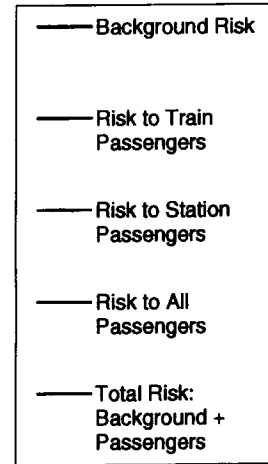
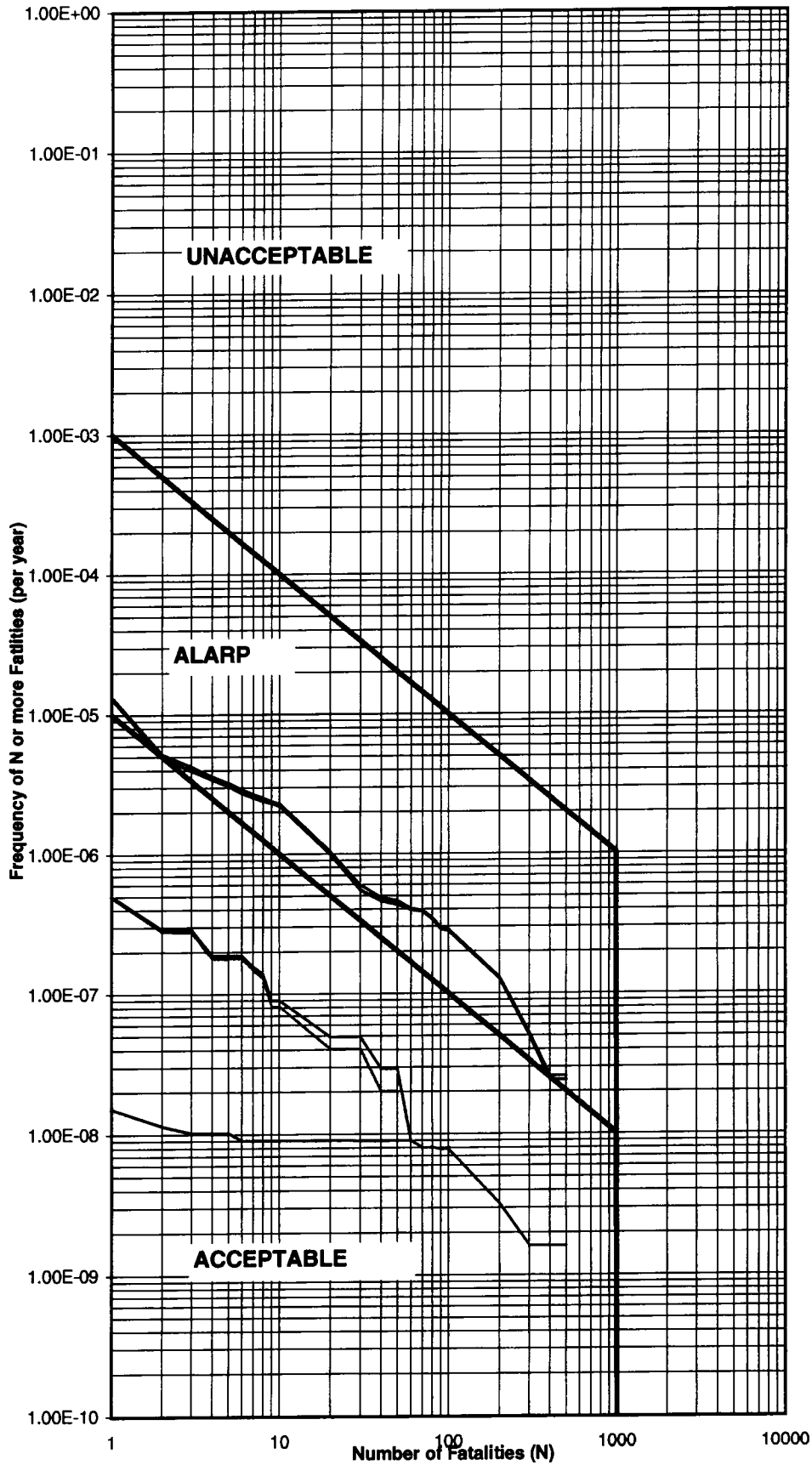


## **ANNEX H**

### **Hazard Assessment : Supporting Data**

**Figure 11.11a: Societal Risk for High Pressure Pipeline Interfacing with TAW to MOS Railway**



ALARP: As Low As Reasonably Practicable

Figure 11.11b: Risk Transect for Towngas Pipeline

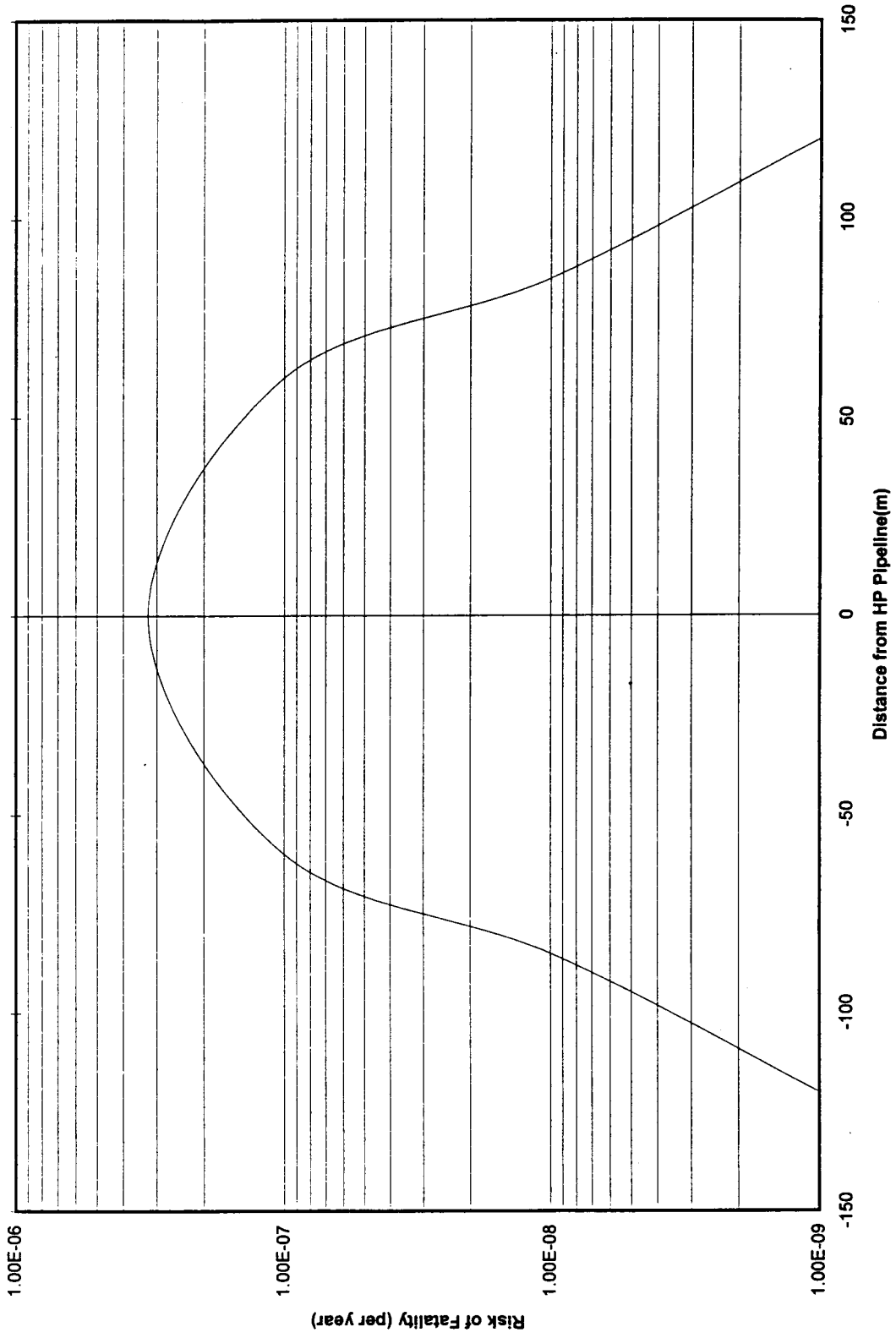


Table 11.7a Meteorological Data from Sai Kung Weather Station

Wind Speed (m/s)	Day						Night						Rushhours											
	3		6		1.5		3		6		1.5		3		6		1.5							
	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F						
Direction																								
N	2.48%		2.06%		1.20%		2.19%		1.83%		8.71%		0.93%		0.78%		1.98%		0.93%		0.78%		1.98%	
NE	3.39%		3.91%		0.64%		1.75%		2.16%		3.06%		1.03%		1.21%		0.74%		1.03%		1.21%		0.74%	
E	3.94%		3.18%		0.50%		2.09%		2.79%		3.04%		1.21%		1.19%		0.71%		1.21%		1.19%		0.71%	
SE	3.15%		0.48%		0.35%		0.82%		0.17%		1.22%		0.79%		0.13%		0.31%		0.79%		0.13%		0.31%	
S	7.14%		4.53%		0.44%		1.18%		0.79%		2.32%		1.66%		1.06%		0.55%		1.66%		1.06%		0.55%	
SW	1.91%		0.26%		0.38%		0.65%		0.09%		2.96%		0.51%		0.07%		0.67%		0.51%		0.07%		0.67%	
W	0.88%		0.07%		0.15%		0.26%		0.05%		1.82%		0.23%		0.02%		0.40%		0.23%		0.02%		0.40%	
NW	0.38%		0.05%		0.20%		0.21%		0.05%		1.44%		0.12%		0.02%		0.33%		0.12%		0.02%		0.33%	
Percentage	23.28%		14.53%		3.86%		9.15%		7.93%		24.59%		6.48%		4.49%		5.69%		6.48%		4.49%		5.69%	
			Total day		41.67%				Total night		41.67%				Total Rushhours		16.67%				Total Rushhours		100.01%	

Table 11.11a: Frequency Input File for RISKPLOT (Base Case)

Pipeline section length (km)		2.3		
Pipeline failure frequency (/km/year)		1.10E-04		
Consequence outcome	Outcome probability	Outcome Frequency per year		
		Total	Day/night	Rushhours
TG 10mm VJ	5.00E-03	1.27E-06	5.27E-07	2.11E-07
TG 10mm DJ	5.00E-03	1.27E-06	5.27E-07	2.11E-07
TG 10mm FF/DJ	2.85E-02	7.21E-06	3.00E-06	1.20E-06
TG 10mm Tox	6.65E-02	1.68E-05	7.01E-06	2.80E-06
TG 1in VJ	7.50E-03	1.90E-06	7.91E-07	3.16E-07
TG 1in DJ	7.50E-03	1.90E-06	7.91E-07	3.16E-07
TG 1in FF/DJ	4.28E-02	1.08E-05	4.51E-06	1.80E-06
TG 1in Tox	9.98E-02	2.52E-05	1.05E-05	4.21E-06
TG 2in VJ I	7.50E-03	1.90E-06	7.91E-07	3.16E-07
TG 2in VJ D	1.43E-02	3.61E-06	1.50E-06	6.01E-07
TG 2in DJ	7.50E-03	1.90E-06	7.91E-07	3.16E-07
TG 2in FF/DJ	4.28E-02	1.08E-05	4.51E-06	1.80E-06
TG 2in Tox	9.98E-02	2.52E-05	1.05E-05	4.21E-06
TG 4in VJ I	7.50E-03	1.90E-06	7.91E-07	3.16E-07
TG 4in VJ D	6.75E-03	1.71E-06	7.12E-07	2.85E-07
TG 4in DJ	7.50E-03	1.90E-06	7.91E-07	3.16E-07
TG 4in FF/DJ D	3.38E-02	8.54E-06	3.56E-06	1.42E-06
TG 4in Tox	3.38E-02	8.54E-06	3.56E-06	1.42E-06
TG FBR FB/VJ	1.00E-02	2.53E-06	1.05E-06	4.22E-07
TG FBR VJ D	2.00E-02	5.06E-06	2.11E-06	8.43E-07

Table 11.11b: Consequence Input File for RISKPLOT (Base Case)

