COWI

MEMO

TITLE	**Suðuroy tunnel - cost estimation of different alignments. 3rd part review**
DATE	20. October 2025
TO	Teitur Samuelsson, Suduroyartunnilin p/f
COPY	Einar Brimnes, Ráð
FROM	Matthías Loftsson, geological engineer, Valgeir Kjartansson, civil engineer, Cowi
PROJECT NO	A294605

1 Introduction

Undersigned was asked to perform an independent review (3rd part review) of an alternative tunnel alignment for the Suduroy tunnel, a subsea tunnel between the islands Sandoy and Suduroy, via Skuvoy, as per mail text below:

> *"Vi arbejder videre på Suðuroyartunnilin. Politikkerne har besluttet, at vi skal undersøge en alternativ linjeføring nærmere (Fra ca. Sandoyartunnilin via Skúvoy til Suðuroy), hvor tunnellen også bores fra Skúvoy. Dvs. der skal laves byggeplads på Skúvoy.*
>
> *I den forbindelse vil vi høre om du har mulighed for at lave 3 part kontrol af cost estimaterne."*

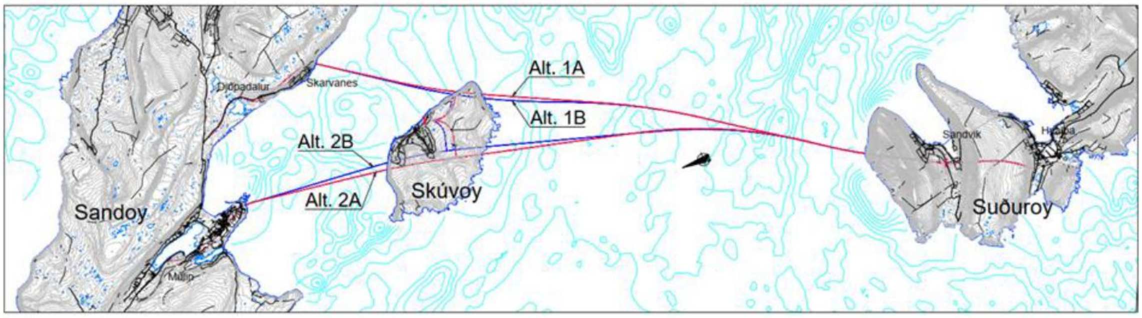
Previously undersigned (ML) has compared alignment options from Skarvanes on Sandoy in one 22,8 km long tunnel to Suðuroy in comparison with tunnel 25,65 km long tunnel alignment from Sandur village to Suðuroy, passing Skuvoy close to the island[1].

Now four alternatives are to be compare, alternatives 1A, 1B, 2A and 2B, all lying in the seabed bedrock close to Skuvoy. Difference between A- and B-alternatives is tunnel excavation towards Skuvoy from the main tunnel in A-alternatives, without work area on Skuvoy, and from Skuvoy to the main tunnel with a relatively large work and camp area on Skuvoy plus harbour construction for alternative B.

Alignments are shown on figure 1.[2]

[1] Suduroytunnel, alignment options, independent review, Memo dated 9. January 2025.

[2] SUTU. Alternative traseer for Suðuroyartunnilin, Norconsult 30. September 2025



Lengder for tunnelene og lengder for tunnelarm opp til Skúvoy varierer for alternativ 1A, 1B og 2A og 2B. Se tabell under.

	Lengde hovedtunnel	Lengde tunnel Skúvoy	
Alternativ 1A	22 747	1 550	Ikke tunneldrift fra Skúvoy
Alternativ 1B	22 762	1 421	Tunneldrift fra Skúvoy
Alternativ 2A	26 275	1 870	Ikke tunneldrift fra Skúvoy
Alternativ 2B	26 305	1 393	Tunneldrift fra Skúvoy

Figure 1. Alternatives to be compared.

2 Alignment details

Alignment option 1A is a 22.747 m long tunnel, from Skarvanes on Sandoy to Sandvik on Suðuroy, plus 1.550 m long connection tunnel to Skuvoy. Skuvoy tunnel then excavated towards Skuvoy from the main tunnel, figure 2. This alternative is the basis for present cost estimation in the predesign[3].

