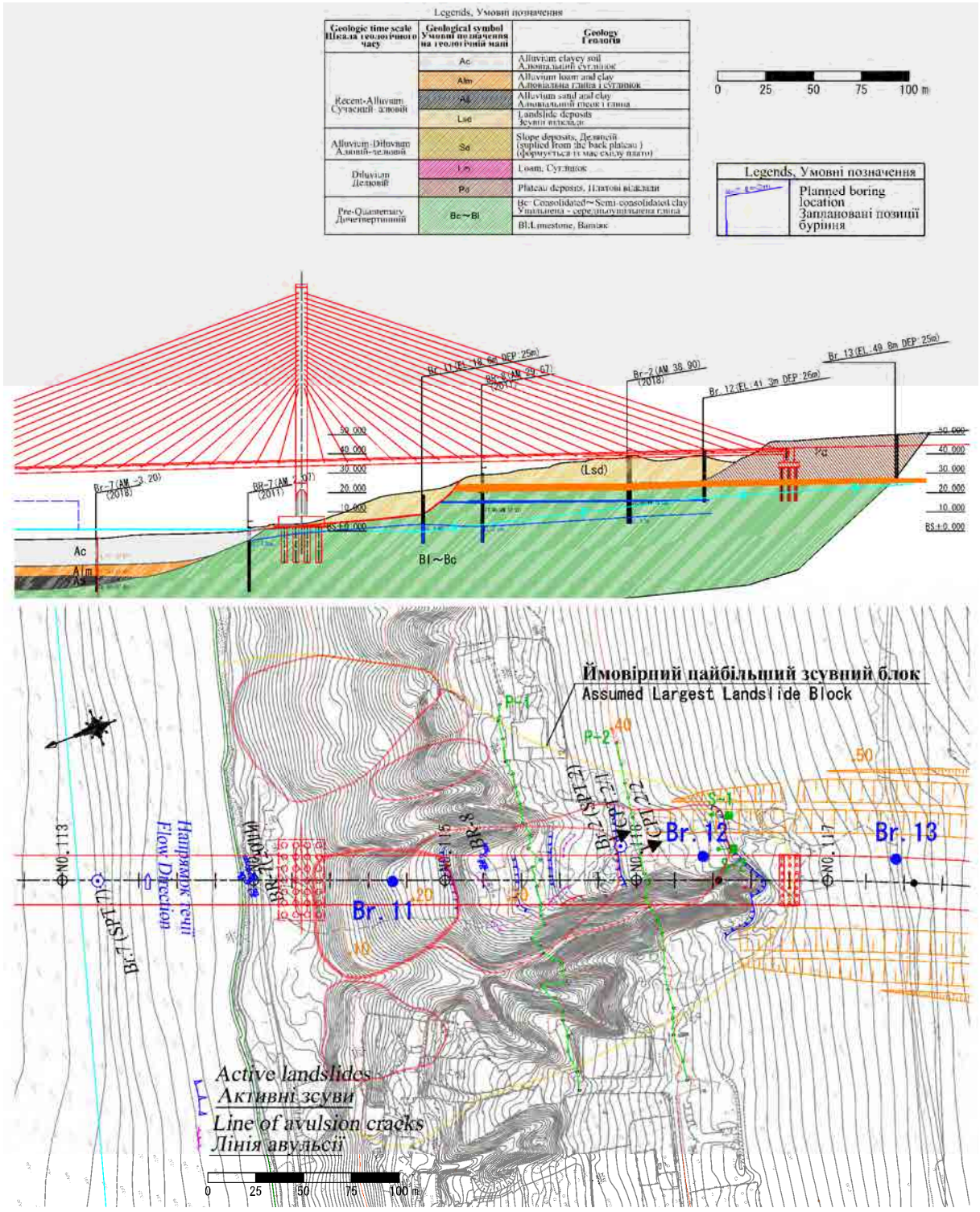
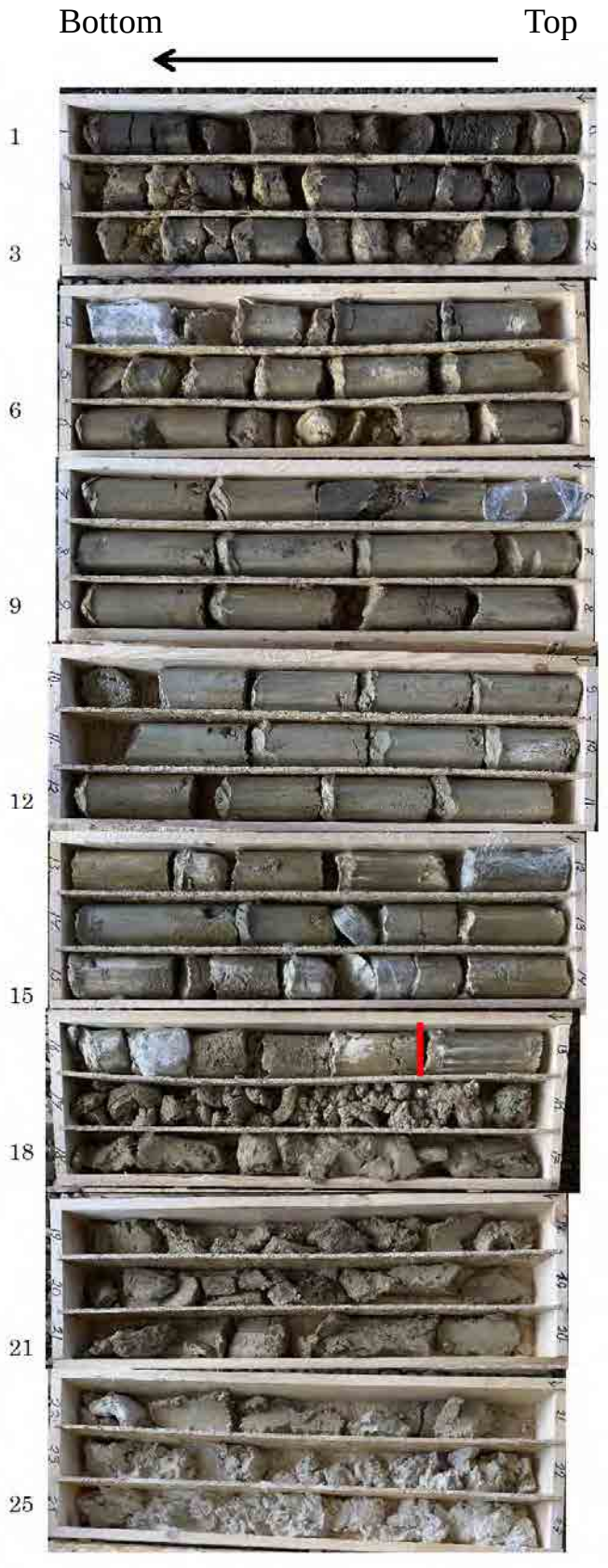


Figure 9-8-1. Map of the Complementary Survey (Route 2)



Br-11			L=25.0m
0	–	1.5	Topsoil
1.5	–	3.0	soil with the inclusion of gravel, loam, cohesive soil, limestone gravel 10%-20%
3.0	–	5.8	Cohesive soil, gray/gray-green
5.8	–	12.5	Soft cohesive soil with good continuity
12.5	–	15.2	Cohesive soil, gray/white, with thin layer of limestone
15.2	–	21.8	Dolomitized limestone
21.8	–	25.0	Limestone, grayish-white, soft

Figure 9-8-2. Pictures of the Core Samples (Br-11)

-1-

Borehole 11

Depth of borehole: 25.0 m
Earth mark: 18.60 m
Coordinate (WGS84/UTM zone36N):
x=5204480,720; y=415005,331

Groundwater level: 19.1 m (13.05.19)
Start date of drilling: 01.05.19
End date of drilling: 01.05.19

Layer number	Bottom of the layer, m: Depth	Bottom of the layer, m: Absolute mark	Layer thickness, m	Cross-section Scale 1:200	Sampling depth	LGW	Lithological description of soils
1	1.5	17.10	1.5				Soil-vegetative layer - loam, dark gray, hard, with the inclusion of limestone gravel up to 10%
2	3.0	15.60	1.5				Loam and clay, dark gray, dark brown, hard, with the inclusion (layers) of limestone 10-20%, deluvial deposits
3	5.8	12.80	2.8				Clay, gray-green, brown-gray, hard. Angle of slip at a depth of 3.8 m is 70°
4	12.5	6.10	9.7				Clay, green-gray, very stiff and hard. Angle of slip at a depth of 6.0-11.0 m is 70°
5	15.2	3.40	2.7				Clay, green-gray, gray-white, hard and very stiff, with the inclusion of layers of limestone up to 20-30%
6	21.8	-3.20	6.6			▼19.1 -0.50	Dolomitized limestone, light gray, strongly fractured, low strength, with layers of clay greenish-gray, stiff and very stiff consistency of 20-25%, there are traces of water
7	25.0	-6.40	3.2				Limestone grayish-white, strongly fractured, low strength

70° Angle of slip plane is 70° from the horizon

Rev.	Q-ty	Sheet	Annex number	Signature	Date
Head of sector		Shepitchak			05.2019
Chief engineer		Gabor			05.2019

23-04-19-L

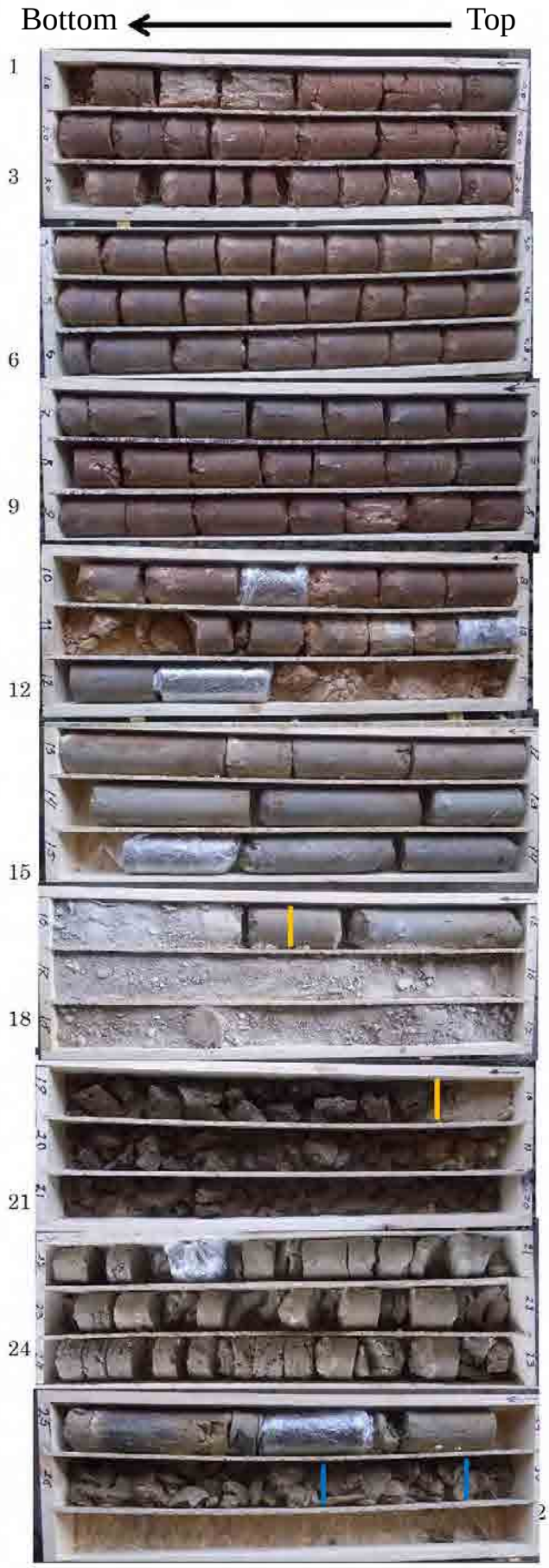
Columns of geological boreholes

Stage	Sheet	All sheet
DD	1	6

LLC "ARATTA GEO"

ФОРМАТ / SIZE : A4

Figure 9-8-3. Boring Logs (Br-11)



Br-12			L=26.0m
0	–	5.5	Loam/cohesive soil
5.5	–	7.2	Cohesive soil, green
7.2	–	10.8	Cohesive soil, brown/dark brown, hard, highly dense, with limestone gravel
10.8	–	11.6	Sand/cohesive soil, with thin layer of limestone
11.6	–	15.5	Cohesive soil, green, hard to somewhat hard
15.5	–	18.1	Sand, medium-grained, with light gray cohesive soil and limestone gravel
18.1	–	21.0	Cohesive soil, dark brown, somewhat hard, with sand layers
21.0	–	25.1	Cohesive soil, green-brown/brown-gray, hard to somewhat hard, with the inclusion of limestone gravel
25.1	–	25.4	Limestone, with cohesive soil
25.4	–	26.0	Cohesive soil, greenish-brown/brown-gray, hard to somewhat hard, with the inclusion of limestone gravel
Near 19.0			Groundwater level

Figure 9-8-4. Pictures of the Core Samples (Br-12)

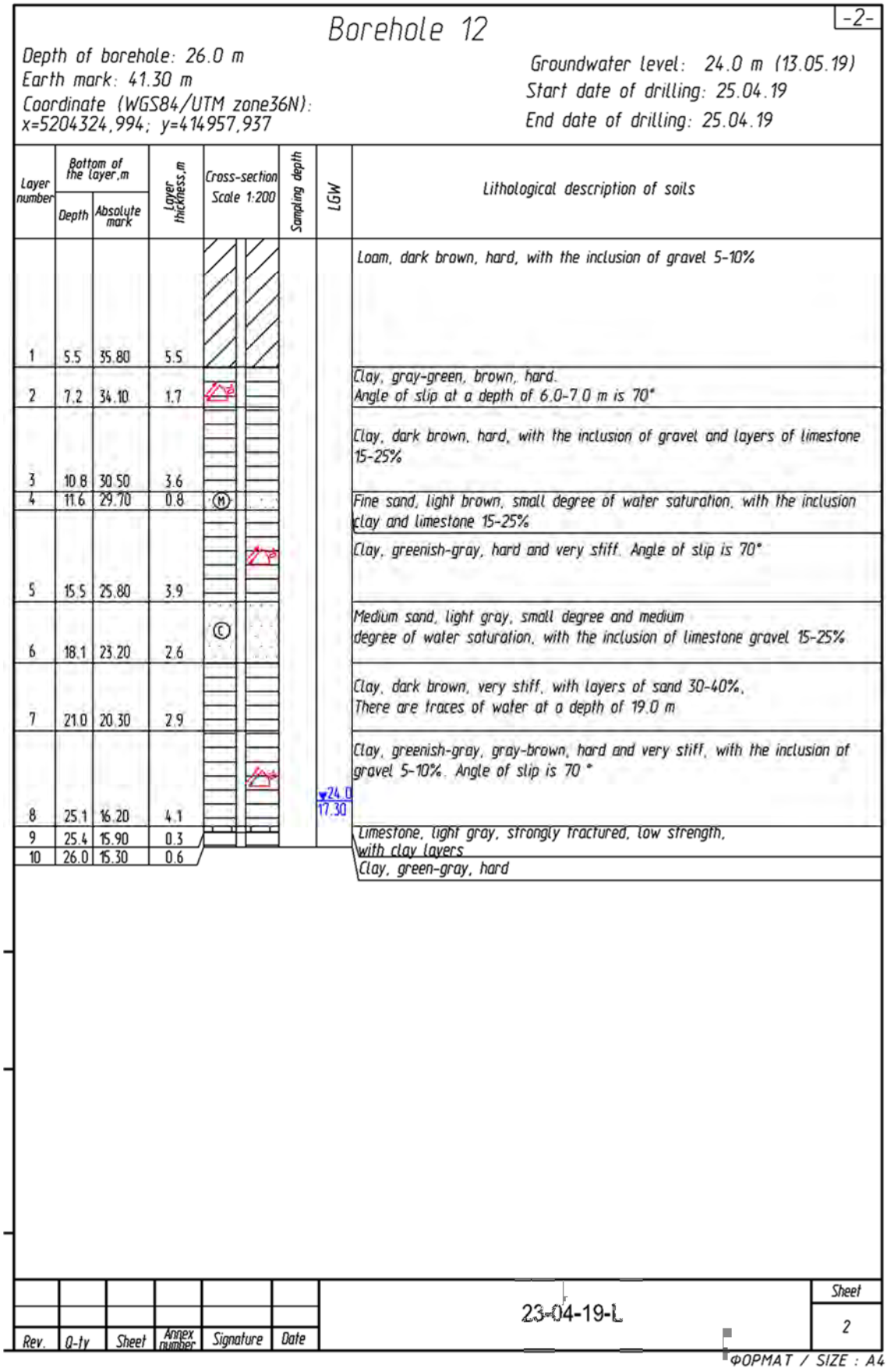
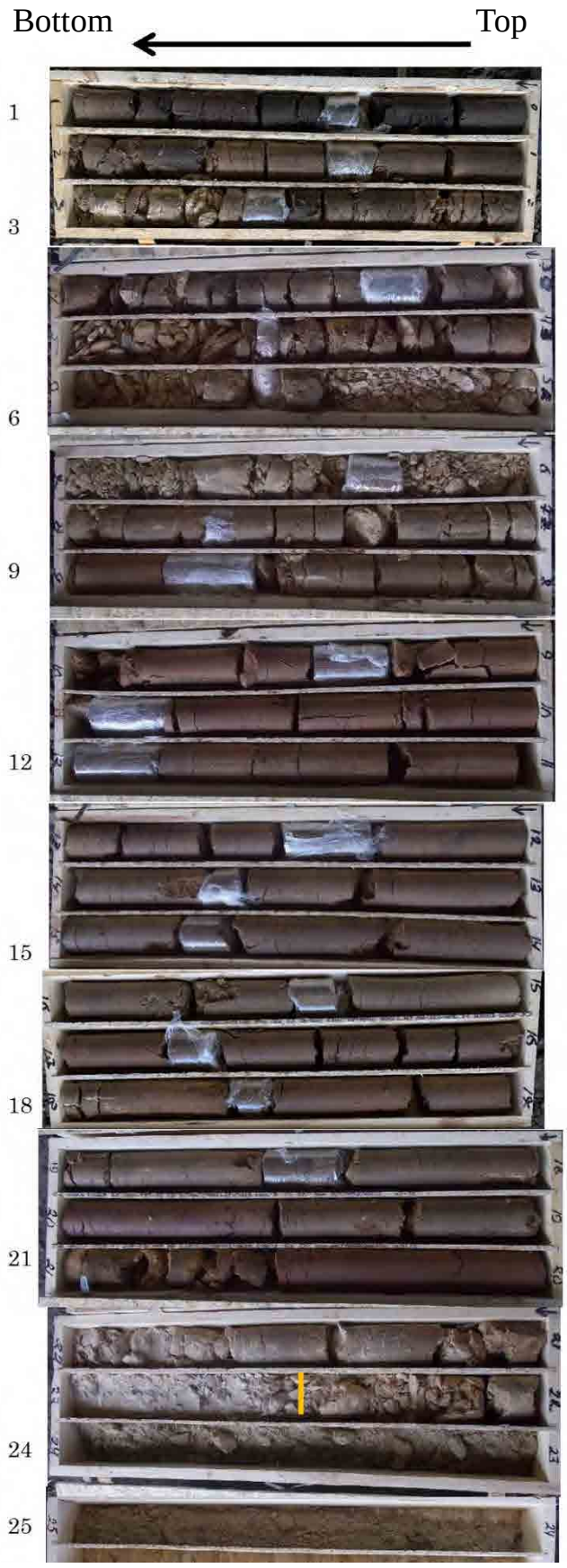


Figure 9-8-5. Boring Log (Br-12)



Br-13			L=25.0m
0	–	0.9	Topsoil
0.9	–	5.0	Soil with the inclusion of gravel, hard, with limestone gravel
5.0	–	8.6	Loam, light brown, hard, with the inclusion of gravel
8.6	–	20.6	Loam, dark brown, highly dense
20.6	–	22.2	Loam and sand, light brown, light gray
22.2	–	25.0	Sand, light brown, light gray

Figure 9-8-6. Pictures of the Core Samples (Br-13)

Borehole 13

-3-

Depth of borehole: 25.0 m
Earth mark: 49.80 m
Coordinate (WGS84/UTM zone36N):
x=5204231,617; y=414919,764

Groundwater level: non-available (13.05.19)
Start date of drilling: 25.04.19
End date of drilling: 25.04.19

Layer number	Bottom of the layer,m: Depth	Bottom of the layer,m: Absolute mark	Layer thickness,m	Cross-section Scale 1:200	Sampling depth	LGW	Lithological description of soils
1	0.9	48.90	0.9				Soil-vegetative layer - loam, dark gray, hard
2	5.0	44.80	4.1				Loam, dark brown, hard, with the inclusion of limestone gravel 10-20%
3	8.6	41.20	3.6				Loam, light brown, hard, with the inclusion of carbonate gravel (Loess-like eolian-deluvial, vd)
4	20.6	29.20	12.0				Loam, dark brown, hard and very stiff, with layers of green-gray clay, hard and very stiff consistency. Angle of slip is 70°-90° (very few)
5	22.5	27.30	1.90				Loam light gray, hard and very stiff, with layers of sand 20-30%
6	25.0	24.80	2.5				Medium sand, light brown, low degree of water saturation, with the inclusion of gravel 10-20% (absolutely dry)

Rev.	Q-ty	Sheet	Annex number	Signature	Date	23-04-19-L	Sheet 3

ФОРМАТ / SIZE : A4

Figure 9-8-7. Boring Log (Br-13)

2) Extensometer Survey

The monitoring graph of the extensometers is shown in Figure 9-8-8. Each extensometer has been installed at the step around GL 44m. The interval of two extensometes is around 20m.

S-1: Soon after started monitoring on May 1st, the device recorded compression of 0.1mm, but there was no movement after May 10th. On June 28th, tension movement was observed and on July 11th, cumulative compression of 1.0mm was recorded. After that, the tension movement was accumulated although there was a period without temporary fluctuation. The total displacement until mid-October was ＋5.3mm, and the monthly average displacement since July was ＋1.5 ㎜ / month.).

S-2: Monitoring started on May 8th. The device recorded cumulative compressional moving of -2.5 mm by May 22nd and the subsequent oscillations had subsided. However, the accumulation of tension moving becomes remarkable from June 28th, with cumulative tension moving of 2.3 mm till 11th July. In addition, it was confirmed that this measuring instrument was stolen with the protection pipe at the on-site confirmation on July 30. The installation site was in a forest that is difficult to see, and the sensor machine was buried in the ground, but it was assumed that the sensor was taken away by a person who wanted to steal the pipe.

Although these two devices show cumulative accumulation of movement, there is no continuous cumulative trend, and the cumulative fluctuation amount is 2 mm/ month or less. Possibility of landslide is low, and there is a possibility of measuring the looseness of the surface that occurred temporarily locally.

3) Pipe Strain Gauge Survey

Pipe strain gauges were installed at lower (Br-11), middle (Br-12), higher (Br-13, flat area) parts of the site. The monitoring graphs of the pipe strain gauges are shown in Figures 9-8-9 to 9-8-11.

Br-11: During the first observation (May 3rd to May 13th) this device observed about 300 (μ strain) displacement at depths near GL-14 m in a clay layer which is about 1m above limestone. However, no particular cumulative displacement has been observed since. . (363 (μ-strain) as of October 21)

Br-12: During the first and second observations, the device recorded about 400 (μ strain) displacement at the bottom of the hole and at depths near GL-23 m in a clay layer which is below the sand layer. However, no particular cumulative displacement has been observed since. (440 (μ-strain) as of October 21)

Br-13: Except for about 100 (μ strain) accumulated displacement observed at near GL-22m during the first observation, the device has not recorded any noticeable displacement. The cumulative value as of October 21 is only 139 (μ-strain).

Normally, when landslide moving are active, the cumulative tendency of the same trend is shown at the same time at a specific depth. In this site, cumulativeness was monitored at several depths at the beginning, but the cumulative tendency thereafter has been calmed down. In addition, the cumulative strain for 6 months is 500μ-s or less, and the strain of these depth cannot be recognized as slip surface moving. It is surmised that the moving at the initial stage of the moving is the displacement until the pipe with the sensor adapts to the ground at a specific depth due to differences in hardness and water retention of the ground.

4) Piezometer survey

The monitoring graph of the Pezometer is shown in Figure 9-8-8. Piezometers used the same holes as the pipe strain gauges. The locations were lower (Br-11), middle (Br-12), higher (Br-13,flat area) parts of the site.

Br-11: The groundwater level in this hole stayed at around GL-19m.

Br-12: The groundwater level of this hole stayed between GL-23-24 m.

Br-13: No groundwater was observed in this hole.

5) Displacement Stake Survey

The monitoring graph of the Displacement stakes is shown in Figures 9-8-12 and 9-18-13.Monitoring lines of displacement stake ware placed orthogonal to the landslide line as P-1 and P-2. Most of the elevation values measured by GPS were within 0.1m. Similarly, it remains within the coordinate range within 0.05m in the horizontal direction. When there is significant landslide activity,

there is a tendency of subsidence and movement in a specific direction in the area other than the fixed areas on both sides of the graph, but such tendency is not observed in this area.Therefore, there are no moves due to landslides.

6) Evaluation for possibility of landslide

The following table shows the observed values of each monitoring device and the possibility of landslide moving. In Route 2, there was no moving equivalent for landslide to class b, which is evaluated as "almost definite."

Table 9-8-2. Evaluation for possibility of landslide (Route2)

Monitoring device	Measured Value	Value of Landslide Occurrence（Class-b）	Evaluation
Extensometer	S-1 :1.5mm/month S-2 : -0.2mm/month	Cumulative fluctuation amount is more than 2 mm/ month	c
Pipe Strain Gauge	Br-11: 363μ/6month Br-12 :440μ/6month Br-13 :139μ/6month	Cumulative strain for more than 1000μ-s / month	c～d
Piezometer	Lower than slip surface. Constant deprh or no water	Higher in the landslide block. Moving by rainfall.	d
Displacement Stake	Vertical: less than 0.1mm Horizontal: less than 0.05m There is no difference for inside and outside of landslide block.	More than 0.1m inside the landslide block and indicate same tendency of moving.	d

The landslide moving evaluation criteria were in accordance with Table 9-8-3 prepared by JICA Survey Team. The evaluation criteria pf extensometers and pipe strain gauges were determined based on Tables 9-8-4 and 9-8-5 from the PWRI (Public Works Reserch Institute) Technical Note “Glidelines for Landslide Prevention Technologies(Draft) ” (September 2007).

Table 9-8-3. Evaluation of landslide activity by variation classification

Classification	Extensometer	Pipe strain gauge
a／Definite moving	Active movement (more than 10mm/month)	Definite slip surface (more than 5000μ－s/month)
b／Almost definite Semi deterministic moving	Slowly moving (more than 2-10mm/month)	Semi deterministic slip surface (more than 1000μ－s/month)
C／Continuous monitoring neccessary Potentially moving	Continuous monitoring requied (more than 0.5-2 ㎜/month)	Potentially slip surface (more than 100μ－s/month)
d／Abnormal moving	Local ground deformation Caused by other factors (Intermittent moving)	Caused by other factors (more than 1000μ－s/month, Short term)

*All the instruments focus on the presence or absence of variation accumulation.

Source:Arranged by JICA Survey team reference to the PWRI (Public Works Reserch Institute) Technical Note “Glidelines for Landslide Prevention Technologies(Draft) ” (September 2007).

Table 9-8-4. Landslide evaluation criteria based on the measurement results using a ground extensometer

Type of displacement variation	Daily displacement (mm)	Cumulative displacement (mm/month)	Cumulative trend in the same direction	Overall evaluation	
				Landslide evaluation	Activity level, etc.
Type A	More than 1	More than 10	Significant	Definite	Actively moving, surface and deep slides
Type B	0.1 – 1	2 – 10	Less significant	Almost definite	Slowly moving, clayey and collusive slides
Type C	0.02 – 0.1	0.5 – 2	Slight	Latent	Continuous monitoring necessary
Type D	More than 0.1	None (Intermittent displacement)	None	Abnormal	Local ground deformation, others

Source:PWRI (Public Works Reserch Institute) Technical Note “Glidelines for Landslide Prevention Technologies(Draft) ” (September 2007)

Table 9-8-5. Landslide evaluation criteria based on the measurement results using a pipe strain gouge

Type of strain variation	Cumulative strain (μ/month)	Mode of strain variation		Slip surface presence - topologically/ geologically possible or not	Overall evaluation	
		Cumulative trend	State		Landslide evaluation	Sliding possibility
Type A	More than 5,000	Significant	Cumulative	Yes	Definite	Very active bedrock – landslide with colluvial deposit
Type B	More than 1,000	Less significant	Cumulative	Yes	Fairly definite	Landslide with rather slow creep
Type C	More than 100	Slight	Cumulative Intermittent Disturbance Recurrence	Yes	Latent	Presence of a slip surface not confirmed. Continuous observation necessary
Type D	More than 1,000 (short period)	None	Intermittent Disturbance Recurrence	No	Abnormal	No slip surface exists. Attributable to factors other than a landslide.

Source:PWRI (Public Works Reserch Institute) Technical Note “Glidelines for Landslide Prevention Technologies(Draft) ” (September 2007)

.

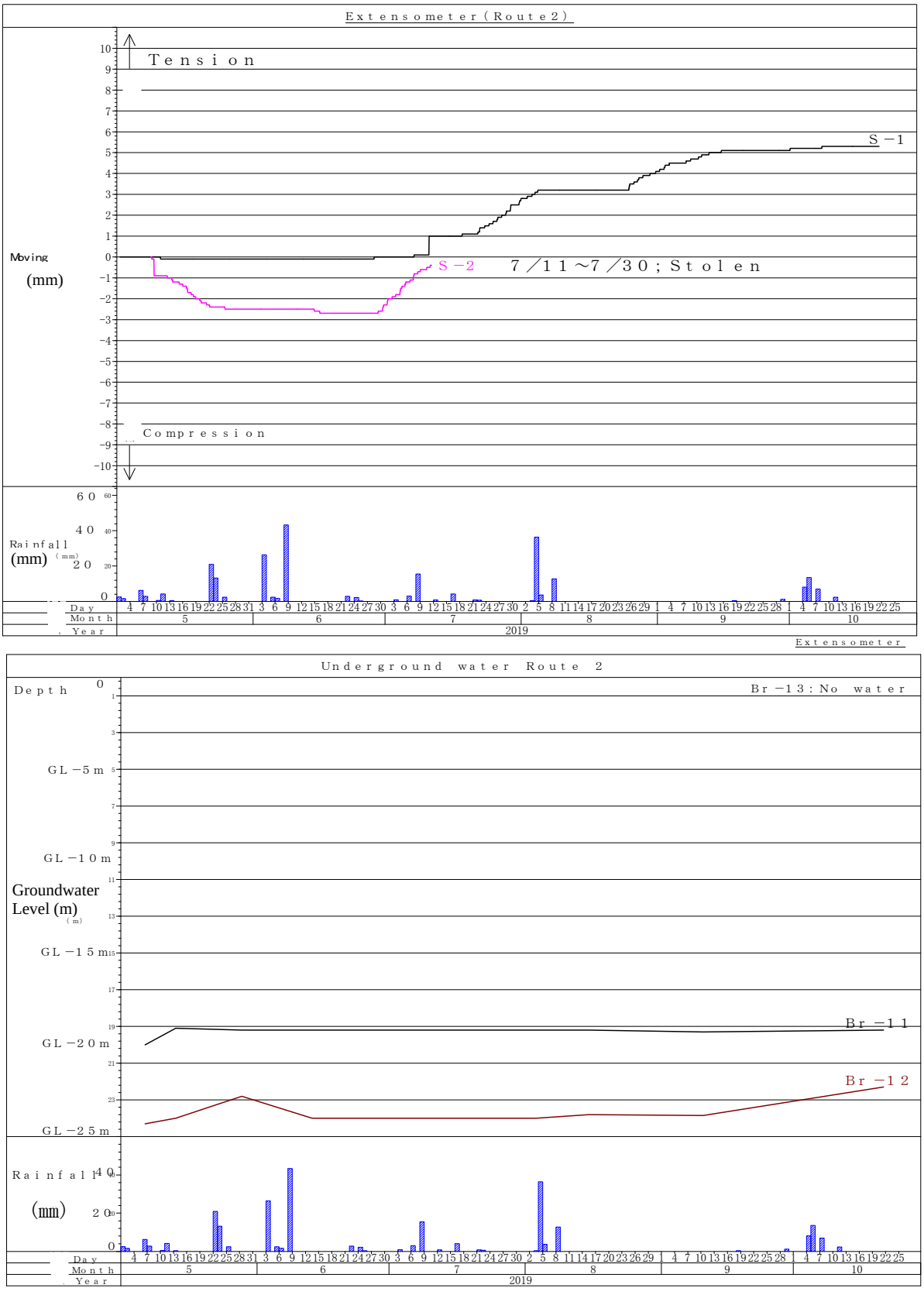
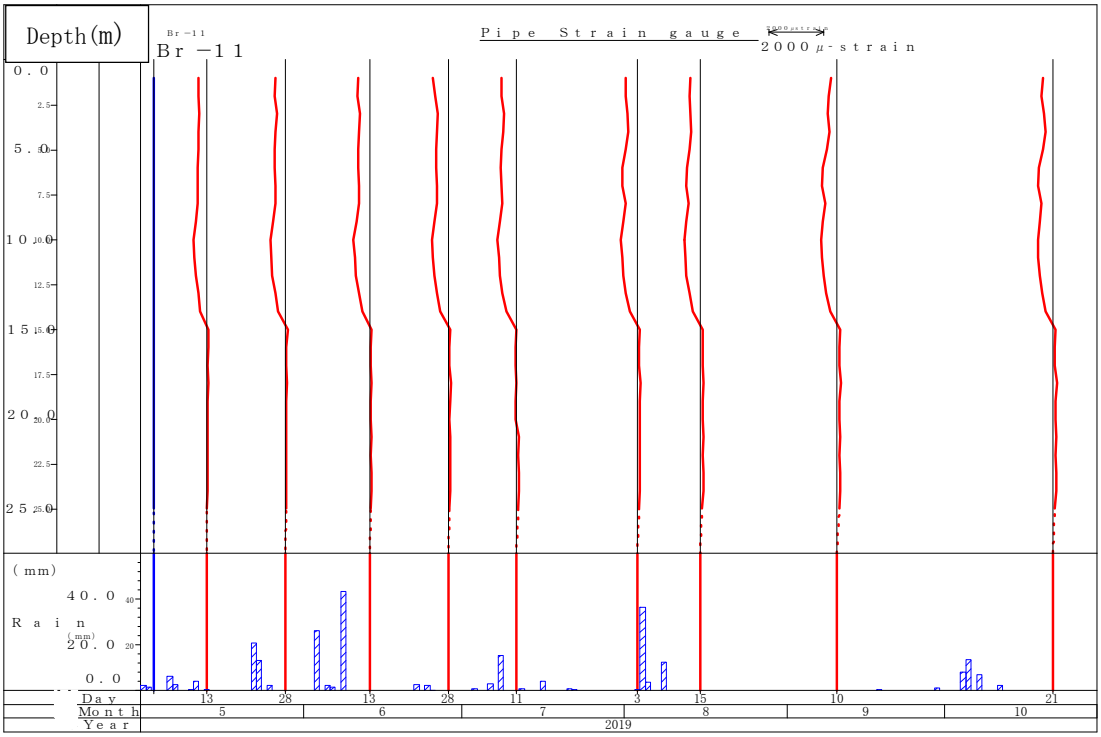


Figure 9-8-8. Monitoring Graph (Route 2: Extensometer, Piezometer)



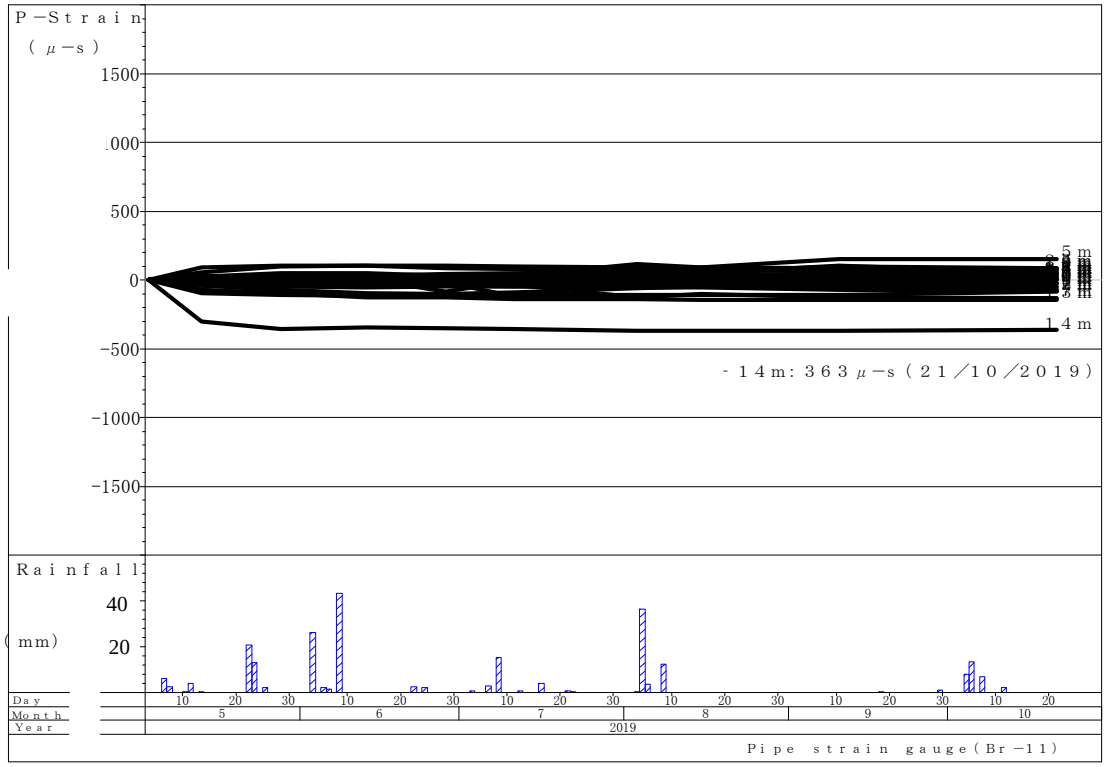


Figure 9-8-9. Monitoring Graph (Route 2: Pipe Strain Gauge Br-11)

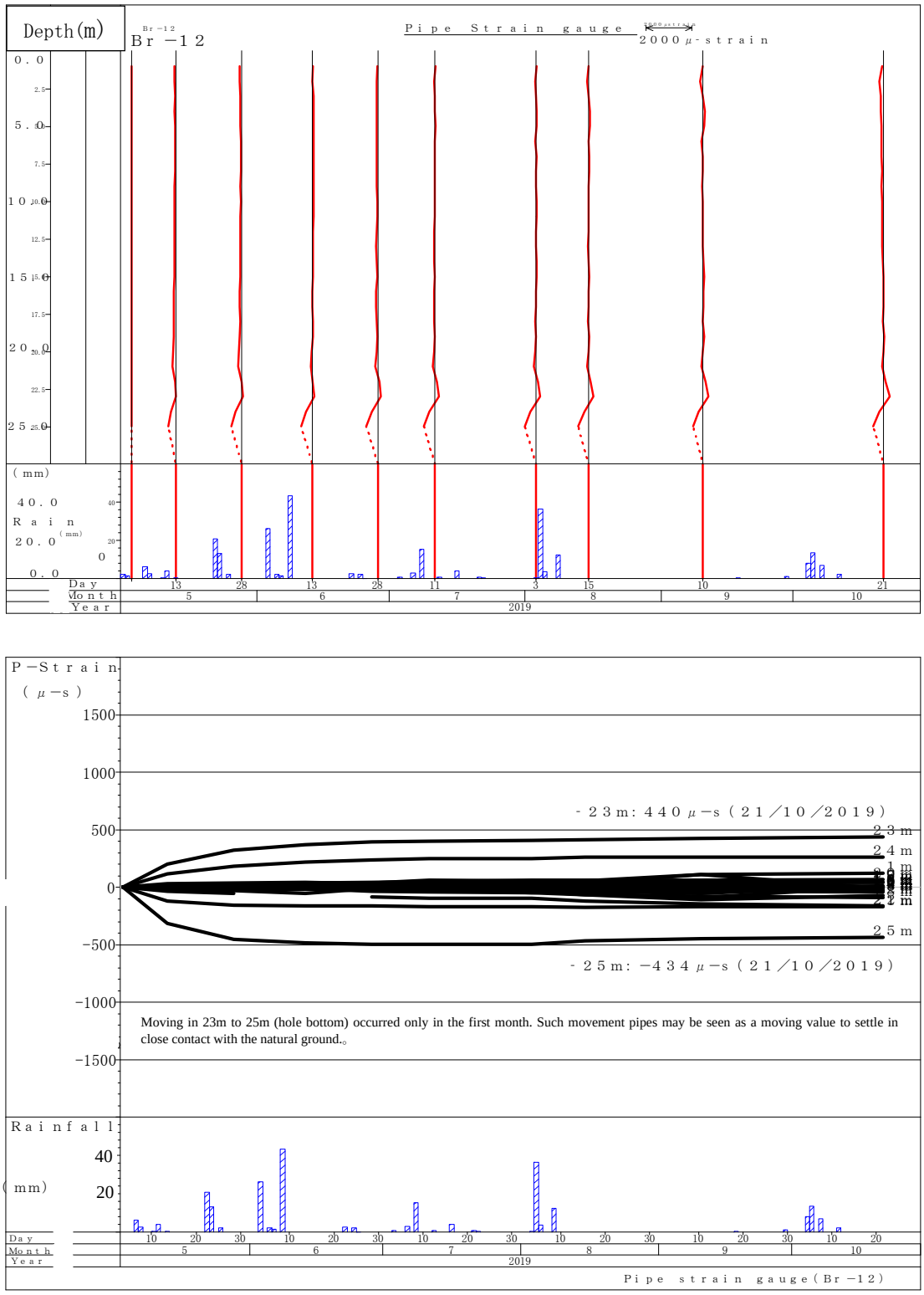
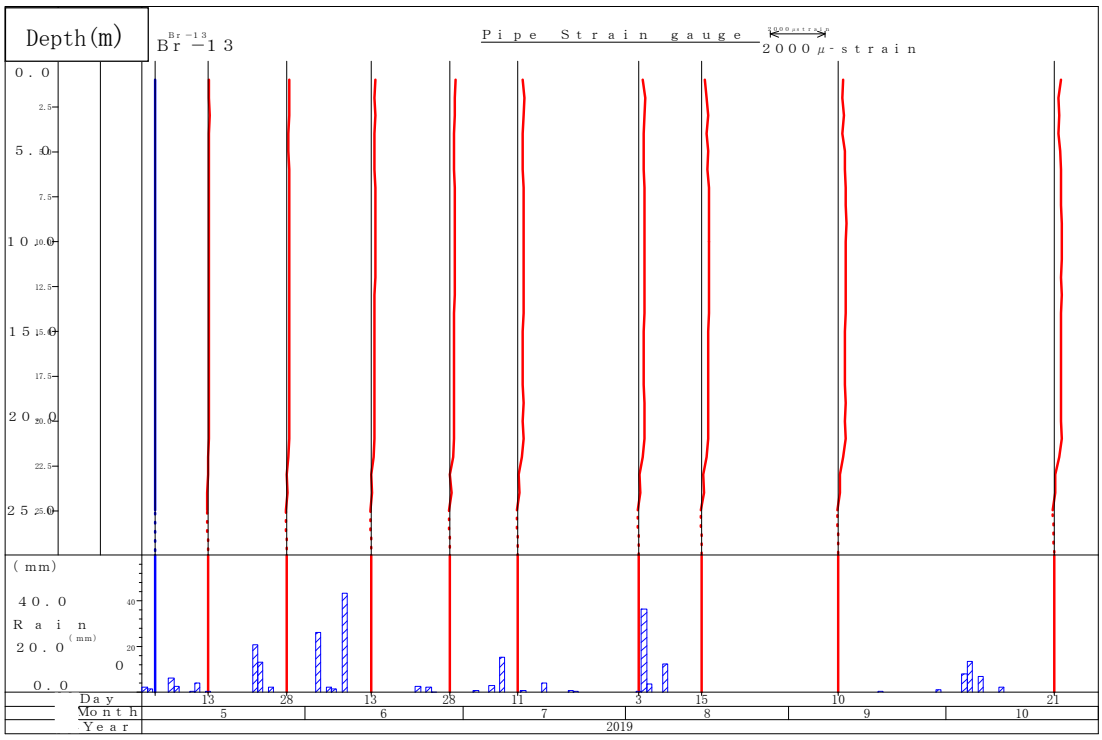


Figure 9-8-10. Monitoring Graph (Route 2: Pipe Strain Gauge Br-12)



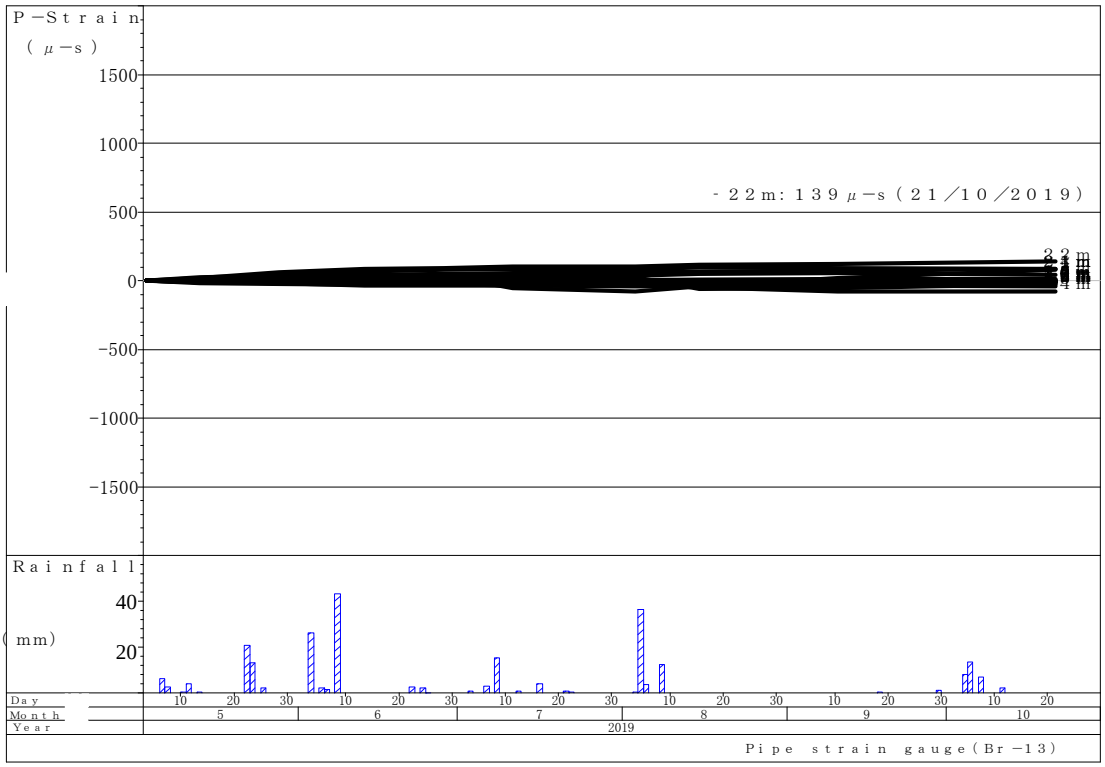


Figure 9-8-11. Monitoring Graph (Route 2: Pipe Strain Gauge Br-13)

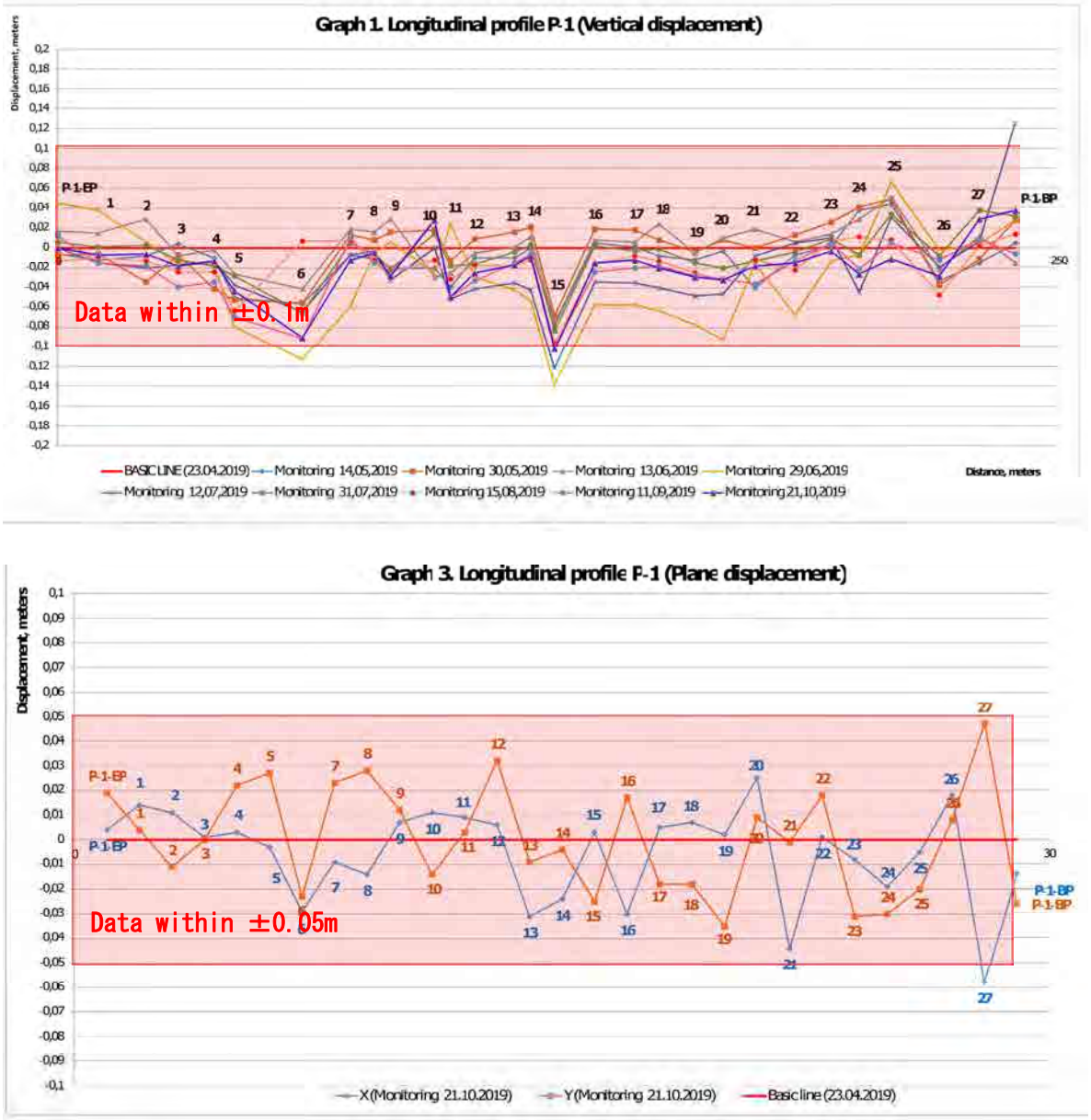


Figure 9-8-12. Monitoring Graph (Route 2: Displacement Stakes P-1)

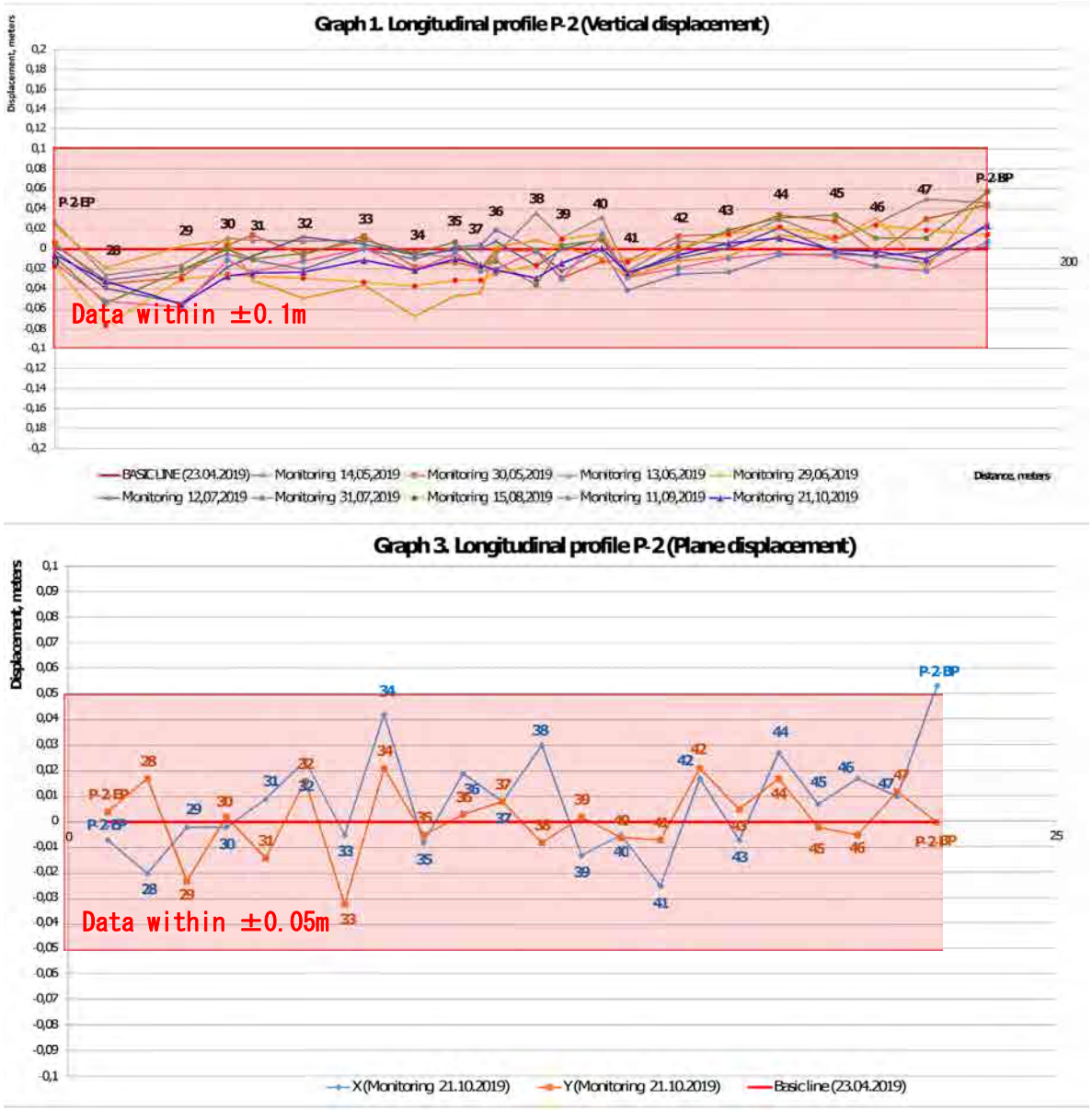


Figure 9-8-13. Monitoring Graph (Route 2: Displacement Stakes P-2)

9-8-2 Route 3

1) Boring survey

The boring survey shown in the table below was conducted for Route 3.

Table 9-8-6. Quantity of Boring Survey for Route 3

Borehole No.	Elevation (m)	Survey depth (m)	Location	Groundwater level (m)
Br-14 (No. 4 Initial plan)	19.8	25.0	Central part of envisioned landslide	-19.8
Br-15 (No. 5 Initial plan)	27.0	26.0	Top part of envisioned landslide	None
Br-16 (No. 6 Initial plan)	33.1	25.5	Plateau (apart from envisioned landslide)	-14.8

Boring survey and field survey made the following information clear:

- At Br-14, closest to the river, limestone appears nearly at the same elevation as the limestone outcrops near the edge of the river.
- This limestone is at nearly the same elevation at Br-15 as well, and thus is regarded as nearly horizontal sedimentation in this area.
- Despite the difficulty determining landslide surfaces from core samples, the intermixture of organic materials, slip surface and other features of the samples from Br-15 supports the assumption that the landslide surface is near GL-12.3 m.
- As for presently confirmed deformations (that have occurred since February 2019), intermittent small steps and cracks of the behind slope of Br-14 have been confirmed; these appear to indicate movement of the head of a small landslide toward the river, with a layer thickness of roughly 5 m.

The following are map of the survey, pictures of the core samples and boring logs.

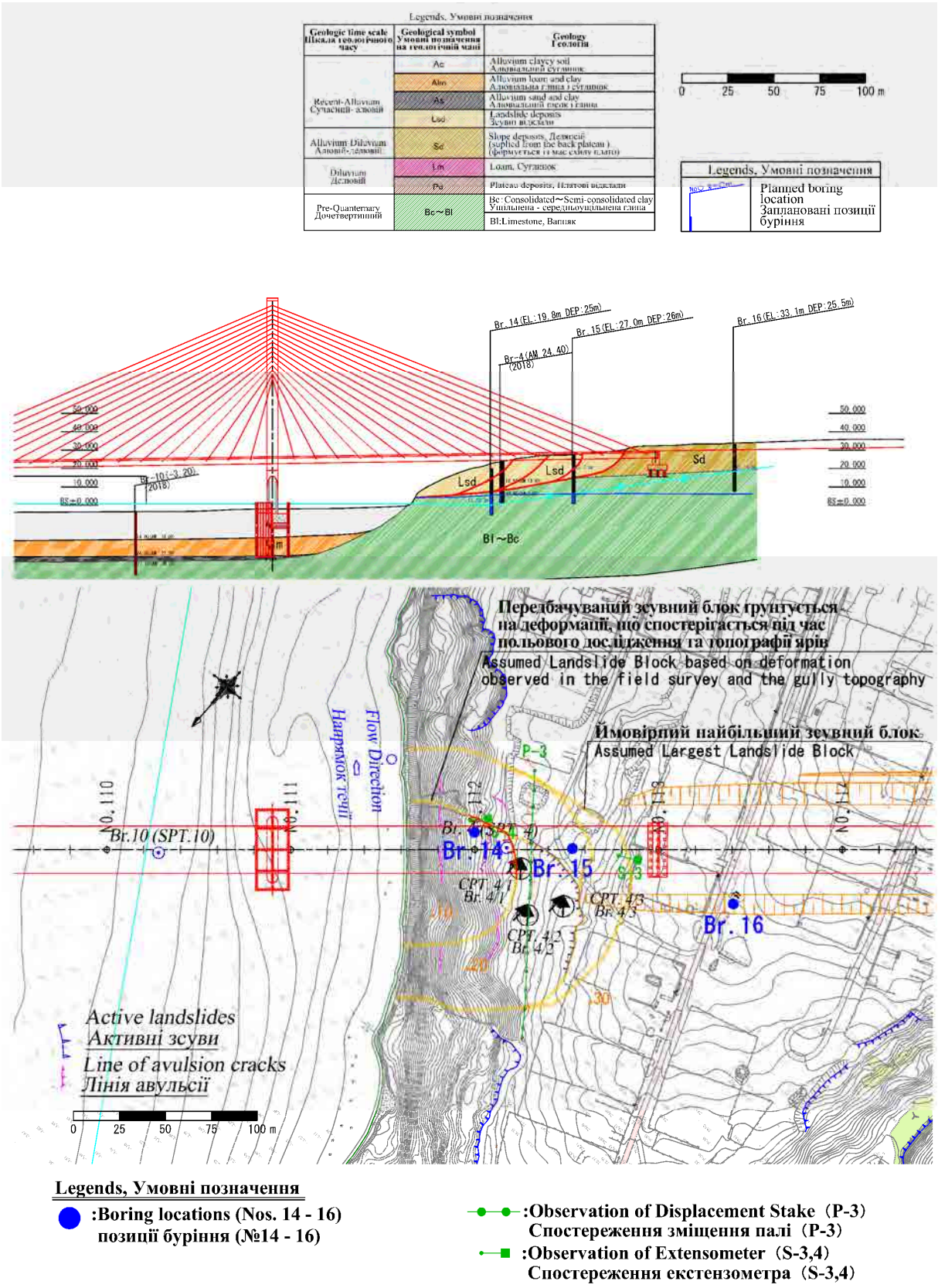
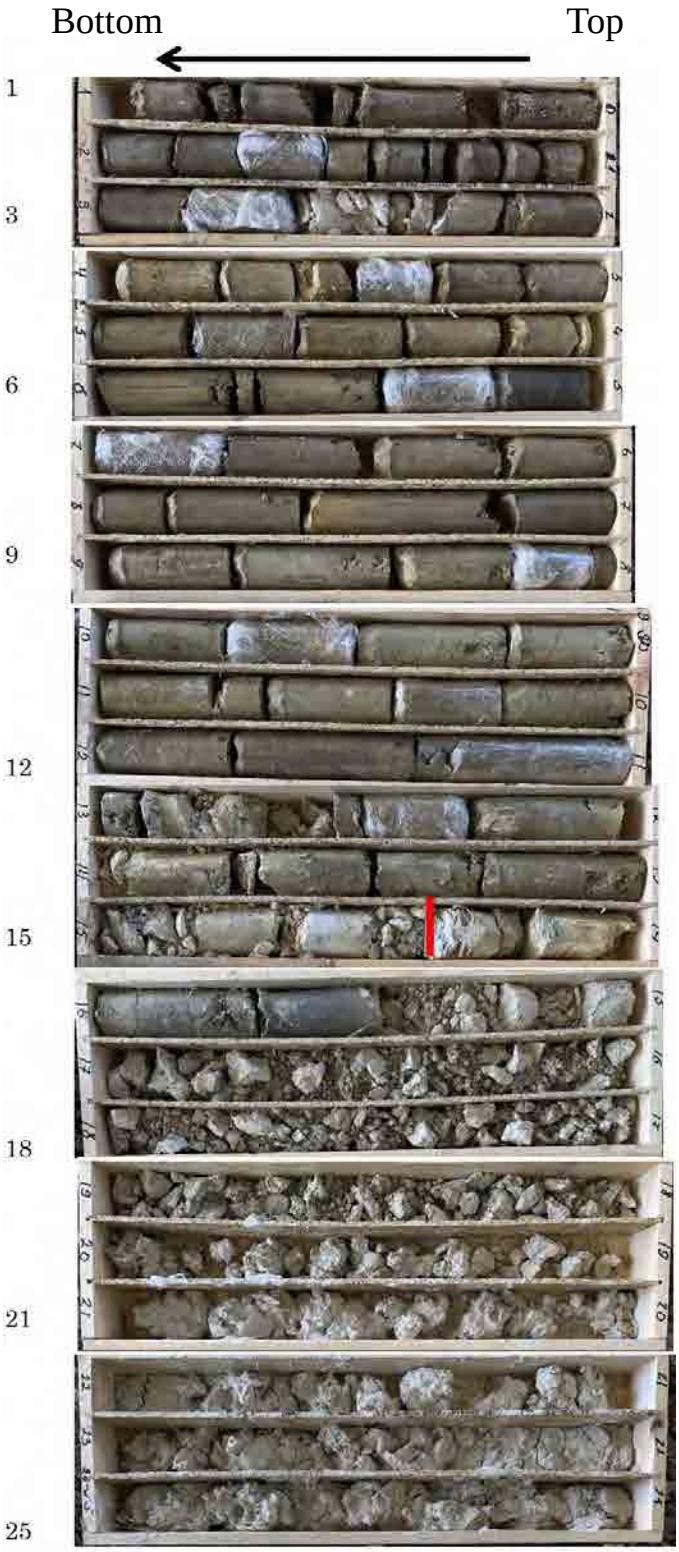


Figure 9-8-14. Map of the Complementary Survey (Route 3)



Br-14			L=25.5m
0	–	0.2	Topsoil
0.2	–	2.6	Cohesive soil, green-gray
2.6	–	5.0	Cohesive soil, green-gray/brown-gray, hard
5.0	–	12.5	Cohesive soil, greenish-gray, hard to medium hard
12.5	–	14.4	Cohesive soil, greenish-gray/light green, hard to medium hard, with the inclusion of limestone gravel
14.4	–	16.0	Limestone, fractured, with clay layers
16.0	–	25.5	Limestone, light gray, fractured
Near 19.0			Groundwater level

Figure 9-8-15. Picture of the Core Sample (Br-14)

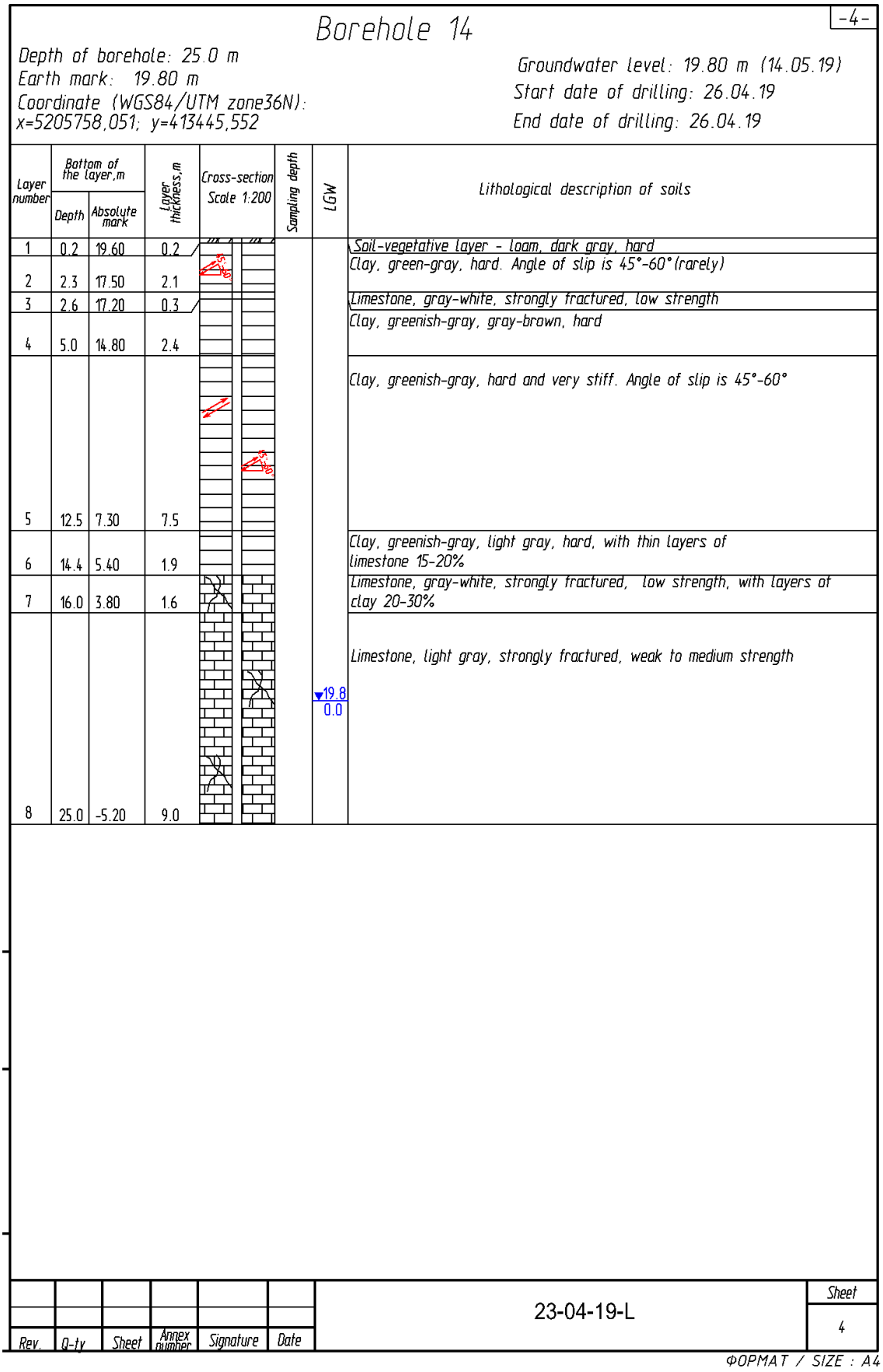
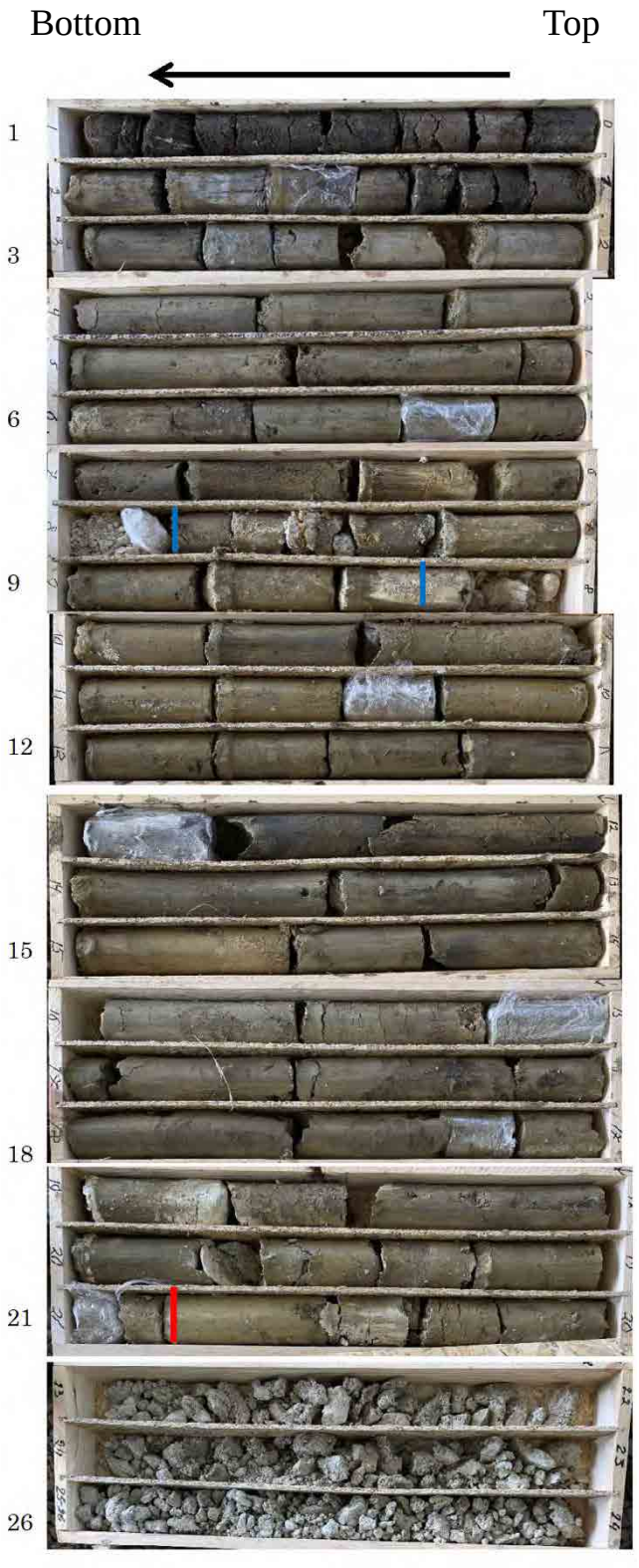
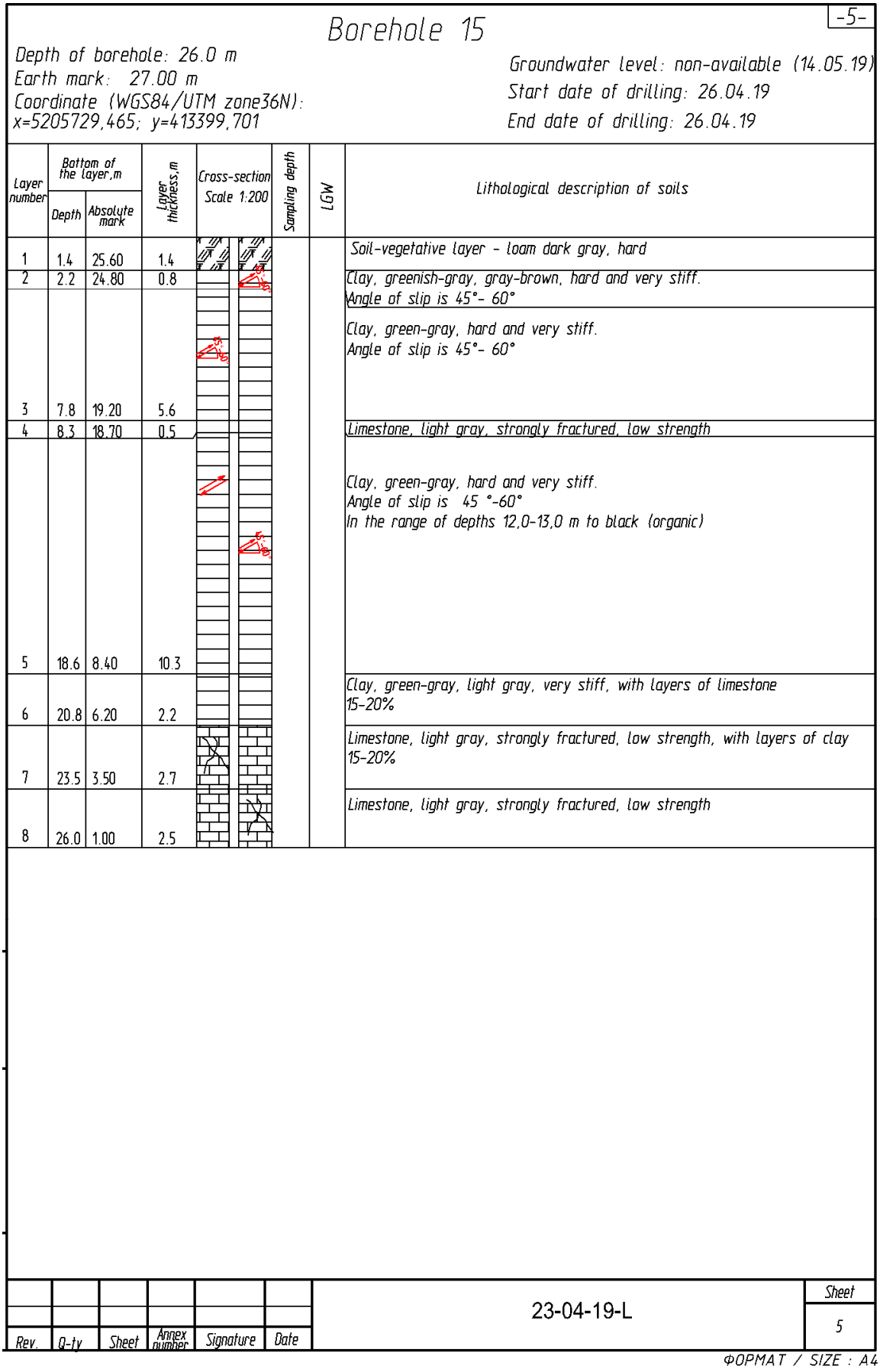


Figure 9-8-16. Boring Log (Br-14)



Br-15			L=26.0m
0	–	1.4	Topsoil
1.4	–	2.2	Cohesive soil, green/brown
2.2	–	7.8	Cohesive soil, grayish-green, hard to medium hard
7.8	–	8.3	Limestone, thin layer
8.3	–	12.0	Cohesive soil, grayish-green, hard to medium hard
12.0	–	13.0	Cohesive soil, dark gray/brown, shallow groundwater
13.0	–	18.6	Cohesive soil, swelling
18.6	–	20.8	Cohesive soil, green/light gray, medium hard, with thin layer of limestone
20.8	–	23.5	Limestone, with inclusion of a cohesive soil layer
23.5	–	26.0	Limestone, fragmented core
25.8			Groundwater level

Figure 9-8-17. Picture of the Core Sample (Br-15)



Borehole 15

-5-

Depth of borehole: 26.0 m
Earth mark: 27.00 m
Coordinate (WGS84/UTM zone36N):
x=5205729,465; y=413399,701

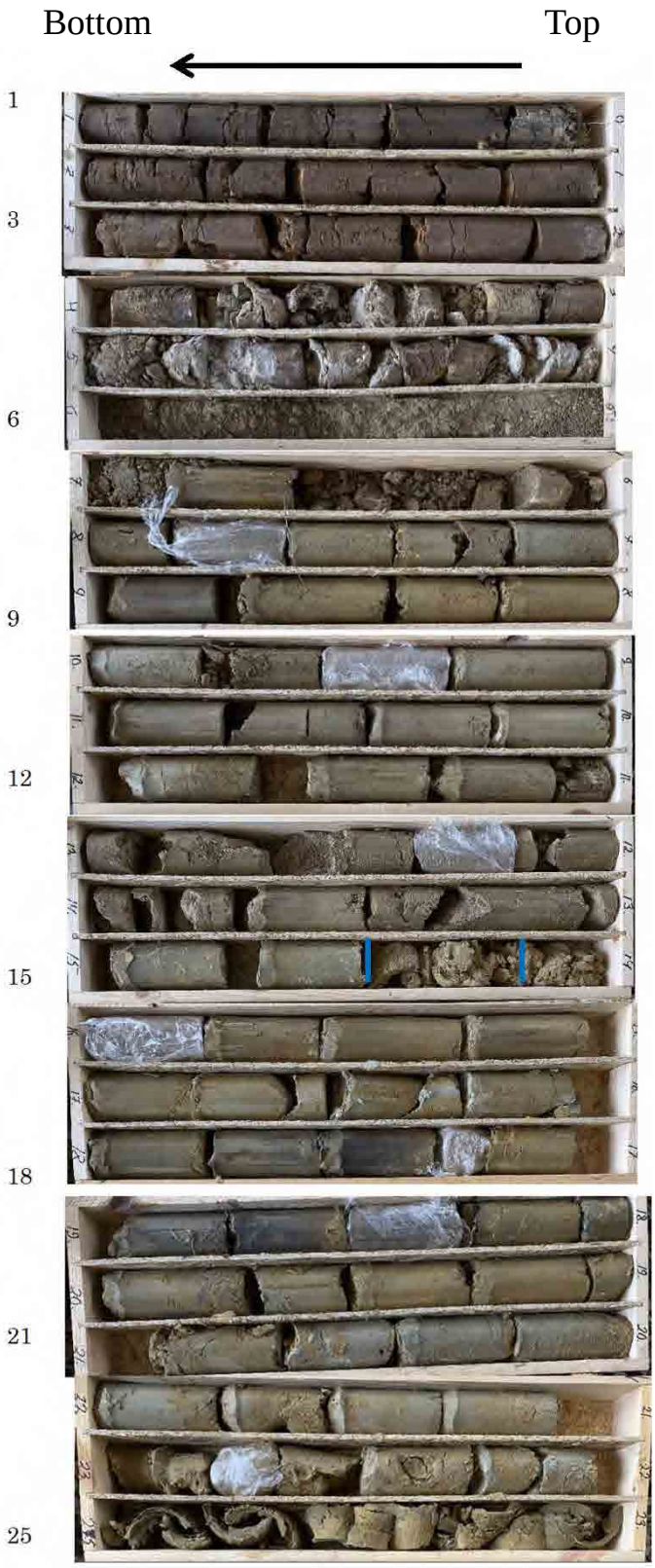
Groundwater level: non-available (14.05.19)
Start date of drilling: 26.04.19
End date of drilling: 26.04.19

Layer number	Bottom of the layer, m: Depth	Bottom of the layer, m: Absolute mark	Layer thickness, m	Cross-section Scale 1:200	Sampling depth	LGW	Lithological description of soils
1	1.4	25.60	1.4				Soil-vegetative layer - loam dark gray, hard
2	2.2	24.80	0.8				Clay, greenish-gray, gray-brown, hard and very stiff. Angle of slip is 45°- 60°
3	7.8	19.20	5.6				Clay, green-gray, hard and very stiff. Angle of slip is 45°- 60°
4	8.3	18.70	0.5				Limestone, light gray, strongly fractured, low strength
5	18.6	8.40	10.3				Clay, green-gray, hard and very stiff. Angle of slip is 45 °-60° In the range of depths 12,0-13,0 m to black (organic)
6	20.8	6.20	2.2				Clay, green-gray, light gray, very stiff, with layers of limestone 15-20%
7	23.5	3.50	2.7				Limestone, light gray, strongly fractured, low strength, with layers of clay 15-20%
8	26.0	1.00	2.5				Limestone, light gray, strongly fractured, low strength

Rev.	Q-ty	Sheet	Annex number	Signature	Date	23-04-19-L	Sheet 5

ФОРМАТ / SIZE : A4

Figure 9-8-18. Boring Log (Br-15)



Br-16			L=25.0m
0	–	0.2	Topsoil
0.2	–	3.1	Loam, dark gray, hard
3.1	–	5.0	Loam, brown/light brown
5.0	–	6.0	Sand, medium to coarse-grained, with inclusion of gravel
6.0	–	7.0	Loam, brown/light brown
7.0	–	9.0	Cohesive soil, green/green-brown, hard to medium hard
9.0	–	12.5	Cohesive soil, green-gray, hard to medium hard, with zone of rheological deformation
12.5	–	14.2	Sand, medium hard, with the inclusion of cohesive soil
14.2	–	14.5	Limestone, localized (gravel)
14.5	–	15.8	Cohesive soil, green-gray, hard to medium hard
15.8	–	17.3	Loam, light gray, gray-brown, medium hard, plastic deformation, with the inclusion of sand
17.3	–	25.5	Cohesive soil, greenish-brown, medium hard
14.0			Shallow groundwater

Figure 9-8-19. Picture of the Core Sample (Br-16)

Borehole 16

Depth of borehole: 25.5 m
Earth mark: 33.10 m
Coordinate (WGS84/UTM zone36N):
x=5205694,249; y=413314,125

Groundwater level: 14.8 m(14.05.19)
Start date of drilling: 26.04.19
End date of drilling: 27.04.19

Layer number	Bottom of the layer, m: Depth	Bottom of the layer, m: Absolute mark	Layer thickness, m	Cross-section Scale 1:200	Sampling depth	LGW	Lithological description of soils
1	0.2	32.90	0.2				Soil-vegetative layer - loam, dark gray, hard
2	3.1	30.00	2.9				Loam, dark brown, hard
3	5.0	28.10	1.9				Loam, brown, light brown, hard, with layers of sand 20-30%
4	6.0	27.10	1.0				Medium sand, with layers of coarse, light brown, small degree of water saturation, with the inclusion of gravel 10-20%
5	7.0	26.10	1.0				Loam, dark brown, light brown, hard, with layers of sand 20-30%
6	9.0	24.10	2.0				Clay, greenish-gray, gray-brown, hard and very stiff. Angle of slip is 60° (1 pcs)
7	12.5	20.60	3.5				Clay, green-gray, very stiff and hard. Angle of slip in the depth range 11.0-11.3 m is 60°(2 pcs), in the depth range 12.0-14.0 m is 60°-70°
8	14.2	18.90	1.7				Clay, green-gray, very stiff, with nests and sand lenses. There are traces of water
9	14.5	18.60	0.3			▼14.8	Limestone highly fractured, low strength
10	15.8	17.30	1.3			18.30	Clay, green-gray, hard and very stiff
11	17.3	15.80	1.5				Loam, light gray, gray-brown, very stiff and stiff, with thin layers of silty sand. Angle of slip at a depth of 16.1 m is 45°-50° (traces of water)
12	25.5	7.60	8.2				Clay, greenish-gray, hard and very stiff, in the depth range 18.2-19.0 m - organic, very stiff, angle of slip is 30°-45°, from the depth of 22.0 m is stiff, there are weak traces of water, with layers of loam

Rev.	Q-ty	Sheet	Annex number	Signature	Date	23-04-19-L	Sheet 6

ФОРМАТ / SIZE : A4

Figure 9-8-20. Boring Log (Br-16)

2) Extensometer Survey

The monitoring graph of the extensometers is shown in Figure 9-8-21. S-3 has been located on the flat area which crossing largest scale landslide perimeter line. S-4 has been located on the lower slope which crossing on the small landslide perimeter line. These two extensometers have been installed at the upper area of each landslide block.

