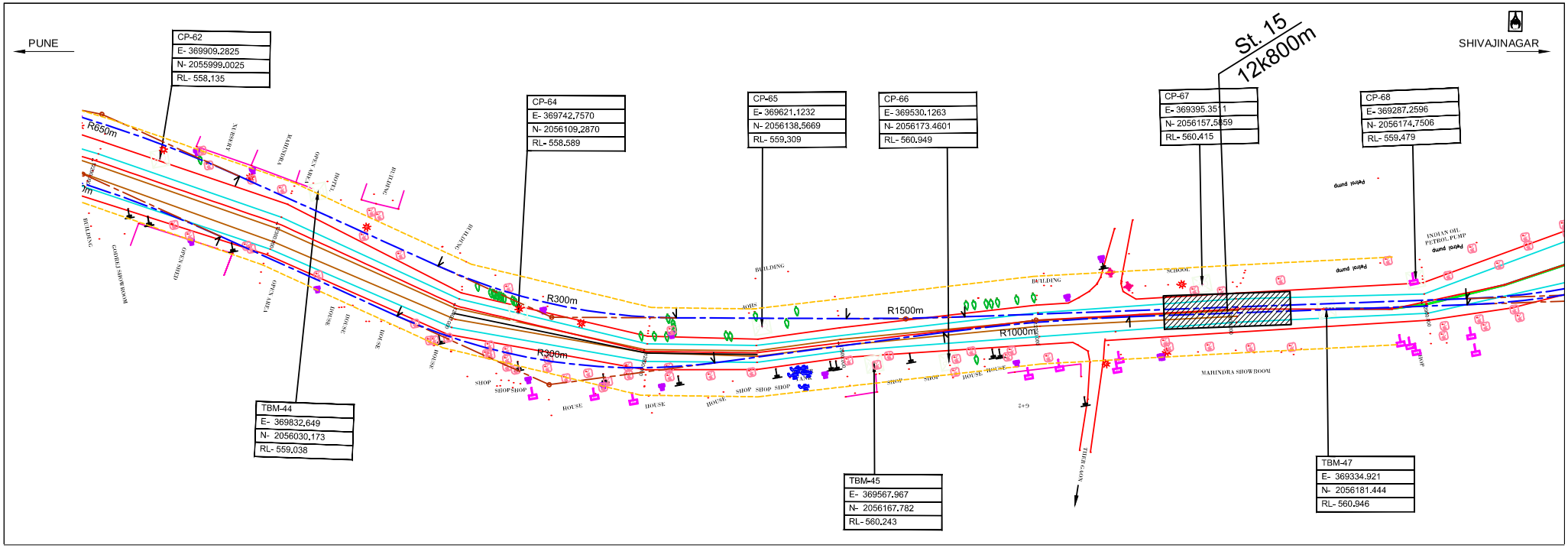
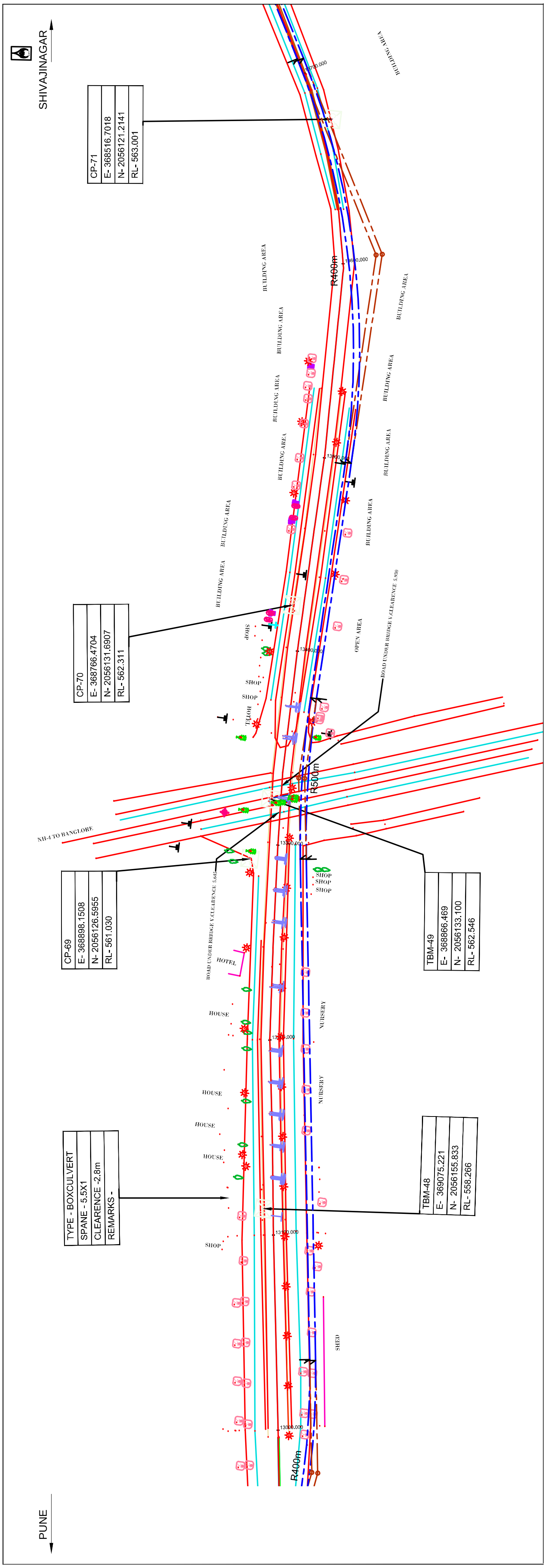
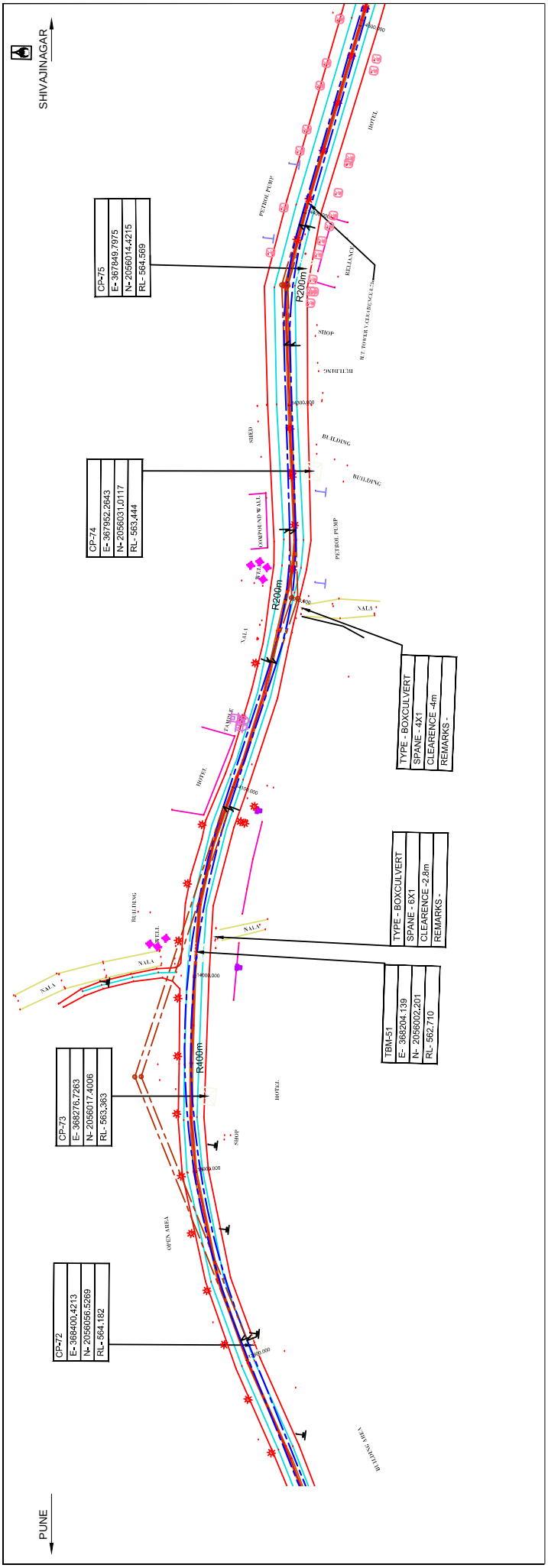

SHIVAJINAGAR
PUNE
CP-61
E- 370129.3952
N- 2055904.0259
RL- 557.601
TYPE - BOXCULVERT
SPANE - 4X1
CLEARENCE - 4m
REMARKS -
TBM-43
E- 370510.149
N- 2055892.602
RL- 556.916
CP-60
E- 370553.5976
N- 2055900.4082
RL- 555918
St. 14
11K490m
R200m
R400m
R650m
PAN SHOP
BUILDING
GOLDEN CASCADE
TOILET
SHAURYA RESTAURANT
WINE SHOP
G.O SQUARE
PUSHPA GANGA
SHOP
SHED
NALA
DANGE CHOWK

AP-32


PUNE
SHIVAJINAGAR
St. 15
12k800m
CP-62
E- 369909.2825
N- 2055999.0025
RL- 558.135
CP-64
E- 369742.7570
N- 2056109.2870
RL- 558.589
CP-65
E- 369621.1232
N- 2056138.5669
RL- 559.309
CP-66
E- 369530.1263
N- 2056173.4601
RL- 560.949
CP-67
E- 369395.3511
N- 2056157.5659
RL- 560.415
CP-68
E- 369287.2596
N- 2056174.7506
RL- 559.479
TBM-44
E- 369832.649
N- 2056030.173
RL- 559.038
TBM-45
E- 369567.967
N- 2056167.782
RL- 560.243
TBM-47
E- 369334.921
N- 2056181.444
RL- 560.946
R650m
R300m
R300m
R1500m
R1000m
BUILDING
SHOP
HOUSE
SCHOOL
MAHINDRA SHOWROOM
INDIAN OIL PETROL PUMP
Petrol pump


SHIVAJINAGAR
CP-71
E- 368516.7018
N- 2056121.2141
RL- 563.001
BUILDING AREA
R400m
CP-70
E- 368766.4704
N- 2056131.6907
RL- 562.311
SHOP
HOTEL
OPEN AREA
R500m
NH-4 TO BANGLORE
CP-69
E- 368898.1508
N- 2056126.5955
RL- 561.030
TBM-49
E- 368866.469
N- 2056133.100
RL- 562.546
HOUSE
NURSERY
TYPE - BOXCULVERT
SPANE - 5.5X1
CLEARENCE -2.8m
REMARKS -
TBM-48
E- 369075.221
N- 2056155.833
RL- 558.266
SHED
R400m
PUNE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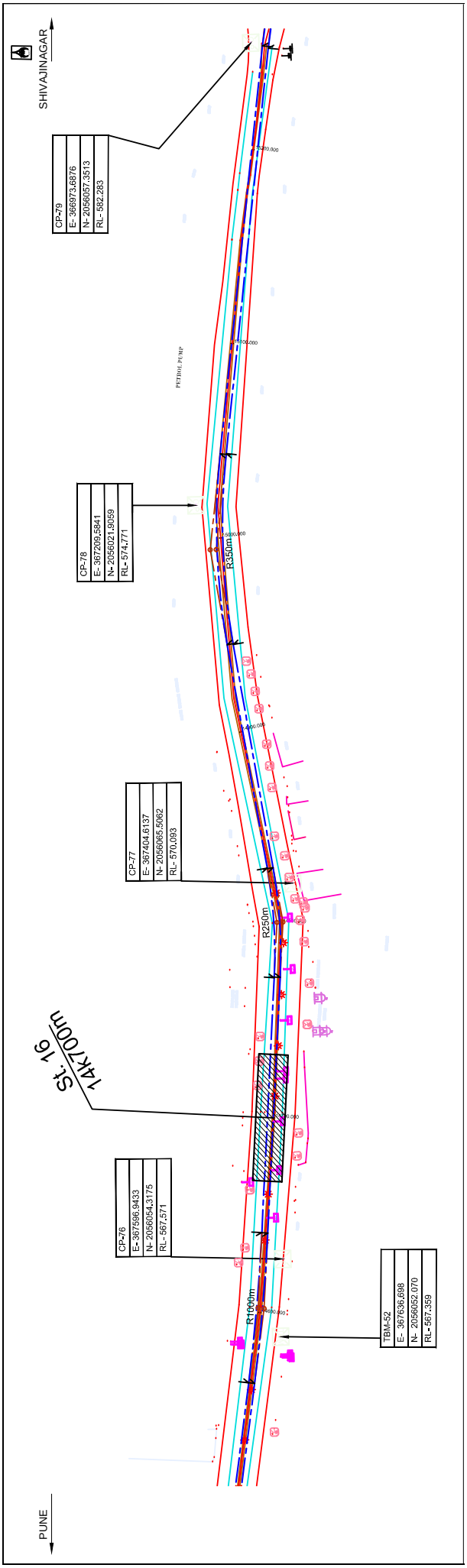
PUNE
CP-75
E- 367849.7975
N- 2056014.4215
RL- 564.569
CP-74
E- 367952.2643
N- 2056031.0117
RL- 563.444
CP-73
E- 368276.7263
N- 2056017.4006
RL- 563.363
CP-72
E- 368400.4213
N- 2056056.5269
RL- 564.182
TBM-51
E- 368204.139
N- 2056002.201
RL- 562.710
TYPE - BOXCULVERT
SPANE - 4X1
CLEARENCE -4m
REMARKS -
TYPE - BOXCULVERT
SPANE - 6X1
CLEARENCE -2.8m
REMARKS -
R200m
R200m
R400m
HOTEL
PETROL PUMP
BUILDING
SHED
NALA
SHOP
OPEN AREA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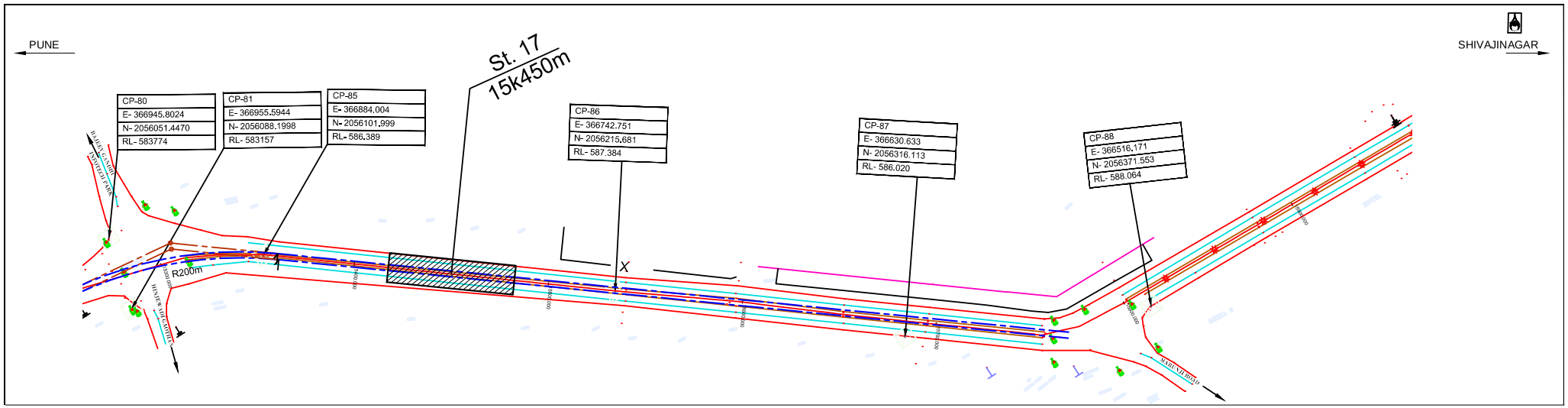
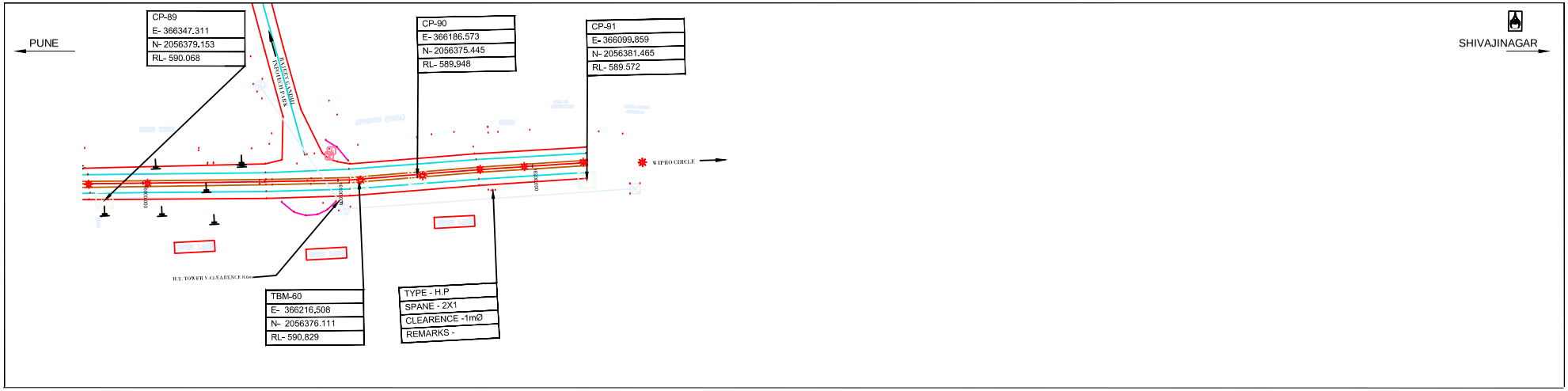
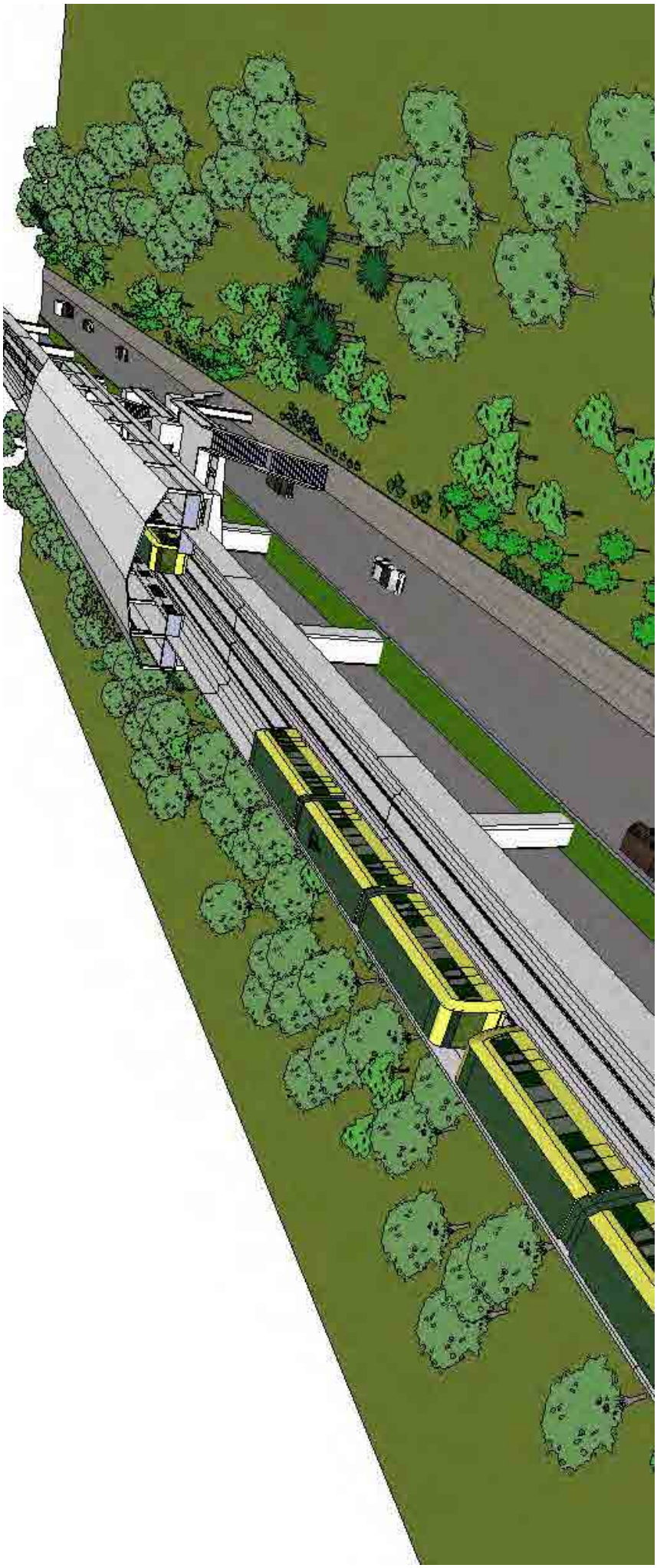
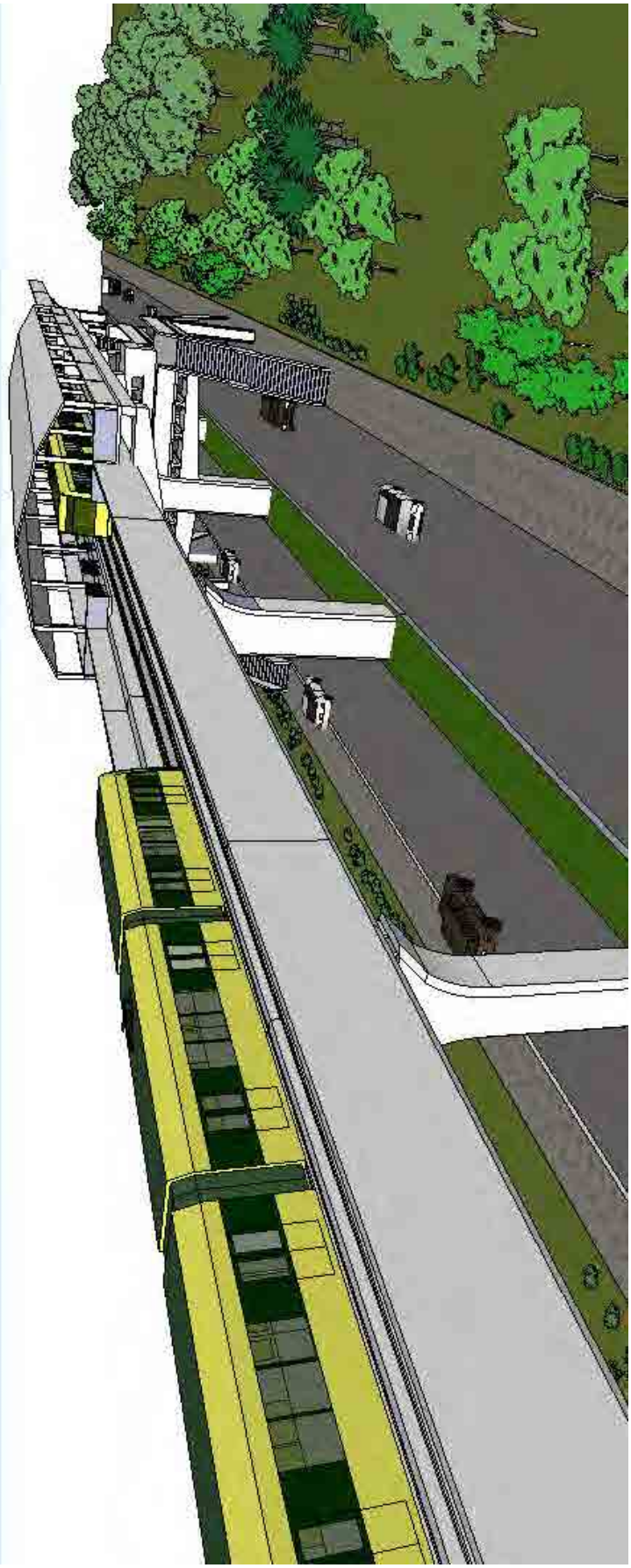
PUNE
CP-79
E- 366973.6876
N- 2056057.3513
RL- 582.283
CP-78
E- 367209.5841
N- 2056021.9059
RL- 574.771
CP-77
E- 367404.6137
N- 2056065.5062
RL- 570.093
CP-76
E- 367596.9433
N- 2056054.3175
RL- 567.571
TBM-52
E- 367636.698
N- 2056052.070
RL- 567.359
R350m
R250m
R1000m
St. 16
14X700m
PETROL PUMP

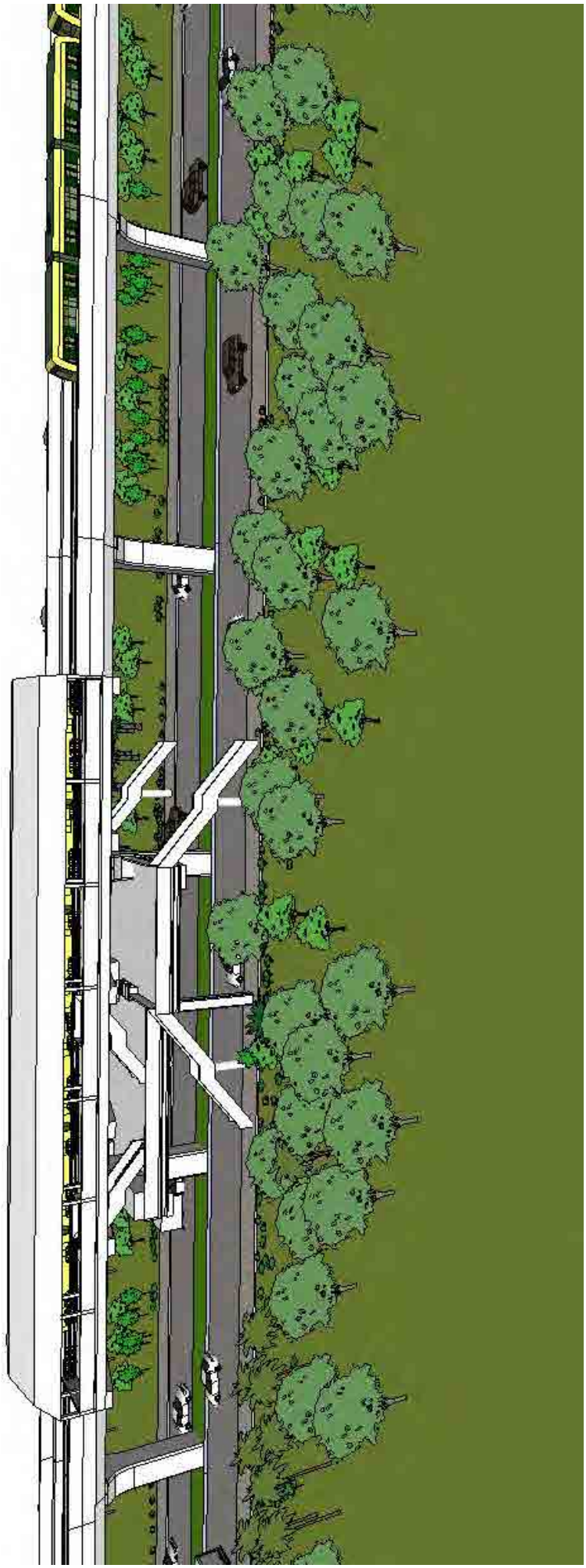

PUNE
SHIVAJINAGAR
St. 17
15k450m
CP-80
E- 366945.8024
N- 2056051.4470
RL- 583774
CP-81
E- 366955.5944
N- 2056088.1998
RL- 583157
CP-85
E- 366884.004
N- 2056101.999
RL- 586.389
CP-86
E- 366742.751
N- 2056215.681
RL- 587.384
CP-87
E- 366630.633
N- 2056316.113
RL- 586.020
CP-88
E- 366516.171
N- 2056371.553
RL- 588.064
R200m
MARKET ROAD

AP-36


PUNE
SHIVAJINAGAR
CP-89
E- 366347.311
N- 2056379.153
RL- 590.068
CP-90
E- 366186.573
N- 2056375.445
RL- 589.948
CP-91
E- 366099.859
N- 2056381.465
RL- 589.572
WIPRO CIRCLE
H.T. TOWER V. CLEARANCE R.6m
TBM-60
E- 366216.508
N- 2056376.111
RL- 590.829
TYPE - H.P
SPANE - 2X1
CLEARENCE -1mØ
REMARKS -

