

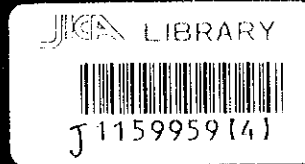
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA

THE DETAILED DESIGN
OF
FLOOD CONTROL, URBAN DRAINAGE AND
WATER RESOURCES DEVELOPMENT IN
SEMARANG IN THE REPUBLIC OF INDONESIA

FINAL REPORT

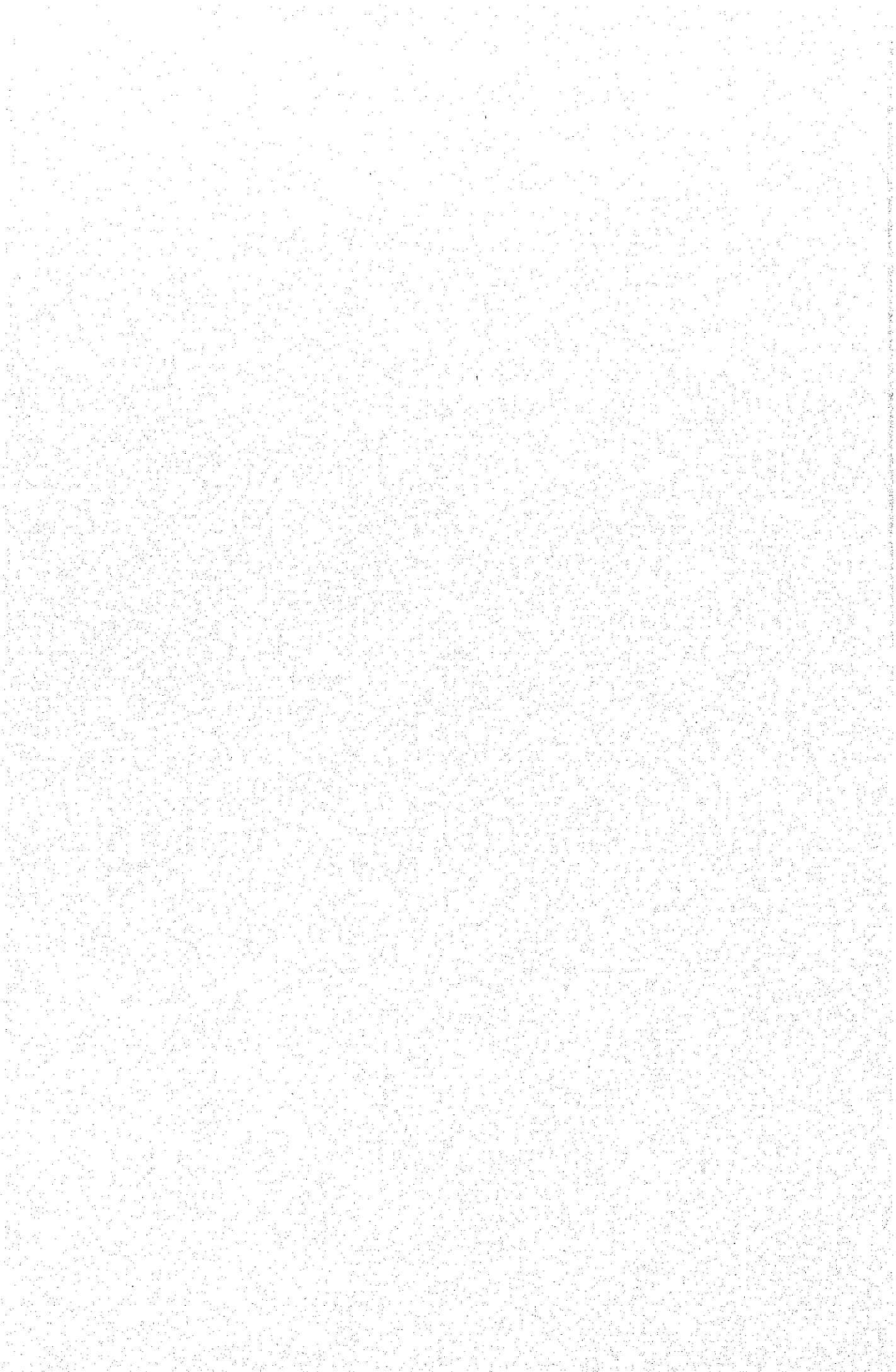
GOVERNMENT OF INDONESIA
MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
REPUBLIC OF INDONESIA
JICA



AUGUST 2000

CTI ENGINEERING INTERNATIONAL CO., LTD.
IN ASSOCIATION WITH
PACIFIC CONSULTANTS INTERNATIONAL
AND
PASCO INTERNATIONAL INC.

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MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA

**THE DETAILED DESIGN
OF
FLOOD CONTROL, URBAN DRAINAGE AND
WATER RESOURCES DEVELOPMENT IN
SEMARANG IN THE REPUBLIC OF INDONESIA**

FINAL REPORT

**COMPONENT A:
WEST FLOODWAY / GARANG RIVER IMPROVEMENT
VOLUME IV WORK QUANTITY CALCULATION**

AUGUST 2000

CTI ENGINEERING INTERNATIONAL CO., LTD.
IN ASSOCIATION WITH
PACIFIC CONSULTANTS INTERNATIONAL
AND
PASCO INTERNATIONAL INC.



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CONSTITUTION OF THE REPORT

1. SUMMARY
2. COMPONENT A : WEST FLOODWAY/GARANG RIVER IMPROVEMENT

VOLUME I	MAIN REPORT
VOLUME II	DESIGN CRITERIA
VOLUME III	DESIGN NOTES
VOLUME IV	WORK QUANTITY CALCULATION
VOLUME V	CONSTRUCTION PLANNING
VOLUME VI	COST ESTIMATE
VOLUME VII	DATA BOOK

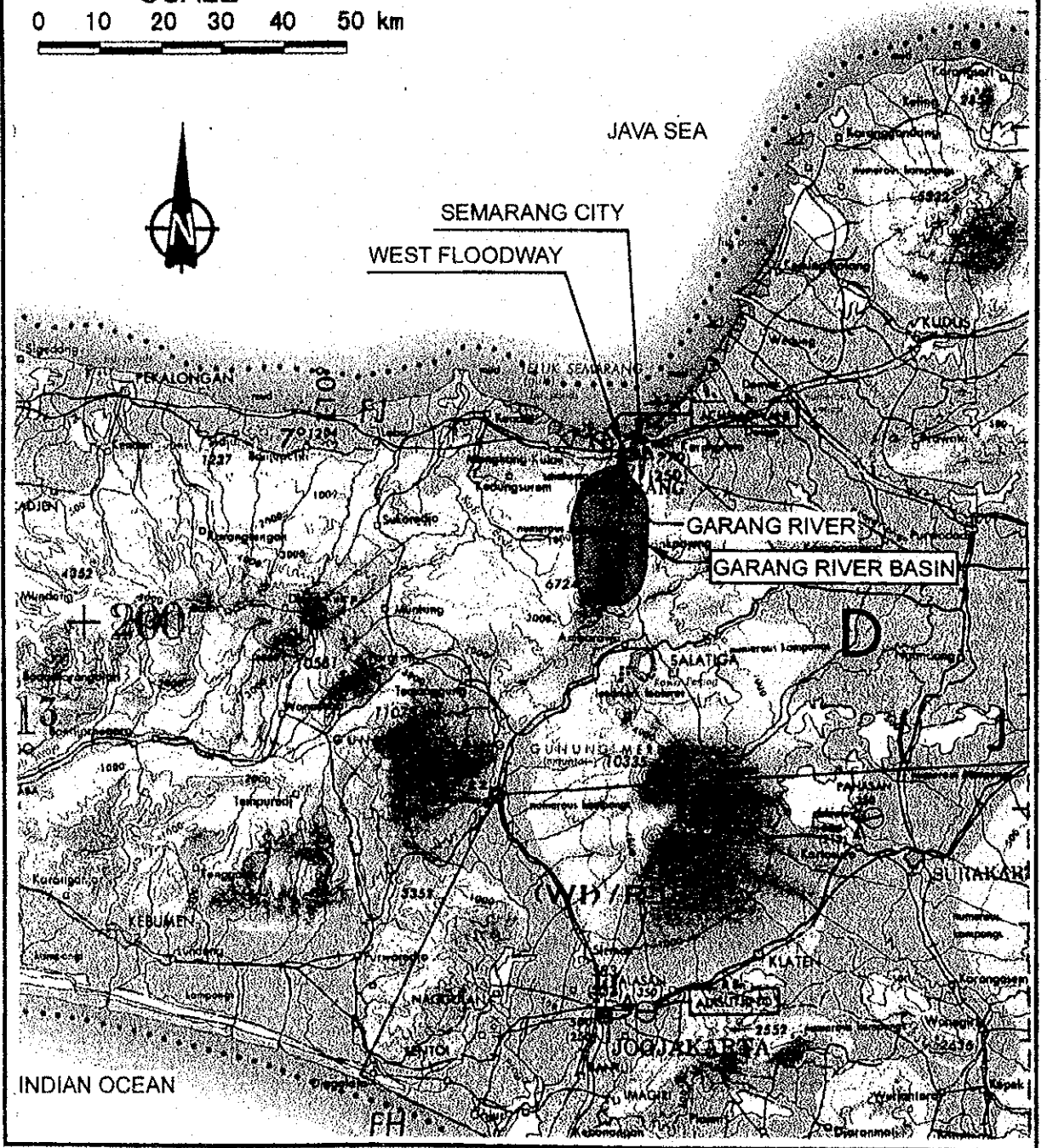
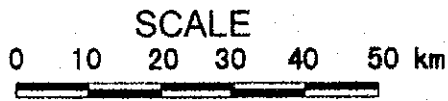
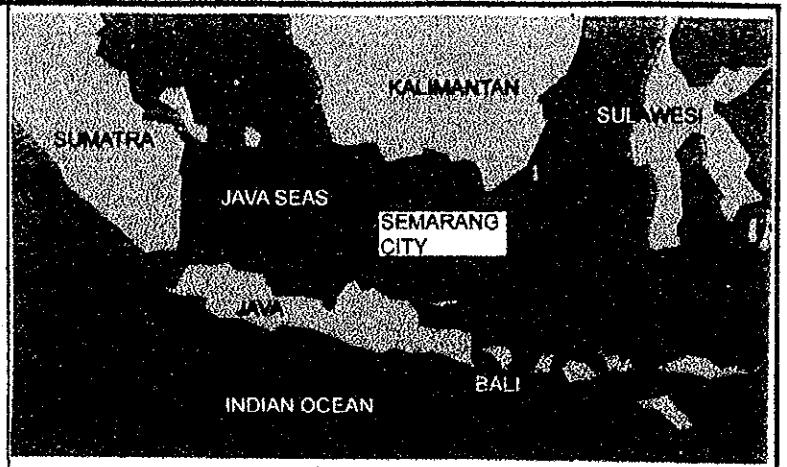
3. COMPONENT B : JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

VOLUME I	MAIN REPORT
VOLUME II	DESIGN CRITERIA
VOLUME III	DESIGN NOTES
VOLUME IV	WORK QUANTITY CALCULATION
VOLUME V	CONSTRUCTION PLANNING
VOLUME VI	COST ESTIMATE
VOLUME VII	DATA BOOK
VOLUME VIII	ANNEX

