Chapter VIII Technical Evaluation of Sites for Construction of New Cold Rolling Mill

1. Summary

BIEN HOA2 was excluded from the candidate sites by the result of VSC's preliminary site survey. This is because BIEN HOA2 does not have enough land space for the planned new cold rolling mill complex. Accordingly, the survey was made in three candidate sites, namely AMATA, NHON TRACH and PHU MY.

(1) Survey schedule
   1) AMATA Industrial Zone : March 8, 2000
   2) NHON TRACH Industrial Zone : March 9, 2000
   3) PHU MY Industrial Zone : March 10, 2000

(2) Survey items
   1) Soil conditions (elevation, boring data)
   2) Infrastructure (electric power supply, water supply, fuel gas, tele-communication, water treatment)
   3) Port (draft, length of berth, loading facilities)
   4) Environmental issues (sewage disposal standards, emission standards, noise level)

(3) Criteria for site selection
   1) Site area : more than10 ha (100,000 m^2)
   2) Water supply : more than 140 m^3/hr
   3) Electric power supply : more than 15 MVA

(4) Evaluation results of construction sites (as shown in Table VIII-1-1)
   1) All of three candidate sites have no fatal problems for the planned new cold rolling mill complex because all of them satisfy the above-mentioned criteria and sufficiently meet the conditions of other evaluation items such as soil condition and environmental issues.
   2) Compared to AMATA and NHON TRACH, PHU MY has the following advantages and disadvantage ;

[Advantage]
   ① Near the PHU MY port
   ② Lower transportation cost of hot rolled coils
   ③ Suitable for heavy industry
      A large power plant, natural gas station and VINA KYOEI are in operation in PHU MY.
      On the other hand, existing companies in AMATA and NHON TRACH are almost those of light industries.
   ④ High expandability.

[Disadvantage]

① Relatively remote from customers

3) Although PHU MY is located a little far from the customers, the difference is about 30 km and is not a fatal disadvantage compared to AMATA and NHON TRACH. Accordingly, PHU MY is recommended as the best site for the new cold rolling mill complex.

Table VIII-1-1 Results of Site Survey

Item \ Name of site		AMATA	PHU MY	NHON TRACH
1. The proposed criteria				
1.1 Site area		More than 10ha (100,000m^2) A	More than 10ha (100,000m^2) A	More than 10ha (100,000m^2) A
1.2 Water supply volume		More than 140m^3/hr A	More than 140m^3/hr A	More than 140m^3/hr A
1.3 Electricity from outside network		More than 15MVA available A	More than 15MVA available A	More than 15MVA available A
A : Satisfies criteria, B : Uncertain, subject to further information, C : Not satisfies criteria				
2.1 Site condition	2.1.1 Location	Bien Hoa City, Dong Nai province. ·to HO CHI MINH City : 30km ·to PHU MY Port : 40km ·to GO DAU Port : 37km	Phu My new urban area, Ba ria-Vung tau province. ·to HO CHI MINH City : 68km ·to PHU MY Port : 1.5km ·to GO DAU Port : 10km	New Nhon Trach City, Dong Nai province ·to HO CHI MINH City : 60km ·to PHU MY Port : 22km ·to GO DAU Port : 15km
	2.1.2 Elevation	EL=+31m～+47m	EL=+6～+10m	EL=+28m
	2.1.3 Soil condition	This area provides 11 boreholes. Rough description is as follows: ① 1st layer is clayey sand, thickness(T) is 5m, Nvalue is 6～8. ② 2nd layer is sandy clay, T=7m, N=10～20. ③ 3rd layer is sand, T=5m, N=18～19. ④ 4th layer is clay, T=3m, N>50. There is a possibility for spread foundation (without pile), because lower level is good bearing layer.	According to boring data No.111, No.122 which are near the candidate site, rough description is as follows: ① 1st layer is clay, thickness(T) is 2m, Nvalue is 6. ② 2nd layer is clay, T=5m, N=24. ③ 3rd and 4th layer is sandy clay with gravel, T=29 m, N=19～24. There is a possibility for spread foundation (without pile), because lower level is good bearing layer. Neighboring factory Vina-Kyoei has been constructed without pile.	According to boring data of SIKA factory area, at the center of Industrial Zone, rough description is as follows: ① 1st layer is sandy clay, thickness(T) is 3m, Nvalue is 8. ②2nd layer is clay with gravel, T=7m, N=27～28. ③3rd layer is clayey sand, T=3m, N=20. ① 4th layer is clay, T=7m, N=17～18. There is a possibility for spread foundation (without pile), because lower level is good bearing layer.
	2.1.4 Other		Under construction, candidate site at present is a wood land.	Candidate site at present is a wood land.
2.2 Water supply	2.2.1 Actual state	Supply capacity is 2000m^3/day obtained from well in the IZ.	Supply capacity is 2,000 m^3/day obtained from well, 3km from the IZ.	Supply capacity is 8,000m^3/day obtained from well in the IZ.

Item \ Name of site		AMATA	PHU MY	NHON TRACH
	2.2.2 Future plan	More than 3000m³/day of water volume will be supplied from Water department of Dong Nai province with actual capacity of 15000m³/day as water consumption increases in the IZ.	Water supply capacity will be increased to 10,000 m³/day in the first stage and 20,000 m³/day in the second stage in accordance with increase of water consumption in the IZ.	Supply capacity will be increased to 60000m³/day in the development plan
2.3 Electric power supply	2.3.1 Actual state	110kV power is received from Long Binh substation with 2 lines. 1 set of 40MVA transformer and 6.5MW on-site generator (AMATA power) operates to distribute power to the IZ at 22Kv	110kV power is received from Phu My power plant at Phu My 1-A power station with 2 set of 40MVA transformers which operates to distribute power to the IZ at 22kV.	110kV power is received from Phu My power station and Long Binh substation . 1 set of 40MVA and 16MVA transformer operates to distribute power to the IZ at 22kV
		110kV power receiving is required in cold rolling because of large volume of power consumption and big power fluctuation. Power supply capacity at each candidate IZ : - Long Binh SS is 375MVA - Phu My PP is 500MVA		
	2.3.2 Future plan	1 set of the same capacity of transformer will be added. 120MW in total capacity of generators (AMATA power) will be planned.	220kV power will be able to be supplied from Phu My power plant. 1 set of 63MVA transformer will be installed (Phu My 1-B power station) by the year 2005 to distribute 22kV power to the IZ. 20MW generator in 1st stage will be put into operation by 2001 and 80MW in total capacity at final stage will be planned on BOT system in the IZ.	New substation, named Long Thanh substation, with 220kV power receiving from Long Binh substation, and Ham Thuan hydro power and Phu My power plant will be installed in the IZ. 2 sets of 250 MVA transformers in the substation to step down 220kV power to 110kV to interconnect the existing substation are planned.
2.4 Fuel gas	2.4.1 Actual state	LPG and Heavy oil as fuel will be procured by the Project owner.	LPG and Heavy oil as fuel will be procured by other Project owner. As an alternative plan, fuel will be supplied from existing gas station installed in the IZ.	LPG and Heavy oil as fuel will be procured by other Project owner. As an alternative plan, existing gas pipe line installed along national road of route 51, 4km far from the IZ, may supply fuel.
	2.4.2 Future plan	Not received	Not received	Not received
2.5 Tele-communi-cation	Capacity (lines)	1200	Concrete data were not received. But capacity of the existing exchange is expected to have no problem	500
	In current use(lines)	60		200

Item \ Name of site			AMATA	PHU MY	NHON TRACH
2.6 Port			Useful ports are as follows: ① Phu My port (40km) ② Go Dau port (37km) Sai gon port (32km)	Useful ports are as follows: ① Phu My port (1.5km) ② Go Dau port (10km)	Useful ports are as follows: ① Phu My port (22km) ② Go Dau port (15km)
			○Summary of port specification ①Phu My port: <draft> 12～13m; <Max DWT> 60,000t; <length of berth> 300m; <loading facilities> None ②Go Dau port: <draft> 6.5～10.5m; <Max DWT> 12,000t; <length of berth> 120m; <loading facilities> None ③Sai gon port: <draft> 8.5～13m; <Max DWT> 25,000～35,000t; <length of berth> 132～207m; <loading facilities> 5～100tCr		
2.7 Waste water treatment	2.7.1 Actual state		1,000 m^3/day	-	-
	2.7.2 Near Future plan		4,000 m^3/day	-	4,000 m^3/day (June 2000)
	2.7.3 Future plan		In accordance with demand	18,000 m^3/day (2002)	12,000 m^3/day
2.8 Environ-mental issue	2.8.1 Waste water		①Discharging to the Dong Nai River which is used for sources of domestic water supply for HCM city. ②Discharge standards are almost the same as Vietnam standard "A", the most strict one.	①Discharging to the Dong Tranh River which is <u>not</u> used for sources of domestic water supply. ② Discharge standards 1)Vietnam standard "C" : From CRM to waste water treatment plant in the IZ 2)Vietnam standard "B": To the Dong Tranh River after treatment ③Discharging point to the Dong Tranh River is more downstream side than Nhon Trach IZ. Namely there is less chance to be used for domestic water.	①Discharging to the Dong Tranh River which is <u>not</u> used for sources of domestic water supply. ②Discharge standards are the same as Vietnam standard "B". ③Discharging point to the Dong Tranh River is more upstream side than Phu My IZ. Namely there is more chance to be used for domestic water.
	2.8.2 Waste gas		Should follow AMATA emission standards, middle position between "A" and "B".	Might follow Vietnam emission standards "B" for new plants. It needs to be confirmed again.	
	2.8.3 Noise		There is no noise standards for IZs in Vietnam standards. So should follow certain foreign standards for IZs, for example Japanese standards.		
	2.8.4 Landfill disposal area	Actual	Not exist	Not exist	Exist
		Future	Possible	Possible	Possible

Item \ Name of site		AMATA	PHU MY	NHON TRACH
	2.8.5 Incineration plant	Use out-side company		
	2.8.6 Scale, sludge treatment	No plan	There is a plan. Vina-Kyoei has a plan of EAF.	No plan
	2.8.7 Application for the Project	The Project belongs to the category 1 in the Circular No.490/1998/TT-BKHCMT. But the "Environmental Impact Assessment Report" is not required, because those IZ have been approved by MOSTE. Only the "Application for Registration for Securing Environment Standards" is required.		

