Appendix to report:

SBJ-33-C5-OON-22-RE-100
K12 SUMMARY REPORT

Appendix title:

APPENDIX A – TECHNICAL DRAWINGS

Contract no:	18/91094
Project number:	5187772/12777
Document number:	SBJ-33-C5-OON-22-RE-100 App. A
Date:	22.08.2019
Revision:	0
Number of pages:	75
Prepared by:	Anette Fjeld
Controlled by:	-
Approved by:	Kolbjørn Høyland

CONCEPT DEVELOPMENT FLOATING BRIDGE E39 BJØRNAFJORDEN

DRAWINGS LIST

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Doc. No.	Rev	Title	Doc.page
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PROFIL NR.: 35500 · 35750 · 36000 · 36250 · 36500 · 36750 · 37000 · 37250 · 37500 · 37750 · 38000 · 38250 · 38500 · 38750 · 39000 · 39250

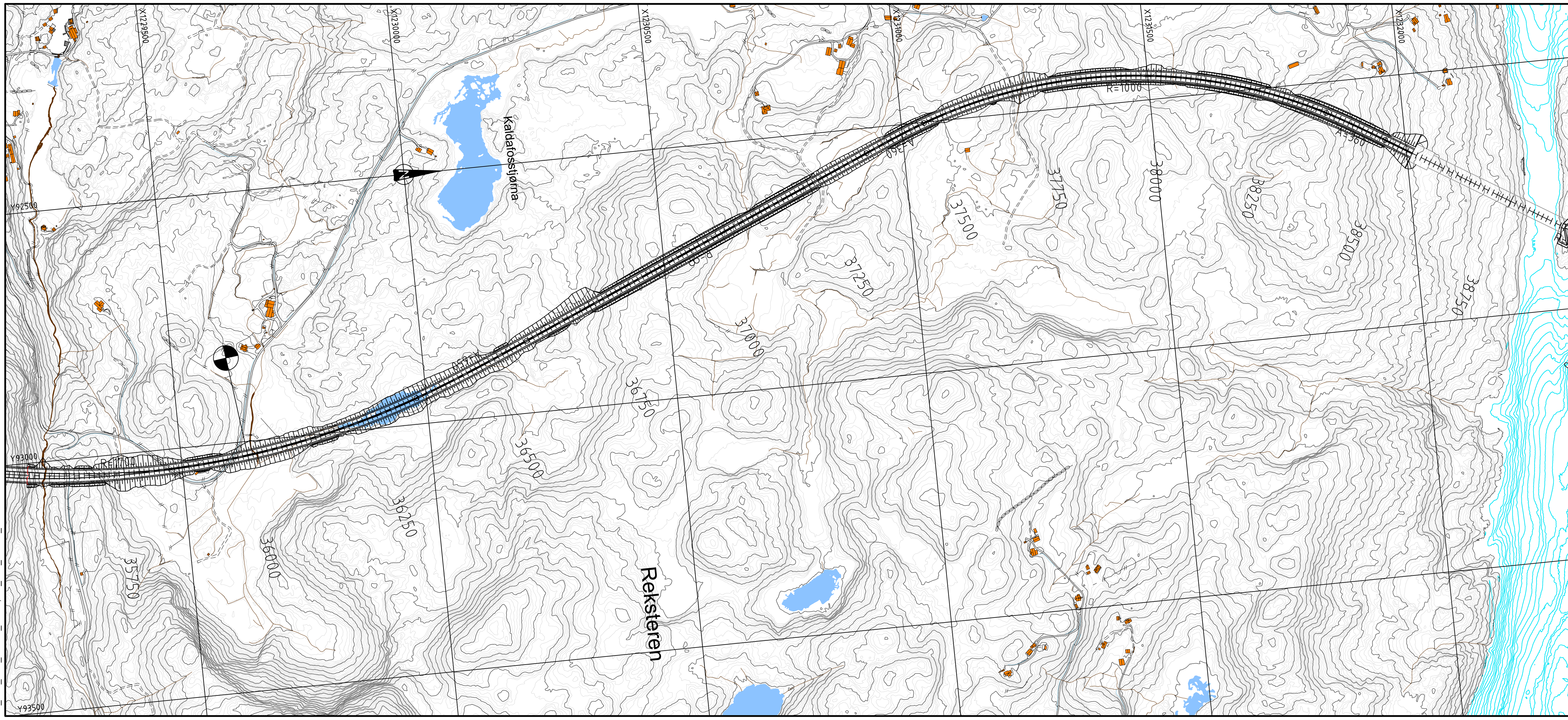
HOR.KURV.: R=-1700 · A=650 · R=∞ · A=360 · R=1000 · A=360 · R=∞

BREDDEUTV.

TVERRFALL: — H.kj.b.k. / - - - V.kj.b.k.: 3,2% · 3,2% 3,0% · 3,2% 3,0% 6,5% · 6,5% 3,0% 3,0% · 3,2% 3,3% · 3,2% 3,3%

PROFIL NR	PROFIL H.	TERRENG H.
35500	74,25	129,79
	73,00	92,09
	71,75	69,45
	70,50	71,39
	69,25	70,04
35750	68,00	55,75
	66,78	55,79
	65,78	59,12
	65,03	69,09
	64,53	61,28
36000	64,28	56,73
	64,28	57,34
	64,53	56,73
	65,03	58,56
	65,77	59,77
36250	66,60	59,80
	67,43	59,75
	68,26	59,80
	69,08	59,90
	69,91	60,01
36500	70,74	61,03
	71,56	69,24
	72,39	67,06
	73,22	72,84
	74,00	70,25
36750	74,65	71,32
	75,18	81,89
	75,59	93,31
	75,87	95,52
	76,03	98,46
37000	76,06	91,24
	75,97	92,24
	75,75	78,76
	75,40	88,30
	74,93	85,62
37250	74,34	80,53
	73,62	69,36
	72,78	69,09
	71,81	68,90
	70,71	76,22
37500	69,49	73,53
	68,20	65,49
	66,91	63,54
	65,66	61,58
	64,81	58,31
37750	64,45	59,65
	64,60	70,70
	65,18	72,84
	65,81	70,74
	66,44	65,67
38000	67,06	67,03
	67,53	67,07
	67,83	76,26
	67,97	81,29
	67,94	74,06
38250	67,75	66,23
	67,38	81,69
	66,85	90,57
	66,23	83,78
	65,60	73,29
38500	64,97	57,82
	64,34	48,76
	63,71	43,44
	63,09	32,84
	62,43	23,85
38750	61,69	14,30
	60,87	-3,83
	59,97	-5,34
	58,99	-0,36
	57,92	-15,97
39000	56,76	-24,66
	55,52	-39,89
	54,20	-94,94
	52,80	-166,60
	51,31	-254,08
39250	49,74	-328,32

OVERBYGN.T.: 112CM · 10CM



Design team: Norconsult · DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	RuWes	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge

Road alignment - Plan and profile

Profile 35500 - 39250

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:5000/1:1000
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOT	NO/RuWes	OO/KH	5187772 / 12777	SBJ-33-C5-00N-05-DR-001 0

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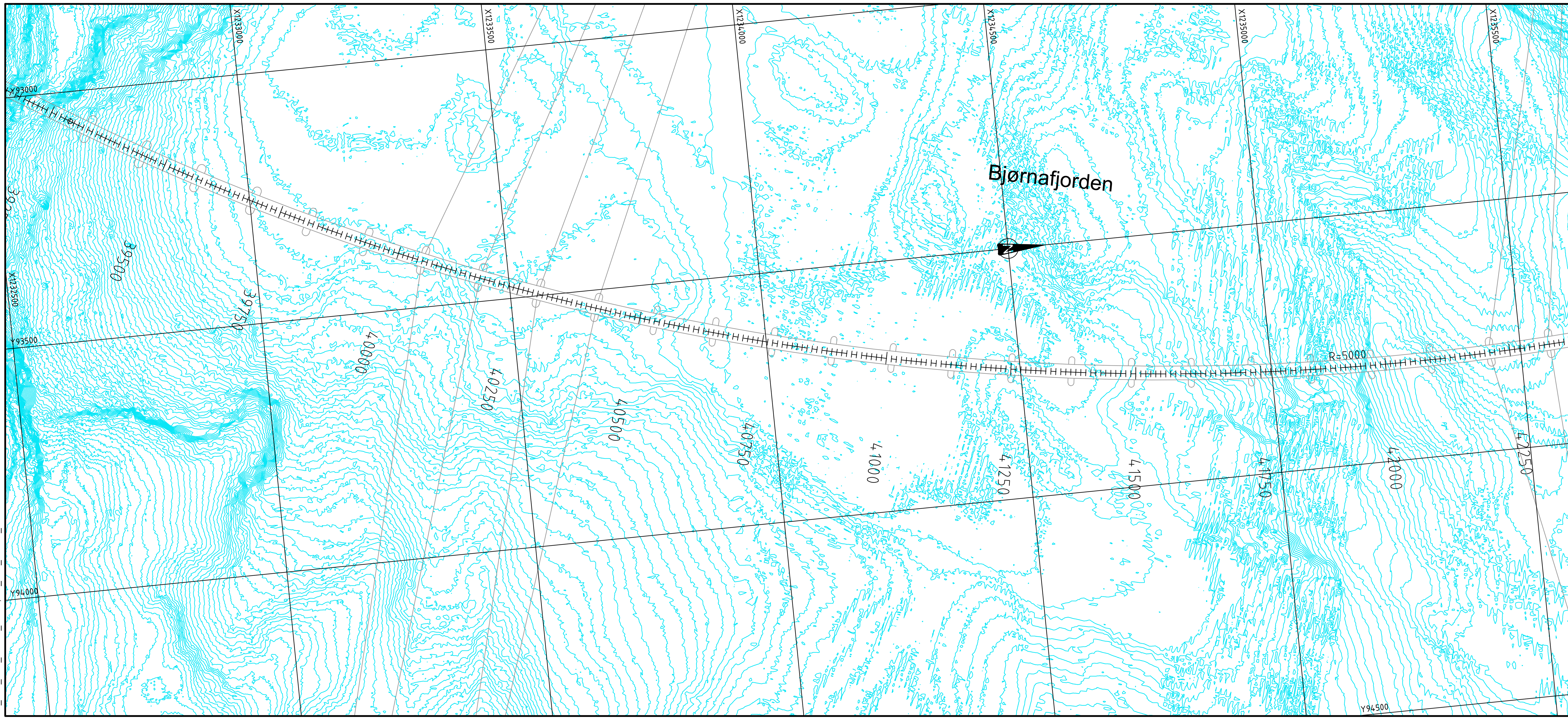
PROFIL NR.	HOR.KURV.	PROFIL H.	TERRENG H.
39250	R=∞	49,74	-328,32
		48,09	-374,84
		46,35	-413,34
		44,53	-444,88
		42,63	-474,05
39500		40,64	-498,67
		38,57	-512,65
		36,41	-520,52
		34,18	-527,07
		31,95	-530,28
39750		29,88	-532,78
		27,97	-533,77
		26,23	-534,68
		24,66	-532,20
		23,25	-528,25
40000		22,01	-527,74
		20,94	-524,05
		20,03	-525,15
		19,29	-540,01
		18,72	-539,73
40250		18,31	-539,64
		18,07	-538,92
		18,00	-536,78
		18,00	-536,16
		18,00	-535,56
40500		18,00	-535,50
		18,00	-537,52
		18,00	-548,13
		18,00	-550,99
		18,00	-552,24
40750		18,00	-552,55
		18,00	-552,94
		18,00	-553,26
		18,00	-552,17
		18,00	-551,55
41000		18,00	-551,91
		18,00	-551,96
		18,00	-551,46
	R=-5000	18,00	-549,13
		18,00	-542,15
41250		18,00	-542,65
		18,00	-547,97
		18,00	-546,69
		18,00	-545,01
		18,00	-542,22
41500		18,00	-533,28
		18,00	-526,35
		18,00	-511,87
		18,00	-492,84
		18,00	-480,27
41750		18,00	-469,40
		18,00	-444,56
		18,00	-435,10
		18,00	-417,20
		18,00	-392,08
42000		18,00	-365,96
		18,00	-347,46
		18,00	-358,84
		18,00	-388,63
		18,00	-397,40
42250		18,00	-397,33
		18,00	-397,57
		18,00	-390,45
		18,00	-381,09
		18,00	-364,09
42500		18,00	-355,57
		18,00	-338,25
		18,00	-330,74
		18,00	-313,01
		18,00	-298,74
42750		18,00	-282,97
		18,00	-264,32
		18,00	-261,58
		18,00	-260,17
		18,00	-237,41
43000		18,00	-211,73

BREDDEUTV.

TVERRFALL: —— H.kj.b.k. 3,2% / 3,3% (at 39250 and 43000); ---- V.kj.b.k.

OVERBYGN.T. 10CM



Design team: Norconsult | Dr. techn. Olav Olsen

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	RuWes	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge
Road alignment - Plan and Profile
Profile 39250 - 43000

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:5000/1:1000
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/RuWes	OO/KH	5187772 / 12777	SBJ-33-C5-OON-05-DR-002 0

HOR.KURV.: R=-5000 · A=540 · A=270 · R=1000 · A=270 · A=460 · R=-5000

BREDDEUTV.

TVERRFALL — H.kj.b.k. / V.kj.b.k.: 3,2% 3,3% · 3,2% 3,3% 6,5% 6,5% · 6,5% 3,0% 3,0% · 3,0%

OVERBYGN.T.: 10CM · 112CM 10CM · 112CM

PROFIL NR.	PROFIL H.	TERRENG H.
43000	18,00	-211,73
	18,00	-169,59
	18,00	-154,22
	18,00	-168,02
	18,00	-176,82
43250	18,00	-178,06
	18,00	-178,53
	18,00	-178,39
	18,00	-177,52
	18,00	-171,38
43500	17,96	-163,85
	17,80	-137,19
	17,51	-125,47
	17,10	-106,89
	16,56	-95,82
43750	15,90	-77,28
	15,11	-54,48
	14,19	-43,48
	13,16	-27,22
	11,99	-18,08
44000	10,70	-1,13
	9,29	6,25
	7,75	0,17
	6,09	-24,00
	4,30	-17,50
44250	2,39	0,38
	0,35	8,20
	-1,82	9,10
	-4,11	14,16
	-6,51	17,74
44500	-8,91	24,93
	-11,32	27,79
	-13,73	29,08
	-16,14	18,39
	-18,55	7,81
44750	-20,96	8,27
	-23,37	7,38
	-25,78	16,63
	-28,19	21,88
	-30,60	25,05
45000	-33,01	23,80
	-35,42	25,80
	-37,83	19,54
	-40,24	17,84
	-42,64	1,95
45250	-45,05	4,16
	-47,46	10,03
	-49,87	15,42
	-52,28	16,87
	-54,69	18,62
45500	-57,10	0,23
	-59,51	8,33
	-61,92	24,17
	-64,33	24,12
	-66,74	24,27
45750	-69,15	18,30
	-71,56	13,49
	-73,97	16,11
	-76,37	19,40
	-78,78	8,09
46000	-81,19	-12,43
	-83,60	-24,68
	-86,01	-0,85
	-88,38	-2,89
	-90,41	-18,80
46250	-92,01	-25,08
	-93,20	-18,90
	-93,97	-17,85
	-94,33	-21,19
	-94,27	6,31
46500	-93,79	13,53
	-92,89	10,23
	-91,58	3,83
	-90,04	-19,17
	-88,49	-18,58
46750	-86,94	-12,28

Design team: Norconsult · DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	RuWes	KH	2019-06-30

Statens vegvesen

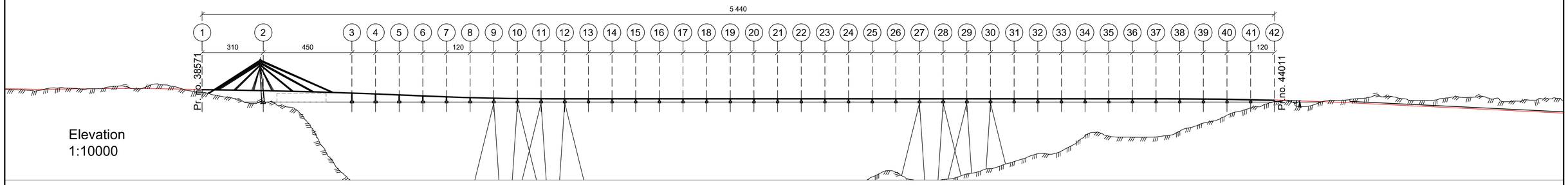
E39 Bjørnafjorden

Concept development floating bridge
Road Alignment - Plan and profile
Profile 43000 - 46750

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:5000/1:1000
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
NO/MaSOt	NO/RuWes	OO/KH	5187772 / 12777	SBJ-33-C5-OON-05-DR-003	0

Profile number	38571		38881		39331	39451	39571	39691	39811	39931	40051	40171	40291	40411	40531	40651	40771	40891	41011	41131	41251	41371	41491	41611	41731	41851	41971	42091	42211	42331	42451	42571	42691	42811	42931	43051	43171	43291	43411	43531	43651	43771	43891	44011
Elevation above mean sea level (m)	+64.1		+59.4		+47.0	+42.6	+37.7	+32.4	+27.6	+23.8	+20.1	+19.0	+18.1	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+18.0	+17.9	+17.0	+15.6	+13.4	+10.4



Elevation
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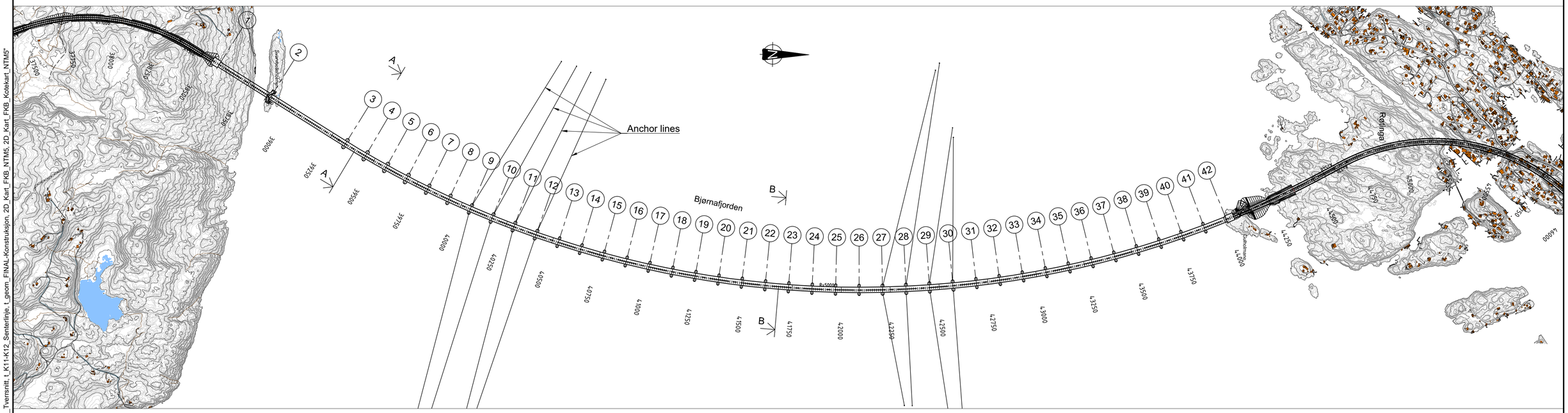

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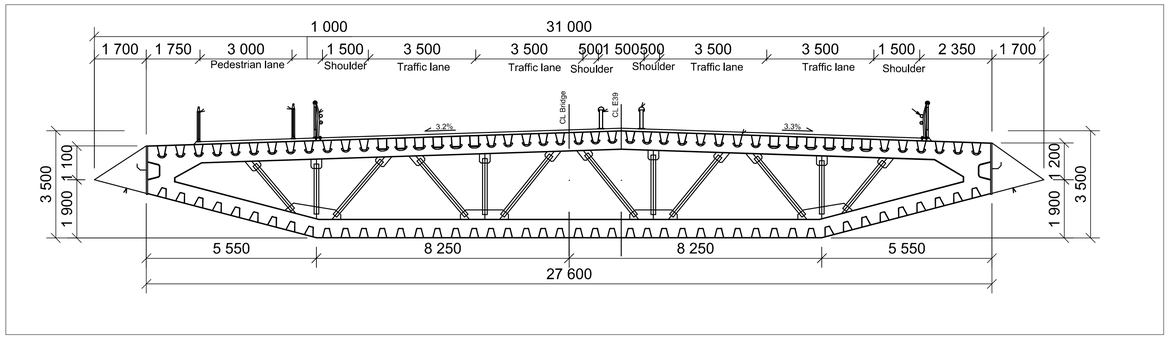

Cross section
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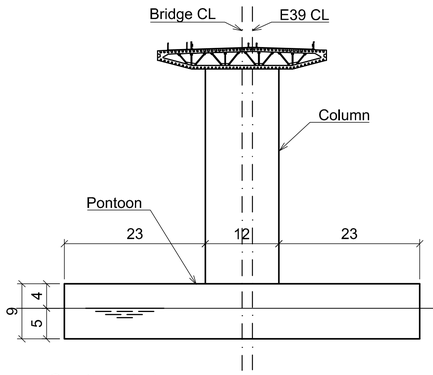

Section A-A
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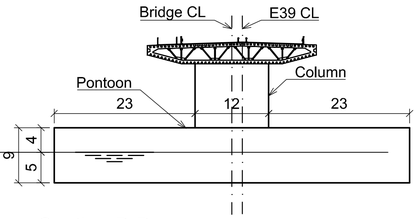


Section B-B
1:500

Remarks:

1. General:
- Side-anchored floating brigde for new E39 crossing Bjørnafjorden
- Road class H9
- Design traffic volume: 12000 - 14000 AADT 2050
- Road surface weight driving lanes: 2.0 kN/m²
- Road surface weight pedestrian lanes: 1.5 kN/m²
- Surfacing class CC3
- Reliablilit class RC3
- Design supervision level DSL3
- Inspection level L2

2. Regulations:
- Handbook N400 2015
- Handbook N100 2013
- Handbook R762 2015
- Eurocodes
- DNVGL-RP-C203 Fatigue design
- DNVGL-RP-C205 Environmental Loads

3. Steel structures:
- S420N/NL according to NS-EN 10025-3
- 25Cr SDSS Super Duple steel in pontoon splash one

4. Concrete Structures:
- B85 Abutments
- B55-SV30 Towers
- Reinforcement B500NC
- Presstressing reinforcement $f_{pk}/fp_{0,1k}$ = 1860/1640 MPa

5. Foundations:
- On rock above MSL

6. Bridge railings:
- Containment level H3 according to NS-EN 1317

7. Bearings:
- No bearings

8. E pansion joints:
- No e pansion joints

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

Statens vegvesen

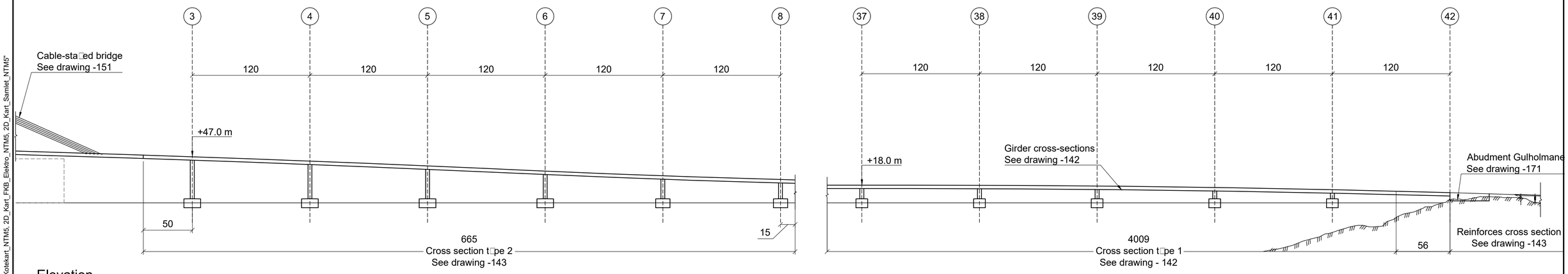
E39 Bjørnafjorden

Concept development floating bridge
General Arrangement
Elevation, plan, detail and sections

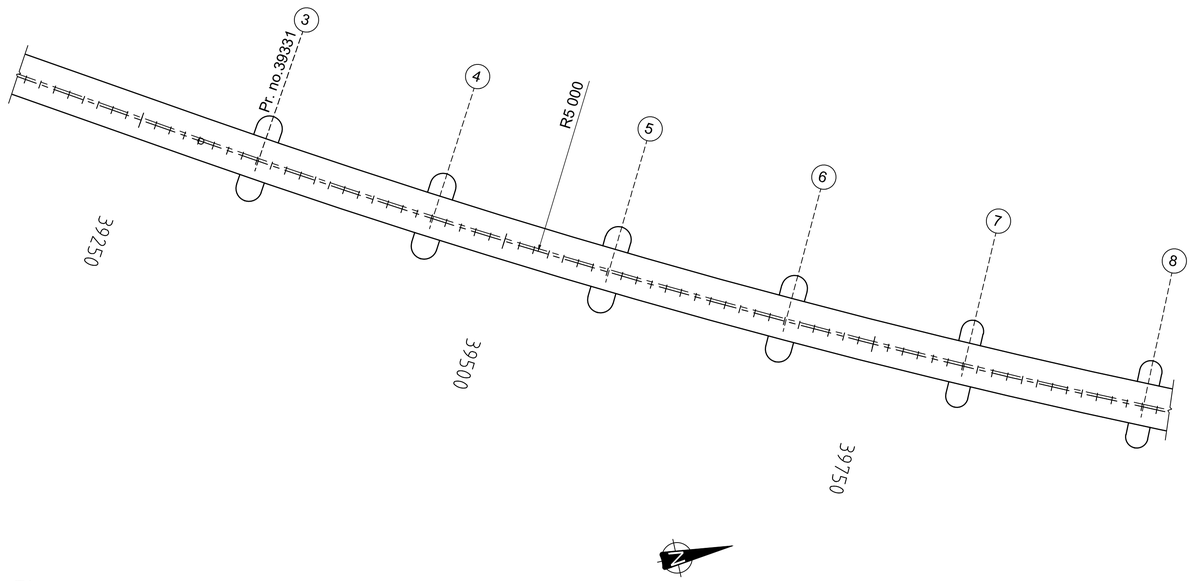
Drawing date	2019-01-28
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:10000/1:200/1:100
Coordinate system	EUREF89NTM5/NN2000

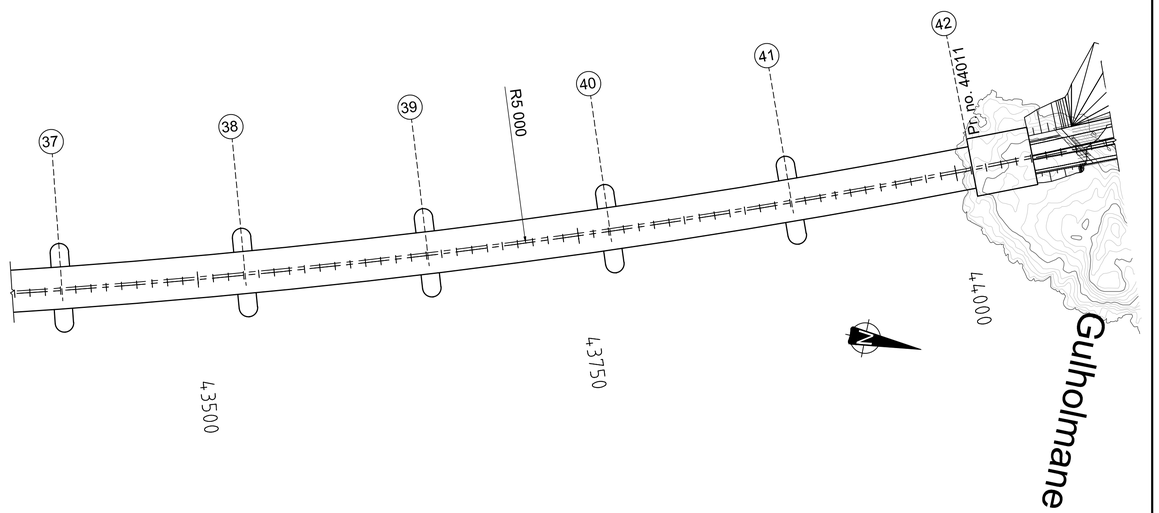
Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	00/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-001 0

'X:\nor\oppdrag\Sandvika\5187\7\5187772\BIM\Konstruksjon\Arkfil\Final\SBJ-33-C5-OON-22-DR-001.dwg - MaSOt - Plottet: 2019-07-01, 13:34:26 - XREF = K_Form_Tverrsnitt_t_K11-K12_Senterlinje_t_geom_FINAL-Konstruksjon_2D_Kart_FKB_NTM5_2D_Kart_FKB_Kotekart_NTM5"



Elevation
1:2000





Plan
1:2000

Column/Pontoon type		
Axis	Type	Drawing
3 -6	3	-124
7 -8	2	-122
9 -12	2 anchor	-123
13 -26	1	-121
27 -30	2 anchor	-123
31 - 41	1	-121

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

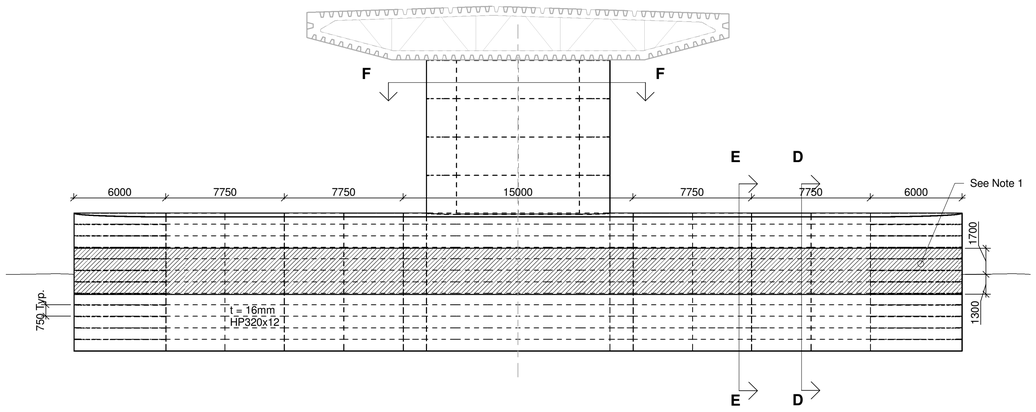
Statens vegvesen

E39 Bjørnafjorden

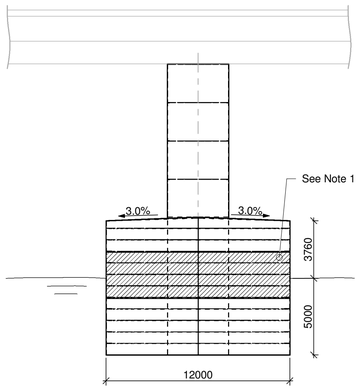
Concept development floating bridge
Floating bridge
Plan and elevation

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:2000
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-111 0



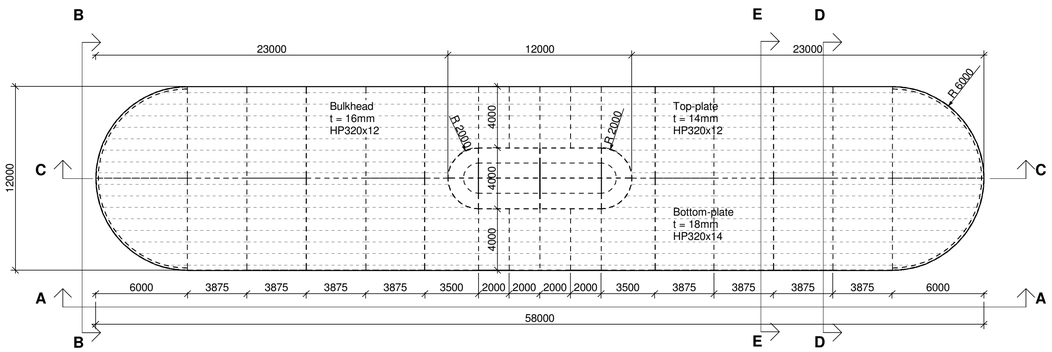
Section A-A
1 : 200



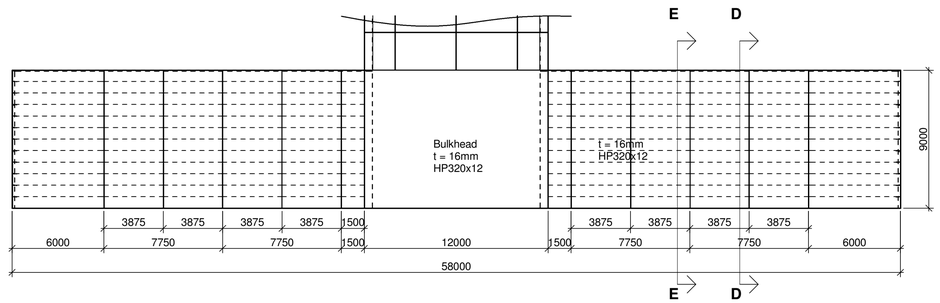
Section B-B
1 : 200

Pontoon dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
1. Low bridge - Axis 13 through 26 and 31 through 41	58	12	9	898	25
2. Ramp - Axis 7 through 8	58	14.5	9	1074	2
2. Anchor version - Axis 9 through 12 and Axis 27 through 30	58	14.5	9	1074	8
3. Ship navigation channel - Axis 3 through 6	58	17	9	1247	4
Total				36 700	39

Column dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
Low bridge - Axis 13 through 41	12	4	10.25	15.5	29
Ramp - Axis 7 through 12	12	4	17.34 (avg.)	13.2 (avg.)	6
High bridge - Axis 3 through 6	12	4	36.24 (avg.)	13.2 (avg.)	4
Total					39



Plan
1 : 200



Section C-C
1 : 200

Remarks:

Note 1: Optional (material currently not used)
25Cr DSSS
Super Duplex Stainless Steel with 25 % Cr.

Note 2: Two accessmanholes with access ladder to each compartment

Directions:

1. Structural design according to NPRA Handbook R762, N400 and Eurocode 3 (NS-EN-1993) or equivalent DNVGL standards.
2. Steel quality in plates: S420 MPa
3. Steel quality in stiffeners: S355 MPa
4. All measurements in mm.

References:

- SBJ-33-C5-OON-22-DR-122 Pontoons and columns Type 2 - structural arrangement
- SBJ-33-C5-OON-22-DR-123 Pontoons and columns Type 2A - structural arrangement
- SBJ-33-C5-OON-22-DR-124 Pontoons and columns Type 3 - structural arrangement
- SBJ-33-C5-OON-22-DR-125 Pontoons and columns Sections

Design team: Norconsult, DR. TECHN. OLAV OLSEN

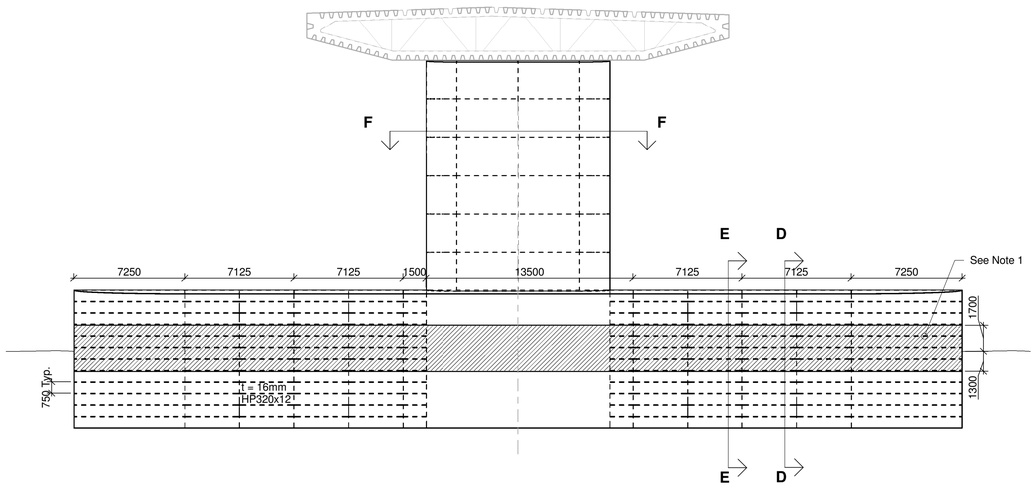
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	OHHK	KH	2019-06-30

Statens vegvesen

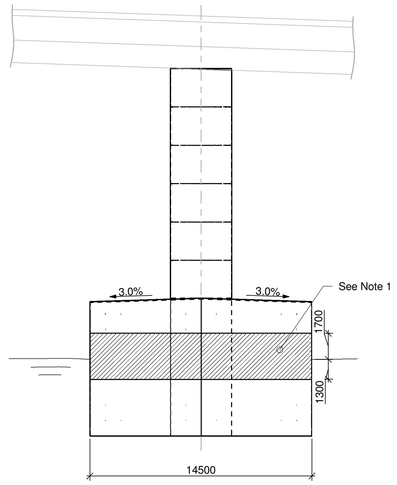
E39 Bjørnafjorden
Concept development floating bridge
K12 - Pontoons and columns
Type 1 - Structural Arrangement

Drawing dato	2019-03-28
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	OHHK	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-121	0



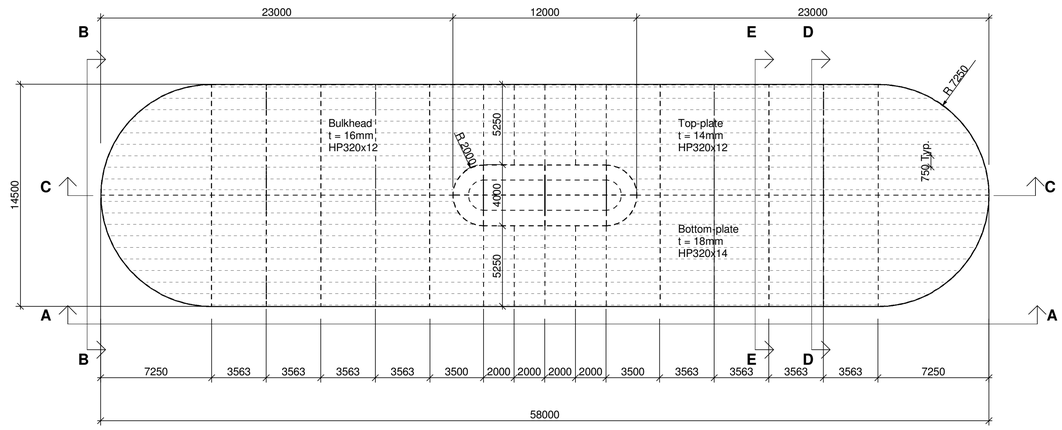
Section A-A
1 : 200



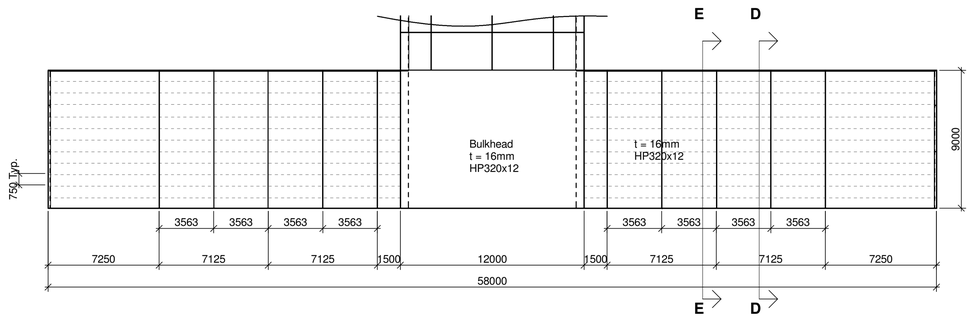
Section B-B
1 : 200

Pontoon dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
1. Low bridge - Axis 13 through 26 and 31 through 41	58	12	9	898	25
2. Ramp - Axis 7 through 8	58	14.5	9	1074	2
2. Anchor version - Axis 9 through 12 and Axis 27 through 30	58	14.5	9	1074	8
3. Ship navigation channel - Axis 3 through 6	58	17	9	1247	4
Total				36 700	39

Column dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
Low bridge - Axis 13 through 41	12	4	10.25	15.5	29
Ramp - Axis 7 through 12	12	4	17.34 (avg.)	13.2 (avg.)	6
High bridge - Axis 3 through 6	12	4	36.24 (avg.)	13.2 (avg.)	4
Total					39



Plan
1 : 200



Section C-C
1 : 200

Remarks:

Note 1: Optional (material currently not used)
25Cr DSSS
Super Duplex Stainless Steel with 25 % Cr.

Note 2: Two accessmanholes with access ladder to each compartment

Directions:

1. Structural design according to NPRA Handbook R762, N400 and Eurocode 3 (NS-EN-1993) or equivalent DNVGL standards.
2. Steel quality in plates: S420 MPa
3. Steel quality in stiffeners: S355 MPa
4. All measurements in mm.

References:

- SBJ-33-C5-OON-22-DR-121 Pontoons and columns Type 1 - structural arrangement
- SBJ-33-C5-OON-22-DR-123 Pontoons and columns Type 2A - structural arrangement
- SBJ-33-C5-OON-22-DR-124 Pontoons and columns Type 3 - structural arrangement
- SBJ-33-C5-OON-22-DR-125 Pontoons and columns Sections

Design team: Norconsult, DR. TECHN. OLAV OLSEN

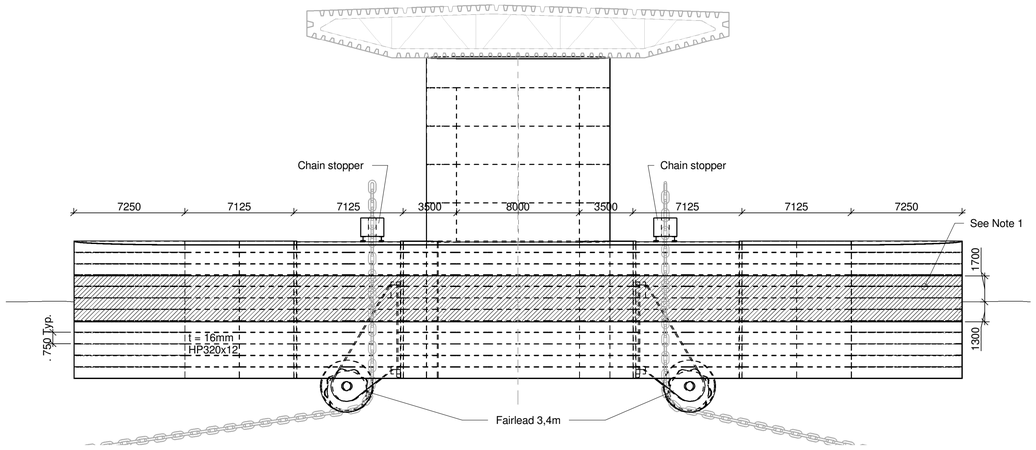
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	OHHK	KH	2019-06-30

Statens vegvesen

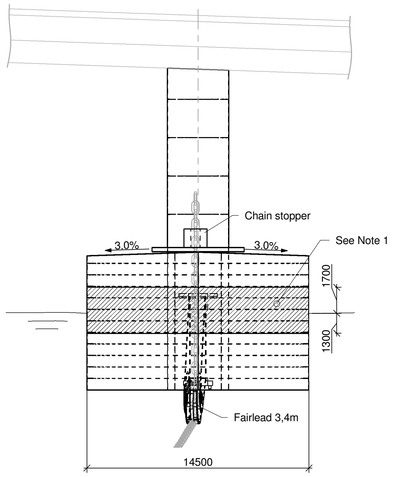
E39 Bjørnafjorden
Concept development floating bridge
K12 - Pontoons and columns
Type 2 - Structural Arrangement

Drawing dato	2019-03-28
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index
PLH	OHHK	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-122 0



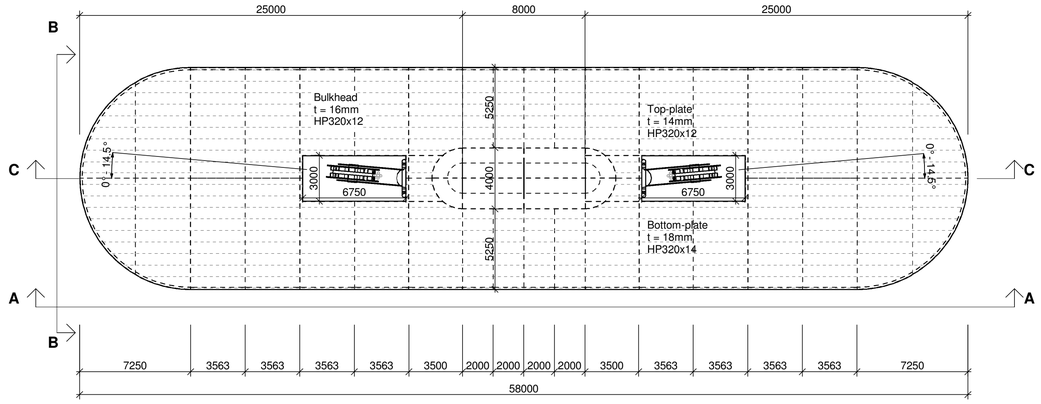
Section A-A
1 : 200



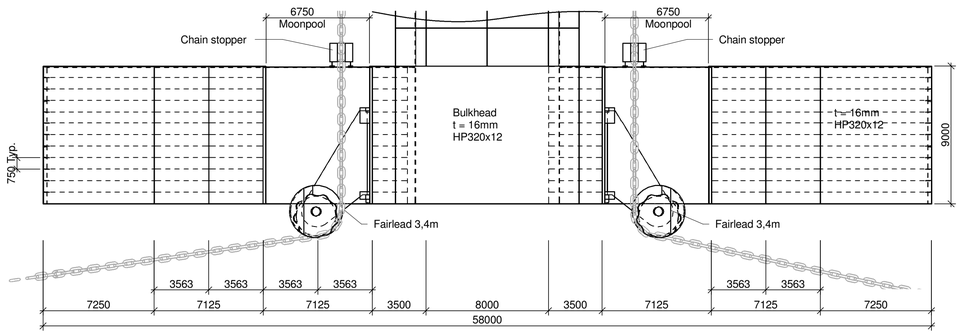
Section B-B
1 : 200

Pontoon dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
1. Low bridge - Axis 13 through 26 and 31 through 41	58	12	9	898	25
2. Ramp - Axis 7 through 8	58	14.5	9	1074	2
2A. Anchor version - Axis 9 through 12 and Axis 27 through 30	58	14.5	9	1074	8
3. Ship navigation channel - Axis 3 through 6	58	17	9	1247	4
Total				36 700	39

Column dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
Low bridge - Axis 13 through 41	12	4	10.25	15.5	29
Ramp - Axis 7 through 12	12	4	17.34 (avg.)	13.2 (avg.)	6
High bridge - Axis 3 through 6	12	4	36.24 (avg.)	13.2 (avg.)	4
Total					39



Plan
1 : 200



Section C-C
1 : 200

Remarks:

Note 1: Optional (material currently not used)
25Cr DSSS
Super Duplex Stainless Steel with 25 % Cr.

Note 2: Two accessmanholes with access ladder to each compartment

Directions:

1. Structural design according to NPRA Handbook R762, N400 and Eurocode 3 (NS-EN-1993) or equivalent DNVGL standards.
2. Steel quality in plates: S420 MPa
3. Steel quality in stiffeners: S355 MPa
4. All measurements in mm.