S-3: From the monitoring started till late June, this device recorded only temporary slight movement. The cumulative compression movement of -4.6 mm was recorded between June 28th and Oct 21st. The average monthly displacement during this period is -1.3mm.

S-4: This device recorded a cumulative tension movement of + 0.4 mm until the middle of May. Since late June, compression movement started and accumulated -12.9 mm compressional movement until end of Sep.In early October, a tension movement of +1.9 mm was recorded. The average monthly displacement since late June is -2.7mm.

These two devices show a commonality in the cumulative accumulation of monitoring data, with an average movement amount of 1.3 to 2.7 mm / month. However, although the movement of the landslide block of the assumed scale causes a tension movement peculiar to the landslide head, a compression movement occurs, and it is considered that the relevance with the assumed landslide block is low.

3) Pipe Strain Gauge Survey

Pipe strain gauges were installed at lower (Br-14), middle (Br-15), higher (Br-16, flat area) parts of the site. The monitoring graphs of the pipe strain gauges are shown in Figures 9-8-22 to 9-8-24.

Br-14: This device has recorded a cumulative displacement of 824(μstrain) around GL-15m(EL+4.8 m). The trend of cumulative displacement has been moderate since mid-June.

Br-15: This device has recorded a cumulative displacement of 1593 (μstrain) around GL-6m(EL+21.0m). The trend of cumulative displacement has been moderate since early June.

Br-16: This device has recorded a cumulative displacement at GL-11m, 12m and the bottom of the hole. A cumulative displacement of 1546 (μstrain) has been observed at GL-12m(EL+11.0m). The trend of cumulative strain is clear only around GL-12m from July to August.

The pipe strain of GL-15m in Br-14 and GL-6m in Br-15 were considered to be equivalent to the landslide block B, but the accumulation has been extremely slow since June. Contrary to this, pipe strain around the depth of 12m in Br-16 accumulated in July to August, but no strain in other holes were recognized at the same time, and continuity as slip surface movement was not difinite by present data.

4) Piezometer Survey

Figure 9-8-21 shows the monitoring graph of groundwater level. Piezometers used the same hole as the pipe strain gauges. The locations were lower (Br-14), middle (Br-15), higher (Br-16, flat area) parts of the site.

Br-14: The groundwater level in this hole stayed around GL-20m.

Br-15: No groundwater was observed in this hole.

Br-16: The groundwater level in this hole stayed around GL-15m.

5) Displacement Stake Survey

Figure 9-8-25 shows the monitoring graph of displacement stake survey. Monitoring line of displacement stake was placed orthogonal to the landslide line as P-3.

Most of the elevation values measured by GPS were within 0.1m. Similarly, it remains within the coordinate range within 0.05m in the horizontal direction. When there is significant landslide activity, there is a tendency of subsidence and movement in a specific direction in the area other than the fixed areas on both sides of the graph, but such tendency is not observed in this area.Therefore, there are no moves due to landslides.

6) Evaluation for possibility of landslide

The following table shows the observed values of each monitoring device and the possibility of landslide moving. In Route 3, moving equivalent to class b, which is evaluated as "alomost definite" was monitored only at extensometer S-4. But there is a possibility that local displacements near the surface have been accumulated, since the equivalent moving are not seen in other measuring devices.

Table 9-8-7. Evaluation for possibility of landslide (Route3)

Monitoring device	Measured Value	Value of Landslide Occurrence（Class-b）	Evaluation
Extensometer	S-3 :-1.3mm/month S-4 :-2.7mm/month	Cumulative fluctuation amount is more than 2 mm/ month	b～c
Pipe Strain Gauge	Br-14: 824μ/6month Br-15 :1593μ/6month Br-16 :1546μ/6month	Cumulative strain for more than 1000μ-s / month	c
Piezometer	Lower than slip surface. No changes.	Higher in the landslide block. Moving by rainfall.	d
Displacement Stake	Vertical: less than 0.1mm Horizontal: less than 0.05m There is no difference for inside and outside of landslide block.	More than 0.1m inside the landslide block and indicate same tendency of moving.	d

The landslide moving evaluation criteria were in accordance with Table 9-8-3 prepared by JICA Survey Team same as Route 2. The evaluation criteria pf extensometers and pipe strain gauges were determined based on Tables 9-8-4 and 9-8-5 from the PWRI (Public Works Reserch Institute) Technical Note “Glidelines for Landslide Prevention Technologies(Draft) ” (September 2007).

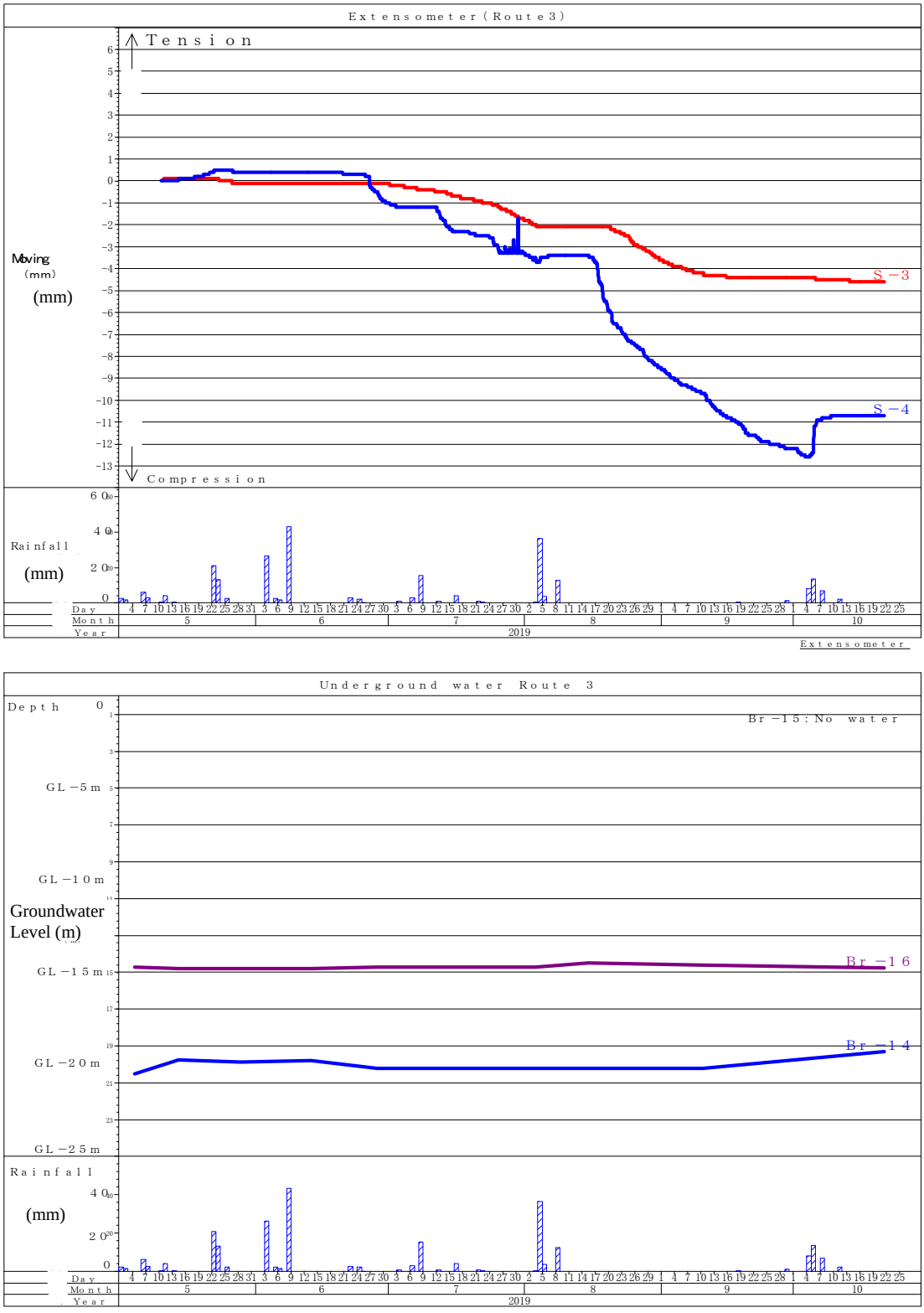


Figure 9-8-21. Monitoring Graph (Route 3: Extensometer, Piezometer)

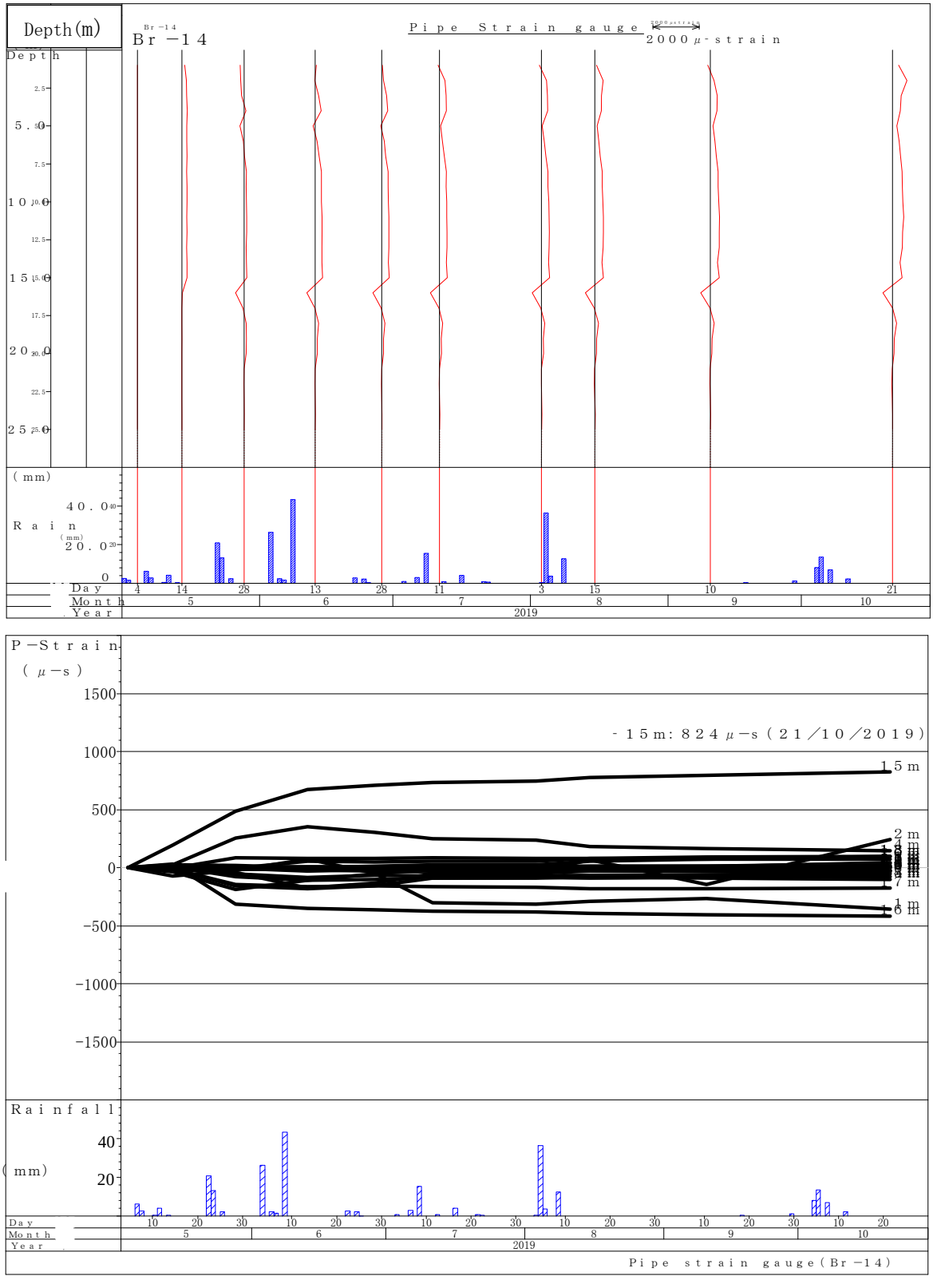


Figure 9-8-22. Monitoring Graph (Route 3: Pipe Strain Gauge Br-14)

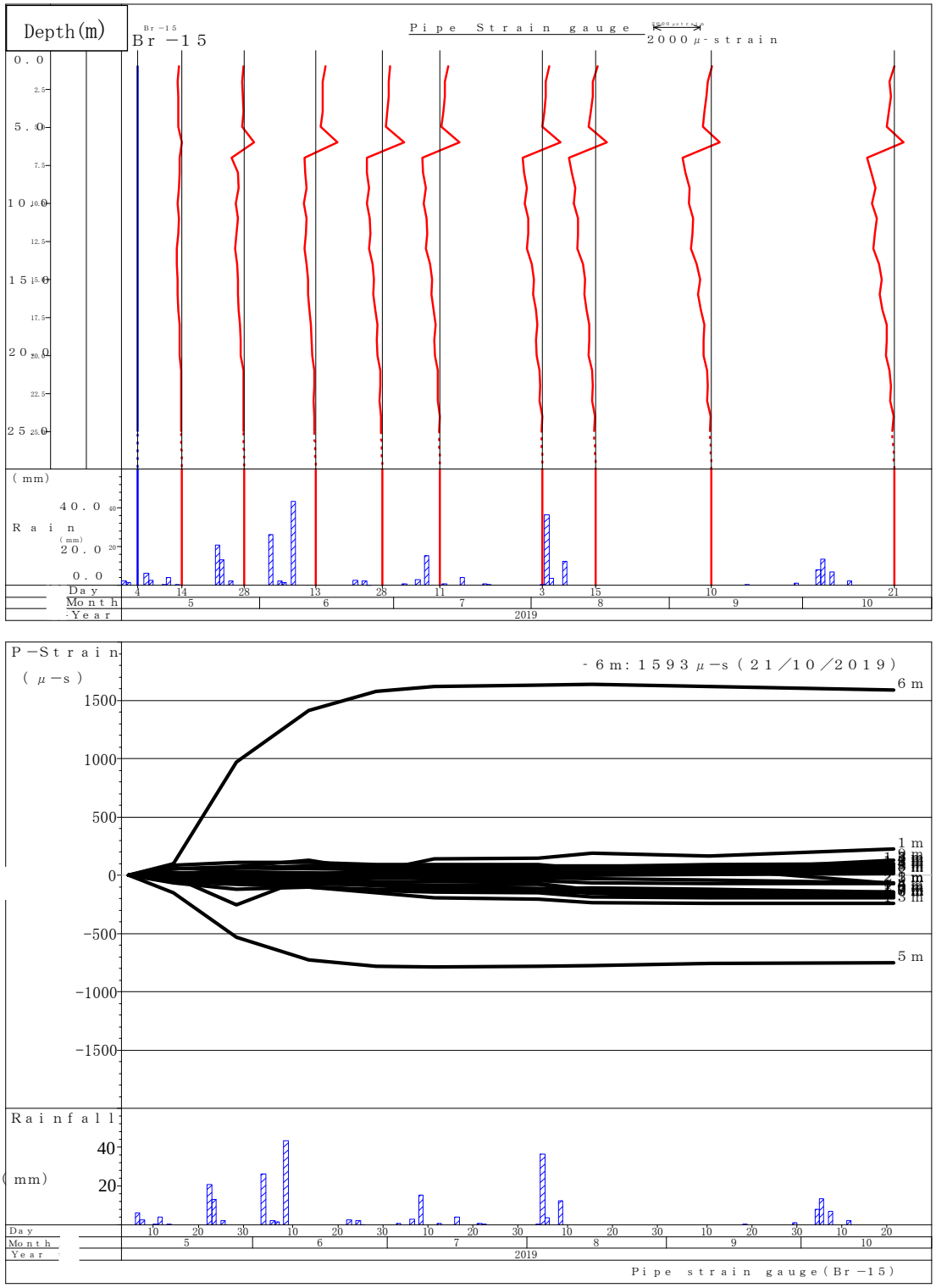


Figure 9-8-23. Monitoring Graph (Route 3: Pipe Strain Gauge Br-15)

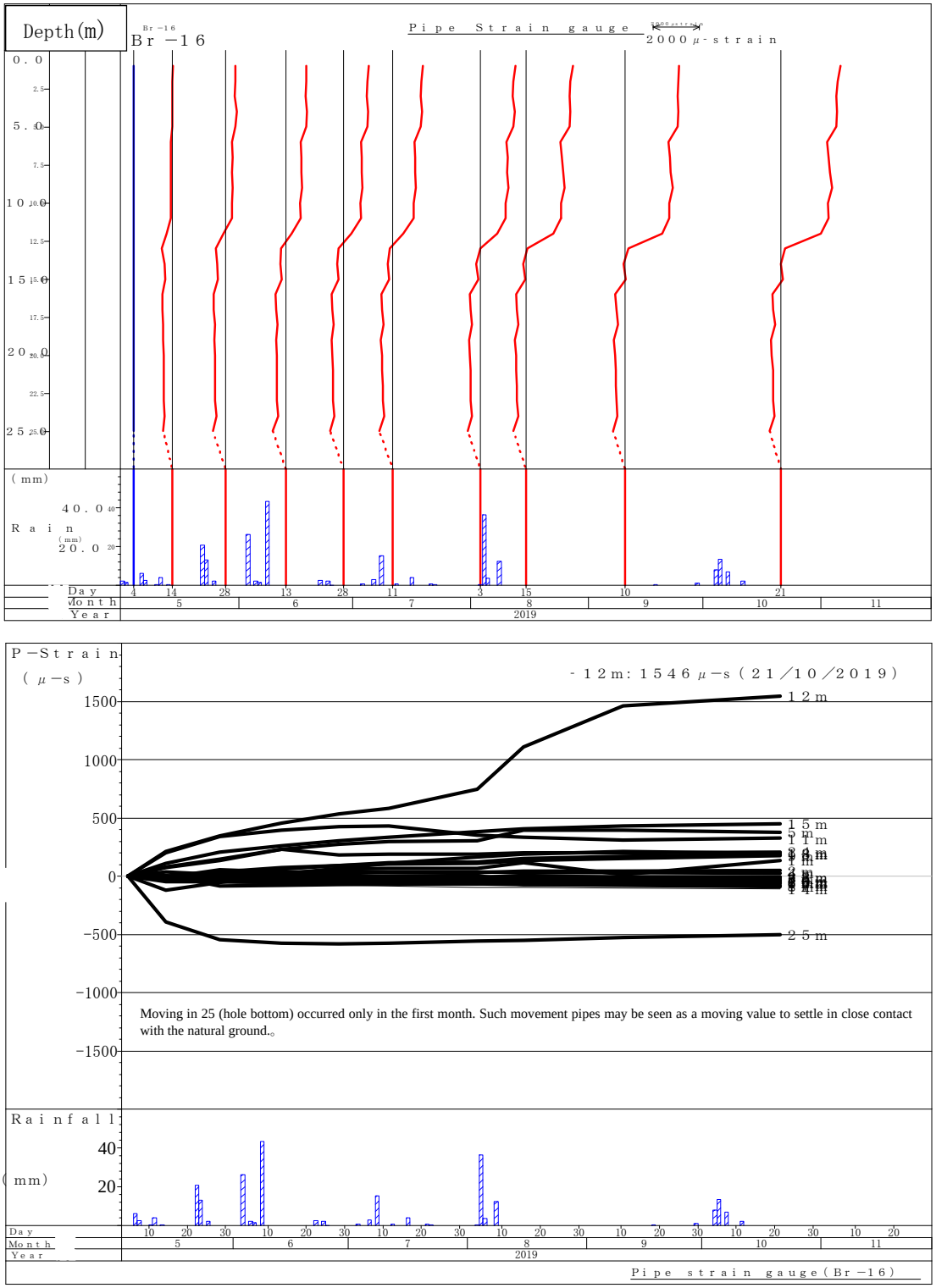
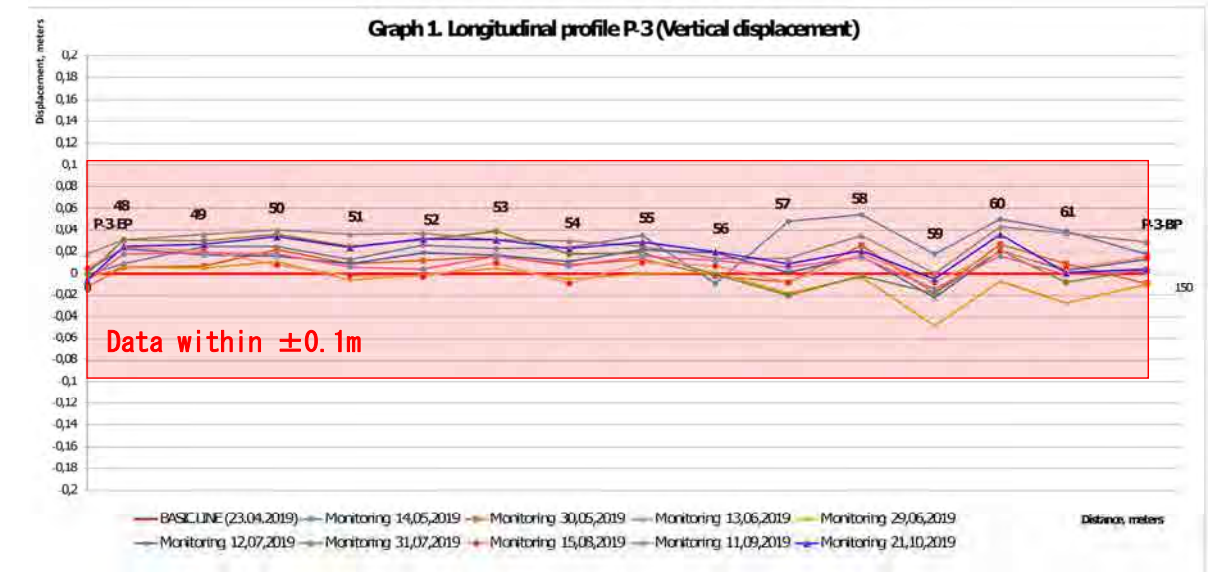


Figure 9-8-24. Monitoring Graph (Route 3: Pipe Strain Gauge Br-16)



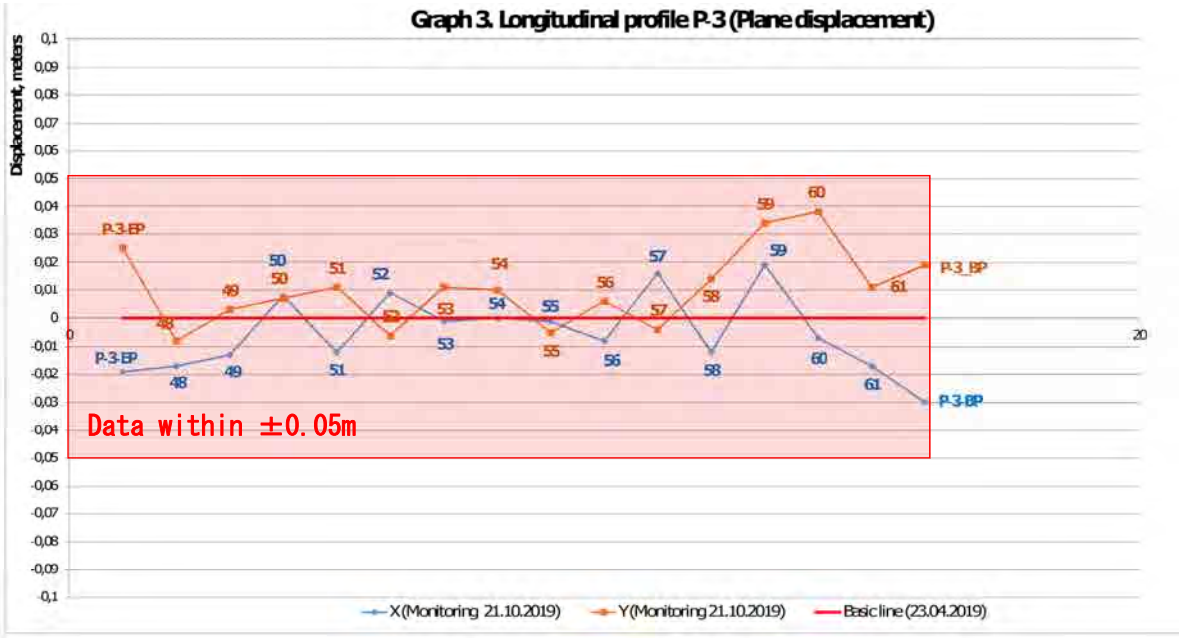


Figure 9-8-25. Monitoring Graph (Route 3: Displacement Stake P-3)

9-9 Landslide Countermeasures

Necessary measures for preserving road structures were examined based on the complementary survey (geological survey and monitoring) results. Basic design policy of the countermeasures based on the present landslide analysis and the slope stability analysis in each route are shown below.

9-9-1 Route 2

1) Landslide Analysis

・As a result of geological survey, the sand layer observed at about GL 24 to 27 m of Br-11, BR-8, Br-2 and Br-12 has a layer thickness of about 3 m and a horizontally continuous sedimentary layer. This layer is continuously observed till the plateau on the upper slope.

・The geologic layer above this sand layer is the loam and clay layer, and no disorder was found due to the secondary movement.

・Therefore, the ground higher than the sand layer mentioned above is likely to be a geologically stable ground, since there is no history of landslide movement.

・On the lower slope, the sand layer mentioned above is not confirmed from the topographical position.

・Landslide activity may become apparent in the future in the range of landslide block A with a width of about 60m. This landslide block has step topography on the head area and spring water from the side area affected by gully erosion.

・In the monitoring results, remarkable change which showed signs of landslide movement was not recognized.

Table 9-9-1. Monitoring result of Landslide(Route 2)

Devive	№	Location	Value of movement	Tendency of movement	Class
Extesometer	S-1	Upper	Accumulation +5.3mm Ave. +1.5mm/month	Temporary tension moving - tension moving	c
	S-2	Upper	Accumulation -0.4mm	Compression → tension, theft in July 2019	d
Pipe Strain Gauge	Br-11	Lower	363μ-s (-14m)	Cumulative deformation only at the beginning of monitoring but subsequently calms down	c～d
	Br-12	Upper	440μ-s(-23m)		
	Br-13	Plateau	139μ-s (-22m)		
Ground water	Br-11	Lower	Around GL-19m	Constant depth	d
	Br-12	Upper	Around GL-24m	Constant depth	
	Br-13	Plateau	No water	-	
Moving pile	P-1	Center	No moving	-	d
	P-2	Upper	No moving	-	

・Considering comprehensively, no clear landslide moving has occurred as of July 2019. In terms of comprehensive evaluation, this is equivalent to a landslide with a latent moving of class “c”, and it is evaluated as “continuous observation is necessary”.

・Bridge structures are planned outside the assumed landslide block. However, it is better to take preventive measures for landslide areas that may affect bridge structures for the future.

2) Design Policy of the Countermeasure Work

When landslide block A is activated, extrusion of soil mass to the pier (main tower) is expected. In addition, although the groundwater level has not been confirmed in the landslide mass on the main survey line, spring water is recognized from the sand layer on the side of this landslide block. Therefore, it is better to stabilize by combining drainage water method. From the result of geological survey, it is assumed that landslide is not existed from the middle to upper slopes However, in consideration of the long-term stability of the ground during and after construction of the abutment, it is better to set a structure that protects the abutment on the valley side. As other small scale landslide blocks are expected to have little impact on this route, it is considered that there is no need for countermeasures. For the longtime stability, it is necessary to consider the prevention of erosion of Gully and the riverbank.

3) Result of the Slope Stability Analysis

The result of slope stability analysis as follows.

Table 9-9-2. Result of slope safety analysis (Route 2)

Landslide block	Safety factor	Necessary Deterrence(Fsp=1.20)	Condition
Block A	Fs=1.00	Pr=449.9(kN/㎡)	Assumed high water (Slipsurface +3m)
	Fs=1.043	Pr=353.1(kN/㎡)	Downed water level (Maximum —3m)

4) Countermeasure Works

Map of Landslide Countermeasures is shown in Figure 9-9-1.

The steel pipe pile work and groundwater drainage work will secure a predetermined planned safety factor Fs> 1.2 for the landslide block A. In addition, gabion works will have the functuion for prevent the gully erosion. And the sheet pile at the front ground of the abutment will keep the stability of the ground aroud the abutment structures.

The result of the countermeasure work examination and the construction cost are as follows.

Table 9-9-3. Tentative Coutermeasures and Cost Estimation (Route 2)

（Unit：1000JPY）

	Type of the countermeasures	Detail	Estimated direct construction cost
Route 2	Steel pipe pile(STK400)	φ406.4×t19 18.0m/pile×43piles ΣL = 774.0m	81,000
	Drainage drilling(φ90mm)	25m/hole×5 holes×2pont ΣL＝250m	3,000
	Stability work(Abutment)	Steel Sheet pile L=11m, W=100m, @0.6m ΣL=1,100m	19,000
	Protection for gully erosion	Gabion workφ45 ㎝ L=8,142m	53,000
	Total		156,000

*Countermeasures for river erosion are separately booked

9-9-2 Route 3

1) Landslide Analysis

・As a result of geological survey, it was confirmed that there is a possibility of moving of several landslide blocks with different head positions in the soil above the limestone basement layer.

・Monitoring result of the case of pipe strain gauges, some ground movements were identified at specific depths. In particular, GL-15m of Br-14 matches the depth of the assumed slip surface, and GL-6m of Br-15 has accumulated ground deformation exceeding 1600μs. This movement is match to the Type “c” as presence of a slip surface not confirmed and countinuous observation necessary. The possibility of sliding surface connecting these two points was assumed. In addition, this landslide surface is corresponded to the assumed third-order slide, and it calls it "landslide block B" hereafter.

・The measuring instruments other than pipe strain gauges did not measure clear data indicating signs of landslides, but distortion occurred at an unexpected depth in July-September at a depth of 12 m at Br-16. Depending on the progress of the project, it is suggested to excavate Br-17 on the flat surface behind Br-16 and check for any changes related to the same period.

・ In terms of comprehensive evaluation, this is equivalent to a landslide with a latent moving of class “c”, and it is evaluated as “continuous observation is necessary”.

Table 9-9-4. Monitoring Result of Landslide(Route 3)

Devive	№	Location	Value of movement	Tendency of movement	Class
Extesometer	S-3	Upper	Accumlation-4.6mm Ave. -1.3mm/month	Accumulation only June	c
	S-4	Lower	Accumlation-10.7 ㎜ Ave. -2.7mm/month	Tension→No moveing →Compression	b
Pipe Strain Gauge	Br-14	Center	824μ-s (-15m)	Cumulative moving is up to early June. Later, the moving was subsided.	c
	Br-15	Upper	1593μ-s (-6m)		
	Br-16	Plateau	1545μ-s (-12m)	The accumulation starain from July to September is remarkable.	
Ground water	Br-14	Center	Around GL-20m	Constant depth	d
	Br-15	Upper	No water	-	
	Br-16	Plateau	Around GL-15 m	Constant depth	
Moving pile	P-3	Center	No moving	-	d

・The data of pipe strain gauge indicate the possibility of minor landslide moving. However, the bridge structure is not planned the point which is directly affected by landslides.

・It is necessary to consider long-term stabilization measures for landslide areas, including the areas where deformation has been occurred.

・In addition, as explaind in Chapter 7,river bank erosion is proigression both Route 2 and 3. And it is considered to be an immadeate cause of landslides. To account for that, riprap and river bank protection shall be installed on river banks within the maximum landslide block.

2) Design Policy of the Countermeasure Work

・The largest landslide block C of width 150m, and the other landslide blocks are included in the block C.

・On the cross-sectional view, first, second, third(Block B), and fourth-order slips(Block C) are continuous in a positional relationship.

・The countermeasure construction should consider for the fourth-order slip which is the most influential when the scale is large activity.

・And the check work of the countermeasure effect is needed. The effect to the third-order landslide which is currently moving should be checked.

・The main countermeasure work is steel pipe piling work. Groundwater level is not observed in landslide block, but groundwater drainage work should be considered for drainage effect for during excess water in rainfall.

3) Result of the Slope Stability Analysis

The result of slope stability analysis as follows.

Table 9-9-5. Result of slope safety analysis (Route 3)

Landslide block	Safety factor	Necessary Deterrence(Fsp=1.20)	Condition
First order slide	Fs=1.00	Pr=374.4(kN/㎡)	No water
	Fs=1.00	Pr=374.4(kN/㎡)	No water
Second order slide	Fs=1.00	Pr=646.3(kN/㎡)	Assumed high water (Slipsurface +3m)
	Fs=1.037	Pr=526.1(kN/㎡)	Downed water level (Maximum —3m)
Thirdorder slide (Landslide block B)	Fs=1.00	Pr=757.6(kN/㎡)	Assumed high water (Slipsurface +3m)
	Fs=1.040	Pr=604.2(kN/㎡)	Downed water level (Maximum —3m)
Fourth order slide (Landslide block C)	Fs=1.00	Pr=836.3(kN/㎡)	Assumed high water (Slipsurface +3m)
	Fs=1.039	Pr=669.6(kN/㎡)	Downed water level (Maximum —3m)

* Assuming C = h for each target landslide, φ was calculated backwards with Fs = 1.00.

4) Countermeasure Works

Map of Landslide Countermeasures is shown in Figure 9-9-2.

The steel pipe pile work and groundwater drainage work will secure a predetermined planned safety factor Fs> 1.2 for the landslide block C. In addition, it was confirmed that the safety factor Fs> 1.2 can be secured by this measures also for the landslide block B. The result of the countermeasure work examination and the construction cost are as follows.

Table 9-9-6. Tentative Coutermeasures and Cost Estimation (Route 3)

（Unit：1000JPY）

	Type of the countermeasures	Detail	Estimated direct construction cost
Route 3	Steel pipe pile(STK400)	φ508×t34 24.0m/pile×81piles　ΣL＝1,944m	340,000
	Drainage drilling(K400)u	50m/hole×5holes×3 point ΣL＝750m	10,000
	Total		350,000

*Countermeasures for river erosion are separately booked

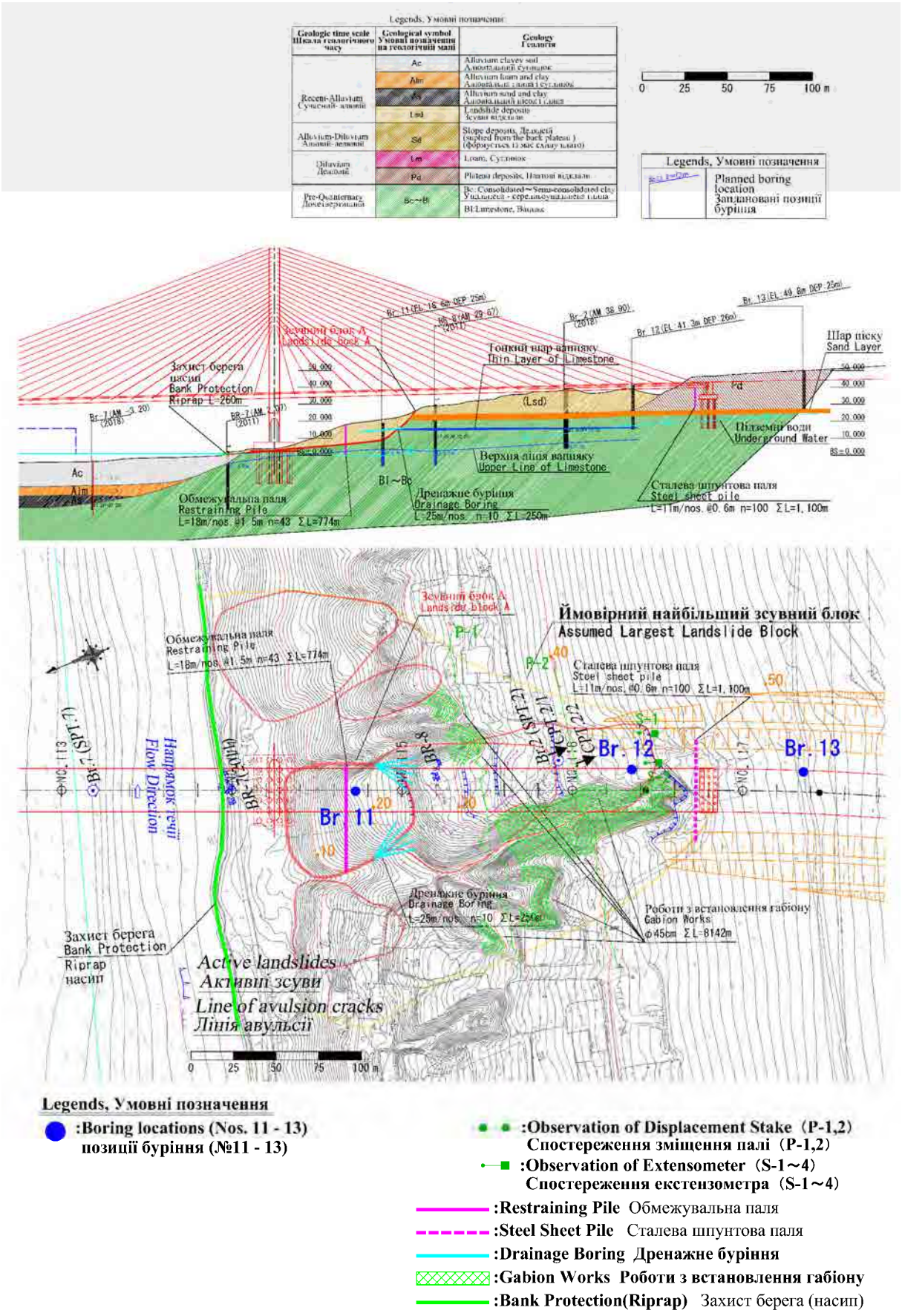


Figure 9-9-1. Map of Landslide Countermeasures for Route 2

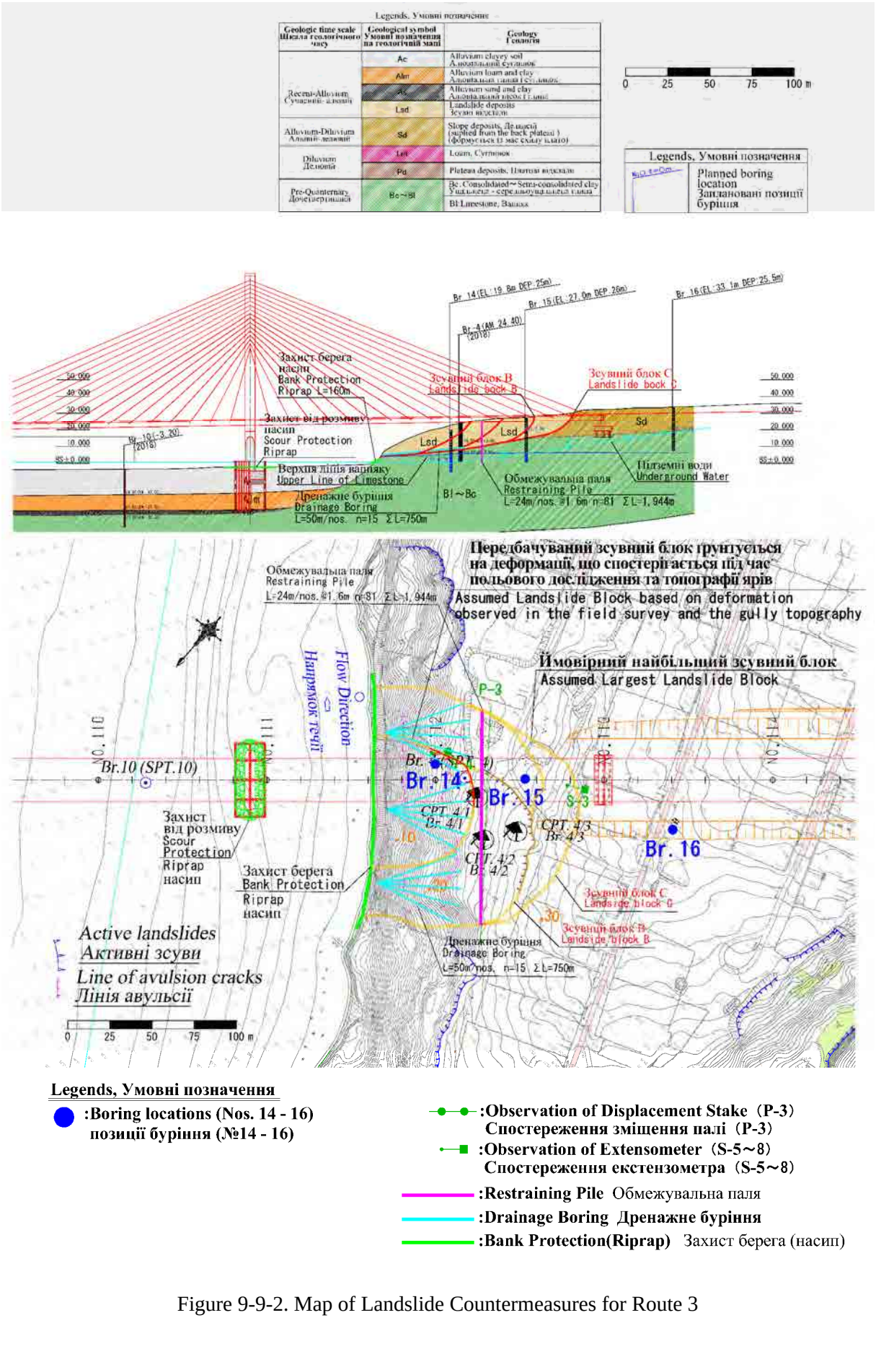


Figure 9-9-2. Map of Landslide Countermeasures for Route 3

Chapter 10 Environmental and Social Considerations

This chapter presents the results of confirmations of the need to update EIA/RAP reports drafted in 2011, and policy for additional studies of environmental and social considerations.

10-1 Basic Policy for Confirming the Need to Update EIA/RAP Reports

10-1-1 Review Implementation Flow

Figure 10-1-1 shows the implementation flow for the confirmation of the need to update EIA/RAP reports ("the Review").

Source: JICA Survey Team

Figure 10-1-1. Review Implementation Flow

10-1-2 Documents Subject to the Review

Table 10-1-1 shows documents subject to the Review. A note should be made that only after JICA Survey Team entered Ukraine, it was found that Ukraine did not approve the 2011 F/S devised by JICA in 2011; in 2012, the Mykolaiv branch of Ukravtodor conducted the 2012 F/S (TEO), which was approved by the Cabinet of Ministers.

Table 10-1-1. Approval Status of Documents Subject to the Review

Documents Subject to the Review	Documents found in this Survey	JICA Review	Ukraine Cabinet of Ministers
Final Report of Preparatory Study for the Project of Construction of Mykolaiv Bridge in Ukraine (JICA, 2011) (2011 F/S)		Complete	
Environmental Impact Assessment Report for the Project of Construction of Mykolaiv Bridge in Ukraine (JICA, 2011)		Complete	
Resettlement Action Plan Report for the Project of Construction of Mykolaiv Bridge in Ukraine (JICA, 2011)		Complete	
Studies for the Environmental and Social Consideration Studies for the Project of Construction of Mykolaiv Bridge in Ukraine (JICA, 2013)			
Feasibility Study (TEO) Report for Mykolaiv Bridge Construction Project (Ukravtdor, 2012) (2012 F/S (TEO))	✓		Complete
Annex 3 EIA Study Report for Mykolaiv Bridge Construction Project (Ukravtdor, 2012)	✓		Complete
Annex 7 RAP Study Report for Mykolaiv Bridge Construction Project (Ukravtdor, 2012)	✓		Complete

Note: Additional documents subject to the Review are all in Ukrainian; the titles above were tentatively translated by JICA Survey Team.

Source: JICA Survey Team

10-1-3 Laws and Regulations, Guidelines and Other Materials for Reference

1) Laws and Regulations, Guidelines and Other Materials in Ukraine

The table below shows laws, regulations and guidelines regarding the implementation of EIA that have gone into effect in Ukraine since the 2011 F/S.

Table 10-1-2. EIA-Related Laws, Regulations, and Guidelines, etc. Enacted in Ukraine since the 2011 F/S

Document	Year of Enactment	Overview
Law of Ukraine on Environmental Impact Assessment (Amended)	2017	Sets out matters, procedures, time required, reports and other details subject to EIA and SEA Amended the former law in order to satisfy EU standards With this amendment, The Law of Ukraine "on Ecological Expertise" BP, 1995 (the "Ecological Expertise Law") was repealed.
Handbook for Environmental Impact Assessment in Ukraine	2017	Sets out implementation flowcharts, frequently asked questions and other information for EIA and SEA
Cabinet Resolution No. 1010: Cabinet of Ministers of Ukraine Resolution No. 1010 On Approval of the Criteria for Determination of the Planned Activity, its Extension and Change that are not the Subject to an Assessment of the Environmental Impact	2017	Sets out regulations for EIA exceptions (minor changes, anti-terror measures, emergency countermeasures, etc.)
Cabinet Resolution No. 989: Cabinet of Ministers of Ukraine Resolution No. 989 On the approval of the Procedure of conducting of public hearings in the process of environmental impact assessment	2017	Sets out public hearing implementation methods, methods for taking minutes including records of Q&A sessions, etc.
Cabinet Resolution No. 1026: Cabinet of Ministers of Ukraine Resolution No. 1026 On Approval of the Procedure for the Transfer of Documents for submission of an outcome on the Environmental Impact Assessment and the Procedure for maintaining the Unified Register for Environmental Impact Assessment	2017	Sets out provisions for submitting EIA reports, centralized management through electronic data, etc.

Source: JICA Survey Team

2) JICA Guidelines and Documents for Environmental and Social Considerations

The table below shows JICA's guidelines and other documents for environmental and social considerations that have gone into effect since the 2011 F/S.

Table 10-1-3. JICA Guidelines and Documents for Environmental and Social Considerations Enforced since the 2011 F/S

Document	Year of Enactment	Enforcement Organization	Overview
Guidelines for Environmental and Social Considerations[1]	2010	JICA	New guidelines as a result of the consolidation of JICA in 2008.
Guidelines for Writing Category B Project Reports	2017	JICA	Clear provisions for matters to clarify in more depth based on report reviews and other activities by JICA's Credit Risk Analysis and Environmental Review Department to date.

[1]2011F/S mentions that the former JBIC guidelines (Japan Bank for International Cooperation Guidelines for Confirming Environmental and Social Considerations (April 2002)) were used to conduct the study.

Source: JICA Survey Team

10-2 Review Results

10-2-1 EIA

1) Summary of Review Results

The table below shows the results of reviews of EIA reports prepared in 2011 and 2012.

Table 10-2-1. Results of Reviews of EIA 2011 and EIA 2012

Items to Include in EIA Reports	Results of Reviews of EIA 2011 and EIA 2012
Baseline environmental and social conditions	Although both EIA 2011 and EIA 2012 include descriptions of baseline environmental and social conditions (flora and fauna, pollution, etc.), it was confirmed that field surveys were not conducted in either case. Later, it was also confirmed that sufficient distance is still secured between the target area of the Project and wildlife reserves, including Bird Life International IBAs. [1] In addition, the Mykolaiv Oblast land use map was updated in 2015, and reflects changes in the social environment since the previous study, including the new construction near the artificial forest on the left bank of a facility for what appears to be a private-sector forest industry operator, which would not be subject to resettlement under the Project.
Partner country systems/organizations for environmental and social considerations	EIA 2011 and EIA 2012 were implemented in accordance with a former law (The Law of Ukraine "on Ecological Expertise" BP, 1995). However, as explained previously, the EIA Law was amended in 2017. In general, projects approved prior to the amendment are not subject to the amended law; however, such projects are subject to the amended law when making substantial changes to previously approved (EIA conclusion) plans, designs, mitigation measures and other elements that have a relatively large impact on the environment compared to the approved elements. The appendix includes report details, projects subject to EIA and the implementation flow set out in the Amended EIA Law.
Laws, regulations, etc. regarding environmental consideration	Of the relevant laws, regulations and standards that served as references for preparing EIA 2011 and EIA 2012, as of now, at least the following have been revised or repealed: − The State health and safety rules and standards 2.2.7.029-99. Hygienic requirements for the management of industrial waste and the definition of their class of danger to the health of the population; − State building code V2.3-4:2007. Highways. Part 1. Planning. Part 3. Construction; − VBN B.2.3-218-007-98. Ecological standards for highways;

[1]Interview with MENR (June 23, 2018).

	− Construction standards and regulations II-12-77 Planning standards. Noise protection; − Sanitary standards 3077-84. Sanitary standards for permissible noise in the premises of residential and public buildings and on the territory of residential buildings; − Construction standards and regulations 2.04.03-85. Sewerage. Outdoor networks and facilities; − Health and safety rules and standards 4630-88. Sanitary rules and norms of protection of surface water from pollution; − Construction standards and regulations 3.05.04-85. Outdoor networks and facilities for water supply and sewerage; − Health and safety rules and standards 42-128-4433-87 Sanitary norms of permissible concentrations of chemicals in the soil; − State sanitary regulations 201-97. State sanitary regulations for the protection of atmospheric air in the populated areas.
Methods of resolving diversions from new JICA guidelines	Gap analysis has not been conducted in either EIA 2011 or EIA 2012.
Roles of relevant organizations	The details in the reports of EIA 2011 and EIA 2012 only cover the roles of relevant organizations for the Ecological Examination as required by the former law (The Law of Ukraine “on Ecological Expertise” BP, 1995).
Comparison and consideration of alternative proposals	In both EIA 2011 and EIA 2012, four alternative routes and a zero option (a proposal to refrain from implementing the Project) were considered in terms of route length, construction costs, ground conditions, resettlement, the location of the road as a section of the East-West Corridor, coherence with land use plans of Mykolaiv City, connectivity to adjacent ports and other factors. In both cases, Route 2 was recommended as the optimal proposal.
Scoping	In EIA 2011, scoping was conducted for the construction period and the first two years of operation period for essentially the same 31 items as the present JICA Guidelines for Environmental and Social Considerations. In EIA 2012, there is no mention of scoping; however, the TOR for EIA 2012 did contain descriptions of envisioned impacts.
Impact projection	EIA 2011 listed six items subject to impact projection: 1) land acquisition, 2) soil erosion and landslides, 3) air pollution, 4) water contamination, 5) soil contamination, and 6) noise. EIA 2012 listed eight items subject to impact projection: 1) micrometeorological phenomena, 2) air pollution, 3) noise, 4) landslides, 5) water contamination, 6) soil contamination, 7) ecosystems, and 8) land acquisition. As for air pollution, long-term impact projections through 2035 are below the emission cap. It should be possible to omit studies of air pollution from the additional study items as long as there are no significant differences in the selected route, traffic demand projections and background concentration levels from EIA 2011. As for noise, separate projections for daytime and nighttime hours were not provided; therefore, it is not possible to evaluate the noise during day and night separately.
Mitigation measures	The Basin Office of Water Resources of the Southern Bug River has provided several technical specifications (No 01-4/14/05-11 of 09/02/2011) as measures to mitigate impact on landslides and the ecosystem. However, as the three-year period of validity of the specifications has already passed, the project implementing agency is required to obtain approval from the authorities before starting construction work in accordance with Cabinet of Ministers of Ukraine Resolution No. 557 (July 12, 2005) (EIA 2011, Appendix 5). In addition, although the point was made at the 2011 stakeholders meeting that the construction work would negatively impact fish spawning, no mention of impact mitigation measures in the EIA report was found. In this field survey, the gathering of Mykolaiv Fishery Association Decree No. 47 “Fishery Regulations Regarding Aquatic Biological Resources during the Spawning

	Season from Spring to Summer" and interviews with private-sector ocean transport operators were used to confirm fishery restriction periods and restricted areas; therefore, it is best to propose mitigation measures that take these findings into account. As for mitigation measures for noise, it is necessary to conduct investigations that incorporate results of route selection, traffic demand forecast, and surveys of areas around noise sensitive receptors, and more. For example, if noise barriers are to be installed, barriers that are 3 m high deliver soundproofing effect of 10 dB (A), which would substantially reduce the number of households impacted calculated in Chapter 5.
Environmental management plans/monitoring plans	In light of the reviews above, environmental management plans and monitoring plans must be revised.
Budget, finances, implementation system	EIA 2011 includes the cost of planting trees along roads, but budgetary measures should also be planned for the cost of maintenance (watering, applying insecticides and replanting dead trees as necessary, etc.) for two years after planting.
Stakeholder meetings	New stakeholder meetings are recommended because almost seven years have passed since the last meeting in September 2011 (the participating organizations at that time were Mykolaiv Oblast (the governor, the first deputy governor, and the heads of the Land Resources Department and the Environmental Conservation Department), the Mykolaiv branch of Ukravtodor, JICA Survey Team, Mykolaiv Airport, the mayor of the town of Nova Odesa, and representatives of the Project Affected People in the Nova Odesa district).

Notes: EIA: Environmental Impact Assessment, IBA: Important Bird Area, RAP: Resettlement Action Plan

Source: JICA Survey Team

10-2-2 RAP

The table below shows the results of reviews of RAP 2011 and RAP 2012.

Table 10-2-2. Results of Reviews of RAP 2011 and RAP 2012

Items to Include in RAP Reports	Results of Reviews of RAP 2011 and RAP 2012
Needs for land acquisition and resettlement (including other forms of economic loss, etc.)	Both RAP 2011 and RAP 2012 mention of the needs of land acquisition. It is worth noting that resettlement under the Project was not envisioned in any of the past studies (the same applies to the ensuing matters below).
Legal frameworks for land acquisition and resettlement	RAP 2011 describes the framework for land acquisition set out in the Land Code of Ukraine (2001). Although there is no mention of gap analysis between JICA environmental guidelines at the time (the JBIC Guidelines for Environmental and Social Considerations), WB OP 4.12 and the laws of Ukraine, the report opens with an expression of the intent to observe the requirements of the JBIC Guidelines for Environmental and Social Considerations in addition to the laws of Ukraine. The 2011 F/S was the only place a matrix of detailed gap analysis could be found. RAP 2012 does mention Cabinet of Ministers Resolution of Ukraine No. 217 (November 14, 2007) approved by the Mykolaiv branch of Ukravtodor and TOR No. 14-2/12 (February 17, 2012), but contains no mention of other legal frameworks. Note that, at the times of each study, no squatters or encroachers without legal rights to the land subject to acquisition were identified.
Results of population census surveys and financial/land surveys for all occupants (including gender classifications)	Population censuses for RAP 2011 and RAP 2012 were calculated based on a letter from the State Committee on Land Resources in Mykolaiv Region (Letter from 23.02, 2011 No. 366-1800-714/11, Annex A), and contain lists of the plots of land subject to acquisition and all occupants. However, details such as family structure and gender classification are unclear. Number of PAUs: 65 households is given as the number of PAPs, the actual number of PAPs is unclear. In addition, no mention of assets such as trees, facilities or the likes was found. Cadastral data in Ukraine may not necessarily reflect reality; therefore, land surveys must be conducted with this possibility in mind. The cut-off date (COD) for the Project[2] is inconsistent; the Minutes of Discussion (M/D) from the Fact Finding (F/F) shows that the COD is the first day of the F/S (February 17, 2012), but the 2011 F/S says that the COD is the deadline announced by the implementing agency within three months of project approval. In either case, more than six years have passed since these CODs were set.
Household finance/livelihood surveys of lowest 20% of occupants	No mention. Based on RAP 2011, assuming the number of Project Affected Households is 65 and taking invalid answers and other factors into consideration, it should be sufficient to survey 20 households (> 65 households x 20%).
Eligibility requirements for compensation for lost assets and livelihood restoration program (Entitlement Matrix)	RAP 2011 and the 2011 F/S contain Entitlement Matrices, but RAP 2012 does not. Plans for constructing aquaculture facilities funded by the government of Mykolaiv Oblast 80 km upstream of Mykolaiv Bridge location as compensation to fishermen are described on Page 71 of EIA 2011, but the validity of these plans is unclear at this point in time.

[2] World Bank OP 4.12 says that, in general, data must be updated if land acquisition has not been performed within two years of the census survey.

	In addition, when the issue of compensation for remaining land divided as a result of land acquisition was brought up at past stakeholder meetings, the Mykolaiv branch of Ukravtodor responded that meetings will be held with the State Committee on Land Resources to resolve the issue (2011 F/S, p. 6-53). However, due to the substantial turnover in employees in the Mykolaiv branch of Ukravtodor in recent years, it is unclear whether the information has been passed down; thus the authorities should require a proper input of information.
Investigation and procedures for lost asset compensation policy based on replacement costs based on studies of the replacement prices	In principle, the purchase prices of land for public projects are determined by government-designated appraisers based on the Land Code of Ukraine, Article 146. RAP 2011 does not contain specific details about replacement cost, but EIA 2011, which was prepared during the same period, does. Page 45 and Table No. 2 with responses from the State Committee on Land Resources on Page 102 in Appendix 3 of EIA 2011 set out unit prices for land as well as unit prices that account for the cost of grading, registration taxes and moving costs, which suggests that unit prices were set with consideration given to replacement prices and costs. Here, agricultural land was priced at 3,000-35,000 UAH/ha. These figures likely referred to the replacement value of land (cash compensation under law and additional grant to cover the market value of land at market price to be determined by Expert) as Entitlement (compensation package for lost agricultural land, aquaculture ponds and fruit orchards in the Entitlement Matrix (p. 6-50) in the 2011 F/S. In contrast, RAP 2012 adopts the estimated unit price given in a response by the State Committee on Land Resources in Mykolaiv Region to the Mykolaiv branch of Ukravtodor on January 12, 2010 (TOM 7 c10-15). Here, farming land was priced at 12,000 UAH/ha, and gardening land was priced at 35,000 UAH/ha. It is worth noting that no unit prices are required for state-owned land because the only required process is a change of registration. However, for several of the unit prices described above, it is not possible to confirm coherence with compensation unit prices in the 2011 F/S (p. 6-48). It is likely that the land prices of the State Committee on Land Resources have changed over the years; therefore, it is probably best to obtain updated figures for replacement costs.
Livelihood restoration program for improving/recovering eligible beneficiaries' standard of living	RAP contained no details about livelihood restoration program. The M/D from the F/F indicates that the Mykolaiv branch of Ukravtodor was to prepare a draft of livelihood restoration program before the review and submit to JICA, but these documents could not be found onsite.
Authority of organization responsible for grievance redress, and grievance redress procedures	No information about the grievance redress mechanism was found in either RAP 2011 or RAP 2012. According to the M/D from the F/F, it seems that a grievance redress committee for the Project was to be established, and that the mechanism in which the committee would reply with solutions to complaints filed by residents and others within one month of the filing date was suggested.
Identification and responsibilities of the organization responsible for resettlement	RAP 2011 sets out a clear division of responsibilities, namely between the Mykolaiv branch of Ukravtodor, the State Committee on Land Resources in Mykolaiv Region, and Mykolaiv City (Mykolaiv Oblast State Administration, generally referred to as MRA (Mykolaiv Region Administration) at the time the report was written).
Costs and financial resources for land acquisition and resettlement	As mentioned previously, there was not sufficient information found on the costs and financial resources in RAP 2011 or RAP 2012.
Monitoring system by the implementing agency and monitoring form	A monitoring system and monitoring form were prepared in RAP 2011, and their estimated costs were calculated (2011 F/S, p. A8-4 to A8-6). Such descriptions could not be found in RAP 2012; therefore, there is a concern regarding the monitoring implementation system, monitoring content and budgeting.

	It is probably best to add grievance redress records to the monitoring form.
Public consultation about land acquisition and resettlement	No records of public consultations were found in RAP 2011 or RAP 2012. According to the 2011 F/S, two stakeholder meetings were held, one in December 2010, before the Project study was launched, and one in September 2011, when the study results were being presented. No comments from PAPs were presented. However, a basic agreement with landholders was reached in a workshop held in 2007, and information from stakeholder meetings was published in bulletins and on websites, which gave people opportunities to file objections. Given these facts, it appears that people were given opportunities to participate to a certain extent. However, roughly 10 years have passed since the conclusion of the basic agreement with landholders; therefore, it is probably best to provide further opportunities for discussions that include other people who will be impacted by the Project.

Note: COD: Cut-off date, F/F: Fact Finding Mission, M/D: Minutes of Discussion, PAPs: Project Affected Persons, PAUs (PAHs): Project Affected Units (or Project Affected Households), RAP: Resettlement Action Plan

Source: JICA Survey Team

10-3 Additional Survey Policy

The following is additional survey policy.

10-3-1 Additional Survey Policy for Route 2

1) Basic Policy

For Route 2, the Cabinet of Ministers of Ukraine approved the 2012 F/S (TEO) in 2013, and the need to conduct the study again depends on the types of changes as shown in Section 3-2. The procedure for conducting the studies again is the same as those for the case of Route 3, which is explained later, so the policy here is for the case in which studies do not need to be conducted again. If the studies do not need to be conducted again, then the Law of Ukraine on Environmental Impact Assessment (2017) does not apply, and the procedure required by Ukraine is for Ukravtodor to create documents related to environmental and social considerations based on project plans, designs and the like from the Project (P) stage. The items to be discussed in Project (P) are essentially the same as those from the 2012 F/S (TEO), but because the Project (P) stage requires more highly precise discussion than the F/S (TEO) stage,[3] an impact assessment must be conducted in line with the most updated laws and regulations about the environment, mitigation measures, environmental management plans and environmental monitoring plans must be drafted. In addition, because the roles of relevant organizations were not clarified in EIA 2011 and EIA 2012, and because seven years have passed since the last stakeholder meetings were held, it is important to hold stakeholder meetings again to clarify the scope of responsibilities for relevant organizations.

These actions are also necessary to satisfy the requirements in JICA Guidelines for Environmental and Social Considerations (2010).

2) Environmental Impact Assessment (EIA)

The following is additional survey policy.

(1) Confirm Baseline Environmental and Social Conditions

Conduct literature searches based on past research, gather data and interview relevant organizations as necessary about the social, physical and natural environments that could be impacted by the implementation of the proposed project. Obtain documents regarding underground facilities and other utilities from relevant organizations. The following are survey items that require particular attention and policies therein.

- ✓ Road traffic noise: Conduct field measurements (of equivalent noise level L_{Aeq} per unit of time at measurement height H = 1.2 m at the boundaries between public and private property, a total of three points including the planned locations of interchange construction and the residential area adjacent to the right bank over a period of three days including two weekdays and one holiday, and over a 24-

[3]Interview with local consultants in Ukraine (August-November 2018)

hour period). In addition, during noise surveys, confirm the topography, planimetric features and other properties of areas alongside roads (for example, the locations and types of houses nearby, the actual state of use, and the state of the ground surface) through interpretation of satellite images or interviews with residents in the area.

- ✓ Soil erosion and landslides: Field surveys will not be conducted as part of the EIA survey because the consolidated results of the geological surveys conducted by the JICA survey team from 2018 to 2019 should serve as reference material. The same applies to subsequent items. Be careful to avoid including the expense of landslide countermeasures twice (in both the geological survey and environmental and social consideration items).

(2) Laws and Regulations, Standards, Programs and Organizations regarding Environmental and Social Considerations in the Partner Country

Many laws related to the environment in Ukraine referenced in the 2012 F/S (TEO) have been amended or abolished; therefore, confirm the content and relevant organizations, namely the supervising government agencies.

Confirm the procedures required by Ukrainian laws and regulations as to the selection of multiple sites for soil borrow pits and disposal yards.

Also include discussion of standards set out in the Environmental, Health, and Safety (EHS) Guidelines of the WB Group.

(3) Comparison and Consideration of Alternate Proposals

Conduct comparison and consideration of multiple alternate proposed routes, including a zero option (a proposal in which the project objectives can be achieved without implementing this type of project), based on the results of the most recent surveys. The results of surveys conducted by the JICA survey team from 2018 to 2019 should serve as reference materials for summaries of the routes (length, alignment, and structure types), technical evaluations and evaluations of economic efficiency.

(4) Scoping

Narrow down impact items by performing scoping excersise for the selected route as a result of the alternative analysis. Evaluate at three different stages of the Project; before construction, during construction, and the first two years operation of the Project.

Scoping involves assigning the following four assessments and listing the reasoning for those assessments.

A+/-: Significant impact (positive or negative), B+/-: Some level of impact (positive or negative), C: Level of impact unclear (surveys and consideration required, and the level of impact will become clear during the survey process), D: Hardly any impact

(5) Impact Projection

Project the impact of the impact items that resulted from the scoping. In the course of conducting the environmental impact assessment of the road, it should be possible to obtain information about future traffic volumes per lane/type of vehicle per hour, projections of alignment and numbers of lanes for the target road, average traffic speeds, ratios of daytime traffic to nighttime traffic, percentages of heavy vehicle traffic, standard sections that clearly delineate boundaries between public and private property, ground surface characteristics and more from the F/S (TEO) and Project (P).

As for air pollution, the intent is to use the results of long-term projections through 2035.

(6) Impact Assessments

Use the results of impact projections to conduct impact assessments based on maximum allowable concentrations (MAC) of emissions regulation values set out in Ukrainian environment-related regulations, and the Environmental, Health, and Safety (EHS) Guidelines of the WB Group.

(7) Mitigation Measures and Environmental Management Plans

Use the results of the impact assessments to consider mitigation measures, and use those results to discuss each impact item for each of three time periods: before construction, during construction, and once the structure is put into service. In order to ensure the effectiveness of the proposed mitigation measures, discuss the implementing agencies, responsible organizations and expenses of each of the measures.

Expenses include project costs.

(8) Environmental Monitoring Plans

In order to fully and faithfully monitor the implementation of items listed in environmental management plans, write out a list of monitoring items, methods, frequencies, assessment criteria, guidelines or limit value, locations, implementing agencies and expenses for each assessment item.

Expenses include project costs.

(9) Implementation System

Create written implementation system charts for environmental management plans and environmental monitoring plans for each of two time periods: during construction and the first two years of operation once the structure is put into service. In addition, write out a system for redressing grievances about environmental matters. In the course of creating these implementation systems, conduct confirmations using the results of stakeholder meetings as follows.

(10) Stakeholder Meetings

Conduct stakeholder analysis in the initial stage of the additional surveys, and use the results to consider the meeting agenda, location, participants, schedule and other matters.

At the very least, stakeholder meetings that include PAPs should be held in the initial stage of the additional surveys and at the draft final stage. Note that field survey procedures do not set out a particular number of focus group discussions, meetings with individuals or the like to conduct; conduct these types of meetings as necessary.

3) Land Acquisition and RAP

The following is additional survey policy.

(1) Census Surveys and Asset/Property Surveys

Past surveys did not produce enough information about the following points; keep them in mind and gather enough information about them in the course of conducting census surveys and asset/property surveys of all owners subject to land acquisition or relocation under the project.

i. Properly calculate the number of project affected units (PAUs) and project affected persons (PAPs)
ii. Use age range, gender, disability and other information from the census to identify households that qualify as socially disadvantaged people
iii. Consider realistic solutions to the mismatch between the areas of planimetric features registered in the State Service of Ukraine for Geodesy, Cartography and Cadastre Ukraine as Public Cadastre Card (PAC) and the areas measured through electronic GIS data by the survey team
iv. Organize the handling of remaining land which is not to be affected but out of value for land owner due to its unproductive shape or size.
v. Set a clear cut-off date
vi. As part of asset surveys, conduct surveys and calculate volumes of agricultural products and fish catches by PAPs

The following are templates for reference in consolidating survey results.

Table 10-3-1. Census Survey Results (Reference Template)

Type of loss	No of PAUs			No of PAPs		
	Legal	Illegal	Total	Legal	Illegal	Total
Required for displacement						
1 HH (Structure owner on Gov. land)						
2 HH (Structure on Private land)						
3 HH (Tenants)						
4 CBEs (Structure owner Gov. land)						
5 CBEs (Structure owner on Private land)						
6 CBEs (Tenants)						
7 Community owned structures including physical cultural resources						
Not required for displacement						
8 Land owners						
9 Wage earners						
Grand Total (1-9)						

HH: House Hold, CBEs: Commercial and Business Enterprises

Table 10-3-2. Results of Survey of Land and Assets Impacted by the Project (Reference Template)

Land

Category		Land type	Affected area (m2)	Total
1	Village A	Farm land	1,000	1,500
2		Housing land	500	
3	Village B	Government land	800	850
4		Commercial land	50	

Buildings

Category			Quantity	Affected area (m2)	Total
1	Village A	Private (Residential)			
2		Private (Warehouse)			
3		Public assets			
4	Village B	Shops			

Other assets including agricultural products, fishery products, fruit orchard, livestock

Category			Quantity	Affected area (m2)	Total
1	Village A	Fish ponds	3	200	
2		Lemon trees	30	-	
3	Village B	Pain trees	500	1,000	
4		White birch	10	-	

(2) Socioeconomic Surveys

Write out basic information about the socioeconomic characteristics of households receiving compensation, targeting at least 20% of impacted households. Include employment, household structure, income (official/unofficial), standard of living and other information with the aim of using this information to consider specific measures for compensation and support in the future.

(3) Specific Measures for Compensation and Support

Create requirements for beneficiaries (commonly called as an Entitlement Matrix) for the Project in light of entitlement matrices developed for past surveys, the results of additional surveys (census surveys, asset/property surveys and socioeconomic surveys), and reviews of entitlement matrices for similar WB donation projects.[4]

Total compensation for loss is calculated based on the replacement cost (See Table 10-3-3 below). Include a written description of the basis for the calculations in the report or attach relevant materials.

In addition, use the results of asset/property surveys and socioeconomic surveys to develop an income restoration program (IRP) (for example, vocational training or support for purchasing materials for agriculture or aquaculture).

Table 10-3-3. Description of Replacement Cost

Land	Agricultural Land	The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes
	Land in Urban Areas	The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Structure	Houses and Other Structures	The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes.