< Results >

1. There is no significant problem in 3 candidate sites.

However,

2. There are some advantages in Phu My.
   * Near the Phu My port.
   *Lower transportation cost of hot rolled coils.
   * Suitable for heavy industry.
   A large power plant, a natural gas station and Vina Kyoei have been in operation in Phu My.
   On the other hand, existing companies in Amata and Nhon Trach are almost those of light industries.
   *High expandability.

2. Soil Condition

(1) Fig. VIII-2-1 shows boring data at three candidate sites.
(2) Soil characteristics of three candidate sites are mainly clay and sandy clay.
(3) N value is almost constant along the depth of soil layer and the bearing capacity is sufficient for foundation of the new cold rolling mill complex.

For instance, soil characteristics, thickness of layer and N values at PHU MY are a follows ;

(1) The first layer (GL～GL-2m) is clay. N value is 6.
(2) The third layer (GL-7m～GL-24m) is sandy-clay with gravel. N value is 19
(3) The second layer (GL-2m～GL-7m) is clay. N value is 24.
(4) The fourth layer (GL-24m～GL-36.5m) is sandy-clay. N value is 24.

BORING DATA

AMATA

Bore hole No. : H4

Layer	Depth (m)	Thickness (m)	Soil	Sample depth	Blow count
1	5.0	5.0	clayey sand	2.0-2.5	6
					8
				4.0-4.5	8
					15
					20
2	12.0	7.0	sandy clay		12
					17
				8.0-8.5	18
					17
					19
					20
					19
3	17.0	5.0	sand	12.0-12.5	20
					19
					18
				16.5-17.0	19
					19
4	20.0	3.0	clay	18.5-19.0	65
					50
					61

Diagram of SPT: 5 10 20 30 40 50 60

PHU MY

Bore hole No. : PM111

Layer	Depth (m)	Thickness (m)	Soil	Sample depth	Blow count
1	2.0	2.0	clay	1.3-1.5	6
2	7.0	5.0	clay	3.3-3.5	24
3	24.0	17.0	sandy clay with gravel	9.3-9.5	19
4	36.5	12.5	sandy clay	30.0-30.6	24
5	37.5	1.0	clay		
6	40.0	2.5	clayey sand	38.0-38.2	24

Diagram of SPT: 5 10 20 30 40 50 60

NHON TRACH

Bore hole No. : S8

Layer	Depth (m)	Thickness (m)	Soil	Sample depth	Blow count
1	3.0	3.0	sandy clay	2.0-2.6	8
2	10.0	7.0	clay with gravel	4.8-5.0	28
				7.8-8.0	27
3	13.0	3.0	clayey sand	10.8-11.0	20
4	20.0	7.0	clay	14.0-14.2	17
				16.8-17.0	18
				19.3-19.5	17

Diagram of SPT: 5 15 20 30 45 50 60

Fig. Ⅵ-2-1 Boring Data

3. Utility

3.1 General

The new cold rolling mill (CRM) with annual production of around 250,000 tons consumes such utilities as electric power, industrial water, fuel, nitrogen gas and hydrogen gas. Consumption volumes of these utilities are estimated as shown in Table VIII-3-1.

Table VIII-3-1 Estimated Consumption Volume of Utility

Utility	Averaged consumption	Maximum consumption
Electric power	—	15 MVA
Industrial water for make-up	140 Nm^3/h	—
Fuel	440 Nm^3/h	700 Nm^3/h
Nitrogen gas	25 Nm^3/h	200 Nm^3/h
Hydrogen gas	25 Nm^3/h	60 Nm^3/h

Note: Fuel is assumed to be LPG.

The supply capacity and development plan of the candidate sites, Amata IZ, Phu My IZ and Nhon Trach IZ, for each utility as shown in Table VIII-3-1 have been investigated. As the electricity is a matter covering the wide areas, a detailed investigation on present situation in South Viet Nam has been made.

3.2 Electric Power Supply

3.2.1 Requirement for Power Distribution

The estimated power consumption in CRM operation is average power of 7 MVA, maximum hourly power of 15 MVA and peak power of 20 MVA. Thus, a big power fluctuation as well as large power consumption is expected and large quantity of harmonic is generated as well. Due to these there exists a possibility of troubles such as abnormal voltage drop in power distribution system. CRM of the size of this project requires a huge capacity of electric power source to prevent serious troubles in the power distribution system and to keep stable operation.

Main transmission lines in Viet Nam use 220 kV and 110 kV system as the transmission voltage. 22 kV is used for distribution voltage to supply power to factories in the industrial zone. For the power of the new cold rolling mill, 220 kV or 110 kV power receiving system should be adopted due to the abovementioned reason.

3.2.2 Present Situation of Power Distribution in South Viet Nam

Fig.VIII-3-1 shows 220 kV and 110 kV main transmission system including power plants in South Viet Nam. Most of the power plants are interconnected to each other and connected to 500kV Phu Lam SS via main substations, Long Binh SS and Nha Be SS, through 220 kV transmission line. Phu Lam SS interconnects power generated and consumed in South Viet Nam with Middle and North Viet Nam.

Fig.III-3-1 also shows a development plan of new 220 kV transmission line with total length of approximately 330 km by 2 lines which will be completed by the end of 2000 in accordance with reinforcement of the power plants.

Power to each candidate site is supplied with 110 kV transmission lines from Long Binh SS and Phu My PP where 220 kV power is stepped down to 110 kV by transformers as shown in Table VIII-3-2. New substation named long Thanh SS has been planned to meet the increase of power demand in Dong Nai Province, Baria Vung Tau Province, Ho Chi Minh city and their surrounding areas. With regard to short circuit capacity in the power distribution system, actual maximum value at 110 kV bus of Phu My power plant is 29kA and at Nha Be substation is 30 kA.

Table VIII-3-2 shows power supply capacity of main substations to distribute power to regions including the candidate sites.

Table VIII-3-2 Power Supply Capacity of Main Substations

Name of substation	Tension (kV)	Transformer capacity (MVA)	Remarks
Phu Lam	500/220	900	Interconnection between South Viet Nam and Middle ,North Viet Nam
Long Binh	220/110	375	Power supply to regions including candidate IZ
Phu My PP	220/110	500	Ditto above
Long Thanh	220/110	250 (at first stage)	Under planning (construction start on May 2000)

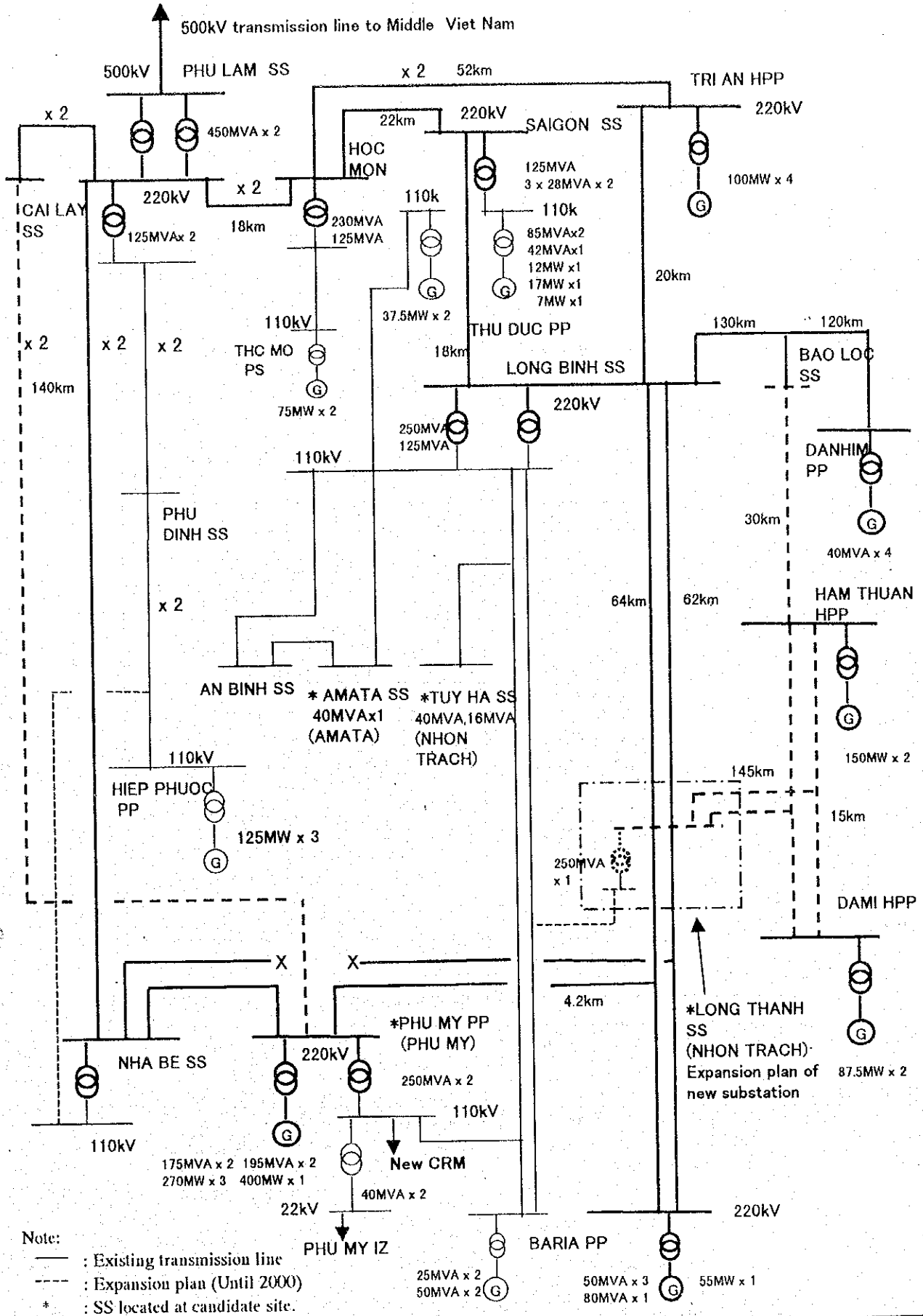
No problem is expected in supplying the power to the planned CRM from the existing power distribution system because existing system has sufficient supply capacity and redundancy system.

3.2.3 Power Consumption and Generation in South Viet Nam

Table VIII-3-3 shows actual power consumption from 1995 to 1999 in South Viet Nam and Table VIII-3-4 shows existing and under construction power plants in South Viet Nam.