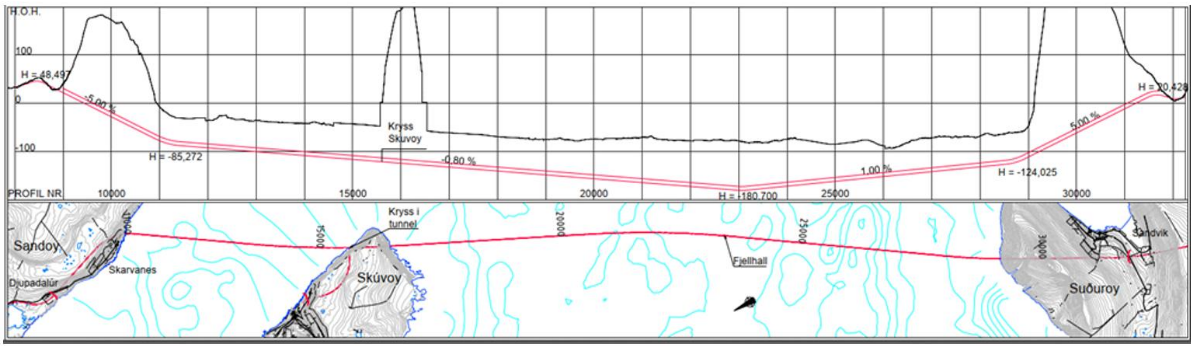


Figure 2. Alternative 1A.

Alignment option 1B is a 22.762 m long tunnel, starting at Skarvanes and ending in Sandvik in Suðuroy as alternativ 1A. In this alternative connection tunnel from Skuvoy to the maintunnel would be 1.421 m long connection and excavated from Skuvoy, figure 3. For this alternative a work camp and facility will have to be built on Skuvoy and muck material from the main tunnel partly deposited on the Skuvoy island.

[3] Forprosjekt for Suðuroyartunnilin. Kostnadsoverslag etter Anslagmetoden, 7 desember 2023

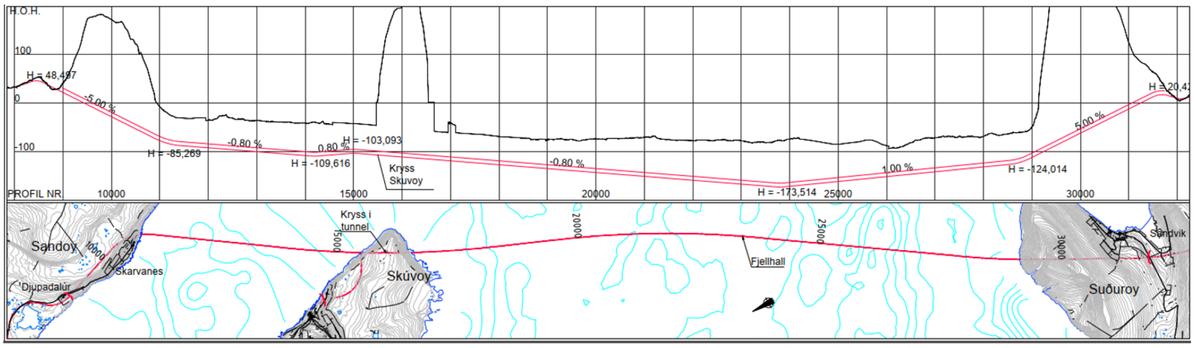


Figure 3. Alternative 1B.

Alignment option 2A is a 26.275 m long tunnel, with portal at Mulin close to the Sandur village on Sandoy and in Sandvik on Suðuroy. Connection tunnel to Skuvoy will be 1.870 m long excavated from the main tunnel towards Skuvoy to Skuvoy, figure 4. No workplace nor fasilities on Skuvoy.

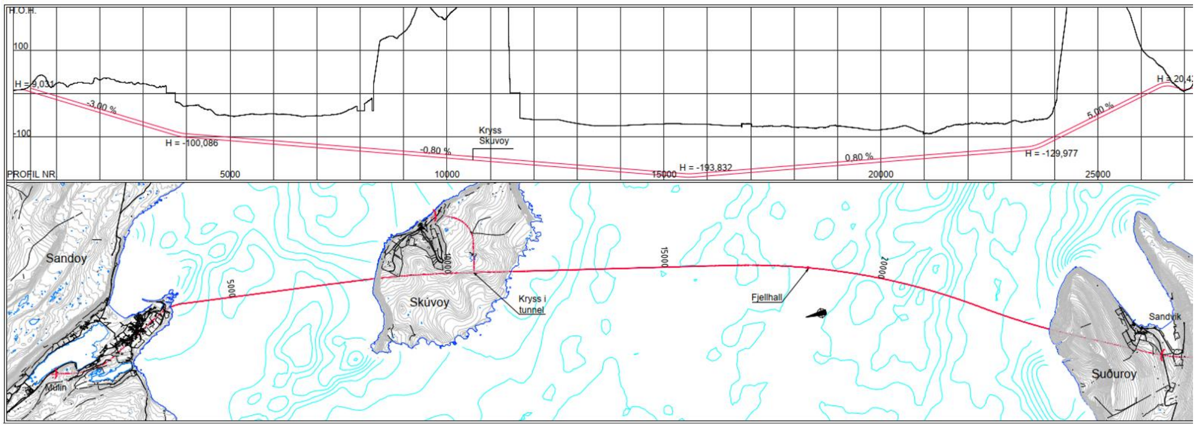


Figure 4. Alternative 2A.