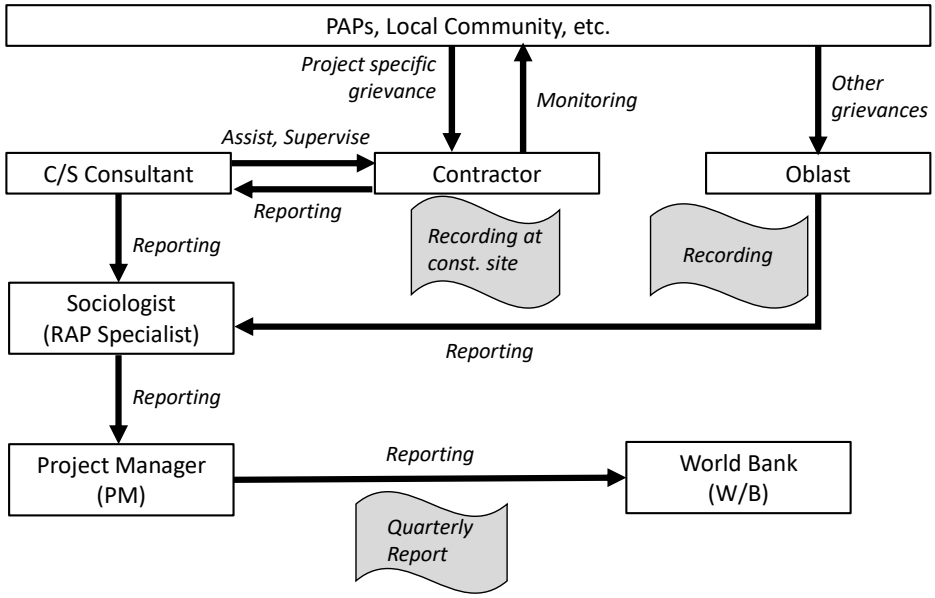
Source: JICA (2017) Guidelines for Writing Category B Project Reports, Annex 1 Key principle of JICA policies on involuntary resettlement

(4) Grievance Redress Mechanism (GRM)

In similar projects funded by the WB, it has been reported that various grievances came to light after the commencement of construction due to the low level of familiarity with the Ukraine's grievance redress mechanism and delays in the process of establishing a liaison for redressing grievances on the Ukravtodor website. It has also been reported that grievances have been redressed continuously during construction and through project completion based on the following flow.

i. The construction contractor organizes grievances specific to the project with support from the construction supervision consultant
ii. Oblast governments organize other grievances from communities
iii. Social environment experts procured to specialize in the Project organize the grievances from the first two steps, and submit them to the project manager
iv. The project manager reports records of grievance redress along with quarterly reports to the WB

[4] Ukravtodor (2017) Addendum to the Resettlement Action Plan, SECOND ROAD SECTOR IMPROVEMENT PROJECT (P-127156), UKRAINE



Source: Prepared by the JICA Survey Team based on Ukravtodor (2017) Addendum to the Resettlement Action Plan, SECOND ROAD SECTOR IMPROVEMENT PROJECT (P-127156), UKRAINE

Figure 10-3-1. Grievance Redress Mechanism for Similar Projects in the Ukrainian Road Sector

Therefore, during additional surveys, conduct interviews of relevant people based on the figure above, and consider an appropriate grievance redress mechanism for the Project. In particular, because the figure does not clarify the positioning of Ukravtodor (the Project implementing agency) and the State Land Committee (SLC), and because means and methods of communicating information to PAPs and local communities and other legal measures for cases when grievances are not resolved are unclear, confirm these issues and consider ways to ensure simplicity, convenience and transparency.

(5) Implementation System for Land Acquisition and Resettlement

Use the results of the aforementioned surveys to reconfirm the implementation system for land acquisition and resettlement set out in RAP2011, and revise the system as necessary.

(6) Implementation Schedule

i. Pay particular attention to the following items in the course of creating the implementation schedule for land acquisition and resettlement with the aim of minimizing the impact to PAPs.
ii. Construction schedule
iii. Ukrainian government fiscal year schedule
iv. Seasonal schedules for the livelihoods and lifestyles of PAPs (planting schedules for agriculture, fishing seasons for fishery, school terms and summer/winter vacations, etc.)

(7) Expenses and Financial Resources

Calculate budget for compensation for permanent or temporary loss due to project implementation, and the expenses of resettlement support, the income restoration program, and RAP implementation (including personnel expenses for the implementation and monitoring and contingency). In addition, clarify the source of finances for that budget, and reflect it in the Project cost.

(8) Monitoring System and Monitoring Form

For the monitoring system, refer to items in the RAP implementation system. Use the results of reviews of similar projects to consider adding a column for grievance redress records on the monitoring form attached to the 2011 F/S. Set an appropriate monitoring period upon considering the time required for income restoration by PAPs.

In addition, create and attach TOR for the implementation of external monitoring by universities, NGOs and other third-party organizations.

(9) Public Consultations

Upon considering the burden and level of convenience to PAPs, consider scheduling public consultations about land acquisition and resettlement at the same times as stakeholder meetings for the environmental impact assessment.

Attach records of all consultations (dates, places, agendas, records of Q&A, and numbers, affiliations and genders of participants) and lists of participants to additional survey reports.

10-3-2 Additional Survey Policy for Route 3

Although the origin of Route 3 is the same as that for Route 2, which was approved by the Cabinet of Ministers in 2013, the route of the bypass and the location of Mykolaiv Bridge are different. In addition, Route 3 passes through the residential area on the right bank of the Southern Bug River and would require the demolition of dozens of houses and the relocation of their inhabitants; significantly, the 2012 F/S (TEO) makes no mention of this. Therefore, the selection of Route 3 would result in environmental and social impacts not discussed in the 2012 F/S (TEO). In light of this fact, the possibility of undergoing the F/S (TEO) procedure again has been suggested, and in that case, the new F/S (TEO) procedure is subject to the Law of Ukraine on Environmental Impact Assessment (2017).

Appendix 7 contains the requirements of the Law of Ukraine on Environmental Impact Assessment, which are generally equivalent to the requirements of JICA Guidelines for Environmental and Social Considerations (2010); the requirements of the JICA guidelines are more comprehensive. Therefore, most of the additional survey policy for Route 2 created to comply with JICA Guidelines for Environmental and Social Considerations also applies to Route 3. However, the following differences in additional survey policy must be noted.

- ✓ EIA based on the Law on Environmental Impact Assessment must be conducted in addition to F/S (TEO) (Refer to Figure 3 in Appendix 7). Submit the Letter of Intent and the EIA Study Report to NENR.
- ✓ Compensation for loss of residence facilities will be added to the resettlement action plan (RAP), which will result in the diversification and increase in the scale of PAPs. In addition, there is likely a definite number of landowners and residents who will unexpectedly become PAPs. Suddenly publicizing a Letter of Intent could cause confusion in communities; therefore, it is necessary to proceed carefully with meetings with local stakeholders in an effort to create an understanding of the need for the construction of Route 3.
- ✓ Changing from Route 2 to Route 3 will have an impact on the development plan for Mykolaiv City; therefore, the required procedures and the schedule for them must be confirmed.

Chapter11 Review of the Construction and Procurement Plans

11-1 Basic Policies on Construction Plans

11-1-1 Policy on Natural Conditions

1) Temperature and humidity

According to temperature records over the past 10 years in Mykolaiv, temperatures in summer and winter vary greatly: average temperatures in December, January and February are around 4°C or lower with river freeze whereas temperatures in July and August average around 24°C. Moreover, depending on the year, it is possible for summer temperatures to exceed 25°C. Taking this into account, concreting measures that meet the requirements of both cold and hot weather will need to be adopted.

In terms of humidity, records over the past 10 years show that average humidity levels in summer and winter are around 50% and 85% respectively. As these humidity levels are not low enough to affect the concrete, there should not be any issues with construction.

2) Rainfall and Precipitation

The 10-year average annual precipitation is lower than the global average at roughly 400-500 mm. Even in the rainiest months of May to July, precipitation of 10 mm/day or greater occurs less than 2 days on average, which would not suspend work or otherwise greatly impact construction. However, from the viewpoint of landslide consideration, groundwater fluctuation of the right bank will be monitored after rainfall especially.

3) Natural Environment

The following environmental conditions will be considered in the planning, designing, and construction for the Project:

a. Fishing season and fishing area regulations based on Mykolaiv Fishery Association ordinances
b. Water quality conditions in the Southern Bug River, over which Mykolaiv Bridge will be built
c. Measures for potential noise pollution to local residents
d. Dust control measures for potential dust pollution to local residents

11-1-2 Policies for Socioeconomic Conditions

The following socioeconomic conditions will be considered in the planning, designing, and construction for the Project:

a. Adequate children’s rights and gender rights, particularly women’s rights
b. Traditional regional history, culture, and lifestyles, including language, religion, and communication methods
c. Impact on the local landscape
d. Residents’ economic activity, livelihoods, and other lifestyle and economic environment
e. Measures against HIV/AIDS and other infectious diseases
f. Accident preventions and appropriate work sanitation

11-1-3 Policy for Construction Conditions

Ukraine has constructed a number of track records of concrete and steel bridges , which are construted mainly by the local companiesand seems to be capable of constructing them. Accordingly, this project will actively make use of the local technologies of the country.

11-1-4 Policies for Construction Methods and Schedule

1) Policy for construction methods

Methods based on Japanese technology will be actively adopted to build infrastructures with high quality up to Ukrainian standards. Where multiple Japanese technologies are applicable, methods that optimally exploit local equipment and materials will be adopted for effective transfer of technology.

The Southern Bug River is used as an inland waterway route, with barges and hydrofoils navigating the water daily throughout most of the year, except in winter when the river is frozen. Therefore, the construction method allows to keep the navigation clearance at all times will be adopted.

2) Policy for construction schedule

The construction schedule will take factors such as the individual workloads, construction procedures, critical paths and local weather conditions into consideration. In terms of weather conditions, the period with temperatures below freezing in winter will render outside work infeasible. From 2013 to 2018, notices of freezing in Mykolaiv Port lasted roughly three months from January to March. Also, with regard to safety measures, the 2011 F/S mentions that the Ukrainian labor law prohibits any work outside and/or in the river when the snow exceeds a prescribed depth. However, since it is currently unclear when construction will start, the construction period will be calculated as year-round and 3 months of work period will be added to the annual work schedule. On the other hand, member fabrication using the Japanese PCa method will take place indoors and thus be deemed year-round work.

11-2 Construction Plan of Route 2

11-2-1 Construction Conditions

1) Bridge Structural Components

The superstructure of the main bridge is a steel cable-stayed bridge, and the deck slabs are high quality PC slab. One of the substructures is a steel pipe sheet pile (hereinafter referred to as “SPSP”) foundation; the other is a cast-in-place pile foundation with cast-in-place piers. The superstructure on the left bank approach is composed of steel girders, and the deck slabs are high-quality PC slab. This substructure is constructed by the PC well method using high-quality PCa cylinders, a method that makes it possible to reduce the construction times.

A list of the bridge's structural compornents is shown in Table 11-2-1.

Table 11-2-1. List of Bridge Structural Compornents

	Left bank approach section	Main bridge section	
Length (m)	1,185	930	
Super-structure	Steel girder (2 main girders)	Steel cable-stayed bridge (edge-girder bridge)	
Deck slab	PC slab (non-composite)	PC slab (composite)	
Pier	PC Well	Cast-in-place	
Foundation		Left bank	Right bank
		Steel pipe sheet pile	Cast-in-place pile

2) Supporting Ground

Supporting ground and its depth are shown in Table 11-2-2.

Table 11-2-2. Route 2 Supporting Ground

	Near the left bank approach section		Near the left bank main tower position	Near the right bank main tower position
Borehole No.	Br.1	Br.5	Br.6	Br.7
Supporting ground	GL-22m (AM-19.4m) Monolithic clay (MC) N value 41-55	GL-25.9m (AM-28.2m) Monolithic clay (MC) N value of at least 23	GL-31.1m (AM-34.9m) Dolomite limestone N value of at least 58	GL-31.5m (AM-34.7m) Dolomite limestone N value of at least 60

3) Primary Material

(1) Concrete

The minimum design strength of concrete to be used on this bridge is as follows: 21 MPa for reinforced concrete (applied for footings, piers, etc.); 30 MPa for post-tensioned concrete (applied for PC wells) and 36 MPa for pre-stressed, pretensioned concrete members (applied for PC slab); (see “Specifications for Highway Bridges, I Common Edition, (Japan Road Association, November 2017)”).

A survey of locally procurable ready-mixed concrete was conducted. It was confirmed that the maximum concrete strength was about 60 MPa (for 10 cm cube test pieces). In the case of cylinders (ϕ 10 cm*20 cm), the strength would be about 54 MPa. However, an examination of the composition of locally procurable ready-mixed concrete indicated a slightly higher cement content than is found in the ready-mixed concrete used in Japan for similar bridge construction. For the concrete to be used in footings, top slab, and piers, it will thefore be necessary to examine the water/cement ratio (hereinafter referred to as “W/C”) and other ratios by trial mixing, and to perform thermal cracking analysis before construction.[1]

The ready-mixed concrete plant visited for the interview survey is located about 10 km from the site on the left bank side and 18 km from the right bank side. At these distances, delivery time to the bridge construction site would be an estimated 30 minutes, even at times of heavy traffic. Since some traffic trouble which are traffic jam and the aging of existing bridge are expected, the construction of a temporary batching plant on the right side of the river should be considered. In addition, the plant's track

[1] According to Japan Society of Civil Engineers, the maximum W/C with frequent freezing and thawing is 60%.

record for production capacity is 50-60 m^3 per hour, or 700-1,000 m^3 per day. During construction, the footing and top slab alone will require the placement of about 1,000-1,500 m^3 of concrete per day. Figure 11-2-1 shows 4 cement silos and the panel used to automatically control the measurement of water, aggregate, and admixture. Figure 11-2-2 shows the crushed stone used as the coarse aggregate and the river sand used as fine aggregate.[234]

Concrete plant, Cement silo, Agitator truck

Control panel of concrete plant

Source: JICA Survey Team

Figure 11-2-1. Example of a Local Ready-Mixed Concrete Plant

Coarse aggregate

Fine aggregate

Source: JICA Survey Team

Figure 11-2-2.Aggregates Used

(2) SPSP

Based on interviews with Japanese vendors, Vietnam is one of the candidates, in addition to Japan, to ship SPSP to Ukraine. The transportation route is shown in Appendix 10.

11-2-2 Overview

This construction plan is implemented for the structures listed in Table 11-2-1. Also, this bridge may be to be Ukraine's first to be built by the pre-cast construction method (Japanese technology). This production method is described in 11-2-5. In principle, training on construction and production by the pre-cast method should be mandatory for all local engineers before the work begins. The construction site (right bank) in this project, however, is located within a landslide zone, and the landslide mechanisms are still unclear. Therefore, it is recommended that the complemetary survey described in Chapter 9 be carried out over the course of about a year to fully understand the landslide range and to more fully consider and plan the detailed construction measures.

11-2-3 Overall Temporary Construction Work

For the left bank approach, a temporary bridge is installed to facilitate construction of the substructure and steel girders. The structure of the temporary bridge at the main tower position must take into account

[2] According to the interview to the local companies, delivery within about 45km is typically possible, and with blending agents, the maximum deliverable distance extends to about 120km (about 5 hours). However, considering traffic and the load on the existing bridge, construction of temporary plants on the right and left banks are recommended.

[3] According to the interview to the local companies, regularly 8 agitator trucks (8 to 10m^3) and maximum 18 of them are available.

[4] To avoid creating concrete joints, continuous concrete pouring is supposed.

the weight of the pile driver as well as the SPSP as its maximum weight. The temporary brige must also be reinforced with diagonal or corner bracing to ensure stability under vibration when the SPSP construction is underway. The temporary bridge on the left bank approach will extend to P22 (see Figure 11-2-3). The barge is also used for constructing pile foundations and material carry-in.

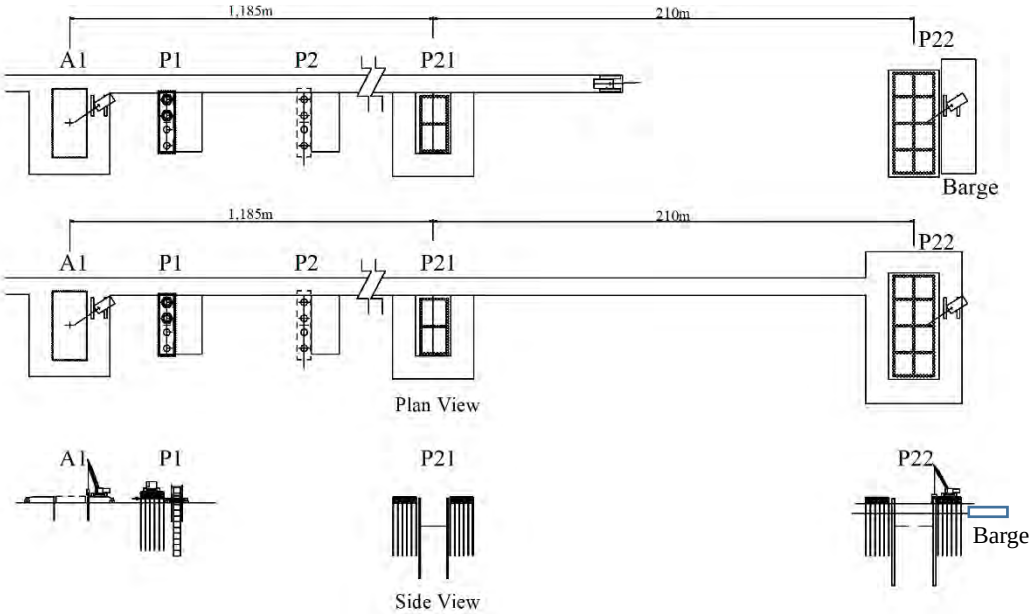


Figure 11-2-3. Reference Drawing for Temporary Construction on the Left Bank

Figure 11-2-4 shows the construction access road for transporting equipment/materials and ready-mixed concrete. As the A2 abutment is located at the top of a landslide, the landslide countermeasures (restraining pile, drainage pipe) determined based on the survey must be put in place before the start of construction in order to ensure construction safety (see Chapter 9).

Since the inclination of temporary load is about about 12%, the temporary pavement needs for stable transportation.

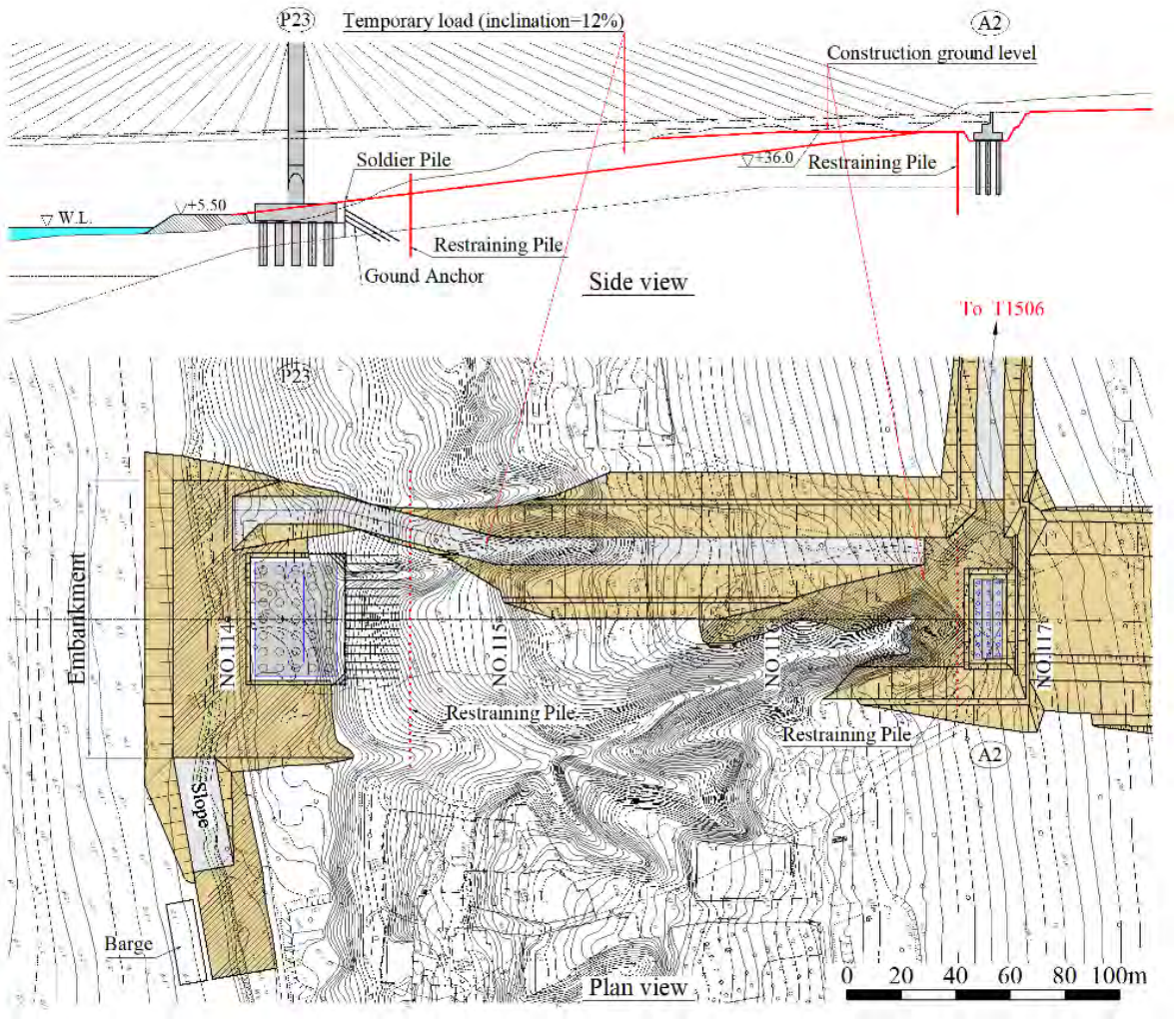


Figure 11-2-4. Reference Drawing for Temporary Construction on the Right Bank

11-2-4 Construction of Steel Cable-stayed Bridge (Edge-Girder Bridge)

1) Temporary Construction Work

Figure 11-2-5 shows the temporary work to construct the P23 pile foundation and footing. The plan view shows the area of embankment and flat place used for assembling the crawler crane and storing the materials and equipment. The side view shows the retaining wall with ground anchors.

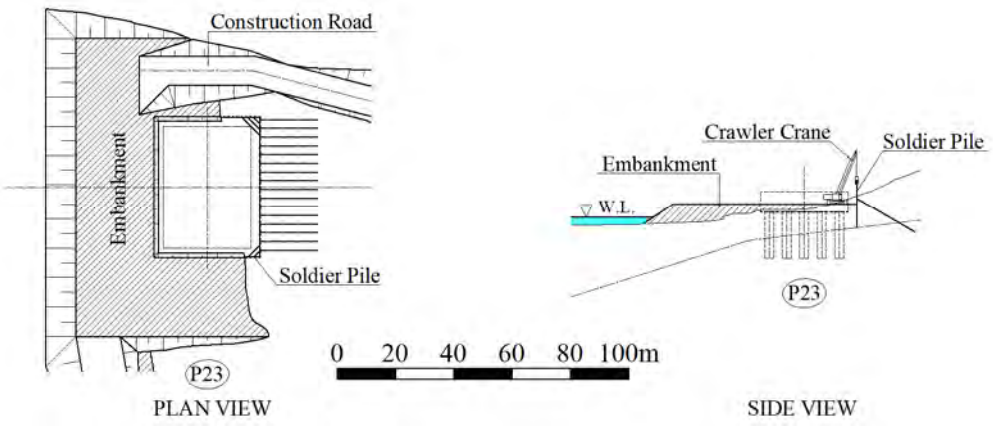
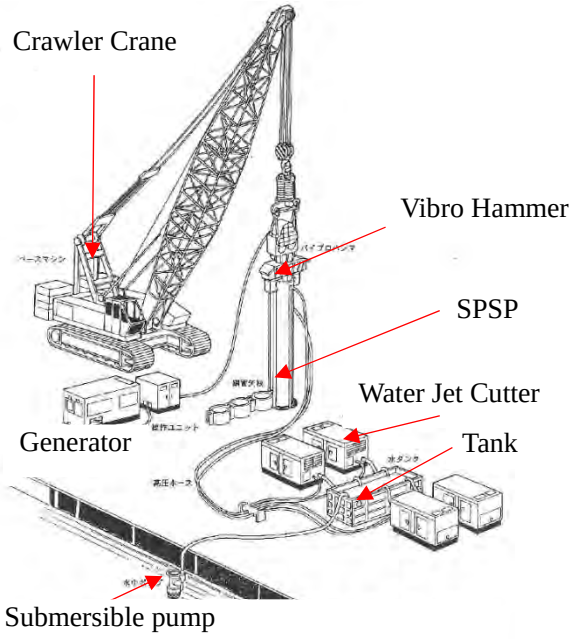


Figure 11-2-5. Reference Drawing for Temporary Construction at P23

2) Construction of Main Tower Substructure of the Left Bank Side (P22)

The structural format of the P22 substructure is SPSP foundation. For reference, Figure 11-2-6 and Figure 11-2-7 show the equipment (vibro hammer, water jet cutter, flying hammer, etc.) and crawler crane for beating the SPSP. Because the bearing layer is hard clay (N value of 50 or more) or limestone (N value of 60 or more, Uni-axial compression strength is about 10MPa), the flying hammer (see Figure 11-2-7) is expected to be necessary. [5]



Source: Steel Pipe Pile, Steel Pipe Sheet Pile and Vibro Hammer Methods (May 1996)

Figure 11-2-6. Vibro Jet Construction Method

[5] An uniaxial compression test of the bearing layer was conducted in the 2011F/S only. The maximum value indicated was the value at the depth of 39m in the river. Upper side of limestone includes weak parts.

Source: Kochi Marutaka website

Figure 11-2-7. Flying Hammer Construction Method

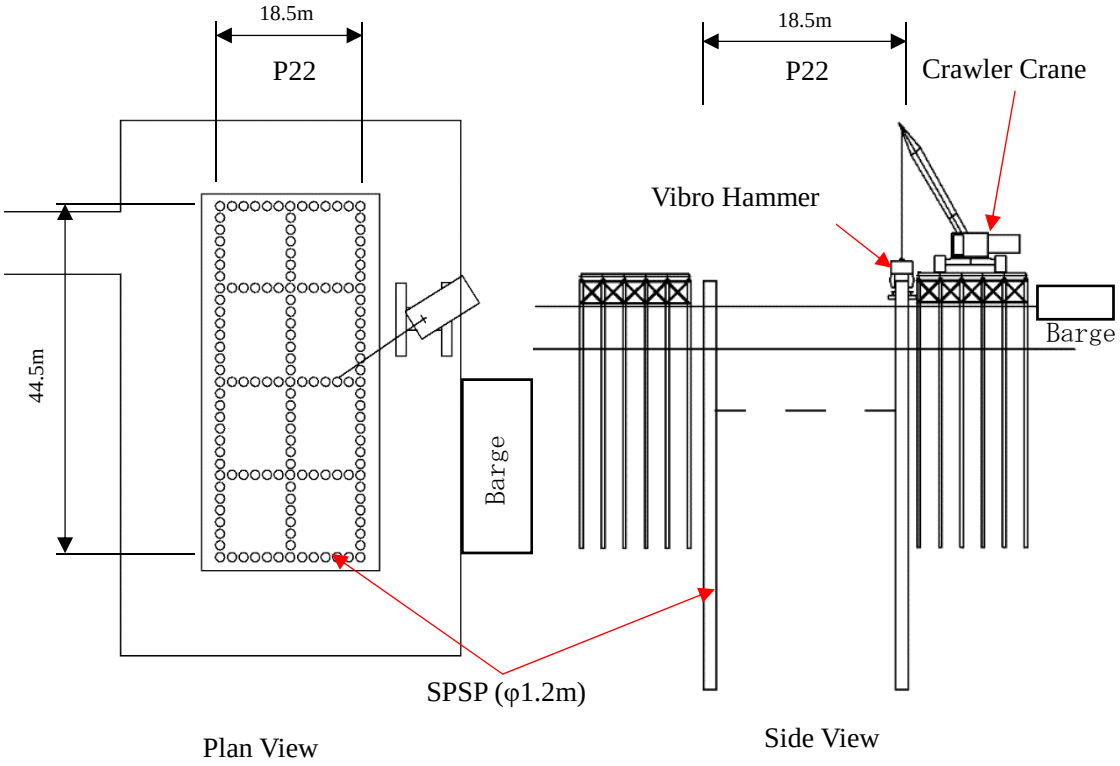


Figure 11-2-8. Reference Drawing for Steel Pipe Sheet Pile Foundation Construction at P22

(1) SPSP Foundation Construction

Figure 11-2-9 shows the flow of construction with a description of each process.

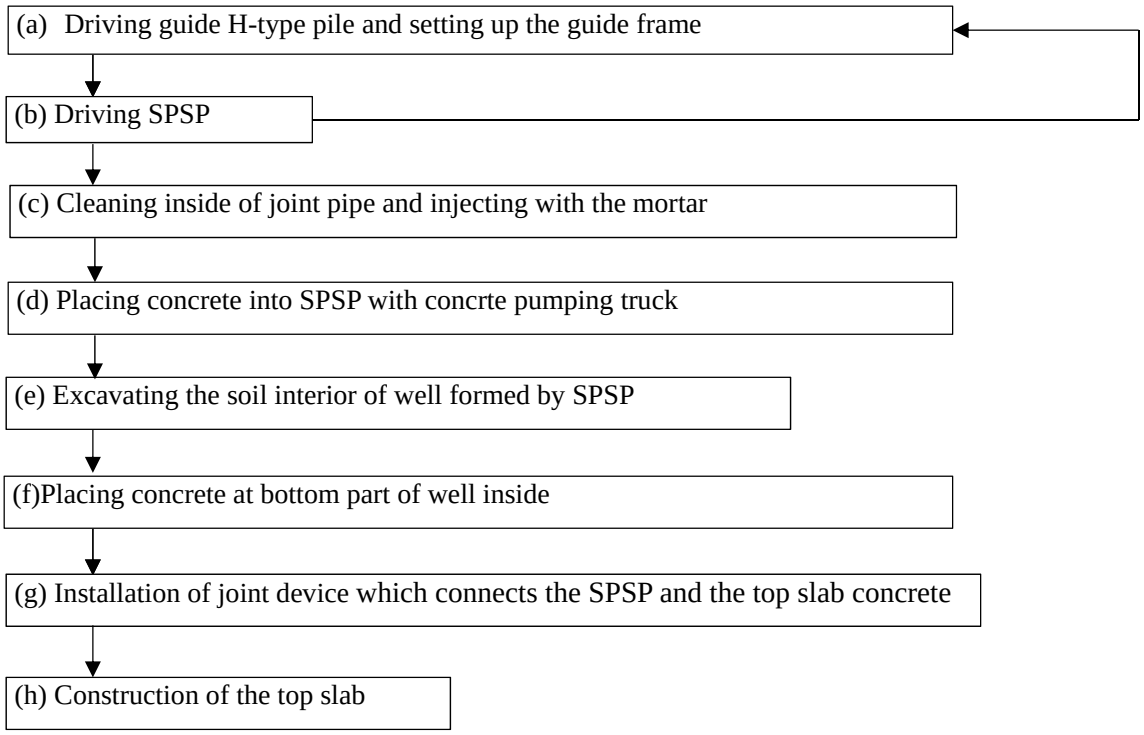


Figure 11-2-9. Flow of Construction for SPSP Foundation

a) Driving Guide H-type Pile and Setting up the Guide Frame

A closed section is formed by joining steel pipe sheet pile together. When forming with the steel pipe sheet, accurate joint spacing and positioning must be maintained. To achieve this, the width of the guide frame shall be pile diameter+buffer width (20 to 30 mm). A rotation-prevention jig is attached to the joint of the SPSP, and spacers are used to prevent misalignment of the steel pipe.

b) Driving SPSP

The SPSP is driven with the vibro hammer, checking the vertical accuracy from two directions. The driving is stopped when the elevation of the top-edge of the SPSP reaches the design elevation. When the bottom edge of the SPSP reaches the bearing layer, the vibro hammer is switched to the flying hammer.

c) Cleaning Inside of the Joint Pipe and Injecting with the Mortar

After the soil is removed from the joints, the base body range is filled with mortar with a strength of 21 MPa or higher to increase the performance of the water stop. Next, the temporary cofferdam range is filled with 0.10-0.25 MPa low-strength mortar.

d) Placing Concrete into the SPSP with a Concrete Pumping Truck

A significant counterforce acts on the SPSP when the temporary cofferdam is formed, and local deformation may occur due to the welding done when the top slab is joined. To address these issues, concrete is placed into the SPSP to provide reinforcement. The concrete filling range is usually twice the length of the top slab from the top edge. The filling concrete should have a strength of 21 MPa and is placed with tremie tube.

e) Excavating the Soil Interior of Well Formed by SPSP

Excavation is performed underwater using a clamshell bucket. Because confined groundwater has been detected at Br.5, the attention must be paid to internal water level drops to prevent boiling.

f) Placing Concrete at the Bottom of the Inside of the Well

The bottom concrete is a very important element for maintaining safety and assuring quality during construction with the cofferdam. The following steps must therefore be carefully performed during the construction.

・Excavation in the well is completed to the design depth
・The diver cleans off soil attached to the wall of the SPSP.
・A layer of sand of approximately 50 cm in thickness is spread on the bottom.
・The concrete design strength is 24 MPa, so concrete with a strength of 30 MPa should be used in the case of underwater placement.

g) Installation of a Joint Device that Connects the SPSP and Top Slab Concrete

The joint device is set up at the SPSP inside surface to transmit the external force from the upper pier frame to the SPSP. After drainage of the inside well, the deformation of the SPSP is measured and the SPSP surface is fully cleaned.

h) Construction of the Top Slab

The amount of concrete placed on the top slab is estimated to be about 1,500 m^3. Concrete placement work is estimated to take several days, so a detailed concrete placement method should be planned. A sheet fence or such will be installed to prevent the inflow/spread of the water from the ready-mixed concrete into the river. Because mass concrete is used, temperature cracks must be considered by accounting for the air temperature at the time of placement, and measures must be taken as necessary.

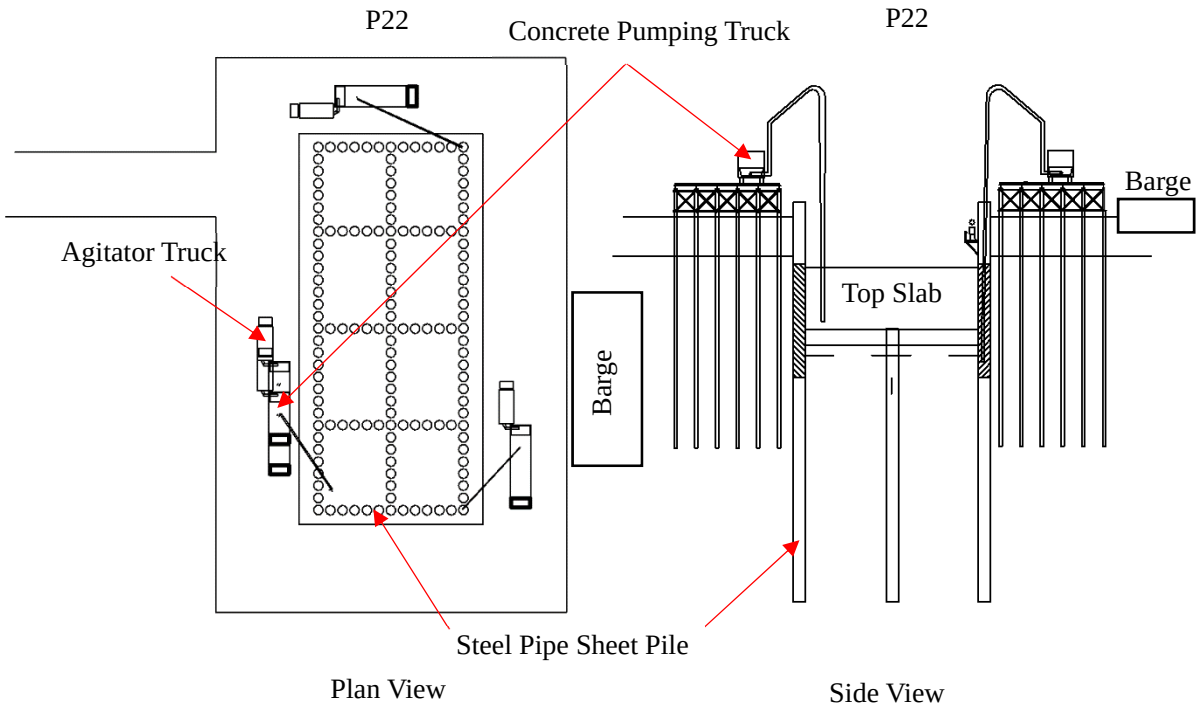


Figure 11-2-10. Reference Drawing for Placement of Top Slab Concrete inside the SPSP

Figure 11-2-10 shows the concrete placement inside of the SPSP (d) and the concrete placement of top slab (h) from Figure 11-2-9. For reference, the plan view shows the location of the agitator truck and concrete pumping truck, and the side view shows the placement of the concrete into the SPSP and the top slab. The hatching describes the filling range of the concrete.

(2) Construction of Bridge Pier

a) Removal of Laitance on Top Surface of Top Slab's Concrete and Cleaning of Embedded Rebar

Laitance occurring on the joint surface between the pier and top slab must be sufficiently removed while taking careful steps to prevent the wash-water from flowing into the river. After the joint surface is washed, the water should be sucked up using a submersible pump.

b) Rebar Arrangement and Installation of Side Formwork

The rebars are arranged while checking the vertical accuracy and coverage. The height of a single-lot side form is set to about 3 m. There should be no more than 1.5 m between the pump nozzle and concrete pouring surface. It will be important to consider the bar arrangement in order to ensure adequate space to insert a vibrator.

c) Concrete Placement

Because the concrete is placed from a highly elevated work position, scaffolding must be placed around the piers after carefully confirming the safety. Since the placment height of one lot is 3 m and the placement area is wide, it will be very important to plan out the order of placement in a manner that prevents the occurrence of cold joints.

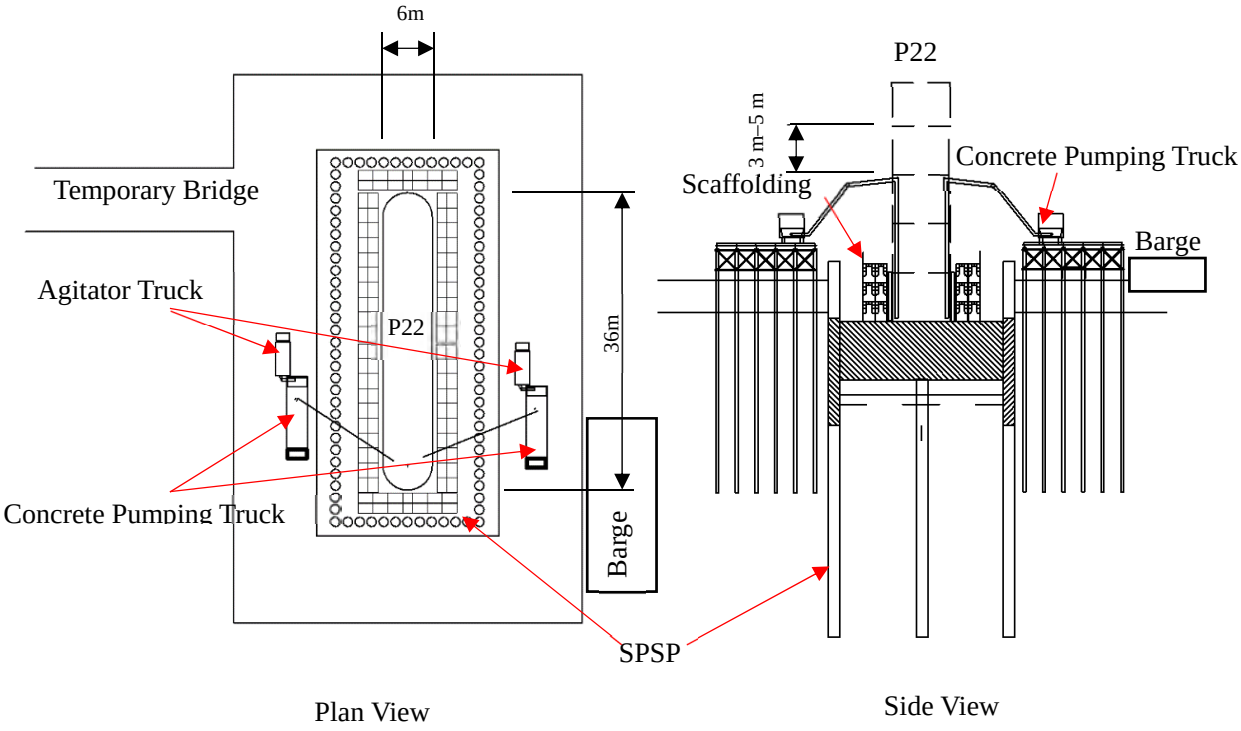


Figure 11-2-11. Reference Drawing for Pouring of Pier Concrete at P22

3) Construction of Main Tower Substructure of the Right Bank Side (P23)

The structural format of substructure is a cast-in-place pile. Figure 11-2-12 describes the flow of construction with a description of each process.

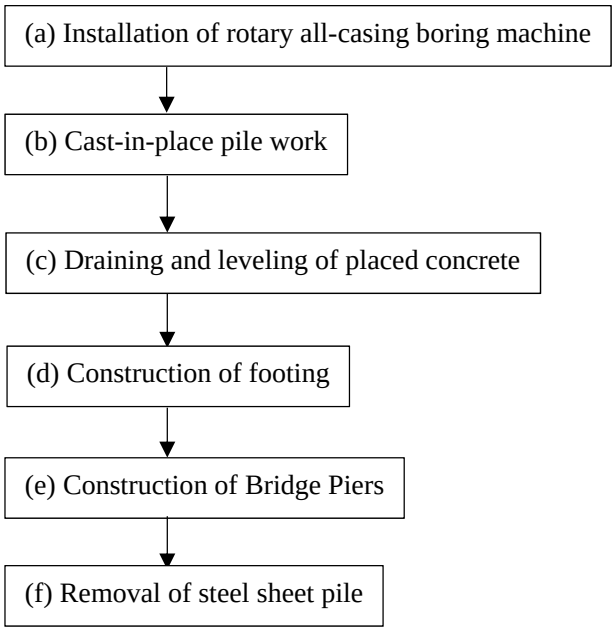
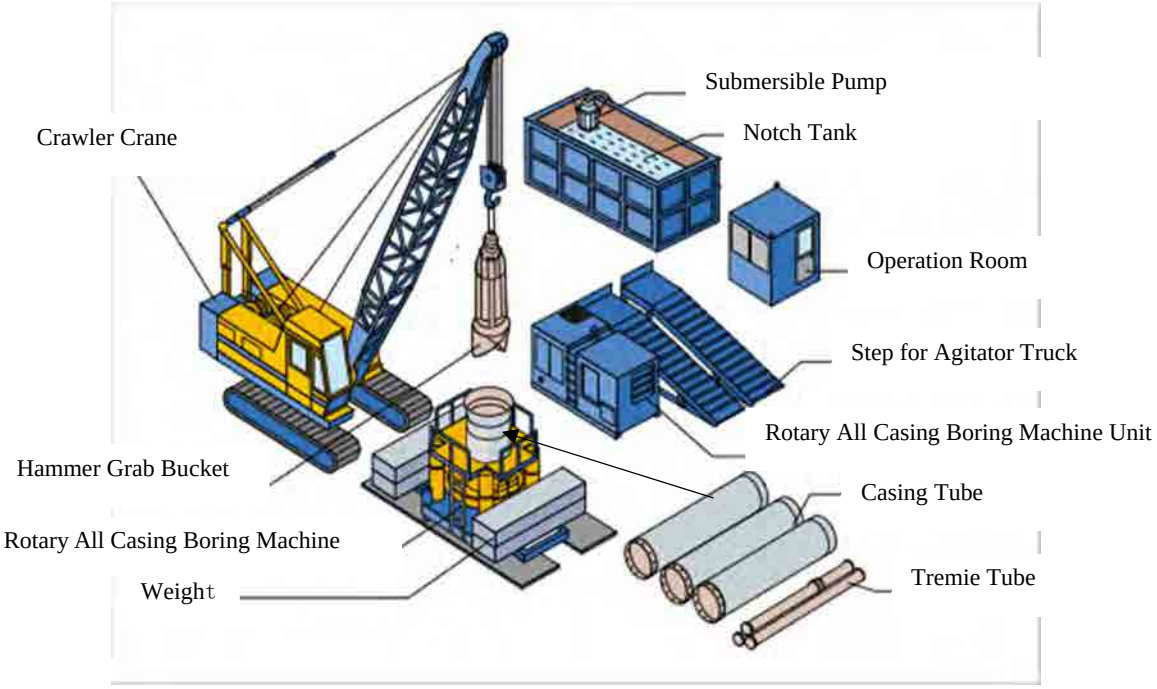


Figure 11-2-12. Flow of Construction for Cast-in-Place Pile

(1) Installation of Rotary All-Casing Boring Machine

As the bearing layer is rigid limestone, a rotary all-casing boring machine is used for cast-in-place pile work. Figure11-2-13 shows general construction conditions (major equipment) when using a rotary all-casing boring machine.

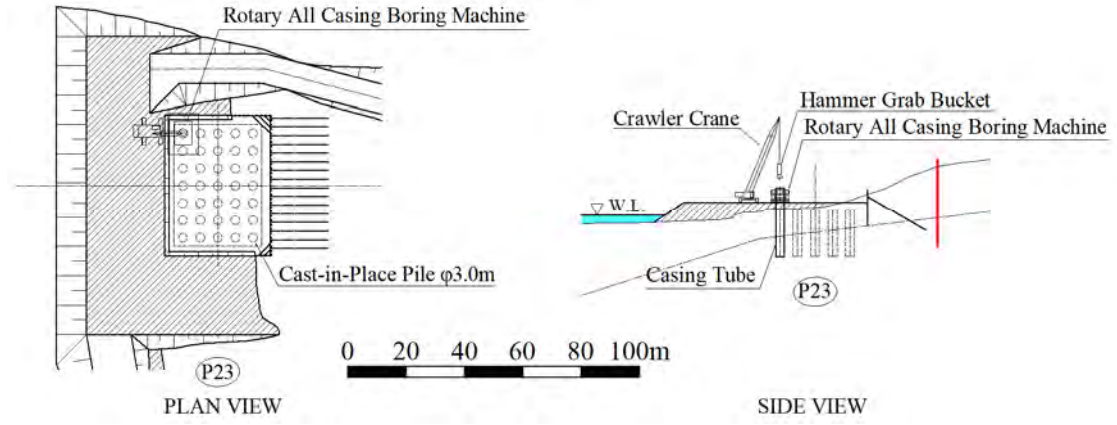


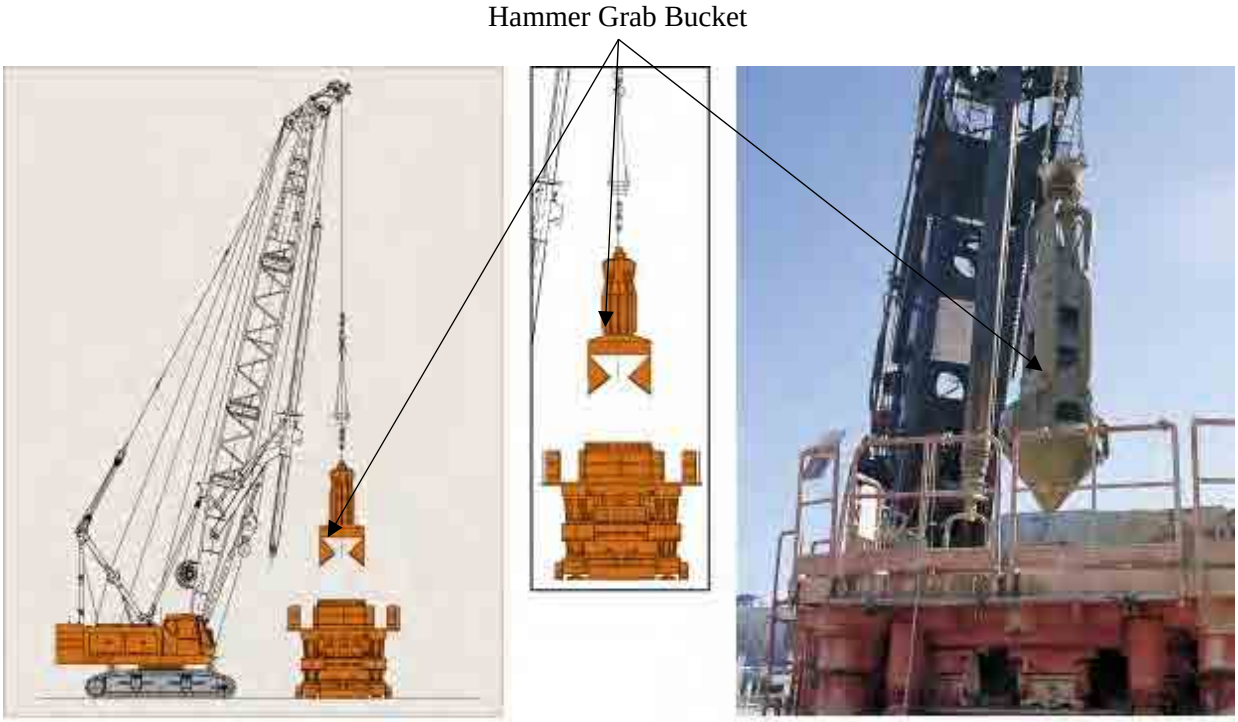
Source: Ueda Kikou Co., Ltd. website

Figure 11-2-13. General View of Construction Site with Rotary All-Casing

(2) Cast-in-Place Pile Work (Excavation/Reinforcement Cage Work, and Concrete Placing)

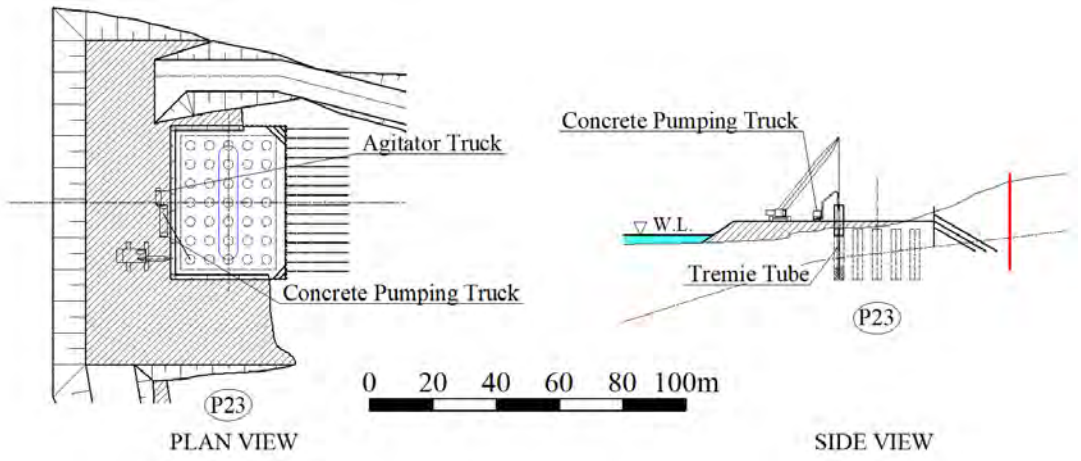
Casing tubes are pushed in by a rotary all-casing boring machine, and interior soil and sand is removed using a hammer grab bucket. This work is repeated until the casing tubes reach a 1D depth (sufficient for the pile diameter) in the supporting ground. At that point, internal slime, etc. is cleaned off, the reinforcement cage is placed in its design position, and the concrete is placed using a tremie tube. The placement height must be sufficiently controlled to ensure that the tremie tube does not come out from the surface of the placed concrete during pouring (see Figures 11-2-14 and 11-2-15).

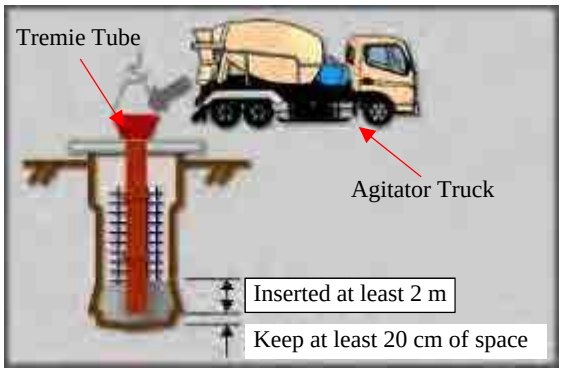




Source: Takemoto Kiso Koji Co., Ltd. website

Figure 11-2-14. Reference Drawing for Excavating with Rotary All Casing Boring





Source: EIKO Co., Ltd. website

Figure 11-2-15. Reference Drawing for Construction of Cast-in-Place Pile (Placing Concrete)

(3) Draining and Leveling of Poured Concrete

After completing the construction of the cast-in-place piles, pile heads are exposed and the rebar to be embedded in the footings are cleaned. Once complete, leveling concrete is placed.

(4) Footing Construction (Rebar Arrangement/Formwork Assembly; Concrete Pouring and Curing)

The position of the footing is chalk-marked on the surface of the leveling concrete. Next, the rebar and formwork are assembled while ensuring the prescribed coverage. Since a large amount of concrete is to be placed, it will also be necessary to plan out an appropriate concrete placement order. Figure 11-2-16 shows an example of the positions of the agitator truck and concrete pumping truck.

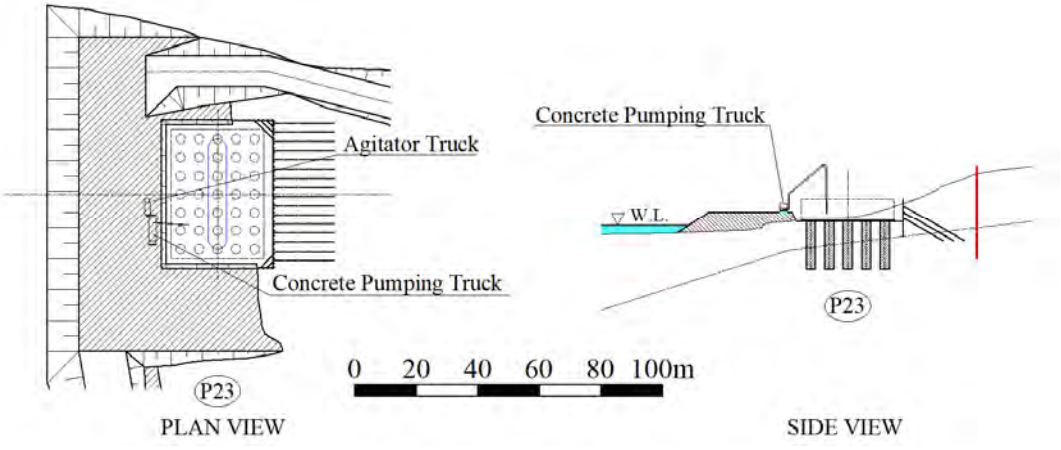


Figure 11-2-16. Reference Drawing for Construction of Footing (Placing Concrete)

(5) Construction of Bridge Pier

Figure 11-2-17 shows the positiond of the agitator truck and concrete pumping truck. The construction method is the same as that for the Top Slab.

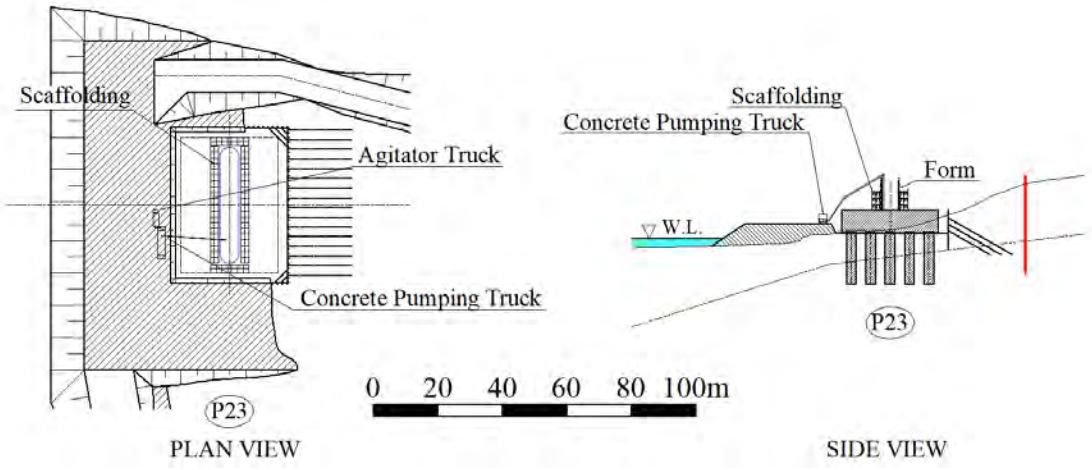


Figure 11-2-17. Reference Drawing for Construction of Pier (Placing Concrete)

(6) Removal of Steel Sheet Pile

After the construction of the bridge pier is completed beyond the cover soil position, the retaining wall is removed using a vibro hammer and the ground is leveled.

4) Main Tower Construction

The construction procedure for the main tower is described below.

(1) Tower crane assembly

a) Construction of the Installation Platform

Installation position is determined by factoring in maximum hanging load and the maximum operation radius. The installation platform is designed by calculating cross-sectional forces such as the bending moment on the platform when cranes are installed.

b) Tower Crane Assembly

The tower crane is assembled by the manufacturer according to its assembly procedure manual. Tower crane sections are sequentially added as construction of the main tower progresses. Midway through the construction process, connectors are removed from the constructed main tower. Due to the operation radius and hanging load capacity, it is believed that four cranes will be necessary with one on each edges of the main towers.

(2) Construction of the Main Tower

The section up to the main tower's intermediate crossbeam is designated the First Section, while the section from that point up is designated the Second Section. After constructing the main tower lot to about the 10 m point, the bracket holding the scaffolding load is installed by a tower crane and scaffolding is assembled. Hoisting of materials and equipment is performed at both edges of the main tower. The hoisting capacity of the tower crane is assumed to be about 100kN with an operation radius of 20 m (procured in Ukraine). The method of hoisting PC slabs must be considered with the above in mind. Figure 11-2-18 is an example of using the sliding form with the following divisions: the First Section is 6 divisions (approx. 5 m/lot), the crossbeam 2 divisions, and the Second Section 10 divisions (approx. 5 m/lot).

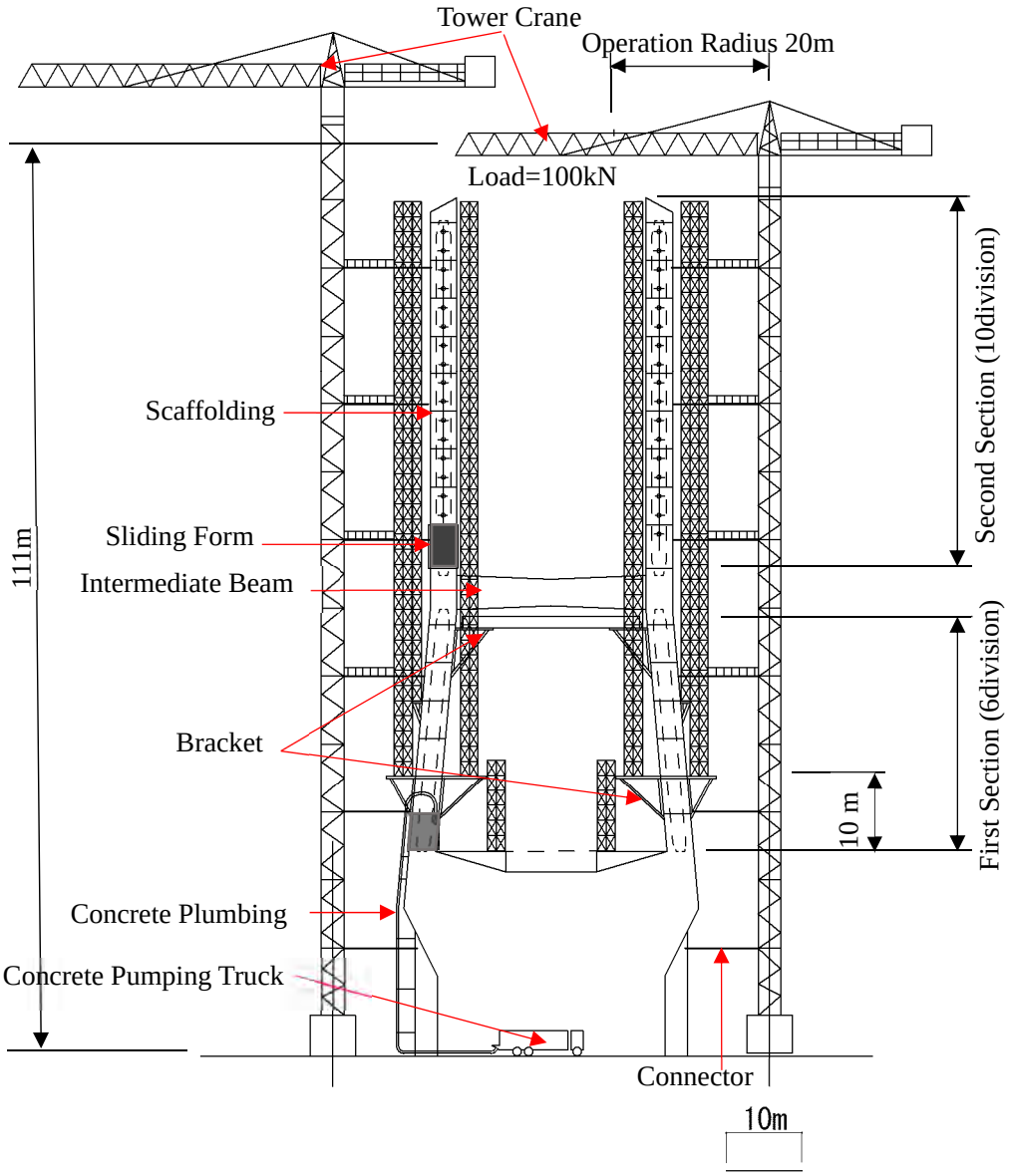


Figure 11-2-18. Reference Drawing for Main Tower Construction (P22, P23)

a) Rebar Arrangement

Rebar is connected with lap joints and arranged for each lot to ensure proper coverage. With a single-lot size of 5 m, rebar spacing is adjusted and open space secured in such a manner that concrete falling-height is no more than 1.5 m, flexible hose can be lowered, and a φ50 m vibrator can be inserted.

b) Concrete Pouring

To carry out concrete pouring, agitator and concrete pumping trucks are positioned on the temporary bridge or embankment near the main tower; pipes are run beside the main tower; and concrete pouring work is carried out. Points to keep in mind are as follows:

- The pumping capacity (discharge pressure) of the locally procurable pumping truck must be confirmed beforehand as there is a vertical distance of about 100 m from the ground where the pumping truck is to the top of the main tower, which will create a significant load during pumping.
- The concrete shall be either plasticized concrete or concrete that uses high performance AE water reducing agent. A slump of 15 to 18 cm is desirable.
- A concrete pumping test should be carried out before the actual concrete placement under the same condition.

・Especially when placing concrete in cold weather, it is important to consider measures such as wrapping concrete piping with an insulating material.

c) Installation of Outer Piping

Outer piping must be installed accurately while measuring x, y, and z transit routes, etc.

5) Superstructure

(1) Construction Procedure for Steel Girder and PC Slabs

Two proposals of PC slab construction were compared: a proposal to construct both girders and PC slabs simultaneously and a proposal to construct girders and PC slabs separately. As a result of the study, as shown in Table 11-2-3, Proposal 2, to construct girders and PC slabs separately, was selected as it is superior in terms of workability and safety.

Table 11-2-3. Comparison of Girder/PC Slab Construction Sequences

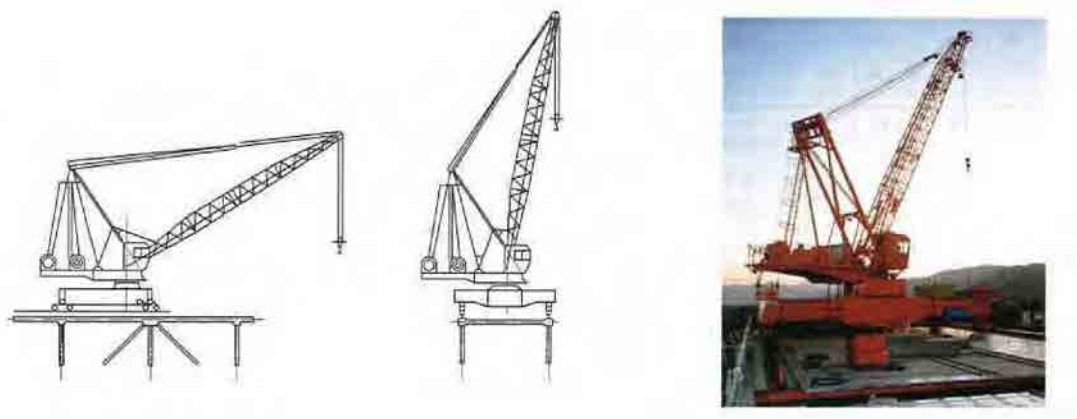
	Proposal 1: Construct girders and PC slabs simultaneously	Proposal 2: Construct girders and PC slabs separately
Workability	It is necessary to construct girders and PC slabs within a single construction block, and to retool at the construction site. This choice has inferior construction efficiency.	Since the construction of girders and PC slabs take place at different times, each construction process is repeated uninterruptedly. This offers better workability than the Proposal 1.
Safety	Due to a larger unbalance moment when constructing on cantilevered sections, this proposal is not as safe as Proposal 2.	Due to a smaller unbalance moment when constructing on cantilevered sections, this proposal is safer than Proposal 1.
Construction time	13.0 months	13.0 months
Economic feasibility	The weight of the steel can be reduced somewhat, but there is no particular advantage of either proposal since larger scale erection equipment grows larger.	The weight of the steel is slightly heavier, but there is no particular advantage of either proposal since smaller scale erection equipment is used.
Evaluation		Selected

(2) Selection of Girder Construction Method

The construction of cable-stayed bridges can be generally categolized into three types: piece-by-piece erection, medium-block erection, and large-block erection. Among these choices, large-block erection requires a large floating crane, which is not practical for application at the target site due to the massive costs for floating operation, etc. As a result of a comparative study on piece-by-piece erection versus medium-block erection, as shown in Table 11-2-4, Proposal 1, piece-by-piece erection (by traveler crane), was selected as it is superior in terms of workability, safety, and economic feasibility.

(3) Girder Installation Procedure

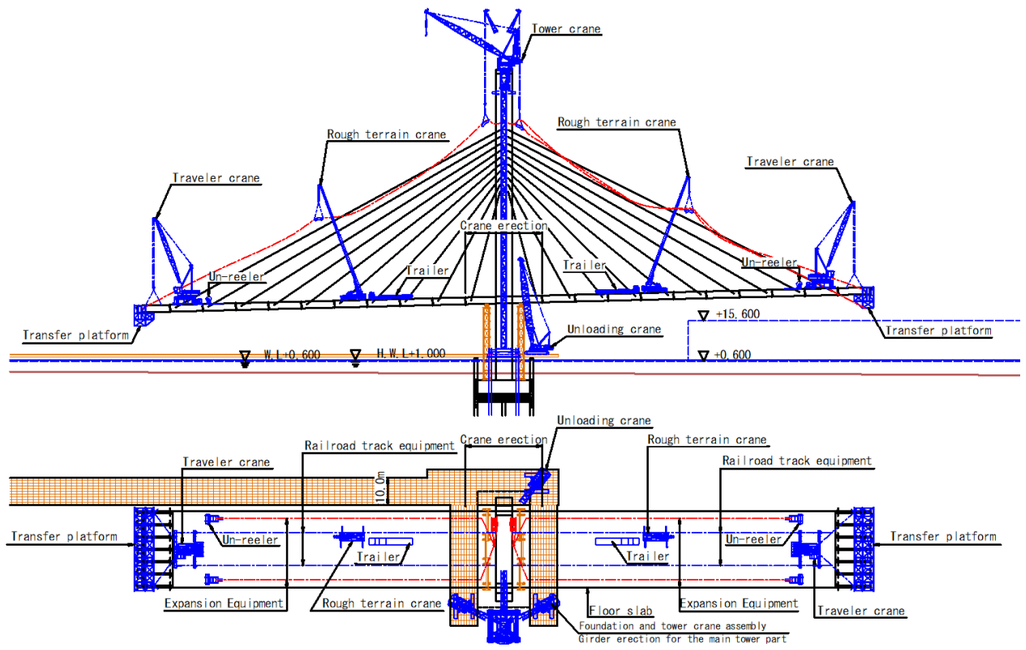
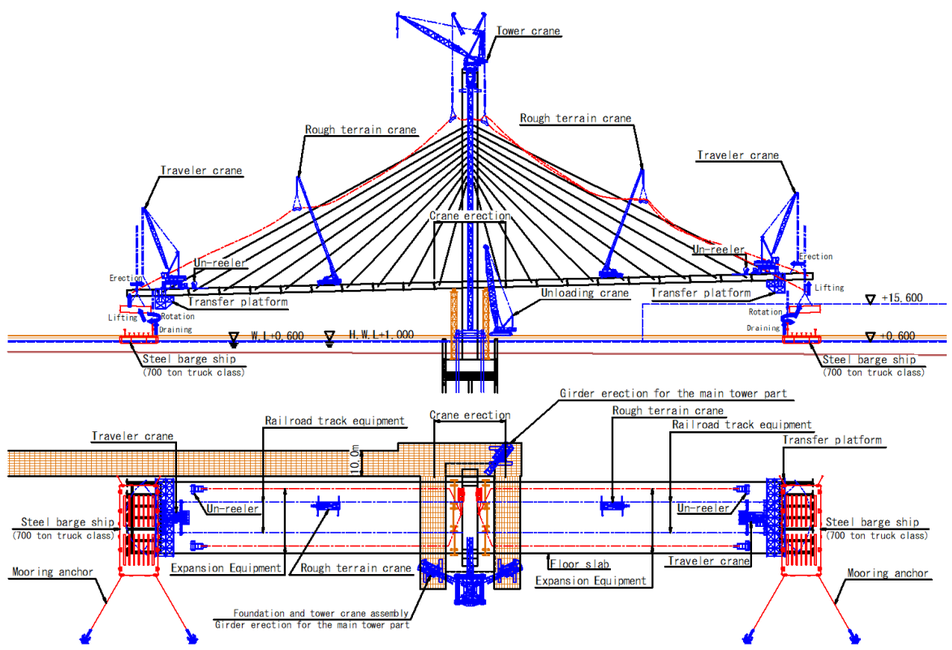
The selected Proposal 1, piece-by-piece erection (by traveler crane), uses the crane shown in Figure 11-2-19. This crane has excellent versatility and is easy to procure. Ordinarily, tracks are installed on the top flange of the main girder and equipment moves along this track while constructing on cantilevered sections. But in the case of this bridge, tracks would be installed on the stringers since the main girders are spaced too far apart.



Source: Estimations in Bridge Construction - 2016 Edition

Figure 11-2-19. Reference Drawing for the Traveler Crane

Table 11-2-4. Comparative Study of Girder Erection Methods

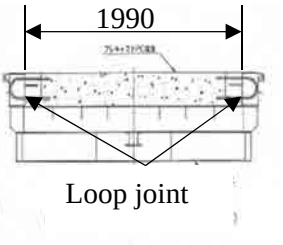
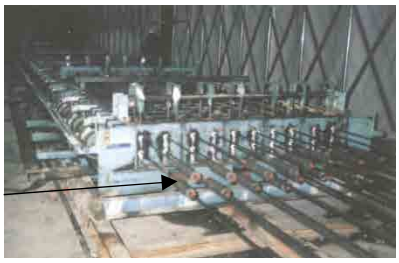
	Proposal 1: Piece-by-piece Erection (By Traveler Crane)	Proposal 2: Medium-block Erection (By Hanging Crane)
Overview		
Proposal Summary	A minimum unit of materials is transported in using the temporary bridge, and a traveler crane is used to erect over the river channel.	A medium-block (12 m long cross sections) is transported by crane barge ship to the yard near the bridge in advance, and a hanging crane hoists them up for erection.
Workability	・ No special temporary equipment is required outside the erection site. ・ The repetition of similar work at a single place makes it easier for local workers to improve their familiarity with the work, thus workability is good. ・ As the crane equipment on the bridge is compact, there are few problems such as competing for space with the cable assembly yard. ・ As the weight of construction equipment on the bridge is lighter, there is less chance for cable tension or camber errors.	・ It is necessary to construct medium-block assembly and storage yard facilities, and prepare equipment to transport to the river, thus there is a significant amount of temporary facilities. ・ This option consists of many different types of work, including medium-block assembly, transfer to the river, medium-block transport, and girder erection work. Work locations are also disjointed. Local workers improve their familiarity with the work slower, thus workability is inferior. ・ As the crane equipment on the bridge takes much space, there are issues such as competing for space with the cable assembly yard. ・ As the weight of construction equipment on the bridge is heavier, there is more chance for cable tension or camber errors.
Safety	・ In addition to consisting of singular repetitive work, the work is concentrated at the construction site, making it easier to ensure safety.	・ In addition to many different types of work, work locations are also disjointed—and worse still, these are all happening at the same time. This raises the potential for oversights in site management and makes it difficult to ensure safety.
Construction time	・ Although construction time is longer than Proposal 2, it is not a critical difference when considering the entire construction period (approx. 3 years). Girder construction period: 5.5 months PC slab construction periods: 7.5 months Total: 13.0 months	・ This was originally a method to shorten the construction period, but has little merit in doing so. Girder construction period: 4.5 months PC slab construction periods: 7.5 months Total: 12.0 months
Economic feasibility	・ Since temporary equipment, cranes, etc., are few and small, this method is more cost-effective.	・ This method has inferior cost-effectiveness as it requires a temporary bridge to transfer girders, a large crane besides the hanging crane for stacking, and the hanging crane must also be of larger scale.
Evaluation	Selected	

6) PC Slab Work

(1) Production of PC slab

The methods and equipment used for PC slab production satisfy the design strength and dimensional accuracy requirements and are confirmed by a supervising PC engineer. Table 11-2-5 shows the process and various stages of production.

Table 11-2-5. Process of PC Slab Production

Stage	Process	Figure
1	Fabrication of Rebar The figure shows a cross section of PC slab with a loop joint and 1990 mm width.	 
2	1) Setting the PC Wire 2) Setting the Side Form 3) Tensioning the PC Wire The figure shows pre-tensioning.	PC wire 
3	1) Placing the Concrete The figure shows placement with a hopper. 2) Curing	Hopper 
4	Transfer to the Stock Yard The figure shows the PC slab stock yard.	PC slab 
5	Transfer to the Site The figure shows the transfer using a trailer for reference, or PC slab members transport by barge to the construction site. The transportation method is influenced by the construction condition.	PC slab 

Sorce: PC Slab Construction Procedures (March 2004)

(2)Construction of PC Slab

Figure 11-2-20 describes the flow of construction with a description of each process.

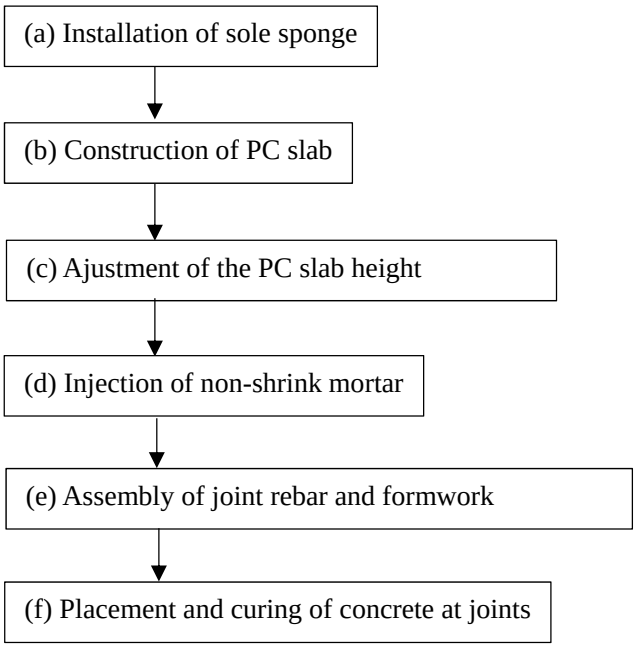
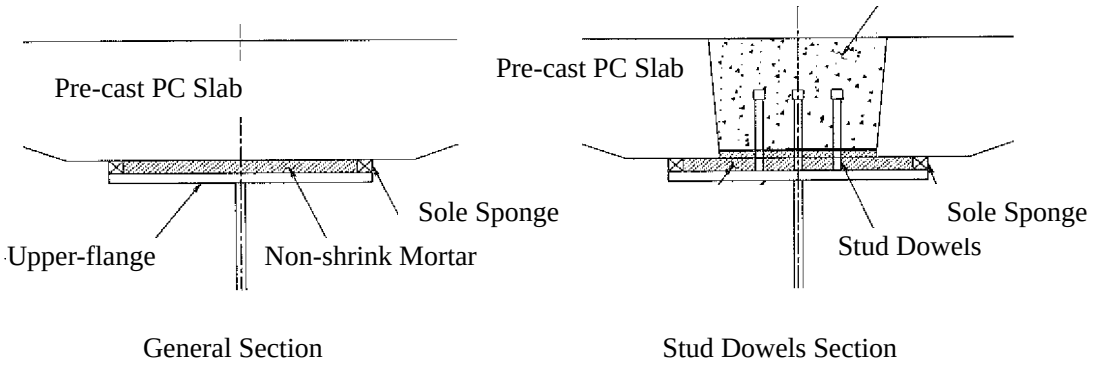


Figure 11-2-20. Flow of Construction for PC Slabs

(a)Installation of Sole Sponge

To prevent the non-shrink mortar from leaking, a sole sponge is installed in the bridge's axial direction at both ends of the girders' top flange.



