Report on
Proposed Electrical Infrastructure
Marina Expansion
Jones Bay Wharf
Wharf 19, 20 & 21
Pirrama Road
Pyrmont

Prepared by:
Simpson Kotzman Pty. Ltd.
Consulting Engineers
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SimpsonKotzman

Document Control

Originator

Simpson Kotzman Pty. Ltd. Consulting Engineers

Level 1, 2 Elizabeth Plaza, North Sydney, NSW 2060
T: 02 9929 3321 F: 02 9929 3327 E: email@skz.com.au

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Approval

Author:	Geoff Taylor	**Sign:**	**Date:** 15 June 2010
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Client:		**Sign:**	**Date:**

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SECTION 1 - Executive Summary

The purpose of the report is to provide a summary for the proposed electrical infrastructure to the marina expansion including the following key items:

- Estimated marina expansion electrical maximum demand;
- Proposed reticulation methodology;
- Availability of on-site electrical supply to support the marina expansion;

The Supply Authority has advised verbally that the existing on-site substation has around 1000 Amperes per phase spare capacity; this is based on readings that were obtained in 2009.

An Application for Power Supply form will need to be issued to Energy Australia by the appointed electrical contractor to formalise this advice once the final operational load for the facility has been confirmed.

The marina operator will need to advise on the expected target market for the vessels and whether it is likely that large shore power requirements are anticipated. International cruising vessels will have increased requirements over local pleasure vessels.

The adopted methodology for calculating the maximum demand of the proposed infrastructure has been undertaken to the requirements of AS/NZS 3004.1 Electrical Installations – Marinas and recreational boats, where the usage of heating and air-conditioning has been advised as being “light”.

SECTION 2 - Marina Expansion Electrical Loads

2.1 MAXIMUM DEMAND METHODOLOGY

Calculations have been prepared in accordance to the methodology nominated within the following documents: -

AS/NZS 3000 Electrical Installation – Wiring Rules
AS/NZS 3004.1 Electrical Installations – Marinas and recreational boats.

The electrical maximum demand for the marina expansion can be undertaken by one of the following methods: -

Calculation
Assessment
Measurement
Limitation

Calculation
The calculation method for determining the maximum demand includes the tables nominated within AS/NZS 3000 for common area lighting and power and the tables within AS/NZS3004.1 for the amenities and service pillars to each berth. This calculation method has been determined from various similar facilities and provides an average expectation to determine the maximum demand.

Assessment
The assessment method for the maximum demand is based on an expected operational load achieved from a similar facility. This method is adopted where the final use of the facility is known to be different from the normal operational average as depicted in the calculation method.

Measurement
The measurement method for maximum demand requires the final connected loads to be known for the worst operation circumstance. This method is normally selected when firm information is available from the operator.

Limitation
The limitation method of maximum demand is applied by the selection of the protective device (circuit breaker) controlling the load to the marina. This method is usually selected when the supporting infrastructure is limited in its supply availability.

For the initial assessment, the calculation method of maximum demand has been adopted from the tables of AS/NZS3004.1.

The operator, through their own review process, may opt to vary the results and apply the assessment and / or limitation maximum demand methods.

2.2 MARINA POWER REQUIREMENTS

The following schedule represents the power requirements nominated for each berth type: -

BERTH SIZE	1-PHASE SOCKET RATING	3-PHASE SOCKET RATING
12m	1 x 15A	-
15m	1 x 15A	-
18m	1 x 15A	1 x 32A
20m	1 x 15A	1 x 63A
22m	1 x 15A	1 x 63A
23m	1 x 15A	1 x 100A
33m	1 x 15A	1 x 125A
44m	1 x 15A	1 x 250A
45m	1 x 15A	1 x 250A

2.3 MARINA EXPANSION MAXIMUM DEMAND

The maximum demand calculation has been prepared for the main reticulation submains to the connection distribution boards serving the east and west wharfs and for each of the localised hardstand distribution boards that supply the individual finger wharfs.

The AS/NZS3004.1 calculation is based on vessels having a requirement for low use heating or air-conditioning.

The following tables summarise the calculations for each separate wharf. This represents the diversified maximum demand that may be expected for a typical marina installation utilising electrical power for low use heating and air-conditioning.