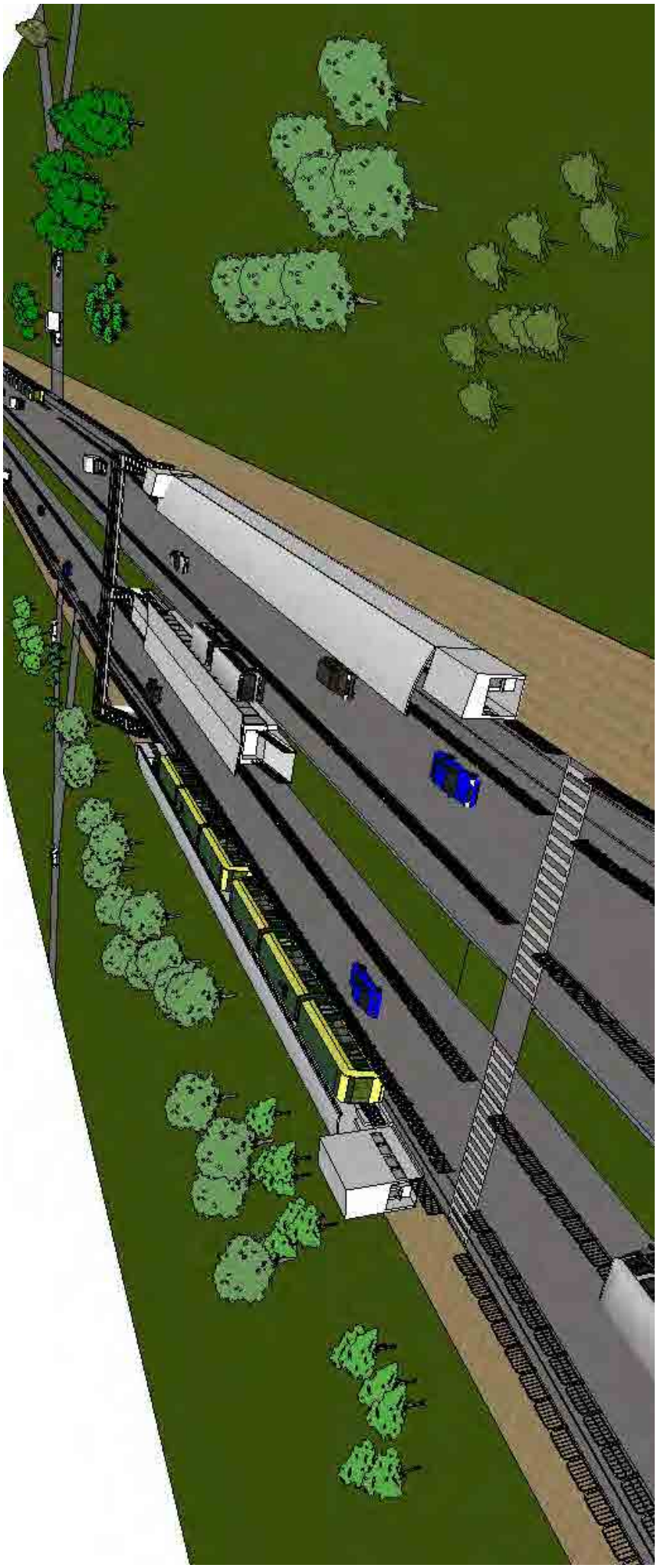


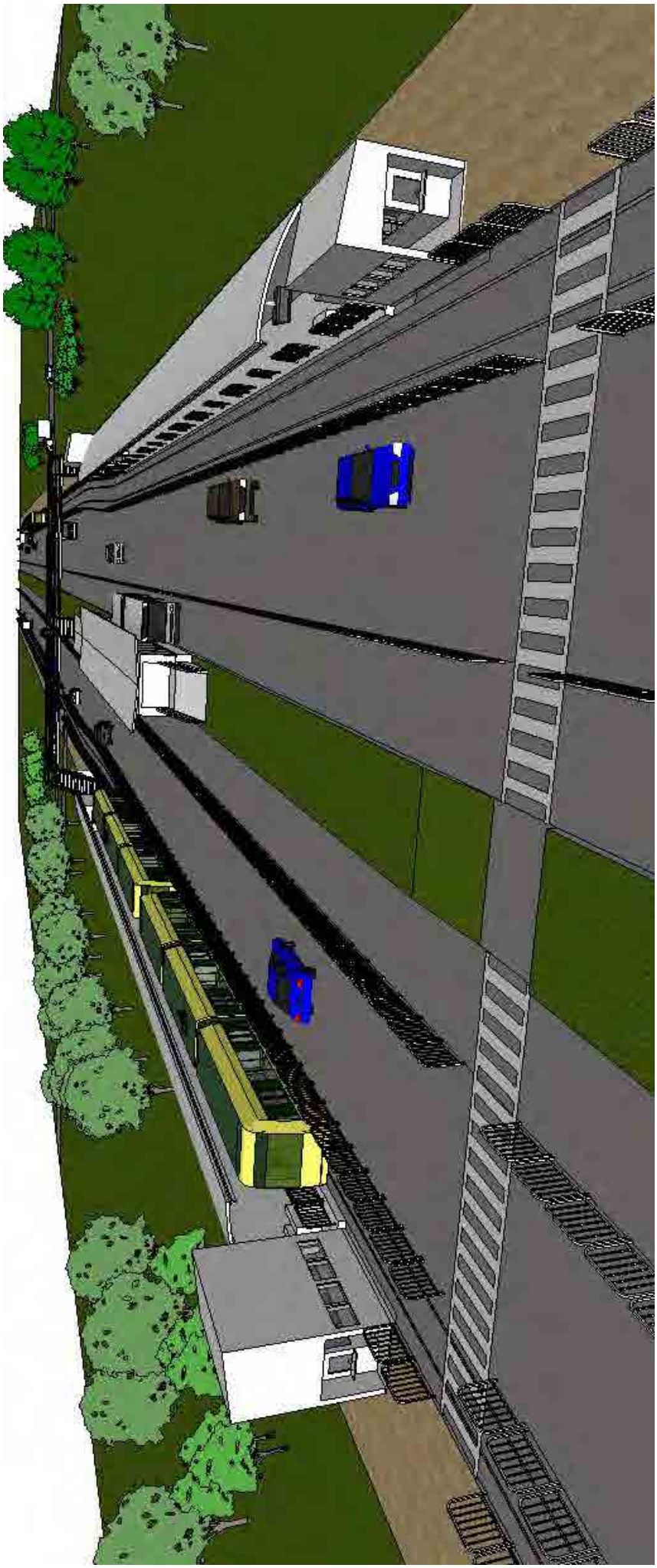




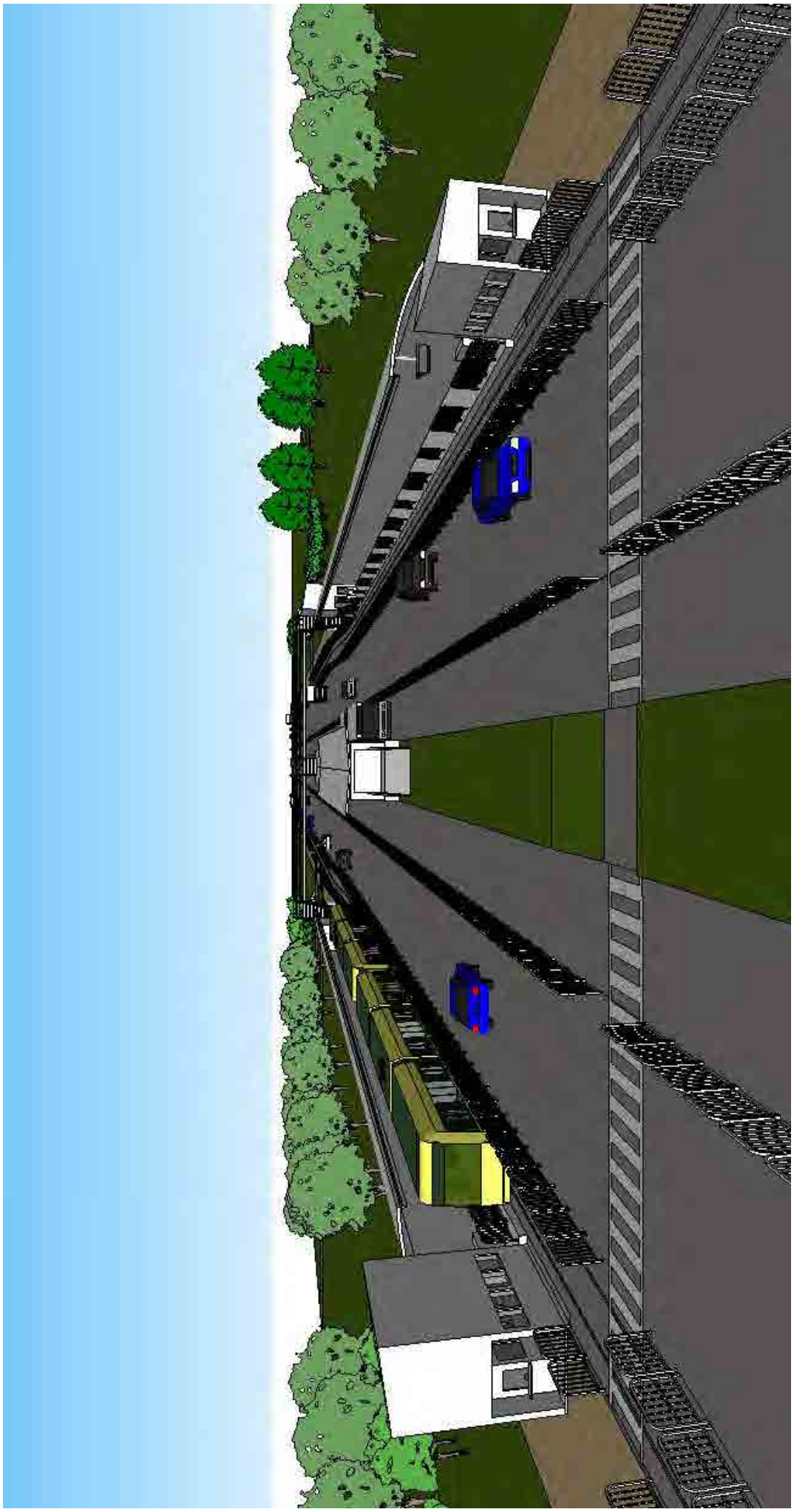
APPENDIX-12: ACAD図　高架駅5

APPENDIX-13: ACAD図　地上駅1

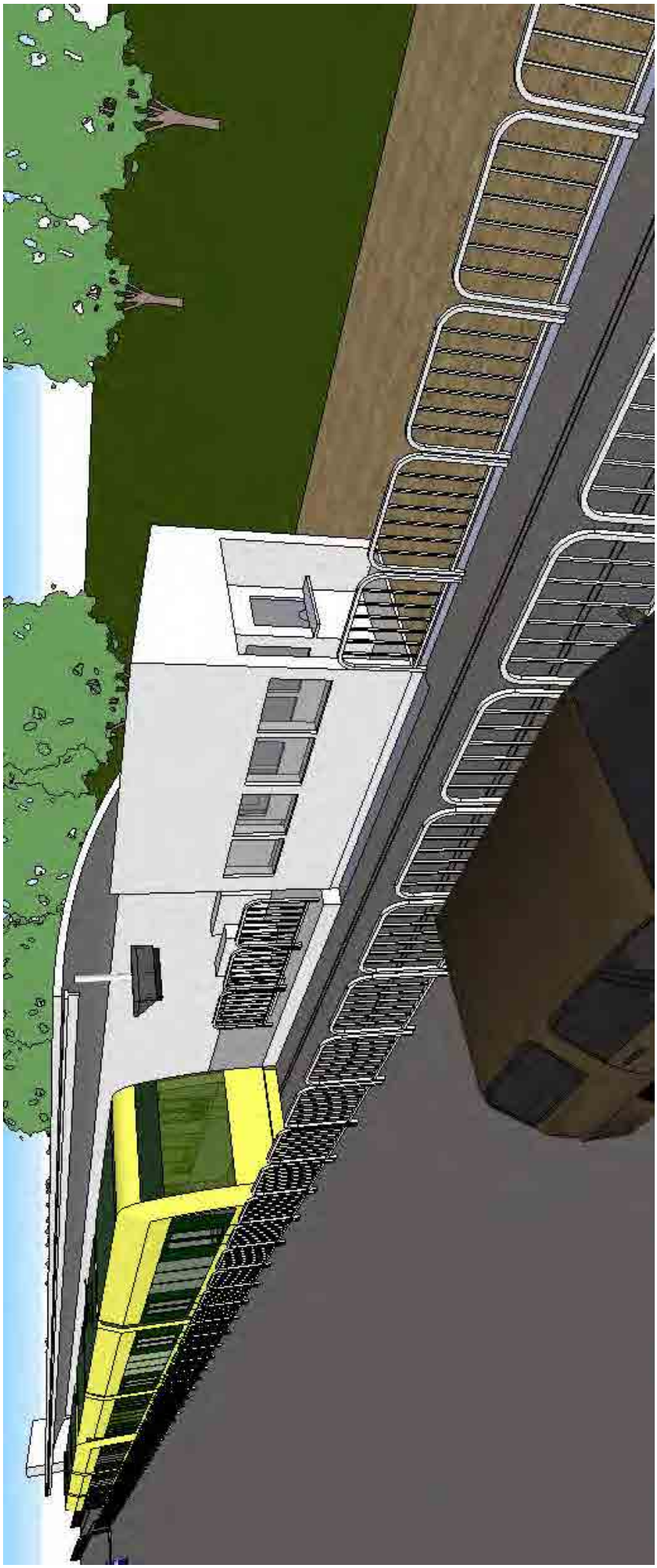


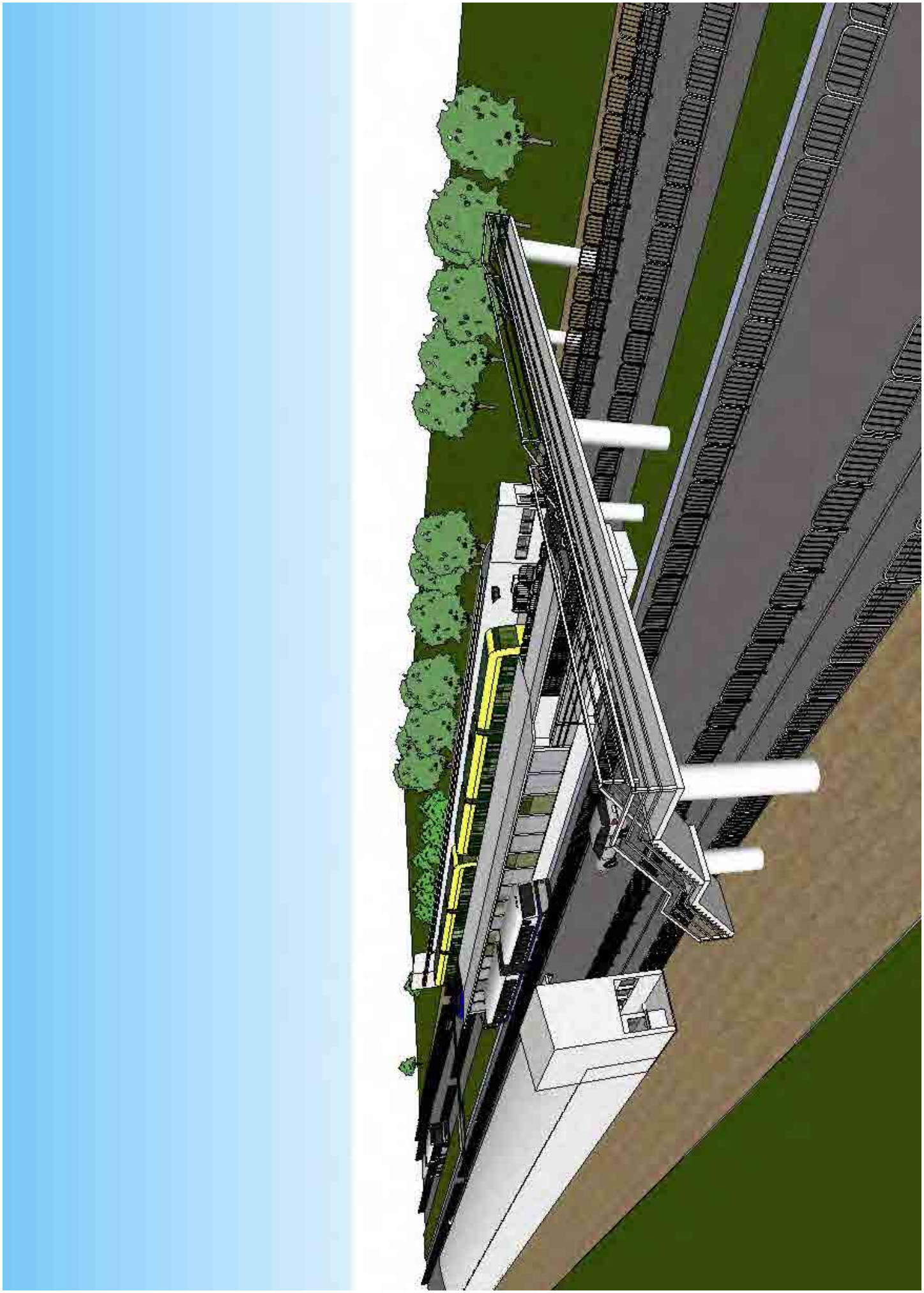


APPENDIX-15: ACAD図　地上駅3



APPENDIX-16: CAD図 地上駅4





Integrity

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE

Borehole No: BH-01	**CLIENT : ORIENTAL CONSULTANTS CO. LTD.**	**JOB NO : : IGPL-MUM-068/012**
Sheet : 1 of 1	**Casing size (mm) : 150/76**	**Date of Start : : 08-07-2012**
T.D. (m) : 5.10 Below EGL	**Drilling Equipment : Rotary Drilling Rig**	**Date of Completion :: 08-07-2012**
	Co-ordinates : E 0379809 / N 2049029	**Water Depth (m) : ------**

DEPTH BELOW EGL	SAMPLE & INSITU TEST DEPTH	TYPE	SPT - NUMBER OF BLOWS 0-15	15-30	30-45	N VALUE	Depth below EGL	SYMBOL	DESCRIPTION	Cu/ϕ KN/m²	CLAY, %	SILT, %	SAND,%	GRAVEL,%	W_L / I_P / MC , %	TCR %	SCR %	RQD %
0	0.00 - 0.50						**0.00**		MADE GROUND (recovered as pieces of Basalt)									
1	0.50 - 1.50															22	9	9
2	1.50 - 1.80		24	50	-	>100	**1.50**		Very dense, blackish, SAND		5	93		2				
3	2.10 - 3.60						**2.10**		Moderately weak to moderately strong, slightly weathered, greyish BASALT with secondary minerals infilling							99	95	91
4	3.60 - 5.10															98	95	87
5																		
6									**Borehole Terminated at 5.10m below EGL**									
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Remarks :

Legends

- SPT - UDS - DS
- Rock Recovery - No Recovery
- W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content
- TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation
- T.D. : Termination Depth
- EGL : Existing Ground Level
- RL - Reduced Level

CHECKED BY : KKJ APPROVED BY : ST

Integrity

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE

Borehole No: BH-02	**CLIENT : ORIENTAL CONSULTANTS CO. LTD.**	**JOB NO : : IGPL-MUM-068/012**
Sheet : 1 of 1	**Casing size (mm) : 150/76**	**Date of Start : : 08-07-2012**
T.D. (m) : 8.50 Below EGL	**Drilling Equipment : Rotary Drilling Rig**	**Date of Completion :: 08-07-2012**
	Co-ordinates : E 0376342 / N 2050622	**Water Depth (m) : ------**

DEPTH BELOW EGL	SAMPLE & INSITU TEST DEPTH	TYPE	SPT - NUMBER OF BLOWS 0-15	15-30	30-45	N VALUE	Depth below EGL	SYMBOL	DESCRIPTION	Cu/ϕ KN/m²	CLAY, %	SILT, %	SAND,%	GRAVEL,%	W_L / I_P / MC , %	TCR %	SCR %	RQD %
0	0.00 - 0.50						**0.00**		Very soft blakish CLAY with sand		25	59	15	1	59/25/-			
1																		
2	1.50 - 1.60		50 blows/ 5 cm			>100	**1.50**		MADE GROUND (recovered as gravel size BASALT fragments)									
3	2.50 - 4.00															25	-	-
4																		
5	4.00 - 5.50															38	-	-
6	5.50 - 6.00						**5.50**		Weak, highly weathered brownish BASALT							58	24	-
7	6.00 - 7.50						**6.00**		Moderately weak to moderately strong slightly weathered greyish BASALT with secondary minerals							93	91	91
8	7.50 - 8.50															97	73	73
9									**Borehole Terminated at 8.50m below EGL**									
10																		
11																		
12																		
13																		
14																		
15																		

Remarks :

Legends

- SPT - UDS - DS
- Rock Recovery - No Recovery

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

T.D. : Termination Depth
EGL : Existing Ground Level
RL - Reduced Level

CHECKED BY : KKJ APPROVED BY : ST

Integrity

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE

Borehole No: BH-03	**CLIENT : ORIENTAL CONSULTANTS CO. LTD.**	**JOB NO : : IGPL-MUM-068/012**
Sheet : 1 of 1	**Casing size (mm) : 150/76**	**Date of Start : : 07-07-2012**
T.D. (m) : 4.20 Below EGL	**Drilling Equipment : Rotary Drilling Rig**	**Date of Completion :: 07-07-2012**
	Co-ordinates : E 0374621 / N 2053396	**Water Depth (m) : ------**

DEPTH BELOW EGL	SAMPLE & INSITU TEST DEPTH	TYPE	SPT - NUMBER OF BLOWS 0-15	15-30	30-45	N VALUE	Depth below EGL	SYMBOL	DESCRIPTION	Cu/ϕ KN/m²	CLAY, %	SILT, %	SAND,%	GRAVEL,%	W_L / I_P / MC , %	TCR %	SCR %	RQD %
0	0.00 - 0.50						**0.00**		MADE GROUND (gravelly SAND)		7	23	41	29	40/13/-			
1																		
	1.20 - 2.70						**1.20**		Moderately strong, slightly weathered, greyish amygdaloidal BASALT							100	98	98
2																		
	2.70 - 4.20															100	97	97
3																		
4																		
									Borehole Terminated at 4.20m below EGL									
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Remarks :

Legends

- SPT - UDS - DS
- Rock Recovery - No Recovery
- W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content
- TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation
- T.D. : Termination Depth
- EGL : Existing Ground Level
- RL - Reduced Level

CHECKED BY : KKJ **APPROVED BY : ST**

Integrity

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE

Borehole No: BH-04	**CLIENT : ORIENTAL CONSULTANTS CO. LTD.**	**JOB NO :**	**: IGPL-MUM-068/012**
Sheet : 1 of 1	**Casing size (mm) : 150/76**	**Date of Start :**	**: 05-07-2012**
T.D. (m) : 7.00 Below EGL	**Drilling Equipment : Rotary Drilling Rig**	**Date of Completion :**	**: 05-07-2012**
	Co-ordinates : E 0368999 / N 2056129	**Water Depth (m)**	**: ------**

DEPTH BELOW EGL	SAMPLE & INSITU TEST DEPTH	TYPE	SPT - NUMBER OF BLOWS 0-15	15-30	30-45	N VALUE	Depth below EGL	SYMBOL	DESCRIPTION	Cu/ϕ KN/m²	CLAY, %	SILT, %	SAND,%	GRAVEL,%	W_L / I_P / MC , %	TCR %	SCR %	RQD %
0	0.00 - 0.50						**0.00**		Medium dense to dense sandy SILT (Filled up soil)		19	55	22	4	61/24/-			
1																		
	1.50 - 1.95		11	19	25	44					9	43	41	7	60/25/-			
2																		
3																		
	3.00 - 3.45		9	26	35	61	**3.00**		Very dense, reddish silty SAND		7	23	63	7	44/14/-			
4																		
	4.00 - 5.50						**4.00**		Moderately strong, slightly weathered, reddish brown BASALT with secondary minerals							99	97	87
5																		
	5.50 - 7.00															98	71	42
6									- moderately weak below 6.50m									
7									**Borehole Terminated at 7.00m below EGL**									
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Remarks :

Legends

- SPT - UDS - DS
- Rock Recovery - No Recovery

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

T.D. : Termination Depth
EGL : Existing Ground Level
RL - Reduced Level

CHECKED BY : KKJ APPROVED BY : ST

Integrity

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE

Borehole No: BH-05	**CLIENT : ORIENTAL CONSULTANTS CO. LTD.**	**JOB NO : : IGPL-MUM-068/012**
Sheet : 1 of 1	**Casing size (mm) : 150/76**	**Date of Start : : 04-07-2012**
T.D. (m) : 4.10 Below EGL	**Drilling Equipment : Rotary Drilling Rig**	**Date of Completion :: 05-07-2012**
	Co-ordinates : E 0366209 / N 2056397	**Water Depth (m) : ------**

DEPTH BELOW EGL	SAMPLE & INSITU TEST DEPTH	TYPE	SPT - NUMBER OF BLOWS 0-15	15-30	30-45	N VALUE	Depth below EGL	SYMBOL	DESCRIPTION	Cu/ϕ KN/m²	CLAY, %	SILT, %	SAND,%	GRAVEL,%	W_L / I_P / MC , %	TCR %	SCR %	RQD %
0	0.00 - 0.50						**0.00**		MADE GROUND (SANDY SILT)		7	36	54	3	37/8/-			
1	0.80 - 1.10															Nil	Nil	Nil
	1.10 -2.60						**1.10**		Moderately weak to moderately strong, slightly weathered reddish brown amygdaloidal BASALT							96	71	16
2																		
	2.60 - 4.10															97	95	74
3																		
4																		
									Borehole Terminated at 4.10m below EGL									
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Remarks :

Legends

- SPT - UDS - DS
- Rock Recovery - No Recovery
- W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content
- TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation
- T.D. : Termination Depth
- EGL : Existing Ground Level
- RL - Reduced Level

CHECKED BY : KKJ APPROVED BY : ST

Integrity

SUMMARY OF LABORATORY TEST RESULTS ON SOIL SAMPLES

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE **Job No :IGPL-MUM/**

CLIENT : ORIENTAL CONSULTANTS CO. LTD.

Bore Hole No	Depth (m)		Sample Type (D/s/SPT/ UDS)	NMC (%)	Density (t/m3)		Soil Clasification (USC)	Grain Size Analysis (%)				Consistancy Limits (%)				Swell Properties		Triaxial Shear Test		Direct Shear Test		Consolidation Test			Standard/ Modified Proctor	Laboratory CBR (%)				Specific Gravity (G)	Remarks
								Mechanical analysis		Hydrometer Analysis								Type of Test: UU		Type of Test: CD						Soaked		Unsoaked			
	From	To			Wet	Dry		Gravel	Sand	Silt	Clay	Liquid (w_L)	Plastic (w_P)	Plasticity Index (I_P)	Shrinkage (w_S)	Free Swell Index (%)	Swelling Pressure (Mpa)	C (Kpa)	Φ^0	C (Kpa)	Φ^0	Pre Consolidation Pressure (Mpa)	Compression Index (Cc)	Initial Void Ratio (e0)		2.5 mm	5.0 mm	2.5 mm	5.0 mm		
BH-01	1.50	1.80	SPT	-	-	-		2	93	5		-	N/P	-																-	
BH-02	0.00	0.50	D/S	-	-	-		1	15	59	25	59	34	25																2.54	
BH-03	0.00	0.50	D/S	-	-	-		29	41	23	7	40	27	13																2.6	
BH-04	0.00	0.50	D/S	-	-	-		4	22	55	19	61	37	24																2.68	
	1.50	1.95	SPT	-	-	-		7	41	43	9	60	35	25																2.58	
	3.00	3.45	SPT	-	-	-		7	63	23	7	44	30	14																2.64	
BH-05	0.00	0.50	D/S	-	-	-		3	54	36	7	37	29	8																2.66	

D/S - Disturbed Sample
UDS - Undisturbed Sample

NMC - Natural Moisure Content
C - Cohesion in Mpa

UU - Un-Consolidated Un-drained
CU - Consolidated Un-Drained

CD - Consoliodated Drained
Φ – Angle shearing resistance

Tested By : KB | **Prepared By : VN** | **Checked By : TVS** | **Approved By : ST**

Integrity

SUMMARY OF LABORATORY TEST RESULTS ON ROCK SAMPLES

Project : PREPARATORY SURVEY ON THE URBAN RAILWAY PROJECT IN PUNE

Job No. : IGPL-MUM-068/012 **Date : 13/7/2012**

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Unit Weight (g/cm^3)	Specific Gravity	Point Load Index Strength(Mpa)	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)	Modulus of Elasticity	Brazilian Test	Remarks
BH-1	2.10-3.50	4.72	5.31	SOAKED	2.18	4.89	2.24	2.34	0.65	14.24	12.32	-	-	
	2.10-3.50	10.65	5.41	SOAKED	1.20	3.14	2.62	2.67	-	37.00	36.92	-	-	
	3.60-5.10	10.32	5.46	SOAKED	1.09	2.82	2.60	2.56	-	7.74	7.68	-	-	
BH-2	5.50-6.00	3.53	5.32	SOAKED	1.43	3.70	2.59	2.54	0.14	3.16	2.52	-	-	
	6.00-7.50	10.63	5.44	SOAKED	0.99	2.46	2.50	2.53	-	27.62	27.53	-	-	
	6.00-7.50	10.60	5.44	SOAKED	2.69	6.17	2.29	2.31	-	22.54	22.47	-	-	
	7.50-8.90	10.68	5.46	SOAKED	1.14	2.96	2.59	2.60	-	34.67	34.57	-	-	
BH-3	1.20-2.70	10.60	5.45	SOAKED	2.67	6.48	2.43	2.45	-	23.69	23.61	-	-	
	2.70-4.20	10.67	5.43	SOAKED	1.57	3.96	2.52	2.55	-	43.02	42.92	-	-	
BH-4	4.00-5.50	10.67	5.44	SOAKED	1.15	2.94	2.57	2.60	-	29.90	29.83	-	-	
	5.50-7.00	10.72	5.44	SOAKED	1.33	3.44	2.59	2.74	-	27.92	27.87	-	-	
	5.50-7.00	6.81	5.41	SOAKED	1.85	4.66	2.51	2.54	0.50	10.91	10.16	-	-	
BH-5	1.10-2.60	6.04	5.44	SOAKED	1.45	3.78	2.61	2.52	0.85	18.64	16.95	-	-	
	1.10-2.60	10.73	5.39	SOAKED	0.93	2.41	2.58	2.63	-	29.49	29.47	-	-	
	2.60-4.10	10.65	5.41	SOAKED	1.22	2.98	2.44	2.49	-	42.99	42.90	-	-	

Checked By: VN Approved by : ST

APPENDIX-20: 交通調査シート

表 A20-1　断面交通量調査シート

Urban Railway Project in Pune City

Classified Volume Count Survey

Station: Date & Day: Enumerator:

No. of Lanes/Dir.:

Road Name: Direction: To: Weather:

From:

ime	Private Bus	Public Bus	Mini-Bus	Car/Jeep		Van		2-Wheeler	3-Wheeler	Goods Vehicles			
				Private	Taxi	Private	Taxi			LGV	MGV	HGV	Tractors
:00 To :15													
:00 To :15													
:00 To :15													
:00 To :15													

表A20-2　路側乗用車OD調査シート

Urban Railway Project in Pune City

Roadside OD Passenger Survey Sheet

Name of the Road :

Location:

Direction:

Interviewer :

Date :

Day :

Time (24:00 Hour Format)

Vehicle Type	Occupancy	Trip Frequency	Origin of Trip	Destination of Trip	Purpose of Trip	How many times a week do you usually ride the bus?	"Do you use public transport when private transport is available?**	"If so, what is the main reason?***

Vehicle type

1. Two-Wheeler
2. Three-Wheeler
3. Car
4. Van
5. Taxi- Small
6. Taxi- Large

Trip frequency

1. Multiple trips a day
2. Daily
3. Alternate Day
4. Weekly
5. Fortnightly
6. Monthly

Purpose of trip

1. Work
2. Business
3. Education
4. Social
5. Tourism & Recreation
6. Others

**

1. Yes
2. No

***

1. Faster
2. Less expensive
3. Others(Please specify)

表A20-3　意思決定調査シート

Urban Railway Project in Pune City
Stated Preference Survey Format
Pune Metro Region & JICA

Date Of Survey:　　Enumerator's Name:
Location Name:

1 Personal Details

Age	
Occupation	
Sex	

2 Vehicle Ownership

	No	
Car	1	>1
2-Wheeler	1	>1

3 Monthly Income in Rs (check one)

<10000	
10000-20000	
20000-30000	
30000 to 50000	
50000 to 75000	
75000 to 1 lakh	
Above 1 lakh	

4 Do you receive a commutation allowance? Circle one: Yes No

If yes, how much? Rs. _____ per month

5 Travel Particulars (Please specify full travel details)

Origin	
Destination	
Start Time In Hrs	
End time in Hrs	

6 Dominant Mode of Travel

Two-wheeler	
Own Car	
Taxi	
Company Bus	
Public Bus	AC/Non-AC
Three-Wheeler	
Shared Auto	
Shared Taxi	

7 **Frequency of Trip**

Daily	
Alternate Days	
Weekly	
Occasionally	

8 Purpose

1. Work	
2. Business	
3. Education	
4. Social	
5. Tourism & Recreation	
6. Other	

8. Accompanied Travelers

No. of Adults	
No. of Children	

9. Parking Fee (Rs) if any you paid _____

Pune and PCMC are considering to implement Light Rail Transit (LRT) service from Shivaji Nagar to Hinjewadi. LRT service frequency will be every five minutes & will be completely air-conditioned. There will also be feeder services & parking facilities at major stations. In this regard, we wish to know your opinion about your willingness to shift to the LRT given the scenarios below.