General Section　　Stud Dowels Section

Source: PC Slab Construction Procedures (March 2004)

Figure 11-2-21. Sole Sponge Installation

(b) PC Slab

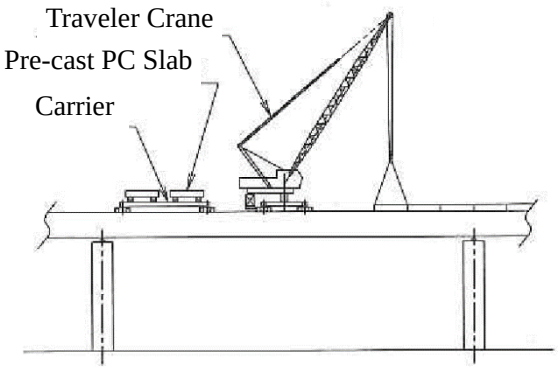
After construction of a single block of girders is completed, it is hoisted from the approach section to the bridge surface by crane (see Figure 11-2-22), transferred to the construction location by a carrier installed on the bridge, and then the PC slab is progressively installed by traveler crane (see Figure 11-2-23).

Figure 11-2-22. Reference Drawing of Hoisting Work

Source: Japan Prestressed Concrete Contractors Association website

Figure 11-2-23. Reference Drawing of Erection by Traveler Crane

For the main bridge section, after all girder erection is complete, the PC slab is hoisted from the approach section to the bridge surface, transferred by bogie, and progressively installed by the traveler crane from the main tower section side(Figure11-2-24).

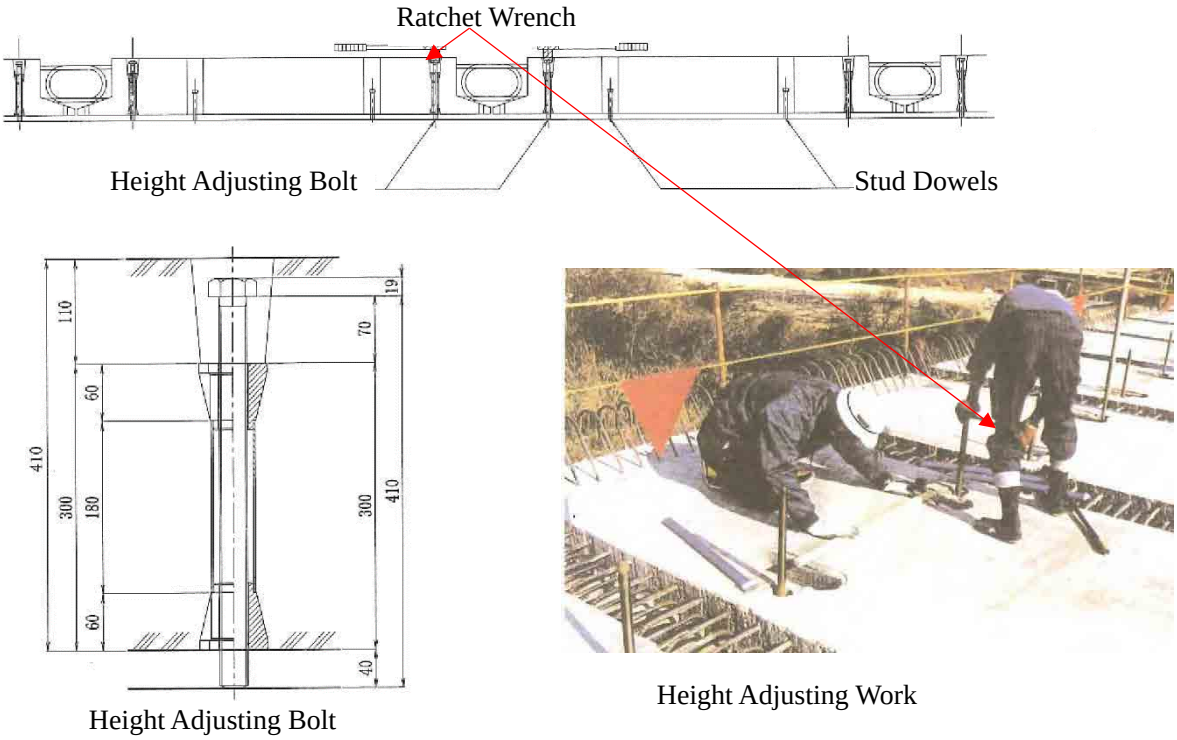


Source: PC Slab Construction Procedures (March 2004)

Figure 11-2-24. Reference Drawing of Erection by Traveler Crane

(c)Adjustment of the PC Slab Height

Figure 11-2-25 shows some examples of adjusting bolts and height adjustment work.



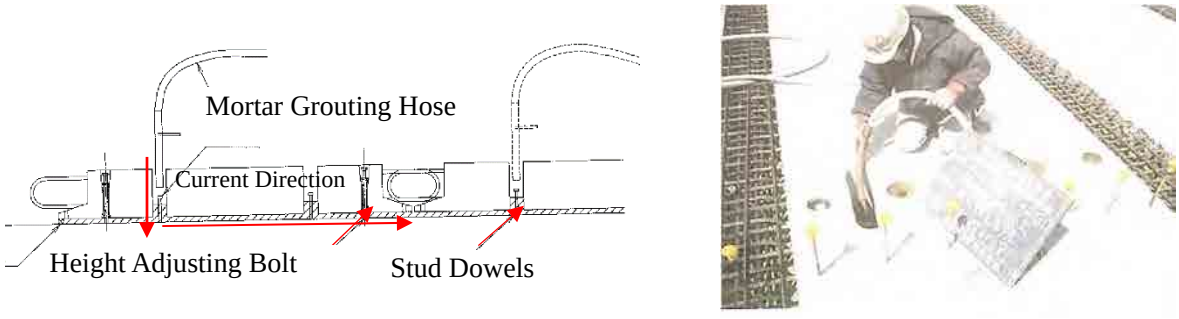
Source: PC Slab Construction Procedures (March 2004)

Figure 11-2-25. Reference Drawing for PC Slab Position and Height Adjustment

Height adjustment is performed with height adjusting bolts that is embedded during fabrication. Adjustment is performed to ensure that the design thickness of mortar is loaded (standard is about 40 mm) and to achieve the design slab height at the completion of deck construction. When adjusting height, it is important to avoid creating a large bending moment or warping of the slab.

(d)Injection of Non-shrink Mortar

The joint, specifically the gap between the slab and girder top flange, must be properly filled to achieve the design quality. Before filling with mortar, the floor is checked to ensure the design space between the slab and girder top flange is achieved. Mortar is injected directly from the stud dowel hole of the lower floor slab (see Figure 11-2-26).

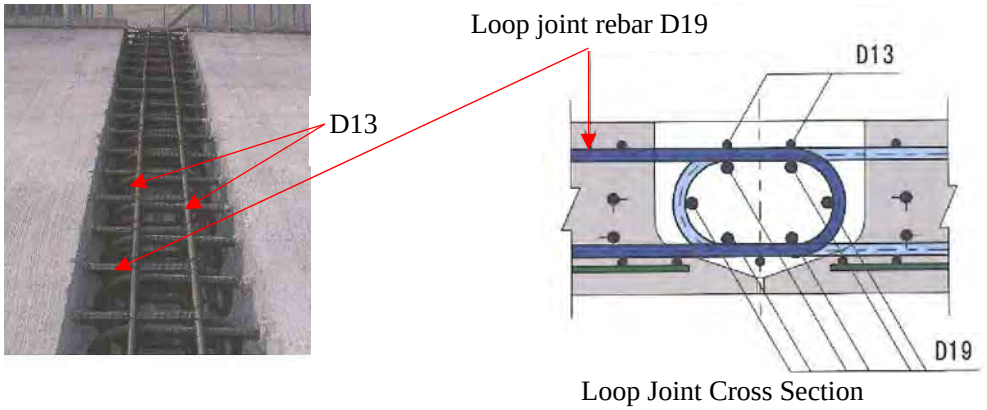


Source: PC Slab Construction Procedures (March 2004)

Figure 11-2-26. Reference Drawing of Mortar Grouting Work

(e)Assembly of Joint Rebar and Formwork

After the slab is constructed, through-arranged reinforcement perpendicular to the bridge axis is inserted from the edge section of the cantilevered slab. Figure 11-2-27 shows what the completed assembly looks like.



Source: Design and Construction of Road Bridges with Precast PC Slab (March 1991)

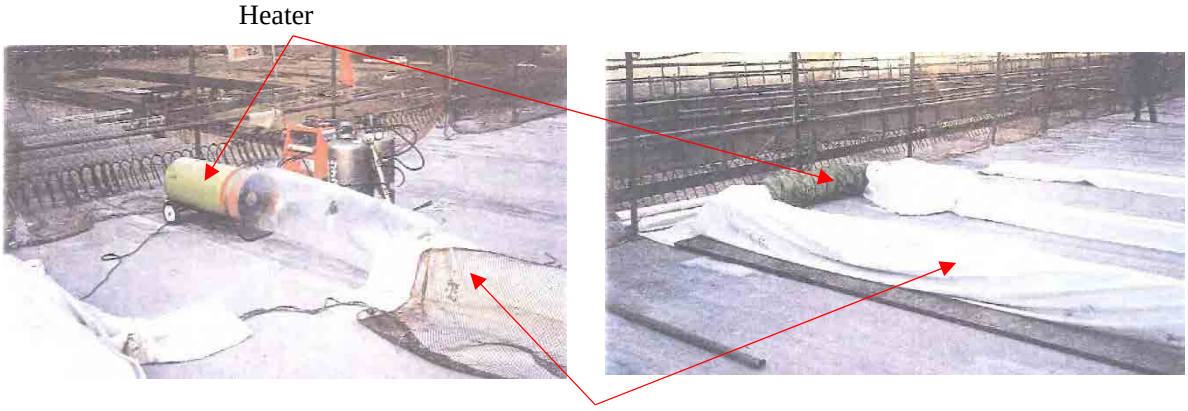
Figure 11-2-27. Reference Drawing of Rebar Arrangement at a Joint Section

(f)Placing and Curing of Concrete at Joints

The design strength of the connecting concrete must be equal to or greater than the strength of the deck slab. Shrinkage-compensated concrete is used to prevent the concrete from cracking, (expansion factor $150 \sim 250 \times 10^{-6}$). Construction using winter concreting is adopted especially when the daily average temperature is 4°C or less.

During cold season, winter concrete curing is applied to keep the concrete temperature at no less than 5°C while curing. Sheet curing is also used to prevent wind from hitting the concrete surface directly, and this is used in combination with heated curing. In the case of heated curing, water should be sprinkled to prevent concrete from drying too rapidly and minimize localized heating.

Figure11-2-28 shows examples of winter concrete curing.



Source: PC Slab Construction Procedures (March 2004)

Figure 11-2-28. Reference Drawing of Heated Curing in Winter

11-2-5 Construction of the Left Bank Approach Bridge

Below describes construction of the left bank approach bridge.

1) Temporary Construction Work

Weather-resistant large size sandbags (Japanese technology) are used to create level ground on which to set the push-in frame. An H-steel pile or ground anchor, which bears the counterforce when press-fitting the PC well, is installed, and the push-in frame is assembled (see Figure11-2-29).

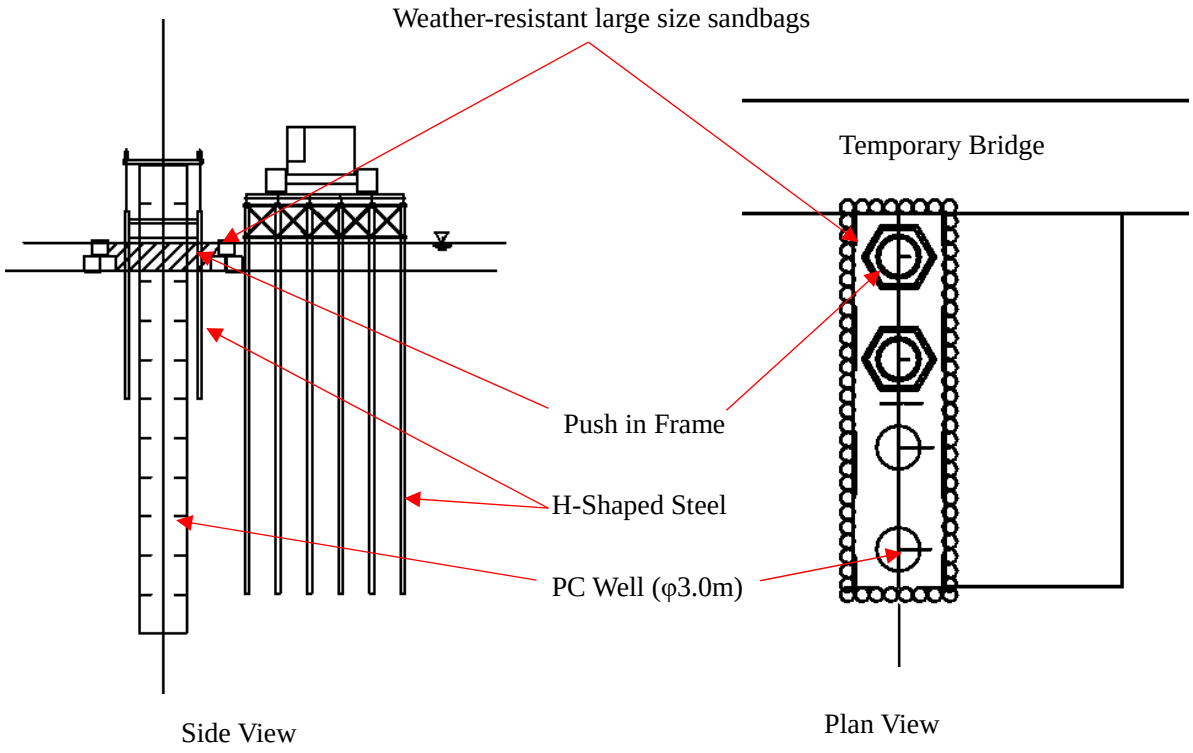


Figure 11-2-29. Reference Drawing for Temporary Facilities P1-P20

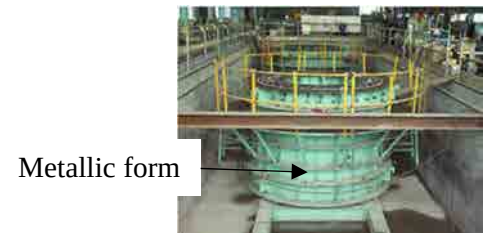
2) Substructure (PC Well Method)

The PC Wells are constructed using by the "PC Well Method, Design and Construction Manual (March 2009)" as a reference. This manual is to be used as a reference when applying PC wells to the bridge substructure, etc. Since the PC well method is unique to Japan and has no history of use in other countries, it should be necessary to provide workshops and training based on this manual before work begins and to ensure that the manual's technical content is fully understood by all involved.

(1) Production of PC Well Members

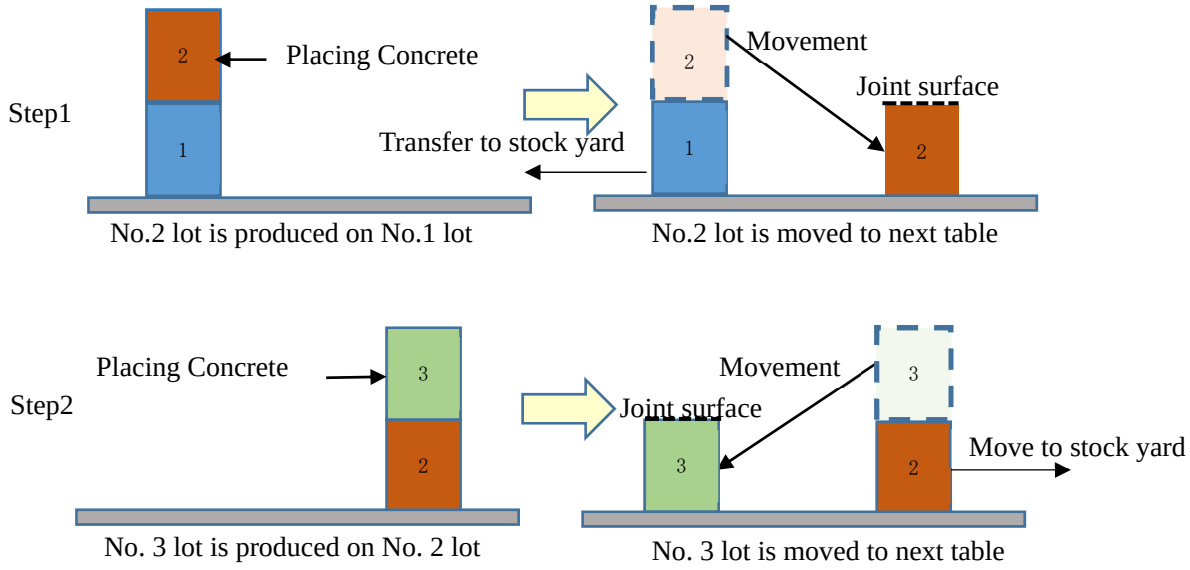
The methods, equipment, and supervision of the PC Well Member production are all sufficient to satisfy the design strength and dimensional accuracy requirements. Table 11-2-6 shows the process and various stages of production. Fabrication by the match-casting method is adopted in order to prevent tension cracks when the PC wells are joined.

Table 11-2-6. Production Process of PC Members

Stage	Process	Figure
1	Assembly of Rebar Cage The figure shows the rebar cage and inspection of the rebar space.	
2	1) Fabrication of Form The figure shows the fabricated metallic form arranged in 2 steps. 2) Placement Concrete 3) Removing form	
3	Inspection of Dimension The figure shows an inspection of the height, circumference, and diameter of a PC well member.	
4	Transfer to the Stock Yard The figure shows the members stocked at the yard.	
5	Transfer to the Site The figure shows the transfer by trailer for reference, or PC well members transport by barge to the construction site. The transportation method is influenced by the construction condition.	

Source: P.S. Mitsubishi Construction Co., Ltd.

In the match-casting method, the top surface of the previously molded lot becomes the bottom of a new lot when the concrete is placed for the new lot. As a result, the joint surfaces between the lots are carefully matched to avoid unevenness from occurring. This step boosts durability and helps prevent cracks from occurring when a joint section is under tension. Figure 11-2-30 shows the production procedure at the casting yard.



- Repeating the Step 1 and Step 2

Figure 11-2-30. Match-Casting Method

(2) Construction of a PC Well

Table 11-2-7 shows the main process and various stages of construction. Figure 11-2-31 and Figure 11-2-32 show the two types of Pushing-in Devices in detail. One is the standard type and the other is for solid stratum.

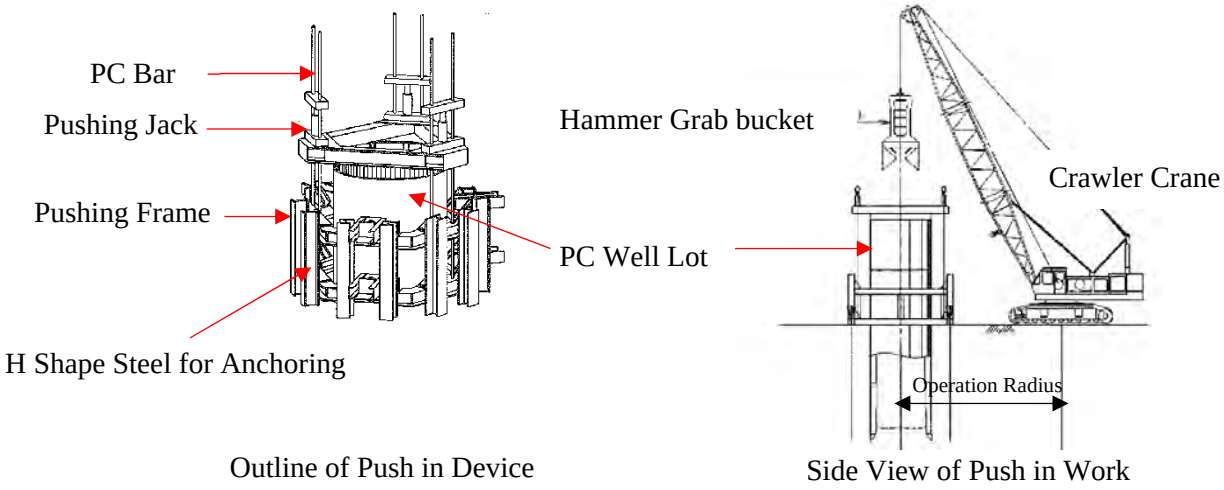
Table 11-2-7. Main Process and Various Stages of Construction.

Stage	Process	Figure
1	Fabrication of the Cutting Edge Lot The figure shows the steel cutting edge and RC lot being joined by applying a predetermined tension to the PC bar. After that, non-shrink mortar is injected into the cavity surrounded by the cutting edge.	
2	Force Fitting Work 1) Setting the RC Lot The figure shows the cutting edge lot using a crane. 2) Setting the PC bar 3) Painting the adhesive The figure shows painting at the joint surface. Moisture and dust on the joint surface is removed, and epoxy adhesive of about 1 mm in thickness is evenly applied. 4) Tensioning the PC bar The figure shows tensioning at the top of the PC well. The first lot is installed and tension is applied on the PC bar to join the sections. At this point, the workers check for any adhesive protruding from the joint and remove any excess they find. 5) Grouting 6) Pushing into the ground	1)  3)  4) 
3	Placing the Bottom Concrete A compressed airlift, etc. is used to remove slime from the bottom section, then the bottom concrete is placed to the design height.	 
4	Fabrication of the Pier Part After the foundation work is completed, the land around the construction site is prepared, scaffolding for pier construction is assembled, and RC lots are stacked and tension-clamped up to the design position	

Source: P.S. Mitsubishi Construction Co., Ltd.

a) The Stadard Type of Pushing in Device

Until the bearing layer is reached, a push-in jig is mounted on the top edge of the PC well, each pushing jack's pressure is adjusted while monitoring verticality of the PC well, and interior ground is excavated evenly with the hammer grab (see Figure11-2-31).

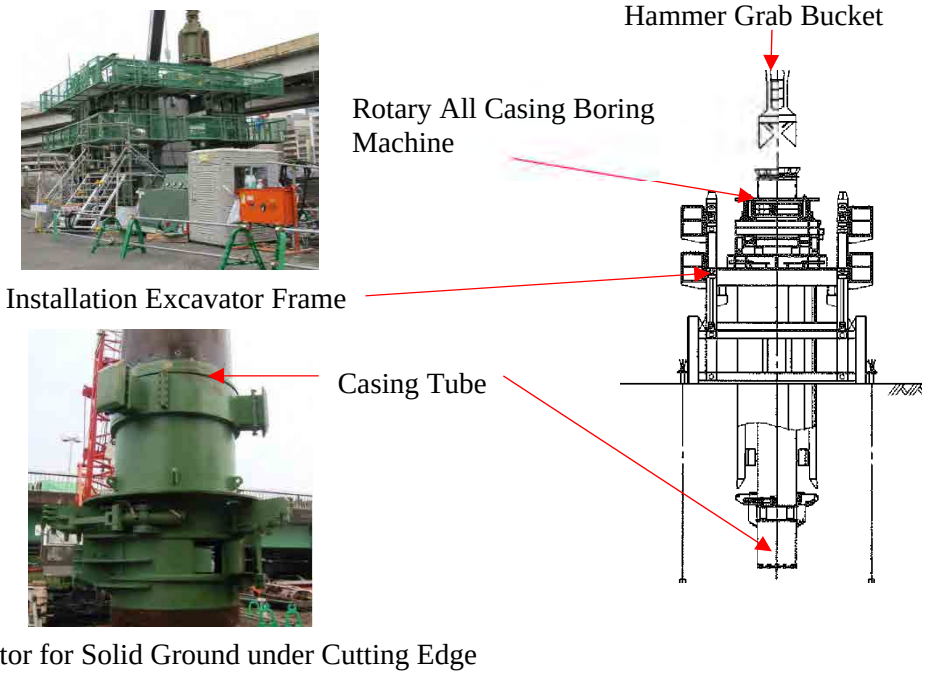


Source: PC Well Method, Design and Construction Manual (March 2009)

Figure 11-2-31. Reference Drawing for Push- in Construction Method until Bearing Layer

b) The Solid Stratum Type of Pushing Device

Once excavation reaches a stratum of hard clay or limestone, which is the bearing layer, the equipment switches to the 'excavator for solid ground under cutting edge' shown in Figure 11-2-32 and push-in construction work begins.



Source: Kato Construction Co., Ltd.

Figure 11-2-32. Reference Drawing of Push-in Construction Method under Bearing Layer

3) Support Beam

An insert is embedded beforehand into the uppermost lot which is used to install a side bracket. Then H-type and angled steel pipe are arranged on this and the formwork is assembled. The side of the PC well that contacts the cast-in-place concrete part of the beam has its surface roughened in advance, and the PC well interior between beam heights is filled with concrete (see Figure11-2-33).

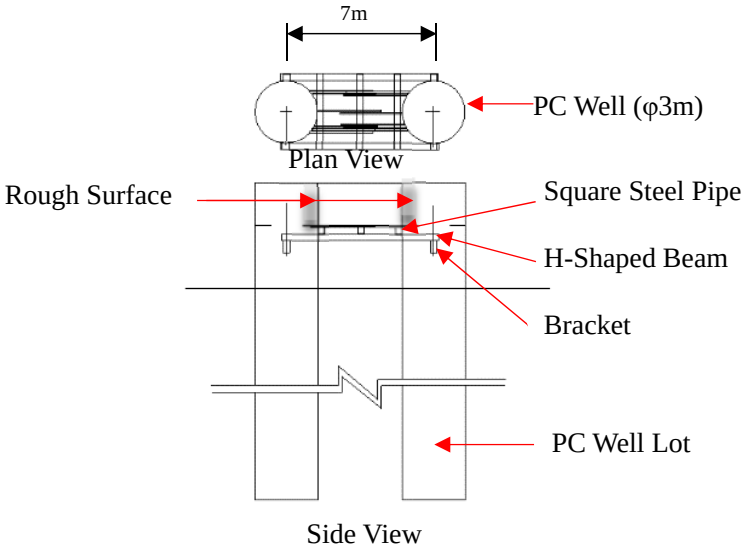


Figure 11-2-33. Reference Drawing for Fabricating the Support Beam

4) Girder Erection

The bents are constructed at an 18 m intervals and the girder block (18 m in length and 240 kN in weigth) is hung and set using a 150t crane on the temporary bridge (see Figure 11-2-34).

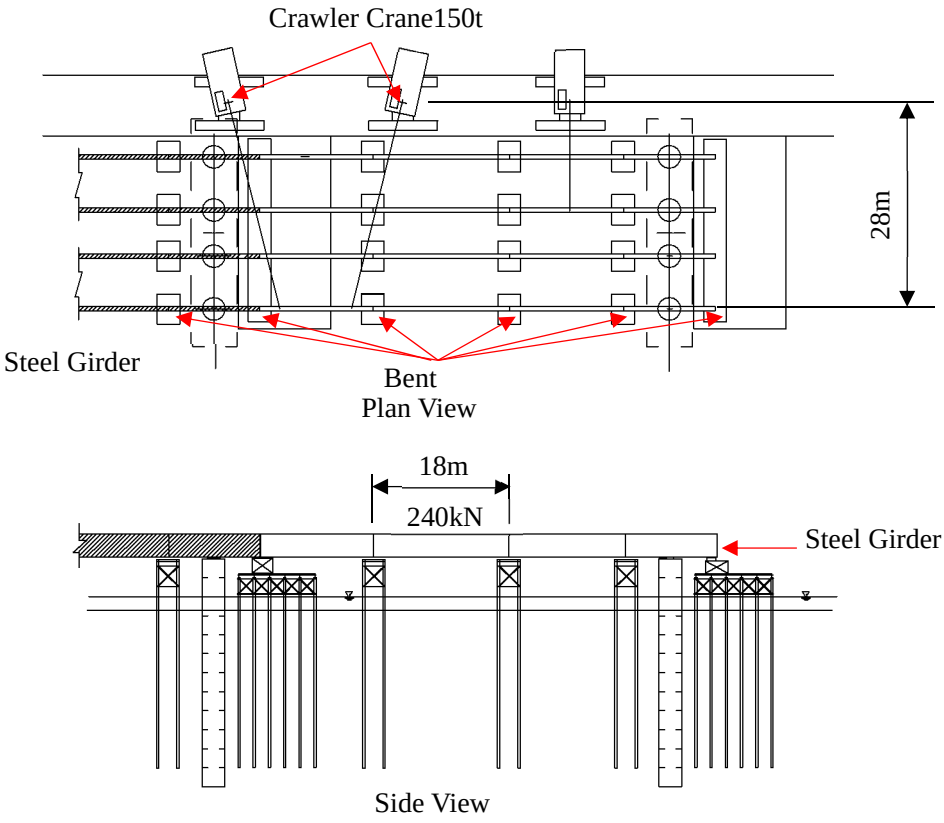


Figure 11-2-34. Reference Drawing for Erection of the Left Bank Approach Section

11-2-6 Construction process

Table 11-2-8.Construction Schedule (Route2)

Route2

Construction schedule of right bank side			Month
Preparation work			1
Temporary work & Land slide protection	Approach road from T1506 to the bank		1.5
	Countermeasure for land-slide		Survey:0.5
			Well:2
			Pile:19
Substructure work	A2	Pile Foundation	1
		Excavation	0.5
		Pile, Tower	2
	P23	Pile Foundation	3
		Cofferring and Excavation	4
		Pile, Tower	14.5
Superstructure work (main bridge section)	Construction girder & PC slab(P23-span center&P24)		13.5
	Construction of center span		0.5
Bridge surface construction work			3
Clean up work			1

Construction schedule of left bank side			Month
Preparation work			1
Temporary work	Temporary bridge from A1 to P22(l=1395m+1144m)		13
Substructure work	A1		1.5
	P1(PC well)		1.5
	P2(PC well)		1.5
	P3(PC well)		1.5
	P4(PC well)		1.5
	P5(PC well)		1.5
	P6(PC well)		1.5
	P7(PC well)		1.5
	P8(PC well)		1.5
	P9(PC well)		1.5
	P10(PC well)		1.5
	P11(PC well)		1.5
	P12(PC well)		1.5
	P13(PC well)		1.5
	P14(PC well)		1.5
	P15(PC well)		1.5
	P16(PC well)		1.5
	P17(PC well)		1.5
	P18(PC well)		1.5
	P19(PC well)		1.5
	P20(PC well)		1.5
	P21	Pile Foundation	7.5
		Pile, Tower	3.5
	P22	Pile Foundation	11
		Pile, Tower	13
Superstructure work (approch section)	Construction girder(A1-P21,1185m@2)		31
	PC slab(A1～P21.num.=1185pieces)		21
Superstructure work (main bridge section)	Construction girder & PC slab(P22-span center&P21)		11

Production schedule of Pre-cast blocks and Steel Pipe Sheet Pile		Month
Steel Pipe Sheet Pile		6
PC well members:num.=1184(27pieces/month)		44
PC slab (48pieces/month)	Approach section : num.=1185pieces	27
	Main bridge : num.=840pieces	18
Pre-tension slab girder	Approch section : num.=102pieces	10

Note:The starting time of the pre-cast block production depends on the construction schedule.

11-3 Construction Plan of Route 3

For the construction plan of Route 3, only contents that differ from Route 2 will be described.

11-3-1 Construction Conditions

1) Bridge Structural CompornentsCompornents

The superstructure of the main bridge is a steel cable-stayed bridge, the deck slabs are high quality PC slab, and the substructure is a SPSP foundation with cast-in-place piers. The superstructure on the left bank approach is steel girder construction, the deck slabs are high quality PC slab, and the substructure is constructed with the PC well method using high quality PCa members, which allows the construction period to be reduced.

The list of the bridge's structural formats is shown in Table 11-3-1.

Table 11-3-1. List of Bridge Structural Compornents

	Left bank approach section	Main bridge section
Length (m)	1,340	840
Superstructure	Steel girder (2 main girders)	Steel cable-stayed bridge (edge-girder bridge)
Deck slab	PC slab (non-composite)	PC slab (composite)
Pier	PC Well	Cast-in-place
Foundation		SPSP

2) Supporting ground

Supporting ground and its depth are shown in Table 11-3-2.

Table 11-3-2. Route 3 Supporting Ground

	Near the left bank approach section		Near the left bank main tower position	Near the right bank main tower position
	Br.3	Br.8	Br.9	Br.10
Supporting ground	GL-26.0m (AM-22m) Monolithic clay (MC)	GL-24m (AM-25.7m) Monolithic clay (MC)	GL-30.1m (AM-33.6m) Monolithic clay (MC)	GL-29.9m (AM-33.1m) Monolithic clay (MC)

11-3-2 Overall Temporary Construction Work

For the left bank approach, a temporary bridge will be installed to facilitate construction of the substructure and steel girders. The temporary bridge on the left bank approach will extend to the left bank main tower position (P25, see Figure 11-3-1).

On the right bank, the riverbank has a steep slope and there is a large gully on the rear side. If a construction access road is set straight and perpendicular to the river bank, the gradient would be about 30%. For this reason, the construction access road will detour to a location upstream side where inclination is about 9%, and the temporary bridge will be built at P26. The barge is also used for constructing pile foundations and material carry-in.

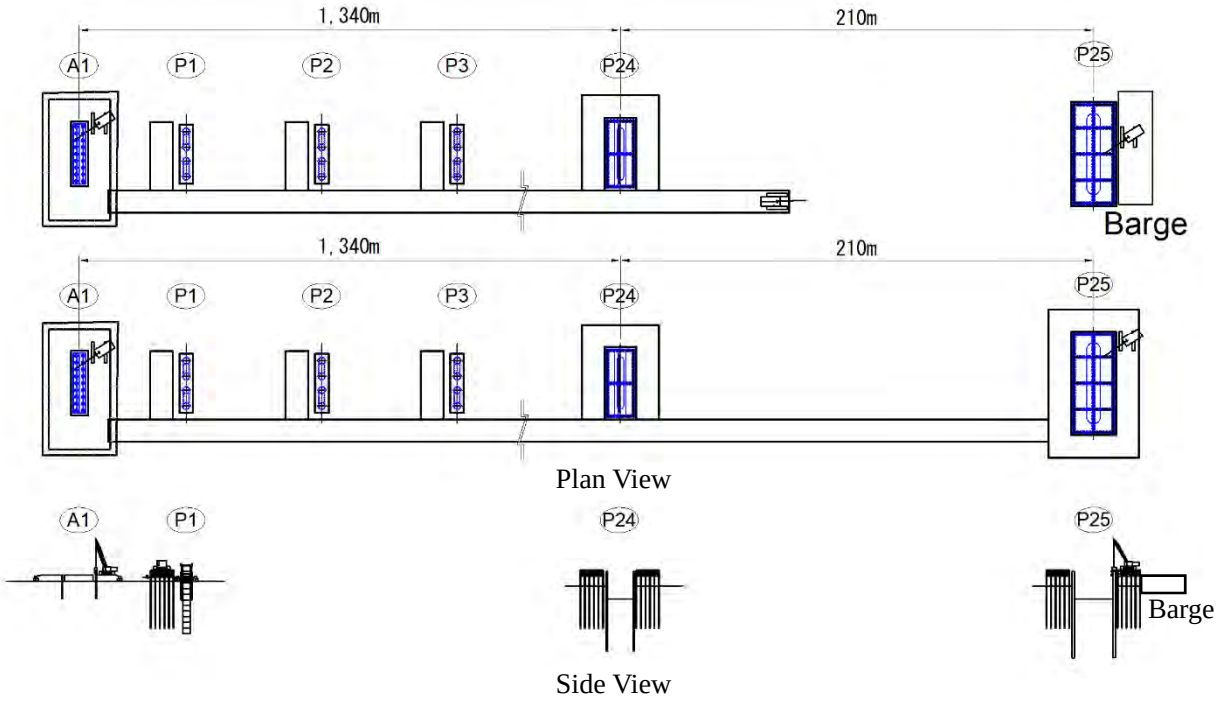


Figure 11-3-1. Left Bank Temporary Bridge

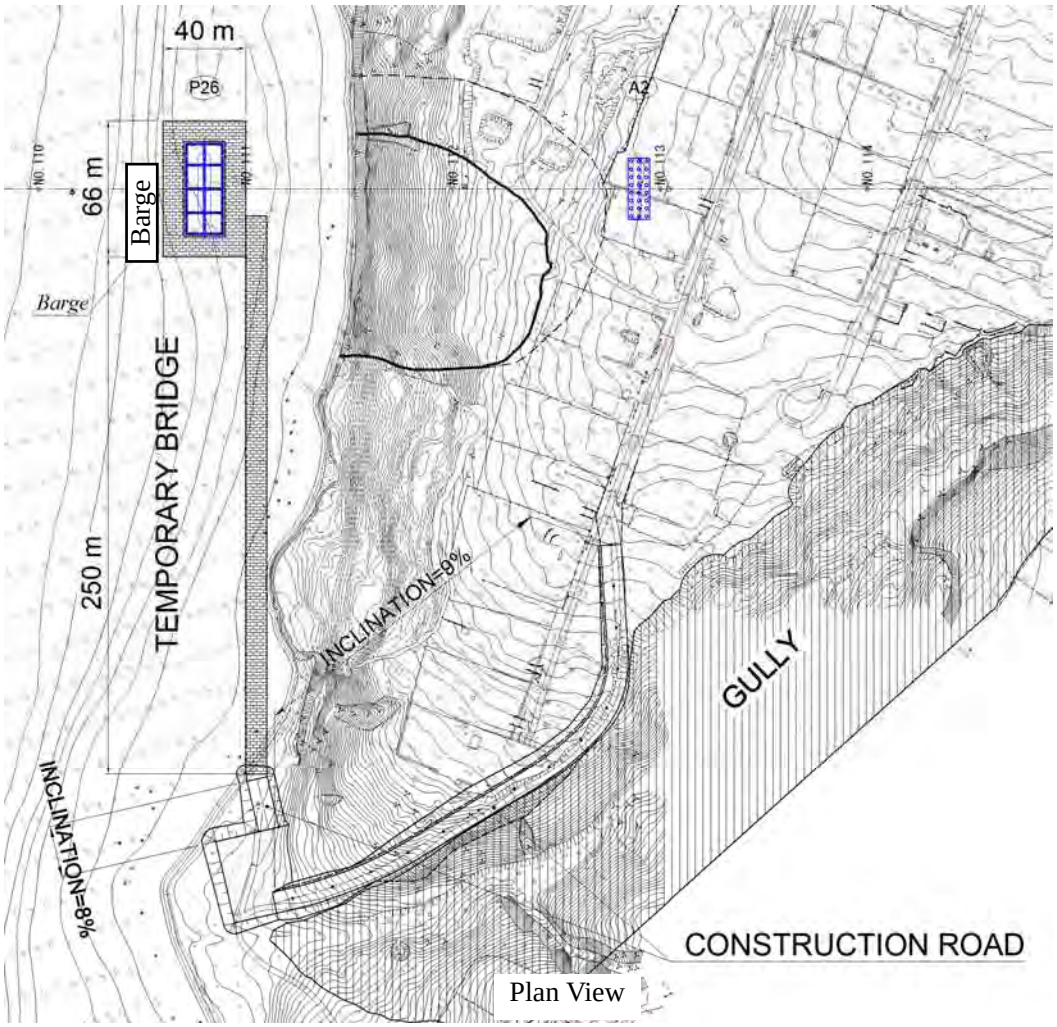


Figure 11-3-2. Right Bank Temporary Bridge and Construction Road

11-3-3 Construction process

Table 11-3-3.Construction Schedule (Route3)

Route3

Construction schedule of right bank side			month
Preparation work			1
Temporary work & Land slide protection	Approach road from T1506 to A2		0.5
	Construction road(from A2 to bank) and Temporary bridge(from bank to P26:300m)		2
	Countermeasure for land-slide		Survey:0.5
			Well:2
			Pile:11
Substructure work	A2	Pile Foundation	1
		Excavation	0.5
		Pile, Tower	2
	P26	Pile Foundation	11
		Pile, Tower	13
Superstructure work (main bridge section)	Construction girder & PC slab(P26-span center&A2)		11
	Construction of center span		0.5
Bridge surface construction work			3
Clean up work			1

Construction schedule of left bank side			month
Preparation work			1
Temporary work	Temporary bridge from A1 to P25(l=1340m+210m)		13
Substructure work	A1(Cast-in-place pile and abutment)		1.5
	P1(PC well)		1.5
	P2(PC well)		1.5
	P3(PC well)		1.5
	P4(PC well)		1.5
	P5(PC well)		1.5
	P6(PC well)		1.5
	P7(PC well)		1.5
	P8(PC well)		1.5
	P9(PC well)		1.5
	P10(PC well)		1.5
	P11(PC well)		1.5
	P12(PC well)		1.5
	P13(PC well)		1.5
	P14(PC well)		1.5
	P15(PC well)		1.5
	P16(PC well)		1.5
	P17(PC well)		1.5
	P18(PC well)		1.5
	P19(PC well)		1.5
	P20(PC well)		1.5
	P21(PC well)		1.5
	P22(PC well)		1.5
	P23(PC well)		1.5
	P24	Pile Foundation	7.5
		Pile, Tower	3.5
	P25	Pile Foundation	11
		Pile, Tower	13
Superstructure work (approch section)	Construction girder(A1-P24)		33
	PC slab (A1～P24,num.=1340pieces)		23
Superstructure work (main bridge section)	Construction girder & PC slab(P25-span center&P24)		11

Production schedule of Pre-cast blocks and Steel Pipe Sheet Pile		month
Steel Pipe Sheet Pile		6
PC well members:num.=1362(31pieces/month)		44
PC slab (48pieces/month)	Approach section : num.=1340pieces	28
	Main bridge : num.=840pieces	18

Note:The starting time of the pre-cast block production depends on the construction schedule.

11-4 Procurement Plan

11-4-1 Procurement Plan for Major Materials

Table 11-4-1 shows suppliers of major materials.

Table 11-4-1. Suppliers of Major Materials

Major material	Supply source			Remarks
	Domestic	Japan	Third country	
Gasoline	○			From Ukraine's domestic market
Diesel	○			From Ukraine's domestic market
Natural Gravel	○			Produced domestically
Graded Crushed Stone	○			Produced domestically
Coarse Aggregate	○			Produced domestically
River Sand	○			Produced domestically
Asphalt Prime Coat	○			From Ukraine's domestic market
Bitumen	○			From Ukraine's domestic market
Portland Cement	○			Produced domestically
Plywood	○			Produced domestically
H-shape Steel	○			Produced domestically
Reinforcement Bar	○			Produced domestically
Steel Pipe Casing		○		
Sheet Pile (S270GP)	○			Produced domestically
Steel pipe sheet pile		○	○	Imported from abroad
Steel Plate	○			Produced domestically
PC Strand	○			Produced domestically
Rubber Bearing		○		Imported from abroad
Expansion Joint		○		Imported from abroad
Scaffoldings		○		Leased products that are not locally procurable shall be procured from Japan.
Nonshrink mortar		○		For PC slab and bearing seat
Multi-strand cable		○		For cable-stayed bridges
PC bar		○		For joining PC well members
PC gewindestab		○		For pressing in PC well sections
Steel girder(SBHS400,500)		○		For cable-stayed bridges
FRP wind shielding panel		○		For cable-stayed bridges
Bearing for high surface-pressure		○		For cable-stayed bridges
Aluminum handrail		○		
Concrete test device		○		
Weather resistance large sandbag		○		For embankment (Route 2 only)
Metallic form		○		For PC well, PC slab, and pretensioned slab girder

11-4-2 Procurement Plan for major equipment

Table 11-4-2 and Table 11-4-3 show suppliers of major equipment.

Table 11-4-2. Major Equipment Supply Sources (1/2)

Equipment	Specs.	Supply source			Type of construction used in
		Local	Japan	Third country	
Bulldozer	15t	○			Leveling and compaction of embankment
Bulldozer	21t	○			
Excavator	0.35m^3	○			Excavation
Excavator	0.6m^3	○			
Clamshell	1.2m^3	○			Excavation
Wheel loader	1.2m^3	○			Loading of sediment, crushed stone, etc.
Dump truck	2t	○			Sediment transportation
Dump truck	4t	○			
Dump truck	10t	○			
Truck	2t	○			Material transportation
Truck	4t	○			
Truck	10t	○			
Trailer	35t	○			Long material transport
Truck crane	16t	○			Material hoisting and lowering
Truck crane	25t	○			
Truck crane	45t	○			
Crawler crane	50t	○			Material/PCa section hoisting and lowering
Crawler crane	150t	○			
Concrete breaker (attachment)	600-800kg	○			Rock drilling/concrete breaking
Concrete breaker (attachment)	1,300kg	○			
Concrete pumping truck with boom	90-110m^3	○			Concrete pouring
Rammer tamper	60-100kg	○			Ground compaction
Vibrating roller	0.8-1.1t	○			Ground compaction
Vibrating roller	3.0-4.0t	○			
Road roller (macadam roller)	10-12t	○			Ground compaction
Tire roller	8-20t	○			Ground compaction
Motor grader	3.1m	○			Gravel leveling
Asphalt finisher	2.4-6.0m	○			Asphalt pavement
Compressor	10.5-11.0m^3/min	○			

Table 11-4-3. Major Equipment Supply Sources (2/2)

Equipment	Specs.	Supply source			Type of construction used in
		Local	Japan	Third country	
Engine generator	25kVA	○			Power generation
Engine generator	45kVA	○			
Engine generator	75kVA	○			
Engine generator	150kVA	○			
Engine generator	200kVA	○			
Engine generator	300kVA	○			
Submerge pump	50mm	○			Wastewater
Submerge pump	150mm	○			
Vibro hammer MS-25	174/274kW	○			Sheet pile driving
Hammer grab bucket	1.5m	○			Ground excavation
Tower crane	Radius-Capacity 20m-10t	○			Hoisting and lowering of main bridge section material
Excavator for solid ground	Excavating diameter 3m		○		For PC well
Rotary all casing boring machine unit			○		For cast-in-place pile and PC wells
Push in device for PC well			○		For pushing in PC wells
Traveler crane			○		For PC slab construction
Tension jack			○		For tensioning primary cable of the main bridge
Tension jack			○		For tensioning PC bar of the PC well
Tension jack			○		For tensioning PC slab and pretensioned slab girder PC strand
Portal crane			○		For transferring material when fabricating PC wells, PC slabs, and pretensioned slab girder

Chapter 12 The Safety Measures during the Construction

12-1 Construction during the Freezing Period in Winter (December to February)

The following is a discussion of winter construction work, since the construction in winter is done under the very severe conditions which are the low temperature and the strong wind. Ukrainian labor laws and regulations prohibit outdoor workers from continuing to work when the snowfall exceeds the standard volume. Work on frozen rivers is also prohibited. In this plan, it is necessary to prioritize the safety of workers under such severe weather conditions, and to develop the construction process with a margin that allows for a three-month winter outage.

12-2 Safety Measures in Construction of the Main Bridge (Superstructure and Substructure)

Because the construction of steel cable-stayed bridges, the main bridge in this project, typically involves aerial work at some 40 m above ground level at the present design, it is necessary to take sufficient measures to prevent serious disasters caused by a worker's fall, falling of a building member itself or other dangers. In particular, to prevent third-party damage to ships navigating the river, shipping companies and construction officials should conduct discussions on river-passage planning and construction to promote understanding between them. It is also necessary to assign a patrol boat near the temporary bridge to prevent collisions. Because equipment specific to each construction method are operated, it is also essential to fully understand their unique characteristics, ensure that regular maintenance of all the construction equipment has to be performed, and be mindful to prevent equipment from being involved in any type of accident.

12-2-1 Measures to Address Characteristics of the Surrounding Environment

Since the waterway and roadway under the girder structure is used during construction of the main bridge, interchange and junction bridge, it is necessary to put measures in place to protect third parties by considering installation of fall prevention and fall arrest safety netting, and posting a guard while dangerous work is in progress, etc.

As mentioned in Chapter 7, the wind conditions of the bridge location is such that the peak instantaneous wind gust is 40m/s and the peak wind gust is 27m/s. Because there are residential houses nearby, adequate scatter prevention measures will taken.

12-2-2 Safety Measures for High-altitude Work

It will be necessary to ensure the use of safety belts, and also to set up lifeline ropes at appropriate locations to prevent falling accidents during aerial work. As it is unclear whether the use of the safety belts is being thoroughly enforced in Ukraine, it is necessary to inform all workers of the importance and proper use of safety equipment during safety training before construction begins.

12-2-3 Proper Use of Construction Equipment

1) General

Construction equipment must be subjected to pre-work as well as routine inspections based on checklists and performed by a person in charge, and equipment may only be used after its safety has been sufficiently confirmed.

2) Construction of Main Bridge by Traveler Crane

Construction of the main bridge will be via the cantilever erection method using a traveler crane. Table 12-2-1 and Figure 12-2-1 show a summary of erecting/construction equipment. It is necessary to consider meaures to ensure that equipment is properly checked and managed at all times, including assigning a responsible personnel for each equipment, who shall prepare a log for routine inspections, etc. Safety measures to prevent falling are also essential with movable scaffolding at elevated position, and it is important to consider a system in which all work can be performed from this scaffolding, whose safety has been secured.

Table 12-2-1. Summary of Construction Equipment

Equipment name	Use
Traveler crane	To install and secure parts carried to the edge of a cantilevered section under construction.
Trailer	Transfers building members, which have been hoisted by a tower crane to the top of the girder structure near the main tower, to the cantilevered section under construction.
Tower crane	Hoists building members, which have been transported by trailer etc. to the temporary bridge by the main tower, to the girder-top area
Rail equipment	Traveler crane moving equipment
Transfer Platform	Scaffolding for cantilever erection

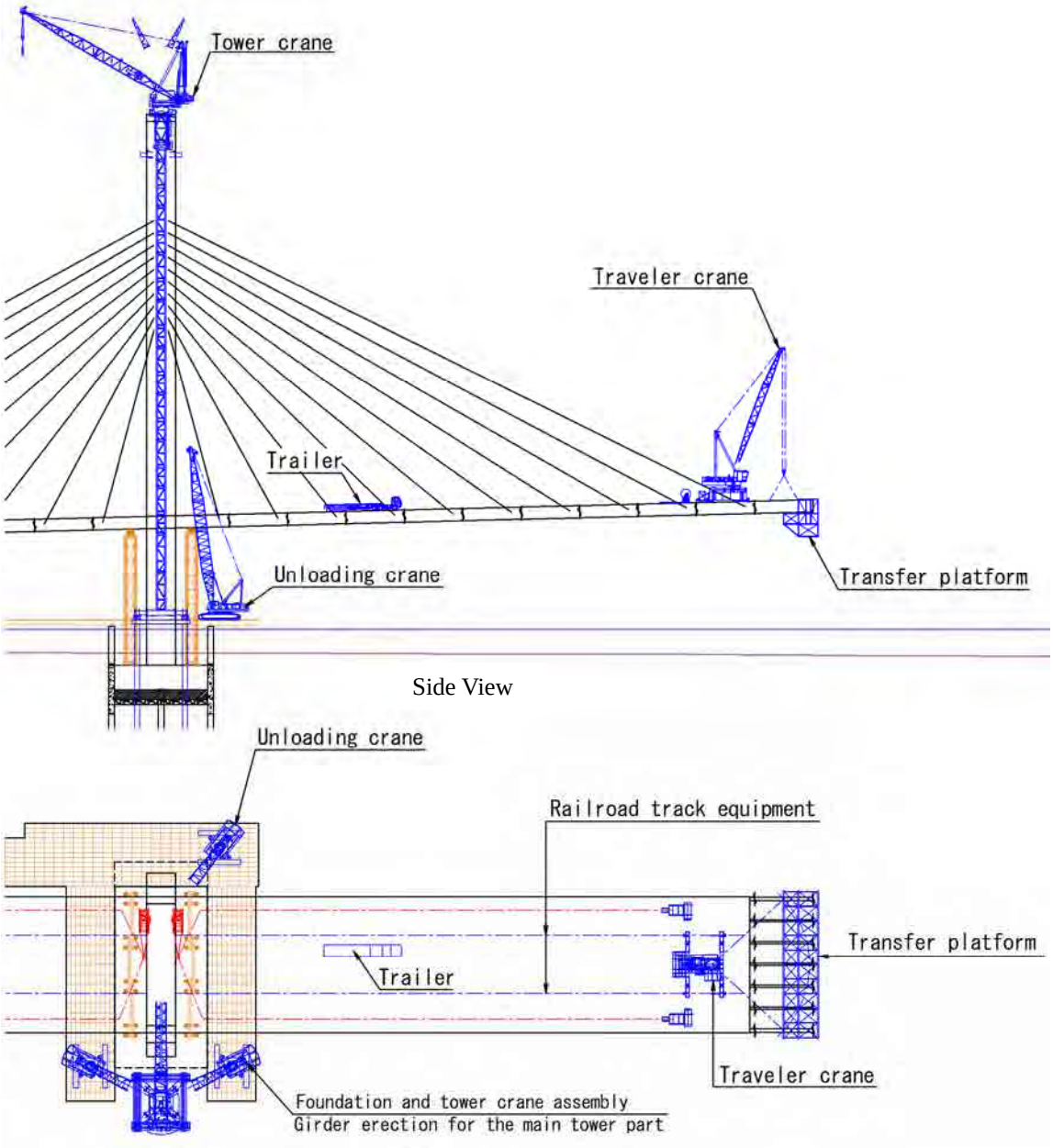


Figure 12-2-1. Visualization of a Traveler Crane and Transfer Platform

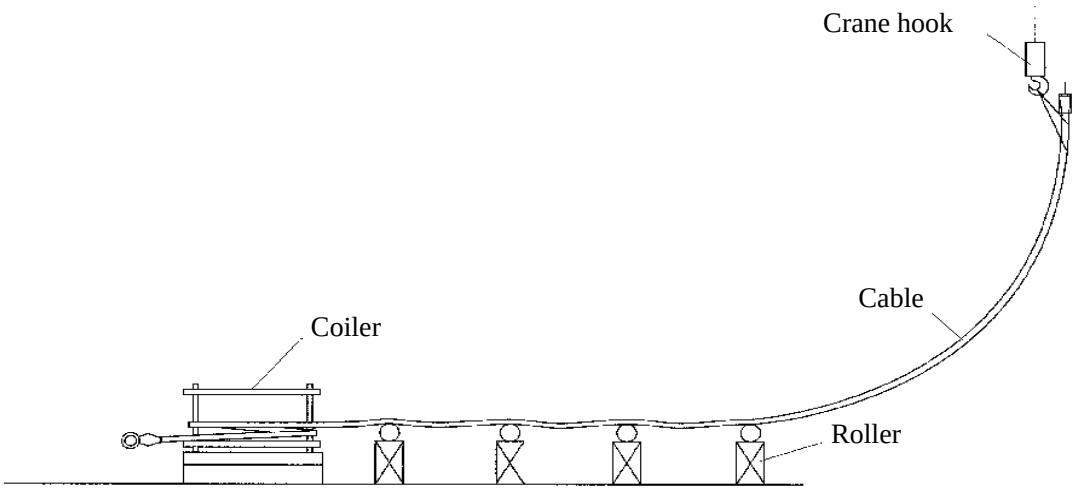
3) Cable Erection

Cable erection is one of the most important work in building cable-stayed bridges. While two types of cable are typically used: multi-strand cable and parallel-wire-strand cable, this document describes construction using parallel-wire-strand cable, which has a proven track record of use as the cable in the overwhelming majority of cable-stayed bridges.

Table 12-2-2 shows a summary of cable construction equipment. As cable construction uses extremely long cable material, swaying can occur in cable that has unexpectedly become unwound, etc. Thus, safety measures must be put in place to either ensure sufficient clearance distance during work or implement measures to prevent the cable from swaying (see Figure 12-2-2). In addition, the cable installation height on the main tower is about 100 meters above ground at the topmost cable. For this reason, sufficient safety measures must be implemented that factor in the effects of wind.

Table 12-2-2. Summary of Cable Construction Equipment

Equipment name		Use
Traveler crane	Crane body	Deploys cable loaded in a square coiler out in a straight line.
	Adjustment trestle/traveling trestle	
Stay cable deployment equipment	Deployment rollers	Deploys coil-loaded cables out in a straight line.
	Square coiler	
Tower crane		Hoists cable, which has been transported by trailer etc. to the temporary bridge by the main tower, to the girder-top area
Winch		Pulls a lead-in cable attached to the end of cable, and set it in a predetermined position after passing it through a fixed sleeve.
Rail equipment		Equipment for moving the traveler crane
Tension jack		Applies a predetermined tension on cables
Transfer Platform		Scaffolding for cantilever erection



Source: Estimations in Bridge Construction - 2016 Edition

Figure 12-2-2. Visualization of Cable Deployment Work

4) Construction of the Approach Bridge (Superstructure)

The approach bridge is planned for construction with the crane and vent method. This construction method enables construction with a locally procurable crane (150 ton crawler crane) and is a simple method with a proven history of use in many projects. Because the work is at relatively high elevations and involves the erection of large members (about 240 kN/piece) with girder heights of around 3 m, it is necessary to be sufficiently vigilant to prevent girders from toppling or falling. There have been girder falling accidents both in and outside of Japan (i.e. Can Tho Bridge collapse) due to uneven settlement or supporting ground or faulty vent structure placement, which is why it is necessary to prepare a Work Procedures Manual, make it mandatory to review the manual before work starts and strictly observe the procedure. Table12-2-3 shows the Summary of Construction Equipment.

Table 12-2-3. Summary of Construction Equipment

Equipment name	Use
Crawler crane (2 cranes)	Erects building members, which have been transported by trailer etc. to the temporary bridge, by hoisting with either a single crane or multiple cranes to the predetermined location.
Vent structure	Provides a temporary support for girders to reduce the weight exerted by the member being installed.
Vent foundation work	Because the vent structure is built on the water, a vent foundation built of H-shaped steel must be constructed.
Suspended scaffolding	Scaffolding for the crane erection

12-3 Safety Measures for Constructing the Approach Bridge (Substructure and Deck Slabs)

12-3-1 PC Well Method (Japanese Technology)

The PC well method of the precast (hereinafter PCa) method is applied for approach bridge substructures. PCa members were selected for the Project for two reasons: first, the members can be produced at a temporary factory during the winter season, when outdoor work is prohibited; second, the method is effective toward ensuring quality and shortening the construction period. First, the PCa members are to be brought on site and press-fitted using push-in frames by excavating the ground with a large crane and hammer grab. It is a special construction method that is being applied in Ukraine for the first time; therefore, the following points about safety should be taken into consideration for each process: (see Chapter 11)

1) Works using the Large Crane when Setting RC Lot (Figure12-3-1)

- Since lifting works are conducted for heavy members and machines (PCa Members: approximately 15 t, Rotary all casing Boring Machine: approximately 42 t) using a large crane, the bearing capacity of the site should be checked, reinforced and protected prior to the work. Check overhead lines and other pre-existing obstacles in the crane work site and relocate and protect.
- Train and assign slinging operators and ensure they comply with work standards such as how to make signals and checks and knowledge of prohibited matters.
- Make regular inspections compulsory and appropriately keep the slinging wires.

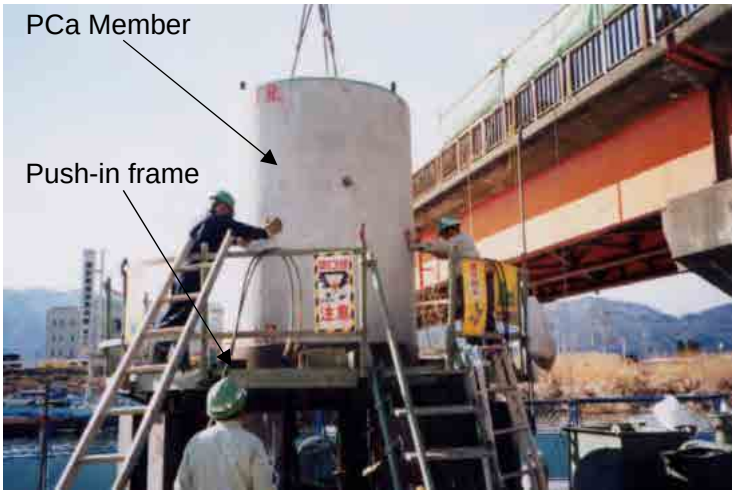


Figure 12-3-1. Installation of PCa member

2) Preventing Workers and Third Parties from Falling into the PC well when Tensioning PC Bars

While safety handrails are installed on push-in frames, the use of safety belts and other fall-prevention measures should be ensured (see Figure 12-3-2).

With unforeseeable cases such as third parties entering the yard during the downtime, the opening part on the upper PC well should be covered by a safety net or working scaffold when the work ends.

3) Tension Work when Tensioning PC Bars

To prevent danger and ensure quality, tension work must be carried out by skilled workers in the presence of certified PC engineers. Since a PC steel bar under tension accumulates significant energy, no one except the relevant parties is allowed to enter the working area during the tension work.

Source: P.S. Mitsubishi

Figure 12-3-2. Tension work

4) Grout Scatter Prevention when Grouting PC Bar

When injecting grout into the ducts of the PC steel bars, the grout may scatter due to clogging and other factors. A scatter-prevention sheet should therefore be installed, and the workers should wear protective glasses.

5) Grout when Grouting PC Bars

During construction in the river, the necessary measures should be taken to avoid any water pollution caused by an outflow of grout.

6) Generation of Hazardous Gas or Oxygen-deficient Air when Placing the Bottom Concrete

When the generation of hazardous gas, etc. is expected, steps should be taken to check for its presence. The type of gas and permissible concentration for workers must be known, and sufficient countermeasures must be taken. PC Slab (Japanese Technology)

12-3-2 PC Slab (Japanese Technology)

PC slabs preproduced at a temporary pretension factory are transported by truck or barge and constructed using a crane and traveler crane on girders (see Figure 12-3-3).

Source: Japan Prestressed Concrete Contractors Association website

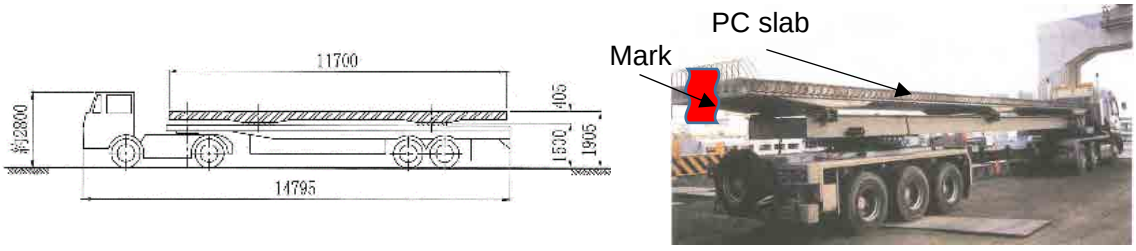
Figure 12-3-3. Construction Work by Crane (Left Side) and Construction Work by Traveler Crane on Girders (Right Side)

1) Works using the Large Crane when Constructing PC Slabs

A PC slab is approximately 12 m long and approximately 0.3 m thick, and is flat with a cross-section that can be easily deformed. Accordingly, when lifting, care should be taken to avoid the occurrence of cracks by bending and twisting, and a balance (Figure 12-3-3) should be used as needed. When lifting, guide ropes should be installed to control the shaking and swaying of the members in the wind. Rules should be enforced to prevent entry and keep the space under the suspended load clear of people, and the crane wire should always be inspected before starting work.

2) Transportation of PC Slabs (in the case of trailer)

Reference packaging for transportation is shown in Figure 12-3-4. To prevent collisions, marks should be placed on PCa members protruding from the vehicle body when transporting. To find out problems and solutions on the route, a test will be conducted in advance with a trailer carrying the weight equivalent to PC slab. In addition, during the actual transportation, fastening of a PC slab on a trailer will be confirmed and watchpersons will check in front of and behind the trailer. In the case of barge the same safty measures should be taken.



Source: Guidelines for PC Deck Slab Construction, March 2004

Figure 12-3-4.Packing for Transportation

3) Construction of PC Slabs

As there are many openings between steel girders and on the front of existing PC slabs, preventive measures should be taken during construction to eliminate any risk of falling objects, including the installation of scaffolding on the steel girders (see Figure 12-3-5), lifeline rope for construction work (see Figure 12-3-6), and safety netting under the steel beams (see Figure 12-3-7).

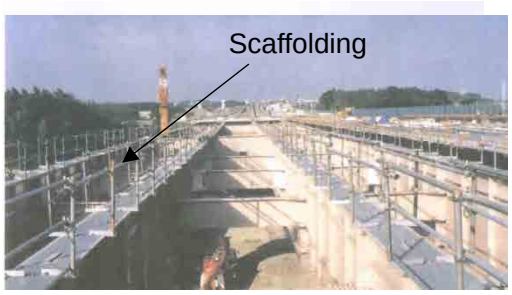


Figure 12-3-5. Scaffolding on the Steel Girders

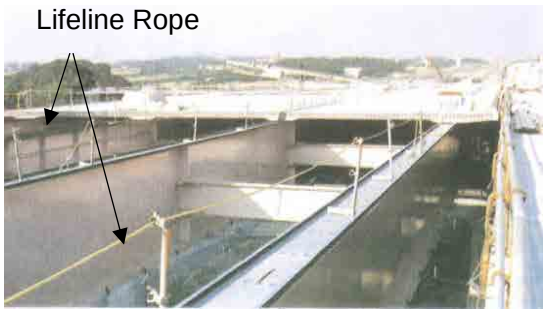
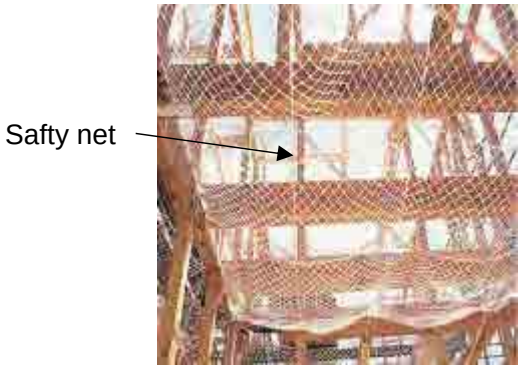


Figure 12-3-6. Lifeline Rope for Construction Work



Source: Home page of Tanaka Steel

Figure 12-3-7. Safety Net under the Steel Beams

12-4 Safty Measures for Landslide Prevention Work

Based on the additional survey, the possibility of landslides cannot be ruled out. Therefore, it is proposed to take measures to prevent landslides prior to construction, considering the safety of workers during construction. Landslide prevention works include revetment erosion prevention work, steel pipe pile work, and drainage boring. Safety considerations for each are described below.

12-4-1 Revetment Erosion Prevention Work

Since it is construction along riversides and swamps, secure a secure scaffolding.Pay attention to scattering and dropping when transporting Gabion's filling materials

12-4-2 Steel Pipe Pile Work

Pay attention to the stability of the installation location of the large bore boring machine, so that it will not fall over or sink. Store the steel pipe pile material in a stable condition on flat ground so that it does not slide.

12-4-3 Drainage Boring Work

Special attention should be given to clothes and boot to prevent accidents caused by contact with the drilling machine or being caught.
Pay attention to the stability of the drilling machine so that it will not fall over or sink.

12-5 Check System in the Temporary Construction Plan

To secure safety during construction, it is crucial to check the quality of temporary structures, hence the need to establish a check system when constructing the same. The system must include the client, relevant agencies, the contractor, and others.

Normally, the third-party checking system organization appointed by the client also checks such temporary constructions. As described, the number of contractors and consultants with experience in constructing cable-stayed bridge is limited in Ukraine. Accordingly, it is preferable to carry out international tender to procure a consultant capable of checking not only from construction point of view, but also from other various perspectives.

12-6 Preparation of the Plan for Safety Measures

12-6-1 Before Commencement of Construction

First, a plan for safety measures should be prepared in advance. Just in case about emergency issues, the plan should incorporate a communication network, which covers Ukrainian, Japanese, and the other stakeholders.

Safety training and drills should be provided regularly to everyone involved in the construction, including local contractors, to ensure their understanding of safety and promote the thorough dissemination of that understanding. These people should be given overviews of the construction and notified of when the construction is to start, and hazard maps of the areas around the construction sites should be created.

12-6-2 During Construction

Mutual collaboration is an important part of safety control management, as the work of the Project will progress simultaneously on the left bank, in the river, on the right bank, at the production facilities for the precast members, and elsewhere. The leaders of each area of responsibility should gather roughly once per month during the construction period to hold safety meetings, review the situation in each term and share the result and the other information with appropriate members. The leaders should promptly inform, report, and consult with relevant agencies on the issues raised at these meetings and deal with the situations accordingly, and the PDCA (Plan-Do-Check-Action) cycle must be employed continuously. Efforts should be made to constantly share information with the people living along the route and to conduct regular interviews about the environment and other topics.

Chapter 13 Project Operation and Maintenance Plans

13-1 Project Implementation System

13-1-1 Organization

Ukravtodor is a central executive agency that implements national road policy in the field of road transportation. Its activities are managed and coordinated by the Cabinet of Ministers of Ukraine through MoI.

Following are the main responsibilities of Ukravtodor, as defined by the Cabinet Resolution (2014 No. 439, 2017 No. 847).

- Implementation of state policy in the field of road management and management of public roadways;
- Submission of proposals to MoI to realize public policy in the road sector;
- Management of state property.

Ukravtodor locates its Head Office in Kyiv and has 24 branch offices, one in each oblast. The Head Office plans and manages international corridors; each branch office manages state roads within its oblast. Figures 13-1-1 and 13-1-2 show the organizational charts of Ukravtodor's Head Office and its branch office in Mykolaiv, the target area of the Project.

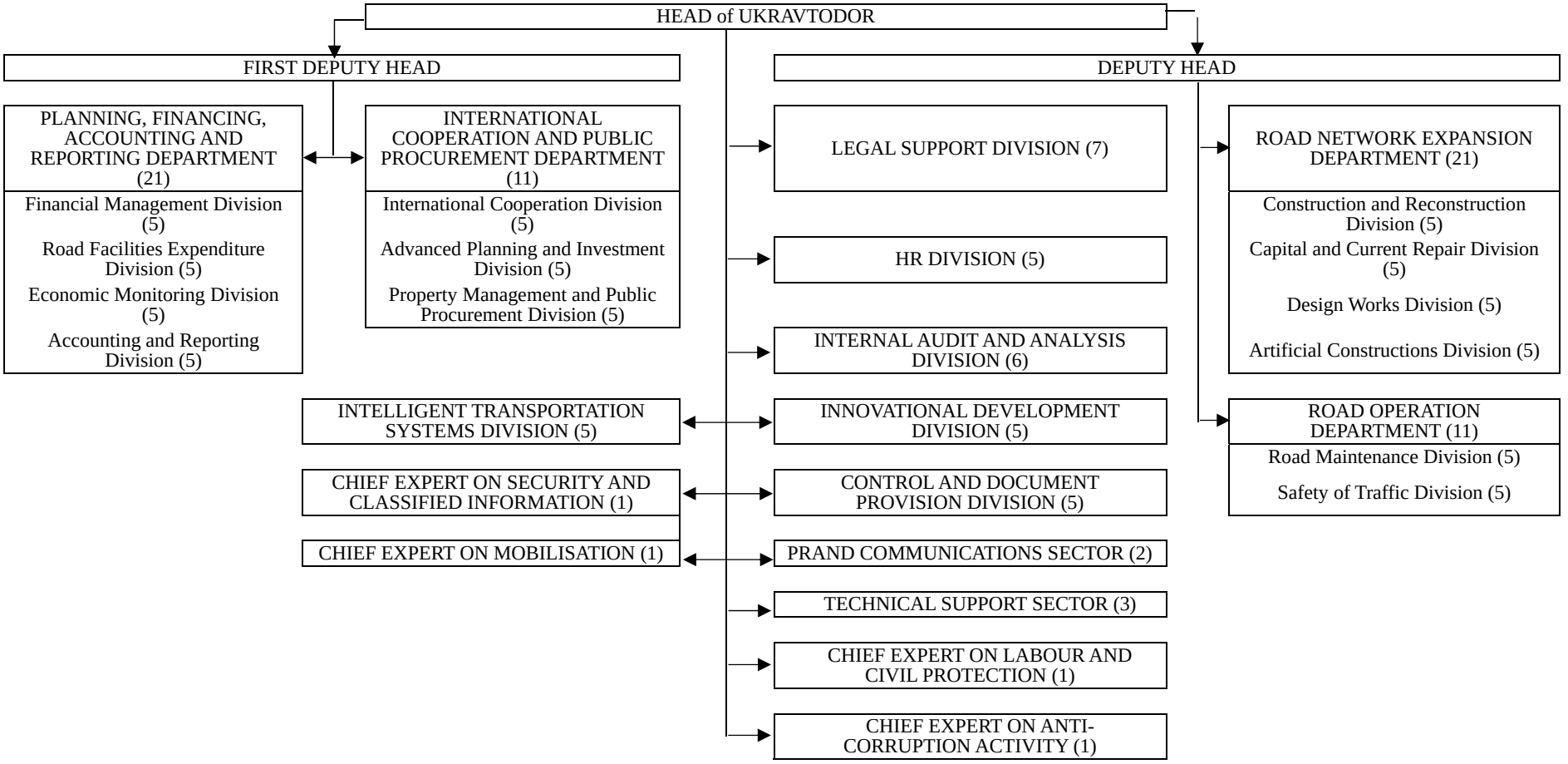
Figure 13-1-1 shows that the Head Office comprises three departments. According to Ukravtodor, the three departments may be assigned as responsible for the project implementation.

The department that plays a central role is currently being confirmed.

The main tasks of the Road Network Expansion Department are as follows:

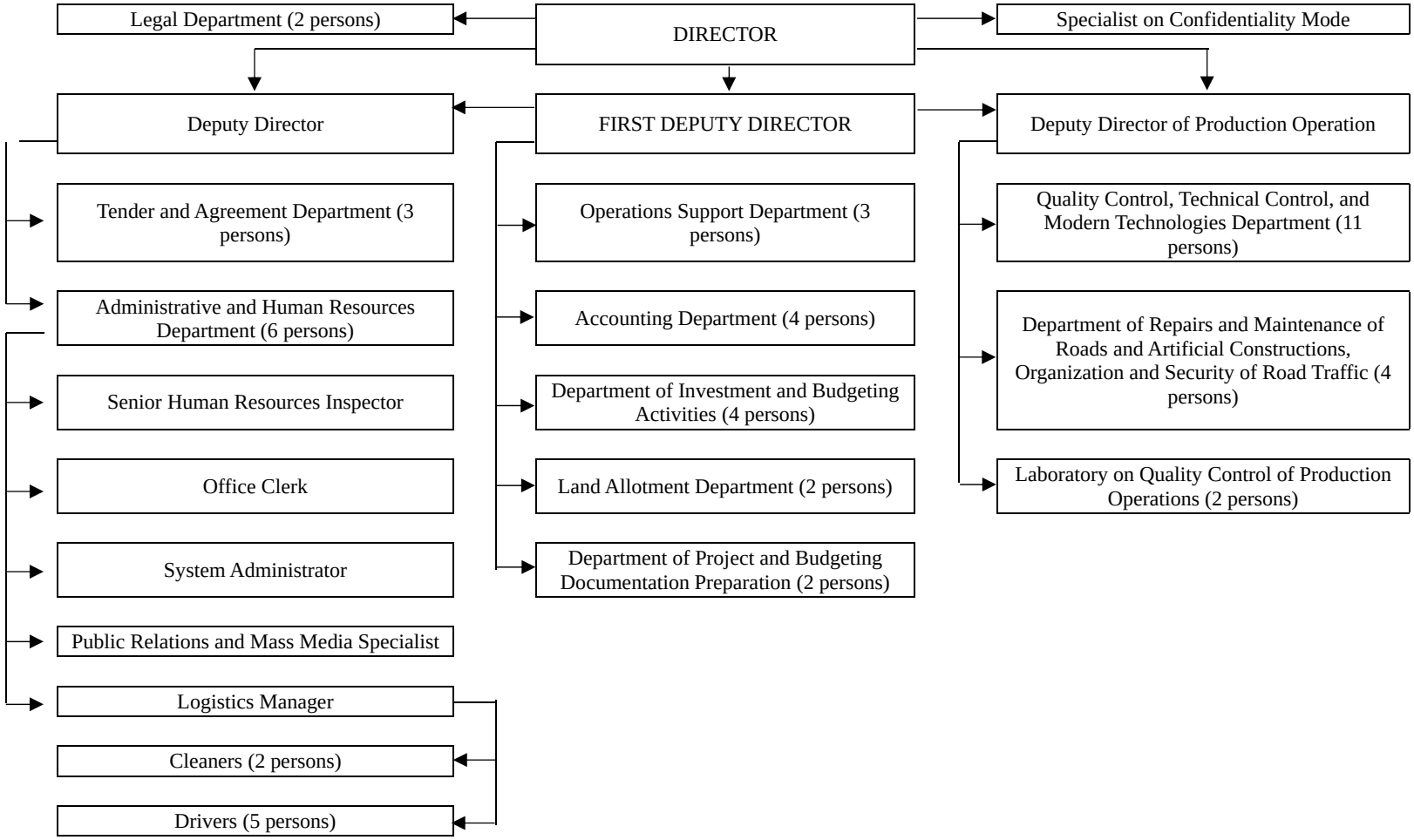
- Implementation of state policy and proposals for development (construction and renovation), planning for capital expenditures and repairs of public roads and engineering structures, scientific and technical research and pricing;
- Formation of plans and objectives for the construction, renovation, maintenance and repair of public roads, facilities, and implementation monitoring;
- Development of forecasts and future plans for the construction, renovation, maintenance and repair of public roads and facilities in accordance with the development and improvement strategies of the network of public roads, highway development programs and other decisions by the Government;
- Coordination and approval of project documentation for construction, renovation, maintenance and repair of public roads and facilities;
- Matching the variants of design for constructions and pavements as well as structural diagrams of bridges, overpasses and viaducts;
- Introduction of new advanced technologies and materials, software development and implementation of key scientific and technological development of the road sector to improve the quality of construction, renovation and repair of public roads and reducing the cost of execution of road works;
- Coordination of the activities of enterprises, institutions and organizations within the management of Ukravtodor in regards to construction, renovation, capital expenditures and repair of public roads and engineering structures, scientific and technical research and pricing;
- Management, operation and development of streets and roads of cities and other settlements under local authorities in their respective areas of responsibilities.