EAST WHARF TOTAL					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
12m	15A 1-PHASE	52	80A	80A	84A
15m	15A 1-PHASE				
18m	15A 1-PHASE				
28m	15A 1-PHASE				
44m	15A 1-PHASE				
45m	15A 1-PHASE				
18m	32A 3-PHASE	12	156A	156A	156A
28m	100A 3-PHASE	6	240A	240A	240A
44m	250A 3-PHASE	3	300A	300A	300A
45m	250A 3-PHASE				
	MAXIMUM DEMAND EAST WHARF		**776A**	**776A**	**776A**

WEST WHARF TOTAL					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
18m	15A 1-PHASE	21	40A	40A	40A
20m	15A 1-PHASE				
22m	15A 1-PHASE				
23m	15A 1-PHASE				
28m	15A 1-PHASE				
33m	15A 1-PHASE				
18m	32A 3-PHASE	8	96A	96A	96A
20m	63A 3-PHASE	11	235A	235A	235A
22m	63A 3-PHASE				
23m	63A 3-PHASE				
28m	100A 3-PHASE	1	40A	40A	40A
33m	125A 3-PHASE	1	50A	50A	50A
	MAXIMUM DEMAND WEST WHARF		**461A**	**461A**	**461A**

SECTION 3 - Existing Electrical Infrastructure

3.1 SURFACE CHAMBER SUBSTATION

The site is supported from an on-site Energy Australia surface chamber substation # 8061.

The chamber consists of 2-off 1500kVA transformers with a firm rated load of 3000 Amperes per phase.

3.2 MAIN SWITCHBOARDS

Main switchboards are provided within a dedicated room located on the upper level above the Energy Australia substation.

The main switchboards reticulate house and tenancy services.

3.3 MARINA SERVICES

The marina services are reticulated from the main switchboard via 2-off supplies: -

EAST MARINA
SWITCH M1
630A / 630A

WEST MARINA
SWITCH M2
540A / 630A

Each supply is separately metered via a localised CT metering panel.

The sub-main cables extend from the main switchboard room to conduit system installed below the hardstand, reticulating to local distribution boards positioned adjacent to each pontoon ramp access way.

A spare 400A / 400A circuit breaker is available on the main switchboard adjacent the existing marina protection circuit breakers.

SPARE SPACE
400A / 400A

The hardstand areas adjacent the existing marina pontoons are equipped with distribution boards that feed the existing marina services including lighting, sewage pump outs, security and service pedestals.

Each board is constructed as a stainless steel enclosure with an isolator and circuit breaker chassis within. A separate section contains the local security controls.

The east marina is equipped with 4-off local distribution boards and the west marina is equipped with 3-off local distribution boards. A main distribution board is provided to each side acting as the local reticulation centre, this board is equipped with a separate main isolator and circuit breaker chassis.

SECTION 4 - Recommendations

4.1 GENERAL SCHEDULE OF WORKS

The load calculations for each wharf have been calculated as follows: -

East Wharf – 763 Amperes per phase
West Wharf – 461 Amperes per phase

4.2 EAST WHARF

The existing 630A supply will need to be augmented with a new separate service to meet the new total of 763A.

The 400A spare circuit breaker will need to be utilised along with the installation of a new submain cable to feed a portion of the East Wharf services. This new supply would feed the local distribution board proposed to supply the outer pontoon containing the larger vessels.

The main switchboard will need to be temporarily shut down for the new electrical connections to be made; this shut down period will be around 2 to 4-hours.

A new cable reticulation support system will be required for the new submain cable; this will need to be installed below the hardstand apron.

Modifications to the existing hardstand distribution boards will be necessary to accommodate the revised load reticulation system.

A new CT metering panel to the approval of the supply authority will be required for the marina extension metering; this will be installed within the main switchboard room. This provides a third metering location for a single customer, this arrangement is not preferred by the supply authorities however it is not an unusual situation, and final acceptance of this arrangement will need to be sought from the operators preferred energy retailer.

4.3 WEST WHARF

The existing 540A supply is sufficient to cater for the proposed load.

No further works are required to the main infrastructure cabling system.

A new cable reticulation support system will be required from the main hardstand distribution board to each of the local hardstand distribution boards; this will need to be installed below the hardstand apron.

Modifications to the existing hardstand distribution boards will be necessary to accommodate the revised load reticulation system.