10. SCENARIOS & RANKING, Please give your opinion based on your present mode of travel

Bus					
Circle the Distance of Your Trip on the LRT Corridor (Distance in Km)	Max. Savings in Minutes if you Use LRT (incl. waiting & in-vehicle time)	How much are you willing to pay to ride on the LRT for your trip given the stated savings in time? Tick (√) the appropriate option.			
		Fare Level-1	Fare Level-2	Fare Level-3	Fare Level-4
<=3	13	8	12	16	20
3-6	18	11	17	22	26
6-9	23	14	21	28	39
9-12	34	17	26	34	52
12-15	40	21	32	42	65
Car/2-Wheeler					
Circle the Distance of Your Trip on the LRT Corridor	Max. Savings in Minutes if you Use LRT (incl. waiting & in-vehicle time)	How much are you willing to pay to ride on the LRT for your trip given the stated savings in time? Tick (√) the appropriate option.			
		Fare Level-1	Fare Level-2	Fare Level-3	Fare Level-4
6-9	7	14	21	28	39
9-12	15	17	26	34	52
12-15	20	21	32	42	65
3-wheeler					
Circle the Distance of Your Trip on the LRT Corridor	Max. Savings in Minutes if you Use LRT (incl. waiting & in-vehicle time)	How much are you willing to pay to ride on the LRT for your trip given the stated savings in time? Tick (√) the appropriate option.			
		Fare Level-1	Fare Level-2	Fare Level-3	Fare Level-4
<=3	7	8	12	16	20
3-6	11	11	17	22	26
6-9	15	14	21	28	39
9-12	25	17	26	34	52
12-15	30	21	32	42	65

How much is your bus fare for the selected distance? Rs. _____

How much is your fare for the selected distance? Rs. _____

表A20-4　バスOD・混雑度調査シート

Urban Railway Project in Pune City
Bus Origin-Destination & Occupancy

Location　　Date :

Road Name :　　Day:

Landmark:　　Direction :

Enumerator :　　Weather:

Time	Bus Category	Bus Route No.	Origin	Destination	Sitting Capacity (%)	Standing Capacity (%)	Crush Capacity (Put✓ Mark)

Bus category	A/C City Service Buses	Non-A/C City Service Buses	Interstate Buses	Company buses	School buses
Code	1	2	3	4	5

表A20-5　バス乗り･降り調査シート

Urban Railway Project in Pune City
Bus Passenger Counts

Location
Road Name :
Landmark:
Enumerator :

Date :
Day:
Direction :
Weather:

Time	Bus Type	Bus Route Number (with Origin & Destination)	No. of Passengers Alighted	No. of Passengers Boarded

Bus category	A/C City Service Buses	Non-A/C City Service Buses	Interstate Buses	Company buses	School buses
Code	1	2	3	4	5

表A20-6　速度・ディレー調査シート

Urban Railway Project in Pune City

Speed and Delay Survey Format

Road Name: **Sheet No:** **Date:**

Direction: **Weather:** **Trip No:**

Town: **Name of Surveyor:**

Sl.No.	Time	From Node	To Node	BEGIN		END		Delay (sec.)	Delay Cause
				Time	Km Reading	Time	Km Reading		

Delay Causes

(i) Traffic Signal/Police control
(ii) Stop sign
(iii) Market Pedestrian Crossing
(iv) Right turn / U-Turn (Uncontrolled junction)
(v) General congestion
(vi) Accident
(vii) Parked vehicles
(viii) Pedestrian interference
(ix) Level crossing
(x) Road repair
(xi) Breakdown
(xii) Passenger Boarding/Alighting
(xiii) Ticket issuing(Fare stage)
(xiv) Other delays(mention)

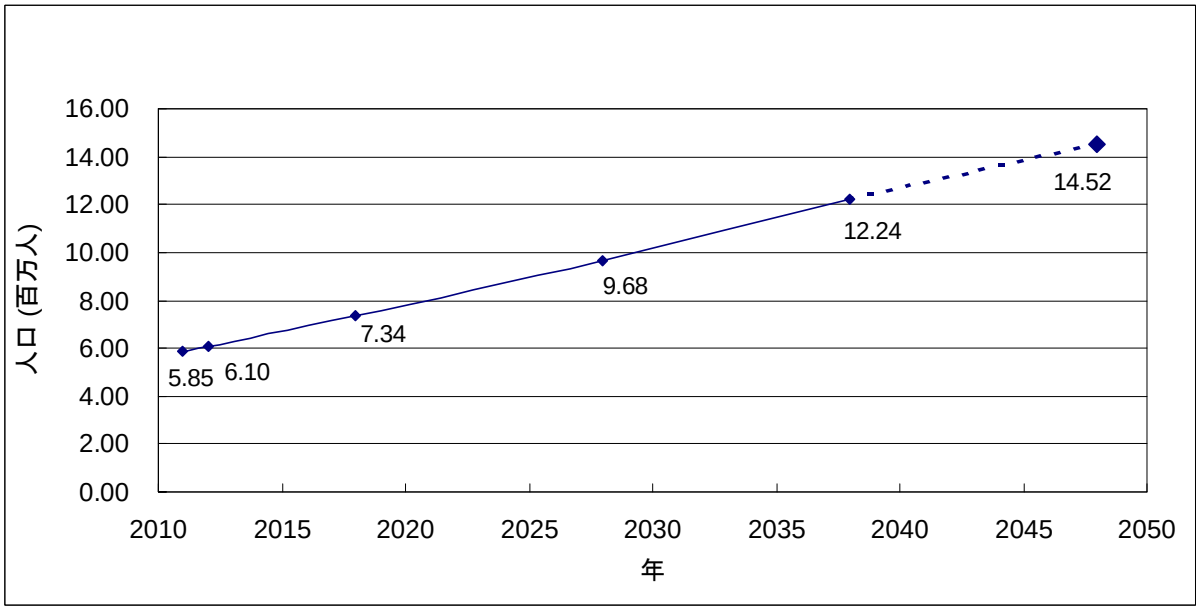
表A20-7　道路インベントリー調査シート

Urban Railway Project in Pune City																	
Road Inventory Survey																	
Chainage (Km) / Location		Pavement Condition	Number of Lanes / Road Width Details			Shoulder				Total width of Road Way (m)	Land Use (LHS)	Land Use (RHS)	Encroachments	Intersection		Lighting	Remarks
						LHS		RHS									
From	To	Good/Fair/ Poor	LHS Width (m)	Median Width (m)	RHS Width (m)	Type (P/UP)	Width (m)	Type (P/UP)	Width (m)		R/C/I/A/O/ W	R/C/I/A/O/ W	Heavy/ Moderate/ Nil	Type of junction	Type of control	Central / Roadside/ Nil	

APPENDIX-21： 2048 年の LRT 需要予測

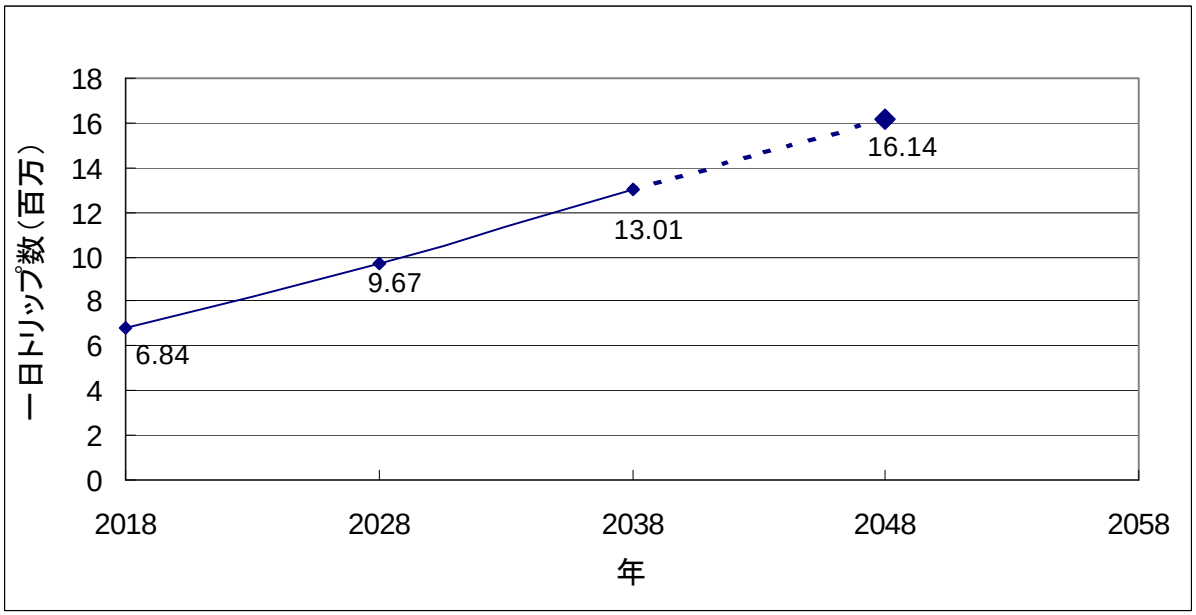
下記に、LRTの2048年の需要予測を行い、輸送力の十分さを確認する。

先ず、3.6節のトレンド分析により、2048年のプネ大都市圏（PMR）の人口を推定する。図ーA21-1から分かるように2048年のPMR人口は約14.52百万人となる。



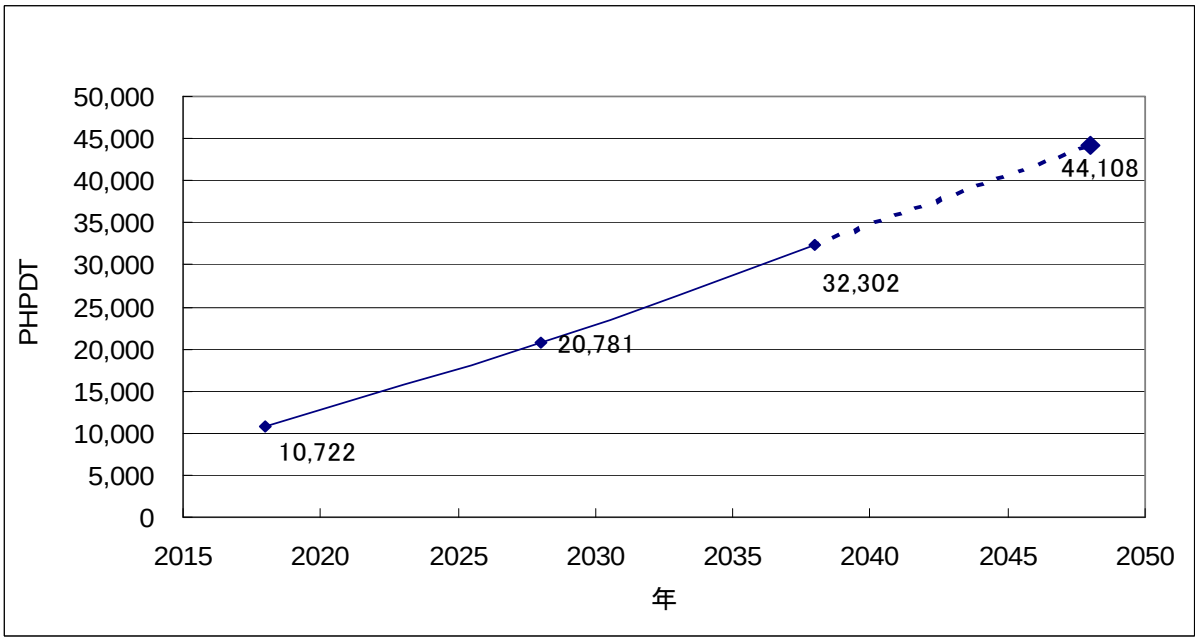
図A21-1　2048年までのPMRー日トリップ数のトレンド

需要予測モデルによると、交通と人口の成長関係は一定である。この関係を踏まえ、2038年ら2048年までの人口増加率を2028年から2038年の交通成長にかけ、2038年から2048年の交通増加率を求めた。この計算により、2038年から2048年までの交通年増加率は2%となる。即ち、2038年の13.01百万の日トリップは2048年に16.14百万となる（図ーA21-2参照）。



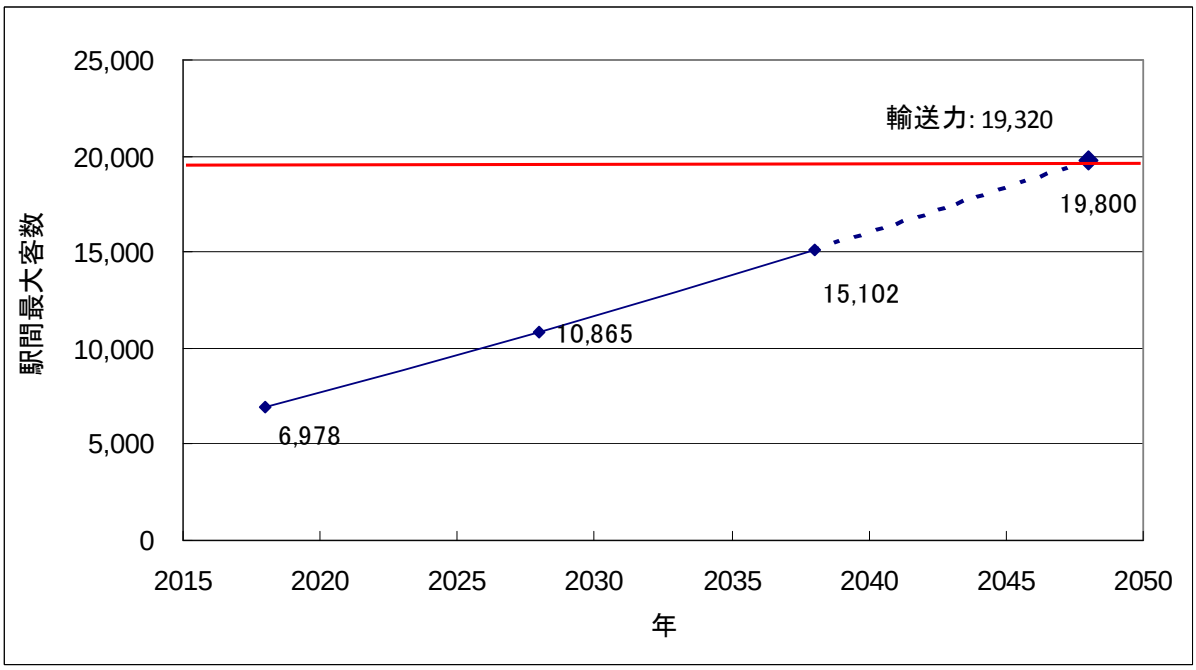
図A21-2　2048年までのPMR人口トレンド

運賃レベル-2の場合、2038年のPMR一日トリップ数に関するLRTのピーク時トリップ数割合は5%である。この関係は2048年で同じと仮定する。その仮定により、LRTの2048年のピーク時のトリップ数は約8万トリップである。そして、このトリップ数を2038年OD表の更新で分布した。ピーク時におけるピーク方向の乗客数のトレンドは図ーA21－3に示してある。



図A21-3　ピーク時におけるピーク方向の乗客数のトレンド（部分的高架LRT）

下図に、運賃レベル-2 のピーク時における駅間の最大客数を示してある。この図から分かるように LRT が 30 年後（2048 年）の需要でも対応できる。但し、その場合、LRT 延長を当初の 60m から 70m へ長くしないといけない。電車間隔は 2.5 分である。