Table VIII-3-3 Actual Power Consumption in South Viet Nam

Year	Total power consumption (Gwh)	Max. power demand (Mw)	Load factor (%)
1995	6,700	1,123	68.1
1996	7,878	1,307	68.8
1997	8,956	1,484	68.9
1998	10,362	1,717	68.9
1999	11,588	1,917	69.0



Note:

——— : Existing transmission line
---- : Expansion plan (Until 2000)
* : SS located at candidate site.
HPP : Hydro power plant
PP : Power plant
SS : Substation
CRM : Cold rolling mill

Fig. VIII-3-1 220kV/110kV Main Power Distribution System in South Viet Nam

Table VIII-3-4 Existing and Under Construction Power Plants

Name of plant		Capacity	Number of unit	Remarks
Tri An HPP		100 MW	4	
Thac Mo PP		75 MW	2	
Phu My PP		195 MVA	2	
		175 MVA	2	
		270 MW	3	Under construction(GT)
		400 MW	1	Under construction(ST)
Can Tho PP		68 MW	1	
		32 MW	1	
Hiep Phuoc PP		125 MW	3	
Ba Ria PP		55 MW	1	Under construction
		80 MVA	1	
		50 MVA	5	
		25 MVA	2	
Song Pha PP		9 MVA	-	Total capacity
Dan H PP		40 MVA	4	
Thu Duc PP		37.5 MW	2	
		42 MVA	1	
		85 MVA	2	
		12 MW	1	
		17 MW	1	
		7 MW	1	
Ham Thuan HPP		150MW	2	Under construction
Da Mi HPP		87.5 MW	2	Under construction
Con Don HPP		36 MW	2	Under construction BOT project
Total power generation	Existing plant	2412 MW		
	Available output	1894 MW		In 1999
	Under Construction	1807 MW		
Estimated total capacity of power generation in development plan in South Viet Nam until 2010		4173 MW		Excluding under construction plant

Note: MW : To be converted from MVA by pF=0.85 assumed
HPP : Hydro power plant
PP : Power plant
GT: Gas turbine
ST: Steam turbine
BOT: Build Operation Transfer

Electric power required in South Viet Nam is normally supplied from power plants in South Viet Nam. However, comparing the power supply and demand in 1999 in South Viet Nam as shown in Tables VIII-3-4 and VIII-3-3 respectively, the maximum power demand exceeds available power generation by a small quantity. This means a little shortage of power generated in South Viet Nam. In this case, however, power to fill this gap is supplied from Middle and North Viet Nam through 500 kV Phu Lam SS. Accordingly, there seems to be no fatal problem of power supply to the candidate sites in South Viet Nam.

As for development plan of power generation, plants described as "under construction" in Table VIII-3-4 will be put into operation by the end of 2000 to 2002, which means that the total power generation increases by 75% after completion of the construction. Furthermore, there is a plan to increase 99% of power generated in South Viet Nam by 2010.

3.2.4 Electric Power Supply in Each Candidate Industrial Zone

(1) Amata IZ.

a) Present situation

There is a substation in the industrial zone which receives 110kV power from Long Binh SS with two lines. 40 MVA transformer and 6.5 MW on-site diesel generator owned by Amata Power operate to distribute power at 22 kV to factories.

b) Future plan

Increase of one set of transformer with the same capacity as the existing one and 120 MW in total capacity of generators using natural gas are planned.

(2) Phu My IZ.

a) Present situation

Existing Phu My 1-A power station receives 110 kV power which is stepped down to 22 kV with two sets of 40 MVA transformers and distributes power to the IZ.

b) Future plan

Phu My 1-B power station has a plan to install one set of 63 MVA transformer by 2005 to distribute 22 kV power to the IZ. 220 kV power will be able to be supplied from Phu My Power plant to the IZ if necessary. 20 MW generator in the first stage will be put into operation by 2001 and 80 MW in total capacity at the final stage is planned on BOT system.

(3) Nhon Trach IZ

a) Present situation

110 kV power is received at Tuy Ha SS located in Nhon Trach IZ from Phu My power plant and Long Binh SS. 40 MVA and 16 MVA transformers operate to distribute power at 22 kV to factories.

b) Future Plan

New substation named Long Than SS with 220 kV power receiving from Long Binh SS, Ham Thuan hydro power plant and Phu My power plant will be installed in the IZ. Two sets of 250 MVA transformers at the substation step down 220 kV power to 110 kV to interconnect with the existing substations.

3.3 Water Supply

3.3.1 Requirement for Water Supply

Table VIII-3-5 shows analysis data of water supply for each industrial zone. According to the data, water is supplied after being treated for drinking usage.

Table VIII-3-5 Analysis Data of Water Supply

No	Parameters & substance	Unit	Industrial Zone				TCVN 5501-1991	TCVN 5502-1991	The Decision No.505 BYT/QD Ministry of Health
			Amata		Nhon Trach	Phu My			
			Inside	Outside					
1	Clearness	cm	>100	>100	30	30	min 100	min 80	> 30
2	Color		4	5	0	0	max 5	max 40	< 10
3	Odor & taste at 20C		Nil	Without strange odor, taste	0	0	Without strange odor, taste	Without strange odor, taste	0
4	SS	mg/l	Nil	<1	-	0.4	max 10	max 30	-
5	pH value	-	7.5	7.1	6.7	6.73	6.0-8.5	6.0-8.5	6.5-8.5
6	Total hardness as $CaCO_3$	mg/l	60	28.0	4.98	4.98	max 300	max 600	< 500
7	COD	mg/l	0.3	0.6	0	0	max 2	max 5	< 2
8	Chlorine content	mg/l	0.87	0.74	-	0.8	max 0.3	*	
9	Chloride content	mg/l	3.4	5.2	11.2	17.55	max 300	max 500	< 250
10	Nitrite content	mg/l	0.02	0.01	0	0	max 0.1	max 0.1	0
11	Nitrate content	mg/l	14.0	8.7	0.01	0	max 5.0	max 50.0	< 45
12	Ammonia content	mg/l	-	Nil	0	0	max 3.0	max 3.0	< 3
13	Sulfate content	mg/l	-	9.0	1.69	2.88	max 250	max 250	< 400
14	Sulfur	mg/l	-	-	0	0	-	-	0
15	Calcium content	mg/l	21	5.0	-	1.2	max 75	*	-
16	Magnesium content	mg/l	3.4	1.5	-	1.73	max 75	*	-
17	Iron content	mg/l	0.03	0.07	0.02	0.12	max 0.3	max 1.5	< 0.3

Note * : Not defined in the standard - : Not mentioned in the analysis reports

There is no difference of data between the rainy season and dry season in Phu My IZ with stabilized conditions.

3.3.2 Water Supply in Each Candidate Industrial Zone

(1) Amata IZ

a) Present situation

Water supply station with a capacity of 2,000 m^3/day which pumps up underground water in the IZ has been operated to supply potable water after the treatment.

b) Future plan

Water of more than 3000 m^3/day in quantity will be supplied from Water Department of Dong Nai Province with an actual capacity of 15,000 m^3/day in case the water consumption in the IZ increases. Dong Nai Province has a plan to increase the capacity of water supply up to 30,000 m^3/day in the future.

(2) Phu My IZ

a) Present situation

Water supply station managed by Ba Ria Vung Tau water supply company, located 3 km far from the IZ, provides potable water with a capacity of 2,000 m^3/day obtained from well.

b) Future plan

The water supply station has a plan to increase supply capacity up to 10,000 m^3/day in the first stage and 20,000 m^3/day in the second stage in accordance with the increase of water consumption in the IZ. Furthermore, according to the master plan of Phu My new urban development and water supply planning of National route 51, there exists a development plan of the underground water near the IZ with a capacity of 340,000 m^3/day.

(3) Nhon Trach IZ

a) Present situation

Water supply plant with a capacity of 8,000 m^3/day which pumps up underground water in the IZ has been operated to supply potable water after the treatment.

b) Future plan

The supply capacity will be increased up to 15,000 m^3/day by 2000 in the second stage and 60,000 m^3/day in the final stage.

3.4 Fuel Supply

3.4.1 Present Situation of Natural Gas Supply and Demand in South Viet Nam

(1) Consumption from 1995 to 1999

Existing Bach Ho and Rong well, located in the offshore of Vung Tau, have supplied natural gas (associated gas) since May 1995. The amount of consumption and main users are shown in Table VIII-3-6.

Table VIII-3-6 Actual Consumption and User of Natural Gas unit: million Nm^3/year

User	1995	1996	1997	1998	1999
Ba Ria power plant	300	300	300	400	400
Phu My power plant	-	-	-	300	400
Dinh Co LPG plant	-	-	-	-	150
others			100	100	100
Total	300	300	400	800	1,050

Natural gas (associated gas) having calorific value of approximately 9,000 kcal/Nm^3 in dry gas and approximately 10,400 kcal/Nm^3 in wet gas is supplied and contains methane of around 85% of volume and hydrocarbon (C3-C4).

(2) Development plan and expected demand from 2000 to 2010

Table VIII-3-7 shows the expected maximum supply capacity of the natural gas to be developed and Table VIII-3-8 shows the expected natural gas demand.

Table VIII-3-7 Expected Maximum Capacity to be Developed unit: million Nm^3/year

Gas zone	2000	2002	2005	2010
Cuu Lung basin: Bac Ho, Rang, Dong and Ruby wells	1,500	2,000	2,000	1,500
Nam Con Son basin: Lan Tay, Lan Do, Hai Thach, Moc Tinh wells	-	3,000	4,000	6,000
Red river basin	-	-	-	-
Malay – Tho Chu basin	-	-	1,000	2,000
Total	1,500	5,000	7,000	12,500

Table VIII-3-8 Expected Natural Gas Demand unit: million Nm^3/year

Production branch	2000 to 2003	2005	2010
Power plant	1,400	3,000	5,600
Fertilizer(urea)	350	700	1,100
Methane	-	600	600
LPG	300	300	300
Others	100	300	400
Total	2,150	4,900	8,000

There is a possibility to supply the natural gas for new CRM because of the sufficient capacity expected.

3.4.2 Present Situation of LPG Production in South Viet Nam

Dinh Co LPG plant in Ba Ria Vung Tau province started to produce LPG from associated gas (natural gas) in 1999 with the annual production capacity of 300 kton. On the other hand, the domestic consumption is estimated to be approximately 82 kton per year in 2000 and approximately 175 kton in 2010. Considering the said capacity and the demand prediction, there seems to be no problem with regard to the supply of LPG to the new CRM.

3.4.3 Fuel Supply in Each Candidate Industrial Zone

(1) Amata IZ

LPG and Heavy oil as fuel will be procured in the market by CRM itself.