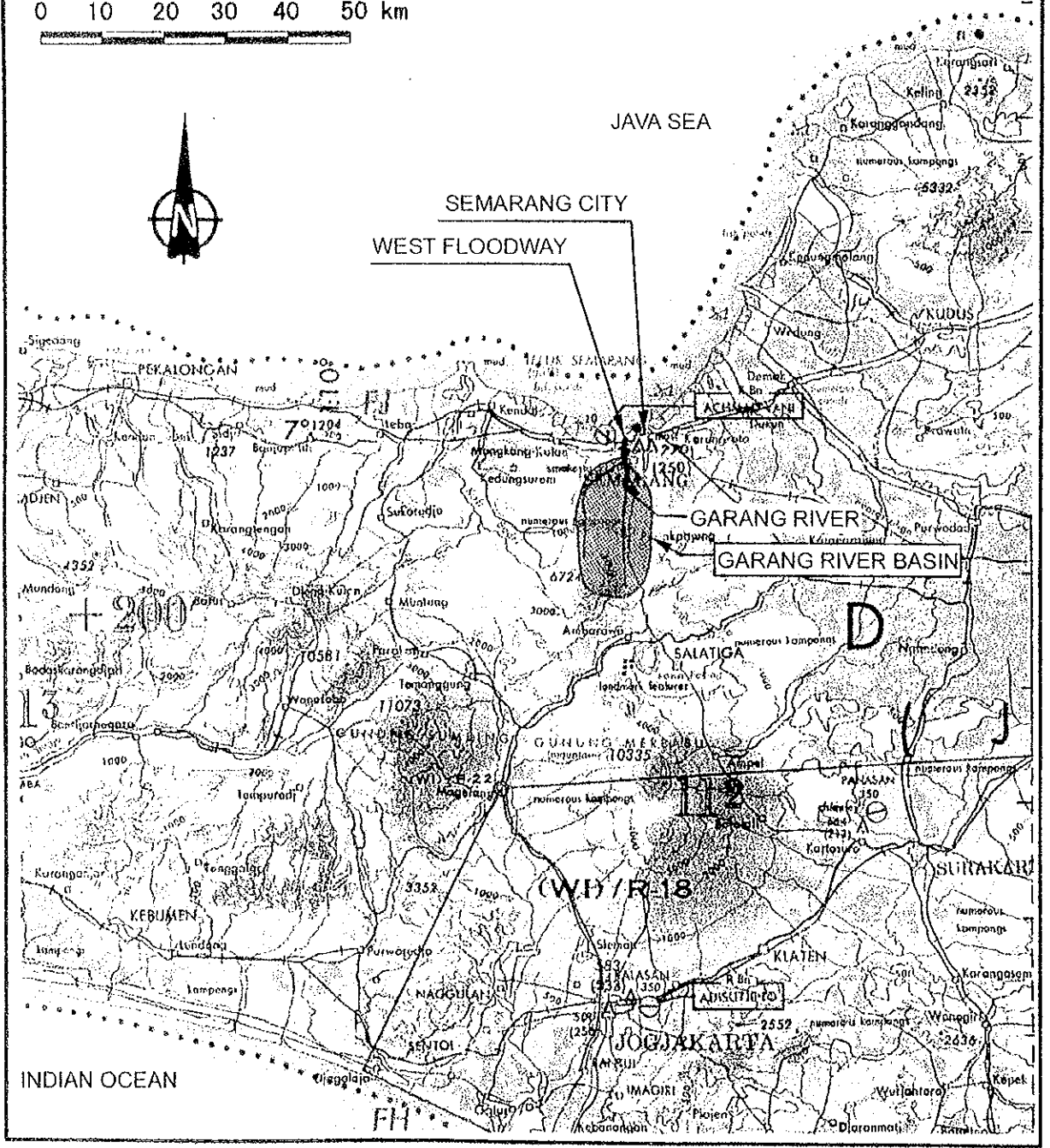
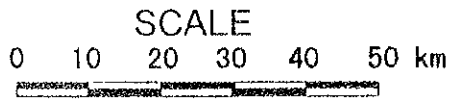
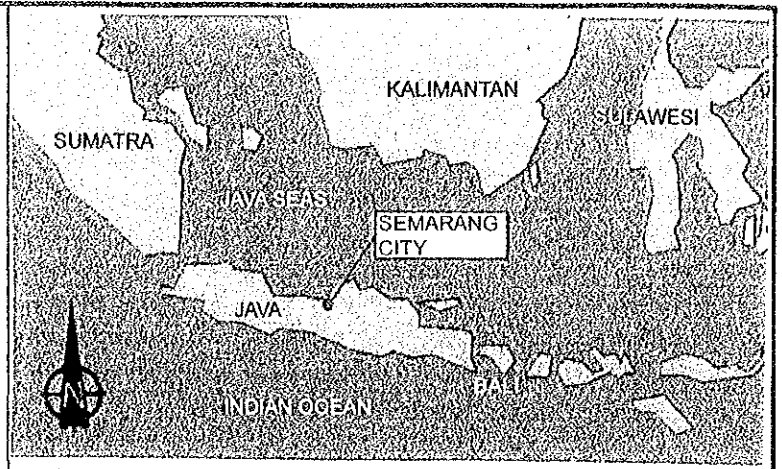
4. COMPONENT C : URBAN DRAINAGE SYSTEM IMPROVEMENT

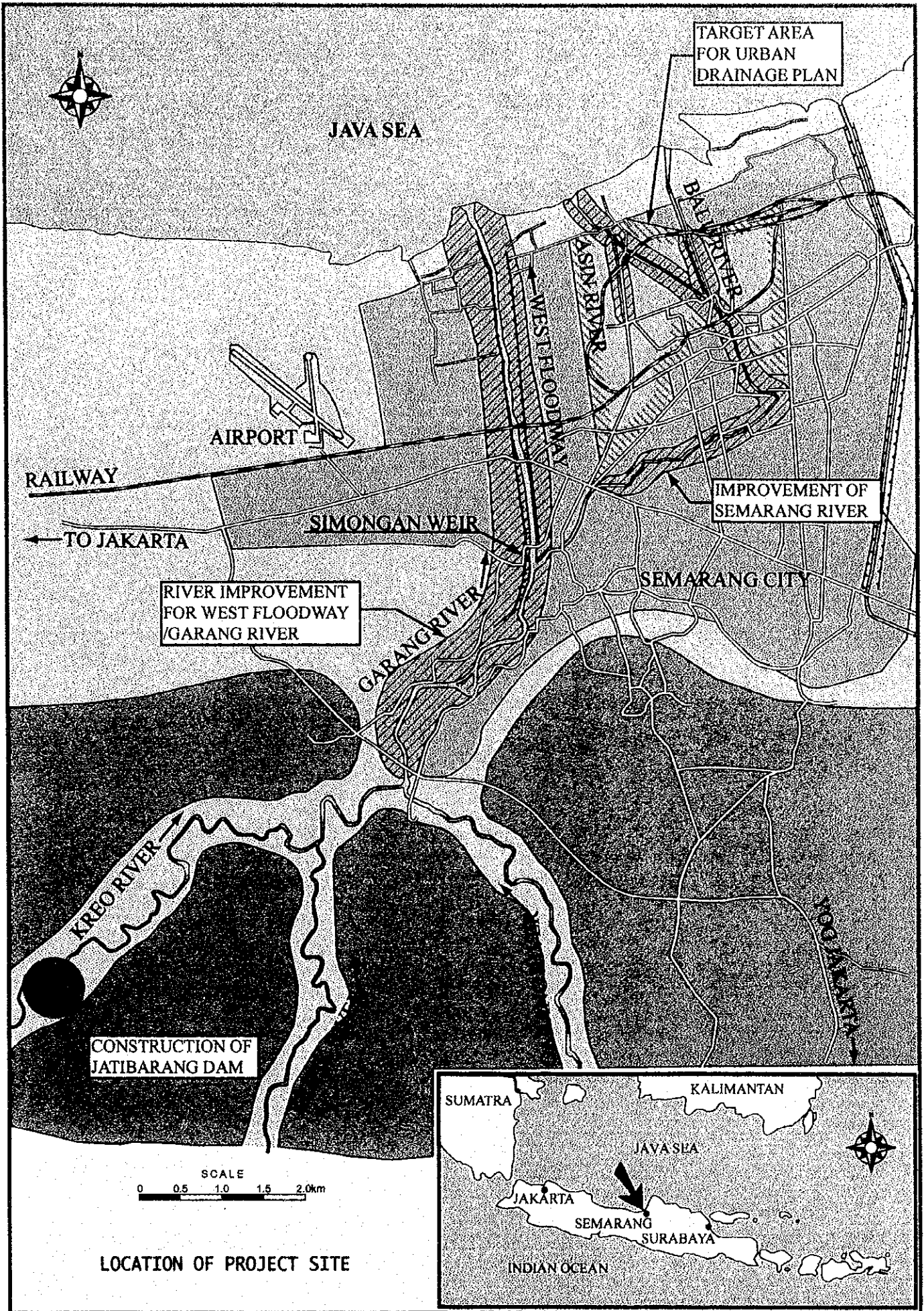
VOLUME I	MAIN REPORT
VOLUME II	DESIGN NOTES
VOLUME III	WORK QUANTITY CALCULATION
VOLUME IV	CONSTRUCTION PLANNING
VOLUME V	COST ESTIMATE
VOLUME VI	DATA BOOK

