRAM
19000\67\5001	LOAD CENTER 24.2, 24.3 & 25.3 SINGLE LINE DIAGRAM
19000\49\5001	LOAD CENTER 22.3 SINGLE LINE DIAGRAM
19000\500\5001	LOAD CENTER 24.1 SINGLE LINE DIAGRAM
19000\500\5001	LOAD CENTER 22.2, 23.2 & 25.1 SINGLE LINE DIAGRAM
19000\500\5001	LOAD CENTER 22.1, 23.1 & 25.1 SINGLE LINE DIAGRAM
19000\B4\5002	13.8kV SWITCHGEAR SINGLE LINE DIAGRAM

Drawing No. | Drawing Title

REFERENCE DRAWINGS

NOTES:
1. LOAD CENTER EQUIPMENT ARE CLOSED COUPLED.
2. MCC ARE CLOSED COUPLED TO LOAD CENTER

NO.	DESCRIPTION	BY	CHK'D/APP'D	DATE

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
A	INTERNAL REVIEW		

ISSUE AUTHORIZATION

HATCH
H.A. DWG. NO. H328668-0400-70-082-5001

DESIGNED BY | DRAWN BY V.TCHOUDOUNG | DATE
CHECKED BY | DATE | DWGR. ENGR. | DATE
PROJ. DES. COORD. | DATE | PROJ. ENGR. | DATE
PROJ. MGR. | DATE