Consequence Name	Dominant Hazard	Weather State	3D				6D				1.5F			
			d (m)	c(m)	s(m)	m(m)	d (m)	c(m)	s(m)	m(m)	d (m)	c(m)	s(m)	m(m)
TG 10mm_VJ	Jet fire	0.01	2	2	-2	0	2	2	-2	0	2	2	-2	0
TG 10mm_DJ	Jet fire	0.01	2	2	-2	0	2	2	-2	0	2	2	-2	0
TG 10mm_FF/DJ	Flash fire	1	15	1	0	7	9	1	0	4	46	2	0	23
TG 10mm_TOX	CO toxicity	0.011	13	1	0	6	8	1	0	4	42	1	0	21
TG 1in_VJ	Jet fire	0.01	5	5	-5	0	5	5	-5	0	5	5	-5	0
TG 1in_DJ	Jet fire	0.01	5	5	-5	0	5	5	-5	0	5	5	-5	0
TG 1in_FF/DJ	Flash fire	1	39	3	0	19	27	2	0	13	126	4	0	63
TG 1in_TOX	CO toxicity	0.011	35	2	0	17	25	2	0	12	113	4	0	56
TG 2in_VJ_I	Jet fire	0.01	10	10	-10	0	10	10	-10	0	10	10	-10	0
TG 2in_VJ_SD	Jet fire	0.01	10	10	-10	0	10	10	-10	0	10	10	-10	0
TG 2in_DJ	Jet fire	0.01	10	10	-10	0	10	10	-10	0	10	10	-10	0
TG 2in_FF/DJ	Flash fire	1	76	5	0	38	54	4	0	27	283	9	0	141
TG 2in_TOX	CO toxicity	0.011	70	5	0	35	49	3	0	24	253	8	0	126
TG 4in_VJ_I	Jet fire	0.01	21	21	-21	0	21	21	-21	0	21	21	-21	0
TG 4in_VJ_SD	Jet fire	0.01	21	21	-21	0	21	21	-21	0	21	21	-21	0
TG 4in_DJ	Jet fire	0.01	21	21	-21	0	21	21	-21	0	21	21	-21	0
TG 4in_FF/DJ_SD	Flash fire	1	50	5	0	50	50	3	0	50	50	8	0	50
TG 4in_FF/DJ_D	Flash fire	1	140	9	0	70	96	6	0	48	569	16	0	284
TG 4in_TOX	CO toxicity	0.011	140	9	0	70	96	6	0	48	569	16	0	284
TG_FBR_FBMJ	Fireball	1	71	71	-71	0	71	71	-71	0	71	71	-71	0
TG_FBR_VJ_SD	Jet fire	0.01	73	73	-73	0	73	73	-73	0	73	73	-73	0

Note:

- d is maximum downwind distance
- c is maximum crosswind distance
- m is distance to maximum width
- s is offset distance

Table 11.11c: Frequency Input File for RISKPLOT (Rail Passengers)

Consequence Outcome	Outcome Frequency per year		
	Peak	Off-Peak	Night
10mm_JF_FIE	1.25E-09	3.23E-09	9.44E-10
10mm_JF_FIR	1.05E-08	2.85E-08	8.33E-09
10mm_JF_R	7.01E-10	5.70E-10	1.67E-10
1_JF_FIE	1.87E-09	4.84E-09	1.41E-09
1_JF_FIR	1.58E-08	4.27E-08	1.25E-08
1_JF_R	1.05E-09	8.54E-10	2.50E-10
2_JF_FIE	2.33E-09	6.03E-09	1.76E-09
2_JF_FIR	1.97E-08	5.32E-08	1.56E-08
2_JF_R	1.31E-09	1.06E-09	3.11E-10
FB_JR_FIE	2.79E-09	7.45E-09	2.18E-09
FB_JF_FIR	6.38E-09	1.73E-08	5.05E-09
FB_JF_R	8.74E-09	2.26E-08	6.62E-09
FB_FB_FIE	3.06E-08	8.24E-08	2.41E-08
4_JF_FIE	1.79E-09	4.64E-09	1.36E-09
4_JF_FIR	1.51E-08	4.10E-08	1.20E-08
4_JF_R	2.52E-09	4.91E-09	1.44E-09

Table 11.11d Consequence Input File for RISKPLOT (Rail Passengers)

Consequence	Dominant Hazard	Weather States		3D					6D					1.5F					
		Fatality Probability		d	c	s	m	d	c	s	m	d	c	s	m	d	c	s	m
10mm_JF_FIE	Jet Fire	0.012		4	4	-4	0	4	4	-4	0	4	4	-4	0	4	4	-4	0
10mm_JF_FIR	Jet Fire	0.003		4	4	-4	0	4	4	-4	0	4	4	-4	0	4	4	-4	0
10mm_JF_R	Jet Fire	0.01		2	2	-2	0	2	2	-2	0	2	2	-2	0	2	2	-2	0
1_JF_FIE	Jet Fire	0.036		11	11	-11	0	11	11	-11	0	11	11	-11	0	11	11	-11	0
1_JF_FIR	Jet Fire	0.003		11	11	-11	0	11	11	-11	0	11	11	-11	0	11	11	-11	0
1_JF_R	Jet Fire	0.01		5	5	-5	0	5	5	-5	0	5	5	-5	0	5	5	-5	0
2_JF_FIE	Jet Fire	0.067		20	20	-20	0	20	20	-20	0	20	20	-20	0	20	20	-20	0
2_JF_FIR	Jet Fire	0.003		20	20	-20	0	20	20	-20	0	20	20	-20	0	20	20	-20	0
2_JF_R	Jet Fire	0.01		10	10	-10	0	10	10	-10	0	10	10	-10	0	10	10	-10	0
FB_JF_FIE	Jet Fire	0.343		102	102	-102	0	102	102	-102	0	102	102	-102	0	102	102	-102	0
FB_JF_FIR	Jet Fire	0.003		102	102	-102	0	102	102	-102	0	102	102	-102	0	102	102	-102	0
FB_JF_R	Jet Fire	0.01		65	65	-65	0	65	65	-65	0	65	65	-65	0	65	65	-65	0
FB_FB_FIE	Fireball	1		71	71	-71	0	71	71	-71	0	71	71	-71	0	71	71	-71	0
4_JF_FIE	Jet Fire	0.121		36	36	-36	0	36	36	-36	0	36	36	-36	0	36	36	-36	0
4_JF_FIR	Jet Fire	0.003		36	36	-36	0	36	36	-36	0	36	36	-36	0	36	36	-36	0
4_JF_R	Jet Fire	0.01		21	21	-21	0	21	21	-21	0	21	21	-21	0	21	21	-21	0

Note:

- d is maximum downwind distance
- c is maximum crosswind distance
- m is distance to maximum width
- s is offset distance



Table 11.11f: Potential Loss of Life due to All Events

Consequence Scenario	Rate of Death per year
<b>Jet Fire Events</b>	
TG_10mm_DJ	0.00E+00
TG_10mm_VJ	0.00E+00
TG_1in_DJ	1.17E-10
TG_1in_VJ	1.17E-10
TG_2in_DJ	7.21E-09
TG_2in_VJ_1	7.21E-09
TG_2in_VJ_SD	1.37E-08
TG_4in_DJ	5.14E-08
TG_4in_VJ_1	5.14E-08
TG_4in_VJ_SD	4.63E-08
TG_FBR_VJ_SD	2.50E-06
10mm_JF_FIE	0.00E+00
10mm_JF_FIR	0.00E+00
10mm_JF_R	0.00E+00
1_JF_FIE	0.00E+00
1_JF_FIR	0.00E+00
1_JF_R	0.00E+00
2_JF_FIE	2.03E-10
2_JF_FIR	7.80E-11
2_JF_R	0.00E+00
4_JF_FIE	1.77E-08
4_JF_FIR	8.58E-10
4_JF_R	4.10E-11
FB_JF_FIE	1.04E-07
FB_JF_FIR	2.10E-09
FB_JF_R	1.11E-08
<b>Total for Jet Fire Events</b>	<b>2.81E-06</b>
<b>Contribution to the Total</b>	<b>2.09%</b>
<b>Flash Fire Events</b>	
TG_10mm_FF/DJ	3.88E-09
TG_1in_FF/DJ	1.64E-07
TG_2in_FF/DJ	1.78E-06
TG_4in_FF/DJ_D	9.13E-06
TG_4in_FF/DJ_SD	0.00E+00
<b>Total for Flash Fire Events</b>	<b>1.11E-05</b>
<b>Contribution to the Total</b>	<b>8.25%</b>
<b>Toxic Events</b>	
TG_10mm_TOX	5.61E-09
TG_1in_TOX	2.69E-07
TG_2in_TOX	3.61E-06
TG_4in_TOX	4.66E-06
<b>Total for Toxic Events</b>	<b>8.55E-06</b>
<b>Contribution to the Total</b>	<b>6.37%</b>
<b>Fireball Events</b>	
TG_FBR_FB/VJ	1.10E-04
FB_FB_FIE	1.99E-06
<b>Total for Fireball Events</b>	<b>1.12E-04</b>
<b>Contribution to the Total</b>	<b>83.28%</b>
<b>Total for all Events</b>	<b>1.34E-04</b>

Table 11.11g: F-N Pairs for Base Case and Rail Passengers

Number of fatalities	Background Population	Train Passengers	Station Passengers	All Passengers	Total Risk: Background + Passengers
1	1.31E-05	1.52E-08	4.92E-07	5.07E-07	1.36E-05
2	4.91E-06	1.16E-08	2.80E-07	2.92E-07	5.21E-06
3	3.97E-06	1.03E-08	2.80E-07	2.90E-07	4.26E-06
4	3.43E-06	1.03E-08	1.80E-07	1.90E-07	3.62E-06
5	3.06E-06	1.03E-08	1.80E-07	1.90E-07	3.25E-06
6	2.73E-06	9.09E-09	1.80E-07	1.89E-07	2.92E-06
7	2.54E-06	9.09E-09	1.48E-07	1.57E-07	2.70E-06
8	2.40E-06	9.09E-09	1.31E-07	1.40E-07	2.54E-06
9	2.31E-06	9.09E-09	8.11E-08	9.02E-08	2.40E-06
10	2.21E-06	9.09E-09	8.11E-08	9.02E-08	2.30E-06
20	9.91E-07	9.08E-09	4.03E-08	4.94E-08	1.04E-06
30	5.48E-07	9.01E-09	4.03E-08	4.93E-08	5.98E-07
40	4.57E-07	8.98E-09	2.01E-08	2.91E-08	4.86E-07
50	4.32E-07	8.98E-09	2.01E-08	2.91E-08	4.61E-07
60	3.96E-07	8.98E-09		8.98E-09	4.05E-07
70	3.84E-07	8.07E-09		8.07E-09	3.92E-07
80	3.40E-07	8.07E-09		8.07E-09	3.48E-07
90	2.88E-07	7.82E-09		7.82E-09	2.96E-07
100	2.80E-07	7.82E-09		7.82E-09	2.88E-07
200	1.27E-07	3.23E-09		3.23E-09	1.30E-07
300	5.03E-08	1.61E-09		1.61E-09	5.20E-08
400	2.42E-08	1.61E-09		1.61E-09	2.59E-08
500	2.42E-08	1.61E-09		1.61E-09	2.59E-08