References:

- SBJ-33-C5-OON-22-DR-121 Pontoons and columns Type 1 - structural arrangement
- SBJ-33-C5-OON-22-DR-122 Pontoons and columns Type 2 - structural arrangement
- SBJ-33-C5-OON-22-DR-124 Pontoons and columns Type 3 - structural arrangement
- SBJ-33-C5-OON-22-DR-125 Pontoons and columns Sections

Design team: Norconsult, DR. TECHN. OLAV OLSEN

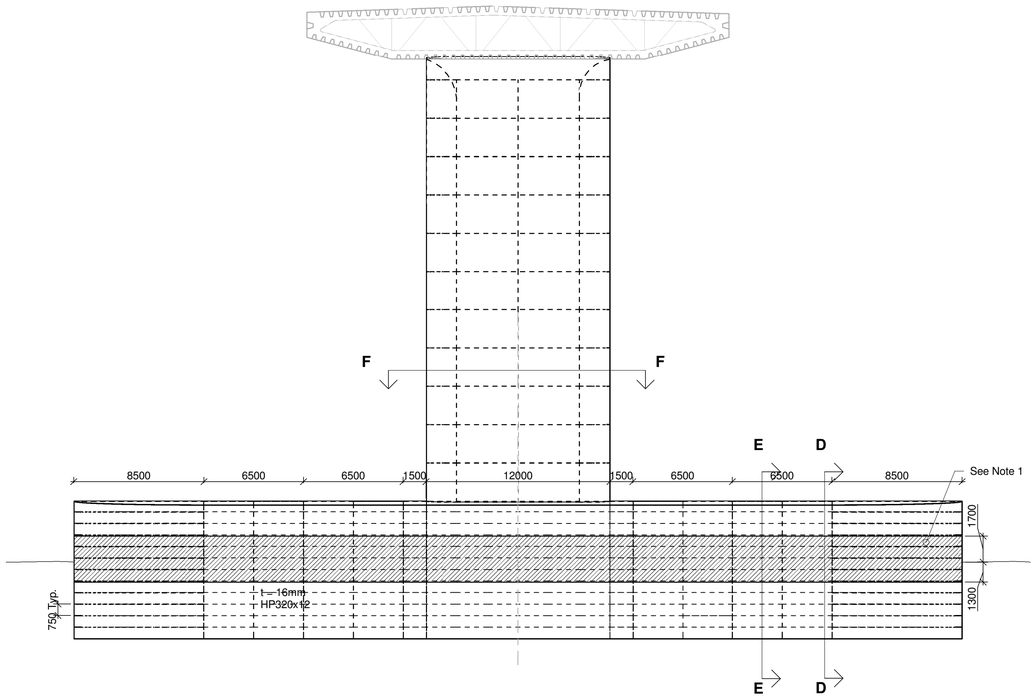
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	OHHK	KH	2019-06-30

Statens vegvesen

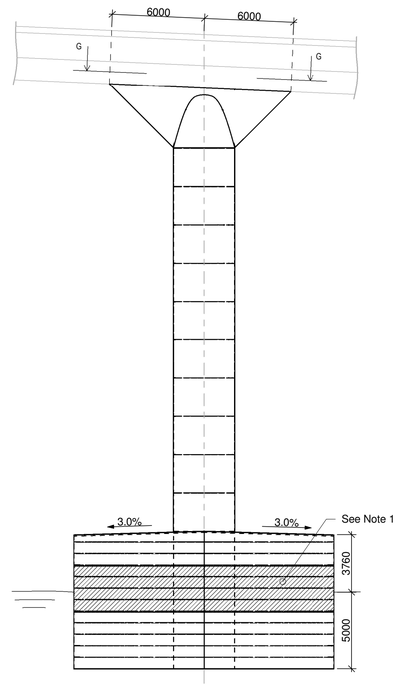
E39 Bjørnafjorden
Concept development floating bridge
K12 - Pontoons and columns
Type 2A Anchor- Structural Arrangement

Drawing dato	2019-03-28
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	OHHK	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-123	0



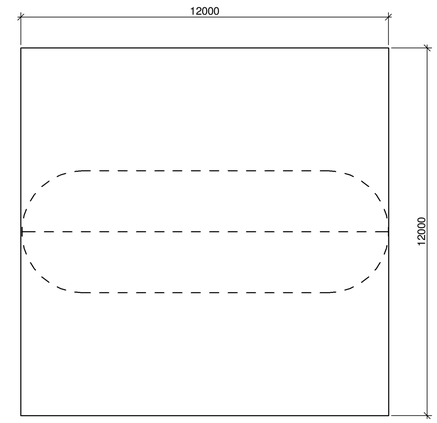
Section A-A
1 : 200



Section B-B
1 : 200

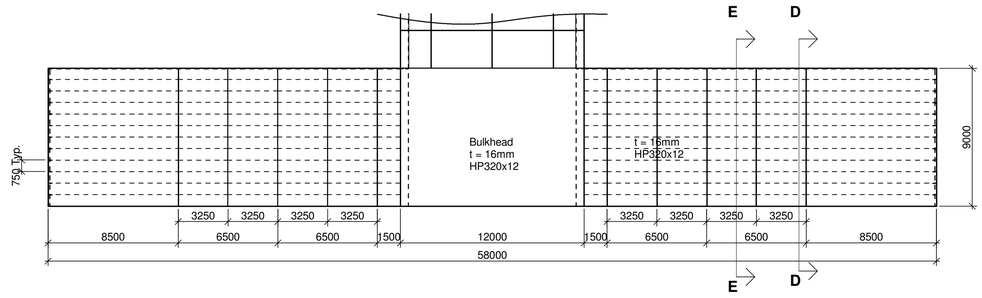
Pontoon dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
1. Low bridge - Axis 13 through 26 and 31 through 41	58	12	9	898	25
2. Ramp - Axis 7 through 8	58	14.5	9	1074	2
2. Anchor version - Axis 9 through 12 and Axis 27 through 30	58	14.5	9	1074	8
3. Ship navigation channel - Axis 3 through 6	58	17	9	1247	4
Total				36 700	39

Column dimensions and weights					
Pontoon types	L (m)	B (m)	H (m)	Weight (ton)	Nos.
Low bridge - Axis 13 through 41	12	4	10.25	15.5	29
Ramp - Axis 7 through 12	12	4	17.34 (avg.)	13.2 (avg.)	6
High bridge - Axis 3 through 6	12	4	36.24 (avg.)	13.2 (avg.)	4
Total					39



Section G-G
1 : 100

Plan
1 : 200



Section C-C
1 : 200

Remarks:

Note 1: Optional (material currently not used)
25Cr DSSS
Super Duplex Stainless Steel with 25 % Cr.

Note 2: Two accessmanholes with access ladder to each compartment

Directions:

1. Structural design according to NPRA Handbook R762, N400 and Eurocode 3 (NS-EN-1993) or equivalent DNVGL standards.
2. Steel quality in plates: S420 MPa
3. Steel quality in stiffeners: S355 MPa
4. All measurements in mm.

References:

- SBJ-33-C5-OON-22-DR-121 Pontoons and columns Type 1 - structural arrangement
- SBJ-33-C5-OON-22-DR-122 Pontoons and columns Type 2 - structural arrangement
- SBJ-33-C5-OON-22-DR-123 Pontoons and columns Type 2A - structural arrangement
- SBJ-33-C5-OON-22-DR-125 Pontoons and columns Sections

Design team: Norconsult; DR. TECHN. OLAV OLSEN

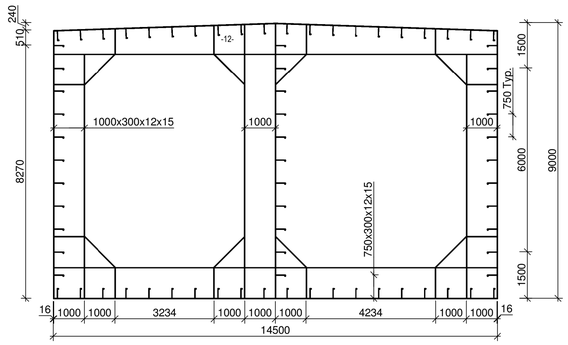
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	OHHK	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden
Concept development floating bridge
K12 - Pontoons and columns
Type 3 - Structural Arrangement

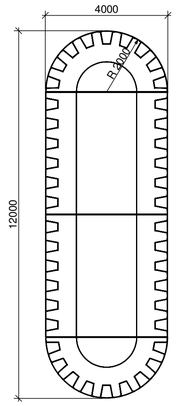
Drawing dato	2019-03-28
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index
PLH	OHHK	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-124 0



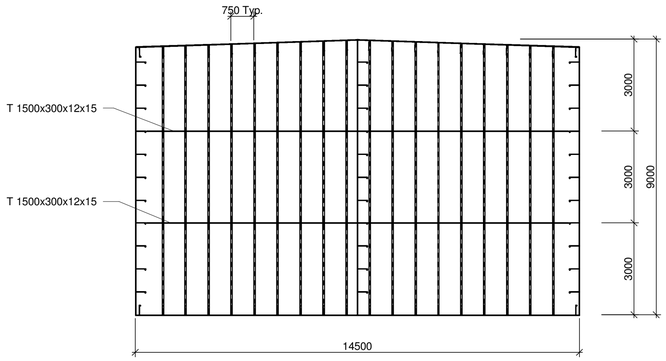
Section D-D

1 : 100 Frame in floater



Section F-F

1 : 100 Frame in column



Section E-E

1 : 100 Bulkhead in floater

Remarks:

-

Directions:

1. Structural design according to NPRA Handbook R762, N400 and Eurocode 3 (NS-EN-1993) or equivalent DNVGL standards.
2. Steel quality in plates: S420 MPa
3. Steel quality in stiffeners: S355 MPa
4. All measurements in mm.

References:

- SBJ-33-C5-OON-22-DR-121 Pontoons and columns Type 1 - structural arrangement
- SBJ-33-C5-OON-22-DR-122 Pontoons and columns Type 2 - structural arrangement
- SBJ-33-C5-OON-22-DR-123 Pontoons and columns Type 2A - structural arrangement
- SBJ-33-C5-OON-22-DR-124 Pontoons and columns Type 3 - structural arrangement

Design team: Norconsult DR. TECHN. OLAV OLSEN

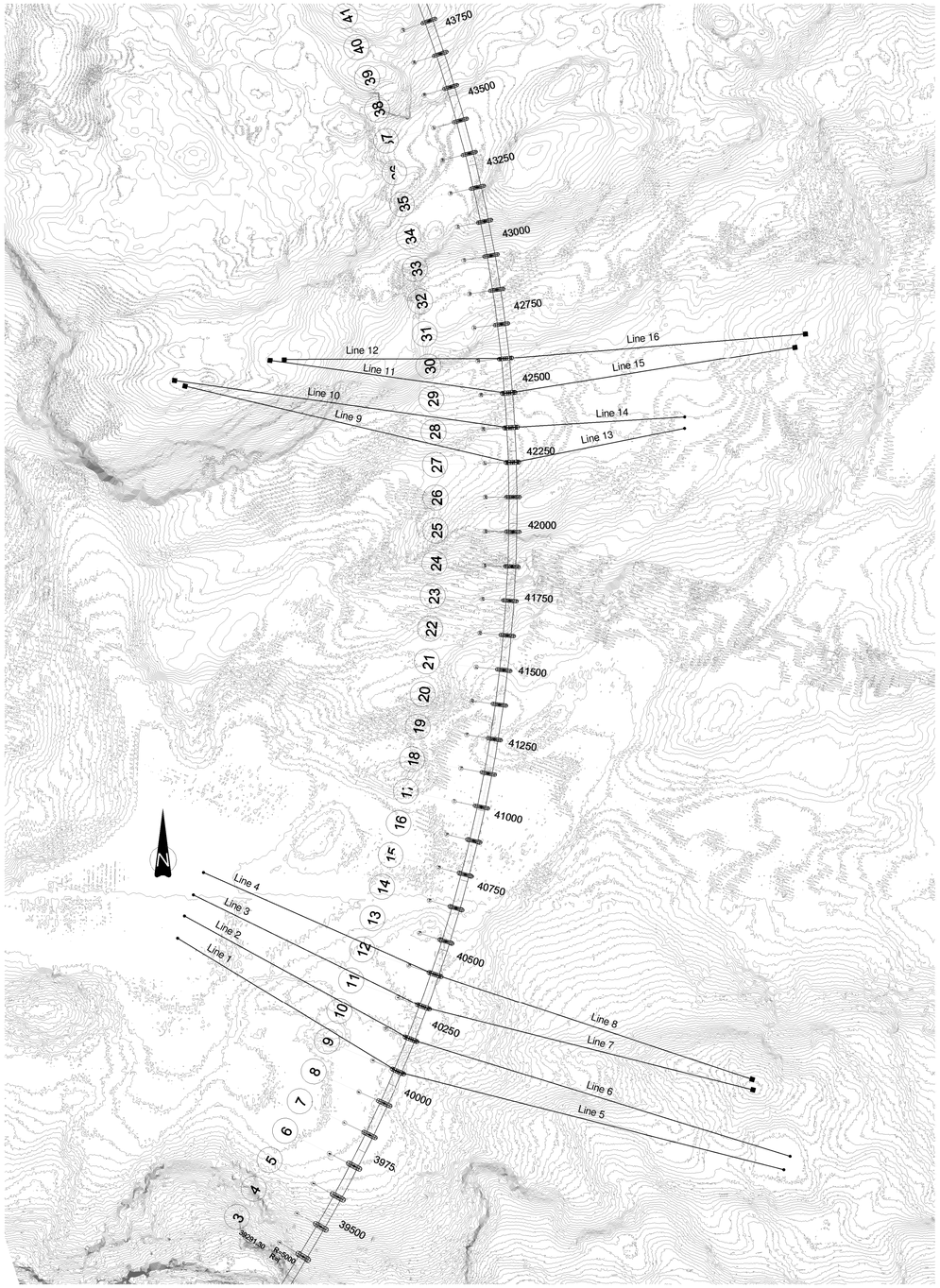
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	OHHK	KH	2019-06-30

Statens vegvesen

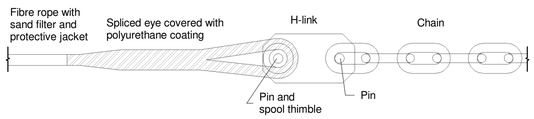
E39 Bjørnafjorden
Concept development floating bridge
K12 - Pontoons and columns
Sections

Drawing dato	2019-06-30
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	OHHK	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-125	0

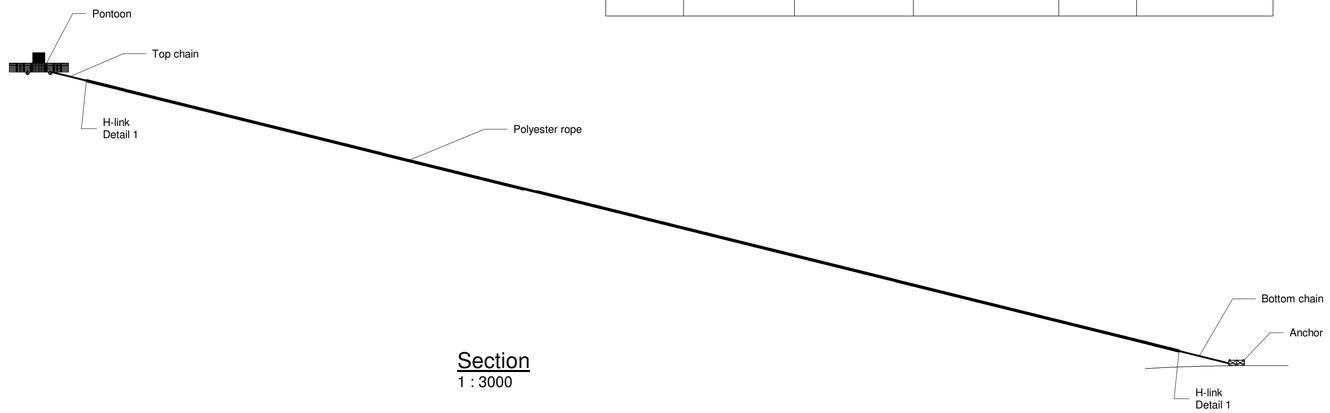


Plan view
1 : 10000



Detail 1

Global					
Line no.	Pontoon	Easting	Northing	Anchor type	Sea bed level
1	Type 2 anchor	92649.84000	1233791.87780	Suction	-561.5
2	Type 2 anchor	92673.69184	1233868.78408	Suction	-561.2
3	Type 2 anchor	92704.50704	1233941.73403	Suction	-561.1
4	Type 2 anchor	92739.73261	1234019.09616	Suction	-561.2
5	Type 2 anchor	94734.32868	1232996.20186	Suction	-359.3
6	Type 2 anchor	94756.02019	1233042.62511	Suction	-359.2
7	Type 2 anchor	94625.02032	1233271.95165	Gravity	-291.7
8	Type 2 anchor	94622.53372	1233308.72372	Gravity	-296.5
9	Type 2 anchor	92679.12417	1235699.96534	Gravity	-123.2
10	Type 2 anchor	92643.05611	1235720.02881	Gravity	-123.5
11	Type 2 anchor	92972.17586	1235789.46254	Gravity	-167.2
12	Type 2 anchor	93021.28794	1235793.90940	Gravity	-158.1
13	Type 2 anchor	94392.11560	1235554.87627	Suction	-382.2
14	Type 2 anchor	94392.40362	1235594.93325	Suction	-380.5
15	Type 2 anchor	94769.59995	1235835.63239	Gravity	-410.3
16	Type 2 anchor	94805.79378	1235882.81228	Gravity	-411.8



Section
1 : 3000

Line No.	Pretension	Botton Chain R4				Polyester fibre rope				Top Chain R4			
	(MN)	Dimension (mm)	Length (m)	Dry weight (kg/m)	MBL (MN)	Dimension (mm)	Length (m)	Dry weight (kg/m)	MBL (MN)	Dimension (mm)	Length (m)	Dry weight (kg/m)	MBL (MN)
1	2,3	100	60	200,0	9,9	177	985	22,0	9,8	146	25	426,3	18,9
2	2,1	100	60	200,0	9,9	177	985	22,0	9,8	146	25	426,3	18,9
3	1,8	92	60	169,3	8,5	177	978	22,0	9,8	146	25	426,3	18,9
4	1,8	92	60	169,3	8,5	177	968	22,0	9,8	146	25	426,3	18,9
5	2,0	100	75	200,0	9,9	185	1279	24,1	10,8	146	35	426,3	18,9
6	1,8	100	75	200,0	9,9	185	1274	24,1	10,8	146	35	426,3	18,9
7	1,6	92	50	169,3	8,5	168	1091	19,4	8,8	146	35	426,3	18,9
8	1,6	92	50	169,3	8,5	168	1074	19,4	8,8	146	35	426,3	18,9
9	1,7	92	70	169,3	8,5	177	1047	22,0	9,8	146	50	426,3	18,9
10	1,6	92	175	169,3	8,5	168	952	19,4	8,8	146	50	426,3	18,9
11	1,6	92	70	169,3	8,5	145	725	15,7	6,9	146	50	426,3	18,9
12	1,6	92	50	169,3	8,5	145	675	15,7	6,9	146	50	426,3	18,9
13	2,0	92	50	169,3	8,5	145	633	15,7	6,9	146	25	426,3	18,9
14	1,8	92	50	169,3	8,5	145	627	15,7	6,9	146	25	426,3	18,9
15	1,7	92	150	169,3	8,5	168	897	19,4	8,8	146	25	426,3	18,9
16	1,7	92	100	169,3	8,5	177	982	22,0	9,8	146	25	426,3	18,9

Remarks:

1. STANDARDS / PROVISIONS:

-Norwegian public roads adm. handbook N400 (2015)
-Norwegian public roads adm. handbook R762 (2015)
-Associated Eurocodes
-ISO 19901-7, Annex B
-DNVGL-OS-E301
-DNVGL-OS-E302
-DNVGL-OS-E304
-All measurements in m
-Top and bottom chain protected by corrosion allowance
-Polyester rope protected with sand filter and protection jacket

EXPLANATIONS:

● Suction anchor

■ Gravity anchor

References:

- SBJ-33-C5-OON-22-DR-123 Pontoons and columns Type 2A - structural arrangement
- SBJ-33-C5-OON-22-DR-132 Floating bridge - Suction anchor plan, sections and details
- SBJ-33-C5-OON-22-DR-133 Gravity anchor plan, sections and details

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	KWA	KH	2019-06-30

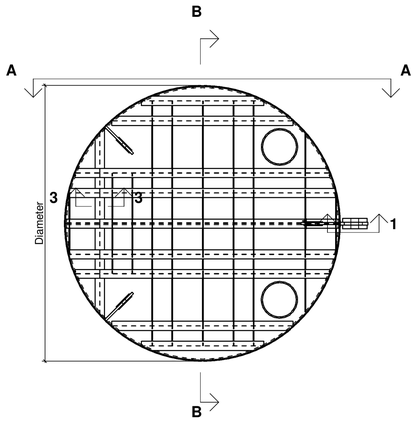
Statens vegvesen

E39 Bjørnafjorden
Concept development floating bridge
K12 - Anchors and mooring lines
Layout

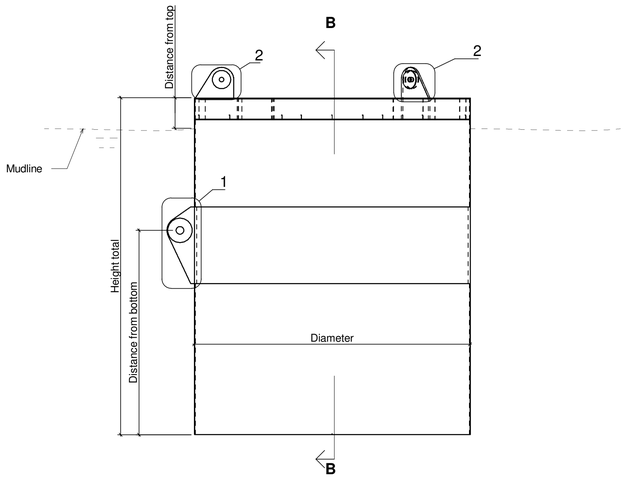
Drawing dato	2019-05-24
Client rep.	
Produced for	
Produced by	
Project number	
PROF number	
File number	
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	KWA	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-131	0

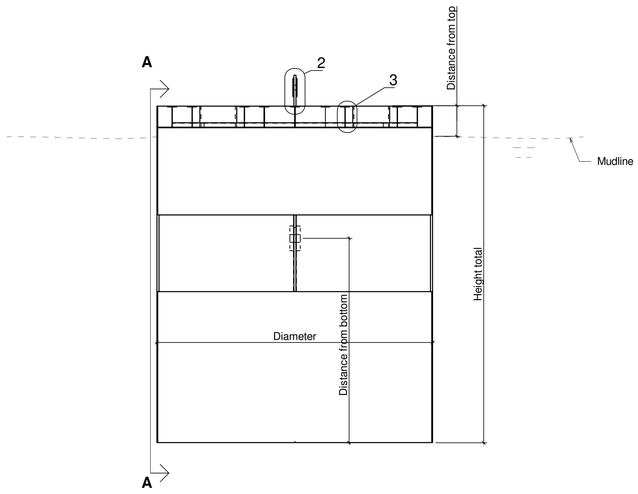
Measures				
Line no. (See drawing SBJ-33-C5-OON-22-DR-131)	Diameter	Height total	Distance from bottom	Distance from top
1-6	9.0m	12.5m	5.75m	1.0m
13 and 14	9.0m	11.0m	6.67m	1.0m



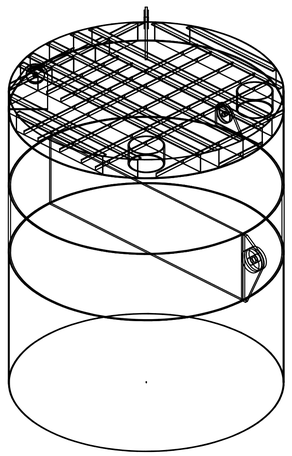
Plan view
1 : 100

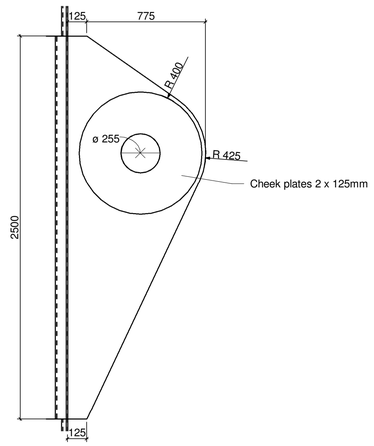


Section A-A
1 : 100

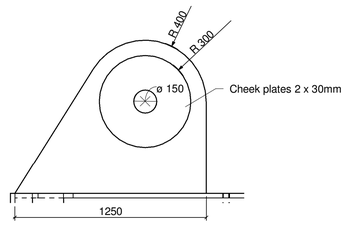


Section B-B
1 : 100

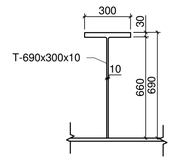




Detail 1
1 : 20



Detail 2
1 : 20



Detail 3
1 : 20

Remarks:

-

Directions:

-

References:

- SBJ-33-C5-OON-22-DR-131 Floating bridge - Anchors and mooring lines - Layout
- SBJ-33-C5-OON-22-DR-133 Gravity anchor plan, sections and details

Design team: Norconsult, DR. TECHN. OLAV OLSEN

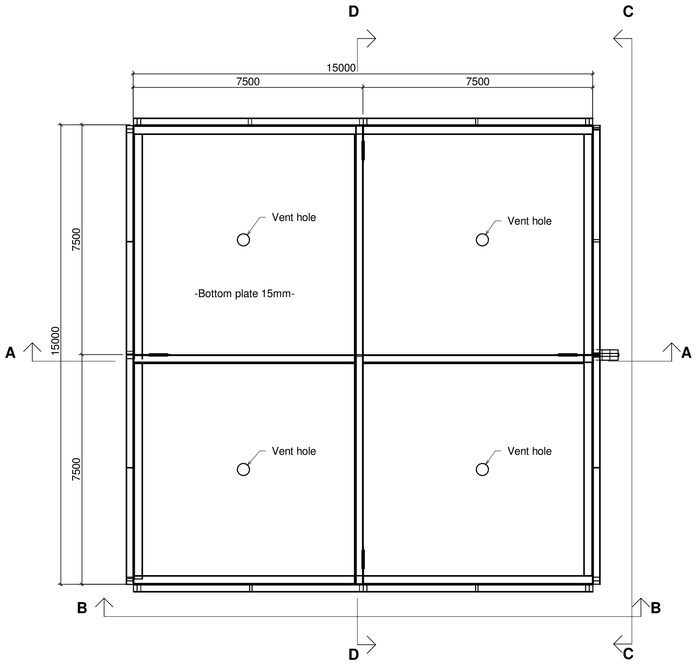
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	JOM	KH	2019-06-30

Statens vegvesen

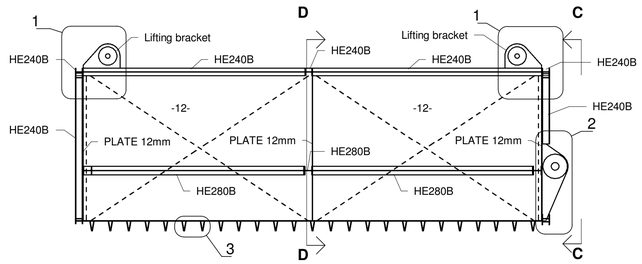
E39 Bjørnafjorden
Concept development floating bridge
K12 - Anchors
Suction anchor plan, sections and details

Drawing dato	2019-05-24
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	JOM	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-132	0



Plan view
1 : 100



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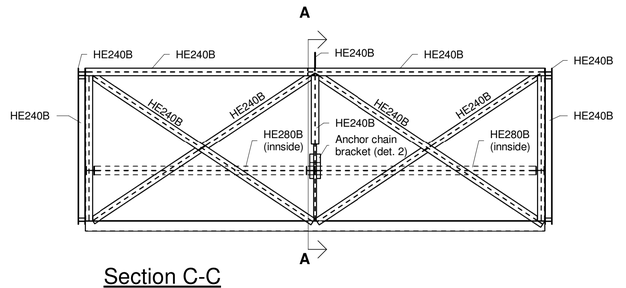

Section C-C
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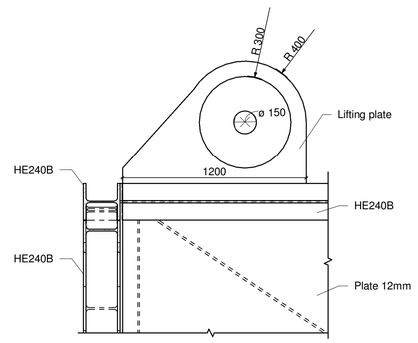
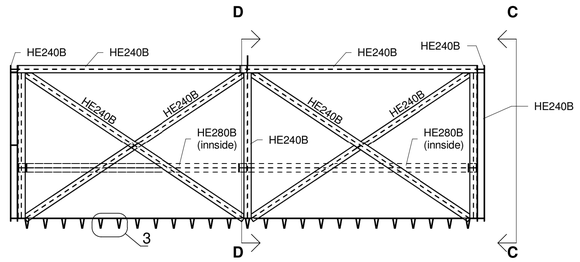
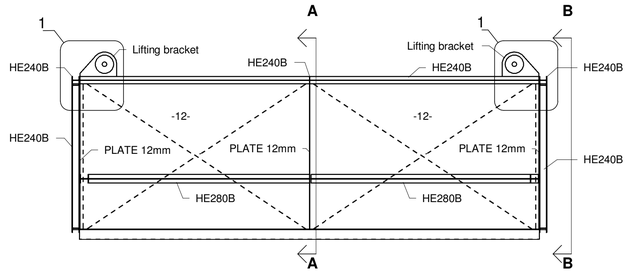


Detail 1
1 : 20



Section B-B
1 : 100



Section D-D
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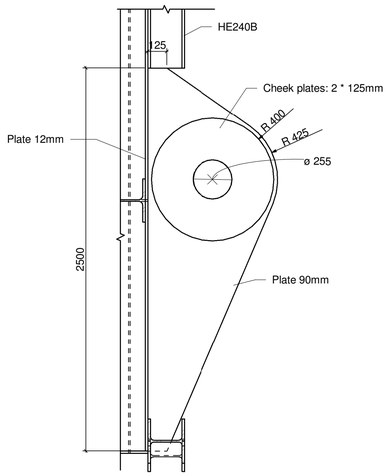
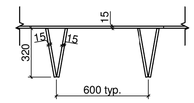
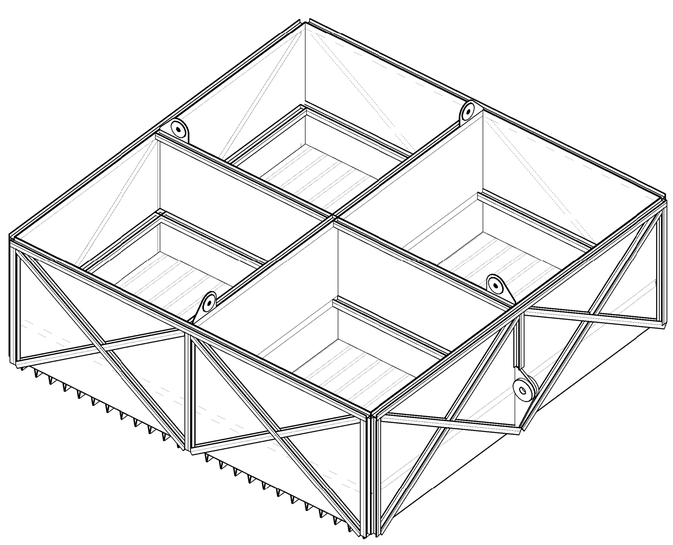


Detail 2
1 : 20



Ribs / plates

Detail 3
1 : 20



Remarks:

-

Directions:

-

References:

- SBJ-33-C5-OON-22-DR-131 Floating bridge - Anchors and mooring lines - Layout
- SBJ-33-C5-OON-22-DR-132 Floating bridge - Suction anchor plan, sections and details

Design team: Norconsult, DR. TECHN. OLAV OLSEN

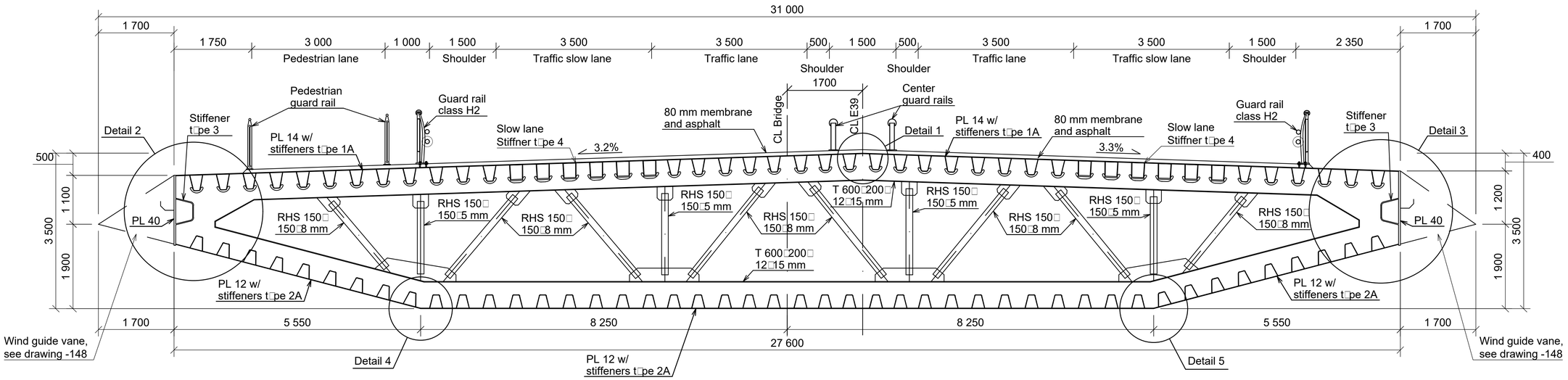
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	JOM	KH	2019-06-30

Statens vegvesen

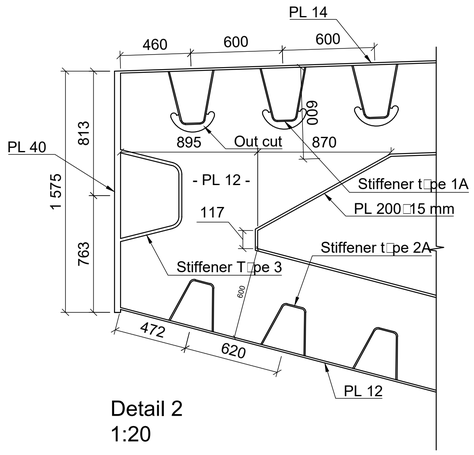
E39 Bjørnafjorden
Concept development floating bridge
K12 - Anchors
Gravity anchor plan, sections and details

Drawing dato	2019-05-24
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

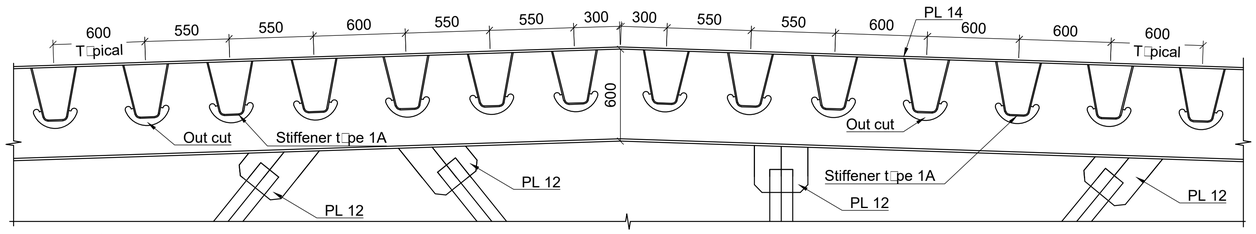
Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	JOM	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-133	0



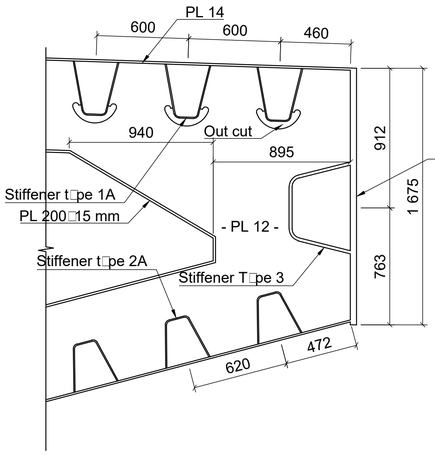
Standard cross section
1:50



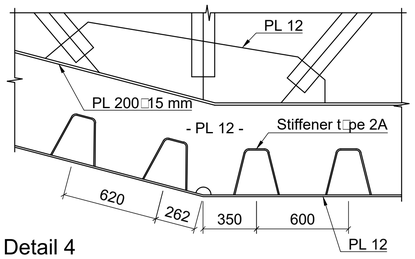
Detail 2
1:20



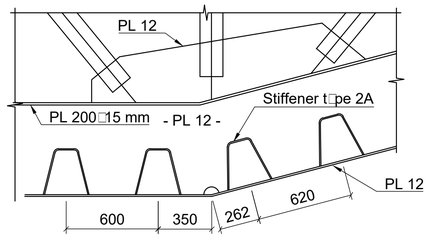
Detail 1
1:20



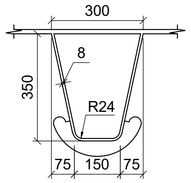
Detail 3
1:20



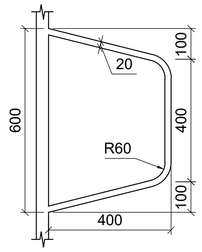
Detail 4
1:20



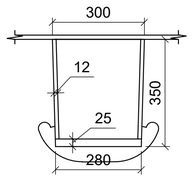
Detail 5
1:20



Stiffener type 1A
1:10



Stiffener type 3
1:10



Stiffener type 4
1:10

Steel weights

Cross Section:	12300	kg/m
Transverse girders and bracings:	1206	kg/m
Sum Steel	13506	kg/m

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

Statens vegvesen

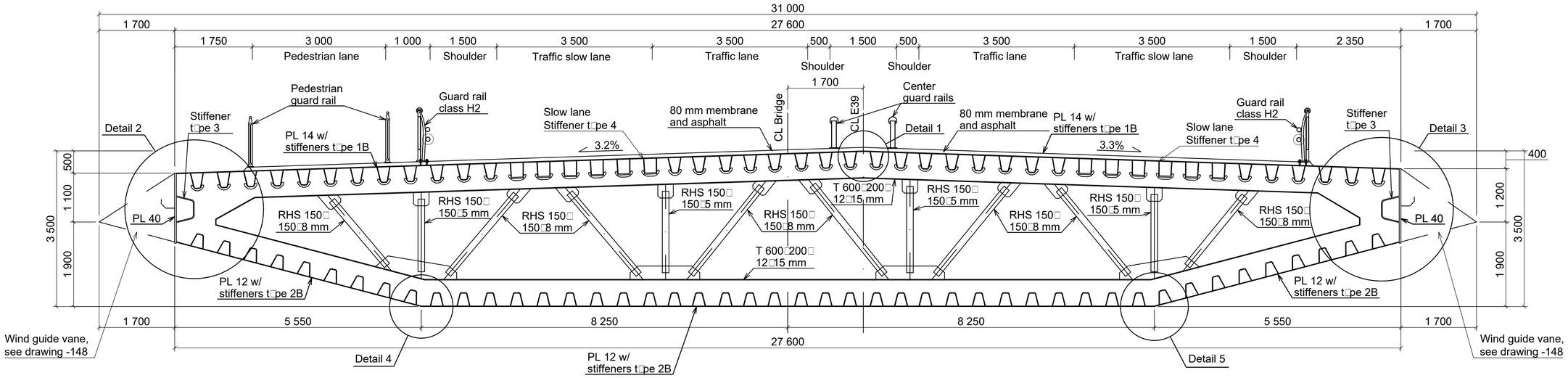
E39 Bjørnafjorden

Concept development floating bridge
Girder
Cross-sections 1

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	As shown
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-141 0

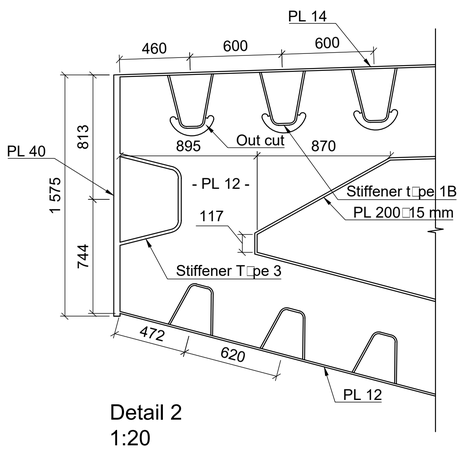
"X:\nor\oppdrag\Sandvika\518\77\5187772\BIM\Konstruksjon\Arkfil\Final\SBJ-33-C5-OON-22-DR-141.dwg - MaSOt - Plottet: 2019-07-01, 13:29:36 - XREF = K_Form_Tverrsnitt"



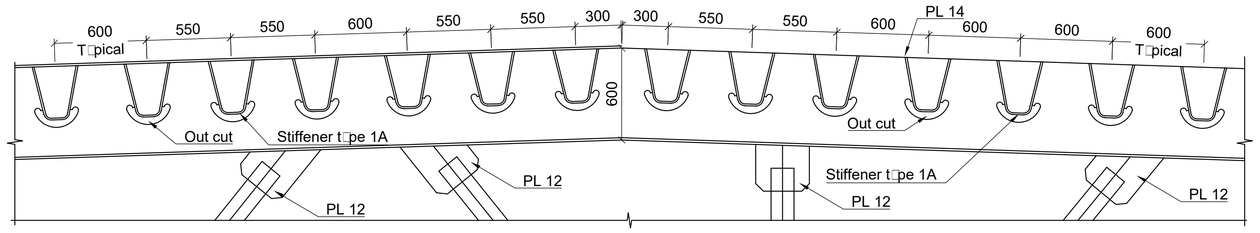
Reinforced cross section

1:50

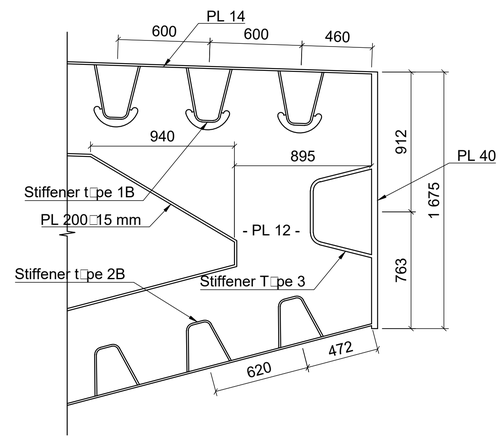
Reinforced cross section used for the high floating bridge □appro□ 665 m length□



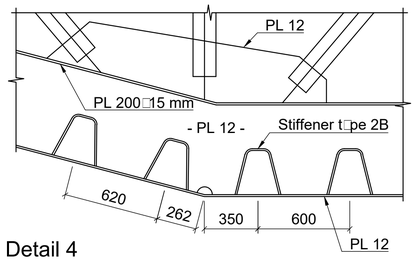
Detail 2
1:20



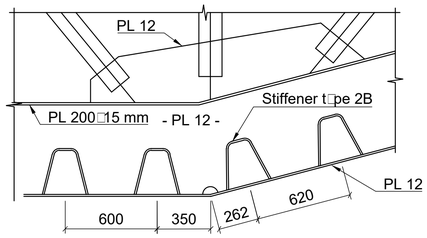
Detail 1
1:20



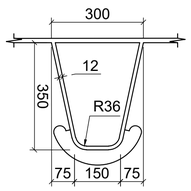
Detail 3
1:20



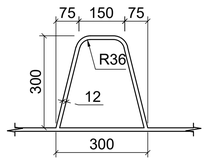
Detail 4
1:20



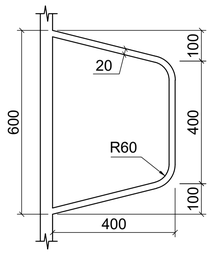
Detail 5
1:20



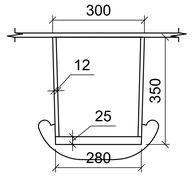
Stiffener type 1B
1:10



Stiffener type 2B
1:10



Stiffener type 3
1:10



Stiffener type 4
1:10

Steel weights

Cross Section:	14115	kg/m
Transverse girders and bracings:	1206	kg/m
Sum Steel	15321	kg/m

Remarks:

1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge

Girder

Cross-sections 2

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	As shown
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-142 0

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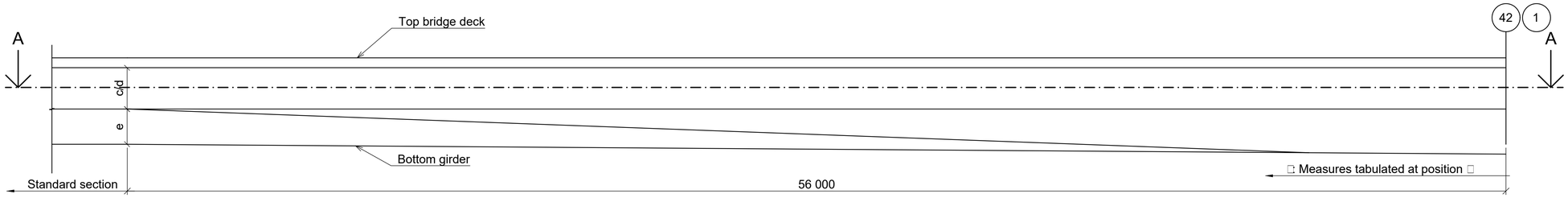
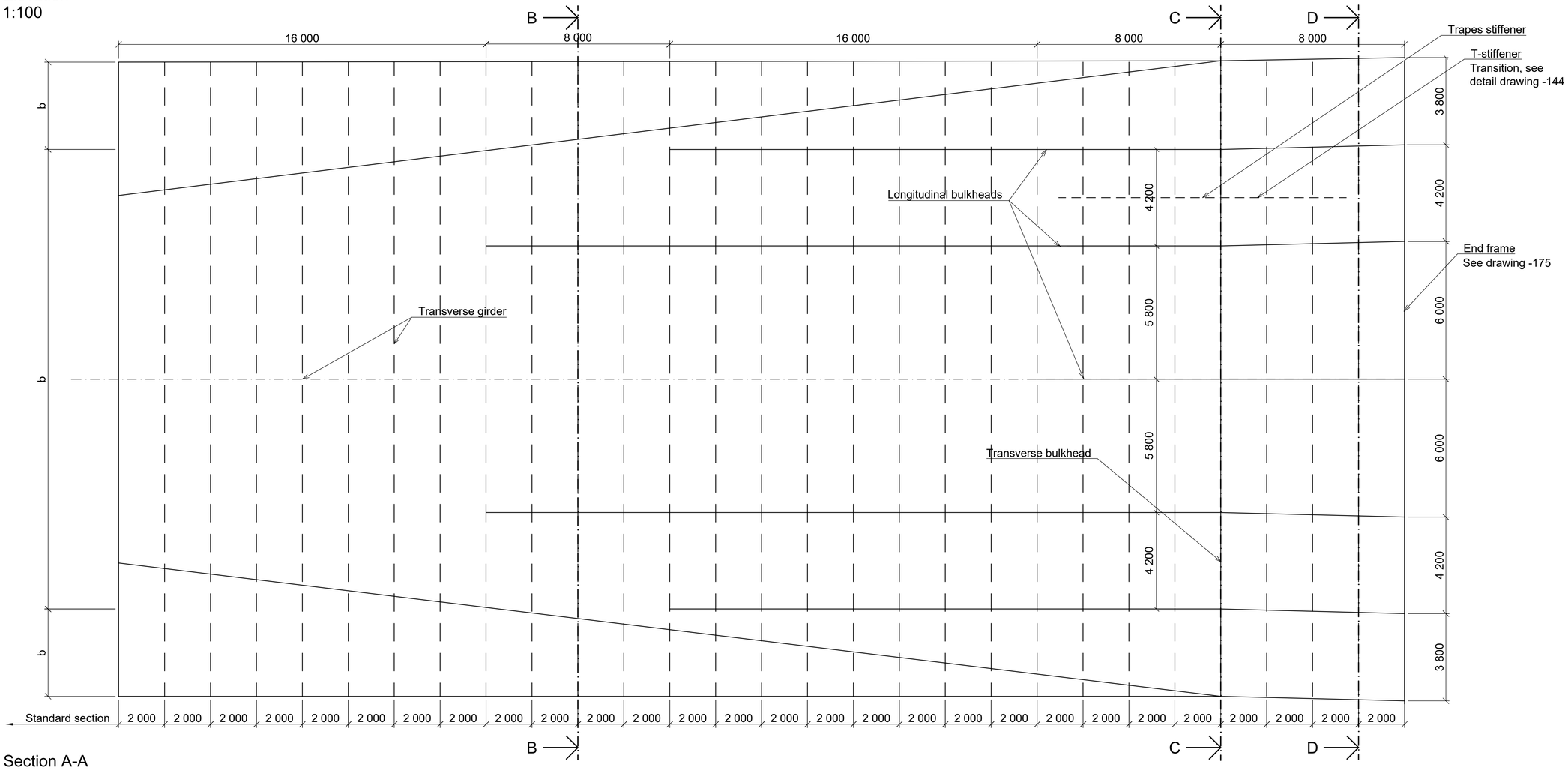
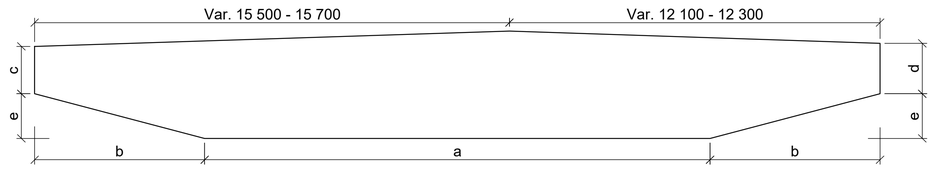


Elevation
1:100



Section A-A
1:100



Measures, see table

Measures					
□	a	b	c	d	e
0	28000	0	3300	3400	0
8000	27600	0	3000	3100	0
16000	25750	925	2763	2863	237
24000	23900	1850	2525	2625	475
32000	22050	2775	2288	2388	712
40000	20200	3700	2050	2150	950
48000	18350	4625	1813	1913	1187
56000	16500	5500	1575	1675	1425

Steel weights	
Reinforces length	2 □56 = 112 m
Cross sections	1892 tons
Transverse girders	270 tons
Sum steel	2162 tons

X position □m□	Deck plate thickness	Deck stiffener	Bottom plate thickness	Bottom stiffener	Web plate thickness	Web stiffener	No longitudinal bulkheads	Bulkhead plate thickness	Bulkhead stiffener
0 - 8	40	T	40	T	40	T	5	24	T
8 - 16	20	1B + 4	20	2B	40	3	5	24	3
16 - 24	20	1B + 4	20	2B	40	3	4	24	3
24 - 32	14	1B + 4	12	2B	40	3	4	24	3
32 - 40	14	1B + 4	12	2B	40	3	2	24	3
40 - 48	14	1B + 4	12	2B	40	3	0		
48 - 56	14	1B + 4	12	2B	40	3	0		
56 -	14	1A + 4	12	1A	40	3	0		