(2) Phu My IZ

LPG and Heavy oil as fuel will be procured in the market by CRM itself. As an alternative, existing natural gas station located in the IZ can be used for the supply of the fuel to the IZ.

(3) Nhon Trach IZ

LPG and Heavy oil as fuel will be procured in the market by CRM itself. As an alternative, existing natural gas pipe line installed along the national road of Route 51, 4km far from the IZ, can be used for the supply of the fuel to the IZ.

3.5 Nitrogen Gas and Hydrogen Gas Supply

Viet Nam Japan Gas CO., LTD. is the only company which can provide nitrogen gas and hydrogen gas in South Viet Nam. However, hydrogen gas is not produced at present in Viet Nam because there exists no demand.

(1) Production capacity of Nitrogen gas

- Production capacity : 1,000 Nm^3/h (for nitrogen production only)
  500 Nm^3/h (in case of 500 Nm3 production of oxygen gas)
- Purity : 99.999%
- Storage tank : 100 ton for liquid nitrogen gas and 100 ton for liquid oxygen gas
- Transportation : 10,000 Nm^3 tank truck

(2) Actual sales volume

- Nitrogen gas : 50,000 Nm^3/month
- Oxygen gas : 50,000 Nm^3/month

3.6 Unit Price of Utility

(1) Electric power

Unit price for 110 kV or more receiving power of domestic manufacturers is as follows.

- Normal time (4 to 18 o'clock) : 770 VND/kWh
- Off-peak time (22 to 4 o'clock) : 374 VND/kWh
- Peak time (18 to 22 o'clock) : 1364 VND/kWh

There is no demand charge (monthly charge) system.

(2) Water

Table VIII-3-9 shows unit price of water in each IZ.

Table VIII-3-9 Unit Price of Water in Each IZ

Name of IZ	Amata	Phu My	Nhon Trach
Unit price (VND/m3)	5,004	4,140	4,200

Note: Unit price of Amata is 36 cent/m^3. 1US$ = 13900VND

(3) Fuel

Unit price of fuel is as follows.

- LPG : 6394 VND/kg in March, 4700 VND/kg in July
- Heavy oil : 1930 VND/kg
- Natural gas : 1-3US$/million BTU

(4) Nitrogen gas

Unit price and monthly charge are as follows.

- Unit price : 0.5 US$/$Nm^3$
- Monthly charge : 1,700US$/month (for storage tank construction and operation in new CRM)

(5) Hydrogen gas

Unit price and monthly charge are as follows

- Unit price : 0.2 US$/$Nm^3$
- Monthly charge : 40,000 US$/month (for on-site plant construction and operation in new CRM)

4. Telecommunication Equipment

4.1 Comparison of Candidate Sites with regard to Telecommunication Equipment

Table VIII-4-1-1 shows the comparison of candidate sites (AMATA, PHUMY, NHON TRACH) with regard to telecommunication equipment.

Table VIII-4-1 Comparison of Telecommunication Equipment

	AMATA	PHU MY	NHON TRACH
Capacity of exchange (lines)	1200	Concrete data were not available	500
lines in use	60	Concrete data was not available	200
Location of exchange	1km from industrial zone	2km from industrial zone	1.5km from industrial zone
Registration fee (1 lines)	1,200,000VND	1,200,000VND	1,200,000VND
period from registration to actual use.	Normally 7 days~ 10 days	Normally 7 days~ 10 days	Normally 7 days~ 10 days

For the cold rolling mill complex about twenty lines are required.

All of three candidate sites (AMATA, PHU MY, NHON, TRACH) have no problem with regard to the capacity and location of exchange, registration fee and period from registration to actual use. In PHU MY concrete data (capacity of exchange etc.) were not available, however, considering the number of lines required there should be no problem.

4.2 Present Situation of Telecommunication Equipment and Its Projection

Table VIII-4-2 shows the present situation of telecommunication equipment in Viet Nam and Ba ria-Vong Tau Province.

Table VIII-4-2 Number of Telecommunication Equipment

<Viet Nam> UNIT : 1000 lines

	1995	1996	1997	1998	1999
Capacity of exchange (lines)	1,2024.0	1,581.3	2,152.0	2,714.7	3,278.7
lines in use	768.0	1,186.0	1,614.0	2,036.0	2,459.0

<Ba ria-Vong Tau province> UNIT : 1000 lines

	1995	1996	1997	1998	1999
Capacity of exchange (lines)	14.9	23.3	33.5	43.1	54.3
lines in use	11.2	17.3	25.1	32.3	40.7

Table VIII-4-3 shows the future projection of the telecommunication equipment in Viet Nam, in Ba ria-Vong Tau province and in Dang Nai province.

Table VIII-4-3 Projection of Telecommunication Equipment

<Viet Nam> UNIT : 1000 lines

	2000	2001	2002	2003	2004	2005
Capacity of exchange (lines)	4,078.7	4,669.3	5,261.3	5,813.3	6,329.3	6,820.0
lines available	3,059.0	3,502.0	3,946.0	4,360.0	4,747.0	5,115.0

<Ba ria-Vong Tau province> UNIT : 1000 lines

	2000	2001	2002	2003	2004	2005
Capacity of exchange (lines)	69.1	81.7	93.2	103.2	111.9	119.9
lines available	51.8	61.3	69.9	77.4	83.9	89.9

<Dong Nai province> UNIT : 1000 lines

	2000	2001	2002	2003	2004	2005
Capacity of exchange (lines)	127.1	151.1	173.7	141.7	215.1	233.7
lines available	95.3	113.3	130.3	106.3	161.3	175.3

Three candidate sites are located either in Ba ria-Vong Tau or in Dong Nai province. The number of telecommunication in these provinces in 2005 is expected to increase approximately by 70%. There seems to be no problem with regard to the capacity of telecommunication for the planned cold rolling mill complex.

5. Transportation

5.1 General

The main conditions of this project with regard to transportation are as follows ;

(1) Production is 200,000-250,000 tons/year.
(2) Hot coil as raw material are all imported.
(3) Hot coil weight is average 20 tons (maximum 25 tons).
(4) Products of the mill are cold rolled coil and sheet.
(5) Most of the customers are located in southern Viet Nam.

The candidate sites for the mill are AMATA, NHON TRACH and PHU MY. The preliminary study in Japan revealed six ports available for the import of hot coils, namely Phu My Port, Go Dau Port, Saigon Ports (Saigon Port, Bong Sen Port), New Saigon Port, Dong Nai Port and Vung Tau Port. After the discussions with VSC, it became clear that Dong Nai Port and New Saigon Port were not available because the former was a local port and too small and the latter was an army port. Accordingly, the ports to be surveyed became four. All the ports were confirmed to be available for the import of hot coils, however, there existed a difference in the draft. In addition, at the site survey all the roads from the ports to the candidate sites were examined by driving a car. All the roads from the ports to the candidate sites were well-surfaced and well maintained except PHU MY Industrial Zone where the construction work was being made. The traffic regulations were also investigated during the first site survey.

The results are described in detail below, and the difference among the ports and the sites is evaluated from a viewpoint of transportation.

5.2 Results of Site Survey with regard to Ports and Roads

5.2.1 Ports

(1) Conclusions

The available ports for each candidate site are listed in Table VIII-5-1 with the distance between the sites and ports by roads.

Table VIII-5-1 Available Ports for Each Candidate Site and Distances between Them

Site	AMATA	PHU MY	NHON TRACH
Ports	Saigon Ports (32 km) Go Dau Port (37 km) Phu My Port (40 km) Vung Tau Port (90 km)	Phu My Port (1.5 km) Go Dau Port (10 km) Vung Tau Port (50 km) Saigon Port (70 km)	Go Dau Port (15 km) Phu My Port (22 km) Saigon Port (60 km) Vung Tau Port (60 km)

The distance between PHU MY Industrial Zone and Phu My Port is the shortest in all cases, followed by that between PHU MY industrial Zone and Go Dau Port. From these figures PHU MY Industrial Zone is the most convenient site for the import and transportation of hot coils.

All ports in the table cane be used for the import of hot coils. The cargo vessels of 5,000 to

20,000 DWT which are commonly used to transport the hot coils to Southeast Asia are able to use these ports. Phu My Port has the widest berth (12-13 m) and 60,000DWT vessel (PANA-MAX class) can enter. Saigon Ports have the second widest berth (8.5-13 m) among them, and vessels from 25,000 to 35,000 DWT can enter. Vessels of 12,000 DWT can enter to Go Dau Port (Draft 6.5-10.5 m), and Vung Tau Port has 6.2-8 m Draft berths. (Refer to Table VIII-5-2)

Table VIII-5-2 Port Specifications and Facilities

	Draft (m)	Max.DWT (mt)	Length of Berth (m)	Unloading Facilities	Future Plan by 2010 (projections)
Phu My Port	12-13	60,000	300	None	extend quay-200 m,shore crane Thi Vai Port
Saigon Ports	8.5-13	25,000-35,000	132-207	5-100 t Cr	
Go Dau Port	6.5-10.5	12,000	120	None	(New quay)
Vung Tau Port	6.2-8	(5,000-10,000)	120-250	10-75 t Cr	(International port)

*Vung Tau : Max.DWT is a presumed figure

No unloading facilities are installed at Phu My Port and Go Dau Port, where ship cranes are used to unload the cargo. Accordingly, ships rigged with the cranes large enough to unload hot coils should be chartered. Other functions of the ports are shown in Table VIII-5-3.

Table VIII-5-3 Functions of Port

	Working Hour	Warehouse	Experience in Handling Steel Products
Phu My Port	24 hrs	available	billet (Vina Kyoei)
Saigon Ports	24 hrs	available	coil, plate, etc.
Go Dau Port	24 hrs	none	billet (Vina Kyoei)
Vung Tau Port	24 hrs	available	no-information

The specific information of each port is described below in detail.

(2) Phu My Port (Baria-Serece Port)

1) Location and general information

a) Latitude : 10°35'00"N - 10°35'30"N
b) Longitude : 107°01'30"E - 107°02'02"E
c) Located in Phu My Port zone on Thi Vai River (Baria-Vung Tau province)
d) Commercial operation started in September 1996.
e) This port is the first joint venture operating privately in Viet Nam.
f) Main cargo: fertilizer (dry bulk), general cargo, minerals, steel
g) This port is the main port for VINA KYOEI for the import of billets.

