



**TRANSNET SOC LTD**  
**FEASIBILITY STUDY (FEL 3) FOR THE DEEPENING OF**  
**BERTHS 203 TO 205**  
**PORT OF DURBAN**  
**STORM WATER MANAGEMENT PLAN**

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**ZAA 1370 | RPT | 023 REV B**

**March 2013**

T: +27 (0) 21 791 9100  
F: +27 (0) 21 790 4470  
E: ZAAEPNA@ZAAEPNA.COM  
[WWW.ZAAENGINEERING.COM](http://WWW.ZAAENGINEERING.COM)

PO BOX 26546  
HOUT BAY  
SOUTH AFRICA  
7872

31 MELKHOUT CRES.  
HOUT BAY  
CAPE TOWN  
7806

**ZAA**  
ENGINEERING PROJECTS &  
NAVAL ARCHITECTURE (PTY) LTD



REVISIONS					
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AUTHORISED BY		NAME	SIGNATURE	DATE	
DIRECTOR		J ZIETSMAN	<i>John Zietsman</i>	15 March 2013	

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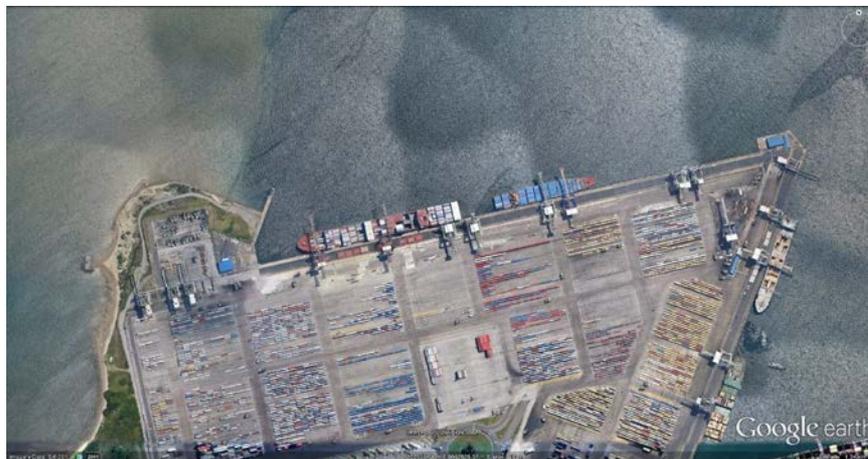
## 1.0 INTRODUCTION

The Port of Durban Container Terminal at Pier No 2, Berths 203 to 205, is being deepened and refurbished to accommodate Post Panamax container vessels up to 9,000 to 12,000 TEU (fully laden) and 14,000 TEU (partially laden). ZAA Engineering Projects and Naval Architecture (Pty) Ltd has been appointed under Contract No TCP CON-041-2011-005 to carry out a FEL 3 Study to this end.

The proposal is to extend the cope edge of these berths 48.5m seaward. The cope will have a final length of approximately 1200m.

## 2.0 LOCATION

The proposed site (see figure 1) for the new extended quay is located at Berths 203 to 205.



*Figure 1: Pier 2, Berths 203 to 205*

## 3.0 OBJECTIVES

The stormwater management plan serves the following objectives:

- To quantify the stormwater that will be generated by the proposed berth deepening during and after construction, and
- To propose any mitigation measures, where the development increases the current stormwater run-off.

The following considerations have been taken into account:

- Provision of a reliable stormwater drainage system
- Environmental and water pollution considerations
- Temporary diversions during phased construction program at Pier 2 and Lot 10. Adequate temporary drainage systems for all 3 phases of construction
- Prevent erosion and siltation
- Minimizing costs through Pre and Post development conditions
- Maintenance issues relating to pipes, inlet and outlet structures
- Stormwater discharge positions through the wall of caissons
- Surface slopes of the existing quay and the existing minor system
- Tides for the levels of the discharge from the outlet pipes.



#### 4.0 CONSTRUCTION SEQUENCING

The proposed berth deepening will be completed in three phases/stages viz. first Berth 205, then Berth 204 and finally Berth 203. [Refer to the drawings in Annexure 1].