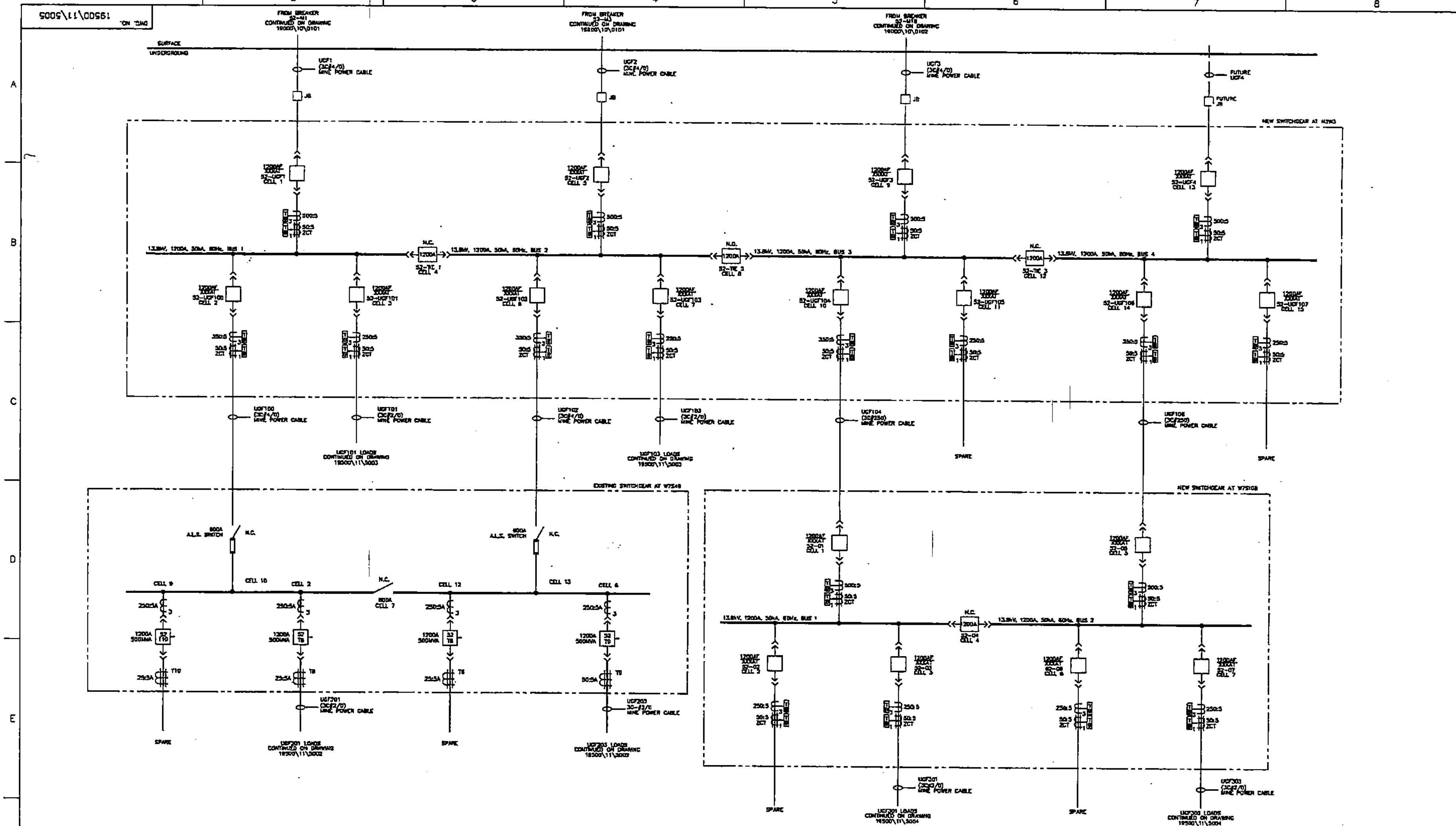
Mosaic Potash Colonsay

Mosaic Potash Colonsay Expansion Project

MINE GENERAL
MAIN POWER DISTRIBUTION
SINGLE LINE DIAGRAM

SCALE: NTS OR AS NOTED | DWG. NO. 19000\10\5005 | REV. A

H328668-0400-70-082-5001.dgn 10/6/2010 2:22:28 PM



DRAWING NO.	DRAWING TITLE
19500\11\5002	EXISTING SWGR AT W7549 AND UGF201 & 203 SLD
19500\11\5001	13.8kV SWGR AT W7108 SLD
19500\11\5000	13.8kV SWGR AT N3W3 SLD
19500\11\5004	UGF301 AND 303 LOADS SLD
19500\11\5002	UGF201 AND 203 LOADS SLD
19500\11\5003	UGF101 AND 103 LOADS SLD
19000\10\0102	MAIN POWER DISTRIBUTION, TRANSFORMER 'T3' ADDITION SLD