Alignment option 2B is a 26.305 m long tunnel, with portal at Mulin close to the Sandur village on Sandoy and in Sandvik in Suðuroy, as for 2A, but with 1.393 m long connection tunnel to Skuvoy, figure 5. For this alternative a work camp and facility will be built on Skuvoy and the Skuvoy tunnel is excavated from Skuvoy and the main tunnel excavated partly from the Skuvoy island.

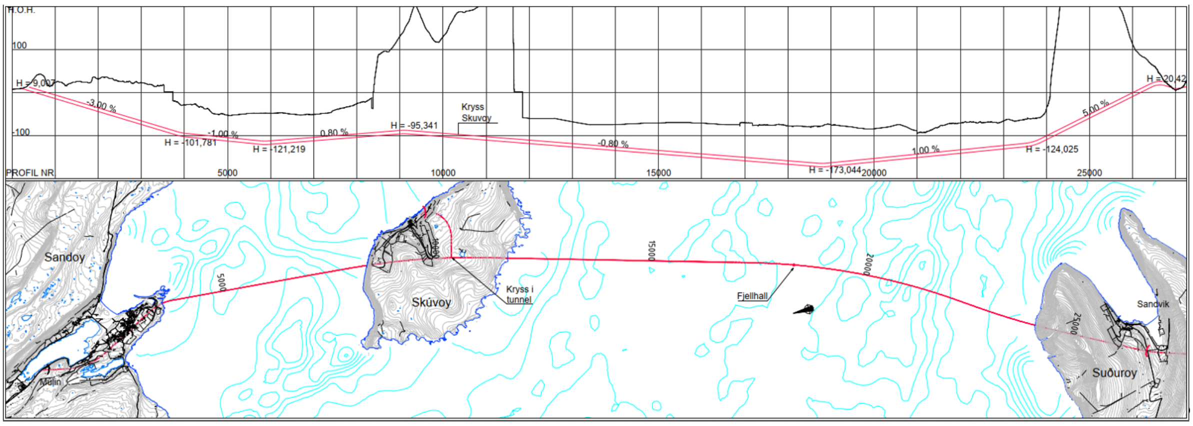


Figure 5. Alternative 2B.

For all tunnel alignments, tunnel geometry and design is according to the Norwegian tunnel standard, N500, with T9,5 cross section for the main tunnel and T8,5 for the tunnel to Skuvoy.

For alternatives 1A and 1B, additionally about 7,6 km of roads need to be built (or reconstructed) and about 1,1 km of tunnel through Sands Lið to the tunnel portal area at Skarvanes.

For alternative 2A and 2B only about 0,45 km of roadwork is required on Sandoy.

Portal at Suðuroy and road work on the island is the same for all the alternatives.

The workplace at Skuvoy covers a relatively large area and a port facility for transport of excavation materials and more. Also, harbour area needs to be built along with breakwater dike.

Prerequisites

In earlier predesign report from Norconsult, for alignment option 3, will 1/3 of the Suðuroy tunnel lie in the so-called Enni formation and of 2/3 will lie in the Malinstindur formation4. Both these two geological rock formations are well known and described from earlier tunnel construction in the Faroe Islands. Using average prices from other subsea tunnel projects in the Faroe Islands, for evaluation of cost for the Suduroy tunnel, is therefore considered a logical approach.

According to report from Suðuroyartunnilin[5] both alternatives 1 and 2 crosses about the same stratigraphy of rock layers. Difference between the two alternatives is mainly in the orientation of the tunnel routes in relation to the layering. This is mainly in favour of alternative 1. At this stage it is uncertain if this will lead to less average rock support per meter tunnel for alternative 1 than for alternative 2. The assumption in this cost comparison is therefore that rock support and grouting along with watershielding per meter tunnel will be similar for all alternatives.

Cost

According to the predesign report from December 2023 total construction cost for 22.818 m long tunnel (alternative 1) is 4.580 million NOK. Updated cost evaluation for somewhat shorter tunnel, 22.747 m long, is 4.591 mNOK (September 2025), see table 1. Total cost has been converted to Danish kroner (DKK), see line below table 1.

Table 1. Cost summary for alternatives 1A, 1B, 2A and 2B[6].