図A21-4　ピーク時における駅間の最大乗客数（部分的高架LRT）

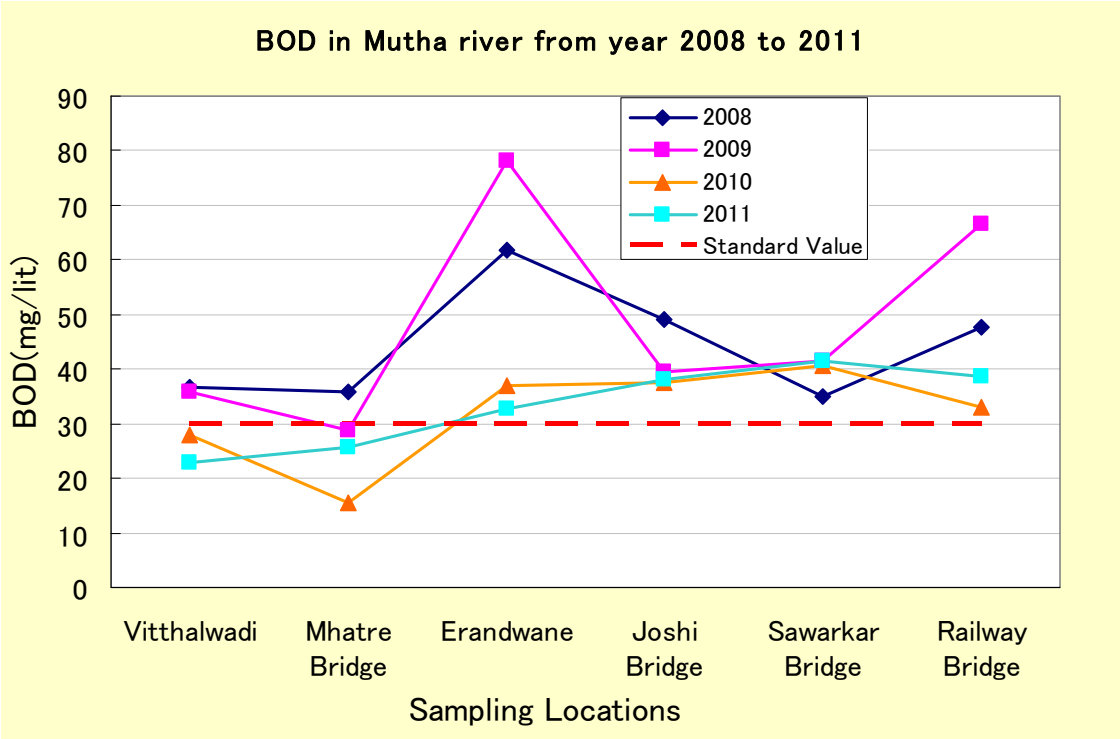


図 A22-1　BOD（ムタ川）2008～2011

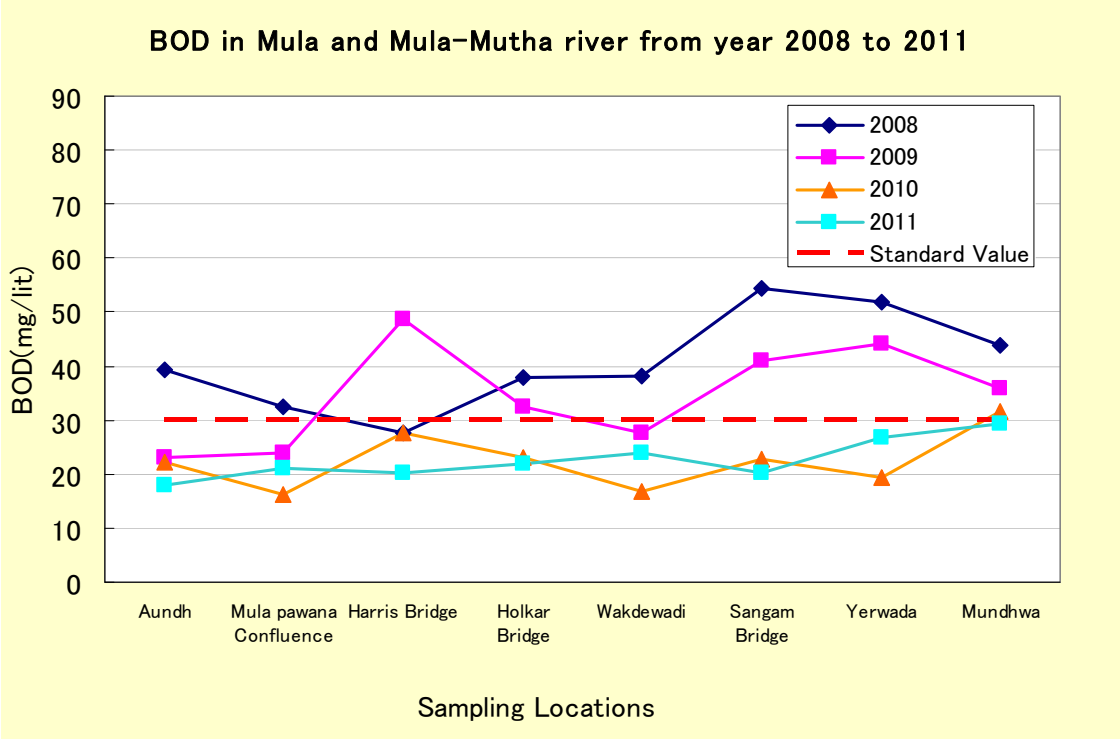


図 A22-2　BOD（ムラ川　及び　ムラームタ川）2008～2011

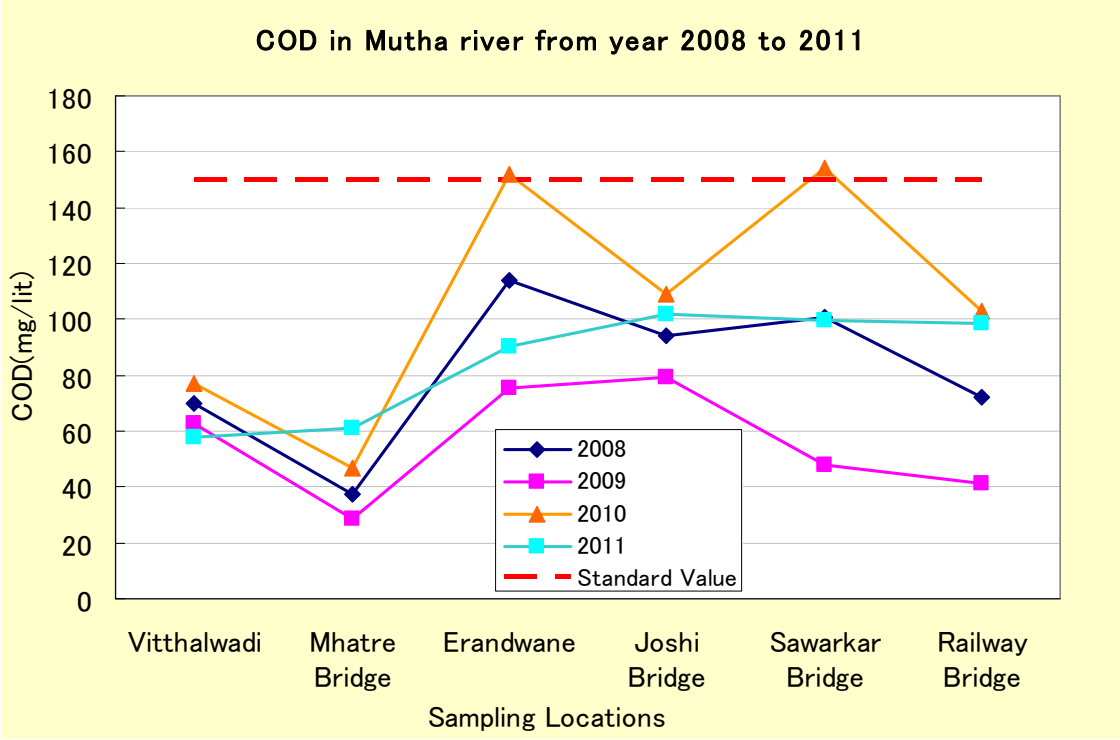


図 A22-3　COD（ムタ川）2008～2011

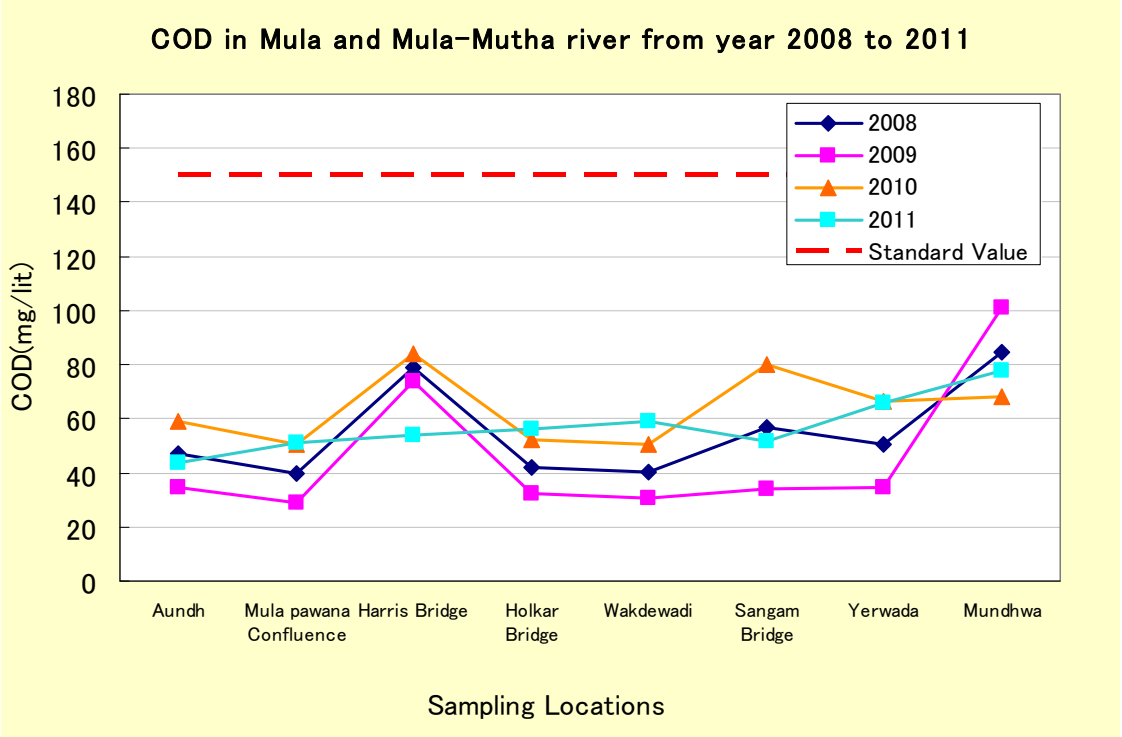


図 A22-4　COD（ムラ川　及び　ムラームタ川）2008～2011

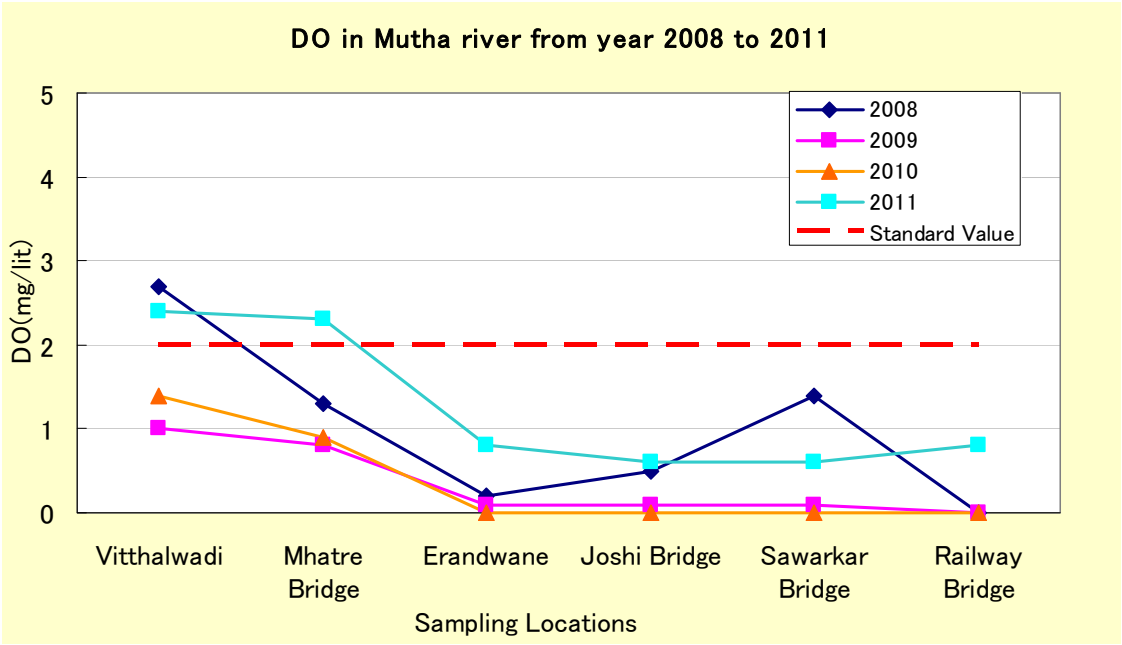


図 A22-5　DO（ムタ川）2008～2011

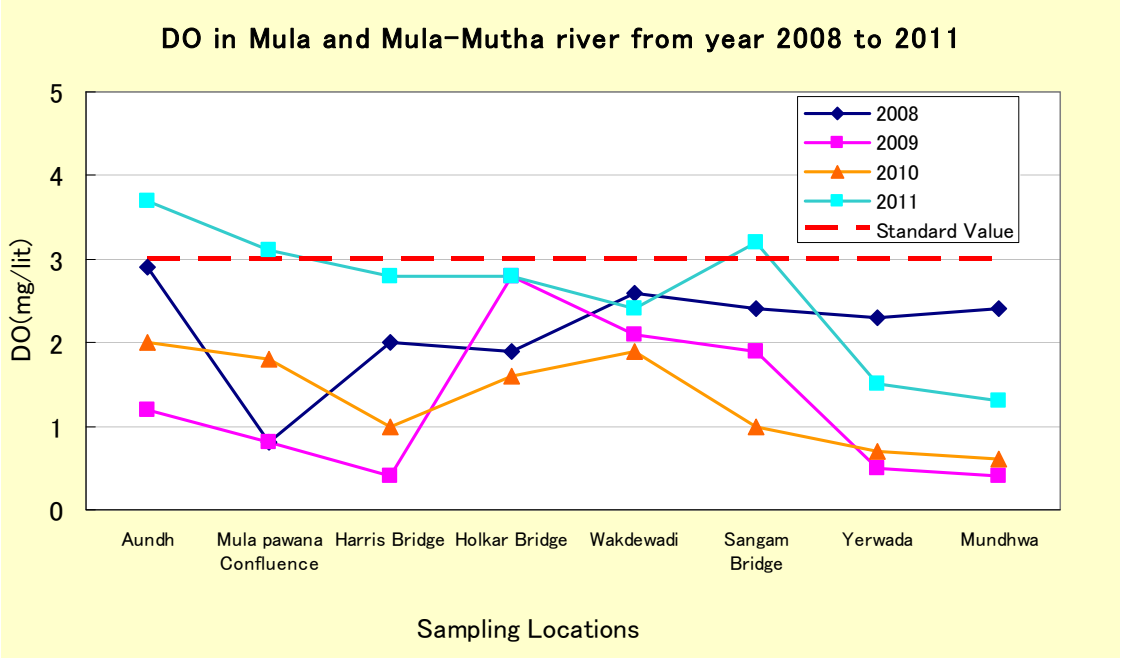


図 A22-6　DO（ムラ川　及び　ムラ－ムタ川）2008～2011

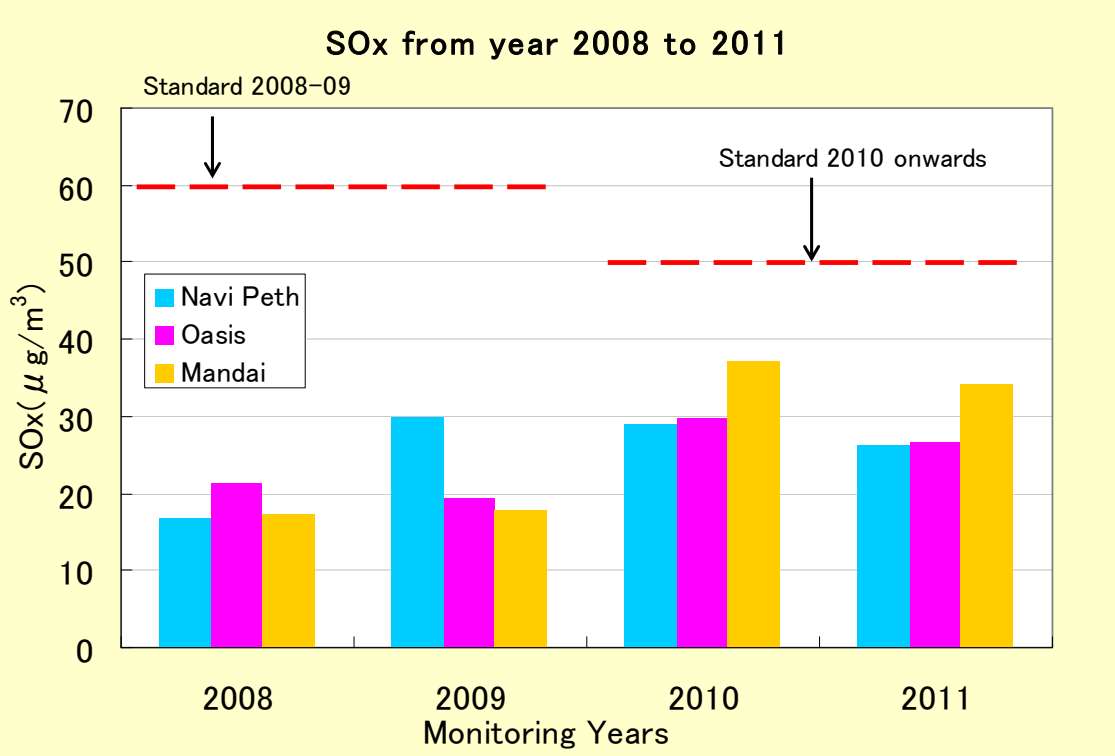


図 A22-7　SOx 2008～2011

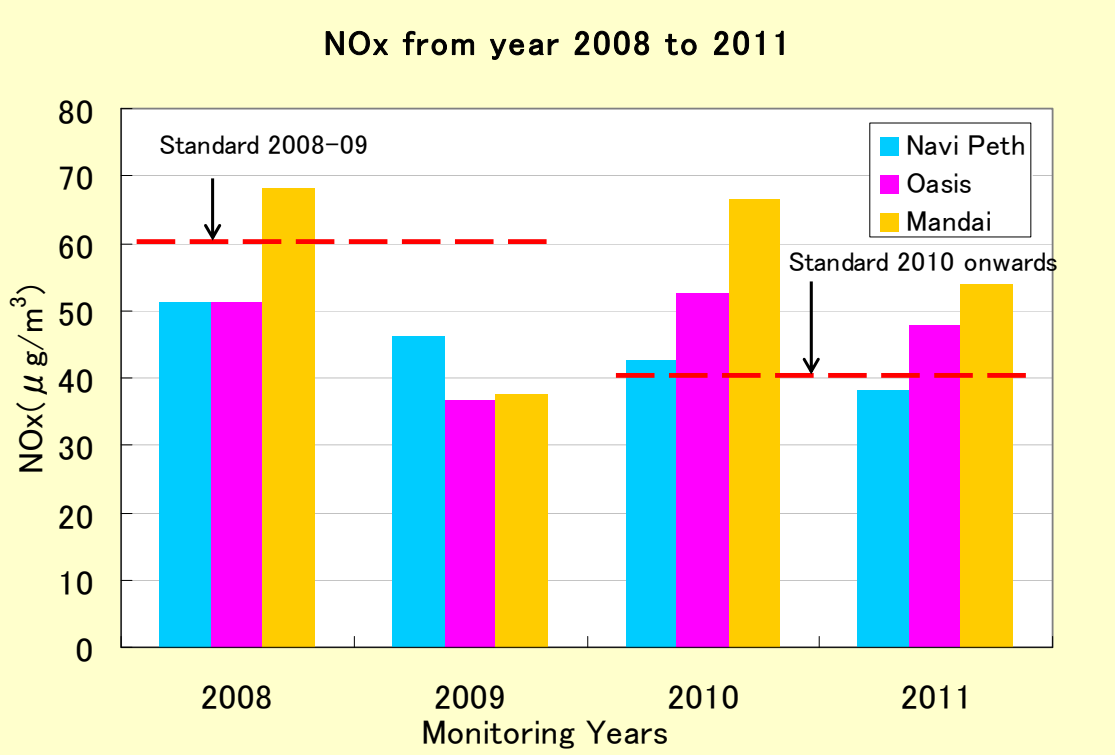


図 A22-8　NOx 2008～2011

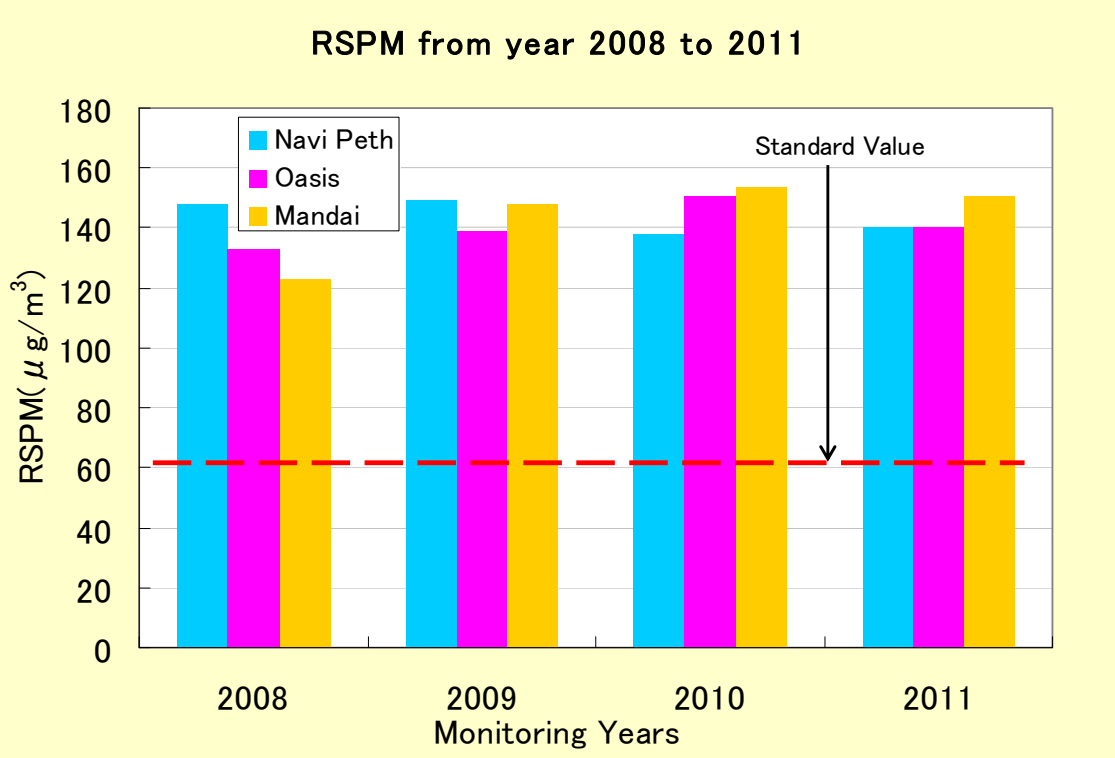


図 A22-9　RSPM 2008～2011

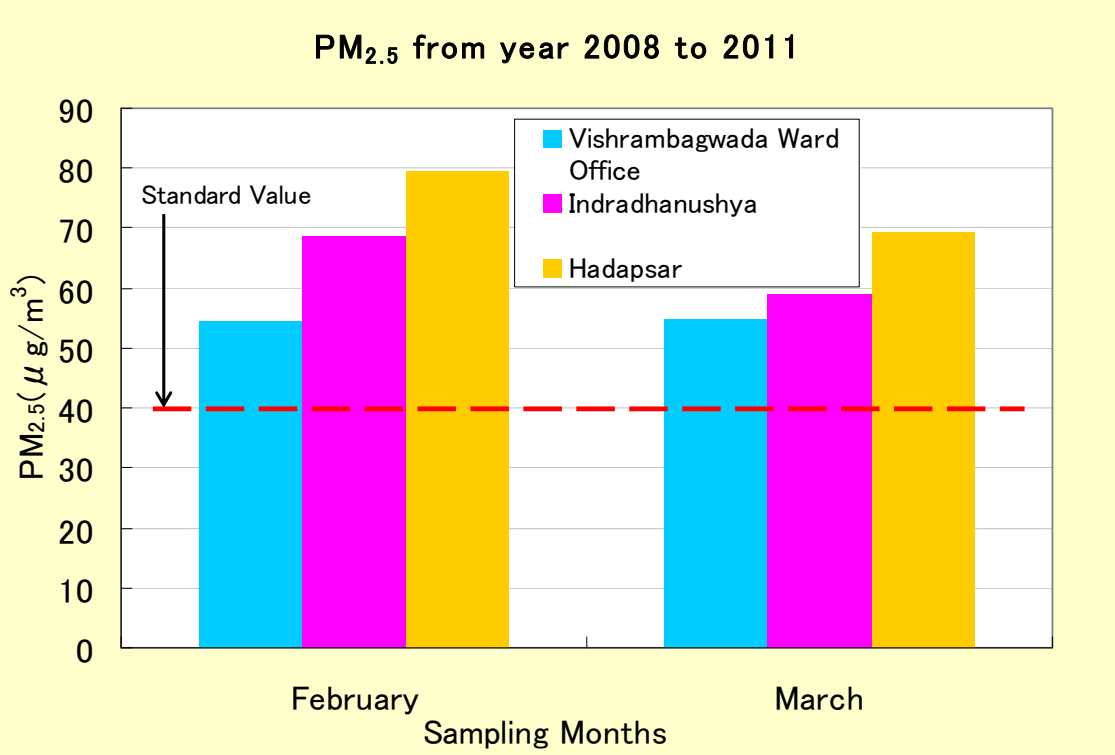


図 A22-10　PM2.5 2011

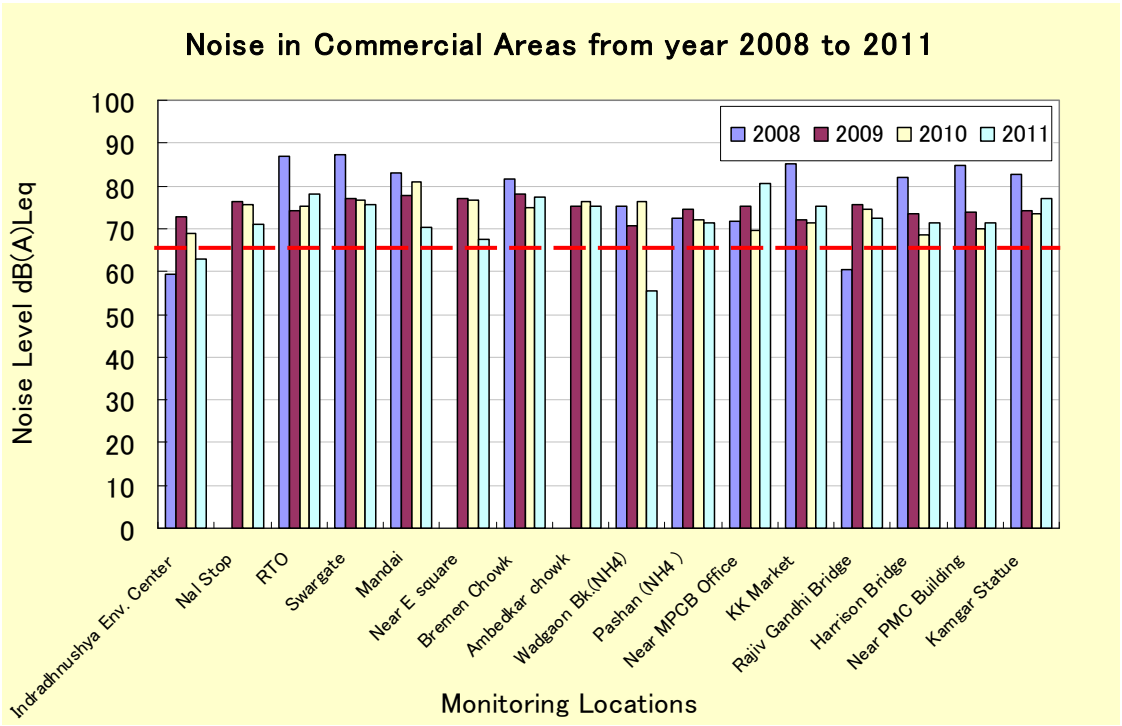


図 A22-11　Noise in Commercial Areas 2008～2011

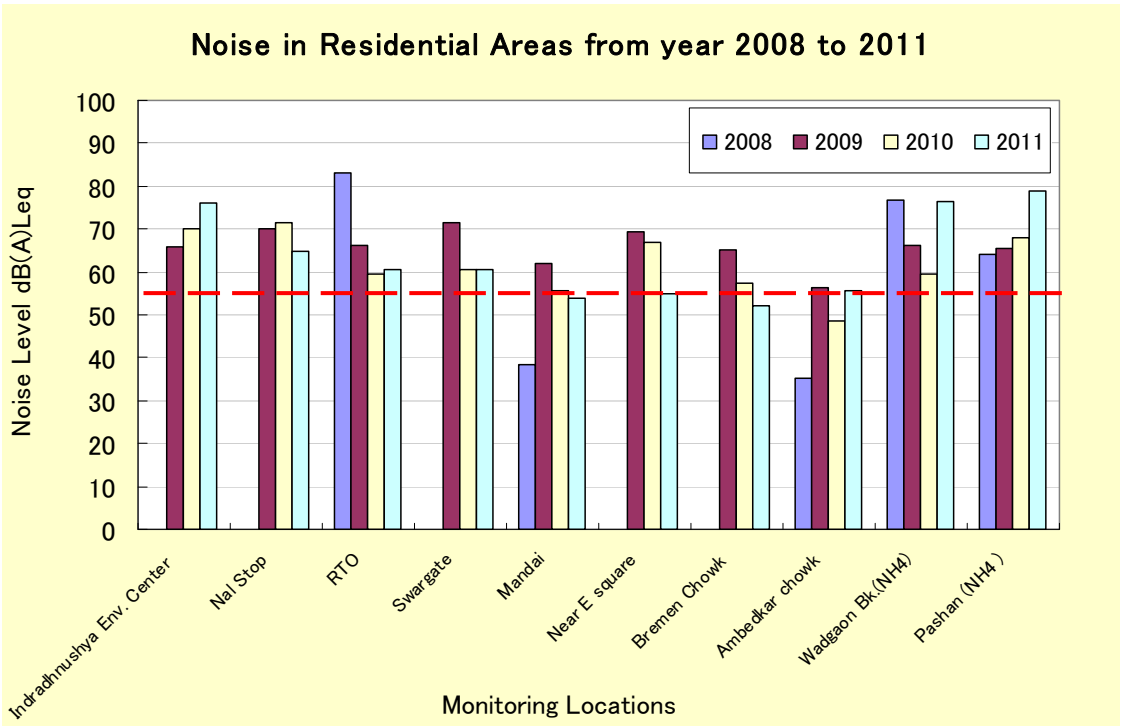


図 A22-12　Noise in Residencial Areas 2008～2011

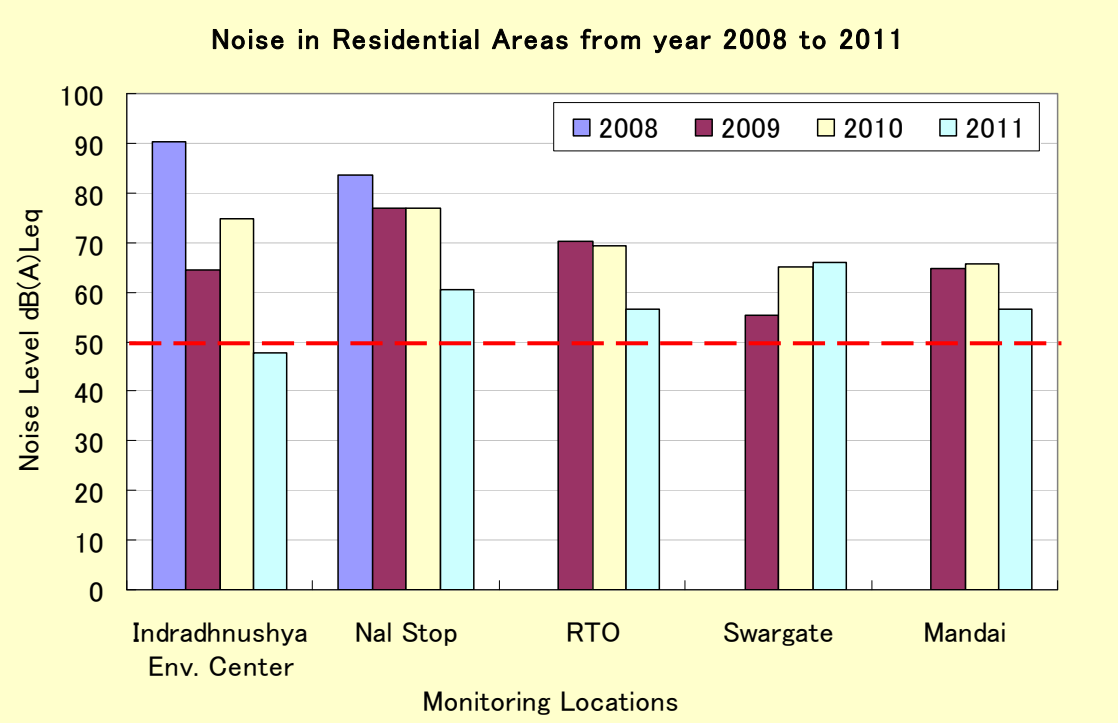


図 A22-13　Noise in Silence Areas 2008～2011

APPENDIX-23: 用地買収箇所の写真

出典：調査団撮影

St9～10:警察署と警察のトレーニングセンター

St9 写真 1:警察署の南側

St9 写真 2:警察署

St9 写真 3:警察のトレーニングセンター

St9 写真 4:警察署のトレーニングセンターの北側

ムラ川付近：寺院、住居、小売店、学校、広場

ムラ川付近 写真 1：寺院 北側

ムラ川付近 写真 2：寺院 南側

ムラ川付近 写真 3：寺院 正面

ムラ川付近 写真 4：工事中の土地

ムラ川付近 写真 5：小売店

ムラ川付近 写真 6：小売店

ムラ川付近 写真 7：小売店

ムラ川付近 写真 8：小売店

ムラ川付近 写真 9:小売店

ムラ川付近 写真 10:小売店

ムラ川付近 写真 11:小売店

ムラ川付近 写真 12:住居

ムラ川付近 写真 13:住居

ムラ川付近 写真 14:小売店

ムラ川付近 写真 15:住居

ムラ川付近 写真 16:住居

ムラ川付近 写真 17:住居

ムラ川付近 写真 18:小売店

ムラ川付近 写真 19:小売店

ムラ川付近 写真 20:住居

ムラ川付近 写真 21:住居

ムラ川付近 写真 22:バス停

ムラ川付近 写真 23:学校

ムラ川付近 写真 24:学校

ムラ川付近 写真 25:寺院

ムラ川付近 写真 26:寺院近くの広場

NH4 東側：小売店

NH4 東側 写真 1：小売店

NH4 東側 写真 2：小売店

NH4 東側 写真 3：小売店

NH4 東側 写真 4：小売店

NH4 東側 写真 5：小売店

NH4 東側 写真 6：小売店

NH4 東側 写真 7：小売店

NH4 東側 写真 8：小売店

NH4 東側 写真 9:小売店

NH4 東側 写真 10:空き地

NH4 東側 写真 11:空き地

NH4 東側 写真 12:空き地

NH4 東側 写真 13:建設に従事する労働者の住居

NH4 東側 写真 14:工事中の土地

NH4 東側 写真 15:小売店

NH4 東側 写真 16:小売店

NH4 東側 写真 17:小売店

NH4 東側 写真 18:小売店

NH4 西側：小売店及び住居

NH4 西側 写真 1：小売店

NH4 西側 写真 2：小売店

NH4 西側写真 3：小売店

NH4 西側 写真 4：空き地

NH4 西側 写真 5：住居

NH4 西側 写真 6：住居

NH4 西側 写真 7：小売店

NH4 西側 写真 8：小売店

NH4 西側 写真 9:小売店

NH4 西側 写真 10:住居

NH4 西側 写真 11:小売店

車両基地:工場、学校、住居、畑

車両基地 写真 1:学校

車両基地 写真 2:学校全体

車両基地 写真 3:学校の南側

車両基地 写真 4:学校の南側

車両基地 写真 5:学校の東側

車両基地 写真 6:学校の西側

車両基地 写真 7:工場

車両基地 写真 8:学校近くの住居

車両基地 写真 9:学校の南側にある住居

車両基地 写真 10:学校の南側にある住居

車両基地 写真 11:学校の南側にある住居

車両基地 写真 12:ソルガムの畑

車両基地 写真 13:ソルガム

車両基地 写真 14:ソルガムの畑近くにある住居

車両基地 写真 15:ソルガムの畑近くにある住居

車両基地 写真 16:ソルガムの畑近くにある住居

車両基地 写真 17:ソルガムの畑の南側

車両基地 写真 18:ソルガムの西側

APPENDIX-24：環境社会配慮調査 ToR

表-A1 は、LRT 実施に向けた環境クリアランス取得に必要な環境社会配慮調査（ESIA）の主要検討項目をまとめたものである。表 A2 及び A3 は表 A1 中の項目 1、" **Descriptions of Baseline Environment Condition**"並びに" **Environmental Field Survey**"の内訳詳細をまとめたものである。ちなみに樹木伐採許可申請に関する一連の調査は、ESIA 調査内で実施するものとしている（関連作業項目としては、例えば、表-A1 の項目 1 の 9、項目 5、及び表 A3 の項目 9 にて言及）。当 LRT 案件では車両基地建設などにより大規模な土地取得の発生が予想される。表 A4 は RAP 等に関連した社会調査の ToR（案）をまとめたものでる。

2012 年 11 月時点において、当プネ LRT 事業計画の最終的な実施体制は未定である。従って事業スコープの内容についても、今後、新しい展開が出てくる可能性があるが、関連する環境社会配慮調査の ToR 策定においては、それらの変化に柔軟に対処しつつ必要に応じて内容を変更し、最適な環境ライセンス申請も含めた環境監理体制を模索する事が重要である。

表 A24-1　環境社会配慮主要検討項目

	Items to be collected
1	**Descriptions of Baseline Environment Condition**
	Describe environmental baseline condition of selected pre-feasibility projects. 1) Bio-Physical condition 2) Socio-Cultural condition More detailed descriptions are summarized in Table-A2.
2	**Environmental Field Survey**
	Carry out following environmental field surveys, 1) Roadside Air Quality Survey 2) Roadside Noise Survey 3) Roadside Vibration Survey 4) Soil Survey 5) Sediment Survey 6) Water Quality Survey 7) Groundwater Quality Survey 8) Hydrological Survey 9) Tree Inventory Survey More detailed descriptions are summarized in Table A3.
3	**Social Survey**
	Carry out following social surveys, 1) Socio-Cultural Survey 2) RAP-related survey 3) RAP-related survey (illegal squatters) More detailed descriptions are summarized in Table A4.

4	**Environmental Impact Assessment**
	Evaluate potential environmental impacts of three project stages such as 1) pre-construction phase, 2) construction phase, and 3) operational phase shall be described. Besides, following impact assessment studies shall be conducted in order to stress out the advantage/disadvantage of the proposed project quantitatively. 1) Vehicular Emission Study (CO_2) 2) Air Quality Prediction Study 3) Noise Prediction Study 4) Vibration Prediction Study 5) Run-off (road surface drainage) Study 6) Urban Vegetation Impact Study 7) Mula River Flood Prediction Study 8) Regional Land Subsidence Prediction Study 9) Visual Impact Study 10) Socio-Economic Impact Study
5	ㄔ. Environmental Mitigation
	Describe comprehensive, effective measures of the mitigation (i.e., avoidance, reduction, and elimination) of negative impacts for the pre-construction, construction and operation phases of the project. In particular, the re-vegetation plan, based on study results of both the tree inventory survey (Item 9 of Table A3) and the urban vegetation impact study shall be developed.
6	**Environmental Management**
	Establish appropriate environmental management plan. Specific objectives of this plan are to 1) define organizational and administrative arrangements for the environmental monitoring, including the definition of responsibilities of staff, coordination, liaison and reporting procedures, and 2) to discuss procedures for pro-active environmental management, so that potential problems can be identified and mitigation measures to be adopted prior to the construction commencement.
7	**Environmental Monitoring**
	Establish appropriate environmental monitoring program. The scope of the monitoring plan are 1) to identify the monitoring tasks, 2) to identify the nature and the schedule of the monitoring, and 3) to identify samples to be taken for analysis and parameters to be measured.
8	**Public Involvement**
	Describe contents of both stakeholder meetings and information disclosures, held for selected pre-feasibility projects. Followings are major items to be checked within this item, **Stakeholder Meeting** (1) Entire Schedule of stakeholder meeting (e.g., dates and places) (2) List of Participants (3) Minutes of Meeting (4) Handouts and/or brochures, used for the public participation process. **Information Disclosure** (1) Outline of entire information disclosure process (dates and the ways of disclosures: Internet, library, newspaper and others). (2) Disclosure (public review) periods (3) Comments and/or questions collected from information disclosure.

表 A24-2　環境・社会関連現況情報の把握

1. Bio-Physical condition
1) Regional hydrology (e.g., major tributaries, channels, regional water balance) 2) Water quality of surface/subsurface within the study area. 3) Air quality 4) Regional drainage 5) Roadside noise/vibration/air quality 6) Climate 7) Geology 8) Disaster Records (e.g., past earthquake, landslide, inundation or flood events) Especially, past flood events of Mula River shall be investigated. 9) Soil/sediment 10) Biological Environment It is noted that periodical environmental monitoring of the water quality and the roadside air quality are conducted by PMC (see Table 7.2.1). So, it is strongly recommended to incorporate those information within this collection of the baseline environmental information.
2. Socio-Cultural condition
1) Cultural (historical and archaeological) resources (e.g., Ruins, memorial facilities, historic spots and others) 2) Visual resources (e.g., scenic zones, townscape) 3) Land take/resettlements (e.g., conditions of existing roadside building) 4) Illegal squatter 5) Land use 6) Water use (e.g., water supply system, well and others) 7) School, hospital, park, library, religious facilities. 8) Waste Disposal Site (location, capacity, treatment method) 9) Vehicle Registration 10) Vehicle Inspection/Maintenance Program 11) Clean Fuel Program 12) Sewage system
3. Pollution
1) Roadside Air Quality 2) Roadside Noise 3) Roadside Vibration 4) Soil Contamination 5) Sediment Contamination 6) Water Contamination 7) Bad odor

出典、調査団、2012

表 A24-3　実測調査一覧

1. Roadside Air Quality
Carry out 24-hours continuous survey at five (5) points across the study area. Parameter: PM2.5, PM10, CO, HC, NOX, and SOX Traffic volume by vehicle type Survey Campaign: At least twice (once in rainy season and the other in dry season). Note that one survey point shall be for baseline air quality condition across Pune City, that would represent the air quality environment without significant negative impacts from nearby traffic volume.
2. Roadside Noise
Carry out 24-hours continuous survey at five (5) points across the study area. Parameter: Leq Traffic volume by vehicle type Survey Campaign: At least twice (once in rainy season and the other in dry season). Note that one survey point shall be for baseline noise condition across Pune City, that would represent the noise environment without significant negative impacts from nearby traffic volume.
3. Roadside Vibration
Carry out 24-hours continuous survey at five (5) points across the study area. Parameter: L_{10} Traffic volume by vehicle type Survey Campaign: At least twice (once in rainy season and the other in dry season). Note that one survey point shall be for baseline vibration condition across Pune City, that would represent the vibration environment without significant negative impacts from nearby traffic volume.
4. Soil Survey
Soil survey is to be carried out at five (5) points in total across the study areas in order to obtain the baseline soil characteristics data that would support the identification of potential soil contaminated sites. Several heavy metal and other contaminant parameters such as arsenic, PCB, Chrome, iron, lead, zinc and mercury are of concern.
5. Sediment Survey
Sediment survey is to be carried out at two (2) points in total across the proposed construction areas, inside and nearby Mula River in order to obtain the baseline port sediment characteristics data that would support the identification of potential soil contaminated sites. Several heavy metal and other contaminant parameters such as arsenic, PCB, Chrome, iron, lead, zinc and mercury are of concern.
6. Water Quality Survey
Two (2) sampling points in total shall be designated along Mula River around the study area (e.g., one point at downstream site and the other at the upstream site). Ten parameters such as pH, turbidity, DO, BOD, COD, conductivity, temperature, SS, E-Coli form and Total Coli form are of concern. Available current water quality data from the competent agencies and/or organizations, is to be examined to improve the credibility of the whole water quality data collected by this study.

7.Groundwater Quality Survey

Three (3) or Four (4) sampling points in total shall be designated around the study area. Exact number of sampling points for well shall be determined based on the existing groundwater usage information, to be addressed the proposed baseline environmental and social information collection. Ten parameters such as pH, turbidity, DO, BOD, COD, conductivity, temperature, SS, E-Coli form and Total Coli form are of concern. Available current water quality data from the competent agencies and/or organizations, is to be examined to improve the credibility of the whole water quality data collected by this study.

8. Hydrological Study

7.1 Literature Review

Carry out literature review/or database search that would contain appropriate regional hydrological info, based on the available hydrological and/or meteorological data such as,

a) Rain
b) Regional Groundwater Level
c) Groundwater pumping rate (location included)
d) Evapo-transpiration data
e) Regional Drainage System

7.2 Regional Water Balance

a) Analyze regional water balance under non-flood condition (dry and rainy season)
b) Analyze regional water balance under flood events.

9. Tree Inventory Survey

Tree inventory survey is carried out at green areas, located within the area of concerns in order to grasp the existing tree inventory and prepare for the permit application for tree-cutting to be required for the implementation of the proposed project.

Methodology

1) Determine the green areas, located inside of the area of concern.
2) Prepare tree inventory by grasping following information,
   a) Name of Tree (academic, English and local name)
   b) GPS Coordinate
   c) DBH (Diameter at Breast Height)
   d) Photo records of each tree.
   e) IUCN-status
   f) Others
3) Prepare tree distribution and/or vegetation map.

出典、調査団、2012

表 A24-4　関連社会調査一覧

1. Socio-Cultural Survey
Community participation plays an important role for proper infrastructure project planning and management. It is essential to examine variety of aspects of the proposed project based on the current community's needs or priority. A questionnaire-based socio-cultural survey is to be carried out in order to grasp the public opinion about this proposed project as well as current concerns about urban transport system of Pune from nearby community properly. It is recommended to have 500 interviews (or samples) inside and/outside of the study area. The opinion survey sheet will be provided to local consultant from JICA Study Team.
2. RAP-related Survey
As mentioned in Section 6.1, the study area is classified as either of mixed residential/commercial area and farm lands, and has certain amounts of private properties such as house and/or office complex are to be affected by the implementation of the proposed project. Survey items such as the inventory of the property owners, type of property (e.g., house, multi-tenant building and others), lease agreement and others shall be developed based on the Land Law of 1894, JICA Guideline as well as relevant laws and/or regulations. Sample survey form of this RAP-related study is attached in Appendix 2 of this report.
3. RAP-related Survey (illegal squatters)
Some communities of illegal squatters exist along the existing railway line. According to JICA Guideline, it is recommended to take appropriate social considerations for those communities in case of expropriation. Followings are majors items to be summarized within this study, a) Property owner and his/or her household structure (# of family member) b) Length of stay c) Type of Housing d) Occupation e) Reason to settle this current place. f) Willing to move out if requested. g) Others

出典、調査団、2012

APPENDIX-25: 新規植樹可能な樹種

表 A25-1　NAME OF INDIGENIOUS TREES

Sr.NO.	NAME OF TREE	S.NO.	NAME OF TREE
1	Kasmal	71	Kailashpati
2	Mangolia	72	Supari
3	Sonchapha	73	Naral
4	Pandhra chapha	74	Kevada
5	Ashok	75	Bamboo
6	Shendri	76	Pimparana
7	Vayvaran	77	Devdat
8	Kokam	78	Pine
9	Nag chapha/Nakesar	79	Pandhra Shirish
10	Kanak	80	Rakht rohida
11	Saal	81	Dhavada
12	Pandhari dhoop	82	Hinganabet
13	Bhend	83	Apta
14	Gorakh Chinch	84	Kate sayar
15	Rudraksh	85	Taad
16	Bel	86	Asan
17	Kavath	87	Panchunda
18	Sayali	88	Anjan
19	Neem	89	Mohogony
20	Bor	90	Bhokar
21	Reetha	91	Dandus
22	Kusum	92	Sisu
23	Babul	93	Tembuni
24	Saundad	94	Umbar
25	Shirish	95	Anant
26	Muchkund	96	Kakad
27	Bahava	97	Shivan
28	Kanchan	98	Papada
29	Chinch(Tamarind)	99	Amba
30	Pallas	100	Bakan
31	Pangara	101	Kalam
32	Bibva	102	Bartondi
33	Rakht chandan	103	Tuti
34	Shisu	104	Kadipatta
35	Shisma	105	Tetu
36	Karanj(Pongaimia pinnata)	106	Tivas
37	Tivas	107	Sindhi
38	Bhadras	108	Shammi
39	Arjun(Terminalia)	109	Bija

Sr.NO.	NAME OF TREE	S.NO.	NAME OF TREE
40	Herada(Terminalia)	110	Khair
41	Jamun(Syzigium)	111	Reetha
42	Taman(Lagesstronia)	112	Sita Ashok
43	Kadamba	113	Biba
44	Haldu	114	Haadga
45	Nilgiri	115	Ambada
46	Moha (Madhucaindica)	116	Jungli Badaam
47	Khirini	117	Arjun
48	Parizaat	118	Behada
49	Satvin	119	Biti
50	Aakash neem	120	Nandrukh
51	Kalavash	121	Payar
52	Shivan	122	Dikamali
53	Saag	123	Saag
54	Chandan(Sandal)	124	Jamun
55	Awala	125	Awala
56	Putrvati	126	Guava
57	Vad	127	Pomegranate
58	Pimpal	128	Orange
59	Rubber	129	Sweet lime
60	Phanas	130	Chikoo
61	Mulberry		
62	Karvat		
63	Chinar		
64	Suru		
65	Indian Popular		
66	Valunja		
67	Khajoor		
68	Maharukh		
69	Yen		
70	Taad		

（注：原本はヒンヅゥー語で記載されており、ここではそれらを英語に翻訳している）

APPENDIX-26：RAP 関連社会調査（Sample）

This is the sample sheet of a socio-economic survey and is designed to collect relevant information about socio-economics and resources and to understand communities to be affected by the implementation of the proposed LRT project. The information to be collected will be used to make a detailed and balanced assessment of the potential impacts of Pune LRT project.
It is noted that any criteria and/or norms, used in this survey sheets, shall be modified, based on the latest social conditions around the project site. Also, it is strongly recommended that additional questions shall be introduced for more meaningful survey.

Survey Date_____
Interviewee_____
Interviewer_____

100	SURVEY QUESTIONNAIRE IDENTIFICATION	
A	Survey Control Number:	
B	Type of Occupants:	1. Legal; 2. Illegal.
C	Date of Interview:	
D	Place of Interview:	
E	Name of Interviewer:	
G	Time of Interview	

101	BASIC PROFILE OF PAPs (Data of affected people by the project)	
A	Name of interviewee: (only adult member)	
B	Address of the interviewee:	
	a) House No. & Street:	
	b) Unit	
	c) Village	
C	Location of house:	1. Rural 2. Half rural 3. Urban 4. Farm
D	Relation to head of family: (choose one)	1. Myself; 2. Wife; 3. Child; 4. Partner; 5. Others (notify).
E	How long have you been living here?	
F	Is there any tenant in this house? If yes, number of tenants?	
G	How many years have the tenants resided?	
H	What is the most serious problem of family's livelihood in the present?	1. 2.
I	Where is the main income source of family (notify):	

102	BASIC PROFILE OF HEAD OF FAMILY	
A	Name of head of family:	
B	Gender:	1. Male; 2. Female.
C	Age:	
D	Marital status:	1. Married; 2. Single; 3. Divorced 4. Separated 5. Widow
E	Currently Occupation:	1. Gov. service; 2. Private service; 3. Business; 4. Wage employee; 5. Agriculture; 6. Daily wage labor; 7. Unemployed; 8. Others (notify). _____ _____
F	Level of education completed:	1. Illiterate; 2. Can read only; 3. Can read and write both; 4. Kindergarten 5. Primary school; 6. Secondary school; 7. University 8. University or specific technical 9. Others _____ _____
H	Faith (Religion): (Choose one)	1. Buddhist; 2. Hindu 3. Muslim 4. Others (Specify) _____ _____
I	Total number of family members: (including infants and children)	Total | Females | Males
J	Total number of households in one structure: (e.g. if there are 2 households in one house, record as "2")	

103	HOUSING BUDGET			
A	Average Income	Daily (Rupees)	Monthly (Rupees)	Yearly (Rupees)
	a) Agriculture			
	b) Wage labor			
	c) Business/Trading			
	d) Service			
	e) Livestock & animal Husbandry			
	f) Fishing & Aquaculture			
	g) Cottage Craft			
	h) Forestry			
	j) Salary			
	k) Other (notify)			
	Total income			

B	Have you taken any loan?	1. Previously; 2. Currently; 3 Never; 4 Don't know.
	If YES ask for details – amount, when, from who, due to repay	

104	ACCESS TO UTILITIES	
A	Portable Water in the village, which can't moveable (Choose all that apply)	Dig well (Private: Protected or Unprotected); Dig well (Common: Protected or Unprotected); Pump well (Private: Protected or Unprotected); Pump well (Common: Protected or Unprotected); Public water supply; Bought from water vendors; Other facilities (Specify); _____ _____ Other natural water resources (Specify) _____ _____
B	Toilet Facilities: (Choose main one)	In-door toilet; Out-door toilet (Private); Out-door toilet (Common); Not available.
C	Access to Electricity:	Power line; Generator (Private); Generator (Common); Use battery; Not Available.