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
A	ISSUED FOR CLIENT REVIEW	TA	2010\10\12

ISSUE AUTHORIZATION

HATCH

HA DWG. NO. H335923-0000-70-082-0008

DESIGNED BY T.ALZAHAWI	DRAWN BY P.MAY
CHECKED BY P.VANDYK	DISCIP. ENGR. T.ALZAHAWI
PROJ. DES. COORD. S.NUESCH	PROJ. ENGR. S.NUESCH
PROJ. MGR. S.NUESCH	

Mosaic Potash Colonsay

Mosaic Potash Colonsay Expansion Project

UNDERGROUND DISTRIBUTION SINGLE LINE DIAGRAM

SCALE NTS OR AS NOTED

DWG. NO. 19500\11\5005

REV. A

DWG. NO. 19500\11\5005

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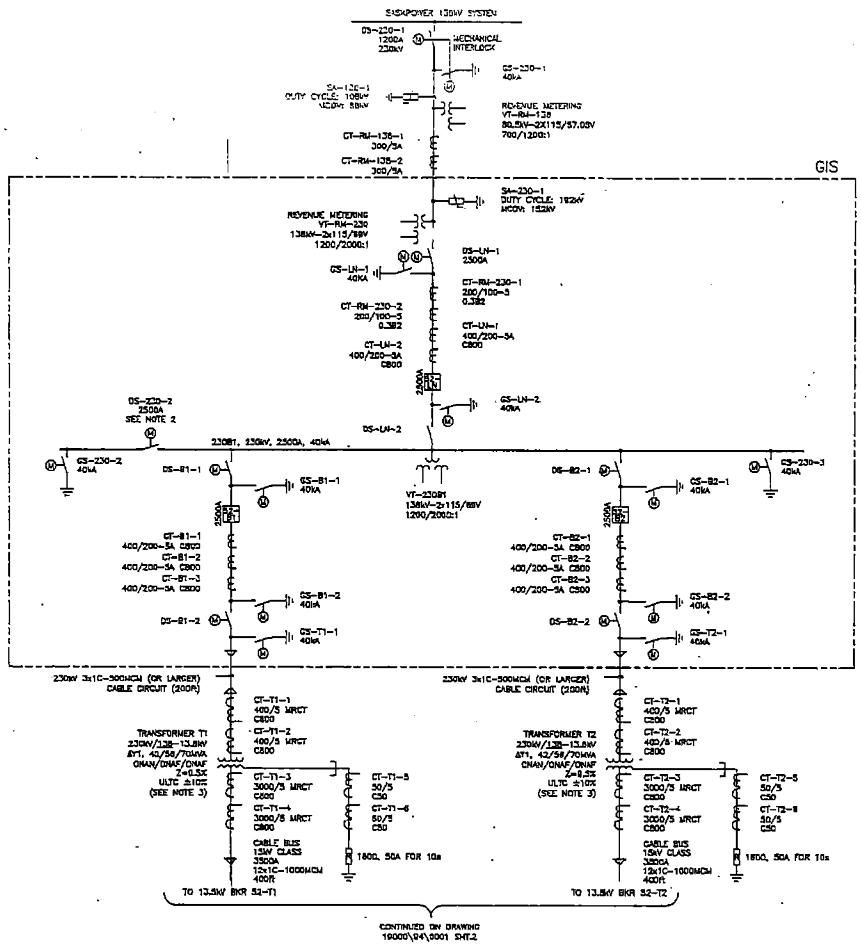