Remarks:
1. Steel structures:
   - S420N/NL according to NS-EN 10025-3

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

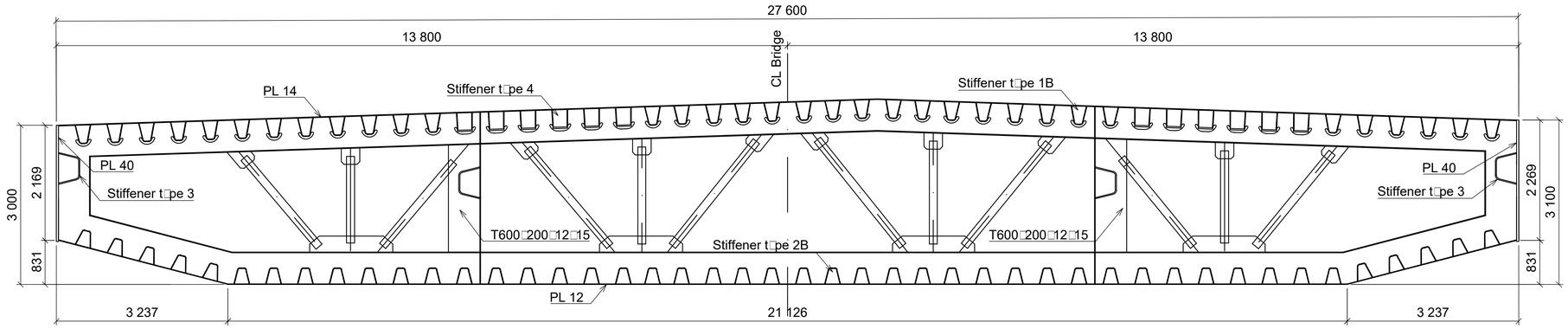
Statens vegvesen

E39 Bjørnafjorden

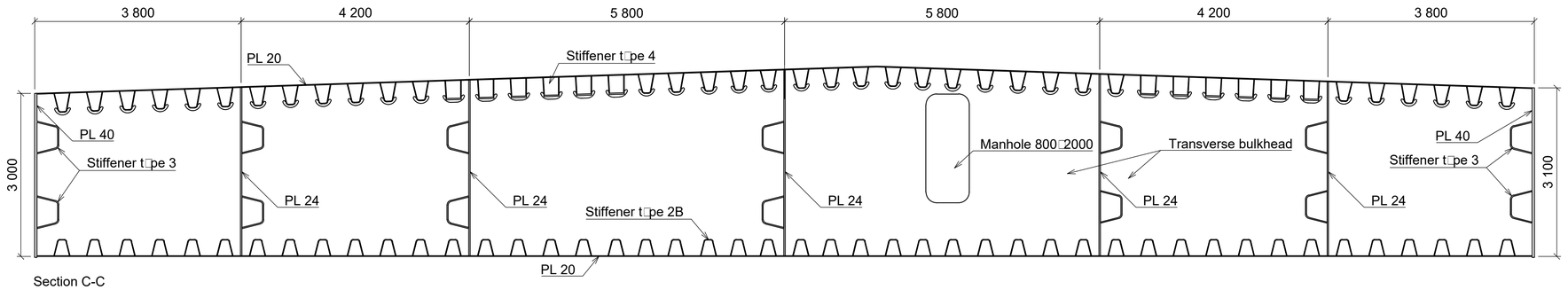
Concept development floating bridge
Girder
Reinforced bridge girder ends

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-22-DR-143 / 0

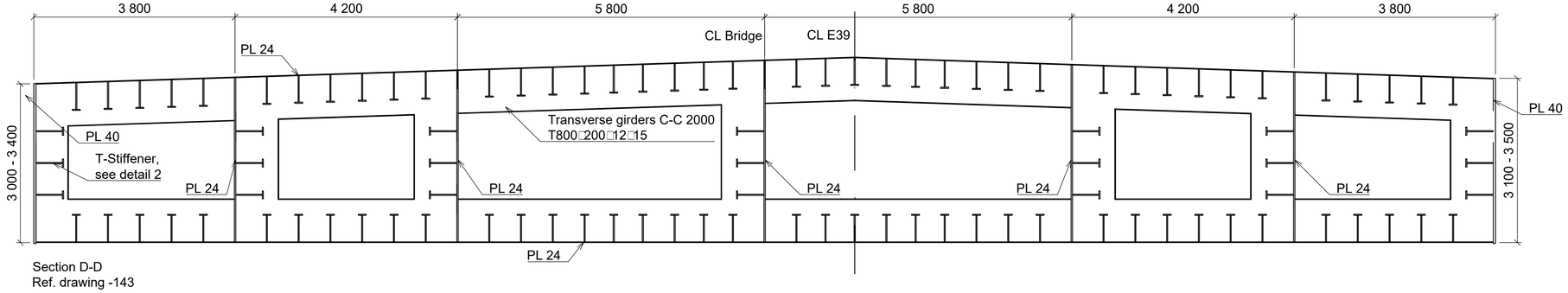
Drawn by:	Checked by:	Approved by:	Project no:
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777



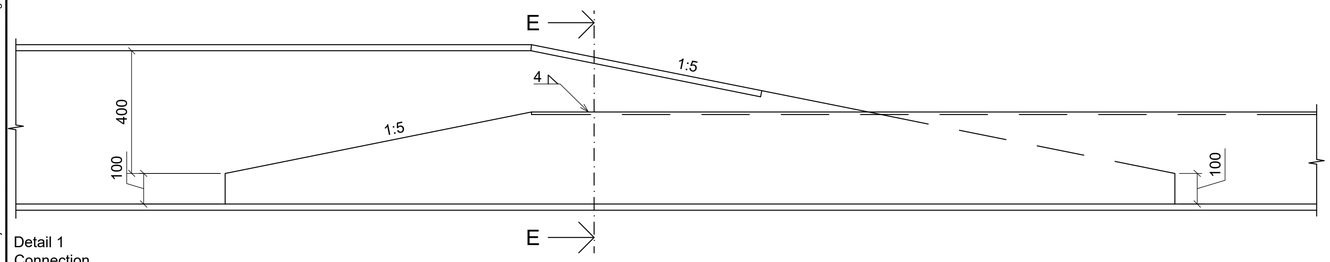
Section B-B
Ref. drawing -143
1:50
Position =36



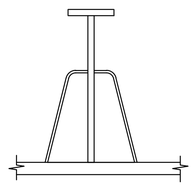
Section C-C
Ref. drawing -143
1:50



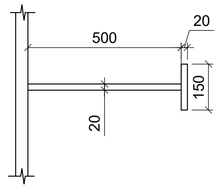
Section D-D
Ref. drawing -143
1:50



Detail 1
Connection
T-Stiffener/Trapese stiffener
1:10



Section E-E
1:10



Detail 2
T-Stiffener
1:10

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

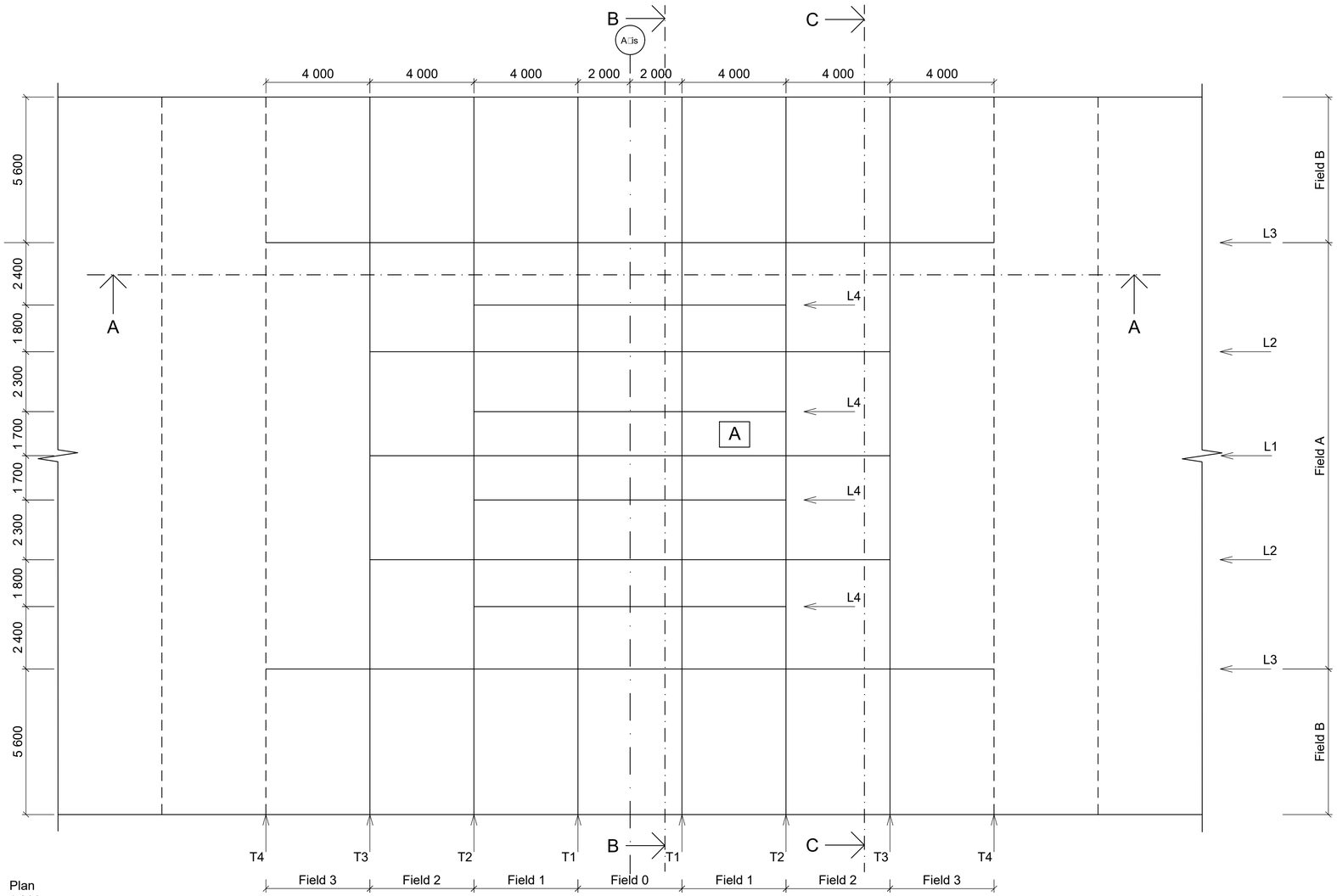
Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge
Girder
Details part 1

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-144 | 0



Plan
1:200

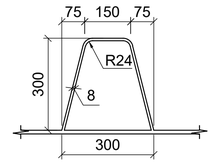
Reinforcement column axis 3 - 6										
Longitudinal bulkheads - Plate thickness (mm)								Transverse girders - Plate thickness (mm)			
	Field 3	Field 2	Field 1	Field 0	Field 1	Field 2	Field 3		Field B	Field A	Field B
L1		12	30	30	30	12		T1	12	30	12
L2		12	30	30	30	12		T2	12	30	12
L3	12	12	30	30	30	12	12	T3	12	12	12
L4			12	12	12			T4	Truss	Truss	Truss
Longitudinal bulkheads - Number of stiffeners								Transverse girders -Number of stiffeners			
	Field 3	Field 2	Field 1	Field 0	Field 1	Field 2	Field 3		Field B	Field A	Field B
L1		2	4	4	4	2		T1	1	1	1
L2		2	4	4	4	2		T2	1	1	1
L3	2	2	4	4	4	2	2	T3	1	1	1
L4			4	4	4			T4	0	0	0

Reinforcement column axis 7 - 41										
Longitudinal bulkheads - Plate thickness (mm)								Transverse girders - Plate thickness (mm)			
	Field 3	Field 2	Field 1	Field 0	Field 1	Field 2	Field 3		Field B	Field A	Field B
L1		12	12	30	12	12		T1	12	30	12
L2		12	12	30	12	12		T2	12	12	12
L3	12	12	12	30	12	12	12	T3	12	12	12
L4				12				T4	Truss	Truss	Truss
Longitudinal bulkheads - Number of stiffeners								Transverse girders -Number of stiffeners			
	Field 3	Field 2	Field 1	Field 0	Field 1	Field 2	Field 3		Field B	Field A	Field B
L1		2	4	4	4	2		T1	1	1	1
L2		2	4	4	4	2		T2	1	1	1
L3	2	2	4	4	4	2	2	T3	1	1	1
L4				4				T4	0	0	0

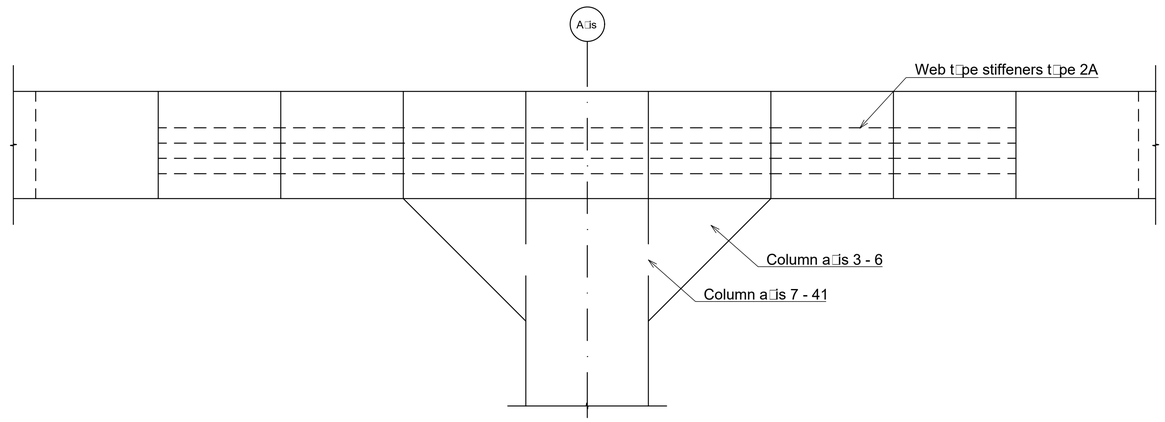
Increased bottom plate thickness	
Axis 3 - 6	20x16500x12000
Axis 7 - 41	20x16500x4000

A

Weights		
Axis 3 - 6	164	tons
Axis 7 - 4	112	tons
Sum	4576	tons



Stiffener t□pe 2A
1:10



Section A-A
1:200

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

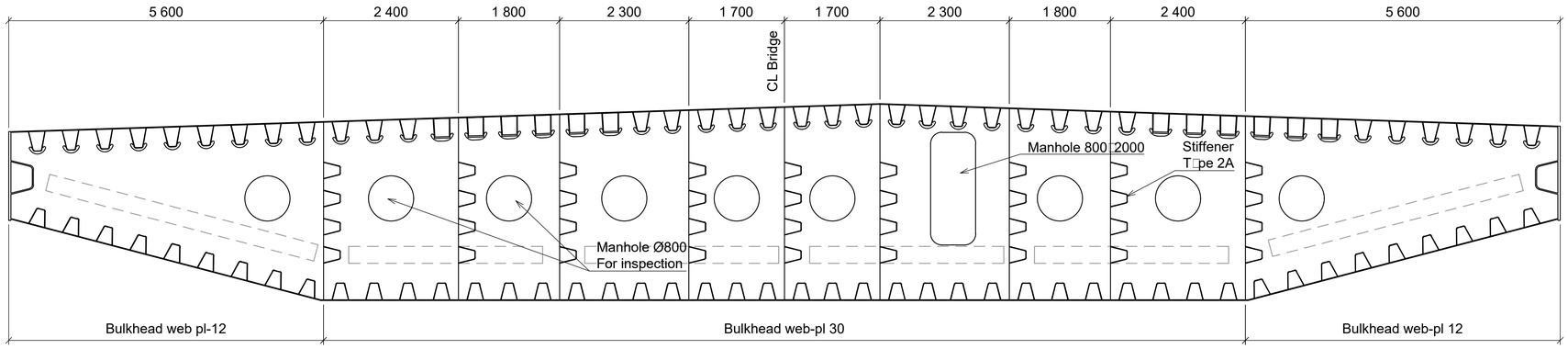
Statens vegvesen

E39 Bjørnafjorden

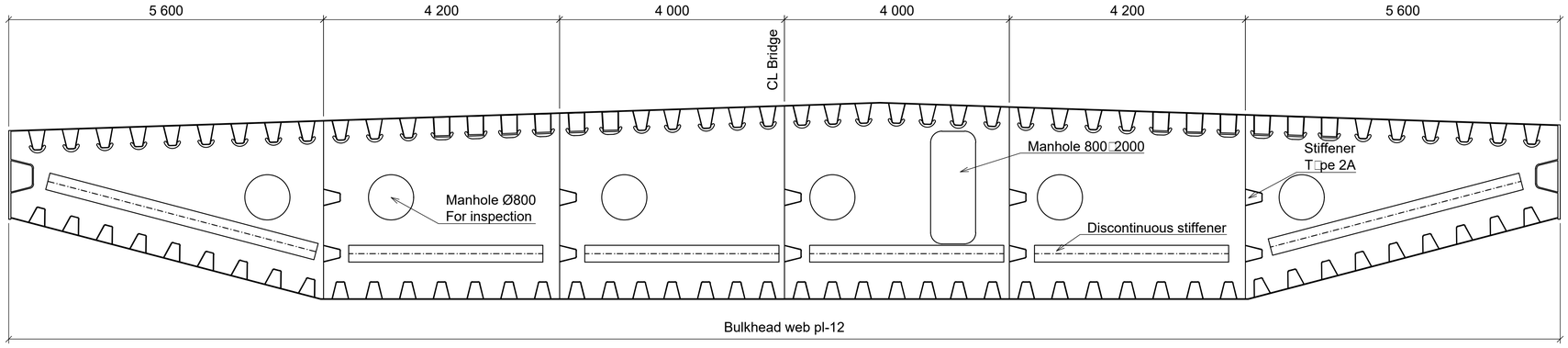
Concept development floating bridge
Girder
Girder-Column connection - Arrangement

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-145 0



Section B-B
Ref. drawing -146
1:50



Section C-C
Ref. drawing -146
1:50

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge
Girder
Column connection 2

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	–
PROF-number	–
File number	–
Scale A1-format	
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-146 0

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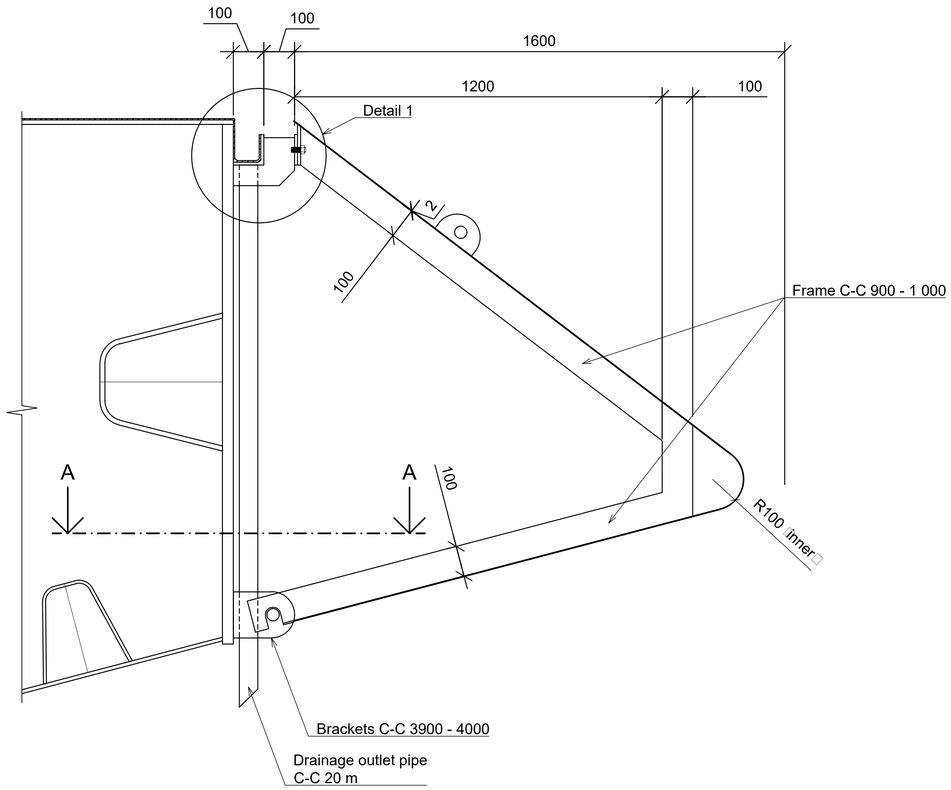
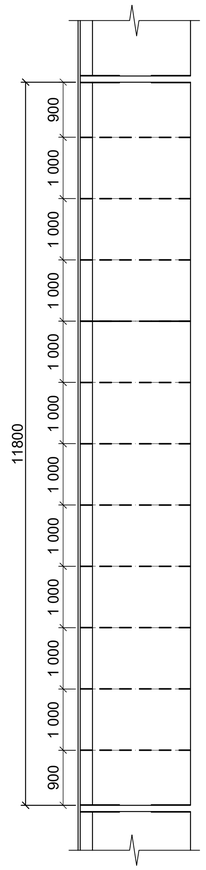


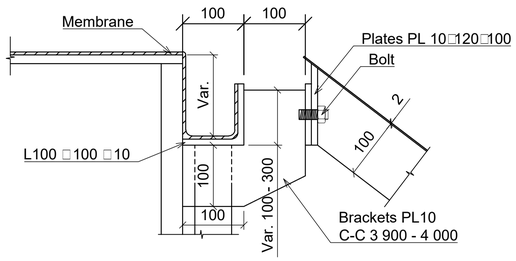
Wind guide vane, section
1:10



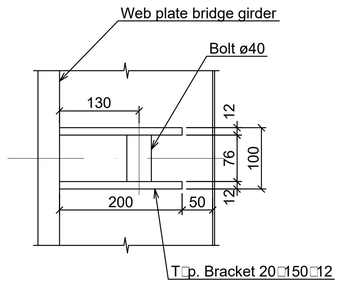
Plan
Wind guide vane element
1:50

Weights

Wind guide element	1000 kg
No. of elements	888
Brackets	20 ton
Drainage	170 ton
Total	1080 ton



Detail 1
1:5



Section A-A
1:5

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge
Wind guide and drainage
Sections and details

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-147 0

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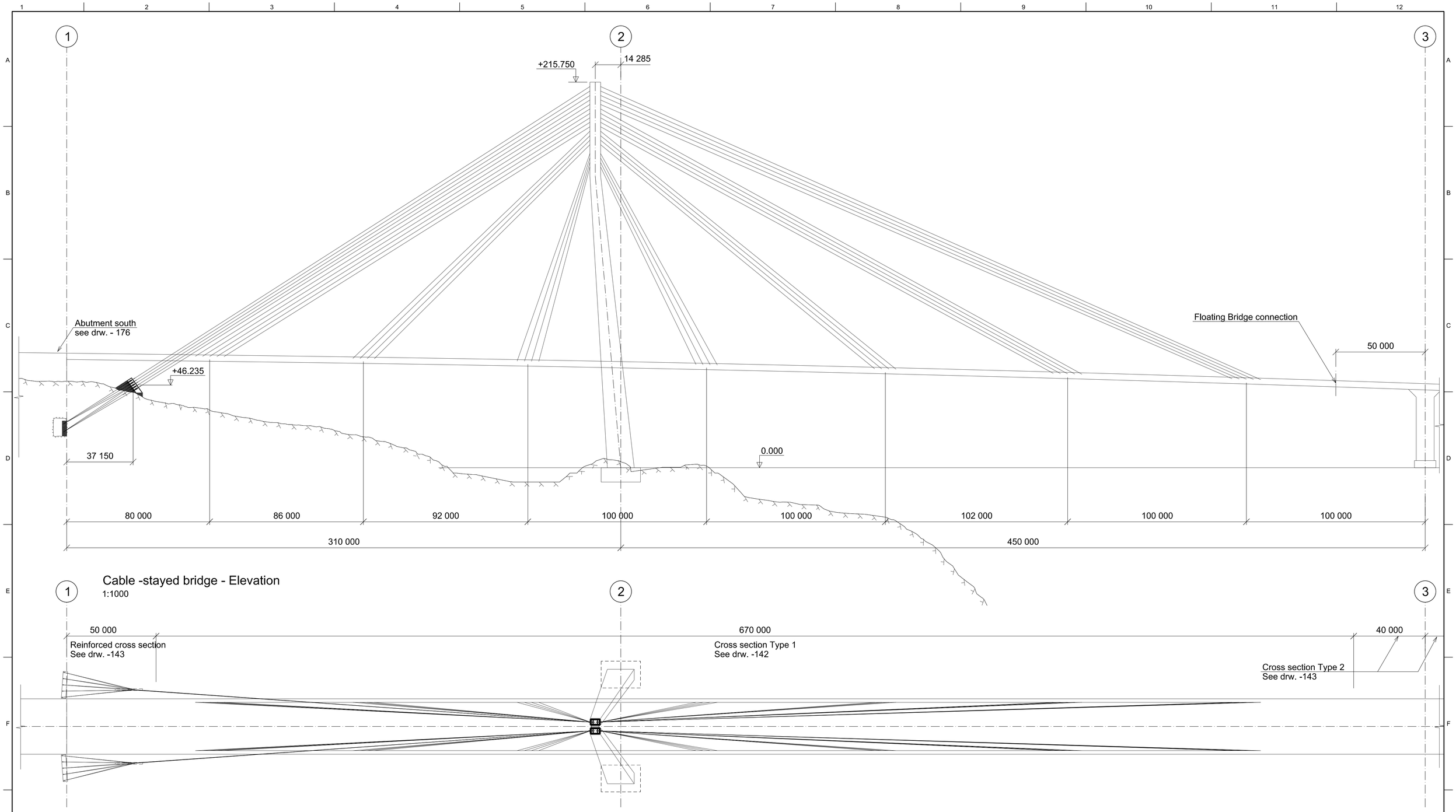


Cable -stayed bridge - Elevation
1:1000

Cable -stayed bridge - Plan
1:1000

Design team: Norconsult; DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:1000
Coordinate system	EUREF89NTM5/NN2000

Statens vegvesen

E39 Bjørnafjorden

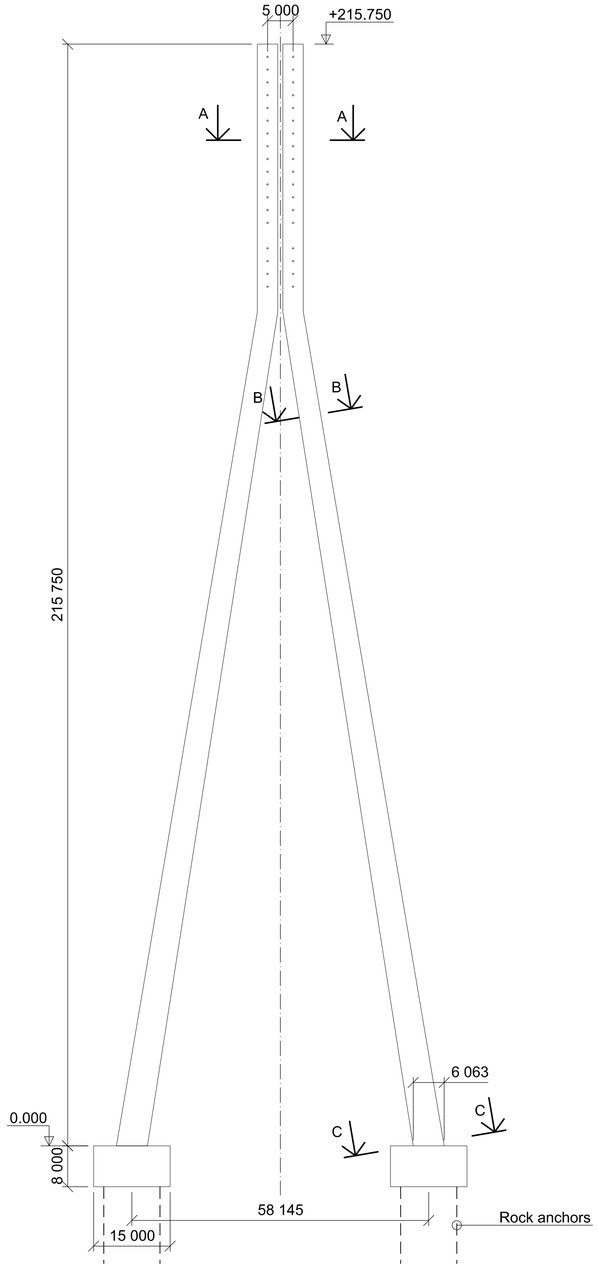
K12 - Cable-stayed bridge

Plan and elevation

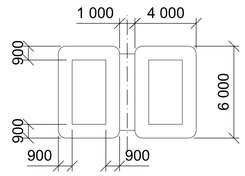
Concept development floating bridge

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-151	0

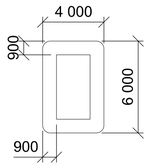
Filnavn: $FILE$ Plotdato: $DATE$ $TIME$



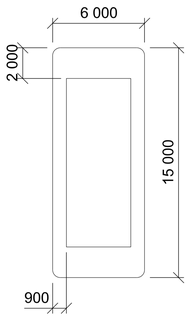
Cable-stayed bridge - Tower - Front
1:600



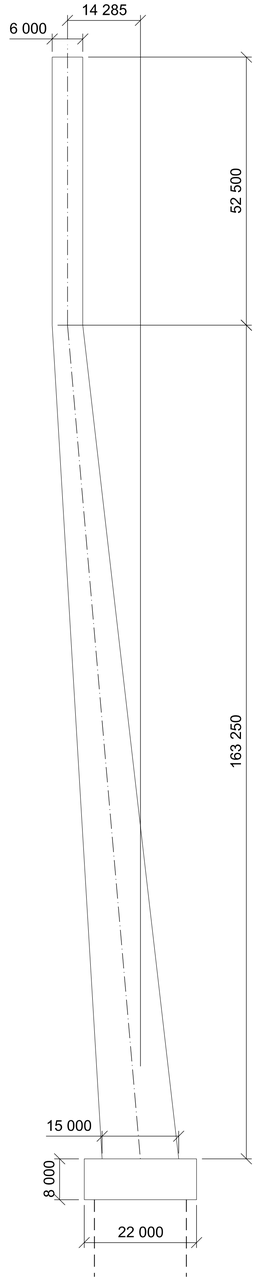
Section A-A
1:200



Section B-B
1:200



Section C-C
1:200



Cable-stayed bridge - Tower - Side
1:600

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

Tower - Plan and sections

Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:600/1:200
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-152	0

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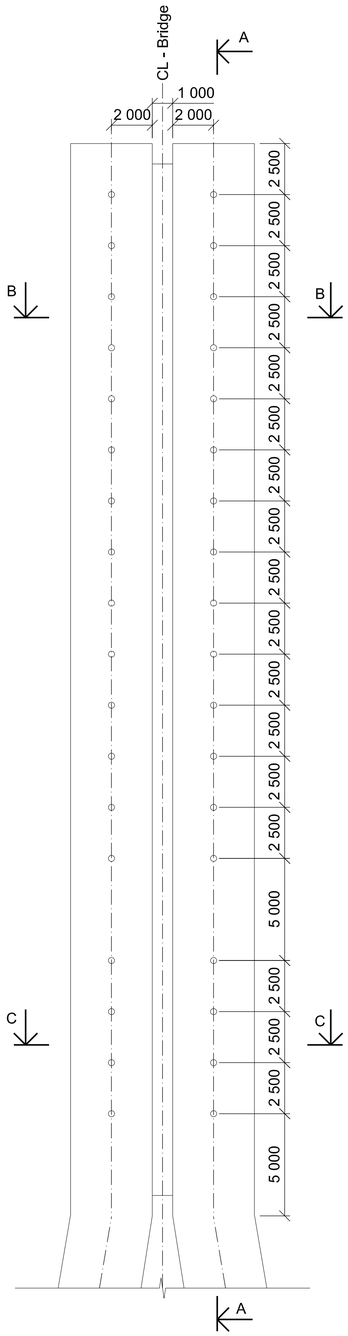
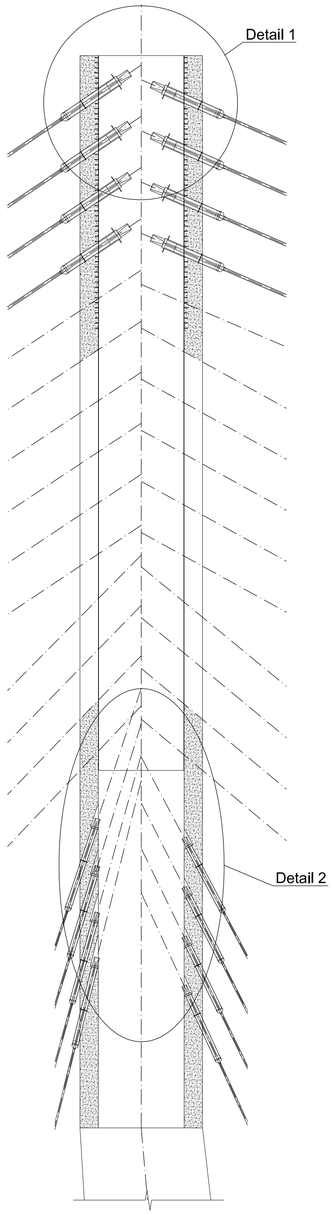
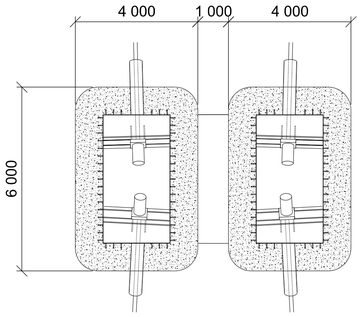
Printdato: $DATE$ $TIME$



Cable-stayed bridge - Tower - Top
1:150

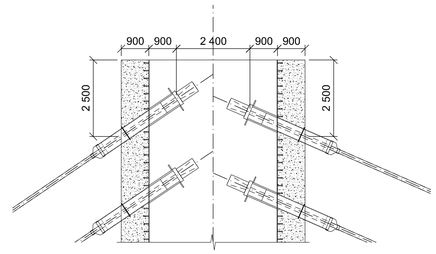


Section A-A
1:150

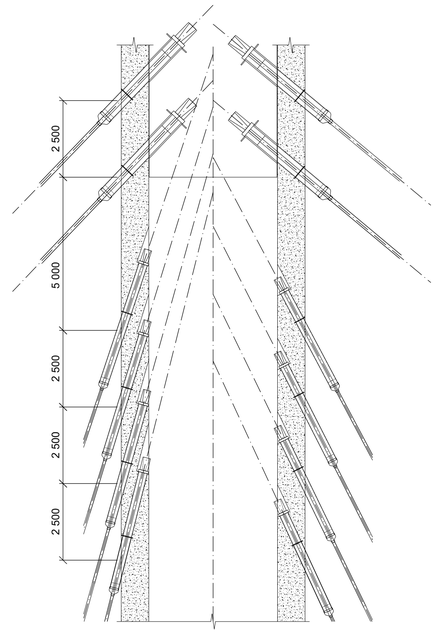


Section B-B
1:100

Section C-C
1:100



Detail 1
1:100



Detail 2
1:100

Design team: Norconsult — DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	KGS	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

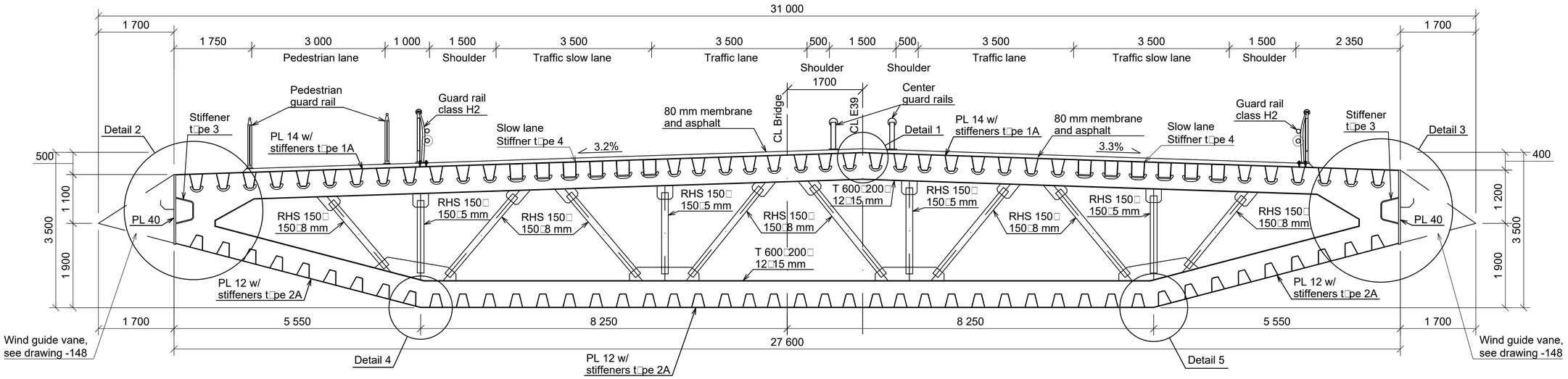
Tower - Cable attachement

Concept development floating bridge

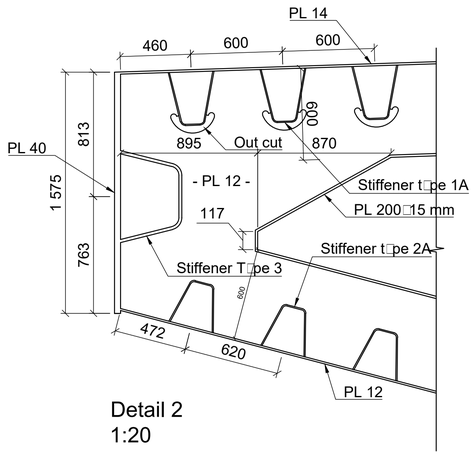
Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:150/1:100
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	KGS	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-153	0

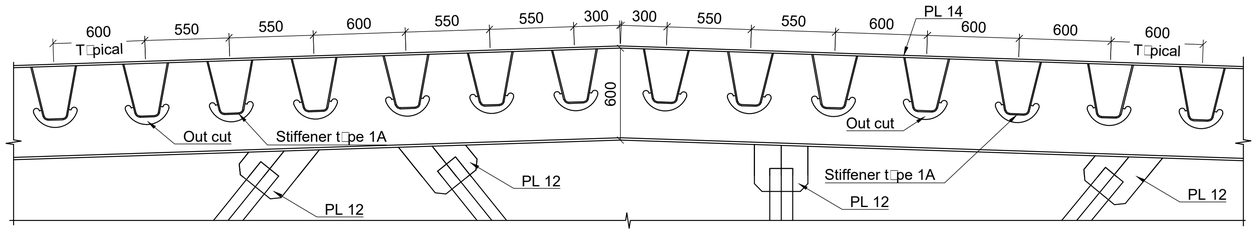
Filnavn: $FILE$
Plottedato: $DATE$ $TIME$



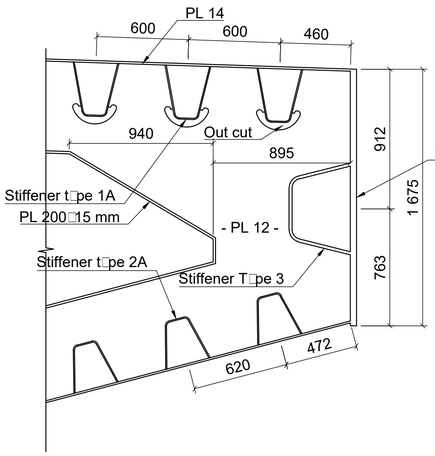
Standard cross section
1:50



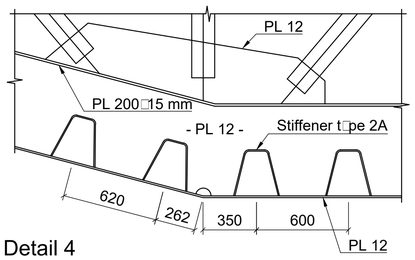
Detail 2
1:20



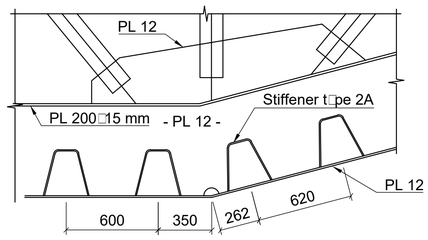
Detail 1
1:20



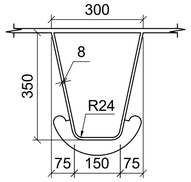
Detail 3
1:20



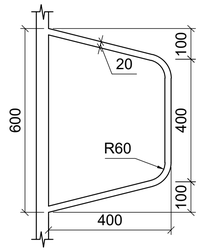
Detail 4
1:20



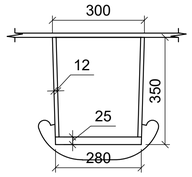
Detail 5
1:20



Stiffener type 1A
1:10



Stiffener type 3
1:10



Stiffener type 4
1:10

Steel weights

Cross Section:	12300	kg/m
Transverse girders and bracings:	1206	kg/m
Sum Steel	13506	kg/m

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

Statens vegvesen

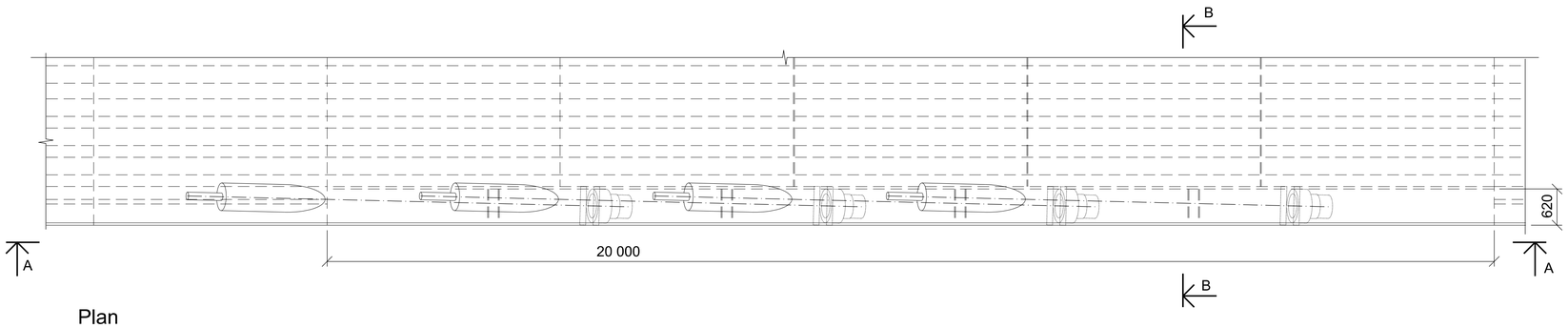
E39 Bjørnafjorden

Concept development floating bridge
Cable-stayed brigde
Bridge girder

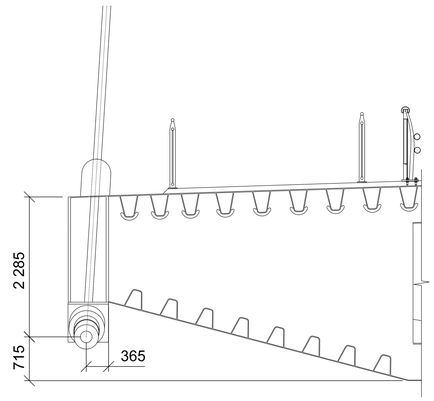
Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	As shown
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-154 0

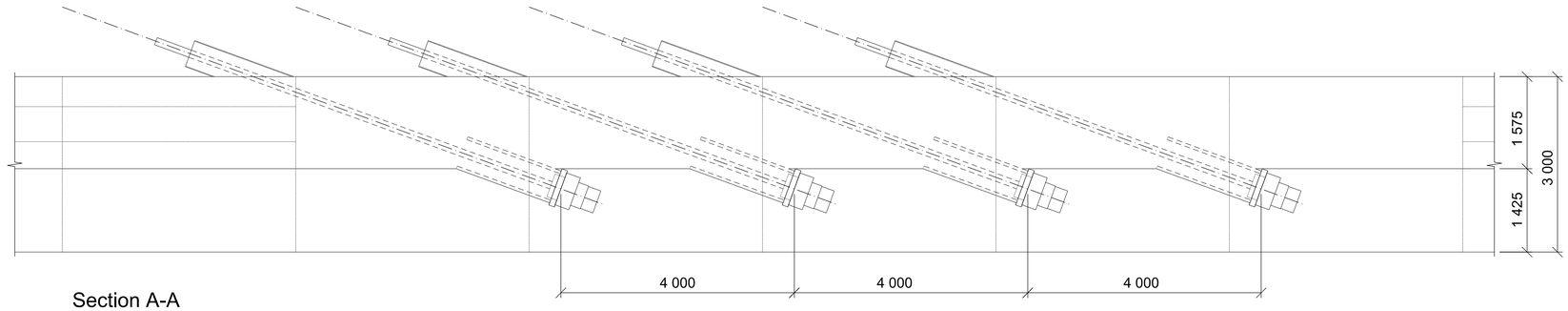
"X:\nor\oppdrag\Sandvika\518\77\5187772\BIM\Konstruksjon\Arkfil\Final\SBJ-33-C5-OON-22-DR-154.dwg - MaSOt - Plottet: 2019-07-01, 13:06:08 - XREF = K_Form_Tverrsnitt"



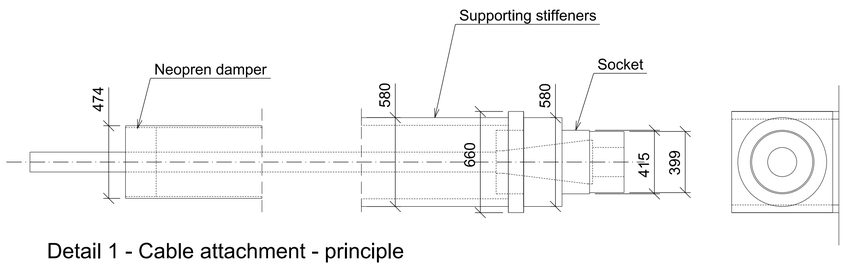
Plan
1:50



Section B-B
1:50



Section A-A
1:50



Detail 1 - Cable attachment - principle
1:20

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	JoS	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

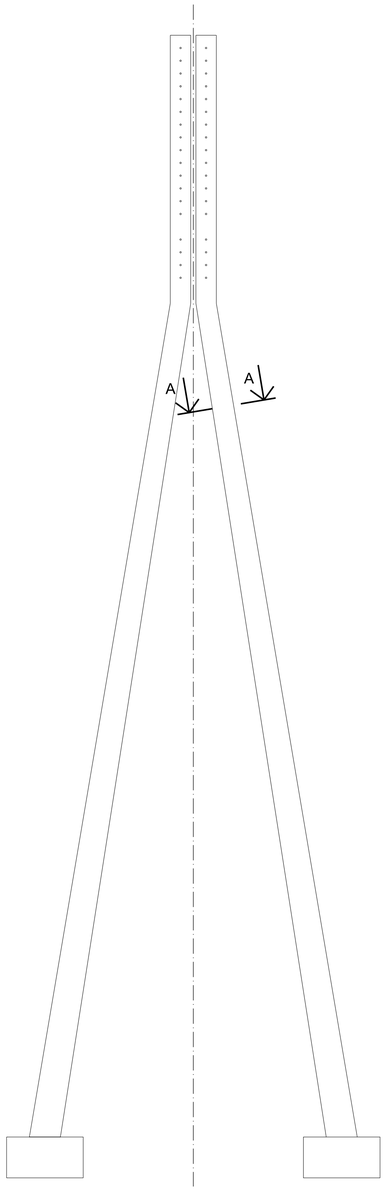
Bridge girder - Cable attachment

Concept development floating bridge

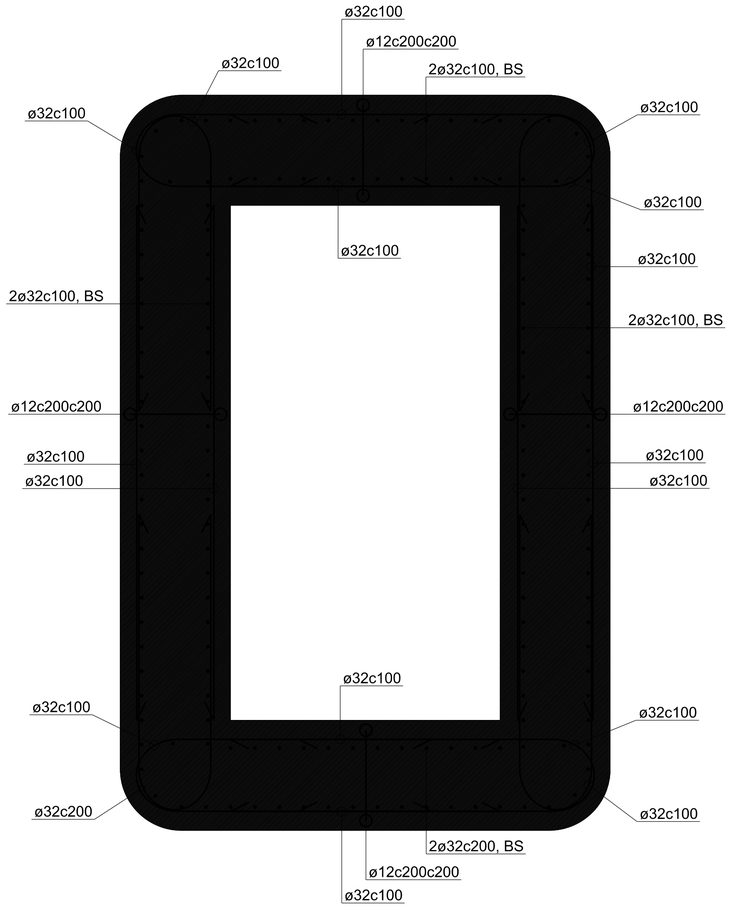
Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:50/1:20
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	JoS	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-155	0

Filnavn: $FILE$
Plotdato: $DATE$ $TIME$



Cable-stayed bridge - Tower - Front
1:600



Section A-A, typical reinforcement
1:25

Directions:

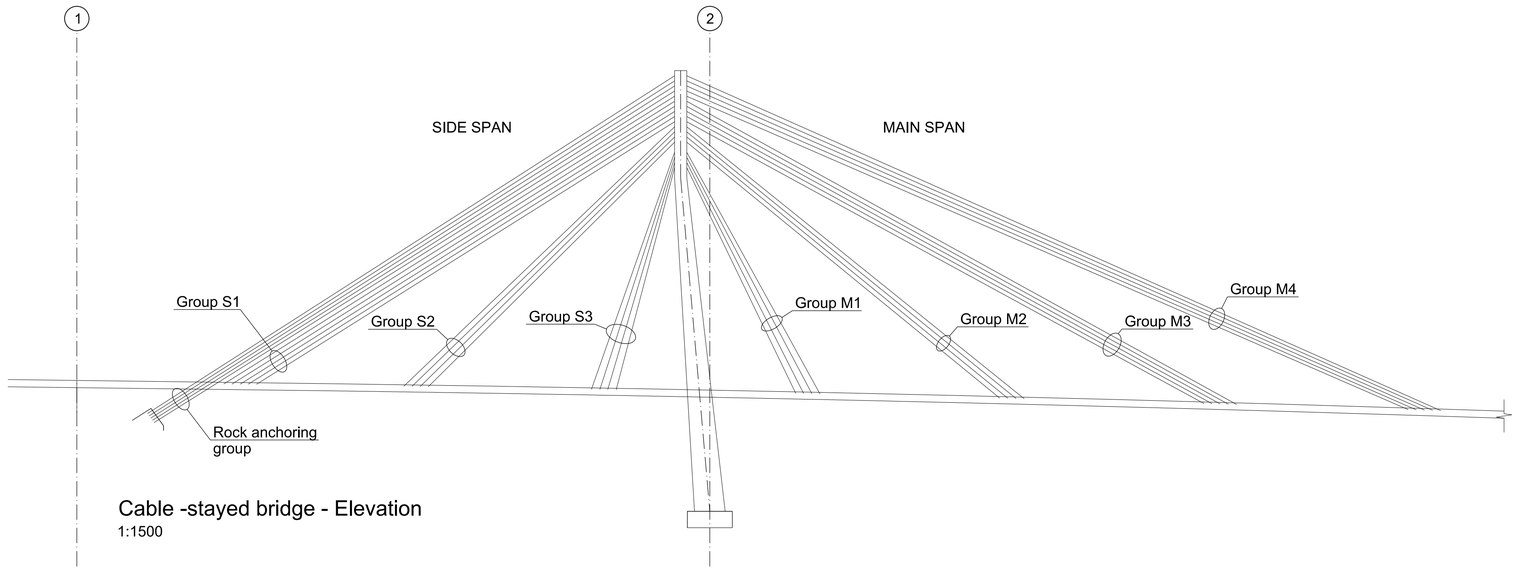
Reinforcement: B500NC (NS 3576-3)

Design team:	Norconsult	DR. TECHN. OLAV OLSEN			
0	Issued for use	TH	SGR	KH	30.06.19
Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue

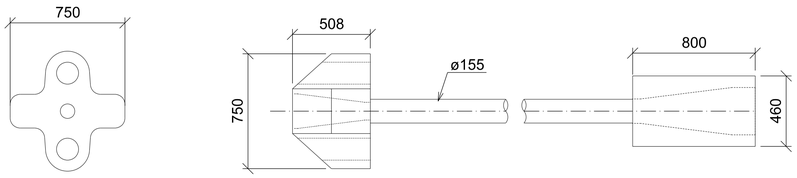
Statens vegvesen	
Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
E39 Bjørnafjorden	
Produced by	Norconsult / Olav Olsen
Project number	-
K12 - Cable-stayed bridge	
PROF-number	-
Reinforcement in critical sections	
File number	-
Scale A1-format	1:600/1:25
Concept development floating bridge	
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	SGR	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-156	0

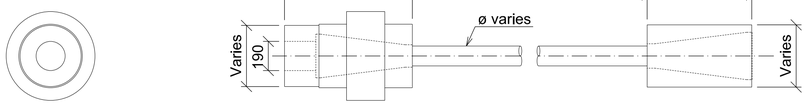
Plottedato: $DATE$ $TIME$
Filnavn: $FILE$



Cable -stayed bridge - Elevation
1:1500



Stag type 1
1:20



Stag type 2
1:20

Group	Type	No.	Number	Diameter	Ca length
				mm	m
Rock anchoring	1	1, 2	2	155	306,5
		3, 4	2	155	305
		5, 6	2	155	304,5
		7, 8	2	155	302,5
		9, 10	2	155	301
S1	2	11, 12	2	110	260,5
		13, 14	2	110	256
		15, 16	2	110	251
		17, 18	2	110	246,5
		19, 20	2	110	242
S2	2	21, 22	2	120	183,5
		23, 24	2	120	179
		25, 26	2	120	175
		27, 28	2	120	170
S3	2	29, 30	2	110	123
		31, 32	2	110	119,5
		33, 34	2	110	116
		35, 36	2	110	112,5
M1	2	37, 38	2	120	123
		39, 40	2	120	127
		41, 42	2	120	131
		43, 44	2	120	135
M2	2	45, 46	2	130	198
		47, 48	2	130	203
		49, 50	2	130	207,5
		51, 52	2	130	212
M3	2	53, 54	2	140	288,5
		55, 56	2	140	293
		57, 58	2	140	298
		59, 60	2	140	303
		61, 62	2	140	307,5
M4	2	63, 64	2	150	385
		65, 66	2	150	390
		67, 68	2	150	395
		69, 70	2	150	399,5
		71, 72	2	150	404

Design team: Norconsult; DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

Cable system - Arrangement and details

Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:1500/1:50
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-157	0

PlotVersion: $DATE$ $TIME$
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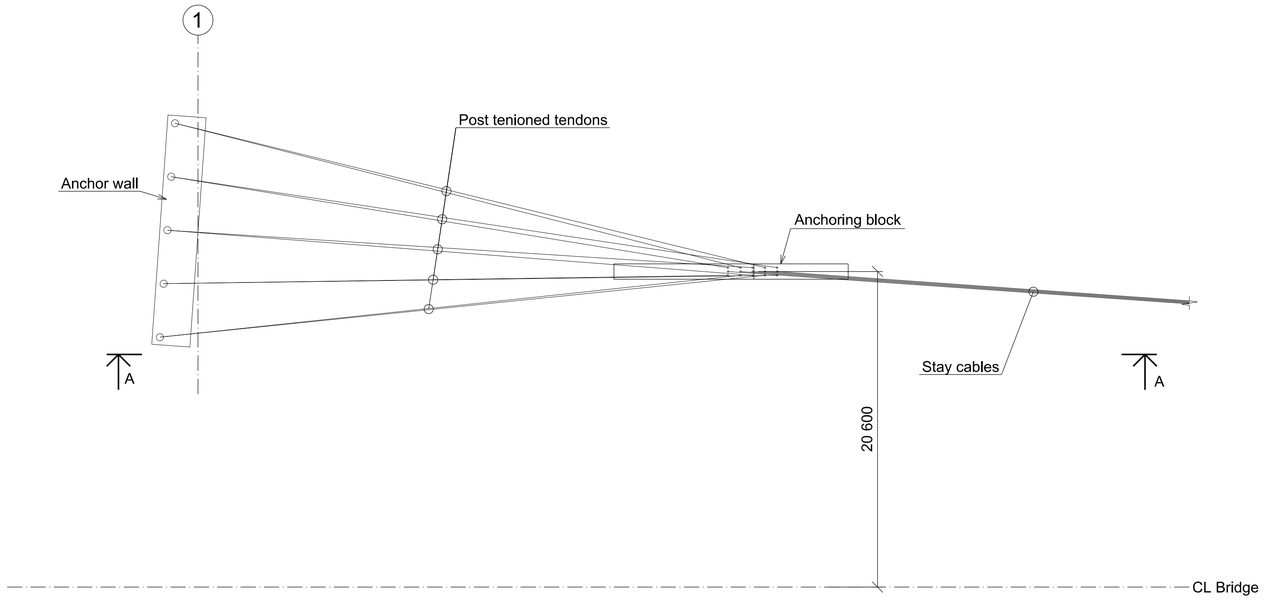
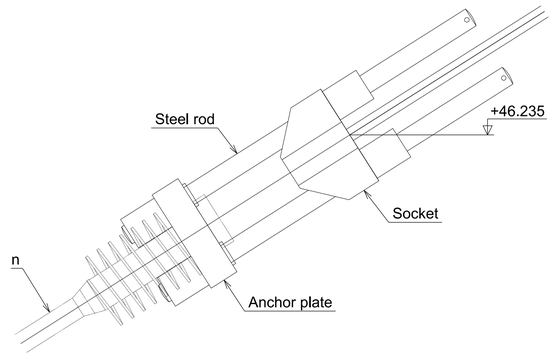
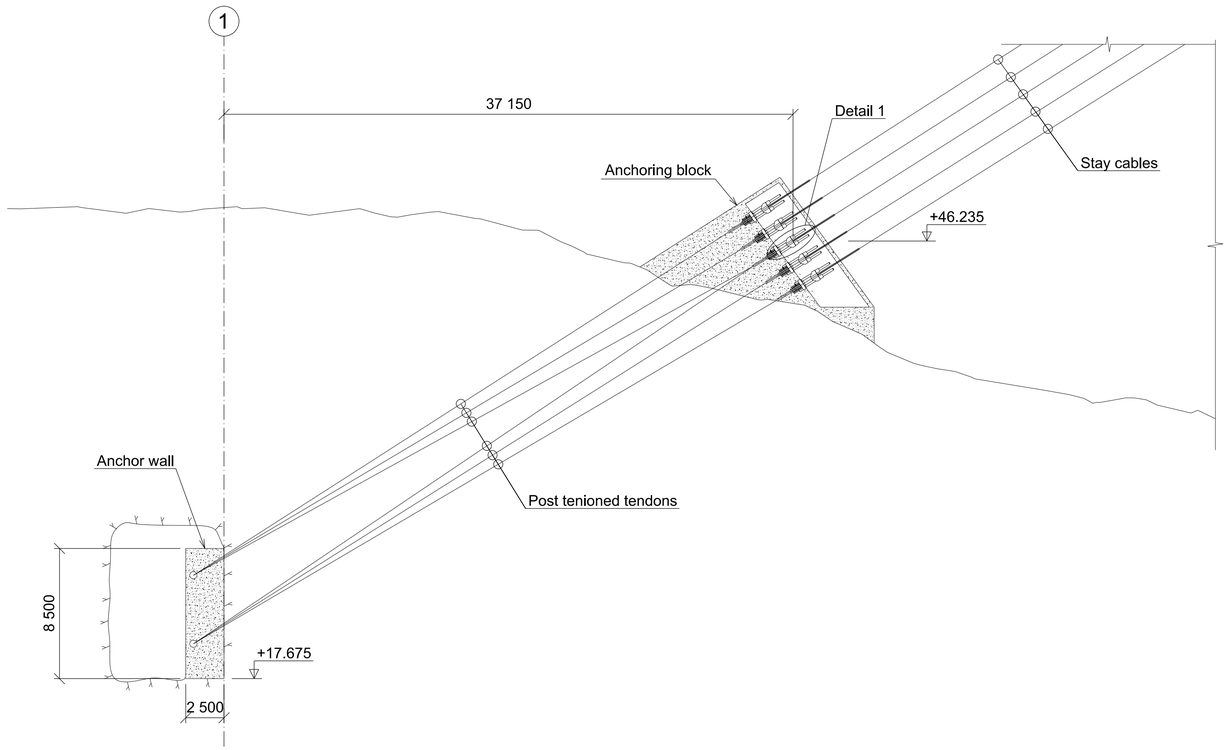


Plan
1:200



Detail 1
1:20



Section A-A
1:200

Design team: Norconsult — DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

Rock anchoring

Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:200/1:20
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-158 0

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Plotdato: $DATE$ $TIME$

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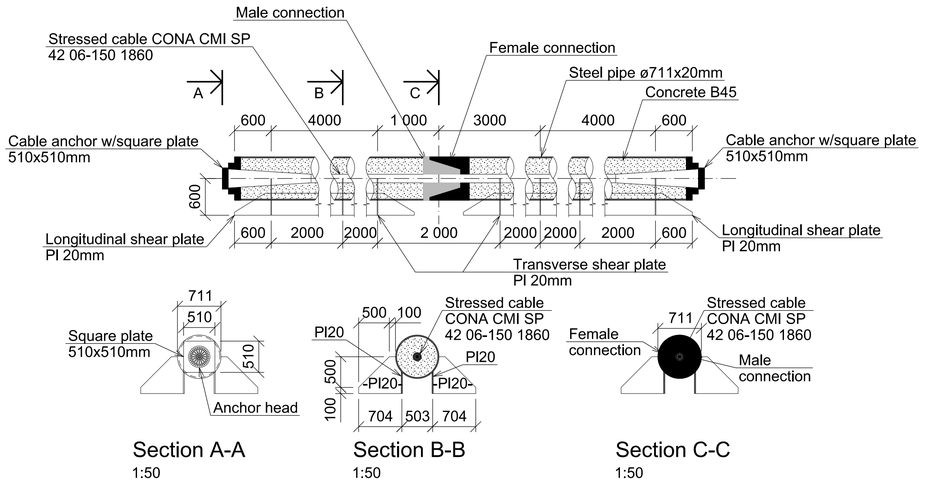
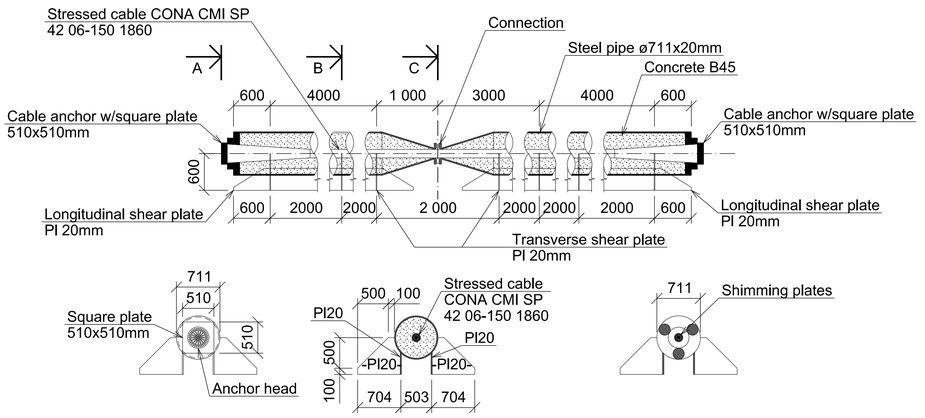


Section A-A
1:50

Section B-B
1:50

Section C-C
1:50

TYPE B

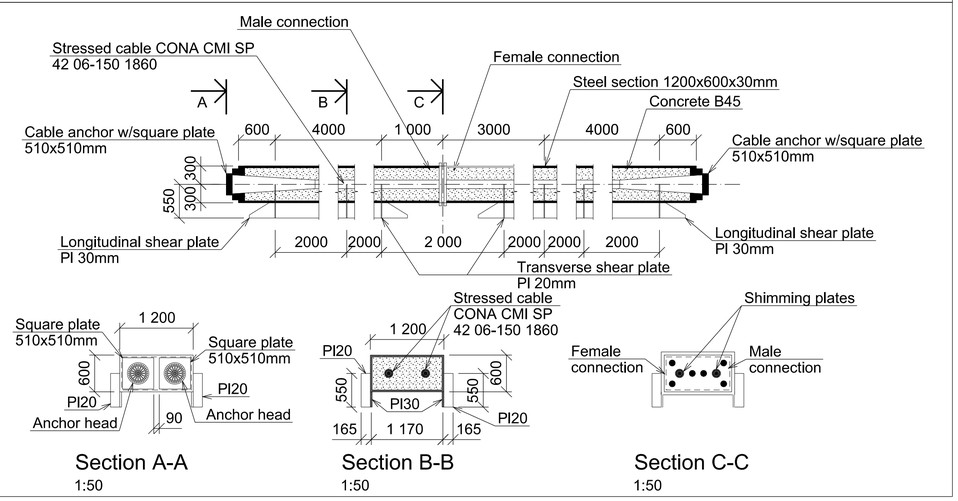


Section A-A
1:50

Section B-B
1:50

Section C-C
1:50

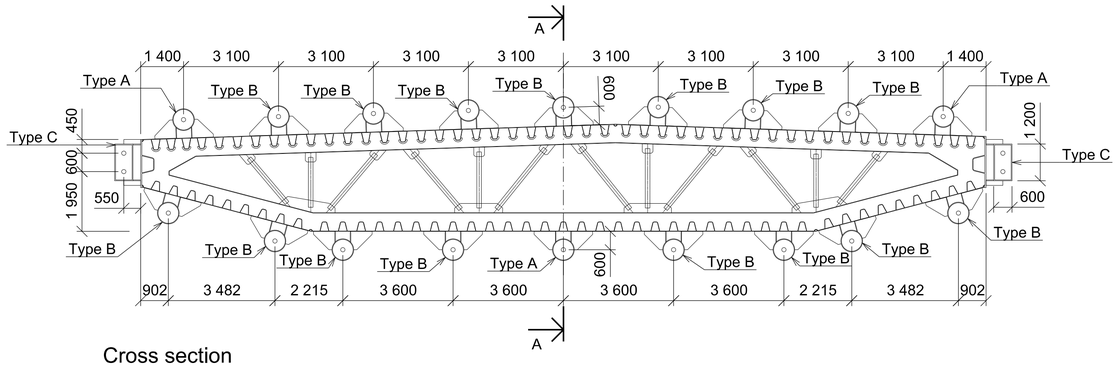
TYPE C



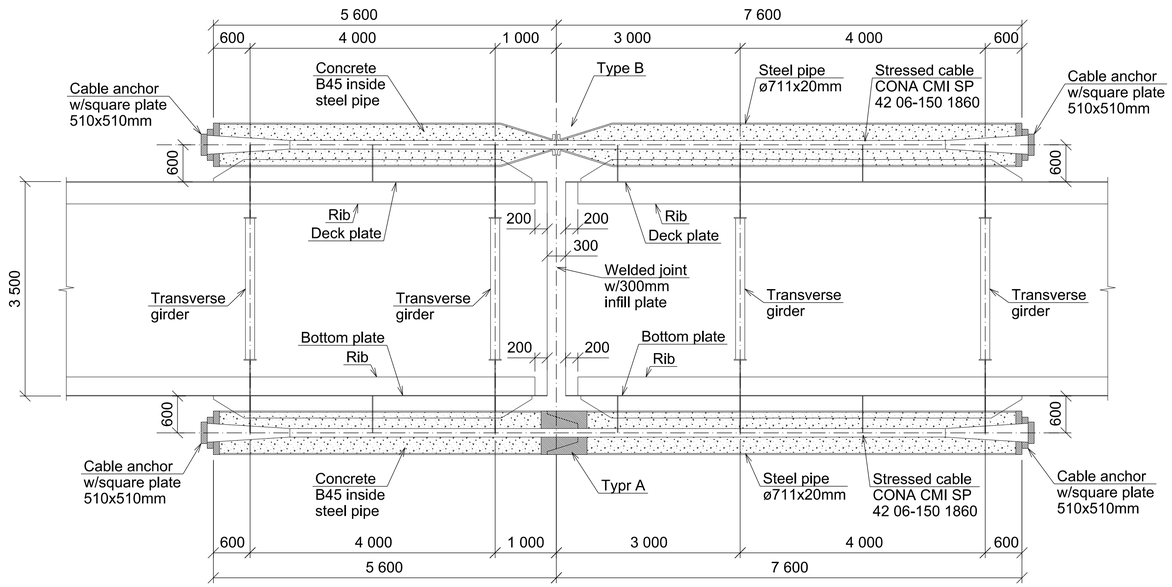
Section A-A
1:50

Section B-B
1:50

Section C-C
1:50



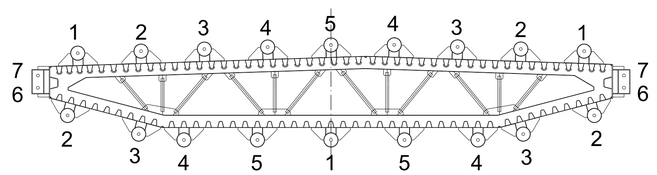
Cross section
1:100



Section A-A
1:50

REMARKS:

1. The temporary bridge deck connection will be used for the bridge closure joints (shown) and intermediate superelement joints.
2. Pre-assembled PT tendons are tread after docing of floating bridge.
3. Stressing sequence starts with the dowel connections Type A followed by symmetrical stressing of Type B connections.
4. PT tendons are to be grouted after finalized stressing.



Design team: Norconsult — DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	SAH	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Temporary bridge deck connection

Concept development floating bridge

Drawing date	-
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:50
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
T. Holth	S. A. Haugerud	K. Høyland	5187772 / 12777	SBJ-33-C5-OON-22-DR-159	0

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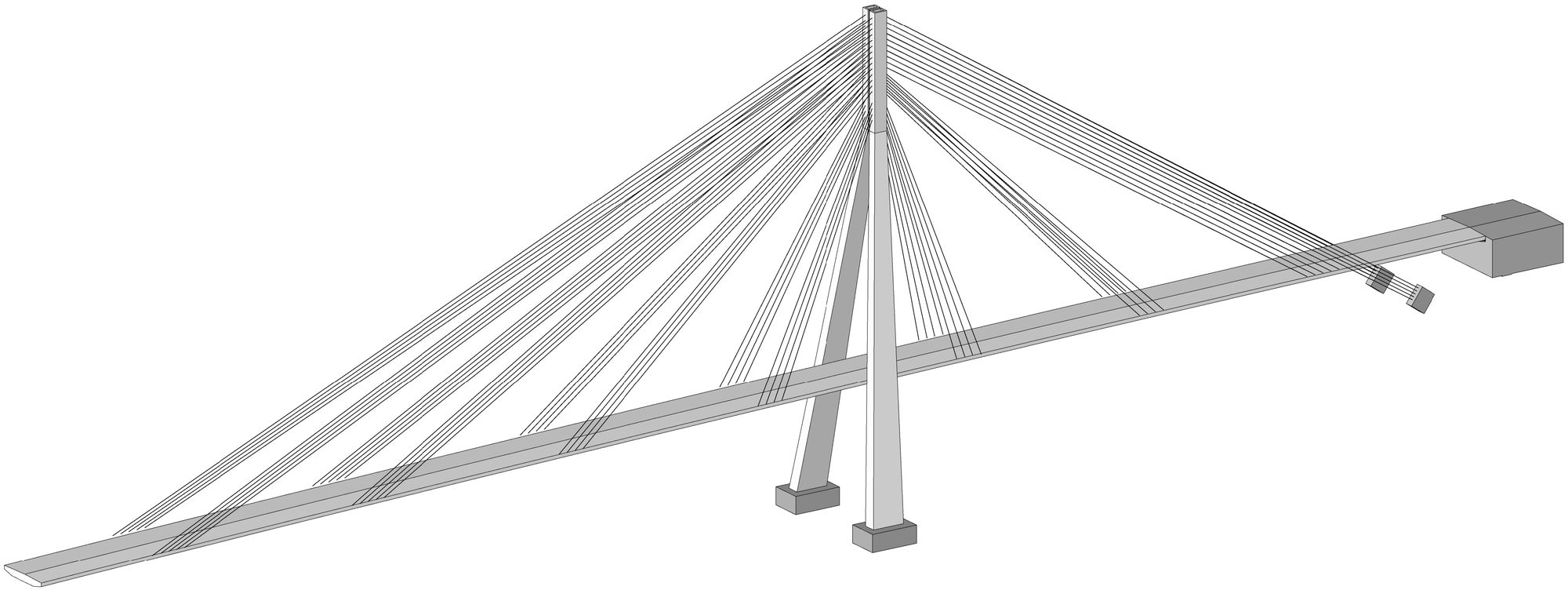
Plottedato: $DATE$ $TIME$



Design team: Norconsult · DR. TECHN. OLAV OLSEN

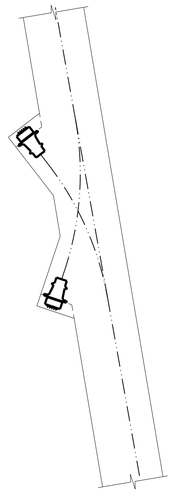
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	HGJ	HeSky	KH	2019-06-30

Statens vegvesen

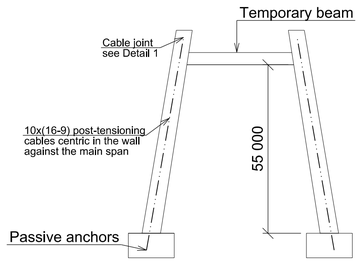
E39 Bjørnafjorden
Cable-stayed bridge - Isometric 3D View

Drawing dato	2019-06-28
Client rep.	
Produced for	Region Vest
Produced by	Design Team
Project number	
PROF number	
File number	
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

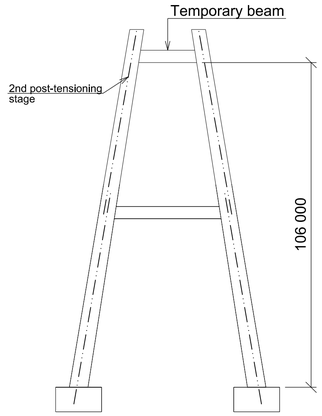
Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
HGJ	HeSky	HeSky	5187772 / 12777	SBJ-33-C5-OON-22-DR-160	0



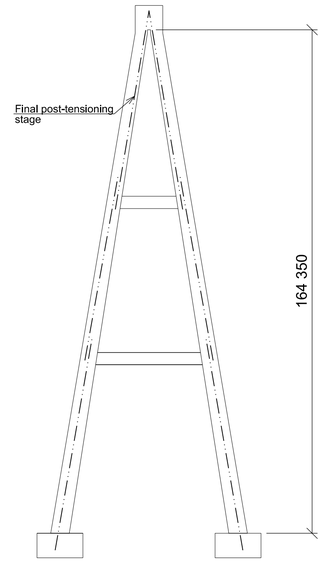
Detail 1
1:50



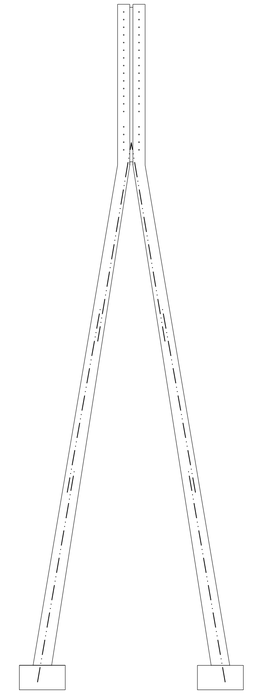
Stage 1
First post-tensioning stage



Stage 2
2.nd post-tensioning stage



Stage 3
Final post-tensioning stage



Stage 4
Final construction and removal of temperary beams

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

Tower. Post-tensioning layout

Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:1000/1:50
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-161 | 0

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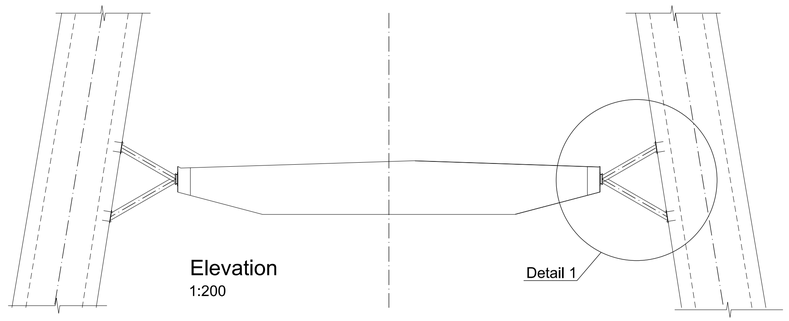
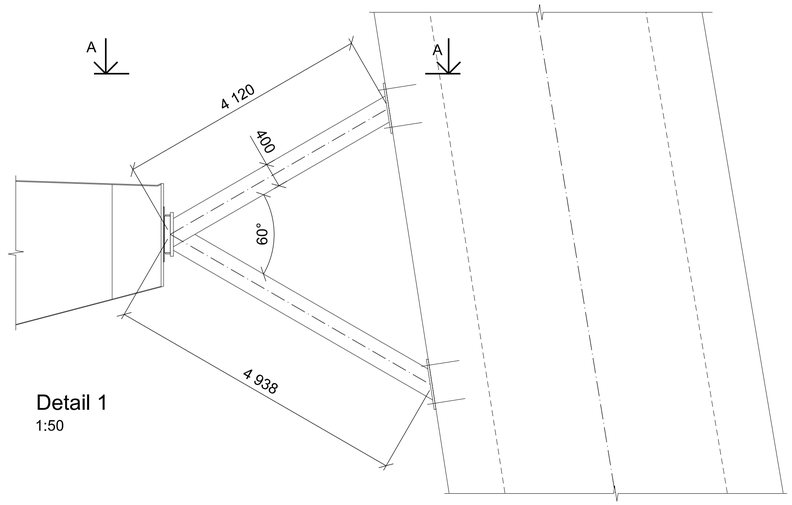
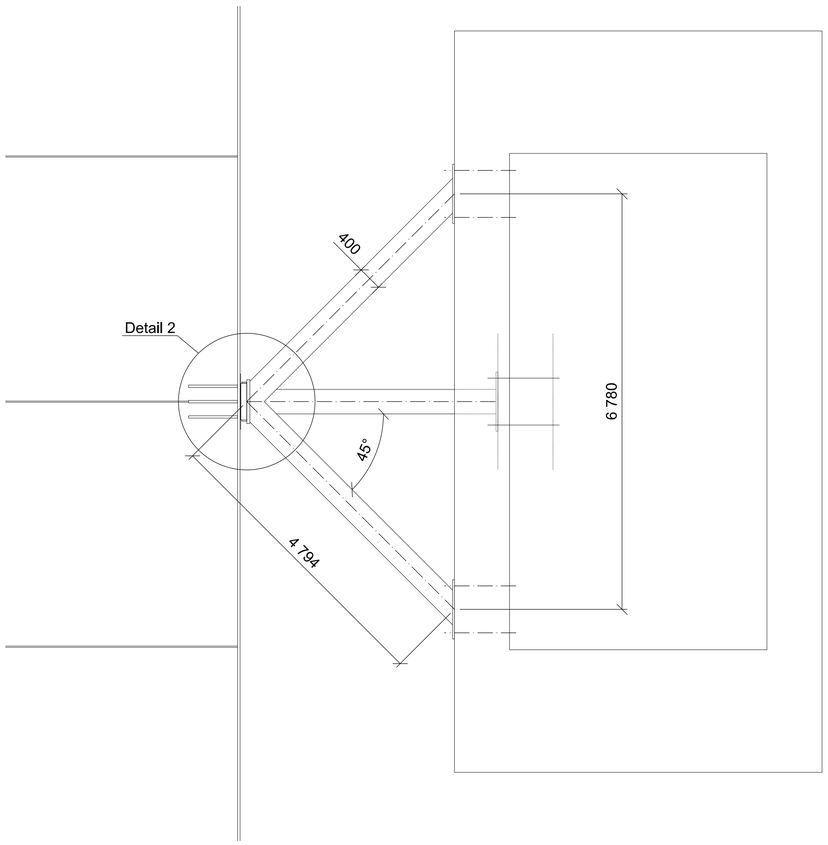
Printdato: $DATE$ $TIME$



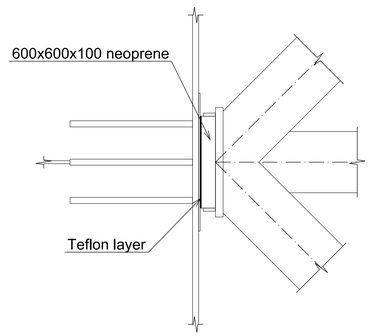
Elevation
1:200



Detail 1
1:50



Section A-A
1:50



Detail 2
1:50

PlotHeight: $PLOTHEIGHT$
Filnavn: $FILE$

0	Issued for use	TH	HeSky	KH	30.06.19
Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue

Design team: Norconsult; DR. TECHN. OLAV OLSEN

Statens vegvesen

E39 Bjørnafjorden

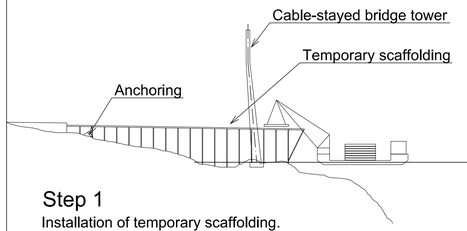
K12 - Cable-stayed bridge

Temperary connection of tower and girder

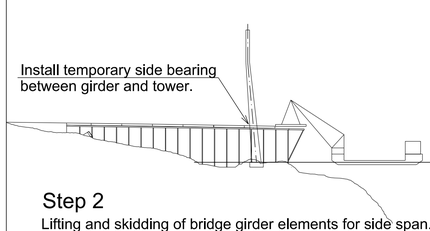
Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:200/1:50/1:20
Coordinate system	EUREF89NTM5/NN2000

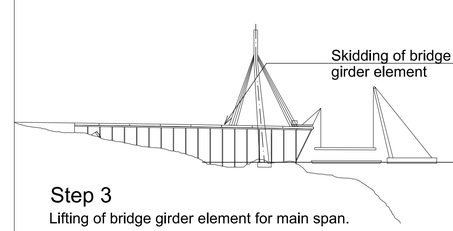
Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-162 0



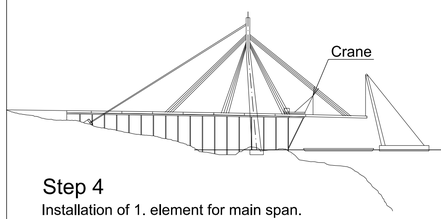
Step 1
Installation of temporary scaffolding.



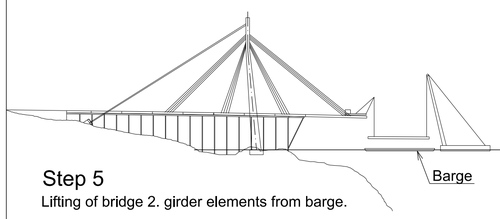
Step 2
Lifting and skidding of bridge girder elements for side span.



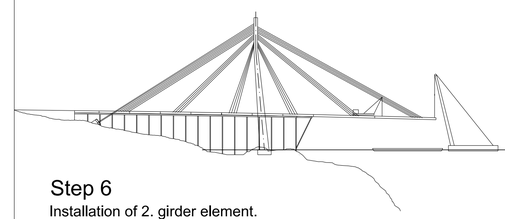
Step 3
Lifting of bridge girder element for main span.



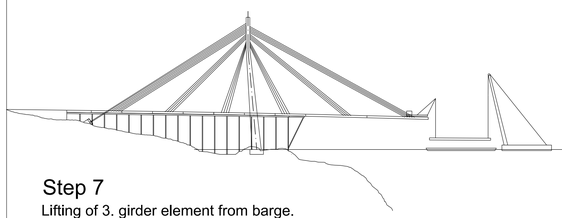
Step 4
Installation of 1. element for main span.



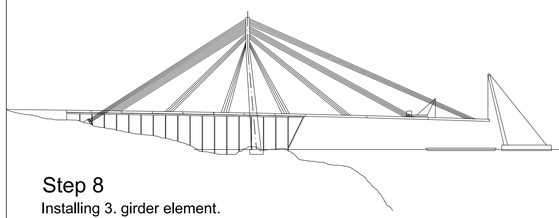
Step 5
Lifting of bridge 2. girder elements from barge.



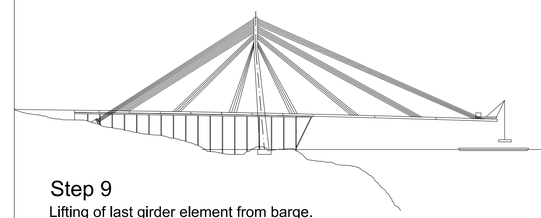
Step 6
Installation of 2. girder element.



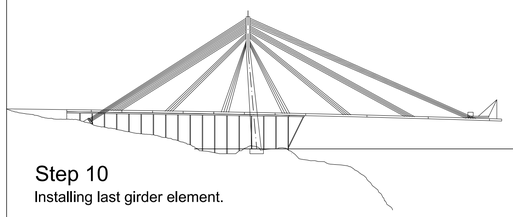
Step 7
Lifting of 3. girder element from barge.



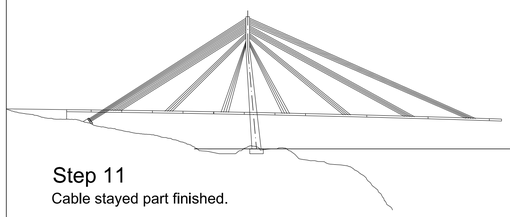
Step 8
Installing 3. girder element.



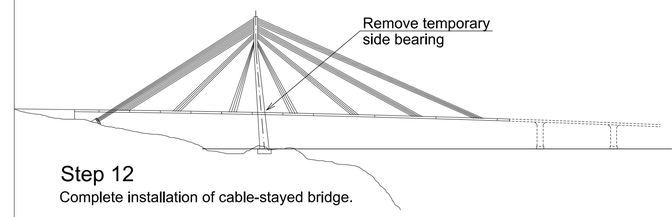
Step 9
Lifting of last girder element from barge.



Step 10
Installing last girder element.



Step 11
Cable stayed part finished.



Step 12
Complete installation of cable-stayed bridge.

Design team: Norconsult — DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

Construction sequences

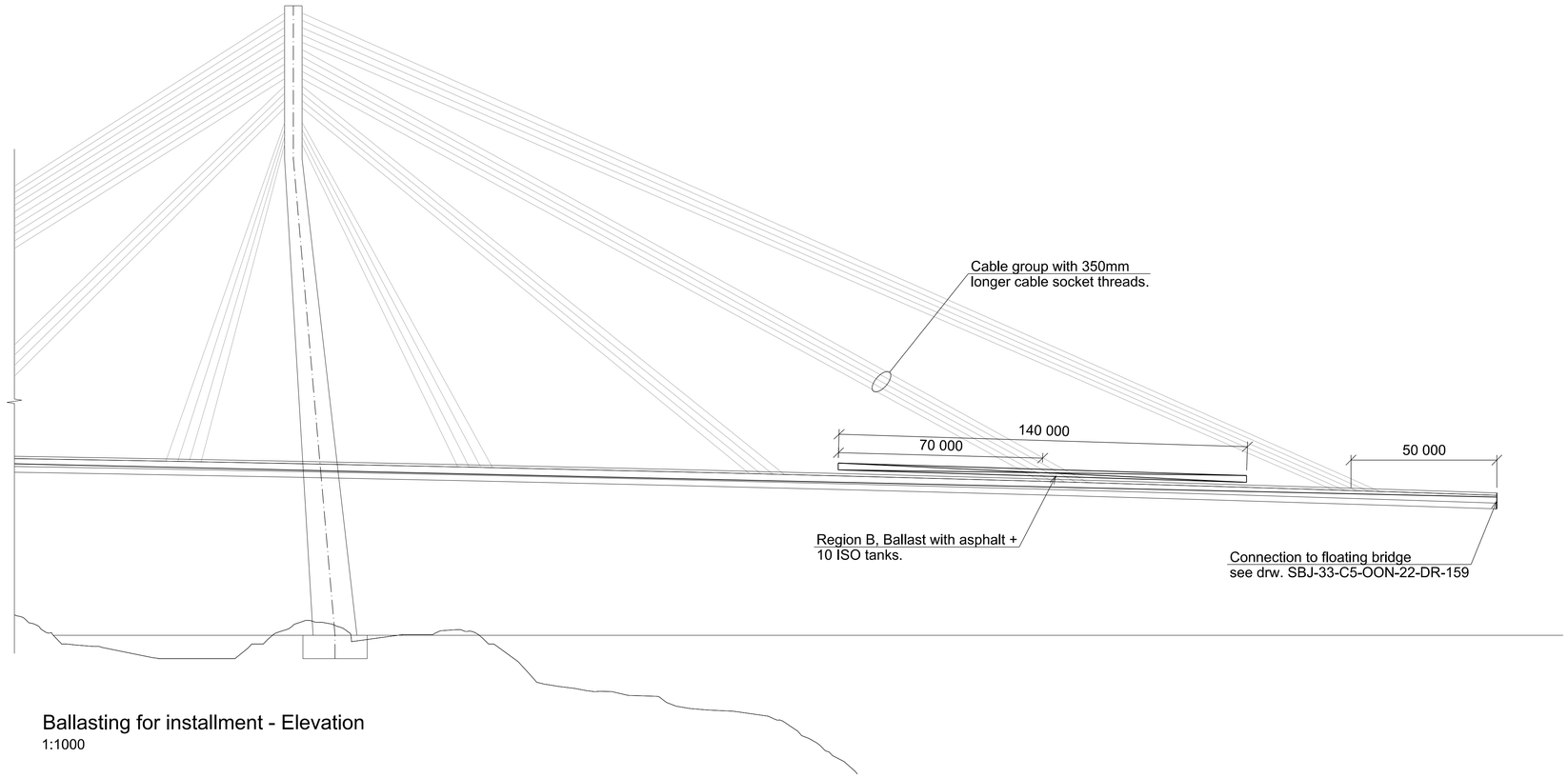
Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:5000
Coordinate system	EUREF89NTM5/NN2000

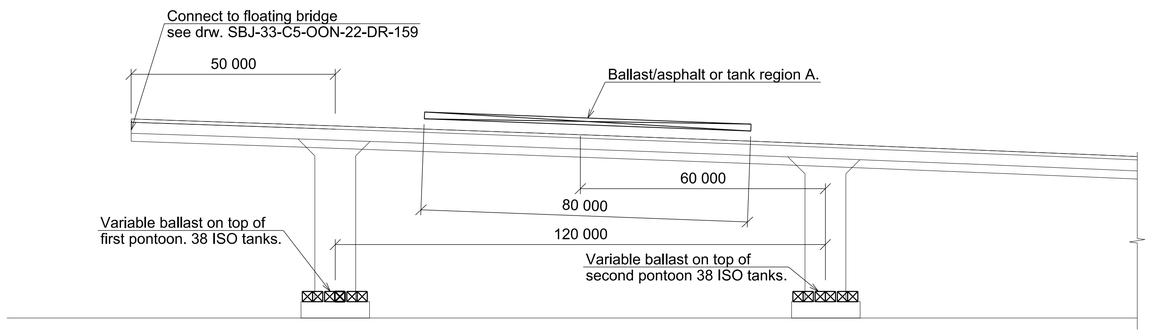
Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-163 0

Plottedato: $DATE$ $TIME$

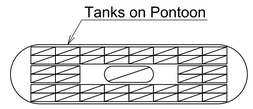
Filnavn: $FILE$



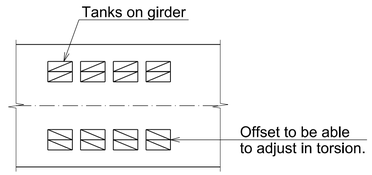
Ballasting for installment - Elevation
1:1000



Ballasting for installment - Elevation
1:750



Pontoon
1:750



Girder
1:750

NOTES

1. ISO tanks type: 20ft 24000 liter.
2. Ballasting weight is characteristic.
   Additional 30% ballast is recommended.
3. Max ballast: 36 000kN
   Variable ballast: 9120kN
   Possible tide adjustments = ± 0.5m

BALLAST PROCEDURE:

1. Extend cable groups.
2. Install ballast in region A and B.
3. Fill variable ballast on pontoons according to tide.

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Cable-stayed bridge

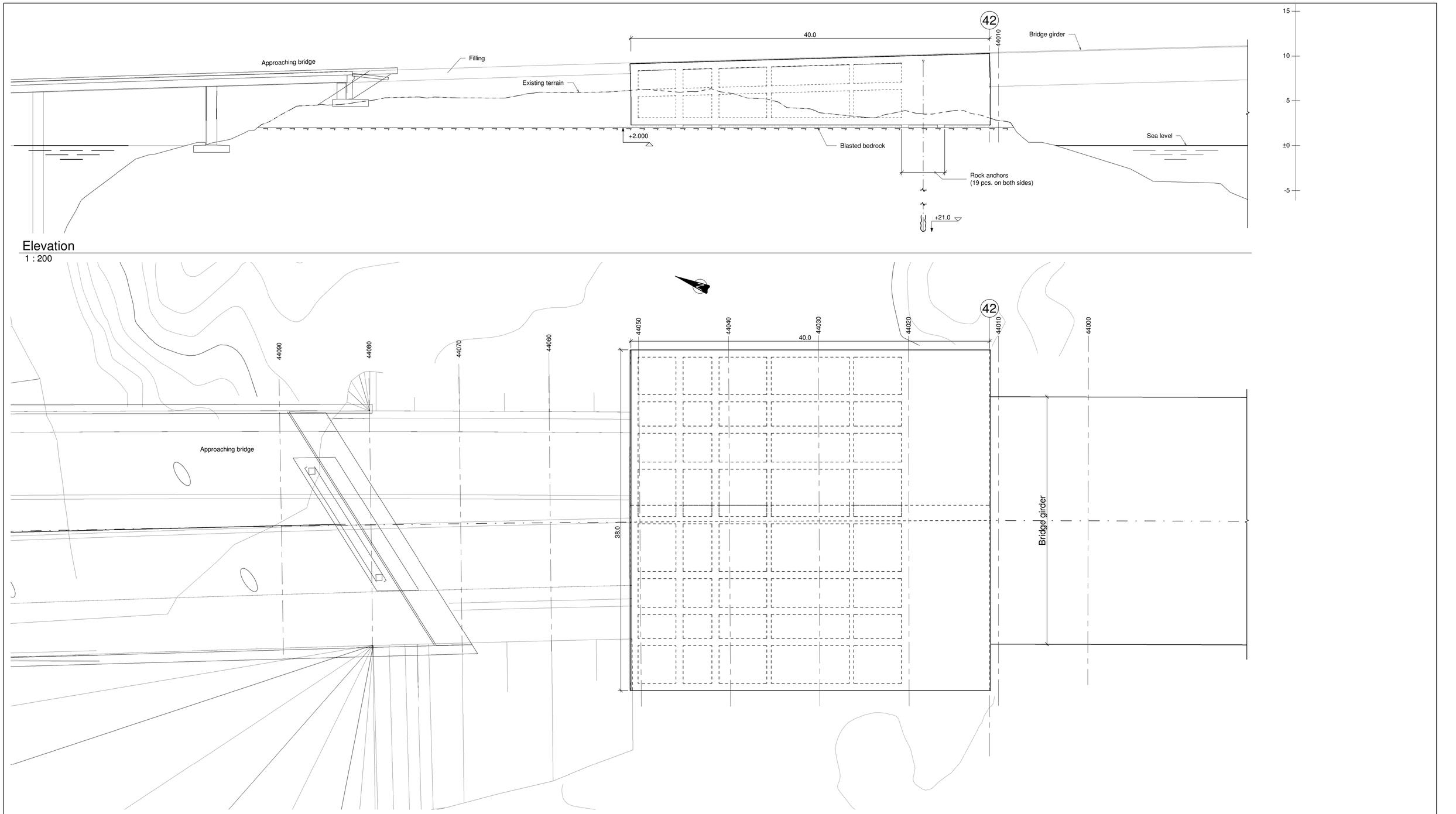
Ballasting for installment

Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:1000/1:750
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-164	0

Filnavn: $FILE$
Printdato: $DATE$ $TIME$



Elevation
1 : 200

Plan Abutement Gulholmane
1 : 200

Remarks:

1. All dimensions in m.
2. Horisontal post-tensioning not shown

References:

- SBJ-33-C5-OON-22-DR-172 Sections and details I
- SBJ-33-C5-OON-22-DR-173 Sections and details II
- SBJ-33-C5-OON-22-DR-174 Post-tensioning
- SBJ-33-C5-OON-22-DR-175 Connection to bridge girder

Design team: Norconsult, DR. TECHN. OLAV OLSEN

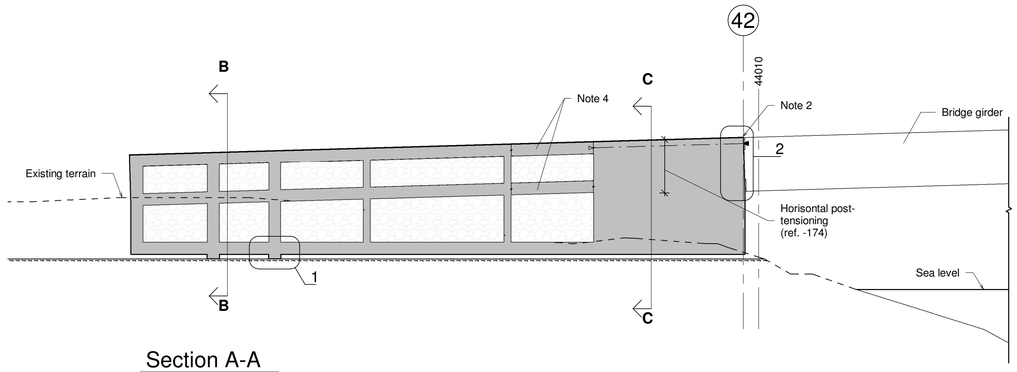
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	TN	KH	2019-06-30

Statens vegvesen

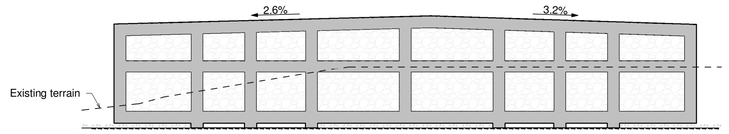
E39 Bjørnafjorden
Concept development floating bridge
K12 - Abutment Gulholmane
General Arrangement

Drawing dato	2019-05-24
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

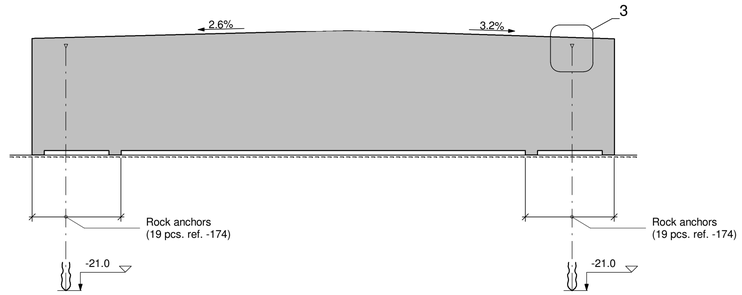
Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-171	0



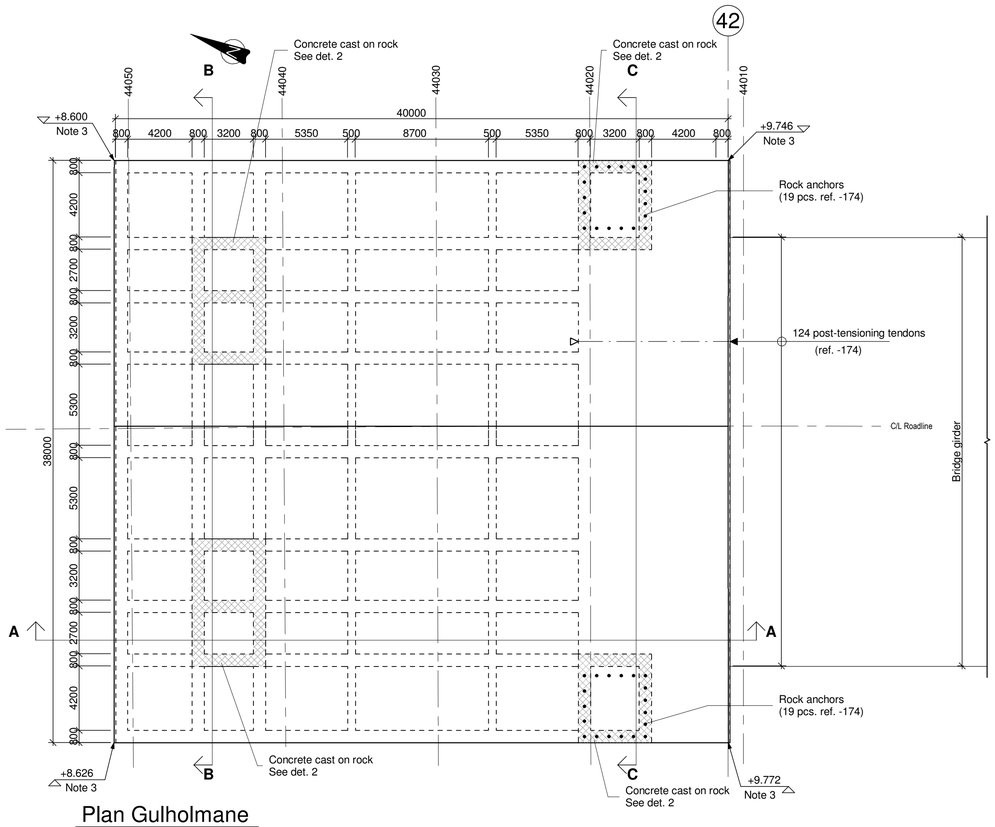
Section A-A
1 : 200 Horizontal post-tensioning not shown



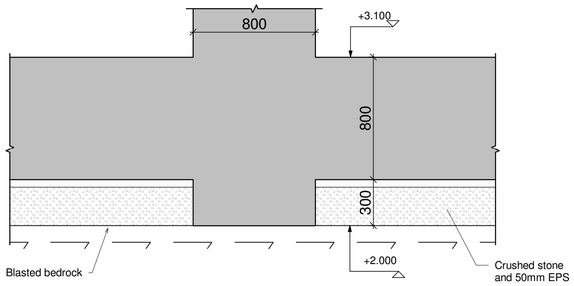
Section B-B
1 : 200



Section C-C
1 : 200 Horisontal post-tensioning not shown



Plan Gulholmane
1 : 200



Detail 1
1 : 20 Concrete cast on rock, typ.

