MAY 2017

RECOMMENDED BORGARLÍNA ALIGNMENTS

PROGRESS REPORT

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1 Purpose

In February 2017, the screening and scoping phase started up aiming at selecting the most appropriate alignments for Borgarlína.

The output of this phase is an evaluation and priority of the corridors and potential alignments based on a multi-criteria analysis that makes it possible to;

- choose and prioritize the alignments in the corridors
- narrow the scope of the project down to the most appropriate alignment(s)
- choose which type of high-class public transport system to use (BRT/LRT)

2 Selection of criteria and corridors

The recommendation of alignments will be based on a multi-criteria analysis (MCA). The starting point for this process is selecting the relevant criteria to be used in the MCA and selection the corridors and alignments to be analysed in the MCA.

The recommendation of criteria, corridors and alignments for the MCA was presented for the different stakeholders involved in the Borgarlína-project (working group, project committee, steering committee and Regional Planning committee) in February. Based on the input from the meetings with the stakeholders the selection of criteria, corridors and alignments was handled.

2.1 Selection of criteria

COWI brought up MCA-criteria that previous has been used for evaluating and selecting alignments and assessed if the given criteria could be recommended for the Borgarlína-project. Some criteria was not recommended or data was simply not available to include in a MCA.

The recommended criteria was presented for the involved stakeholders and it was agreed to use the criteria in Table 1 for the MCA.

Table 1 Agreed criteria for the MCA.

Criteria	Themes
Passenger estimates	Two estimates: Reach the vision of 12 % and projection of existing passenger numbers combined with urban development potential and elasticity assessment.
Residents and employees	Number/density of residents and employees (sq.m)
Urban development potential	Transit-oriented development, densification
Service levels	Three parameters: Frequency, travel time, regularity
Network for high-class PT	Coherence in the network
Potential for bus savings	Overall adaption of bus network → savings in operational costs for bus network
Construction costs	Distance based price combined with special constructions
Operational costs	Distance based operation costs
Physical challenges	Bridges, tunnels, utilities, expropriation of buildings, terrain conditions, mixed traffic, NATURA 2000 conditions

Passenger estimates

The passenger numbers are estimated in two different ways;

- Elasticity model – increasing existing passenger numbers based on the urban growth and effects of service improvements (higher frequency, lower travel time and effect of having a high-class public transport system).
- Trip generation model – estimating the number of trips generated in 2040 based on today's trips and the urban growth potential and reaching 12 % public transport share in Greater Reykjavik. For the Borgarlína stations the public transport share is estimated to be 15 % to be able to reach the 12 % in total (due to that 66 % of all urban growth should be within 400 m of a Borgarlína station).

While the first model emulates the situation in 2040 with urban growth and improved transport service on Borgarlína, the second shows how many passengers Borgarlína should have in order for the capital area to reach its vision of a 12 % public transport share. The difference between the numbers indicates the level of supporting measures that will be needed on top of the Borgarlína service to reach the vision.

The trip generation model hence emphasize the need to not only improve the public transport service but also to support the system in the best possible way. This means densification (transit oriented development) around the high-class public transport stations, prioritising the public transport at the expense of the car traffic, restrictive parking policy and strategy and make the good conditions for supporting the high-class public transport (feeder bus service, bike and ride, walking paths, park and ride etc.).

Both models give a passenger estimate for the year 2040.

Residents and employees

The number of residents and employees within the walking distance of Borgarlína stations gives a good indication of whether the alignment is located where people are living and working. This makes it possible to benchmark the different alignments and see which of them are covering the highest potential for future passengers.

The data for residents are calculated for both today´s population and the expected 2040 population. The employment data are only available as square meters making it difficult to link it to the number of employees within the walking distance.

This criteria is therefore assessed as the catchment area of;

- Residents within 400 m - 2017
- Residents within 400 m – 2040 (incl. growth potential)

Figures are given as a total for each Borgarlína alignment and as residents per km to be able to benchmark the alignments.

Urban development potential

Based on the transit-oriented development agreed on for the capital area, the densification potential for residents and employment is estimated in all zones. The estimate is provided by SSH, and included planned development as well as an assessment of realistic long-term development.

This is converted to daily trips and compared with today's number of trips. This gives an urban growth factor within the vicinity of each Borgarlína alignment. This is the urban growth factor used for the two passenger estimates.

Service levels

Three parameters has been used to evaluate the service level for each Borgarlína (alignment);

- Frequency (the given frequency along the alignment). Borgarlína is assumed to run with 7½-minute frequency.
- Travel time (the total travel time for each Borgarlína and the change in travel times compared to today´s travel time)
- Regularity (the change in regularity compared to today).

Network for high-class public transport

This criteria looks at the coherence in the network – and how it connects with the total public transport network. The more bus lines it connects with the better coherence in the network.

The criteria does not look at the consequences for the travel time to obtain the coherence.