2) Facilities
   a) Berth length : 300 m
   b) Draft : 12-13 m
   c) Max. displacement : 60,000 DWT (actual record : 54,615 DWT)
      (The depth of estuary of Thi Vai River is 9.5 m at the low tide, so large size vessels enter the port at high tide. There is 3.8 m tidal range.)
   d) Unloading facility : No shore crane. Mobile crane, 10 tons
      : The ship crane is used when heavy cargo is discharged.
      (The rail for gantry crane is to be installed on the berth as a provision.)
   e) Berth strength : 5 tons/sqm
   f) Open air storage : 2,500 sqm
   g) Warehouse : 6,500 sqm (18,000 mt)
   h) Customs : available
   i) Discharging hour : 24 hrs

3) Distance between port and sites by road
   a) AMATA : 22 km
   b) PHU MY : 1.5 km

4) Handling rate
   a) Hot Coil will be discharged by ship cranes.
   b) Cycle time of discharging will be 3 min.
   c) Discharging rate of steel: 6,849 tons/WWD (actual record)

5) Future plan
   a) Extend quay to 200 m
   b) Shore crane (Gantry crane)
   c) Thi Vai Port

(3) Go Dau Port
1) Location and general information
   a) Latitude : 10°37'08"N - 10°39'30"N
   b) Longitude : 107°01'25"E - 107°01'58"E
   c) Located : upstream of Phu My Port on Thi Vai River (Baria-Vung Tau province)
   d) Main cargo : fertilizer(dry bulk), general cargo, timber, steel
   e) This port is the sub-port of VINA KYOEI, where billets are unloaded. 20,000 tons of billets were imported from Japan, Taiwan and China in 1999 with 6,000 to 7,000 t import lot. VINA KYOEI has experiences in exporting steel products from Go Dau Port. The steel products are transported from Go Dau Port to Saigon Port by barge and transmitted to the export ship there.
   f) The ports of Go Dau area are composed of public berth Go Dau Port (A, B berth) and Vedan wharf of Taiwan J.V.C.

2) Facilities
   a) Berth length : A berth, 86 m (LOA=120 m); B berth, 30 m
   b) Draft : 6.5-10.5 m
   c) Max. displacement: 12,000 DWT (actual record: 10,000 DWT)
   (The depth of estuary of Thi Vai river is 9.5 m at the low tide, so large sized vessels enter the port at high tide. There is 3.8 m tidal range.)
   d) Unloading facility : No shore crane. Mobile crane is available.
   : The ship cranes are used when heavy cargo is discharged.
   e) Open air storage : 5,000 sqm
   f) Warehouse : 720 sqm (fertilizer only)
   g) Customs : available
   h) Discharging hour : 24 hrs

3) Distance between port and sites by road
   a) AMATA : 37 km
   b) NHON TRACH : 15 km
   c) PHU MY : 10 km

4) Handling rate
   a) Hot coils will be discharged by ship crane.
   b) Discharging rate of steel : 2,500 mt/day, actual record of Vina Kyoei's billet)

5) Other remarks
   This port seems to be inferior to other ports in operation quality because there was much fertilizer spilt on the berth at the time of survey. Therefore, a special supervision is required in discharging hot coils to avoid handling defects.

(4) Saigon Ports (Ho Chi Minh City Ports)
1) General information
   There are 10 ports in Ho Chi Minh City Ports. The functions of each port are listed in Table VIII-5-4.

Table VIII-5-4 Functions of Ho Chi Minh City Ports

Port name	Functions
Saigon Port (Nha Rong, Khanh Hoi, Tan Thuan I II)	General cargo. steel.
Bong Sen Port (Lotus Port)	General cargo. steel.
Ben Nghe Port	Container, general cargo (bulk).
Saigon New Port	Army port. container, timber.
Ba Son Port	Repair of ship.
VICT Port	Container.
Vegetable Port	Fresh vegetable and fruits.
Saigon Petro Port	Oil.
PETEC Terminal Port	Oil
Nha Be Oil Terminal Port	Oil.

From preliminary study in Japan and through discussions held in Viet Nam, two ports namely Saigon Port and Bong Sen Port were selected for the survey.

2) Saigon Port

2-1) Location and general information

a) Latitude : 10°50' 00" N

b) Longitude : 106°45' 00" E

c) Located upstream of Saigon river

d) Saigon Port has more than 130 years of history and is one of the ports having the highest throughput in Viet Nam. Saigon Port is controlled directly under the management of Viet Nam National Shipping Line. This port is divided into 4 terminals as mentioned below.

d-1) Nha Rong Terminal

d-2) Khanh Hoi Terminal

d-3) Tan Thuan I

d-4) Tan Thuan II

e) The cargo covers a wide range such as general cargo, cargo in bags and container.

f) Saigon-Vung Tau access channel

Vessels go into Nga Bay River from offshore of Vung Tau, go through the upstream of Long Tao River, come into Nha Be River (Dong Nai River) and go up Saigon River which is the tributary of Nha Be River.

(Large size vessels go by a roundabout route described above because down stream of Dong Nai River and estuary of it called Cua Soirap is shallow.)

g) Maximum displacement which can enter the port is 35,000 DWT.

2-2) Facilities

The facilities of each Terminal in Saigon Port are shown in Table VIII-5-5. These have the total area of 50 hectares and 15 wharves totaling 2,667 m in length.

Table VIII-5-5 Facilities of Each Terminal in Saigon Port

	Nha Rong	Khanh Hoi	Tan Thuan I	Tan Thuan II
Quay No.	K1～K4	K5～K10	K11～K12 (A,B)	1
Berth Length	139～207 m	160～194 m	132～204 m	210 m
Draft *1	7.5～8.7 m	7.5～9.3 m	9.5 m	9.5 m
DWT *2	25,000 t	30,000 t	35,000 t	30,000 t
Crane	Max.30 mt× 2	Max.100 mt× 2	Max.80 mt× 2	6 mt× 2
Berth strength	2-4 t/sqm	4-10 t/sqm	6-10 t/sqm	6-10 t/sqm
Warehouse	8,680 sqm	46,504 sqm	17,683 sqm	2,100 sqm
Open storage area	7,240 sqm	42,669 sqm	57,700 sqm	18,000 sqm
Cargo	general cargo	general cargo	container, bulk	general cargo

*1 Draft=Depth (Low tide) −1 m *2 DWT : 35,000 t is restricted by channel (river) depth.

2-3) Distance between Saigon Port and three sites by road

a) AMATA : 32 km
b) NHON TRACH : 60 km
c) PHU MY : 70 km

2-4) Handling rate

a) Hot coils are to be discharged by mobile crane.
b) Discharging rate of steel : 700 to 1,000 tons/gang/day

2-5) Other remarks

a) The main road which connects Saigon Port with Industrial Zones is National Road Route No.1. The exit and entrance of Ho Chi Minh City (Saigon Port) to and from Industrial Zones on National Road Route No.1 is Saigon Bridge. Many cars and bikes rush into this bridge especially at commuting time, and furthermore all day long the bridge is a bottleneck of transportation of Route No.1. Saigon Bridge is now expanding its width, but it seems difficult to solve the bottleneck considering the present traffic jam.
b) There are 4 bridges along Route No.1 between Ho Chi Minh City and Bien Hoa. The total truck weight limit of these bridges are 20 to 25 tons.
c) The traffic regulations prohibit trucks from entering the city during 6am-9am, and 4pm-7pm. So, many trucks have to wait out of Saigon Bridge interrupting the transportation twice a day. After the regulations clear trucks start to move slowly.
d) There were steel products on the berth of Saigon Port, which were imported from KAZAKHSTAN.

3) Bong Sen Port (Lotus Port)

3-1) Location and general

a) Latitude : 10°50' 00" N
b) Longitude : 106°45' 00" E
c) Located upstream of Saigon river (Ho Chi Minh City)

d) Main cargo : general cargo, container, steel
e) This port is a joint venture port run by Vietrans (Viet Nam), Blasco (Ukraine) and port berth operation company SSA (USA).
f) Access channel to this port is same as Saigon Port.
g) Maximum displacement which can enter the port is 28,000 DWT.

3-2) Facilities
a) Berth length : 150 m (LOA=230 m)
b) Draft : average 9.7 m
c) Max. displacement: 28,000 DWT
d) Unloading facility : No shore crane. Mobile crane, 10 tons.
: The ship crane is used when heavy cargo is discharged.
: 13ton fork-lift, 3×31 ton container fork-lifts are available.
e) Open air storage : 8,000 sqm
f) Warehouse : 3,500 sqm
g) Customs : available
h) Discharging hour : 24 hrs

3-3) Distance between port and sites by road
a) AMATA : 32 km
b) NHON TRACH : 60 km
c) PHU MY : 70 km

3-4) Handling rate
a) Hot coils will be discharged by ship crane.
b) Discharging rate of steel : 700-1,000 tons/day.

3-5) Other remarks
a) The main road conditions for transportation are same as Saigon Port.
b) Future plans are to build the second berth with 150m length and to create 60,000 sqm yard for containers.
c) There were lot of steel products from Japan in open storage yard of this berth.

(5) Vung Tau Port
1) Location and general information
a) Latitude : 10°20' 00" N
b) Longitude : 107°03' 00" E
c) Located near Dinh River Delta, 5 km from Vung Tau downtown. (Baria-Vung Tau province)
d) This port is commercial port and main cargoes are general cargoes, machinery, and equipment.

2) Facilities

a) Berth length : 120 m (Upstream pier)
: 150 m (Downstream pier)
(LOA=150 m)
b) Draft : 6.2-8 m
c) Max. displacement: (5,000-10,000 DWT) (presumed figure)
d) Unloading facility : No shore crane. Mobile crane of 10 to 75 tons is available.
: The ship crane is used when heavy cargo is discharged.
e) Open air storage : 8,000 sqm
f) Warehouse : 720+400 sqm
g) Customs : available
h) Discharging hour : 24 hrs

3) Distance between port and sites by road
a) AMATA : 90 km
b) NHON TRACH : 60 km
c) PHU MY : 50 km

4) Handling rate
a) Hot coils will be discharged by ship crane.

5) Future plan
First stage of the Project (Sao Mai - Ben Dinh port / Master Plan 2010) is as below.
a) Located near Vung Tau downtown in Ganh Rai bay.
b) Max. displacement: 60,000 DWT.
c) Wharf : 400 m for container
: 200 m for barges
: 200 m for oil

5.2.2 Roads

(1) Conclusions

The competent authority of national roads in Viet Nam is MOT and that of other general roads is Local Authority (People's Committee). 10% of all roads in Viet Nam are national roads and almost 80% of national roads are well-surfaced. For local roads, however, well-surfaced accounts for only 20%.