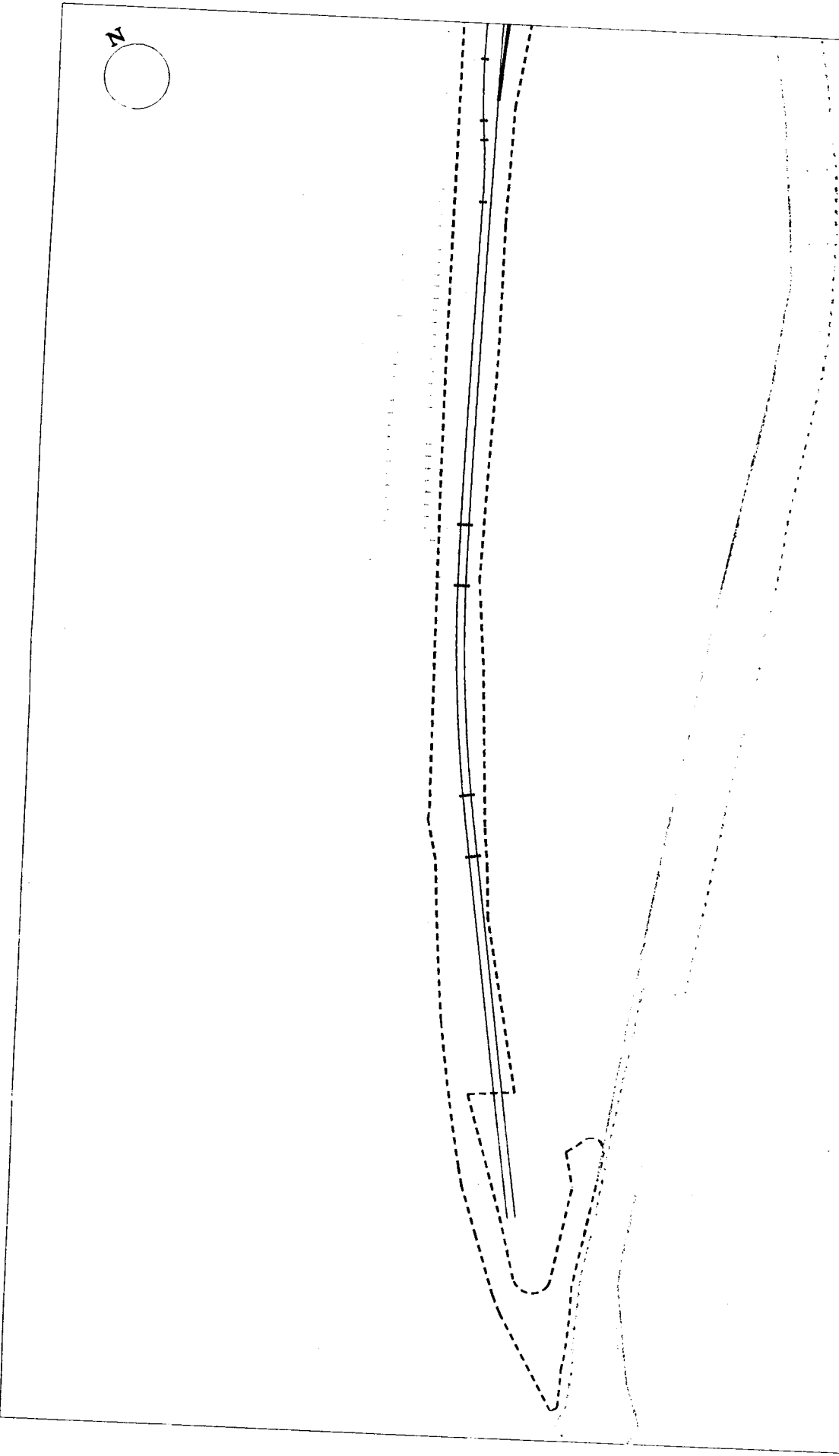


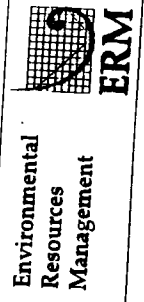
FIGURE 11.30

INTERFACE BETWEEN TOMNGAS PIPELINE & MOS RAILWAY

SCALE 1:2000

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DATE: 14/04/98

KEY  
- - - - - PG (Proposed)  
- - - - - PG  
- - - - - MP



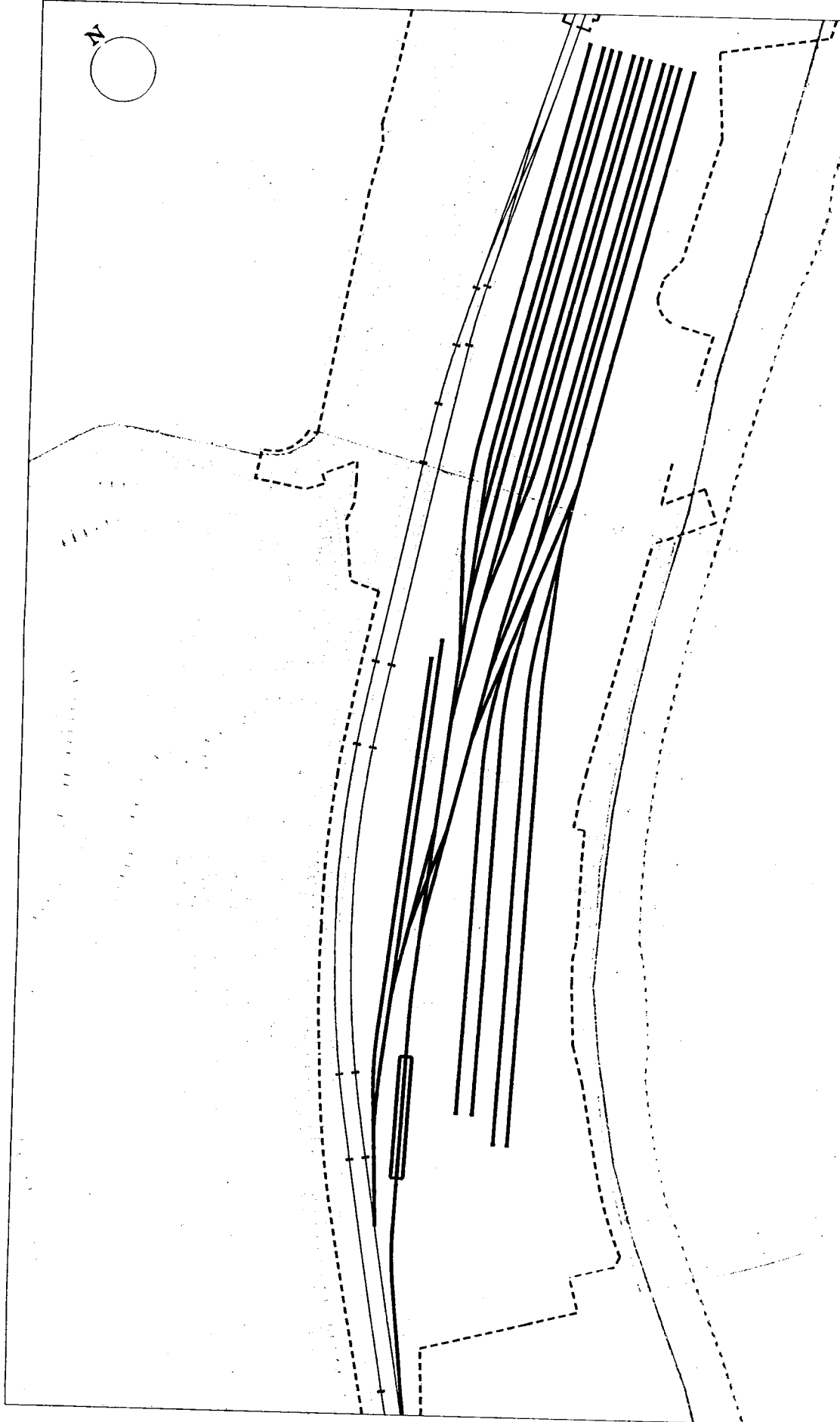
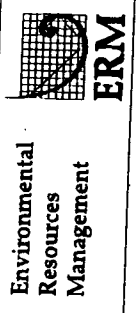


FIGURE 11.3b

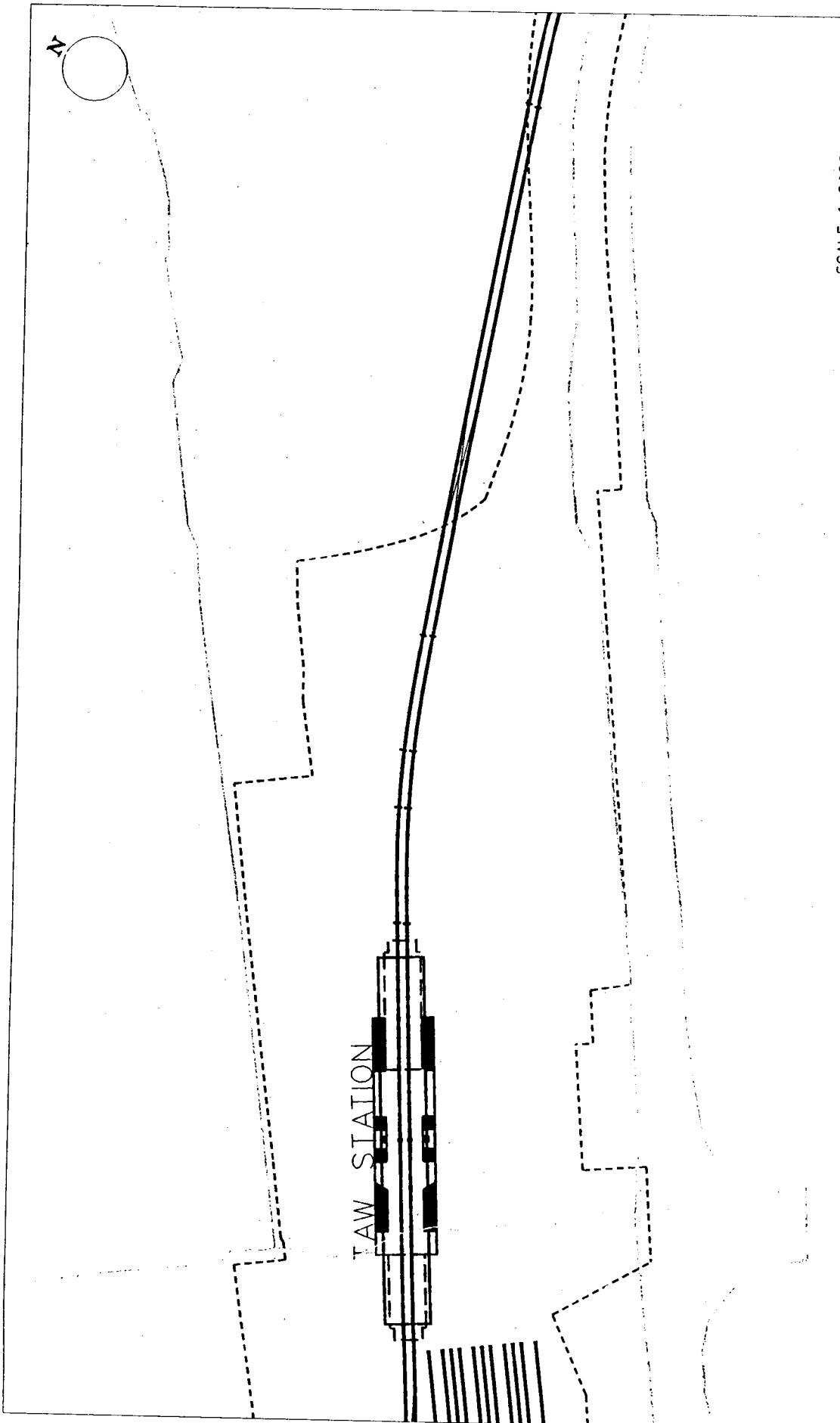
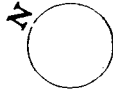
INTERFACE BETWEEN TOWNGAS PIPELINE & MOS RAILWAY