Potential for bus saving

An initial adaption of the existing bus network to avoid parallel service with the analysed Borgarlína alignments. This means abolishing, shortening and re-routing existing bus routes or changes in frequencies to make the Borgarlína as attractive as possible and not compete with the other bus routes. The bus network has not been re-planned to support the Borgarlína in the best possible way.

The output is changes in existing bus network for each Borgarlína alignment and estimate the savings in operational costs for the existing bus network (only at the cost side – not the revenue side). This should be done in the next phase with only one alternative to know more about the total level of subsidies for the public transport.

Construction costs

The construction costs for the Borgarlína infrastructure is based on the required space for a light rail (LRT) infrastructure. Therefore a BRT system later on could be upgraded to a LRT-system as the space for a BRT system is dimensioned to a later upgrade. Each Borgarlína alignment is drawed up as LRT and all elements to construct the infrastructure for both BRT and LRT is estimated and priced based on experience figures from abroad.

Construction costs are all infrastructure necessary for operating the service on the alignment – but not the rolling stock as this is seen more as a cost depending on the operational service level.

Construction costs are compared to an Icelandic context to ensure that the price level is at the right level.

The construction costs are handled in the same way making the benchmarks of the Borgarlína alignments reliable.

Operational costs

The operational costs for Borgarlína is at this level based on the number of service hours to operate each Borgarlína alignment. To be able to benchmark the different alignments this are assessed to be the right level for the MCA. For the final report this will be calculated as operational costs and not service hours.

The service hours for the calculation are gives as a 24-hour service;

Frequency at weekdays:

- Peak hour service: 7½ minutes service (07-19)
- Daytime service: 10 minutes service (06-07+19-20)
- Evening service: 15 minutes service (20-23)
- Night service: 30 minutes service (23-06)

Frequency at weekends:

- Daytime service: 10 minutes service (10-19)
- Morning and evening service: 15 minutes service (08-10+19-22)
- Night service: 30 minutes service (22-08)

Physical challenges

This criteria does mainly look into if the alignments has any huge physical challenges construction wise (bridges, tunnels, large utilities) – but also physical challenges that affects the surroundings in terms of expropriation of buildings, terrain conditions, mixed traffic and NATURA 2000 conditions.

Furthermore, the criteria look into if the alignments causes any risks in terms of political obstacles (such as transforming the city airport into an urban development area).

2.2 Selection of corridors and alignments

The vision for the high-class public transport system is defined in the new Regional Development Plan based on the main cores/centers and the growth boundaries for Capital Area 2040. These main cores and centers are where the urban development should mainly take place and these have schematically been connected to form the main corridors relevant for the high-class public transport system, see Figure 1. Statement from the new Regional Development Plan:

> "*It should be assumed that town centres will be linked to future frequent transit development corridors (high-quality system) if development yields sufficient passenger demand.*"