GENERAL MAP



GENERAL MAP





TARGET AREA FOR URBAN DRAINAGE PLAN

JAVA SEA

AIRPORT

RAILWAY

← TO JAKARTA

SIMONGAN WEIR

IMPROVEMENT OF SEMARANG RIVER

RIVER IMPROVEMENT FOR WEST FLOODWAY / GARANG RIVER

SEMARANG CITY

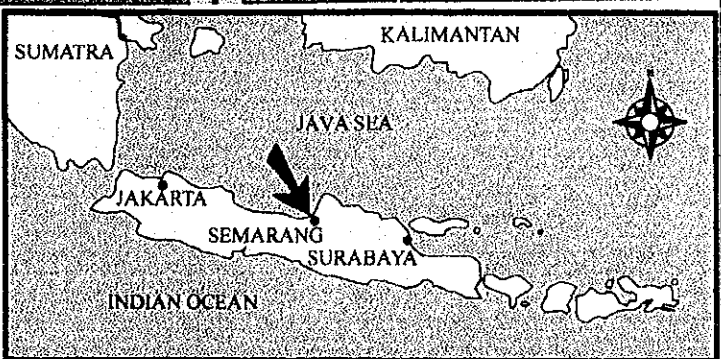
GARANG RIVER

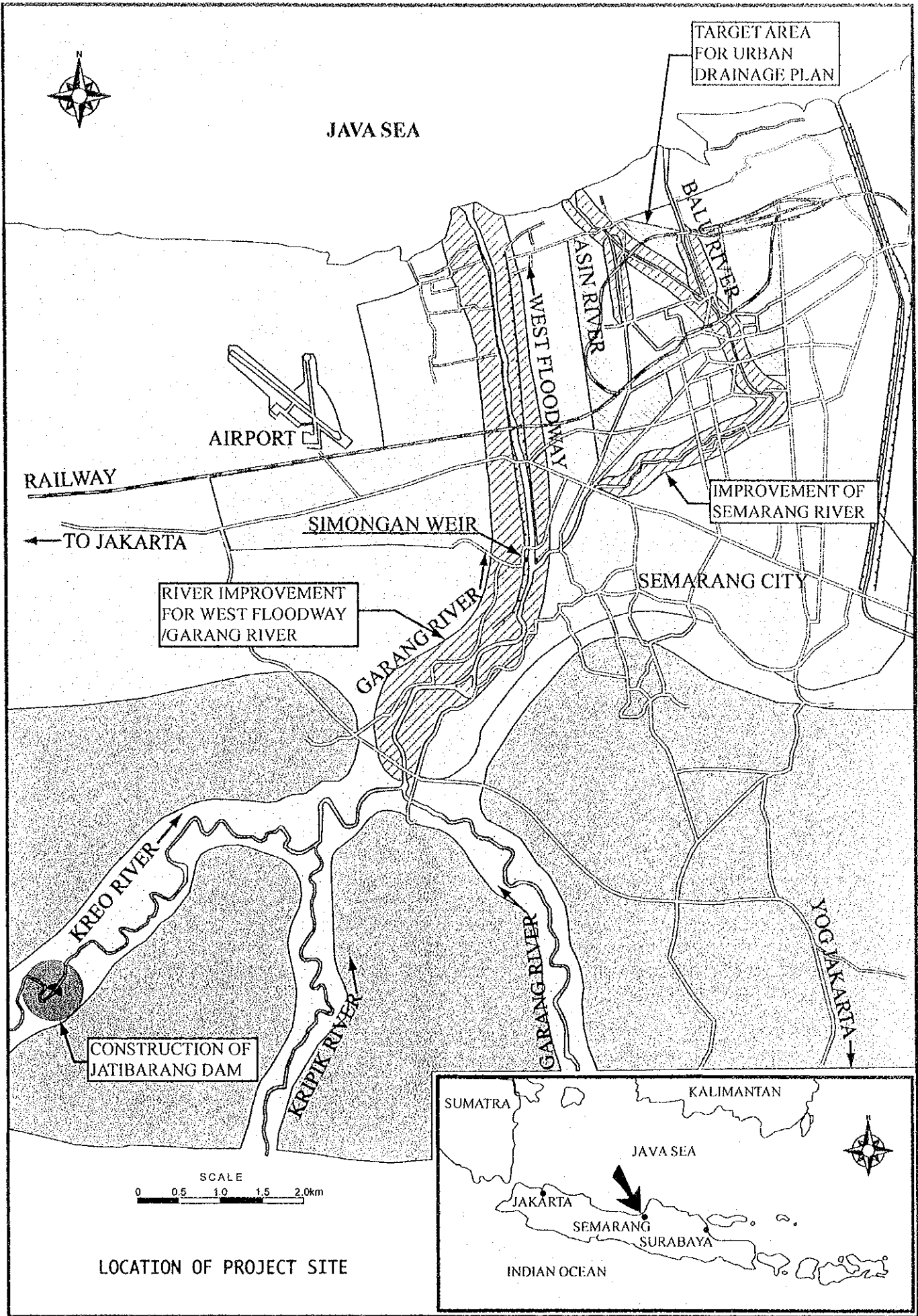
KREO RIVER

CONSTRUCTION OF JATIBARANG DAM

SCALE
0 0.5 1.0 1.5 2.0km

LOCATION OF PROJECT SITE





TARGET AREA FOR URBAN DRAINAGE PLAN

JAVA SEA

BALI RIVER
ASIN RIVER

WEST FLOODWAY

AIRPORT

IMPROVEMENT OF SEMARANG RIVER

RAILWAY

SIMONGAN WEIR

← TO JAKARTA

RIVER IMPROVEMENT FOR WEST FLOODWAY / GARANG RIVER

GARANG RIVER

SEMARANG CITY

KREO RIVER

CONSTRUCTION OF JATIBARANG DAM

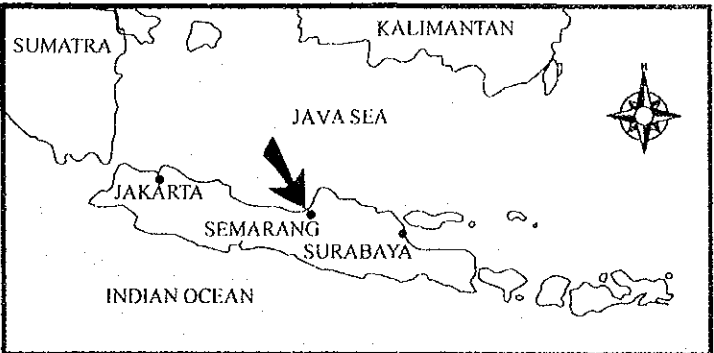
KRIPIH RIVER

GARANG RIVER

YOCCJAKARTA

SCALE
0 0.5 1.0 1.5 2.0km

LOCATION OF PROJECT SITE





VOLUME IV WORK QUANTITY CALCULATION

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Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
A	General			
A.1	Mobilization and Demobilization	L.S.	1	1.000
A.2	Establishment			
A.2.1	Temporary Construction Road and Bridge	L.S.	1	1.000
A.2.2	Contractor's Site Office and Facilities	L.S.	1	1.000
A.2.3	Engineer's Site Office and Facilities	L.S.	1	1.000
A.3	Drawings	L.S.	1	1.000
A.4	Surveying	L.S.	1	1.000
A.5	Geological Investigation			
A.5.1	Auger Boring	m	57	54.000
A.5.2	Rotary Boring	m	378	360.000
A.5.3	Exploratory Excavation	m ³	90	90.000
B	Channel and Dike Works			
B.1	Preparatory Works			
B.1.1	Coffering and Dewatering	L.S.	1	1.000
B.1.2	Clearing and Grubbing	m ²	133,800	121,614.600
B.1.3	Demolition of Existing Concrete Sheet Pile Wall Type Revetment	L.S.	1	1.000
B.1.4	Demolition of Existing Concrete/Masonry Structures in River Channel	m ³	210	200.000
B.2	Channel Excavation for West Floodway including Drainage By-pass Channel			
B.2.1	Excavation below Water Level (Low Water level shown on the cross sections)	m ³	651,700	592,449.300
B.2.2	Excavation above Water Level (Low Water level shown on the cross sections)	m ³	277,000	251,774.220
B.2.3	Soft Rock Excavation	m ³	700	598.300
B.3	Channel Excavation for Garang River			
B.3.1	Excavation below Water Level (Low Water level shown on the cross sections)	m ³	148,400	134,847.044
B.3.2	Excavation above Water Level (Low Water level shown on the cross sections)	m ³	284,000	258,168.200
B.3.3	Soft Rock Excavation	m ³	2,400	2,100.000
B.4	Earth Dike			
B.4.1	Stripping of Top Soil, 250mm thick	m ³	6,200	5,556.500
B.4.2	Embankment	m ³	15,300	13,857.200
B.4.3	Solid Sodding	m ²	10,700	9,671.700
B.4.4	Gravel Pavement, 200mm thick	m ²	697	663.100
B.5	Floodwall/Parapet Wall (Wet Stone Masonry Type)			
B.5.1	Structural Excavation	m ³	1,060	956.200
B.5.2	Backfill with Selected Soil	m ³	720	645.500
B.5.3	Gravel Bedding	m ³	40	35.113
B.5.4	Wet Stone Masonry	m ³	310	293.867
B.5.5	Joint Filler, 10mm thick (Elastic Material)	m ²	30	28.288
B.5.6	Water Stop, 200mm wide	m	41	39.000
B.5.7	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	383	364.632
B.6	Filling on Riverbed, River Bank and Flood Plain			
B.6.1	Stripping of Top Soil, 250mm thick	m ³	15,500	14,030.500
B.6.2	Earth Fill	m ³	46,400	42,091.300
B.7	Miscellaneous Work			
B.7.1	Maintenance Marker Post, 500m interval on Right and Left River	nos.	36	36.000
C.	Raising the Existing Floodwall			
C.1	Preparatory Works			

Summary of Package - I				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
C.1.1	Coffering and Dewatering	L.S.	1	1.000
C.1.2	Clearing and Grubbing	m ²	22,200	20,133.600
C.1.3	Demolition of Existing Buttress Wall (Wet Stone Masonry)	m ³	172	163.800
C.2	Raising Works			
C.2.1	Structural Excavation	m ³	6,670	6,059.800
C.2.2	Stripping of Top Soil, 250mm thick	m ³	5,600	5,033.400
C.2.3	Embankment at the River Side Front of Floodwall	m ³	15,500	14,084.800
C.2.4	Solid Sodding	m ²	44,000	39,992.300
C.2.5	Backfill with Selected Soil	m ³	1,700	1,532.200
C.2.6	Gravel Bedding	m ³	400	345.630
C.2.7	Chipping on Existing Floodwall Surface	m ²	16,789	15,989.311
C.2.8	Concrete, Type C1 including Formwork	m ³	5,056	4,814.536
C.2.9	Deformed Reinforcing Bars for C.2.8	kg	221,410	208,872.000
C.2.10	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m	m	5,373	5,216.000
C.2.11	Drilling, Anchoring Steel Bars in Existing Floodwall and Filling the Hole with Non-shrinkage Mortar	nos.	44,163	42,060.000
C.2.12	Joint Filler, 10mm thick (Elastic Material)	m ²	530	500.084
C.2.13	Water Stop, 200mm wide	m	1,363	1,297.600
C.2.14	Cement Mortar Plastering on Roadside Surface of Floodwall	m ²	5,171	4,923.812
D.	Protection Works for Riverbank and Riverbed			
D.1	Preparatory Works			
D.1.1	Coffering and Dewatering	L.S.	1	1.000
D.1.2	Clearing and Grubbing	m ²	23,100	21,000.000
D.1.3	Demolition of Existing Wet Masonry Wall	m ³	420	400.000
D.2	Revetment for Side Slope of 1:2 and 1:1.5 (Wet Stone Masonry)			
D.2.1	Structural Excavation	m ³	34,220	31,100.745
D.2.2	Backfill with Selected Soil	m ³	5,740	5,214.914
D.2.3	Gravel Bedding	m ³	9,500	8,628.422
D.2.4	Wet Stone Masonry	m ³	9,080	8,647.579
D.2.5	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	28,386	27,034.101
D.2.6	Concrete, Type C1 including Formwork	m ³	1,928	1,835.255
D.2.7	Deformed Reinforcing Bars for Item D.2.6	kg	97,720	92,180.000
D.2.8	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m, 3.0m	m	2,450	2,378.500
D.2.9	Joint Filler, 10mm thick (Elastic Material)	m ²	1,871	1,781.688
D.2.10	Weep Hole, Dia.50mm including Filter Cloth	nos.	3,010	2,866.000
D.2.11	Gabion Cylinder Dia.500mm (Galvanized and Coated with PVC)	m ³	1,645	1,566.229
D.2.12	Soil Filling	m ³	480	428.099
D.2.13	Gabion Mattress t=500mm (Galvanized)	m ³	4,914	4,679.294
D.2.14	Rubble Stone Filling	m ³	917	833.001
D.3	Revetment for Side Slope of 1:2 (Stone Facing Type)			
D.3.1	Structural Excavation	m ³	5,110	4,638.000
D.3.2	Rubble Stone Bedding	m ³	2,373	2,157.047
D.3.3	Stone Facing (Dia.250 to 400mm)	m ³	5,005	4,549.320
D.4	PC (Prestressed Concrete) Sheet Pile Wall Type Revetment			
D.4.1	Structural Excavation	m ³	440	396.000
D.4.2	Backfill with Selected Soil	m ³	6,660	6,051.200
D.4.3	Gravel Bedding	m ³	29	26.318
D.4.4	Furnishing and Driving PC Sheet Pile (K-500, t=220mm,	m	15,050	14,332.500