LEGEND:

- CURRENT TRANSFORMER
- TRANSFORMER
- BUSHING TYPE CURRENT TRANSFORMER
- POTENTIAL TRANSFORMER
- CIRCUIT BREAKER (SF6)
- SURGE ARRESTER (MOV)
- DISCONNECT SWITCH (MOTORIZED)
- GROUND SWITCH (MOTORIZED)
- RESISTOR
- SPLICE
- CABLE CIRCUIT
- ULTC – UNDER LOAD TAP CHANGER

NOTES:
1) EQUIPMENT RATINGS AND DESIGNATIONS ARE TENTATIVE
2) BUS DISCONNECT SWITCH FOR FUTURE GIS EXPANSION
3) ALL UNUSED CT WINDINGS TO BE SHORTED AND GROUNDED
4) KEY INTERLOCKS ARE NOT SHOWN

PRELIMINARY

DRAWING NO.	DRAWING TITLE
19000\94\0001-2	13.8kV SWITCHGEAR

REFERENCE DRAWINGS

NO.	DESCRIPTION		DATE
5	INTER DISCIPLINE REVIEW (IFC 4)		
4	NEW DRAWING		

REVISIONS

ISSUE AUTHORIZATION

HATCH

Mosaic

Potash Colonsay

Mosaic Potash Colonsay Expansion Project

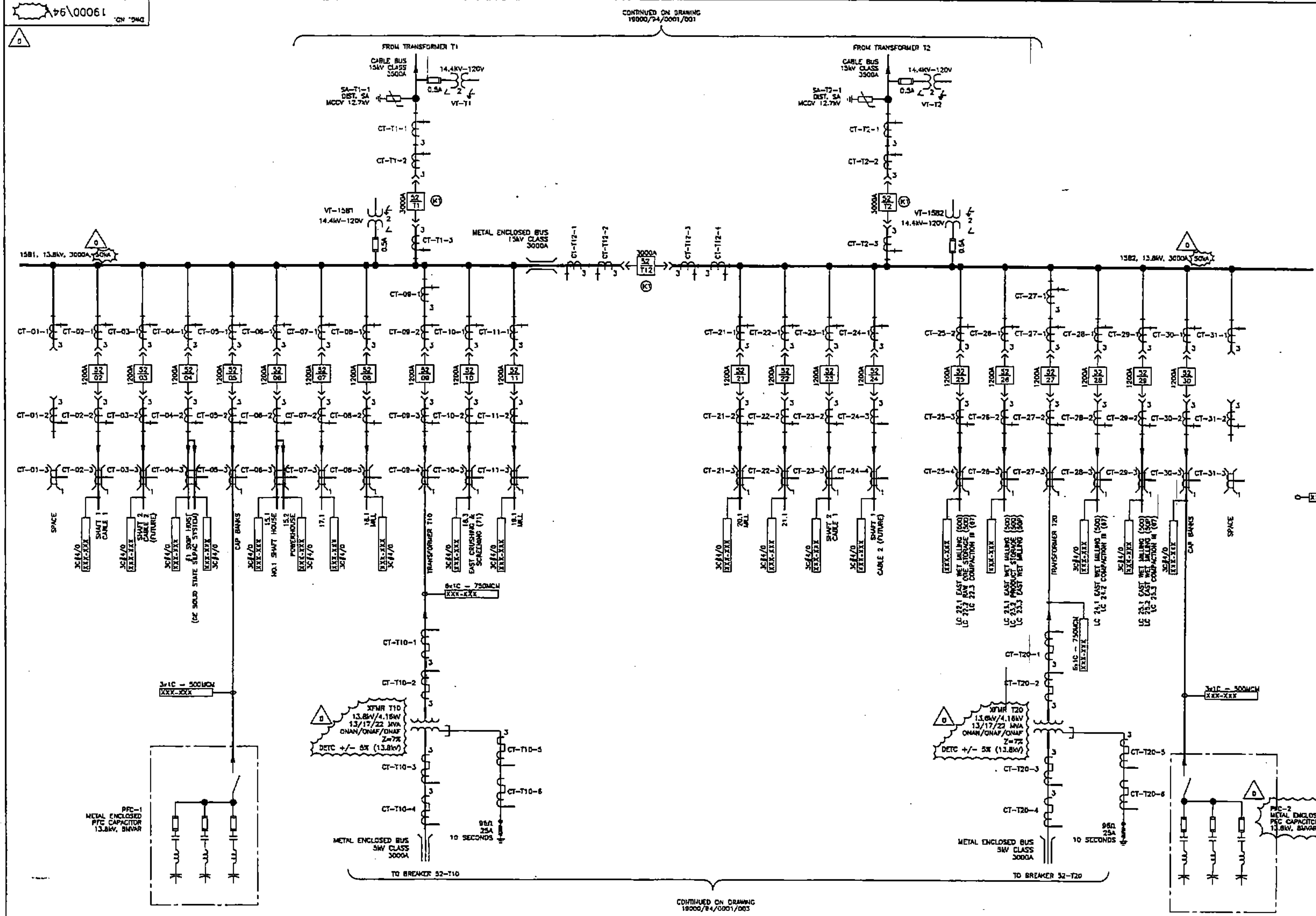
NEW SUBSTATION TWO
GIS & 230/138-13.8 kV TRANSFORMERS
SINGLE LINE DIAGRAM

SCALE NTS

DWG. NO. 19000\94\0001 SHT. 1 OF 3

REV. B

19000\94\0001 SHT.1



NOTES:
1. EQUIPMENT RATINGS AND DESIGNATIONS ARE TENTATIVE.
2. ALL UNUSED CT WINDINGS TO BE SHORTED AND GROUNDED.
(K) KEY INTERLOCK FOR 13.8kV SWITCHGEAR. ONLY 2 OF 3 BREAKERS MAY BE CLOSED.

LEGEND:

- CURRENT TRANSFORMER
- CIRCUIT BREAKER DRAWOUT TYPE (VACUUM)
- DISCONNECT SWITCH
- CAPACITOR
- VACUUM CONTACTOR
- CABLE CIRCUIT
- NEUTRAL GROUNDING RESISTOR
- CURRENT TRANSFORMER ZERO SEQUENCE
- TWO-WINDING TRANSFORMER
- TWO POTENTIAL XFMRS CONNECTED OPEN DELTA
- FUSE
- REACTOR
- BUS DUCT
- BUSHING CURRENT TRANSFORMER
- SURGE ARRESTER
- DETC - DE-ENERGIZED LOAD TAP CHANGER
- XXX-XXX CONDUIT OR CABLE WITH XXX-XXX CABLE TAG NUMBER

APEGN Certificate of Authorization HATCH Ltd. No. 4400 Date:

NOT FOR CONSTRUCTION

DRAWING NO.	DRAWING TITLE
19000-94-	4.16kV SWITCHGEAR
19000-94-	GIS & 230/13.8kV POWER TRANSFORMERS

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
0	FOR BID	NA	NA	NA	NA

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
0	FOR BID	RA	SB

ISSUE AUTHORIZATION

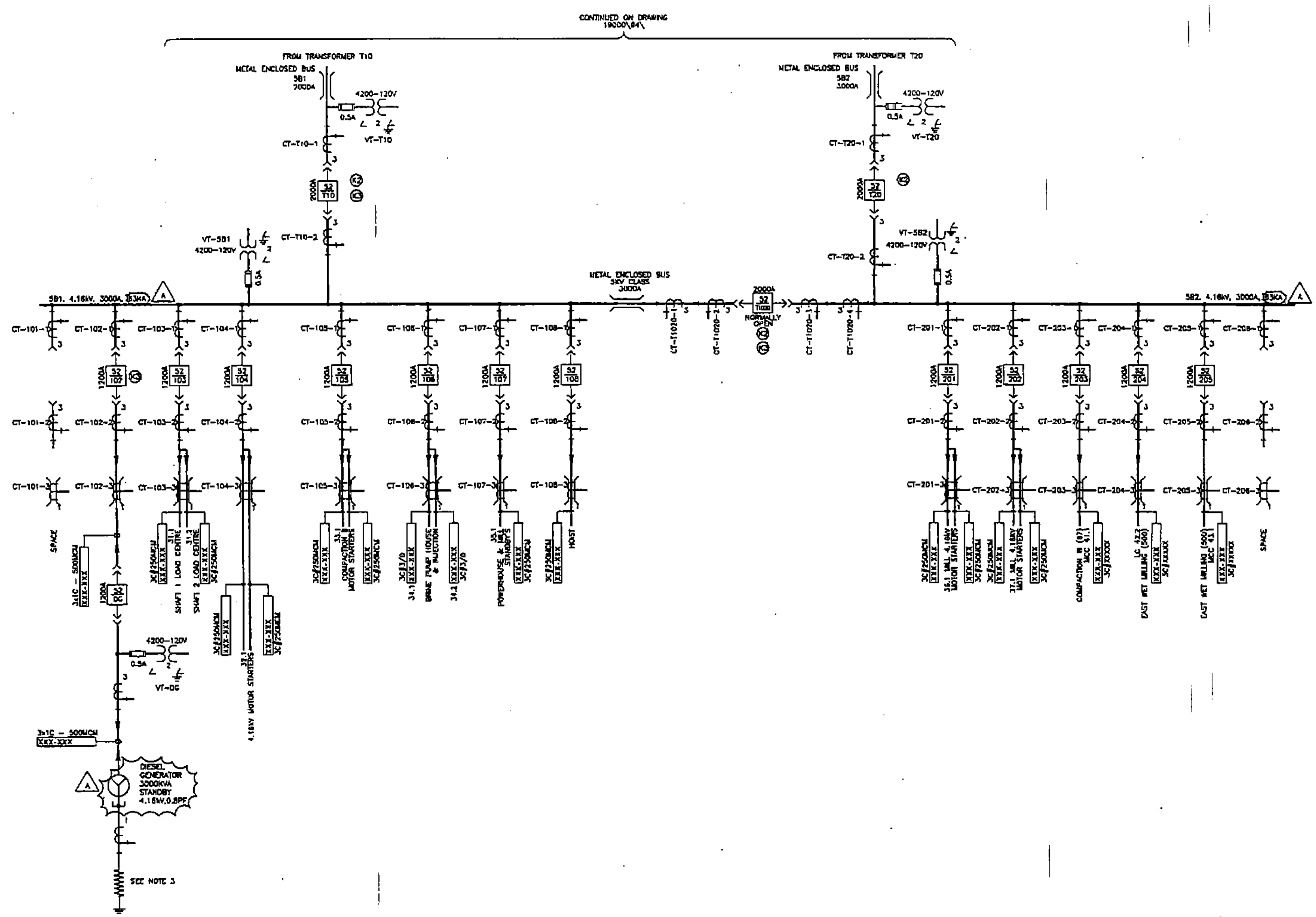
HATCH
HA DWG. NO. H328868-4940-70-062-0001-002
DESIGNED BY A. BILESKY
DRAWN BY A. BILESKY DATE 2010-05-17
CHECKED BY R. AHMED
DISCIP. ENGR. P. VANDYK
PROJ. DES. COORD. N/A
PROJ. ENGR. S. BEDARD
PROJ. MGR. M. HALL

Mosaic Potash Colonsay

Mosaic Potash Colonsay Expansion Project

NEW SUBSTATION TWO
13.8kV SWITCHGEAR
SINGLE LINE DIAGRAM

SCALE N.T.S. OR AS NOTED
DWG. NO. 19000\94\
REV. 0



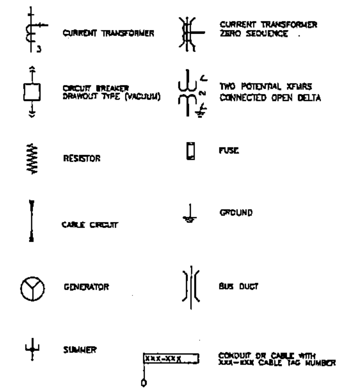
NOTES:

1. EQUIPMENT RATINGS AND DESIGNATIONS ARE TENTATIVE.
2. ALL UNUSED CT WINDINGS TO BE SHORTED AND GROUNDED.
3. LIMIT THE CURRENT TO 25A FOR A PHASE TO GROUND FAULT.

(K2) KEY INTERLOCK FOR 4.16kV SWITCHGEAR. ONLY 2 OF 3 BREAKERS MAY BE CLOSED.

(K3) KEY INTERLOCK FOR 4.16kV SWITCHGEAR. 52-101 OR 52-T10/ 52-T1020 MAY BE CLOSED.