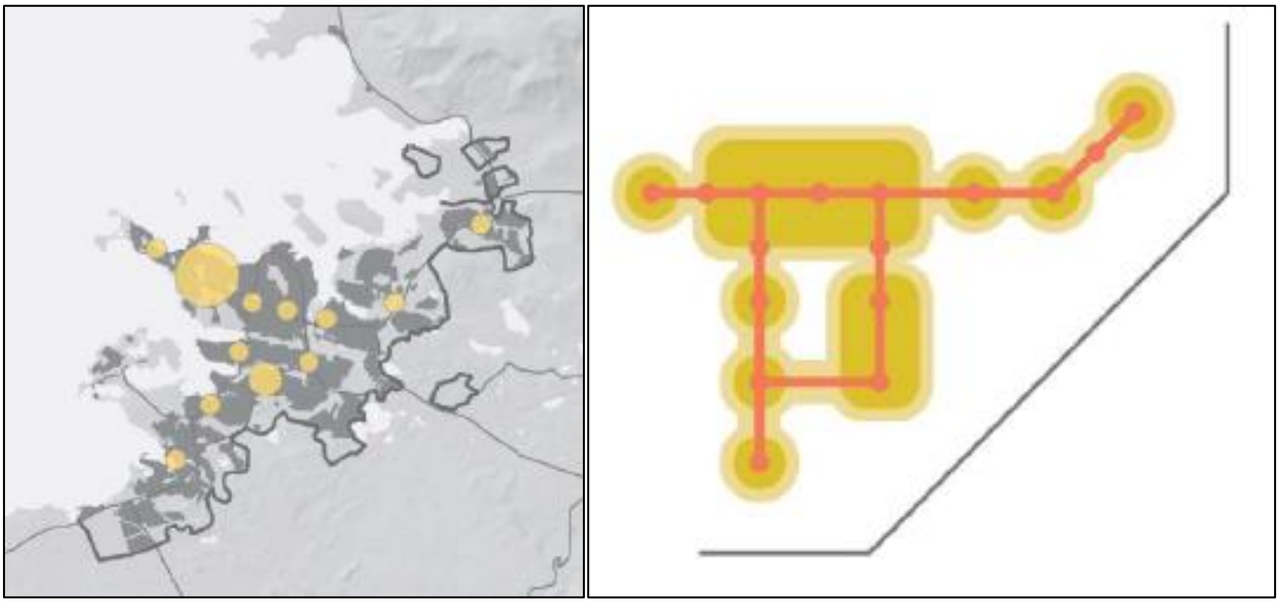
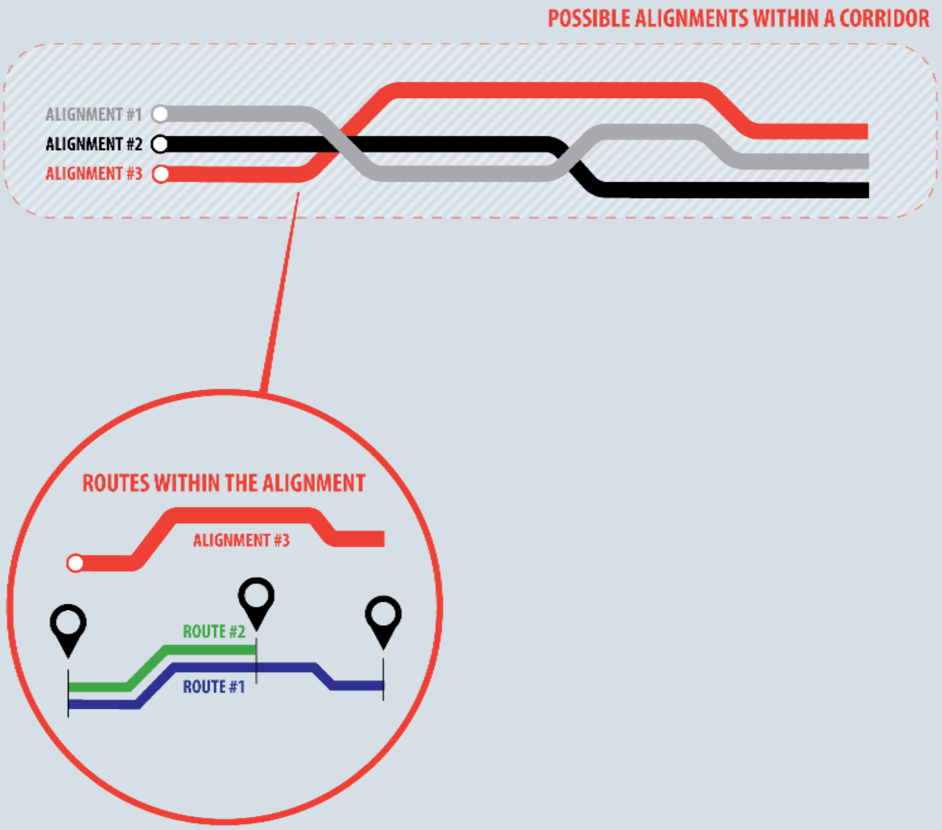


Figure 1 Main cores and growth boundaries for Capital Area 2040 and a schematic connection of the centres.

Based on the previous work, workshops and COWI ideas for how Borgarlína alignments could be outlined the project group identified the relevant corridors and alignments for the Borgarlína. The involved stakeholders was presented for the identified corridors and alignments and gave some relevant input. Based on the input the corridors and alignments for the MCA was agreed on.

Definition of corridor, alignments and routes

Corridors are in this report defined as a broad band where one or more alignments could be fitted in, depending on the requirements and consequences for the Borgarlína.



The chosen alignment will end up as the infrastructure for the Borgarlína and within this alignment (or infrastructure) different routes could be operated.

Four principle corridors are selected as a starting point for defining the possible alignments for the Borgarlína, see Figure 2.