During the construction phase of the extension of Berths 205 through to 203, cut-off drains are to be provided to collect stormwater in the affected areas which will be routed temporarily and drained into adjacent stormwater system of the existing quay. This stormwater system will apply to the sequence of three stages so that the existing stormwater system at Berth 204 will accommodate the stormwater of the affected areas of Berth 205. Likewise, the affected areas of Berth 204 will be accommodated by the existing stormwater system of Berth 203.

The existing outlet pipes are to be blocked off separately during each construction stage to ensure that the majority of the existing outlet pipes are operational at all times. Sufficient additional temporary stormwater drain pipes will be provided to accommodate extreme events.

#### 5.0 METHODOLOGY: HYDROLOGY AND HYDRAULICS

The rainfall data used for this assessment corresponds to an annual rainfall of 1009mm. The total extension area of the new quay is approximately 5.82 ha and zoned as industrial. The entire area will be paved and this rainfall area will drain as surface run-off into slot drains and then into outlet pipes in the cope face, via sandtrap manholes. The surface runoff area has been subdivided for calculation purposes, into smaller areas that are centred at each manhole with outlet pipe, thus to consider the flow per outlet pipe.

The stormwater system is divided into major and minor systems. The major system is the paved surface area of quay and minor systems comprise of the pipes, inlet and outlet structures. The major system caters for the surface run-off of the new quay with relevant slopes that route surface water into the minor systems such as the new slot drains previously mentioned. The major and minor systems have been checked to accommodate an extreme flood condition such as the 1:50 year storm. Should further unforeseen extreme events occur, the surface stormwater would run off the quay to the water side of the structure.

The existing stormwater system that has been affected by the extension of the new quay has been modified to suit.

The stormwater system for the new quay has been integrated into the stormwater system of the existing quay and modifications were made to the existing stormwater system to accommodate the additional flow conditions. The modification to the existing stormwater replaces relevant existing manholes with sandtrap manholes and the existing pipes are replaced with HDPE pipes. The number of pipes has not been increased over the existing number. Modifications have only been made to the relocation, material type, size and length of pipes that accommodate the additional works.

Slot drains are located between sandtrap manholes. These manholes collect the stormwater which flows into the outlet pipes of the new quay. The sandtrap manholes are located at every low point of the slot drains.

The Rational Method of analysis has been adopted to determine the stormwater of the new quay. Run-off peaks for a 1:50yr storm event has been considered. The following assumptions have been used to quantify the stormwater:

##### Assumptions

- Time of concentration value not less than 15min
- An area width of 30.5m seaward from existing cope would drain into the new slot drains
- The modified section of existing stormwater would be able to facilitate part of the run-off of the extended area ( 15m width)



## 6.0 STORMWATER SYSTEM CAPACITY

Capacity checks have been completed for the existing and proposed new stormwater networks. Calculation flows are given in Annexure 2.

A summary of the peak flow rate is tabulated below:

Table 6-1: Proposed development conditions for new quay

Return Period	Ft	C	Tc(min)	I (mm/hr)	A (ha)	Q (m <sup>3</sup> /s)
1:50 yr	N/A	0.95	15	230	0.259	0.157

The peak flows for the area of the new quay exceed 0.12m<sup>3</sup>/s flow by 0.037m<sup>3</sup>/s

## 7.0 CONCLUSION AND RECOMMENDATION

The objectives of the SWMP are met. Based on the estimated maximum/peak rate of run-off, a 1:50 yr storm event will have no real impact on the proposed development. Since there are no significant changes to the existing stormwater layout, no mitigation measures are required. The difference in the flow of 0.037m<sup>3</sup>/s will have no significant impact on the environment.