LEGEND:



NOT FOR CONSTRUCTION

19000\94\	13.8kV SWITCHGEAR SLD
DRAWING NO.	DRAWING TITLE

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
A	NEW DRAWING	NA	NA	NA	X

REVISIONS

REV	ISSUE FOR	AUTH.	BY	DATE
A	INTERNAL REVIEW (FEL 4)	NA	NA	X

ISSUE AUTHORIZATION

HATCH

HA DWG. NO. H328666-4940-70-062-0001-003

DESIGNED BY R. AHMED DATE

DRAWN BY B. MCLEOD DATE 2010-05-17

CHECKED BY R.AHMED DATE

DISCIP. ENGR. P. VANDYK DATE

PROJ. DES. COORD. DATE

PROJ. ENGR. DATE

PROJ. MGR. DATE

Mosaic Potash Colonsay

Mosaic Potash Colonsay Expansion Project

NEW SUBSTATION TWO
4.16kV SWITCHGEAR
SINGLE LINE DIAGRAM

SCALE N.T.S. OR AS NOTED

DWG. NO. 19000\94\

REV. A

Appendix C:
SaskPower Point of Connection Data

Appendix D:
Transformer Data

Table D-1: Transformer Data

Transformer	Voltage (kV)	Windings	MVA Rating	Impedance (%Z)*	X/R Ratio (Typical)*
T1	230/13.8	Delta/Wye (105 Amp NGR grounded)	42/56/70	12	29.5
T2	230/13.8	Delta/Wye (105 Amp NGR grounded)	42/56/70	12	29.5
T10	13.8/4.16	Delta/Wye (25 Amp NGR grounded)	13/17/22	7	18.6
T20	13.8/4.16	Delta/Wye (25 Amp NGR grounded)	13/17/22	7	18.6
50Q-70143	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
50Q-70146	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
67-70152	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
50Q-70144	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
50P-70169	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
50Q-70145	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
67-70150	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
50Q-70142	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
50P-70148	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098
67-70149	13.8/0.6	Delta/Wye (Isolated)	1.25	6.07	7.098

Note 1: Presently, the transformer impedance values are kept the same for both the positive and zero sequence impedances.

Note 2: All X/R ratios and impedances are typical values generated by ETAP based on the ANSI Standard C57.12.10.

Appendix E:
Switchgear Data

Table E-1: 13.8 kV Major Equipment Ratings

Switchgear/Bus	Voltage (kV)	Continuous Rating (A)	Int. Rating/Short Time Withstand Rating (kA)
Colonsay 230 kV Substation Main Bus	230	2500	40
15B1, 13.8 kV Bus	13.8	3000	50
15B2, 13.8 kV Bus	13.8	3000	50
5B1, 4.16 kV Bus	4.16	3000	63
5B2, 4.16 kV Bus	4.16	3000	63
Bus 1, 13.8 kV at N3W3	13.8	1200	50
Bus 2, 13.8 kV at N3W3	13.8	1200	50
Bus 3, 13.8 kV at N3W3	13.8	1200	50
Bus 4, 13.8 kV at N3W3	13.8	1200	50
Bus 1, 13.8 kV at W7S108	13.8	1200	50
Bus 2, 13.8 kV at W7S108	13.8	1200	50
Bus 1, 13.8 kV at W7S49	13.8	1200	Unknown (Note 1)
Bus 2, 13.8 kV at W7S49	13.8	1200	Unknown (Note 1)
13.8 kV Side of Hoist #1-A	13.8	1200	30.5
13.8 kV Side of Hoist #1-B	13.8	1200	30.5
13.8 kV Side of LC 15.1	13.8	1200	30.2
13.8 kV Side of LC 15.2	13.8	1200	30.2
13.8 kV Side of LC 15.3	13.8	1200	30.2
13.8 kV Side of LC 15.4	13.8	1200	30.2
13.8 kV Side of LC 17.1	13.8	1200	29
13.8 kV Side of LC 17.2	13.8	1200	29
13.8 kV Side of LC 17.3	13.8	1200	29
13.8 kV Side of LC 17.4	13.8	1200	29
13.8 kV Side of LC 18.1	13.8	1200	28.5
13.8 kV Side of LC 18.2	13.8	1200	28.5
13.8 kV Side of LC 18.3	13.8	1200	28.5
13.8 kV Side of LC 18.4	13.8	1200	28.5
13.8 kV Side of LC 19.1	13.8	1200	28.7
13.8 kV Side of LC 19.2	13.8	1200	28.7
13.8 kV Side of LC 19.3	13.8	1200	28.7
13.8 kV Side of LC 19.4	13.8	1200	28.7
13.8 kV Side of LC 20.1	13.8	1200	28
13.8 kV Side of LC 20.2	13.8	1200	28
13.8 kV Side of LC 20.3	13.8	1200	28
13.8 kV Side of LC 20.4	13.8	1200	28
13.8 kV Side of LC 21.1	13.8	1200	16.1
13.8 kV Side of LC 21.2	13.8	1200	16.1
13.8 kV Side of LC 21.3	13.8	1200	16.1
13.8 kV Side of LC 22.1	13.8	1200	30.3
13.8 kV Side of LC 22.2	13.8	1200	30.3
13.8 kV Side of LC 22.3	13.8	1200	30.3