Summerized cost	Alternativ 1A	Alternativ 1B	Alternativ 2A	Alternativ 2B
Main tunnel	3 981 MNOK	3 984 MNOK	4 599 MNOK	4 604 MNOK
Safety rooms (44/52 stk)	360 MNOK	360 MNOK	416 MNOK	416 MNOK
Tunnel to Skúvoy	250 MNOK	229 MNOK	301 MNOK	224 MNOK
Camp and work place on Skúvoy		976 MNOK		986 MNOK
Sum entreprisekostnad	**4 591 MNOK**	**5 549 MNOK**	**5 316 MNOK**	**6 230 MNOK**
Converted to DKK (0,64 x NOK):	**2 938 MDKK**	**3 551 MDKK**	**3 402 MDKK**	**3 987 MDKK**

4 Suðuroyarleiðin. Forprosjekt, Norconsult, 05-12-2023

5 Suðuroyartunnelin. Linjefringer. Bestutningsnotat, xx.10.2025

6 SUTU. Alternative traseer for Suðuroyartunnilinn, Norconsult, 30-09-2025

In their report Norconsult only compares direct cost for the 4 alternatives, including tunnel connection to Skuvoy and safety rooms, marked with red boxes in table 2 below, excluding road work and tunnels on land, owners cost and unspecified cost. This other cost has been quantified by Suðuroyartunnel p/f, as shown in table 2. If same-coloured items in table 2 are added together into one value, i.e. portals, unspecified, mass transport and owner's cost, are added to direct construction cost of the Suðuroy tunnel, the cost comparison will be as shown in table 3.

Table 2. Divided cost for different alternatives, from Suðuroyartunnel p/f.

2025 MDKK	1A	1B	2A	2B
Hovedtunnel	2.548	2.550	2.943	2.947
Portaler	27	27	37	37
Uspecifiseret og usikkert	676	676	719	719
Veje og tunnel i Suðuroy	364	364	364	364
Tunnelvej Sandoy	97	97	9	9
Massedepot Sandoy	20	10	20	10
Massedepot Suðuroy	20	20	20	20
Bygherreudgifter	494	460	519	481
Tunnelarm Skúvoy	160	146	193	144
Portal og P-plads i Skúvoy	14	14	14	14
Evakueringsrum	230	230	266	266
Hovedvej til østsiden af Sandoy	188	188	188	188
Arbejder og rigg Skúvoy		625		631
Samlet	4.837	5.406	5.292	5.829

Table 3. Divided cost, with sub-values added, to for different alternatives, from Suðuroyartunnel p/f

	Djúpidalur - Sandvík		Múlin - Sandvík	
	Bora upp í Skúvoy	Bora úr Skúvoy	Bora upp í Skúvoy	Bora úr Skúvoy
Kostnader summert, MDKK	**Alternativ 1A**	**Alternativ 1B**	**Alternativ 2A**	**Alternativ 2B**
Suðuroyartunnilin	3.785	3.743	4.259	4.214
Veje og tunnel i Suðuroy	364	364	364	364
Tunnelvej i Sandoy	97	97	9	9
Vej til østsiden af Sandoy	188	188	188	188
Arbejder og rigg í Skúvoy	0	625	0	631
Evakueringsrum pr 500m	230	230	266	266
Tunnelarm Skúvoy	174	161	207	158
Byggekostnad i alt	**4.837**	**5.406**	**5.292**	**5.829**

Review of tunnel construction values in table 2 and 3:

- For all the alternatives tunnel construction cost for the main tunnel is the same or about 112.000 DKK/m tunnel (about 175.000 NOK/m tunnel), as per table 2.

  As unspecified and unsure cost and owners cost is not, percentage wise, the same for the tunnel construction cost of different alternatives in table 3, calculated construction tunnel cost, including unspecified, unsure and owners cost, ranges between 160.000 and 166.000 DKK/m tunnel.

  These values are considered probable as they are derived from real cost for previous subsea tunnels in the Fareo islands. According to Suðuroyartunnil p/f (SUTU) average cost, updated to 2019 index, for Eysturoy and Sandoy tunnels was about 120.000 DKK/m tunnel and price increase has been about 38% since then to fall 2025 (120 x 1,38 ~ 166). => OK

  Cost/m tunnel is normally higher for longer tunnels and cost per meter should therefore be somewhat higher for alternative 2A than for 1A because of longer transport distances. This difference is considered within acceptable error limits in this comparison.