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
D.4.5	Fixing Steel Tie Rod, Steel Cannel and Steel Plate to PC Sheet Pile	kg	13,580	12,930.000
D.4.6	Concrete, Type C1 including Formwork	m ³	325	308.945
D.4.7	Deformed Reinforcing Bars for D.4.6	kg	10,650	10,040.000
D.4.8	Joint Filler, 10mm thick (Elastic Material)	m ²	29	27.477
D.4.9	Gabion Mattress (Galvanized) t=300mm with Soil Covering	m ³	434	413.183
D.4.10	Riprap Mound (Dia.250 to 400mm)	m ³	6,641	6,036.770
D.5	Leaning Wall (Concrete Type)			
D.5.1	Structural Excavation	m ³	6,340	5,758.756
D.5.2	Backfill with Selected Soil	m ³	1,430	1,295.692
D.5.3	Backfill with Gravel	m ³	1,530	1,389.266
D.5.4	Rubble Stone Bedding	m ³	260	235.188
D.5.5	Concrete, Type D including Formwork	m ³	3,847	3,663.294
D.5.6	Deformed Reinforcing Bars for Item D.5.5	kg	3,000	2,828.000
D.5.7	Joint Filler, 10mm thick (Elastic Material)	m ²	272	258.920
D.5.8	Weep Hole, Dia.50mm including Filter Cloth	nos.	491	467.000
D.5.9	Steel Fence (with Anti-corrosion Painting), H=1,100mm	m	630	596.129
D.6	Leaning Wall (Wet Stone Masonry Type)			
D.6.1	Structural Excavation	m ³	11,960	10,867.400
D.6.2	Backfill with Selected Soil	m ³	3,140	2,847.600
D.6.3	Backfill with Gravel	m ³	2,746	2,495.515
D.6.4	Rubble Stone Bedding	m ³	347	314.631
D.6.5	Wet Stone Masonry	m ³	4,520	4,301.342
D.6.6	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	5,152	4,905.924
D.6.7	Covering Concrete, Type D	m ³	91	85.889
D.6.8	Joint Filler, 10mm thick (Elastic Material)	m ²	423	402.126
D.6.9	Weep Hole, Dia.50mm including Filter Cloth	nos.	1,803	1,717.000
D.6.10	Steel Fence (with Anti-corrosion Painting), H=1,100mm	m	1,240	1,175.969
D.7	Earth Retaining Wall (Wet Stone Masonry Type)			
D.7.1	Structural Excavation	m ³	200	176.450
D.7.2	Backfill with Selected Soil	m ³	92	82.775
D.7.3	Gravel Bedding	m ³	28	24.800
D.7.4	Wet Stone Masonry	m ³	320	299.750
D.7.5	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	388	369.000
D.7.6	Joint Filler, 10mm thick (Elastic Material)	m ²	29	27.000
D.8	Pile Type Groin			
D.8.1	Structural Excavation	m ³	10	5.000
D.8.2	Reinforced Concrete Pile, Concrete Type A3, Section 200x200	m	1,603	1,526.000
D.8.3	Test Piling for D.8.2	m	63	60.600
D.8.4	Driving RC Pile	m	682	661.200
D.8.5	Cutting Pile Head	m ³	16	14.480
D.8.6	Concrete Type C1 for Beam including Formwork	m ³	34	32.335
D.8.7	Deformed Reinforcing Bars for Beam	kg	4,130	3,888.000
D.8.8	Stone Facing (Dia.250 to 400mm)	m ³	479	435.200
D.9	Riverbed Protection around Bridge Piers			
D.9.1	Structural Excavation	m ³	830	754.475
D.9.2	Backfill with Selected Soil	m ³	180	156.135
D.9.3	Rubble Stone Filling	m ³	91	82.725
D.9.4	Placing Filter Cloth (Geotextile sheet)	m ²	261	247.750

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
D.9.5	Gabion Mattress (Galvanized) t=500mm	m ³	471	447.750
D.9.6	Placing Palm Fiber Filter under Gabion Mattress	m ²	648	616.500
D.9.7	Riprap Mound (Dia.250 to 400)	m ³	430	390.120
D.9.8	Gravel Bedding	m ³	28	24.750
D.9.9	Precast Concrete Block (2.0t/piece), Concrete Type-D	nos.	116	110.000
D.10	Sodding			
D.10.1	Solid Sodding	m ²	70,350	63,949.500
E.	Ground Sills			
E.1	Preparatory Works			
E.1.1	Coffering and Dewatering	L.S.	1	1.000
E.1.2	Clearing and Grubbing	m ²	1,590	1,440.000
E.2	Ground Sill with Head at WF124			
E.2.1	Structural Excavation	m ³	380	339.410
E.2.2	Backfill with Selected Soil	m ³	630	569.120
E.2.3	Replacement of Base Soil under the Ground Sill by Selected Material	m ³	620	557.830
E.2.4	Furnishing and Driving Concrete PC Pile (K-500, t=220mm, w=500mm)	m	833	808.000
E.2.5	Leveling Concrete, Type E including Formwork	m ³	52	48.727
E.2.6	Concrete for Main Body, Type D including Formwork	m ³	580	551.699
E.2.7	Concrete for Side Wall, Type C1 including Formwork	m ³	67	62.949
E.2.8	Deformed Reinforcing Bars for Side Wall	kg	4,370	4,114.000
E.2.9	Water Stop, 200mm wide	m	14	13.064
E.2.10	Joint Filler, 10mm thick (Elastic Material)	m ²	161	152.471
E.2.11	Wet Stone Masonry for Revetment	m ³	350	332.083
E.2.12	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	1,216	1,157.499
E.2.13	Concrete, Type C1 for Revetment including Formwork	m ³	69	65.591
E.2.14	Deformed Reinforcing Bars for Revetment	kg	3,840	3,618.000
E.2.15	Gabion Mattress t=500mm (Galvanized) on Riverbed	m ³	693	659.500
E.2.16	Placing Palm Fiber Filter under Gabion Mattress	m ²	1,196	1,139.000
E.2.17	Gabion Cylinder Dia. 500mm (Galvanized and coated with PVC) on Side Slope	m ³	72	68.344
E.2.18	Soil Filling	m ³	30	18.674
E.2.19	Gravel Bedding	m ³	392	356.072
E.2.20	Rubble Stone Bedding	m ³	55	49.750
E.3	Ground Sill without Head at WF173			
E.3.1	Structural Excavation	m ³	1,240	1,121.100
E.3.2	Soft Rock Excavation	m ³	660	600.000
E.3.3	Backfill with Selected Soil	m ³	540	484.400
E.3.4	Gravel Bedding for Main Body and Side Wall	m ³	33	29.565
E.3.5	Wet Stone Masonry for Main Body and Side Wall	m ³	240	227.800
E.3.6	Gravel Bedding for Revetment	m ³	153	138.824
E.3.7	Wet Stone Masonry for Revetment	m ³	140	130.786
E.3.8	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	521	496.021
E.3.9	Concrete Type C1 including Formwork for Revetment	m ³	21	19.064
E.3.10	Deformed Reinforcing Bars for Revetment	kg	1,090	1,025.000
E.3.11	Joint Filler, 10mm thick (Elastic Material)	m ²	47	44.098
E.3.12	Gabion Mattress t=500mm (Galvanized) on Riverbed	m ³	693	660.000

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
E.3.13	Placing Palm Fiber Filter under Gabion Mattress	m ²	1,239	1,179.760
E.3.14	Gabion Cylinder Dia. 500mm (Galvanized and Coated with PVC) on Side Slope	m ³	59	55.729
E.3.15	Soil Filling	m ³	20	15.227
E.3.16	Rubble Stone Bedding	m ³	20	9.750
F.	Drainage Sluiceway at WF172R+15m			
F.1	Preparatory Works			
F.1.1	Coffering and Dewatering	L.S.	1	1.000
F.1.2	Clearing and Grubbing	m ²	560	504.000
F.1.3	Demolition and Removal of Existing Concrete and Masonry Structures	m ³	170	153.000
F.2	Main Structures and Steel Slide Gate			
F.2.1	Structural Excavation	m ³	970	875.820
F.2.2	Backfill with Selected Soil	m ³	340	304.830
F.2.3	Embankment for Dike	m ³	150	130.860
F.2.4	Solid Sodding	m ²	30	22.175
F.2.5	Furnishing and Driving PC Sheet Pile (K-500, t=220mm,	m	68	66.000
F.2.6	Leveling Concrete, Type E including Formwork	m ³	9	7.620
F.2.7	Concrete for Structure, Type C1 including Formwork	m ³	83	78.662
F.2.8	Concrete for Blockout, Type C2 including Formwork	m ³	2	1.157
F.2.9	Deformed Reinforcing Bars for Item F.2.7	kg	5,650	5,321.000
F.2.10	Water Stop, 200 mm wide	m	16	15.100
F.2.11	Joint Filler, 10mm thick (Elastic Material)	m ²	10	9.052
F.2.12	Furnishing and Installing Slide Gate, H=1.6m x W=1.6m	L.S.	1	1.000
F.2.13	Furnishing and Installing Hoist	L.S.	1	1.000
F.2.14	Furnishing and Installing Anchor Bars and Metal Guide Frames	kg	40	32.000
F.2.15	Furnishing and Installing Hand Rail and Ladder (with Anti-corrosion Painting)	kg	190	176.000
F.3	Riverside Open Channel and Revetment			
F.3.1	Structural Excavation	m ³	320	285.200
F.3.2	Backfill with Selected Soil	m ³	40	35.900
F.3.3	Filling Existing Open Channel	m ³	30	23.000
F.3.4	Gravel Bedding	m ³	81	73.388
F.3.5	Wet Stone Masonry	m ³	90	76.576
F.3.6	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	217	205.809
F.3.7	Concrete, Type C1 including Formwork	m ³	24	22.433
F.3.8	Deformed Reinforcing Bars for F.3.7	kg	1,040	972.000
F.3.9	Concrete Type D including Formwork	m ³	3	2.430
F.3.10	Joint Filler, 10mm thick (Elastic Material)	m ²	19	17.199
F.3.11	Gabion Cylinder Dia. 500mm (Galvanized and Coated with PVC)	m ³	66	62.355
F.3.12	Soil Filling	m ³	20	17.033
F.3.13	Gabion Mattress t=500mm (Galvanized)	m ³	29	27.000
F.3.14	Rubble Stone Filling	m ³	9	7.800
F.4	Connecting Channel and Drainage Pipe			
F.4.1	Structural Excavation	m ³	630	564.600
F.4.2	Backfill with Selected Soil	m ³	390	354.500
F.4.3	Gravel Bedding	m ³	16	14.407
F.4.4	Wet Stone Masonry	m ³	100	88.560