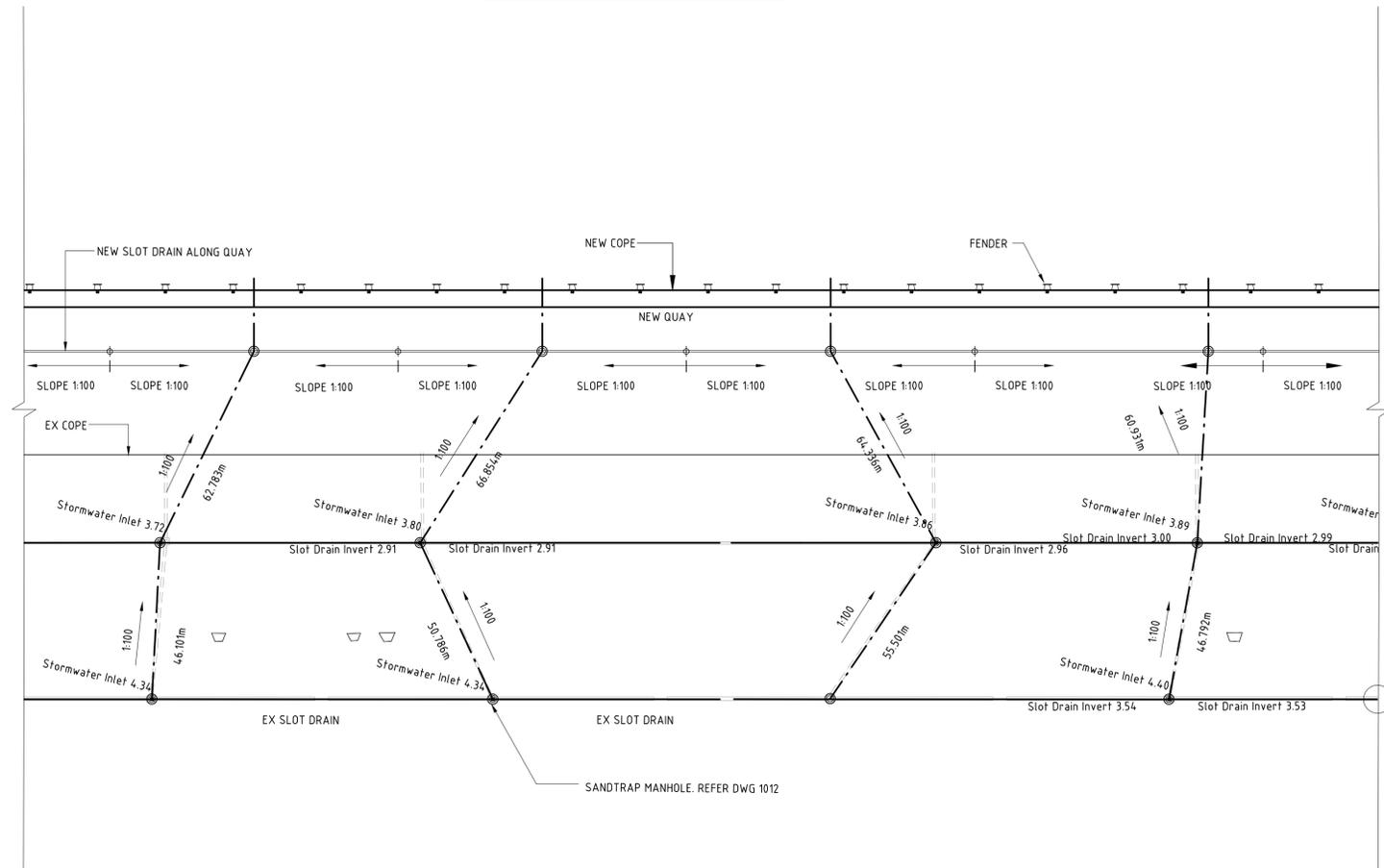
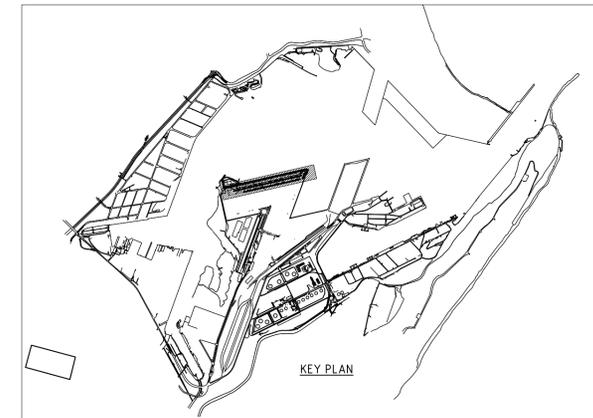
## ANNEXURE 1 DRAWINGS