The main roads (trunk line: Route No.1 and No.51) are well-surfaced from Ho Chi Minh City to AMATA and Vung Tau, and the bridges are also well-maintained along these roads. Route No. 1 and No. 51 can be used for transportation of heavy cargo such as steel by truck. However, other general roads and byroads are not surfaced and not well maintained, and bridges are small and old. Accordingly, these general roads can not be used for transportation of heavy cargo by trucks.

The regulations of the main roads are shown in Table VIII-5-6. The load limit of 30 tons restricts the transportation of heavy hot coils.

Table VIII-5-6 Regulations of Roads

Name of Regulation	Route No. 1, & No. 51	Route No. 1 Near HCMC
speed limit	50 km/hr	50 km/hr
load limit	total 30 t	total 20 t - 25 t

There are traffic jam near HCMC and at the junction of Route No.1 and No. 51 in Bien Hoa. Especially during commuting time traffic jam is very heavy. These traffic jams are mainly caused by low speed vehicles such as bicycles, motorbikes and old hackneyed cars. Future plans are listed in Table VIII-5-7. According to these plans the traffic conditions of the area is expected to be improved for transportation of heavy cargo by truck.

Table VIII-5-7 Future Plans of Road in this Area

a. Construction of bypass road at Ho Chi Minh City
b. Expansion of route No. 51 from two-lane road to four-lane road between Bien Hoa and Vung Tau.
c. Construction of bypass road from Ho Chi Minh City to Long Thanh (near NHON TRACH)

(2) National Road No.1

This road is elongated up to 1,730 km from the Viet Nam - China frontier to Ho Chi Minh City. At the first site-survey, the National Road No. 1 in South Viet Nam which has much to do with this project is verified to be well-surfaced and maintained. The lane number of one side of Road No.1 in this area are two, and near HCMC the construction work is being made at Road No.1 to expand the lane number from two to six for one side. Other remarks are shown in Table VIII-5-8.

Table VIII-5-8 Remarks of National Road No. 1

Items	Remarks
a) Bottleneck of road No. 1	Saigon bridge
b) Load limit	20 - 25 t
c) Time regulations trucks are not allowed to enter HCMC	6am-9am 4pm-7pm

Many cars and bikes rush into Saigon Bridge especially at commuting time. Not only during commuting time but also all day long this bridge is a bottleneck of transportation of Route No.1. The construction work is being made now at Saigon Bridge to expand its width, but it seems difficult to solve the bottleneck considering the present traffic jam.

There are four bridges along Route No. 1 between Ho Chi Minh City and Bien Hoa. The total truck weight limit of these bridges are 20-25 tons. This restriction is to be considered when Road No. 1 is to be used to transport steel products such as hot rolled coils, cold rolled coils and other steel sheets.

(3) National Road No. 51

This road is elongated up to 100 km from Bien Hoa to Vung Tau. At the first site-survey, it was verified that this road is well-surfaced and maintained with two lanes for one side. Traffic of Road No.51 is not heavy now, but a traffic jam exists at the junction of Road No.1 and No. 51 in Bien Hoa.

There are some bridges along Route No.51 between Bien Hoa and Vung Tau, and the total truck weight limit is 30 tons. This restriction should be considered when Road No. 51 is to be used to transport steel products such as hot rolled coils, cold rolled coils and steel sheet.

5.3 Unloading and Transportation of Hot Coils

5.3.1 Unloading Capacity

(1) The results of the first site survey are shown in Table VIII-5-9. Analysis was made based on the overall capacity as there existed no detailed time study of unloading operations. The figures of Saigon Port are used to calculate transportation conditions because they are obtained from the actual operation of handling steel coils. Namely, unloading capacity is assumed to be 700 tons/gang/day.

Table VIII-5-9 Unloading Capacity of Ports

	Crane	Unloading Capacity	Coil Weight	Remarks
Saigon Port	Mobile	700 - 1,000 t/gang/day	10 t	cold coil
Go Dau Port	Ship	2,500 t/day	-	billet
Phu My Port	Ship	6,849 WWD	-	billet

WWD: Weather Working Day

(2) These figures are based upon direct discharge on truck. If there exists delay of trucks, unloading operation must wait for truck arrivals.

(3) Calculation results of handling time of unloading crane from the first site survey are shown in Table VIII-5-10. The handling time of unloading crane is assumed to be 6 min./coil. When three gangs are available, unloading capacity is 700×3=2,100 t/day.

Table VIII-5-10 Calculation Results of Handling Time of Unloading Crane

Assumptions and calculation results			Remarks
(1) Handling time of unloading crane	6	min/coil	Calculation result
(2) Cold coil weight	10	mts/coil	Surveyed
(3) Crane operating time	7	hr/gang/day	Assumption
(4) Crane not-operating time (lunch etc.)	1	hr/gang/day	Assumption
(5) Number of gang for unloading	1	gang/day	Assumption
(6) Crane operating rate	87.5	%	Calculation result
(7) Unloading crane (t/hr-operating)	100	t/hr-operating	Calculation result
(8) Net total unloading capacity (t/day)	700	t/day	Surveyed

(4) Calculation results of unloading capacity of 20 ton hot coils are shown in Table VIII-5-11. The unloading capacity is assumed 1,400 tons/day. When three gangs are available, unloading capacity is 1,400×3 = 4,200 t/day.

Table VIII-5-11 Calculation Results of Unloading Capacity of 20 ton Hot Coil

Assumptions and Calculation Results			Remarks
(1) Handling time of unloading crane	6	min/coil	Assumption
(2) Hot coil weight	20	mts/coil	Assumption
(3) Crane operating time	7	hr/gang/day	Assumption
(4) Crane not-operating time (lunch etc.)	1	hr/gang/day	Assumption
(5) Number of gang for unloading	1	gang/day	Assumption
(6) Crane operating rate	87.5	%	Calculation result
(7) Unloading crane (t/hr-operating)	200	t/hr-operating	Calculation result
(8) Net total unloading capacity (t/day)	1400	t/day	Calculation result

5.3.2 Transportation Capacity by Truck from Berth to Plant

(1) The regulations obtained at the first site survey are given below

1) Speed limit on road : 50 km/hr
2) Total weight limit : 30 t

(2) From the above regulations hot coil transportation conditions are assumed as follows ;

1) Truck speed (loaded) : 30 km/hr
2) Truck speed (not loaded) : 40 km/hr
3) Truck load limit = 30 t - (truck weight : 11～14 t in NSC) = 16～19 t = 20 t
4) Hot coil weight : 20 t/coil

(3) Calculation results of transportation capacity of 20 ton hot coils by truck are shown in Table VIII-5-12.

Table VIII-5-12 Transportation Capacity by Truck from Berth to Plant

Assumptions and Calculation Results			Remarks
(1) Handling time of unloading crane	6	min/coil	Assumption
(2) Lashing time at berth	15	min/coil	Assumption
(3) Dis-lashing time at plant	15	min/coil	Assumption
(4) Handling time of plant yard crane	3	min/coil	Assumption
(5) Coil weight	20	mts/coil	Assumption
(6) Truck load limit	20	mts	Assumption
(7) Truck speed (load)	30	km/hr	Assumption
(8) Truck speed (no load)	40	km/hr	Assumption
(9) Distance from berth to plant by road	20	km	Surveyed
(10) Number of trucks to provide	1	N/day	Assumption
(11) Number of gang (shift)	1	gang/day	Assumption
(12) Truck operating time	7	hr/gang/day	Assumption
(13) Truck not-operating time (lunch etc.)	1	hr/gang/day	Assumption
(14) Truck operating rate	87.5	%	Calculation
(15) Truck driving time (load)	40.0	min	Calculation
(16) Truck driving time (no load)	30.0	min	Calculation
(17) Number of Coil on truck	1	N/truck	Calculation
(18) Truck cycle time	109.0	min	Calculation
(19) Truck (t/hr/truck)	9.6	t/hr/truck	Calculation
(20) Truck total (t/hr)	9.6	t/hr	Calculation
(21) Truck net total (t/day)	77.1	t/day	Calculation

Equations of Table VIII-5-12 are shown in Table VIII-5-13.

Table VIII-5-13 Equations for Calculation of Transportation Capacity of 20 Ton Hot Coils

(15) Truck driving time (loaded)	(9)×60/(7)
(16) Truck driving time (not loaded)	(9)×60/(8)
(17) Number of coil on truck	Integral((6)/(5))
(18) Truck cycle time	(17)×((1)+(2)+(3)+(4))+(15)+(16)
(19) Truck (t/hr)	(5)×(17)×60×(14)/((18)×100)
(20) Truck total (t/hr)	(19)×(10)
(21) Truck net total (t/hr)	(20)×(11)×((12)+(13))

In case of 20 km distance and 1 gang / day, one truck can transport 77.1 t/day from the berth to the plant. The longer the distance between the berth and the plant, the less the transportation capacity. This means more trucks are necessary to keep transportation capacity in case of long distance.

5.3.3 Overall Unloading and Transportation Capacity from the Berth to the Plant

(1) Unloading period (lay days) is to be agreed in a contract with operators. Generally, a shorter unloading period is preferable, and this period is determined by unloading capacity. If the actual unloading period is longer than that of the contract, the excess fare must be paid to operators. This excess fare is called "Demurrage", which necessitates the shippers providing enough number of trucks to catch up with the unloading capacity. Accordingly, the overall unloading and transportation capacity is important.
The number of trucks with which transportation capacity can catch up with unloading capacity is calculated in two cases as an example and the result is shown in Table VIII-5-14. The following assumptions are made for this calculation.

<Assumptions in Table VIII-5-14>

1) Directly discharge on truck base. Demurrage is zero.
2) Unloading from ship and transporting by truck continue 24 hrs.
3) Hot coil weight (truck load limit) is 20 tons.
4) Imported hot coil weight per ship (Import lot) is 10,000 tons.
5) Available port is Phu My Port.

In case of PHU MY the number of trucks which meets the unloading capacity is 8 and in NHON TRACH 20 trucks are required. In the former case 57 drivers are necessary and in the latter 143 drivers. It is obvious from these figures that the closer the distance between the port and the plant, the better the condition from the standpoint of hot coil transportation.