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
F.4.5	Mortar Plastering on Surface of Wet Stone Masonry	m ²	208	197.580
F.4.6	Furnishing and Installing RC Pipe, Dia.600mm	m	16	15.000
F.4.7	Concrete, Type D including Formwork	m ³	17	15.672
F.4.8	Concrete, Type C1 including Formwork	m ³	13	12.321
F.4.9	Deformed Reinforcing Bars for Item F.4.7 and F.4.8	kg	1,440	1,353.000
F.5	Reinforcement of Existing Dike			
F.5.1	Structural Excavation	m ³	130	114.400
F.5.2	Embankment for Dike	m ³	120	105.000
F.5.3	Solid Sodding	m ²	40	36.060
F.5.4	Gravel Bedding	m ³	3	2.400
F.5.5	Wet Stone Masonry	m ³	30	25.200
F.5.6	Cement Mortar Pointing on Surface of Wet Stone Masonry	m ²	32	30.000
F.5.7	Backfill with Selected Soil	m ³	80	69.300
G.	Drainage Outlet Works			
G.1	Preparatory Works			
G.1.1	Coffering and Dewatering	L.S.	1	1.000
G.1.2	Clearing and Grubbing	m ²	580	520.000
G.1.3	Demolition of Existing Structure (Concrete and Wet Masonry)	m ³	20	19.000
G.2	Outlet Structures			
G.2.1	Structural Excavation	m ³	1,570	1,425.355
G.2.2	Backfill with Selected Soil	m ³	460	415.699
G.2.3	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m	m	25	24.000
G.2.4	Gravel Bedding	m ³	39	34.637
G.2.5	Chipping on Existing Structure	m ²	30	27.780
G.2.6	Concrete, Type E including Formwork	m ³	4	3.661
G.2.7	Concrete, Type-C1 including Formwork	m ³	49	46.528
G.2.8	Concrete, Type-C2 including Formwork	m ³	2	1.349
G.2.9	Concrete, Type-D including Formwork	m ³	3	2.187
G.2.10	RC Concrete Pipe, Dia.600mm	m	5	4.550
G.2.11	Deformed Reinforcing Bars for G.2.7	kg	1,940	1,828.000
G.2.12	Wet Stone Masonry	m ³	380	361.373
G.2.13	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	176	166.999
G.2.14	Joint Filler, 10mm thick (Elastic Material)	m ²	24	22.358
G.2.15	Drilling, Anchoring Steel Bars in Existing Floodwall and Filling the Hole with Non-shrinkage Mortar	nos.	113	107.000
G.2.16	Plastering on Surface of Wet Masonry	m ²	26	23.960
G.2.17	Gabion Mattress t=500mm (Galvanized)	m ³	24	22.500
G.2.18	Gabion Cylinder Dia. 500mm (Galvanized and Coated with PVC)	m ³	70	66.464
G.2.19	Rubble Stone Filling	m ³	5	4.500
G.2.20	Soil Filling	m ³	30	18.514
G.3	Gate Works			
G.3.1	Furnishing and Installing Steel Flap Gate (H=0.7m x W=1.1m)	nos.	1	1.000
G.3.2	Furnishing and Installing Steel Flap Gate (H=0.8m x W=1.4m)	nos.	1	1.000
G.3.3	Furnishing and Installing Steel Flap Gate (H=1.0m x W=1.0m)	nos.	1	1.000
G.3.4	Furnishing and Installing Steel Flap Gate (H=1.0m x W=1.0m)	nos.	1	1.000
G.3.5	Furnishing and Installing Steel Flap Gate (H=0.9m x W=1.1m)	nos.	1	1.000
G.3.6	Furnishing and Installing Steel Flap Gate (H=2.2m x W=1.6m)	nos.	1	1.000
G.3.7	Furnishing Stop Log (H=2.6m x W=1.2m)	nos.	1	1.000
H.	River Amenity and Maintenance Facilities			

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
H.1	Preparatory Works			
H.1.1	Coffering and Dewatering	L.S.	1	1.000
H.1.2	Clearing and Grubbing	m ²	610	550.000
H.2	Approach Steps, Type-W.A (18 places)			
H.2.1	Structural Excavation	m ³	230	207.429
H.2.2	Backfill with Selected Soil	m ³	90	75.015
H.2.3	Wet Stone Masonry	m ³	90	80.223
H.2.4	Gravel Bedding	m ³	51	46.191
H.2.5	Cement Mortar Plastering	m ²	131	124.553
H.2.6	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	89	83.941
H.2.7	Joint Filler, 10mm thick (Elastic Material)	m ²	152	144.053
H.2.8	Drilling, Anchoring Steel Bars in Existing Floodwall and Filling the Hole with Non-shrinkage Mortar	nos.	278	264.000
H.2.9	Concrete Type D including Formwork	m ³	19	18.060
H.2.10	Concrete Type C1 including Formwork	m ³	31	29.379
H.2.11	Deformed Reinforcing Bar for Item H.2.10	kg	2,020	1,897.000
H.3	Approach Steps, Type-W.B (6 places)			
H.3.1	Structural Excavation	m ³	150	132.198
H.3.2	Backfill with Selected Soil	m ³	20	15.048
H.3.3	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m	m	38	36.000
H.3.4	Gravel Bedding	m ³	26	22.818
H.3.5	Rubble Stone Filling	m ³	19	16.416
H.3.6	Concrete, Type C1 including Formwork	m ³	19	17.562
H.3.7	Concrete, Type D including Formwork	m ³	16	14.898
H.3.8	Deformed Reinforcing Bars for Item H.3.6 and H.3.7	kg	1,230	1,152.000
H.3.9	Gabion Cylinder Dia. 500mm (Galvanized and PVC Coated)	m ³	38	35.766
H.3.10	Joint Filler, 10mm thick (Elastic Material)	m ²	21	19.068
H.3.11	Soil Filling	m ³	20	9.774
H.4	Approach Steps, Type-G.A (7 places)			
H.4.1	Structural Excavation	m ³	150	133.155
H.4.2	Backfill with Selected Soil	m ³	40	28.584
H.4.3	Gravel Bedding	m ³	34	30.793
H.4.4	Concrete, Type C1 including Formwork	m ³	37	34.311
H.4.5	Concrete, Type D including Formwork	m ³	18	16.728
H.4.6	Deformed Reinforcing Bars for Item H.4.4 and H.4.5	kg	1,430	1,343.000
H.4.7	Gabion Cylinder Dia. 500mm (Galvanized and Coated with PVC)	m ³	42	39.513
H.4.8	Joint Filler, 10mm thick (Elastic Material)	m ²	71	67.495
H.4.9	Soil Filling	m ³	20	10.887
H.5	Approach Steps, Type-G.B (9 places)			
H.5.1	Structural Excavation	m ³	400	358.522
H.5.2	Backfill with Selected Soil	m ³	60	48.234
H.5.3	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m	m	13	12.000
H.5.4	Gravel Bedding	m ³	213	193.210
H.5.5	Concrete, Type C1 including Formwork	m ³	40	37.329
H.5.6	Concrete, Type D including Formwork	m ³	78	73.847
H.5.7	Deformed Reinforcing Bars for Item H.5.5 and H.5.6	kg	4,550	4,289.000
H.5.8	Gabion Cylinder Dia. 500mm (Galvanized and Coated with PVC)	m ³	160	151.557

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
H.5.9	Soil Filling	m ³	50	41.707
H.5.10	Joint Filler, 10mm thick (Elastic Material)	m ³	75	70.819
H.5.11	Gabion Mattress t=500mm (Galvanized) on Riverbed	m ³	50	47.250
H.5.12	Rubble Stone Filling	m ³	18	15.972
H.6	Mooring Facilities			
H.6.1	Structural Excavation	m ³	1,780	1,612.530
H.6.2	Backfill with Selected Soil	m ³	40	31.500
H.6.3	Furnishing and Driving PC Sheet Pile (K-500, t=220mm,	m	816	792.000
H.6.4	Gravel Bedding	m ³	61	55.275
H.6.5	Rubble Stone Bedding	m ³	201	182.487
H.6.6	Stone Facing (Dia.250 to 400mm)	m ³	298	270.324
H.6.7	Concrete, Type C1 including Formwork	m ³	26	24.075
H.6.8	Concrete, Type D including Formwork	m ³	94	89.400
H.6.9	Deformed Reinforcing Bars for Item H.6.7 and H.6.8	kg	2,150	2,022.000
H.6.10	Joint Filler, 10mm thick (Elastic Material)	m ²	16	14.496
H.6.11	Gabion Mattress t=500mm (Galvanized) on Riverbed	m ³	48	45.000
H.6.12	Rubble Stone Filling	m ³	7	5.625
H.6.13	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m	m	31	30.000
H.7	Walkway along Riverbank (3.0m wide)			
H.7.1	Structural Excavation	m ³	12,230	11,114.112
H.7.2	Embankment	m ³	1,230	1,111.500
H.7.3	Gravel Pavement, 200mm thick	m ²	55,858	50,779.380
H.7.4	Penetration Macadam Pavement 200mm thick	m ²	5,271	4,791.180
H.7.5	Solid Sodding	m ²	76,840	69,846.300
H.8	Approach Road for Maintenance (4.0m wide)			
H.8.1	Structural Excavation	m ³	660	600.000
H.8.2	Embankment	m ³	270	240.000
H.8.3	Penetration Macadam Pavement 200mm thick	m ²	132	120.000
H.8.4	Solid Sodding	m ²	220	200.000
H.9	Tree Planting and Relocation of Existing Tree			
H.9.1	Tree Planting (Angsana, Goldogan, Flamboyant)	nos.	630	600.000
H.9.2	Relocation of Existing Trees (Rare species such as Trembesi, Flamboyant, Dadap and Pines)	nos.	32	30.000
I	Waterlevel Gauging Station			
I.1	Preparatory Work			
I.1.1	Coffering and Dewatering	L.S.	1	1.000
I.1.2	Clearing and Grubbing	m ²	330	300.000
I.2	Well Type Water Level Gauging Station			
I.2.1	Structural Excavation	m ³	2,050	1,855.130
I.2.2	Backfill with Selected Soil	m ³	1,960	1,781.260
I.2.3	Gravel Bedding	m ³	1	0.075
I.2.4	Concrete, Type E including Formwork	m ³	2	1.553
I.2.5	Concrete, Type C1 including Formwork	m ³	29	27.324
I.2.6	Concrete Type D including Formwork	m ³	1	0.156
I.2.7	Deformed Reinforcing Bars including Anchor bars for Gauging	kg	1,660	1,563.000
I.2.8	Furnishing and Placing Concrete Pipe, Dia.600mm, L=10.2m	m	14	12.500
I.2.9	Furnishing and Placing Concrete Pipe, Dia.300mm, L=6.6m	m	8	7.500
I.2.10	Gabion Mattress t=500mm (Galvanized)	m ³	43	40.500
I.2.11	Rubble Stone Filling	m ³	1	0.188
I.2.12	Steel Maintenance Steps (with Anti-corrosion Painting)	kg	280	266.000

Summary of Package - 1				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
I.2.13	Steel Hand Rail (with Anti-corrosion Painting)	kg	80	73.000
I.2.14	Steel Ladder (with Anti-corrosion Painting)	kg	90	82.000
I.2.15	Gauging House (including Reinforced Concrete, Hollow Concrete Block, Plastering, Roofing, Steel Door)	L.S.	1	1.000
I.2.16	Installation of Water Level Gage and Related Apparatus and	L.S.	1	1.000
I.2.17	Setting Bench Mark	L.S.	1	1.000
J	Supplying Maintenance Equipment			
J.1				
J.1.1	Backhoe, 0.35m ³	nos.	1	1.000
J.1.2	Truck, 8t	nos.	1	1.000
J.1.3	Bulldozer, 11t	nos.	1	1.000
J.1.4	Patrol Car, 4WD	nos.	1	1.000
J.1.5	Outboard Motor Boat	nos.	1	1.000

