

MTR Corporation Limited

Kwun Tong Line Extension (KTE)

KTE Tunnel Water-tight Liner Audit Report

Verified by:  \_\_\_\_\_

Position: Independent Environmental Checker

Date: 3 Jun 2016

MTR Corporation Limited

Kwun Tong Line Extension (KTE)

KTE Tunnel Water-tight Liner Audit Report

Certified by:  \_\_\_\_\_

Position: Environmental Team Leader

Date: - 3 JUN 2016

## 1. Introduction

1.1 In accordance with Condition 4.8 of Environmental Permit (EP-399/2010/D) for Kwun Tong Line Extension (KTE), at least one month before commencement of operation of the Project, the Permit Holder shall carry out audit and confirm in writing to the Director of EPD that all tracks are contained in concrete tunnel box with tunnel wall equipped with water-tight liner. During tunnel construction and tracks installation, audits were conducted to ensure the tunnel of KTE fulfills with the requirements. This report summarized relevant information and the audit results.

## 2. Tunnel Design

2.1 Tunnel of KTE is divided into two portions for construction under two contracts:

- Contract 1001: Yau Ma Tei to Whampoa Tunnels and Ho Man Tin Station
- Contract 1002: Whampoa Station and Overrun Tunnel

2.2 Design drawings showing all tracks are contained in concrete tunnel box with tunnel wall equipped with water-tight liner (i.e. waterproof membrane) are shown in **Appendix A1** for 1001 and **Appendix A2** for 1002.

2.3 Table 1 shows the KTE's contract requirements for waterproofing liner. Based on these requirements, 1001 and 1002 Contractors provided material specifications to MTRC for approval. All waterproofing liners provided by 1001 and 1002 Contractors comply with KTE's contract requirements.

Table 1 – KTE Waterproofing Liner Contract Requirements

Property	Minimum Requirement
Thickness	2mm +/- 5%
Tensile strength	>8MPa
Elongation at break	>300%
Behavior when subjected to hydrostatic pressure	No leaking at 10 bar
Puncture resistance	No perforation for 750mm drop of test tool
Cold bend behavior	No cracking
Warranty period	Not less than 15 years

2.4 Table 2 shows the waterproofing liner products applied for KTE. Application area of various waterproof liners is presented in **Appendix B**.

Table 2 – Application Area of Waterproofing Liner Products for Contract 1001 & 1002

Contract	Waterproofing liner product	Application Area
1001	Mapeplan TUS 20	Tunnel section from Gascoigne Road (GAR), Wylie Road (WAB), Ho Man Tin (HOM), to Wuhu street and Ho Man Tin Station (HOM)
1002	Preprufe 300 R	Tunnel section of Whampoa Station (WHA), including West Concourse and East Concourse
	Sikaplan 14.6	Platform tunnel and overrun tunnel

### **3. Auditing**

3.1 Before commencement of tunnel and station box construction, method statements detailing concrete tunnel box construction and waterproof liner installation were prepared by Contractors and approved by MTRC. During the course of construction, MTRC carried out audits to ensure the construction of tunnel and station box complies with the design requirements and method statements. MTRC inspection and survey check records were checked by ET. Photo records showing the construction of concrete tunnel box with water-tight liner at tunnel wall are shown in **Appendix C**.