Table VIII-5-14 Overall Unloading and Transportation Capacity and Total Unloading Days

Site		NHON TRACH	PHU MY
Port		Phu My	Phu My
Distance by road	km	22	1.5
(1) Handling time of unloading crane	min/coil	6	6
(2) Lashing time at berth	min/coil	15	15
(3) Dis-lashing time at plant	min/coil	15	15
(4) Handling time of plant yard crane	min/coil	3	3
(5) Hot coil weight	mts/coil	20	20
(6) Crane loading number of coil	N	1	1
(7) Truck load limit	mts/track	20	20
(8) Truck speed (loaded)	km/hr	30	30
(9) Truck speed (not loaded)	km/hr	40	40
(10) Distance from berth to plant by road	km	22	1.5
(11) Number of trucks to be provided	N	20	8
(12) Imported Hot coil weight per ship	mts/ship	10,000	10,000
(13) Crane operating time	hr/gang/day	7	7
(14) Crane not-operating time (lunch etc.)	hr/gang/day	1	1
(15) Crane operating rate	%	87.5	87.5
(16) Number of gang for unloading	gang/day	3	3
(17) Truck operating time	hr/gang/day	7	7
(18) Truck not-operating time (lunch etc.)	hr/gang/day	1	1
(19) Truck operating rate	%	87.5	87.5
(20) Number of gang for truck transportation	gang/day	3	3
(21) Truck driving time (load-one way)	min	44.0	3.0
(22) Truck driving time (no load-one way)	min	33.0	2.3
(23) Number of coil on truck	N/truck	1	1
(24) Truck cycle time	min	116.0	44.3
(25) Truck (t/hr/truck)	t/hr/truck	9.1	23.7
(26) Truck total (t/hr)	t/hr	181.0	189.8
(27) Truck net total (t/day)	t/day	4344.8	4555.9
(28) Unloading crane (t/hr-operating)	t/hr-operating	200.0	200.0
(29) Net total unloading capacity (t/day)	t/day	4200.0	4200.0
(30) Net Total (t/day) (smaller (27) or (29))	t/day	4200.0	4200.0
(31) Total unloading days ((12) / (30))	day	2.38	2.38
Overall truck driver	men	143	57
Number of truck	N	20	8
Demurrage	days	0	0

(2) Hot coil transportation conditions in all sites and ports are shown in Table VIII-5-15. According to these figures the case of PHU MY IZ and Phu My Port has the best condition amongst all, followed by the case of PHU MY IZ and Go Dau Port.

Table VIII-5-15 Calculation Results of Hot Coil Transportation Conditions

Site	Port	Distance (km)	Number of trucks	Overall truck drivers
AMATA	Saigon	32	26	186
	Go Dau	37	29	207
	Phu My	40	30	214
NHON TRACH	Saigon	60	42	300
	Go Dau	15	16	114
	Phu My	22	20	143
PHU MY	Saigon	70	48	343
	Go Dau	10	13	93
	Phu My	1.5	8	57

In case of PHU MY IZ and Phu My Port, there exist the following advantages expected in the future ;

<Advantages in case of PHU MY IZ and Phu My Port>
The road from the port to the plant is located inside PHU MY Industrial Zone. New well-surfaced road with 46 m width to Phu My Port is under construction as a trunk line of PHU MY Industrial Zone. Accordingly, there is possibility to ease both the truck load limit regulation in public road (30 tons) and the lashing condition of hot coils to trucks.

1) Possibility of transportation of heavy hot coils by large-sized trucks.
2) Possibility of hot coil transportation without lashing.

5.3.4 Unloading and Transportation Fare

(1) The results of the first site survey are shown in Table VIII-5-16. Unloading and transportation fare including shift and customs fare is around US$6/ton for a distance of 1.5 km from the berth to the plant.

Table VIII-5-16 Unloading and Transportation Fare

Items	Port name	Fare (US$/mt)	Remarks
Unloading	Saigon Port Haiphong Port (VSC Hanoi Metal Co.) Haiphong Port (Vinanic Steel)	1.2 (100% DDT) 1.7 (50% DDT) 1.3 (100% DDT)	 JV-company 4.5 US$/mt
Shift (if not DDT case)	Saigon Port Haiphong Port	0.9 0.5 - 0.7	
Customs fee	Haiphong Port	0.35	
Unloading + shift + customs + transportation to plant	Phu My Port(1.5 km) (Vina Kyoei billet)	5 - 6 (30% DDT)	JV-company
	Go Dau Port(10 km) (Vina Kyoei billet)	5 - 6 (30% DDT)	JV-company

In case of Vina Kyoei billets the fare of both ports are the same in spite of different distance due to the result of bidding.

5.4 Delivery of Steel Products to Customers

5.4.1 Transportation Modes in Viet Nam

There were four types of transportation methods.

1) Trucks and tractor-trailers are available for transporting by roads
2) Barge system is arranged for inland waterway
3) Maritime transport (sea ports and river ports) system
4) Railroad system

These four transportation methods are available for the cold rolled steel products of this project. For southern Viet Nam customers truck and tractor-trailer methods are available. There are National Roads No.1 and 51 in the southern Viet Nam area, connecting various Industrial Zones where main customers are located. These trunk lines are well-surfaced and maintained. For the customers in northern Viet Nam maritime transport system is available, and there are a lot of domestic shipping companies and agencies in Viet Nam. The main port of northern Viet Nam is Haiphong Port, which owns 2,500 m berth and over 200,000 sqm of warehouses and storage yard. It has much experience in handling steel products such as cold rolled steel coils, plates and billets. The trunk line between Haiphong Port and HANOI is National Road No.5, which has two lanes on one side and well-surfaced and maintained.

5.4.2 Commercial Custom of Delivery in Viet Nam

The results of preliminary study in Japan and the first site survey with regard to the delivery in Viet Nam are as follows ;

1) Ex factory base
2) Customers employ transporters
3) Transporters come to receive the products in the factory warehouse
4) Customers pay the transportation fare to the transporters

This ex factory delivery system used in all Vietnamese companies is expected to be applied to this project as well.

5.5 Study of Hot Coil Import Lot from the Overall Transportation Standpoint

5.5.1 Freight of Ship

(1) Size effect

Generally speaking, the freight of large size vessels is lower than that of small ones. Operators take count of return-cargo when a contract is made with consignor. It is difficult to obtain return-cargo for large size vessels because of the large volume required. Furthermore, there are some regions where the return-cargo is not enough to fill the vessel because the balance of trade tends to be in excess in imports. Accordingly, the freight of large size vessels is not always lower than that of small ones. It can be said that South-East Asia belongs to one of those regions.

(2) Negotiation of the freight of cargo

The freight is negotiated between the consignor and the operators, and then a contract is made based on many factors such as oil price, the exchange rate, charging-discharging conditions, the market rate and return-cargo.

(3) Conclusion

There is a scale effect, but not always true as the freight depends on many factors. Accordingly, when the import lot is determined, all the factors are to be taken into consideration and the cheapest figure should be sought for.

5.5.2 Plant Operation and Hot Coil Stock Level

(1) Proper stock level and import lot

The proper stock of hot coils is always necessary to continue the mill operation.

For example, in case the import lot is very large, the following points are to be noted ;

1) The mill operation depends on only one country, company and vessel. There are too many risks.
2) When vessels delay, the mill operation has to stop due to the lack of hot coils. When vessels arrive earlier, there will be an overflow of hot coils at the open storage yard.
3) Difficulty in making quick response to customers' demands.

(2) Hot coil stock level change

<Assumptions>

1) Stock capacity of the hot coil yard is same as one month production amount. (20,833 tons)
2) Production amount is 250,000 tons/year.
3) Discharging rate is 4,200 tons/day. (Unloading capacity)
4) Import lot is 5,000 tons, 10,000 tons, 20,000 tons and 30,000 tons.

Hot coil stock level changes depending on the production rate and purchasing lot (import lot). In case of the production rate of 250,000 t/year hot coil stock decreases at 29 tons/hr. On the other hand, imported hot coils come to the coil yard and the hot coil stock increases at 175 tons/hr when a ship arrives at the berth.

Overall stock level increases at 146 tons/hr during discharging hot coils. The maximum stock level appears just after the end of discharging, and depends on the import lot. If the stock level is considerably high at the arrival of ship, imported hot coils will overflow in the open storage yard. One example of the estimated variation of hot coil stock is shown below. The following assumptions were made and the estimated rate of overall stock change is shown in Table VIII-5-17.

Table VIII-5-17 Overall Stock Change Rate

	t/year	t/month	t/day	t/hr
Production rate of CRM	250,000	20,833	685	29
Discharging rate			4,200	175
Overall stock change rate				146

The estimated variation of hot coil stock is shown in Table VIII-5-18. In case of import lot of 5,000 tons there is expected no overflow at the open storage yard even with the base stock level of 0.7 month. In case of import lot of 10,000 tons there is expected no overflow at the open storage yard with the base stock level of 0.6 month. In 20,000 tons and 30,000 tons of import lots case, however, there is expected an overflow, more than 2,000 tons, even if the base stock is 0.3 month. This overflow at the open storage yard causes an additional cost in the open yard handling.

Table VIII-5-18 The Calculation on Result of Hot Coil Stock Change

	Import lot	5,000 t	10,000 t	20,000 t	30,000 t
Base stock	Increase of stock after discharging	4,182	8,365	16,730	25,095
0.3 month	Base stock level	6,250	6,250	6,250	6,250
	Total stock after discharge hot coil	10,432	14,615	22,980	31,345
	Overflow of hot coil to open yard	-10,401	-6,218	2,147	10,512
0.4 month	Base stock level	8,333	8,333	8,333	8,333
	Total stock after discharge hot coil	12,516	16,698	25,063	33,428
	Overflow of hot coil to open yard	-8,318	-4,135	4,230	12,595
0.5 month	Base stock level	10,417	10,417	10,417	10,417
	Total stock after discharge hot coil	14,599	18,782	27,147	35,512
	Overflow of hot coil to open yard	-6,234	-2,052	6,313	14,678
0.6 month	Base stock level	12,500	12,500	12,500	12,500
	Total stock after discharge hot coil	16,682	20,865	29,230	37,595
	Overflow of Hot Coil to open yard	-4,151	32	8,397	16,762
0.7 month	Base stock level	14,583	14,583	14,583	14,583
	Total stock after discharge hot coil	18,766	22,948	31,313	39,678
	Overflow of hot coil to open yard	-2,068	2,115	10,480	18,845

5.5.3 One Example of Import Lot

Import lot of SUS (Cold Rolling Mill company in South-East Asia) is shown in Table VIII-5-19.