SCALE 1:2000

KEY  
 PB (Proposed)  
 ---  
 ---  
 ---



USTN FILE: C1890b2  
 DATE: 14/04/98



TAW STATION

SCALE 1:2,000



Environmental  
Resources  
Management

ERM

KEY  
 - - - - - IPB (Proposed)  
 - - - - - IPB  
 - - - - - MP

FIGURE 11.3c  
 INTERFACE BETWEEN TOWNGAS PIPELINE & MOS RAILWAY

USM FILE: C18903  
 DATE: 14/04/98

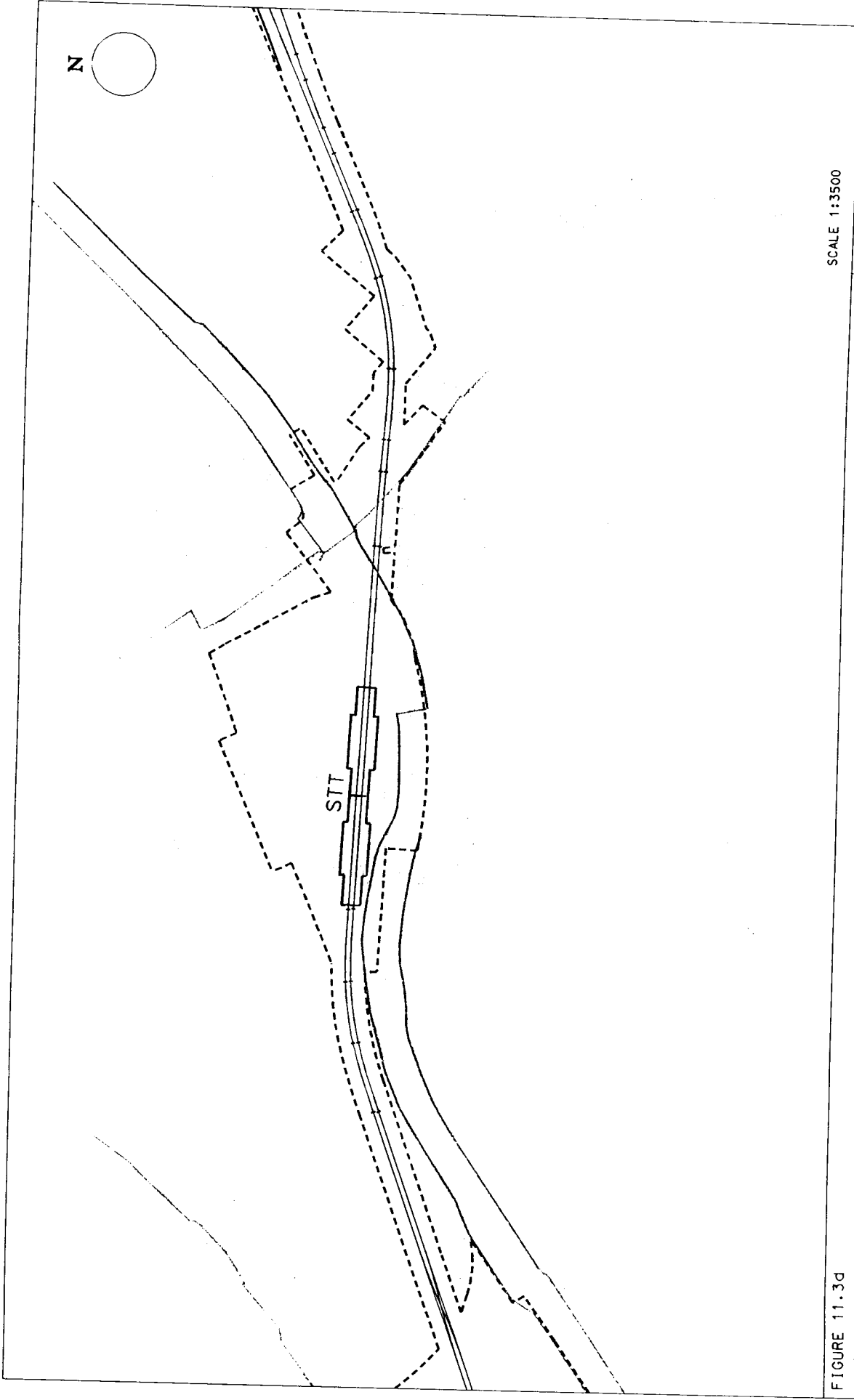


FIGURE 11.3d

SCALE 1:3500

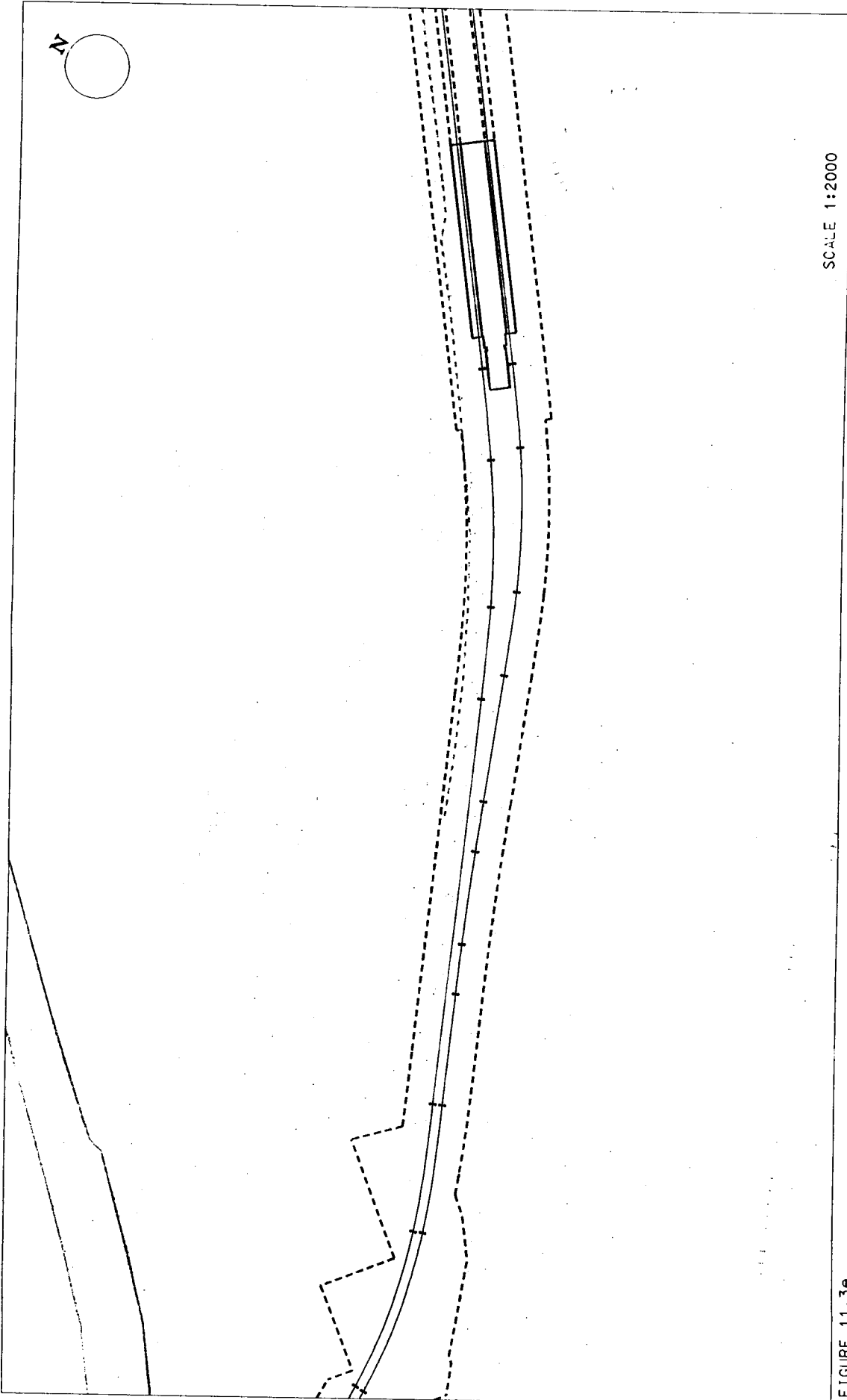
INTERFACE BETWEEN TONGAS PIPELINE & MOS RAILWAY



Environmental Resources Management

KEY  
 (Proposed)  
 ---  
 ---  
 ---

USTN FILE: C18906-4  
 DATE: 14/04/99



SCALE 1:2000



Environmental  
Resources  
Management

KEY  
 --- (Proposed)  
 ---  
 ---  
 ---

FIGURE 11.30

INTERFACE BETWEEN TOWNGAS PIPELINE & MDS RAILWAY

USTN FILE: C18805  
 DATE: 14/04/98

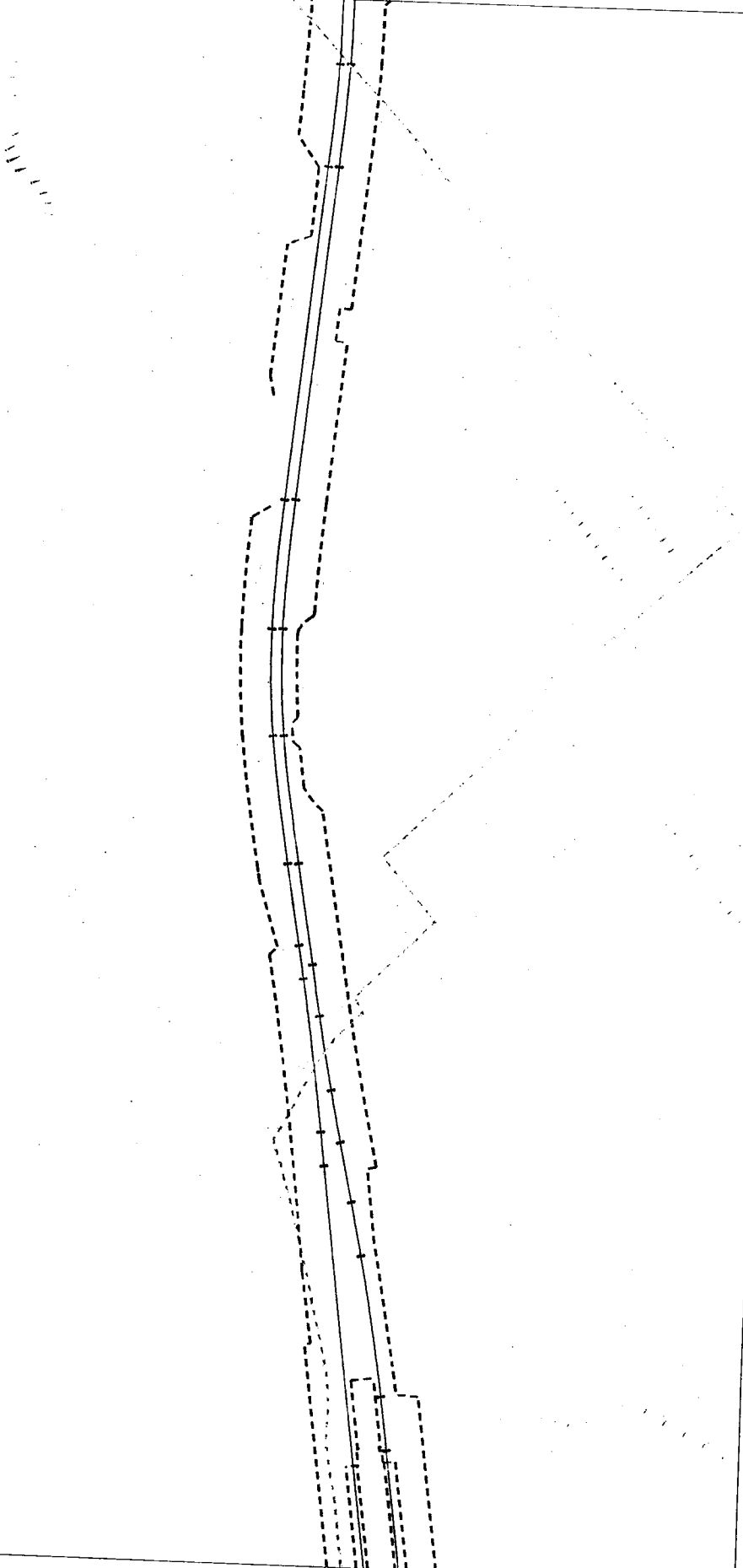
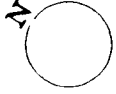


FIGURE 11.3f

SCALE 1:2000

INTERFACE BETWEEN TONGAS PIPELINE & MOS RAILWAY

Environmental  
Resources  
Management

KEY  
IPB (Proposed)

USTM FILE: C18006  
DATE: 14/04/98





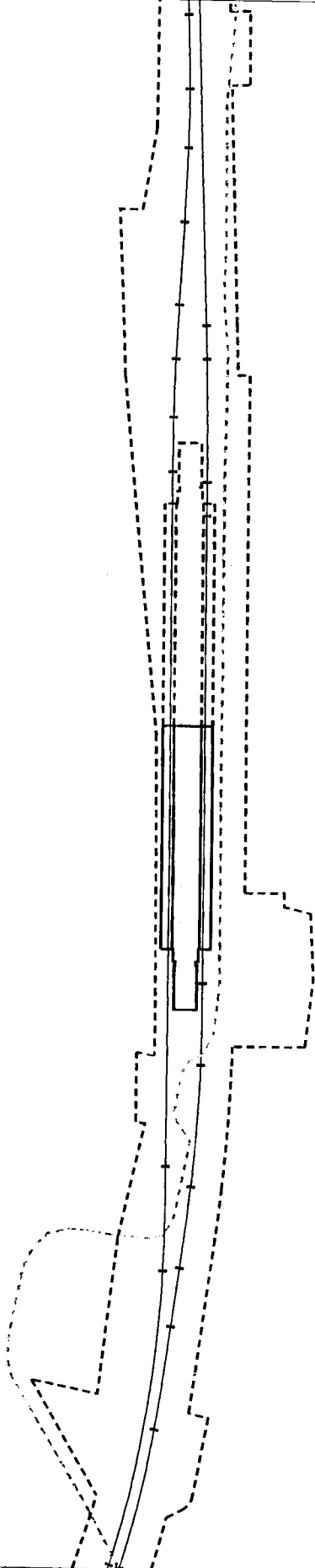
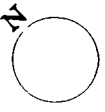