Summary of Package - 2				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
A	General			
A.1	Mobilization and Demobilization	L.S.	1	1.000
A.2	Establishment			
A.2.1	Temporary Construction Road and Bridge	L.S.	1	1.000
A.2.2	Contractor's Site Office and Facilities	L.S.	1	1.000
A.2.3	Engineer's Site Office and Facilities	L.S.	1	1.000
A.3	Drawings	L.S.	1	1.000
A.4	Surveying	L.S.	1	1.000
A.5	Geological Investigation			
A.5.1	Auger Boring	m	13	12.000
A.5.2	Rotary Boring	m	105	100.000
B	Preparatory and Temporary Works			
B.1	Clearing and Grubbing	m ²	11,800	10,639.365
B.2	Demolition and Removal of Existing Weir, Intake Structures and Others	m ³	5,481	5,219.400
B.3	Temporary Works for Construction of Weir and Intake Structures (Including Coffering, Dewatering, Channel Diversion for Semarang River and Left Bank Irrigation Channel, Channel Diversion for Drainage on Left Bank, Earth Retaining Wall and Others)	L.S.	1	1.000
B.4	Coffering and Dewatering for Construction of Revetment in upstream and downstream channels	L.S.	1	1.000
C.	Earth Work			
C.1.	Channel Excavation			
C.1.1	Excavation below Water Level (Low water level shown on the cross sections)	m ³	34,780	31,610.400
C.1.2	Excavation above Water Level (Low water level shown on the cross sections)	m ³	7,770	7,057.700
C.2	Weir and Intake Structures			
C.2.1	Structural Excavation	m ³	24,210	22,001.100
C.2.2	Soft Rock Excavation	m ³	550	500.000
C.2.3	Earthfill on Riverbed with Selected Soil	m ³	3,070	2,784.100
C.2.4	Backfill with Selected Soil	m ³	12,190	11,077.100
C.2.5	Embankment for Dike	m ³	340	306.700
C.2.6	Solid Sodding	m ²	650	584.400
C.3	Approach Road and Bridge			
C.3.1	Structural Excavation	m ³	220	196.200
C.3.2	Backfill Gravel	m ³	30	19.440
C.3.3	Backfill with Selected Soil	m ³	40	29.160
C.3.4	Embankment for Road	m ³	220	193.200
C.3.5	Gravel Bedding	m ³	20	13.100
D.	Foundation Piles and Seepage Blocking Sheet Piles			
D.1	Main Weir Structure (Gate Pier, Gate Floor Slab, Apron, Approach Wall and Riverbed Partition)			
D.1.1	PC Pile for Test Piling, Dia. 600 mm Type-A	m	119	114.900
D.1.2	Furnishing and Driving PC Piles, Dia. 600mm Type-A	m	4,964	4,819.000
D.1.3	PC Pile for Test Piling, Dia. 450 mm Type-A	m	44	41.800
D.1.4	Furnishing and Driving PC Piles, Dia. 450mm Type-A	m	2,225	2,160.000
D.1.5	PC Pile for Test Piling, Dia. 400 mm Type-A	m	24	22.700
D.1.6	Furnishing and Driving PC Piles, Dia. 400mm Type-A	m	737	715.000
D.1.7	Concrete Filling in Pile Holes, Concrete Type D	m ³	22	20.384
D.1.8	Cutting Pile Head	m ³	135	128.529
D.1.9	Furnishing and Driving Steel Sheet Pile, Type II	m	3,161	3,010.000

Summary of Package - 2				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
D.1.10	Furnishing and Driving PC Sheet Pile (Prestressed Concrete K-500, t=220mm, w=500mm)	m	3,866	3,753.000
D.2	Right and Left Bank Intakes Structures (Box Culvert, Breast Wall and Upstream Approach Wall)			
D.2.1	PC Pile for Test Piling, Dia. 600 mm Type-A	m	36	34.800
D.2.2	Furnishing and Driving PC Piles, Dia. 600mm Type-A	m	668	648.000
D.2.3	PC Pile for Test Piling, Dia. 350 mm Type-A	m	29	27.300
D.2.4	Furnishing and Driving PC Piles, Dia. 350mm Type-A	m	1,005	975.000
D.2.5	Furnishing and Driving Steel Sheet Pile, Type II	m	1,249	1,212.000
D.2.6	Furnishing and Driving Concrete Sheet Pile (Prestressed Concrete K-500, t=220mm, w=500mm)	m	133	129.000
D.2.7	Cutting Pile Head	m ³	18	16.891
D.3	Approach Bridge			
D.3.1	PC Pile for Test Piling, Dia. 500 mm Type-A	m	16	15.000
D.3.2	Furnishing and Driving PC Piles, Dia. 500mm Type-A	m	109	105.000
D.3.3	Cutting Pile Head	m ³	3	2.600
E.	Concrete Work			
E.1	Main Weir Structure (Gate Pier, Gate Floor Slab, Apron, Approach Wall and Riverbed Partition)			
E.1.1	Leveling Concrete, Type-E including Formwork	m ³	700	666.458
E.1.2	Concrete Type B including Formwork for Gate Floor Slab, Pier Footing and Apron	m ³	6,290	5,981.186
E.1.3	Deformed Reinforcing Bar for Item E.1.2	kg	197,490	186,309.000
E.1.4	Concrete Type B including Scaffolding and Formwork for Gate Piers, Operation Decks and Approach Walls	m ³	3,290	3,131.833
E.1.5	Deformed Reinforcing Bar for Item E.1.4	kg	161,420	152,278.000
E.1.6	Concrete Type D including Formwork for Riverbed Partition	m ³	260	243.308
E.1.7	Concrete Type D including Formwork for Steps in Gate Pier	m ³	10	7.788
E.1.8	Concrete Type B including Formwork for Pile Head Treatment Work	m ³	120	105.556
E.1.9	Deformed Reinforcing Bar for Item E.1.8	kg	24,540	23,150.000
E.1.10	Concrete Type-C2 including Formwork for Blockout in Gate Pier and Floor Slab and Floor of Control House	m ³	150	141.358
E.1.11	Steel Anchor Bars for Item E.1.10	kg	2,250	2,121.000
E.1.12	Precast Concrete Blocks and their Installation (Cross-shape Block with Anchor Bars, 2U/piece)	nos.	1,424	1,356.000
E.1.13	Joint Filler 10mm thick (Elastic Material)	m ²	1,237	1,177.698
E.1.14	Water Stop, 300mm wide	m	675	642.375
E.1.15	Dowel Bar, Dia.19mm 1.0m long (Round Bar and PVC Pipe)	kg	5,590	5,267.000
E.1.16	Steel Anchor Bars for Maintenance Step and Control House	kg	390	366.000
E.2	Right and Left Bank Intake Structures (Box Culvert, Breast Wall, Approach Channel and Upstream Approach Wall)			
E.2.1	Leveling Concrete, Type-E	m ³	88	83.336
E.2.2	Concrete Type B including Scaffolding and Form	m ³	1,156	1,100.462
E.2.3	Deformed Reinforcing Bar for Item E.2.2	kg	78,290	73,852.000
E.2.4	Concrete Type B including Formwork for Pile Head Treatment Work	m ³	12	10.531
E.2.5	Deformed Reinforcing Bar for Item E.2.4	kg	4,190	3,946.000
E.2.6	Concrete Type-C2 for Blockout in Gate Pier	m ³	11	10.121
E.2.7	Anchor Bars for Item E.2.6	kg	420	394.000
E.2.8	Concrete Type D for Concrete Lining on Channel Bed and Leaning Wall	m ³	14	12.728
E.2.9	Joint Filler, 10mm thick (Elastic Material)	m ²	63	59.653
E.2.10	Water Stop, 300mm wide	m	29	27.000

Summary of Package - 2				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
E.3	Maintenance Bridges (21.0m long PC Girder and 8.35m long RC Girder)			
E.3.1	Precast Prestressed Concrete Beam including Reinforcing Bars, Tension Reinforcing and Erection (Concrete Type A2, PC Cable)	nos.	12	12.000
E.3.2	Precast Prestressed Concrete Diaphragm including Reinforcing Bars, Tensioning and Erection (Concrete Type A2, PC Cable)	nos.	12	12.000
E.3.3	Concrete Type B including Scaffolding and Form for Slab and Beam for RC Girder	m ³	190	180.915
E.3.4	Deformed Reinforcing Bars for Items E.3.3	kg	31,710	29,908.000
E.3.5	Elastomeric Bearing Pad (350x280x73)	nos.	24	24.000
E.3.6	Elastomeric Bearing Pad (310x210x24)	nos.	24	24.000
E.3.7	Rubber Sheet (200x200x30)	nos.	24	24.000
E.3.8	Drain Pipe, PVC Pipe, Dia.100	m	322	306.000
E.4	Approach Bridges and Walls (13.0 and 9.0 m long RC Girders, Abutments and Earth Retaining Walls)			
E.4.1	Leveling Concrete, Type E including Formwork	m ³	16	14.658
E.4.2	Concrete Type B including Scaffolding and Form for Abutments	m ³	128	121.600
E.4.3	Deformed Reinforcing Bars for Items E.4.2	kg	8,480	7,998.000
E.4.4	Concrete Type B including Scaffolding and Form for Concrete Beam	m ³	78	73.358
E.4.5	Deformed Reinforcing Bars for Items E.4.4	kg	15,720	14,823.000
E.4.6	Concrete Type B including Form for Retaining Wall	m ³	62	58.210
E.4.7	Deformed Reinforcing Bars for Items E.4.6	kg	4,990	4,706.000
E.4.8	Concrete Type D including Form Work	m ³	4	3.300
E.4.9	Elastomeric Bearing Pad (310x210x24)	nos.	24	24.000
E.4.10	Drain Pipe, PVC Pipe, Dia.100	m	105	100.000
E.4.11	Joint Filler, 10mm thick (Elastic Material)	m ²	8	6.804
E.4.12	Weep Hole, Dia.50mm including Filter Cloth	nos.	24	22.000
E.5	U-shape Concrete Channel on Left Bank (to be connected with the existing concrete channel)			
E.5.1	Chipping of Existing Concrete	m ²	6	5.000
E.5.2	Leveling Concrete, Type-E including Formwork	m ³	9	7.992
E.5.3	Concrete Type-C1 including Formwork and Scaffolding	m ³	62	58.743
E.5.4	Deformed Reinforcing Bars for E.5.3	kg	2,840	2,679.000
E.5.5	Water Stop, 200mm wide	m	23	21.114
E.5.6	Joint Filler, 10mm thick (Elastic Material)	m ²	3	2.679
F.	Stone and Masonry			
F.1	Wet Masonry			
F.1.1	Wet Stone Masonry on Side Slope of 1:2 and 1:1.5	m ³	1,960	1,859.610
F.1.2	Wet Stone Masonry for Earth Retaining Type Wall in Downstream Channel	m ³	950	902.732
F.1.3	Wet Stone Masonry for Leaning Wall for Connecting Channel of Semarang River and Left Irrigation Channel	m ³	360	334.798
F.1.4	Weep Hole, Dia.50mm including Filter Cloth	nos.	340	323.000
F.1.5	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	7,530	7,171.123
F.1.6	Furnishing and Driving Log Pile, Dia. 150mm, L=2.0m	m	95	92.000
F.2	Stone			
F.2.1	Gravel Bedding	m ³	2,567	2,333.008
F.2.2	Backfill Gravel	m ³	196	178.106
F.2.3	Rubble Stone Filling	m ³	1,341	1,218.962
F.2.4	Gabion Mattress, 3.0m x 1.5m x 0.5m (Galvanized and PVC Coated)	m ³	2,162	2,058.822