- Cost for portals is 10 mDKK higher for alternatives 2A and 2B in table 2. This must be because of longer portal for alternative 2 in Sandoy. => OK

- Unspecified and unsure cost is ranging from 24 to 26% of the tunnel construction cost in table 2. In the predesign report, from Norconsult, undefined-unsure cost is estimated about 325 mDKK. SUTU increased this to 676 mDKK for alternatives 1, used the same value for unspecified as Norconsult but increased uncertainty, according to (SUTU). Higher value is for alternative 2, 719 mDKK, is because of longer tunnel. Normally unspecified and unsure cost is evaluated as percentage from the calculated contractor cost, but since this the same method is done for all the alternatives, and probably based on cost for older subsea tunnel projects considered acceptable => OK

- Owner’s cost consists of design, construction management, professional supervision of work and follow-up. According to SUTU, costs for different alternatives is adjusted to the time spent on work but SUTU has not considered need for additional personnel at the construction site on Skúvoy. Lower owners cost for B-alternatives is therefore questionable as work on harbour construction on Skuvoy will require more cost for the owner.

  => Should be corrected and increased for B-alternatives (or lowered for A-alternatives).

- Construction cost of the tunnel to Skuvoy from the main tunnel is estimated the same for all alternatives, about 112.000 DKK/m tunnel. Norconsult has estimated the contractor cost 103.100 DKK/m tunnel[7]. Unspecified and unsure and owner´s cost should be added to this figure in table 3 as was done for the main tunnel, see second paragraph under “Review of tunnel construction values in table 2 and 3”.

  => Cost should be increased to about 150.000 DKK/m tunnel (unknown and owners cost included).

  In their cost estimation Norconsult uses the same unit price for upward and downward tunnel excavation. However, upward driving is generally cheaper because it is less expensive to remove material by help of gravity and less pumping is required.

[7] Altenative traseer for Suðuroyartunnilin, Norconsult, 30. September 2025

=> Cost per meter tunnel in the Skuvoy tunnel should be evaluated higher for alternatives 1B and 2B than for 1A and 2A. For B-alternatives cost/meter then maybe 10% higher.

- Evacuation rooms are estimated about 5,25 mDKK/room which is considered high (estimated about 4 mDKK/room for tunnel in Iceland), but assumed to be based on cost for comparable rooms in Norwegian tunnels. Estimated cost per room is the same for all the alternatives and total cost thus respectively higher for longer tunnel. => OK
- Roadwork outside the main tunnel is estimated about 90 mDKK higher for alternative 2 than 1 on Sandoy. Cost is the same for road work on Suðuroy => OK

Review of Cost for workplace in Skuvoy:

- Construction and operation of a work camp on Skuvoy is estimated rather high in our opinion. Possible savings in operation of work camps on Sandoy and Suðuroy should be taken into consideration in the cost evaluation for camp in Skuvoy. => Needs to be reconsidered.
- As regards transport of rock material from Sandoy to Skuvoy, we consider this is based known cost from other projects. => OK
- Cost evaluation for the construction of the breakwater dike and harbour facilities is considered not unrealistic. However, as we lack information on basic parameters such as costal waves, currents etc. we have to assume size and shape of the breakwater dike to be correct as designed by Norconsult => OK
  - ⇨ Total cost estimation for construction and operation of the workplace on Skuvoy, of about 625 mDKK in table 2, is rather high but does not change the total picture for cost comparison of different alignments.

Construction time

Total construction time has been evaluated as shown in table 4[8].

Table 4. Construction time (orange coloured line is reviewed time, see text explanation)

	Djúpidalur - Sandvík		Múlin - Sandvík	
	Bora upp í Skúvoy	Bora úr Skúvoy	Bora upp í Skúvoy	Bora úr Skúvoy
Tid, år	**Alternativ 1A**	**Alternativ 1B**	**Alternativ 2A**	**Alternativ 2B**
Prosjekering og udbud mm.	2,0	2,0	2,0	2,0
År med tunneldriving	5,5	4,9	7,3	4,8
Færdiggørelse	2,6	1,8	1,7	2,5
Samlet prosjekttid	10,1	8,7	11,0	9,3
Time estimated by reviewer (year)	**10,4**	**9,1**	**11,9**	**10,0**

Average progress of excavation for Sandoy tunnel was about 40 m/week/tunnel face from Gamlarætt and about 44 m/week/tunnel face from Traðardalur (all weeks counted). Average thus total about 82 m/week with excavation from two faces. After breakthrough work took some 23 months. Total thus about 4,5 years from first blast to finish for 10,8 km long Sandoy tunnel. Suðuroy tunnel has the same cross section as the Sandoy tunnel.