DO NOT SCALE - IF IN DOUBT, ASK

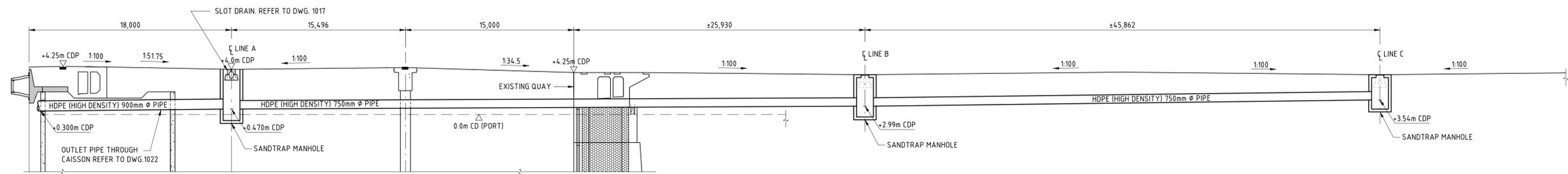
LEGEND

- SANDTRAP MANHOLE
- NEW CATCHPIT
- EXISTING MANHOLES
- EXISTING SLOT DRAINS (ALONG LINE B & C)
- EXISTING STORMWATER PIPES
- HIGH POINT OF NEW SLOT DRAINS
- NEW 750mm Ø PIPES
- NEW 900mm Ø OUTLET PIPES
- NEW SLOT DRAIN (ALONG LINE A)

- NOTES:
1. THE NEW STORMWATER DRAINAGE ONLY CONSIDERS THE PORTION OF THE EXISTING DRAINAGE SHOWN ON THIS LAYOUT. THEREFORE ANY FURTHER STORMWATER DRAINAGE NOT SHOWN ON THIS LAYOUT BUT LINKS TO THE SAME EXISTING STORMWATER (SHOWN ON THIS LAYOUT) IS PUT ON HOLD
  2. THE EXISTING OUTLET PIPES THROUGH THE EXISTING QUAY TO BE BLOCKED OFF
  3. THE EXISTING PIPES LOCATED FROM LINE C TO LINE B THAT ARE LINKED TO THE EXISTING MANHOLES ARE TO BE REPLACED BY THE NEW PIPES. SEE DRAWING LAYOUT
  4. ALL EXISTING MANHOLES ON LINE B AND C FROM THE EXISTING SLOT DRAINS ARE TO BE REPLACED BY SANDTRAP MANHOLES. SANDTRAP MANHOLES ALSO TO BE INSTALLED AT EACH OUTLET PIPE ON LINE A
  5. PIPE LENGTHS ON PLAN LAYOUT ONLY APPLY TO DIMENSIONS IN PLAN (HORIZONTAL)



PLAN: BERTH 204 : PHASE 2  
SCALE 1:1000



TYPICAL SECTION OF LONGITUDINAL PIPES, 1:100  
SCALE 1:200

DRAWING NO.	REFERENCE
1370-DWG-1022	CAISSON INTERFACE DETAILS
1370-DWG-1150	SERVICES AND PAVEMENT DETAILS
1370-DWG-1140	SERVICES GENERAL ARRANGEMENT
REFERENCE DRAWINGS	

Engineers



PO Box 26546  
HOUT BAY 7872  
Tel: +2721 791 9100  
EMAIL : zaaepna@zaaepna.com

31 Melkhout Crescent  
HOUT BAY 7806  
Fax: +2721 790 4470  
www.zaaepna.com

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ENG. COORD.	JZ		13/02/18	CHECKED	JZ		13/02/18
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AREA MANAGER				DISCIP. ENG.			
PROJECT MGR.				ENG. MANAGER			
DIVISION				AREA MANAGER			