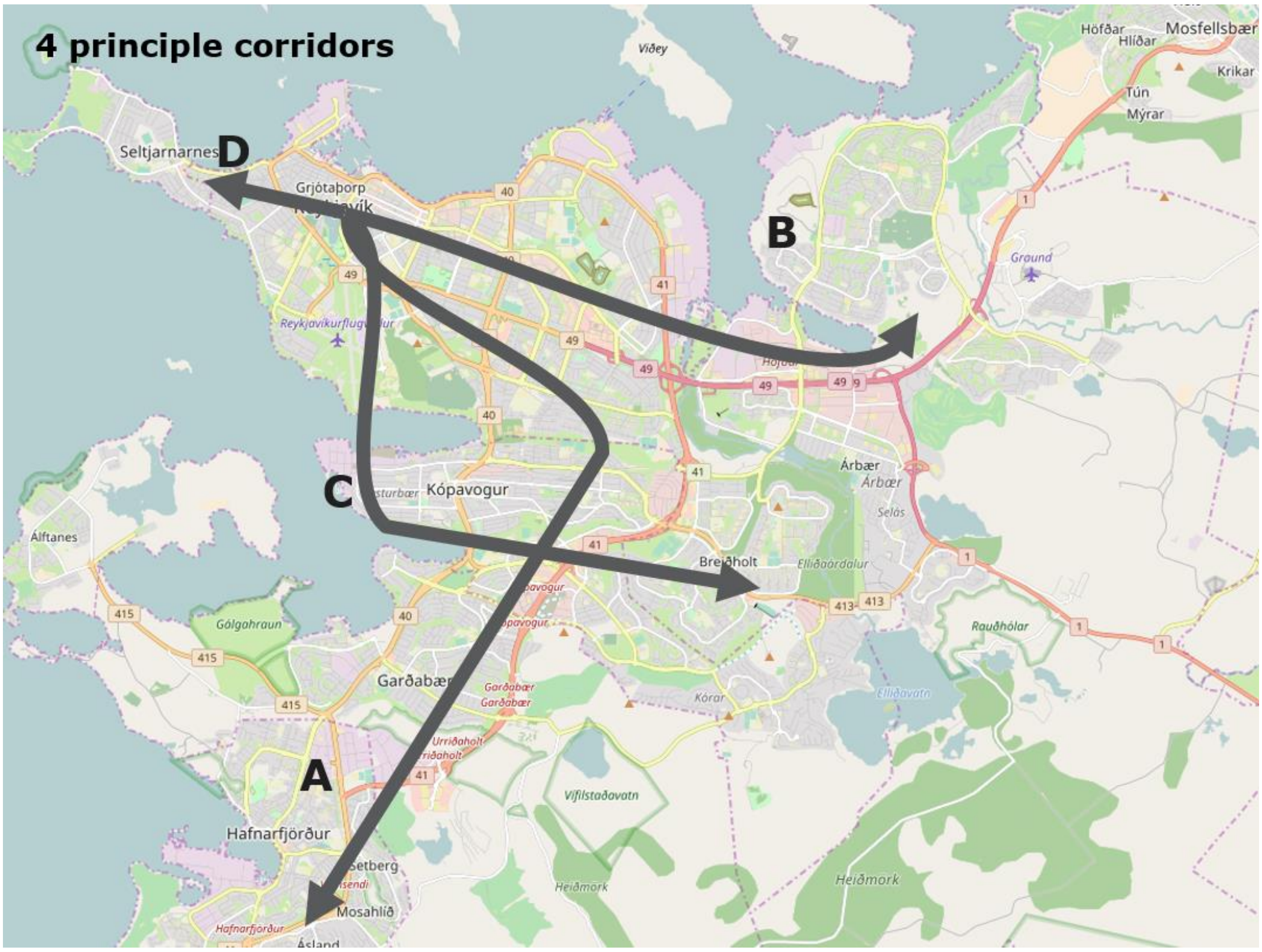


Figure 2 The four corridors where the alignments could be build.

The naming of the corridors do not mean that the A-corridor is higher prioritised than the D-corridor – they do only function as a help when discussing the different defined alignments in the MCA. All alignments are handled equally and the priority of the alignments are based on the analysed figures for each alignment.

- A-corridor: north-south corridor between Hafnarfjörður, Garðabær, Kópavogur and Reykjavik city centre
- B-corridor: east-west corridor between Reykjavik city centre and Artún and further towards Mosfellsbær, Grafarvogur or Norðlingaholt
- C-corridor: ring corridor utilising the ring roads (e.g. Reykjanesbraut or city airport) connecting the centres Smáralind or Mjódd with Reykjavik city centre
- D-corridor: east-west corridor between Reykjavik city centre and Seltjarnarnes

The defined alignments for the MCA are shown in Figure 3 and will be presented a bit further in chapter 3. In total 16 alignments are analysed in the MCA.