105	Others	
A	Have you experienced any hazard such as flood and storm? If Yes, please specify that. (Choose all that apply)	No; Yes; Flood; Storm; Others
B	If Yes is the answer to A, how often have you experienced?	Always Others (please specify)
C	How did you survive from that hazard? (Notify in detail)	

200	TYPE OF IMPACTS	
A	Type of social impact related to the land acquisition under the project: (Choose all that apply)	Loss of landholding/farmland; Loss of housing; Loss of structures/assets; Loss of crops and trees; Loss of (Impacts on access to) facilities, services, or natural resources; Loss of businesses/enterprises; Loss of incomes and livelihoods (Specify) _____ _____ Loss of access to productive assets Others(Specify) _____ _____ _____

201	LAND OWNER/FARMLAND LOST	
A	Land Ownership:	State-owned; State-owned land for rental with the Certificate of Land; State-owned land for rental with Occupancy License; Private-owned land for rental or borrow; Group-or community owned; Uncertain ownership; Illegal land occupation with Land paper; Illegal land for production without approval.
B	How many ha, m^2 of the land (Specify; paddy field (rain-fed and/or irrigated, tree plantation etc.) is to be lost by the project?	1. Structure(…… ha, …… m^2) 2. Agriculture/field (…… ha, …… m^2) 3. Fruit park (…… ha, …… m^2) 4. Others (…… ha, …… m^2) Total (…… ha, …… m^2)
C	How many % of your total income is to be affected by losing the land?	Less than 20 %: More than 20 %:
D	Do you have any legal documents for your land?	Yes; No.
E	If yes, type of legal document?	Land Use Certificate; Land Survey Certificate; Provincial Land Certificate; Temporal Land Use Certificate Land Tax Receipt Land Tax Return; Land Declaration Certificate; Permanent land paper
	Who is name appear in land certificate	

F	What type of tree and how many tree is to be lost by the project?	Size of tree 1) Big (D>= 20 cm), 2) Medium (D >= 10cm), 3) Small (D<10 cm) Kind of tree 1) Fruit, 2) Fire wood for self-consumption, 3) Fire wood for selling Age of tree Number of tree
G	How many % of your total income is to be affected by losing the tree?	Less than 20 %: More than 20 %:

202	HOUSING LIKELY TO BE LOST	
A	What is the type of house likely to be affected? (Choose one) **<u>Take photo of the house appearance.</u>**	Single floor; Two floor; Three floor or more Apartment/Row house duplex; Small room connected to other; Tents or temporary simple hut; Others (Specify) _____ _____
B	How many percent of your house is to be affected by the project	Less than 20 %: More than 20 %:
C	Roof: (Choose one)	1. Corrugate 2. Tiles/CPAQ 3. Natural materials; 4. Others (Specify) _____ _____
D	Walls: (Choose one)	1. All concrete; 2. Concrete and wood 3. All wood; 4. Natural materials; 5. Others (Specify) _____ _____
E	Housing ownership:	Self-owned; Owned structure for rental; Private-owned house for rental or borrow; Group-/Community-owned; Uncertain ownership; Illegal Occupation; Others (Specify) _____ _____
F	If rented, how much do you pay per month?	(…….Rupees/month)
G	Living area/Floor area:	(…….m^2)
H	Number of bedroom:	
I	Age of house:	(…….year)

<table>
<tr><th colspan="3">203 OTHER STRUCTURES/ASSETS LIKELY TO BE LOST (PERSONAL or COMMUNAL)</th></tr>
<tr><td>A</td><td>Type of structure:
(Choose all that apply)</td><td>1. Residential;
2. Commercial;
3. Residential & Commercial;
4. Office;
5. Health facility;
6. Cattle shed;
7. Farm house;
8. Boundary wall/Fencing;
9. Church, temple & shrine;
10. Well;
11. Hand pump;
12: School;
13. Graveyard/Crematorium Ground;
14. Others (Specify)
_____
_____</td></tr>
<tr><td rowspan="4">B</td><td>Address of the structure:</td><td></td></tr>
<tr><td>House No. & Street:</td><td></td></tr>
<tr><td>Units</td><td></td></tr>
<tr><td>Village</td><td></td></tr>
<tr><td>C</td><td>Ownership of the structure:
(Choose one)</td><td>Self-owned;
State-owned structure for rental;
Private-owned house for rental or borrow;
Group-/Community-owned;
Uncertain ownership;
Illegal Occupation;
Others (Specify)
_____
_____</td></tr>
<tr><td>D</td><td>What is(are) the market value of the structure(s) in current condition?</td><td><table><tr><th>Material</th><th>Unit</th><th>Total</th></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>E</td><td>If rented how much do you pay per month?</td><td></td></tr>
</table>

204	ACCESS TO BE IMPACTED TO EXISTING FACILITIES					
A	The present conditions of the access to existing facilities and impacts on the conditions by the project					
	Destination	Average time per trip (minutes)	Frequency 1 day; 2-3 days; 1 week; 2 weeks; 1 month; 2 months; 6 months; 1 year.	How to do Walk Bicycle Oxcart Horse Truck Motor bike; Car Bus Others.	Distance (km)	Impacts by the project Access lost; Impact on facility No impact.
	Village office					
	Market					
	School					
	Farmland					
	Hospital/Healthcare					
	Religion center					
	Other facility (notify)					
	Natural resource (e.g. hunting, fishing, redeem, etc.)					

205	LOST BUSINESS/ENTERPRISE	
A	How long has the business/enterprise been activating?	Years Months
B	Ownership	1 Self owned/family 2 Company 3 Partnership (no.) 4 Other
C	Utility of Structure of the business/enterprise? (Choose all that utility)	1. Shop; 2. Storage/Warehouse; 3.Workshop; 4. Factory; 5. Others (notify)
D	What kind of business have you been doing? (Specify)	1. 2.
E	Do you have the business licenses authorized?	
F	How many are workers there?	

APPENDIX-27:　9.2 財務経済分析

27-1. PPP 事業のキャッシュフロー表

1-A. 基本シナリオ 1:　ケース 2a(iii)

1-B. 基本シナリオ 2:　ケース 2a(v)

1-C. 基本シナリオ 3:　ケース 3a(v)

27-2. SPV の各検討ケースの Equity IRR の試算表

2-A. 基本シナリオを含むベース・ケース

2-B. 中央政府・州政府税免除の想定ケース

2-C. 中央政府・州政府税免除＋電力費削減の想定ケース

2-D. FSI 収入を見込まないケース

2-E. FSI 収入を見込まない＋中央政府・州政府税免除の想定ケース

27-3. PMRC のキャッシュフロー表（基本シナリオへの対応ケース）

3-A. ケース P2a(iii)-1

3-B. ケース P2a(v)-1

3-C. ケース P3a(v)-1

27-4. PMRC の各検討ケースの資金構成とキャッシュフロー図（10 ケース）

27-5. 政府部門の初期投資負担率の試算表

5-A. 基本シナリオ 1:ケース 2a(iii)＋ケース P2a(iii)

5-B. 基本シナリオ 1:ケース 2a(v)＋ケース P2a(v)

5-C. 基本シナリオ 1:ケース 3a(v)＋ケース P3a(v)

27-6. 全線高架による LRT 事業実施の想定ケースの財務・経済試算結果

6-A. 事業投資コスト（インフレ・為替変動想定前と後）

6-B. 財務・経済内部収益率（FIRR 及び EIRR）の試算結果

6-C. PMRC のキャッシュフロー図（基本シナリオ対応 3 ケース）

Appendix -27-1. PPP 事業のキャッシュフロー表

1-A. 基本シナリオ 1： ケース 2a(iii)

試算条件	指標結果		資金調達				収入項目				インフレ率（内貨）		インフレ率（外貨）		備考
	Equity FIRR	% 13.3%		D/E	%	Million Rs	サービス収入（運賃収入比）	95%	関連収入（運賃収入比）	5%	2012-2028年	4.20%	2012-2028年	2.10%	*補助金率は、土地収用関連費用を除いた初期投資額に対する比率。
	Net Present Value	Mil. Rs. -866	初期投資総	-	100%	28,459	その他1	含む	その他2	含まない	2028-2048年	4.20%	2028-2048年	2.10%	*法人税率30%（実効32.445%）だが、インフラ投資ではプロジェクト開始から20年間のうち連続する10年間の非課税措置が適用。また日本への配当送金課税は最高15%（実効16.2225%）。
	（割引率）	% 15.0%	資本比率	30%	21%	5,976	支出項目				感度分析		為替レート変動率（円／ルピー）		
	SPVの事業範囲		借入金比率	70%	49%	13,945	コンセッション費（運賃収入比）			0%	収入 +−%	0%	2012-2020年 +−%／年	-5.0%	
	Land acquisition, relocation	含まない	補助金率*	30%	30%	8,538	コンサルタント費（建設・調達費比）			5%	初期投資 +−%	0%	2020-2048年 +−%／年	0.0%	
	Civil	含まない	借入金利			4.0%	予備費（建設・調達・コンサル費比）			5%			2012年設定レート JPY/Rs.	1.50	
	Track	含む	据置期間		年	5	税率（投資コスト）（予備費除く）			18%	減価償却期間（追加投資車両の資産移転を考慮）		その他		
	E&M	含む	返済期間（据置含む）		年	20	税率（O&M）			18%	Civil（年）	50	Operational Subsidy/VGF: 税引前損失補てん		
	Rolling Stock	含む					法人税＊				Track, E&M, Rolling Stock（年）	30	Utility Subsidy（電力等）O&M費比	0%	

		-6 2013	-5 2014	-4 2015	-3 2016	-2 2017	-1 2018	1 2019	2 2020	3 2021	4 2022	5 2023	6 2024	7 2025	8 2026	9 2027	10 2028	11 2029	12 2030	13 2031	14 2032	15 2033	16 2034	17 2035	18 2036	19 2037	20 2038	21 2039	22 2040	23 2041	24 2042	25 2043	26 2044	27 2045	28 2046	29 2047	30 2048
a	Revenue							1,105	1,176	2,634	2,847	3,079	3,332	3,608	3,911	4,240	4,601	5,040	5,524	6,058	6,647	7,296	8,012	8,802	9,673	10,634	11,693	12,123	12,568	13,031	13,511	14,009	14,526	15,062	15,619	16,197	16,797
	Passenger Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Service Fee Revenue							733	801	2,186	2,388	2,608	2,849	3,112	3,399	3,712	4,054	4,472	4,931	5,439	5,998	6,615	7,295	8,046	8,873	9,786	10,792	11,200	11,623	12,063	12,519	12,992	13,483	13,993	14,522	15,071	15,640
	Off-rail Revenue							39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	823
	FSI Contribution							333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333
	Other Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b	O&M expense						0	795	834	878	916	1,092	1,771	1,840	1,913	1,988	2,128	1,913	1,991	2,073	2,159	2,338	2,908	3,024	3,146	3,273	3,405	3,294	3,421	3,554	3,693	3,837	3,770	3,919	4,073	4,234	4,401
	Staff cost						0	258	272	286	301	317	341	359	378	398	419	444	467	492	518	545	578	608	640	673	708	746	777	810	844	879	916	954	994	1,036	1,080
	Maintenance						0	536	562	591	614	775	1,430	1,481	1,535	1,590	1,709	1,469	1,524	1,582	1,641	1,794	2,330	2,416	2,506	2,600	2,697	2,548	2,644	2,745	2,849	2,958	2,854	2,964	3,079	3,198	3,321
c	(Utility subsidy)						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	Concession Fee							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e=a-b+c-d	EBITDA						0	310	342	1,757	1,931	1,986	1,561	1,768	1,998	2,252	2,473	3,127	3,532	3,984	4,488	4,958	5,105	5,778	6,527	7,361	8,288	8,829	9,147	9,476	9,818	10,172	10,755	11,144	11,546	11,963	12,395
f	Depreciation									867	867	867	1,071	1,071	1,071	1,071	1,071	1,141	1,141	1,141	1,141	1,141	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206
g	Interest payment									597	557	517	478	438	398	358	318	279	239	199	159	119	80	40	-0	-0	-0											
h=e-f-g	Profit before tax						0	310	342	293	507	602	12	259	528	823	1,083	1,707	2,153	2,644	3,187	3,697	3,819	4,532	5,321	6,155	7,082	7,623	7,941	8,271	8,612	8,967	9,550	9,938	10,340	10,757	11,190
i	(Operational VGF/subsidy)																																				
j	Corporate Tax							93	103	88	152	181	4	78	159	247	325	512	646	793	956	1,109	1,146	1,360	1,596	1,847	2,125	2,287	2,382	2,481	2,584	2,690	2,865	2,981	3,102	3,227	3,357
k	Tax adjustment														159	247	325	512	646	793	956	1,109	1,146	1,360													
l=h+i+j+k	Profit after tax						0	217	240	205	355	421	8	181	528	823	1,083	1,707	2,153	2,644	3,187	3,697	3,819	4,532	3,725	4,309	4,958	5,336	5,559	5,789	6,029	6,277	6,685	6,956	7,238	7,530	7,833
m	Equity			0	0	344	2,005	2,388	1,039	201																												-4,424
n	Debt			0	0	803	4,677	5,571	2,424	469																												
o	Subsidies			0	0	492	2,864	3,411	1,484	287																												
p	Investment			0	0	1,639	9,545	11,369	4,947	958		6,398					2,184					2,019							0	0			0			-4,424
(pa)	Initial investment			0	0	1,639	9,545	11,369	4,947	958																												
(pb)	Additional investment											6,398					2,184					2,019							0	0			0			0
q	IDC			0	0	16	126	334	503																												
r	Debt outstanding			0	0	803	5,497	11,194	13,952	14,924	12,934	11,939	10,944	9,949	8,954	7,959	6,964	5,969	4,975	3,980	2,985	1,990	995	-0	-0	-0	-0										
s	Debt repayment											995	995	995	995	995	995	995	995	995	995	995	995	995	0	0	0										
g	Interest payment											597	557	517	478	438	398	358	318	279	239	199	159	119	80	40	-0	-0	-0									
t=f+g+l	Cash flow available for debt service			0	0	0	0	0	217	240	1,669	1,779	1,806	1,557	1,690	1,998	2,252	2,473	3,127	3,532	3,984	4,488	4,958	5,105	5,778	4,931	5,514	6,163	6,542	6,765	6,995	7,234	7,482	7,891	8,162	8,444	8,736	9,038
u=t/(g+s)	Debt service coverage ratio										1.05	1.15	1.19	1.06	1.18	1.43	1.66	1.88	2.46	2.86	3.34	3.89	4.45	4.75	5.58	0.00	0.00	0.00										
	Loan Life Coverage Ratio									0.93	1.03	1.14	1.27	1.45	1.66	1.90	2.17	2.50	2.83	3.20	3.60	4.01	4.43	5.05													
v=t+f-s-pb	Cash flow after repayment of interest and principal			0	0	0	0	0	217	240	77	227	-6,105	85	258	605	899	-1,025	1,853	2,299	2,791	3,334	1,824	4,030	4,743	4,931	5,514	6,163	6,542	6,765	6,995	7,234	7,482	7,891	8,162	8,444	8,736	9,038
v=e-p	NCF for Project IRR	0	0	0	-1,639	-9,545	-11,369	-4,637	-615	1,757	1,931	-4,412	1,561	1,768	1,998	2,252	288	3,127	3,532	3,984	4,488	2,938	5,105	5,778	6,527	7,361	8,288	8,829	9,147	9,476	9,818	10,172	10,755	11,144	11,546	11,963	16,819
w=v-m	NCF for Equity IRR	0	0	0	-344	-2,005	-2,388	-822	39	77	227	-6,105	85	258	605	899	-1,025	1,853	2,299	2,791	3,334	1,824	4,030	4,743	4,931	5,514	6,163	6,542	6,765	6,995	7,234	7,482	7,891	8,162	8,444	8,736	13,462
	Accumulated NCF for E.IRR			0	0	-344	-2,349	-4,736	-5,558	-5,520	-5,443	-5,216	-11,321	-11,236	-10,978	-10,373	-9,474	-10,499	-8,645	-6,347	-3,556	-222	1,601	5,632	10,375	15,305	20,820	26,983	33,525	40,290	47,285	54,519	62,002	69,892	78,054	86,498	95,234	108,696

Project FIRR:	9.1%	NPV:	-7,556	@	15%	
Equity FIRR:	13.3%	NPV:	-866	@	15%	
					DSCR平均	2.35

1-B. 基本シナリオ 2： ケース 2a(v)

試算条件	指標結果			資金調達				収入項目			インフレ率(内貨)		インフレ率(外貨)		備考
	Equity FIRR	%	16.6%		D/E	%	Million Rs.	サービス収入（運賃収入比）	95%	関連収入(運賃収入比) 5%	2012-2028年	4.20%	2012-2028年	2.10%	*補助金率は、土地収用関連費用を除いた初期投資額に対する比率。
	Net Present Value	Mil. Rs.	621	初期投資総	-	100%	28,458	その他1 含む		その他2 含まない	2028-2048年	4.20%	2028-2048年	2.10%	*法人税率30%（実効32.445%）だが、インフラ投資ではプロジェクト開始から20年間のうち連続する10年間の非課税措置が適用。また日本への配当送金課税は最高15%（実効16.2225%）。
	（割引率）	%	15.0%	資本比率	30%	15%	4,259	支出項目			感度分析		為替レート変動率（円／ルピー）		
	SPCの事業範囲			借入金比率	70%	35%	9,961	コンセッション費（運賃収入比）		0%	収入 +－%	0%	2012-2020年 +－%／年	-5.0%	
	Land acquisition, relocation		含まない	補助金率*	50%	50%	14,229	コンサルタント費（建設・調達費比）		5%	初期投資 +－%	0%	2020-2048年 +－%／年	0.0%	
	Civil		含まない	借入金利			4.0%	予備費（建設・調達・コンサル費比）		5%			2012年設定レート JPY／Rs.	1.50	
	Track		含む	据置期間		年	5	税率（投資コスト）（予備費除く）		18%	減価償却期間（追加投資車両の資産移転を考慮）		その他		
	E&M		含む	返済期間（据置含む）		年	20	税率（O&M）		18%	Civil（年）	50	Operational Subsidy/VGF: 税引前損失を補てん		
	Rolling Stock		含む					法人税*			Track, E&M, Rolling Stock（年）	30	Utility Subsidy(電力等）O&M費比	0%	

		-6 2013	-5 2014	-4 2015	-3 2016	-2 2017	-1 2018	1 2019	2 2020	3 2021	4 2022	5 2023	6 2024	7 2025	8 2026	9 2027	10 2028	11 2029	12 2030	13 2031	14 2032	15 2033	16 2034	17 2035	18 2036	19 2037	20 2038	21 2039	22 2040	23 2041	24 2042	25 2043	26 2044	27 2045	28 2046	29 2047	30 2048
a	Revenue							1,105	1,176	2,634	2,847	3,079	3,332	3,608	3,911	4,240	4,601	5,040	5,524	6,058	6,647	7,296	8,012	8,802	9,673	10,634	11,693	12,123	12,568	13,031	13,511	14,009	14,526	15,062	15,619	16,197	16,797
	Passenger Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Service Fee Revenue							733	801	2,186	2,388	2,608	2,849	3,112	3,399	3,712	4,054	4,472	4,931	5,439	5,998	6,615	7,295	8,046	8,873	9,786	10,792	11,200	11,623	12,063	12,519	12,992	13,483	13,993	14,522	15,071	15,640
	Off-rail Revenue							39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	823
	FSI Contribution							333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333
	Other Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b	O&M expense						0	795	834	878	916	1,092	1,771	1,840	1,913	1,988	2,128	1,913	1,991	2,073	2,159	2,338	2,908	3,024	3,146	3,273	3,405	3,294	3,421	3,554	3,693	3,837	3,770	3,919	4,073	4,234	4,401
	Staff cost						0	258	272	286	301	317	341	359	378	398	419	444	467	492	518	545	578	608	640	673	708	746	777	810	844	879	916	954	994	1,036	1,080
	Maintenance						0	536	562	591	614	775	1,430	1,481	1,535	1,590	1,709	1,469	1,524	1,582	1,641	1,794	2,330	2,416	2,506	2,600	2,697	2,548	2,644	2,745	2,849	2,958	2,854	2,964	3,079	3,198	3,321
c	(Utility subsidy)						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	Concession Fee							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e=a-b+c-d	EBITDA						0	310	342	1,757	1,931	1,986	1,561	1,768	1,998	2,252	2,473	3,127	3,532	3,984	4,488	4,958	5,105	5,778	6,527	7,361	8,288	8,829	9,147	9,476	9,818	10,172	10,755	11,144	11,546	11,963	12,395
f	Depreciation									867	867	867	1,071	1,071	1,071	1,071	1,071	1,141	1,141	1,141	1,141	1,141	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206	1,206
g	Interest payment									426	398	370	341	313	284	256	227	199	171	142	114	85	57	28	0	0	0											
h=e-f-g	Profit before tax						0	310	342	464	666	750	148	384	642	925	1,174	1,787	2,221	2,701	3,233	3,731	3,842	4,544	5,321	6,155	7,082	7,623	7,941	8,271	8,612	8,967	9,550	9,938	10,340	10,757	11,190
i	(Operational VGF/subsidy)																																				
j	Corporate Tax							93	103	139	200	225	45	115	193	278	352	536	666	810	970	1,119	1,153	1,363	1,596	1,847	2,125	2,287	2,382	2,481	2,584	2,690	2,865	2,981	3,102	3,227	3,357
k	Tax adjustment														193	278	352	536	666	810	970	1,119	1,153	1,363													
l=h+i-j+k	Profit after tax						0	217	240	325	467	525	104	269	642	925	1,174	1,787	2,221	2,701	3,233	3,731	3,842	4,544	3,725	4,309	4,958	5,336	5,559	5,789	6,029	6,277	6,685	6,956	7,238	7,530	7,833
m	Equity			0	0	246	1,432	1,705	742	144																												-4,424
n	Debt			0	0	574	3,341	3,979	1,732	335																												
o	Subsidies			0	0	820	4,773	5,685	2,474	479																												
p	Investment			0	0	1,639	9,545	11,369	4,947	958		6,398					2,184					2,019							0	0			0			-4,424
(pa)	Initial investment			0	0	1,639	9,545	11,369	4,947	958																											
(pb)	Additional investment											6,398					2,184					2,019							0	0			0			0
q	IDC			0	0	11	90	238	359																												
r	Debt outstanding			0	0	574	3,926	7,995	9,965	10,660	9,949	9,238	8,528	7,817	7,106	6,396	5,685	4,975	4,264	3,553	2,843	2,132	1,421	711	0	0	0	0									
s	Debt repayment										711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	0	0	0									
g	Interest payment										426	398	370	341	313	284	256	227	199	171	142	114	85	57	28	0	0	0									
t=f+g+l	Cash flow available for debt service			0	0	0	0	0	217	240	1,618	1,731	1,761	1,516	1,653	1,998	2,252	2,473	3,127	3,532	3,984	4,488	4,958	5,105	5,778	4,931	5,514	6,163	6,542	6,765	6,995	7,234	7,482	7,891	8,162	8,444	8,736	9,038
u=t/(g+s)	Debt service coverage ratio										1.42	1.56	1.63	1.44	1.62	2.01	2.33	2.64	3.44	4.01	4.67	5.44	6.23	6.65	7.82	0.00	0.00	0.00									
	Loan Life Coverage Ratio									1.29	1.43	1.58	1.77	2.02	2.32	2.66	3.04	3.50	3.96	4.48	5.03	5.61	6.20	7.07													
v=l+f-s-pb	Cash flow after repayment of interest and principal			0	0	0	0	0	217	240	481	623	-5,717	465	629	1,003	1,286	-650	2,217	2,651	3,132	3,663	2,142	4,337	5,039	4,931	5,514	6,163	6,542	6,765	6,995	7,234	7,482	7,891	8,162	8,444	8,736	9,038
v=e-p	NCF for Project IRR	0	0	0	-1,639	-9,545	-11,369	-4,637	-615	1,757	1,931	-4,412	1,561	1,768	1,998	2,252	288	3,127	3,532	3,984	4,488	2,938	5,105	5,778	6,527	7,361	8,288	8,829	9,147	9,476	9,818	10,172	10,755	11,144	11,546	11,963	16,819
w=v-m	NCF for Equity IRR	0	0	0	-246	-1,432	-1,705	-525	96	481	623	-5,717	465	629	1,003	1,286	-650	2,217	2,651	3,132	3,663	2,142	4,337	5,039	4,931	5,514	6,163	6,542	6,765	6,995	7,234	7,482	7,891	8,162	8,444	8,736	13,462
	Accumulated NCF for EIRR		0	0	-246	-1,678	-3,383	-3,908	-3,812	-3,332	-2,709	-8,426	-7,961	-7,332	-6,329	-5,043	-5,693	-3,476	-824	2,307	5,971	8,113	12,450	17,489	22,420	27,934	34,097	40,639	47,404	54,399	61,634	69,116	77,006	85,169	93,612	102,348	115,810

Project FIRR:	9.1%	NPV:	-7,556	@	15%	
Equity FIRR:	16.6%	NPV:	621	@	15%	
					DSCR平均	3.27

1-C. 基本シナリオ 3: ケース 3a(v)

試算条件	指標結果			資金調達				収入項目				インフレ率(内貨)		インフレ率(外貨)		備考
	EquityFIRR	%	17.8%		D/E	%	Million Rs.	サービス収入(運賃収入比)	95%	関連収入(運賃収入比)	5%	2012-2028年	4.20%	2012-2028年	2.10%	*補助金率は、土地収用関連費用を除いた初期投資額に対する比率。
	Net Present Value	Mil. Rs.	1,013	初期投資総額	-	100%	25,147	その他1	含む	その他2	含まない	2028-2048年	4.20%	2028-2048年	2.10%	*法人税率30%(実効32.445%)だが、インフラ投資ではプロジェクト開始から20年間の3年連続する10年間の非課税措置が適用。また日本への配当送金課税は最高15%(実効16.2225%)。
	(割引率)	%	15.0%	資本比率	30%	15%	3,772	支出項目				感度分析		為替レート変動率(円ノルピー)		
	SPVの事業範囲			借入金比率	70%	35%	8,802	コンセッション費(運賃収入比)			0%	収入	+-% 0%	2012-2020年	+-%／年 -5.0%	
	Land acquisition, relocation		含まない	補助金率*	50%	50%	12,574	コンサルタント費(建設・調達費比)			5%	初期投資	+-% 0%	2020-2048年	+-%／年 0.0%	
	Civil		含まない	借入金利			4.0%	予備費(建設・調達・コンサル費比)			5%			2012年設定レート	JPY/Rs. 1.50	
	Track		含まない	据置期間		年	5	税率(投資コスト)(予備費除く)			18%	減価償却期間(追加投資車両の資産移転を考慮)		その他		
	E&M		含む	返済期間(据置含む)		年	20	税率(O&M)			18%	Civil (年)	50	Operational Subsidy/VGF: 税引前損失を補てん		
	Rolling Stock		含む					法人税*				Track, E&M, Rolling Stock (年)	30	Utility Subsidy(電力等)O&M費比	0%	

		-6 2013	-5 2014	-4 2015	-3 2016	-2 2017	-1 2018	1 2019	2 2020	3 2021	4 2022	5 2023	6 2024	7 2025	8 2026	9 2027	10 2028	11 2029	12 2030	13 2031	14 2032	15 2033	16 2034	17 2035	18 2036	19 2037	20 2038	21 2039	22 2040	23 2041	24 2042	25 2043	26 2044	27 2045	28 2046	29 2047	30 2048
a	Revenue							1,105	1,176	2,634	2,847	3,079	3,332	3,608	3,911	4,240	4,601	5,040	5,524	6,058	6,647	7,296	8,012	8,802	9,673	10,634	11,693	12,123	12,568	13,031	13,511	14,009	14,526	15,062	15,619	16,197	16,797
	Passenger Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Service Fee Revenue							733	801	2,186	2,388	2,608	2,849	3,112	3,399	3,712	4,054	4,472	4,931	5,439	5,998	6,615	7,295	8,046	8,873	9,786	10,792	11,200	11,623	12,063	12,519	12,992	13,483	13,993	14,522	15,071	15,640
	Off-rail Revenue							39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	823
	FSI Contribution							333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333
	Other Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b	O&M expense						0	795	834	878	916	1,092	1,771	1,840	1,913	1,988	2,128	1,913	1,991	2,073	2,159	2,338	2,908	3,024	3,146	3,273	3,405	3,294	3,421	3,554	3,693	3,837	3,770	3,919	4,073	4,234	4,401
	Staff cost						0	258	272	286	301	317	341	359	378	398	419	444	467	492	518	545	578	608	640	673	708	746	777	810	844	879	916	954	994	1,036	1,080
	Maintenance						0	536	562	591	614	775	1,430	1,481	1,535	1,590	1,709	1,469	1,524	1,582	1,641	1,794	2,330	2,416	2,506	2,600	2,697	2,548	2,644	2,745	2,849	2,958	2,854	2,964	3,079	3,198	3,321
c	(Utility subsidy)						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	Concession Fee							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e=a-b+c-d	EBITDA						0	310	342	1,757	1,931	1,986	1,561	1,768	1,998	2,252	2,473	3,127	3,532	3,984	4,488	4,958	5,105	5,778	6,527	7,361	8,288	8,829	9,147	9,476	9,818	10,172	10,755	11,144	11,546	11,963	12,395
f	Depreciation									766	766	766	970	970	970	970	970	1,040	1,040	1,040	1,040	1,040	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105	1,105
g	Interest payment									377	352	326	301	276	251	226	201	176	151	126	100	75	50	25	-0	-0	-0											
h=e-f-g	Profit before tax						0	310	342	614	814	894	289	521	776	1,056	1,301	1,911	2,341	2,819	3,347	3,842	3,950	4,648	5,422	6,256	7,183	7,724	8,042	8,372	8,713	9,067	9,651	10,039	10,441	10,858	11,290
i	Operational VGF/subsidy																																				
j	Corporate Tax							93	103	184	244	268	87	156	233	317	390	573	702	846	1,004	1,153	1,185	1,394	1,627	1,877	2,155	2,317	2,413	2,511	2,614	2,720	2,895	3,012	3,132	3,257	3,387
k	Tax adjustment														233	317	390	573	702	846	1,004	1,153	1,185	1,394													
l=h+i+j+k	Profit after tax						0	217	240	430	570	626	202	365	776	1,056	1,301	1,911	2,341	2,819	3,347	3,842	3,950	4,648	3,796	4,379	5,028	5,407	5,629	5,860	6,099	6,347	6,755	7,027	7,309	7,601	7,903
m	Equity		0	0	180	1,292	1,532	685	84																												-4,222
n	Debt		0	0	419	3,015	3,574	1,598	195																												
o	Subsidies		0	0	599	4,308	5,106	2,283	278																												
p	Investment		0	0	1,197	8,616	10,211	4,566	557			6,398					2,184					2,019								0	0			0			-4,222
(pa)	Initial investment		0	0	1,197	8,616	10,211	4,566	557																												
(pb)	Additional investment											6,398					2,184					2,019								0	0			0			0
q	IDC			0	0	8	77	211	320																												
r	Debt outstanding		0	0	419	3,443	7,094	8,903	9,418	8,790	8,162	7,534	6,906	6,279	5,651	5,023	4,395	3,767	3,139	2,511	1,884	1,256	628	-0	-0	-0	-0										
s	Debt repayment									628	628	628	628	628	628	628	628	628	628	628	628	628	628	628	0	0	0										
g	Interest payment									377	352	326	301	276	251	226	201	176	151	126	100	75	50	25	-0	-0	-0										
t=f+g+l	Cash flow available for debt service		0	0	0	0	0	217	240	1,573	1,687	1,718	1,474	1,612	1,998	2,252	2,473	3,127	3,532	3,984	4,488	4,958	5,105	5,778	4,900	5,484	6,133	6,512	6,734	6,965	7,204	7,452	7,860	8,132	8,414	8,705	9,008
u=t/(g+s)	Debt service coverage ratio									1.57	1.72	1.80	1.59	1.78	2.27	2.64	2.98	3.89	4.54	5.29	6.16	7.05	7.53	8.85	0.00	0.00	0.00										
	Loan Life Coverage Ratio								1.45	1.60	1.78	1.99	2.28	2.63	3.01	3.44	3.96	4.49	5.07	5.70	6.35	7.01	8.00														
v=l+f-s-pb	Cash flow after repayment of interest and principal		0	0	0	0	0	217	240	568	708	-5,634	545	708	1,119	1,398	-540	2,323	2,754	3,231	3,759	2,235	4,427	5,125	4,900	5,484	6,133	6,512	6,734	6,965	7,204	7,452	7,860	8,132	8,414	8,705	9,008
v=e-p	NCF for Project IRR	0	0	0	-1,197	-8,616	-10,211	-4,256	-215	1,757	1,931	-4,412	1,561	1,768	1,998	2,252	288	3,127	3,532	3,984	4,488	2,938	5,105	5,778	6,527	7,361	8,288	8,829	9,147	9,476	9,818	10,172	10,755	11,144	11,546	11,963	16,617
w=v-m	NCF for Equity IRR	0	0	0	-180	-1,292	-1,532	-468	156	568	708	-5,634	545	708	1,119	1,398	-540	2,323	2,754	3,231	3,759	2,235	4,427	5,125	4,900	5,484	6,133	6,512	6,734	6,965	7,204	7,452	7,860	8,132	8,414	8,705	13,230
	Accumulated NCF for E.IRR		0	0	-180	-1,472	-3,004	-3,472	-3,316	-2,748	-2,040	-7,674	-7,129	-6,422	-5,303	-3,905	-4,445	-2,122	632	3,863	7,623	9,858	14,284	19,409	24,310	29,794	35,927	42,439	49,173	56,138	63,342	70,794	78,654	86,786	95,200	103,905	117,135