Remarks:

1. Solid ballast (olivine 30kN/m³) in all chambers
2. End joint cast in-situ after installation of bridge girder section.
3. Top of concrete elevations are given for all four corners.
4. Slabs and inner walls in south upper chambers to be cast after post-tensioning

Directions:

1. Standards/provisions:
   Handbook N400:2015
   Prosesskode 2, handbook R762:2015
   NS-EN 1990-1999 (Eurocodes)
2. Steel:
   Steel grade S420
3. Concrete:
   Concrete grade B45. B85 in PT anchorage zones
4. Reinforcement:
   B500NC (NS 3576-3)
5. Post-tensioning:
   Y-1860-S7 CL. 2 (EN 10138-3)

References:

- SBJ-33-C5-OON-22-DR-171 General arrangemet
- SBJ-33-C5-OON-22-DR-173 Sections and details II
- SBJ-33-C5-OON-22-DR-174 Post-tensioning
- SBJ-33-C5-OON-22-DR-175 Connection to bridge girder

Design team: Norconsult, DR. TECHN. OLAV OLSEN

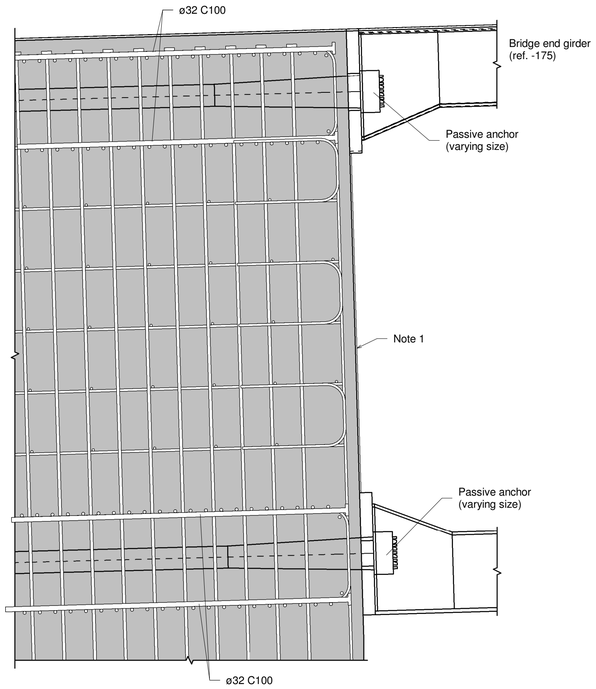
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	TN	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden
Concept development floating bridge
K12 - Abutment Gulholmane
Sections and details I

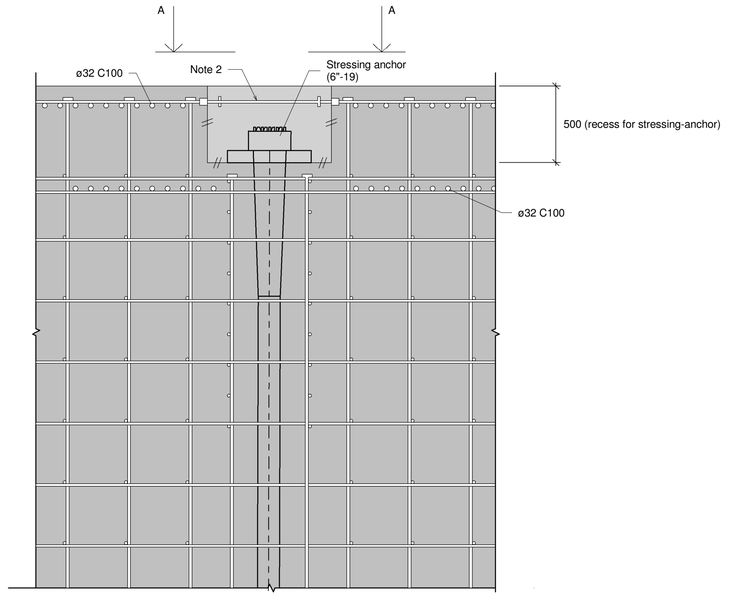
Drawing dato	2019-05-24
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-172	0



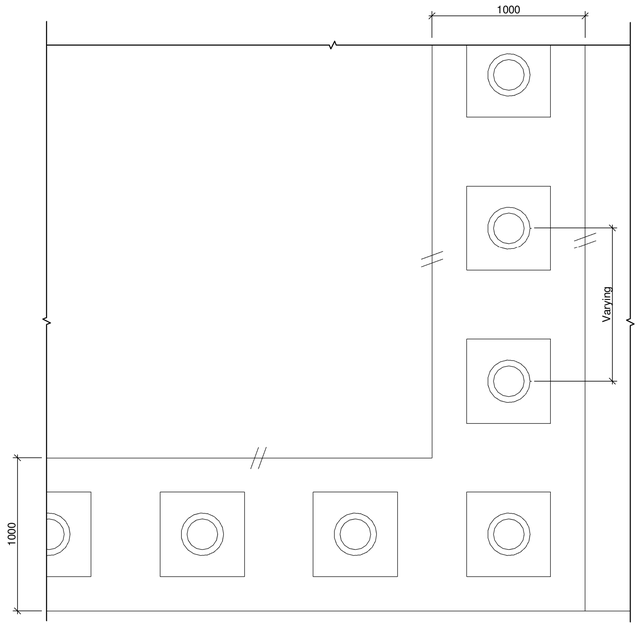
Detail 2

1 : 20 Post-tensioned connection of bridge end girder



Detail 3

1 : 20 Recess for stressing of rock anchors



Section A-A

1 : 20 Recess top view.
Reinforcement not shown

Remarks:

1. Steel plate 10mm, or formwork of optional type.
   The end joint is cast in situ after installation of bridge girder end section.
2. T-bars with couplers. Recess to be reinforced and cast when stressing is completed
3. Reinforcement arrangement may be adjusted in later design phases.

Directions:

1. Standards/provisions:
   Handbook N400:2015
   Prosesskode 2, handbook R762:2015
   NS-EN 1990-1999 (Eurocodes)
2. Steel:
   Steel grade S420
3. Concrete:
   Concrete grade B45. B85 in PT anchorage zones
4. Reinforcement:
   B500NC (NS 3576-3)
5. Post-tensioning:
   Y-1860-S7 CL. 2 (EN 10138-3)

References:

- SBJ-33-C5-OON-22-DR-171 General arrangemet
- SBJ-33-C5-OON-22-DR-172 Sections and details I
- SBJ-33-C5-OON-22-DR-174 Post-tensioning
- SBJ-33-C5-OON-22-DR-175 Connection to bridge girder

Design team: Norconsult DR. TECHN. OLAV OLSEN

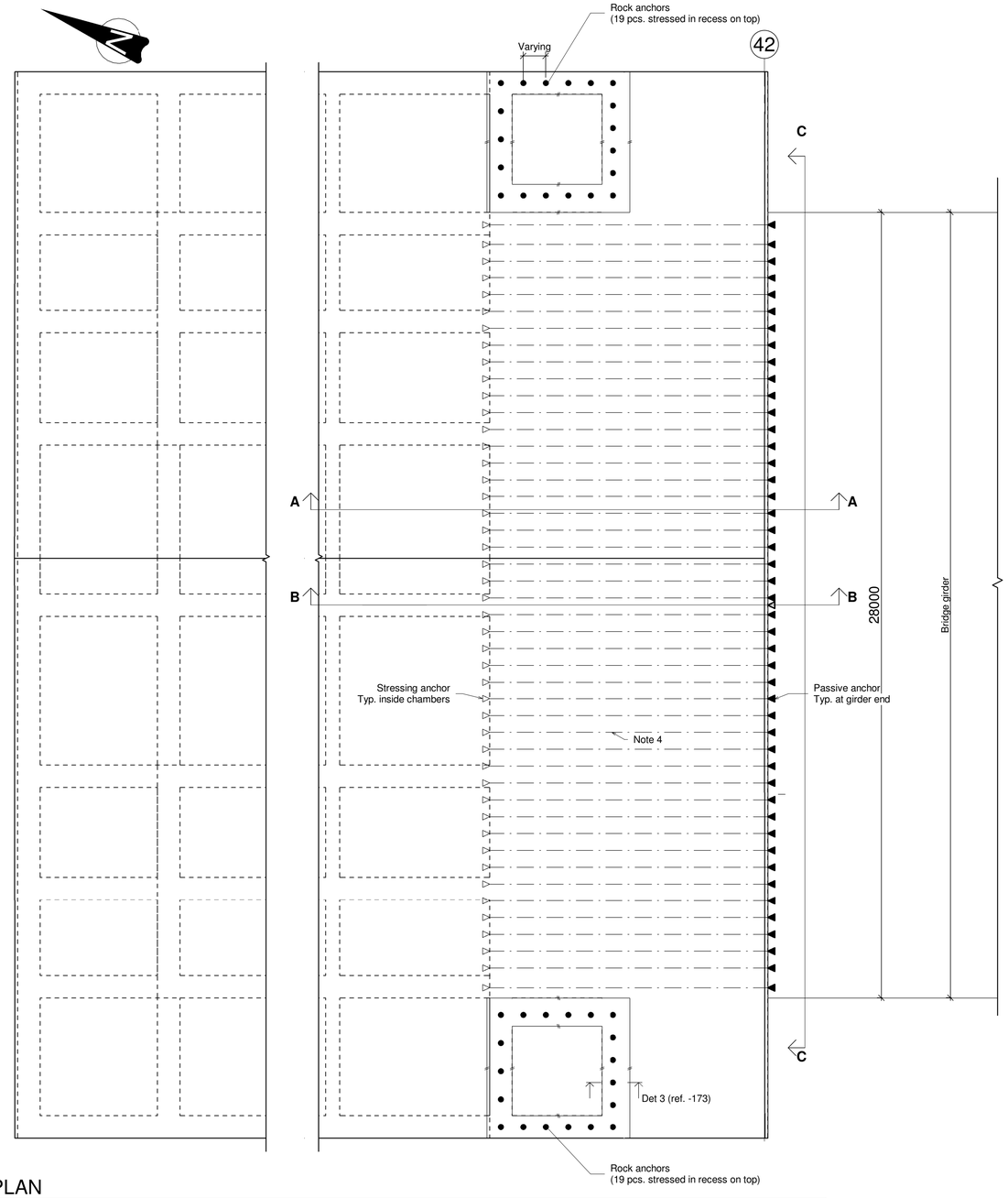
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	TN	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden
Concept development floating bridge
K12 - Abutment Gulholmane
Sections and details II

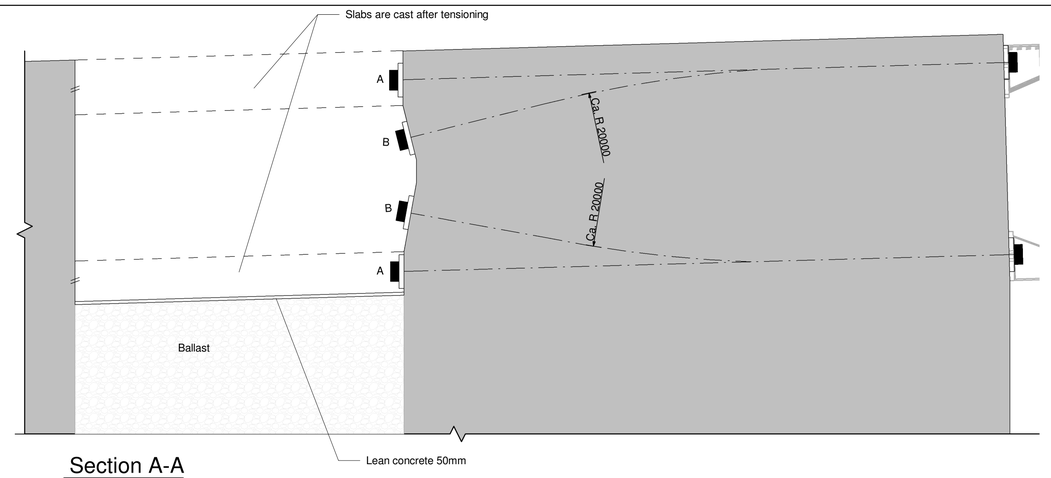
Drawing dato	2019-06-30
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-173	0



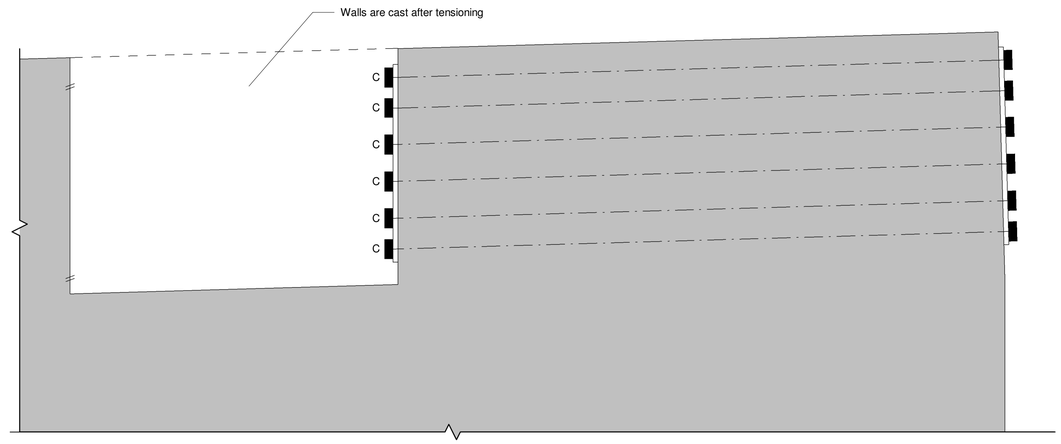
PLAN

1 : 100 Tendons and anchors in top slab are shown



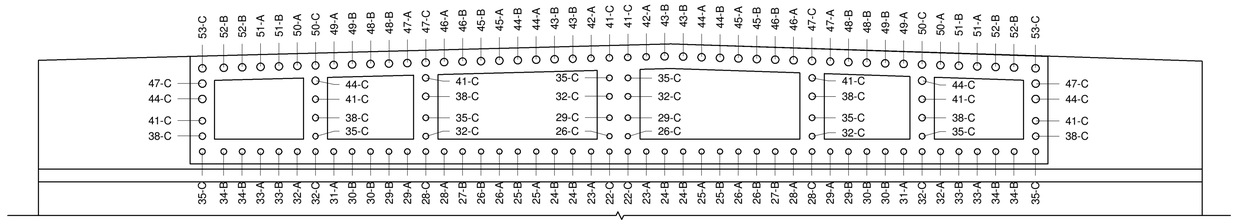
Section A-A

1 : 50



Section B-B

1 : 50



38-C
Type, placement of stressing anchor
Number of strands in tendon

Section C-C

1 : 100

Remarks:

1. Rock anchors 6"-19 with bonded lenght 10 m and unbonded length 13 m.
   Stressed to 0,7 f_{td} (2650 kN)
2. Horisontal post-tendioning with 0,6" strands.
   Tendons to be stressed maximum 0.95*$f_{p0.1k}$*Ap
   Max stressing force after locking of wedges 0.85*$f_{p0.1k}$*Ap
   Ap = 150*n(mm^2), wher n is no. of strands acc. to section C-C
3. All tendons grouted
4. Small horizontal curvature will occur for some tendons.
   Curvature not shown

Directions:

1. Standards/provisions:
   Handbook N400:2015
   Prosesskode 2, handbook R762:2015
   NS-EN 1990-1999 (Eurocodes)
2. Steel:
   Steel grade S420
3. Concrete:
   Concrete grade B45. B85 in PT anchorage zones
4. Reinforcement:
   B500NC (NS 3576-3)
5. Post-tensioning:
   Y-1860-S7 CL. 2 (EN 10138-3)

References:

- SBJ-33-C5-OON-22-DR-171 General arrangemet
- SBJ-33-C5-OON-22-DR-172 Sections and details I
- SBJ-33-C5-OON-22-DR-173 Sections and details II
- SBJ-33-C5-OON-22-DR-175 Connection to bridge girder

Design team: Norconsult / DR. TECHN. OLAV OLSEN

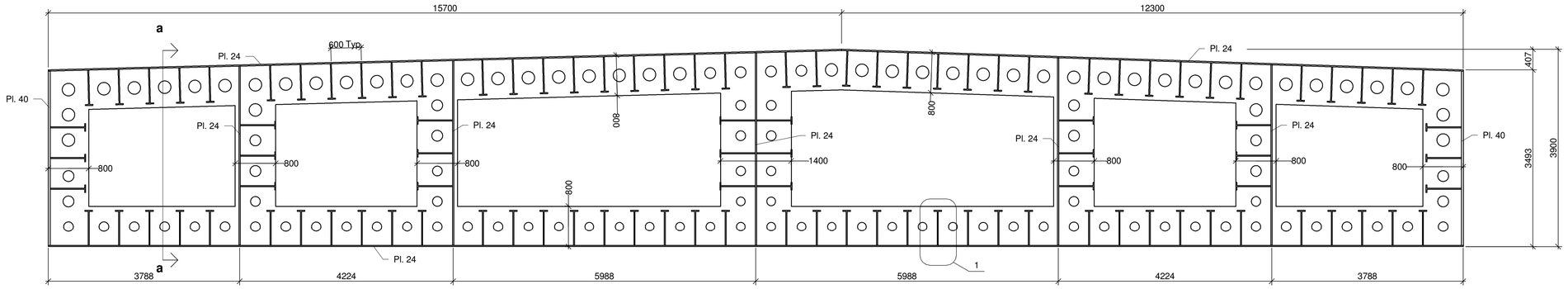
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	TN	KH	2019-06-30

Statens vegvesen

E39 Bjørnafjorden
Concept development floating bridge
K12 - Abutment Gulholmane
Post-tensioning

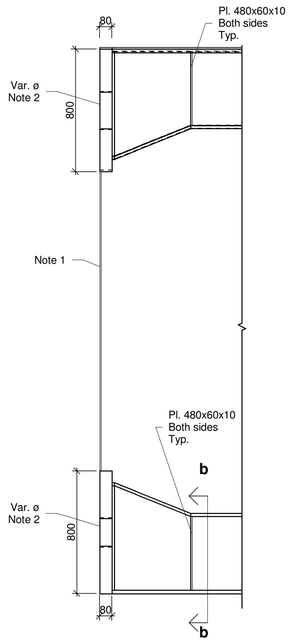
Drawing dato	2019-06-30
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
PLH	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-174	0



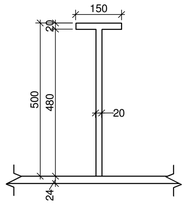
Bridge girder end

1 : 50



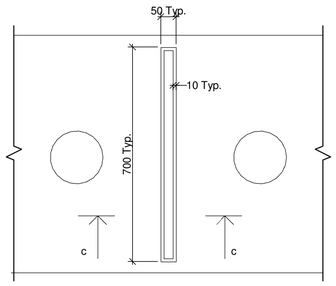
Section a-a

1 : 20 Typ.



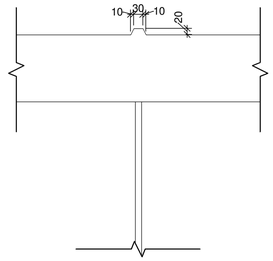
Section b-b

1 : 10 Stiffener, Typ.



Detail 1

1 : 10 Showing concrete side of steel frame.
Typ. shear key.



Section c-c

1 : 10

Remarks:

1. Steel plate 10mm, or formwork of optional type.
   End joint cast in situ after installation of bridge girder
2. Diameter of holes varying, depending on tendon size.

Directions:

1. Standards/provisions:
   Handbook N400:2015
   Prosesskode 2, handbook R762:2015
   NS-EN 1990-1999 (Eurocodes)
2. Steel:
   Steel grade S420
3. Concrete:
   Concrete grade B45. B85 in PT anchorage zones
4. Reinforcement:
   B500NC (NS 3576-3)
5. Post-tensioning:
   Y-1860-S7 CL. 2 (EN 10138-3)

References:

- SBJ-33-C5-OON-22-DR-143 K12 - Floating bridge - Girder - Reinforced bridge girder ends
- SBJ-33-C5-OON-22-DR-171 General arrangemet
- SBJ-33-C5-OON-22-DR-172 Sections and details I
- SBJ-33-C5-OON-22-DR-173 Sections and details II
- SBJ-33-C5-OON-22-DR-174 Post-tensioning

Design team: Norconsult, DR. TECHN. OLAV OLSEN

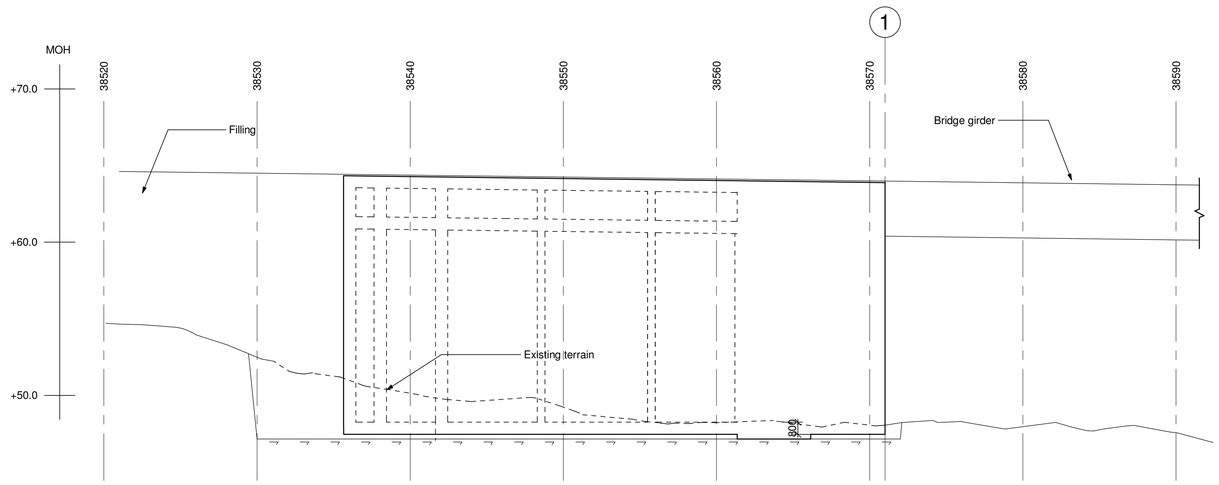
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	PLH	TN	KH	2019-06-30

Statens vegvesen

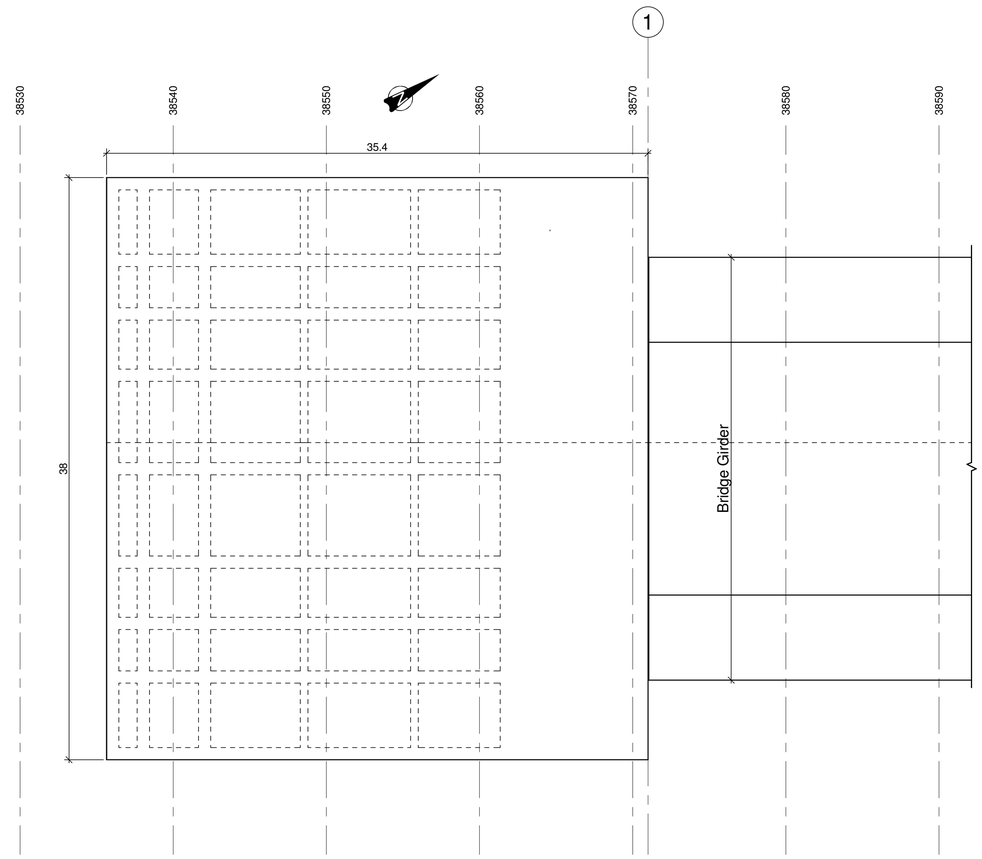
E39 Bjørnafjorden
Concept development floating bridge
K12 - Abutment Gulholmane
Connection to bridge girder end

Drawing dato	2019-06-30
Client rep.	-
Produced for	Region vest
Produced by	Design team
Project number	-
PROF number	-
File number	-
Scale A1-format	
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index
PLH	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-175 0



Elevation
1 : 200



Plan Abutment South
1 : 200

Remarks:
1. All dimensions in m.
2. Horisontal post-tensioning not shown

References:
SBJ-33-C5-OON-22-DR-177 K12 - Abutment south - Sections and detail

Design team: Norconsult, DR. TECHN. OLAV OLSEN

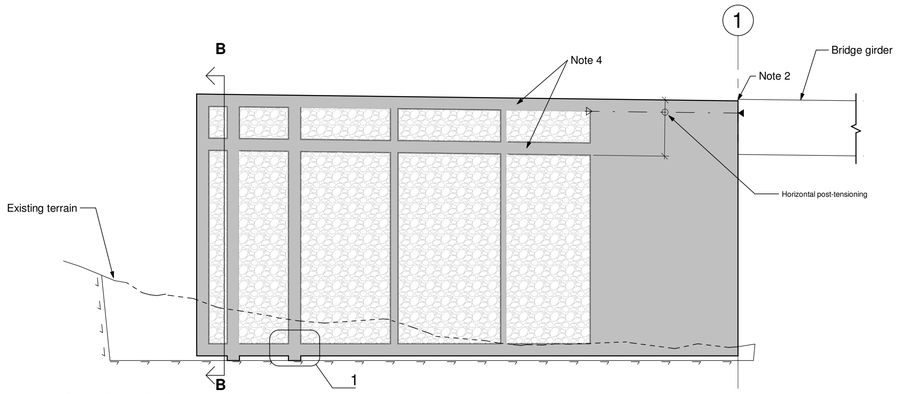
Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	HGJ	TN	KH	2019-06-30

Statens vegvesen

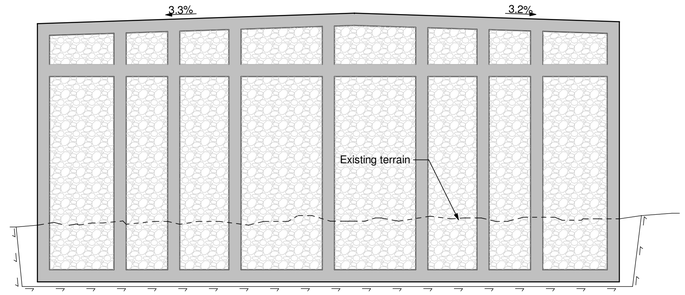
E39 Bjørnafjorden
K12 - Abutment South - General Arrangement

Drawing dato	2019-06-25
Client rep.	
Produced for	Region Vest
Produced by	Design Team
Project number	
PROF number	
File number	
Scale A1-format	1:200
Coordinate System	EUREF89NTM5/NN2000

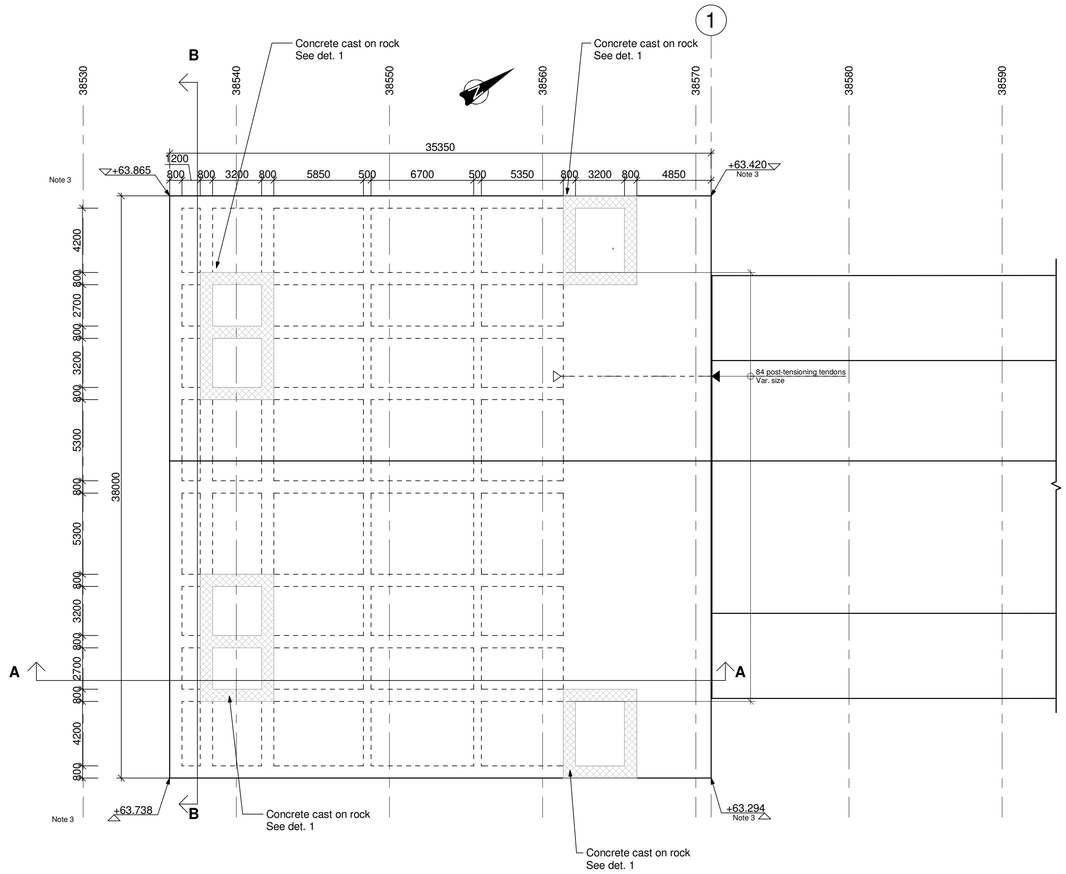
Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
HGJ	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-176	0



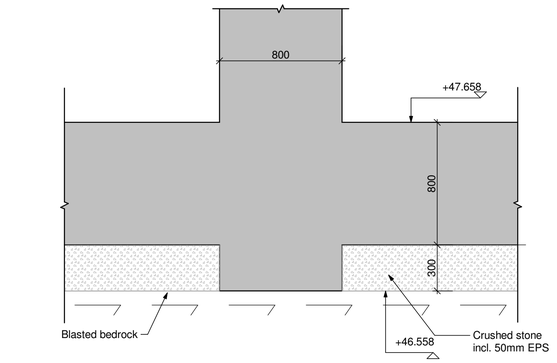
Section A-A
1 : 200



Section B-B
1 : 200



Plan Abutment South
1 : 200



Detail 1
1 : 20 Concrete cast on rock, typ.

Remarks:

1. Solid ballast (20 kN/m³) in all chambers
2. End joint cast in-situ after installation of bridge girder section. Connection with bridge end provided by 84 pcs. of post-tensioning tendons. Size varying from 6"-31 and smaller. Following same principles as given in drawing SBJ-33-C5-OON-22-DR-174. No rock anchors.
3. Top of concrete elevations are given for all four corners.
4. Slabs and inner walls in south upper chambers to be cast after post-tensioning

Directions:

1. Standards/provisions:
   Handbook N400:2015
   Prosesskode 2, handbook R762:2015
   NS-EN 1990-1999 (Eurocodes)
2. Steel:
   Steel grade S420
3. Concrete:
   Concrete grade B45. B85 in PT anchorage zones
4. Reinforcement:
   B500NC (NS 3576-3)
5. Post-tensioning:
   Y-1860-S7 CL. 2 (EN 10138-3)

References:

SBJ-33-C5-OON-22-DR-174 K12 - Abutment Gulholmane - Post-tensioning layout
SBJ-33-C5-OON-22-DR-176 K12 - Abutment South - General arrangement

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Description	Drawn by	Checked	Approved	Rev. date
0	Issued for use	HGJ	TN	KH	2019-06-30

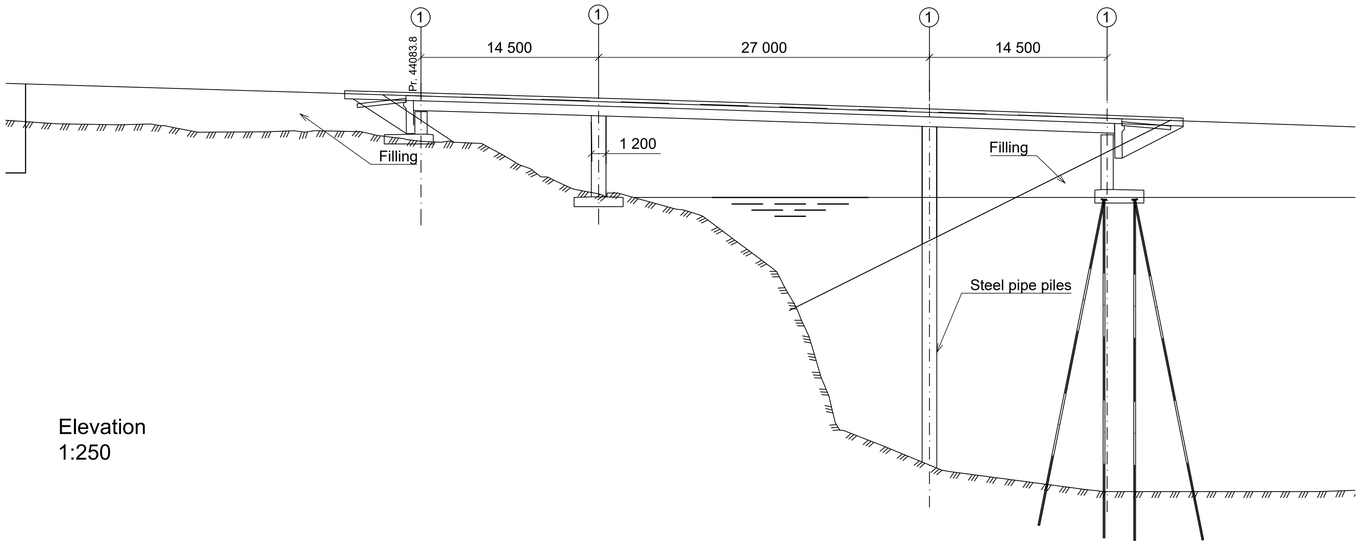
Statens vegvesen

E39 Bjørnafjorden
K12 - Abutment South - Sections and details

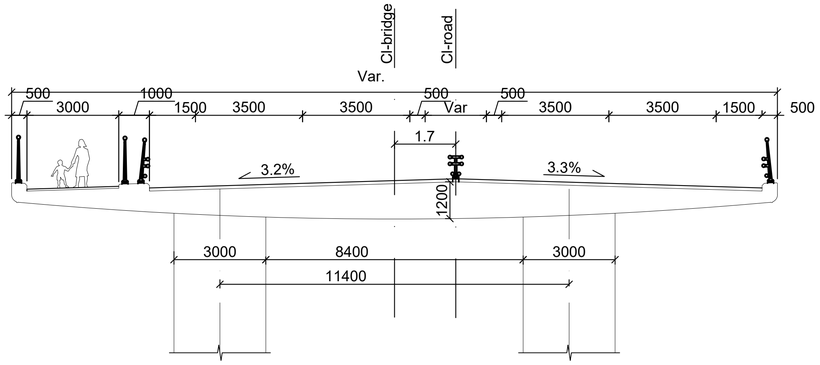
Drawing dato	2019-28-06
Client rep.	
Produced for	Region Vest
Produced by	Design Team
Project number	
PROF number	
File number	
Scale A1-format	As indicated
Coordinate System	EUREF89NTM5/NN2000

Drawn by	Checked by	Approved by	Project no.	Drawing number/Revision index	
HGJ	TN	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-177	0

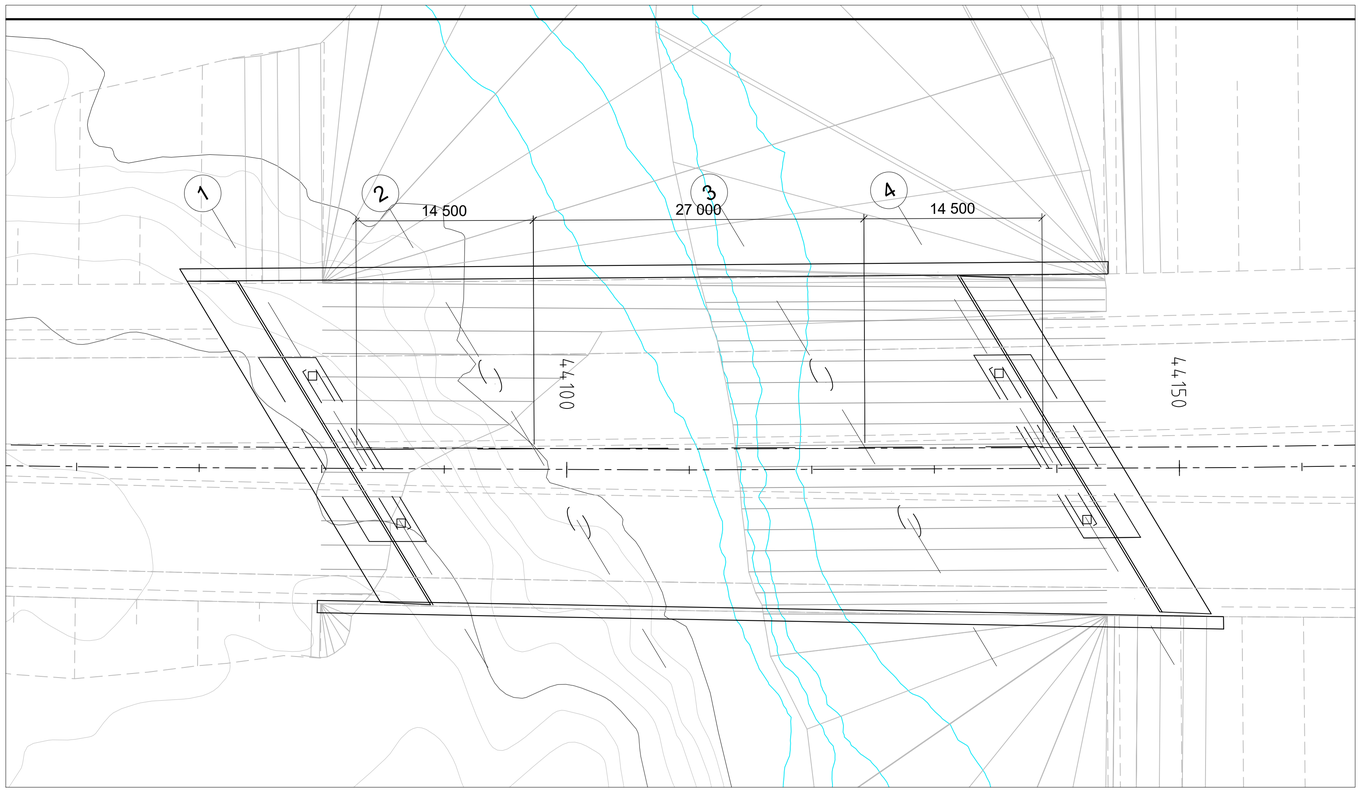
Profile no.	44083.8		44098.3		44125.3		44139.8
Profile height	+8.3 m		+7.8 m		+6.9 m		+6.5 m



Elevation
1:250



General section
1:250



Plan
1:250

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

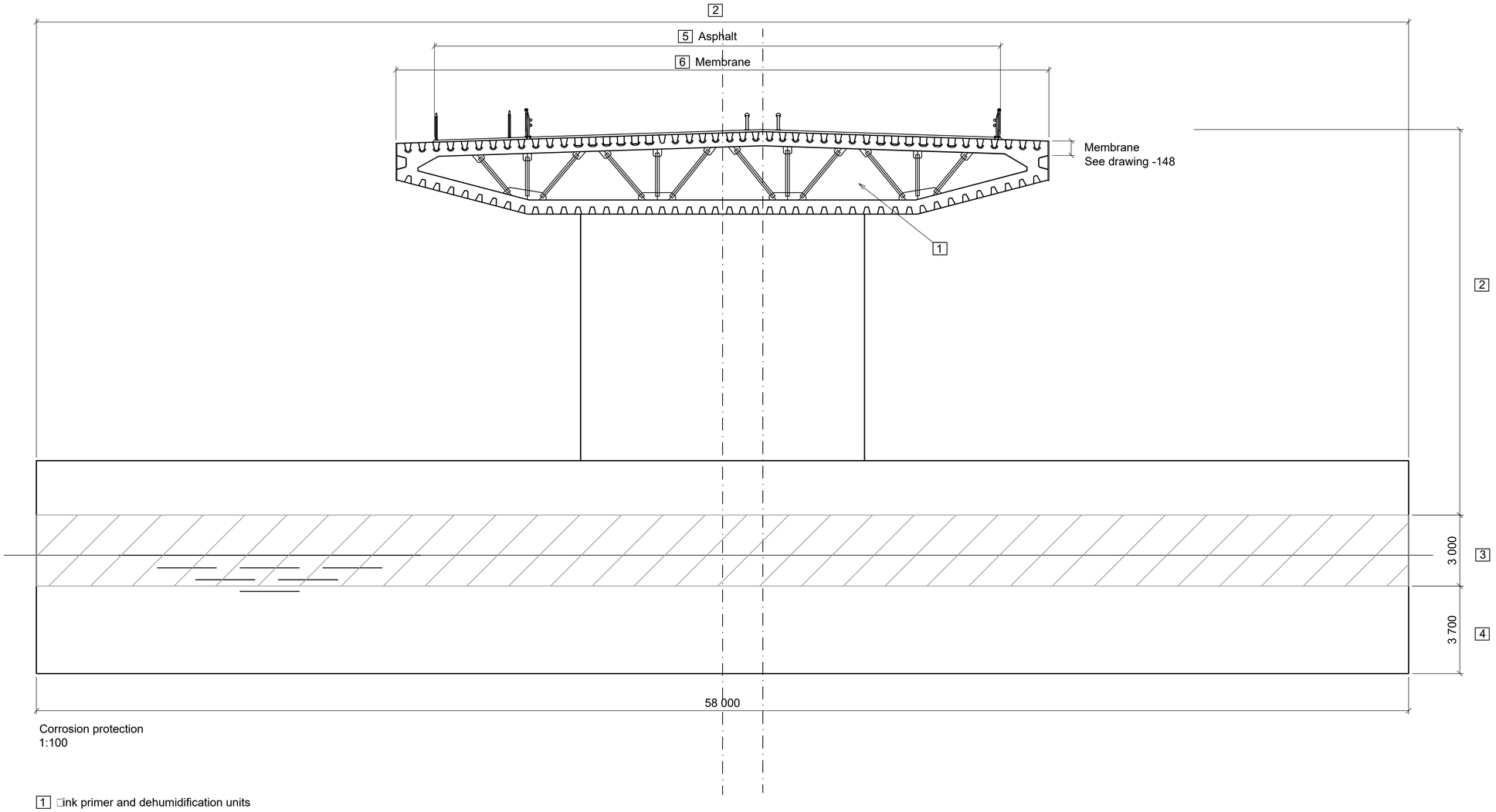
Statens vegvesen

E39 Bjørnafjorden

Concept development floating bridge
Gulholmane approach brigde
General arrangement

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:250/1:100
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MASOT	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-181 0



Corrosion protection
1:100

1 □ink primer and dehumidification units
2 SVV s□stem No. 2
3 25Cr Super duple□ stainless steel with 25% Cr
4 NORSOK s□stem No. 7B and cathodic protection
5 Asphalt ma□imum 80 mm
6 Sand covered pol□uerethan membrane

Remarks:
1. Steel structures:
- S420N/NL according to NS-EN 10025-3

References:

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For use	MaSOt	JOS	KH	2019-06-30

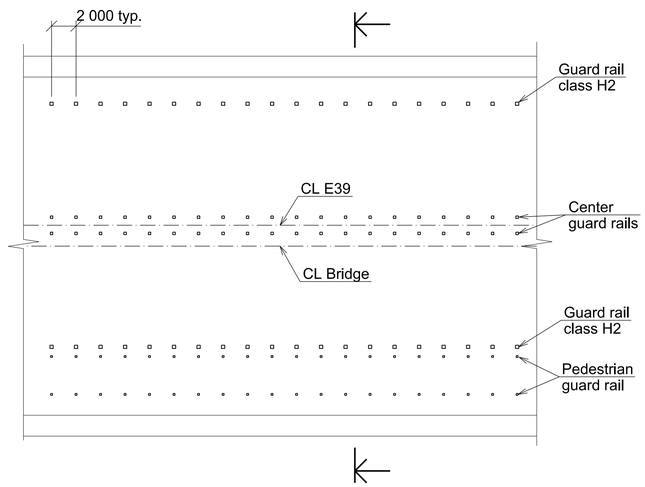
Statens vegvesen

E39 Bjørnafjorden

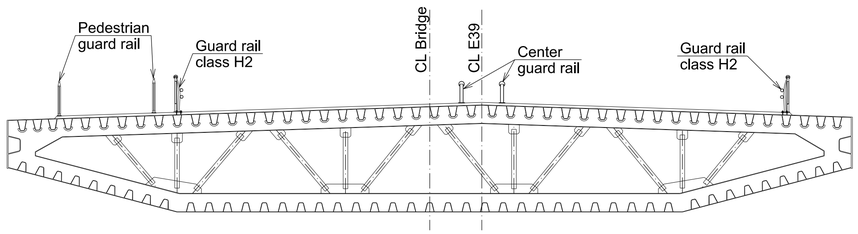
Concept development floating bridge
Corrosion protection and membrane

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
NO/MaSOt	NO/JOS	OO/KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-191 0



Railing - Plan
1:250



Typical section
1:100

Design team: Norconsult / DR. TECHN. OLAV OLSEN

Rev. index	Description	Drawn by	Checked by	Approved by	Date of issue
0	Issued for use	TH	HeSky	KH	30.06.19

Statens vegvesen

E39 Bjørnafjorden

K12 - Bjørnafjorden bridge

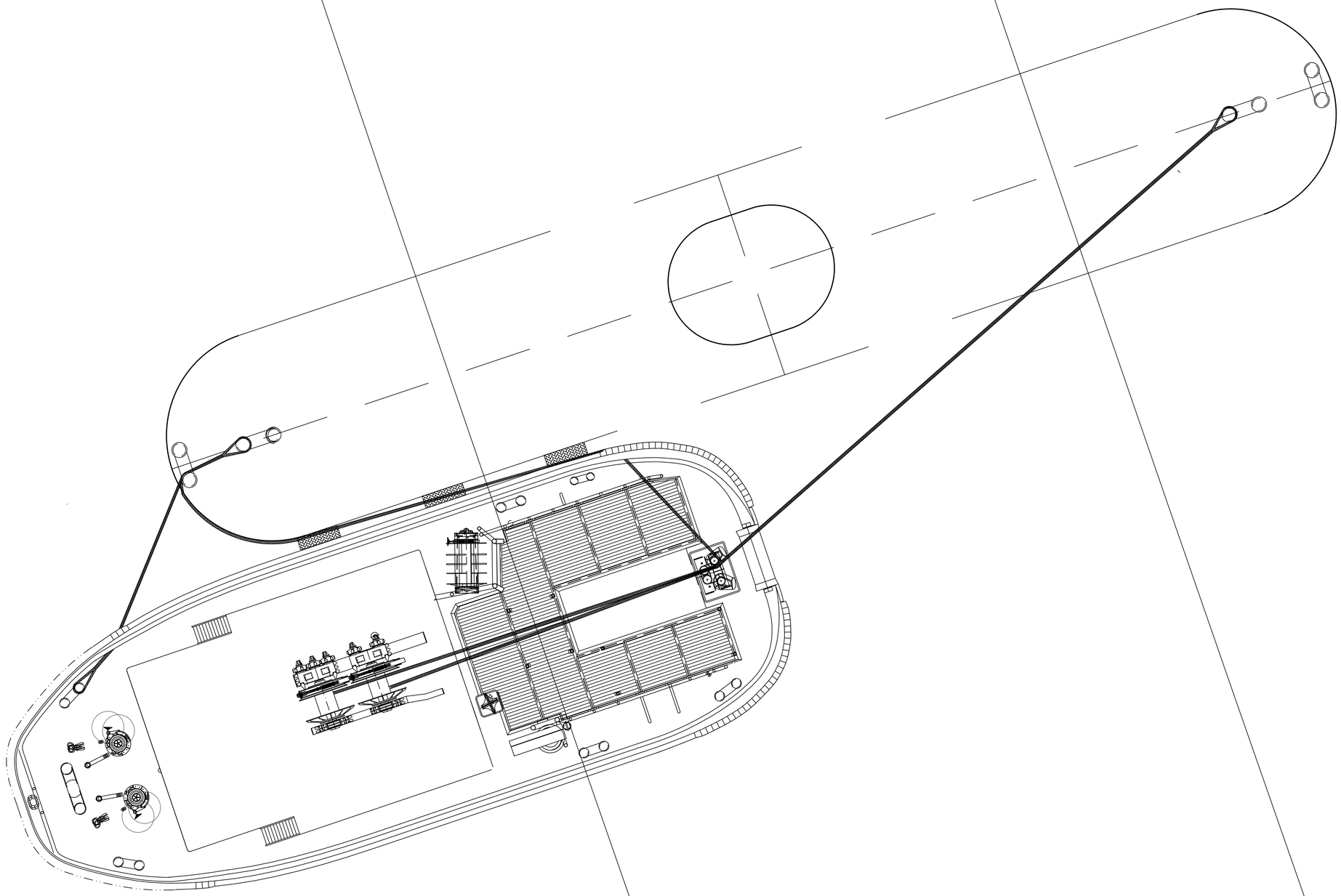
Railings - Principle drawing

Concept development floating bridge

Drawing date	30.06.2019
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult / Olav Olsen
Project number	-
PROF-number	-
File number	-
Scale A1-format	1:250/1:100
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index	
TH	HeSky	KH	5187772 / 12777	SBJ-33-C5-OON-22-DR-192	0

Filnavn: $FILE$



Configuration:

1 off mooring rope secured at bollard on bow.
2 off mooring ropes from winches by towing pins to pontoon.
3 off dumper tires between tug and pontoon

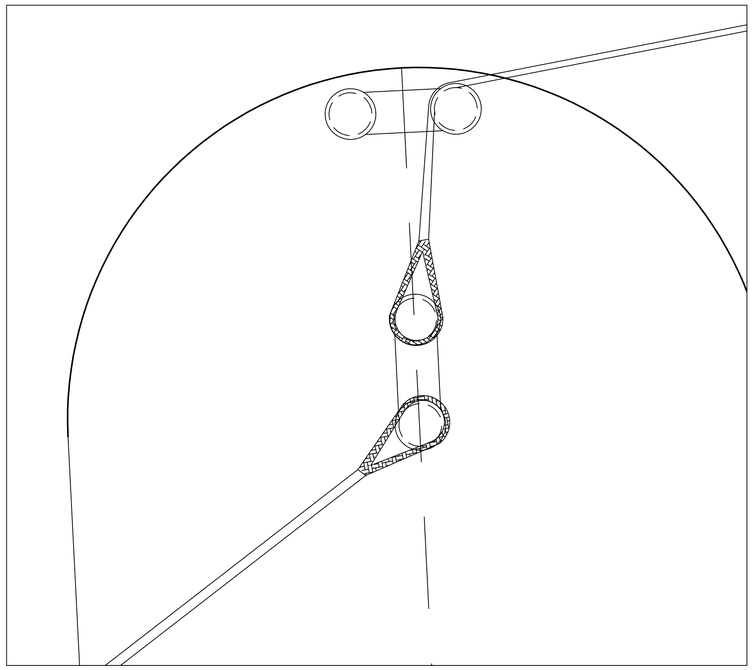
0	For USe	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

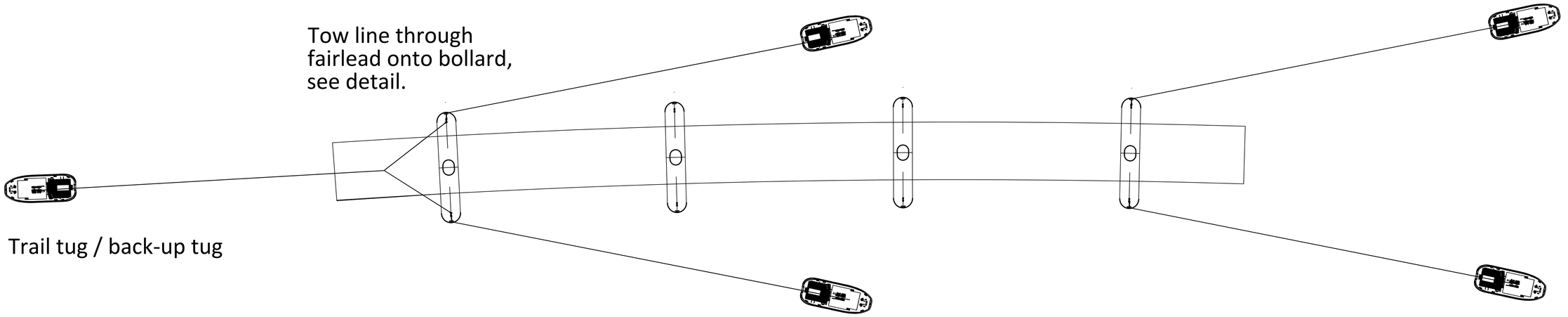
E39 Bjørnafjorden
Marine Operations
Tug Moored at Pontoon

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
			5187772 / 12777	SBJ-33-C5-00N-24-DR-001 0



5 off 60-70 TBP tugs



0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden

Marine Operations

Towing Configuration 480 m section

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-002 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777

Håkonshella
Iso G 4s 2.6M

Trollholmen
F G 2.6M

Vatlestraumen
Oc G 6s 3.6M

Bjørøygavlen
F R 2.6M

Vonflua
Oc WRG 6s 6.4-4.3M

Røverskolten
F R 2.6M

Jomfruhavn
F R 2.6M

Fløsteinsneset
Iso R 4s 2.3M

Hilleren
Oc(2)WRG 8s 2.5-1.4M

Hilleren

Katlaflu

Savaholmen V-Side

S.