FIGURE 11.39

SCALE 1:2000

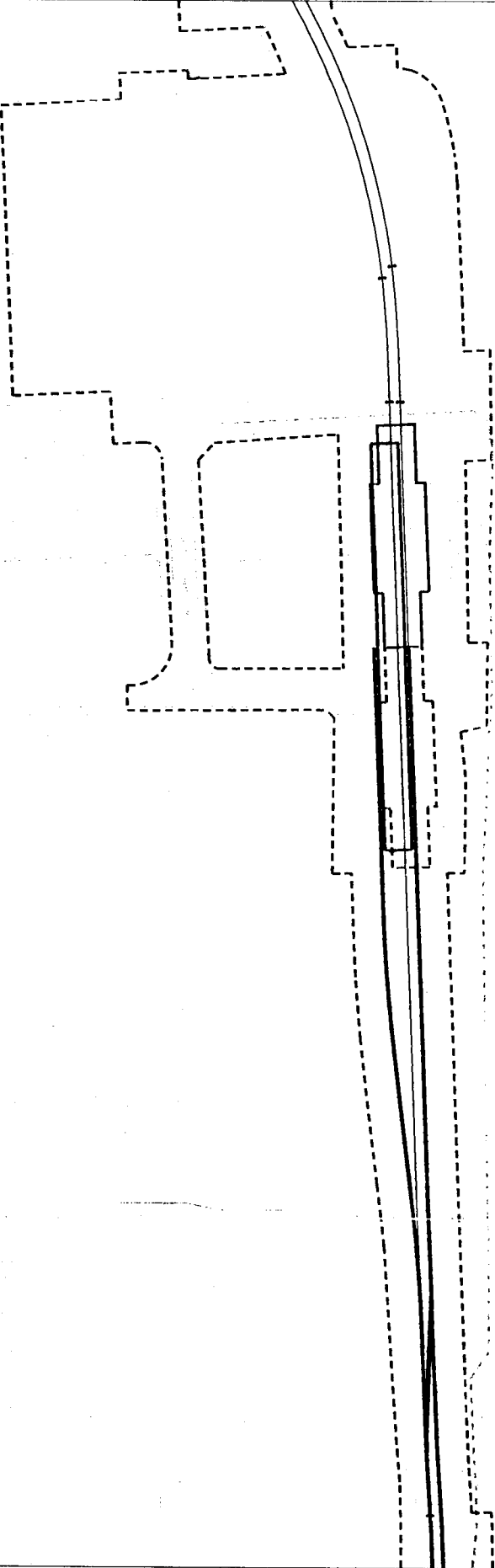
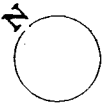
INTERFACE BETWEEN TONGAS PIPELINE & MOS RAILWAY

KEY  
IPB (Proposed)



Environmental  
Resources  
Management

JUSTIN FILE: C189007  
DATE: 14/04/98



SHM

SCALE 1:2000



Environmental  
Resources  
Management

KEY  
 --- IPB (Proposed)  
 --- MP

INTERFACE BETWEEN TOWNGAS PIPELINE & MOS RAILWAY

FIGURE 11.3h

USTN FILE: C195008  
 DATE: 14/04/98

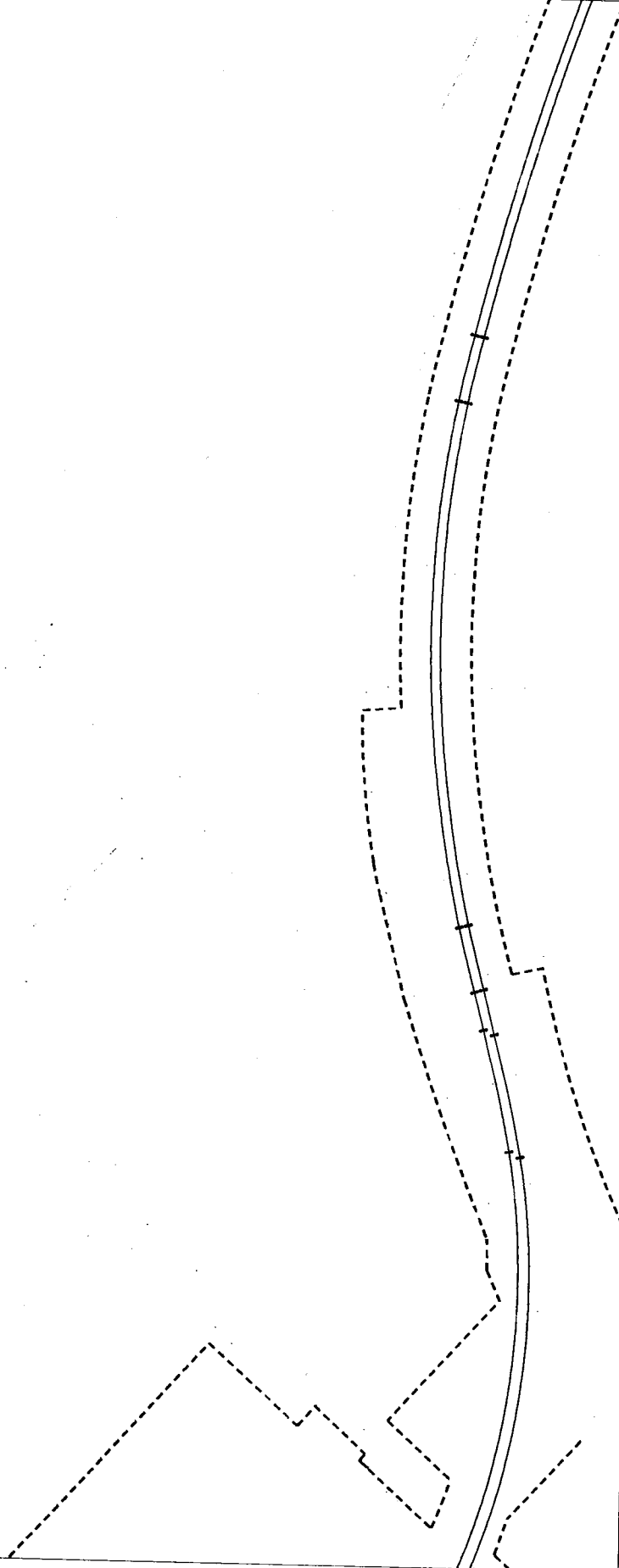
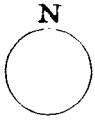
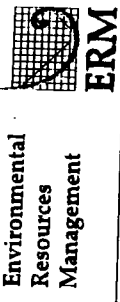


FIGURE 11.31

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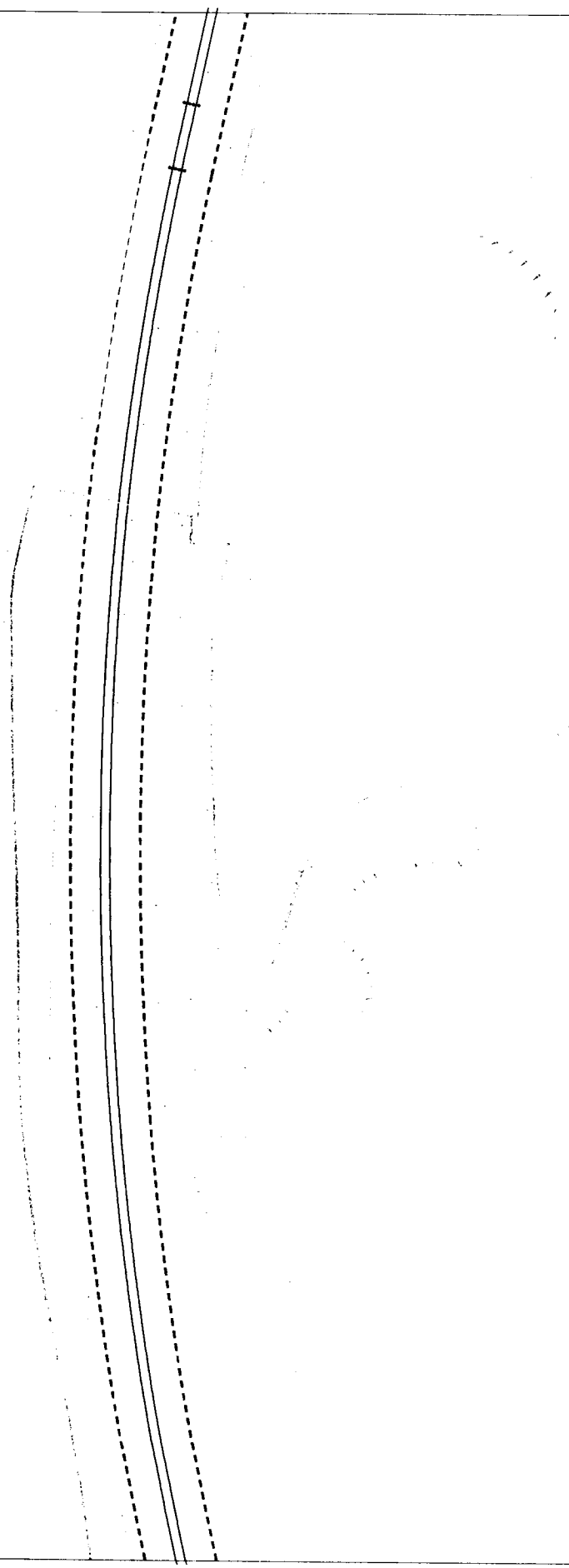
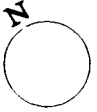
INTERFACE BETWEEN TOWNGAS PIPELINE & MDS RAILWAY

KEY  
MP  
HP



Environmental  
Resources  
Management

USIN FILE: C18009  
DATE: 11/04/98



SCALE 1:2000



Environmental  
Resources  
Management

KEY  
MP  
HP

INTERFACE BETWEEN TOWNGAS PIPELINE & MDS RAILWAY

FIGURE 11.3J

USTM FILE: C1890010  
DATE: 15/04/98

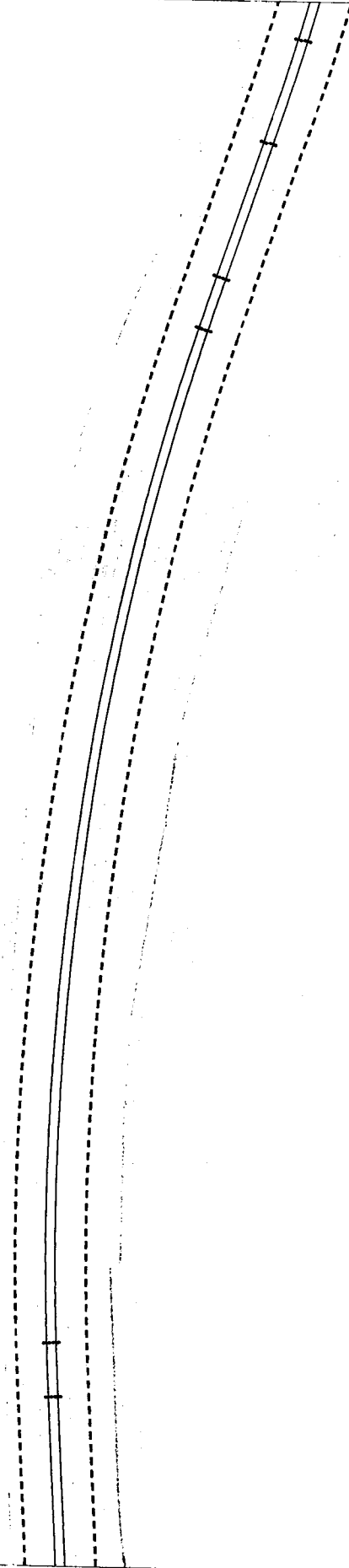
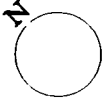