Project FIRR:	9.8%	NPV:	-6,067	@	15%	
Equity FIRR:	17.8%	NPV:	1,013	@	15%	
					DSCR平均	3.68

Appendix -27-2. SPV の各検討ケースの Equity IRR の試算表

2-A. 基本シナリオを含むベース・ケース

Case	Case 1a(i)	Case 1a(ii)	Case 1a(iii)	Case 2a(i)	Case 2a(ii)	Case 2a(iii)	Case 2a(iv)	Case 2a(v)	Case 3a(i)	Case 3a(ii)	Case 3a(iii)	Case 3a(iv)	Case 3a(v)
Sector													
Public				Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work
SPV	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock
Government Subsidy	20% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment
Non-Fare Box Revenue	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box
SPV Financing													
Debt: Equity	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30
Borrowing Rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Term (grace period)	22 (7) years	22 (7) years	22 (7) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years
Equity IRR- Fare Box Rev.	**6.5%**	**8.5%**	**9.8%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equity IRR- Service Fee Revenue: 100% of Fare box collected				**11.7%**	**12.8%**	**14.1%**	**15.7%**	**17.6%**	**12.8%**	**13.9%**	**15.3%**	**16.9%**	**18.9%**
Equity IRR- Service Fee Revenue: 95% of Fare box collected				**11.0%**	**12.0%**	**13.3%**	**14.7%**	**16.6%**	**12.0%**	**13.1%**	**14.3%**	**15.9%**	**17.8%**
Equity IRR- Service Fee Revenue: 90% of Fare box collected				**10.2%**	**11.2%**	**12.4%**	**13.8%**	**15.5%**	**11.2%**	**12.2%**	**13.4%**	**14.8%**	**16.6%**

2-B. 中央政府・州政府税免除の想定ケース

Case	Case 1a(i)	Case 1a(ii)	Case 1a(iii)	Case 2a(i)	Case 2a(ii)	Case 2a(iii)	Case 2a(iv)	Case 2a(v)	Case 3a(i)	Case 3a(ii)	Case 3a(iii)	Case 3a(iv)	Case 3a(v)
Sector													
Public				Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work
SPV	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock
Government Subsidy	20% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment
Non-Fare Box Revenue	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box
SPV Financing													
Debt: Equity	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30
Borrowing Rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Term (grace period)	22 (7) years	22 (7) years	22 (7) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years
Equity IRR- Fare Box Rev.	**8.6%**	**10.9%**	**12.3%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equity IRR- Service Fee Revenue: 100% of Fare box collected				**14.5%**	**15.9%**	**17.4%**	**19.3%**	**21.7%**	**15.9%**	**17.2%**	**18.8%**	**20.8%**	**23.3%**
Equity IRR- Service Fee Revenue: 95% of Fare box collected				**13.7%**	**15.0%**	**16.5%**	**18.2%**	**20.5%**	**15.0%**	**16.3%**	**17.8%**	**19.7%**	**22.0%**
Equity IRR- Service Fee Revenue: 90% of Fare box collected				**12.9%**	**14.1%**	**15.5%**	**17.2%**	**19.3%**	**14.1%**	**15.3%**	**16.7%**	**18.5%**	**20.7%**

2-C. 中央政府・州政府税免除＋電力費削減の想定ケース

Case	Case 1a(i)	Case 1a(ii)	Case 1a(iii)	Case 2a(i)	Case 2a(ii)	Case 2a(iii)	Case 2a(iv)	Case 2a(v)	Case 3a(i)	Case 3a(ii)	Case 3a(iii)	Case 3a(iv)	Case 3a(v)
Sector													
Public				Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work
SPV	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock
Government Subsidy	20% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment
Non-Fare Box Revenue	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box
SPV Financing													
Debt: Equity	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30
Borrowing Rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Term (grace period)	22 (7) years	22 (7) years	22 (7) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years
Equity IRR- Fare Box Rev.	**9.1%**	**11.4%**	**12.9%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equity IRR- Service Fee Revenue: 100% of Fare box collected				**15.2%**	**16.7%**	**18.3%**	**20.2%**	**22.8%**	**16.7%**	**18.1%**	**19.7%**	**21.8%**	**24.5%**
Equity IRR- Service Fee Revenue: 95% of Fare box collected				**14.4%**	**15.8%**	**17.3%**	**19.2%**	**21.6%**	**15.8%**	**17.1%**	**18.7%**	**20.7%**	**23.2%**
Equity IRR- Service Fee Revenue: 90% of Fare box collected				**13.6%**	**14.9%**	**16.3%**	**18.1%**	**20.4%**	**14.9%**	**16.2%**	**17.7%**	**19.6%**	**22.0%**

2-D. FSI 収入を見込まないケース

Case	Case 1a(i)	Case 1a(ii)	Case 1a(iii)	Case 2a(i)	Case 2a(ii)	Case 2a(iii)	Case 2a(iv)	Case 2a(v)	Case 3a(i)	Case 3a(ii)	Case 3a(iii)	Case 3a(iv)	Case 3a(v)
Sector													
Public				Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work
SPV	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock
Government Subsidy	20% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment
Non-Fare Box Revenue	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box
SPV Financing													
Debt: Equity	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30
Borrowing Rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Term (grace period)	22 (7) years	22 (7) years	22 (7) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years
Equity IRR- Fare Box Rev.	**5.9%**	**7.7%**	**8.9%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equity IRR- Service Fee Revenue: 100% of Fare box collected				**10.7%**	**11.7%**	**12.8%**	**14.1%**	**15.7%**	**11.6%**	**12.6%**	**13.7%**	**15.1%**	**16.8%**
Equity IRR- Service Fee Revenue: 95% of Fare box collected				**10.0%**	**10.9%**	**12.0%**	**13.2%**	**14.8%**	**10.8%**	**11.8%**	**12.9%**	**14.2%**	**15.7%**
Equity IRR- Service Fee Revenue: 90% of Fare box collected				**9.4%**	**10.2%**	**11.2%**	**12.4%**	**13.9%**	**10.1%**	**11.0%**	**12.0%**	**13.2%**	**14.7%**

2-E. FSI 収入を見込まない＋中央政府・州政府税免除の想定ケース

Case	Case 1a(i)	Case 1a(ii)	Case 1a(iii)	Case 2a(i)	Case 2a(ii)	Case 2a(iii)	Case 2a(iv)	Case 2a(v)	Case 3a(i)	Case 3a(ii)	Case 3a(iii)	Case 3a(iv)	Case 3a(v)
Sector													
Public				Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work	Land Acquisition Civil Work Track Work
SPV	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Land Acquisition Civil Work Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	Track Work E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock	E&M Rolling Stock
Government Subsidy	20% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment	10% of Initial Investment	20% of Initial Investment	30% of Initial Investment	40% of Initial Investment	50% of Initial Investment
Non-Fare Box Revenue	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box	5% of Fare Box
SPV Financing													
Debt: Equity	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30	70:30
Borrowing Rate	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Term (grace period)	22 (7) years	22 (7) years	22 (7) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years	20 (5) years
Equity IRR- Fare Box Rev.	**7.8%**	**9.9%**	**11.2%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equity IRR- Service Fee Revenue: 100% of Fare box collected				**13.2%**	**14.4%**	**15.7%**	**17.3%**	**19.3%**	**14.4%**	**15.5%**	**16.9%**	**18.5%**	**20.6%**
Equity IRR- Service Fee Revenue: 95% of Fare box collected				**12.4%**	**13.5%**	**14.8%**	**16.3%**	**18.1%**	**13.5%**	**14.6%**	**15.9%**	**17.4%**	**19.4%**
Equity IRR- Service Fee Revenue: 90% of Fare box collected				**11.6%**	**12.6%**	**13.8%**	**15.2%**	**17.0%**	**12.6%**	**13.7%**	**14.9%**	**16.3%**	**18.1%**

Appendix -27-3. PMRC のキャッシュフロー表（基本シナリオへの対応ケース）

3-A. ケース P2a(iii)-1

試算条件	指標結果			資金調達			収入項目			インフレ率（内貨）			インフレ率（外貨）			備考
	Equity FIRR	%	#NUM!		%	Million Rs.	関連収入（運賃収入比）		0%	2012-2028年		4.20%	2012-2028年		2.10%	+法人税率30%（実効32.445%）だが、インフラ投
	Net Present Value	Mil. Rs.	-7,850	初期投資総額	100%	29,235	その他1	含まない	その他2 含まない	2028-2048年		4.20%	2028-2048年		2.10%	資ではプロジェクト開始から20年間のうち連続す
	（割引率）	%	15.0%	自己資金比率	43%	12,621	**支出項目**			**感度分析**			**為替レート変動率（円／ルピー）**			る10年間の非課税措置が適用。
	Publicの事業範囲			借入金比率	57%	16,614	サービス費用（運賃収入比）		95%	収入	+-%	0%	2012-2020年	+-%／年	-5.0%	
	Land acquisition, relocation		含む	(PMC/PCMC/MIDC)	19%	5,501	コンサルタント費（建設・調達費比）		5%	初期投資	+-%	0%	2020-2048年	+-%／年	0.0%	
	Civil		含む	(中央・州政府等)	24%	7,120	予備費（建設・調達・コンサル費比）		5%				2012年設定レート	JPY／Rs.	1.50	
	Track		含まない	借入金利		1.4%	税率（投資コスト）（予備費除く）		18%	**減価償却期間**						
	E&M		含まない	据置期間	年	10	税率（O&M）		18%	Civil（年）		50				
	Rolling Stock		含まない	返済期間（据置含む）	年	30				Track, E&M, Rolling Stock（年）		30				

		-6 2013	-5 2014	-4 2015	-3 2016	-2 2017	-1 2018	1 2019	2 2020	3 2021	4 2022	5 2023	6 2024	7 2025	8 2026	9 2027	10 2028	11 2029	12 2030	13 2031	14 2032	15 2033	16 2034	17 2035	18 2036	19 2037	20 2038	21 2039	22 2040	23 2041	24 2042	25 2043	26 2044	27 2045	28 2046	29 2047	30 2048
a	Revenue							772	843	2,301	2,514	2,746	2,999	3,275	3,578	3,907	4,268	4,707	5,191	5,725	6,314	6,963	7,679	8,469	9,340	10,301	11,360	11,790	12,235	12,698	13,178	13,676	14,193	14,729	15,286	15,864	16,464
	Passenger Revenue							772	843	2,301	2,514	2,746	2,999	3,275	3,578	3,907	4,268	4,707	5,191	5,725	6,314	6,963	7,679	8,469	9,340	10,301	11,360	11,790	12,235	12,698	13,178	13,676	14,193	14,729	15,286	15,864	16,464
	Off-rail Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Revenue 1							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Revenue 2							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b	Service fee payment							733	801	2,186	2,388	2,608	2,849	3,112	3,399	3,712	4,054	4,472	4,931	5,439	5,998	6,615	7,295	8,046	8,873	9,786	10,792	11,200	11,623	12,063	12,519	12,992	13,483	13,993	14,522	15,071	15,640
c	Subsidy to SPV							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	Administrative cost							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e	Asset transfer from SPV																																				4,424
f=a-b-c-d	EBITDA						0	39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	-3,600
g=d-e-f	Depreciation									434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434
h	Interest payment				0	11	67	154	210	233	233	233	233	233	233	221	209	198	186	174	163	151	140	128	116	105	93	81	70	58	47	35	23	12	0		
i=f-g-h	Profit before tax				0	-11	-67	-115	-168	-551	-541	-529	-516	-503	-487	-459	-430	-396	-360	-322	-281	-237	-189	-138	-83	-23	41	74	108	143	179	215	253	291	331	359	-4,034
j	Corporate Tax							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	22	32	43	54	65	76	87	99	108	0
k	Tax adjustment							0	0	0	0	0	0	0	0	0	0																				
l=i+j+k	Profit after tax				0	-11	-67	-115	-168	-551	-541	-529	-516	-503	-487	-459	-430	-396	-360	-322	-281	-237	-189	-138	-83	-23	29	52	76	100	125	151	177	204	231	252	-4,034
m	Government budget		1,425	2,529	2,214	2,779	2,534	905	236																												0
	PMC/PCMC/MIDC		621	1,102	965	1,211	1,104	394	103																												
	Central/State		804	1,427	1,249	1,568	1,429	511	133																												
n	Debt		0	0	1,556	6,484	5,912	2,112	550																												
o	Investment		1,425	2,529	3,769	9,263	8,445	3,017	786			0					0					0															0
	Initial investment		1,425	2,529	3,769	9,263	8,445	3,017	786																												
	Additional investment											0					0					0															
p	IDC																																				
q	Debt outstanding		0	0	1,556	8,040	13,952	16,064	16,614	16,614	16,614	16,614	16,614	16,614	15,783	14,953	14,122	13,291	12,460	11,630	10,799	9,968	9,138	8,307	7,476	6,646	5,815	4,984	4,153	3,323	2,492	1,661	831	0		
r	Debt repayment														831	831	831	831	831	831	831	831	831	831	831	831	831	831	831	831	831	831	831	831			
h	Interest payment				0	11	67	154	210	233	233	233	233	233	233	221	209	198	186	174	163	151	140	128	116	105	93	81	70	58	47	35	23	12	0		
s=g+h+l	Cash flow available for debt service		0	0	0	0	0	39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	556	567	579	592	605	619	634	649	665	685	-3,600
t=s/(h+r)	Debt service coverage ratio									0.49	0.54	0.59	0.64	0.70	0.17	0.19	0.21	0.23	0.26	0.28	0.32	0.35	0.40	0.44	0.49	0.55	0.60	0.62	0.64	0.67	0.69	0.72	0.74	0.77			
	Loan Life Coverage Ratio																																				
u=l+g-r	Cash flow after repayment of interest and principal		0	0	0	-11	-67	-115	-168	-118	-107	-95	-83	-69	-884	-856	-827	-793	-757	-719	-678	-634	-586	-535	-480	-420	-368	-345	-321	-297	-272	-246	-220	-193	665	685	-3,600
v=f-o	NCF for Project IRR	0	-1,425	-2,529	-3,769	-9,263	-8,445	-2,979	-744	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	-3,600
w=u-m	NCF for Equity IRR	0	-1,425	-2,529	-2,214	-2,790	-2,601	-1,020	-404	-118	-107	-95	-83	-69	-884	-856	-827	-793	-757	-719	-678	-634	-586	-535	-480	-420	-368	-345	-321	-297	-272	-246	-220	-193	665	685	-3,600
	Accumulated NCF for EIRR		-1,425	-3,954	-6,167	-8,957	-11,558	-12,578	-12,982	-13,099	-13,206	-13,302	-13,384	-13,453	-14,338	-15,194	-16,021	-16,814	-17,571	-18,290	-18,968	-19,601	-20,188	-20,723	-21,203	-21,623	-21,991	-22,336	-22,657	-22,954	-23,226	-23,472	-23,693	-23,886	-23,221	-22,535	-26,136

Project FIRR:	-8.5%	NPV:	-14,052	@	15%
Equity FIRR:	#NUM!	NPV:	-7,850	@	15%

3-B. ケース P2a(v)-1

試算条件	指標結果			資金調達			収入項目				インフレ率（内貨）		備考
	Equity FIRR	%	#NUM!		%	Million Rs.	関連収入（運賃収入比）			0%	2012-2028年	4.20%	
	Net Present Value	Mil. Rs.	-9,625	初期投資総額	100%	29,235	その他1	含まない	その他2	含まない	2028-2048年	4.20%	
	（割引率）	%	15.0%	自己資金比率	59%	17,368	支出項目				感度分析		
	Publicの事業範囲			借入金比率	41%	11,867	サービス費用（運賃収入比）			95%	収入	+-% 0%	
	Land acquisition, relocation		含む	（PMC/PCMC/MIDC）	19%	5,501	コンサルタント費（建設・調達費比）			5%	初期投資	+-% 0%	
	Civil		含む	（中央・州政府等）	41%	11,867	予備費（建設・調達・コンサル費比）			5%			
	Track		含まない	借入金利		1.4%	税率（投資コスト）（予備費除く）			18%	減価償却期間		
	E&M		含まない	据置期間	年	10	税率（O&M）			18%	Civil（年）	50	
	Rolling Stock		含まない	返済期間（据置含む）	年	30					Track, E&M, Rolling Stock（年）	30	

		-6 2013	-5 2014	-4 2015	-3 2016	-2 2017	-1 2018	1 2019	2 2020	3 2021	4 2022	5 2023	6 2024	7 2025	8 2026	9 2027	10 2028	11 2029	12 2030	13 2031	14 2032	15 2033	16 2034	17 2035	18 2036	19 2037	20 2038	21 2039	22 2040	23 2041	24 2042	25 2043	26 2044	27 2045	28 2046	29 2047	30 2048
a	Revenue							772	843	2,301	2,514	2,746	2,999	3,275	3,578	3,907	4,268	4,707	5,191	5,725	6,314	6,963	7,679	8,469	9,340	10,301	11,360	11,790	12,235	12,698	13,178	13,676	14,193	14,729	15,286	15,864	16,464
	Passenger Revenue							772	843	2,301	2,514	2,746	2,999	3,275	3,578	3,907	4,268	4,707	5,191	5,725	6,314	6,963	7,679	8,469	9,340	10,301	11,360	11,790	12,235	12,698	13,178	13,676	14,193	14,729	15,286	15,864	16,464
	Off-rail Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Revenue 1							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Revenue 2							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b	Service fee payment							733	801	2,186	2,388	2,608	2,849	3,112	3,399	3,712	4,054	4,472	4,931	5,439	5,998	6,615	7,295	8,046	8,873	9,786	10,792	11,200	11,623	12,063	12,519	12,992	13,483	13,993	14,522	15,071	15,640
c	Subsidy to SPV							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	Administrative cost							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e	Asset transfer from SPV																																				4,424
f=a-b-c-d	EBITDA						0	39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	-3,600
g=d-e-f	Depreciation									434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434	434
h	Interest payment				0	8	48	110	150	166	166	166	166	166	166	158	150	141	133	125	116	108	100	91	83	75	66	58	50	42	33	25	17	8	0		
i=f-g-h	Profit before tax				0	-8	-48	-71	-108	-485	-474	-463	-450	-436	-421	-396	-370	-340	-307	-272	-234	-194	-149	-102	-50	7	68	98	128	160	192	225	259	294	331	359	-4,034
j	Corporate Tax							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	20	29	38	48	58	68	78	88	99	108	0
k	Tax adjustment							0	0	0	0	0	0	0	0	0	0																				
l=i-j+k	Profit after tax				0	-8	-48	-71	-108	-485	-474	-463	-450	-436	-421	-396	-370	-340	-307	-272	-234	-194	-149	-102	-50	5	47	68	90	112	134	158	182	206	231	252	-4,034
m	Government budget		1,425	2,529	2,658	4,631	4,223	1,509	393																												0
	PMC/PCMC/MIDC		451	801	842	1,467	1,337	478	124																												
	Central/State		973	1,728	1,816	3,165	2,885	1,031	269																												
n	Debt		0	0	1,111	4,631	4,223	1,509	393																												
o	Investment		1,425	2,529	3,769	9,263	8,445	3,017	786			0					0					0															0
	Initial investment		1,425	2,529	3,769	9,263	8,445	3,017	786																												
	Additional investment											0					0					0															
p	IDC																																				
q	Debt outstanding		0	0	1,111	5,743	9,965	11,474	11,867	11,867	11,867	11,867	11,867	11,867	11,274	10,680	10,087	9,494	8,900	8,307	7,714	7,120	6,527	5,933	5,340	4,747	4,153	3,560	2,967	2,373	1,780	1,187	593	0			
r	Debt repayment															593	593	593	593	593	593	593	593	593	593	593	593	593	593	593	593	593	593	593			
h	Interest payment				0	8	48	110	150	166	166	166	166	166	166	158	150	141	133	125	116	108	100	91	83	75	66	58	50	42	33	25	17	8	0		
s=g+h+l	Cash flow available for debt service		0	0	0	0	0	39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	513	548	560	573	587	601	616	632	648	665	685	-3,600
t=s/(h+r)	Debt service coverage ratio									0.69	0.76	0.83	0.90	0.99	0.24	0.26	0.29	0.32	0.36	0.40	0.44	0.50	0.55	0.62	0.69	0.77	0.83	0.86	0.89	0.92	0.96	1.00	1.04	1.08			
	Loan Life Coverage Ratio																																				
u=l+g-r	Cash flow after repayment of interest and principal		0	0	0	-8	-48	-71	-108	-51	-40	-29	-16	-2	-581	-556	-529	-499	-467	-432	-394	-353	-309	-261	-209	-155	-112	-91	-70	-48	-25	-2	22	46	665	685	-3,600
v=f-o	NCF for Project IRR	0	-1,425	-2,529	-3,769	-9,263	-8,445	-2,979	-744	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	-3,600
w=u-m	NCF for Equity IRR	0	-1,425	-2,529	-2,658	-4,639	-4,271	-1,580	-501	-51	-40	-29	-16	-2	-581	-556	-529	-499	-467	-432	-394	-353	-309	-261	-209	-155	-112	-91	-70	-48	-25	-2	22	46	665	685	-3,600
	Accumulated NCF for EIRR		-1,425	-3,954	-6,612	-11,251	-15,522	-17,102	-17,603	-17,654	-17,694	-17,723	-17,739	-17,742	-18,322	-18,878	-19,407	-19,907	-20,373	-20,805	-21,199	-21,552	-21,861	-22,123	-22,332	-22,487	-22,599	-22,691	-22,760	-22,808	-22,834	-22,836	-22,814	-22,767	-22,102	-21,417	-25,017

Project FIRR:	-8.5%	NPV:	-14,052	@	15%
Equity FIRR:	#NUM!	NPV:	-9,625	@	15%

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3-C. ケース P3a(v)-1

試算条件	指標結果			資金調達			収入項目				インフレ率（内貨）			インフレ率（外貨）			備考
	Equity FIRR	%	#NUM!		%	Million Rs.	関連収入（運賃収入比）			0%	2012-2028年		4.20%	2012-2028年		2.10%	*法人税率30%（実効32.445%）だが、インフラ投資ではプロジェクト開始から20年間のうち連続する10年間の 非課税措置が適用。
	Net Present Value	Mil. Rs.	-10,538	初期投資総額	100%	32,546	その他1	含まない	その他2	含まない	2028-2048年		4.20%	2028-2048年		2.10%	
	（割引率）	%	15.0%	自己資金比率	58%	19,023	支出項目				感度分析			為替レート変動率（円／ルピー）			
	Publicの事業範囲			借入金比率	42%	13,523	サービス費用（運賃収入比）			95%	収入	+-%	0%	2012-2020年	+-%／年	-5.0%	
	Land acquisition, relocation		含む	(PMC/PCMC/MIDC)	17%	5,501	コンサルタント費（建設・調達費比）			5%	初期投資	+-%	0%	2020-2048年	+-%／年	0.0%	
	Civil		含む	（中央・州政府等）	42%	13,523	予備費（建設・調達・コンサル費比）			5%				2012年設定レート	JPY／Rs.	1.50	
	Track		含む	借入金利		1.4%	税率（投資コスト）（予備費除く）			18%	減価償却期間						
	E&M		含まない	据置期間	年	10	税率（O&M）			18%	Civil（年）		50				
	Rolling Stock		含まない	返済期間（据置含む）	年	30					Track, E&M, Rolling Stock（年）		30				

		-6 2013	-5 2014	-4 2015	-3 2016	-2 2017	-1 2018	1 2019	2 2020	3 2021	4 2022	5 2023	6 2024	7 2025	8 2026	9 2027	10 2028	11 2029	12 2030	13 2031	14 2032	15 2033	16 2034	17 2035	18 2036	19 2037	20 2038	21 2039	22 2040	23 2041	24 2042	25 2043	26 2044	27 2045	28 2046	29 2047	30 2048
a	Revenue							772	843	2,301	2,514	2,746	2,999	3,275	3,578	3,907	4,268	4,707	5,191	5,725	6,314	6,963	7,679	8,469	9,340	10,301	11,360	11,790	12,235	12,698	13,178	13,676	14,193	14,729	15,286	15,864	16,464
	Passenger Revenue							772	843	2,301	2,514	2,746	2,999	3,275	3,578	3,907	4,268	4,707	5,191	5,725	6,314	6,963	7,679	8,469	9,340	10,301	11,360	11,790	12,235	12,698	13,178	13,676	14,193	14,729	15,286	15,864	16,464
	Off-rail Revenue							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Revenue 1							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other Revenue 2							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b	Service fee payment							733	801	2,186	2,388	2,608	2,849	3,112	3,399	3,712	4,054	4,472	4,931	5,439	5,998	6,615	7,295	8,046	8,873	9,786	10,792	11,200	11,623	12,063	12,519	12,992	13,483	13,993	14,522	15,071	15,640
c	Subsidy to SPV							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	Administrative cost							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
e	Asset transfer from SPV																																				4,804
f=a-b-c-d	EBITDA						0	39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	-3,981
g=d-e-f	Depreciation									535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535	535
h	Interest payment				0	9	54	124	171	194	194	194	194	194	194	185	175	165	155	146	136	126	117	107	97	87	78	68	58	49	39	29	19	10	0		
i=f-g-h	Profit before tax				0	-9	-54	-86	-129	-614	-603	-592	-579	-565	-550	-524	-496	-464	-430	-394	-355	-313	-267	-218	-165	-107	-44	-13	19	52	85	120	156	192	230	259	-4,516
j	Corporate Tax							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	16	26	36	47	58	69	78	0
k	Tax adjustment											0	0	0	0	0	0	0	0	0	0	0															
l=i-j+k	Profit after tax				0	-9	-54	-86	-129	-614	-603	-592	-579	-565	-550	-524	-496	-464	-430	-394	-355	-313	-267	-218	-165	-107	-44	-13	13	36	60	84	109	135	161	181	-4,516
m	Government budget		1,425	2,529	2,879	5,096	4,802	1,699	593																												0
	PMC/PCMC/MIDC		412	731	833	1,474	1,388	491	172																												
	Central/State		1,013	1,798	2,047	3,623	3,413	1,208	422																												
n	Debt		0	0	1,332	5,096	4,802	1,699	593																												
o	Investment		1,425	2,529	4,212	10,192	9,603	3,398	1,187			0					0					0															0
	Initial investment		1,425	2,529	4,212	10,192	9,603	3,398	1,187																												
	Additional investment											0					0					0															
p	IDC			0	0	9	54	124	171																												
q	Debt outstanding		0	0	1,332	6,438	11,294	13,117	13,882	13,882	13,882	13,882	13,882	13,882	13,187	12,493	11,799	11,105	10,411	9,717	9,023	8,329	7,635	6,941	6,247	5,553	4,859	4,164	3,470	2,776	2,082	1,388	694	0		
r	Debt repayment														694	694	694	694	694	694	694	694	694	694	694	694	694	694	694	694	694	694	694	694			
h	Interest payment				0	9	54	124	171	194	194	194	194	194	194	185	175	165	155	146	136	126	117	107	97	87	78	68	58	49	39	29	19	10	0		
s=g+h+l	Cash flow available for debt service		0	0	0	0	0	39	42	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	606	619	633	648	663	679	695	716	-3,981
t=s/(h+r)	Debt service coverage ratio									0.59	0.65	0.71	0.77	0.84	0.20	0.22	0.25	0.27	0.31	0.34	0.38	0.42	0.47	0.53	0.59	0.66	0.74	0.77	0.81	0.83	0.86	0.90	0.93	0.96			
	Loan Life Coverage Ratio																																				
u=l+g-r	Cash flow after repayment of interest and principal		0	0	0	-9	-54	-86	-129	-79	-69	-57	-44	-31	-710	-683	-656	-624	-590	-554	-514	-472	-427	-378	-324	-266	-204	-173	-146	-123	-100	-75	-51	-25	695	716	-3,981
v=f-o	NCF for Project IRR	0	-1,425	-2,529	-4,212	-10,192	-9,603	-3,360	-1,144	115	126	137	150	164	179	195	213	235	260	286	316	348	384	423	467	515	568	589	612	635	659	684	710	736	764	793	-3,981
w=u-m	NCF for Equity IRR	0	-1,425	-2,529	-2,879	-5,106	-4,856	-1,785	-722	-79	-69	-57	-44	-31	-710	-683	-656	-624	-590	-554	-514	-472	-427	-378	-324	-266	-204	-173	-146	-123	-100	-75	-51	-25	695	716	-3,981
	Accumulated NCF for EIRR		-1,425	-3,954	-6,833	-11,939	-16,795	-18,579	-19,301	-19,381	-19,449	-19,506	-19,551	-19,581	-20,291	-20,974	-21,630	-22,254	-22,844	-23,397	-23,912	-24,384	-24,811	-25,188	-25,513	-25,779	-25,983	-26,155	-26,302	-26,425	-26,525	-26,600	-26,651	-26,676	-25,980	-25,265	-29,246

Project FIRR:	#NUM!	NPV:	-15,544	@	15%
Equity FIRR:	#NUM!	NPV:	-10,538	@	15%

Appendix -27-4. PMRC の各検討ケースの資金構成とキャッシュフロー図

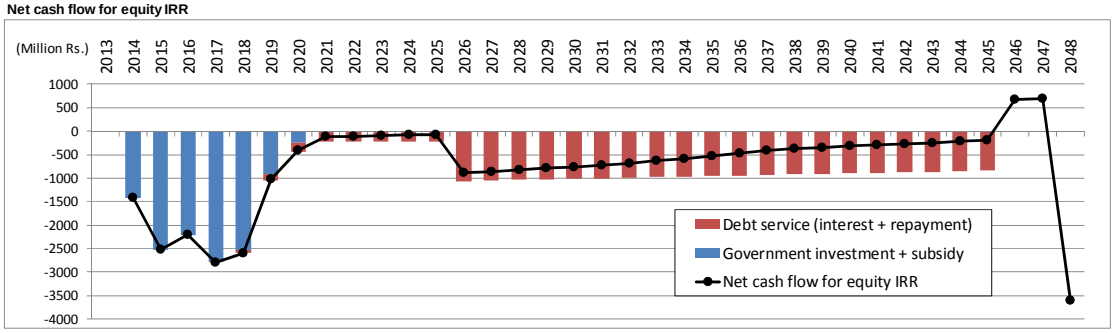
政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P2a(iii)-1	Land Civil work	29,235	PMC/PCMC/MIDC VGF State government VGF Central government **Debt (JICA ODA loan)**	5,501 3,560 3,560 **16,614**	18.8% 12.2% 12.2% **56.8%**	Track work E&M Rolling Stock	**Case 2a(iii)** * 30% of initial investment subsidized by public * 95% of fare box revenue is received as service fee SPV equity IRR: 13.3%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	3,769	9,263	8,445	3,017	786	29,235	100%
Debt	Mil. Rs.	0	0	1,556	6,484	5,912	2,112	550	16,614	57%
Central Government	Mil. Rs.	402	713	624	784	715	255	67	3,560	12%
State Government	Mil. Rs.	402	713	624	784	715	255	67	3,560	12%
PMC/PCMC/MIDC	Mil. Rs.	621	1,102	965	1,211	1,104	394	103	5,501	19%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30(10) years

Net cash flow for equity IRR



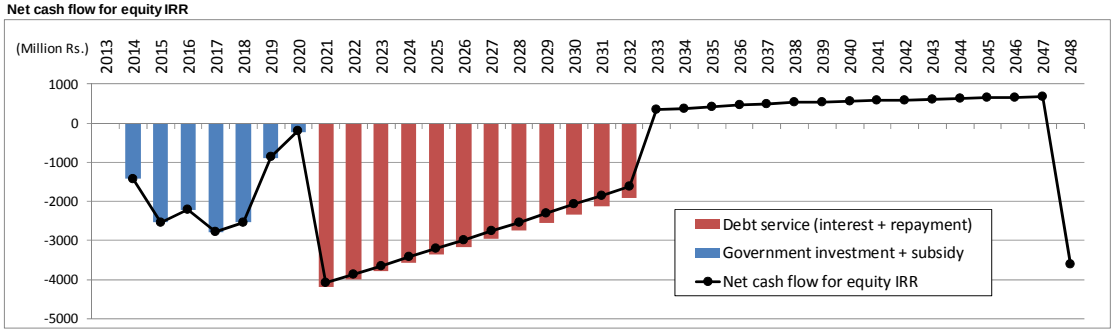
政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P2a(iii)-2	Land Civil work	29,235	PMC/PCMC/MIDC VGF State government VGF Central government **Debt (Commercial loan)**	5,501 3,560 3,560 **16,614**	18.8% 12.2% 12.2% **56.8%**	Track work E&M Rolling Stock	**Case 2a(iii)** * 30% of initial investment subsidized by public * 95% of fare box revenue is received as service fee SPV equity IRR: 13.3%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	3,769	9,263	8,445	3,017	786	29,235	100%
Debt	Mil. Rs.	0	0	1,556	6,484	5,912	2,112	550	16,614	57%
Central Government	Mil. Rs.	402	713	624	784	715	255	67	3,560	12%
State Government	Mil. Rs.	402	713	624	784	715	255	67	3,560	12%
PMC/PCMC/MIDC	Mil. Rs.	621	1,102	965	1,211	1,104	394	103	5,501	19%