Sh.

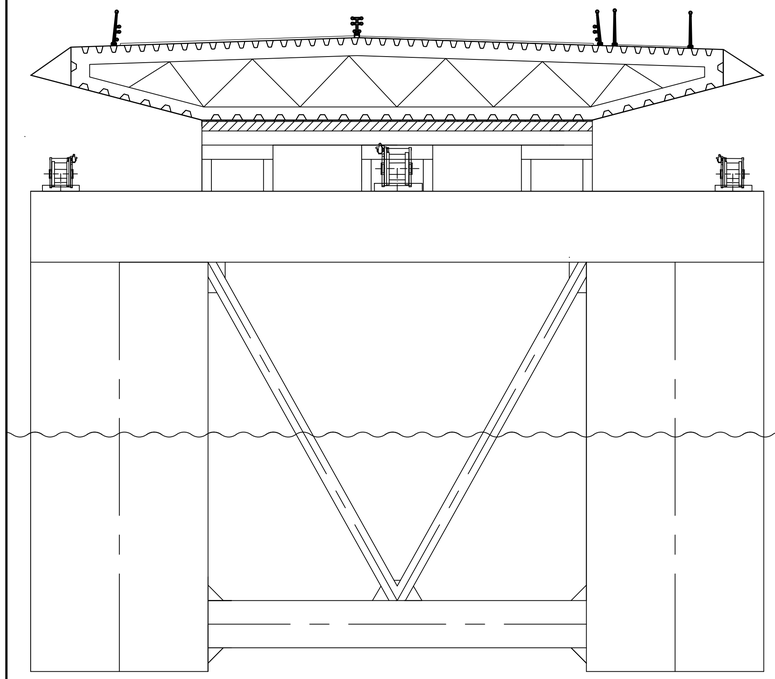
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

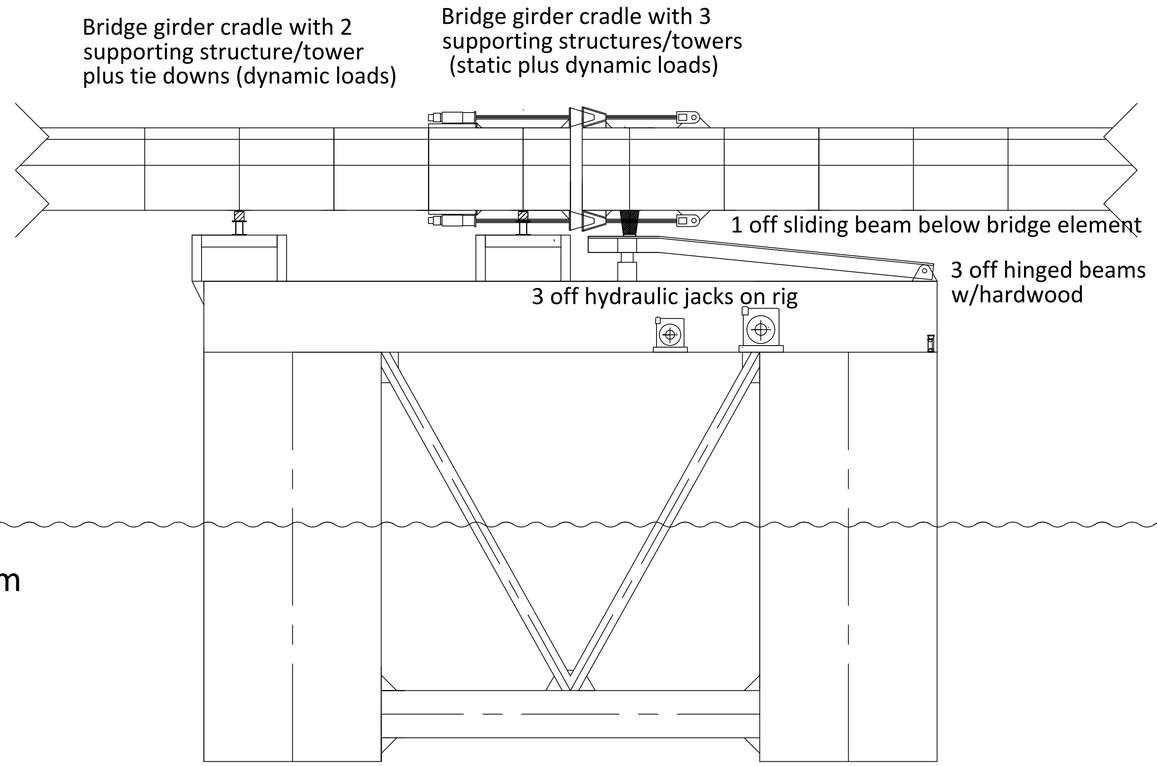
E39 Bjørnafjorden
Marine Operations
Tow 480 m section – Vatlestraumen

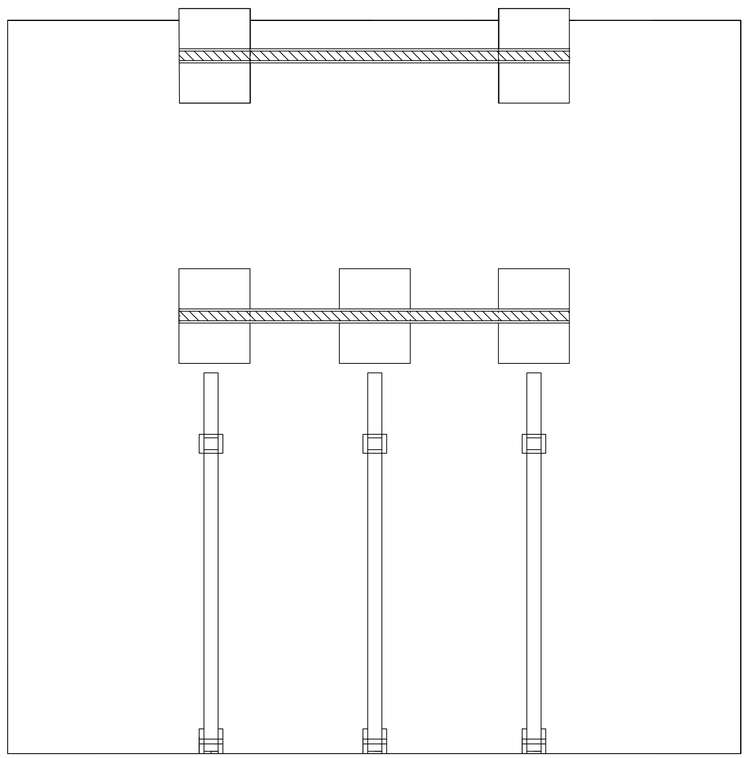
Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	–
PROF–number	–
File number	–
Scale	A1–format
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
			5187772 / 12777	SBJ–33–C5–00N–24–DR–003 0



Columns: Ø = 7.5 m, H = 17.5 m





Main deck: 31.0 m x 31.0 m x 3.0 m.
Winches omitted as they are below deck.

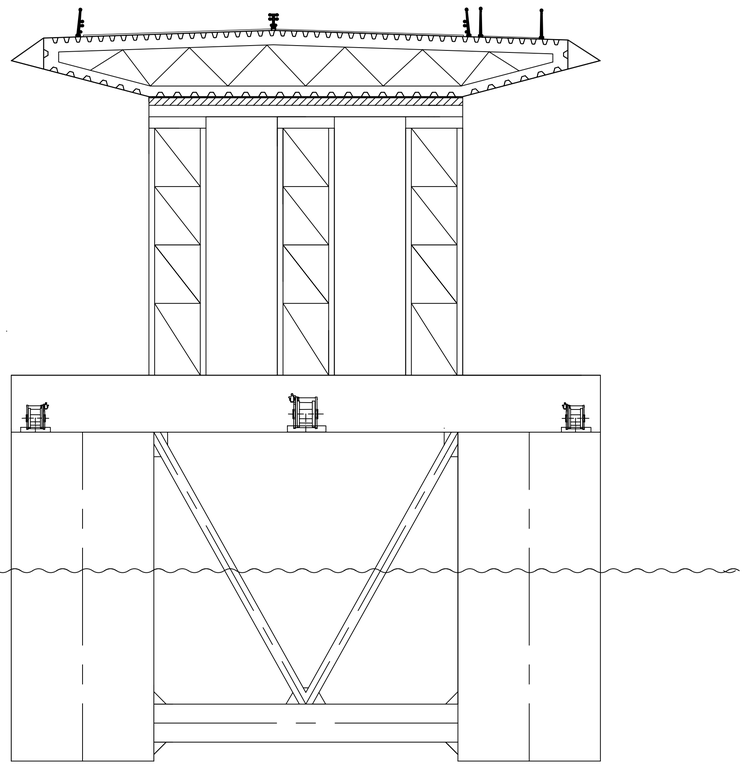
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

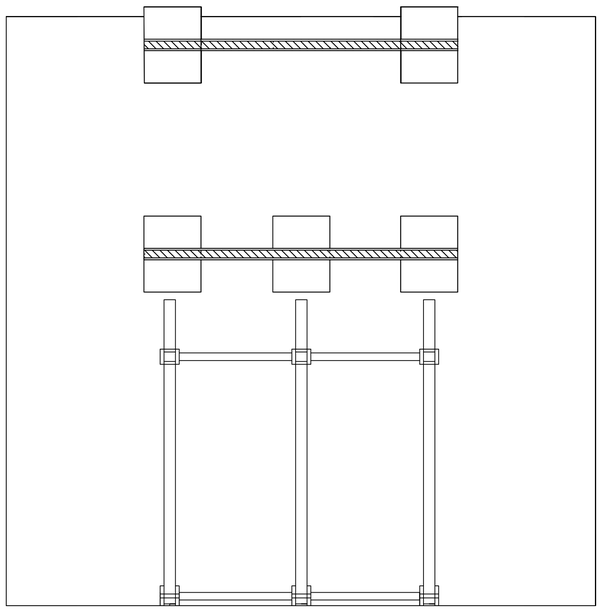
Statens vegvesen

E39 Bjørnafjorden
Marine Operations
General Arrangement Assembly Rig

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-004 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777

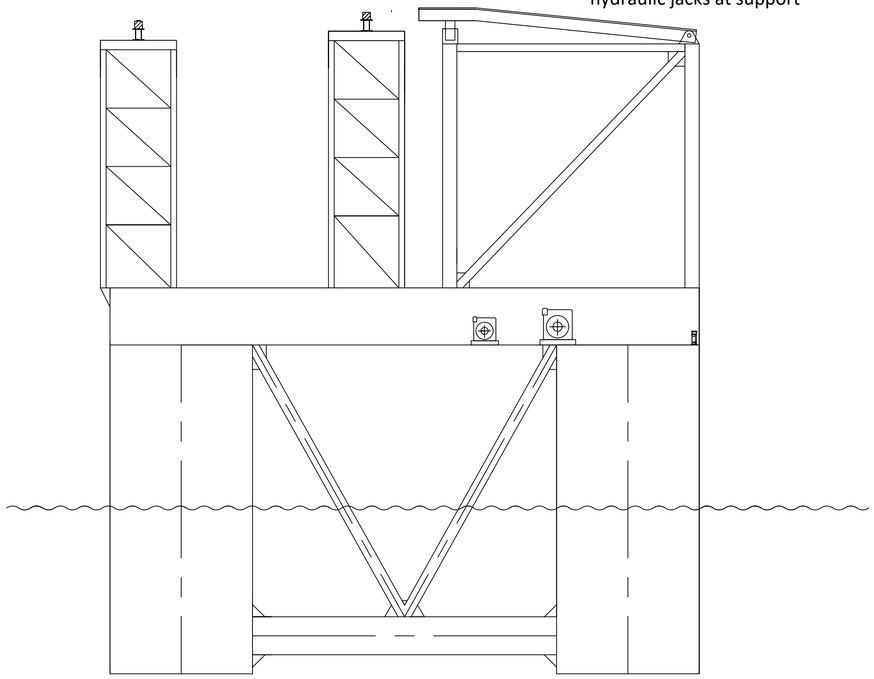




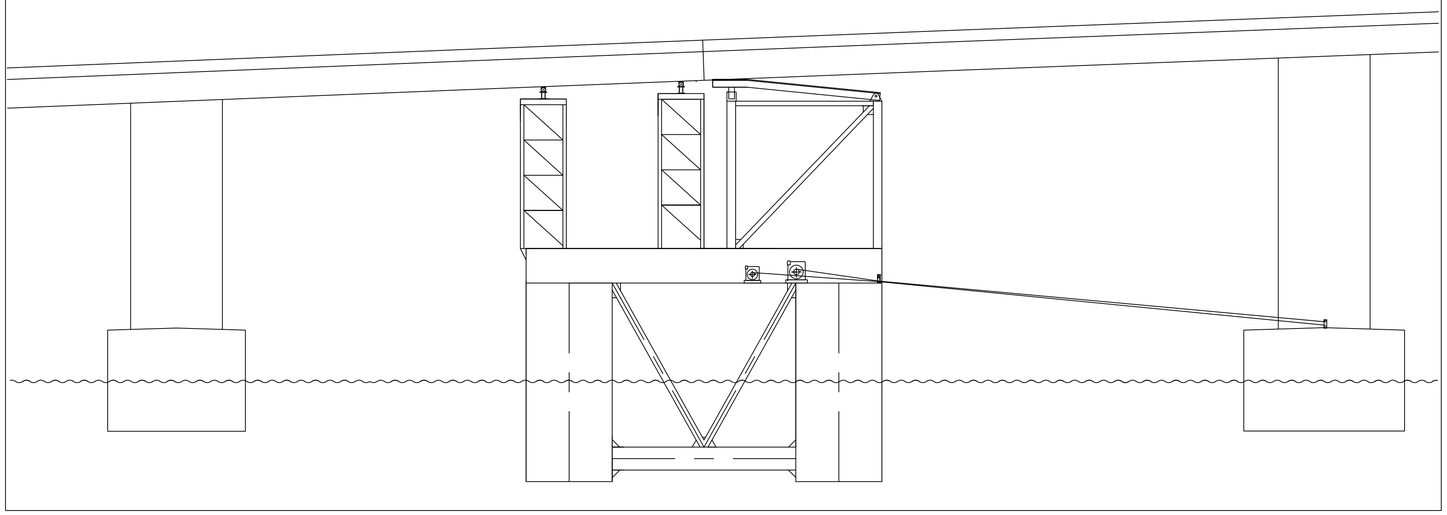
Bridge girder cradle with 2 supporting structure/tower plus tie downs (dynamic loads)

Bridge girder cradle with 3 supporting structures/towers (static plus dynamic loads)

3 off hinged beams with hydraulic jacks at support



Typical setup for installation of high section



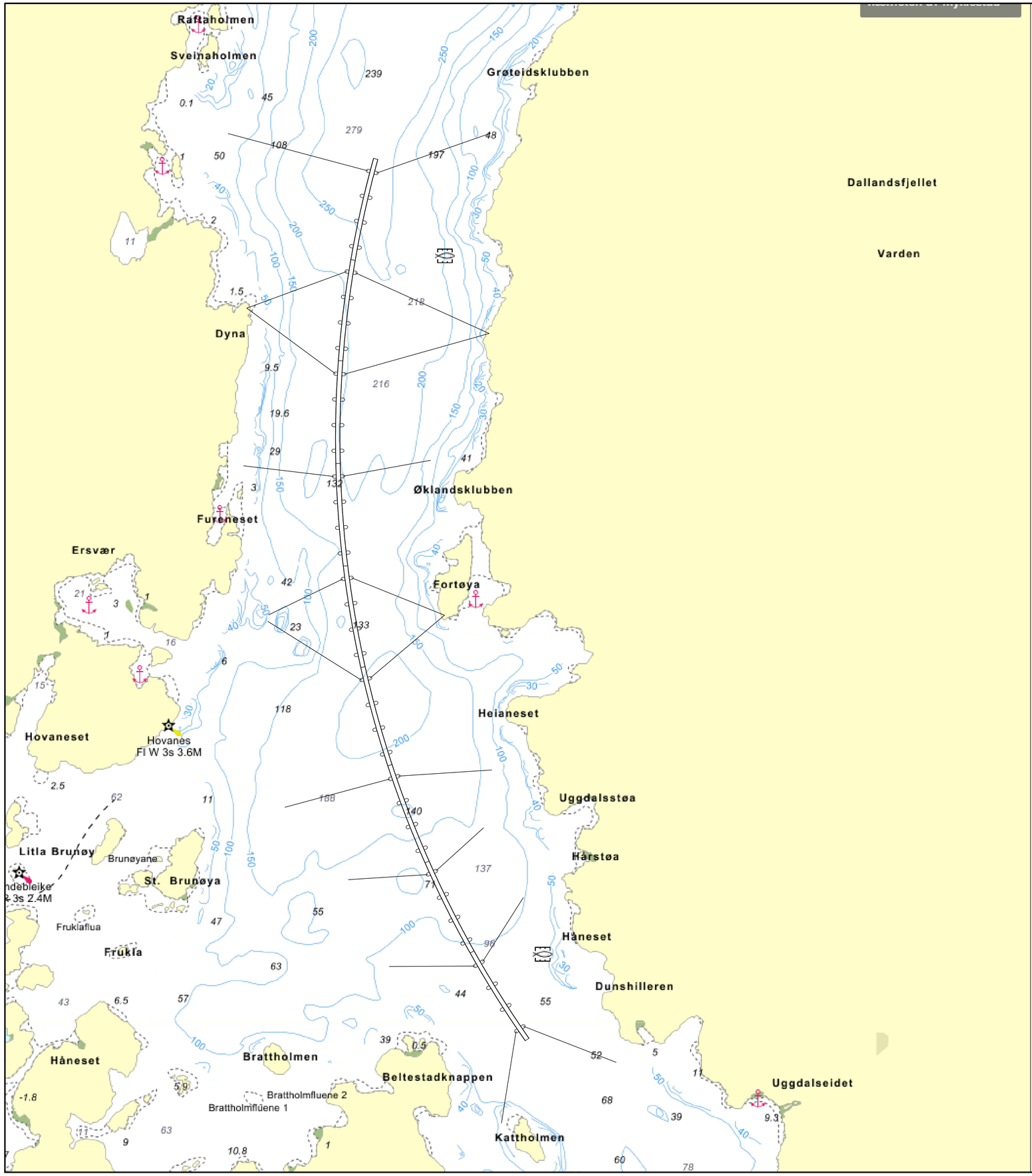
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
GA High Assembly Rig

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
			5187772 / 12777	SBJ-33-C5-OON-24-DR-005 0



Mooring lines to shore: 6 off.

Mooring lines to anchor: 14 off.

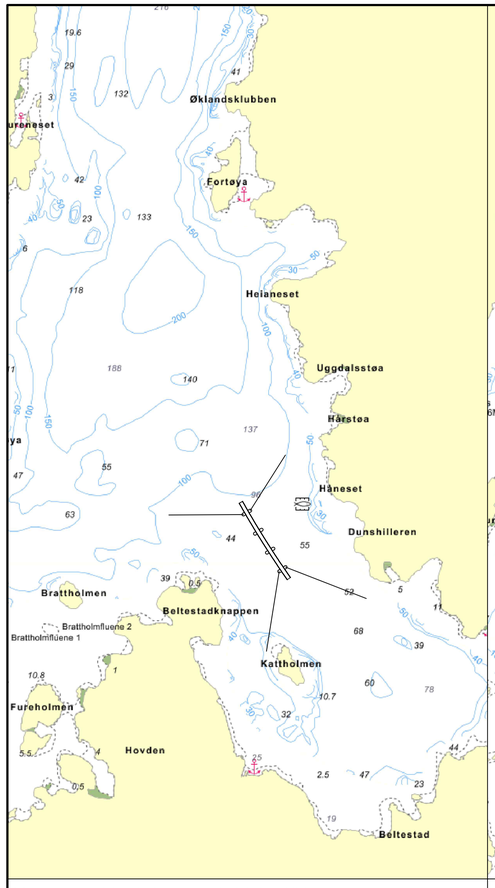
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

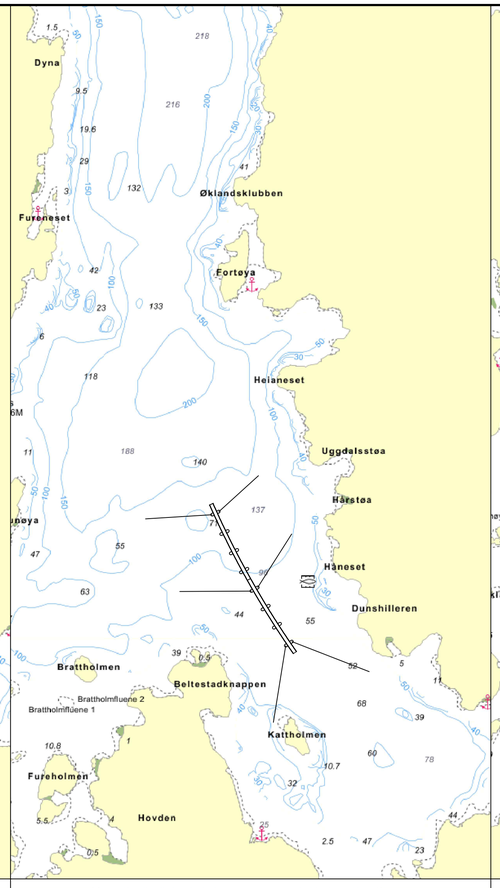
Statens vegvesen

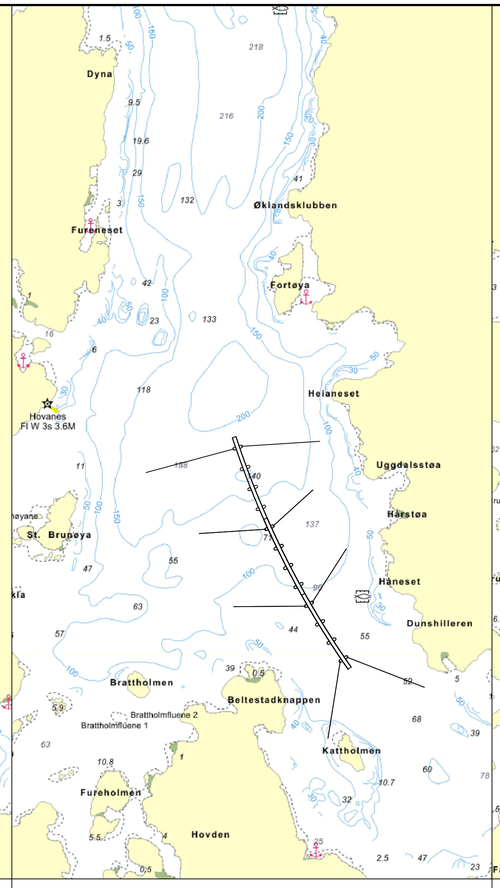
E39 Bjørnafjorden
Marine Operations
Bridge mooored Søreidvågen

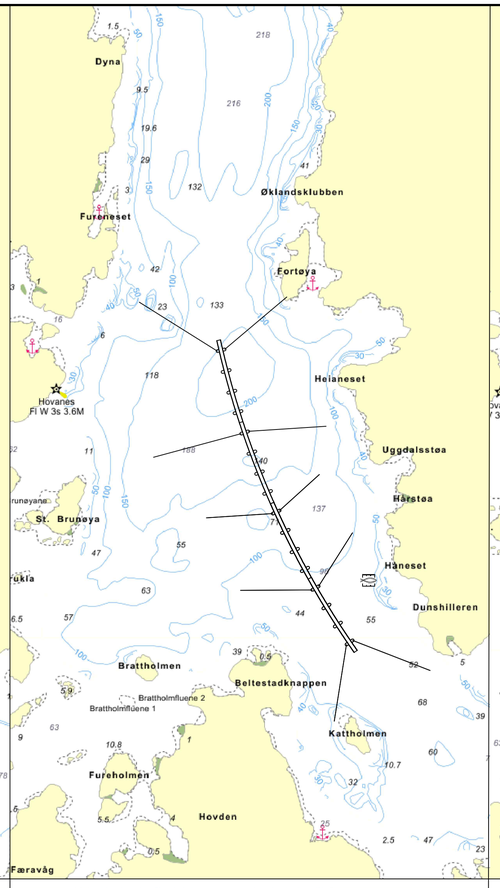
Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-006 0

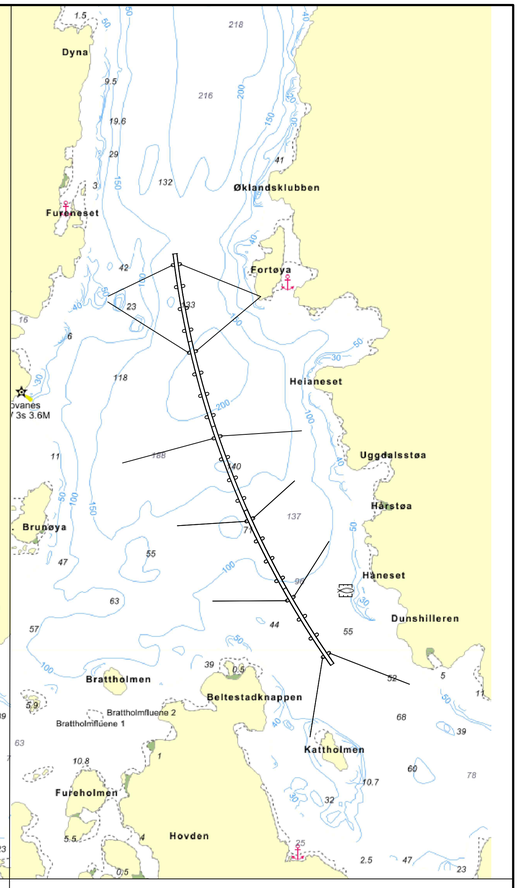
Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777

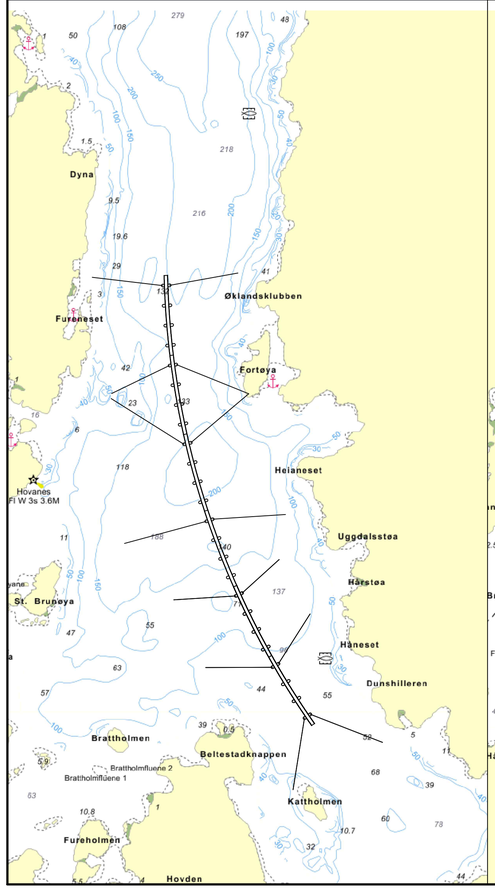


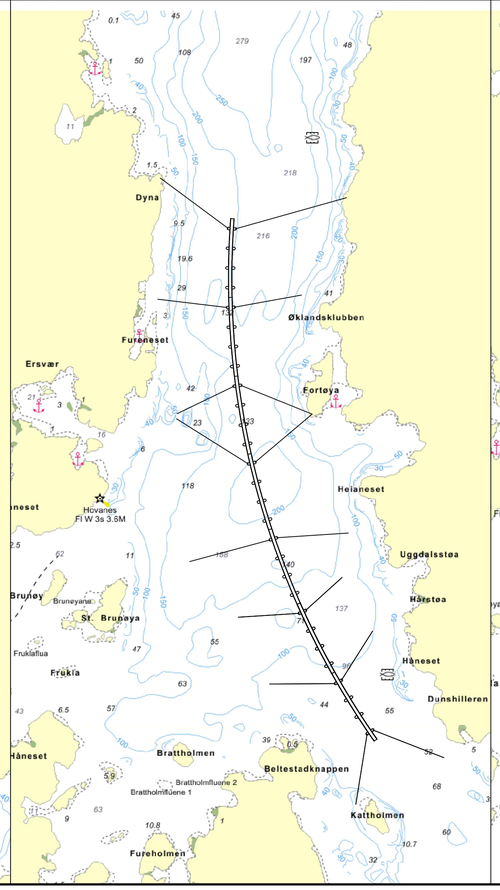


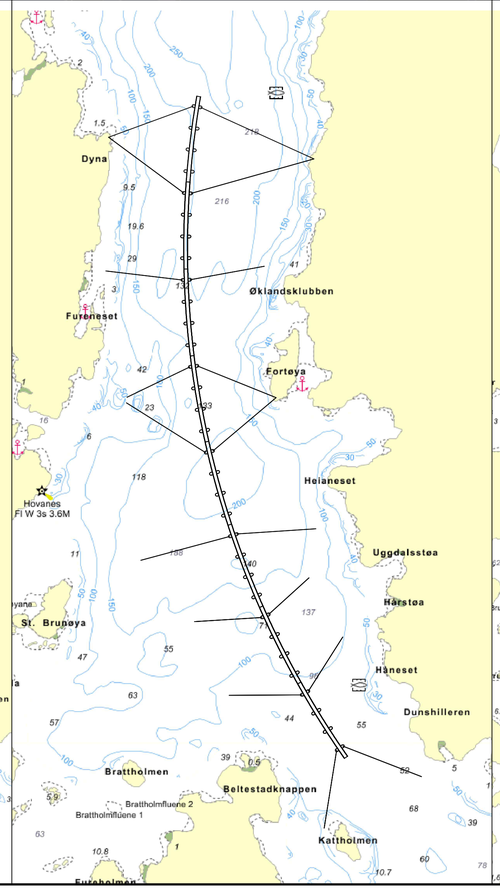


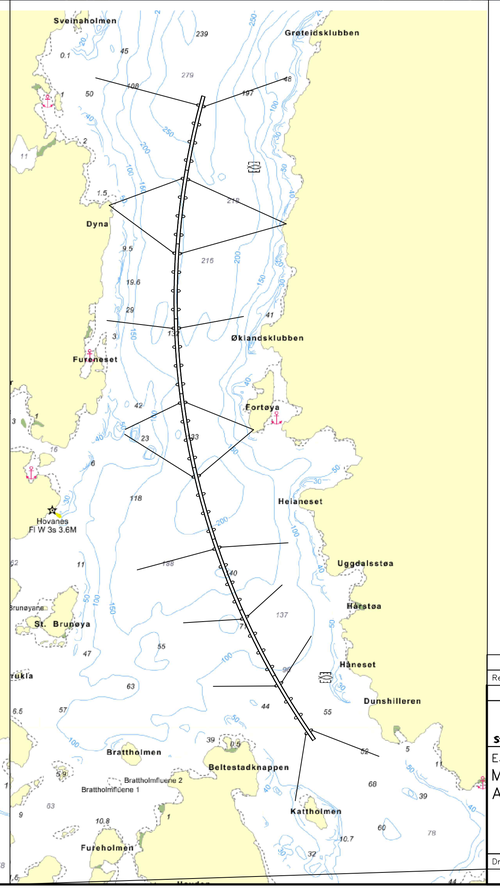












0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

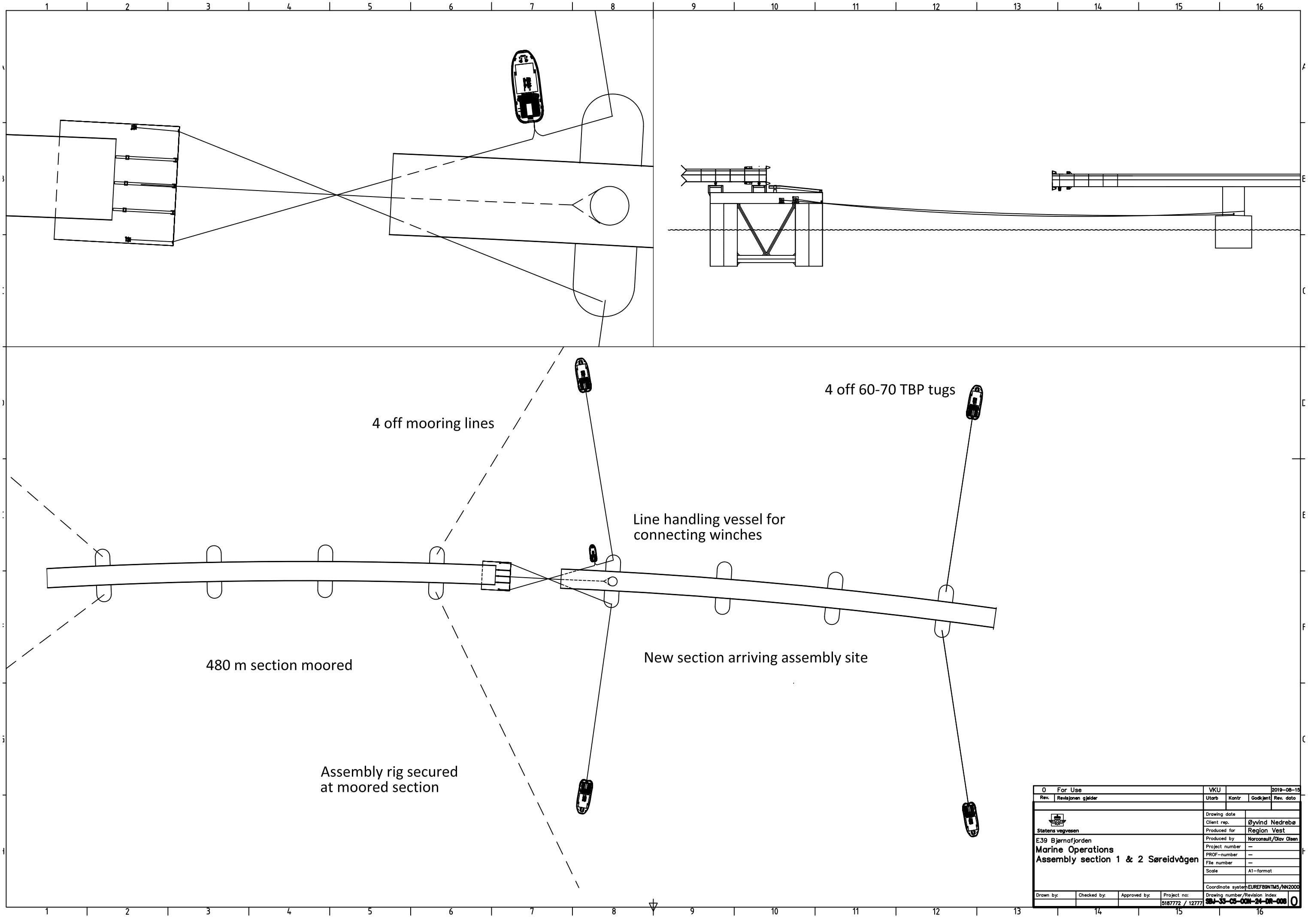
E39 Bjørnafjorden

Marine Operations

Assembly sequence Søreidvågen

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
			5187772 / 12777	SBJ-33-C5-00N-24-DR-007 0



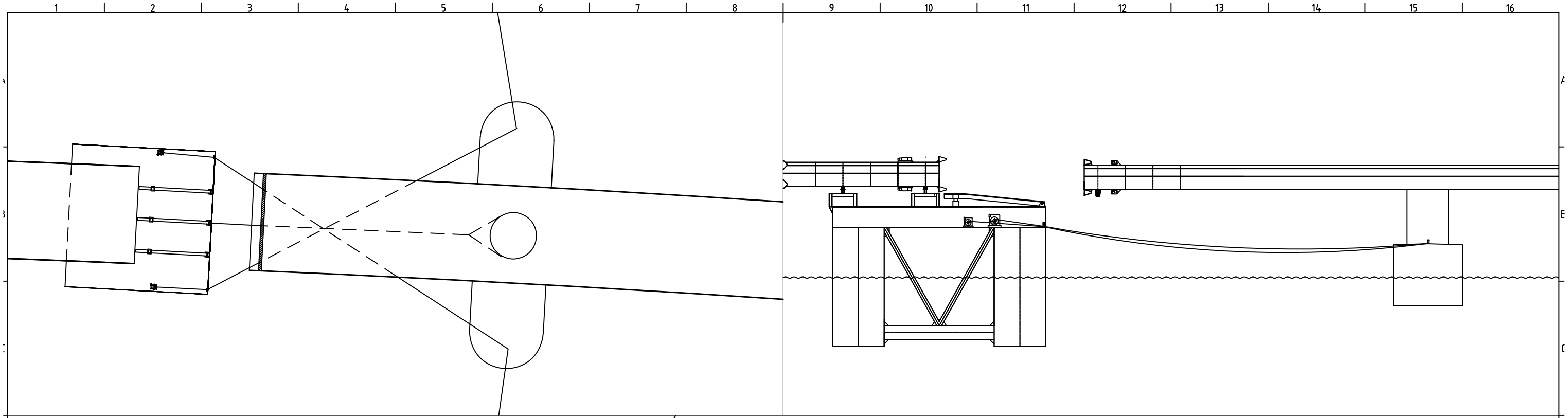
0	For Use	VKU			2019-08-15
Rev.	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

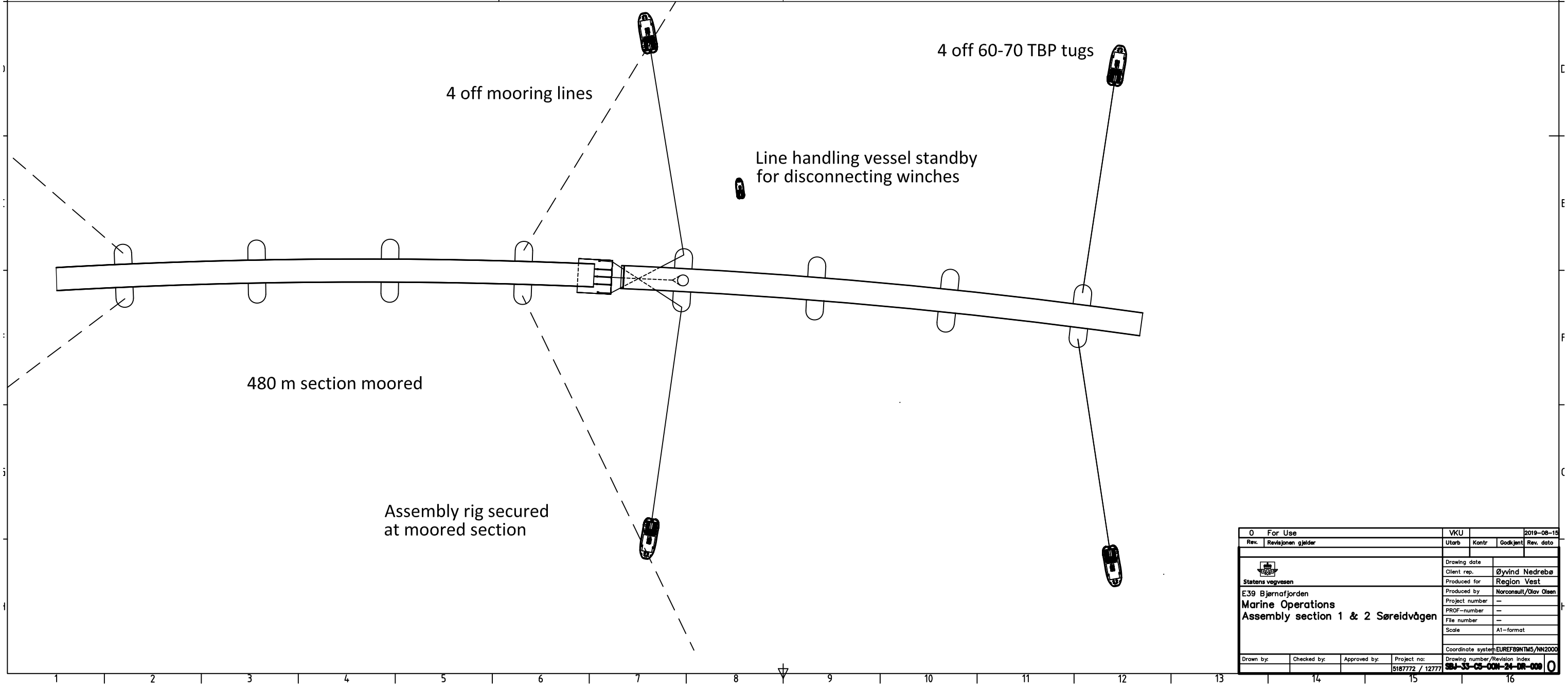
Statens vegvesen

E39 Bjørnafjorden

Marine Operations
Assembly section 1 & 2 Søreidvågen

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	–
PROF–number	–
File number	–
Scale	A1–format
Coordinate system	EUREF89NTM5/NN2000
Drawn by:	
Checked by:	
Approved by:	
Project no:	5187772 / 12777
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-008 0