For the Eysturoy tunnel average progress of excavation was about 48 m/week on average from Hvítanes. From Strendur about 42 m/week to the roundabout but total about 64 m/week when driving on two faces towards Rokin and Hvítanes. It took only about 19 months to complete the interior work in the tunnel from last blast to opening for traffic. Higher effort set to this than in the Sandoy tunnel (more workforce)

Based on this one can assume about 40 m/week for one face driving and about 50% higher progress of excavation when excavating on two faces (alternating face excavation)

- For all the alternatives, 2 years are assumed for design and tendering. This is considered within acceptable time frame => OK
- Alternative 1A: progress of excavation has been assumed as per figure 2, 285 weeks for excavation which is about 85 m/week (Tunnel to Skuvoy included). Based on experience from Eysturoy and Sandoy tunnels about 80 m/week, total for two faces, more realistic. If assumed alternating drift of excavation for 1550 m (up the Skuvoy tunnel and towards Suðuroy from the cross point), advance will only be 60 to 70 m/week for 3100 m (2 x 1550 m) of the main tunnel and if assuming 80 m/week for the rest, total then about 293 weeks. Having in mind that progress of excavation will reduce with increased distance from portal to face. => Increase excavation time to 5,7 years.

  After breakthrough work is estimated 2,6 years (31 month) which is considered which is considered accomplishable. => OK

  - ⇨ Increase total estimated time to 10,4 years.

[8] Alternative traseer for Suðuroyartunnilin, Norconsult, september 2025

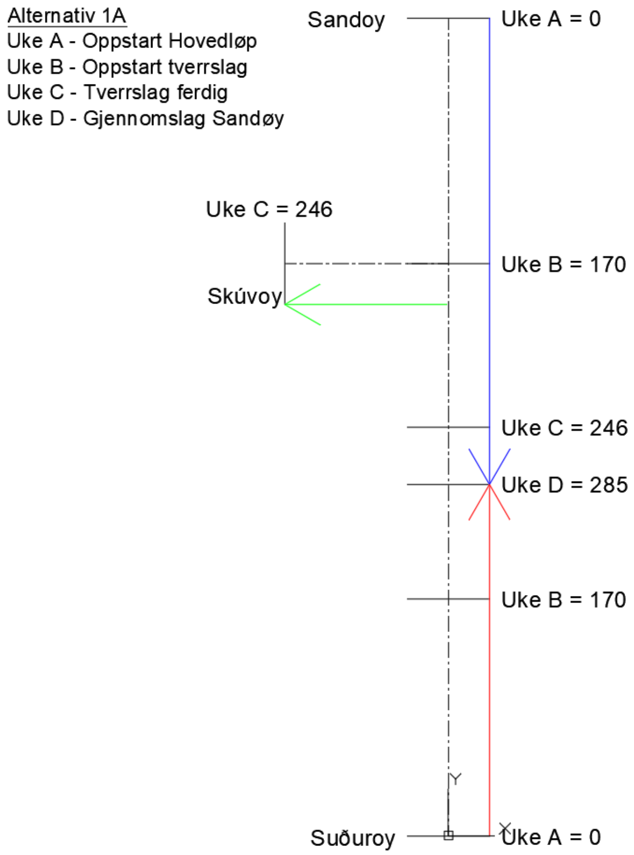


Figure 2. Assumed progress of excavation for alternative 1A [Alternative traseer for Suðuroyar tunnilin, Norconsult sept 2025]

› Alternative 1B: Progress of excavation is estimated 256 weeks, figure 3, starting in week 1 on both ends Sandoy and Suðuroy and with the 3rd rig staring one year later in Skuvoy. Rig from Skuvoy operating in 41 weeks down the Skuvoy tunnel which accounts to about 35 m/week and then additional 60 weeks for remaining of the tunnel. Estimated 256 weeks (4,9 years) for excavation to breakthrough => OK

  For after breakthrough work only 1,8 year is estimated, 10 months less than for alternative 1A. This is debatable as space in the main tunnel is the same despite additional access from Skuvoy. It took 19 months to complete interior work for Eysturoy tunnel with 3 portals or about 83% less time than for Sandoy tunnel. If using the same precentage for interior work as was the difference between Eysturoy and Sandoy tunnels, after breakthrough work will take about 2,1 to 2,2 years.

  ⇨ Increase total estimated time to 9,1 years.