*Terms of commercial loan
Borrowing rate: 12%
Loan (grace) period: 17(5) years

Net cash flow for equity IRR



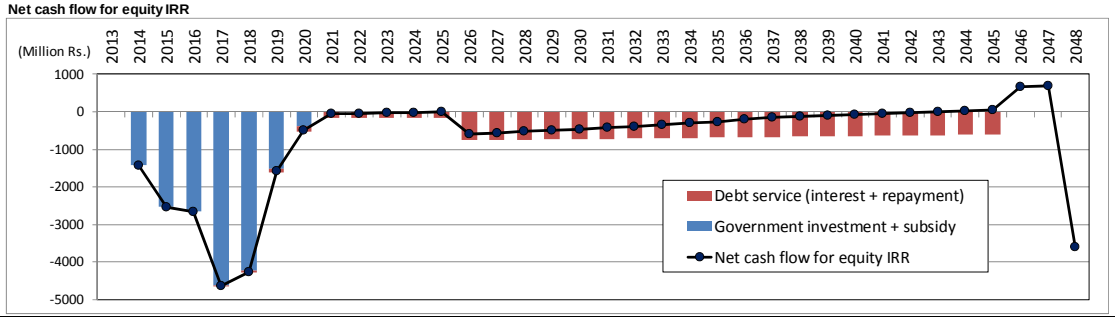
政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P2a(v)-1	Land	29,235	PMC/PCMC/MIDC	5,501	18.8%	Track work	**Case 2a(v)**
	Civil work		VGF State government	5,933	20.3%	E&M	* 50% of initial investment subsidized by public
			VGF Central government	5,933	20.3%	Rolling Stock	* 95% of fare box revenue is received as service fee
			Debt (JICA ODA loan)	**11,867**	**40.6%**		SPV equity IRR: 16.6%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	3,769	9,263	8,445	3,017	786	29,235	100%
Debt	Mil. Rs.	0	0	1,111	4,631	4,223	1,509	393	11,867	41%
Central Government	Mil. Rs.	487	864	908	1,582	1,443	515	134	5,933	20%
State Government	Mil. Rs.	487	864	908	1,582	1,443	515	134	5,933	20%
PMC/PCMC/MIDC	Mil. Rs.	451	801	842	1,467	1,337	478	124	5,501	19%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30(10) years

Net cash flow for equity IRR



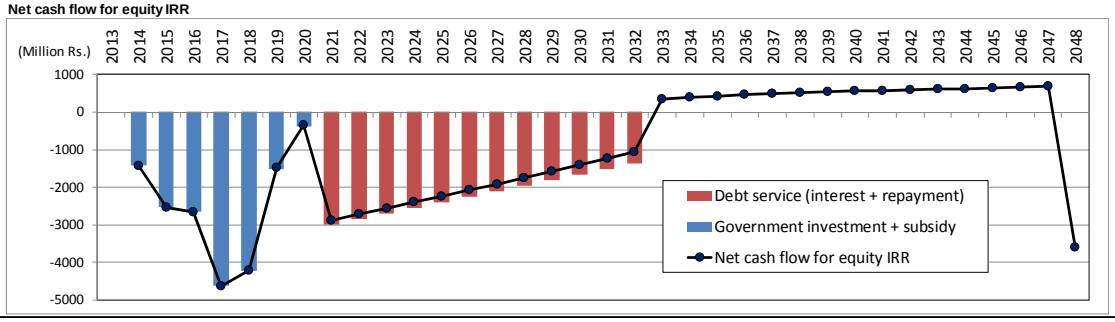
政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P2a(v)-2	Land	29,235	PMC/PCMC/MIDC	5,501	18.8%	Track work	**Case 2a(v)**
	Civil work		VGF State government	5,933	20.3%	E&M	* 50% of initial investment subsidized by public
			VGF Central government	5,933	20.3%	Rolling Stock	* 95% of fare box revenue is received as service fee
			Debt (Commercial loan)	**11,867**	**40.6%**		SPV equity IRR: 16.6%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	3,769	9,263	8,445	3,017	786	29,235	100%
Debt	Mil. Rs.	0	0	1,111	4,631	4,223	1,509	393	11,867	41%
Central Government	Mil. Rs.	487	864	908	1,582	1,443	515	134	5,933	20%
State Government	Mil. Rs.	487	864	908	1,582	1,443	515	134	5,933	20%
PMC/PCMC/MIDC	Mil. Rs.	451	801	842	1,467	1,337	478	124	5,501	19%

*Terms of commercial loan
Borrowing rate: 12%
Loan (grace) period: 17(5) years

Net cash flow for equity IRR



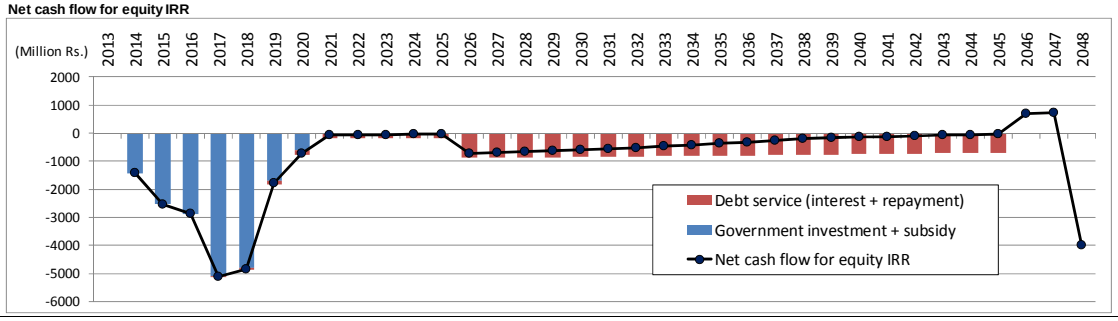
政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P3a(v)-1	Land	32,546	PMC/PCMC/MIDC	5,501	16.9%	E&M	**Case 3a(v)**
	Civil work		VGF State government	6,761	20.8%	Rolling Stock	* 50% of initial investment subsidized by public
	Track work		VGF Central government	6,761	20.8%		* 95% of fare box revenue is received as service fee
			Debt (JICA ODA loan)	**13,523**	41.5%		SPV equity IRR: 17.8%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	4,212	10,192	9,603	3,398	1,187	32,546	100%
Debt	Mil. Rs.	0	0	1,332	5,096	4,802	1,699	593	13,523	42%
Central Government	Mil. Rs.	506	899	1,023	1,811	1,707	604	211	6,761	21%
State Government	Mil. Rs.	506	899	1,023	1,811	1,707	604	211	6,761	21%
PMC/PCMC/MIDC	Mil. Rs.	412	731	833	1,474	1,388	491	172	5,501	17%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30(10) years

Net cash flow for equity IRR



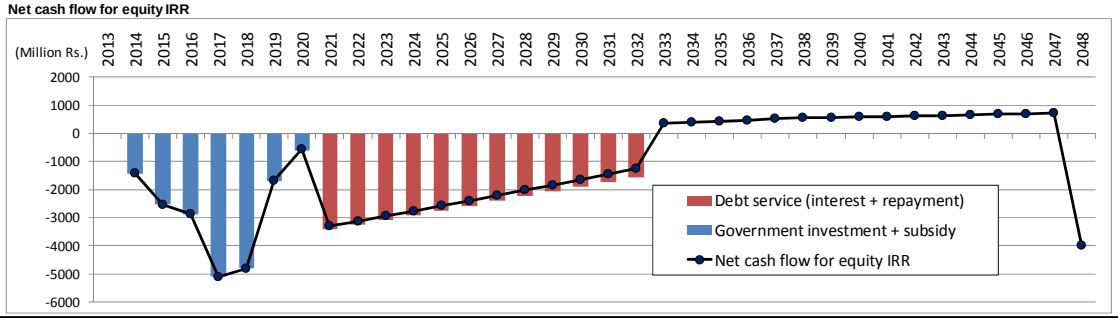
政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P3a(v)-2	Land	32,546	PMC/PCMC/MIDC	5,501	16.9%	E&M	**Case 3a(v)**
	Civil work		VGF State government	6,761	20.8%	Rolling Stock	* 50% of initial investment subsidized by public
	Track work		VGF Central government	6,761	20.8%		* 95% of fare box revenue is received as service fee
			Debt (Commercial loan)	**13,523**	41.5%		SPV equity IRR: 17.8%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	4,212	10,192	9,603	3,398	1,187	32,546	100%
Debt	Mil. Rs.	0	0	1,332	5,096	4,802	1,699	593	13,523	42%
Central Government	Mil. Rs.	506	899	1,023	1,811	1,707	604	211	6,761	21%
State Government	Mil. Rs.	506	899	1,023	1,811	1,707	604	211	6,761	21%
PMC/PCMC/MIDC	Mil. Rs.	412	731	833	1,474	1,388	491	172	5,501	17%

*Terms of commercial loan
Borrowing rate: 12%
Loan (grace) period: 17(5) years

Net cash flow for equity IRR



政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P1-1	Fullly public undertaking	57,693	Gov. Budget (PMC/PCMC/MIDC)	17,308	30%	-	-
			Debt (JICA ODA loan)	**40,385**	**70%**		

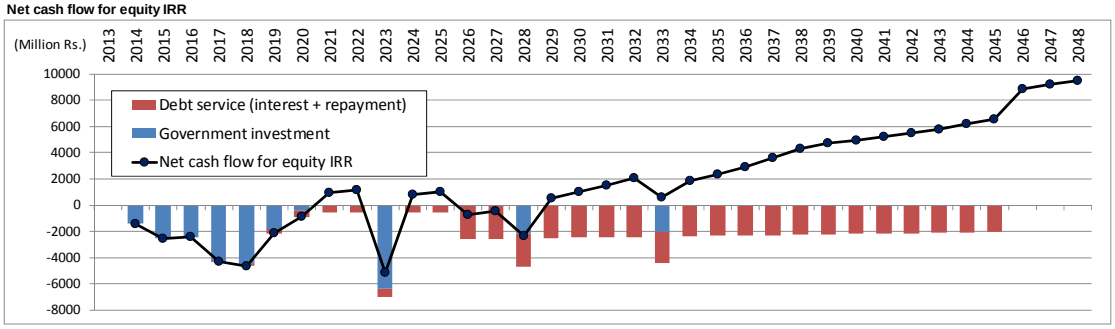
Initial investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	5,409	18,808	19,815	7,964	1,744	57,693	100%
Debt	Mil. Rs.	0	0	2,988	14,553	15,332	6,163	1,349	40,385	70%
Central Government	Mil. Rs.	0	0	0	0	0	0	0	0	0%
State Government	Mil. Rs.	0	0	0	0	0	0	0	0	0%
PMC/PCMC/MIDC	Mil. Rs.	1,425	2,529	2,420	4,255	4,483	1,802	394	17,308	30%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30 (10) years

Equity IRR
6.0%

Net cash flow for equity IRR



政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P1-2	Fullly public undertaking	57,693	Gov. Budget (PMC/PCMC/MIDC)	17,308	30%	-	-
			Debt (Commercial loan)	**40,385**	**70%**		

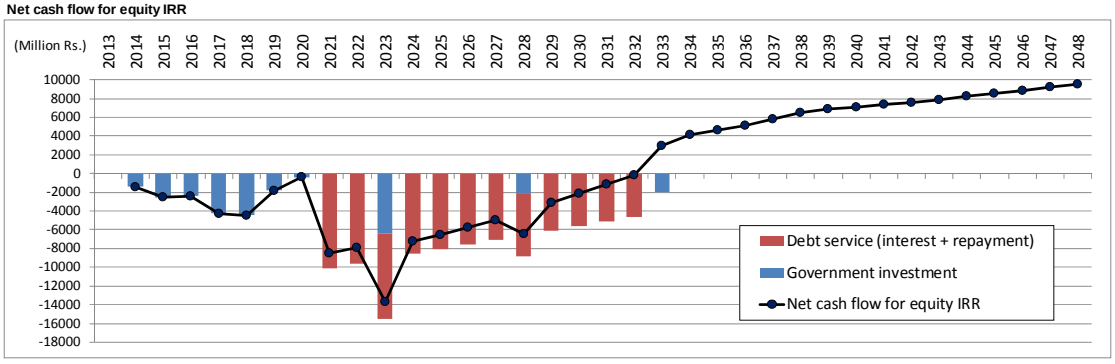
Initial investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	5,409	18,808	19,815	7,964	1,744	57,693	100%
Debt	Mil. Rs.	0	0	2,988	14,553	15,332	6,163	1,349	40,385	70%
Central Government	Mil. Rs.	0	0	0	0	0	0	0	0	0%
State Government	Mil. Rs.	0	0	0	0	0	0	0	0	0%
PMC/PCMC/MIDC	Mil. Rs.	1,425	2,529	2,420	4,255	4,483	1,802	394	17,308	30%

*Terms of commercial loan
Borrowing rate: 12%
Loan (grace) period: 17 (5) years

Equity IRR
1.4%

Net cash flow for equity IRR



政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P1-3	Fullly public undertaking	57,693	Gov. Budget (PMC/PCMC/MIDC)	5,769	10%		
			Gov. Budget (State government)	11,539	20%		
			Gov. Budget (Central government)	11,539	20%	-	-
			Debt (JICA ODA loan)	**28,847**	**50%**		

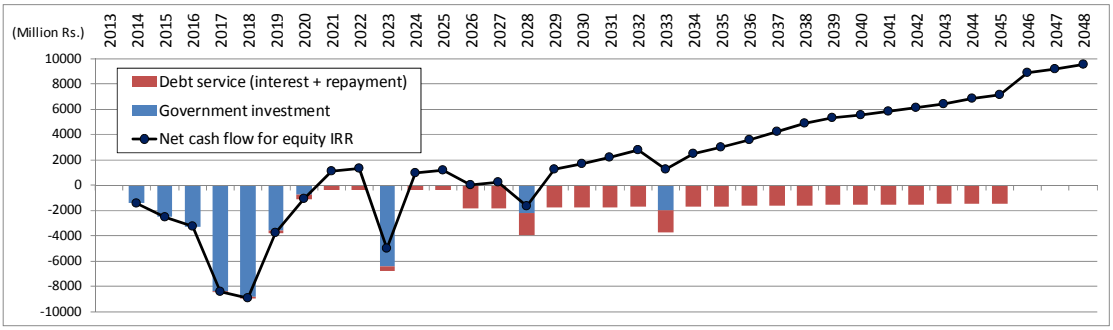
Initial investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	5,409	18,808	19,815	7,964	1,744	57,693	100%
Debt	Mil. Rs.	0	0	2,134	10,395	10,952	4,402	964	28,847	50%
Central Government	Mil. Rs.	570	1,012	1,310	3,365	3,545	1,425	312	11,539	20%
State Government	Mil. Rs.	570	1,012	1,310	3,365	3,545	1,425	312	11,539	20%
PMC/PCMC/MIDC	Mil. Rs.	285	506	655	1,683	1,773	713	156	5,769	10%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30 (10) years

Equity IRR
5.1%

Net cash flow for equity IRR



政府部門 (PMRC)の検討ケース						SPVの対応ケース	
ケース	投資範囲	初期投資額 (Mil. Rs)	資金調達先 (Mil. Rs)			投資範囲	ケースの内容
Case P1-4	Fullly public undertaking	57,693	Gov. Budget (PMC/PCMC/MIDC)	5,769	10%		
			Gov. Budget (State government)	11,539	20%		
			Gov. Budget (Central government)	11,539	20%	-	-
			Debt (Commercial loan)	**28,847**	**50%**		

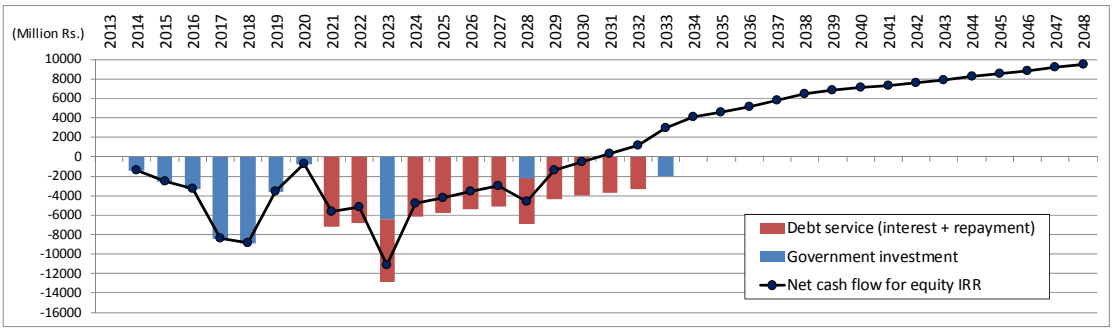
Initial investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	5,409	18,808	19,815	7,964	1,744	57,693	100%
Debt	Mil. Rs.	0	0	2,134	10,395	10,952	4,402	964	28,847	50%
Central Government	Mil. Rs.	570	1,012	1,310	3,365	3,545	1,425	312	11,539	20%
State Government	Mil. Rs.	570	1,012	1,310	3,365	3,545	1,425	312	11,539	20%
PMC/PCMC/MIDC	Mil. Rs.	285	506	655	1,683	1,773	713	156	5,769	10%

*Terms of commercial loan
Borrowing rate: 12%
Loan (grace) period: 17 (5) years

Equity IRR
2.2%

Net cash flow for equity IRR



Appendix -27-5. 政府部門の初期投資負担率の試算表

5-A. 基本シナリオ 1:ケース 2a(iii)＋ケース P2a(iii)

COST SHARING & FUNDING -Public/Private (VGF: 30%)*

Investment			Amount INR m	Share %
Initial Investment Total			**57,693**	100.0%
	Land	Public	5,501	9.5%
	Civil	Public	23,734	41.1%
	Track	Private	3,312	5.7%
	E&M	Private	9,011	15.6%
	Rolling Stock	Private	16,136	28.0%

Funding	Share within	INR m	Share of total
Initial Investment Total		**57,693**	100.0%
Public	100.0%	29,235	50.7%
VGF Central Govt	12.2%	3,560	6.2%
VGF State Govt	12.2%	3,560	6.2%
PMC/PCMC/MIDC sub	18.8%	5,501	9.5%
PMRC Borrowing	56.8%	16,614	28.8%
Private	100.0%	28,459	49.3%
Equity (30%)	21.0%	5,976	10.4%
Debt (70%)	49.0%	13,945	24.2%
VGF	30.0%	8,538	14.8%

VGF Allocation

	Fundnig Req	Allocated	
Total VGF	57,693	15,658	27.1%
Public	29,235	7,120	24.4%
Private	28,459	8,538	30.0%

Overall Funding

VGF	15,658	27.1%
Public	22,114	38.3%
Private	19,921	34.5%
Total	57,693	100.0%

VGF+Public: 65.5%

* Land cost is excluded from VGF calculation.

5-B. 基本シナリオ 1:ケース 2a(v)＋ケース P2a(v)

COST SHARING & FUNDING -Public/Private (VGF: 50%)*

Investment			Amount INR m	Share %
Initial Investment Total			**57,693**	100.0%
	Land	Public	5,501	9.5%
	Civil	Public	23,734	41.1%
	Track	Private	3,312	5.7%
	E&M	Private	9,011	15.6%
	Rolling Stock	Private	16,136	28.0%

Funding	Share within	INR m	Share of total
Initial Investment Total		**57,693**	100.0%
Public	100.0%	29,235	50.7%
VGF Central Govt	20.3%	5,933	10.3%
VGF State Govt	20.3%	5,933	10.3%
PMC/PCMC/MIDC sub	18.8%	5,501	9.5%
PMRC Borrowing	40.6%	11,867	20.6%
Private	100.0%	28,459	49.3%
Equity (30%)	15.0%	4,269	7.4%
Debt (70%)	35.0%	9,961	17.3%
VGF	50.0%	14,229	24.7%

VGF Allocation

	Fundnig Req	Allocated	
Total VGF	57,693	26,096	45.2%
Public	29,235	11,867	40.6%
Private	28,459	14,229	50.0%

Overall Funding

VGF	26,096	45.2%
Public	17,368	30.1%
Private	14,229	24.7%
Total	57,693	100.0%

VGF+Public: 75.3%

* Land cost is excluded from VGF calculation.

5-C. 基本シナリオ 1：ケース 3a(v)＋ケース P3a(v)

COST SHARING & FUNDING -Public/Private (VGF: 50%)*

Investment			Amount INR m	Share %
Initial Investment Total			**57,693**	100.0%
	Land	Public	5,501	9.5%
	Civil	Public	23,734	41.1%
	Track	Public	3,312	5.7%
	E&M	Private	9,011	15.6%
	Rolling Stock	Private	16,136	28.0%

VGF Allocation		Fundnig Req	Allocated	
	Total VGF	57,693	26,096	45.2%
	Public	32,546	13,523	41.5%
	Private	25,147	12,574	50.0%

* Land cost is excluded from VGF calculation.

Funding	Share within	INR m	Share of total
Initial Investment Total		**57,693**	100.0%
Public	100.0%	32,546	56.4%
VGF Central Govt	20.8%	6,761	11.7%
VGF State Govt	20.8%	6,761	11.7%
PMC/PCMC/MIDC sub	16.9%	5,501	9.5%
PMRC Borrowing	41.5%	13,523	23.4%
Private	100.0%	25,147	43.6%
Equity (30%)	15.0%	3,772	6.5%
Debt (70%)	35.0%	8,802	15.3%
VGF	50.0%	12,574	21.8%

Overall Funding

VGF	26,096	45.2%
Public	19,023	33.0%
Private	12,574	21.8%
Total	57,693	100.0%

VGF+Public: 78.2%

Appendix -27-6. 全線高架による LRT 事業実施の想定ケースの財務・経済試算結果

6-A. 事業投資コスト：全線高架ケース

【プライス・エスカレーション、為替変動考慮前】

【外貨・内貨合計】

(Unit: Million Rs.)

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total	初期投資のみTotal
(1)建設・調達費用													
Civil Works		0	0	1,665	6,659	6,473	1,998	946	0	0	0	17,740	17,740
Track		0	0	282	564	669	209	209	0	0	0	1,933	1,933
E&M		0	0	743	1,485	2,037	552	276	0	0	0	5,093	5,093
Rolling Stock		0	0	0	3,285	3,285	1,643	0	2,746	845	704	12,508	8,213
小計		0	0	2,689	11,993	12,464	4,401	1,431	2,746	845	704	37,273	32,979
(2)その他													0
Land acquisition, Utility relocation		1,112	1,894	1,112	0	0	0	0				4,118	4,118
Consulting service		0	0	134	600	623	220	72				1,649	1,649
Contingency		0	0	141	630	654	231	75	137	42	35	1,946	1,731
小計		1,112	1,894	1,388	1,229	1,278	451	147	137	42	35	7,713	7,499
(3)税金													0
Tax & Duty		200	341	708	2,267	2,356	832	270	494	152	127	7,747	6,974
合計		1,312	2,235	4,785	15,489	16,097	5,684	1,848	3,377	1,039	866	52,734	**47,452**

【外貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	0	0	0	0	0	0	0	0	0
Track		0	0	66	132	157	49	49	0	0	0	453
E&M		0	0	330	660	905	245	123	0	0	0	2,262
Rolling Stock		0	0	0	3,285	3,285	1,643	0	2,746	845	704	12,508
小計		0	0	396	4,077	4,347	1,937	172	2,746	845	704	15,223
(2)その他												
Land acquisition, Utility relocation		0	0	0	0	0	0	0	0	0	0	0
Consulting service		0	0	20	204	217	97	9				546
Contingency		0	0	21	214	228	102	9	137	42	35	788
小計		0	0	41	418	446	199	18	137	42	35	1,335
(3)税金												
Tax & Duty		0	0	75	771	822	366	32	494	152	127	2,838
合計		0	0	511	5,266	5,614	2,501	222	3,377	1,039	866	19,396

【内貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	1,665	6,659	6,473	1,998	946	0	0	0	17,740
Track		0	0	216	432	512	160	160	0	0	0	1,480
E&M		0	0	413	826	1,132	307	153	0	0	0	2,831
Rolling Stock		0	0	0	0	0	0	0	0	0	0	0
小計				2,293	7,916	8,117	2,465	1,259	0	0	0	22,051
(2)その他												
Land acquisition, Utility relocation		1,112	1,894	1,112	0	0	0	0	0	0	0	4,118
Consulting service		0	0	115	396	406	123	63				1,103
Contingency		0	0	120	416	426	129	66	0	0	0	1,158
小計		1,112	1,894	1,347	811	832	253	129	0	0	0	6,379
(3)税金												
Tax & Duty		200	341	634	1,496	1,534	466	238	0	0	0	4,909
合計		1,312	2,235	4,274	10,224	10,483	3,183	1,627	0	0	0	33,338

【プライス・エスカレーション、為替変動考慮後】

【外貨・内貨合計】 (Unit: Million Rs.)

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total	初期投資のみTotal
(1)建設・調達費用													
Civil Works		0	0	1,962	8,180	8,285	2,664	1,314	0	0	0	22,406	22,406
Track		0	0	343	720	897	295	310	0	0	0	2,564	2,564
E&M		0	0	927	1,960	2,844	815	431	0	0	0	6,977	6,977
Rolling Stock		0	0	0	4,711	5,063	2,721	0	5,202	1,776	1,642	21,113	12,494
小計		0	0	3,232	15,570	17,088	6,495	2,056	5,202	1,776	1,642	53,060	44,441
(2)その他													0
Land acquisition, Utility relocation		1,207	2,143	1,311	0	0	0	0	0	0	0	4,662	4,662
Consulting service		0	0	162	779	854	325	103	0	0	0	2,222	2,222
Contingency		0	0	170	817	897	341	108	260	89	82	2,764	2,333
小計		1,207	2,143	1,642	1,596	1,752	666	211	260	89	82	9,648	9,217
(3)税金													0
Tax & Duty		217	386	847	2,943	3,230	1,228	389	936	320	296	10,790	9,238
合計		1,425	2,529	5,721	20,109	22,069	8,388	2,655	6,398	2,184	2,019	**73,498**	**62,897**

【外貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	0	0	0	0	0	0	0	0	0
Track		0	0	88	189	241	81	87	0	0	0	688
E&M		0	0	440	946	1,394	406	218	0	0	0	3,405
Rolling Stock		0	0	0	4,711	5,063	2,721	0	5,202	1,776	1,642	21,113
小計		0	0	528	5,846	6,699	3,208	305	5,202	1,776	1,642	25,206
(2)その他												
Land acquisition, Utility relocation		0	0	0	0	0	0	0	0	0	0	0
Consulting service		0	0	26	292	335	160	15	0	0	0	829
Contingency		0	0	28	307	352	168	16	260	89	82	1,302
小計		0	0	54	599	687	329	31	260	89	82	2,131
(3)税金												
Tax & Duty		0	0	100	1,105	1,266	606	58	936	320	296	4,686
合計		0	0	682	7,550	8,651	4,143	395	6,398	2,184	2,019	32,023

【内貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	1,962	8,180	8,285	2,664	1,314	0	0	0	22,406
Track		0	0	254	530	655	214	223	0	0	0	1,877
E&M		0	0	487	1,014	1,449	409	213	0	0	0	3,572
Rolling Stock		0	0	0	0	0	0	0	0	0	0	0
小計		0	0	2,704	9,724	10,389	3,287	1,750	0	0	0	27,855
(2)その他												
Land acquisition, Utility relocation		1,207	2,143	1,311	0	0	0	0	0	0	0	4,662
Consulting service		0	0	135	486	519	164	88	0	0	0	1,393
Contingency		0	0	142	511	545	173	92	0	0	0	1,462
小計		1,207	2,143	1,588	997	1,065	337	179	0	0	0	7,517
(3)税金												
Tax & Duty		217	386	747	1,838	1,964	621	331	0	0	0	6,104
合計		1,425	2,529	5,039	12,559	13,418	4,245	2,261	0	0	0	41,475

6-B. 財務・経済内部収益率（FIRR 及び EIRR）の試算結果：全線高架ケース

Project FIRR	Economic IRR
4.8%	13.3%

6-C. PMRC のキャッシュフロー図（基本シナリオ対応 3 ケース）：全線高架ケース

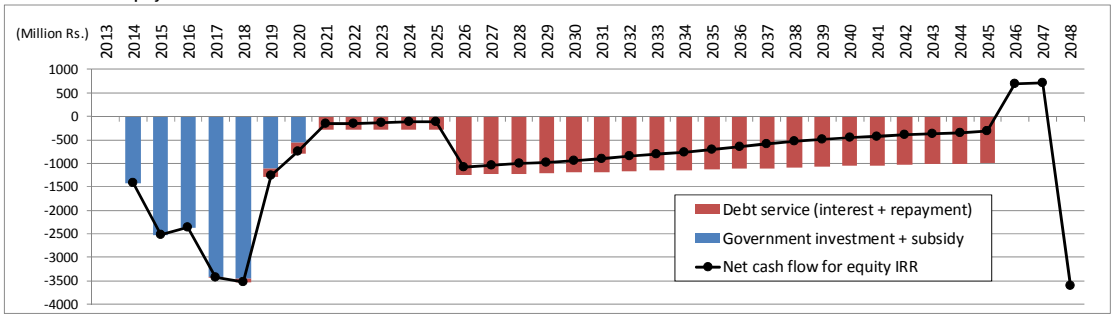
Public (PMRC)						SPV	
Case	Undertaking	Initial Investment Cost (Mil. Rs)	Financing sources (Mil. Rs)			Undertaking	Case
Case P2a(iii)-1	Land Civil work	34,438	PMC/PCMC/MIDC VGF State government VGF Central government **Debt (JICA ODA loan)**	5,501 4,341 4,341 **20,256**	16.0% 12.6% 12.6% **58.8%**	Track work E&M Rolling Stock	**Case 2a(iii)** * 30% of initial investment subsidized by public * 95% of fare box revenue is received as service fee SPV equity IRR: 13.3%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	4,081	10,564	10,700	3,441	1,698	34,438	100%
Debt	Mil. Rs.	0	0	1,714	7,145	7,237	2,327	1,148	19,571	57%
Central Government	Mil. Rs.	402	713	668	964	977	314	155	4,194	12%
State Government	Mil. Rs.	402	713	668	964	977	314	155	4,194	12%
PMC/PCMC/MIDC	Mil. Rs.	621	1,102	1,032	1,490	1,509	485	239	6,480	19%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30(10) years

Net cash flow for equity IRR



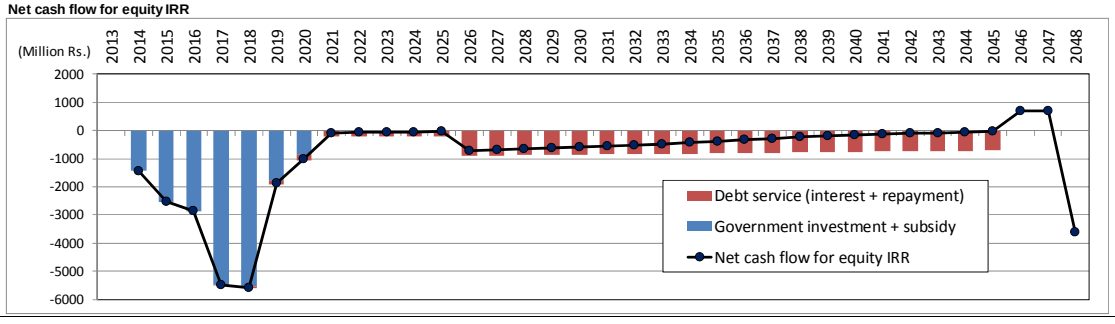
Public (PMRC)						SPV	
Case	Undertaking	Initial Investment Cost (Mil. Rs)	Financing sources (Mil. Rs)			Undertaking	Case
Case P2a(v)-1	Land Civil work	34,438	PMC/PCMC/MIDC VGF State government VGF Central government **Debt (JICA ODA loan)**	5,501 7,234 7,234 **14,469**	16.0% 21.0% 21.0% **42.0%**	Track work E&M Rolling Stock	**Case 2a(v)** * 50% of initial investment subsidized by public * 95% of fare box revenue is received as service fee SPV equity IRR: 16.6%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	4,081	10,564	10,700	3,441	1,698	34,438	100%
Debt	Mil. Rs.	0	0	1,224	5,103	5,169	1,662	820	13,979	41%
Central Government	Mil. Rs.	487	864	976	1,866	1,890	608	300	6,990	20%
State Government	Mil. Rs.	487	864	976	1,866	1,890	608	300	6,990	20%
PMC/PCMC/MIDC	Mil. Rs.	451	801	905	1,730	1,752	563	278	6,480	19%