According to the organizational charts, number of employees at the Head Office and Mykolaiv branch seem to be approx. 109 and 60 respectively. Since the total length of these roads in Mykolaiv Oblast is 1,487km, road length per employee is approx. 24.7km. It shows that the number of employees is considerably less than relevant authorities in Japan because the road length per employee of them is approx. 4km in average.



Source: Ukravtodor (as of September 2019)

Figure 13-1-1. Organizational Chart of the Head Office of the State Agency of Automobile Roads of Ukraine (Ukravtodor)



Source: Ukravtodor (as of April 2018)

Figure 13-1-2. Structure of Mykolaiv Branch of Ukravtodor

13-1-2 Financing and Budget

1) Actual Expenditures: Past and Present

Table 13-1-1 shows the actual expenditures of Ukravtodor for its 2014-2017 budgets, and its planned expenditures for 2018.

Table 13-1-2 shows the following information for the Mykolaiv region from 2013 to 2017.

- Actual figures and expenditures by work type
- Budgeted and actual expenditures for road maintenance
- Number of Ukravtodor employees and their average salary

Table13-1-3 shows the actual expenditures for maintenance in the Mykolaiv region from 2016 to the first half of 2018.

According to Table 13-1-2 and Table 13-1-3, the budget for maintenance ranges from 10 million UAH/year to 18 million UAH/year and roughly 71,000 UAH/km/year in 2018. On the other hand, roughly 80,000 UAH/km/year is required for daily maintenance of the bypass roads alone. In addition, 1,700,000 UAH/km/year is required when the cost of bridge inspections, coating, lighting, repaving, and other regularly occurring expenses are considered. Hence, a budget for these expenses must be systematically secured.

Table 13-1-1. Annual Expenses in the National Budget for Budget Execution of Ukravtodor, Actual Figures (2014-2017) and Planned Figures (2018)

Thousand UAH

Sources of funding and name of budget programs		Fact 2014	Fact 2015	Fact 2016	Fact 2017	Plan 2018
	General income	17,672,766.5	24,852,803.6	16,965,743.8	21,904,373.5	45,109,381.3
602100	Special fund balances at the beginning of the year (excise tax and import duty on petroleum products and vehicles highway fee	736,380.0				
140200	Excise tax on excisable goods (products) made in Ukraine in the part of petroleum products and vehicles (special fund)	1,948,340.4			2,394,198.0	5,469,625.0
140300	Excise tax on imported excisable goods (products) to the customs territory of Ukraine in the part of petroleum products and vehicles (special fund)	11,143,727.9			10,319,361.5	22,669,375.0
150105	Import duty on petroleum products and vehicles and tires for them (special fund)	1,092,313.4			1,422,780.5	3,142,600.0
221601	Highway fee for vehicles and other self-propelled vehicles and machines, weight or dimensional parameters that exceed the standards (special fund)	6,929.3			3,466.5	16,462.5
500801	Confiscated property, and property acquired through the sale of property confiscated as a penalty for bribery and violations of laws				843,030.4	2,000,000.0
	Outstanding debt provided to Ukravtodor for developing the network of public roads under the guarantee of the Cabinet of Ministers of Ukraine	707,942.0	665,736.8	1,685,955.1	3,284,095.8	
	Loans from International financial organizations, Governments of foreign states	2,027,438.1	1,943,273.1	1,874,923.8	1,739,345.7	5,378,000.0
	General fund of the state budget	9,695.4	22,243,793.7	13,404,864.9	1,898,095.1	6,433,318.8
KPKVK *	All outlays (expenditure)	17,672,766.5	24,852,803.6	16,965,743.8	21,904,373.5	45,109,381.3
3111010	Governance and management in the field of construction, repair and maintenance of highways	9,695.4	10,419.9	11,182.0	45,366.7	56,673.1
3111020	Development of the network and maintenance of general-purpose roads, including	3,462,719.1	4,553,889.2	9,376,057.0	13,292,717.1	10,726,159.3
	at the expense of state funds	2,754,777.1	3,888,152.4	7,690,101.9	10,008,621.3	10,726,159.3
	at the expense of loan balances, received under the guarantee of the Cabinet of Ministers of Ukraine	707,942.0	665,736.8	1,685,955.1	3,284,095.8	
3111030	Payment of debt provided to develop the network of public roads under the guarantee of the Cabinet of Ministers of Ukraine	10,777,342.3	17,646,099.2	5,535,048.5	4,902,542.0	6,041,038.0
	Proportion of payment of debt	7,806,654.6	14,791,107.8	3,996,924.9	3,661,046.9	4,618,978.2
	Proportion of payment of interest, etc.	2,970,687.7	2,854,991.4	1,538,123.6	1,241,495.1	1,422,059.8
3111040	Construction of a bridge crossing in Zaporizhzhia				71,673.6	
3111090	Development of road complex of regions of Ukrainian part of Carpathian Euroregion (in particular roads Mukacheve-Lviv, Tatariv-Kamyanets-Podilsky, Stryi-Mamalyga)		699,122.2			
3111800	Realization of the investment state project Improvement of the condition of general-purpose roads in Lviv region			168,532.5	259,558.8	357,645.7
3111820	Development of the automobile road R-52 Dnipro-Tsarychanka-Kobeliaky-Reshetylivka				348,116.3	
3111600	Development of the highway and reform of a road sector	2,027,438.1	1,943,273.1	1,874,923.8	1,739,345.7	5,208,000.0
3111610	Development of border road infrastructure at the Ukrainian-Polish border					50,000.0
3111620	Development of border road infrastructure at the Ukrainian-Hungarian state border					120,000.0
3111100	Improvement of the condition of general-purpose roads in the direction Lviv-Ternopil-Uman; Bila Tserkva-Odesa-				800,000.0	4,000,000.0
3111120	Improvement of the condition of general-purpose roads of state significance M-03 Kyiv-Kharkiv-Dovzhanskyi on the site Chuhuiv-Izium -Sloviansk				199,471.5	2,000,000.0
3111130	Improvement of the condition of general-purpose roads in the direction Kharkiv-Kupiansk-Svatove-Stanytsia-				245,581.8	
3111140	Improvement of the condition of the automobile road N-31 Dnipro-Tsarychanka-Kobeliaky-Reshetylivka					2,000,000.0
3111150	Improvement of the condition of the automobile road Kharkiv- Ohtyrka					2,000,000.0
3111160	Improvement of the condition of the automobile road Zhytomyr Chernivtsi					1,000,000.0
3131020	Subvention from the state budget to the local budgets for the construction, reconstruction, repair and maintenance of streets and roads of communal property in populated areas	1,395,571.6				
3131090	Subvention from the state budget to the local budgets for financial providing with construction, reconstruction, repair and maintenance of general-purpose automobile roads of local significance, streets and roads of communal					11,530,865.2
3131200	Subvention from the state budget to the regional budgets of Kherson region for construction of the overpass road on Admiral Seniavina Avenue - Zalaeherserh Street in Cherson					19,000.0

KPKVK *: the code and the name of the program classification of expenditures and lending to the state or local budgets are indicated (code and name of the Standard Programming Classification of Expenditures and Lending to Local Budgets / Provisional Classification of Expenditures and Lending for Local Government Budgets that do not use the Program-Target Method)

Source: Ukravtodor

Table 13-1-2. Information on the Execution of Road Works on Public (general)-Use Roads, with a Breakdown into Types based on All Funding Sources and Cost Estimations on Customer Service Maintenance, the Number of Personnel at the Ukravtodor Mykolaiv Branch, and the Average Salary of the Same, for the Period

Period	Scope of works									Costs estimation for Service maintenance		Number of workers	Average salary (UAH)	Annual average USD currency rate (NBU)	Average salary in USD equivalent in line with the NBU rate
	Construction and reconstruction		Major repairs		Ordinary repairs		Operation and Maintenance	Total							
	Amount (Thousand UAH)	km	Total (Thousand UAH)	km	Amount (Thousand UAH)	km	Amount (Thousand UAH)	Amount (Thousand UAH)	km	Approved for a year (Thousand UAH)	Execution (Thousand UAH)				
2013	172.2		389.0		174,763.6	26.4	102,368.1	277,692.9	26.4	7,933.5	7,088.2	56	5,680	7.99	711
2014					155,268.7	24.4	62,628.5	217,897.2	24.4	7,123.0	4,685.2	52	4,147	11.89	349
2015			679.6		19,069.4		123,572.9	143,321.9	0.0	7,311.6	6,252.2	53	5,453	21.84	250
2016	1,202.2		1,901.9		70,953.6	10.0	110,807.2	184,864.9	10.0	9,600.0	7,067.3	52	6,768	25.55	265
2017	4,374.5		5,530.2		576,587.6	14.6	176,104.4	762,596.7	14.6	15,357.6	12,221.8	52	11,309	26.60	425

Source: Ukravtodor

Table 13-1-3. Information on Execution of Operation and Maintenance of Automobile Roads of the Public (General) Use in Mykolaiv Region during 2016–2018.

Period	Actual execution (thousand UAH)	
	State budget	Local budget
2016	103,683.0	6,944.2
2017	130,022.1	46,672.4
January–June of 2018 (national roads only)	52,929.3 (out of the annual plan of 106,582.1)	-

Source: Ukravtodor

2) Spending Plans: Present and Future

Table 13-1-4 shows the spending plan for each financial resource, and Table 13-1-5 shows the spending plan for each type of work for implementing the New Program.

Table 13-1-6 shows spending plans divided into road development and construction of structures.

According to Table 13-1-5, the plan calls for the securement of roughly 7,000-8,000 million UAH for 2019-2022. Assuming that the target is State Roads, the budget per length of road is 135,000-155,000 UAH/km/year. Therefore, the 2018-2022 operation and maintenance budget per road length seems sufficient for the required operation and maintenance budget for the bypass roads.

Table 13-1-4. Spending Plan by Financial Resource for the New Program

Million UAH

Source of funding	Volume of funding	Breakdown by Year				
		2018	2019	2020	2021	2022
State budget:	251,978	33,491	43,320	60,954	57,643	56,569
Funds of Special Fund of the State Budget (State Road Fund)	178,111	21,767	30,707	41,879	41,879	41,879
Funds of General Fund of the State Budget	6,358	6,358	-	-	-	-
Funds of international financial organizations	67,510	5,367	12,613	19,075	15,764	14,691
Local Budget						
Other sources, including investors' funds	46,372	-	1,810	8,995	15,077	20,490
Total	298,349	33,491	45,130	69,949	72,720	77,060

Source: New Program

Table 13-1-5. Spending Plan by Work Type for the New Program (1/2)

Million UAH

Category of road construction	Year				
	2018	2019	2020	2021	2022
New Construction	3,361	5,514	17,006	21,954	27,986
Reconstruction	2,219	4,971	10,244	10,518	9,458
Major repairs	5,099	9,010	27,786	25,422	23,955
Medium ordinary repairs	11,468	9,335	-	-	-
Operation and maintenance	4,466	7,037	8,129	7,828	8,122
Total	26,513	35,867	63,165	65,722	69,521

Source: New Program

Table 13-1-6. Spending Plan by Work Type for the New Program (2/2)
(Upper: Road Development, Lower: Construction of Structures)

Types of works	Automobile roads									
Year	2018		2019		2020		2021		2022	
	Length km	Amount million UAH	Length km	Amount million UAH	Length km	Amount million UAH	Length km	Amount million UAH	Length km	Amount million UAH
New construction	17.8	2.253	41.8	4.165	40.9	12.490	7.9	16.264	192.6	20.211
Reconstruction	26.8	1.954	79.9	4.673	104.9	9.756	104.6	10.276	112.1	9.147
Major repairs	74.1	4.547	303.8	8.554	1,387.0	27.235	1,182.1	24.805	1,362.1	16.198
Ordinary repairs	946.0	11.264	631.8	9.088	-	-	-	-	-	-

Types of works	Artificial constructions									
Year	2018		2019		2020		2021		2022	
	Length km	Amount million UAH	Length km	Amount million UAH	Length km	Amount million UAH	Length km	Amount million UAH	Length km	Amount million UAH
New construction	6	1,108	19	1,348	7	4,516	5	5,690	8	7,775
Reconstruction	4	165	6	297	4	488	5	243	3	311
Major repairs	19	552	17	453	18	551	16	616	13	1,019
Ordinary repairs	12	207	20	457	-	-	-	-	-	-

Source: New Program

13-1-3 Technical Level

Ukravtodor itself is not such a large organization; it comprises numerous state-owned enterprises and operates in an environment in which it can assign the work of design, construction, construction supervision, and maintenance to these organizations and the other State Enterprises.

Regarding technical standards, proactive efforts have been made to establish Ukrainian standards by switching from SNiP and GOST used during the Soviet era to DBN design and construction standards after gaining independence, and the standards are updated as necessary.

In addition, Ukraine has experiences with cable-stayed bridges as shown in Table 13-1-7.

Ukraine therefore seems to fulfill the technical standards necessary to implement normal road development projects. However, appropriate technical assistance is required for the Project because it includes a cable-stayed bridge with 420-m spans, and Ukraine has no experience with cable-stayed bridges with spans longer than 312 m.

Table 13-1-7. Long Span Road Bridges in Ukraine

Name of the Bridge Type of Main Bridge Material	Location	Total Length Main Span Length Number of Lanes	Completion Year Name of Contractor
Zaporizhzha Bridge Cable-stayed Bridge Steel	Dnipro River Zaporizhzhya	4484m 260m 6 lanes	Under Construction Mosybud Company(Ukraine)
Kyiv Podil Bridge Steel Arch Bridge Steel	Dnipro River Kyiv	7100m 344m 6 lanes +2 metros	Under Construction Mosybud Company(Ukraine)
Unknown Cable-stayed Bridge Steel and Concrete (not PC)	Odessa Port Odessa	150.5m 114.7m 2 lanes	1998 Mosybud Company(Ukraine)
Kiev Southern Bridge Cable-stayed Bridge Steel	Dnipro River Kyiv	1228m 271m 6 lanes + 2 metros	1992 Mosybud Company(Ukraine)
Kiev Moscow Bridge Cable-stayed Bridge Steel	Dnipro River Kyiv	779m 300m 6 lanes	1976 Mosybud Company(Ukraine)
<Reference>※ Vanšu Bridge Cable-stayed Bridge Steel and Concrete	Daugava River Riga, Latvia	554.8m 312m 6lanes	1981 Mosybud Company(Ukraine)

※ Although it is not located in Ukraine, it was constructed by Ukrainian contractor

1) Subordinate Organizations

The following are the state owned enterprises of Ukravtodor:

- PJSC "DAK" Automobile roads of Ukraine
- State Enterprise "Derzhdorndi"
- State Enterprise "Ukrdiprodor"
- State Enterprise "Ukrdorzvyazok"
- DP "Ukrdorinvest"
- State Enterprise "Scientific and Technical Center" Road Quality Control "
- State Enterprise "Ukrgolovmost-ekspertiza"
- State Enterprise "Training Center for Training, Retraining and Upgrading of Personnel"

Of the above, Ukrdiprodor performs the road designing and the following main tasks:

- Planning and designing of construction, reconstruction and capital repairs of highways and other facilities;
- Topographic, geodetic, cartographic surveys and research;
- Geophysical, hydrogeological surveys and research;

- Planning of land-use such as project design for land clearance operations, and planning for rational utilization of land;
- Execution of civil engineering survey by classes (for buildings and constructions of I and II class roads);
- Execution of a complex projects (new construction, reconstruction, and capital repairs of road facilities under standard conditions and for territories with rough engineering-geological conditions, ground subsidence, landslides, landfalls);
- Architectural and construction design;
- Designing of internal/external civil engineering networks, systems and facilities;
- Fire prevention planning;
- Scientific, technical research and development in the area of designing and surveys of highways, custom-made facilities and road service facilities;
- Preparation of pre-project documentation to substantiate foreign and national investments;
- Preparation of tender documents;
- Supervision of construction process, and academic support to construction-and-repair works;
- IT promotion and software development;
- Preparation of regulatory, metrological and policy documents for the design base, standards, typological project documentation and cost estimate standards in the area of road industry and distribution thereof, and;
- Others

In contrast, regarding bridges, there are several small firms that design viaducts and small bridges for Ukravtodor on a tender basis.

2) Technical Rules, Standards, and Other Requirements

Table 13-1-8 shows standards relevant to the Project.

During the Soviet era in and before 1991, SNiP and GOST were used as standards for road and bridge design and construction in Ukraine. After gaining independence from the Soviet Union, Ukraine introduced its own standards—DBN design and construction standards—to replace SNiP. While Ukraine has completed the creation of DBN standards that set out road design, bridge design, and various testing methods, it still refers to SNiP on some matters. In addition, DBN standards were prepared based on GOST, the standards of the former Soviet regions. Regarding the standard for roads (DBN V.2.3-4:2015), Ukraine has subdivided the numbers of lanes and lane widths and the slope gradients of the cut earth and embankments according to soil and climate categories. Ukraine has also defined geometrical structures for curve radii, longitudinal slopes, and other characteristics of main routes and interchanges. It can therefore be said that Ukraine's standards are highly descriptive compared to those of other developing countries.

Table 13-1-8. Relevant Standards

	Name of Standard
1	Відомості Верховної Ради (ВВР), 2017, № 29, ст.315 Про оцінку впливу на довкілля Verkhovna Rada (BBR) Bulletin, 2017, No 29, Art.315 On environmental impact assessment
2	КАБІНЕТ МІНІСТРІВ УКРАЇНИ ПОСТАНОВА, 28 серпня 2013 р. № 808 Про затвердження переліку видів діяльності та об’єктів, що становлять підвищену екологічну небезпеку Cabinet of Ministers of Ukraine Resolution, August 28, 2011, No808 On approval of the list of activities and objects posing an increased environmental hazard
3	ДСТУ Б В.2.3-1-95. Габарити підмостові судноплавних прогонів мостів на внутрішніх водних шляхах. DSTU B V.2.3-1-95. Navigation Clearance under Bridges
4	ДБН Д.2.2-1-99. Ресурсні елементи кошторисні норми на будівельні роботи. Земляні роботи. DBN D 2.2-1:99. Cost Estimate for Earth Work
5	ДБН Д.2.2-30-99 Збірник 30. Мости і труби. DBN D 2.2-30:99.Collection 30. Bridges and pipes
6	СНиП 2.02.01-83 (2000). Основи будинків і споруд. SNiP 2.2.01-83(2000). Construction Standards and Rules/Foundation
7	ДБН В.2.3-5-2001. Вулиці та дороги населених пунктів. DBN V.2.3-5:2001. Street and Roads in Population Center
8	ДБН А.2.2-1-2003. Склад і зміст матеріалів оцінки впливів на навколишнє середовище (ОВНС) DBN A.2.2-1-2003. Composition and Content of Environmental Impact Assessment Materials (EIA)
9	ДБН В.1.2-2:2006. Система забезпечення надійності та безпеки будівельних об'єктів. DBN V.1.2-2:2006. System Reliability and Safety of Construction Project
10	ДБН В .1.1-12-2006. Будівництво у сейсмічних районах України. DBN V.1.1-12:2006. Earthquakes in Ukraine
11	ДБН В.2.3-14:2006. Мости та труби. Правила проектування. DBN V.2.3-14:2006. Bridges and Pipes. Design Rules
12	ДБН В.2.3-16:2007. Норми відведення земельних ділянок для будівництва (реконструкції) автомобільних доріг. DBN V.2.3-16:2007. Land Allotement for Construction of Motor Roads
13	ДБН В.1.2-15:2009. Мости та труби. Навантаження і впливи. DBN V.1.2-15:2009. Bridges and pipes. Load and Impact
14	ДБН В.2.3-22:2009. Мости та труби. Основні вимоги проектування. DBN V.2.3-22:2009. Bridges and Pipes. General Requirement for Design
15	ДБН Б.1.1-4-2009. Склад, зміст, порядок розроблення, погодження та затвердження містобудівного обґрунтування. DBN V.1.1-4:2009. The system of Approval Planning Justification
15	ДСТУ-Н Б В.2.3-23:2009. Настанова з оцінювання і прогнозування технічного стану автодорожніх мостів. DSTU-N B V.2.3-23:2009. Transport facilities Rules for Assessment and Forecast of Technical Condition of Automobile Bridges
16	ДСТУ Б Д.1.1-1:2013. Правила визначення вартості будівництва. DSTU B D.1.1-1:2013. Rules for Construction Cost Calculation
17	ДСТУ Б Д.1.1-7:2013 Правила визначення вартості проектних робіт та експертизи проектів будівництва. DSTU B D.1.1-7:2013. Rules for Cost Calculation of Design Survey Works and Expertise of Project Documentation for Construction
18	ДБН А.2.2-3:2014. Склад та зміст проектної документації на будівництво DBN A.2.2-3:2014 Composition and Contents of Design Documentation for Construction
19	ДБН В.2.3-4:2015. Автомобільні дороги. Частина І. Проектування. Частина ІІ. Будівництво. DBN V.2.3-4:2015. Automobile roads. Part I. Design. Part II.Construction
20	ДБН А.3.1-5:2016. Організація будівельного виробництва. DBN A.3.1-5:2016. Organization of Construction Operation

13-2 Система експлуатації/обслуговування

Як пояснювалося раніше, з 2018 року «Укравтодор» обслуговує є лише Державні дороги, а об’їзна дорога цього Проекту належить до Державної дороги. Технічне обслуговування державних доріг поділяється на щоденне технічне обслуговування та інше обслуговування.

Для визначення субпідрядників використовуються тендери, які фактично виконують обидва види технічного обслуговування, але субпідрядник, який виконує щоденне обслуговування, ПАТ (ДАК) "ДАК" Автомобільні дороги України, по суті є підпорядкованою організацією Укравтодору і отримує всі замовлення на щоденне обслуговування.

Компанія виконує технічне обслуговування на загальну суму 4 млрд. грн. (Еквівалент 3000 км) щороку, і проводить технічне обслуговування на дорогах загального користування та місцевих довжиною понад 170 000 км по всій території України. Компанія має 24 філії (Облстводор) по всій території України, у ній працює 19 000 кваліфікованих інженерів, у тому числі понад 5000 інженерів, які мають досвід і навички.

Однак на даний час лише вісім відділень компанії стабільно керуються, і хоча «Миколаївський облстводор», дочірнє підприємство, що перебуває у підпорядкуванні Миколаївської області, має 24 управлінські офіси та 800 працівників по всій області, воно підтримує роботи з технічного обслуговування, оскільки не має матеріалів та машин, необхідних для проведення технічного обслуговування. Фактично він стикається з труднощами управління, як і багато інших філій.

Тому не можна сказати, що Укравтодор розробив систему щоденного обслуговування, необхідної після будівництва об'їзної дороги, і треба його реструктуризувати, щоб зокрема здійснити такі покращення:

- Інтеграція робочої сили, коштів та фінансових ресурсів
- Оптимізація мережі виробничих потужностей
- Стабілізація фінансового стану та фінансова реконструкція
- Підвищення якості та конкурентоспроможності будівництва та послуг
- Підвищення ефективності внутрішнього контролю та внутрішнього управління
- Впровадження ефективних методів корпоративного управління

Тим не менш, Укравтодор безпосередньо звертається щодо щоденного обслуговування до приватних компаній на пробній основі, використовуючи фінансову підтримку Міжнародної фінансової установи (IFI), намагаючись зменшити витрати та впорядкувати роботу. Потрібно зберегти можливість використовувати цю схему для об’їзної дороги.

Для довідки, місцеві дороги підтримуються обласними державними адміністраціями, а нагляд за цією роботою передано адміністраціям у 2018 році, як описано раніше. Наразі ситуація поліпшилася лише у п'яти областях, де працюють відділи, що займаються обслуговуванням. Інші області, в тому числі Миколаївська, не мають таких підрозділів, і тому відсутні системи забезпечення бюджетів та формування планів обслуговування.

Рисунок 13-2-1. Організація виконання робіт з технічного обслуговування

Although no construction or rehabilitation work has been performed on bridges or crossovers in Mykolaiv Oblast in the past 5 years, maintenance has been performed. Tables 13-2-1 to 13-2-4 show maintenance performed in 2017.

In addition to the maintenance performance, Ukravtodor employs AESUM and Interactive Road Map as non-structural measures for operation/maintenance.

AESUM stands for Analytical Expertise Bridge Management System and is a modern instrument of bridge management. A significant socioeconomic effect is expected from the extensive implementation of the AESUM by means of the optimum use of funds for repairs and reconstruction of bridges, development state control, increase of their residual operation time, and, hence, increase of crossing capacity of the transport network of Ukraine.

However, the access to data of the AESUM remains limited at this point, and thus it has not been used effectively.

If AESUM functions effectively in the future, it may be able to facilitate asset management for Mykolaiv Bridge.

Interactive Road Map is accessible on the Ukravtodor website, which provides information on “Repair of roads”, “Emergency areas”, Restriction of movement”, “Travel condition”, and “Accident concentration areas”. However, only fragmented information resources are available at the moment since the key elements of the system are missing. In order to obtain such complete information system, there is a need for sufficient fund allocation.

If Interactive Road Map functions effectively in the future, it may be able to facilitate efficient road operation.

Table 13-2-1. Maintenance Performed on Bridges and Crossovers (2017) (1/4)

Operational maintenance					
Automobile road				Unit of Measure	Quantity of work
Index	Address		Name of works		
	Km+m	Km+m			
Automobile road of state importance					
M-14 Sandora August	Odessa-Melitopol-Novoazovsk (in Taganrog City)				
	159+811 Overpass		painting of metal piercing (handrails)	10 m.	10.4
Bridge over Ingul river	157+266		Cold-milling coating	1000 sq.m	1813
			construction of a leveling layer	100 tons	1.0008
			shoring of asphalt concrete layer	1000 sq.m	1813
Bridge over Ingul river November	157+266		Cold-milling coating	1000 sq.m	2314
			construction of a leveling layer	100 tons	1.1107
			construction of asphalt concrete layer	1000 sq.m	2314
Bridge over Ingul river December	157+266		Cold-milling coating	1000 sq.m	0.05
			pit repair	1 sq.m	50
N-24	Blagovishchenske-Mykolaiv (through Voznesensk City)				
	75+673		cleaning of dirt in openings and pumps	1 m. building	
			disassembling of gravel pavement and foundations	100 cu.m	00126
			dismantling of blocks and slabs of tape foundations	100 units	0.09
			Laying of blocks and plates of tape foundations	100 units	0.09
			installation of a metal covering of a pedestrian path (pavement)	1 ton	1.21
			setting of metal barrier fences	100 m	0.048
N-24	Blagovishchenske-Mykolaiv (through Voznesensk City)				
June	185+139		dismantling of fence	100 m	0.18
			repair of metal barrier fences	1m	62.9
			Setting (Assembling) of a fence	100 m	0.26
			repair of metal rails	10 m	4,7
			Manufacturing and setting of handrail fence	1 ton	1.615
July	185+139		Assembling of supporting structures	1 ton	3.8
			straightening of crane girders	1 unit/node	2
			manufacturing lattice structures	1 ton	0.4
			grounding of metal surfaces	100 sq.m	0.072
			Painting of metal surfaces	100 sq.m	0.072

Table 13-2-2. Maintenance Performed on Bridges and Crossovers (2017) (2/4)

Operational maintenance					
Automobile road				Unit of Measure	Quantity of work
Index	Address		Name of works		
	Km+m	Km+m			
Automobile road of state importance					
R-55	Odessa-Voznesensk-Novyi Bug				
June	162+933		construction of sand and gravel pillows under the foundation (substructure)	100 cu.m	0.0625
			plastering of masonry (stone) work of piers	sq.m	4
			Repairing of masonry (stone) wall work in particular parts	cu.m	3
			preparation of cement-concrete mix	cu.m	1.14
			development of soil with moving by trailers	cu.m	24.5
			cleaning dirt in openings of pipes and bridges, cleaning of pumps	1m. of building	49
July	162+933		clearing an under-bridge bed from the bushes and grass	10 sq.m	20
			cleaning dirt in openings of pipes and bridges, cleaning of pumps	1m. of building	140
			installation and replacement of road signs	100 sign	15
December	225,442		pit repair and cover without breakage	1 sq.m	267
			vibroplate sealing	1 sq.m	54
			laying of leveling layer	100 ton	1.3875
			Compactor sealing	1000 sq.m	1.4592
December	225,442		pit repair and cover without breakage	1 sq.m	77
			restoration of deformed joint	1 m. joint	77
			clearing of drainage ditches	1 m. ditch	20
			material loading and waste disposal	1 ton	5.2
			Compactor sealing	1000 sq.m	

Table 13-2-3. Maintenance Performed on Bridges and Crossovers (2017) (3/4)

Operational maintenance					
Automobile road				Unit of Measure	Quantity of work
Index	Address		Name of works		
	Km+m	Km+m			
Automobile road of state importance					
R-75	Checkpoint " Tymkove" -Balta-Pervomaisk-Domanivka-Oleksandrivka				
September	84+883		Cleaning dirt on bridge	sq.m	144
			cleaning dirt in openings of pipes and bridges, cleaning of pumps	1m. of building	31
			Cleaning of a under-bridge bedding line	10 sq.m	20
			Cleaning of pumps on watercourse of small bridges and pipes	10 sq.m	12
			development of soil with moving trailers	1 cu.m	20
			Soil disposal	cu.m	10
July	184,822		Manual cleaning of dirt in openings of bridge and pipes	1 sq.m	29
			preparation of a cement solution	1 cu.m	278
			repairing of masonry (stone) work of walls	cu.m	7
			Plastering of masonry (stone) work of bridge	1 sq.m	72
			repairing of damaged plaster on pipes	1 sq.m	
			repair of metal rails	10 m	0.6
			repair of ferro-concrete girder - 60 cm high	1 m. girder	24
			development of soil with moving	1 cu.m	15
			Transfer materials on pallets	1 ton	
			loading of materials and tractor transportation	1 ton	9.8
R-81	Kazanka-Snigurivka-Antonivka - (R-47)				
November	62+572		Cleaning of pumps on watercourse of small bridges and pipes	10 sq.m	39
			Cleaning under the road bridge	10 sq.m	52
T-15-04	Pervomaisk-Novoukrainka				
	6+100		Cleaning under the road bridge	10 sq.m	36
T-15-06	Mykolaiv-Domanivka-Berizky				
August	15+428		Installing (shoring) steel welded handrails	Ton	0.8
			Painting of metal girder		48
			Painting of metal railing fence	10 m	2,4

Table 13-2-4. Maintenance Performed on Bridges and Crossovers (2017) (4/4)

Ordinary repair					
Automobile road				Unit of Measure	Quantity of wok
Index	Address		Name of works		
	Km+m	Km+m			
T-15-08	Kalynivka-Snigurivka				
	2+456		Posting (shoring) of metal railing fence	100 m	0.21
			Painting of metal railing fence	10 m	8.4
			Construction of a deformed seam of a road junction	100m	0.2
			Repair of road surfacing (pavement)-RMA	sq.m	460
	20+105		Setting of deformed seam of a road junction	1 m	14.9
			Repair of road surfacing (pavement)-RMA	sq.m	230
	36+520		Laying of protective layer of reinforced concrete road	1 sq.m	4.2
			Bond (laying)	1 cu.m	0.126
			Setting of deformed seam of a road junction	1 m.	14.9
			Painting of metal railing fence	10 m.	8.54
N-11	Dnipro-Mykolaiv-Kryvyi Rig				
	198+443		Repair of road surfacing (pavement)-RMA	sq.m	154
	199+333		Repair of road surfacing (pavement)-RMA	sq.m	288

Source: Ukravtodor

Chapter 14 Recalculation of Estimated Project Cost

14-1 Conditions for cost estimation

The following are the conditions for cost estimation.

・Base year/month for cost estimation:	The unit price used in this estimation are as of June 2018.
・Exchange rates:	The exchange rates used in this estimate are as shown below US$1.0＝108.06 JPY US$1.0＝26.50 UAH UAH1.0= 4.08 JPY
・Price escalation:	Foreign currency: 0%, Local currency: 5.0%
・Physical contingency:	Physical contingency is 10.0% of construction costs and 5% of engineering costs.
・Rate of interest during construction:	Interest during construction is 0.1% of construction costs and 0.01% of engineering costs.
・Value added tax (VAT[1]):	VAT is 20% as of June 2018.
・Import tax[2]:	Since import tax for iron and cast iron products ranges from 0% to 5.0%, an import tax of 5.0% was used for calculation.
・Rate of administration cost:	Administration cost of the project implementor is set at 5% of construction costs.
・Rate of Front end fee:	Set at 0.2% of the ODA loan covered amount

・Scope of loans

Within scope	Outside scope
● Civil works ➢ Construction of the bridge over the Southern Bug River ➢ Construction of bypass road and Interchanges ➢ Construction of main route bridges ➢ Construction of overbridge at T1506 ➢ Construction of overbridge at P06 ➢ Construction of ramp bridge ➢ Construction of temporary yards ● Price escalation ● Physical contingency ● Engineering cost	● Land acquisition and resettlement ● Leasing construction yards ● Relocating utilities ● VAT (Value Added Tax) ● Import tax ● Other taxs

[1] Tax Code of Ukraine; Article 193

[2] State Fiscal Service of Ukraine - http://sfs.gov.ua/baneryi/mitne-oformlennya/subektam-zed/stavki-vviznogo-ta-viviznogo-mita/eksportne-mito/

14-2 Expenses Borne by the Partner Country

14-2-1 Costs related to land acquisition and resettlement

The following tables show the costs related to land acquisition and resettlment.

Table 14-2-1. Summary of Land Acquisition Cost by Land use type

Land use type	Cost (UAH)	
	Route 2	Route 3
Agriculture	3,846,000	4,650,360
Artificial Forest	3,697,627	2,618,426
Road*1		
Residential	15,544	53,269
Others*2	5,712	70,918
Unknown*3	1,434,920	1,518,799
Total	8,999,803	8,911,771

*1: No compensation will be paid because the government owns the land

*2: Applied unit price of agricultural land

*3: Government-owned land not included

Table 14-2-2. Summary of Compensation Cost

Category	Unit	Route 2	Route 3
Number of affected buildings	bldgs.	26	60
Compensation cost	UAH	105,680,425	154,772,958

14-2-2 Cost of leasing construction yards and cost of relocating utilities

The Administration Cost includes the cost of leasing construction yards and the cost of relocating utilities.

14-3 Package

The Project was packaged in the following way and the cost estimation was carried out accordingly.

Package	Section
Package 1	Highway & Interchange
Package 2	Main Bridge (Steel stayed-cable bridge)
Package 3	Approach Bridge

14-4 Route 2 cost estimation results and project schedule

1) Cost estimation comparison table of 2011 F/S and This study

Table 14-4-1 compares the construction cost for Route 2 estimated in the 2011F/S and This Study. The estimated total cost increased by 11 billion Japanese Yen due to the reasons below.

- The total length of the main bridge and approach bridge increased from the 2011F/S.
- Japanese bridge standards (Specification for Highway Bridges) was revised in 2017, which set the service life of a bridge to 100 years, requiring even higher quality to be achieved.
- Landslide countermeasures were included.
- A diamond-type interchange was proposed at the intermediate point of the main route.
- Greater pavement thickness was adopted.
- Ukraine experienced price escalation.

Table 14-4-1. Cost estimation comparison table of 2011 F/S and This study

Cost Breakdown (Unit: 1,000JPY)

	2011F/S			This Study (Route 2)		
Main Bridge L=820m	Substructure	11,405,467	Main Bridge L=930m	Substructure	6,216,862	92%
	Superstructure	7,911,445		Superstructure	11,880,929	
	Other	389,432				
	Total	19,706,344		Total	18,097,791	
Approach Bridge L=1,230m	Substructure	4,218,583	Approach Bridge L=1,185m	Substructure	8,538,229	139%
	Superstructure	4,041,747		Superstructure	7,631,114	
	Side span of main bridge	3,238,125				
	Other	142,990				
	Total	11,641,445		Total	16,169,342	
Approach Road: L=10.34km Interchange: 2 places Bridge: L=803m	Road	2,611,919	Approach Road L=10.99km Interchange: 3 places Bridge L=408m	Road and Interchange	6,725,441	312%
	Structure (Bridge etc)	82,573		Structure (Bridge etc)	3,786,956	
	Accessory	1,140,472		Accessory	1,452,457	
	Total	3,834,964		Total	11,964,854	
Total		35,182,753	Total		46,231,988	131%

2) Cost estimation results

Table 14-4-2 shows the total Project cost for Route 2, and Table 14-4-3 to Table 14-4-5 show the breakdown of estimated construction cost for each Package.

Table 14-4-2. Cost estimation result

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Amount (million JPY)			Amount (million USD)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
Package 1 / Highway & Interchange	4,323	4,323	0	7,642	7,642	0	11,965	11,965	0	111	111	0
Package 2 / Bridge-1 / Main Bridge	13,240	13,240	0	4,858	4,858	0	18,098	18,098	0	167	167	0
Package 3 / Bridge-2 / Approach bridge	10,071	10,071	0	6,098	6,098	0	16,169	16,169	0	150	150	0
Civil Works Sub Total	**27,634**	**27,634**	**0**	**18,598**	**18,598**	**0**	**46,232**	**46,232**	**0**	**428**	**428**	**0**
Price Escalation	0	0	0	8,632	8,632	0	8,632	8,632	0	80	80	0
Physical Contingency	2,763	2,763	0	2,723	2,723	0	5,486	5,486	0	51	51	0
Consulting Services	3,079	3,079	0	2,119	2,119	0	5,199	5,199	0	48	48	0
Interest during Construction	256	256	0	0	0	0	256	256	0	2	2	0
Front End Fee	132	132	0	0	0	0	132	132	0	1	1	0
Land Acquisition	0	0	0	596	0	596	596	0	596	6	0	6
Administration Cost	0	0	0	3,307	0	3,307	3,307	0	3,307	31	0	31
VAT	0	0	0	6,415	0	6,415	6,415	0	6,415	59	0	59
Import Tax	0	0	0	1,520	0	1,520	1,520	0	1,520	14	0	14
Other Taxes	0	0	0	0	0	0	0	0	0	0	0	0
Total	**33,864**	**33,864**	**0**	**43,911**	**32,073**	**11,838**	**77,775**	**65,937**	**11,838**	**720**	**610**	**110**

Table 14-4-3. Cost Breakdown of Package 1/ Highway & Interchange

Package 1 / Highway & Interchange Loan Coverage Ratio 100

Item	Unit	Q'ty	Unit Price		Cost		Amount
			Foreign	Local	Foreign	Local	
			JPY	UAH	JPY	UAH	JPY
Road works	LS	1	383,536,000	1,050,938,599	383,536,000	1,050,938,599	4,668,986,000
Accessory works	LS	1	26,690,000	230,219,179	26,690,000	230,219,179	965,463,000
Main route bridge L=25m	LS	4	81,258,000	37,124,278	325,032,000	148,497,113	930,564,000
T1506 Bridge	LS	1	386,995,000	42,567,250	386,995,000	42,567,250	560,573,000
P06 Bridge	LS	1	150,300,000	73,556,506	150,300,000	73,556,506	450,244,000
Ramp Bridge	LS	1	153,761,000	82,657,389	153,761,000	82,657,389	490,816,000
Main route bridge (Culvert)	LS	1	0	6,964,159	0	6,964,159	28,398,000
Landslide countermeasures	LS	1	81,571,000	17,956,779	81,571,000	17,956,779	154,794,000
Bank protection	LS	1	0	3,340,089	0	3,340,089	13,620,000
Indirect cost	LS	1	1,933,550,750	209,842,737	1,933,550,750	209,842,737	2,789,234,000
General Expense	LS	1	850,406,000	0	850,406,000	0	850,406,000
Dispute Board	LS	1	30,878,145	7,572,375	30,878,145	7,572,375	61,756,290
Total					4,322,719,895	1,874,112,173	11,964,854,290

Table 14-4-4. Cost Breakdown of Package 2/ Main Bridge

Package 2 / Bridge-1 / Main Bridge Loan Coverage Ratio 100

Item	Unit	Q'ty	Unit Price		Cost		Amount
			Foreign	Local	Foreign	Local	
			JPY	UAH	JPY	UAH	JPY
Factory fabrication (Girder, cable, bearing)	LS	1	4,215,446,000	0	4,215,446,000	0	4,215,446,000
Material transportation	LS	1	630,021,000	0	630,021,000	0	630,021,000
Main girder erection	LS	1	399,964,000	98,084,578	399,964,000	98,084,578	799,927,000
On-site painting	LS	1	7,090,000	745,021	7,090,000	745,021	10,128,000
Cable installation	LS	1	323,062,000	184,859,939	323,062,000	184,859,939	1,076,872,000
Bridge surface	LS	1	321,351,000	56,838,159	321,351,000	56,838,159	553,122,000
Bearing installation	LS	1	1,200,000	294,281	1,200,000	294,281	2,400,000
Equipment consumption cost of transportation priod	LS	1	195,262,000	0	195,262,000	0	195,262,000
Main tower works	LS	1	1,653,930,000	284,728,840	1,653,930,000	284,728,840	2,814,979,000
Deck slab	LS	1	1,425,244,000	140,644,716	1,425,244,000	140,644,716	1,998,756,000
Substructure	LS	1	348,948,000	72,320,035	348,948,000	72,320,035	643,850,000
Scour protection	LS	1	0	2,120,049	0	2,120,049	8,645,000
Temporary bridge	LS	1	114,504,000	112,321,155	114,504,000	112,321,155	572,520,000
Indirect cost	LS	1	2,284,104,000	230,872,238	2,284,104,000	230,872,238	3,225,540,000
General Expense	LS	1	1,288,567,000	0	1,288,567,000	0	1,288,567,000
Dispute Board	LS	1	30,878,145	7,572,375	30,878,145	7,572,375	61,756,290
Total					13,239,571,145	1,191,401,387	18,097,791,290

Table 14-4-5. Cost Breakdown of Package 3/ Approach Bridge

Package 3 / Bridge-2 / Approach bridge Loan Coverage Ratio 100

Item	Unit	Q'ty	Unit Price		Cost		Amount
			Foreign	Local	Foreign	Local	
			JPY	UAH	JPY	UAH	JPY
Factory fabrication (Girder, bearing)	LS	1	2,438,520,000	0	2,438,520,000	0	2,438,520,000
Material transportation	LS	1	524,037,000	0	524,037,000	0	524,037,000
Main girder erection	LS	1	184,340,000	105,481,575	184,340,000	105,481,575	614,466,000
On-site painting	LS	1	41,819,000	23,929,456	41,819,000	23,929,456	139,397,000
Bridge surface	LS	1	408,303,000	72,390,908	408,303,000	72,390,908	703,494,000
Bearing installation	LS	1	5,700,000	1,397,835	5,700,000	1,397,835	11,400,000
Deck slab	LS	1	747,972,000	183,428,262	747,972,000	183,428,262	1,495,944,000
Substructure	LS	1	1,857,220,000	455,453,729	1,857,220,000	455,453,729	3,714,440,000
Temporary bridge	LS	1	423,096,000	415,030,316	423,096,000	415,030,316	2,115,480,000
Indirect cost	LS	1	2,258,536,000	230,785,180	2,258,536,000	230,785,180	3,199,617,000
General Expense	LS	1	1,150,791,000	0	1,150,791,000	0	1,150,791,000
Dispute Board	LS	1	30,878,145	7,572,375	30,878,145	7,572,375	61,756,290
Total					10,071,212,145	1,495,469,636	16,169,342,290

3) Project schedule

Table 14-4-6 shows the Project schedule for Route 2.

Table 14-4-6. Project Schedule

Implementation Schedule

	Month	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Preparation of Feasibility Study (T E O)	12											
	0											
Appreisal	1											
Pledge	1											
Signing of Loan Agreement	1											
	0											
Procurement of Consultant	12											
- Preparation of RFP	1											
- No Objection by JICA	1											
- Advertising	3											
- Technical Bid Evaluation	1											
- No Objection by JICA	1											
- Price Bid Evaluation	1											
- No Objection by JICA	1											
- Contract Negotiation	2											
- No Objection by JICA	1											
	0											
Consulting Services	88											
Detailed Design	18											
Tender Assistance	16											
- Preparation of PQ Documents	1											
- No Objection by JICA	1											
- PQ Advertising	1											
- PQ Evaluation	1											
- No Objection by JICA	1											
- Preparation of Bid Documents	3											
- No Objection by JICA	1											
- Advertising	3											
- Technical Bid Evaluation	2											
- No Objection by JICA	1											
- Price Bid Evaluation	2											
- No Objection by JICA	1											
- Contract Negotiation. Preoration for Contract/Commencement of works	2											
- No Objection by JICA	1											
Construction Supervision	57											
Defect Notification Period (DNP)	12											
	0											
Land Acquisition/ Utility relocation	24	0	6	12	6	0	0	0	0	0	0	0
Package 1 / Highway & Interchange	45	0	0	0	0	0	10	9	9	9	8	0
Package 2 / Bridge-1 / Main Bridge	45	0	0	0	0	0	10	9	9	9	8	0
Package 3 / Bridge-2 / Right bank side approach bridge	45	0	0	0	0	0	10	9	9	9	8	0
Package 4	0	0	0	0	0	0	0	0	0	0	0	0
Package 5	0	0	0	0	0	0	0	0	0	0	0	0

14-5 Route 3 cost estimation results and project schedule

1) Cost estimation comparison table of 2011 F/S and This study

Table 14-5-1 compares the construction cost for Route 3 estimated in the 2011F/S and This Study. The estimated total cost increased by 12 billion Japanese Yen due to the reasons below.

- The total road length increased due to the change in the route.
- The total length of the main bridge and approach bridge increased from the 2011F/S.
- Japanese bridge standards (Specification for Highway Bridges) was revised in 2017, which set the service life of a bridge to 100 years, requiring even higher quality to be achieved.
- Landslide countermeasures were included.
- A diamond-type at-grade intersection was proposed at the intermediate point of the main route.
- Greater pavement thickness was adopted.
- Ukraine experienced price escalation.

Table 14-5-1. Cost estimation comparison table of 2011 F/S and This study

Cost Breakdown (Unit:1,000JPY)

	2011F/S			This Study (Route 3)		
Main Bridge L=820m	Substructure	11,405,467	Main Bridge L=840m	Substructure	7,065,501	84%
	Superstructure	7,911,445		Superstructure	9,410,267	
	Other	389,432				
	Total	19,706,344		Total	16,475,767	
Approach Bridge L=1,230m	Substructure	4,218,583	Approach Bridge L=1,340m	Substructure	9,434,711	153%
	Superstructure	4,041,747		Superstructure	8,398,822	
	Side span of main bridge	3,238,125				
	Other	142,990				
	Total	11,641,445		Total	17,833,533	
Approach Road: L=10.34km Interchange: 2 places Bridge: L=803m	Road	2,611,919	Approach Road L=12.22km Interchange: 3 places Bridge L=361m	Road	7,692,504	349%
	Structure (Bridge etc)	82,573		Structure (Bridge etc)	4,200,147	
	Accessory	1,140,472		Accessory	1,499,327	
	Total	3,834,964		Total	13,391,978	
Total		35,182,753	Total		47,701,279	136%

2) Cost estimation results

Table 14-5-2 shows the total Project cost for Route 3, Table 14-5-3 to Table 14-5-5 show the breakdown of estimated construction cost for each Package.

Table 14-5-2. Cost estimation result

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Amount (million JPY)			Amount (million USD)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
Package 1 / Highway & Interchange	4,999	4,999	0	8,393	8,393	0	13,392	13,392	0	124	124	0
Package 2 / Main Bridge	11,693	11,693	0	4,783	4,783	0	16,476	16,476	0	152	152	0
Package 3 / Approach bridge	11,719	11,719	0	6,114	6,114	0	17,834	17,834	0	165	165	0
Civil Works Sub Total	**28,411**	**28,411**	**0**	**19,290**	**19,290**	**0**	**47,701**	**47,701**	**0**	**441**	**441**	**0**
Price Escalation	0	0	0	8,953	8,953	0	8,953	8,953	0	83	83	0
Physical Contingency	2,841	2,841	0	2,824	2,824	0	5,665	5,665	0	52	52	0
Consulting Services	3,079	3,079	0	2,119	2,119	0	5,199	5,199	0	48	48	0
Interest during Construction	264	264	0	0	0	0	264	264	0	2	2	0
Front End Fee	136	136	0	0	0	0	136	136	0	1	1	0
Land Acquisition	0	0	0	851	0	851	851	0	851	8	0	8
Administration Cost	0	0	0	3,418	0	3,418	3,418	0	3,418	32	0	32
VAT	0	0	0	6,637	0	6,637	6,637	0	6,637	61	0	61
Import Tax	0	0	0	1,563	0	1,563	1,563	0	1,563	14	0	14
Other Taxes	0	0	0	0	0	0	0	0	0	0	0	0
Total	**34,732**	**34,732**	**0**	**45,656**	**33,187**	**12,469**	**80,388**	**67,919**	**12,469**	**744**	**629**	**115**

Table 14-5-3. Cost Breakdown of Package 1/ Highway & Interchange

Package 1 / Highway & Interchange Loan Coverage Ratio 100

Item	Unit	Q'ty	Unit Price		Cost		Amount
			Foreign	Local	Foreign	Local	
			JPY	UAH	JPY	UAH	JPY
Road and interchange	LS	1	400,061,000	1,211,010,763	400,061,000	1,211,010,763	5,338,243,000
Accessory works	LS	1	26,957,000	238,036,753	26,957,000	238,036,753	997,608,000
Main route bridge L=25m	LS	5	81,258,000	37,124,278	406,290,000	185,621,391	1,163,205,000
T1506 Bridge	LS	1	386,995,000	42,567,250	386,995,000	42,567,250	560,573,000
P06 Bridge	LS	1	150,300,000	73,556,506	150,300,000	73,556,506	450,244,000
Main route bridge L=50m	LS	1	131,328,000	61,433,847	131,328,000	61,433,847	381,839,000
Landslide countermeasures	LS	1	345,363,000	1,246,770	345,363,000	1,246,770	350,447,000
Bank protection	LS	1	0	2,059,967	0	2,059,967	8,400,000
Indirect cost	LS	1	2,168,226,000	235,196,942	2,168,226,000	235,196,942	3,127,297,000
General Expense	LS	1	952,366,000	0	952,366,000	0	952,366,000
Dispute Board	LS	1	30,878,145	7,572,375	30,878,145	7,572,375	61,756,290
Total					4,998,764,145	2,058,302,562	13,391,978,290

Table 14-5-4. Cost Breakdown of Package 2/ Main Bridge

Package 2 / Main Bridge Loan Coverage Ratio 100

Item	Unit	Q'ty	Unit Price		Cost		Amount
			Foreign	Local	Foreign	Local	
			JPY	UAH	JPY	UAH	JPY
Factory fabrication (Girder, cable, bearing)	LS	1	3,143,631,000	0	3,143,631,000	0	3,143,631,000
Material transportation	LS	1	500,131,000	0	500,131,000	0	500,131,000
Main girder erection	LS	1	326,592,000	80,091,259	326,592,000	80,091,259	653,183,000
On-site painting	LS	1	5,789,000	608,426	5,789,000	608,426	8,270,000
Cable installation	LS	1	205,637,000	117,667,995	205,637,000	117,667,995	685,456,000
Bridge surface	LS	1	294,654,000	51,457,723	294,654,000	51,457,723	504,485,000
Bearing installation	LS	1	1,200,000	294,281	1,200,000	294,281	2,400,000
Equipment consumption cost of transportation priod	LS	1	195,262,000	0	195,262,000	0	195,262,000
Main tower	LS	1	1,764,300,000	289,447,881	1,764,300,000	289,447,881	2,944,592,000
Deck slab	LS	1	1,287,317,000	127,033,976	1,287,317,000	127,033,976	1,805,328,000
Substructure	LS	1	358,345,000	73,856,427	358,345,000	73,856,427	659,512,000
Scour protection	LS	1	0	4,240,098	0	4,240,098	17,290,000
Temporary bridge	LS	1	201,576,000	197,733,259	201,576,000	197,733,259	1,007,880,000
Indirect cost	LS	1	2,205,653,000	222,877,360	2,205,653,000	222,877,360	3,114,488,000
General Expense	LS	1	1,172,103,000	0	1,172,103,000	0	1,172,103,000
Dispute Board	LS	1	30,878,145	7,572,375	30,878,145	7,572,375	61,756,290
Total					11,693,068,145	1,172,881,060	16,475,767,290

Table 14-5-5. Cost Breakdown of Package 3/ Approach Bridge

Package 3 / Approach bridge Loan Coverage Ratio 100

Item	Unit	Q'ty	Unit Price		Cost		Amount
			Foreign	Local	Foreign	Local	
			JPY	UAH	JPY	UAH	JPY
Factory fabrication (Girder, bearing)	LS	1	2,670,509,000	0	2,670,509,000	0	2,670,509,000
Material transportation	LS	1	560,037,000	0	560,037,000	0	560,037,000
Main girder erection	LS	1	195,752,000	112,011,915	195,752,000	112,011,915	652,507,000
On-site painting	LS	1	47,338,000	27,087,336	47,338,000	27,087,336	157,793,000
Bridge surface	LS	1	444,811,000	81,399,338	444,811,000	81,399,338	776,736,000
Bearing installation	LS	1	8,400,000	2,059,967	8,400,000	2,059,967	16,800,000
Deck slab	LS	1	1,014,970,000	165,936,693	1,014,970,000	165,936,693	1,691,616,000
Substructure	LS	1	2,547,219,000	422,455,270	2,547,219,000	422,455,270	4,269,880,000
Temporary bridge	LS	1	434,184,000	425,906,941	434,184,000	425,906,941	2,170,920,000
Indirect cost	LS	1	2,495,481,000	254,997,145	2,495,481,000	254,997,145	3,535,292,000
General Expense	LS	1	1,269,687,000	0	1,269,687,000	0	1,269,687,000
Dispute Board	LS	1	30,878,145	7,572,375	30,878,145	7,572,375	61,756,290
Total					11,719,266,145	1,499,426,979	17,833,533,290

3) Project schedule

Table 14-5-6 shows the Project schedule for Route 3.

Table 14-5-6. Project Schedule

Implementation Schedule

	Month	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Preparation of Feasibility Study (TEO)	12											
	0											
Appreisal	1											
Pledge	1											
Signing of Loan Agreement	1											
	0											
Procurement of Consultant	12											
- Preparation of RFP	1											
- No Objection by JICA	1											
- Advertising	3											
- Technical Bid Evaluation	1											
- No Objection by JICA	1											
- Price Bid Evaluation	1											
- No Objection by JICA	1											
- Contract Negotiation	2											
- No Objection by JICA	1											
	0											
Consulting Services	88											
Detailed Design	18											
Tender Assistance	16											
- Preparation of PQ Documents	1											
- No Objection by JICA	1											
- PQ Advertising	1											
- PQ Evaluation	1											
- No Objection by JICA	1											
- Preparation of Bid Documents	3											
- No Objection by JICA	1											
- Advertising	3											
- Technical Bid Evaluation	2											
- No Objection by JICA	1											
- Price Bid Evaluation	2											
- No Objection by JICA	1											
- Contract Negotiation. Preparation for Contract/Commencement of works	2											
- No Objection by JICA	1											
Construction Supervision	57											
Defect Notification Period (DNP)	12											
	0											
Land Acquisition/ Utility relocation	24	0	6	12	6	0	0	0	0	0	0	0
Package 1 / Highway & Interchange	45	0	0	0	0	0	10	9	9	9	8	0
Package 2 / Bridge-1 / Main Bridge	45	0	0	0	0	0	10	9	9	9	8	0
Package 3 / Bridge-2 / Right bank side approach bridge	45	0	0	0	0	0	10	9	9	9	8	0
Package 4	0	0	0	0	0	0	0	0	0	0	0	0
Package 5	0	0	0	0	0	0	0	0	0	0	0	0

Chapter 15 Review of Project Risk Analysis

This is a review of the risk analysis conducted for the 2011F/S. The risk analysis will be updated in response to the results of investigations during this study.

Table15-1. Risks of the Mykolaiv Bridge Construction Plan

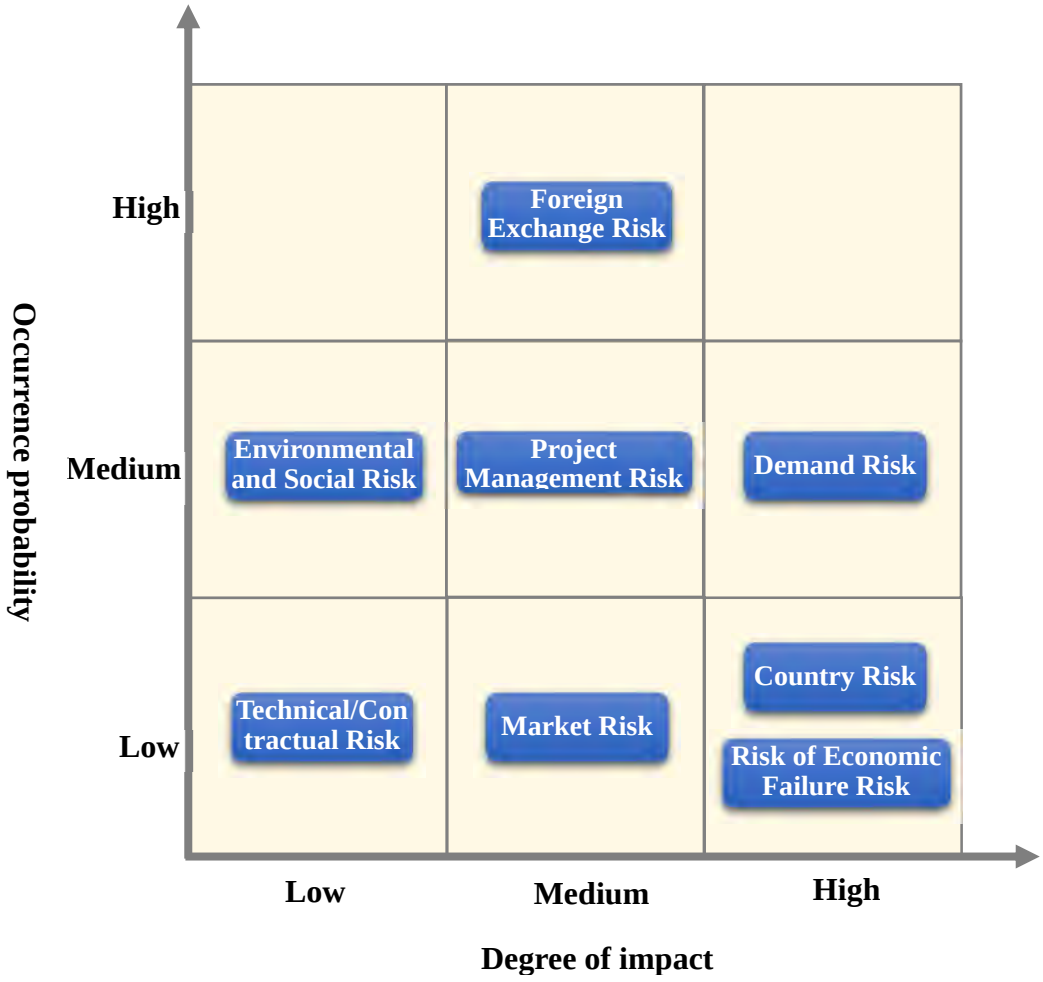
Type of Risk	2011F/S	This Study
Country Risk	**Description** Russians comprise 30% of the population of Ukraine, and a relatively high number of Russian people live in Mykolaiv City. Conflict between pro-American and pro-Russian sentiments was kept in check after the 2010 presidential election, but political instability persists.	**Description** Relations with Russia have degraded rapidly due to its annexation of Crimea and the instability in the eastern part of Ukraine. Ukraine is working toward solutions for the many problems it faces, but the situation remains unstable. Mr. Velodymyr Zelensky, who showed willingness to consider negotiating with Russia, was elected as the sixth president of the Ukraine in April 2019. There is now scope for the Ukraine-Russia relationship to change because of the new president's policies, hence the focus on future foreign policy, despite the still-unstable nature of internal politics.
	Response Updating political and economical information of the country is required to avoid the effect of those risks.	**Response** The same course of action as the 2011F/S will be taken: updating political and economical information of the country is required to avoid impact to the Project.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Low Degree of Impact: High
Risk of Economic Failure	**Description** In the seven-year period from 2003 to 2010, commodity prices in Ukraine rose more than 70%. Ukraine depends on Russian imports to supply energy; political relations with Russia could have a substantial impact on the Ukrainian economy.	**Description** The economic situation rapidly deteriorated after the 2014 Ukrainian Revolution, but is showing signs of recovery with roughly 3% growth since 2016. However, the intensification of conflict in the eastern part of the country, persistently high-level foreign debt, problems in the external environment, and other developments could send the country into another economic downturn.
	Response Updating political and economical information of the country is required to avoid the effect of those risks.	**Response** The same course of action as the 2011F/S will be taken: updating political and economical information of the country is required to avoid impact to the Project.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Low

Type of Risk	2011F/S	This Study
		Degree of Impact: High
Foreign Exchange Risk	**Description** Recently, the Ukrainian hryvnia (UAH) has been more stable than the euro and the US dollar. However, because the domestic economy continues to retract, the country remains in an economically vulnerable state.	**Description** The Ukrainian hryvnia (UAH) has remained stable at an exchange rate between 25 and 28 UAH per USD after year 2016. However, the economically vulnerable state of Ukraine has remained much the same, despite the sustainable economic growth expected.
	Response The Government of Ukraine will continue to gather political and economic information to avoid impact to the Project.	**Response** The same course of action as the 2011F/S will be taken: the Government of Ukraine will continue to gather political and economic information to avoid impact to the Project.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: High Degree of Impact: Medium
Market Risk	**Description** In the case of a suspension bridge, fluctuations in the price of steel could substantially impact the project cost.	**Description** Fluctuations in the price of steel were raised as an issue during the 2011F/S. Presently, few factors that cause fluctuations in the price of steel exist; therefore, it is very unlikely that such fluctuations will significantly impact the project cost. Fluctuations in commodity prices and personnel costs could impact on the project cost. In addition, since relations with Russia have deteriorated, Ukraine has purchased gas from Europe at high prices (compared to the price from Russia); fluctuations in fuel prices could impact on the project cost.
	Response A 5% annual increase in prices will be factored into the calculation of the estimated project cost.	**Response** Price increases will be factored into the calculation of the estimated project cost.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Low Degree of Impact: Medium
Project Management Risk	**Description** An F/S must be implemented to obtain Cabinet approval of the Project. However, that approval could be delayed because the Ukrainian public corporation responsible for roads does not have anyone with experience designing suspension bridges, and there are no local consultants who could be in charge of the F/S. This lack of skill with regard to the project approval process	**Description** As discussed in Chapter 3, a project approval process under the laws of Ukraine is required to implement the Project. In the past studies, the Project was approved by the Cabinet in 2013. However, the fact that the Survey has been conducted could necessitate the re-creation of the Feasibility Study (TEO). Depending on the types of changes, the re-creation of the TEO could necessitate

Type of Risk	2011F/S	This Study
	could delay the launch of the Project.	the rewriting of the entire document, or the update of only the items that changed. Furthermore, some elements have yet to be finalized. The elements yet to be finalized present the risk of delaying the launch of the Project due to the time required for the project approval process.
	Response Regarding F/S, it is best for the consultant that implemented the preliminary design to support SRA. In addition, collaboration between the consultant that provides the support and the Ukraine is required through the design stage.	**Response** The same course of action as the 2011F/S will be taken: The consultants who made preliminary design shall assist Ukravtodor and the local consultants. Close communication between two sides at design stage is required to avoid those miscomprehension.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Medium Degree of Impact: Medium
Demand Risk	**Description** The actual future traffic volume could be less than the projected traffic volume. The development of Ochakov Port is one of the elements of future traffic volume; delays to the development of the port could result in reduced traffic volume, particularly of heavy vehicles.	**Description** The future traffic volume shown in this Study is estimated based on certain assumptions and may thus vary from the actual future volume.In particular, if the actual volume is higher than the estimate, it could exceed the traffic capacity of Mykolaiv Bridge. In that case, the total volume of traffic crossing the river could exceed capacity. The traffic volume will continue to exceed the capacity of Vavarovsky Bridge regardless of the risk of higher-than-expected or lower-than-expected traffic volume after Mykolaiv Bridge is put into service.
	Response In light of the above, in Chapter 11 of the 2011F/S report, sensitivity analysis was conducted for the case in which the development of Ochakov Port does not progress.	**Response** To understand the risk of higher-than-expected or lower-than-expected traffic volume, sensitivity analysis with variability of 10% in each direction will be conducted as part of economic and financial analysis. Continued observation of traffic volumes will be implemented to monitor the risk of higher-than-expected traffic volume exceeding the capacity of Mykolaiv Bridge, and the risk of lower-than-expected traffic volume, which is a greater risk than higher-than-expected traffic volume. If the big difference between actual traffic volume and estimated traffic volume is observed, future traffic volume plans

Type of Risk	2011F/S	This Study
		will be revised to create a future network in line with the present situation.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Medium Degree of Impact: High
Environmental and Social Risk	**Description** (Not included)	**Description** Future traffic volume will have a substantial impact on the road environment. In particular, regarding noise from road traffic, there is a risk that more communities will be subject to noise in excess of standards. Roughly seven years have passed since the last stakeholder meetings; therefore, if land acquisition proceeds as is, there is a risk of conflict due to insufficient understanding of land acquisition among impacted parties.
	Response (Not included)	**Response** Adaptive management will be implemented in response to the uncertainty of projections. Specifically, through the regular monitoring described in the previous section on demand risk, mitigation measures such as expanding the scope of noise barrier construction will be undertaken. In addition, The consultants who made preliminary design will propose to consider road designs that anticipate the possibility of such improvement work in the future, and accommodate it (securing space to construct noise barriers in the future, layout of streetlights, etc.). After impacted parties are properly identified and included in stakeholder meetings, requirements will be set for rights to receive benefits based on replacement costs, and the status of livelihood recovery will be monitored after payment of compensation/support money related to land acquisition.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Medium Degree of Impact: Low
Technical/Contractual Risk	**Description** (Not included)	**Description** 1) Construction of a cable-stayed bridge with a bridge over 400m long requires

Type of Risk	2011F/S	This Study
		advanced construction technology. 2) Tenders, agreements, and the start of construction work could be delayed if land acquisition, handling of taxes and other matters to be implemented under the initiative of Ukraine are not determined and completed at appropriate times.
	Response (Not included)	**Response** 1) A contractor with appropriate technology must be selected. A consultant who appropriately supervise the construction must be allocated. 2) It is necessary to continue to coordinate with relevant agencies on Ukraine, particularly with Ukravtodor.
		As of 2019, the occurrence probability and degree of impact for this risk are expected as follows. Occurrence Probability: Low Degree of Impact: Low



Source: Figure was modified by reference to "Project Management Handbook, JICA, 2007".

Figure15-1. Risk Occurrence Probability/Impact Matrix

Chapter 16 Consideration of Cost Reduction Effects

Table 16-1 and Table 16-2 show the cost reductions obtained by reviewing the road cross-section of bridge and structure types adopted in the 2011F/S.

Conditions for the cost estimation are shown in 14-1.

The condtions are significantly different from the one in 2011. For example, Ukrainian Hryvnia's exchange rate against U.S. dollar was approx. 8 UAH compared with the current rate of 26.5 UAH.

Therefore, the costs under 2011F/S shown in the table below are not those calculated in the 2011F/S; instead, they are the costs recaluculated in this Study.

As shown in the tables, cost reductions are 83 million USD for Route2 and 75 million USD for Route3.

Main factors of cost reduction regarding road cross-section of bridge, main bridge type and foundation type of approach bridge are reduction in the width of the median, change of bridge type and change of foundation type respectively.

Table16-1. Cost Reduction of Route2

Item	Result of Study and Cost		Cost Reduction
	2011F/S*	Route2	
Road Cross-section of Bridge	Approach Bridge Section L=1,230m, W=28.8m 178 Million USD	Approach Bridge Section L=1,185m, W=26.3m 156 Million USD	22 Million USD
Main Bridge Type	Steel Suspension Bridge L=820m,W=28.8m 211 Million USD	Steel Cable-stayed Bridge L=930m, W=26.3m 158 Million USD	53 Million USD
Foundation Type Of Approach Bridge	Steel Pipe Pile Foundation (Multi Pile-bent Method) L=1,230m 57 Million USD	PC Well Foundation (Single Pile-bent Method) L=1,185m 49 Million USD	8 Million USD
Total of Cost Reduction	-	-	83 Million USD

*: The Costs are not those calculated in the 2011F/S; instead, they are the costs recaluculated in this Study.

Table16-2. Cost Reduction of Route3

Item	Result of Study and Cost		Cost Reduction
	2011F/S*	Route3	
Road Cross-section of Bridge	Approach Road Section L=1,230m, W=28.8m 178 Million USD	Approach Road Section L=1,340m, W=26.3m 177 Million USD	1 Million USD
Main Bridge Type	Steel Suspension Bridge L=820m, W=28.8m 211 Million USD	Steel Cable-stayed Bridge L=840m, W=26.3m 138 Million USD	73 Million USD
Foundation Type Of Approach Bridge	Steel Pipe Pile Foundation (Multi Pile-bent Method) L=1,230m 58 Million USD	PC Well Foundation (Single Pile-bent Method) L=1,340m 57 Million USD	1 Million USD
Total of Cost Reduction	-	-	75 Million USD

*: The Costs are not those calculated in the 2011F/S; instead, they are the costs recaluculated in this Study.

Chapter 17 Economic and Financial Analysis

17-1 Financial Analysis

17-1-1 Basic Policy

In this Study, it is not determined that toll collection is applied or not as of June 30 2019, therefore, financial analysis is implemented under the assumption that toll collection is applied.

The financial analysis is to evaluate to what extent this project has the profitability and whether the sound operation under various cases is feasible or not.

As the evaluation indexes of the Project, Financial Internal Rate of Return (FIRR) on the Project is calculated to judge the viability to carry out commercial undertaking.

17-1-2 Financial Costs (Construction Cost, Maintenance Cost)

As with the economic costs, the financial costs are calculated based on the construction cost and maintenance cost described in Chapter 14. The basic precondition for financial costs are as follows:

- Implementation schedule: Year 2020-2029 for construction period, operation start from year 2030
- VAT and import tax: Included
- Inflation: Not considered.
- Resettlement and compensation costs: Considered.
- Standard conversion factor: Not applicable.

17-1-3 Revenue

Revenue is calculated from the number of vehicles passing through Mykolaiv Bridge multiplying by toll by the type of vehicles.

1) Toll by the Type of Vehicles

The following table shows PCU and toll structure defined in 2011F/S.

Table 17-1-1. PCU and Assumed Toll Structure (2011F/S)

Vehicle type	PCU	Toll structure（UAH/vehicle）			
		Free	Toll-1	Toll-2	Toll-3
Passenger cars	1.0	0	10	20	30
2ax-trucks	2.0	0	15	30	45
3ax + trucks	2.5	0	20	40	60
Trailers	3.0	0	30	60	90

In the table shown above, there is poor correlation between PCU and toll structure for 3+ trucks. The PCU of 3+ trucks are the median value of 2-axle trucks and trailers, however the tolls are not the median value. Other vehicle types such as passenger cars, 2-axle trucks and trailers are correlated between PCU and toll structure. In this Study, the toll structure for the type of vehicles is corrected to correlate with PCU. PCU is also revised for this Study.

When conducting the financial analysis, it is required to determine the most appropriate toll structure considering suitable traffic demand and maximizing the revenue.

The following toll structures were examined based on the equation of conversion rate applied to estimate future traffic demand in Chapter 8.

Table 17-1-2. PCU and Toll Structures

Vehicle type	PCU	Toll structure（UAH/vehicle）				
		Toll-1	Toll-2	Toll-3	Toll-4	Toll-5
Passenger cars	1.0	5	10	15	20	25
2-axle trucks	2.0	10	20	30	40	50
3-axle + trucks	3.0	15	30	45	60	75
Trailers	4.0	20	40	60	80	100

When the toll is lower, the traffic volume is higher. Then, the LoS (Level of Service) becomes lower and revenue remains low. On the other hand, when the toll is higher, the traffic volume is lower. Then, the LoS becomes higher but revenue remains low.

Table 17-1-3. Traffic Volume vs Revenue

Year	Tool-1		Tool-2		Tool-3	
	Traffic Volume (1000 veh./year)	Revenue (1000 UAH/year)	Traffic Volume (1000 veh./year)	Revenue (1000 UAH/year)	Traffic Volume (1000 veh./year)	Revenue (1000 UAH/year)
2030	5,912	34,435	4,309	47,640	3,157	50,375
2040	7,900	45,781	5,796	63,690	4,268	67,727
2050	10,589	61,126	7,814	85,457	5,780	91,313

Year	Tool-4		Tool-5	
	Traffic Volume (1000 veh./year)	Revenue (1000 UAH/year)	Traffic Volume (1000 veh./year)	Revenue (1000 UAH/year)
2030	2,320	48,236	1,700	43,599
2040	3,147	65,154	2,312	59,094
2050	4,275	88,189	3,147	80,214

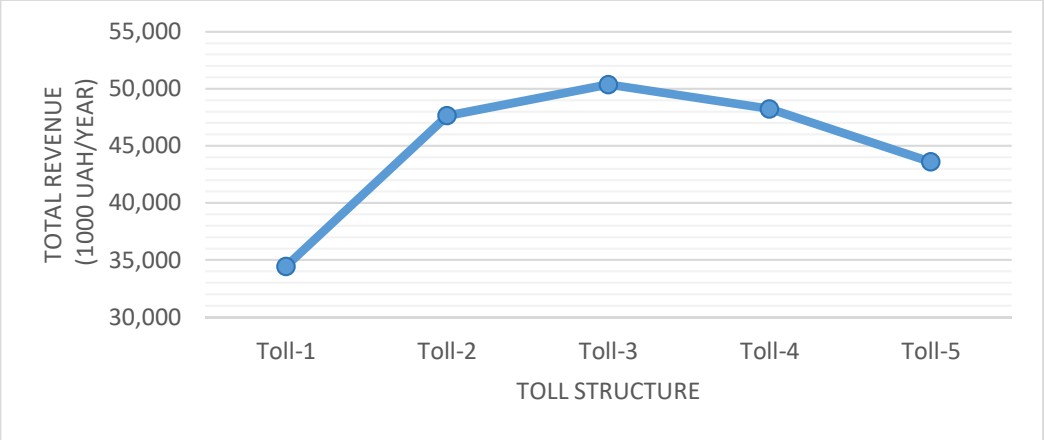


Figure 17-1-1. Total Revenue vs Toll Structure

As a result, the revenue was maximum when the case of toll-3 was applied. Therefore, the toll-3 was adopted for this Study.

17-1-4 Financial Internal Rate of Return (FIRR)

The FIRR is calculated by the following formula.

$$\sum_{t=0}^{n}\left\{\frac{(B_t - C_t)}{(1+FIRR)^t}\right\} = 0$$

where

n : Period for the analysis (First year t = 0)

B_t : Revenue of each year

C_t : Financial costs of each year

t : Years since Year 0 (operation start year) (years)

If estimated FIRR exceed the weighted average capital cost (WACC), it is evaluated that the Project is feasible.

The WACC of the Project is 4.0 percent as calculated in the following table.