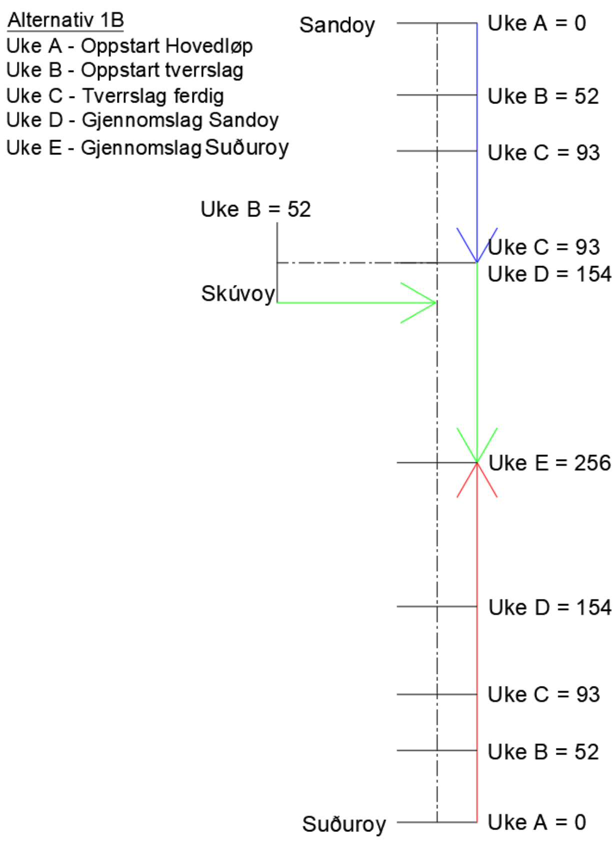


Figure 3. Assumed progress of excavation for alternative 1B [Alternative traseer for Suðuroyar tunnilin, Norconsult sept 2025]

› Alternative 2A: progress of excavation has been assumed as per figure 4, 378 weeks for excavation which is about 74 m/week (Tunnel to Skuvoy included). Based on experience from Eysturoy and Sandoy tunnels about 80 m/week, total for two faces is realistic and if progress of excavation up the Skuvoy tunnel is 35 m/week, total of 378 weeks is considered accepable. If, however, assumed alternating drift of excavation for 1870 m (up the Skuvoy tunnel and towards Suðuroy from the cross point), advance will only be 60 to 70 m/week for about 3740 m (2 x 1870 m) of the main tunnel and if assuming 80 m/week for the rest, total then about 339 weeks. Having in mind that progress of excavation will reduce with increased distance from portal to face. => Excavation should be estimated between 6,5 to 7,3 years. => Use 6,9 years instead of 7,3

For after breakthrough work only 1,7 year is estimated, 11 months less than for alternative 1A. This must be an error. Interior work for longer tunnel takes longer time. Increase estimated time from 1,7 to 3 years.

⇨ Increase total estimated time to 11,9 years.

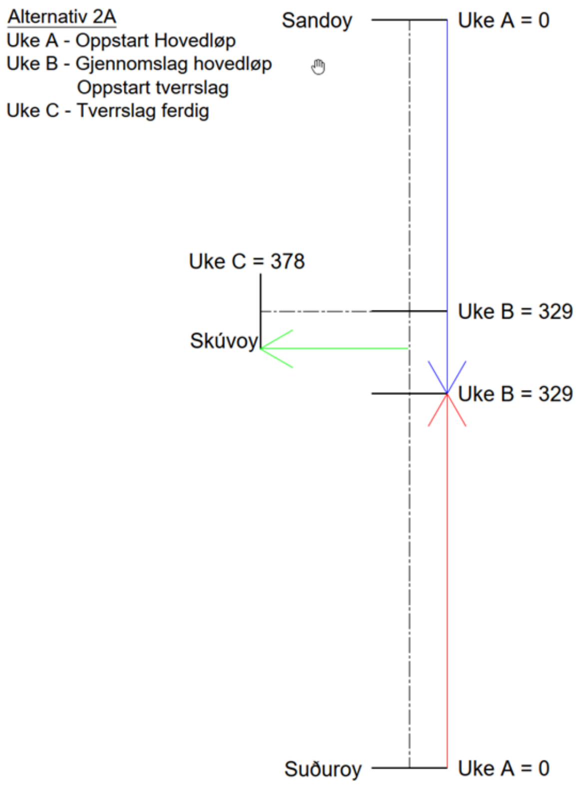


Figure 4. Assumed progress of excavation for alternative 2A [Alternative traseer for Suðuroyar tunnilin, Norconsult sept 2025]

- Alternative 2B: Progress of excavation is estimated 252 weeks, starting in week 1 on both ends Sandoy and Suðuroy and with the 3rd rig staring one year later in Skuvoy. Rig from Skuvoy operating in 41 weeks down the Skuvoy tunnel which accounts to about xx m/week and then additional 60 weeks for remaining of the tunnel in on alternating faces. Estimated 252 weeks (4,8 years) for excavation to breakthrough. This is less time than for alternative 1B which cannot be correct. If assuming 60 m per week for alternating face driving and 40 m/week for single face driving total time would be close to 284 weeks => Increase estimated excavation time to 5,5 years.

  For after breakthrough work only 2,5 year is estimated => OK

  ⇨ Increase total estimated time to 10 years.