SECTION 5 - Appendices

5.1 ELECTRICAL MAXIMUM DEMAND CALCULATION – EAST WHARF

DB-M1A					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
12m	15A 1-PHASE	13	30	24	24
12m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
	MAXIMUM DEMAND HARDSTAND DB-1		**30A**	**24A**	**24A**

DB-M1					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
12m	15A 1-PHASE	24	44A	44A	44A
12m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
12m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
12m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
15m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	32A 3-PHASE	6	78A	78A	78A
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
	MAXIMUM DEMAND HARDSTAND DB-2		**122A**	**122A**	**122A**

DB-M1B					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
18m	15A 1-PHASE	12	24A	24A	24A
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
28m	15A 1-PHASE				
28m	15A 1-PHASE				
28m	15A 1-PHASE				
28m	15A 1-PHASE				
28m	15A 1-PHASE				
28m	15A 1-PHASE				
18m	32A 3-PHASE	6	78A	78A	78A
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
28m	100A 3-PHASE	6	240A	240A	240A
28m	100A 3-PHASE				
28m	100A 3-PHASE				
28m	100A 3-PHASE				
28m	100A 3-PHASE				
28m	100A 3-PHASE				
MAXIMUM DEMAND HARDSTAND DB-3			**342A**	**342A**	**342A**

DB-M1C					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
44m	15A 1-PHASE	3	6A	6A	6A
45m	15A 1-PHASE				
45m	15A 1-PHASE				
44m	250A 3-PHASE	3	300A	300A	300A
45m	250A 3-PHASE				
45m	250A 3-PHASE				
MAXIMUM DEMAND HARDSTAND DB-4			**306A**	**306A**	**306A**

5.2 ELECTRICAL MAXIMUM DEMAND CALCULATION – WEST WHARF

DB-M2					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
18m	15A 1-PHASE	8	12A	18A	18A
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	15A 1-PHASE				
18m	32A 3-PHASE	8	96A	96A	96A
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
18m	32A 3-PHASE				
MAXIMUM DEMAND HARDSTAND DB-5			**108A**	**114A**	**114A**