Table 17-1-4. WACC

<Route 2>

Financial Source	Amount (million USD)	Weight	Cost	Reference
ODA Loan for Construction	584	71.3%	0.10%	Interest
ODA Loan for Consultant	51	6.3%	0.01%	Interest
Ukraine Gov. Budget	183	22.4%	17.50%	Capital Opportunity Cost
Total	819	100%	4.0%	WACC

<Route 3>

Financial Source	Amount (million USD)	Weight	Cost	Reference
ODA Loan for Construction	598	71.5%	0.10%	Interest
ODA Loan for Consultant	51	6.1%	0.01%	Interest
Ukraine Gov. Budget	187	22.4%	17.50%	Capital Opportunity Cost
Total	837	100%	4.0%	WACC

USD 1 = JPY 108.06

17-1-5 Financial Analysis Case

In this Study, the financial analysis was conducted for the following cases that varied in the cost to be considered. The setting of revenue was same for all cases.

Case 1: Total cost for the financial analysis is included.
Case 2: Cost for the loan potion such as construction and consultant cost and cost for the borrower finance portion such as land acquisition and tax are not included. However, the operation and maintenance cost is included.

17-1-6 Financial Analysis Result

1) Financial Analysis Result for Route 2

(1) Estimation of FIRR for Route 2

FIRR was estimated based on revenue and financial costs for Route 2.

a) Case 1

The financial analysis was evaluated to compare with the estimated FIRR and the WACC. The estimated FIRR of -9.4% was substantially below the WACC of 4%, therefore, the project is concluded as financially unfeasible (refer to Table 17-1-7).

b) Case 2

The estimated FIRR 5.3% for Case 2 was exceed the WACC. Therefore, the project is concluded as financially feasible (refer to Table 17-1-8).

2) Financial Analysis Result for Route 3

(1) Estimation of FIRR for Route 3

a) Case 1

The results of the financial analysis for Case 1 of Route 3 was almost same compare with those of Route 2. The estimated FIRR of -9.8% was substantially below the WACC of 4%, therefore, the project is concluded as financially unfeasible (refer to Table 17-1-9).

b) Case 2

The estimated FIRR 4.7% for Case 2 of Route 3 was exceed the WACC. Therefore, the project is concluded as financially feasible (refer to Table 17-1-10).

3) Sensitivity Analysis for Case 2

For the feasibly of the Project, stability should be confirmed by the sensitivity analysis. The sensitivity analysis was conducted to understand the variation of analysis results when costs were increased and benefits were decreased.

As a result, it is conclude that the Project is unfeasible for both Route 2 and Route 3 when the revenue is 80%. It is also the Project is unfeasible for both Routes when the revenue is 90% and the cost is 110%. In addition, the Project is unfeasible for Route 3 when the revenue is 100% and the cost is 110%, and 90% and 100%.

Table 17-1-5. Sensitivity Analysis (Route 2)

FIRR		Revenue		
		100%	90%	80%
Costs	100%	5.3%	4.4%	3.4%
	110%	4.5%	3.6%	2.6%
	120%	3.8%	2.9%	1.8%

Table 17-1-6. Sensitivity Analysis (Route 3)

FIRR		Revenue		
		100%	90%	80%
Costs	100%	4.7%	3.9%	2.8%
	110%	3.9%	3.0%	2.0%
	120%	3.2%	2.3%	1.2%

Table 17-1-7. Result of Financial Analysis for Route 2 (Case 1)

Route 2, Case 1 — Unit: US$

Year	Revenue		Costs								NPV	Total revenue - Total cost
	Toll	Total revenue considered WACC	Construction cost	Maintenance cost					Total cost	Total costs considered discount rate		
				Bridge		Road						
				Inspection	Pinting	Maintenance	Pavement	Lighting				
2021			1,255,897						1,255,897	1,161,148	-1,161,148	-1,255,897
2022			12,665,814						12,665,814	11,259,863	-11,259,863	-12,665,814
2023			11,198,807						11,198,807	9,572,787	-9,572,787	-11,198,807
2024			2,530,250						2,530,250	2,079,681	-2,079,681	-2,530,250
2025			191,272,883						191,272,883	151,165,738	-151,165,738	-191,272,883
2026			95,863,987						95,863,987	72,848,752	-72,848,752	-95,863,987
2027			60,171,301						60,171,301	43,966,580	-43,966,580	-60,171,301
2028			97,678,859						97,678,859	68,627,871	-68,627,871	-97,678,859
2029			101,396,161						101,396,161	68,499,613	-68,499,613	-101,396,161
2030	2,014,987	1,308,897	15,057,632			38,000			15,095,632	9,805,835	-8,496,938	-13,080,646
2031	2,075,222	1,296,177				38,000			38,000	23,735	1,272,443	2,037,222
2032	2,137,331	1,283,626				38,000			38,000	22,822	1,260,804	2,099,331
2033	2,201,370	1,271,236				38,000			38,000	21,944	1,249,292	2,163,370
2034	2,267,400	1,259,007		182,000		38,000			220,000	122,158	1,136,849	2,047,400
2035	2,335,486	1,246,935				38,000			38,000	20,289	1,226,646	2,297,486
2036	2,405,692	1,235,018				38,000			38,000	19,508	1,215,510	2,367,692
2037	2,478,079	1,223,250				38,000			38,000	18,758	1,204,492	2,440,079
2038	2,552,725	1,211,631				38,000			38,000	18,036	1,193,595	2,514,725
2039	2,629,696	1,200,159		182,000			3,500,000	150,000	3,832,000	1,748,875	-548,716	-1,202,304
2040	2,709,062	1,188,828				38,000		150,000	188,000	82,501	1,106,327	2,521,062
2041	2,790,906	1,177,638				38,000		150,000	188,000	79,328	1,098,310	2,602,906
2042	2,875,299	1,166,585				38,000		150,000	188,000	76,277	1,090,308	2,687,299
2043	2,962,327	1,155,667				38,000		150,000	188,000	73,343	1,082,325	2,774,327
2044	3,052,069	1,144,882		182,000		38,000		150,000	370,000	138,793	1,006,089	2,682,069
2045	3,144,610	1,134,227				38,000		150,000	188,000	67,810	1,066,417	2,956,610
2046	3,240,041	1,123,700				38,000		150,000	188,000	65,202	1,058,498	3,052,041
2047	3,338,449	1,113,297				38,000		150,000	188,000	62,694	1,050,604	3,150,449
2048	3,439,933	1,103,019				38,000		150,000	188,000	60,282	1,042,737	3,251,933
2049	3,544,586	1,092,862		182,000			3,500,000	150,000	3,832,000	1,181,477	-88,615	-287,414
2050	3,652,508	1,082,824				38,000		150,000	188,000	55,735	1,027,089	3,464,508
2051	3,763,801	1,072,901				38,000		150,000	188,000	53,591	1,019,311	3,575,801
2052	3,878,576	1,063,095				38,000		150,000	188,000	51,530	1,011,565	3,690,576
2053	3,996,938	1,053,401				38,000		150,000	188,000	49,548	1,003,854	3,808,938
2054	4,119,001	1,043,819		182,000		38,000		150,000	370,000	93,764	950,055	3,749,001
2055	4,244,881	1,034,345				38,000		150,000	188,000	45,810	988,535	4,056,881
2056	4,374,701	1,024,979				38,000		150,000	188,000	44,048	980,931	4,186,701
2057	4,508,581	1,015,718				38,000		150,000	188,000	42,354	973,364	4,320,581
2058	4,646,654	1,006,561				38,000		150,000	188,000	40,725	965,836	4,458,654
2059	4,789,048	997,506		182,000	7,000,000		3,500,000	150,000	10,832,000	2,256,187	-1,258,681	-6,042,952
Total	96,169,958	34,331,789	589,091,593	1,092,000	7,000,000	1,026,000	10,500,000	3,150,000	611,859,593	445,624,987	-411,293,198	-515,689,635
											FIRR	**-9.4%**
											NPV	**-411,293,198**

Table 17-1-8. Result of Financial Analysis for Route 2 (Case 2)

Route 2, Case 2 Unit : US$

Year	Revenue		Costs								NPV	Total revenue - Total cost
	Toll	Total revenue considered WACC	Construction cost	Maintenance cost					Total cost	Total costs considered discount rate		
				Bridge		Road						
				Inspection	Pinting	Maintenance	Pavement	Lighting				
2021			65,614						65,614	60,664	-60,664	-65,614
2022			554,709						554,709	493,134	-493,134	-554,709
2023			542,416						542,416	463,659	-463,659	-542,416
2024			120,928						120,928	99,394	-99,394	-120,928
2025			9,100,694						9,100,694	7,192,411	-7,192,411	-9,100,694
2026			4,636,870						4,636,870	3,523,640	-3,523,640	-4,636,870
2027			4,767,242						4,767,242	3,483,377	-3,483,377	-4,767,242
2028			4,891,827						4,891,827	3,436,933	-3,436,933	-4,891,827
2029			5,169,212						5,169,212	3,492,134	-3,492,134	-5,169,212
2030	2,014,987	1,308,897	756,381			38,000			794,381	516,014	792,882	1,220,606
2031	2,075,222	1,296,177				38,000			38,000	23,735	1,272,443	2,037,222
2032	2,137,331	1,283,626				38,000			38,000	22,822	1,260,804	2,099,331
2033	2,201,370	1,271,236				38,000			38,000	21,944	1,249,292	2,163,370
2034	2,267,400	1,259,007		182,000		38,000			220,000	122,158	1,136,849	2,047,400
2035	2,335,486	1,246,935				38,000			38,000	20,289	1,226,646	2,297,486
2036	2,405,692	1,235,018				38,000			38,000	19,508	1,215,510	2,367,692
2037	2,478,079	1,223,250				38,000			38,000	18,758	1,204,492	2,440,079
2038	2,552,725	1,211,631				38,000			38,000	18,036	1,193,595	2,514,725
2039	2,629,696	1,200,159		182,000			3,500,000	150,000	3,832,000	1,748,875	-548,716	-1,202,304
2040	2,709,062	1,188,828				38,000		150,000	188,000	82,501	1,106,327	2,521,062
2041	2,790,906	1,177,638				38,000		150,000	188,000	79,328	1,098,310	2,602,906
2042	2,875,299	1,166,585				38,000		150,000	188,000	76,277	1,090,308	2,687,299
2043	2,962,327	1,155,667				38,000		150,000	188,000	73,343	1,082,325	2,774,327
2044	3,052,069	1,144,882		182,000		38,000		150,000	370,000	138,793	1,006,089	2,682,069
2045	3,144,610	1,134,227				38,000		150,000	188,000	67,810	1,066,417	2,956,610
2046	3,240,041	1,123,700				38,000		150,000	188,000	65,202	1,058,498	3,052,041
2047	3,338,449	1,113,297				38,000		150,000	188,000	62,694	1,050,604	3,150,449
2048	3,439,933	1,103,019				38,000		150,000	188,000	60,282	1,042,737	3,251,933
2049	3,544,586	1,092,862		182,000			3,500,000	150,000	3,832,000	1,181,477	-88,615	-287,414
2050	3,652,508	1,082,824				38,000		150,000	188,000	55,735	1,027,089	3,464,508
2051	3,763,801	1,072,901				38,000		150,000	188,000	53,591	1,019,311	3,575,801
2052	3,878,576	1,063,095				38,000		150,000	188,000	51,530	1,011,565	3,690,576
2053	3,996,938	1,053,401				38,000		150,000	188,000	49,548	1,003,854	3,808,938
2054	4,119,001	1,043,819		182,000		38,000		150,000	370,000	93,764	950,055	3,749,001
2055	4,244,881	1,034,345				38,000		150,000	188,000	45,810	988,535	4,056,881
2056	4,374,701	1,024,979				38,000		150,000	188,000	44,048	980,931	4,186,701
2057	4,508,581	1,015,718				38,000		150,000	188,000	42,354	973,364	4,320,581
2058	4,646,654	1,006,561				38,000		150,000	188,000	40,725	965,836	4,458,654
2059	4,789,048	997,506		182,000	7,000,000		3,500,000	150,000	10,832,000	2,256,187	-1,258,681	-6,042,952
Total	96,169,958	34,331,789	30,605,892	1,092,000	7,000,000	1,026,000	10,500,000	3,150,000	53,373,892	29,398,480	4,933,309	42,796,066
											FIRR	**5.3%**
											NPV	**4,933,309**

Route 3, Case 1

Table 17-1-9. Result of Financial Analysis for Route 3 (Case 1)

Unit: US$

Year	Revenue		Costs								NPV	Total revenue - Total cost
	Toll	Total revenue considered WACC	Construction cost	Maintenance cost					Total cost	Total costs considered discount rate		
				Bridge		Road						
				Inspection	Pinting	Maintenance	Pavement	Lighting				
2021			1,792,418						1,792,418	1,657,192	-1,657,192	-1,792,418
2022			13,778,263						13,778,263	12,248,826	-12,248,826	-13,778,263
2023			11,738,202						11,738,202	10,033,864	-10,033,864	-11,738,202
2024			2,530,250						2,530,250	2,079,681	-2,079,681	-2,530,250
2025			197,214,003						197,214,003	155,861,091	-155,861,091	-197,214,003
2026			98,788,701						98,788,701	75,071,294	-75,071,294	-98,788,701
2027			99,822,163						99,822,163	72,939,077	-72,939,077	-99,822,163
2028			62,190,872						62,190,872	43,694,482	-43,694,482	-62,190,872
2029			104,527,020						104,527,020	70,614,709	-70,614,709	-104,527,020
2030	1,932,421	1,255,264	15,544,913			38,000			15,582,913	10,122,363	-8,867,099	-13,650,492
2031	1,990,256	1,243,108				38,000			38,000	23,735	1,219,373	1,952,256
2032	2,049,890	1,231,111				38,000			38,000	22,822	1,208,289	2,011,890
2033	2,111,378	1,219,268				38,000			38,000	21,944	1,197,324	2,073,378
2034	2,174,778	1,207,577		182,000		38,000			220,000	122,158	1,085,419	1,954,778
2035	2,240,151	1,196,035				38,000			38,000	20,289	1,175,746	2,202,151
2036	2,307,560	1,184,639				38,000			38,000	19,508	1,165,131	2,269,560
2037	2,377,068	1,173,388				38,000			38,000	18,758	1,154,630	2,339,068
2038	2,448,740	1,162,276				38,000			38,000	18,036	1,144,240	2,410,740
2039	2,522,647	1,151,303		182,000			3,500,000	150,000	3,832,000	1,748,875	-597,572	-1,309,353
2040	2,598,856	1,140,465				38,000		150,000	188,000	82,501	1,057,965	2,410,856
2041	2,677,440	1,129,760				38,000		150,000	188,000	79,328	1,050,433	2,489,440
2042	2,758,478	1,119,187				38,000		150,000	188,000	76,277	1,042,911	2,570,478
2043	2,842,040	1,108,741				38,000		150,000	188,000	73,343	1,035,398	2,654,040
2044	2,928,211	1,098,421		182,000		38,000		150,000	370,000	138,793	959,628	2,558,211
2045	3,017,072	1,088,225				38,000		150,000	188,000	67,810	1,020,416	2,829,072
2046	3,108,707	1,078,151				38,000		150,000	188,000	65,202	1,012,950	2,920,707
2047	3,203,203	1,068,196				38,000		150,000	188,000	62,694	1,005,502	3,015,203
2048	3,300,650	1,058,358				38,000		150,000	188,000	60,282	998,076	3,112,650
2049	3,401,139	1,048,635		182,000			3,500,000	150,000	3,832,000	1,181,477	-132,842	-430,861
2050	3,504,773	1,039,026				38,000		150,000	188,000	55,735	983,291	3,316,773
2051	3,611,641	1,029,527				38,000		150,000	188,000	53,591	975,936	3,423,641
2052	3,721,850	1,020,138				38,000		150,000	188,000	51,530	968,608	3,533,850
2053	3,835,507	1,010,856				38,000		150,000	188,000	49,548	961,308	3,647,507
2054	3,952,718	1,001,680		182,000		38,000		150,000	370,000	93,764	907,916	3,582,718
2055	4,073,596	992,608				38,000		150,000	188,000	45,810	946,798	3,885,596
2056	4,198,254	983,638				38,000		150,000	188,000	44,048	939,590	4,010,254
2057	4,326,813	974,768				38,000		150,000	188,000	42,354	932,414	4,138,813
2058	4,459,396	965,997				38,000		150,000	188,000	40,725	925,272	4,271,396
2059	4,596,133	957,324		182,000	7,000,000		3,500,000	150,000	10,832,000	2,256,187	-1,298,863	-6,235,867
Total	92,271,368	32,937,671	607,926,804	1,092,000	7,000,000	1,026,000	10,500,000	3,150,000	630,694,804	460,959,697	-428,022,026	-538,423,436
											FIRR	**-9.8%**
											NPV	**-428,022,026**

Route 3, Case 2

Table 17-1-10. Result of Financial Analysis for Route 3 (Case 2)

Unit: US$

Year	Revenue		Costs								NPV	Total revenue - Total cost
	Toll	Total revenue considered WACC	Construction cost	Maintenance cost					Total cost	Total costs considered discount rate		
				Bridge		Road						
				Inspection	Pinting	Maintenance	Pavement	Lighting				
2021			93,645						93,645	86,580	-86,580	-93,645
2022			613,573						613,573	545,464	-545,464	-613,573
2023			573,319						573,319	490,076	-490,076	-573,319
2024			120,928						120,928	99,394	-99,394	-120,928
2025			9,385,078						9,385,078	7,417,163	-7,417,163	-9,385,078
2026			4,779,463						4,779,463	3,631,999	-3,631,999	-4,779,463
2027			4,913,798						4,913,798	3,590,464	-3,590,464	-4,913,798
2028			5,042,544						5,042,544	3,542,824	-3,542,824	-5,042,544
2029			5,331,299						5,331,299	3,601,635	-3,601,635	-5,331,299
2030	1,932,421	1,255,264	781,330			38,000			819,330	532,221	723,043	1,113,091
2031	1,990,256	1,243,108				38,000			38,000	23,735	1,219,373	1,952,256
2032	2,049,890	1,231,111				38,000			38,000	22,822	1,208,289	2,011,890
2033	2,111,378	1,219,268				38,000			38,000	21,944	1,197,324	2,073,378
2034	2,174,778	1,207,577		182,000		38,000			220,000	122,158	1,085,419	1,954,778
2035	2,240,151	1,196,035				38,000			38,000	20,289	1,175,746	2,202,151
2036	2,307,560	1,184,639				38,000			38,000	19,508	1,165,131	2,269,560
2037	2,377,068	1,173,388				38,000			38,000	18,758	1,154,630	2,339,068
2038	2,448,740	1,162,276				38,000			38,000	18,036	1,144,240	2,410,740
2039	2,522,647	1,151,303		182,000			3,500,000	150,000	3,832,000	1,748,875	-597,572	-1,309,353
2040	2,598,856	1,140,465				38,000		150,000	188,000	82,501	1,057,965	2,410,856
2041	2,677,440	1,129,760				38,000		150,000	188,000	79,328	1,050,433	2,489,440
2042	2,758,478	1,119,187				38,000		150,000	188,000	76,277	1,042,911	2,570,478
2043	2,842,040	1,108,741				38,000		150,000	188,000	73,343	1,035,398	2,654,040
2044	2,928,211	1,098,421		182,000		38,000		150,000	370,000	138,793	959,628	2,558,211
2045	3,017,072	1,088,225				38,000		150,000	188,000	67,810	1,020,416	2,829,072
2046	3,108,707	1,078,151				38,000		150,000	188,000	65,202	1,012,950	2,920,707
2047	3,203,203	1,068,196				38,000		150,000	188,000	62,694	1,005,502	3,015,203
2048	3,300,650	1,058,358				38,000		150,000	188,000	60,282	998,076	3,112,650
2049	3,401,139	1,048,635		182,000			3,500,000	150,000	3,832,000	1,181,477	-132,842	-430,861
2050	3,504,773	1,039,026				38,000		150,000	188,000	55,735	983,291	3,316,773
2051	3,611,641	1,029,527				38,000		150,000	188,000	53,591	975,936	3,423,641
2052	3,721,850	1,020,138				38,000		150,000	188,000	51,530	968,608	3,533,850
2053	3,835,507	1,010,856				38,000		150,000	188,000	49,548	961,308	3,647,507
2054	3,952,718	1,001,680		182,000		38,000		150,000	370,000	93,764	907,916	3,582,718
2055	4,073,596	992,608				38,000		150,000	188,000	45,810	946,798	3,885,596
2056	4,198,254	983,638				38,000		150,000	188,000	44,048	939,590	4,010,254
2057	4,326,813	974,768				38,000		150,000	188,000	42,354	932,414	4,138,813
2058	4,459,396	965,997				38,000		150,000	188,000	40,725	925,272	4,271,396
2059	4,596,133	957,324		182,000	7,000,000		3,500,000	150,000	10,832,000	2,256,187	-1,298,863	-6,235,867
Total	92,271,368	32,937,671	31,634,975	1,092,000	7,000,000	1,026,000	10,500,000	3,150,000	54,402,975	30,174,939	2,762,732	37,868,393
											FIRR	**4.7%**
											NPV	**2,762,732**

17-2 Economic Analysis

17-2-1 Basic Policy

Overall goal of the Project is to secure the function of the M-14 as a part of the Europe-Asia Corridor (Eurasian Corridor) and to improve the civil life of Mykolaiv. Considering the goal, this Study conducts Economic Analysis of the Project is examined by comparing two cases: the case in which the Project is implemented ("With Project"), and the case in which the Project is not implemented ("Without Project"). "With Project" is the case that Mykolaiv Bridge is constructed and "Without Project" is the case that Mykolaiv Bridge is not constructed.

17-2-2 Economic Costs (Construction Cost, Maintenance Cost)

Economic costs are calculated based on the construction cost and maintenance cost described in Chapter 14. The basic precondition for economic costs are as follows:

- Implementation schedule: Year 2020-2029 for construction period, operation start from year 2030
- VAT and import tax: Not included
- Inflation: Not considered.
- Resettlement and compensation costs: Considered.
- Opportunity cost: Considered (It is assumed that the land which is currently used for agriculture, artificial forest, etc. will be developed as residential area.)
- Standard conversion factor (SCF): 0.97 for nontraded commodity. SCF is estimated based on total amount of import and export (past 5 years data) and total amount of import duty (5% of total amount of import which is set in Chapter 14).

17-2-3 Economic Benefits

Studies required to calculate benefits were conducted in 2011 and 2017; however, for this Study, benefits were re-calculated by revising the basic units. The basic units were estimated based on updated data obtained from corrected information at the site survey in this Study and web search, etc.

1) Types of Benefits

Benefits are defined as the difference in quantitative benefits between two cases for comparison: the case in which the Project is implemented ("With Project"), and the case in which the Project is not implemented ("Without Project").

Implementing the Project should deliver the following quantitative benefits:

- Reduction of vehicle operation cost (VOC)
- Reduction of travel time cost (TTC)

The non-quantifiable indirect benefits are presented below:

<u>Benefit due to reduce traffic jam (improvement of VCR)</u>
With securing altenate route, the taraffic jam in the city will be reduced.
<u>Benefit due to increase an oppotunitiy of larage-scale maintenance and repair for Vavarovsky Bridge.</u>
It is also increased an oppotunity of large-scale maintenance and repair for Vavarovsky Bridge due to secure altenate route.
<u>Benefit due to improve roadside enviroment in the city (air pollusion, noise and vibration, etc.)</u>
The roadside einviroment such as air pollusion, noise and vibration is improved in CBD because the traffic flow is ditributed, however those indicators might be worsend along newly developed corridor.
<u>Benefit due to an increased inter-regional economic exchange</u>
Mykolaiv Bridge will provide a stable transport route, which will thus boost transport and help extend inter-regional exchanges by not only faster and safer alternate route but also load limit of up to 54 metric ton against 24 metric ton on Vavalofsky Bridge.

Benefit through reduced traffic accidents

Once Mykolaiv Bridge is constructed and the vehicular travel environment is correspondingly improved, it will help users cross bridges more safely and thus reduce the number of traffic accidents.

2) Reduction of Vehicle Operation Cost (VOC)

(1) Calculating Reduction of VOC

The reduction of VOC is calculated by subtracting the operation cost in the Without Project case from the operation cost in the With Project case.

The following formula is used to calculate the reduction of VOC:

Reduction of VOC: BR $= BR_O - BR_W$

Operation cost (USD) = Basic unit of vehicle operation cost (USD/vehicle-km) x Traffic volume (vehicles) x Driving distance (km)

Total VOC : $BR_i = \sum_j \sum_i (\alpha_j \times Q_{ijl} \times L_i) \times 365$

Where;

BR : Reduction of VOC

BR_i : Without Project/With Project case total vehicle operation cost (USD/year)

O : Without Project case

W : With Project case

α_j : Basic units of vehicle operation cost (USD/vehicle-km)

Q_{ijl} : Without Project/With Project case traffic volume of vehicle on link (vehicles/day)

L_i : Distance of link l (km)

i : Without Project case, With Project case

j : Vehicle type

l : Link

(2) Basic Units of Operation Cost by Vehicle Type

Required data to calculate VOC were also updated based on corrected information at the site survey in this Study and web search.

Table 17-2-1. Data to Calculate VOC

	Passenger cars	Buses	2-axle truck	3+ axle truck	Trailers
New vehicle price without tax (UAH)	323,048	1,250,480	1,618,344	2,055,040	3.313,752
New vehicle price with tax (UAH)	403,810	1,563,100	2,022,930	2,568,800	4,142,190
Service life (years)	11	15	12	12	12
Kilometers driven per year (km/year)	10,510	55,400	38,600	67,800	67,800
Life time running kilometers (km)	115,500	831,000	463,200	813,600	813,600
Fuel type used	Petrol	Diesel	Diesel	Diesel	Diesel
Fuel costs (UAH/litter)	25.37	22.87	22.87	22.87	22.87
Fuel consumption rate (km/litter)	14.5	5.16	10.39	4.22	3.03
Oil costs (UAH/litter)	125	125	125	125	125
Required Oil (litter)	4	13.5	25	25	25
Oil costs (UAH/1 time)	500	1,688	3,125	3,125	3,125
Distance between oil changes (km)	5,000	15,000	30,000	30,000	30,000
Tire cost (UAH/1 tire)	1,200	6,000	6,000	6,000	6,000
Required number of tires (incl. Spare)	5	5	5	11	17
Price for 1 set of tires (UAH)	6,000	30,000	30,000	66,000	102,000
Running kilometers (km)	30,000	40,000	40,000	50,000	50,000
Car insurance (UAH/year)	1,500	2,000	2,825	2,825	2,825
Annual maintenance cost (UAH/year)	608	682	682	1519	1519
Spare parts cost (UAH/1000km)	196	198	235	159	192

Note) Representative vehicle: Passenger cars = Volkswagen Polo (1.6L), Buses = Neoplan Tourliner, 2-Axle truck = MAN TGM 12.450 4X2 BL, 3+ axle truck = MAN TGS 33.360 6x4 BB-WW_MEILLER, Trailers = MAN GS 41.400 8X4 BB

The basic units of operation cost were calculated from the costs of fuel, oil consumption and change, tires, maintenance and cost depreciation and general administrative expenses per kilometer driven by each type of vehicle.

The table below shows the basic units of operation cost for each type of vehicle.

Table 17-2-2. Basic Units of VOC

Unit: UAH/km

VOC	Passenger cars	Buses	2-axle truck	3+ axle Trucks	Trailers
Fuel cost	1.75	4.43	2.20	5.42	7.55
Oil cost	0.10	0.11	0.10	0.10	0.10
Tire cost	0.20	0.75	0.75	1.32	2.04
Insurance cost	0.14	0.04	0.07	0.04	0.04
Maintenance cost	0.61	0.68	0.68	1.52	1.52
Spare parts cost	0.20	0.20	0.24	0.16	0.19
Depreciation cost	2.80	1.50	3.49	2.53	4.07
Sub-total	5.79	7.72	7.54	11.09	15.52
Overhead cost	0.58	0.77	0.75	1.11	1.55
Total	6.37	8.49	8.29	12.20	17.07

3) Reduction of Travel Time Cost (TTC)

(1) Calculating Reduction of TTC

The reduction of TTC is calculated by converting into money the value of the vehicle operation time saved in the With Project case compared to the Without Project case.

The following formula is used to calculate the reduction of TTC:

Reduction of TTC: $BT = BT_O - BT_W$

Travel time cost (USD) = Basic unit of time value (USD/minute-vehicle) x Traffic volume (vehicles) x Operation time (min)

Total TTC : $BT_i = \sum_j \sum_i (\beta_j \times Q_{ijl} \times T_{ijl}) \times 365$

Where;
BT : Reduction of TTC
BT_i : Without Project/With Project case total travel time cost (USD/year)
β_j : Basic units of time value for vehicle j (USD/minute-vehicle)
Q_{ijl} : Without Project/With Project case traffic volume of vehicle j on link l (vehicles/day)
T_{ijl} : Without Project/With Project case travel time for vehicle j on link l (min)
i : Without Project case O, With Project case W
j : Vehicle type
l : Link

(2) Basic Units of Time Value by Vehicle

Basic units of time value were divided into vehicle and driver/passenger time value by vehicle and freight time value as with the case of 2011F/S.

a) Vehicle and Driver/Passenger Time Value

The table below shows the average hourly incomes calculated based on average monthly wage and average working hours:

Table 17-2-3. Average Hourly Incomes

	Average of all activities	Truck and bus driver
Average monthly wage in 2018 (UAH/month)	8,865	9,187
Monthly working hours (hours/month)	140	140
Average hourly income (UAH/hour/person)	63.3	65.6

Source: State Statistics Service of Ukraine. - http://www.ukrstat.gov.ua/

Driver/passenger occupancy rates per vehicle, income per hour, and proportion of trips for business purposes were used to calculate vehicle and driver/passenger time value.

Table 17-2-4. Time Value by Vehicle

		Passenger cars	Buses	2-axle trucks	3+axle trucks	Trailers
(A) Time value of passengers (UAH/hr.)		64.4	787.5	-	-	-
	Vehicle occupancy (excl. crew)	2.1	20.0	-	-	-
	Ave. hourly income of passenger	63.3	65.6	-	-	-
	Adjustment factor (ratio of business trip)	0.5	0.6	-	-	-
(B) Time value of vehicle (incl. crew cost) (UAH/hr.)		0	28.1	19.4	17.3	21.1
	Ave. crew cost (person/veh.)	-	2.0	1.4	1.2	1.5
	Total crew cost (UAH/year)	-	220,488	152,137	135,600	165,366
	Sub-total (UAH/year)	0	220,488	152,137	135,600	165,366
	Overhead cost (UAH/year)	0	22,049	15,214	13,560	16,537
	Total (UAH/year)	0	242,537	167,350	149,160	181,903
	Total (UAH/year)	0	28.1	19.4	17.3	21.1
Time value (A) + (B) (UAH/hr.)		64.4	815.5	19.4	17.3	21.1

b) Commodity Time Value

Commodity time value was calculated based on the opportunity cost per truck. Commodity time value for this Study was set by converting to 2018 values based on the results of interview survey conducted in 2011F/S.

The following formula was used to calculate the opportunity cost:

$$\mathrm{OC} = \frac{V_C}{W_C} \times L_W \times I_r$$

Where;
OC : Opportunity Cost
Vc : Commodity Price
Wc : Commodity Weight
Lw : Average Load Capacity
Ir : Interest Rate

The table below shows the commodity time value for vehicle passing through Vavarovsky Bridge.

Table 17-2-5. Commodity Time Value

Commodity Type	Value of cargo USD/ton (est. 2010)	Value of cargo USD/ton (est. 2018)	Time value of commodity (USD/ton/hr) in 2018 current price
1.Unprocessed agricultural products	420	1,109	1.233
2.Foodstuffs, beverages	1,418	3,743	4.162
3.Animal feed or fertilizers	588	1,552	1.726
4.Minerals (ores)	214	565	0.628
5.Chemical products	2,991	7,895	8.779
6.Steel and other metal products	1,325	3,498	3.889
7.Machinery and parts	8,141	21,490	23.896
8.Construction materials	112	296	0.329
9.Fabric and textile goods	4,864	12,839	14.277
10.Pulp, paper and printed matter	1,820	4,804	5.342
11.Petroleum	500	1,320	1.468
12.Miscellaneous	1,508	3,981	4.426
Total	897	2,368	2.633

Table 17-2-6. Commodity Time Value passing through Vavarovsky Bridge

2-axle trucks	(A) Time value of commodity (USD/ton/hr)	Est. cargo volume by road interview	(B) Share of loaded commodity	(C) Ave. loaded ton per vehicle	Weighed average (A*B*C) (USD/veh/hr)
1.Unprocessed agricultural	1.233	747	13%	15.2	2.44
2.Foodstuffs, beverages	4.162	2,541	44%	7.0	12.82
3.Animal feed or fertilizers	1.726	24	0%	2.0	0.00
4.Minerals	0.628	204	4%	17.0	0.43
5.Chemical products	8.779	300	5%	2.6	1.14
6.Steel and other Metal	3.889	177	3%	8.4	0.98
7.Machinery and parts	23.896	114	2%	5.2	2.49
8.Construction materials	0.329	100	2%	10.0	0.07
9.Fabric and textile goods	14.277	158	3%	3.0	1.28
10.Pulp, paper and printed	5.342	241	4%	3.2	0.68
11.Petroleum	1.468	n/a	n/a	n/a	-
12.Miscellaneous	4.426	1,159	20%	3.9	3.45
Total	-	5,764	100%	-	25.78

3+axle trucks	(A) Time value Of commodity (USD/ton/hr)	Est. cargo volume by road interview	(B) Share of loaded commodity	(C) Ave. loaded ton per vehicle	Weighed average (A*B*C) (USD/veh/hr)
1.Unprocessed agricultural	1.233	335	5%	11.6	0.72
2.Foodstuffs, beverages	4.162	1,243	19%	15.2	12.02
3.Animal feed or fertilizers	1.726	n/a	n/a	n/a	n/a
4.Minerals	0.628	n/a	n/a	n/a	n/a
5.Chemical products	8.779	703	11%	20.7	19.99
6.Steel and other Metal	3.889	725	11%	22.7	9.71
7.Machinery and parts	23.896	718	11%	18.4	48.37
8.Construction materials	0.329	218	3%	16.8	0.17
9.Fabric and textile goods	14.277	63	1%	7.0	1.00
10.Pulp, paper and printed	5.342	n/a	n/a	n/a	n/a
11.Petroleum	1.468	659	10%	26.4	3.87
12.Miscellaneous	4.426	1,774	28%	17.1	21.19
Total	-	6,438	100%	-	117.04

Trailers	(A) Time value Of commodity (USD/ton/hr)	Est. cargo volume by road interview	(B) Share of loaded commodity	(C) Ave. loaded ton per vehicle	Weighed average (A*B*C) USD/veh./hr
1.Unprocessed agricultural	1.233	7,719	33%	34.3	13.95
2.Foodstuffs, beverages	4.162	4,911	21%	21.6	18.88
3.Animal feed or fertilizers	1.726	n/a	n/a	n/a	n/a
4.Minerals	0.628	66	0%	11.0	0.00
5.Chemical products	8.779	672	3%	17.7	4.66
6.Steel and other Metal	3.889	1,682	7%	18.7	5.09
7.Machinery and parts	23.896	589	2%	12.5	5.97
8.Construction materials	0.329	3,786	16%	22.8	1.20
9.Fabric and textile goods	14.277	50	0%	10.0	0.00
10.Pulp, paper and printed	5.342	n/a	n/a	n/a	n/a
11.Petroleum	1.468	624	3%	26.0	1.14
12.Miscellaneous	4.426	3,608	15%	18.5	12.28
Total	-	23,706	100%	-	63.19

The table below shows the commodity time value per commodity vehicle.

Table 17-2-7. Commodity Time Value per Commodity Vehicle Type

(Unit: USD/veh./hr)

	2-axle trucks	3+ axle trucks	Trailers
Time value of commodities	25.8	117.0	63.2

c) Basic Units of TTC

The table below shows the basic units of TTC for each type of vehicle.

Table 17-2-8. Basic Units of TTC

(Unit: USD/veh.· time)

Vehicle type	Basic units of TTC
Passenger cars	2.58
Buses	32.62
2-axle trucks	26.55
3+ axle trucks	117.73
Trailers	64.03

4) Calculating Benefits

Benefits of the Project were calculated based on the results of calculations of the benefits delivered by the reduction of TTC and VOC.

(1) Establishing Overall Benefits for the Analysis Period

The total benefit was calculated for each year, with the operation start year for the Project as the starting point, and an analysis period of 30 years starting from that point.

Considering the durability of Mykolaiv Bridge which is more than 30 years and the analysis period of 2011F/S, the analysis period of this Study is examined as 30 years.

(2) Social Discount Rate

The United Nations and the WB rank Ukraine as a middle-income country. In general, the social discount rate for developing countries is 12%, and that for middle-income countries is 8%. The economic evaluation of the Project was conducted using the social discount rate of 8%.

(3) Calculating Present Value of Benefits

A social discount rate is used to convert various benefits throughout the analysis period into present values in the base year. The following formula is used to calculate the present value of benefits.

$$\text{Present Value of Benefit j}: \quad BofPV_j = \sum_t \left\{ \frac{B_{jt}}{(1+i)^{s+t}} \right\}$$

where

B of PV_j : Present value of benefit j

s : Number of years from base year to operation start year (years)

t : Years since Year 0 (operation start year) (years)

B_{jt} : Value of benefit j in year t (USD)

i : Social discount rate

j : Type of benefit

(4) Total Benefit

The total benefit is the total of the present values of all benefits.

(5) Economic Internal Rate of Return (EIRR)

EIRR is the discount rate where the economic costs and the benefit calculated into the net present value (NPV) become equal.

If estimated EIRR exceed the social discount rate, it is evaluated that the Project is feasible.

EIRR is calculated by the following formula.

$$\sum_{t=0}^{n}\left\{\frac{(B_t - C_t)}{(1+EIRR)^t}\right\} = 0$$

where

n : Period for the analysis (First year t = 0)

B_t : Benefit of each year

C_t : Difference of investment cost and operation cost between "With Project" and "Without Project" in each year

t : Years since Year 0 (operation start year) (years)

17-2-4 Economic Analysis Result

1) Economic Analysis Result for Route 2

(1) Estimation of EIRR for Route 2

EIRR was estimated based on benefits and economic costs for Route 2. The economic analysis was evaluated by comparing with the estimated EIRR and the social discount rate of 8%. The Project is concluded as economically feasible, because the estimated EIRR of 13.4% exceed the social discount rate of 8% (refer to Table 17-2-11).

(2) Sensitivity Analysis for Route 2

Variable factors might be included in the estimated construction cost, maintenance cost and benefits. Therefore, for the feasibly of the Project, stability should be confirmed by the sensitivity analysis. The sensitivity analysis was conducted to understand the variation of analysis results when costs were increased and benefits were decreased.

As a result, it is conclude that the Project is feasible, because EIRR of the worst case (increase of 20% of costs, decrease of 20% of benefits) satisfy the social discount rate of 8%.

Table 17-2-9. Sensitivity Analysis (Route 2)

EIRR		Benefits		
		100%	90%	80%
Costs	100%	13.4%	12.5%	11.7%
	110%	12.6%	11.8%	11.0%
	120%	12.0%	11.2%	10.3%

17-2-5 Economic Analysis Result for Route 3

1) Estimation of EIRR for Route 3

EIRR was estimated based on benefits and economic costs for Route 3. The economic analysis was evaluated to compare with the estimated EIRR of 13.8% and the social discount rate of 8%. The project is concluded as economically feasible, because the estimated EIRR of 13.8% exceed the social discount rate of 8% (refer to Table 17-2-12).

2) Sensitivity Analysis for Route 3

It is conclude that the Project is feasible, because EIRR of the worst case (increase of 20% of costs, decrease of 20% of benefits) satisfy the social discount rate of 8%.

Table 17-2-10. Sensitivity Analysis (Route 3)

EIRR		Benefits		
		100%	90%	80%
Costs	100%	13.8%	12.9%	12.0%
	110%	13.0%	12.2%	11.3%
	120%	12.4%	11.6%	10.7%

When comparing Route 3 with Route 2 for the economic analysis, Route 3 is slightly more feasible than Route 2.

Both the benefits and cost of Route 3 exceed those of Route 2. However, in the case of the analysis for this Study, the difference in benefits between Routes 2 and 3 has a greater impact than the difference in costs, which renders Route 3 more feasible than Route 2.

Table 17-2-11. Result of Economic Analysis for Route 2

Route 2 Unit: US$

Year	Benefits						Costs										
									Maintenance cost								
									Bridge		Road						
	Reduction of TTC	Reduction of VOC	Total benefits	Benefits considered discount rate for TTC	Benefits considered discount rate for VOC	Total benefits considered discount rate	Construction cost	Opportunity cost	Inspection	Pinting	Maintenance	Pavement	Lighting	Total cost	Total costs considered discount rate	NPV	Total benefit - Total cost
2021							1,218,220	971,541						2,189,761	1,877,367	-1,877,367	-2,189,761
2022							10,647,714							10,647,714	8,452,499	-8,452,499	-10,647,714
2023							10,449,229							10,449,229	7,680,495	-7,680,495	-10,449,229
2024							2,359,857							2,359,857	1,606,079	-1,606,079	-2,359,857
2025							165,712,238							165,712,238	104,426,819	-104,426,819	-165,712,238
2026							82,551,463							82,551,463	48,167,986	-48,167,986	-82,551,463
2027							83,669,574							83,669,574	45,204,068	-45,204,068	-83,669,574
2028							83,892,893							83,892,893	41,967,333	-41,967,333	-83,892,893
2029							86,533,487							86,533,487	40,081,748	-40,081,748	-86,533,487
2030	39,296,360	13,909,171	53,205,531	16,853,535	5,965,405	22,818,940	12,357,196				38,000			12,395,196	5,316,087	17,502,853	40,810,335
2031	40,248,640	14,299,180	54,547,821	15,983,289	5,678,401	21,661,690					38,000			38,000	15,090	21,646,600	54,509,821
2032	41,226,571	14,700,799	55,927,370	15,158,925	5,405,453	20,564,378					38,000			38,000	13,973	20,550,405	55,889,370
2033	42,230,879	15,114,380	57,345,259	14,377,969	5,145,858	19,523,827					38,000			38,000	12,938	19,510,889	57,307,259
2034	43,262,313	15,540,289	58,802,602	13,638,085	4,898,947	18,537,032			182,000		38,000			220,000	69,353	18,467,679	58,582,602
2035	44,321,641	15,978,902	60,300,543	12,937,064	4,664,089	17,601,154					38,000			38,000	11,092	17,590,062	60,262,543
2036	45,409,656	16,430,608	61,840,264	12,272,820	4,440,683	16,713,503					38,000			38,000	10,270	16,703,233	61,802,264
2037	46,527,173	16,895,805	63,422,978	11,643,380	4,228,159	15,871,539					38,000			38,000	9,509	15,862,029	63,384,978
2038	144,300,107	17,374,907	161,675,014	33,436,076	4,025,975	37,462,051					38,000			38,000	8,805	37,453,246	161,637,014
2039	147,868,827	17,868,337	165,737,164	31,724,992	3,833,620	35,558,611			182,000			3,500,000	150,000	3,832,000	822,149	34,736,463	161,905,164
2040	151,534,684	18,376,534	169,911,218	30,103,236	3,650,604	33,753,840					38,000		150,000	188,000	37,347	33,716,493	169,723,218
2041	155,300,446	18,899,950	174,200,396	28,566,043	3,476,466	32,042,509					38,000		150,000	188,000	34,581	32,007,928	174,012,396
2042	159,168,961	19,439,050	178,608,011	27,108,907	3,310,767	30,419,674					38,000		150,000	188,000	32,019	30,387,655	178,420,011
2043	163,143,162	19,994,314	183,137,476	25,727,568	3,153,090	28,880,659					38,000		150,000	188,000	29,647	28,851,011	182,949,476
2044	167,226,065	20,566,237	187,792,302	24,418,000	3,003,039	27,421,039			182,000		38,000		150,000	370,000	54,027	27,367,012	187,422,302
2045	171,420,777	21,155,329	192,576,106	23,176,391	2,860,238	26,036,629					38,000		150,000	188,000	25,418	26,011,211	192,388,106
2046	175,730,495	21,762,115	197,492,610	21,999,142	2,724,330	24,723,471					38,000		150,000	188,000	23,535	24,699,936	197,304,610
2047	180,158,508	22,387,137	202,545,645	20,882,843	2,594,976	23,477,819					38,000		150,000	188,000	21,792	23,456,028	202,357,645
2048	184,708,203	23,030,955	207,739,158	19,824,273	2,471,855	22,296,128					38,000		150,000	188,000	20,178	22,275,951	207,551,158
2049	189,383,065	23,694,144	213,077,209	18,820,384	2,354,661	21,175,045			182,000			3,500,000	150,000	3,832,000	380,814	20,794,231	209,245,209
2050	194,186,682	24,377,299	218,563,981	17,868,291	2,243,103	20,111,394					38,000		150,000	188,000	17,299	20,094,095	218,375,981
2051	190,738,660	25,081,031	215,819,691	16,250,942	2,136,905	18,387,847					38,000		150,000	188,000	16,018	18,371,830	215,631,691
2052	195,597,403	25,805,972	221,403,375	15,430,470	2,035,806	17,466,275					38,000		150,000	188,000	14,831	17,451,444	221,215,375
2053	200,590,405	26,552,773	227,143,177	14,652,188	1,939,555	16,591,743					38,000		150,000	188,000	13,733	16,578,010	226,955,177
2054	205,721,523	27,322,104	233,043,627	13,913,881	1,847,918	15,761,799			182,000		38,000		150,000	370,000	25,025	15,736,774	232,673,627
2055	210,994,730	28,114,657	239,109,387	13,213,456	1,760,668	14,974,124					38,000		150,000	188,000	11,773	14,962,351	238,921,387
2056	216,414,112	28,931,146	245,345,257	12,548,928	1,677,593	14,226,521					38,000		150,000	188,000	10,901	14,215,620	245,157,257
2057	221,983,876	29,772,305	251,756,180	11,918,421	1,598,489	13,516,910					38,000		150,000	188,000	10,094	13,506,817	251,568,180
2058	227,708,353	30,638,892	258,347,245	11,320,158	1,523,164	12,843,322					38,000		150,000	188,000	9,346	12,833,976	258,159,245
2059	233,592,002	31,531,689	265,123,691	10,752,458	1,451,433	12,203,891			182,000	7,000,000		3,500,000	150,000	10,832,000	498,607	11,705,284	254,291,691
																EIRR	**13.4%**
																B/C	**2.13**
																NPV	**345,582,722**

Table 17-2-12. Result of Economic Analysis for Route 3

Route 3 Unit : US$

Year	Benefits						Costs									NPV	Total benefit - Total cost
	Reduction of TTC	Reduction of VOC	Total benefits	Benefits considered discount rate for TTC	Benefits considered discount rate for VOC	Total benefits considered discount rate	Construction cost	Opportunity cost	Maintenance cost					Total cost	Total costs considered discount rate		
									Bridge		Road						
									Inspection	Pinting	Maintenance	Pavement	Lighting				
2021							1738646	1,098,088						11,671,390	9,265,126	-9,265,126	-11,671,390
2022							11671390							10,962,467	8,057,741	-8,057,741	-10,962,467
2023							10962467							2,359,857	1,606,079	-1,606,079	-2,359,857
2024							2359857							170,773,621	107,616,349	-107,616,349	-170,773,621
2025							170773621							85,025,696	49,611,677	-49,611,677	-85,025,696
2026							85025696							86,171,122	46,555,576	-46,555,576	-86,171,122
2027							86171122							86,398,477	43,220,749	-43,220,749	-86,398,477
2028							86398477							89,156,600	41,296,757	-41,296,757	-89,156,600
2029							89156600							12,788,051	5,484,576	19,572,782	45,636,662
2030	41,397,712	17,027,000	58,424,713	17,754,769	7,302,589	25,057,358	12750051				38,000			38,000	15,090	23,776,788	59,873,996
2031	42,406,669	17,505,327	59,911,996	16,840,272	6,951,606	23,791,878					38,000			38,000	13,973	22,577,678	61,402,788
2032	43,442,888	17,997,900	61,440,788	15,973,860	6,617,791	22,591,650					38,000			38,000	12,938	21,440,295	62,974,296
2033	44,507,142	18,505,155	63,012,296	15,152,948	6,300,284	21,453,232					38,000			220,000	69,353	20,304,014	64,407,765
2034	45,600,227	19,027,539	64,627,765	14,375,093	5,998,274	20,373,367			182,000		38,000			38,000	11,092	19,337,882	66,250,476
2035	46,722,963	19,565,513	66,288,476	13,637,987	5,710,987	19,348,974					38,000			38,000	10,270	18,366,869	67,957,748
2036	47,876,192	20,119,555	67,995,748	12,939,448	5,437,691	18,377,139					38,000			38,000	9,509	17,445,595	69,712,939
2037	49,060,784	20,690,155	69,750,939	12,277,414	5,177,691	17,455,105					38,000			38,000	8,805	40,576,783	175,117,265
2038	153,877,447	21,277,818	175,155,265	35,655,261	4,930,327	40,585,588					38,000			3,832,000	822,149	37,707,764	175,754,273
2039	157,703,206	21,883,067	179,586,273	33,834,940	4,694,973	38,529,913			182,000			3,500,000	150,000	188,000	37,347	36,543,089	183,951,833
2040	161,633,394	22,506,438	184,139,833	32,109,403	4,471,033	36,580,436					38,000		150,000	188,000	34,581	34,696,970	188,631,477
2041	165,670,990	23,148,487	188,819,477	30,473,606	4,257,944	34,731,550					38,000		150,000	188,000	32,019	32,945,933	193,440,845
2042	169,819,061	23,809,784	193,628,845	28,922,782	4,055,170	32,977,952					38,000		150,000	188,000	29,647	31,284,975	198,383,683
2043	174,080,765	24,490,919	198,571,683	27,452,421	3,862,202	31,314,623					38,000		150,000	370,000	54,027	29,682,789	203,281,847
2044	178,459,349	25,192,498	203,651,847	26,058,260	3,678,556	29,736,816			182,000		38,000		150,000	188,000	25,418	28,214,622	208,685,308
2045	182,958,160	25,915,148	208,873,308	24,736,266	3,503,774	28,240,040					38,000		150,000	188,000	23,535	26,796,508	214,052,152
2046	187,580,638	26,659,514	214,240,152	23,482,623	3,337,420	26,820,043					38,000		150,000	188,000	21,792	25,451,012	219,568,588
2047	192,330,328	27,426,261	219,756,588	22,293,724	3,179,080	25,472,804					38,000		150,000	188,000	20,178	24,174,338	225,238,949
2048	197,210,874	28,216,075	225,426,949	21,166,154	3,028,361	24,194,515					38,000		150,000	3,832,000	380,814	22,600,760	227,423,695
2049	202,226,031	29,029,664	231,255,695	20,096,684	2,884,891	22,981,574			182,000			3,500,000	150,000	188,000	17,299	21,813,271	237,059,418
2050	207,379,663	29,867,755	237,247,418	19,082,257	2,748,313	21,830,570					38,000		150,000	188,000	16,018	19,956,372	234,229,590
2051	203,686,489	30,731,101	234,417,590	17,354,098	2,618,291	19,972,389					38,000		150,000	188,000	14,831	18,959,499	240,331,547
2052	208,899,071	31,620,476	240,519,547	16,479,824	2,494,506	18,974,330					38,000		150,000	188,000	13,733	18,013,317	246,604,718
2053	214,256,038	32,536,680	246,792,718	15,650,398	2,376,652	18,027,050					38,000		150,000	370,000	25,025	17,102,887	252,872,080
2054	219,761,545	33,480,535	253,242,080	14,863,472	2,264,441	17,127,912			182,000		38,000		150,000	188,000	11,773	16,262,648	259,684,758
2055	225,419,868	34,452,890	259,872,758	14,116,824	2,157,598	16,274,421					38,000		150,000	188,000	10,901	15,453,312	266,502,029
2056	231,235,408	35,454,620	266,690,029	13,408,351	2,055,862	15,464,213					38,000		150,000	188,000	10,094	14,684,954	273,511,325
2057	237,212,696	36,486,629	273,699,325	12,736,064	1,958,985	14,695,048					38,000		150,000	188,000	9,346	13,955,460	280,718,241
2058	243,356,395	37,549,846	280,906,241	12,098,076	1,866,731	13,964,807					38,000		150,000	10,832,000	498,607	12,772,872	277,484,537
2059	249,671,308	38,645,230	288,316,537	11,492,603	1,778,876	13,271,479			182,000	7,000,000		3,500,000	150,000	10,832,000	**498,607**	13,356,359	290,160,501
																EIRR	**13.8%**
																B/C	**2.24**
																NPV	**392,809,943**

17-3 Operation and Effect Indicators

In order to evaluate the achievements of the Project quantitatively, operation and effect are selected based on available data, validity and reliability in both the baseline year (year 2018) and two years after the completion of the Project.

Selected operation and effect indicators are summarized as follows.

17-3-1 AADT and Travel Time

AADT and travel time for 2018 (baseline year) and 2032 (two years after the completion of the Project) are shown in the following table.

Table 17-3-1. AADT and Travel Time (Proposal)

Year			2018	2032
AADT (Veh./day)	Vavarovsky Bridge	Passenger cars	40,046	23,512
		Bus	5,696	3,431
		2-axle trucks	4,574	2,891
		3-axle + trucks	299	134
		Trailers	3,053	1,337
	Mykolaiv Bridge	Passenger cars	-	16,534
		Bus	-	2,265
		2-axle trucks	-	1,683
		3-axle + trucks	-	165
		Trailers	-	1,716
Estimated Access Time (minutes)		Route A	37	30
		Route B	-	10

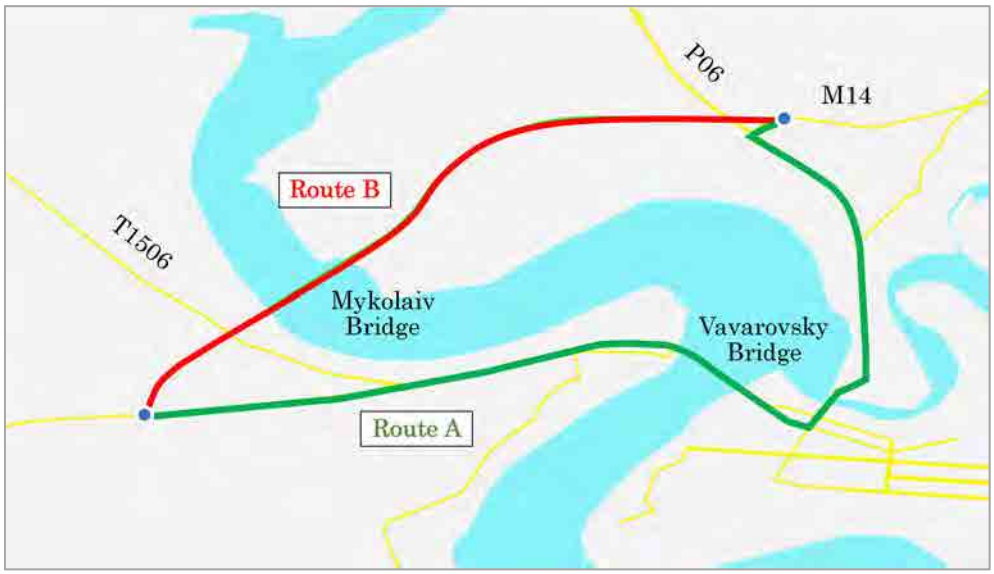


Figure 17-3-1. Selected Routes to Compare Access Time

17-3-2 Annual Passenger and Freight Volume

Annual passenger and freight volume for 2018 (baseline year) and 2032 (two years after the completion of the Project) are shown in the following table.

Table 17-3-2. Annual Passenger and Freight Volume (Proposal)

Year			2018	2032
Passenger Traffic Volume (thousand person/year)	Vavarovsky Bridge	Passenger cars	30,695	18,022
		Bus	41,581	25,046
		Total	72,276	43,068
	Mykolaiv Bridge	Passenger cars	-	12,673
		Bus	-	16,535
		Total	-	29,208
Freight Traffic Volume (thousand ton/year)	Vavarovsky Bridge	2-axle trucks	6,678	4,221
		3-axle + trucks	1,091	489
		Trailers	22,287	9,760
		Total	30,056	14,470
	Mykolaiv Bridge	2-axle trucks	-	2,457
		3-axle + trucks	-	602
		Trailers	-	12,527
		Total	-	15,586

Note)
- Assume the number of car passengers was 2.1 per a car
- Assume the number of bus passengers was 20.0 per a bus
- Annual passenger volume = AADT × car/bus passengers × 365 days

- Assume average load for one way trip of 2-axle trucks was 2.0 ton (50% of load capacity)
- Assume average load for one way trip of 3-axle + trucks was 4.0 ton (50% of load capacity)
- Assume average load for one way trip of Trailers was 10.0 ton (50% of load capacity)
- Annual freight volume = AADT × freight volume for one way trip × 2 (round trip)× 365 days

Chapter 18 Survey of Obstructions and Partner Country Responsibilities

18-1 Buried Objects and Overhead Lines

As shown in Table18-1-1 and Figures 18-1-1 to 18-1-8, the following obstructive buried objects and overhead lines will have to be relocated before the construction begins as one of partner country resposibilities.

Table 18-1-1. List of Obstructive Buried Objects and Overhead Lines

Obstructive Buried Objects	Sewerage Pipe
	Gas Pipe
	Communication Cable
	Drainage Pipe
	High-Voltage Electric Cable
	Low-Voltage Electric Cable
Overhead Lines	High-Voltage Power Line
	Low-Voltage Power Line

Tables 18-1-2 to 18-1-4 show the entities that manage the obstructive buried objects and the overhead lines.

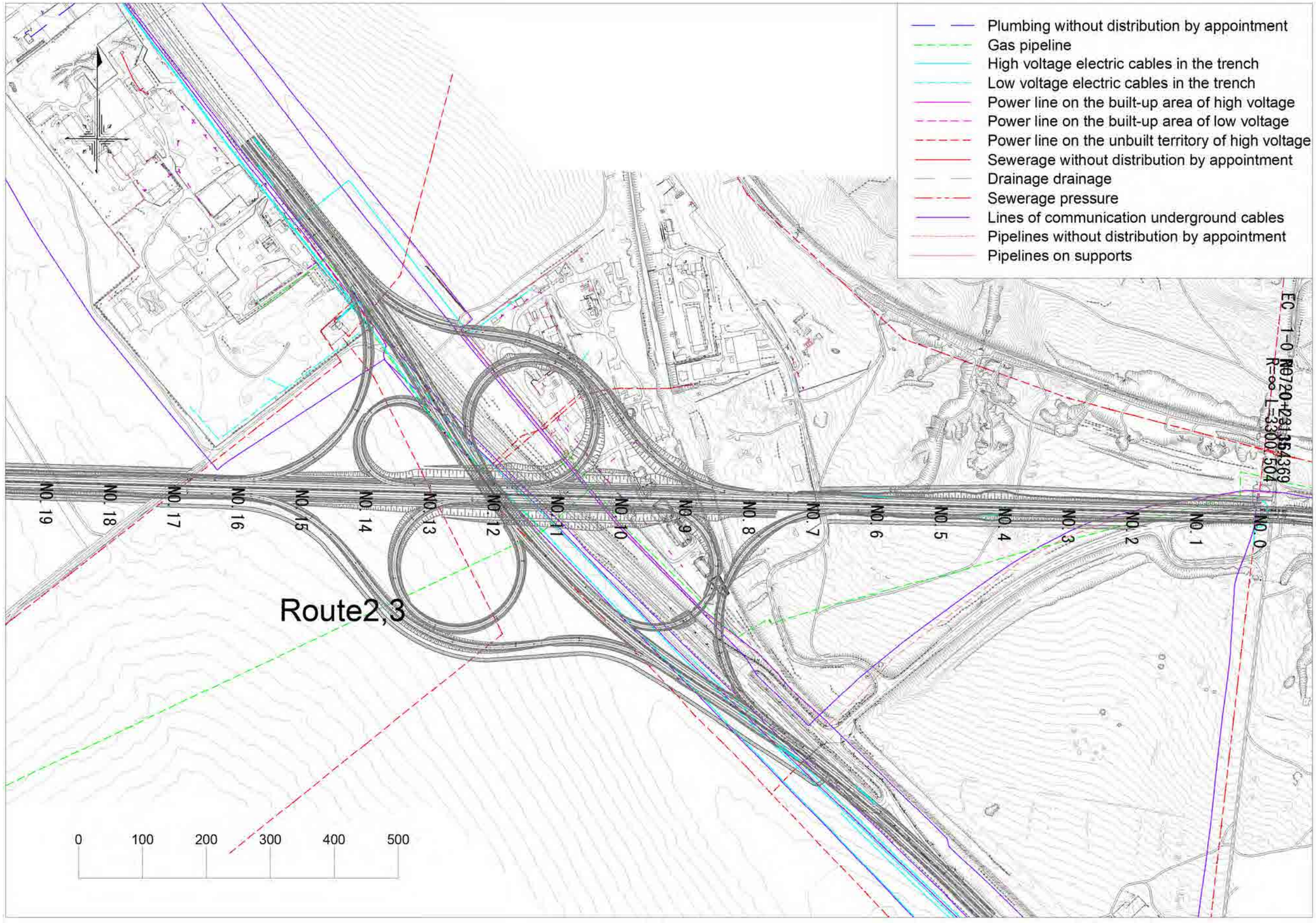


Figure 18-1-1. Image of Buried Objects and Overhead Lines (1/8)

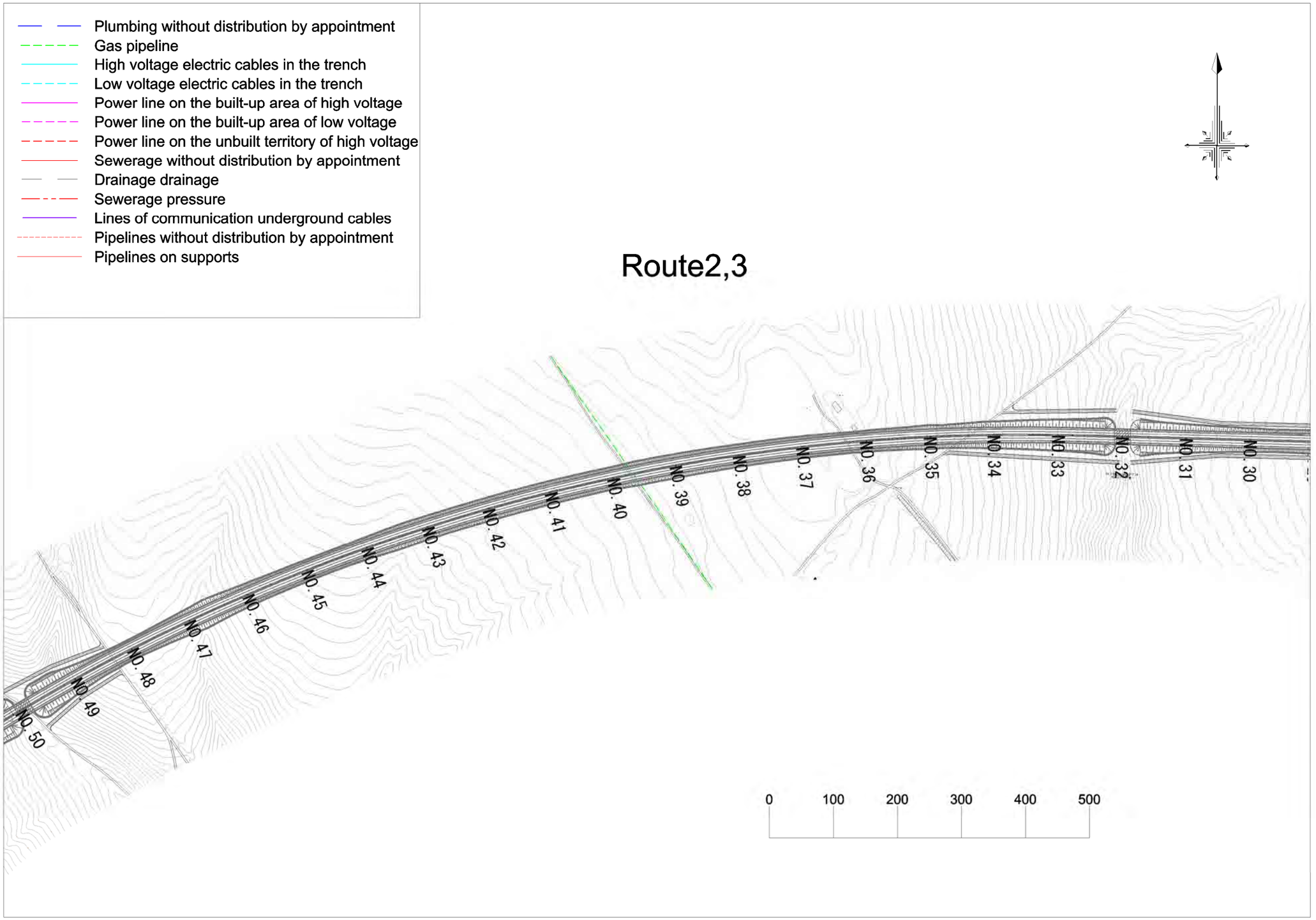


Figure 18-1-2. Image of Buried Objects and Overhead Lines (2/8)

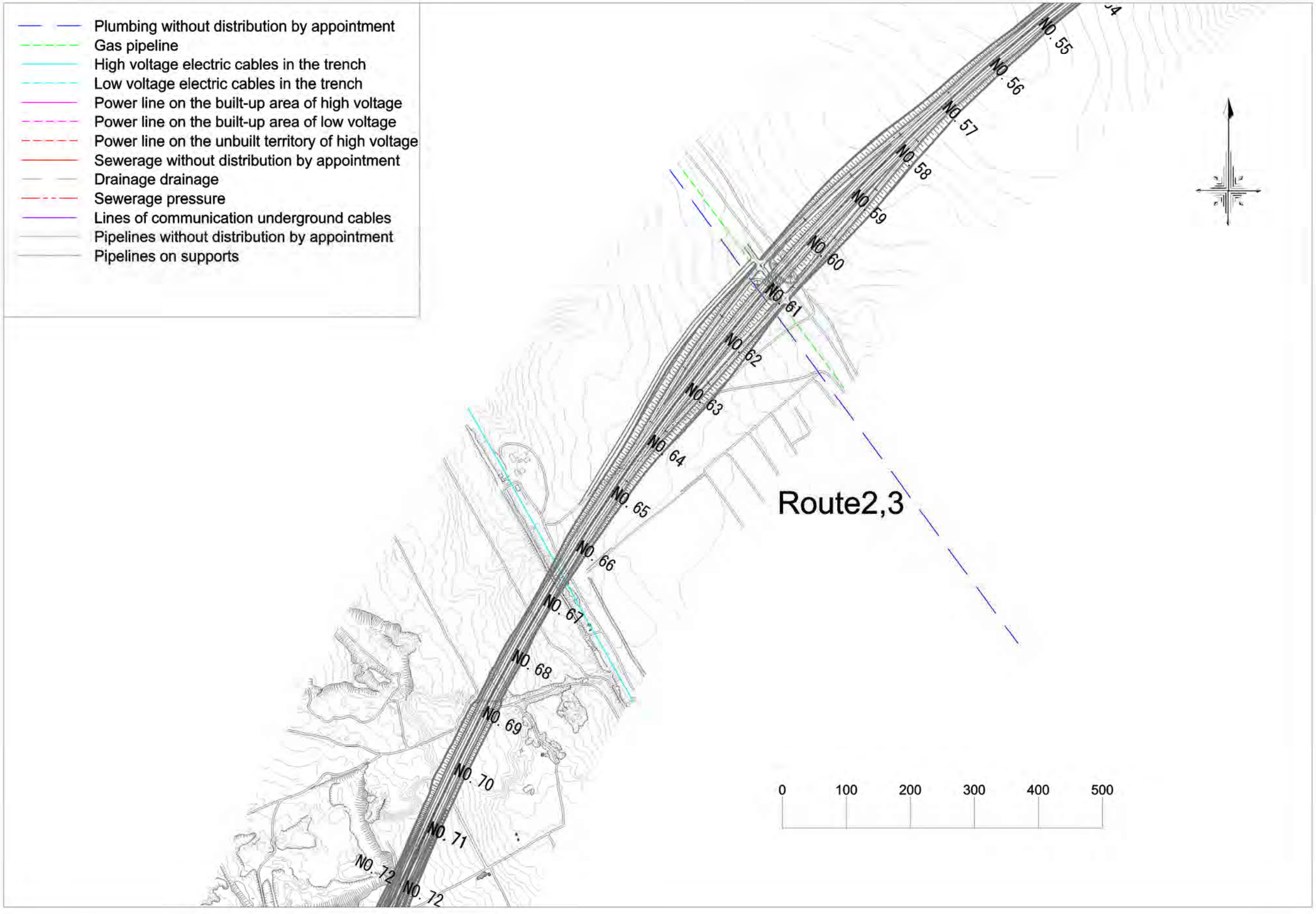


Figure 18-1-3. Image of Buried Objects and Overhead Lines (3/8)

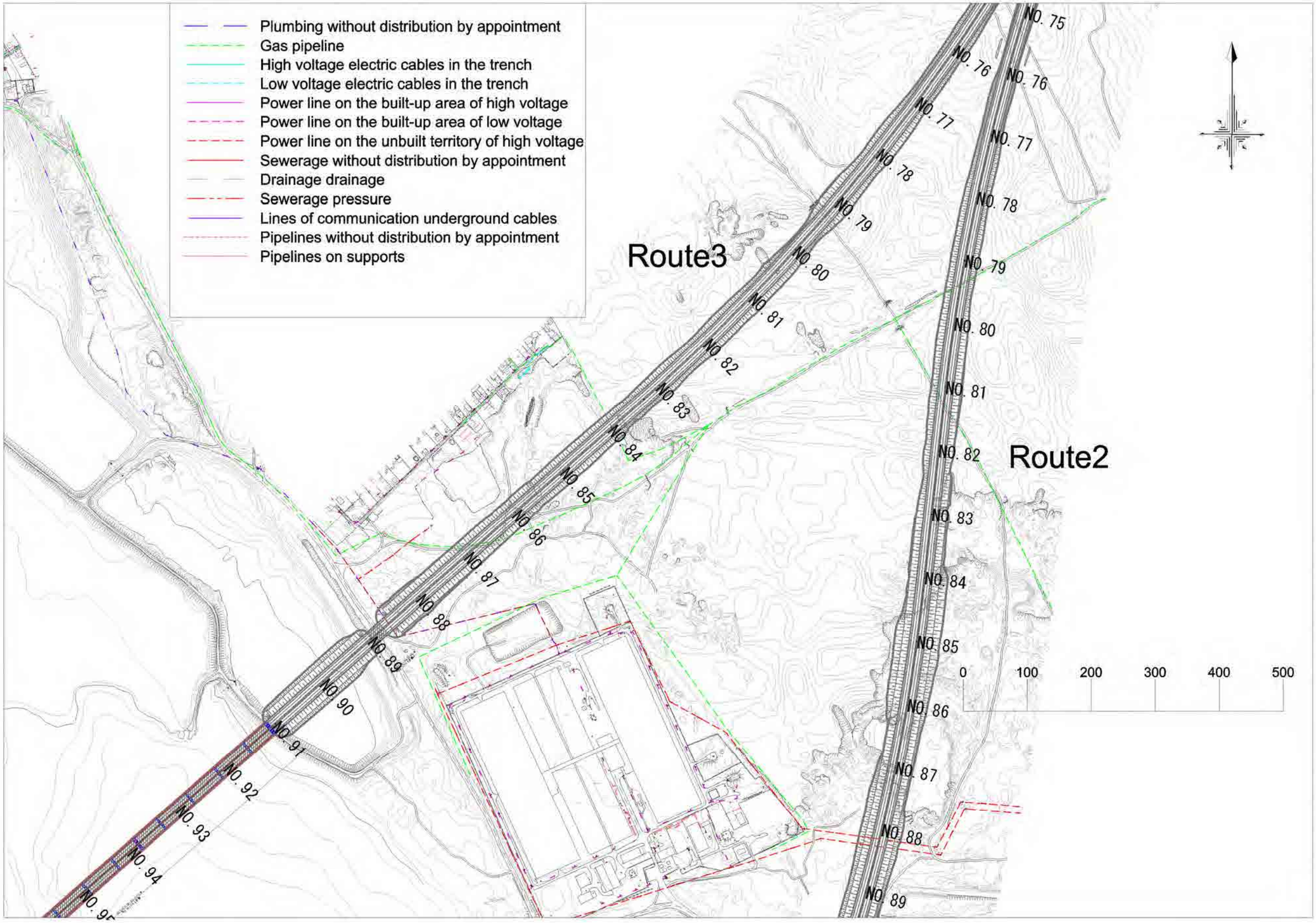


Figure 18-1-4. Image of Buried Objects and Overhead Lines (4/8)

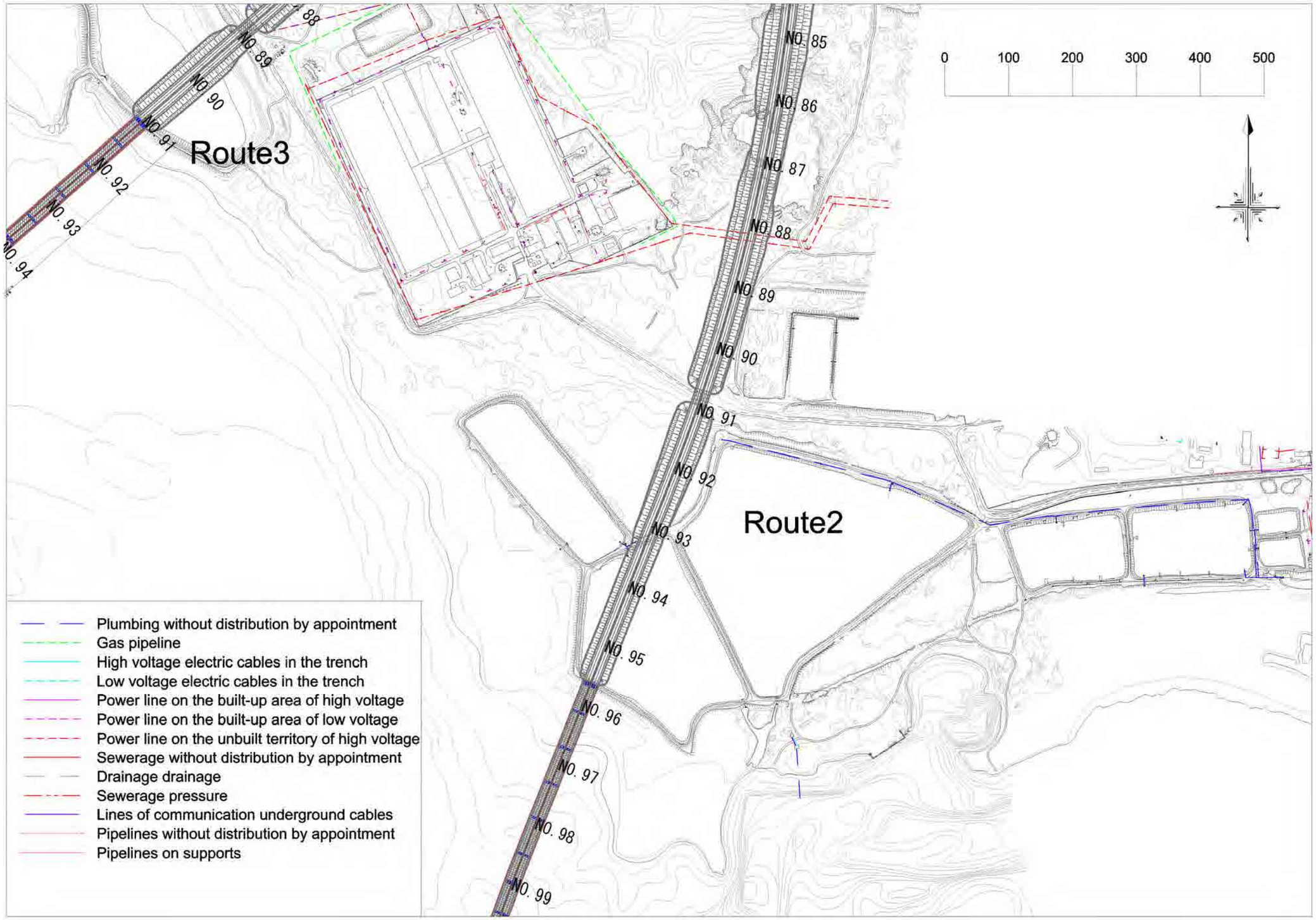


Figure 18-1-5. Image of Buried Objects and Overhead Lines (5/8)