FIGURE 11.3K

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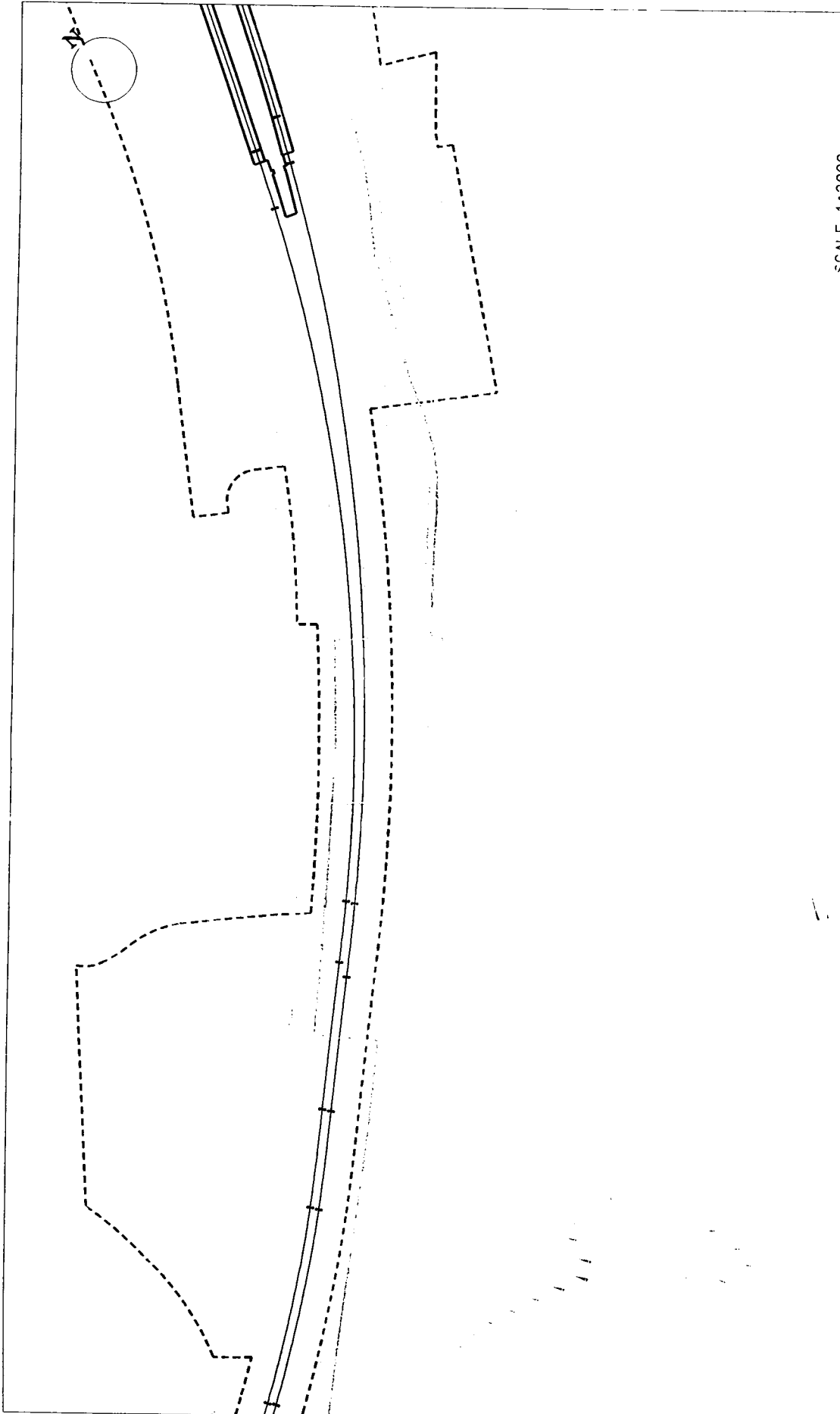
INTERFACE BETWEEN TOWNGAS PIPELINE & MOS RAILWAY  
SHEK MUN TO CHEVALIER GARDEN

KEY  
MP  
HP



Environmental  
Resources  
Management

USM FILE: C1900611  
DATE: 14/04/98



SCALE 1:2000



Environmental  
Resources  
Management

KEY  
MP  
HP

INTERFACE BETWEEN TOWNGAS PIPELINE & MOS RAILWAY  
SHEK MUN TO CHEVALIER GARDEN

FIGURE 11.31

US7N FILE: C1880012  
DATE: 14/04/98

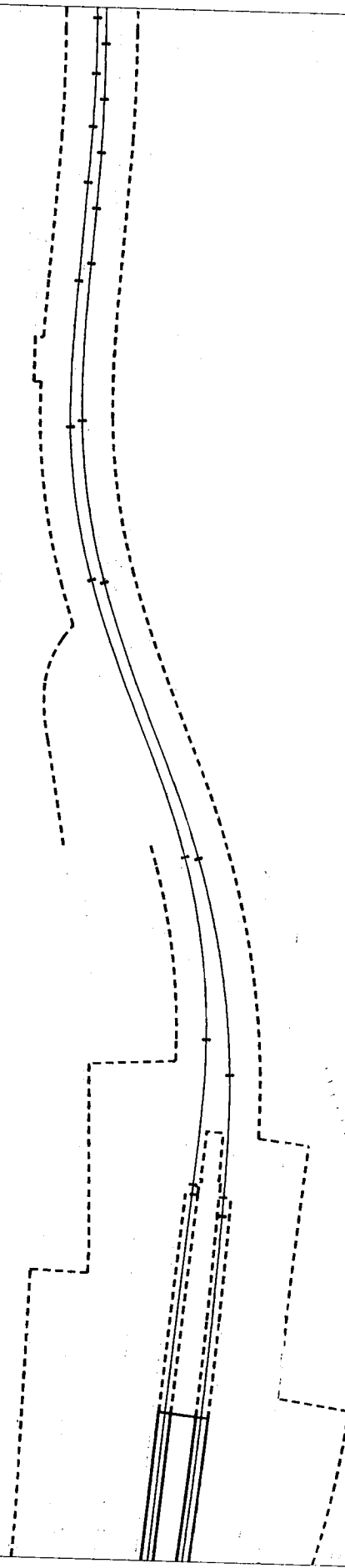
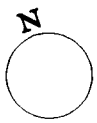