DB-M2B					
BERTH SIZE	SOCKET OUTLET RATING	QTY	LIGHT USE HEAT & AIR COND		
			A-PHASE	B-PHASE	C-PHASE
20m	15A 1-PHASE	13	24A	24A	30A
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
22m	15A 1-PHASE				
23m	15A 1-PHASE				
28m	15A 1-PHASE				
33m	15A 1-PHASE				
20m	63A 3-PHASE	11	235A	235A	235A
22m	63A 3-PHASE				
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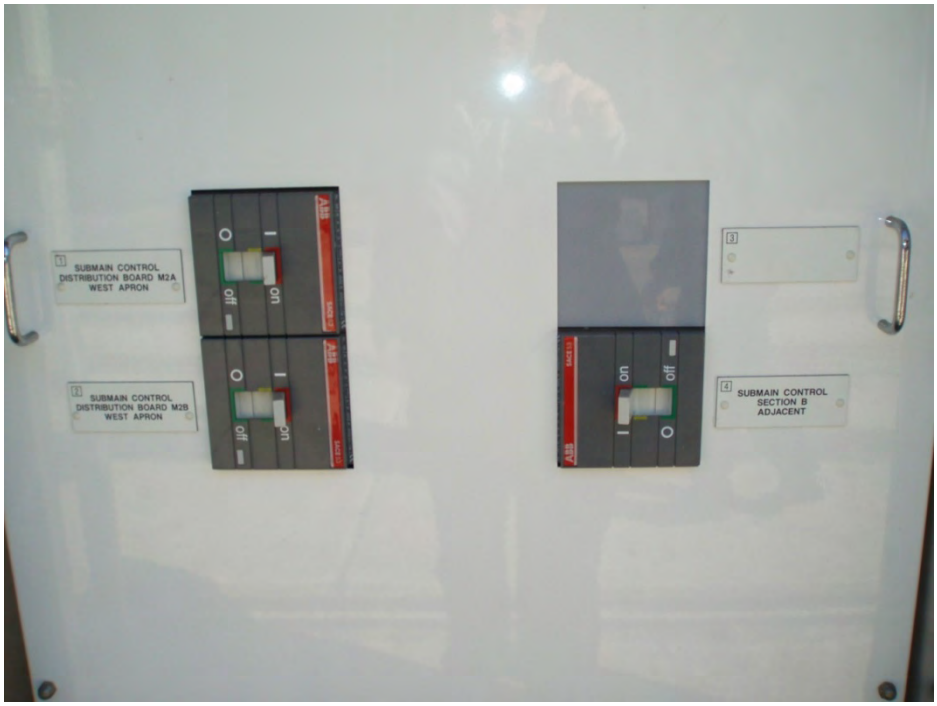
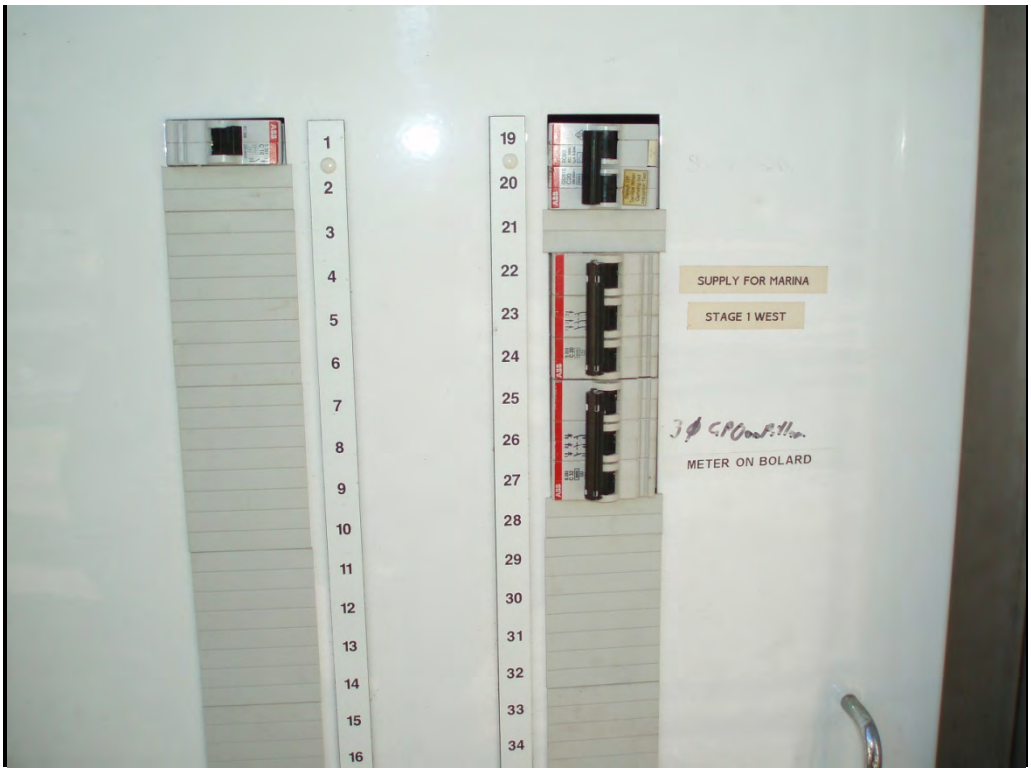
22m	63A 3-PHASE				
22m	63A 3-PHASE				
22m	63A 3-PHASE				
22m	63A 3-PHASE				
22m	63A 3-PHASE				
23m	63A 3-PHASE				
28m	100A 3-PHASE	1	40A	40A	40A
33m	125A 3-PHASE	1	50A	50A	50A
MAXIMUM DEMAND HARDSTAND DB-6			**349A**	**349A**	**355A**