PR.ENG. / PR.TECH.	DATE
NAME J. ZIETSMAN	
SIGNATURE	13/02/18
REG. NUMBER	760293
SCALE :	OR AS NOTED A1



DURBAN CONTAINER TERMINAL  
BERTH 203-205 DEEPENING  
CAISSON QUAY WALL: PHASE 2  
QUAYSIDE SERVICES  
STORMWATER SYSTEM LAYOUT

PROJECT NUMBER	DV	FBS	DIS	TYPE	DRG NO.	SHT.	REV.	ID

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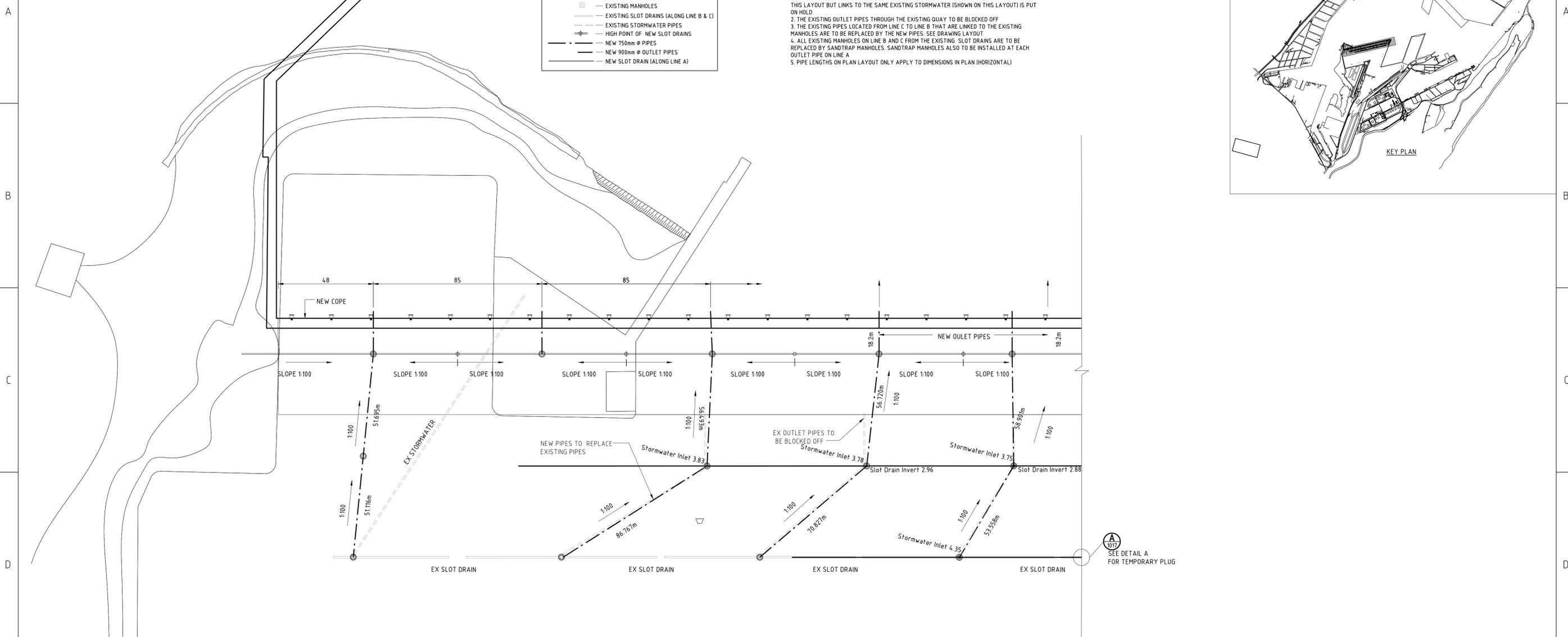
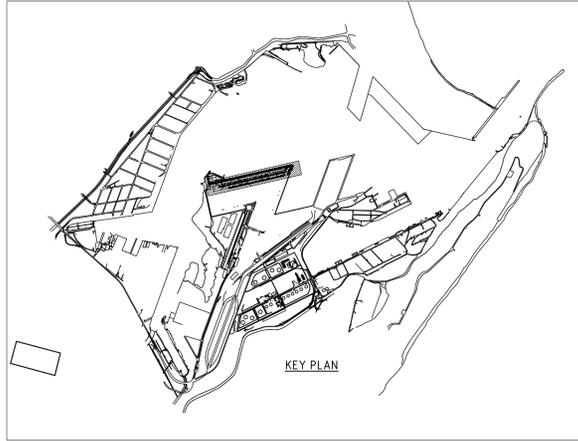
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LEGEND