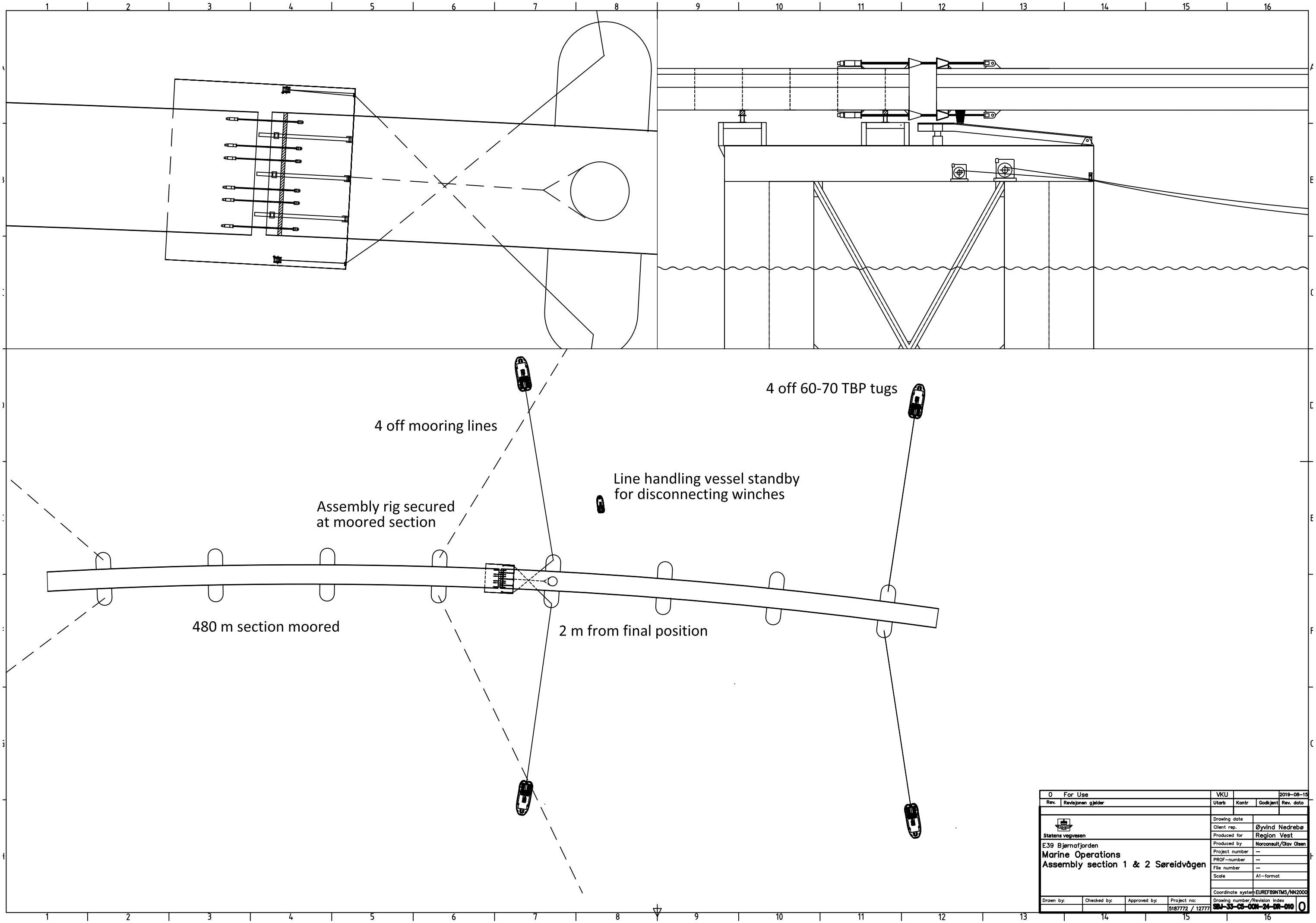
0	For Use	VKU			2019-08-15
Rev.	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
Assembly section 1 & 2 Søreidvågen

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	–
PROF–number	–
File number	–
Scale	A1–format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	5187772 / 12777 SBJ-33-C5-00N-24-DR-009 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777



0	For Use	VKU			2019-08-15
Rev.	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

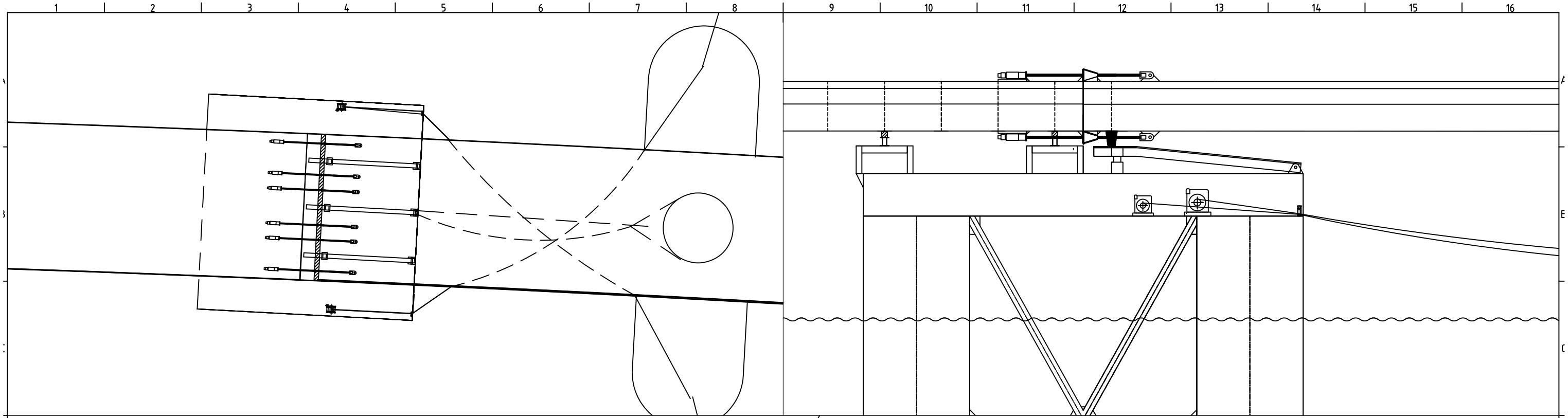
Statens vegvesen

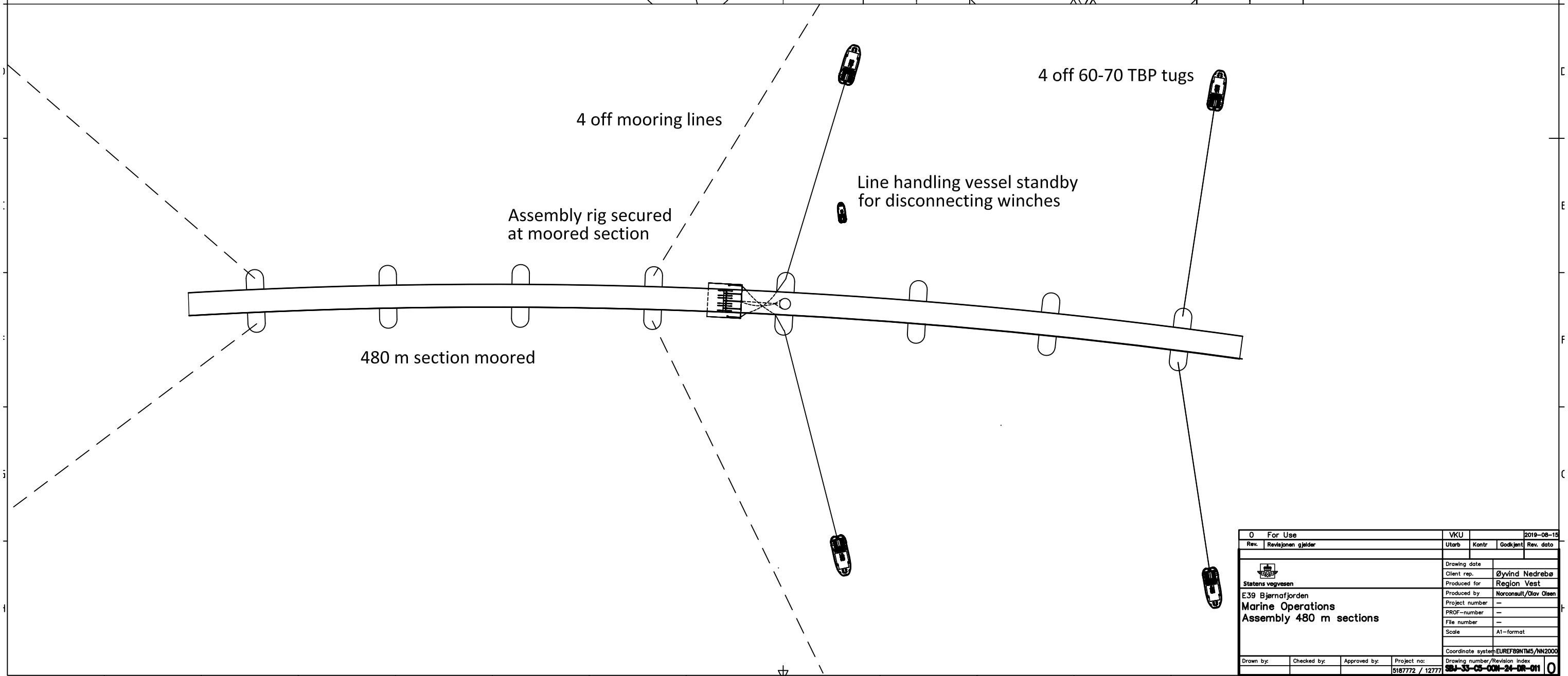
E39 Bjørnafjorden

Marine Operations
Assembly section 1 & 2 Søreidvågen

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OOM-24-DR-010 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777





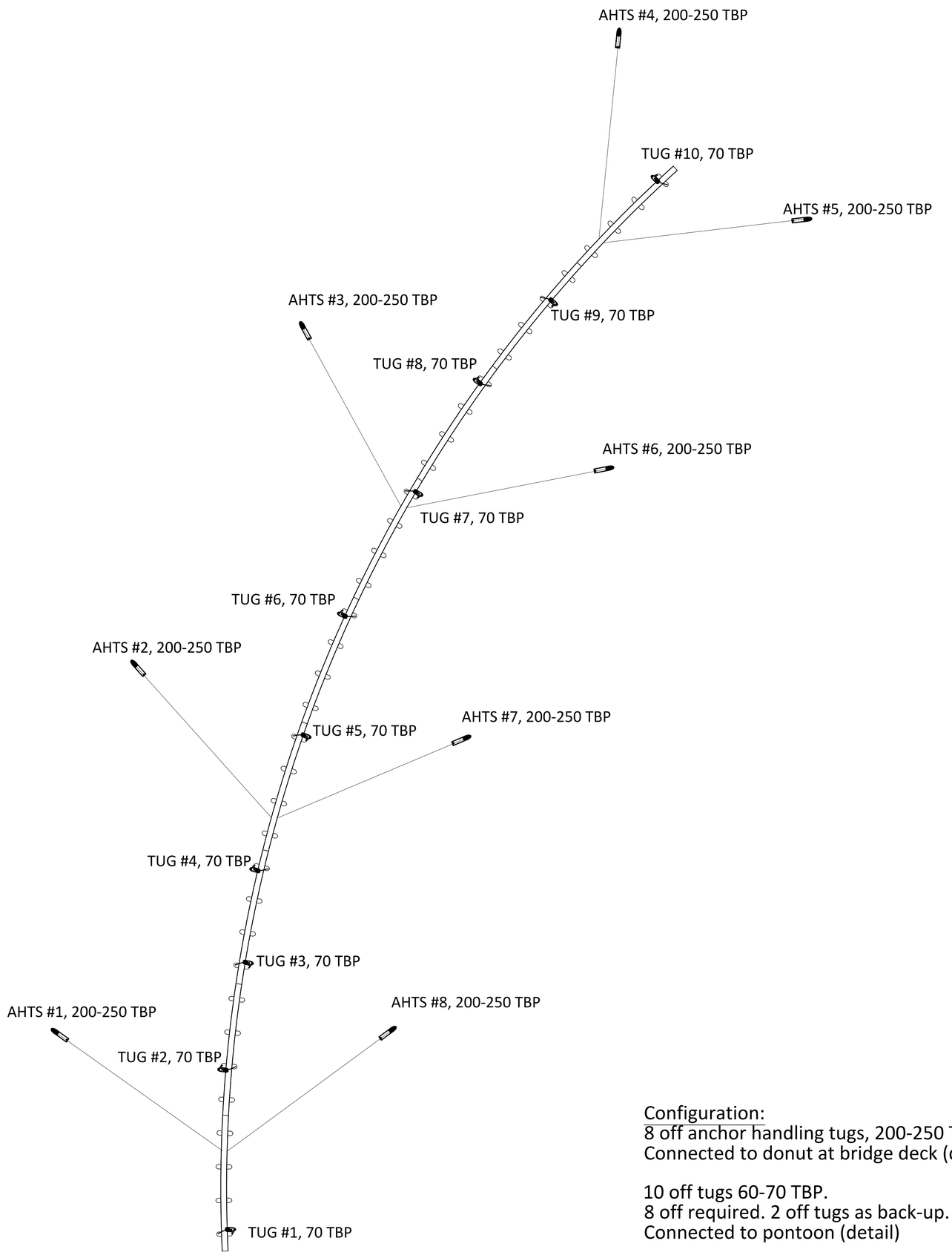
0	For Use	VKU			2019-08-15
Rev.	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

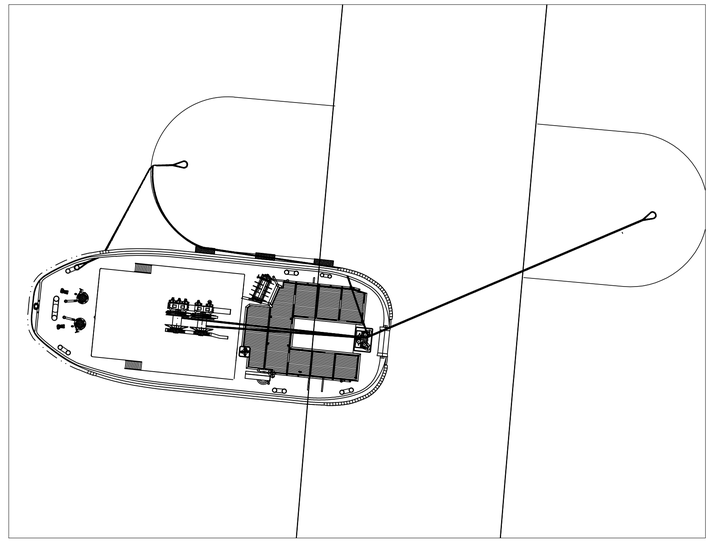
Statens vegvesen

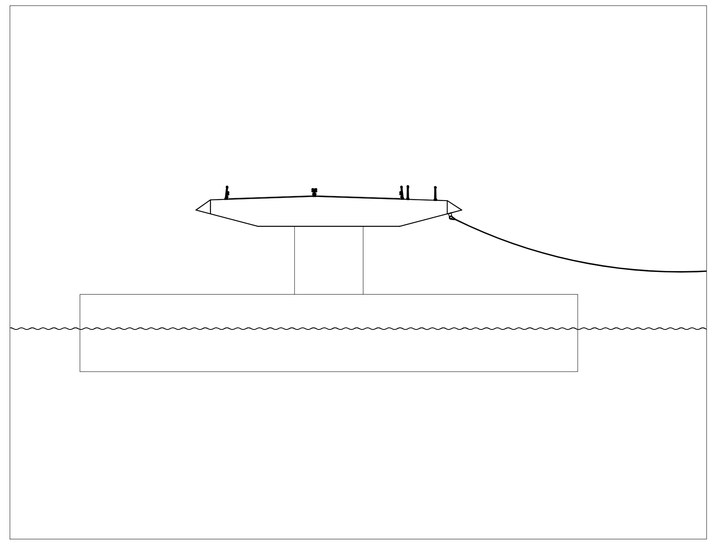
E39 Bjørnafjorden

Marine Operations
Assembly 480 m sections

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawn by:	Checked by:	Approved by:	Project no: 5187772 / 12777
Drawing number/Revision index	E39-33-C5-OOM-24-DR-011	0







Configuration:
8 off anchor handling tugs, 200-250 TBP.
Connected to donut at bridge deck (detail).

10 off tugs 60-70 TBP.
8 off required. 2 off tugs as back-up.
Connected to pontoon (detail)

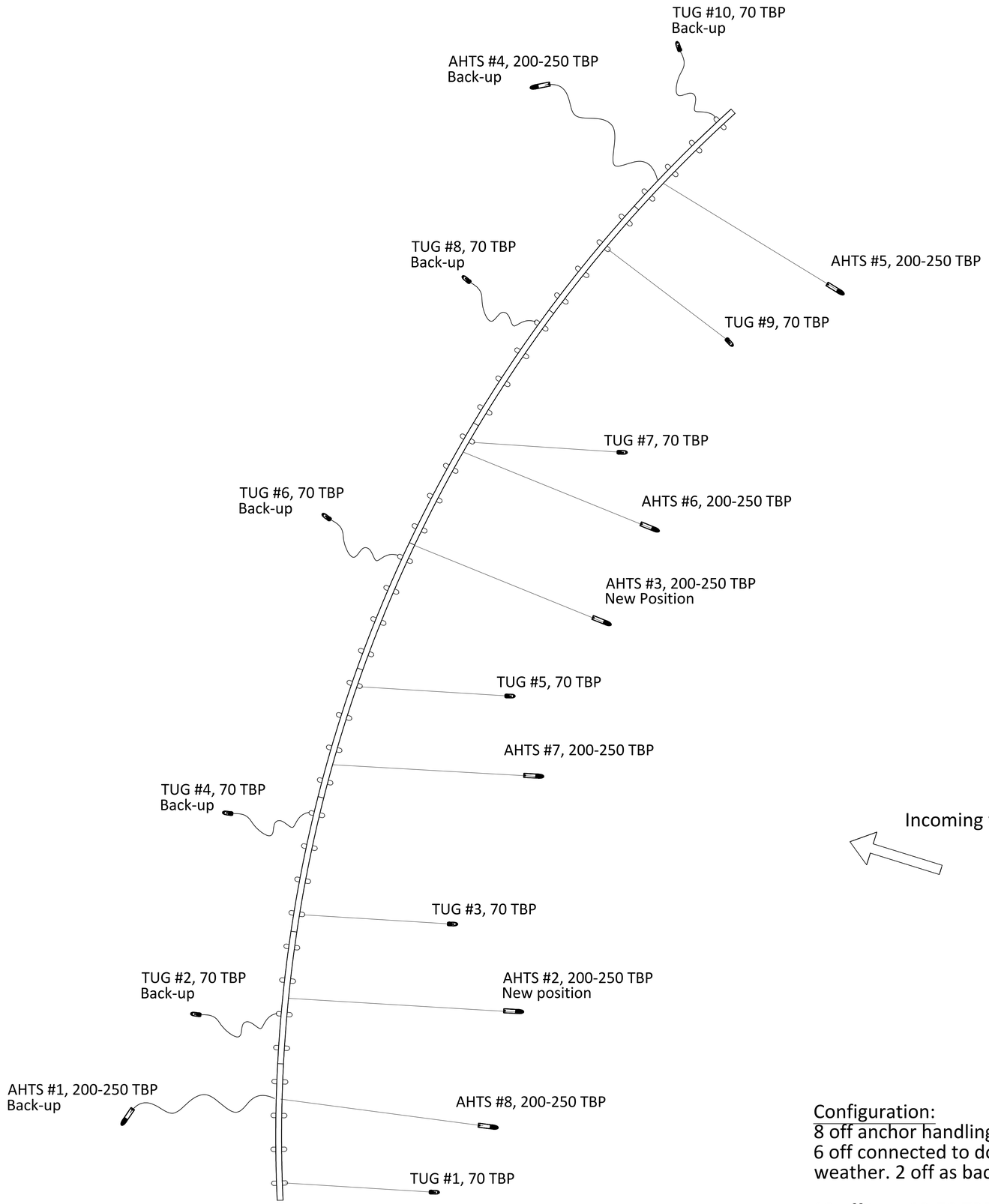
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For Use	VKU			2019-08-15

Statens vegvesen

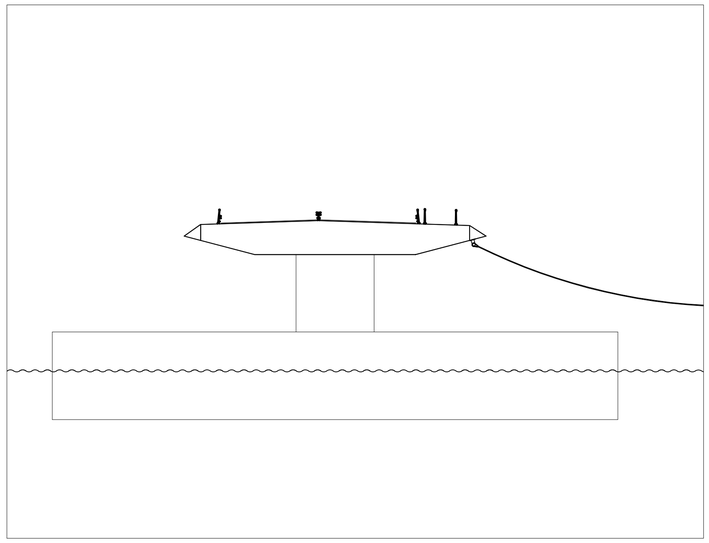
E39 Bjørnafjorden
Marine Operations
Towing Configuration

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-012 0

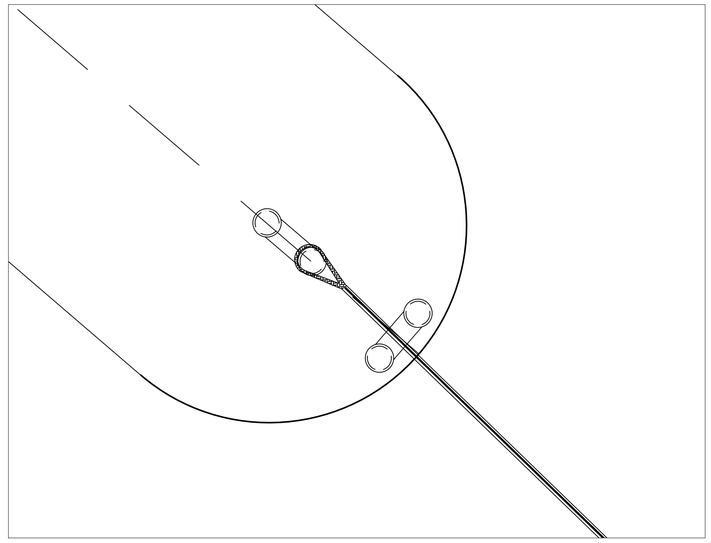
Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777



AHTS connected at bridge element



Tug connected at pontoon



Incoming weather

Configuration:
8 off anchor handling tugs, 200-250 TBP.
6 off connected to donut at bridge deck (detail) facing incoming weather. 2 off as back-up.

10 off tugs 60-70 TBP.
5 off required. 5 off tugs as back-up.
Connected to pontoon (detail)

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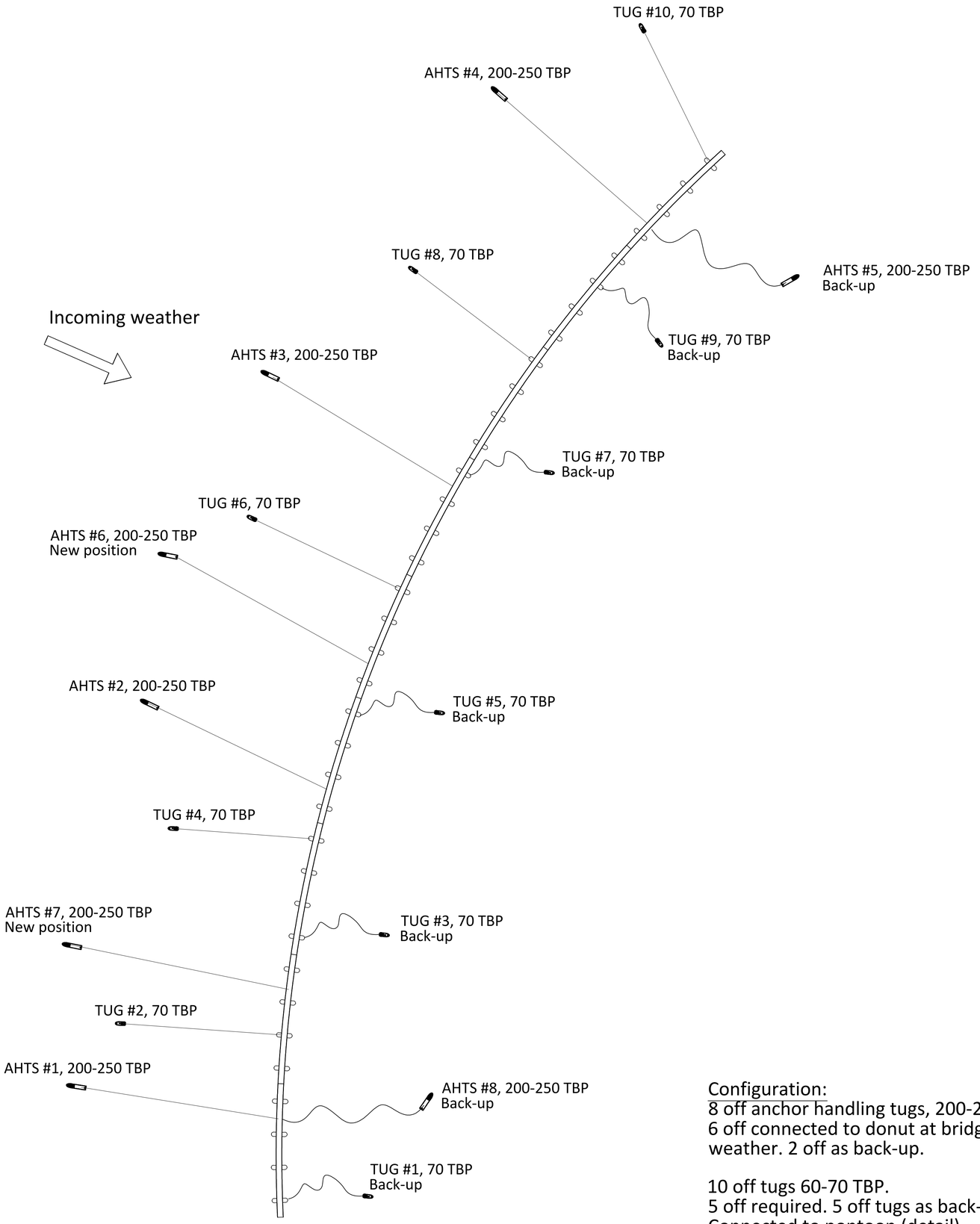
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

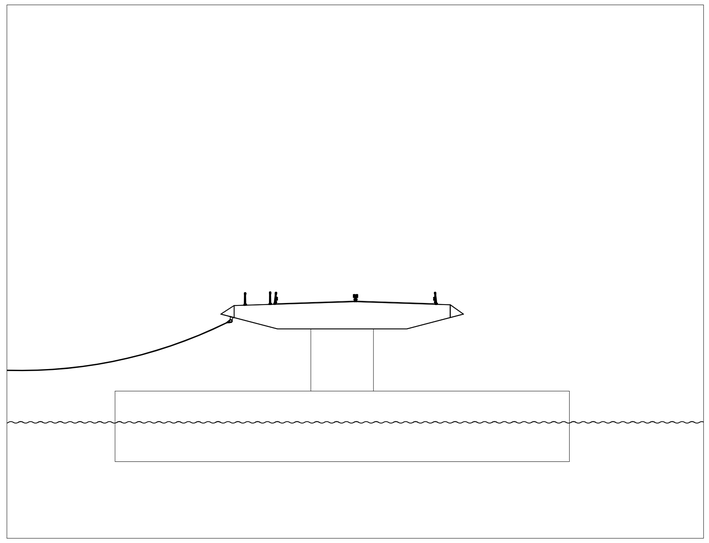
E39 Bjørnafjorden
Marine Operations
Towing Hold Configuration

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-013 0

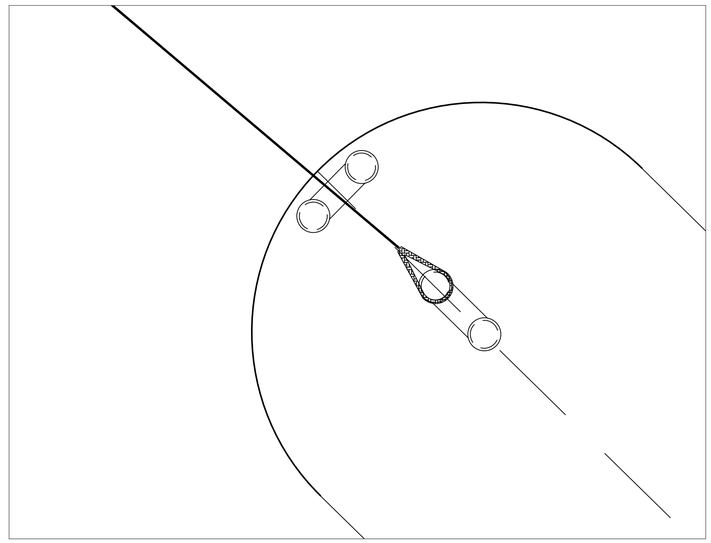
Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777



AHTS connected at bridge element



Tug connected at pontoon



Configuration:
8 off anchor handling tugs, 200-250 TBP.
6 off connected to donut at bridge deck (detail) facing incoming weather. 2 off as back-up.

10 off tugs 60-70 TBP.
5 off required. 5 off tugs as back-up.
Connected to pontoon (detail)

0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
Towing Hold Configuration, alt. B

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-014 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777

682
261
24
74
264
Strømo
128
32
476
M
86
S.
429
487
367
574
463
561
107
57
171
R.
283
289
Cy.
568
M
29
341
Tysnes
R.
120
543
216
Rommelines
Oc(2)WRG 8s 10.8-8M
219
54
442

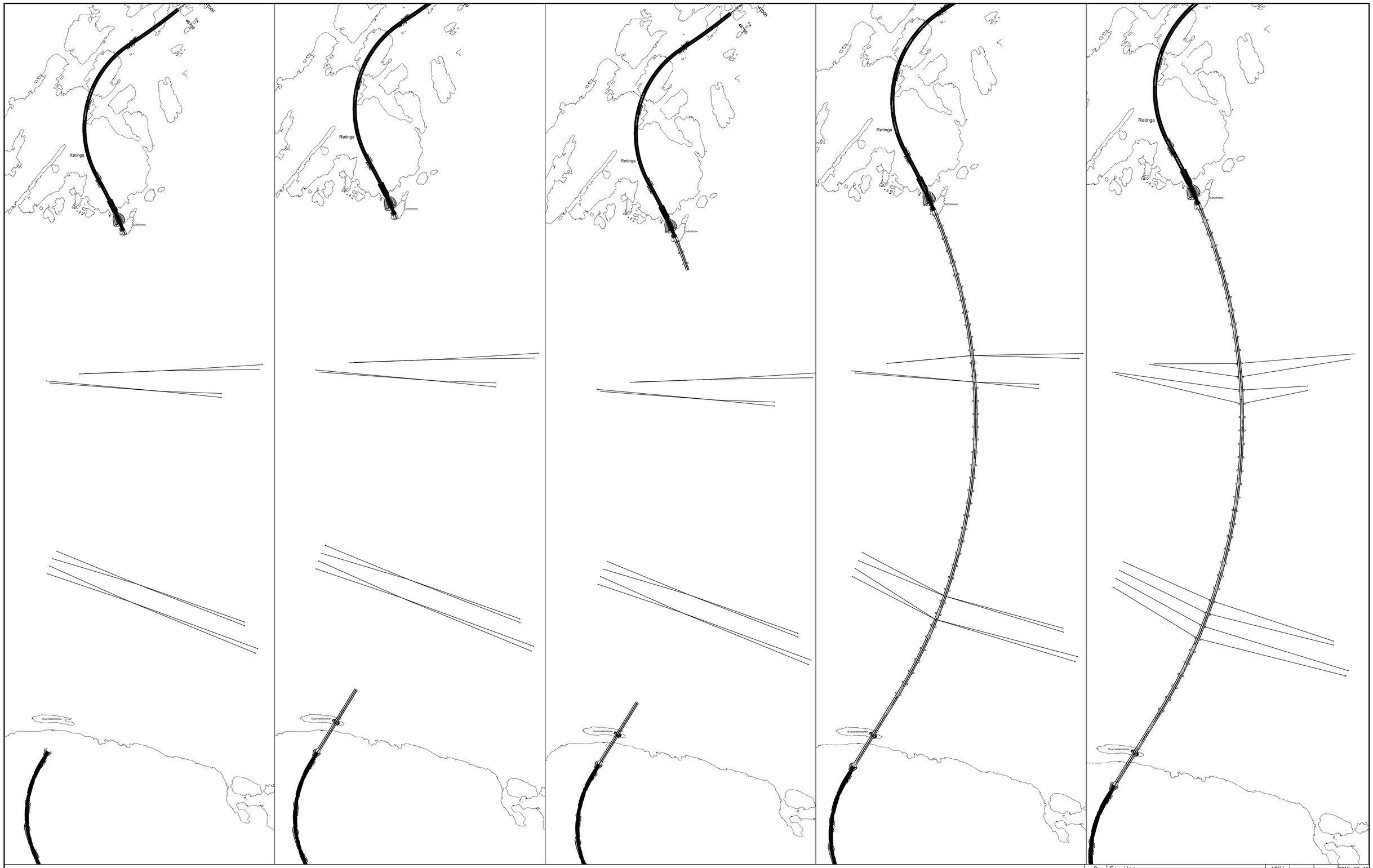
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000

E39 Bjørnafjorden
Marine Operations
Towing Søreidvåg to Bjørnafjorden

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
			5187772 / 12777	SBJ-33-C5-00N-24-DR-015 0



Sequence for installing bridge at Bjørnafjorden:

1: Pre-installation of anchors
2: Install high bridge
3: Install north abutment
4: Install floating bridge
5: Connect mooring lines

Anchors pre-installed one year prior to bridge installation and buoyed-off with offset to planned pontoon position to allow safe towing of bridge.

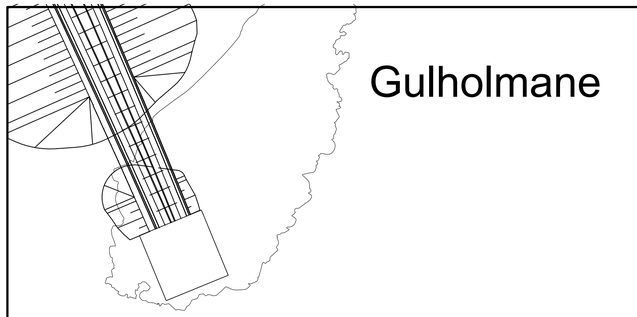
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For Use	VKU			2019-08-15

Statens vegvesen

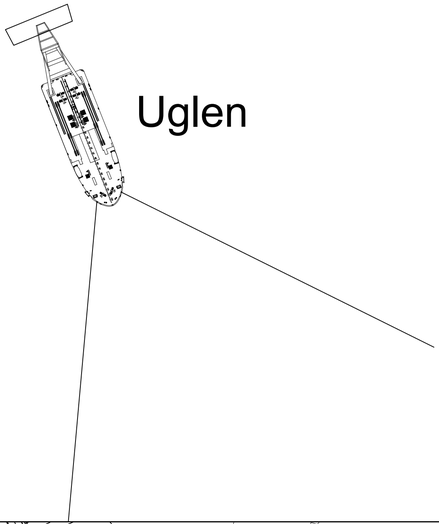
E39 Bjørnafjorden
Marine Operations
Assembly sequence Bjørnafjorden

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-017 | 0

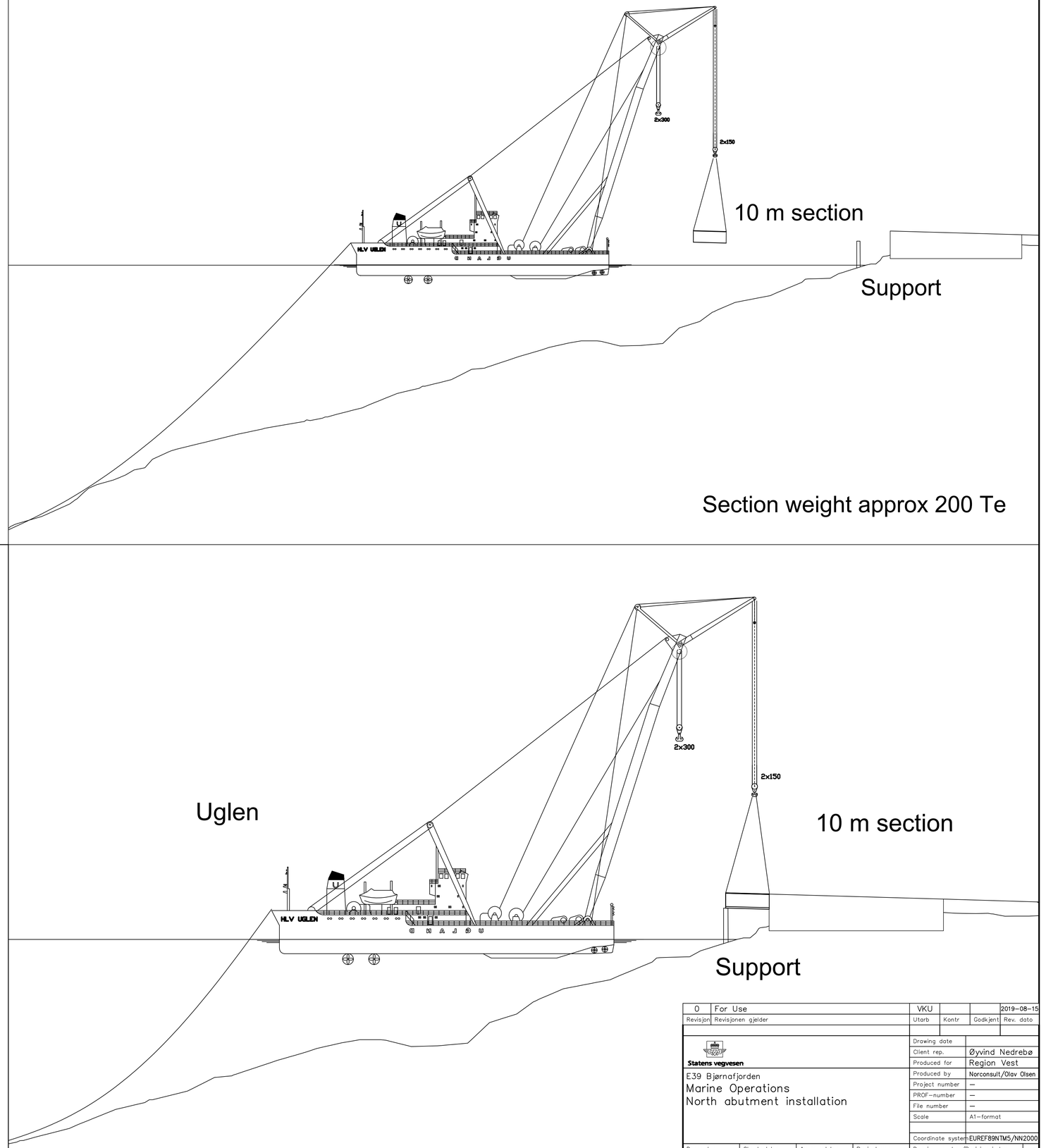
Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777

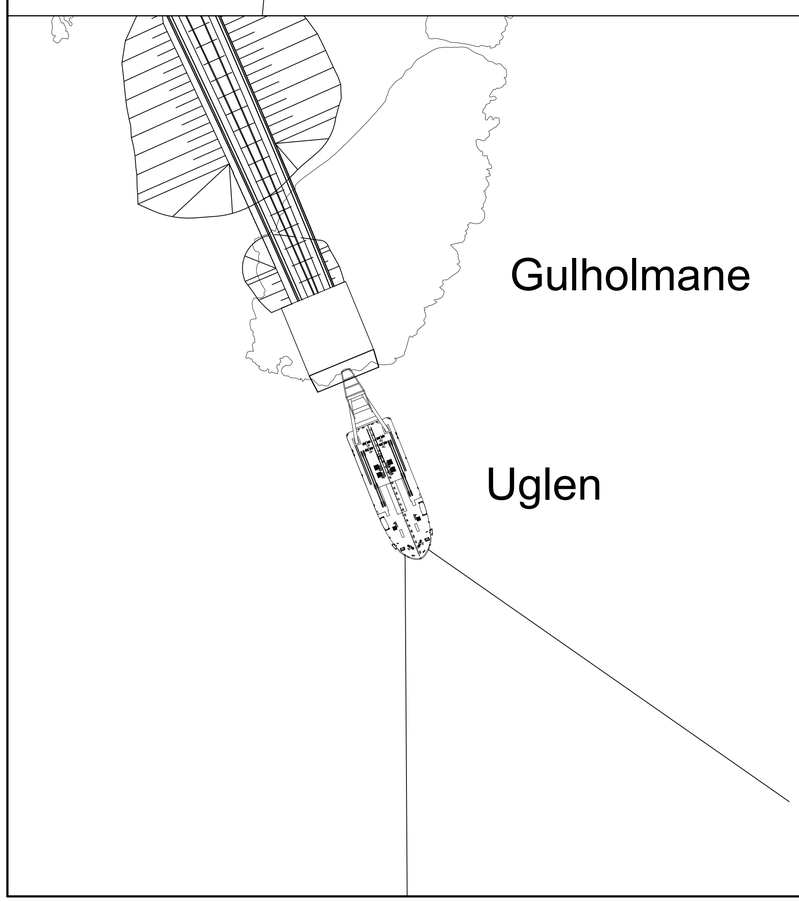


Gulholmane



Uglen





Gulholmane

Uglen

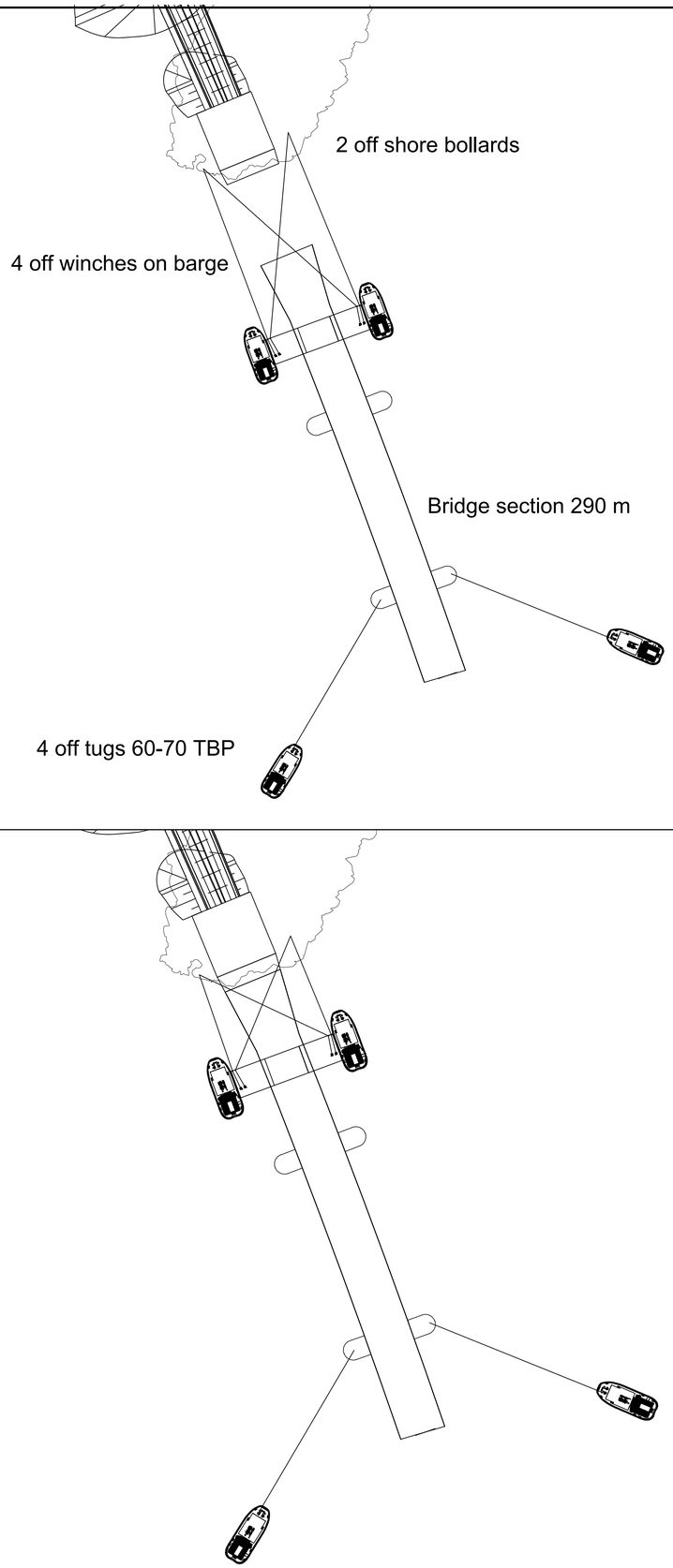
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

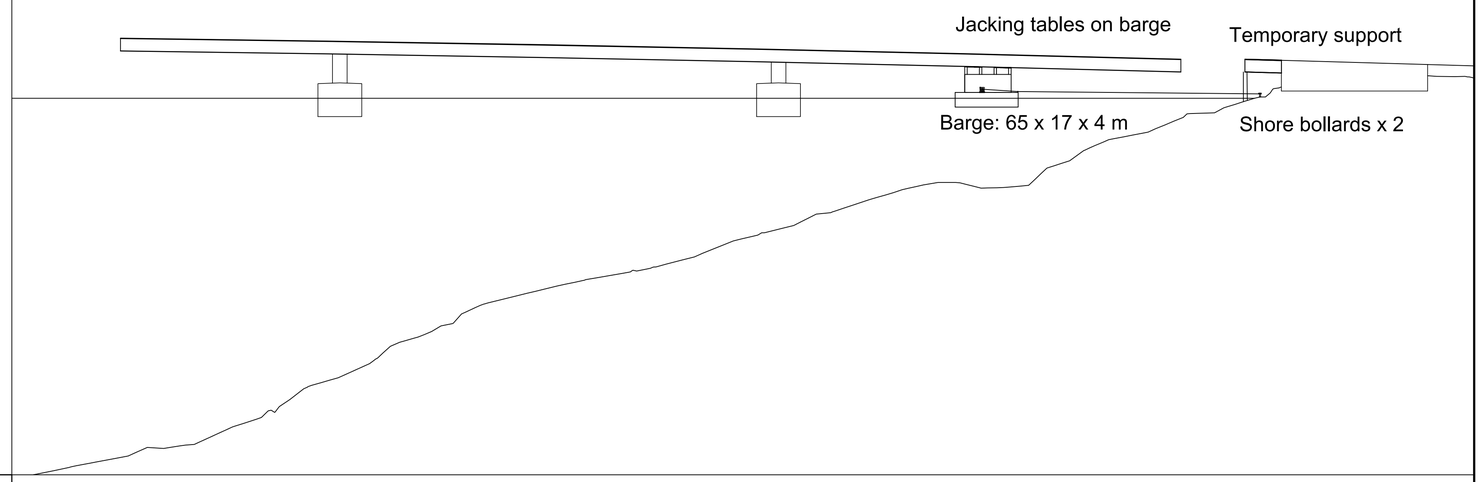
Statens vegvesen

E39 Bjørnafjorden
Marine Operations
North abutment installation

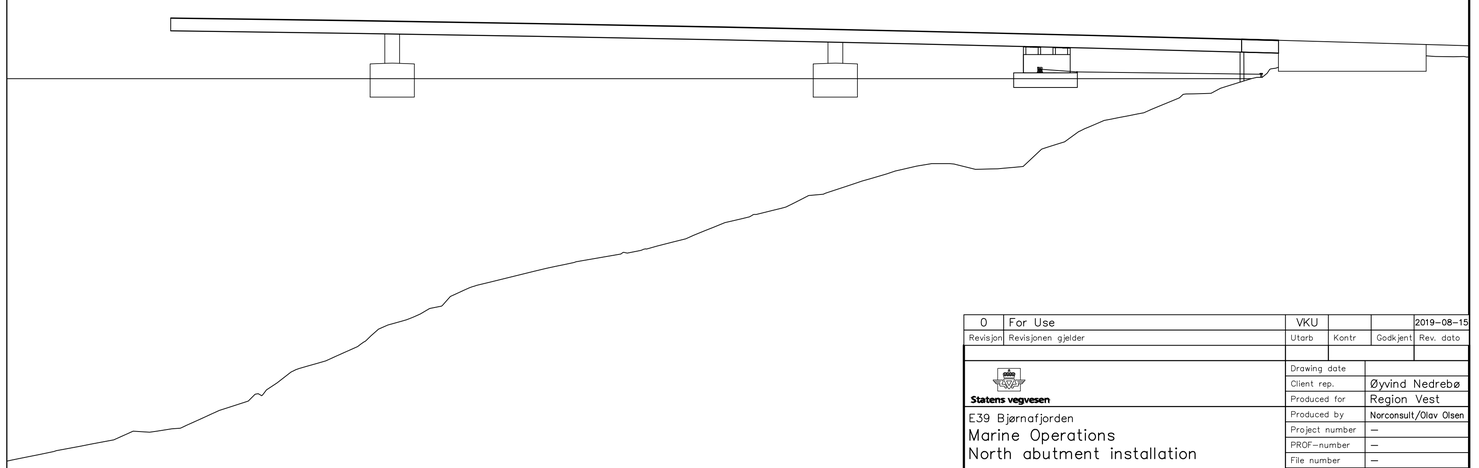
Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-018 | 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777





Vertical alignment of bridge end onto
support adjusted by barge jacking system



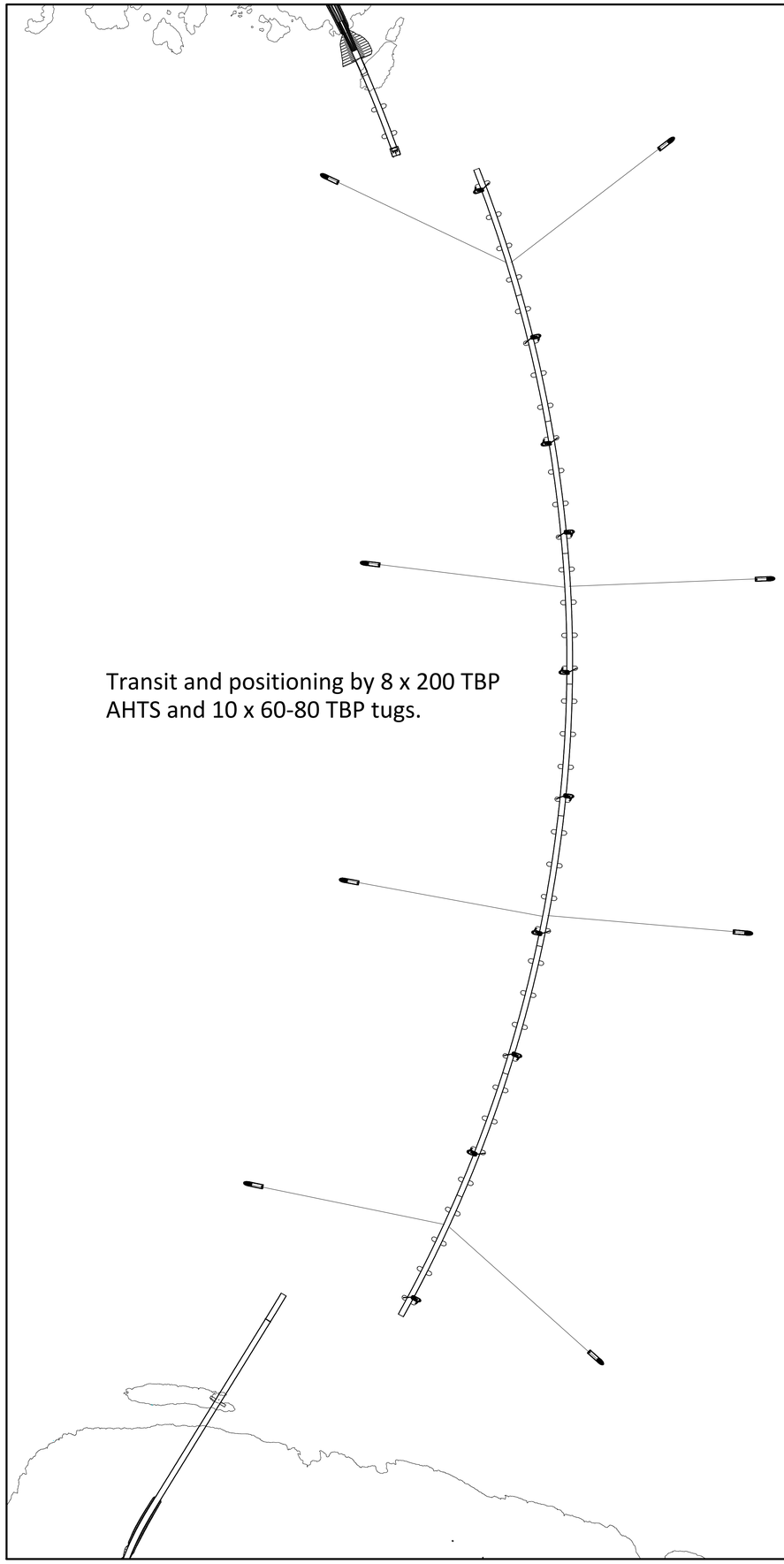
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

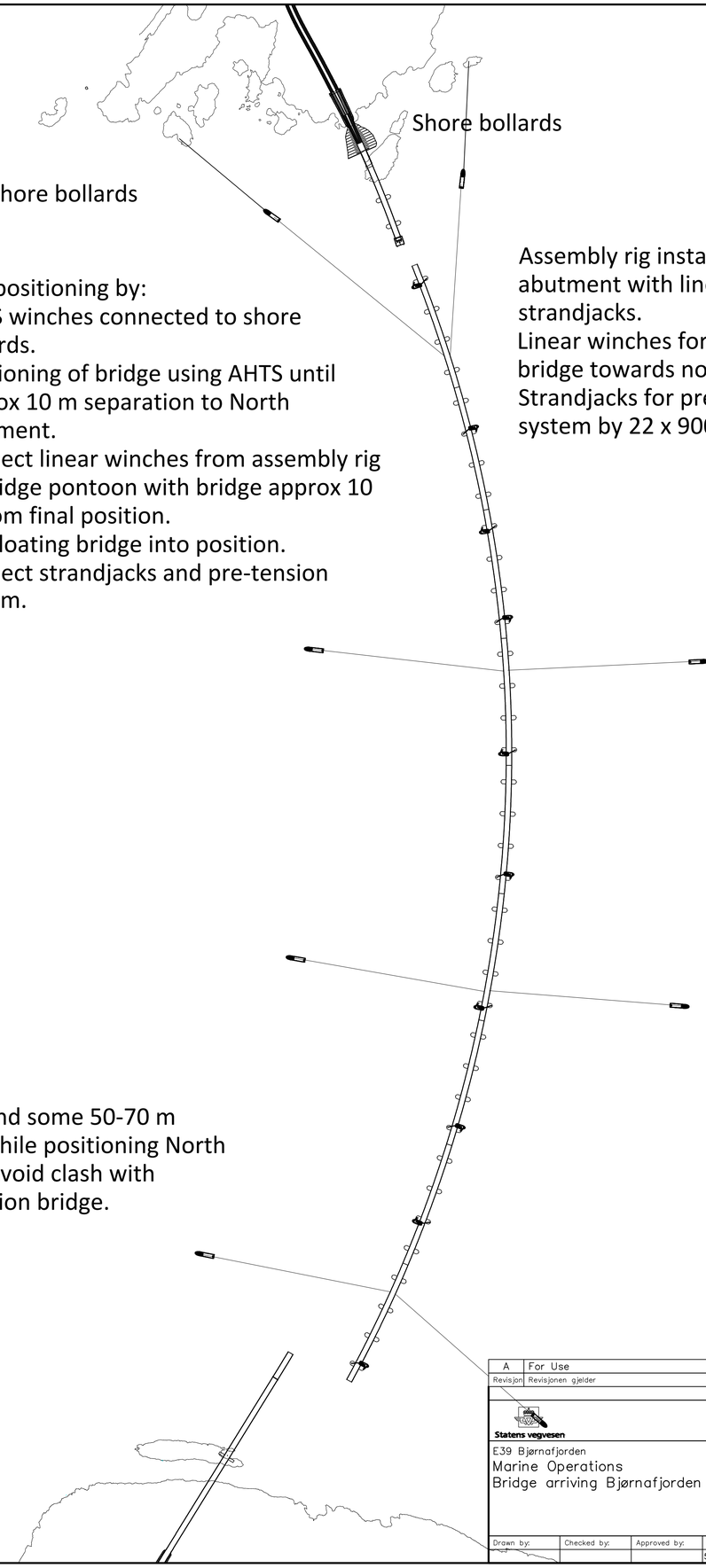
E39 Bjørnafjorden
Marine Operations
North abutment installation

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-019 | 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777



Transit and positioning by 8 x 200 TBP AHTS and 10 x 60-80 TBP tugs.