5.3 MAIN HARDSTAND DISTRIBUTION BOARD – EAST WHARF

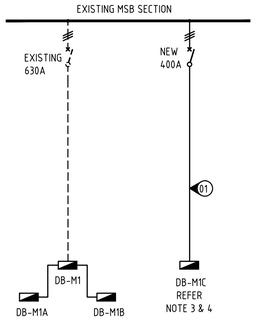
5.4 MAIN HARDSTAND DISTRIBUTION BOARD – WEST WHARF

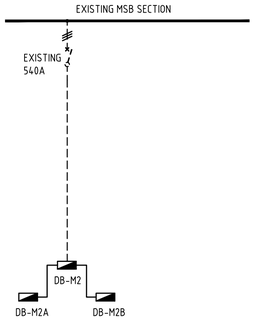


5.5 TYPICAL HARDSTAND DISTRIBUTION BOARD CHASSIS



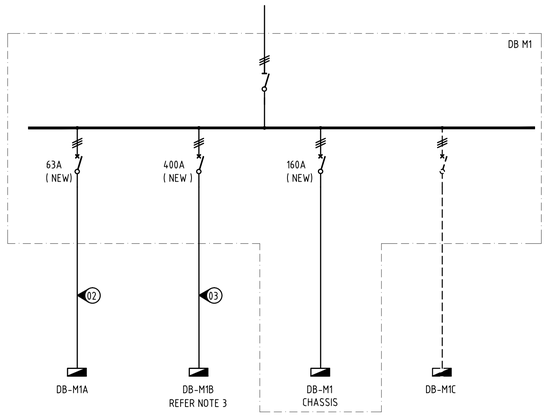
Simpson Kotzman Pty Ltd Consulting Engineers www.sk.com.au ACN 006 757 446
Melbourne: Level 19, 390 St Kilda Road Melbourne VIC 3004 Australia T +61 3 9663 3030 F +61 3 9663 3050
Sydney: Level 1, 2 Elizabeth Plaza North Sydney NSW 2060 Australia T +61 2 9929 3321 F + 61 2 9929 3327
Managing Director: John Kennedy Directors: Jason Afford, Michael Delaney, Laurent Deleu, Rick Hollett, Warwick Meadows, Dermot Small, Steve Toy Associates: Joe Panfalone, VK Phoon, Robert Tombolato

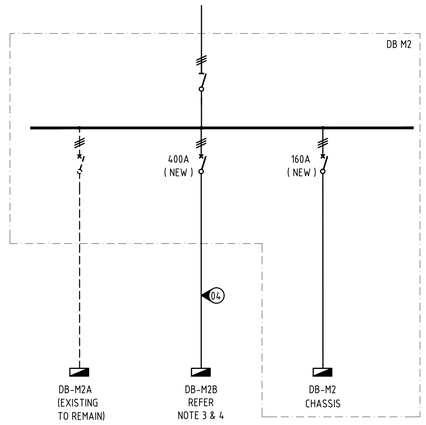




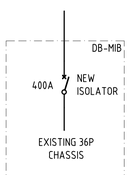
NOTES

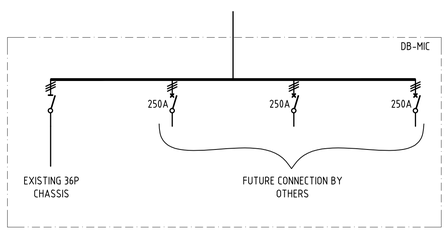
1. INSTALLATION OF NEW SUBMAINS BELOW THE HARD STAND SHALL ENCLOSED WITHIN HD PVC CONDUIT SUPPORTED ON STAINLESS SUPPORTS WITH STAINLESS STEEL THREADED HANGERS. ALL OTHER SUNDRY FIXINGS TO BE STAINLESS STEEL. STAINLESS STEEL TO BE MARINE GRADE 316.
2. ALL CONDUITS TO BE SEALED TO PREVENT WATER AND RODENT ENTRY.
3. DISTRIBUTION BOARD CHASSIS WITHIN BOARDS DB-M1B AND DB-M2B TO BE MODIFIED TO ACCEPT 3 POLE CIRCUIT BREAKERS UP 100A FRAME SIZE. CHASSIS RATING TO EXCEED RATING OF PROTECTION CIRCUIT BREAKER. REPLACE INTERCONNECTION CABLES.
4. DISTRIBUTION BOARDS DB-M1C AND DB-M2B TO BE MODIFIED TO INCLUDE 3 POLE CIRCUIT BREAKERS UP TO 250A FRAME SIZE. DB-M1C TO INCLUDE 3-OFF 250A CIRCUIT BREAKERS. DB-M2BTO INCLUDE 1-OFF 125A 3-POLE CIRCUIT BREAKER
5. ALL PONTOON SERVICES TO BE UNDERTAKEN BY OTHERS
6. RETAIN EXISTING FINAL SUB- CIRCUITS TO EXISTING DB'S
7. ALL SWITCHGEAR TO BE FROM A COMMON MANUFACTURER

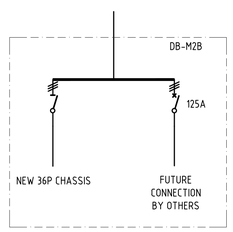




SUBMAINS	SIZE / PHASE	CABLE TYPE	EARTH WIRE
1	2x400mm²	1c XLPE/PVC	2x1c 120mm²
2	1x35mm²	4c XLPE/PVC	INCL
3	1x240mm²	1c XLPE/PVC	2x1c 95mm²
4	1x240mm²	1c XLPE/PVC	2x1c 95mm²







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Consulting Engineers

Simpson Kotzman Pty Ltd
Consulting Engineers
ACN 006 757 446
2 Elizabeth Plaza
Sydney NSW
2060 Australia
T +612 9929 3321
F +612 9929 3327
W www.sk.com.au