13.8 kV Side of LC 23.1	13.8	1200	30.5
13.8 kV Side of LC 23.3	13.8	1200	30.5
13.8 kV Side of LC 24.1	13.8	1200	30.4
13.8 kV Side of LC 24.2	13.8	1200	30.4
13.8 kV Side of LC 25.1	13.8	1200	30.4
13.8 kV Side of LC 25.2	13.8	1200	30.4
13.8 kV Side of LC 25.3	13.8	1200	30.4

Note 1: Short circuit rating for the existing underground switchgear located at W7S49 needs to be verified by Mosaic Colonsay.

Note 2: The ratings provided above are based on data shown on the single line diagrams and may require verification as certified vendor data becomes available.

Appendix F:
Motor Data

Table F-1: 4 kV Motor Data

4 kV Motors	Estimated Normal operation (%) of FLA	Nameplate HP
54-M5006	70	250
54-M5650	70	400
54-M5656	70	400
54-M5657	70	400
59-M5012	80	1000
59-M5013	80	1750
67-M5225	50	300
67-M5226	50	300
67-M5238	50	400
67-M5239	50	400
67-M5240	50	400
67-M5241	50	400
67-M5246	50	350
67-M5247	50	350
67-M5377	90	400
67-M5378	90	400
67-M5379	90	400
67-M5380	90	400
67-M5242	90	400
67-M5243	90	400
67-M5244	90	400
67-M5245	90	400
M5064	90	75
M5065	90	75
MCC 42-11 Lump VFD Motors	50	600
M5050	50	500
57-M5117	50	700
57-M5118	50	700
57-M5119	50	900
57-M5120	50	900

Table F-2: Typical Data used for LV Modeling

575 V Motors	Estimated Normal operation (%) of FLA	Nameplate HP	600 V Motors	Estimated Normal operation (%) of FLA	Nameplate HP	600 V Motors	Estimated Normal operation (%) of FLA	Name-plate HP
M5485	90	125	M5060	90	200	MCC 22-31 Lump Motor	100	341 KVA
M5022	90	60	52-M5074	90	60	56-M5092	90	150
M5023	90	75	52-M5075	90	60	56-M5100	90	300
M5024	90	75	52-M5076	90	60	56-M5111	90	75
M5026	90	200	52-M5077	90	60	56-M5112		75
M5003	90	150	52-M5355	90	150	MCC 23-11 Lump VFD Motors	90	200
51-M5690	90	50	52-M5356	90	150	MCC 23-11 Lump Motor	100	326 KVA
98-M5707	90	125	MCC 22-11	100	25 KVA	M5005	90	400
MCC 15-71 Lump VFD Motors	90	365	MCC 22-11	100	50 KVA	MCC23-31 Lump Motor	100	235 KVA
MCC 15-41 Lump Motor	100	112 KVA	98-M5627	90	50	56-M5427	90	75
56-M5430	90	100	98-M5628	90	50	56-M5428	90	75
59-M5492	90	100	MCC 22-21 Lump VFD Motors	90	700	MCC 24-11 Lump Motor	100	437 KVA
60-M5207	90	50	MCC 22-21 Lump Motor	100	108 KVA	MCC 24-21 Lump VFD Motors	90	855