Summary of Package - 2				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
F.2.5	Gabion Mattress, 2.0m x 1.0m x 0.3m (Galvanized and PVC Coated)	m ³	25	22.935
F.2.6	Geotextile Filter Cloth	m ²	3,218	3,063.810
F.2.7	Palm Fiber	m ²	1,847	1,758.820
F.2.8	Gabion Cylinder Dia.500mm (Galvanized and Coated with PVC)	m ³	15	13.932
F.2.9	Soil Filling	m ³	10	3.807
G.	Metal Work and Mechanical Work			
G.1	Gate			
G.1.1	Furnishing and Installing Shell Type Steel Roller Gate, H=3.7m x L=18.5m x 3 gates (Flood Discharge Gate)	L.S.	1	1.000
G.1.2	Furnishing and Installing Hoist, and Operating and Electrical Equipment for Flood Discharge Gate (3 gates)	L.S.	1	1.000
G.1.3	Furnishing and Installing Girder Type Steel Roller Gate, H=4.35m x L=5.5m x 2 gates (Sediment Flush Gate)	L.S.	1	1.000
G.1.4	Furnishing and Installing Hoist, and Operating and Electrical Equipment for Sediment Flush Gate (2 gates)	L.S.	1	1.000
G.1.5	Furnishing and Installing Steel Slide Gate, H=2.0m x W=2.25m x 4 gates (Right Intake Gate)	L.S.	1	1.000
G.1.6	Furnishing and Installing Hoist, and Operating and Electrical Equipment for Right Intake Gate (4 gates)	L.S.	1	1.000
G.1.7	Furnishing and Installing Steel Slide Gate, H=2.0m x W=2.0m x 2 gates (Left Intake Gate)	L.S.	1	1.000
G.1.8	Furnishing and Installing Hoist, and Operating and Electrical Equipment for Left Intake Gate (2 gates)	L.S.	1	1.000
G.1.9	Furnishing Steel Temporary Gate(including Gate Panels and Posts)	L.S.	1	1.000
G.1.10	Furnishing and Installing Steel Guide Frame for Flood Discharge	L.S.	1	1.000
G.1.11	Furnishing and Installing Steel Guide Frame for Sediment Flush	L.S.	1	1.000
G.1.12	Furnishing and Installing Steel Guide Frame for Right Intake Gate	L.S.	1	1.000
G.1.13	Furnishing and Installing Steel Guide Frame for Left Intake Gate	L.S.	1	1.000
G.1.14	Furnishing and Installing Steel Guide Frame for Temporary Gate (in the Gate Piers, Floor Slabs and Bridge Super-structure)	ton	90	85.572
G.2	Weir and Intake Structures			
G.2.1	Steel Hand Rails (with Anti-corrosion Painting)	kg	340	321.000
G.2.2	Steel Spiral Stairs (with Anti-corrosion Painting)	kg	4,750	4,520.000
G.2.3	Steel Fence (with Anti-corrosion Painting)	m	160	148.000
G.3	Road and Bridge			
G.3.1	Furnishing and Installing Metal Hand Rails in Maintenance and Approach Bridges	m	220	204.000
G.3.2	Expansion Joint, Steel Profile (75mm x 75mm x 6mm)	m	67	63.000
G.3.3	Car Barrier	L.S.	2	2.000
H.	Road Pavement			
H.1	Pavement on Bridge			
H.1.1	Bituminous Prime Coat	ltr	322	306.000
H.1.2	Bituminous Surface Course, 50mm thick	ton	105	99.352
H.2	Pavement on Approach Road			
H.2.1	Sub-Base Course (Class C)	m ³	90	76.934
H.2.2	Base Course (Class A)	m ³	70	55.956
H.2.3	Asphalt Treatment Base (A.T.B.) on the Bridge	ton	46	43.133
H.2.4	Bituminous Prime Coat	ltr	559	531.560
H.2.5	Bituminous Surface Course, 50mm thick	ton	48	44.997
I	Miscellaneous Work			
I.1				
I.1.1	Furnishing and Installing Water Level Gage (Pressure Gauge Type) consisting of Pole Type Protective Pipe, sensor, cable and	set	1	1.000

Summary of Package - 2				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
I.1.2	Furnishing and Installing Water Level Gauging Staff	set	2	2.000
I.1.3	Steel Ladder (with Anti-corrosion Painting)	L.S.	1	1.000
I.1.4	Information Board	L.S.	1	1.000
I.1.5	Name Plate for Weir and Bridge	L.S.	1	1.000
I.1.6	Storage Facility for Temporary Gate	L.S.	1	1.000
I.1.7	Tree Planting (Angsana, Glodogan, Flamboyan)	nos.	11	10.000
I.1.8	Furnishing and Installing Rain Gage Equipment, Tipping Bucket Type (consisting of Rainfall collector, Tipping Bucket, A/D Converter, Concrete Base, Cables and Automatic Rainfall Recorder)	L.S.	1	1.000
I.1.9	Furnishing and Installing Siren	L.S.	1	1.000
J	Electrical Work			
J.1				
J.1.1	Furnishing and Installing Remote Control Panel for Gate Operation at Operation/Maintenance Office	set	1	1.000
J.1.2	Cable Laying between Operation/Maintenance Office and Each Control House	L.S.	1	1.000
J.1.3	Furnishing and Installing Emergency Generator System (Diesel Engine Generator Set 250kVA with Radiator cooling system, Silencer, Exhaust system and Fuel System)	set	1	1.000
J.1.4	Furnishing and Installing Air Ventilation	set	1	1.000
J.1.5	Furnishing and Installing Switching Panel	set	1	1.000
J.1.6	Furnishing and Installing Lighting Equipment for Weir and Maintenance Bridge (consisting of Mercury Vapor Lamp 400W)	L.S.	1	1.000
J.1.7	Furnishing and Installing Lighting Protection for Control Houses, 4 sets	L.S.	1	1.000
K	Simongan Weir Management Complex			
K.1	Entrance Bridge			
K.1.1	Demolition and Removal of Existing Concrete and Wet Masonry Structures	m ³	190	180.863
K.1.2	Structural Excavation	m ³	30	26.425
K.1.3	Backfill with Selected Soil	m ³	12	10.825
K.1.4	Leveling Concrete, Type-E including Formwork	m ³	2	1.808
K.1.5	Concrete Type-C1, including Scaffolding and Formwork	m ³	52	48.600
K.1.6	Deformed Reinforcing Bars for Item K.1.5	kg	3,630	3,423.000
K.1.7	Wet Stone Masonry for Channel Revetment and Wall	m ³	30	23.832
K.1.8	Gravel Bedding	m ³	17	15.346
K.1.9	Weep Hole, Dia.50mm including Filter Cloth	nos.	8	7.000
K.1.10	Cement Mortar Pointing on Surface of Wet Stone Masonry	m ²	58	54.309
K.1.11	Joint Filler 10mm thick (Elastic Material)	m ²	12	10.785
K.1.12	Asphalt Treatment Base (A.T.B.)	ton	19	17.761
K.1.13	Bituminous Prime Coat	ltr	72	68.176
K.1.14	Base Course (Class A)	m ³	7	5.680
K.1.15	Sub-Base Course (Class C)	m ³	10	8.520
K.2	Demolition and Removal of Existing Storage Houses	L.S.	1	1.000
K.3	Building			
K.3.1	Operation/Management Office (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000
K.3.2	Storage House-1 (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000

Summary of Package - 2				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
K.3.3	Storage House-2 (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000
K.3.4	Electrical Building (including excavation, demolition existing wall, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000
K.3.5	Guard House (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000
K.3.6	External Works (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000
K.3.7	Gate Control House (4 houses including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door&Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.	1	1.000
K.3.8	Intake Gate Shed on Right Bank (including steel column and beam, roofing, steel handrail, electrical works and painting works)	L.S.	1	1.000
K.3.9	Intake Gate Shed on Left Bank (including steel column and beam, roofing, steel handrail, electrical works and painting works)	L.S.	1	1.000
L	Preservation of Existing Simongan Weir			
L.1	Cutting and Dismantling Part of the Existing Weir and Transporting			
L.1.1	Removal of Steel Gates, Hoists, Guide Frames, Columns and Roofs of Operation Shed, etc. and Transporting them to the Preservation	L.S.	1	1.000
L.1.2	Cutting and Dismantling Part of the Existing Wet Masonry Weir into Blocks and Transporting them to the Preservation Site	m ³	457	434.300
L.2	Assembling Work at Preservation Site			
L.2.1	Structural Excavation	m ³	164	149.000
L.2.2	Earth Fill	m ³	368	334.000
L.2.3	Backfill with Selected Soil	m ³	36	32.500
L.2.4	Gravel Bedding	m ³	38	34.400
L.2.5	Rubble Stone Bedding	m ³	5	4.500
L.2.6	Backfill with Gravel	m ³	37	32.800
L.2.7	Leveling Concrete, Type-E including Formwork	m ³	49	46.000
L.2.8	Concrete, Type C1 including Scaffolding and Formwork	m ³	31	28.713
L.2.9	Concrete Type D including Form Work	m ³	73	69.000
L.2.10	Deformed Reinforcing Bars for Item L.2.8	kg	2,000	1,886.000
L.2.11	Wet Stone Masonry	m ³	160	145.800
L.2.12	Cement Mortar Pointing on Riverside Surface of Masonry	m ²	74	70.000
L.2.13	Joint Filler 10mm thick (Elastic Material)	m ²	7	6.500
L.2.14	Steel Fence (with Anti-corrosion Painting), H=110cm	m	57	54.000
L.2.15	Assembling Blocks into Original Shape with Scaffolding	m ³	818	778.500
L.2.16	Jointing Blocks with Non-Shrinkage Mortar	m ³	4	3.500
L.2.17	Drilling, Hole (Dia.45mm) in the Block, Anchoring with Steel Deformed Bar (D16) and Filling the Hole with Non-shrinkage	m	735	700.000
L.2.18	Setting Steel Gates, Hoists, Guide Frames, Columns and Roofs of Operation Hut, etc.	L.S.	1	1.000

Summary of Package - 3				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
1	Box Culvert BH 5 Km. 00+816			
1.1	General			
1.1.1	Mobilization and demobilization	L.S.	1	1.000
1.1.2	Establishment			
1.1.2.1	Install and removal of temporary Site Office	m ²	18	18.000
1.1.2.2	Install and removal of temporary Ware House	m ²	18	18.000
1.1.3	Site Clearing and Measurement of the existing condition	L.S.	1	1.000
1.1.4	Furnishing and Installing Communication equipment	unit	1	1.000
1.2	Temporary Works			
1.2.1	Railway sign, structure for telephone cable, signal cable, etc.	L.S.	1	1.000
1.2.2	Demolition and removal of existing structure and others	L.S.	1	1.000
1.2.3	Temporary Works for construction of box culvert (include dewatering, retaining wall, removal ballast, temporary bridge and other steel and/or wooden supportters, and others)	L.S.	1	1.000
1.3	Excavation and backfill			
1.3.1	Structural Excavation	m ³	60	51.610
1.3.2	Backfill with Existing Soil	m ³	30	20.000
1.3.3	Disposal of excavated material	m ³	40	31.000
1.3.4	Landslides & flattening	L.S.	1	1.000
1.4	Concrete Works, Stone masonry, etc.			
1.4.1	Concrete type K250 including Scaffolding and Formwork	m ³	16	15.019
1.4.2	Deformed Reinforcing Bars for 1.4.1	kg	2,380	2,241.000
1.4.3	Concrete Type B0, including Formwork	m ³	1	0.220
1.4.4	Wet Stone Masonry 1Pc : 4Sand	m ³	11	10.000
1.4.5	Cement Mortar Plastering	m ²	17	16.000
1.4.6	Drainage Pipe			
1.4.6.1	GIP1" including filter cloth	nos.	4	4.000
1.4.6.2	PVC 2" including filter cloth	nos.	4	4.000
1.4.7	Sand Fill	m ³	10	5.000
1.4.8	Grass Planting	m ²	60	50.000
1.5	Superstructure Works			
1.5.1	Raising Track on the bridge for 16 cm	L.S.	1	1.000
2	Box Culvert BH 6 Km. 01+177			
2.1	General			
2.1.1	Mobilization and demobilization	L.S.	1	1.000
2.1.2	Establishment			
2.1.2.1	Install and removal of temporary Site Office	m ²	18	18.000
2.1.2.2	Install and removal of temporary Ware House	m ²	18	18.000
2.1.3	Site Clearing and Measurement of the existing condition	L.S.	1	1.000
2.1.4	Furnishing and Installing Communication equipment	Unit	1	1.000
2.2	Temporary Works			
2.2.1	Railway sign, structure for telephone cable, signal cable, etc.	L.S.	1	1.000
2.2.2	Demolition and Removal of existing structure, existing bridge and others	L.S.	1	1.000
2.2.3	Temporary Works for construction of box culvert (include dewatering, retaining wall, removal ballast, temporary bridge and other steel and/or wooden supportters, and others)	L.S.	1	1.000
2.3	Excavation and backfill			