Simpson Kotzman

CONSULT AUSTRALIA
Member Firm

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Project
JONES BAY WHARF

Drawing Title
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SINGLE LINE DIAGRAM

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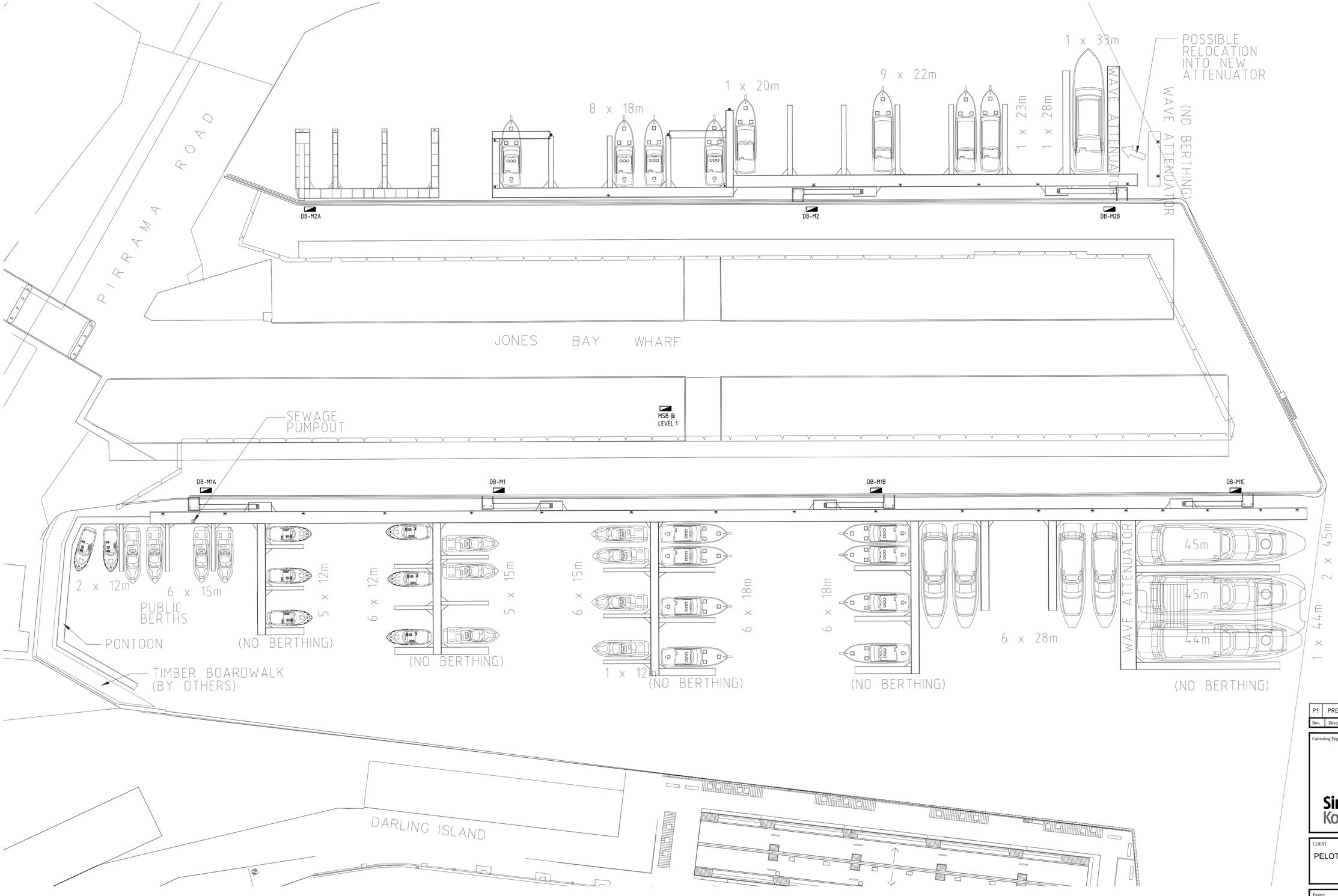
S.Y.	J.W.	NTS@A1	JUL'10

Job Number	Drawing Number	Revision
10272	E011	P1



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Consulting Engineers

Simpson Kotzman

Simpson Kotzman Pty Ltd
Consulting Engineers
ACN 006 757 446
2 Elizabeth Plaza
Sydney NSW
2060 Australia
T +612 9929 3321
F +612 9929 3327
W www.sk.com.au

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