575 V Motors	Estimated Normal operation (%) of FLA	Nameplate HP	600 V Motors	Estimated Normal operation (%) of FLA	Nameplate HP	600 V Motors	Estimated Normal operation (%) of FLA	Name-plate HP
62-M5195	90	125	67-M5214	90	100	MCC 24-21 Lump Motor	100	104 KVA
62-M5196	90	125	67-M5215	90	200	58-M5136	90	300
61-M5014	90	350	67-M5228	90	75	70-M5305	90	50
52-M5357	90	125	67-M5229	90	75	70-M5301	90	50
52-M5358	90	125	67-M5230	90	75	MCC 18-32 Lump Motor	50	50 KVA
MCC25-11 Lump Motor	100	50 KVA	67-M5710	90	50	MCC 18-31 Lump Motor	50	80 KVA
MCC 25-11 Lump VFD Motors	90	585	MCC 25-31 Lump VFD Motors	90	605	52-M5061	90	200
MCC 25-21 Lump Motor	100	240 KVA	MCC 25-31 Lump Motor	100	310 KVA	52-M5062	90	150
MCC 19-43 Lump VFD Motors	90	300	58-M5135	90	300	52-M5070	90	60
MCC 19-43 Lump Motor	100	220 KVA	67-M5231	90	50	52-M5071	90	60
57-M5648	90	125	67-M5232	90	50	52-M5072	90	60
57-M5649	90	125	67-M5233	90	50	52-M5073	90	60

575 V Motors	Estimated Normal operation (%) of FLA	Nameplate HP	600 V Motors	Estimated Normal operation (%) of FLA	Nameplate HP	600 V Motors	Estimated Normal operation (%) of FLA	Name-plate HP
MCC 20-13 Lump VFD Motors	90	160	67-M5513	90	50	MCC 22-31 Lump Load	100	150 KVA
MCC 20-13 Lump Motor	100	100 KVA	MCC 22-31 Lump VFD Motors	90	30			

Note: The VFDs were modeled using 95% efficiency and typical harmonic model based on ETAP library.

Appendix G:
Cap Bank Sizing Calculation

HATCH

CALCULATION SHEET

Hatch Document ID	H328668-0000-70-125-0003

PROJECT: Mosaic Colonsay Expansion SHEET: 1 OF 2
TASK: Size capacitor bank on 13.8 kV system DEPT.: Electrical
Prepared BY: Tara Alzahawi DATE: 2011-02-01 CHECKED BY: Kim Vu Date: 2011-06-15

DESIGN CALCULATION SUMMARY SHEET

Calculation Title:

Cap Bank Sizing Calculation

Purpose of calculation:

Size capacitor bank on 13.8 KV system to maintain p.f on 230 kV bus greater than 0.95.

Method of Analysis:

Conclusion Summary:

2 sets of (3x2.2 MVAR) added to the system to improve pf on 230 kV system to be greater than 0.95

Prepared By: Tara Alzahawi Date: 2011-02-01

Reviewed By: Kim Vu Date: 2011-06-15

Approved By: _____ Date: _____

HATCH™

CALCULATION SHEET

Hatch Document ID	H328668-0000-70-125-0003

PROJECT:	Mosaic Colonsay Expansion			SHEET:	2	OF 2
TASK:	Size capacitor bank on 13.8 kV system			DEPT.:	Electrical	
Prepared BY:	Tara Alzahawi	DATE: 2011-02-01	CHECKED BY: Kim Vu	Date:	15-Jun-11	

(1) PURPOSE:

Size capacitor bank on 13.8 KV system to maintain p.f on 230 kV bus greater than 0.95.

(2) DATA:

From ETAP model:

Total consumed active power (230 kV) is 47.3 MW

Total consumed reactive power (230 kV) is 26.8j MVAR

Power Factor based on project design criteria DOC # 0000-DC-008 Revision 4 needs to be improved to greater than 0.95

(3) ASSUMPTION:

Optimum p.f on 230 kV is to be greater than 0.95 under the worst case load flow scenario.

(4) ANALYSIS:

230 kV system without compensation:

$\cos\theta$ = 47.3 MW / 54.36 MVA = 0.87

To increase pf (cos θ) from 0.87 to 0.96, apparent power (S) will be increased

The new apparent power (S) after compensation = 47.3 MW/0.96 = 49.27 MVA

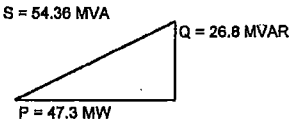
$S = SQRT(P^2 + Q^2)$ ==> $S^2 = P^2 + Q^2$

==> $Q^2 = S^2 - P^2$

$Q2 = (49.27)^2 - (47.3)^2$

Q = 13.79 MVAR

Q added to the sytem = 26.8 - 13.79 = 13.01 MVAR



(5) CONCLUSION:

2 sets of (3x2.2 MVAR) added to the system to improve pf on 230 kV system to be greater than 0.95