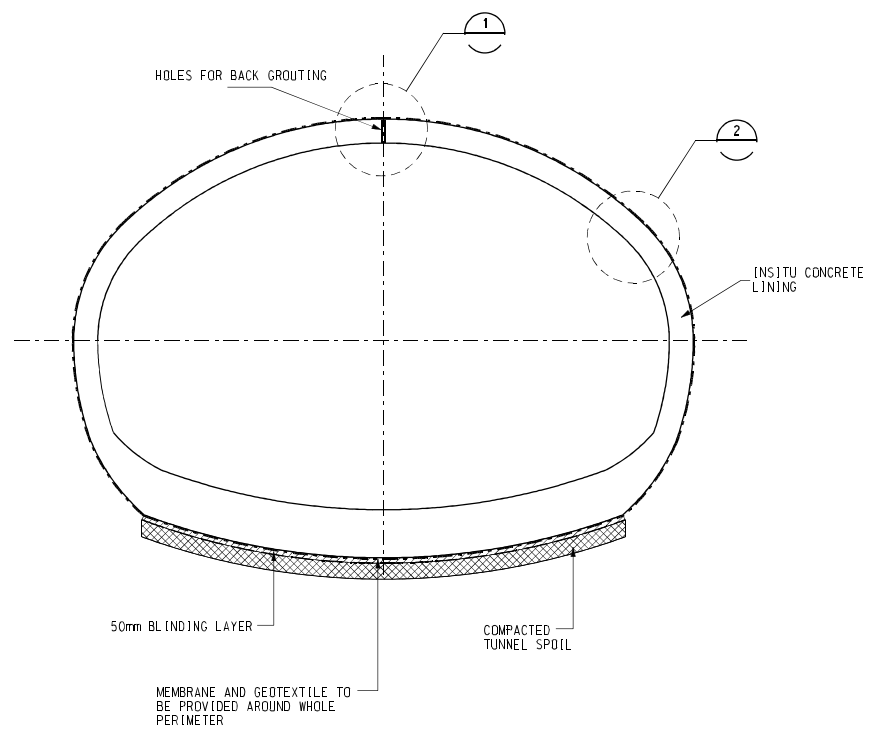
### **4. Conclusion**

4.1 Having reviewed the KTE tunnel design drawings and audit records during tunnel construction, it is concluded that all KTE tracks are contained in concrete tunnel box with tunnel wall equipped with water-tight liner and are properly installed.

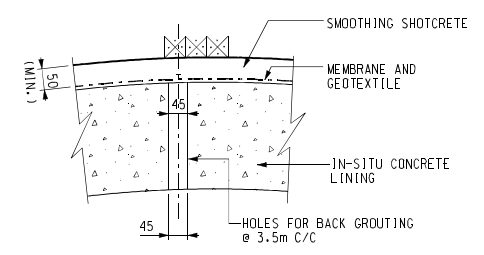
## **Appendix A1**

### **Design Drawings of Contract 1001**

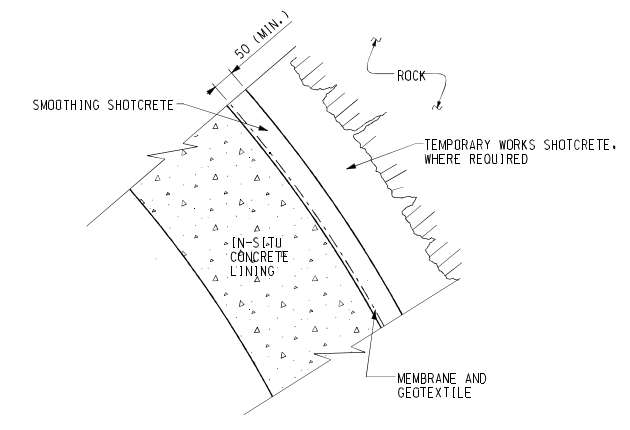
I:\AS\1000 Working\Langdon\Langdon\TUNNELS\WATERPROOFING\AS\1000\1001.dgn  
 I:\AS\1000 Working\Langdon\Langdon\TUNNELS\WATERPROOFING\AS\1000\1001.dgn  
 I:\AS\1000 Working\Langdon\Langdon\TUNNELS\WATERPROOFING\AS\1000\1001.dgn