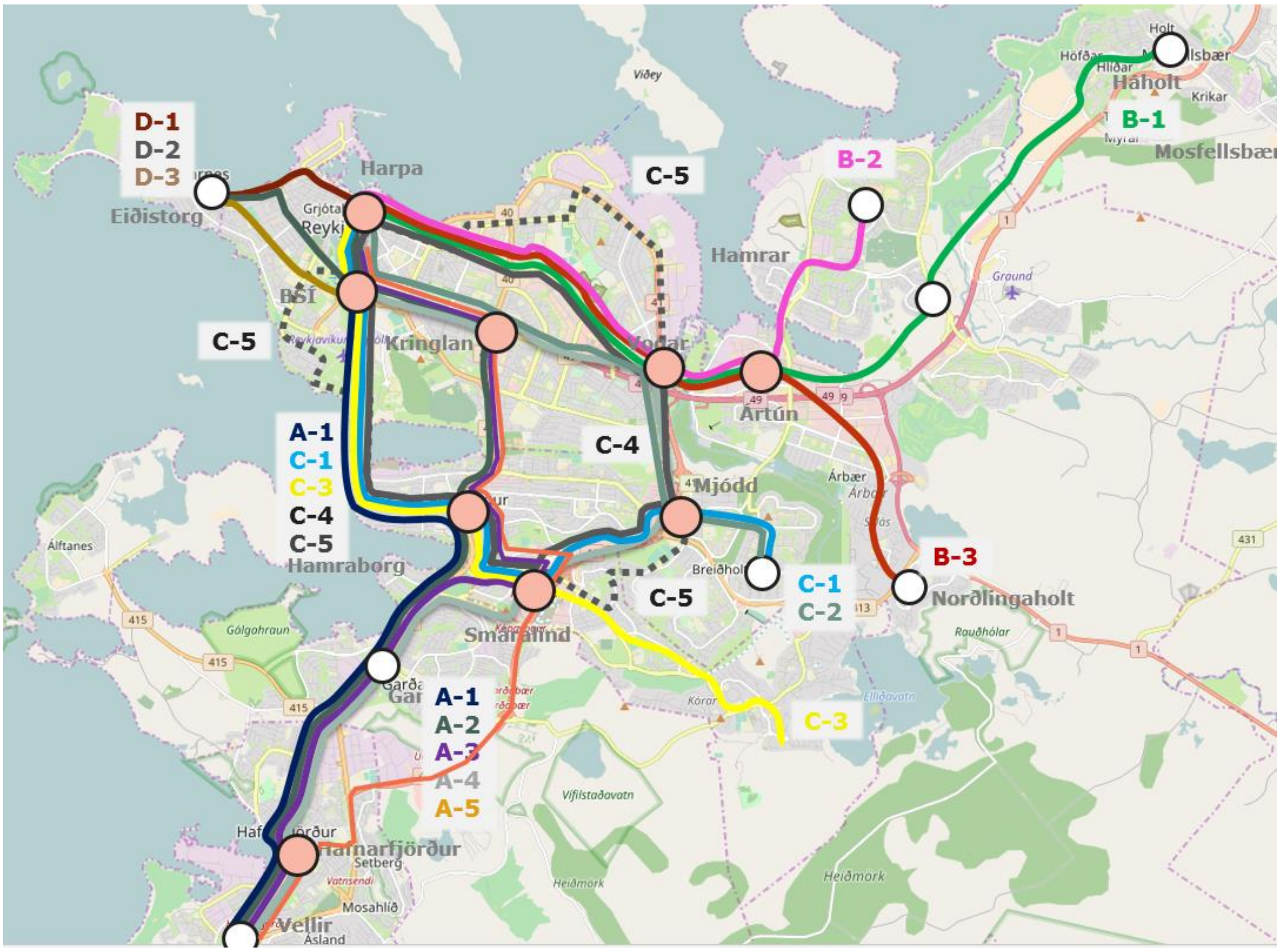


Figure 3 All the analysed alignments within the defined corridors.

- A-corridor: 5 different alignments
- B-corridor: 3 different alignments
- C-corridor: 5 different alignments
- D-corridor: 3 different alignments

The alignments in the Reykjavik city centre will be analysed further based on the recommended alignments for the first phase to get the most appropriate infrastructure for operating the first phase.