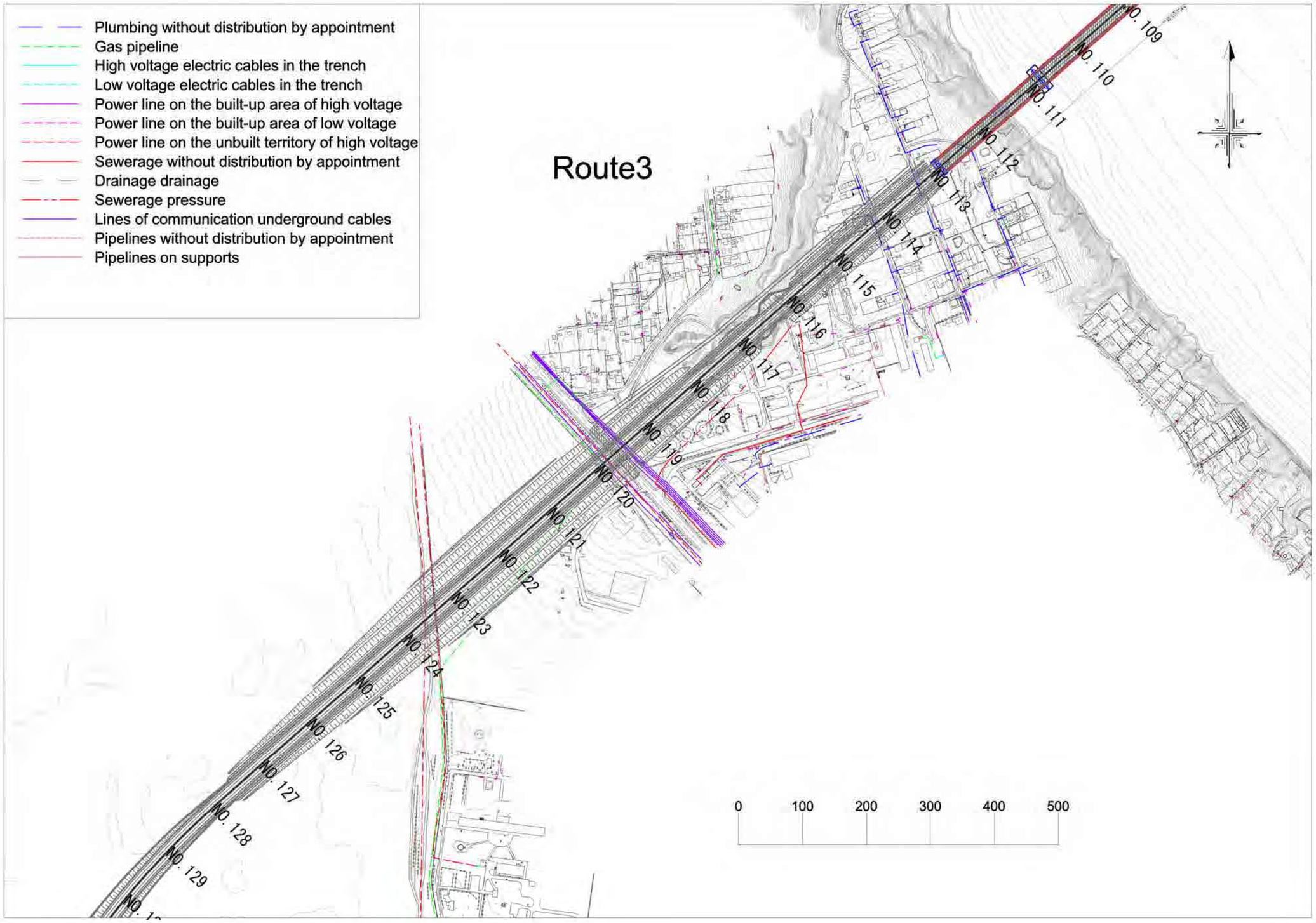


Figure 18-1-6. Image of Buried Objects and Overhead Lines (6/8)

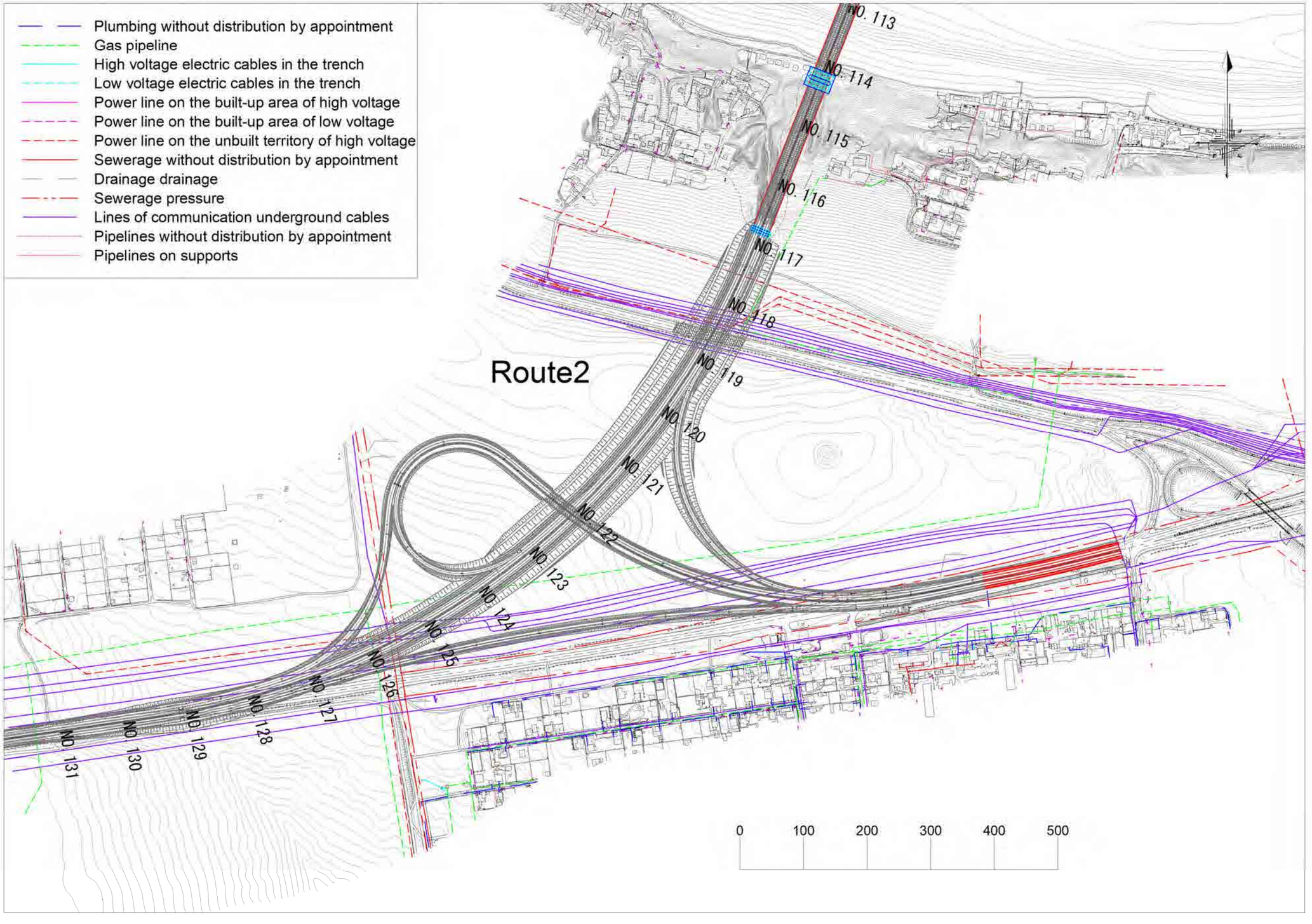


Figure 18-1-7. Image of Buried Objects and Overhead Lines (7/8)

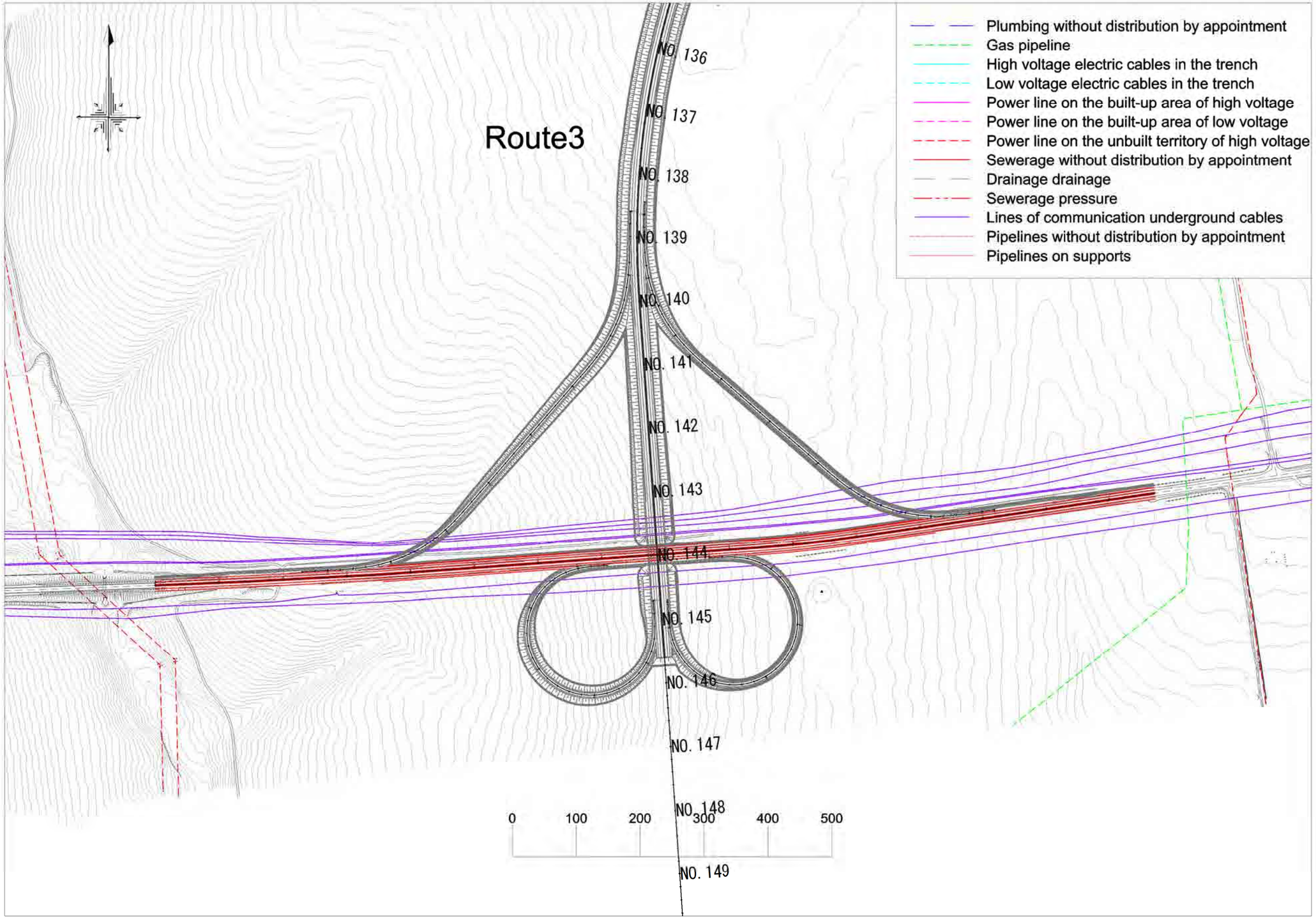


Figure 18-1-8. Image of Buried Objects and Overhead Lines (8/8)

Table 18-1-2. List of the Entities that Manage the Buried Objects and the Overhead Lines (1/3)

A list of enterprises in the city of Nikolaev to coordinate the situation of underground communications

Перелік підприємств в м. Миколаїв по узгодженню положення підземних комунікацій

Contact person Контактна особа	Enterprise Enterprise Підприємство	Head of the enterprise Керівник підприємства	Layer	Type
Head of technical service: Lutsak Volodymyr Yosypovych Начальник технічної служби: Луцак Володимир Йосипович (0512) 37-29-29 (091) 114-73-25 Head of operation department: Sukhorukov Ivan Stanislavovich Начальник відділу експлуатації: Сухоруков Іван Станіславович (091) 114 -18-96	**Public Joint-Stock Company "Ukrtelecom"** **Mykolaiv branch** **(Mykolaiv district)** Mykolaiv, st. Admiral, 27/3 **Публічне акціонерне товариство «Укртелеком»** **Миколаївська філія** **(Миколаївський район)** м. Миколаїв, вул. Адміральська, 27/3	Director: Antoshevsky Alexander Директор: Антошевський Олександр Миколайович (091) 114-92-38	Lines of communication underground cables	ПАТ "Укртелеком" ВОЛЗ ПАТ "Укртелеком" ВОЛЗ ОКЛБГ 24/0 ПАТ "Укртелеком" ЗКВ 1х4х1,2 ПАТ "Укртелеком" КСПП 1х4х1,2 ПАТ "Укртелеком" ОКЛБГ 8/0 ПАТ "Укртелеком" СЛД №1 ТПП 10х2 ПАТ "Укртелеком" ТДСБ ПАТ "Укртелеком" тел. каналізація
Maximenko Victor Максименко Віктор Валерійович (091) 114-30-31	**Public Joint-Stock Company "Ukrtelecom"** **Mykolaiv Branch** **(Mykolaiv)** Mykolaiv, st. Sevastopol, 1 **Публічне акціонерне товариство «Укртелеком»** **Миколаївська філія** **(м. Миколаїв)** м. Миколаїв, вул. Севастопольська, 1	Ukraine, Mykolaiv-001, 54001, st. Admiral, 27 Україна, Миколаїв-001, 54001, вул. Адміральська, 27	Lines of communication underground cables	
Vasiliev Andriy Mikhailovich Васильєв Андрій Михайлович (091) 114-30-36 m. Mykolaiv, pos. Varvara vul. Veselinovskaya, 27 м. Миколаїв, пос. Варварівка вул. Веселинівська, 27	**Public Joint Stock Company "Ukrtelecom"** **SLD №1 Mykolayiv district** **(Vesnya village, Nadbuzskoe village, Sliven village)** city of Nikolaev, pos. Varvara vul. Svitanok, 3	Head of telecommunication services department № 12: Tretyakov Nikolay Ivanovich, tel. (512) 48-04-80.	Lines of communication underground cables	ПАТ "Укртелеком" СЛД №1 тел. каналізація
Chief: Valery Nikolaevich Начальник: Валерій Миколайович (067) 405-44-48 Atrakom	**Limited Liability Company Atrakom № 52** , Mykolayiv, ave. Peace, 34, of. 409 **Товариство з обмеженою відповідальністю «Атраком»** **ЦТОЕ №52** м. Миколаїв, просп. Миру, 34, оф. 409	Head: Valery Nikolaevich Начальник: Валерій Миколайович (067) 405-44-48 USREOU 32250318 ЄДРПОУ 32250318	Lines of communication underground cables	ПАТ "Атраком" ВОЛЗ ВУ-2-16 ПАТ "Атраком" ВОЛЗ ВА-30-24 ВОЛЗ=Fiber optic transmission line
Engineer: Alexander Інженер: Олександр (067) 521-15-88	**Victoria-Felis Limited Liability Company** Mykolayiv, st. 4th Prodolnaya, 74 **Товариство з обмеженою відповідальністю «Вікторія-Феліз»** м. Миколаїв, вул. 4-та Продольна, 74	Head: Rudenko Alexander Vladimirovich Начальник: Руденко Олександр Володимирович (093) 368-98-33	Lines of communication underground cables	ТОВ "Вікторі-Феліз" ВОЛЗ ВОЛЗ=Fiber optic transmission line (ВУ-16 Курячьи Лозы –Николаев)
Sanko Svetlana Olegivna Санько Світлана Олегівна (063) 904-41-12 Nikostar	**Nikostar Limited Liability Company** Mykolayiv, st. Kosmonavts, 89 **Товариство з обмеженою відповідальністю «Нікостар»** м. Миколаїв, вул. Космонавтів, 89	YANCHUK VLADIMIR OLEKSIYOVYCH38313205 ЯНЧУК ВОЛОДИМИР ОЛЕКСІЙОВИЧ ЄДРПОУ 38313205	Cable lines are missing	

Table 18-1-3. List of the Entities that Manage the Buried Objects and the Overhead Lines (2/3)

A list of enterprises in the city of Nikolaev to coordinate the situation of underground communications

Перелік підприємств в м. Миколаїв по узгодженню положення підземних комунікацій

Contact person Контактна особа	Enterprise Enterprise Підприємство	Head of the enterprise Керівник підприємства	Layer	Type
EDRPUCEC: Mykolaiv, st. Nikolskaya, 25-th ЦОК: м. Миколаїв, вул. Нікольська, 25-а	**PUBLIC JOINT STOCK COMPANY FOR GAS SUPPLY AND GASIFICATION "MIKOLAIVGAS"** Mykolaiv, st. Frontier, 159 **ПУБЛІЧНЕ АКЦІОНЕРНЕ ТОВАРИСТВО ПО ГАЗОПОСТАЧАННЮ ТА ГАЗИФІКАЦІЇ "МИКОЛАЇВГАЗ"** м. Миколаїв, вул. Пограничная, 159	ВО of the director of technical: Rubskyi Alexei Ivanovich. Reception: ВО директора технічного: Рубський Олексій Іванович Приймальня: (0512) 67-49-01 USREOU 05410263 ЄДРПОУ 05410263	Gas pipeline	ГВ - high pressure gas pipeline ГС - medium pressure gas pipeline ГН - low pressure gas pipeline
Olena Nikolaevna Олена Миколаївна (0512) 67-51-13	**Public Joint Stock Company "Mykolaivgaz" Electrochemical protection group** , Mykolayiv city, st. Hay (Budennoi), 2 **Публічне акціонерне товариство «Миколаївгаз» Група електрохімзахисту** м. Миколаїв, вул. Сінна (Будьоного), 2	Ba Director of the technical: Rubsky Alexey Ivanovich Reception: В.о. директора технічного: Рубський Олексій Іванович Приймальня: (0512) 67-49-01	Low voltage electric cables in the trench	ПАТ "Миколаївгаз" електрохімзахист дренажний анодний захист= PJSC "Mykolaivgaz" electrochemical protection drainage anodic protection
Operator: Olga Оператор: Ольга (093) 236-99-09	**JOINT STOCK COMPANY "MIKOLAIVOBLENERGO"** Mykolayiv, st. Civic, 40 **АКЦІОНЕРНЕ ТОВАРИСТВО "МИКОЛАЇВОБЛЕНЕРГО"** м. Миколаїв, вул. Громадянська,40	General Director of JSC "MIKOLAIVOBLENERGO" Sivak Oleg Petrovich Генеральний директор АТ «МИКОЛАЇВОБЛЕНЕРГО» Сивак Олег Петрович USREOU 23399393 ЄДРПОУ 23399393	High voltage electric cables in the trench, Power line on the unbuilt territory of high voltage	
Sergiy Petrovich Сергій Петрович (0512) 53-95-89 (096) 309-61-97С.	**JOINT STOCK COMPANY Mykolayivoblenergo, Mykolaiv** city, Nikolaev str.,Border, 94 **АКЦІОНЕРНЕ ТОВАРИСТВО «Миколаївобленерго» м. Миколаєва** м. Миколаїв, вул. Пограничная, 94	Director General of JSC "MIKOLAIVOBLENERGO" Sivak Oleg Petrovich Генеральний директор АТ «МИКОЛАЇВОБЛЕНЕРГО» Сивак Олег Петрович USREOU 23399393 ЄДРПОУ 23399393	High voltage electric cables in the trench, Power line on the unbuilt territory of high voltage	
Engineer: Pavlyuk Andrey Fedorovich Інженер: Павлюк Андрій Федорович (0512) 48-33-11	**JOINT STOCK COMPANY Mykolaivoblenergo Mykolaiv REM** Mykolayiv, pos. Varvarovka, st. Records, 70 **АКЦІОНЕРНЕ ТОВАРИСТВО «Миколаївобленерго» Миколаївський РЕМ** м. Миколаїв, пос. Варварівка, вул. Рекордна, 70	Chief engineer: Gribunov Valery Vladimirovich Головний інженер: Грибунов Валерій Володимирович (0512) 48-43-10	High voltage electric cables in the trench, Power line on the unbuilt territory of high voltage c	
Svitlana Aleksandrovna Tatiana Ivanivna Світлана Олександрівна Тетяна Іванівна (0512) 24-30-87	**CITY MUNICIPAL ENTERPRISE "MIKOLAIVVODOKANAL"** Mykolayiv, st. Border, 161 **МІСЬКЕ КОМУНАЛЬНЕ ПІДПРИЄМСТВО "МИКОЛАЇВВОДОКАНАЛ"** м. Миколаїв, вул. Погранична, 161	Director General of МКР "Mykolaivvodokanal" Dudenko Boris Leonidovich Генеральний директор МКП "Миколаївводоканал" Дуденко Борис Леонідович EDRPOU 31448144 ЄДРПОУ 31448144	Sewerage pressure Sewerage without distribution by appointment Plumbing without distribution by appointment	
Deputy Head: Popov Andriy Sergeevich Заступник начальника: Попов Андрій Сергійович (0462) 65-55-55	**Office of the Civil Service for Special Communications and Information Protection of Ukraine in the Mykolaiv region** Mykolayiv, st. Spaska, 32 **Управління державної служби спеціального зв'язку та захисту інформації України в Миколаївській області** м. Миколаїв, вул. Спаська, 32	Head: Tomchuk Alexander Mikhailovich Начальник: Томчук Олександр Михайлович (067) 600-82-86	Cable lines are missing	

Table 18-1-4. List of the Entities that Manage the Buried Objects and the Overhead Lines (3/3)

A list of enterprises in the city of Nikolaev to coordinate the situation of underground communications

Перелік підприємств в м. Миколаїв по узгодженню положення підземних комунікацій

Contact person Контактна особа	Enterprise Enterprise Підприємство	Head of the enterprise Керівник підприємства	Layer	Type
Head of SEZ: Boychuk Yuriy Начальник СЕЗ: Бойчук Юрій (096) 414-31-59 (066) 653-97-43 (0512) 588-507Ammonia Pipeline	**Mykolaiv Department of MainState Enterprise « Ukrchimtransamiak »** , Mykolayiv, st. Volodymyra Stank (Furmanova), 1 **Миколаївського управління магістрального аміакопроводу Державне підприємство «Укрхімтрансаміак»** м. Миколаїв, вул. Володимира Станка (Фурманова), 1	Mykolayiv Department of the main ammonia pipeline of the State Enterprise "Ukrchimtransamiak" Boyarinov Valeriy Vasilyevich – Director Миколаївського управління магістрального аміакопроводу ДП «Укрхімтрансаміак» Бояринов Валерій Васильович — директор Code of the USREOU: 26029136 Код ЄДРПОУ: 26029136	Lines of communication underground cables	МУМА ДП "Укрхімтрансаміак" МКСА 4х4х1,2 Кабель МКСБ 4х4х1,2 = MKSB trunk cable symmetrical high-frequency with lead-sheathed polystyrene insulation
Director Sereda Volodymyr Nikolayevich Директор Середа Володимир Миколайович (099) 077-15-08 Vesnyansky	**village council of** **PE "Spring"** Mykolaiv district, p. Spring, st. Stepova, 26th **Веснянська сільська рада** **ПП «Весняне»** Миколаївський р-н, с. Весняне, вул. Степова, 26-в	Director Volodymyr Nikolayevich Sereda Директор Середа Володимир Миколайович (099) 077-15-08	Plumbing without distribution by appointment	
Paschuk Pavel Ivanovich Пащук Павло Іванович (095) 889-21-07Nadbuzhskogo	**KP ZhEKvillage council** Mykolaiv district, p. Nadbuzskoe, st. Pavel Glazovoi, 1/1 **КП ЖЕК Надбузької сільської ради** Миколаївський р-н, с. Надбузьке, вул. Павла Глазового, 1/1	Pavel Paschuk Пащук Павло Іванович (095) 889-21-07	Sewerage without distribution by appointment Plumbing without distribution by appointment	
Head of Operations Department: Volodymyr Pavlovich Music Начальник відділу експлуатації: Музика Володимир Павлович (050) 369-63-81; (050) 396-63-81 (067) 621-50-74 Petrol stations with. Balovnaya, Old Airport АЗС с. Баловне, Старий Аеропорт	**Petrol Station «SunOil»** Limited Liability Company «Southern Fuel Company» Kherson branch: Kherson, st. Budennogo, 18th Head office: Odessa, st. Transport, 5 **Автозаправна станція «SunOil»** Товариство з обмеженою відповідальністю «Южная топливная компания» Херсонська філія: м. Херсон, вул. Будьоного, 18-а Головний офіс: м. Одеса, вул. Транспортна, 5	Director Volodymyr Pavlovich Music Директор Музика Володимир Павлович		
Svitlana Aleksandrovna Tatiana Ivanivna Світлана Олександрівна Тетяна Іванівна (0512) 24-30-87	**CITY MUNICIPAL ENTERPRISE "MIKOLAIVVODOKANAL"** Mykolayiv, st. Border, 161 **МІСЬКЕ КОМУНАЛЬНЕ ПІДПРИЄМСТВО "МИКОЛАЇВВОДОКАНАЛ"** м. Миколаїв, вул. Погранична, 161	Director General of MKP "Mykolaivvodokanal" Dudenko Boris Leonidovich Генеральний директор МКП "Миколаївводоканал" Дуденко Борис Леонідович EDRPOU 31448144 ЄДРПОУ 31448144		
EDRPUCEC: Mykolaiv, st. Nikolskaya, 25-th ЦОК: м. Миколаїв, вул. Нікольська, 25-а	**PUBLIC JOINT STOCK COMPANY FOR GAS SUPPLY AND GASIFICATION "MIKOLAIVGAS"** Mykolaiv, st. Frontier, 159 **ПУБЛІЧНЕ АКЦІОНЕРНЕ ТОВАРИСТВО ПО ГАЗОПОСТАЧАННЮ ТА ГАЗИФІКАЦІЇ "МИКОЛАЇВГАЗ"** м. Миколаїв, вул. Погранична, 159	ВО of the director of technical: Rubskyi Alexei Ivanovich. Reception: ВО директора технічного: Рубський Олексій Іванович Приймальня: (0512) 67-49-01. USREOU 05410263 ЄДРПОУ 05410263		

18-2 River Structures

In order to fully understand the present circumstances of the river structures near the Mykolaiv Bridge location, studies on structures ((1) - (7)) shown in Figures 18-2-1 to 18-2-3, what appear to be river structures when viewed on satellite photographs, were conducted to collect and determine the following details.

- Photographs
- Structure names
- Structure purposes
- Structure installation entities
- Structure installation years

The condition of the right bank near Mykolaiv Bridge location for Routes 2 and 3 was also studied.

Table 18-2-1 shows the results of an interview survey with locals and Figures 18-2-4 to 18-2-7 show photographs of the river structures.

The studies revealed that all but (5) and (6) are piers for vessels. The purposes of (5) and (6) are unclear, but they are small structures that were installed individually; therefore, it is likely that they are used as piers for vessels or fishing.

The stone and concrete revetments visible in the photograph of the upstream side of (4) suggest that the area along the river bank has been developed.

Even though the photographs show that developed locations along the river bank presently feature these individually installed revetments, no river structures have been installed systematically for the purpose of stabilizing the river bank or river bed. This indicates that long-term bed elevation changes have not been serious, even though the right bank near the Mykolaiv Bridge location is on the outside of the curve. Given the erosion of the river bank by floods, waves, and the like shown in Figure 18-2-8 and Figure 18-2-9, however, revetments are likely to be necessary near the Mykolaiv Bridge location.

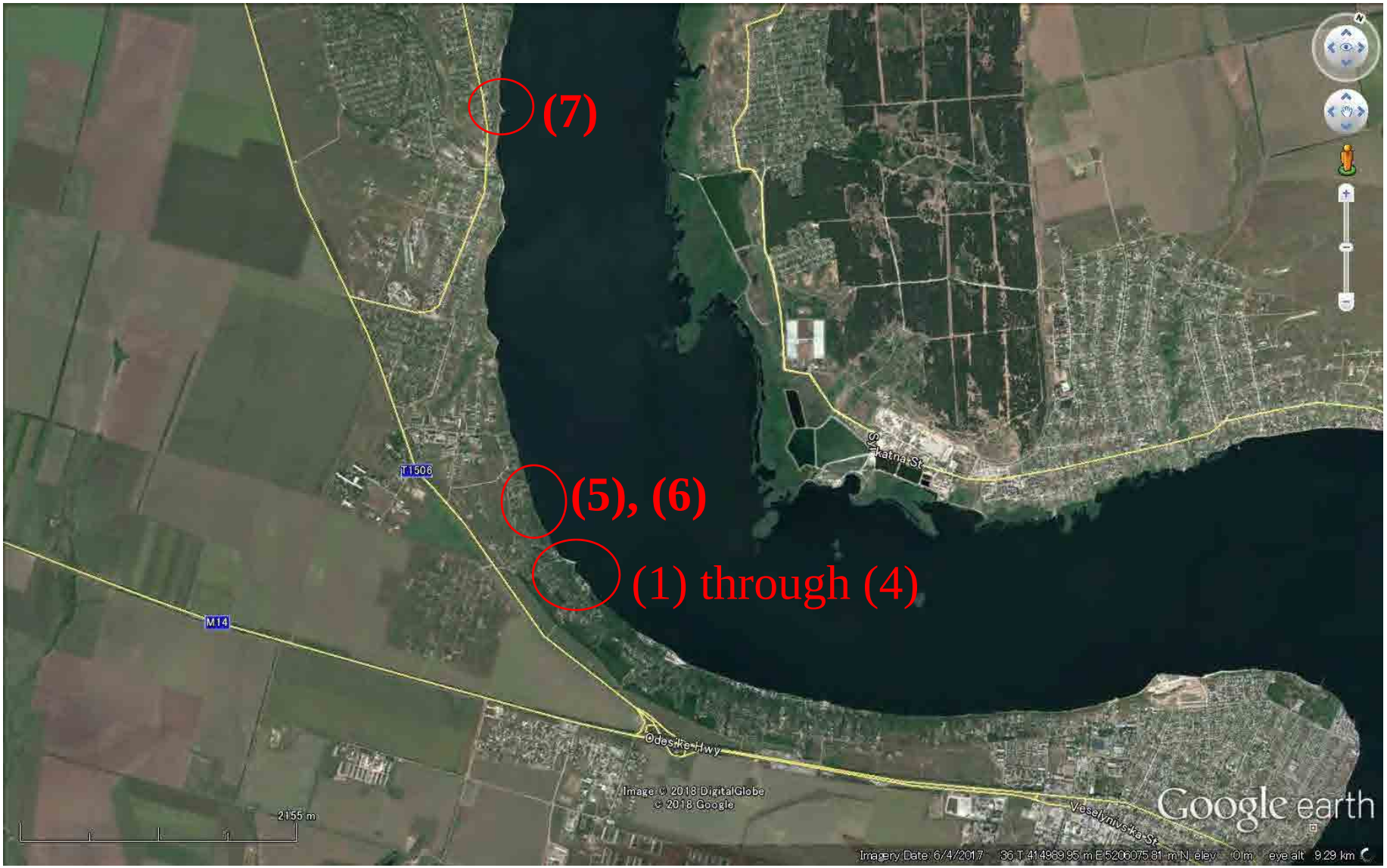


Figure 18-2-1. Location Map of River Structure Study (1/3)

Figure 18-2-2. Location Map of River Structures (2/3)

Figure 18-2-3. Location Map of River Structure Study (3/3)

Table 18-2-1. Results of the Interview Survey on River Structures

No	Name of structure	Purpose	Constructor	Year of Construction
(1)	Pier	Used as a landing stage for private boats	Seizure of waterfront, construction, closed public access	2017
(2)				
(3)				
(4)	Pier on prominence	Used to be a landing stage for water transport	Water transport operator	Before 1990 (USSR time)
(5)	Prominence	Supposedly minor prominence for leisure (handmade or natural). Used as a beach place by locals.	Unknown	Unknown
(6)	Prominence	Supposedly minor handmade prominence for leisure. Used as a beach place by locals.	Unknown	Unknown
(7)	Prominence + mooring	Prominence made as a beach area for leisure + adjacent mooring for boats.	An Investor who wanted to develop the waterfront in 1990-1991. Development stopped unfinished.	1991

(1), (2), (3)	(4)-1
	
(4)-2	(4)-3
	

Figure 18-2-4. Photographs of the State of River Structures (1/4)

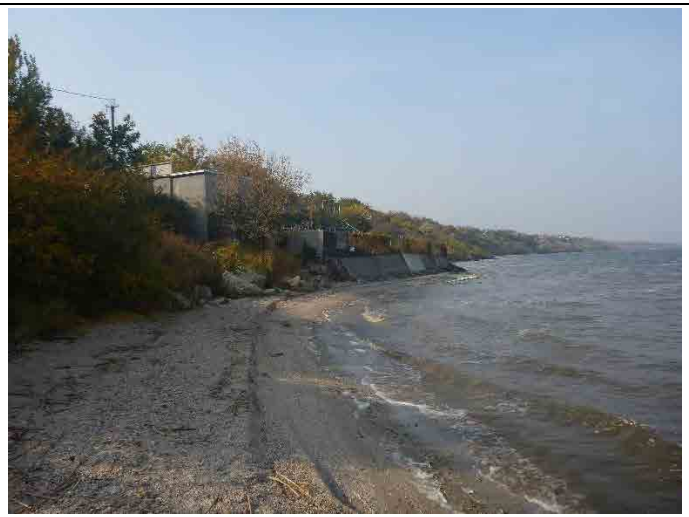
Upstream side of (4), 1	Upstream side (4), 2
	
(5)-1	(5)-2
	

Figure 18-2-5. Photographs of the State of River Structures (2/4)

(6)-1	(6)-2
	
(6)-3	(7)-1
	

Figure 18-2-6. Photographs of the State of River Structures (3/4)

(7)-2	(7)-3
	
(7)-4	
	

Figure 18-2-7. Photographs of the State of River Structures (4/4)

State of Riverbank Near Route 2, 1	State of Riverbank Near Route 2, 2
	
State of Riverbank Near Route 2, 3	State of Riverbank Near Route 2, 4
	

Figure 18-2-8. Photographs of the State of the Riverbank Near Route 2

State of Riverbank Near Route 3, 1	State of Riverbank Near Route 3, 2
	
State of Riverbank Near Route 3, 3	State of Riverbank Near Route 3, 4
	

Figure 18-2-9. Photographs of the State of the Riverbank Near Route 3

18-3 Obstructive Buildings

Figures 18-3-1 and 18-3-2 show the locations of obstructive buildings.

Obstructive buildings are buildings in the bypass road area. Any residents living of them will have to be involuntarily resettled.

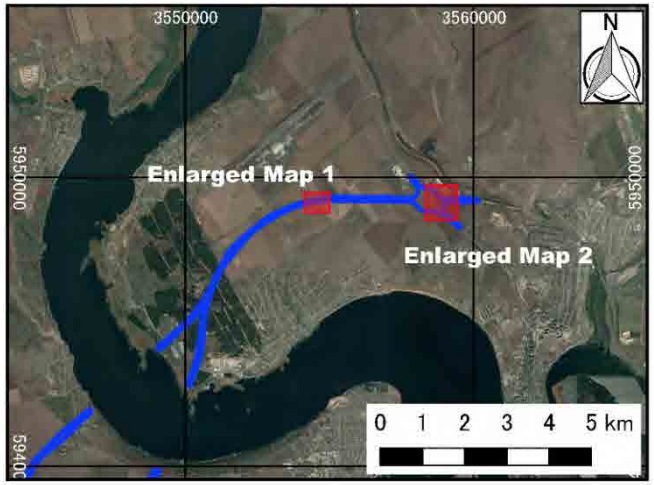
The number of obstructive buildings and number of resettlements indicated by the figures are shown in Table 18-3-1.

As shown in the table, Route 2 has 26 obstructive buildings but no involuntary resettlements. Route 3 has 60 obstructive buildings and 3 involuntary resettlements.

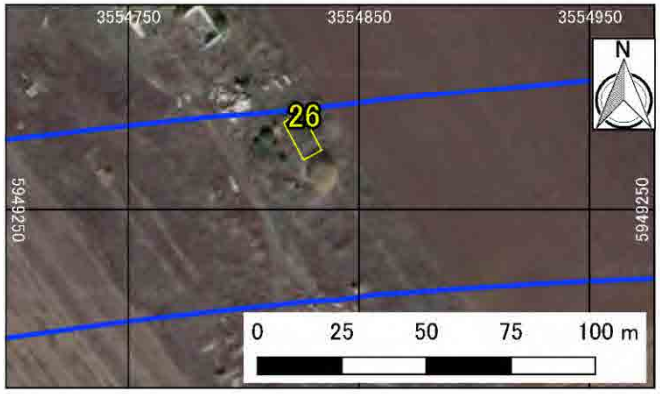
Table 18-3-1. Number of Obstructive Buildings, and Number of Involuntary Resettlement

Route	Number of Obstructive Buildings	Number of Involuntary Resettlements (Buildings with residents)
Route2	26	0
Route3	60	3

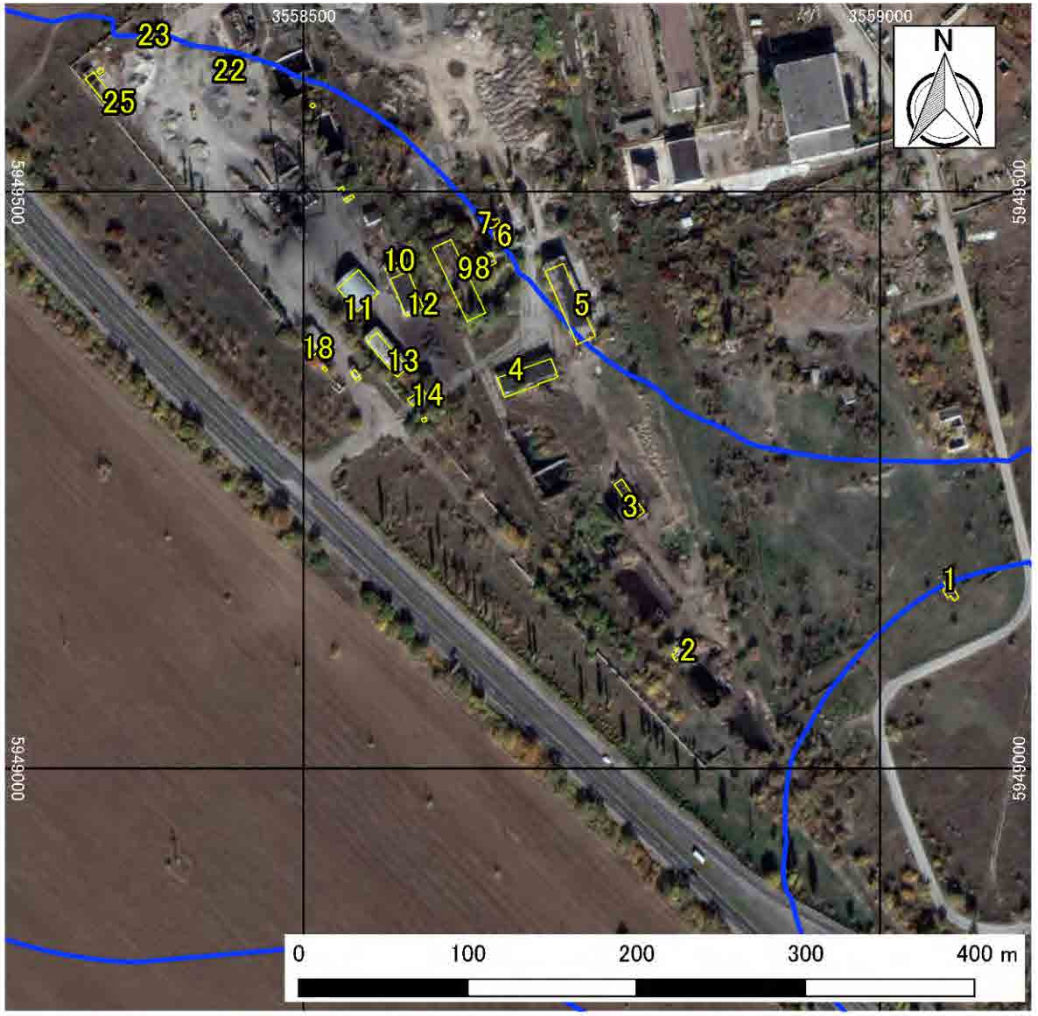
Source: JICA Survey Team



Overall Map of Land Acquisiton Area (Left bank)



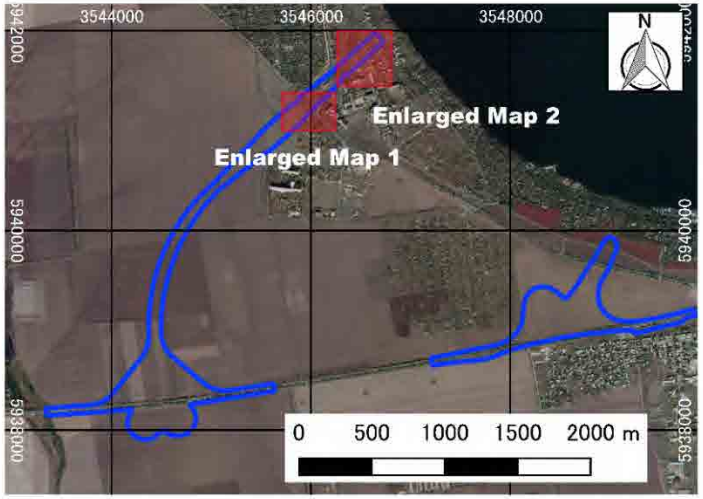
Enlarged Map 1 (Access road)



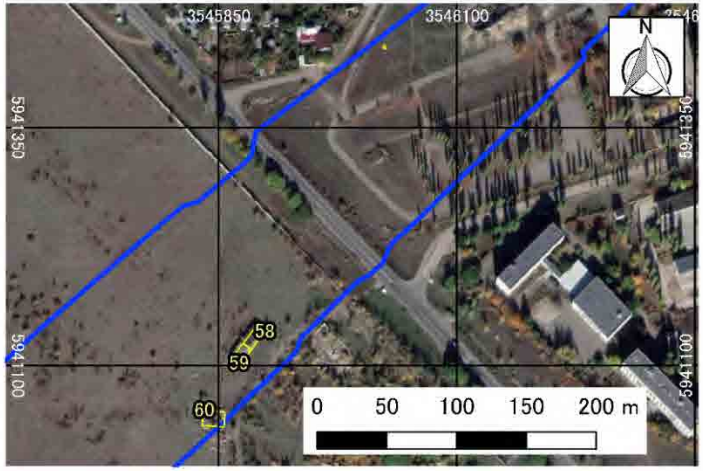
Enlarged Map 2 (Intechange)

: Right of Way

Figure 18-3-1. Location Map of Obstructive Housing Units (Left Bank)



Overall Map of Land Acquisiton Area (Right bank)



Enlarged Map 1

Enlarged Map 2

: Right of Way

Figure 18-3-2. Location Map of Obstructive Housing Units (Right Bank)

18-4 Partner Country Responsibilities

The table below is a list required to implement Mykolaiv Bridge and Bypass Road, which should be coordinated under the responsibilities of Ukravtodor and the relevant authorities.

Table 18-4-1. List of Ukravtodor's Responsibilities

Responsibility	Description	Implementation Deadline
1.Provide and grade land for construction yards	Provide land for construction yards.	Announcement of P/Q
2. Select candidate locations for borrow areas and quarries	Select appropriate candidate locations for borrow areas and quarries. The locations shown in 4-3: Geological Surveys, or selected according to proposals by Ukravtodor.	Announcement of P/Q, or start of construction
3. Select candidate locations for waste disposal areas	Select appropriate candidate locations for waste disposal areas.	Announcement of P/Q
4.Land acquisition	Pay compensation or support money to parties impacted by bypass road construction according to the Resettlement Action Plan (RAP), and faithfully implement the required acquisition of land. Table 18-4-2, Figures 18-4-1 and 18-4-2 show a rough area of land acquisition.	Announcement of P/Q
5.Relocation of obstacles	Relocate the obstacles shown in 18-1: Buried Objects and Overhead Lines.	Announcement of P/Q
6.Obtain approval for the EIA, supervision of environmental management, etc.	Obtain approval for the EIA from MENR.	At least 120 days before signing the L/A
	Supervise the creation and implementation of environmental management plans by the construction contractor.	Plan: Before construction starts Implementation: During construction period
	Obtain the environmental monitoring report from the construction contractor and monitor that the environmental management plan is being implemented appropriately.	During construction period
7.Tax exemption process	Provide support so that tax exemption measures for customs, product service taxes (value added taxes (VAT)), income taxes and corporate taxes are implemented faithfully. The scope of tax exemption is defined by E/N	During detailed design period During construction period
8.Acquire construction permits, etc.	Provide support for registration of Permanent Establishment (PE) required by the MENR and the Ukrainian Tax Authority.	Start of construction work
	Acquire construction permits, etc. required to start construction work.	Announcement of P/Q
	Provide support for acquiring construction permits, etc. required during the construction period.	During construction period
9.Maintenance work	Perform maintenance work on the bypass roads.	After completion of construction (after handover)

Table 18-4-2. Rough Area of Land Acquisition by Form of Land Ownership

Land use type	Area in sq. meter	
	Route 2	Route 3
Agriculture	769,113	930,072
Artificial Forest	147,905	104,737
Road	108,076	102,038
Residential	3,523	11,837
Others*1	1,269	57,345
Unknown*2	286,984	349,806
Total	1,316,870	1,555,835

*1: Includes educational institutions, commercial facilities, etc.

*2: Land in the scope of the Land Acquisition Plan is categorized as “Unknown” if its land use is unidentified in the database of the Ukrainian authorities.

Source: JICA Survey Team

Figure 18-4-1. Rough Area of Land Acquisition (Left Bank)

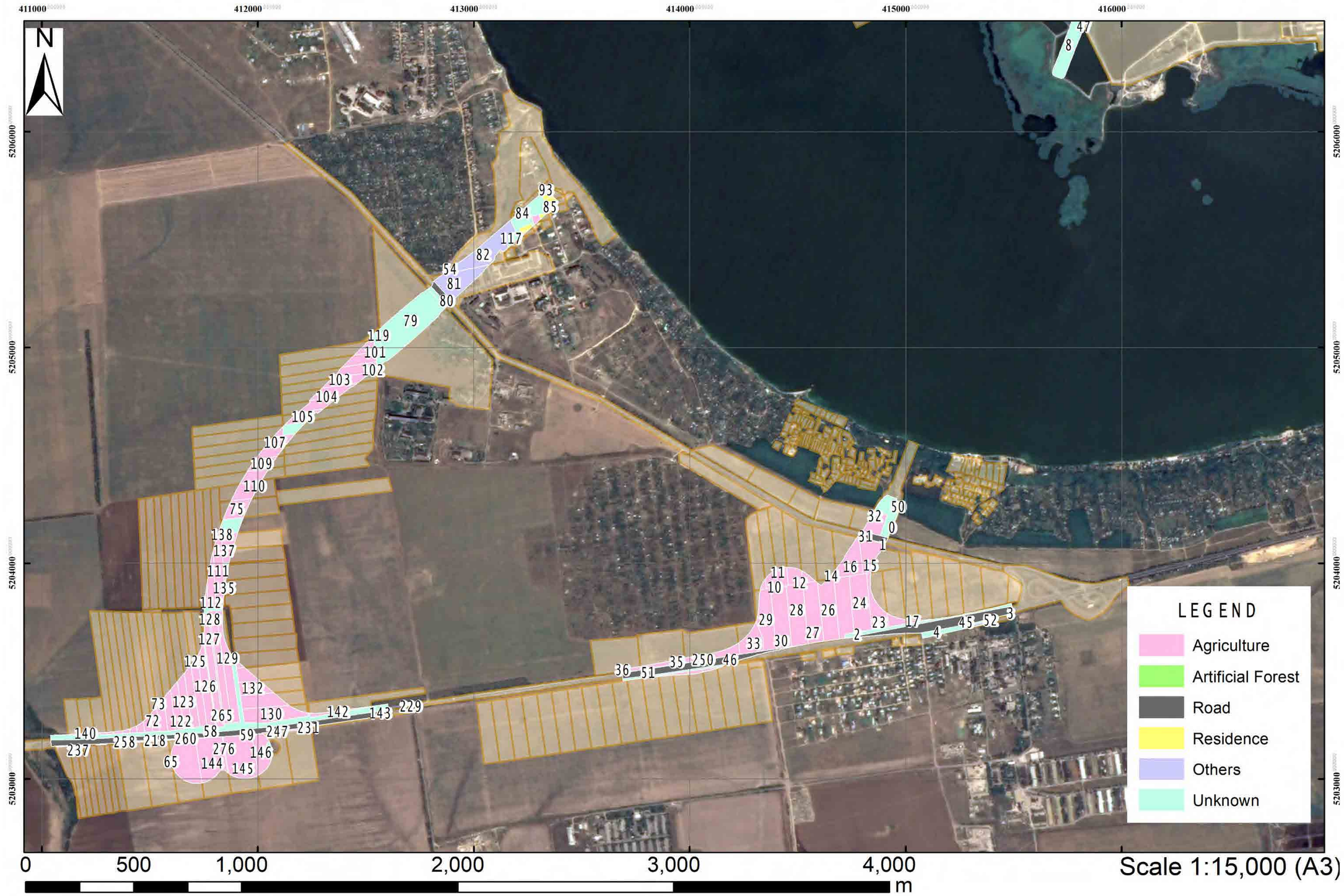


Figure 18-4-2. Rough Area of Land Acquisition (Right Bank)

List of Appendices

Appendix 1: Correspondence

Date/Month/Year	Subject	Attention	Sender
30/May/2018	Basic Information	JICA Survey Team	Ukravtodor
31/May/2018	Recommendations of Ukravtodor to JICA Regarding the Project	JICA	Ukravtodor
05/June/2018	Environmental Regulations	Mykolaiv City Council	State Ecological Inspection in Mykolaiv Oblast
14/June/2018	Basic data about social environment:	Mykolaiv City Council	Mykolaiv City Council, Central District Administration
18/June/2018	Inland Waterway Condition	JICA Survey Team	Derzhgidrografia
18/June/2018	Inland Waterway Condition	JICA Survey Team	Ukrvodshliakh
18/June/2018	Ecological information in the project area (with two attachments)	Mykolaiiv City Council	Mykolaiiv Regional State Administration
22/June/2018	Inland Waterway Condition	JICA Survey Team	Sea Port Authority
22/June/2018	Annexes of 2012 FS (TEO) and list of recommended environmental consultants	JICA Survey Team	Ukravtodor
12/July/2018	Basic Information	JICA Survey Team	Ukravtodor
23/July/2018	Inland Waterway Condition	JICA Survey Team	Derzhgidrografia
30/July/2018	Inland Waterway Condition	JICA Survey Team	Ukrvodshliakh
10/August/2018	Inland Waterway Condition	JICA Survey Team	Derzhgidrografia
08/November/2018	Response from Ukravtodor Regarding Route Selection	JICA	Ukravtodor
21/January/2019	Obstacle Limitation Surface of Mykolaiv International Airport	JICA Survey Team	Mykolaiv International Airport
28/March/2019	Mykolaiv City Master Plan	JICA Survey Team	Mykolaiv City
21/August/2019	Basic Information	JICA	Ukravtodor
18/October/2019	Response from Ministry of Infrastructure Regarding Draft Final Report	JICA	Ministry of Infrastructure
04/November/2019	Response from Ukravtodor Regarding Landslide Monitoring	JICA Survey Team	Ukravtodor

[30/May/2018, Basic Information, Ukravtodor]

Довідка

В рамках місії з підготовки до проведення додаткового вивчення за проектом «Спорудження мостового переходу через р. Південний Буг у м. Миколаєві» Укравтодор надає наступну інформацію, в межах своєї компетенції, відповідно до переліку питань і необхідних відомостей наданих Японським агентством міжнародного співробітництва (JICA)

1. Чинні на даний час плани розвитку (перелік проектів, обсяг робіт у рамках кожного проекту, календарний план-графік реалізації тощо).

1) Державної цільової економічної програми розвитку автомобільних доріг загального користування державного значення на 2018-2022 роки

2) Концепція Державної цільової економічної програми розвитку автомобільних доріг загального користування державного значення на 2018-2022 роки (http://zakon3.rada.gov.ua/laws/show/34-2018-%D1%80)

2. Повноваження «Укравтодору»

Положення про Державне агентство автомобільних доріг України (http://zakon2.rada.gov.ua/laws/show/439-2014-%D0%BF)

3. Програма утримання й ремонту доріг

Концепція Державної цільової економічної програми розвитку автомобільних доріг загального користування державного значення на 2018-2022 роки (http://zakon3.rada.gov.ua/laws/show/34-2018-%D1%80)

4. Діючі в даний час плани розвитку дорожньої мережі

Концепція Державної цільової економічної програми розвитку автомобільних доріг загального користування державного значення на 2018-2022 роки (http://zakon3.rada.gov.ua/laws/show/34-2018-%D1%80)

5. Інформація стосовно нижченаведених питань:

- Інвентаризація мостів і доріг Миколаївської області. Місцезнаходження, категорія дороги, довжина й тип дорожнього покриття, стан тощо.
- Дані щодо будівництва й технічного обслуговування в Миколаївській області по районах, типах споруд, видах робіт, протяжності тощо. За останні 5 років.
- Перелік основних робіт з реконструкції мостів, які були проведені в минулому.
- Процедура затвердження (верифікації) проекту, а саме:

1) термін дії ТЕО, затвердженого в 2013 році.

2) спосіб внесення змін у ТЕО і процедура проведення повторної верифікації (затвердження).

3) питання, які повинні бути затверджені до початку проекту (крім ТЕО), способи виконання цих процедур і компетентні організації:

Перелік автомобільних доріг загального користування державного значення затверджено постановою Кабінету Міністрів України від 16 вересня 2015 року № 712 «Про затвердження переліку автомобільних доріг загального користування державного значення» (в редакції постанови Кабінету Міністрів України від 09 серпня 2017 року № 654). Протяжність автомобільних доріг державного значення у Миколаївській області становить 1 485,4км, зокрема міжнародних - 199,5 км, національних – 406,8 км, регіональних – 367,6 км, територіальних – 511,5 км, перелік додається.

На автомобільних дорогах загального користування державного значення обліковується 98 мостів та шляхопроводів загальною протяжністю 3695,56 пог. м.

Станом на 01.01.2018 виконано обстеження технічного стану з внесенням інформації до бази даних АЕСУМ на 71 споруді.

У зв'язку з реформою децентралізації, з 01.01.2018 згідно чинного законодавства (закони України від 17.11.2016 № № 1762-VIII, 1763-VIII, 1764-VIII) автомобільні дороги загального користування місцевого значення перейшли зі сфери управління Укравтодору до сфери управління обласних державних адміністрацій, відповідно до розпорядження Голови Миколаївської обласної державної адміністрації від 01.12.2017 № 499-р, автомобільні дороги загального користування місцевого значення передані з балансу Служби автомобільних доріг у Миколаївській області на баланс Миколаївської облдержадміністрації протяжністю 3 314,4 км, зокрема обласних - 2 669,4 км, районних – 645 км.

На автомобільних дорогах загального користування місцевого значення обліковується 159 мостів та шляхопроводів загальною протяжністю 2769,5 пог. м.

Інформацію щодо типу покриттів автомобільних доріг, категорійності та штучних споруд у Миколаївській області надаємо у додатку.

За інформацією Служби автомобільних доріг у Миколаївській області, роботи з будівництва, реконструкції мостів та шляхопроводів за останні 5 років не проводилися, інформацію щодо виконання робіт з експлуатаційного утримання мостів та шляхопроводів у Миколаївській області надаємо у додатку.

Щодо процедури затвердження (верифікації) проекту, а саме терміну дії ТЕО, затвердженого у 2013 році, способу внесення змін у ТЕО і процедури проведення повторної верифікації (затвердження) та питань, які повинні бути затверджені до початку проекту (крім ТЕО), способи виконання цих процедур і компетентних організацій інформуємо.

Відповідно до постанови Кабінету Міністрів України від 11.05.2011 № 560 «Про затвердження Порядку затвердження проектів будівництва і проведення їх експертизи та визнання такими, що втратили чинність, деяких постанов Кабінету

Міністрів України» (зі змінами), проекти будівництва при дво- і тристадійному проектуванні затверджуються на стадії проект та робочий проект і схвалюються Кабінетом Міністрів України на стадії техніко-економічне обґрунтування.

На підставі обґрунтованого подання, погодженого з Мінрегіоном, Мінекономрозвитку і Мінфіном, Кабінет Міністрів України може прийняти рішення щодо затвердження проекту будівництва за чергами, визначеними в техніко-економічному обґрунтуванні (техніко-економічному розрахунку, ескізному проекті), схваленому ним в установленому порядку.

Зміни до затверджених (схвалених) проектів будівництва вносяться на підставі завдання на проектування.

Схвалення та перезатвердження проектів будівництва здійснюється у порядку, встановленому для їх затвердження.

Додаток:

- перелік автомобільних доріг загального користування державного значення у Миколаївській області та інформація щодо типу покриттів автомобільних доріг, категорійності та штучних споруд у Миколаївській області на 2 арк.
- інформація щодо виконання робіт з експлуатаційного утримання мостів та шляхопроводів у Миколаївській області на 2 арк.

6. Добова інтенсивність дорожнього руху магістральними автодорогами

Статистичні данні стосовно інтенсивності руху дорожніх транспортних засобів на автомобільних дорогах державного значення в межах Миколаївської області у 2017 наведені у додатках.

Додаток: інформація про середньорічну добову інтенсивність руху дорожніх транспортних засобів на автомобільних дорогах державного значення в межах Миколаївської області у 2017 році на 2 арк.

7. Річний бюджет «Укравтодору» і його витрати, включаючи витрати на утримання і ремонт доріг і адміністративні витрати. За останні 5 років.

Інформацію щодо видатків державного бюджету на фінансування бюджетних програм Укравтодору за 2014-2018 роки наведена у додатках.

Додаток: видатки державного бюджету на фінансування програм Укравтодору (з урахуванням кредитних коштів) за 2014 – 2018 роки на 1 арк.

Індекс	Найменування доріг	Адреса		Всього доріг, км
		з км,+	по км,+	
1	2	3	4	5
Міжнародні автомобільних доріг загального користування державного значення				
М-13	**Кропивницький – Платонове (на м. Кишинів), км 76+432 – км 157+067**	**76,432**	**157,216**	**80,635**
М-14	**Одеса – Мелітополь – Новоазовськ (на м. Таганрог), км 55+550 – км 177+531**	**55,550**	**177,531**	**118,870**
	РАЗОМ:			**199,5**
Національні автомобільних доріг загального користування державного значення				
Н-11	**Дніпро – Миколаїв (через м. Кривий Ріг), км 179+570 – км 329+535**	**179,570**	**329,535**	**139,800**
Н-14	**Олександрівка – Кропивницький - Миколаїв, км 153+196 – км 245+237**	**153,196**	**245,237**	**86,100**
Н-24	**Благовіщенське – Миколаїв (через м. Вознесенськ), км 43+580 – км 232+046**	**43,580**	**232,046**	**178,700**
	Під'їзд до Міжнародного аеропорту "Миколаїв", км 0+000 – км 2+223	**0,000**	**2,223**	**2,200**
	РАЗОМ:			**406,8**
Регіональні автомобільних доріг загального користування державного значення				
Р-55	**Одеса – Вознесенськ – Новий Буг, км 104+763 – км 238+504**	**104,763**	**238,504**	**133,100**
Р-75	**Контрольно-пропускний пункт "Тимкове" – Балта – Первомайськ – Доманівка – Олександрівка, км 83+275 – км 202+896**	**83,275**	**202,896**	**107,900**
Р-81	**Казанка – Снігурівка – Антонівка – /Р-47/, км 0+000 – км 126+604**	**0,000**	**126,604**	**126,600**
	РАЗОМ:			**367,6**
Територіальні автомобільних доріг загального користування державного значення				
Т-15-03	**Обхід м.Нової Одеси, км 0+000 – км 4+601, км 4+601 – км 13+818**	**0,000**	**13,800**	**13,800**
Т-15-04	**Первомайськ – Новоукраїнка, км 0+000 – км 29+246**	**0,000**	**29,246**	**27,900**
Т-15-06	**Миколаїв – Доманівка – Берізки, км 0+000 – км 174+475**	**0,000**	**147,475**	**174,500**
Т-15-07	**Миколаїв – Парутине – Очаків – база відпочинку "Чорноморка", км 0+000 – км 76+676**	**0,000**	**76,676**	**72,800**
Т-15-08	**Калинівка – Снігурівка, км 0+000 – км 44+826**	**0,000**	**44,862**	**44,800**
Т-15-10	**/Р-06/ – Арбузинка – Єланець – Нова Одеса, км 0+000 – км 115+594**	**0,000**	**115,594**	**115,600**
Т-15-13	**Нечаяне-Очаків, км 0+000 – км 36+900**	**0,000**	**36,900**	**36,900**
Т-15-15	**Федорівка – Рибаківка – база відпочинку "Лугове", км 0+000 – км 25+174**	**0,000**	**25,174**	**25,200**
	РАЗОМ:			**511,5**
	ВСЬОГО ПО ОБЛАСТІ:			**1485,4**

01.01.2018

Найменування областей і значення автомобільних доріг	Всього доріг, км	Всього твердого покриття, км	В тому числі по типах покриття (км)					% твердого покриття	Грунтові, км	Розподілення доріг з твердим покриттям по категоріях (км)					Середньозважене значення категорійності	Мости				Труби, шт.
			цементо-бетонні	асфальто-бетонні	чорні щебе	білі щебенені, гравійні	бруківки			I	II	III	IV	V		Всього мостів		в тому числі дерев'яних		
																шт.	пог.м	шт.	пог.м	
1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Миколаївська	4799,8	4785,7	98,5	1317,5	2205,4	1088,3	76,0	99,7	14,1	58,8	451,8	696,8	3578,3		3,6	257,0	6465,06			2487,0
у тому числі:																				
державного значення	1485,4	1485,4	90,5	810,2	582,2		2,5	100,0		57,8	428,9	589,9	408,8		2,9	98	3695,56			902,0
із них: міжнародні	199,5	199,5	81,9	117,6				100,0		12,8	104,8	81,9			2,3	16,0	1250,5			157,0
національні	406,8	406,8	2,2	401,4	3,2			100,0		45	228,3	119,1	14,4		2,3	25,0	577,48			346,0
регіональні	367,6	367,6	5,4	167,2	195			100,0			76,3	123,5	167,8		3,2	27,0	1141,59			191,0
територіальні	511,5	511,5	1	124	384		2,5	100,0			19,5	265,4	226,6		3,4	30,0	725,96			208,0
місцевого значення	3314,4	3300,3	8,0	507,3	1623,2	1088,3	73,5	99,6	14,1	1,0	22,9	106,9	3169,5		4,0	159	2769,50			1585,0
із них:обласні	2669,4	2667,7	8,0	424,7	1368,6	799,4	67	99,9	1,7	1,0	22,9	106,9	2536,9		3,9	144,0	2619,5			1226,0
районні	645,0	632,6		82,6	254,6	288,9	6,5	98,1	12,4				632,6		4,0	15,0	150,0			359,0

Перелік видів робіт на мостах та шляхопроводах

на 01.05.2018

Експлуатаційне утримання					
Автомобільна дорога				Одиниця виміру	Обсяг робіт
індекс	адресна прив'язка км + м	км + м	Найменування робіт		
Автомобільні дороги державного значення					
М-14 сандора серпень	Одеса-Мелітополь-Новоазовськ (на м. Таганрог) 159+811 шляхопровід		фарбування металевого перильного огородження	10 м	10,4
міст через р. Інгул	157+266		холодне фрезерування покриття	1000 кв. м	1813
			влаштування вирівнюючого шару	100 т	1,0008
			влаштування асфальтобетонного покриття	1000 кв. м	1813
міст через р. Інгул листопад	157+266		холодне фрезерування покриття	1000 кв. м	2314
			влаштування вирівнюючого шару	100 т	1,1107
			влаштування асфальтобетонного покриття	1000 кв. м	2314
міст через р. Інгул грудень	157+266		холодне фрезерування покриття	1000 кв. м	0,05
			ямковий ремонт	1 кв. м	50
Н-24	Благовіщенське-Миколаїв (через м.Вознесенськ)				
	75+673		очищення отворів від бруду та наносів	1 м споруди	
			розбирання щебеневих покриттів та основ	100 куб. м	0,0126
			демонтаж блоків і плит стрічкових фундаментів	100 шт.	0,09
			укладання блоків і плит стрічкових фундаментів	100 шт.	0,09
			монтаж металевого покриття пішохідної доріжки	1 т	1,21
			влаштування металевого бар'єрного огородження	100 м	0,048
Н-24	Благовіщенське-Миколаїв (через м.Вознесенськ)				
червень	185+139		демонтаж огородження	100 м	0,18
			ремонт металевого бар'єрного огородження	1 м	62,9
			влаштування огородження	100 м	0,26
			ремонт металевих перил	10 м	4,7
			виготовлення та встановлення перильного огородження	1 т	1,615
липень	185+139		монтаж опорних конструкцій	1 т	3,8
			рихтування підкранових балок	1 вузол	2
			виготовлення гратчастих конструкцій	1 т	0,4
			грунтування металевих поверхонь	100 кв. м	0,072
			фарбування металевих поверхонь	100 кв. м	0,072
Р-55	Одеса-Вознесенськ-Новий Буг				
липень	162+933		улаштування піщано-щебеневих подушок під фунд-ти	100 куб. м	0,0625
			оштукатурювання бутової кладки опор моста	кв. м	4
			ремонт бутової кладки стін окремими місцями	куб. м	3
			приготування цементобетонної суміші	куб. м	1,14
			розробка грунту з переміщенням ручними візками	куб. м	24,5
			очищення отворів труб та мостів від бруду та наносів	1 м споруди	49
липень	162+933		очищення підмостового русла від кущів, очерету та трави	10 кв. м	20
			очищення отворів труб та мостів від бруду та наносів	1 м споруди	140
			встановлення та заміна дорожніх знаків	1 знак	15
грудень	225,442		ямковий ремонт а/б покриття без разламування	1 кв. м	267
			ущільнення віброплитою	1 кв. м	54
			влаштування вирівнювального шару	100 т	1,3875
			ущільнення котками	1000 кв. м	1,4592
грудень	225,442		ямковий ремонт а/б покриття без разламування	1 кв. м	77
			відновлення деформаційного шву	1 м шва	77
			очищення водовідних канав	1 м канави	20
			навантаження матеріалів та перевезення сміття	1 т	5,2
			ущільнення котками	1000 кв. м	
Р-75	КПП "Тимкове"-Балта-Первомайськ-Доманівка-Олександрівка				
вересень	84+883		очищення від бруду елементів моста	кв. м	144
			очищення отворів труб та мостів від бруду та наносів	1 м споруди	31
			очищення підмостового русла	10 кв. м	20
			очищення від наносів русел малих мостів та труб	10 кв. м	12
			розробка грунту з переміщенням візками	1 куб. м	20
			відкидання грунту	куб. м	10
липень	184,822		очищення отворів від бруду елементів моста вручну	1 кв. м	29
			приготування цементного розчину	1 куб. м	2,78
			ремонт бутової кладки стін	куб. м	7
			оштукатурювання бутової кладки оголовків	1 кв. м	72
			ремонт пошкодженої штукатурки труби	1 кв. м	

Автомобільна дорога			Найменування робіт	Одиниця виміру	Обсяг робіт
індекс	адресна прив'язка км + м	км − м			
			ремонт металевих перил	10 м	0,6
			ремонт залізобетонного бруса висотою 60 см	1 м бруса	24
			розробка грунту з переміщенням	1 куб. м	15
			перенесення матеріалів на носилках	1 т	
			навантаження матеріалів та перевезення трактором	1 т	9,8
Р-81	Казанка-Снігурівка-Антонівка-(Р-47)				
листопад	62+572		очищення від наносів русел малих мостів та труб	10 кв. м	39
			очищення підмостового русла	10 кв. м	52
Т-15-04	Первомайськ-Новоукраїнка,				
	6+100		очищення підмостового русла	10 кв. м	36
Т-15-06	Миколаїв-Доманівка-Берізки				
серпень	15+428		установлення стальних сварних поручнів	т	0,8
			фарбування металевого бруса	пм	48
			фарбування металевого перильного огородження	10 м	2,4
Поточний ремонт					
Т-15-08 Калинівка-Снігурівка					
	2+456		Влаштування перильного металевого огородження	100м	0,21
			Фарбування металевого перильного огородження	10м	8,4
			Улаштування заповненого деформаційного шва спряження прогонових конструкцій	100м	0,2
			Ремонт покриття дорожнього одягу ЩМА	м.кв.	460
	20+105		Улаштування заповненого деформаційного шва спряження прогонових конструкцій	1м	14,9
			Ремонт покриття дорожнього одягу ЩМА	м.кв.	230
	36+520		Влаштування захисного шару залізобетонних прогонових конструкцій	1 кв. м	4,2
			Мурування	1 куб. м	0,126
			Улаштування заповненого деформаційного шва спряження прогонових конструкцій	1м	14,9
			Фарбування металевого перильного огородження	10м	8,54
Н-11 Дніпро – Миколаїв (через м. Кривий Ріг)					
	198+443		Ремонт покриття дорожнього одягу ЩМА	м.кв.	154
	199+333		Ремонт покриття дорожнього одягу ЩМА	м.кв.	288

129/04-06
19.01.2018

На № 7.1-8-1672 від 05.12.2017

АВТОМОБІЛЬНИХ ДОРІГ УКРАЇНИ
СЛУЖБА АВТОМОБІЛЬНИХ ДОРІГ
У МИКОЛАЇВСЬКІЙ ОБЛАСТІ
54029, м. Миколаїв,
вул. Галини Петрової, 2-А

129 /04-06 від 19.01.2018

ІНФОРМАЦІЯ

про середньорічну добову інтенсивність руху дорожніх транспортних засобів на автомобільних дорогах державного значення в межах Миколаївської області у 2017 році

Індекс дороги	Місце визначення інтенсивності руху, км	Назва ділянки				Середньорічна добова інтенсивність дорожніх транспортних засобів по типах транспортних засобів										
		Від		До		Легкові	Мікро-автобуси	Автобуси середні	Автобуси важкі	Вантажні легкі	Вантажні середні	Вантажні важкі	Автопоїзди		Мотоцикли та інші ТЗ	Разом
													Тягачі з напівпричепом	Тягачі з причепом		
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
М-13	99	76	432	100	310	322	21	0	0	74	11	42	46	108	0	624
	102	100	310	115	482	416	0	0	0	169	32	21	46	33	0	717
	116	115	482	142	949	763	0	9	0	44	44	9	21	38	0	928
	144	142	949	157	067	766	18	0	0	62	53	27	34	15	0	975
М-14	74	55	550	75	040	4927	246	123	37	642	198	359	1421	155	0	8 108
	81	75	040	82	330	7295	208	104	62	633	151	350	1394	280	0	10 475
	83	82	330	105	009	4882	179	94	37	548	132	321	1408	342	0	7 943
	124	105	009	125	191	5685	182	143	62	792	234	364	1964	215	0	9 639
	126	125	191	126	892	9749	494	227	32	1000	325	507	2034	223	0	14 591
	146	142	827	146	786	2415	52	0	8	589	123	343	1140	121	0	4 791
	148	146	786	159	006	3496	19	0	8	848	188	401	1266	270	0	6 496
	162	159	006	163	313	4058	52	17	8	943	314	620	1852	494	0	8 358
	175	163	313	177	531	5179	148	159	58	1692	434	751	1243	571	0	10 235
	Підїзд до м.Миколаїв															
	1	0	0	4	900	4288	169	222	57	1153	349	476	684	305	0	7 703
Н-11	196	179	570	198	522	366	0	18	0	45	45	36	58	63	0	631
	224	198	522	224	642	1033	0	9	0	63	36	54	164	63	0	1 422
	230	224	642	246	597	962	25	8	0	221	57	148	134	63	0	1 618
	259	246	597	260	139	1152	15	15	0	95	66	44	85	80	0	1 552
	267	260	139	290	180	1225	58	22	0	146	44	15	74	29	0	1 613
	304	290	180	308	713	2652	322	61	0	375	54	84	202	110	0	3 860
	310	308	713	315	639	7480	467	191	16	827	168	352	333	271	0	10 105
	317	315	639	319	355	11124	570	78	0	1210	303	519	723	253	0	14 780
Н-14	161	153	196	162	331	773	0	0	0	124	46	15	175	58	0	1 191
	163	162	331	217	300	765	8	8	0	108	23	8	132	26	0	1 078
	235	217	300	235	559	1539	22	0	0	332	96	52	222	72	0	2 335
	236	235	559	239	273	2214	53	0	0	387	114	106	125	0	0	2 999
Н-24	62	43	580	65	0	3754	74	18	33	582	185	259	1145	84	0	6 134
	84	65	0	85	545	3630	72	36	53	718	129	237	848	46	0	5 769
	86	85	545	91	650	3814	57	22	66	718	136	273	928	133	0	6 147
	103	91	650	104	533	3656	50	33	23	713	232	257	947	104	0	6 015
	106	104	533	111	204	5066	66	58	23	812	265	240	935	109	0	7 574
	116	114	843	127	760	3505	124	41	35	762	182	265	830	92	0	5 836
	130	127	760	143	340	5085	134	134	40	995	297	526	1011	149	0	8 371
	147	143	340	161	817	4920	164	89	62	811	231	298	1064	89	0	7 728
	180	161	817	188	867	3701	151	70	32	623	131	342	1064	115	0	6 229
	195	188	867	210	798	5938	272	112	25	625	136	296	1207	109	0	8 720
	220	210	798	222	667	5683	265	101	26	890	158	423	1355	171	0	9 072
	223	222	667	225	844	5590	265	101	17	574	120	328	1143	137	0	8 275

Індекс дороги	Місце визначення інтенсивності руху, км	Назва ділянки				Середньорічна добова інтенсивність дорожніх транспортних засобів по типах транспортних засобів										
		Від		До		Легкові	Мікро-автобуси	Автобуси середні	Автобуси важкі	Вантажні легкі	Вантажні середні	Вантажні важкі	Автопоїзди		Мотоцикли та інші ТЗ	Разом
													Тягачі з напівпричепом	Тягачі з причепом		
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
Р-55	115	104	763	120	904	657	9	0	0	60	51	68	67	50	0	**962**
	142	120	904	144	503	1290	52	22	0	112	22	97	176	33	0	**1 804**
	148	145	127	186	050	868	9	9	0	188	68	26	29	10	0	**1 207**
	205	186	050	205	440	478	7	7	0	22	15	7	33	34	0	**603**
	206	205	440	220	080	487	7	7	0	22	7	15	33	11	0	**589**
	234	220	080	238	504	907	22	7	0	117	22	124	56	50	0	**1 305**
Р-75	84	83	275	85	790	1767	15	7	11	177	44	66	96	45	0	**2 228**
	101	85	790	101	915	1364	31	15	11	193	85	93	110	37	0	**1 939**
	118	101	915	124	500	1911	38	38	11	248	98	98	110	11	0	**2 563**
	140	131	186	141	130	2171	9	55	0	137	55	46	47	12	0	**2 532**
	142	141	130	176	326	1297	9	37	0	119	18	9	36	18	0	**1 543**
	190	176	326	198	051	638	28	0	0	139	83	74	86	47	0	**1 095**

В.о. начальника
Служби автомобільних доріг
у Миколаївській області А.В. Крістенко

Начальник відділу з ремонту та експлуатаційного утримання автодоріг та штучних споруд, організації та безпеки дорожнього руху Д.В. Блошенко

Виконавець: В.О. Мачко
(0512)564127

A1-10

Видатки державного бюджету на фінансування бюджетних програм Укравтодору (з урахуванням кредитних коштів) за 2014-2018 роки

тис. грн

Джерела фінансування та найменування бюджетних програм		Факт за 2014 рік	Факт за 2015 рік	Факт за 2016 рік	Факт за 2017 рік	План на 2018 рік
	Доходи всього	**17 672 766,5**	**24 852 803,6**	**16 965 743,8**	**21 904 373,5**	**45 109 381,3**
602100	Залишки коштів спецфонду на початок року (акцизний податок та ввізне мито на нафтопродукти та транспортні засоби, плата за проїзд автодорогами)	736 380,0				
140200	Акцизний податок з вироблених в Україні підакцизних товарів (продукції) в частині нафтопродуктів і транспортних засобів *(спецфонд)*	1 948 340,4			2 394 198,0	5 469 625,0
140300	Акцизний податок з ввезених на митну територію України підакцизних товарів (продукції) в частині нафтопродуктів і транспортних засобів *(спецфонд)*	11 143 727,9			10 319 361,5	22 669 375,0
150105	Ввізне мито на нафтопродукти і транспортні засоби та шини до них *(спецфонд)*	1 092 313,4			1 422 780,5	3 142 600,0
221601	Плата за проїзд автомобільними дорогами транспортних засобів та інших самохідних машин і механізмів, вагові або габаритні параметри яких перевищують нормативні *(спецфонд)*	6 929,3			3 466,5	16 462,5
500801	Конфісковані кошти та кошти, отримані від реалізації майна, конфіскованого за рішенням суду за вчинення корупційного та пов'язаного з корупцією правопорушення				843 030,4	2 000 000,0
	Залишки запозичень, отриманих Укравтодором під гарантію Кабінету Міністрів України на розвиток мережі автодоріг загального користування	707 942,0	665 736,8	1 685 955,1	3 284 095,8	
	Запозичення у Міжнародних фінансових організацій, Урядів іноземних держав	2 027 438,1	1 943 273,1	1 874 923,8	1 739 345,7	5 378 000,0
	Загальний фонд державного бюджету	9 695,4	22 243 793,7	13 404 864,9	1 898 095,1	6 433 318,8
КПКВК	**Витрати всього**	**17 672 766,5**	**24 852 803,6**	**16 965 743,8**	**21 904 373,5**	**45 109 381,3**
3111010	Керівництво та управління у сфері будівництва, ремонту та утримання автомобільних доріг	9 695,4	10 419,9	11 182,0	45 366,7	56 673,1
3111020	Розвиток мережі та утримання автомобільних доріг загального користування, з них	3 462 719,1	4 553 889,2	9 376 057,0	13 292 717,1	10 726 159,3
	за рахунок коштів державного бюджету	*2 754 777,1*	*3 888 152,4*	*7 690 107,9*	*10 008 621,3*	*10 726 159,3*
	за рахунок залишку запозичень, залучених під гарантію Кабінету Міністрів України	*707 942,0*	*665 736,8*	*1 685 955,1*	*3 284 095,8*	
3111030	Виконання боргових зобов'язань за кредитами, отриманими під гарантію Кабінету Міністрів України на розвиток мережі автомобільних доріг загального користування*	10 777 342,3	17 646 099,2	5 535 048,5	4 902 542,0	6 041 038,0
	в тому числі: погашення боргу	*7 808 554,6*	*14 791 107,8*	*3 996 924,9*	*3 661 046,9*	*4 618 978,2*
	обслуговування боргу	*2 970 597,7*	*2 854 991,4*	*1 538 123,6*	*1 241 495,1*	*1 422 059,8*
3111040	Будівництво мостового переходу у м.Запоріжжя				71 673,5	
3111090	Розвиток дорожнього господарства областей української частини Карпатського єврорегіону (зокрема доріг Мукачеве – Львів, Татарів – Кам'янець-Подільський, Стрий-Мамалига)		699 122,2			
3111800	Реалізація державного інвестиційного проекту Покращення стану автомобільних доріг загального користування у Львівській області			168 532,5	259 558,8	357 645,7
3111820	Розвиток автомобільної дороги Р-52 Дніпропетровськ-Царичанка-Кобеляки-Решетилівка				348 116,3	
3111600	Розвиток автомагістралей та реформа дорожнього сектору	*2 027 438,1*	1 943 273,1	1 874 923,8	1 739 345,7	5 208 000,0
3111610	Розбудова прикордонної дорожньої інфраструктури на українсько-польському кордоні					50 000,0
3111620	Розбудова прикордонної дорожньої інфраструктури на українсько-угорському державному кордоні					120 000,0
3111100	Покращення стану автомобільних доріг загального користування за маршрутом Львів – Тернопіль – Умань; Біла Церква – Одеса – Миколаїв				800 000,0	4 000 000,0
3111120	Покращення стану автомобільної дороги загального користування державного значення М-03 Київ-Харків-Довжанський на ділянці Чугуїв-Ізюм-Слов'янськ				199 471,5	2 000 000,0
3111130	Покращення стану автомобільних доріг загального користування за маршрутом Харків-Куп'янськ-Сватове-Станиця Луганська				245 581,8	
3111140	Покращення стану автомобільної дороги Н-31 Дніпро - Царичанка - Кобеляки - Решетилівка					2 000 000,0
3111150	Покращення стану автомобільної дороги Харків - Охтирка					2 000 000,0
3111160	Покращення стану автомобільної дороги Житомир - Чернівці					1 000 000,0
3131020	Субвенція з державного бюджету місцевим бюджетам на будівництво, реконструкцію, ремонт та утримання вулиць і доріг комунальної власності у населених пунктах	*1 395 571,6*				
3131090	Субвенція з державного бюджету місцевим бюджетам на фінансове забезпечення будівництва, реконструкції, ремонту і утримання автомобільних доріг загального користування місцевого значення, вулиць і доріг комунальної власності у населених пунктах					11 530 865,2
3131200	Субвенція з державного бюджету обласному бюджету Херсонської області на будівництво шляхопроводу пс просп. Адмірала Сенявіна – вул. Залаегерсег у м. Херсоні					19 000,0

(Provisional translation)

Information

Within the framework of the mission to prepare for additional study on the project "Construction of a bridge crossing over the Pivdennyi Bug River in Mykolaiv", Ukravtodor provides the following information, within its competence, according to the list of issues and necessary information provided by the Japanese International Cooperation Agency (JICA)

1.Development plans presently in force (list of projects, scope of project, time schedule, etc).