FIGURE 11.3m

SCALE 1:2000

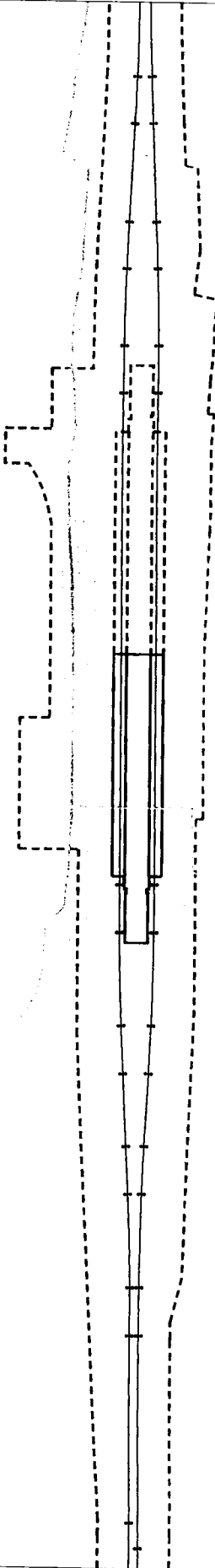
INTERFACE BETWEEN TONGAS PIPELINE & MDS RAILWAY  
CHAVALIER GARDEN TO MENG ON

KEY  
MP  
HP



Environmental  
Resources  
Management

USM FILE: C1800b13  
DATE: 14/04/98



SCALE 1:2000



Environmental  
Resources  
Management

KEY  
MP

INTERFACE BETWEEN TONGAS PIPELINE & MOS RAILWAY  
CHEVALIER GARDEN TO HENG ON

FIGURE 11.30

USTN FILE: C1890014  
DATE: 14/04/98



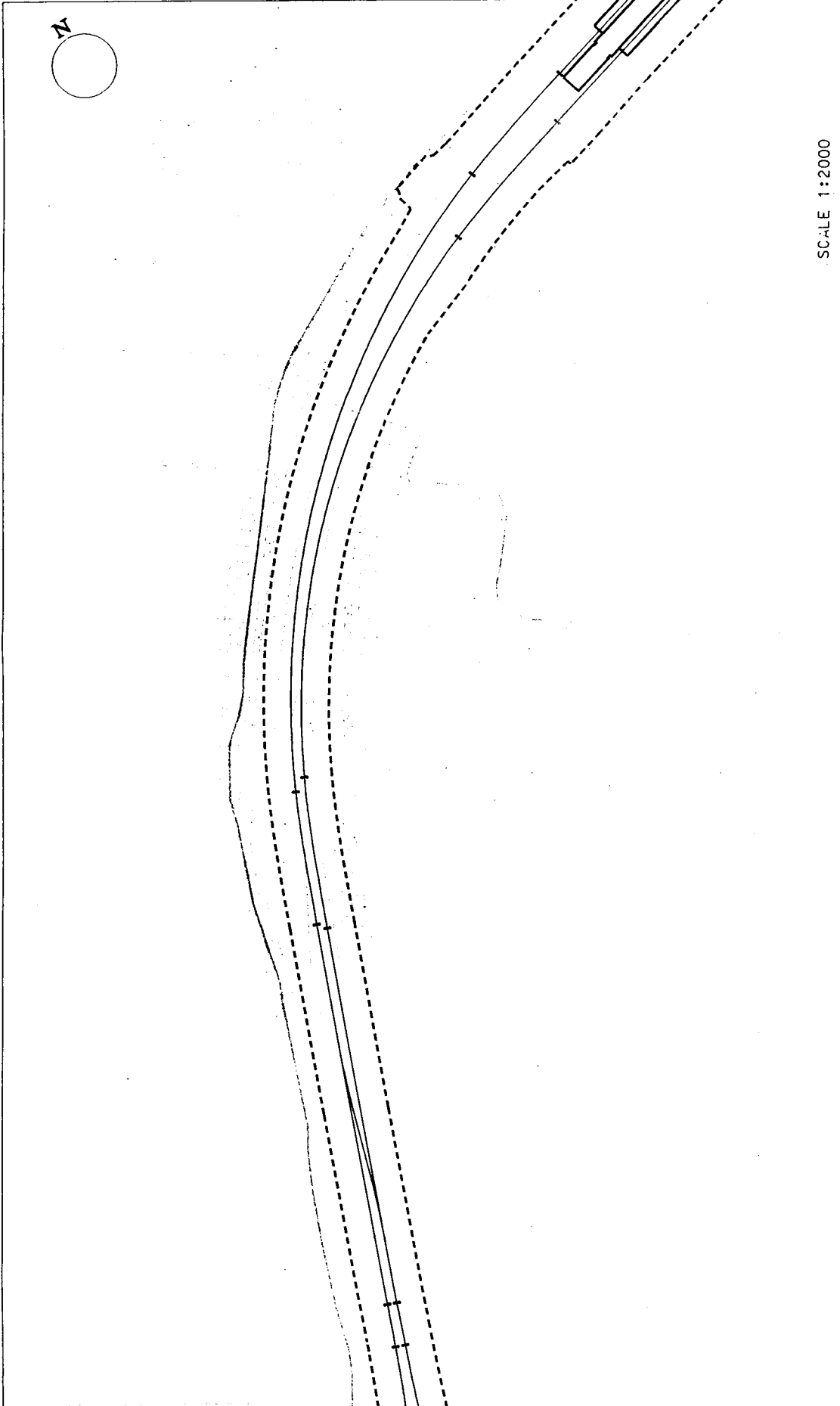



FIGURE 11.30

INTERFACE BETWEEN TOWNGAS PIPELINE & MDS RAILWAY

KEY  

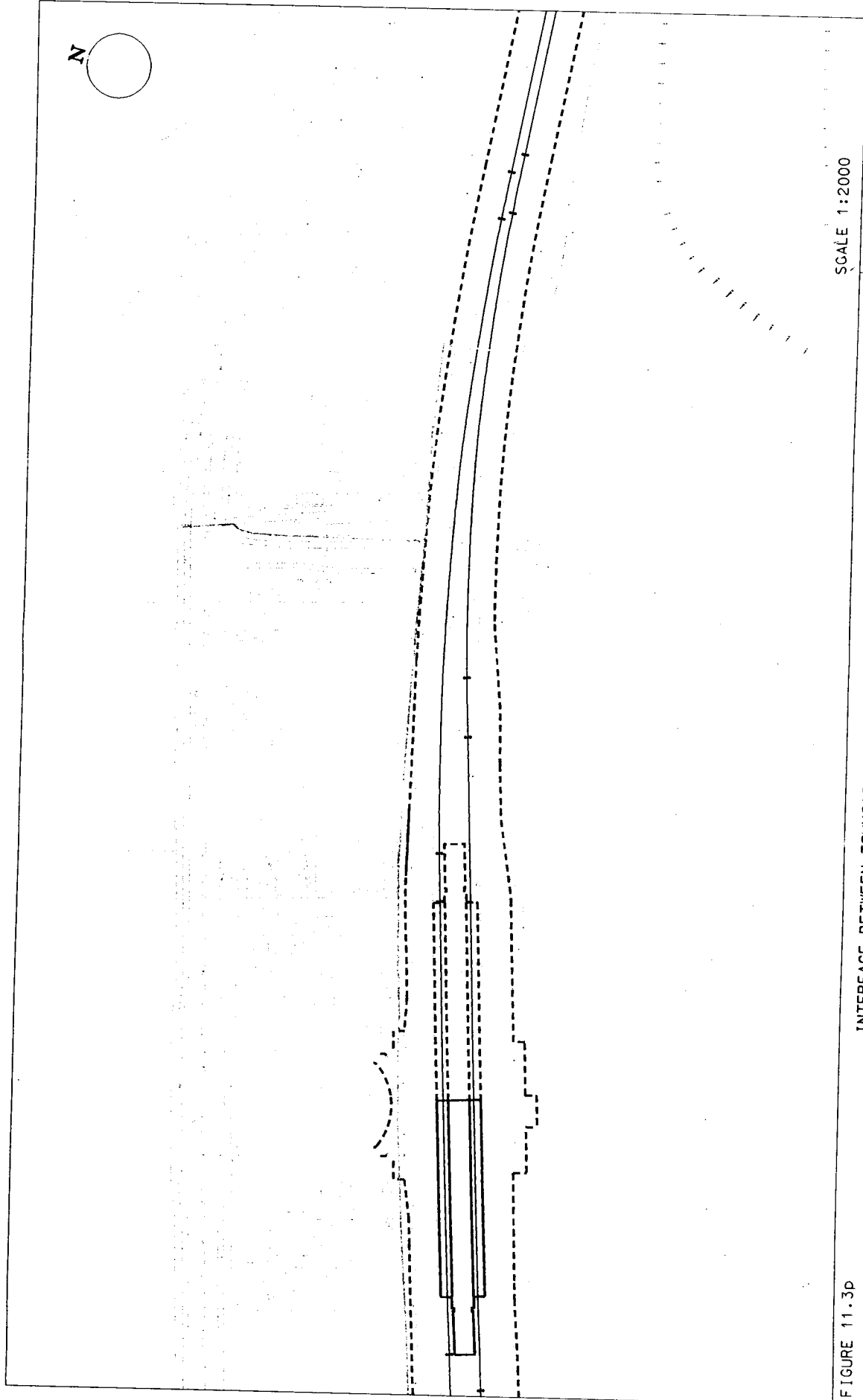

SCALE 1:2000

Environmental  
 Resources  
 Management



**ERM**

USTN FILE: C1809b15  
 DATE: 14/04/98



SCALE 1:2000

INTERFACE BETWEEN TOWN GAS PIPELINE & MDS RAILWAY

KEY  
MP



Environmental  
Resources  
Management

ERM

FIGURE 11.3p

USM FILE: C1890016  
DATE: 14/04/98

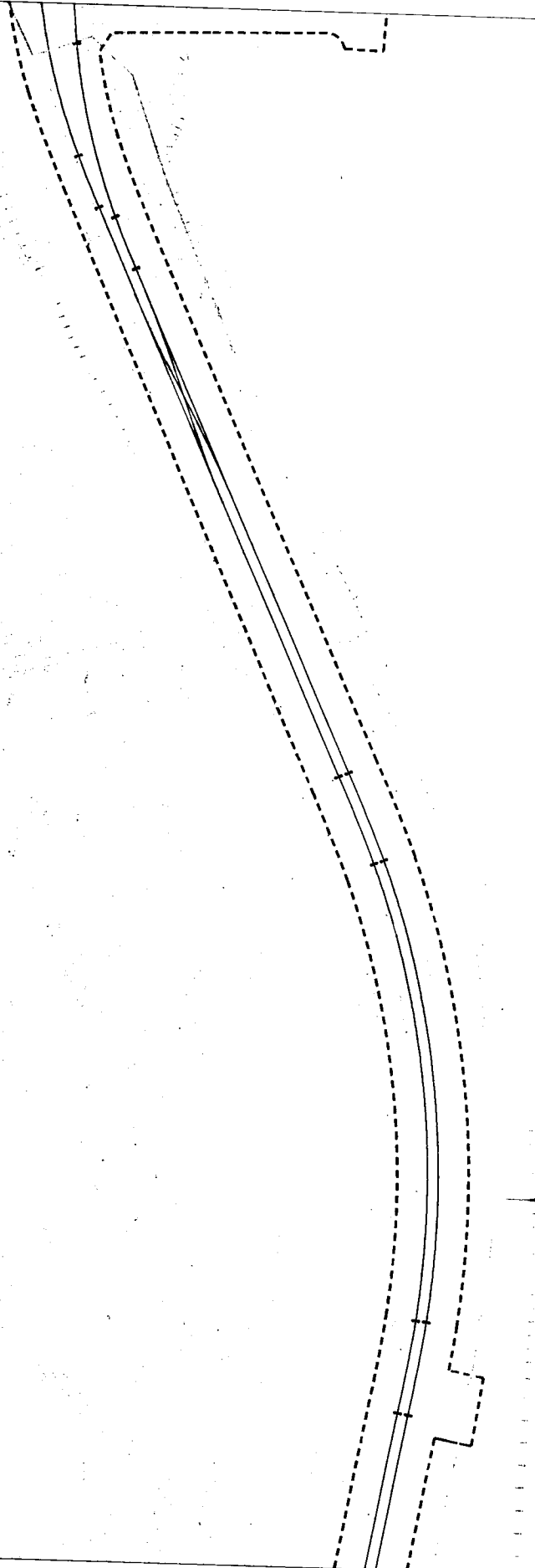
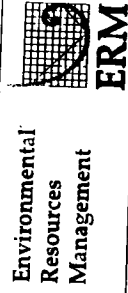


FIGURE 11.3q

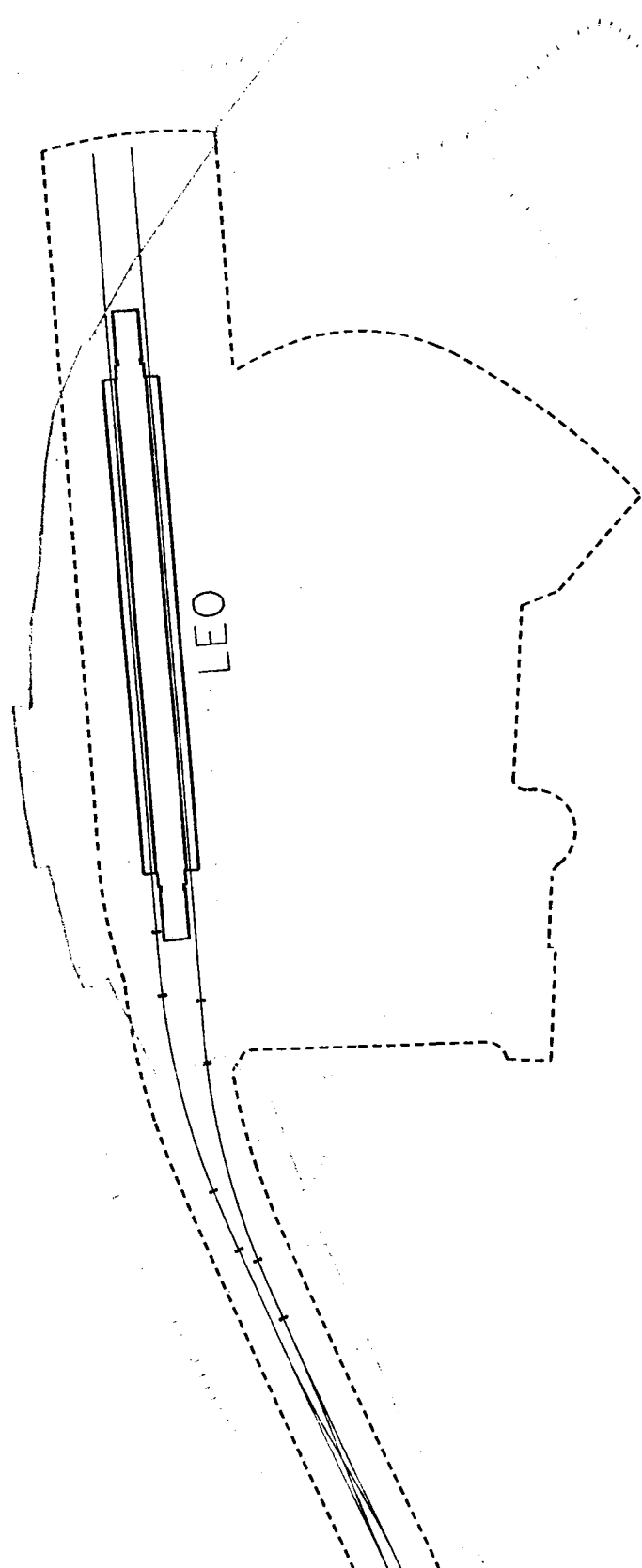
SCALE 1:2000

INTERFACE BETWEEN TOWNGAS PIPELINE & MOS RAILWAY  
MA ON SHAN TO LEE ON

KEY  
MP



USTN FILE: C1890017  
DATE: 14/04/98



SCALE 1:2000



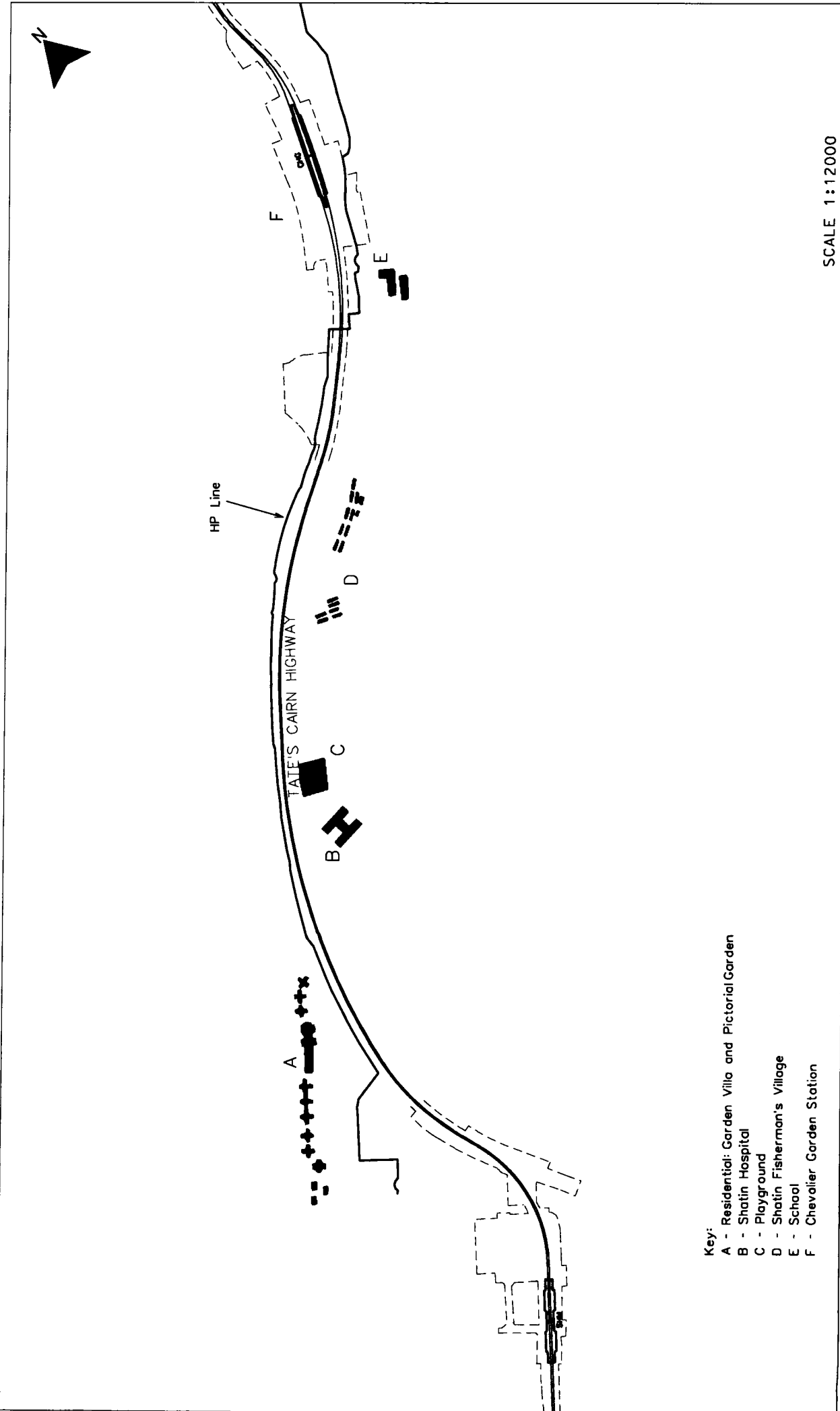
Environmental  
Resources  
Management

INTERFACE BETWEEN TOMGAS PIPELINE & MDS RAILWAY

FIGURE 11.3F

KEY  
MP

JUSTN FILE: C1800018  
DATE: 14/06/98



- Key:
- A - Residential: Garden Villa and Pictorial Garden
  - B - Shatin Hospital
  - C - Playground
  - D - Shatin Fisherman's Village
  - E - School
  - F - Chevalier Garden Station

FIGURE 11.3S

SCHEMATIC OF HP PIPELINE INTERFACING WITH MOS (WITHIN 100m)

GUIDANCE NOTE FOR  
LAYING OF UNDERGROUND LPG PIPES ALONG OR ACROSS PUBLIC ROADS  
GAS SAFETY (GAS SUPPLY) REGULATION 17(4)

1. INTRODUCTION

Liquefied petroleum gas (LPG) is heavier than air and any leakage from underground LPG mains would fall to its lowest level and may enter into poorly ventilated voids, culverts, drains, ducts, pits and adjacent underground car parks and basements. This would then be a hazard if there was an ignition source. In view of this, underground LPG mains are generally limited to developments where the surrounding environment can be controlled. In addition, Regulation 17(4) of the Gas Safety (Gas Supply) Regulations stipulates that "*No person shall install a gas main for the conveyance of liquefied petroleum gas along or across a road.*" A road is defined in the Gas Safety Ordinance to have the same meaning as that of the Road Traffic Ordinance, Cap. 374 which is basically a public road.