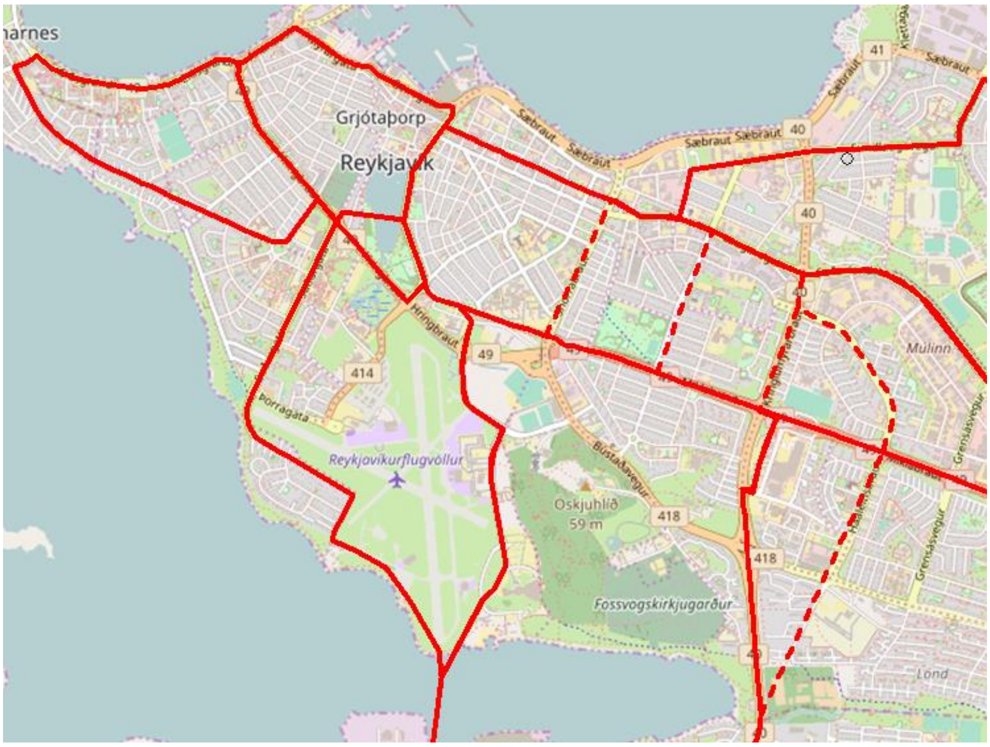


Figure 4 *Borgarlína alignments with red and alternative alignments within Reykjavik city centre with dotted red.*

3 Multi-criteria analysis

The selection of alignments to be built as a Borgarlína is based on the multi-criteria analysis (MCA). An MCA is a useful decision-making tool used for selecting the most appropriate alignment(s) based on the criteria set up for evaluating the alignments.

The outcome of the MCA depends on the given data – but for the planning proposal the MCA aims at eliminating some of the alignments that will not perform well and end up with the most appropriate alignment(s) to be built in a long time perspective.

The remaining or selected alignments will then be analysed and ends up recommending the most appropriate first phase to be build and the next phases of the Borgarlína.

3.1 A-corridor

The A-corridor has five alignments that are analysed (see Figure 5);

- A1: Vellir, Fjörður, Garðabær, Hamraborg, Reykjavik University, BSÍ and Hlemmur
- A2: Vellir, Fjörður, Garðabær, Hamraborg, Kringlan, BSÍ and Hlemmur
- A3: Vellir, Fjörður, Garðabær, Smáralind, Hamraborg, Kringlan, BSÍ and Hlemmur
- A4: Vellir, Fjörður, Álfaskeið, Garðabær, Smáralind, Mjódd, Vogabyggð, Skeifan, BSÍ and Hlemmur
- A5: Vellir, Fjörður, Kauptún, Smáralind, Hamraborg, Kringlan, BSÍ and Hlemmur

Table 2 Characteristics of the five A-alignments.

	A1	A2	A3	A4	A5
Length (km)	16,1	16,0	18,2	21,1	18,9
Stops	20	19	23	26	21
Travel time (min)	36	34	41	47	39
Avr. speed (km/h)	26,7	28,0	26,7	27,2	29,0