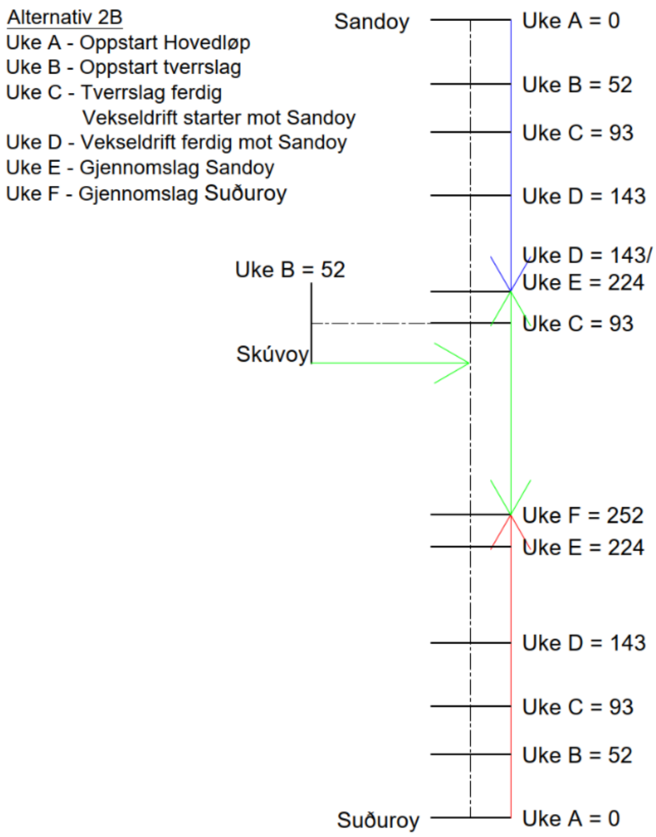


Figure 4. Assumed progress of excavation for alternative 2B [Alternative traseer for Suðuroyar tunnilin, Norconsult sept 2025]

Based on total construction time savings/cost increase for shorter/longer operation time of ferries to Suðuroy and Skuvoy has been evaluated, relative to alternative 1A, presented in table 5 below. Values in table 5 are calculated from on real cost according to SUTU.

Table 5. Estimated savings/additional expense due to shorter/longer construction time of different alignment alternatives. Note Drift excluded.

Færgedrift til Suðuroy, Skúvoy	0	-185	119	-106
Drift af tunnel	0	35	-23	20
Evt. økonomisk indvirkning	**0**	**-149,8**	**96,3**	**-85,6**
Values estimated by reviewer (mDKK)	**0**	**-171,6**	**112**	**-53**

- Referring to review values of construction time, time saving for alternative 1B is less than estimated by Norconsult, or about 172 mDKK and for 2B about 53 mDKK. Cost increase for alternatives 2A is estimated higher or about 112 mDKK, see revised values in line below the table.
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Conclusion

1 Alernative 1A is the considered the best choice, over the other alternatives, as regards costs, being about 500 mDKK lower than the second lowest cost 2A.

2 B-alternatives are probably undervalued in comparison to A-alternatives as higher excavation cost for downward excavation of the Skufoy tunnel is not considered and additional owners cost for construction and workplace on Skuvoy is ignored.

3 Benefit of time saving for alternative 1B and 2B is not enough to justify construction work from Skuvoy. Cost is much greater than the benefit. Also as pointed out, can weather condition and isolation of Skuvoy lead to delay of deliveries of materials and supplies needed for the tunnel construction, spare parts etc., reducing the possible time saving.

4 Total costs for all the alternatives is estimated to be somewhat higher than presented but considered within acceptable error limits and not having effect on the economical comparison of alternatives.

5 Construction time for all alternatives is evaluated somewhat higher than presented by Norconsult in their report "Alternative traseer for Suðuroyartunnilin". Difference in construction time between 1 and 2 alternatives is evaluated less, and between A and B-alternatives evaluated greater, than presented by Norconsult.

6

Regards

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References

7 Suduroytunnel, alignment options, independent review, Memo dated 9. January 2025.

8 Suduroytunnel, alignment options, independent review, Memo dated 9. January 2025.

9 [1] SUTU. Alternative traseer for Suðuroyartunnilin, Norconsult 30. September 2025

10 Forprosjekt for Suðuroyartunnilin. Kostnadsoverslag etter Anslagmetoden, 7 desember 2023

11 Suðuroyartunnelin. Linjeføringer. Bestutningsnotat, 20.10.2025

[1]Suðuroyarleiðin. Forprosjekt, Norconsult, 05-12-2023

12 Suðuroyarleiðin. Forprosjekt, Norconsult

13 Linjuføringar PF Suðuroyartunnil.pdf

14 SINTEF Risikovurdering byggeperiode.pdf