Notwithstanding specific legal requirements, there are circumstances which are considered necessary or beneficial to install some parts of a gas main along or across a public road, and therefore there is a provision under the Gas Safety (Gas Supply) Regulations for the Gas Authority to grant an exemption from the restrictions as stated. In granting an exemption, the Gas Authority must be satisfied that public safety will not be prejudiced and may specify additional conditions for compliance.

The purpose of the Guidance Note is to specify certain circumstances under which the Gas Authority may grant an exemption from the requirements of Regulation 17(4), and to outline necessary criteria for exemption so that a proponent may apply for such an exemption.

2. SPECIAL CIRCUMSTANCES

The following are special circumstances under which the Gas Authority may consider granting an exemption, i.e.

- (a) When a new/existing bulk installation is located at/relocated away from a development, and where the interconnecting LPG main has to be laid across or along a public road.
- (b) When a new development can be supplied by a gas main laid along or across a public road from an existing reticulation system of a piped LPG development, and where the overall risk levels would be less than establishing a new notifiable gas installation.
- (c) When a private road of an existing development which is supplied with piped LPG is to be taken over by Government as a public road and there is a gas main laid beneath it.
- (d) When a piped gas supply is required on a specific development which include a public road.

### 3. CRITERIA FOR EXEMPTION

#### 3.1 Risk Consideration

Where laying of LPG mains may lead to increase in storage inventory and/or road tanker replenishment frequency of an existing LPG compound, a quantitative risk assessment study shall be conducted to demonstrate that the overall risks are in line with the Hong Kong Government Risk Guidelines.

#### 3.2 Material

Material for LPG mains shall be of heavy grade steel conforming to BS 1387 or equivalent. All underground LPG mains shall be of welded construction only and welded joints shall be fabricated in accordance with relevant design and welding standards. Medium density polyethylene (MDPE) pipe is an acceptable alternative for underground pipework provided that suitable precautionary measures are taken.

#### 3.3 Routing and Sizing

Underground LPG mains shall be routed in such a way so as to prevent the possibility of leaking gas from entering into buildings, and to minimise undue interference with other utility services. The separation distance of an LPG main from buildings shall not be less than 1 m. The clearance between an LPG main and other utility services shall be 300 mm minimum. This clearance may be reduced for crossings subject to adequate protection being provided e.g. slabs and sleeving, but shall not be less than 100 mm. The operating pressure and internal diameter of an LPG main shall not be greater than 69 kPag (10 psig) and 200 mm respectively.

#### 3.4 Ground Conditions

In designing pipe routing, careful consideration shall be given to avoid possible ground settlement, subsidence, vehicular and mechanical loading. Where necessary, additional measures shall be provided to monitor and avoid possible damage resulting from adverse ground conditions.

#### 3.5 Trench Preparation and Reinstatement

Underground LPG mains shall be laid on a firm and even foundation at a depth of 1 m minimum measured from the road surface to the top of the mains. The mains shall be protected against mechanical damage by means of concrete slabs or steel plates at a height of 100 mm above the main, be embedded in sand or soil and be compacted with backfill materials firmly and evenly before making good of the road surface. Where an LPG main is laid across a road, it shall be sleeved with suitably sized steel pipe and means for gas leak detection. Yellow plastic marker tape shall be laid between 100 mm and 300 mm above all LPG mains for identification and warning purposes. Additional metallic tracing tape shall be installed in the case of MDPE pipes.

### 3.6 System Protection

Isolating valve and pit shall be provided at either ends of the section of LPG main across the road and be strategically located for sections along the road. Steel mains shall be protected against corrosion by means of suitable coating, wrapping and/or cathodic protection under adverse soil conditions. The design and construction of cathodic protection system shall be carried out by experienced corrosion specialists and the system be checked periodically.

### 3.7 Record Plans

Owners of LPG mains shall maintain accurate alignment records and update as necessary. When requested, relevant information on locations of LPG mains shall be provided to persons wishing to carry out works in the vicinity of the mains.

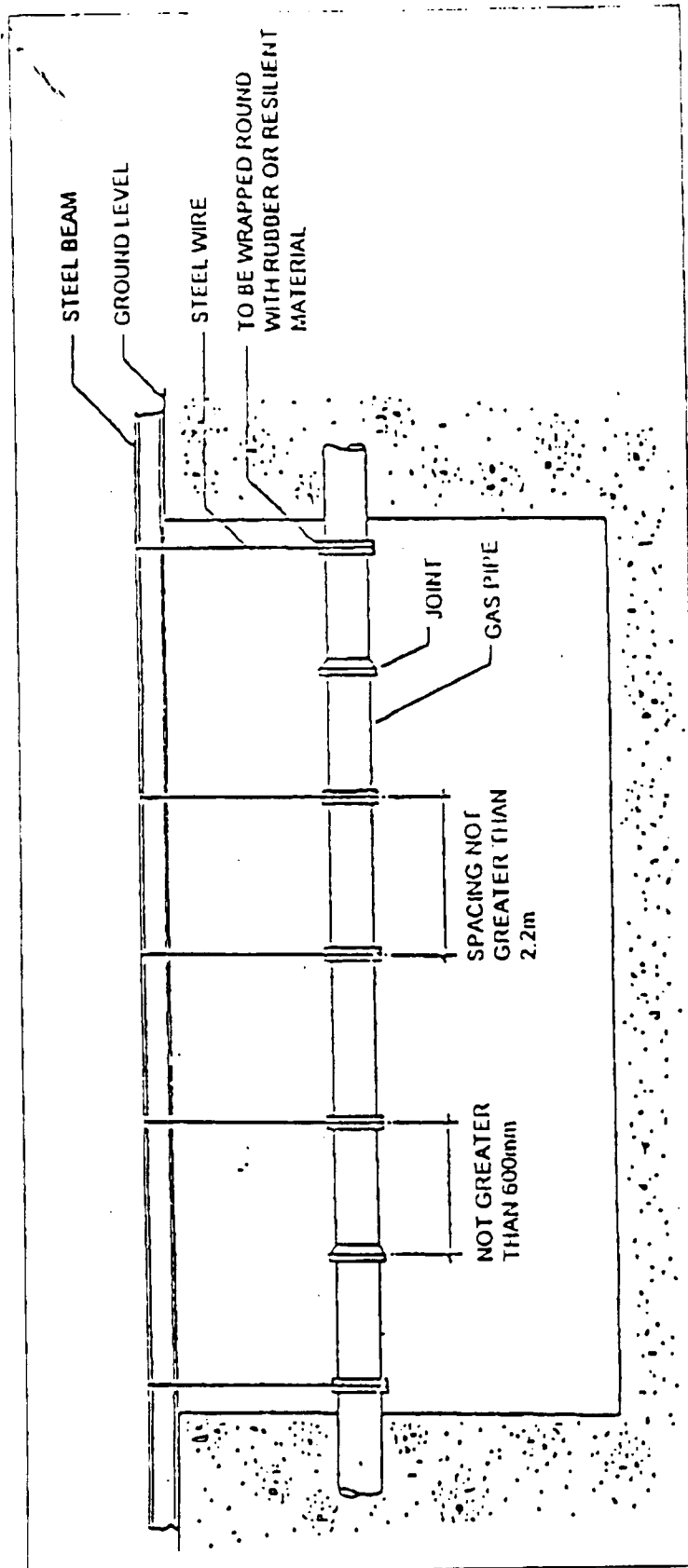
## 4. APPLICATION

In applying for exemption from Reg. 17(4), the applicant shall provide justifications for such application to the Gas Authority and submit two copies of plans showing details of the proposed LPG main including operating pressure, routing, material, mode of protection and any safety provisions. The applicant shall also apply to the Director of Highways and the Director of Lands for an excavation permit and wayleave respectively.

## 5. ENQUIRES

Any enquiry should be made to the Gas Standards Office, Electrical & Mechanical Services Department, 6/F., 98 Caroline Hill Road, Causeway Bay, Hong Kong at Tel. No. : 2808 3683 and Fax No. : 2576 5945.





GR/1

**General Requirement of Excavation Adjacent to Gas Main**

1. When excavation is to be carried out adjacent to a gas main the exact alignment and profile must be ascertained by a series of hand-dug trial holes.
2. BORING AND DRILLING IN THE VICINITY OF GAS MAIN IS STRICTLY PROHIBITED. HKCG must be consulted first should this work be required.
3. No excavator is allowed for excavation at 1.5 metre around the gas pipe.
4. In case of blasting/piling, the vibration acting on the gas pipe must not be higher than 25mm/s peak particle velocity and 0.2mm vibrational amplitude.
5. Excavation running close and parallel to the gas pipe should be avoided. Should such excavation be required, discussion/agreement must be sought from HKCG.
6. Suspension of gas pipe to be agreed with HKCG.
7. Sufficient clearance to be maintained for future maintenance. Normally, 300mm and 600mm clearance is required for D.I. and steel gas pipe respectively.
8. Due care should be given to the ancillary equipment attached to the gas main. Cathodic protection is installed for corrosion-resistant purpose and it has some cables linking from the gas pipe and anodes and connected in a junction box placed in a pit. The anodes are usually installed 1m away from the pipe and the junction box would be located away from carriageway and thus it would be at a certain distance from those gas main laid under carriageway.

FOR REFERENCE ONLY
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GR/2

**General Requirement of Backfilling Adjacent to Gas Main**

1. Selected fine material should be used for backfilling surrounding the gas pipe. For High Pressure or Intermediate Pressure B steel gas mains, zone 2 fresh sand is used at least 150mm surround.
2. Hand rammer should be used for compaction surround and immediate above the gas pipe.
3. Subsequent backfilling should be in layers and compacted by hand held vibrator/roller. Large rollers should not be used until the pipe has at least 1.1m cover.
4. The compaction should meet the requirements of Highways or the relevant authority.
5. No concrete is allowed to cast the gas pipe in the backfill.
6. The pipe integrity protection mechanism (e.g. steel capping plate and warning tape), if any, must be replaced in the relevant position.
7. Due care should be given to avoid damage to the extended cables of 'Cathodic Protection System'.

REFERENCE  
ONLY

GR/3

**General Requirement of Safety Precautions for Construction Work Adjacent to Gas Main**

1. Notification of work should be circulated as stipulated in the Excavation Permit issued by Highways. The same procedure should also be followed for construction site other than Highways' area.
2. Contact HKCG at least 3 days in advance for excavation adjacent to gas pipe. Site meeting to be arranged whenever required. HKCG could be contacted via 28806999 or the responsible Manager specified in the reply letter.
3. No "FIRE"/"WELDING" is allowed adjacent to the gas pipe.
4. The gas pipe will normally be laid not shallower than 450mm and 900mm in footpath and carriageway respectively. Due to the need to negotiate underground obstructions, there are cases where gas mains have to be laid shallower than the requirements. Steel protection plates will normally be laid on top of shallow cover pipe. Due care should be given in subsequent excavation when meeting with the capping plate.
5. Report any damage, even superficial, to HKCG for remedial action.
6. In case of emergency, contact HKCG at 28806999 which is manned 24 hours. If a gas leak is suspected, immediately stop work and evacuate the site personnel from the trenches. It should be noted that gas can travel through underground drains or conduits to other areas of the site. Evacuate the personnel from these areas if this is suspected.

FOR REFERENCE  
ONLY