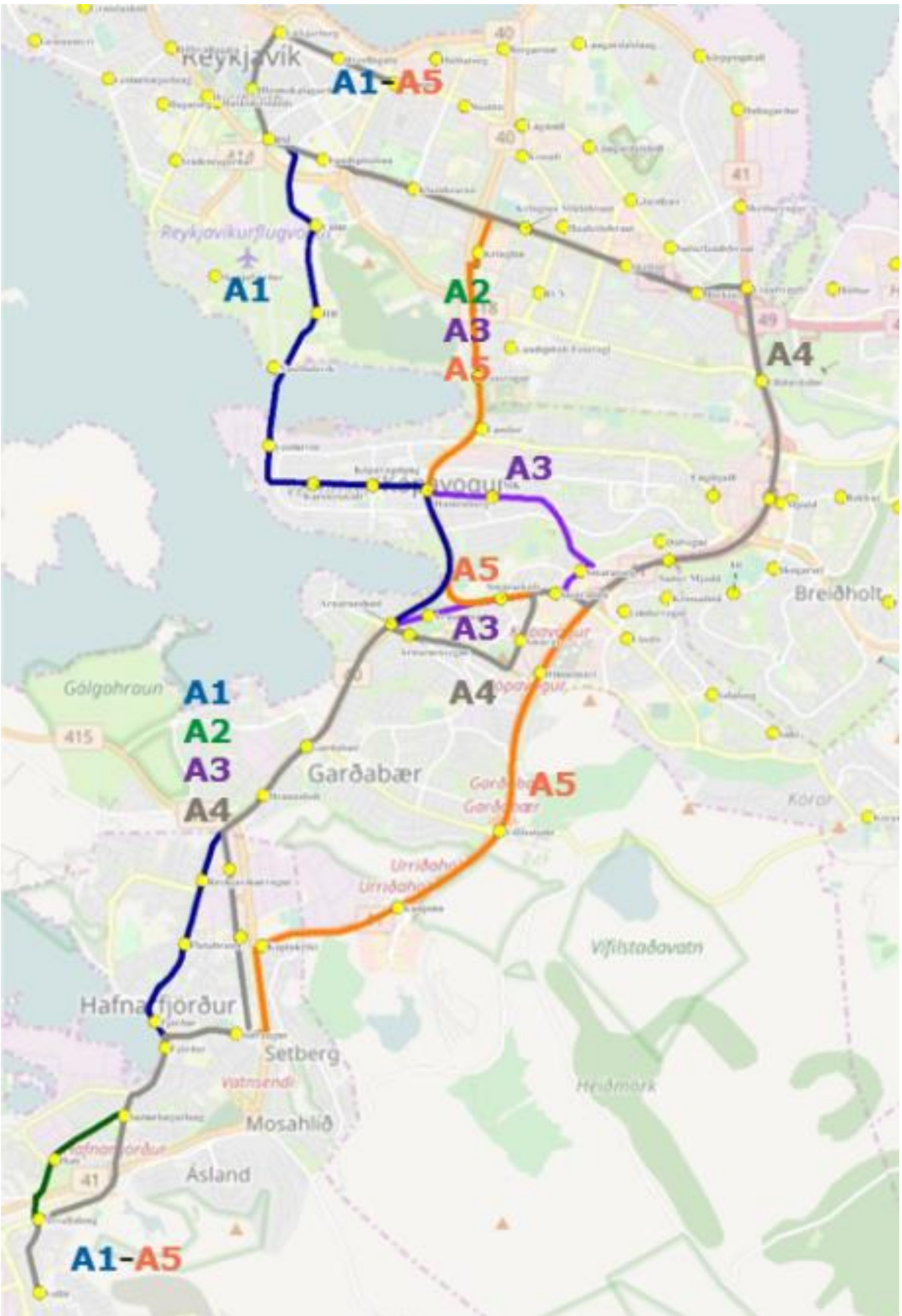


Figure 5 *A-corridor alignments.*

Table 3 MCA-results for the five alignments within the A-corridor.

Criteria	A1	A2	A3	A4	A5
Passenger estimates per km (elasticity model)	**780**	**800**	700	620	610
Passenger estimates per km (Trip gen. - vision)	**1.510**	**1.460**	**1.520**	**1.540**	1.380
Catchment area today, inh. per km (400 m)	1.680	**1.900**	**1.910**	1.670	1.620
Catchment area, incl. growth potential per km	**2.820**	**2.810**	**2.830**	**2.710**	2.390
Frequency and capacity	++	++	++	++	++
Travel time improvement (min.)	**+++(36)**	**+++(34)**	+ (41)	÷ (47)	++ (39)
Coherence	0	0	**+**	**++**	**+**
Urban growth potential	**+44 %**	+35 %	+34 %	**+40 %**	+31 %
Construction Cost – total cost index (BRT)	100%	99%	103%	118%	106%
Construction Cost – total cost index (LRT)	100 %	99 %	105 %	113 %	107 %
Physical challenges and risks	÷÷÷	÷	÷	÷	÷
Operation costs Borgarlína (hours/year)	**58.900**	**55.600**	66.600	75.400	63.000
Bus savings	+++	+++	+++	+++	+

3.1.1 Elimination of A-alignments

A5 performs lower than the other A-alignments for passenger estimates and catchment areas – and combined with a higher travel time (operation costs) and construction costs this alignment is eliminated for the further analysis. Furthermore, the bus saving potential is assessed to be low. On that background A5 is eliminated.

A4 is performing low on travel time where the travel time from south (Hafnarfjörður and Garðabær) to the Reykjavik city centre increases a lot compared to today's bus service. Furthermore this alignment has a low passenger estimate in the elasticity model and a high construction cost. Therefore the alignment is eliminated.

A1 and A2 are similar and the only difference is whether to serve Kársnes and the Reykjavik city airport area or Kringlan on the route between Hamraborg and BSÍ. Comparing these two alignments highlights the risk of whether the Reykjavik city airport is ready to be transformed (closed for operation and developed into an urban area) within the early stages of the Borgarlína project and whether the bridge between Kársnes and the Reykjavik city airport will be build. Based on this risk, the A1 alignment has been eliminated as A2 seems more realistic in the shorter time horizon for a Borgarlína.

3.1.2 Recommendation of A-alignments

The recommendation is to bring A2 and A3 into the planning proposal and the further analysis of where to build the most appropriate Borgarlína infrastructure in the first phase.

They are both performing well in terms of passenger estimates and catchment areas – which is the most important when aiming for increasing the number of passengers (vision of 12 % public transport share).

A2 scores best on travel time, passenger estimate in the elasticity model and on operation costs. A3 on the other hand serves the regional centre Smáralind and improves coherence by increasing accessibility to that destination, at the cost of increased travel time.

Figure 6 Recommended alignments within the A-corridor.

3.2 B-corridor

The B-corridor is special since all three alignments B1, B2 and B3, share the same alignment between BSÍ and Ártun. Hence this shared part has been analysed on its own as well, to assess the benefits of the "extensions" from Ártun in each of the main alternatives.