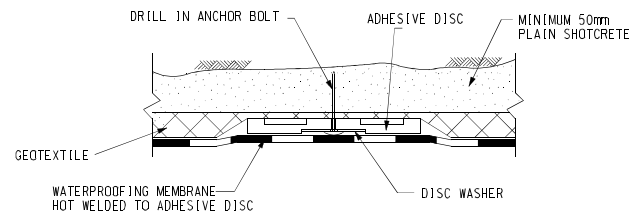
**UNDRAINED TYPICAL SECTION**  
SCALE 1:50



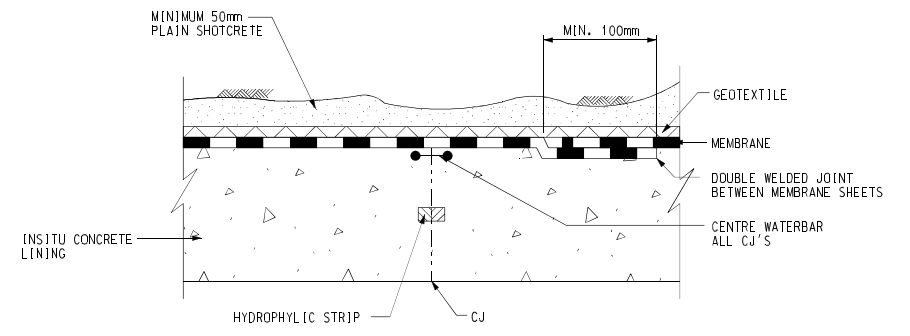
**DETAIL 1**  
SCALE N.T.S.



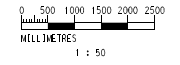
**DETAIL 2**  
SCALE N.T.S.



**DETAIL OF MEMBRANE FIXING**  
SCALE N.T.S.



**WATERPROOFING DETAIL AT CIRCUMFERENTIAL CONSTRUCTION JOINT**  
SCALE N.T.S.



DRAWN		THW				<b>CONTRACT 1001</b> <b>YMT TO WHAMPOA TUNNELS AND HOM STATION</b> <b>UNDRAINED TUNNEL WATERPROOFING DETAIL - TYPICAL DETAILS</b>	
DESIGNED		PS					
CHECKED		MM					
APPROVED		TS					
DATE		13/FEB/2009					
OPERATOR <b>ARUP</b>				Supported by: • Integrated Design Associates Ltd., • Davis Langdon & Seah HK Ltd., • Kenneth Ng & Associates Ltd., • IntelliBuild			
CADD REF. 1001_T_000_OAP_C11_001A.dgn				SCALE AS SHOWN (A1)		DRAWING NO. 1001/T/000/DAP/C11/001	
REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	REV.
1	TENDER DRAWING	PS	01/NOV/10	TS			A







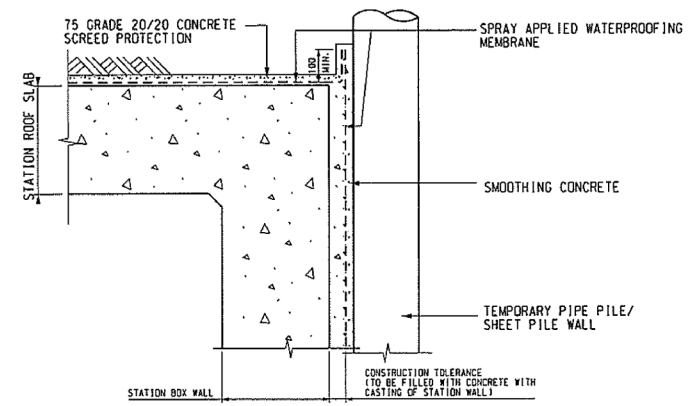
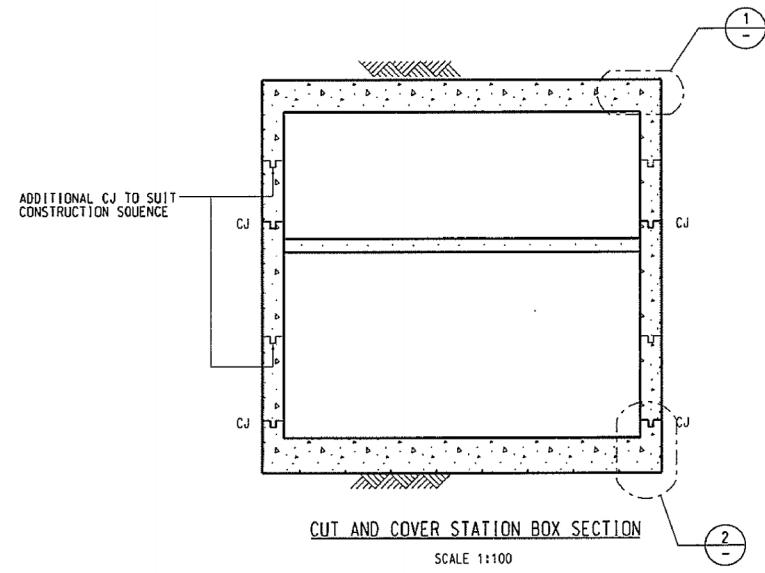
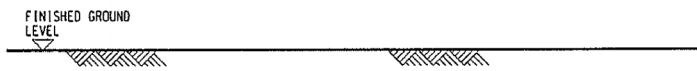