North end positioning by:

1) AHTS winches connected to shore bollards.
2) Positioning of bridge using AHTS until approx 10 m separation to North abutment.
3) Connect linear winches from assembly rig to bridge pontoon with bridge approx 10 m from final position.
4) Pull floating bridge into position.
5) Connect strandjacks and pre-tension system.

Assembly rig installed at North abutment with linear winches and strandjacks.
Linear winches for positioning floating bridge towards north abutment.
Strandjacks for pre-tensioning of system by 22 x 900 T.

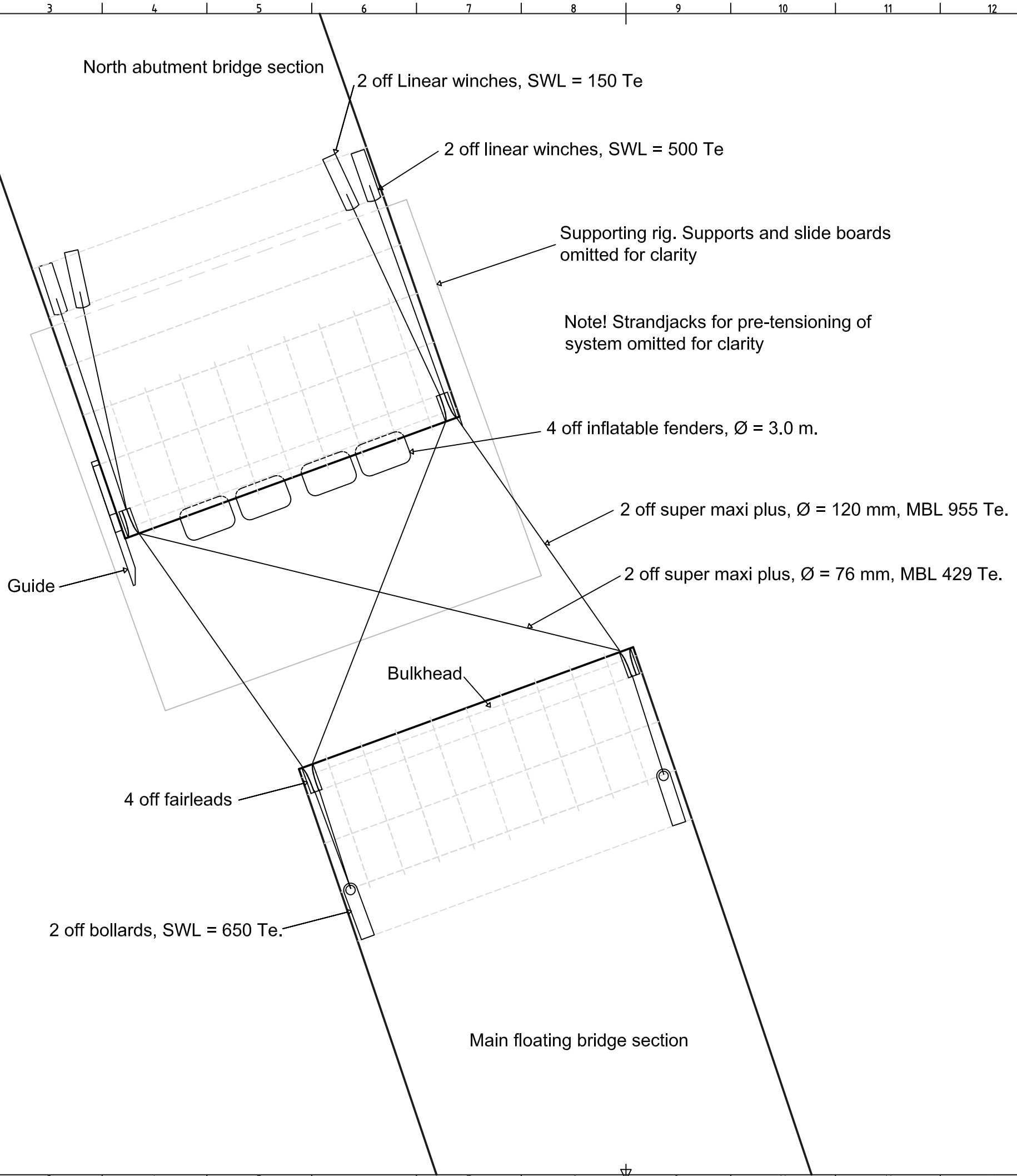
South end some 50-70 m offset while positioning North end to avoid clash with suspension bridge.

A	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
Bridge arriving Bjørnafjorden

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawn by:	Checked by:	Approved by:	Project no: 5187772 / 12777
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-020 0



Rev.	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

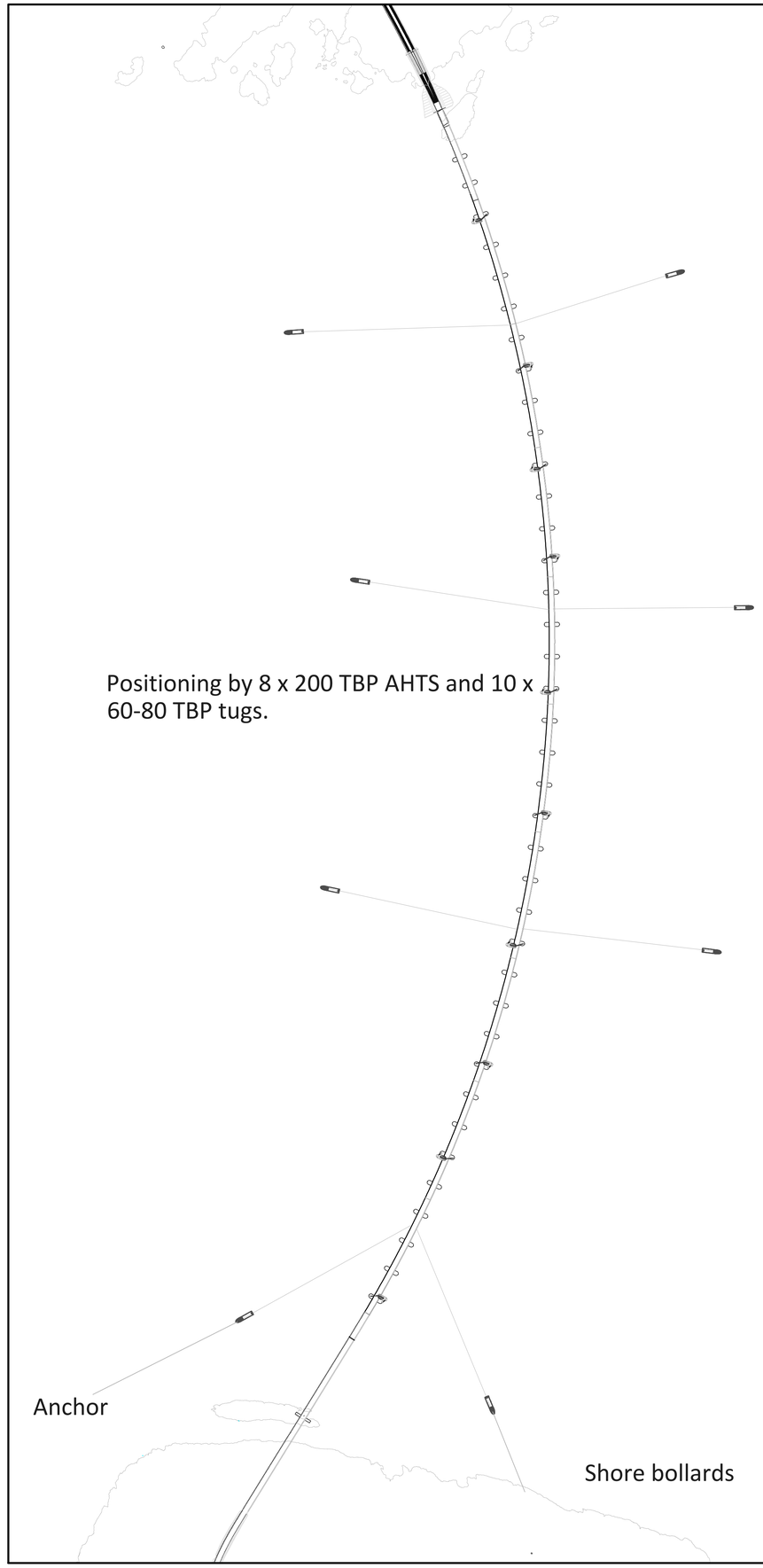
Statens vegvesen

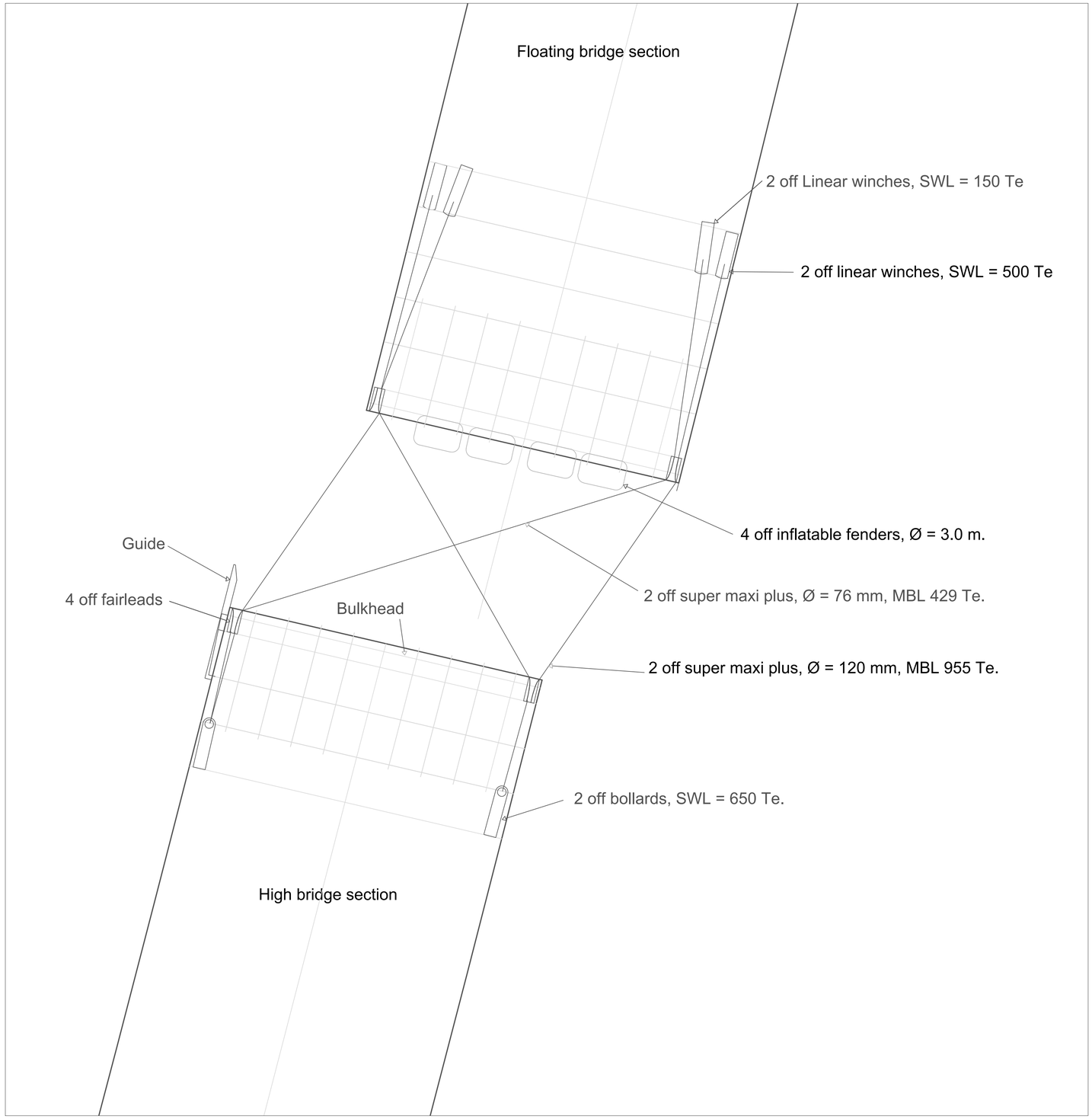
E39 Bjørnafjorden

Marine Operations
Floating bridge at North abutment

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	---
PROF-number	---
File number	---
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-021 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777





Final alignment of bride sections by winches and guides on bridge sections.

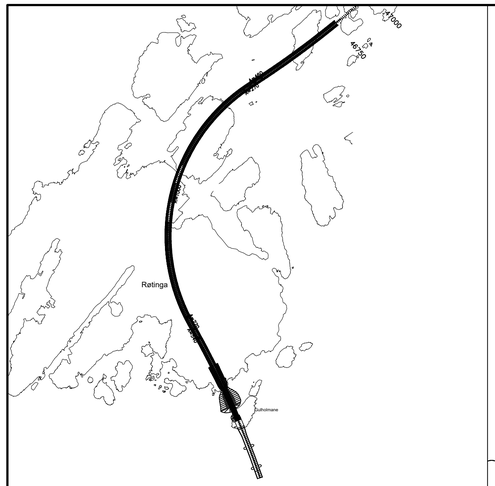
0	For Use	VKU		2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent Rev. dato

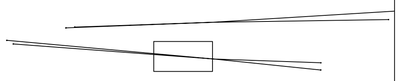
Statens vegvesen

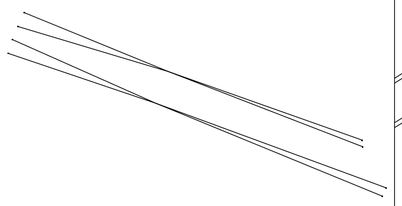
E39 Bjørnafjorden

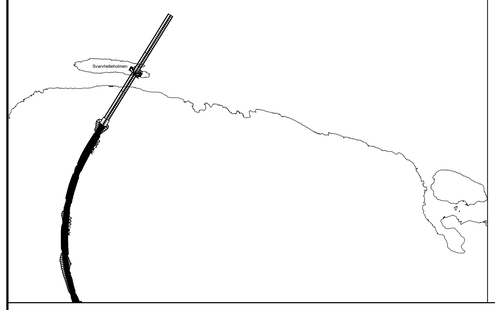
Marine Operations
Connecting at high bridge end

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawn by:	
Checked by:	
Approved by:	
Project no:	5187772 / 12727
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-022 0









Anchors pre-installed one year prior to bridge installation and buoyed-off.
Position of surface buoys to allow safe towing of bridge without conflict with pontoons
Four lines bundled together with two buoy for Eastern lines and two buoys for Western lines.
Wire between mooring lines to tension system and lift-lines off seabed.

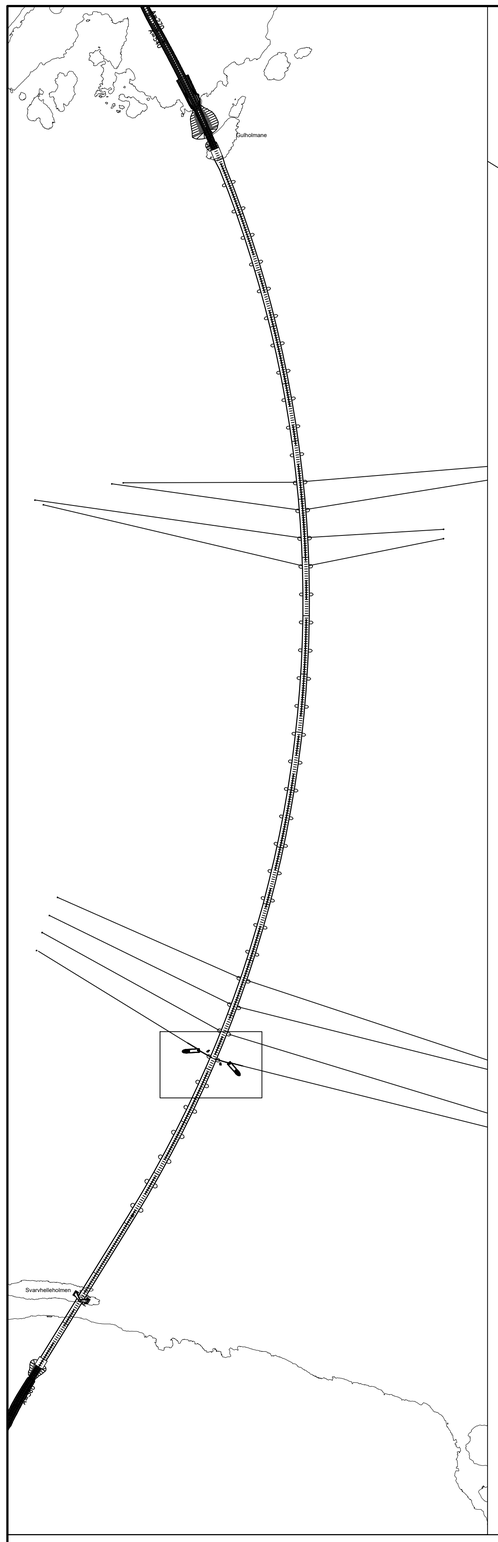
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For Use	VKU			2019-08-15

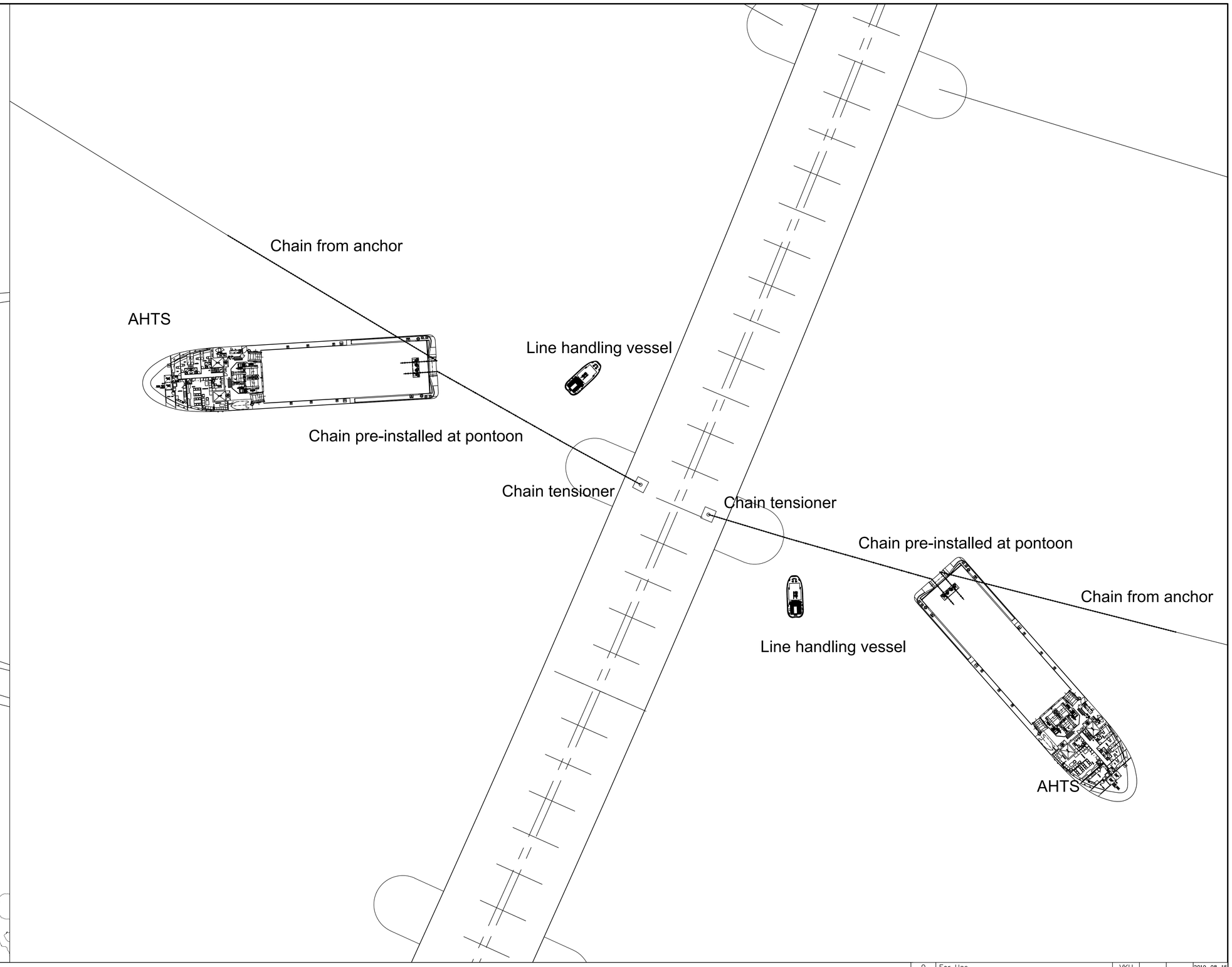
Statens vegvesen

E39 Bjørnafjorden
Marine Operations
Pre-installed anchors

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000

Drawn by:	Checked by:	Approved by:	Project no:	Drawing number/Revision index
			5187772 / 12777	SBJ-33-C5-00N-24-DR-023 0





AHTS Sequence:

1) Recover chain end from anchor line and secure in shark jaw.
2) Transfer chain from pontoon to AHTS using tugger winch and line handling vessel.
3) Secure end of pontoon chain in AHTS shark jaw.
4) Perform connection between chains on AHTS deck.
5) Bring connection to surface and relocate AHTS to receive chain at pontoon.

0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
AHTS connecting mooring lines
Top view

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-024 0

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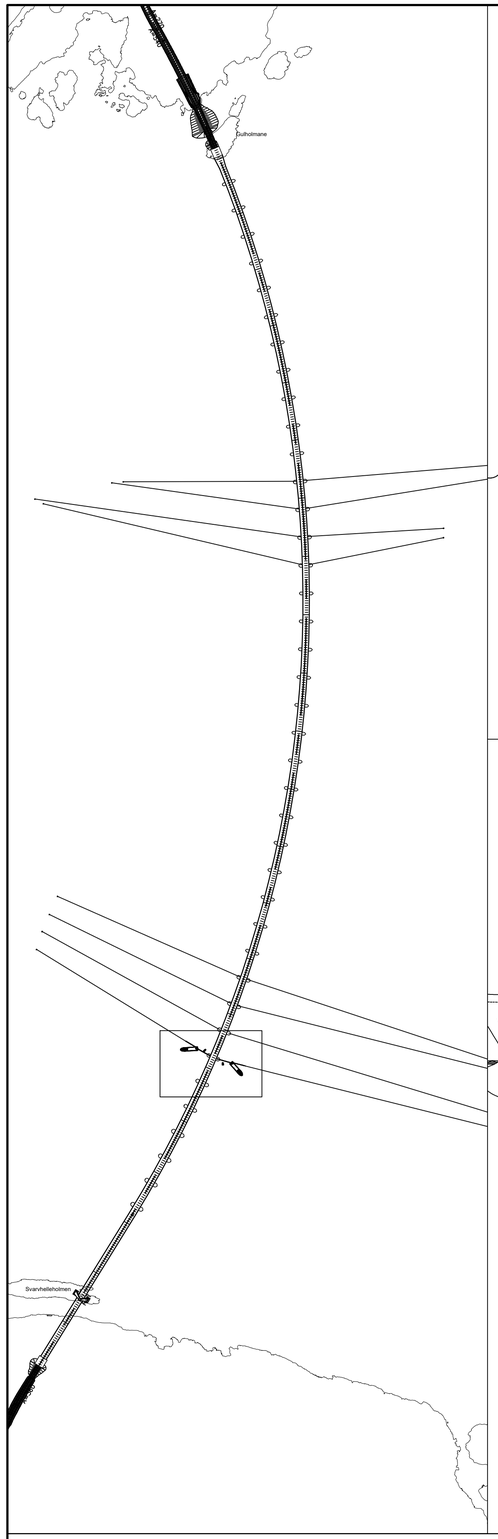
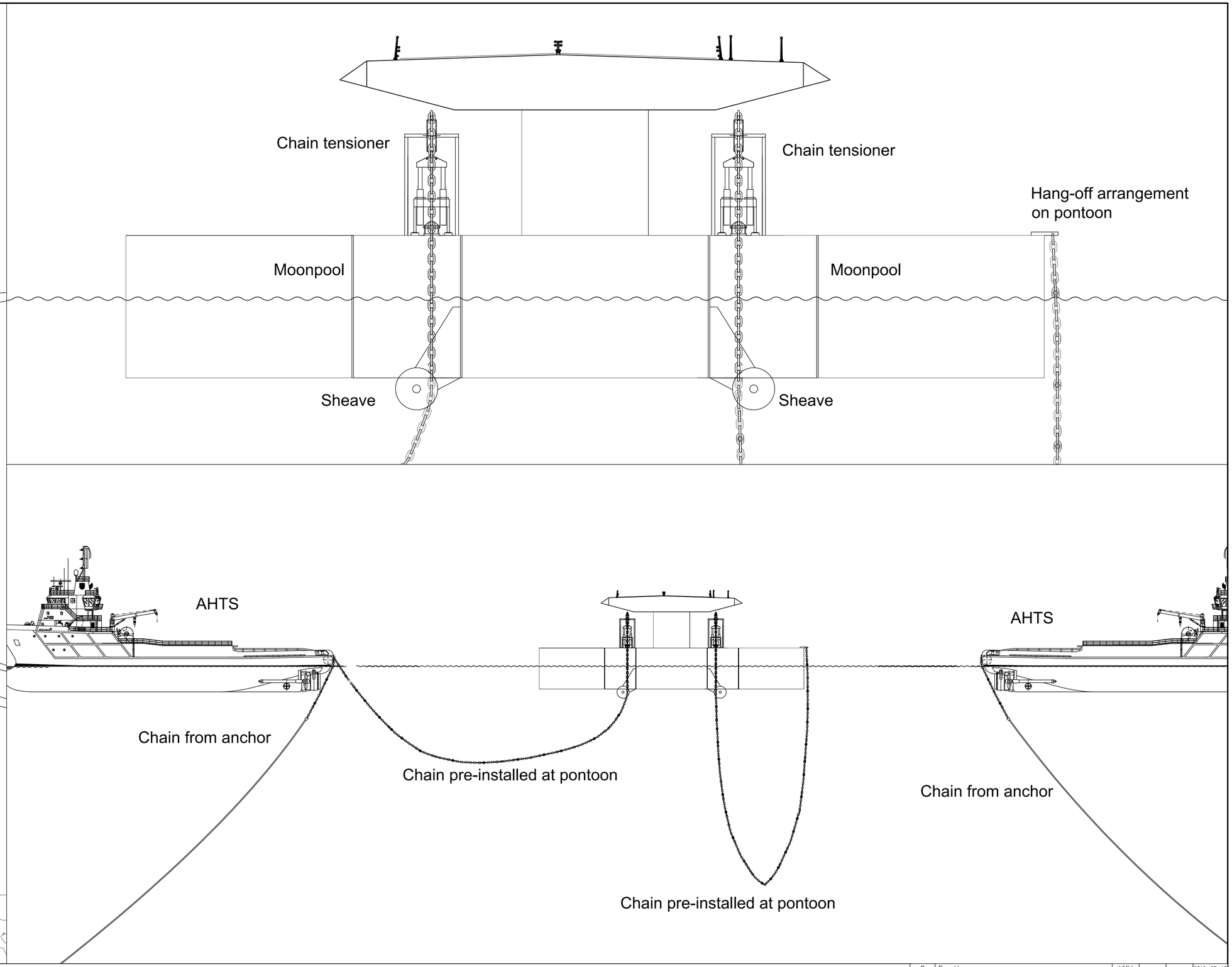
			5187772 / 12777





AHTS Sequence:

1) Recover chain end from anchor line and secure in shark jaw.
2) Transfer chain from pontoon to AHTS using tugger winch and line handling vessel.
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4) Perform connection between chains on AHTS deck.
5) Bring connection to surface and relocate AHTS to receive chain at pontoon.

Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato
0	For Use	VKU			2019-08-15

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
AHTS connecting mooring lines
Side view

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-025 0

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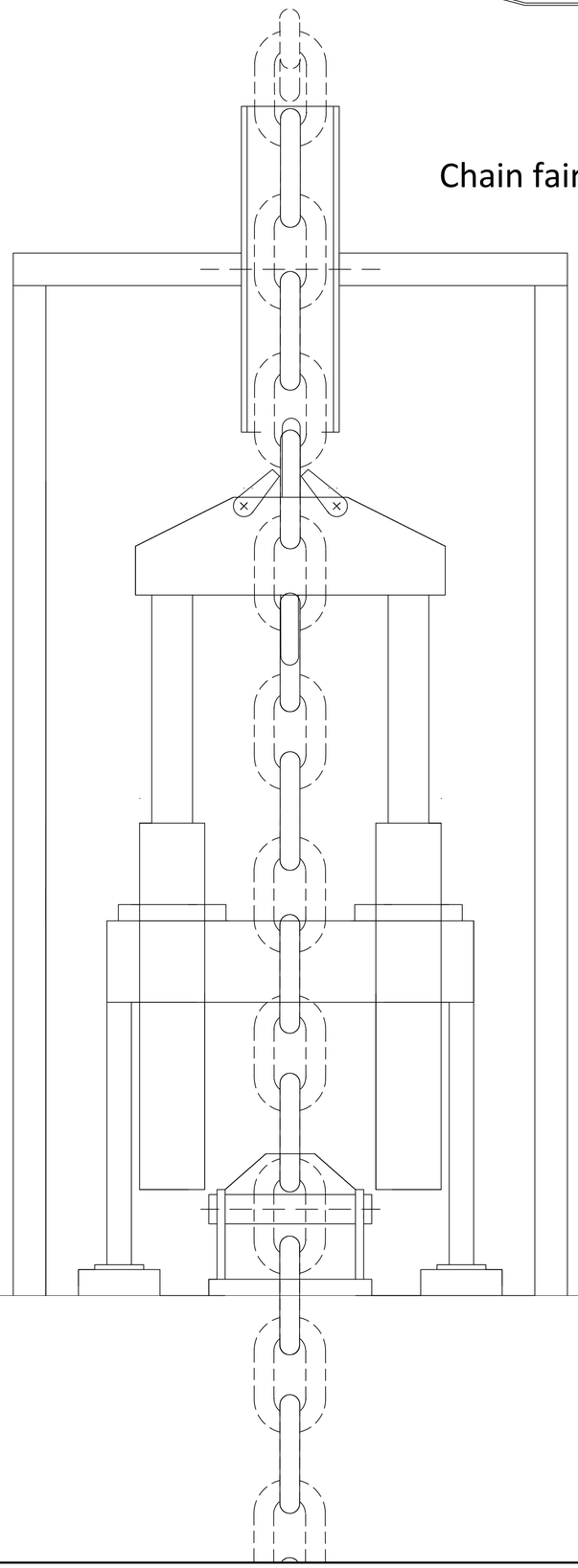


Chain fairlead

Upper chain lock

Chain tensioner with hydraulic jacks and 1400 mm stroke

Pistons

Lower chain lock (Permanent)

Moonpool, W = 6750 mm

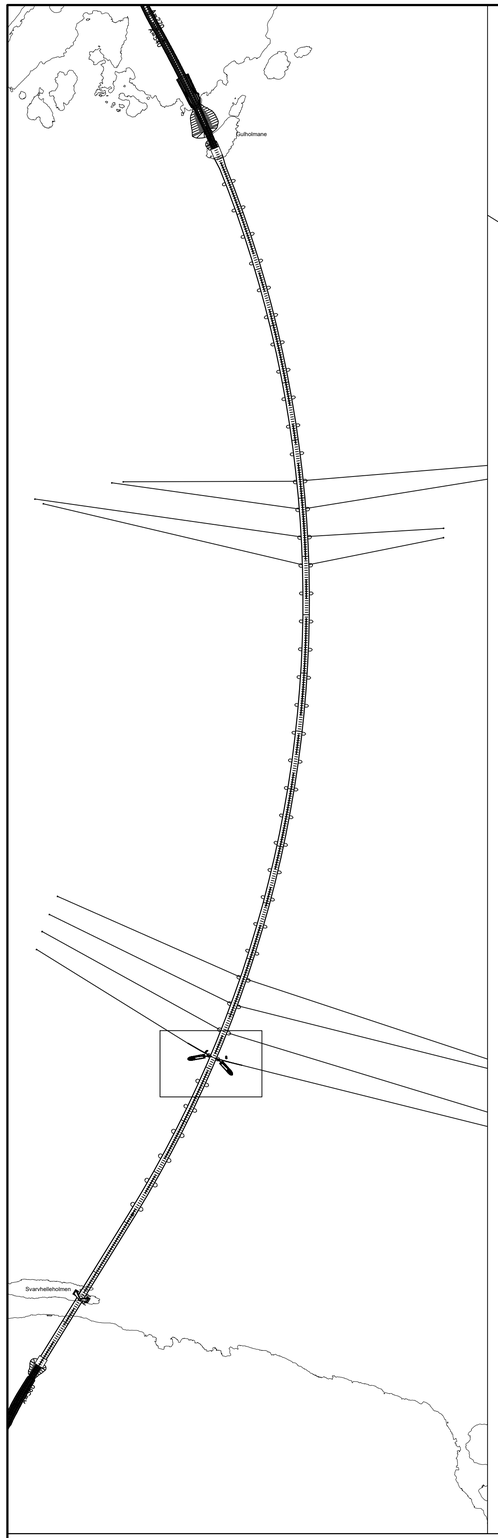
0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

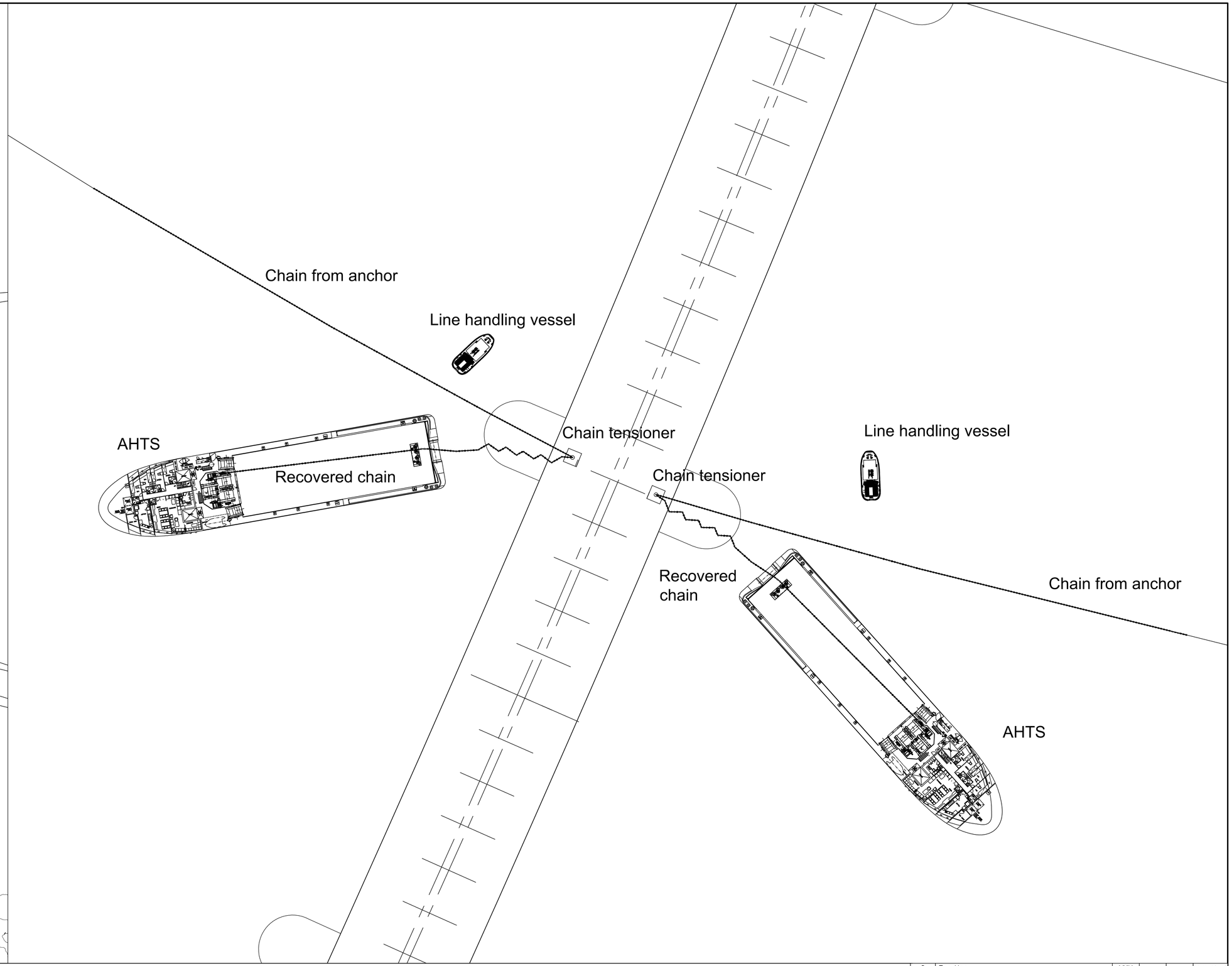
Statens vegvesen

E39 Bjørnafjorden
Marine Operations
Tensioner details
Side view

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-026 | 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777





Sequence:

1) Relocate AHTS to pontoon.
2) Line handling vessel transfer wire forerunner from recovered chain to AHTS.
3) AHTS keep safe distance to bridge and pay-in chain to take up slack. Always keep slack in lines.
4) Continue until correct tension level. Cut chain at suitable location and recover end to AHTS.

Note! Chain is routed over chute to minimize damage to pontoon.

Note! Coordinate tensioning on pontoon to avoid offset of bridge section.

0	For Use	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden
Marine Operations
AHTS tensioning mooring lines
Top view

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-OON-24-DR-027 | 0

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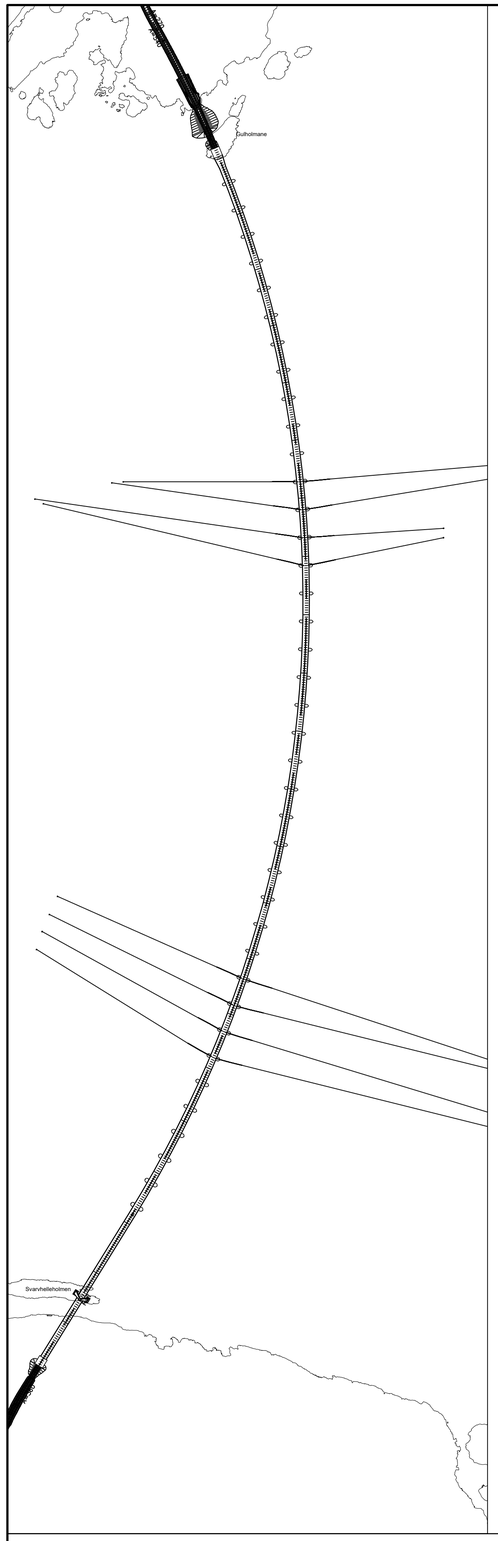

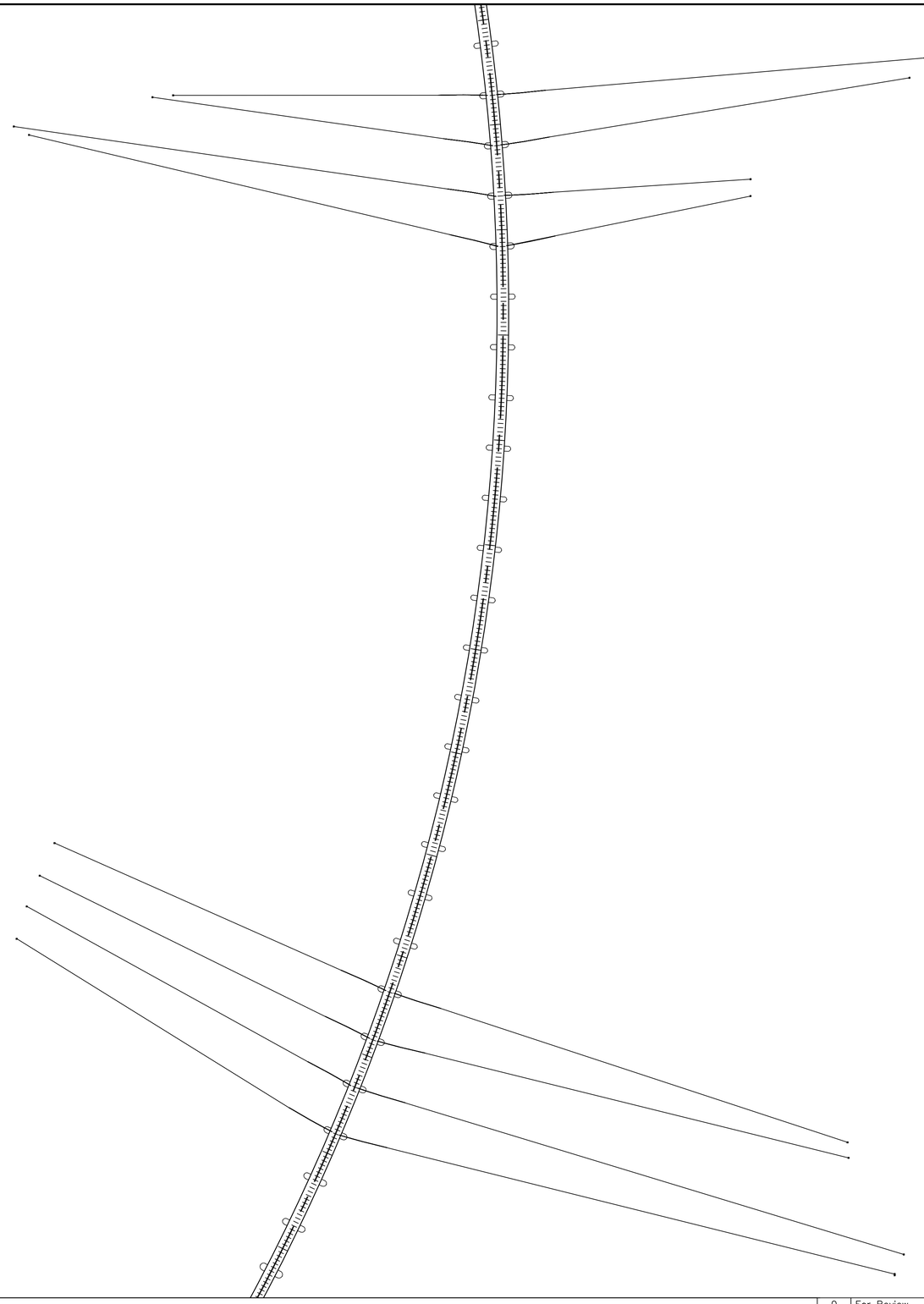

0	For Review	VKU			2019-08-15
Revisjon	Revisjonen gjelder	Utarb	Kontr	Godkjent	Rev. dato

Statens vegvesen

E39 Bjørnafjorden

Marine Operations

Mooring lines installed

Drawing date	
Client rep.	Øyvind Nedrebø
Produced for	Region Vest
Produced by	Norconsult/Olav Olsen
Project number	—
PROF-number	—
File number	—
Scale	A1-format
Coordinate system	EUREF89NTM5/NN2000
Drawing number/Revision index	SBJ-33-C5-00N-24-DR-028 | 0

Drawn by:	Checked by:	Approved by:	Project no:
			5187772 / 12777