*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30(10) years

Net cash flow for equity IRR



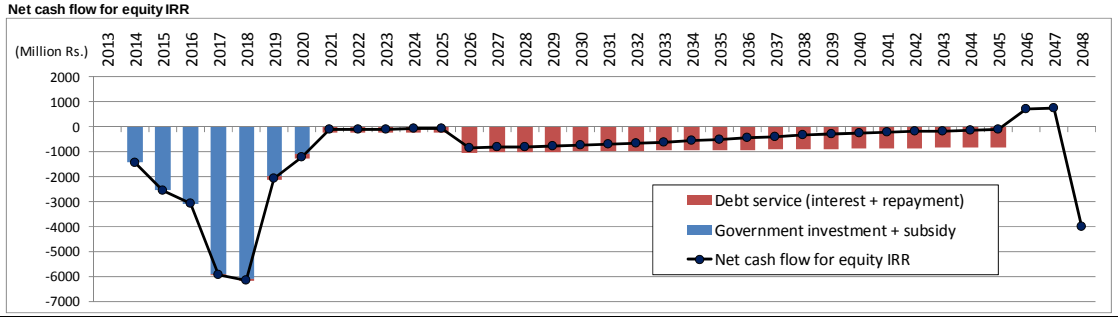
Public (PMRC)						SPV	
Case	Undertaking	Initial Investment Cost (Mil. Rs)	Financing sources (Mil. Rs)			Undertaking	Case
Case P3a(v)-1	Land	37,749	PMC/PCMC/MIDC	5,501	14.6%	E&M	**Case 3a(v)**
	Civil work		VGF State government	8,062	21.4%	Rolling Stock	* 50% of initial investment subsidized by public
	Track work		VGF Central government	8,062	21.4%		* 95% of fare box revenue is received as service fee
			Debt (JICA ODA loan)	**16,124**	42.7%		SPV equity IRR: 17.8%

Investment cost and financing sources

		2014	2015	2016	2017	2018	2019	2020	Total	%
Total investment	Mil. Rs.	1,425	2,529	4,524	11,494	11,858	3,822	2,098	37,749	100%
Debt	Mil. Rs.	0	0	1,448	5,590	5,767	1,859	1,021	15,685	42%
Central Government	Mil. Rs.	506	899	1,093	2,098	2,165	698	383	7,842	21%
State Government	Mil. Rs.	506	899	1,093	2,098	2,165	698	383	7,842	21%
PMC/PCMC/MIDC	Mil. Rs.	412	731	889	1,707	1,761	568	312	6,380	17%

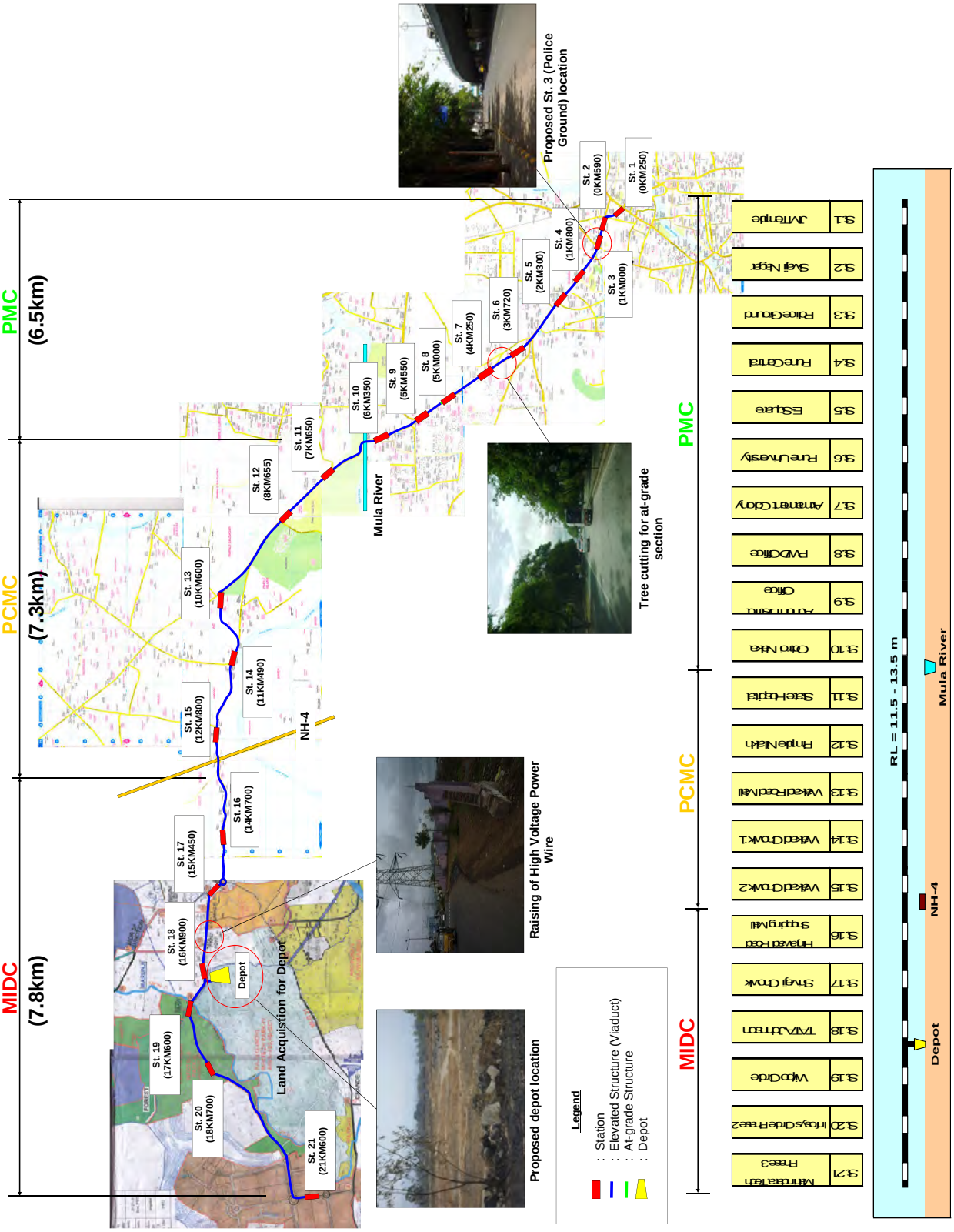
*Terms of JICA ODA loan
Borrowing rate: 1.4%
Loan (grace) period: 30(10) years

Net cash flow for equity IRR



APPENDIX-28：全線高架案

Appendix 28-1：全線高架案



Appendix 28-2（1） 概算事業費の年次配分及び内貨・外貨別の内訳

（プライスエスカレーション、為替変動考慮前）

【外貨・内貨合計】 (Unit: Million Rs.)

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	1,460	5,839	5,109	1,752	438	0	0	0	14,597
Track		0	0	282	564	669	209	209	0	0	0	1,933
E&M		0	0	743	1,485	2,037	552	276	0	0	0	5,093
Rolling Stock		0	0	0	3,285	3,285	1,643	0	2,746	845	704	12,508
小計		0	0	2,484	11,173	11,100	4,155	923	2,746	845	704	34,131
(2)その他												
Land acquisition, Utility relocation		1,112	1,894	1,112	0	0	0	0				4,118
Consulting service		0	0	124	559	555	208	46				1,492
Contingency		0	0	130	587	583	218	48	137	42	35	1,781
小計		1,112	1,894	1,367	1,145	1,138	426	95	137	42	35	7,391
(3)税金												
Tax & Duty		200	341	670	2,112	2,098	785	174	494	152	127	7,153
合計		1,312	2,235	4,521	14,430	14,336	5,367	1,192	3,377	1,039	866	48,675

【外貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	0	0	0	0	0	0	0	0	0
Track		0	0	66	132	157	49	49	0	0	0	453
E&M		0	0	330	660	905	245	123	0	0	0	2,262
Rolling Stock		0	0	0	3,285	3,285	1,643	0	2,746	845	704	12,508
小計		0	0	396	4,077	4,347	1,937	172	2,746	845	704	15,223
(2)その他												
Land acquisition, Utility relocation		0	0	0	0	0	0	0	0	0	0	0
Consulting service		0	0	20	204	217	97	9				546
Contingency		0	0	21	214	228	102	9	137	42	35	788
小計		0	0	41	418	446	199	18	137	42	35	1,335
(3)税金												
Tax & Duty		0	0	75	771	822	366	32	494	152	127	2,838
合計		0	0	511	5,266	5,614	2,501	222	3,377	1,039	866	19,396

【内貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	1,460	5,839	5,109	1,752	438	0	0	0	14,597
Track		0	0	216	432	512	160	160	0	0	0	1,480
E&M		0	0	413	826	1,132	307	153	0	0	0	2,831
Rolling Stock		0	0	0	0	0	0	0	0	0	0	0
小計				2,088	7,096	6,753	2,219	752	0	0	0	18,908
(2)その他												
Land acquisition, Utility relocation		1,112	1,894	1,112	0	0	0	0	0	0	0	4,118
Consulting service		0	0	104	355	338	111	38				945
Contingency		0	0	110	373	355	116	39	0	0	0	993
小計		1,112	1,894	1,326	727	692	227	77	0	0	0	6,056
(3)税金												
Tax & Duty		200	341	595	1,341	1,276	419	142	0	0	0	4,315
合計		1,312	2,235	4,009	9,165	8,722	2,865	971	0	0	0	29,279

地上＋高架案

合計 48 ,675 Million Rs.

Appendix 28-2（2） 全線高架ケース（プライス・エスカレーション、為替変動考慮前）

【外貨・内貨合計】 (Unit: Million Rs.)

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total	初期投資のみTotal
(1)建設・調達費用													
Civil Works		0	0	1,665	6,659	6,473	1,998	946	0	0	0	17,740	17,740
Track		0	0	282	564	669	209	209	0	0	0	1,933	1,933
E&M		0	0	743	1,485	2,037	552	276	0	0	0	5,093	5,093
Rolling Stock		0	0	0	3,285	3,285	1,643	0	2,746	845	704	12,508	8,213
小計		0	0	2,689	11,993	12,464	4,401	1,431	2,746	845	704	37,273	32,979
(2)その他													0
Land acquisition, Utility relocation		1,112	1,894	1,112	0	0	0	0				4,118	4,118
Consulting service		0	0	134	600	623	220	72				1,649	1,649
Contingency		0	0	141	630	654	231	75	137	42	35	1,946	1,731
小計		1,112	1,894	1,388	1,229	1,278	451	147	137	42	35	7,713	7,499
(3)税金													0
Tax & Duty		200	341	708	2,267	2,356	832	270	494	152	127	7,747	6,974
合計		1,312	2,235	4,785	15,489	16,097	5,684	1,848	3,377	1,039	866	52,734	**47,452**

【外貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	0	0	0	0	0	0	0	0	0
Track		0	0	66	132	157	49	49	0	0	0	453
E&M		0	0	330	660	905	245	123	0	0	0	2,262
Rolling Stock		0	0	0	3,285	3,285	1,643	0	2,746	845	704	12,508
小計		0	0	396	4,077	4,347	1,937	172	2,746	845	704	15,223
(2)その他												
Land acquisition, Utility relocation		0	0	0	0	0	0	0	0	0	0	0
Consulting service		0	0	20	204	217	97	9				546
Contingency		0	0	21	214	228	102	9	137	42	35	788
小計		0	0	41	418	446	199	18	137	42	35	1,335
(3)税金												
Tax & Duty		0	0	75	771	822	366	32	494	152	127	2,838
合計		0	0	511	5,266	5,614	2,501	222	3,377	1,039	866	19,396

【内貨】

	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028	2033	Total
(1)建設・調達費用												
Civil Works		0	0	1,665	6,659	6,473	1,998	946	0	0	0	17,740
Track		0	0	216	432	512	160	160	0	0	0	1,480
E&M		0	0	413	826	1,132	307	153	0	0	0	2,831
Rolling Stock		0	0	0	0	0	0	0	0	0	0	0
小計				2,293	7,916	8,117	2,465	1,259	0	0	0	22,051
(2)その他												
Land acquisition, Utility relocation		1,112	1,894	1,112	0	0	0	0	0	0	0	4,118
Consulting service		0	0	115	396	406	123	63				1,103
Contingency		0	0	120	416	426	129	66	0	0	0	1,158
小計		1,112	1,894	1,347	811	832	253	129	0	0	0	6,379
(3)税金												
Tax & Duty		200	341	634	1,496	1,534	466	238	0	0	0	4,909
合計		1,312	2,235	4,274	10,224	10,483	3,183	1,627	0	0	0	33,338

全線高架案

52,734 Million Rs.

Appendix 28-3 （地上＋高架）案と全線高架案の比較

全線高架案での得失を地上と高架の案と比較する。

	検討項目	（地上＋高架）案	全線高架案
1	LRT の特性を生かす	LRT は地上走行できるので、利用者の負担を軽減できる。他の交通機関への乗り換えもしやすい。地上駅はコンパクトに建設できる。	利用者は、高い位置まで移動を要する。高架駅では LRT のコンパクトな特長が十分に生かせない。
2	地上駅数	5 駅（PMC 地区：3 駅、PCMC 地区：2 駅）	なし
3	高架駅	16 駅（PMC 地区：7 駅、PCMC 地区：3 駅、MIDC 地区：6 駅）	21 駅（PMC 地区：9 駅、PCMC 地区：5 駅、MIDC 地区：6 駅）
4	プラットホームまでのアクセス	地上部は道路面からのアクセスが容易である。	高架駅にコンコースを設けるなど大型化する。
5	運転速度	勾配から最高速度が制限される。	運転に支障ない。
6	非常時における乗客の避難	地上駅があるので、乗客の避難は容易である	全線高架であるため、乗客の避難に配慮を要する
7	道路交通への影響	地上走行部分では将来、踏切が必要となる。	立体交差となり、支障はない。
8	鉄道システム	地上走行時に道路信号との連携が必要である。	道路交通へは支障しない。
9	事業費	PPP 事業として、公共の負担する建設費を低減できる。 （鉄道システムは同じ） 合計 48,675Million Rs.	公共が負担する建設費が増える。 （鉄道システムは同じ） 合計 52,734 Million Rs.

APPENDIX-29: 将来需要が増加した場合の対応

1） 列車

需要予測は 2038 年まで見込んでおり、このときのピーク時片方向最大乗車人数は 15,102 人である。このときの運転間隔は 2.5 分で計画され、1 時間当りの輸送力は、1 編成あたりの乗車人数を 690 人として 16,560 人となり輸送能力に対する乗車人数の割合は 91.2%となる。
需要が更に大きくなった場合は、運転間隔をこれ以上小さくすることは、道路との併用区間で道路交通を妨げる恐れがあるため、編成長を延ばして対処するものとする。
開業時の編成は 30m+30m で全長 60m であるが、中間に 1 車体追加して 30m+40m で全長 70m の編成とする。

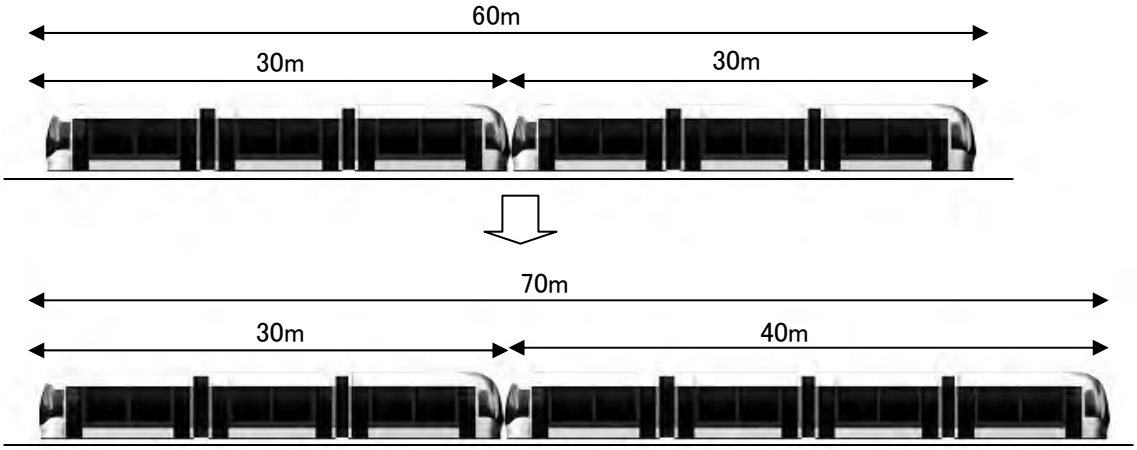


図 A29-1　60m 編成と 70m 編成

1 編成の容量は 805 人となり、運転間隔 2.5 分のとき、1 時間あたりの輸送能力は 19,320 人となる。同じ比率で需要が増加すると仮定すると 2038 年から更に 10 年後の 2048 年までの需要に対応が可能である。

2） 施設

駅は全て相対式プラットホームであり、編成延長時に軌道の変更の必要はないため、開業時は、駅のプラットホームは 60m の列車編成に対応したものとし、70m の列車が導入される時点で、駅のプラットホームを延長し 70m 対応とする。

基地については、のちに延長することは大きな工事になるため、最初から 70m の編成に対応できる長さで建設しておく。

FORM 1

(I) Basic Information

Name of the Project:

Location / site alternatives under consideration:

Size of the Project: *

Expected cost of the project:

Contact Information:

Screening Category:

- *Capacity corresponding to sectoral activity (such as production capacity for manufacturing, mining lease area and production capacity for mineral production, area for mineral exploration, length for linear transport infrastructure, generation capacity for power generation etc.,)*

(II) Activity

1. **Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)**

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)		
1.2	Clearance of existing land, vegetation and buildings?		
1.3	Creation of new land uses?		
1.4	Pre-construction investigations e.g. bore houses, soil testing?		
1.5	Construction works?		
1.6	Demolition works?		
1.7	Temporary sites used for construction works or housing of construction workers?		

1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations		
1.9	Underground works including mining or tunneling?		
1.10	Reclamation works?		
1.11	Dredging?		
1.12	Offshore structures?		
1.13	Production and manufacturing processes?		
1.14	Facilities for storage of goods or materials?		
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?		
1.16	Facilities for long term housing of operational workers?		
1.17	New road, rail or sea traffic during construction or operation?		
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?		
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?		
1.20	New or diverted transmission lines or pipelines?		
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?		
1.22	Stream crossings?		
1.23	Abstraction or transfers of water form ground or surface waters?		
1.24	Changes in water bodies or the land surface affecting drainage or run-off?		
1.25	Transport of personnel or materials for construction, operation or decommissioning?		
1.26	Long-term dismantling or decommissioning or restoration works?		
1.27	Ongoing activity during decommissioning which could have an impact on the environment?		

1.28	Influx of people to an area in either temporarily or permanently?		
1.29	Introduction of alien species?		
1.30	Loss of native species or genetic diversity?		
1.31	Any other actions?		

2. **Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):**

S.No.	**Information/checklist confirmation**	**Yes/No**	**Details thereof (with approximate quantities /rates, wherever possible) with source of information data**
2.1	Land especially undeveloped or agricultural land (ha)		
2.2	Water (expected source & competing users) unit: KLD		
2.3	Minerals (MT)		
2.4	Construction material – stone, aggregates, and / soil (expected source – MT)		
2.5	Forests and timber (source – MT)		
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)		
2.7	Any other natural resources (use appropriate standard units)		

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)		
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)		
3.3	Affect the welfare of people e.g. by changing living conditions?		
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,		
3.5	Any other causes		

4. Production of solid wastes during construction or operation or decommissioning (MT/month)

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes		
4.2	Municipal waste (domestic and or commercial wastes)		
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)		

4.4	Other industrial process wastes		
4.5	Surplus product		
4.6	Sewage sludge or other sludge from effluent treatment		
4.7	Construction or demolition wastes		
4.8	Redundant machinery or equipment		
4.9	Contaminated soils or other materials		
4.10	Agricultural wastes		
4.11	Other solid wastes		

5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)

S.No.	**Information/Checklist confirmation**	**Yes/No**	**Details thereof (with approximate quantities/rates, wherever possible) with source of information data**
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources		
5.2	Emissions from production processes		
5.3	Emissions from materials handling including storage or transport		
5.4	Emissions from construction activities including plant and equipment		
5.5	Dust or odours from handling of materials including construction materials, sewage and waste		
5.6	Emissions from incineration of waste		

5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)		
5.8	Emissions from any other sources		

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers		
6.2	From industrial or similar processes		
6.3	From construction or demolition		
6.4	From blasting or piling		
6.5	From construction or operational traffic		
6.6	From lighting or cooling systems		
6.7	From any other sources		

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials		
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)		
7.3	By deposition of pollutants emitted to air into the land or into water		
7.4	From any other sources		
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?		

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances		
8.2	From any other causes		
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?		

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting. lities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: • Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.) • housing development • extractive industries • supply industries • other		
9.2	Lead to after-use of the site, which could havean impact on the environment		
9.3	Set a precedent for later developments		
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects		

(III) Environmental Sensitivity

S.No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value		
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or		

	other water bodies, coastal zone, biospheres, mountains, forests		
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration		
4	Inland, coastal, marine or underground waters		
5	State, National boundaries		
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas		
7	Defence installations		
8	Densely populated or built-up area		
9	Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*		
10	Areas containing important, high quality or scarce resources *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*		
11	Areas already subjected to pollution or environmental damage. *(those where existing legal environmental standards are exceeded)*		
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (*earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions*)		

(IV). Proposed Terms of Reference for EIA studies

APPENDIX II

FORM-1 A (only for construction projects listed under item 8 of the Schedule)

CHECK LIST OF ENVIRONMENTAL IMPACTS

(Project proponents are required to provide full information and wherever necessary attach explanatory notes with the Form and submit along with proposed environmental management plan & monitoring programme)

1. LAND ENVIRONMENT

(Attach panoramic view of the project site and the vicinity)

1.1. Will the existing landuse get significantly altered from the project that is not consistent with the surroundings? (Proposed landuse must conform to the approved Master Plan / Development Plan of the area. Change of landuse if any and the statutory approval from the competent authority be submitted). Attach Maps of (i) site location, (ii) surrounding features of the proposed site (within 500 meters) and (iii)the site (indicating levels & contours) to appropriate scales. If not available attach only conceptual plans.

1.2. List out all the major project requirements in terms of the land area, built up area, water consumption, power requirement, connectivity, community facilities, parking needs etc.

1.3. What are the likely impacts of the proposed activity on the existing facilities adjacent to the proposed site? (Such as open spaces, community facilities, details of the existing landuse, disturbance to the local ecology).

1.4. Will there be any significant land disturbance resulting in erosion, subsidence & instability? (Details of soil type, slope analysis, vulnerability to subsidence, seismicity etc may be given).

1.5. Will the proposal involve alteration of natural drainage systems? (Give details on a contour map showing the natural drainage near the proposed project site)

1.6. What are the quantities of earthwork involved in the construction activity-cutting, filling, reclamation etc. (Give details of the quantities of earthwork involved, transport of fill materials from outside the site etc.)

1.7. Give details regarding water supply, waste handling etc during the construction period.

1.8. Will the low lying areas & wetlands get altered? (Provide details of how low lying and wetlands are getting modified from the proposed activity)

1.9. Whether construction debris & waste during construction cause health hazard? (Give quantities of various types of wastes generated during construction including the construction labour and the means of disposal)

2. WATER ENVIRONMENT

2.1. Give the total quantity of water requirement for the proposed project with the breakup of requirements for various uses. How will the water requirement met? State the sources & quantities and furnish a water balance statement.

2.2. What is the capacity (dependable flow or yield) of the proposed source of water?

2.3. What is the quality of water required, in case, the supply is not from a municipal source? (Provide physical, chemical, biological characteristics with class of water quality)

2.4. How much of the water requirement can be met from the recycling of treated wastewater? (Give the details of quantities, sources and usage)

2.5. Will there be diversion of water from other users? (Please assess the impacts of the project on other existing uses and quantities of consumption)

2.6. What is the incremental pollution load from wastewater generated from the proposed activity? (Give details of the quantities and composition of wastewater generated from the proposed activity)

2.7. Give details of the water requirements met from water harvesting? Furnish details of the facilities created.

2.8. What would be the impact of the land use changes occurring due to the proposed project on the runoff characteristics (quantitative as well as qualitative) of the area in the post construction phase on a long term basis? Would it aggravate the problems of flooding or water logging in any way?

2.9. What are the impacts of the proposal on the ground water? (Will there be tapping of ground water; give the details of ground water table, recharging capacity, and approvals obtained from competent authority, if any)

2.10. What precautions/measures are taken to prevent the run-off from construction activities polluting land & aquifers? (Give details of quantities and the measures taken to avoid the adverse impacts)

2.11. How is the storm water from within the site managed?(State the provisions made to avoid flooding of the area, details of the drainage facilities provided along with a site layout indication contour levels)

2.12. Will the deployment of construction labourers particularly in the peak period lead to unsanitary conditions around the project site (Justify with proper explanation)

2.13. What on-site facilities are provided for the collection, treatment & safe disposal of sewage? (Give details of the quantities of wastewater generation, treatment capacities with technology & facilities for recycling and disposal)

2.14. Give details of dual plumbing system if treated waste used is used for flushing of toilets or any other use.

3. VEGETATION

3.1. Is there any threat of the project to the biodiversity? (Give a description of the local ecosystem with it's unique features, if any)

3.2. Will the construction involve extensive clearing or modification of vegetation? (Provide a detailed account of the trees & vegetation affected by the project)

3.3. What are the measures proposed to be taken to minimize the likely impacts on important site features (Give details of proposal for tree plantation, landscaping, creation of water bodies etc along with a layout plan to an appropriate scale)

4. FAUNA

4.1. Is there likely to be any displacement of fauna- both terrestrial and aquatic or creation of barriers for their movement? Provide the details.

4.2. Any direct or indirect impacts on the avifauna of the area? Provide details.

4.3. Prescribe measures such as corridors, fish ladders etc to mitigate adverse impacts on fauna

5. AIR ENVIRONMENT

5.1. Will the project increase atmospheric concentration of gases & result in heat islands? (Give details of background air quality levels with predicted values based on dispersion models taking into account the increased traffic generation as a result of the proposed constructions)

5.2. What are the impacts on generation of dust, smoke, odorous fumes or other hazardous gases? Give details in relation to all the meteorological parameters.

5.3. Will the proposal create shortage of parking space for vehicles? Furnish details of the present level of transport infrastructure and measures proposed for improvement including the traffic management at the entry & exit to the project site.

5.4. Provide details of the movement patterns with internal roads, bicycle tracks, pedestrian pathways, footpaths etc., with areas under each category.

5.5. Will there be significant increase in traffic noise & vibrations? Give details of the sources and the measures proposed for mitigation of the above.

5.6. What will be the impact of DG sets & other equipment on noise levels & vibration in & ambient air quality around the project site? Provide details.

6. AESTHETICS

6.1. Will the proposed constructions in any way result in the obstruction of a view, scenic amenity or landscapes? Are these considerations taken into account by the proponents?

6.2. Will there be any adverse impacts from new constructions on the existing structures? What are the considerations taken into account?

6.3. Whether there are any local considerations of urban form & urban design influencing the design criteria? They may be explicitly spelt out.

6.4. Are there any anthropological or archaeological sites or artefacts nearby? State if any other significant features in the vicinity of the proposed site have been considered.

7. SOCIO-ECONOMIC ASPECTS

7.1. Will the proposal result in any changes to the demographic structure of local population? Provide the details.

7.2. Give details of the existing social infrastructure around the proposed project.

7.3. Will the project cause adverse effects on local communities, disturbance to sacred sites or other cultural values? What are the safeguards proposed?

8. BUILDING MATERIALS

8.1. May involve the use of building materials with high-embodied energy. Are the construction materials produced with energy efficient processes? (Give details of energy conservation measures in the selection of building materials and their energy efficiency)

8.2. Transport and handling of materials during construction may result in pollution, noise & public nuisance. What measures are taken to minimize the impacts?

8.3. Are recycled materials used in roads and structures? State the extent of savings achieved?

8.4. Give details of the methods of collection, segregation & disposal of the garbage generated during the operation phases of the project.

9. ENERGY CONSERVATION

9.1. Give details of the power requirements, source of supply, backup source etc. What is the energy consumption assumed per square foot of built-up area? How have you tried to minimize energy consumption?

9.2. What type of, and capacity of, power back-up to you plan to provide?

9.3. What are the characteristics of the glass you plan to use? Provide specifications of its characteristics related to both short wave and long wave radiation?

9.4. What passive solar architectural features are being used in the building? Illustrate the applications made in the proposed project.

9.5. Does the layout of streets & buildings maximise the potential for solar energy devices? Have you considered the use of street lighting, emergency lighting and solar hot water systems for use in the building complex? Substantiate with details.

9.6. Is shading effectively used to reduce cooling/heating loads? What principles have been used to maximize the shading of Walls on the East and the West and the Roof? How much energy saving has been effected?

9.7. Do the structures use energy-efficient space conditioning, lighting and mechanical systems? Provide technical details. Provide details of the transformers and motor efficiencies, lighting intensity and air-conditioning load assumptions? Are you using CFC and HCFC free chillers? Provide specifications.

9.8. What are the likely effects of the building activity in altering the micro-climates? Provide a self assessment on the likely impacts of the proposed construction on creation of heat island & inversion effects?

9.9. What are the thermal characteristics of the building envelope? (a) roof; (b) external walls; and (c) fenestration? Give details of the material used and the U-values or the R values of the individual components.

9.10. What precautions & safety measures are proposed against fire hazards? Furnish details of emergency plans.

9.11. If you are using glass as wall material provides details and specifications including emissivity and thermal characteristics.

9.12. What is the rate of air infiltration into the building? Provide details of how you are mitigating the effects of infiltration.

9.13. To what extent the non-conventional energy technologies are utilised in the overall energy consumption? Provide details of the renewable energy technologies used.

10. Environment Management Plan

The Environment Management Plan would consist of all mitigation measures for each item wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts as a result of the activities of the project. It would also delineate the environmental monitoring plan for compliance of various environmental regulations. It will state the steps to be taken in case of emergency such as accidents at the site including fire.

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Date: 22.02.2013

To
PURP
CASABLANCA
1ST Floor,
Sangam Press Road
Opp. Karisma Soc. Kuthrud,
Pune 411038.

Sub: Initiating Metro link in Pune Metropolis
Ref: Our meeting on 22.02.2013 at Kuthrud, Pune 411038.

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Dear Sir,

We had a meeting 22nd Feb, 2013 morning on the above subject in your office. This letter is I furtherance to that.

We were impressed by the keen-ness of your team on this development in PMC-PCMC-MIDC network. Though this was a preliminary meeting, you had given us adequate information to proceed further.

The starting point in any new project or activity is to look into the EIA Notification promulgated by Ministry of Environment and Forest (MoEF), New Delhi under Central Government, first time in 1994 and amended many times subsequently. It narrates the discipline of obtaining the Environmental Clearance (EC). The frame work steps are:

1. Screening
2. Scoping (getting ToR)
3. Writing draft EIA
4. Public Hearing/ Consultation
5. Writing Final EIA
6. Appraisal by EAC
7. Finally EC

The first step is screening. This aims at finding (1) whether our activity needs such EC and (2) if yes whether it comes under purview of EAC of MoEF in New Delhi (labeled as Category A) or is to be heard by State EAC (also appointed by MoEF, and called as Category B). We find that,

- The Metro Link or railways, as such is not covered anywhere in Column No.2 of the schedule.
- The activity of 'Highway' comes under 7 (f)

- The Aerial Ropeway comes in 7 (g)

- Building Construction comes in 8 (a) and
- Area development projects falls in 8 (b)
- The terrain concerned is not hilly (Above 1000 m MSL).

It therefore means that, by screening we come under Category B, which means to approach SEIAA/ SEAC in Mumbai. It is always better to obtain some EC so that our activity remains safe from the eyes of Public, NGO's & Environmentalists.
We therefore feel that, you should better approach SEAC under category 8 (a or b) so that, you do not attract any public hearing. What will be needed is the immediate preparation for fiiling Form 1 , 1 A and writing a conceptual Note / Prefeasibility Report. If we do this, the further step of fixing the TOR or scoping will be officially done by SEAC and we can voluntarily submit the scoping by ourselves also.
We are capable of doing this in short time as a starting point and thereafter the further steps like,

- Finding the environmental setting
- Study on Biodiversity
- Corporate Social responsibility
- Obtaining NOC's from Stake Holders, if any
- Judging the sensitive points from Environment, Heritage, Defense, Forest, Airport, High Tension Lines and similar angles.

We are very often going before SEAC and hence are acquainted with their system of analysis ad appraisal. Thus we can help you, hopefully, without trial and error. We shall be more comfortable to work with you rather than any other local authority.

This is only a preliminary letter and more involved work we follow as per your requirement.

Thanking You,
Regards
Mr. Kishor Sawant
Director
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Environmental Consultancy & Laboratory
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