## **Appendix A2**

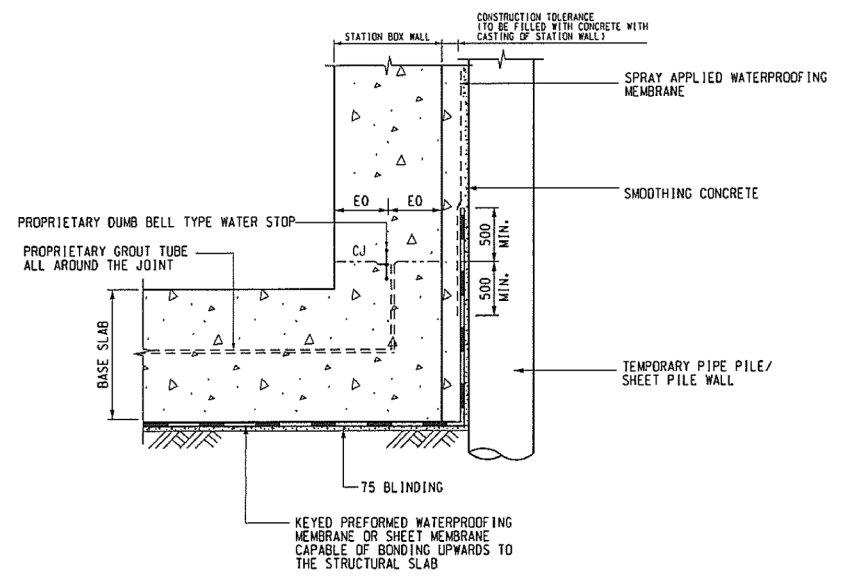
### **Design Drawings of Contract 1002**



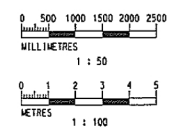
MTR Logo  
 DRAWN: J. JESS K.  
 DESIGNED: T. L.  
 CHECKED: R. L.  
 APPROVED: J. H.  
 DATE: 06/MAY/2011  
 PROJECT: WHAMPOA STATION AND OVERRUN TUNNEL  
 CONTRACT: 1002/W/WHA/HCL/C01/051