1) State target economic program of the development of common use automobile roads of national importance for 2018-2022 years

2) The Concept of the State target economic program of the development of common use automobile roads of national importance for 2018-2022 years (http://zakon3.rada.gov.ua/laws/show/34-2018-%D1%80)

2.Authority of Ukravtodor

Regulation on the State Automobile Roads Agency of Ukraine (http://zakon2.rada.gov.ua/laws/show/439-2014-%D0%BF)

3.Maintenance program

The Concept of the State target economic program of the Development of common use automobile roads of national importance for 2018-2022 (http://zakon3.rada.gov.ua/laws/show/34-2018-%D1%80)

4.Road development plans presently in force

The Concept of the State target economic program of the Development of common use automobile roads of national importance for 2018-2022 years (http://zakon3.rada.gov.ua/laws/show/34-2018-%D1%80)

Information related to the following issues:

Bridges and road inventory of Mykolaiv oblast (region). Location, category of road, length and type of road surface, condition, etc.

Construction and maintenance records of Mykolaiv oblast by region, by type of construction and maintenance, length, etc.Past 5 years.

List of major rehabilitation works for bridges in the past

Project approval procedures

1) The expiration date of the F/S result approved in 2013

2) Procedures for changing and reapproving the F/S result

3) Items other than F/S that are needed to be approved prior to the project commencement, their procedures and organizations concerned

The list of common use automobile roads of national importance was approved by the Resolution of Cabinet of Ministers of Ukraine dated September 16, 2015, No. 712 "On approval of the list of common use automobile roads of national importance" (in the revised edition of the Decree of the Cabinet of Ministers of Ukraine dated August 9, 2017, No. 654).

The length of automobile roads of national importance in Mykolaiv oblast is 1 485, 4 km, in particular international - 199,5 km, national– 406,8 km, regional – 367,6 km, territorial – 511,5 km, the list is attached.

98 bridges and crossovers with a total length of 3695.56 running meters are registered on automobile roads of common use of national importance.

As on 01.01.2018, a survey of the technical condition of 71 constructions was conducted with adding the information into the AESUM (Analytical expert system of bridges management) database.

Due to the decentralization reform, dated 01.01.2018, according to the current legislation (Laws of Ukraine dated 17.11.2016, No. 1762-VIII, 1763-VIII, 1764-VIII), automobile roads of common use of local importance were passed from the Ukravtodor management to the Regional State Administrations management, in accordance with the order of the Head of Mykolaiv Regional State Administration dated

January 1, 2017, No. 499-r, automobile roads of common use of local imortance with the length of 3314.4 km, including regional - 2 669.4 km, district - 645 km were passed from the balance of the Automobile Roads Service of Mykolayiv oblast to the balance of Mykolaiv Regional State Administration.

159 bridges and crossovers with the total length of 2769.5 km are registered on automobile roads of common use of local importance.

Information on the type of road surfaces, categorical and artificial constructions in Mykolaiv oblast is provided in the appendix.

According to the Road Service in Mykolayiv oblast, construction, rehabilitation works for bridges and overpasses for the last 5 years have not been carried out, the information on the work execution on the maintenance of bridges and overpasses in the Mykolayiv region is provided in the appendix.

As for the project approval procedure, in particular, the expiration date of the F/S result approved in 2013, and procedures for changing and reapproving the F/S result and the issues other than F/S that are needed to be approved prior to the project commencement, their procedures and organizations concerned.

In accordance with the Resolution of the Cabinet of Ministers of Ukraine dated May 11, 2011 No. 560 "On Approval of the Construction Projects Approval Procedure, Examination and Invalidation Recognition, of the Cabinet of Ministers of Ukraine" (as amended), construction projects in two- and three-stage design are approved at the stage of the project and working draft and authorized at the stage of F/S by the Cabinet of Ministers of Ukraine.

On the basis of a substantiated request, approved by the Ministry of Regional Development, the Ministry of Economic Development and the Ministry of Finance, the Cabinet of Ministers of Ukraine may take a decision on approval of the construction project in the order determined in the F/S (F/S of a project, draft design) approved in accordance with the established procedure.

Amendments to approved (authorized) construction projects are made on the basis of the design task.

The approval and reapproval of the construction projects are carried out in accordance with the established approval procedure.

Appendix:

- a list of roads of common use of national importance in Mykolaiv oblast and data on the type of road surfaces, categorical and artificial constructions in Mykolaiv region on 2 sheets.
- work performance information on the maintenance of bridges and overpasses in Mykolaiv oblast on 2 sheets.

Daily traffic volumes on main roads by vehicle type

Statistic data on the traffic volumes on main roads by vehicle type within the limits of Mykolaiv oblast in 2017 is given in the annexes.

Appendix:

Data on the annual traffic volumes on main roads by vehicle type within the limits of Mykolaiv oblast in 2017 on 2 sheets.

7. Annual budget and expenditure, including maintenance cost of Ukravtodor. Past 5 years.

Information on expenditures of the state budget for the financing of Ukravtodor budget programs for 2014-2018 is provided in the appendixes.

Appendix: state budget expenditure for the financing of Ukravtodor programs (including credit funds) for 2014 - 2018 years on 1 sheet.

[31/May/2018, Recommendations of Ukravtodor to JICA Regarding the Project, Ukravtodor]

ДЕРЖАВНЕ АГЕНТСТВО АВТОМОБІЛЬНИХ ДОРІГ УКРАЇНИ
(УКРАВТОДОР)

вул. Фізкультури, 9, м. Київ, 03150
Тел.: (044) 287-24-05, 287-24-49, факс: 287-42-18
E-mail: kae@ukravtodor.gov.ua
Web: http:// www.ukravtodor.gov.ua
Код ЄДРПОУ 37641918

31.05.2018 № 1437/3/19.1-13

На № _____ від _____

Японське агентство міжнародного співробітництва (JICA)

В рамках місії JICA з підготовки до проведення додаткового вивчення за проектом «Будівництво мостового переходу через р. Південний Буг в м. Миколаєві, Миколаївська область» Державне агентство автомобільних доріг України (Укравтодор), в межах своєї компетенції, надає інформацію щодо можливості зміни техніко-економічного обґрунтування вищевказаного об'єкту.

Додатки: згадане на 8 арк.

В. о. заступника Голови О. ХАРЧЕНКО

071775

Маліченко Ірина
287 52 00

Рекомендації Укравтодору делегації агентства Джайка щодо можливості зміни техніко-економічного обґрунтування об'єкту «Будівництво мостового переходу через р. Південний Буг в м. Миколаєві, Миколаївська область»

Відповідно техніко-економічного обґрунтування об'єкту «Будівництво мостового переходу через р. Південний Буг в м. Миколаєві, Миколаївська область», схваленого розпорядженням Кабінету Міністрів України від 11.07.2013 № 511-р, розробленого ПАТ «Київсоюзшляхпроект» та рекомендованого до схвалення державним підприємством «Укрдержбудекспертиза», Міністерства регіонального розвитку, будівництва та житлово-комунального господарства, з такими основними техніко-економічними показниками:

- категорія дороги – І-б
- довжина ділянки, кілометрів – 13,2
- у тому числі мостового переходу – 2,05
- ширина земляного полотна, метрів – 28,8
- ширина проїзної частини, метрів – 2 х 7,5
- тип покриття – щебенево-мастиковий асфальтобетон
- транспортні розв'язки, одиниць – 9

у тому числі:
на різних рівнях – 2
у місцях перетину із залізничними коліями – 2

- загальна кошторисна вартість будівництва в поточних цінах станом на 22 лютого 2013 р., тис. гривень. – 3509217,057

У тому числі:
Будівельно-монтажних робіт – 2745184,234

Відповідно до Державних будівельних норм України ДБН В.2.3-4:2015 частини І Проектування, розділу 4 Загальні положення, пункту 4.3 Габарити засобів і навантаження, підпункту 4.3.3 При розрахунках стійкості насипів земляного полотна та підпірних стінок тип навантаження приймається згідно з вимогами ДБН В.1.2-15 в залежності від технічної класифікації автомобільних доріг: НК-100 – на автомобільних дорогах І - ІІІ категорій, НК-80 – на автомобільних дорогах IV і V категорій.

4.3.4 При проектуванні дорожнього одягу для автомобільних доріг, на яких у складі транспортних потоків очікується понад 15 % великовантажних транспортних засобів, параметри навантаження від яких перевищують розрахункові параметри навантаження згідно 4.3.2 (зерновозів, контейнеровозів, рефрижераторів тощо) за навантаження від розрахункового автомобіля призначають навантаження від найважчого транспортного засобу, систематична експлуатація якого прогнозується на даному об'єкті, і на таких дорогах необхідно передбачати лише жорсткий дорожній одяг.

Відповідно до пункту 4.4 Обґрунтування проектних рішень, підпункту 4.4.1 Траса автомобільної дороги повинна прокладатись з урахуванням відповідної містобудівної документації:

- генеральної схеми планування території України;
- схеми планування території Автономної Республіки Крим;
- схеми планування територій областей, районів, їх окремих територій, які мають регіональне значення;
- генеральних планів або планів зонування територій населених пунктів;
- детальних планів територій.

4.4.2 При прийнятті проектних рішень необхідно враховувати результати громадських слухань в межах вимог чинних нормативних документів при відповідному техніко-економічному розрахунку.

4.4.3 Технічні рішення при проектуванні автомобільних доріг повинні забезпечувати високі транспортно-експлуатаційні показники дороги, охорону навколишнього середовища, безпеку дорожнього руху за мінімально можливих матеріальних та фінансових витратах.

4.4.4 Для прийняття оптимальних проектних рішень щодо прокладання дороги необхідно розробляти альтернативні варіанти траси дороги з порівнянням за такими техніко-економічними показниками:

- показники плану траси дороги: протяжність, коефіцієнт розвитку траси, найменший радіус кривої;
- показники профілю: протяжність ділянок з поздовжніми похилами, що дорівнюють або перевищують гранично допустимі, мінімальні радіуси опуклої та увігнутої вертикальних кривих;
- кількість перетинів залізниць в одному рівні;
- протяжність ділянок, які проходять у межах населених пунктів;
- площа вилучення земельних угідь;
- вартість втрат сільськогосподарського та лісогосподарського виробництв;
- показники коефіцієнтів безпеки та аварійності;
- час проїзду автомобіля в прямому та зворотному напрямках;
- витрати на утримання дороги;
- загальна вартість будівництва;
- термін окупність інвестицій.

Головним критерієм вибору оптимального варіанту траси є мінімальний термін окупності інвестицій, з урахуванням забезпечення пріоритетності вимог екологічної безпеки, обов’язковості дотримання екологічних стандартів та нормативів, за рівних показників безпеки дорожнього руху. Решта показників є допоміжними.

4.4.5 При розробленні проектів на будівництво автомобільних доріг державного значення та доріг місцевого значення ІІІ категорії і вище, траси цих доріг, як правило, необхідно прокладати в обхід населених пунктів. При реконструкції зазначених доріг рішення про прокладання траси необхідно приймати на основі ТЕО. У разі проходження ділянок доріг у межах населених

пунктів у проектах на реконструкцію необхідно передбачати заходи щодо забезпечення санітарних норм, безпеки для руху пішоходів, прогону тварин, руху місцевого та гужового транспорту з урахуванням вимог ДСП № 173.

4.4.6 Якщо автомобільна дорога проходить через населені пункти, її необхідно проектувати відповідно до даних норм з врахуванням допустимої швидкості руху. За відсутності вимог до окремих елементів або складових дороги в цих нормах, а також за відповідного обґрунтування допускається проектувати їх згідно з вимогами ДБН 360, ДБН В.2.3-5 та ДБН В.2.5-28.

Відповідно до розділу 5 Проектування основних елементів автомобільних доріг, пункту 5.1 Поперечний профіль, підпункту 5.1.1 Основні параметри поперечного профілю автомобільних доріг залежно від їх категорії необхідно призначати згідно з табл. 5.1. Дороги з трьома смугами руху проектуються згідно з вимогами національних стандартів. При відповідному техніко-економічному обґрунтуванні параметри автомобільних доріг можна збільшувати.

5.1.2 Ширина розділювальної смуги повинна бути достатньою для влаштування перехідно-швидкісної смуги для лівого повороту, наземного пішохідного переходу, опори мосту тощо. Якщо відстань між такими місцями (ділянками) менше ніж 0,5 км то ширина розділювальної смуги не зменшується до параметрів, визначених у табл. 5.1. При відповідному обґрунтуванні довжина такої смуги може бути збільшена.

5.1.3 Ширина смуг безпеки на мостах (довжиною до 100 м включно) з боку узбіччя приймається рівною ширині зупиночної смуги (при її наявності), а за її відсутності 1,0 м або за відповідним ТЕО. Ширина смуг безпеки з боку узбіччя на мостах довжиною понад 100 м приймається 1,0 м або за відповідним ТЕО. Перехід до збільшеної (зменшеної) ширини виконується аналогічно розділювальній смузі згідно вимог 5.1.23.

Таблиця 5.1 – Параметри поперечного профілю автомобільних доріг

Ч. ч.	**Показник**	**Одиниці вимірювання**	**Категорії доріг**					
			I-а	**I-б**	**II**	**III**	**IV**	**V**
1	Кількість смуг руху	шт.	4; 6; 8	4; 6	2	2	2	1
2	Ширина смуги руху	м	3,75	3,75	3,75	3,50	3,00	4,50
3	Ширина узбіччя, у тому числі:	«»	3,75	3,75	3,75	2,50	2,00	1,75
	- ширина зупиночної смуги разом з укріпленою смугою;	«»	2,50	2,50	2,50	-	-	-
	- ширина укріпленої смуги	«»	0,75	0,50	0,50	0,50	0,50	-
4	Ширина	«»	6,00	3,00	-	-	-	-

	розділювальної смуги							
5	Ширина укріпленої смуги на розділювальній смузі	«»	0,75	0,50	-	-	-	-

Примітка 1. При реконструкції існуючих автомобільних доріг І категорії ширину існуючої розділювальної смуги можна не змінювати.

Примітка 2. На дорогах V категорії з автобусним рухом ширину укріплених узбіч необхідно призначати по 0,75 м.

Примітка 3. При влаштуванні на розділювальній смузі дорожнього огородження першої групи ширину розділювальної смуги можна приймати рівною ширині огородження плюс ширина укріпленої смуги на розділювальній смузі з кожного боку огородження.

Примітка4. В населених пунктах, в яких діє обмеження швидкості до 60 км/год., дозволяється звужувати ширину смуги руху до 3,25 м з відповідно встановленими дорожніми знаками згідно з національними стандартами

5.1.4 Кількість смуг руху на дорогах І категорії необхідно призначати залежно від середньорічної, добової інтенсивності руху та рельєфу місцевості згідно з табл. 5.2.

Таблиця 5.2 – Кількість смуг руху залежно від інтенсивності руху

Рельєф місцевості	**Інтенсивність руху, привед. од/добу**	**Кількість смуг руху**
Рівнинний та горбистий	до 40000	4
	від 40000 до 80000	6
	понад 80000	8
Гірський	до 34000	4
	від 34000 до 70000	6
	понад 70000	8

5.1.5 Проїзну частину необхідно проектувати з двосхилим поперечним профілем на прямих ділянках доріг усіх категорій**.**

5.1.6 У випадках, коли проектування автомобільних доріг І-б категорії відбувається стадійно з будівництвом одного проїзду на першій стадії, проїзну частину необхідно влаштовувати з односхилим поперечним профілем.

За відповідного обґрунтування, при реконструкції доріг І-б категорії допускається залишати по існуючому проїзду двосхилий поперечний профіль з обов'язковим забезпеченням відводу води з проїзної частини та розділювальної смуги.

5.1.7 Поперечний похил проїзної частини, крім ділянок, на яких передбачається влаштування віражів, необхідно призначати залежно від матеріалу покриття дорожнього одягу. На дорогах з асфальтобетонним та цементобетонним покриттям поперечний похил проїзної частини необхідно

приймати 25 ‰, на гравійних та щебеневих покриттях - від 25 ‰ до 30 ‰ а на покриттях з ґрунтів, укріплених в'яжучими та місцевими матеріалами, а також на бруківках з колотого та брукованого каменю – від 30 ‰ до 40 ‰.

Відповідно до підпункту 5.1.19 На автомобільних дорогах І категорії а також на визначених і обґрунтованих проектом ділянках автомобільних доріг ІІ категорії необхідно влаштовувати зупиночні смуги завширшки 2,5 м. Конструкція дорожнього одягу на зупиночних та укріплених смугах приймається рівно-міцною із конструкцією по основному проїзду. Дорожній одяг на укріплених смугах з боку розділювальної смуги на дорогах І-б категорії може мати меншу міцність але бути капітального типу.

На укріплених (зупиночних) смугах покриття може відрізнятися від покриття проїзної частини кольором. Укріплені (зупиночні) смуги відділяються від проїзної частини суцільною лінією розмітки згідно з вимогами національних стандартів.

5.1.23 Перехід до зменшеної (збільшеної) ширини розділювальної смуги а також від поперечного профілю дороги І-б категорії до поперечного профілю дороги нижчої категорії необхідно передбачати з відгоном 1:100. В стислих умовах за відповідного обґрунтування допускається передбачати такий перехід з відгоном 1:50. У залежності від умов проходження дороги переходи можна влаштовувати як однобічні так і двобічні.

Відповідно до пункту 5.2 План і повздовжній профіль, підпункту 5.2.1 Трасу автомобільної дороги необхідно проектувати як плавну лінію у просторі з ув'язкою елементів плану, поздовжнього та поперечного профілів між собою, з навколишнім ландшафтом і з оцінкою їх впливу на умови руху та зорове сприйняття дороги.

5.2.2 Проектування плану і поздовжнього профілю автомобільної дороги необхідно виконувати виходячи з інтенсивності руху, умови забезпечення безпеки та комфортності руху транспортних засобів з урахуванням можливості реконструкції дороги за межею перспективного розрахункового періоду.

Для елементів плану та поздовжнього профілю основні параметри необхідно призначати такими:

- поздовжні похили до 30 ‰ ;
- відстань видимості за умови зупинки транспортного засобу – не менше ніж 450 м;
- радіуси кривих у плані – понад 3000 м;
- радіуси опуклих кривих у поздовжньому профілі – понад 70000 м;
- радіуси увігнутих кривих у поздовжньому профілі – понад 8000 м;
- довжину опуклих кривих у поздовжньому профілі – понад 300 м;

довжину увігнутих кривих у поздовжньому профілі – понад 100 м.

Відповідно до розділу 9 транспортні споруди, пункту 9.1 мости, водовідвідні труби та тунелі, підпункту 9.1.1 Мости та водовідвідні труби необхідно проектувати відповідно до ДБН В.1.2-15, ДБН В.2.3-14 та ДБН В.2.3-22.

9.1.2 При проектуванні нових і реконструкції існуючих мостів та

водовідвідних труб необхідно приймати рішення на підставі порівняння варіантів за техніко-економічними показниками (вартість, витрати матеріалів, строки будівництва і експлуатаційні витрати) з урахуванням прогнозованого строку служби окремих частин споруди.

9.1.3 Проектні рішення повинні забезпечувати:

- надійність і довговічність конструкцій, їх архітектурну виразність;
- мінімальний рівень негативного впливу споруди на навколишнє середовище;
- зручність і економічність утримання та ремонту.

Відповідно до ДБН В.2.3-22 розділу 5 Габарити, пункту 7.1 Габарити наближення конструкцій мостів на автомобільних дорогах загального користування, а також на вулицях та дорогах населених пунктів призначаються згідно з обов'язковим додатком В, який встановлює габарити наближення конструкцій мостів – граничні поперечні контури (в площині перпендикулярній до осі проїзду), в середину яких не повинні заходити будь-які елементи споруди або розташоване на ній устаткування.

Параметри габаритів мостів на автомобільних дорогах загального користування надані в таблиці В.2.

Таблиця В.2

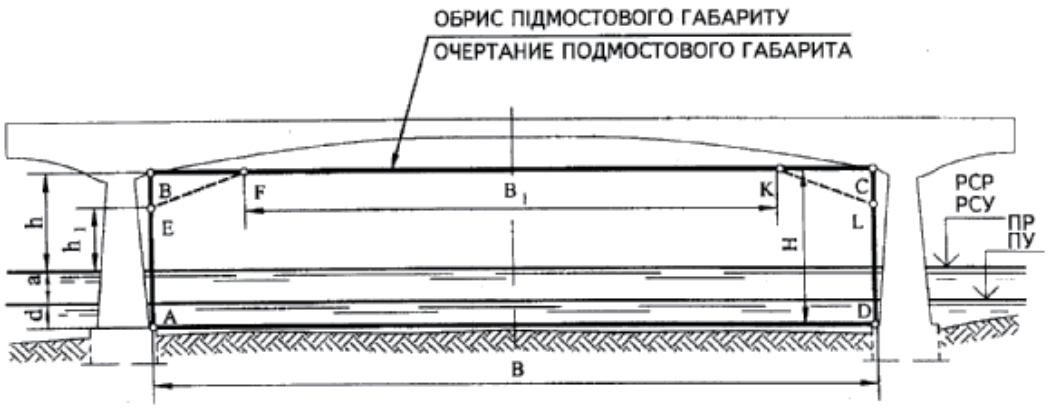
Мости на автомобільних дорогах загального користування							
Категорія дороги (відповідно до ДБН В.2.3-4)	Кількість смуг руху в обох напрямках n, шт.	Кількість проїзних частин, шт.	Ширина смуги руху b, м	Ширина проїзних частин n × b, м	Ширина смуг безпеки, м		Відстань між огорожами безпеки Г, м
					правої sr	лівої sl	
Іа	8	2	3,75	15,00	2,0	1,0	18,00
	6			11,25			14,25
	4			7,50			10,50
Іб	6	2	3,75	11,25	2,0	1,0	14,25
	4			7,50			10,50
II	2	2	3,75	7,50	2,0	1,0	10,50
III	2	2	3,50	7,00	1,5	1,0	9,50
IV	2	1	3,50	7,00	1,0	1,0	9,50
V	1	1	4,50	4,50	0,5	0,5	5,50

5.2 Ширину тротуарів на автодорожніх, міських та пішохідних мостах, у тунелях, на сходах і пандусах слід приймати в залежності від розрахункової інтенсивності руху пішоходів у годину „пік". Максимальну (середньодобову) пропускну здатність однієї смуги завширшки 1м слід приймати:

- для тунелів – 1000 (750) пішоходів/год;
- для тротуарів і мостів – 2000 (1500) пішоходів/год;

- для сходів – 1500 (1250) та пандусів – 1750 (1350) пішоходів/год.

На автодорожніх мостах поза населеними пунктами мають бути передбачені службові проходи.



ОВНС виконується у відповідності до вимог Закону України «Про оцінку впливу на довкілля» від 23.05.2017р. № 2059-VIII.

Укравтодор рекомендує враховувати вимоги зазначених нормативних документів при проектуванні мостового переходу в межах схваленого розпорядженням Кабінету Міністрів України від 11.07.2013 № 511-р техніко-економічного обґрунтування об’єкту «Будівництво мостового переходу через р. Південний Буг в м. Миколаєві, Миколаївська область» та провести консультації з проектним інститутом ДП «Укрдіпродор» та органами місцевої виконавчої влади Миколаївської області та м. Миколаїв.

Recommendations of Ukravtodor (Ukrainian Traffic Infrastructure Administration) to JICA Delegation Regarding the Possible Amendments to the Feasibility Study on "Construction of a Bridge Crossing over Iuzhnyi Buh River in Mykolaiv, Mykolaiv Region".

According to the Feasibility Study for the object called "Construction of a Bridge Crossing over Iuzhnyi Buh River in Mykolaiv, Mykolaiv Region" that has been approved by the Instruction of the Cabinet of Ministers of Ukraine # 511-r dated July 11th, 2013, developed by Public Joint Stock Company "Kyivsoiuzshliakhproekt" and recommended for approval by the state enterprise "Ukrderzhbudekspertyza", Ministry of Regional Development, Construction, Housing and Utility Services, the object has the following principal technological and economic properties:

Road category	– I-b (I-б)
Interval length, kilometers, including the bridge crossing	– 13.2
Roadbed width, meters	– 28.8
Roadway width, meters	– 2 x 7.5
Surface type	Gravel-mastic asphalt concrete
Road interchanges, units	– 9
Including:	
Multilevel interchanges	– 2
Railway crossings	– 2
Total budgeted construction cost based on then-current prices as of February 22nd, 2013, UAH thousand.	– 3,509,217.057
Including:	
Construction and assembly works	– 2,745,184.234

According to the State Road Construction Requirements BDN V.2.3-4:2015 (ДБН В.2.3-4:2015), Part 1 "Project Development", Section 4 "General provisions", provision 4.3 "Dimensions of Vehicles and Loads", sub-provision 4.3.3, during calculation of earth fill and supporting walls durability, the corresponding load type is considered as standard under the DBN V.1.2-15 (ДБН В.1.2-15) requirements, depending on the road technical classification: NK-100 (НК-100) – for category I - III roads, NK-80 (НК-80) – for category IV and V roads.

4.3.4 During design of road surface topping for roads where over 15% of anticipated traffic is expected to exceed the load calculation parameters stipulated in 4.3.2 (grain, container and refrigerator trucks, etc.), the load from the heaviest vehicle planned to be systematically driven on the road is considered as the load from the standard vehicle; for such roadways, only rigid road surface topping should be designed.

According to provision 4.4 “Justification of design choices”, sub-provision 4.4.1, the following urban planning documentation should be taken into account during motor road design:

- General Plan of the Territory of Ukraine;
- Territory plans of the Autonomous Republic of Crimea;
- Territory plans for regions, districts and their particular areas of regional importance;
- General plans or zoning plans of urban areas;
- Detailed territory plans.

4.4.2 During design, it is necessary to consider the results of public hearings within the framework of valid regulations and conduct the corresponding technological and economic calculations.

4.4.3 Technological choices made during road design should ensure high transportation and operation indicators as well as environmental and traffic safety at the minimum material and financial cost.

4.4.4 To ensure rationality of design choices during road design, alternative designs should be developed and compared by the following technological and economic indicators:

- Road horizontal alignment indicators: length, ratio of actual road length to the distance between the connected points, minimum curve radius;
- Cross-section indicators: length of intervals with longitudinal slopes that equal or exceed maximum limits, minimum peak curve and inverted vertical curve;
- Number of railway grade crossings;
- Length of intervals within urban areas;
- Area of land seizure;
- Amount of loss in agriculture and forestry;
- Safety coefficient and accident rate;
- Roadway maintenance expenses;
- Total construction cost;
- Investment payback period.

The primary criterion for selection of the optimal roadway design is minimum payback period, provided that the selected design meets high priority requirements such as ecological safety, observation of ecology standards and guidelines, as well as ensures equal traffic safety indicators. Other indicators are supplementary.

4.4.5 Normally, roads of national importance and category III and higher roads of local importance should be planned to be constructed outside urban areas. During reconstruction of the mentioned types of roads, the decision on road construction should be based on a feasibility study. If the reconstructed roads have intervals within urban areas, the reconstruction projects should provide for measures to meet sanitary standards, ensure pedestrian and cattle crossing safety, local and animal-drawn traffic safety under DSP # 173 (ДСП № 173).

4.4.6 If a road goes through urban areas, it should be designed in accordance with the mentioned guidelines and considering the speed limit. If the mentioned guidelines have no regulations concerning particular elements or components of the road, and the corresponding justification is provided, such a road can be constructed in accordance with requirements of DBN 360 (ДБН 360), DBN V.2.3-5 (ДБН В.2.3-5) and DBN V.2.5-28 (ДБН В.2.5-28).

Under Section 5 "Design of Primary Road Elements", provision 5.1 "Road Cross-section", sub-provision 5.1.1, the primary parameters of the road cross-section should be designed according to Table 5.1. Roads with three traffic lanes are designed under the national standards. Provided a corresponding feasibility study, road parameters may be extended.

5.1.2 Dividing strip width should be enough to construct a deceleration lane for left turn, a surface level pedestrian crossing, a bridge pillar etc. If the distance between such areas (intervals) is less than 0.5 km, the width of the dividing strip is not reduced down to parameters indicated in Table 5.1. Provided a corresponding feasibility study, the length of such a strip may be extended.

5.1.3 Wayside safe margin on bridges (100 or less meters long) should be equal to the width of the emergency braking lane (if any), and if not applicable, 1 m or as provided for in the corresponding feasibility study. Wayside safe margin on bridges longer than 100 m should equal 1 m or as provided for in the corresponding feasibility study. Procedure of width extension (or shortening) is similar to that for the dividing strip under requirements set forth in 5.1.23.

Table 5.1 – Roadway cross-section parameters

#	Index	Measurement Unit	Road category					
			I-a (I-а)	I-b (I-б)	II	III	IV	V
1	Number of traffic lanes	pcs	4; 6; 8	4; 6	2	2	2	1
2	Traffic lane width	m	3.75	3.75	3.75	3.50	3.00	4.50
3	Wayside width, including:	«»	3.75	3.75	3.75	2.50	2.00	1.75
	- emergency braking lane with a reinforced line;	«»	2.50	2.50	2.50	-	-	-
	- reinforced line width	«»	0.75	0.50	0.50	0.50	0.50	-
4	Dividing strip width	«»	6.00	3.00	-	-	-	-
5	Width of the reinforced line on the dividing	«»	0.75	0.50	-	-	-	-

	strip							

Note 1. During reconstruction of the existing category I roadways, the width of the existing dividing strip may remain unchanged.

Note 2. For category V roads with bus traffic, the width of reinforced waysides should be 0.75 m.

Note 3. When first group guardrails are installed on the dividing strip, the width of the dividing strip may equal the width of the guardrails plus the width of the reinforced line from both sides of the guardrails.

Note 4. In urban areas where speed limit of 60 km/h is applied, the width of the traffic lane may be reduced to 3.25 m in accordance with the road signs installed under the national standards.

5.1.4 The number of traffic lanes on category I roads should be assigned considering the average annual and daily vehicle density and topographic landscape as set forth in Table 5.2.

Table 5.2 – Number of traffic lanes depending on vehicle density

Topographic landscape	Vehicle density, units per day	Number of traffic lanes
Plain or hilly	Up to 40,000	4
	40,000 to 80,000	6
	Over 80,000	8
Mountain	Up to 34,000	4
	34,000 to 70,000	6
	over 70,000	8

5.1.5 The roadway design should have a two-sloped cross-section on straight intervals of all categories roads.

5.1.6 In cases when I-b (I-б) category roads are being designed in several stages with one pass way being constructed on the first stage, the roadway should have one-sloped cross-section.

Provided the corresponding justification, during I-b (I-б) category roads reconstruction, two-sloped cross-section may be used on the existing pass way provided obligatory water drainage from the roadway and the dividing stip.

5.1.7 Cross fall of the roadway, except for intervals where road curves are planned, should be designed depending on the road surface topping. For roads with asphalt concrete or cement concrete topping, the cross fall of the roadway should be 25 ‰, for roads with gravel or crushed rock toppings – 25 ‰ to 30 ‰, for roads with soil toppings reinforced with binders or locally available materials and for block-stone roads made of rock-face stones or paving stones – 30 ‰ to 40 ‰.

According to provision 5.1.19, on category I roads as well as on definite intervals on category II roads specified by the project, 2.5 meters wide emergency braking lanes should be constructed. For emergency braking lanes and reinforced lines road surface topping pavement should have staying qualities equivalent to that of the main pass way. The road surface topping on the reinforced lines from the side of the dividing strip on I-b (I-б) category roads may have less staying qualities but must be heavy-duty type.

On reinforced (emergency braking) lanes the topping may have different color than that of the roadway. The reinforced (emergency braking) lanes should be marked by a solid marking line under the requirements of the national standards.

5.1.23 Transition to a narrower (wider) dividing strip as well as from the category I-b (I-б) road cross-section to the cross-section of a lower category road should be designed with attainment of 1:100. Under constrained circumstances and provided the corresponding justification, the attainment for such transition may be 1:50. Depending on the particular road situation, the transitions may be one-sided or two-sided.

According to provision 5.2 "Horizontal Alignment and Longitudinal Section", sub-provision 5.2.1, the road should be designed as a smooth line in space with consistent connections between the projected elements, longitudinal section and cross-section, integral with the surroundings and with consideration of the road elements' influence on the traffic situation and road visual perception.

5.2.Road longitudinal section should be designed considering the vehicle density, traffic safety and convenience requirements and take into account the possibility of road reconstruction after the prospected calculation period.

For horizontal alignment elements and the longitudinal section, the following primary parameters should be applied:

- Cross falls up to 30 ‰ ;
- Visible distance from a parked vehicle – no less than 450 m;
- Horizontal curve radius – over 3,000 m;
- Peak curve radius of the longitudinal section – over 7,0000 m;
- Inverted curve radius of the longitudinal section – over 8,000 m;
- Peak curve length of the longitudinal section – over 300 m;
- Inverted curve length of the longitudinal section – over 100 m.

According to Section 9 "Transport Infrastructure", provision 9.1 "Bridges, Water Draining Pipes and Tunnels", sub-division 9.1.1, bridges and water draining pipes should be designed in accordance with DBN V.1.2-15 (ДБН В.1.2-15), DBN V.2.3-14 (ДБН В.2.3-14) and DBN V.2.3-22 (ДБН В.2.3-22).

9.1.2 During design of new bridges of reconstruction of the existing bridges or water draining pipes, choices should be grounded on the results of comparison of the possible options by their technological and economic characteristics (cost, resource expenses, construction terms and operational expenses) and consideration of the

anticipated service life of particular elements of the structure.

9.1.3 The design choices should ensure:

- Reliability and durability of the constructions, their architectural expressiveness;
- Minimum negative influence on the environment;
- Rationality and convenience of operation and maintenance.

According to DBN V.2.3-22 (ДБН В.2.3-22), Section 5 "Clearance Limits", provision 7.1, clearance limits for bridges on public roads, as well as for streets and roads within urban areas, should be as stipulated in the obligatory Addendum B that describes bridges clearance limits – clearance height limit (in the plane perpendicular to the roadway axis); no elements of the construction or equipment should be installed lower than the clearance limit.

Bridge clearance parameters for public roads are provided in Table B.2.

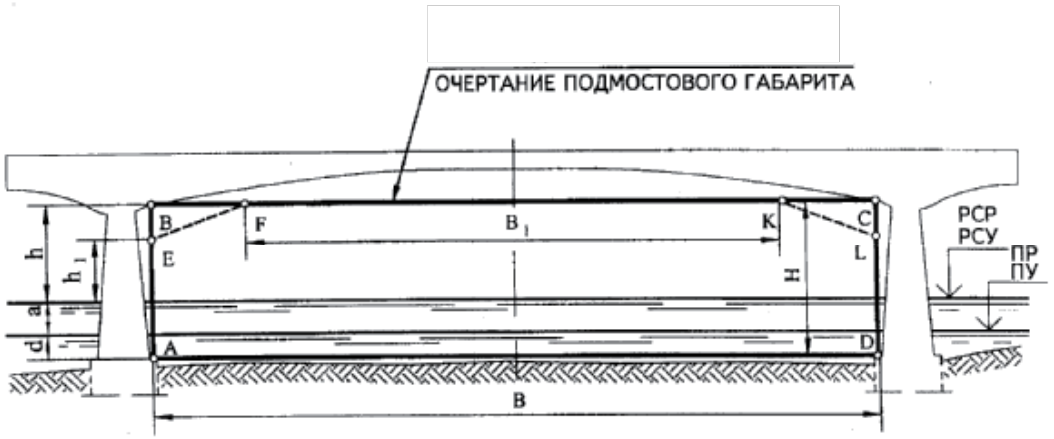
Table B.2

Bridges on public roads							
Road category (according to DBN V.2.3-4)	Number of traffic lanes in both directions, pcs	Number of roadways, pcs	Traffic lane width b, m	Roadway width n × b, m	Safe margin, m		Distance between guardrails Г, m
					right sr	left sl	
(Ia) Ia	8	2	3.75	15.00	2.0	1.0	18.00
	6			11.25			14.25
	4			7.50			10.50
(Ib) Iб	6	2	3.75	11.25	2.0	1.0	14.25
	4			7.50			10.50
II	2	2	3.75	7.50	2.0	1.0	10.50
III	2	2	3.50	7.00	1.5	1.0	9.50
IV	2	1	3.50	7.00	1.0	1.0	9.50
V	1	1	4.50	4.50	0.5	0.5	5.50

5.2 The width of sideways on motor road, urban and pedestrian bridges, in tunnels, on stairs and ramps should be designed considering the standard busy rate of the pedestrian traffic during "rush hours". The maximum (daily) traffic capacity of a single 1-meter-wide lane should be considered as follows:

- for tunnels – 1,000 (750) pedestrians/hour;
- for sidewalks and bridges – 2,000 (1,500) pedestrians/hour;
- for stairs – 1,500 (1,250) and ramps – 1,750 (1,350) pedestrians/hour.

Operating isles should be designed for road bridges outside urban areas.



[the remaining note is the same as above but in Russian – translator's note]

Ukravtodor (Ukrainian Traffic Infrastructure Administration) recommends to consider the requirements stipulated in the mentioned guidelines and regulations during design of the bridge crossing within the framework of the feasibility study for construction of the object called "Construction of a Bridge Crossing over Iuzhnyi Buh River in Mykolaiv, Mykolaiv Region" that has been approved by the Instruction of the Cabinet of Ministers of Ukraine # 511-r dated July 11th, 2013 and to consult the national design institute, State Enterprise Ukrdiprodor, as well as local executive authorities of Mykolaiv Region and city of Mykolaiv.

[05/June/2018, Environmental Regulations, State Ecological Inspection in Mykolaiv Oblast]

ДЕРЖАВНА ЕКОЛОГІЧНА ІНСПЕКЦІЯ УКРАЇНИ
Державна екологічна інспекція у Миколаївській області
вул. Дзержинського, 134, м. Миколаїв, 54055, тел/факс (0512) 47-37-61, тел.53-58-42,
e-mail: myk @dei.gov.ua Код ЄДРПОУ 37992292

05.06.2018 №04/06.01-21/1141 На № _____ від _____

Депутату Миколаївської
міської ради
Горбенко Н.О.
54001 м. Миколаїв, вул. Адміральська, 20

Шановна Наталіє Олексіївно!

Державною екологічною інспекцією у Миколаївській області розглянуто Ваше депутатське звернення від 31.05.2018р. №119, щодо надання інформації за переліком питань, щодо реалізації проекту будівництва об'їзного моста через Південний Буг, для додаткових досліджень для оновлення техніко – економічного обґрунтування проекту будівництва. За результатами розгляду повідомляємо наступне.

Відповідно до ч.2 ст.6, ст.19 Конституції України органи державної влади та органи місцевого самоврядування, їх посадові особи зобов'язані діяти лише на підставі, в межах повноважень та у спосіб, що передбачені Конституцією України та законами України.

Згідно п.2, розділу 2 Положення про Державну екологічну інспекцію в Автономній Республіці Крим, областях, містах Києві та Севастополі, затвердженого наказом Міністерства екології та природних ресурсів України 11.08.2017р. № 312 та зареєстрованого в Міністерстві юстиції України 04.09.2017 за №1080/30948, Державна екологічна інспекція у Миколаївській області: ***здійснює державний нагляд (контроль)*** за додержанням територіальними органами центральних органів виконавчої влади, місцевими органами виконавчої влади, органами місцевого самоврядування в частині здійснення делегованих їм повноважень органів виконавчої влади, підприємствами, установами та організаціями незалежно від форми власності і господарювання, громадянами України, іноземцями та особами без громадянства, а також юридичними особами – нерезидентами вимог природоохоронного законодавства ***і не має повноважень щодо надання офіційних роз'яснень законодавства.***

Ознайомившись з переліком питань, доданим до Вашого звернення , в межах повноважень, повідомляємо наступне. З огляду на те, що будівництво об'їзного мосту через річку Південний Буг проектується в районі населенних пунктів (територія мікрорайону Центрального району – Матвіївка, район села – Родніки), то під час оцінки якості води річки використовують гранично – допустимі концентрації забруднюючих речовин для водойм господарсько – побутового використання згідно Сан ПиН № 4630-88 (Санитарные правила и нормы. Охрана поверхностных вод от

загрязнення). Але слід зазначити, що зазначений документ згідно розпорядження Кабінету Міністрів України від 20.01.2016 № 94-р «Про визнання такими, що втратили чинність, та такими, що не застосовуються на території України, актів санітарного законодавства» з 1 січня 2017 року втратив чинність.

На цей час державою не розроблено гранично – допустимі концентрації для водойм господарсько – побутового використання. Скидання зворотних (стічних) вод у водні об'єкти допускається тільки за умови одержання в установленому порядку дозволу на спеціальне водокористування, в якому для кожного підприємства встановлюються індивідуальні гранично – допустимі концентрації забруднюючих речовин, що скидаються у водойму.

Умови, підстави та органи уповноважені на видачу дозволів на спеціальне водокористування встановлено статтею 49 Водного кодексу України.

Щодо інших питань викладених у Вашому зверненні повідомляємо наступне. Відповідно до Положення про управління екології та природних ресурсів Миколаївської обласної державної адміністрації, затвердженого розпорядженням голови Миколаївської обласної державної адміністрації №161-р від 23.05.2013р. Основними завданнями управління є: 1) забезпечення реалізації державної політики у сферах охорони навколишнього природного середовища, рибного, мисливського господарства та полювання, лісових відносин, раціонального використання; 2) відтворення та охорони природних ресурсів (земля, надра, поверхневі та підземні води, атмосферне повітря, ліси, тваринний і рослинний світ); 3) поводження з відходами (крім поводження з радіоактивними відходами), пестицидами та агрохімікатами, екологічної та в межах своєї компетенції радіаційної безпеки, заповідної справи; 4) формування, збереження та використання екологічної мережі.

Згідно п.п. 8 п. 5 Положення Управління екології та природних ресурсів Миколаївської обласної державної адміністрації організовує та проводить державну екологічну експертизу: державних інвестиційних програм, проектів схем розвитку і розміщення продуктивних сил, розвитку схеми галузей економіки; проектів генеральних планів населених пунктів, схем районного планування; документації по перепрофілюванню, консервації та ліквідації діючих підприємств, окремих цехів, виробництв та інших промислових і господарських об'єктів, які можуть негативно впливати на стан навколишнього природного середовища, в тому числі військового та оборонного призначення; екологічних ситуацій, що склалися в окремих населених пунктах і регіонах; діючих об'єктів та комплексів, в тому числі військового та оборонного призначення, що негативно впливають на стан навколишнього природного середовища; видів діяльності та об'єктів, що становлять підвищену екологічну небезпеку, визначених Кабінетом Міністрів України; документації по впровадженню нової техніки, технологій, матеріалів і речовин (у тому числі тих, що закуповуються за кордоном), які можуть створити потенційну загрозу навколишньому природному середовищу.

Враховуючи вище викладене пропонуємо Вам звернутися за роз'ясненнями до Управління екології та природних ресурсів Миколаївської обласної державної адміністрації.

Начальник **Бабенко В.А.**

Арутюнян
535842

(Provisional translation)

State Ecological Inspection of Ukraine
State Ecological Inspection in Mykolaiv Oblast (Region)

Ukraine, Mykolaiv, str.Dzerzhynskogo, 134, 54055, tel./fax: (0512) 47-37-61, tel. 53-58-42
e-mail: myk@dei.gov.ua, ID (ERDPOU): 37992292

05/06/2018 #07/06.01 - 21/1141 to #_____from_____

To the member of Mykolaiv City Council
Horbenko N.O.
54001, Mykolaiv, Admiralska str., 20

Dear Nataliya Oleksiivna!

State Ecological Inspection in Mykolaiv Oblast had reviewed your request #119 from 31.05.2018 for information regarding Mykolaiv bridge construction project to complete additional research and update feasibility study. Results of the review are the following.

According to the part II, article 6, article 19 of the Constitution of Ukraine, central and local authorities and their officials must act in capacity provided by Constitution and Laws of Ukraine.

According to the paragraph 2, part 2, of the provisions of the state ecological inspection Autonomous Republic of Crimea, the oblast, Kyiv and Sevastopol municipal as approved by Ministry of Ecology and Natural Resources of Ukraine from 11.08.2017 #312, and registered by Ministry of Justice of Ukraine from 04.09.2017 #1080/30948, State Ecological Inspection in Mykolaiv Oblast (Region) ***carries out government control*** of environmental protection law compliance by region administration of central executive body, local authorities, body of local self government while carrying-out delegated executive powers, enterprises, institutes and organizations regardless of the form of property, Ukraine citizens, foreigners and stateless persons (non-residential). State Ecological Inspection in Mykolaiv Oblast (Region) ***doesn't have an authority to provide official interpretation of law.***

As a result of the review of questions list attached to Your request, within the limits of our competence and authority, inform you of the following. Considering that detour bridge construction is designed in the populated area (territory of microregion (area) of Central District - Matviivka, village Rodniki area), river water quality assessment should done based on indicators of maximum ambient concentrations of pollutants in utility-service usage water, acc. to San PiN №4630-88 (Sanitary Rules and Regulations. Surface water protection from pollution). Although, it must be noted, that according to the order of the Cabinet of Ministers of Ukraine from 20.01.2016 № 94-r "On the recognition of documents ceased to be in force on the territory of Ukraine, active sanitary legislation", above mentioned document ceased to be in force from the 1st of January, 2017.

At the present moment, maximum concentrations of pollutants (indicators) in utility-service usage water hadn't been defined by Ukrainian government. Disposal of waste water in territory waters is allowed if only project owner obtains the special permission (license) which specifies individually the limit of maximum concentrations of pollutants that could be disposed in water.

Conditions, reasons and authorities competent in licensing special water disposal are described in the article 49 of the Water Code of Ukraine.

Regarding other questions from your request, inform you of the following. According to Regulation on Department of ecology and natural resources of Mykolaiv state regional administration approved by Order of the Head of Mykolaiv oblast (region) state administration №161-r from 23.05.2013, main tasks of Department are the following:

1) enforcement of national policy in natural environment protection, fishing and hunting industry regulation, forestry and rational usage;

2) natural resources protection and reproduction (earth, soil, surface and subsoil water, air, forests, animal and vegetal life);

3) waste disposal (except radioactive waste disposal), pesticide, agrichemical, ecological and within the limits of its competence radioactive safety, conservations;

4) forming, preservation and management of the ecosystem.

According to subparagraph 8, paragraph 5 of Regulation, Department of ecology and natural resources of Mykolaiv state regional(oblast) administration execute state ecological expertise (examination) of: state investment programs, development scheme projects and distribution of productive forces, development of economic sectors; general plan of human settlements, district planning; reprofiling documentation, temporary closing and liquidation of active enterprises, certain production departments and other industrial and commercial enterprises which can have negative impact on environment, including those of military and defensive orientation; ecological situations in separate places of human settlement and districts; active objects and complexes, including those of military and defensive orientation, which can have negative impact on environment; kinds of activities and objects that constitute a danger to environment according to the Cabinet of Ministers of Ukraine; documentation on new equipment, technology, materials and substances (including exported) implementation which can constitute potential danger to environment.

Taking the above mentioned into consideration we advise You to address with Your request to the Department of ecology and natural resources of Mykolaiv state regional administration.

Director Babenko V.A.
(signature)

[14/June/2018, Basic data about social environment, Mykolaiv City Council Central District Administration]

УКРАЇНА

МИКОЛАЇВСЬКА МІСЬКА РАДА
АДМІНІСТРАЦІЯ ЦЕНТРАЛЬНОГО РАЙОНУ

вул. Інженерна, 1, м. Миколаїв, 54001, тел. (0512)37-56-87, тел/факс 37-56-77
e-mail: cenadmin@mkrada.gov.ua Код ЄДРПОУ 05410576

14.06.2018 № 1735/118/05/05 На № 118 від 31.05.2018

Депутату Миколаївської
міської ради VII скликання
Горбенко Н.О.
вул. Адміральська, 20,
м. Миколаїв, 54001

Про розгляд звернення

Шановна Наталіє Олексіївно!

Адміністрацією Центрального району Миколаївської міської ради розглянуто Ваше звернення щодо надання інформації стосовно реалізації проекту будівництва об'їзного мосту через Південний Буг, для додаткових досліджень по оновленню техніко-економічного обґрунтування проекту будівництва (варіанти розгляду проекту: територія мікрорайону Центрального району - Матвіївка). За результатами розгляду повідомляємо наступне.

Вихідні дані щодо соціального середовища:

1.4. Кількість мешканців, які були переселені або кількість мешканців, яких планується переселити або виплатити компенсацію – немає.

1.5. Наявність будь-яких традиційних або соціальних структур об'єднання співтовариств – Миколаївське сільськогосподарсько-рибоводне підприємство (Миколаївська обл., Єланський район, с. Калинівка), СП «Тепличний» (Новоодеський район), ДП «Миколаївське лісове господарство» (м. Миколаїв, вул. Г. Дивіної, 2-В, т. 236116), колишній МЗСВ (власник невідомий) - входить до санітарної зони.

1.6. Основні сфери зайнятості й основні джерела доходів мешканців, що підлягають переселенню – немає.

1.7. Кількість і територіальний розподіл шкіл, лікарень, релігійних установ тощо в зоні реалізації Проекту – немає.

По території від Київського шосе до межі лісового господарства – землі сільськогосподарського призначення – належать до Новоодеського району.

Частина нового Миколаївського кладовища – входить до санітарної зони.

1.9 Проживання в зоні реалізації Проекту малих або корінних народів – не проживають.

З повагою
голова адміністрації
Центрального району О.Д. Береза

Косьянов
Безушко 428751

(Provisional translation)

UKRAINE

MYKOLAIV CITY COUNCIL
CENTRAL DISTRICT ADMINISTRATION

Ukraine, Mykolaiv, str. Injenerna, 1, 54001, tel. (0512)37-56-87, tel./fax.: 37-56-77
e-mail: cenadmin@mkrada.gov.ua, ID (ERDPOU) 05410576

14.06.2018 №1735/118/05/05 on №118 from 31.05.2018

To the member of Mykolaiv City Council
Horbenko N.O.
54001, Mykolaiv, Admiralska str., 20

Regarding the review of inquiry

Dear Nataliya Oleksiivna!

Central District Administration of Mykolaiv City Council had reviewed your request for information regarding Mykolaiv bridge construction project to complete additional research and update feasibility study (project's options: territory of microregion of Central District - Matviivka). Regarding questions from your request, inform you of the following.

Basic data about social environment:

1.4. The number of citizens who had been resettled or are planned to be resettled - no data.

1.5. Presence of any traditional or social organizations - Mykolaiv agricultural fish-farm enterprise (Mykolaiv oblast (region), Elanskyi district, Kalynivka village), joint venture "Teplychnyi" (Novoodessa district), state enterprise "Mykolaiv forest enterprise" (Mykolaiv, str.G.Dyvinoi, 2-V, n. 236116), former MZSV (owner is undefined) - belong to buffer zone.

1.6. General activities and sources of income of local inhabitants - no data.

1.7. Quantity and territory planning of schools, hospitals and religious organizations in the zone of Project's implementation - no data.

Territories from Kyiv highway till the boundary of forest sector are agricultural lands and belong to Novoodessa district.

The part of the new Mykolaiv cemetery belongs to buffer zone.

1.9. Indigenous ethnic groups in the zone of Project's implementation - no data.

Best regards,
The Head of Central District Administration O.D.Bereza
(Signature)

Kosianov
Bezushko 428751

[18/June/2018, Inland Waterway Condition, Derzhgidrografia]

МІНІСТЕРСТВО ІНФРАСТРУКТУРИ УКРАЇНИ
ДЕРЖАВНА УСТАНОВА "ДЕРЖГІДРОГРАФІЯ"
пр-т Гагаріна, 23, м. Київ, 02660, тел.: (044) 296-60-40
тел./факс: (044) 292-12-17, E-mail: office@hydro.gov.ua; Код ЄДРПОУ 21720000

18.06.2018 № 1/1-5.17/880/2179

на № _____

Міністерство інфраструктури України
Департамент міжнародного
співробітництва

На виконання окремого доручення Міністерства інфраструктури України від 13.06.2018 № 394/13/11-18 щодо надання інформації відповідно до питань, які надіслані Представництвом японського агентства міжнародного розвитку (JICA), ДУ "Держгідрографія" в межах компетенції повідомляє наступне.

Місце, що передбачене для будівництва мостового переходу через річку Південний Буг, знаходиться в межах морської навігаційної карти № 3404 "Річка Південний Буг. Від гирла до Миколаєва" масштаб 1:50 000 видання ФДУ "Укрморкартографія" (копія фрагменту карти додається).

Контактні дані представників, які будуть відповідальні за співробітництво з японськими експертами з питань підготовки проекту "Спорудження мостового переходу через р. Південний Буг у м. Миколаєві":

Білий Михайло Володимирович	начальник відділу гідрографічних робіт ФДУ "Миколаївський район Держгідрографії"	+38(050) 318-26-11, wmikewolf57@gmail.com
Горбатюк Михайло Михайлович	заступник начальника відділу гідрографічних робіт ФДУ "Миколаївський район Держгідрографії"	+38(050) 394-33-37 mihagorbatyuk@gmail.com

011136

Додаток: за текстом на 1 арк. в 1 прим.

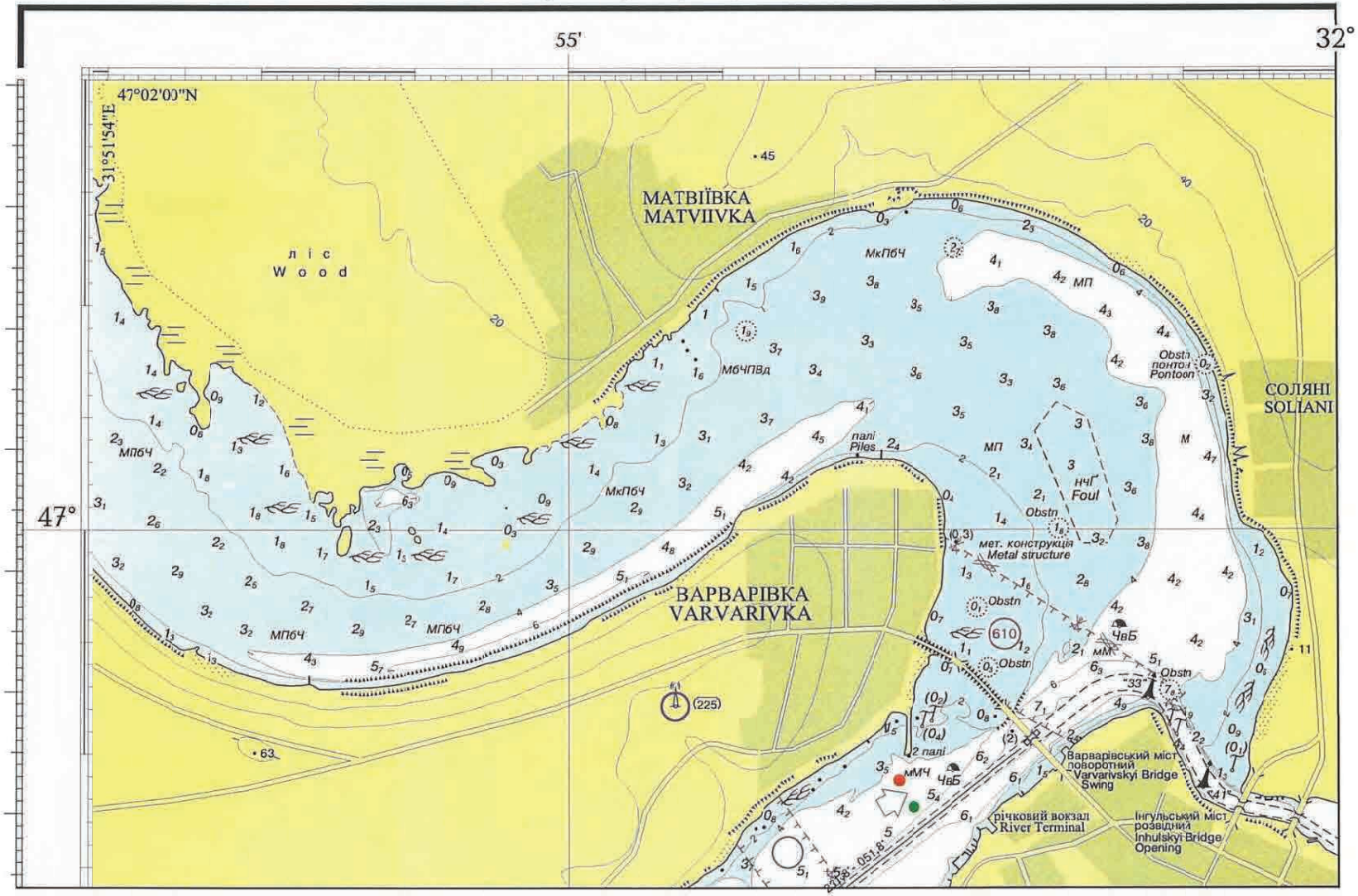
В.о. начальника **О. Щипцов**

Терещенко Р. (044) 292-31-48

СИСТЕМА УПРАВЛІННЯ ЯКІСТЮ СЕРТИФІКОВАНА НА ВІДПОВІДНІСТЬ ДСТУ ISO 9001-2009 Регістром судноплавства України

ISO 9001 CERTIFIED

Фрагмент МНК №3404 місця передбачуваного будівництва мостового переходу через р. Південний Буг



A1-37

(Provisional translation)

MINISTRY OF INFRASTRUCTURE OF UKRAINE
STATE HYDROGRAPHIC SERVICE OF UKRAINE
23, Haharina Ave., Kyiv, 02660 tel: (044) 296-60-40
tel/fax: (044) 292-12-17, E-mail: office@hydro.gov.u; EDRPOU Code 21720000
No 1/7-5.17/880/217 of 18/06/2018

Ministry of Infrastructure of Ukraine
Department of International Cooperation

Following the Ministry of Infrastructure of Ukraine separate request No 394/13/11-18 of 13/06/2018 to provide information on the request sent by the representative office of the Japan International Cooperation Agency (JICA), within its competences, the State Hydrographic Service of Ukraine informs as follows:

The location allocated for construction of the bridge crossing over the Southern Buh River, is within marine chart No 3404 called "The Southern Buh River. From the mouth of the river to Mykolaiv city", scale 1:50 000, published by the Branch of the State Hydrographic Service of Ukraine Branch “Ukrmorcartographia” (copy of a map tile is attached).

Contacts of representatives responsible for cooperation with Japanese experts on issues that relate to preparation of the Construction of the Bridge Crossing Over the Southern Buh River, Mykolaiv City project:

Mykhailo Bilyi	Volodymyrovych,	Head of the Branch of the Hydrographic Works of the Mykolaiv District Derzhhidrografiia	+38(050) 318-26-11 wmikewolf57@gmail.com
Mykhailo Horbatiuk	Mykhailovych,	Deputy Head of the Branch of the Hydrographic Works of the Mykolaiv District Derzhhidrografiia	+38(050) 394-33-37 mihagorbfflyuk@gmail.com

Attached: 1 page of 1 copy.
Deputy Head O. Shchyptsov

R. Tereshchenko (044) 292-31-48

QUALITY MANAGEMENT SYSTEM CERTIFIED
IN COMPLIANCE WITH DSTU ISO 9001-2009
The Shipping Register of Ukraine

[18/June/2018, Inland Waterway Condition, Ukrvodshliakh]

МІНІСТЕРСТВО ІНФРАСТРУКТУРИ УКРАЇНИ

ДЕРЖАВНЕ ПІДПРИЄМСТВО ВОДНИХ ШЛЯХІВ

«УКРВОДШЛЯХ»

04070, м.Київ-70, вул. Петра Сагайдачного,12; адреса для листування: 04071, м.Київ-71, вул. Електриків, 14
Код ЄДРПОУ 03150102, р/р №2600830028067 у Філії ГУ по м. Києву та Київській області АТ «Ощадбанк» МФО 322669
тел.:(044) 337-45-13; факс: (044) 428-88-46; e-mail: office@ukrvodshliah.org.ua

18.06.2018 № 04-10/157

Департамент міжнародного співробітництва
Міністерства інфраструктури України

На виконання Окремого доручення заступника Міністра інфраструктури України з питань європейської інтеграції В.М.Довганя від 13.06.2018 № 394/13/11-18 та з метою залучення кредитних коштів Уряду Японії для реалізації спільних проектів з розвитку транспортної інфраструктури України, надаємо інформацію в межах компетенції відповідно до питань, які надіслані Представництвом японського агентства міжнародного розвитку згідно Додатку.

Контактні дані представника, який буде відповідальний за співробітництво з японськими експертами щодо цього питання – заступник начальника, Строкань Юрій Валерійович, тел. 337-79-24; 337-57-00, e-mail: sgts@bigmir.net

Додаток: Технічні характеристики судноплавних шлюзів Дніпровського каскаду на 1 арк.

В.о. начальника Д.О.Шершньов

Вик. Строкань Ю.В.
Тел. 337-79-24

Технічні характеристики судноплавних шлюзів Дніпровського каскаду

№ з/п	Найменування шлюзу	Річковий кілометр	Кількість ниток для шлюзування	Габарити камери		Глибина на порогах, м		Max розрахунковий напір, м	Максимальний розрахунковий рівень, м		Час шлюзування, хв. (3)	Проектна кількість шлюзувань за добу	Max модуль судна, м³ (4)
				довжина	ширина	верхньому при МПР / НПР	нижньому при МПР / НПР		ВБ	НБ			
1.	Київський	869	1	149	18	4,3 / 5,3	4,0 / 4,0	13,10	103,3	98,2	16-28	36	Дé 2000
2.	Канівський	727	1	270	18	4,5 / 5,0	4,0 / 6,25	16,20	92,7	86,55	18-38	34	Понад 10000
3.	Кременчуцький	555	1	260	18	3,65 / 8,9	3,65 / 3,85	19,20	83,0	67,1	17-42	36	Понад 10000
4.	Дніпродзержинський	433	1	275	18	4,5 / 4,7	3,65 / 3,65	14,60	66,0	56,3	25-50	30	Понад 10000
5.	Другий Запорізький (однокамерний)	302	1	272	18	5,5 / 6,9	5,5 / 7,5	39,20	51,9	21,55	35-75	36	Понад 10000
6.	Запорізький (1) трикамерний	302	1	120x3	18	-	-	37,40	53,1	21,9	- -	24	-
7.	Каховський (2)	91	1	259	18	3,65 / 5,65	3,65 / 4,65	19,00	18,0	8,35	18-110	32	Понад 10000

Примітки:

(1) - виведений із експлуатації на реконструкцію;

(2)- є додаткові обмеження по висоті судна при проходженні під аркою через верхній поріг Каховського шлюзу, а саме:

- максимальна висота по борту судна – 11,2м.(при нормальному рівні води верхнього б'єфу - 16,0м, при максимальній ширині судна 17,2м);
- максимальна висота судна по осі шлюзу – 17,5м.(при нормальному рівні води верхнього б'єфу - 16,0м);
- максимальна висота по борту судна – 9,2м.(при максимальному рівні води верхнього б'єфу - 18.0м, при максимальній ширині судна 17,2м);
- максимальна висота судна по осі шлюзу – 15,5м.(при максимальному рівні води верхнього б'єфу - 18,0м)

(3) - в залежності від типу судна (малі судна – великовантажні судна)

- (4) – Модуль судна – умовний об'єм судна, який обчислюється в кубічних метрах і дорівнює добутку трьох величин (довжини судна, ширини судна та висоти борту судна, визначених в обмірному свідоцтві (для морських суден), судновому посвідченні або документі, що його замінює.

Скорочення: НПР – нормальний навігаційний рівень; МПР – мінімальний навігаційний рівень; НБ – нижній б'єф; ВБ – верхній б'єф; НГШ- нижня голова шлюзу; ВГШ- верхня голова шлюзу.

(Provisional translation)

MINISTRY OF INFRASTRUCTURE OF UKRAINE
STATE ENTERPRISE OF WATERWAYS
"UKRVODSHLIAKH"
12, Petra Sahaidachnoho Street, Kyiv, 04070; address for correspondence: 14, Elektrkiv Street, Kyiv, 04071
EDRPOU Code 03150102, c/a No 2600830028067 of the Branch in Kyiv and Kyiv Oblast, Oshchadbank, MFO322669
tel: (044) 337-45-13 fax: (044) 428-88-46: e-mail: office@ukrvodshliah.org.ua
No 04-10/157 of 18/06/2018

Department of International Cooperation
Ministry of Infrastructure of Ukraine

Following the Ministry of Infrastructure of Ukraine separate request by the Deputy Minister of Infrastructure of Ukraine on European Integration, Mr. V.M. Dovhan, No 394/13/11-18 of 13/06/2018, and in order to raise borrowings from the Government of Japan to implement joint projects on development of infrastructure in Ukraine, we provide information available within our competence as requested by the Japanese Agency representative office, according to the Attachment.

Contact details of representative responsible for cooperation with Japanese Agency representative office on the issues: Deputy Head, Yurii Valeriiovych, Strokan, tel: 337-79-24; 337-57-00, e-mail: sgts@bigmir.net

Attached: Technical specifications of shipping locks on the Dnipro cascade, 1 page.

D.O. Shershniov

Executor Yu. V. Strokan Tel: 337-79-24

QUALITY MANAGEMENT SYSTEM
CERTIFIED
IN COMPLIANCE WITH DSTU ISO 9001-2009
The Shipping Register of Ukraine

Technical specifications of shipping locks on the Dnipro cascade

No	No of lock	River kilometre	Number of threads to lock	Chamber size		Depth at steps, m		Max designed head, m	Max designed level, m		Locking time, min (3)	Designed number of locks per day	Max block-module of ship, m3 (4)
				length	width	upper lower navigation level full navigation level	bottom lower navigation level full navigation level		fore bay	after bay			
1.	Kyiv	869	1	149	18	4.3 5.5	4.0 4.0	13.10	103.3	98.2	16-28	36	up to 2000
2.	Kaniv	727	1	270	18	4.5 5.0	4.0 6.25	16.20	92.7	86.55	18-38	34	Over 10000
3.	Kremenchuk	555	1	260	18	3.65 8.9	3.65 3.85	19.20	83.0	67.1	17-42	36	Over 10000
4.	Dniprodzerzhynsk	433	1	275	18	4.5 4.7	3.65 7365	14.60	66.0	56.3	25-50	30	Over 10000
5.	Second Zaporizhzhia (one-chamber)	302	1	272	18	5.5 6.9	5.5 7.5	39.20	51.9	21.55	35-75	36	Over 10000
6.	Zaporizhzhia triple-chamber (1)	302	1	120X3	18	-	-	37.40	53.1	21.9	-	24	-
7.	Kakhovka (2)	91	1	259	18	3.65 5.65	3.65 4.65	19.00	18.0	8.35	18-110	32	Over 10000

Notes

(1) - decommissioned for reconstruction;

(2) - additional restrictions on ships' height when passing the arch on the upper step of Kakhovka lock, in particular:

- max height of ship's broadside - 11.2 m (standard after bay level of water - 16.0 m, max breadth moulded - 17.2 m);
- max height of ship's axis - 17.5 m (standard after bay level of water - 16.0 m);
- max height of ship's broadside - 9.2 m (max after bay level of water - 18.0 m, max breadth moulded - 17.2 m);
- max height of ship's axis - 15.5 m (standard after bay level of water - 18.0 m);

(3) - depending on the ship type (light ship - heavy ship).

(4) - ship module means notional size of a ship in cubic metres that equals a sum of three dimensions (length, breadth and broadside height specified in measuring certificate (for sea ships), certificate of registry or document that replaces it.

Abbreviations: "НПР" (Ukrainian) - full navigation level; "МПР" (Ukrainian) - lowest navigation level; "НБ" (Ukrainian) - after bay; "ВБ" (Ukrainian) - fore bay; "НГШ" (Ukrainian) - downstream end of lock; "ВГШ" (Ukrainian) - upstream end of a lock.

[18/June/2018, Ecological information in the project area, Mykolaiv Regional State Administration]

Вх №78
від 20.06.18

УПРАВЛІННЯ ЕКОЛОГІЇ ТА ПРИРОДНИХ РЕСУРСІВ
МИКОЛАЇВСЬКА ОБЛАСНА ДЕРЖАВНА АДМІНІСТРАЦІЯ
пр. Центральний, 16, м. Миколаїв, 54029, тел./факс: (0512) 46-04-27
E-mail: ecolog@mk.gov.ua, http://ecolog.mk.gov.ua Код ЄДРПОУ 38694358

18.06.2018 № 01-06/4-02 на № _____ від _____

Депутату Миколаївської міської ради
VII скликання
Н. Горбенко

На депутатське звернення
від 07.06.2018 № 132

Шановна Наталя Олексіївна!

Розглянувши Ваше звернення стосовно екологічної інформації в районі реалізації інвестиційного проекту будівництва об'їзного моста через р.Південний Буг надаємо наявну інформацію в межах компетенції.

1. Закони, нормативні акти, правила й інструкції, що стосуються оцінки екологічного й соціального впливу в Україні.

Закон України «Про охорону навколишнього природного середовища», Закон України «Про оцінку впливу на довкілля», постанова КМУ від 13.12.2017 № 989 «Про затвердження Порядку проведення громадських слухань у процесі оцінки впливу на довкілля»; постанова КМУ від 13.12.2017 № 1026 «Про затвердження Порядку передачи документації для надання висновку з оцінки впливу на довкілля та фінансування оцінки впливу на довкілля та Порядку ведення реєстру з оцінки впливу на довкілля»; постанова КМУ від 13.12.2017 № 1010 «Про затвердження критеріїв визначення планованої діяльності, яка не підлягає оцінці впливу на довкілля та критеріїв визначення розширень і змін діяльності та об'єктів, які не підлягають оцінці впливу на довкілля», постанова КМУ від 28.08.2013 № 808 «Про затвердження переліку видів діяльності та об'єктів, що становлять підвищену екологічну небезпеку».

1.1. Чи відбулися які-небудь зміни в нормативно-правовій системі, що регулює оцінку впливу на навколишнє середовище, плани дій з переселення місцевих мешканців тощо, за період з 2010 по 2018 рік? Якщо так, то зміст цих змін.

18.12.2017 року набув чинності Закон України «Про оцінку впливу на довкілля» (далі - Закон), на підставі якого внесено зміни в низку законів та законодавчих актів та втратив чинності Закон України «Про екологічну експертизу». Метою цих змін є виконання міжнародних зобов'язань України в

сфері оцінки впливу на довкілля та наближення екологічного законодавства до права ЄС.

1.2. Закон, що визначає органи, відповідальні за проведення Оцінки впливу на навколишнє середовище (ОВНС), зміст необхідних процедур (експертиз), час, необхідний на проведення ОВНС, необхідність одержання дозволів і ліцензій тощо.

Згідно Закону суб'єктами оцінки впливу на довкілля є суб'єкти господарювання, органи державної влади, органи місцевого самоврядування, які є замовниками планованої діяльності і для цілей цього Закону прирівнюються до суб'єктів господарювання (далі – суб'єкт господарювання), уповноважений центральний орган, уповноважені територіальні органи, інші органи виконавчої влади, громадськість.

Уповноважений територіальний орган – підрозділ з питань екології та природних ресурсів обласної державної адміністрації (управління екології та природних ресурсів Миколаївської облдержадміністрації).

Уповноважений центральний орган – центральний орган виконавчої влади, що забезпечує формування та реалізує державну політику у сфері охорони навколишнього природного середовища (Мінприроди)

Уповноважений територіальний орган та уповноважений центральний орган забезпечують виконання процедури оцінки впливу на довкілля (далі - ОВД) та у т.ч. шляхом оприлюднення інформації у публічно доступному Реєстрі з ОВД (в якому також враховано питання децентралізації), за результатам процедури ОВД надають висновок з оцінки впливу на довкілля.

Відповідно п. 2 ст. 9 Закону висновок з ОВД є обов'язковим для виконання та повинен враховуватися при прийнятті рішення про провадження планованої діяльності та може бути підставою для відмови у видачі рішення про провадження планованої діяльності.

Законом визначено читки строки здійснення усіх дій та заходів на всіх стадіях ОВД.

Процедуру ОВД інтегровано у чинні дозвільні процедури, в тому числі ті, що стосуються будівництва або використання природних ресурсів (рубки лісів, видобування корисних копалин тощо).

Процедура здійснення ОВД з термінами відповідно до Закону передбачає:

1. Визначення суб'єктом господарювання необхідності проведення ОВД відповідно до статті 3 Закону;

2. Подання уповноваженому органу повідомлення про плановану діяльність через електронний кабінет Єдиного реєстру.

2.1. Оприлюднення повідомлення про плановану діяльність через електронний реєстр та засоби масової інформації (3 робочі дні);

2.2. Забезпечення гласності повідомлення про плановану діяльність для широкого кола громадськості протягом 20 робочих днів;