Table VIII-5-19 Import Lot per Ship (An Example of SUS)

Import lot per ship (mt)	N
1,000 - 1,999	3
2,000 - 2,999	10
3,000 - 3,999	9
4,000 - 4,999	12
5,000 - 5,999	5
6,000 - 6,999	4
7,000 - 7,999	3
8,000 - 8,999	4
9,000 - 9,999	1
10,000 - 10,999	3
11,000 - 11,999	0
12,000 - 12,999	0
13,000 - 13,999	2
14,000 -	0

The production amount of SUS is 70,000 to 90,000 tons/month.
('99:250,000 t/year)
Import lots per ship are mainly 2,000 - 6,000 t.
Maximum lot is around 13,000 t.

5.5.4 Import Lot of CRM (for the project)

The production amount of the planned cold rolling mill is around 20,000 tons/month, and the import lot per ship should be 3,000 to 10,000 tons per ship. Accordingly, for the study of unloading and transportation capacity of this FS the import lot of 10,000 t is assumed.

5.6 Conclusion of Study of Port and Transportation

(1) The port function has the important role of transporting heavy cargo such as steel. The mill should be located near a good port. (In case of this project Phu My Port is good.)

(2) From the administrative standpoint, however, it is risky that the physical distribution of the mill depends on only one port. The mill should have the flexibility for transporting route and method to cope with the following matters ;
   1) Sudden cease of discharging (unloading and shifting) due to some troubles of a port.
   2) Unilateral rise in transportation fare.
   3) Intentional decrease of transportation fare by bidding.

   In case of PHU MY, CRM can use Phu My Port as a main port and Go Dau Port as an auxiliary port. Furthermore, Saigon Ports and Vung Tau Ports can also be used if necessary.

(3) From the standpoint of transportation of steel products the customers (or hired transporters) in southern Viet Nam can use well-surfaced and maintained National Roads No.1 and No. 51. Domestic shipping lines (there are dozens of domestic shipping companies and agencies in Viet Nam) are available to transport steel products for northern Viet Nam customers.

(4) Summary

PHU MY is superior to other candidate sites in terms of transportation capacity, fare and flexibility.

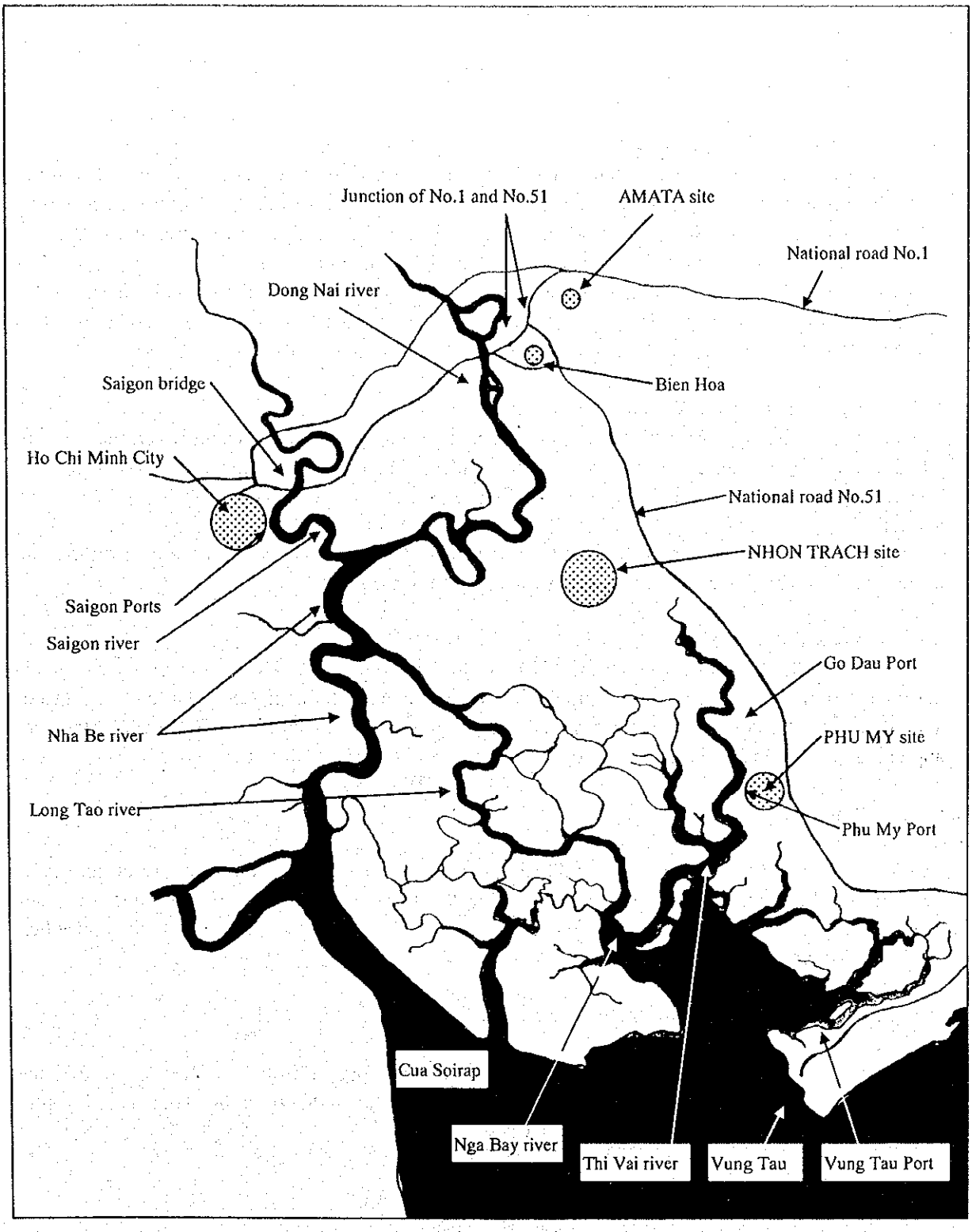


Fig. VIII-5-1 CRM Candidate Sites and Related Ports, Roads

6. Environment

6.1 Situations of Rivers

6.1.1 Dong Nai River for AMATA

The waste water from AMATA Industrial Zone is discharged to the Dong Nai River, the water of which is used as sources of domestic water supply for HCM city. Accordingly, the waste water from AMATA Industrial Zone should comply with "A" standards, which are the most strict in TCVN5945-1995. The water after the final treatment should satisfy "A" standards.

AMATA Industrial Zone has the final treatment plant for the waste water, and the standards of the discharge water from each factory might be eased from "A" standards. However, the standards set by AMATA Industrial Zone by itself are almost the same with "A" standards.

6.1.2 Dong Tranh River for Nhon Trach

The waste water from Nhon Trach Industrial Zone is discharged to Dong Tranh River, the water of which is not used as sources of domestic water supply. The Industrial Zones does not have a final treatment plant for the waste water. Accordingly, "B" standards in TCVN5945-1995 are to be applied.

There exists a plan to construct a final treatment plant for the waste water in the near future, and the standards might be eased further after the installation of the plant.

6.1.3 Thi Vai River for Phu My

The waste water from Phu My Industrial Zone is discharged to Thi Vai River, the water of which is not used as sources of domestic water supply. In addition, Phu My Industrial Zone has a plan to install a final treatment plant for the waste water. Accordingly, "C" standards in TCVN5945-1995 are applied to Phu My Industrial Zone.

6.2 Location

Phu My Industrial Zone is located about 20 Km nearer to the sea compared to Nhon Trach Industrial Zone. In case the water of Dong Tranh River and Thi Vai River are used as sources of domestic water supply, Phu My Industrial Zone has less possibility to be affected by tightened standards than Nhon Trach Industrial Zone.

6.3 Others

Vina Kyoei, which is located in Phu My Industrial Zone, has a plan to install an Electric Arc Furnace (EAF) in the future. After the installation of the EAF, the scale and sludge from the planned cold rolling mill can be recycled as the raw materials for the EAF.

6.4 Suitable Industrial Zone from The Environmental Point of View

Phu My Industrial Zone has the least possibility of causing environmental problems or isuues and has an advantage of possible recycling of scale and sludge through the EAF in the future. Accordingly, it can be said from the environmental point of view that Phu My Industrial Zone is more suitable than other two Industrial Zones mentioned.

7. Others

7.1 Labor Force

7.1.1 Focus Points of Survey

(1) To confirm stable availability of labor force at each site
(2) To check the average salary at each site

7.1.2 Results of Survey

(1) Comparison of labor force is shown in Table VIII-7-1.
(2) With regard to the labor force, there exists no significant difference among the three candidate sites.

TableVIII-7-1 Evaluation of the Procurement of Labor Force

Item \ Name of site		AMATA	PHU MY	NHON TRACH
Labor force	Resident population (aged over 15)	By age group 15-34 (%) / 35-54 (%) / 55 over (%) / 15over total Dong Nai: 720,509 (58) / 350,657 (28) / 171,892 (14) / 1,243,058 (100) Ho Chi Minh: 1,861,732 (52) / 1,133,105 (31) / 562,701 (17) / 3,557,538 (100) Dong Nai and Ho Chi Mihn are the residential areas around the industrial zones. Each candidate site does not have a significant difference in procuring the labor force.		
	Average salary (Existing company)	Worker $60-100 / Month Foreman $140-240 Manager $340-500 (several foreign companies)	Worker $100 / Month Foreman $200 Manager $350 (a foreign company)	Concrete data are not available. However, it seems that the salary level of foreign companies in this industrial zone is the same as other candidate site.

7.2 Condition of Land Lease

7.2.1 Focus Points of Survey

(1) To check the lease fee of each site

(2) To compare the total cost of lease under the same precondition

7.2.2 Results of Survey

(1) Comparison of land lease fee is shown in Table VIII-7-2.

(2) The cost of lease in AMATA is higher than those of other two candidate sites although the comparison is made with certain assumptions.

TableVIII-7-2 Evaluation of Land Lease Fee

Item \ Name of site		AMATA	PHU MY	NHON TRACH
Land lease fee	Lease fee※	Lease fee $45 / sqm / 40years	Lease fee $1.4 / sqm / year	Lease fee $1.54 / sqm / year (from 6th year $1.1 / sqm / year)
	Comparison of total cost	Precondition Lease period : 40 years Lease fee :Refer to above data of each site Method of payment : Lump sum / Gross amount of yearly payment Discount rate for lump sum : 7% (present interest rate in state credit)		
		$4,500,000 / -	$1,870,000 / $5,620,000	$1,650,000 / $4,620,000
	Evaluation	The cost of lease in AMATA is higher than other two candidate sites although the comparison is made with certain assumptions.		

※The data were obtained from each Industrial Zone.