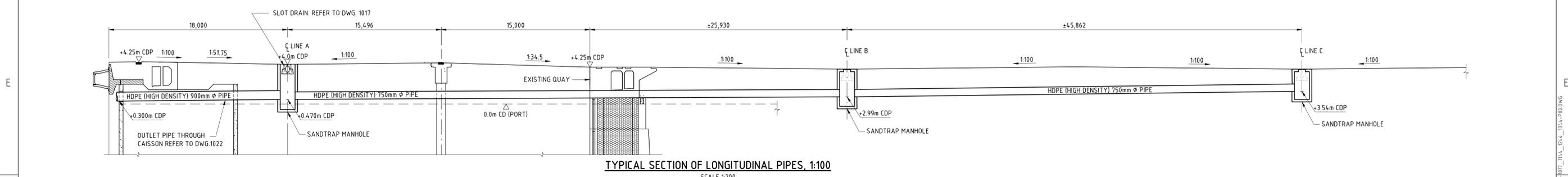
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PLAN: BERTH 205 : PHASE 1  
SCALE 1:1000



TYPICAL SECTION OF LONGITUDINAL PIPES, 1:100  
SCALE 1:200

DRAWING NO.	REFERENCE
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PO Box 26546  
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EMAIL : zaaepna@zaaepna.com

31 Melkhout Crescent  
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www.zaaepna.com

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LEAD DES. ENG.				DRAWN	UN		13/02/18
ENG. COORD.				CHECKED	JZ		13/02/18
ENG. MANAGER				ENG. COORD.	WV		13/02/18
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FOR APPROVAL				PR.ENG. / PR.TECH.			
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SCALE	AS NOTED