DETAIL 1  
SCALE 1:50



DETAIL 2  
SCALE 1:50

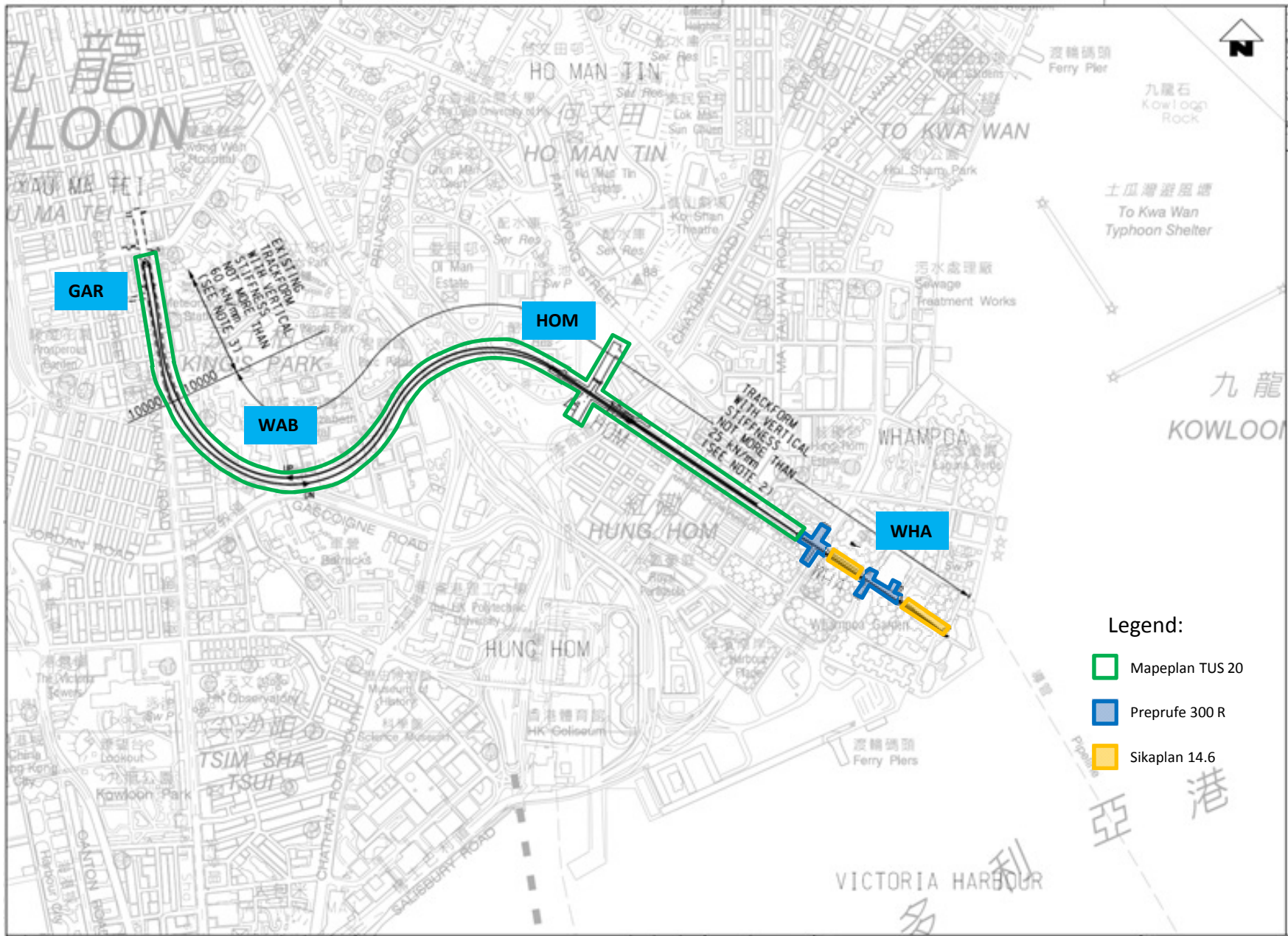


DRAWN: KLC		DESIGNED: TL		CHECKED: RL		APPROVED: JH		DATE: 06/MAY/2011				TITLE: CONTRACT 1002 WHAMPOA STATION AND OVERRUN TUNNEL WHA STATION WATERPROOFING DETAIL FOR STATION BOX	
ORIGINATOR: Hyder		SUPPORTED BY: Ronald Lu and Partners HK Ltd., Davis Langdon and Seah HK Ltd., MVA HK Ltd., ACLA Ltd.		CADD REF: 1002_W.WHA.HCL.C01.051A.DGN		SCALE: AS SHOWN		DRAWING NO: 1002/W/WHA/HCL/C01/051		REV: A			
REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED				
A	WORKING DRAWING	KLC	06/MAY/11	JH									