Summary of Package - 3				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
2.3.1	Structural Excavation	m ³	60	46.710
2.3.2	Backfill with Existing Soil	m ³	20	18.000
2.3.3	Disposal of excavated material	m ³	40	28.000
2.3.4	Landslides & flattening	L.S.	1	1.000
2.4	Concrete Works, Stone masonry and Others			
2.4.1	Concrete type K250 including Scaffolding and Formwork	m ³	28	26.535
2.4.2	Deformed Reinforcing Bars for 2.4.1	kg	4,660	4,396.000
2.4.3	Concrete Type B0 including formwork	m ³	3	2.100
2.4.4	Wet Stone Masonry 1Pc : 4Sand	m ³	9	8.000
2.4.5	Cement Mortar Plastering	m ²	5	4.000
2.4.6	Cement Mortar Pointing	m ²	7	6.000
2.4.7	Drainage Pipe			
2.4.7.1	GIP1" including filter	nos.	6	6.000
2.4.7.2	PVC 2" including filter	nos.	4	4.000
2.4.8	Sand Fill	m ³	6	5.000
2.4.9	Grass Planting	m ²	220	200.000
2.5	Superstructure Works			
2.5.1	Raising Track on the Bridge for 44cm	L.S.	1	1.000
3	Raising Railway Bridge BH 10 Km.01+577			
3.1	General			
3.1.1	Mobilization and demobilization	L.S.	1	1.000
3.1.2	Establishment			
3.1.2.1	Install and removal of temporary Site Office	m ²	24	24.000
3.1.2.2	Install and removal of temporary Ware House	m ²	36	36.000
3.1.3	Site Clearing, Measurement and preparation of stock pile	L.S.	1	1.000
3.1.4	Communication equipment including Base Station, antenna and battery	Unit	1	1.000
3.2	Temporary Work			
3.2.1	Railway sign, structure for telephone cable, signal cable, etc.	L.S.	1	1.000
3.2.2	Demolition and removal of existing structure (retaining wall, steel rail fence, Abutments, Piers, and others)	L.S.	1	1.000
3.2.3	Temporary Works for Abutments and Revetment for sideslope 1:2 (include coffering, dewatering, retaining wall, removal ballast, temporary bridge and other steel and/or wooden supporters, and others)	L.S.	1	1.000
3.2.4	Temporary Works for construction of Piers and Riverbed Protection (including coffering, dewatering, and others)	L.S.	1	1.000
3.2.5	Temporary works for Raising and Shifting the Bridge (including removal of bearing steel, temporary steel and/or wooden bearing, setting/demolish construction with roller, and other steel and/or wooden supporter, and others)	L.S.	1	1.000
3.3	Excavation and backfill			
3.3.1	Structural Excavation	m ³	1,260	1,137.000
3.3.2	Backfill with Existing Soil	m ³	400	361.000
3.3.3	Backfill with Gravel	m ³	110	95.000
3.3.4	Disposal of excavated material	m ³	970	876.000
3.3.5	Landslides & flattening	L.S.	1	1.000

Summary of Package - 3				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
3.3.6	Channel Excavation for West Floodway			
3.3.6.1	Excavation below Water Level	m ³	5,780	5,252.400
3.3.6.2	Excavation above Water Level	m ³	8,180	7,428.080
3.3.6.3	Clearing and Grubbing	m ²	950	898.500
3.4	PC Piling, Concrete Works, Stone Masonry, and others			
3.4.1	PC Pile			
3.4.1.1	Furnishing PC Pile D = 450mm type K500	m	1,420	1,420.000
3.4.1.2	Driving PC Pile	m	1,370	1,370.000
3.4.1.3	Capping, Cutting Pile Head	nos.	92	92.000
3.4.1.4	Welding for connection	nos.	92	92.000
3.4.1.5	Loading Test (load test =125 tf)	nos.	4	4.000
3.4.2	Concrete Work			
3.4.2.1	Concrete type K250 including scaffolding and formwork	m ³	658	626.100
3.4.2.2	Deformed Reinforcing Bars for 3.4.2.1	kg	68,970	65,063.000
3.4.3	Lean Concrete type B0 for Abutment, Piers, Bridge and Riverbed Protection	m ³	72	67.776
3.4.4	Rubble Stone Filling	m ³	75	70.500
3.5	Superstructure Works			
3.5.1	Raising for the bridge for 70cm height step by step	L.S.	1	1.000
3.5.2	Shifting horizontal of bridge	L.S.	1	1.000
3.5.3	Re-install of steel bearing including epoxy grouting	nos.	12	12.000
3.5.4	Re-painting a part of existing steel superstructure that was	L.S.	1	1.000
3.5.5	Pavement Work			
3.5.5.1	Demolition of Existing Pavement	L.S.	1	1.000
3.5.5.2	Aggregate Class A	m ³	143	130.000
3.5.5.3	Aggregate Class B	m ³	267	242.000
3.5.5.4	Asphalt Concrete	ton	131	124.000
3.5.5.5	Asphalt Treated Base (ATB)	ton	188	179.000
3.5.5.6	Prime Coat	m ²	1,130	1,076.000
3.5.5.7	Tack Coat	m ²	1,130	1,076.000
3.5.5.8	Structural Excavation	m ³	85	77.000
3.5.5.9	Backfill	m ³	37	33.000
3.5.5.10	Wet Stone Masonry	m ³	50	45.000
3.5.5.11	Cement Mortar for Pointing	m ²	54	51.000
3.5.5.12	Drainage Pipe, PVC Dia. 50mm included Filter Cloth	nos.	76	72.000
3.6	Protection Works for Riverbank and Leaning Wall			
3.6.1	Excavation and Backfill			
3.6.1.1	Structural Excavation	m ³	2,811	2,555.001
3.6.1.2	Backfill with Selected Soil	m ³	765	694.658
3.6.1.3	Backfill with Gravel	m ³	117	105.731
3.6.1.4	Gravel Bedding for Revetment and Riverbed Protection	m ³	514	466.794
3.6.1.5	Rubble Stone Bedding	m ³	8	6.921
3.6.2	Rubble Stone Filling	m ³	80	71.830
3.6.3	Wet Stone Masonry	m ³	810	768.002
3.6.4	Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry	m ²	1,686	1,605.302

Summary of Package - 3				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
3.6.5	Weep Hole, Dia 50mm including Filter Cloth	nos.	165	157.000
3.6.6	Joint Filler, 10mm thick (Elastic Material)	m ²	172	162.998
3.6.7	Concrete, Type C1 including Formwork	m ³	115	109.166
3.6.8	Deformed Reinforcing Bar for 3.6.7	kg	5,920	5,583.000
3.6.9	Lean Concrete Type B0			
3.6.9.1	Concrete, Type D for Leaning Wall	m ³	17	15.310
3.6.9.2	Cast-In-Place Concrete Block (500kg/piece), Concrete Type-D	nos.	1,023	974.000
3.6.10	Gabion for Revetment			
3.6.10.1	Gabion Cylinder Dia.500mm (Galvanized and Coated with PVC)	m ³	30	27.864
3.6.10.2	Soil Filling	m ³	10	7.614
3.6.10.3	Gabion Mattress t=500mm (Galvanized) on Riverbed	m ³	177	168.000
3.6.11	Furnishing and Driving Log Pile, Dia 150mm, L=2.0m	m	116	112.000
3.6.12	Steel Fence (with Anti-corrosion Painting), H=110cm	m	140	130.656
3.6.13	Penetration Macadam Pavement 200mm thick	m ²	453	411.201
3.6.14	Placing Filter Cloth (Geotextile Sheet)	m ²	490	466.164
4	Double Box Culvert BH 13 Km. 02+ 332			
4.1	General			
4.1.1	Mobilization and demobilization	L.S.	1	1.000
4.1.2	Establishment			
4.1.2.1	Install and removal of temporary Site Office	m ²	18	18.000
4.1.2.2	Install and removal of temporary Ware House	m ²	18	18.000
4.1.3	Site Clearing and Measurement of the existing condition	L.S.	1	1.000
4.1.4	Furnishing and Installing Communication equipment (H.T)	Unit	1	1.000
4.2	Temporary Work			
4.2.1	Railway sign, structure for telephone cable, signal cable, etc.	L.S.	1	1.000
4.2.2	Demolition and Removal of existing structure, existing bridge and others	L.S.	1	1.000
4.2.3	Temporary Works for construction of double box culvert (including coffering, dewatering, retaining wall, removal ballast, temporary bridge and other steel and/or wooden supportters, and others)	L.S.	1	1.000
4.3	Excavation and backfill			
4.3.1	Structural Excavation	m ³	60	53.000
4.3.2	Backfill with Existing Soil	m ³	100	90.000
4.3.3	Landslides & flattening	L.S.	1	1.000
4.4	Concrete Works, Stone Masonry, etc.			
4.4.1	Concrete Type K 225 including Form Work	m ³	30	28.000
4.4.2	Deformed Reinforcing Bars for 4.4.1	kg	3,680	3,468.000
4.4.3	Anchor bar Dia 19mm L = 850mm	kg	40	30.000
4.4.4	Epoxy	m ²	10	9.000
4.5	Superstructure Works			
4.5.1	Raising track for 83 cm step by step	L.S.	1	1.000
5	Track Raising Km. 00+677 - Km. 02+521			
5.1	General			
5.1.1	Mobilization and demobilization	L.S.	1	1.000

Summary of Package - 3				
Item No.	BQ Item	Unit	Quantity for Cost Estimate	Original Quantity
5.1.2	Establishment			
5.1.2.1	Install and removal of temporary Site Office	m ²	18	18.000
5.1.2.2	Install and removal of temporary Ware House	m ²	18	18.000
5.1.3	Site Clearing and Measurement of the existing condition	L.S.	1	1.000
5.1.4	Avoidance of Accident			
5.1.4.1	Watching Train	L.S.	1	1.000
5.1.4.2	Guard of restriction speed	MD	360	360.000
5.2	Truck Work			
5.2.1	Coarse Sand	m ³	5,210	4,730.000
5.2.2	Ballast	m ³	4,380	3,978.000
5.2.3	Wooden Sleepers (size 13 x 22 x 200 cm)	Bar	420	400.000
5.2.4	Track Raising every 5 cm until 70 ~ 100 cm for 5 Km/H	m	15,650	14,897.000
5.2.5	Track Tamping for 20 Km/H	m	1,840	1,745.000
5.2.6	Track Tamping for 40 Km/H	m	1,840	1,745.000
5.2.7	Track Tamping for 60 Km/H	m	1,840	1,745.000
5.2.8	Track Tamping for > 60 Km/H by Tamping machine	m	1,840	1,745.000
5.3	Retaining Wall Work			
5.3.1	Structural Excavation	m ³	1,190	1,080.000
5.3.2	Backfill with Existing Soil	m ³	600	540.000
5.3.3	Disposal of excavated material	m ³	600	540.000
5.3.4	Wet Stone Masonry	m ³	1,900	1,805.000
5.3.5	Lean Concrete	m ³	105	100.000
5.3.6	Fill with Gravel	m ³	210	200.000
5.4	Level Crossing Raising for 8 (eight) crossings			
5.4.1	Coarse Sand	m ³	3,130	2,838.000
5.4.2	To Run Over by Roller	m ²	7,770	7,400.000
5.4.3	Hot Mix Asphalt	m ²	7,770	7,400.000
5.4.4	Stone Masonry 1 PC : 4 Sand for retaining wall	m ³	590	560.000
5.4.5	Guard for Traffic Arrange (8 x 2 x 90)	MD	1,440	1,440.000
5.5	Guard Post Work			
5.5.1	To build guard Building (3 x 3 m2) for 2 Level Crossing	Unit	2	2.000
5.5.2	Raising and shift level Crossing Barrier with it's installation	Unit	1	1.000
5.5.3	Raising level Crossing Barrier with it's installation	Unit	1	1.000