DURBAN CONTAINER TERMINAL  
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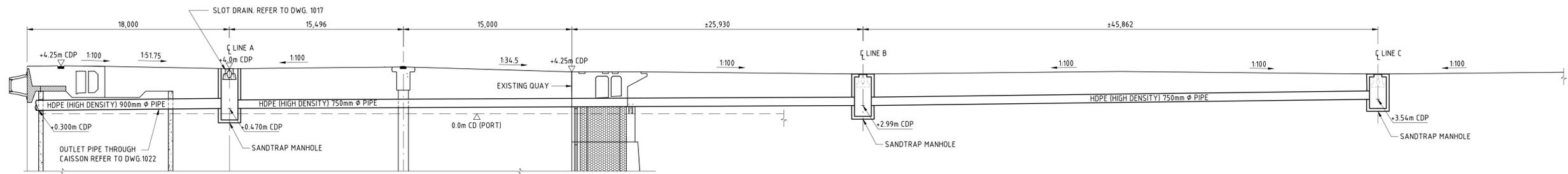
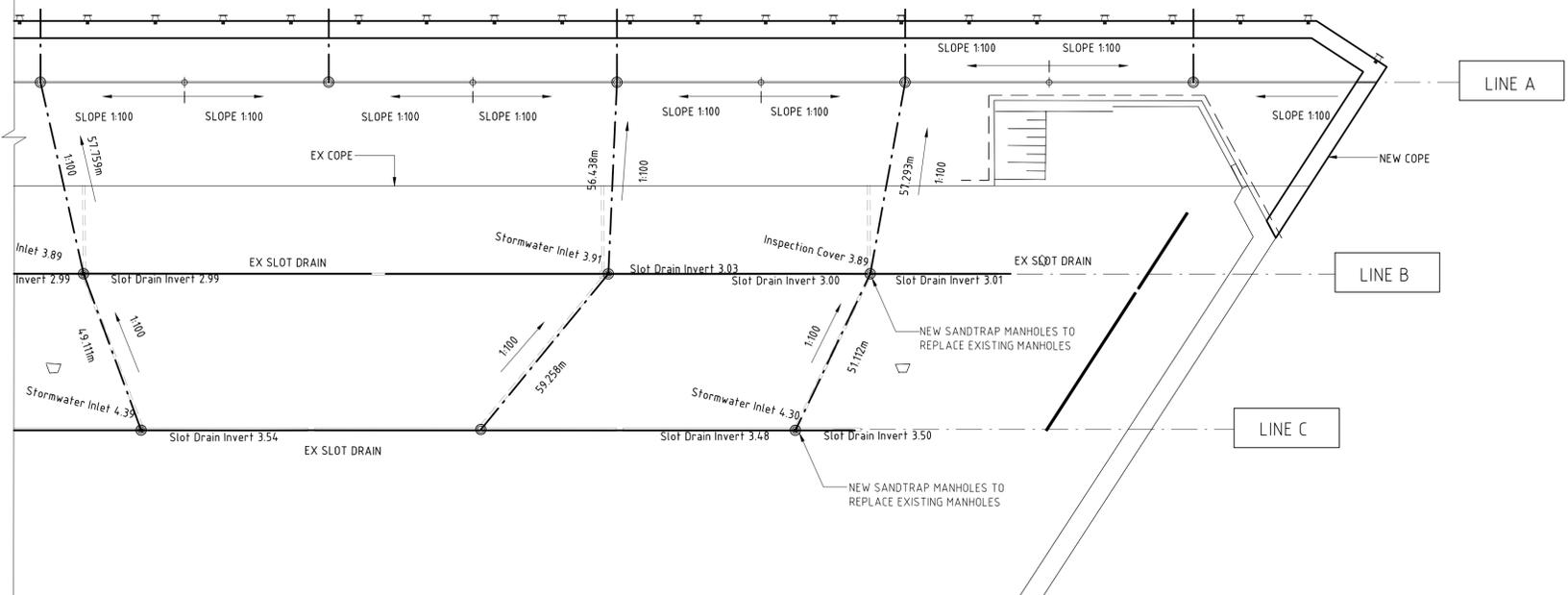
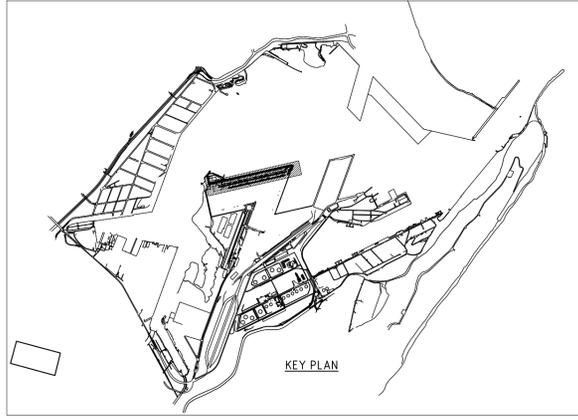
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31 Melkhout Crescent  
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DIVISION				AREA MANAGER			

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## ANNEXURE 2 PEAK FLOW RATE



## PEAK FLOW RATE

A summary of the peak flow rate are tabulated below:

**Table 6-1: Proposed development conditions for new quay**

Return Period	Ft	C	Tc(min)	I (mm/hr)	A (ha)	Q (m <sup>3</sup> /s)
1:50 yr	N/A	0.95	15	230	0.259	0.157

Where:

Ft = adjustment factor for the recurrence interval storm considered

C = run-off coefficient

Tc = time of concentration in minutes

I = rainfall intensity

A = area of catchment in hectares

Q = the maximum/peak rate of run-off

The existing surface runoff has been estimated from the outlet pipes located through the existing quay. A conservative approach has been adopted to determine the flow conditions with a minimum velocity of 0.9m/s and a full-flow existing outlet pipe size of 750mm in diameter. A summary is tabulated below:

**Table 6-2: Existing development conditions**

Pipe diameter (m)	A1(m <sup>2</sup> )	v (m/s)	Q (m <sup>3</sup> /s)
0.75	0.442	0.9	0.397