## **Appendix B**

### **Application Area of Of Various Waterproof Liner**



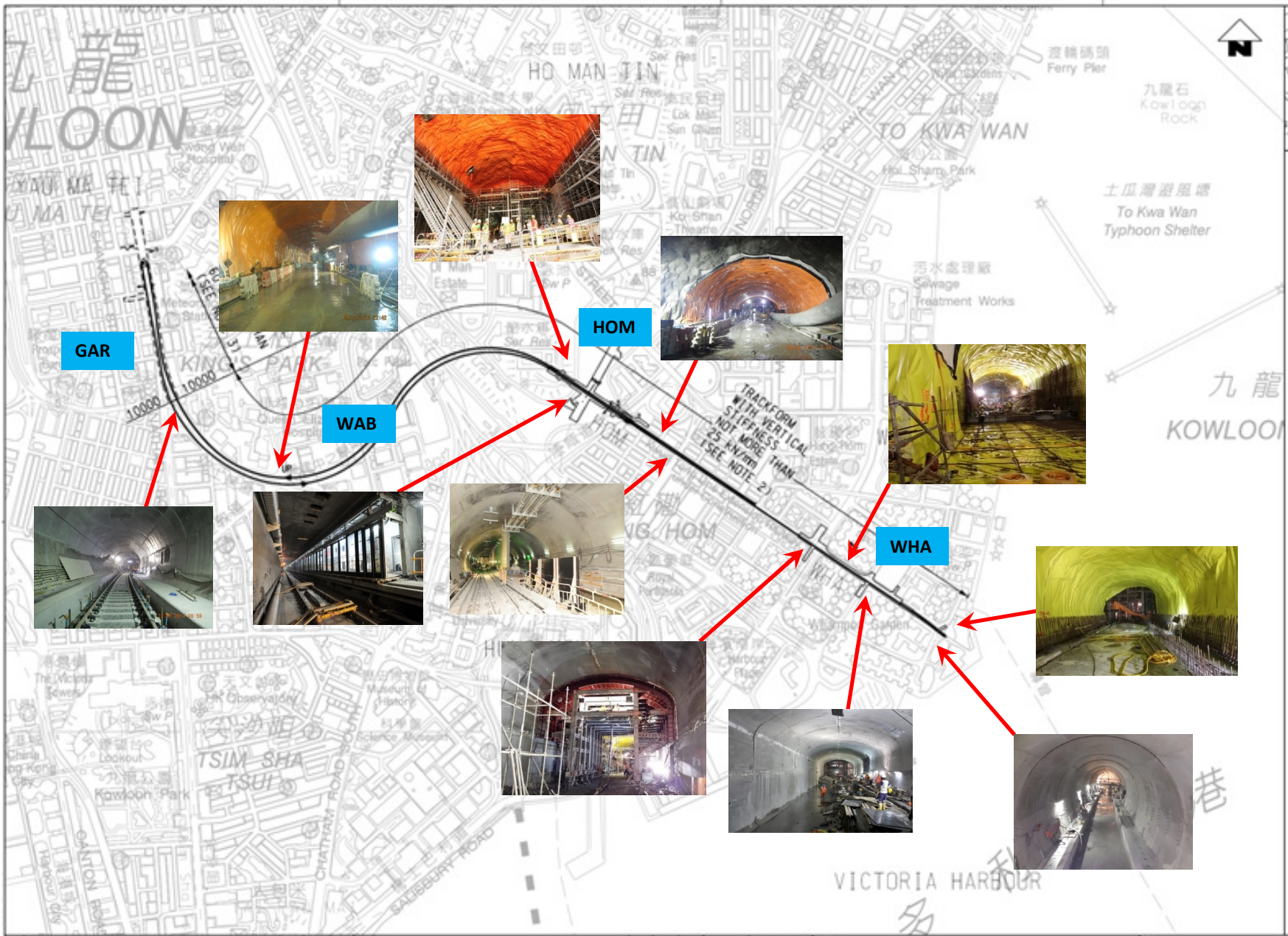
**Legend:**

- Mapeplan TUS 20
- Preprufe 300 R
- Sikaplan 14.6

## **Appendix C**

**Photo Records for  
Construction of Concrete Tunnel Box  
With Water-tight liner at Tunnel Wall**





**GAR**

**WAB**

**HOM**

**WHA**

TRACKFORM WITH VERTICAL STIFFNESS NOT MORE THAN 25 kN/mm (SEE NOTE 2)