- B1: BSÍ, Hlemmur, Suðurlandsbraut, Vogabyggð, Ártun, Keldnaholt and Háholt
- B2: BSÍ, Hlemmur, Suðurlandsbraut, Vogabyggð, Ártun and Spöngin (Grafarvogur)
- B3: BSÍ, Hlemmur, Suðurlandsbraut, Vogabyggð, Ártun, Hraunbær and Norðlingaholt
- B(Ártun): BSÍ, Hlemmur, Suðurlandsbraut, Vogabyggð and Ártun

Table 4 Characteristics of the five B-alignments.

	B(Ártun)	B1	B2	B3
Length (km)	7,5	16,3	11,9	12,7
Stops	13	23	20	20
Travel time (min)	20	42	32	33
Avr. speed (km/h)	22,1	23,4	22,1	23,0

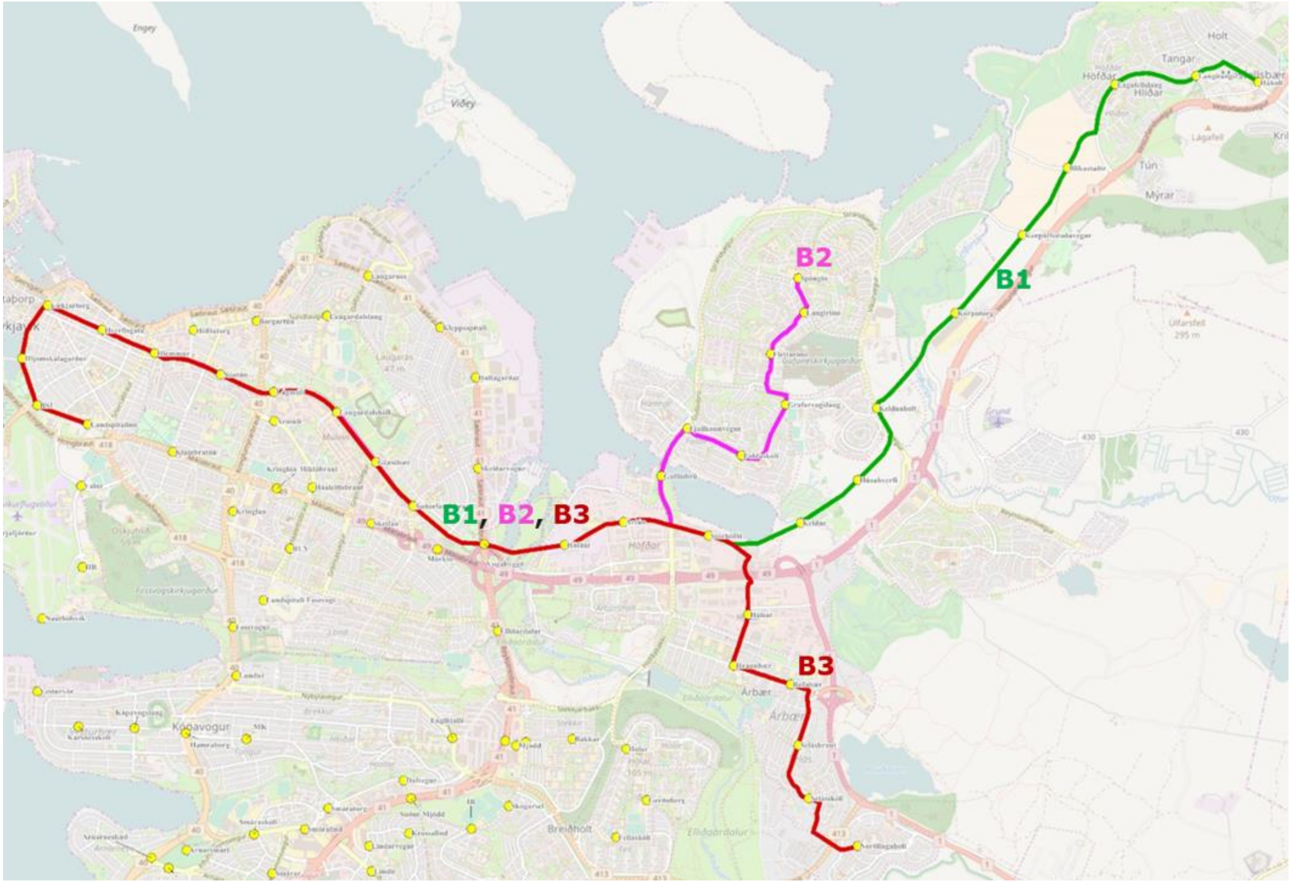


Figure 7 B-corridor alignments.

Table 5 MCA-results for the five alignments within the B-corridor.

Criteria	B(Ártun)	B1	B2	B3
Passenger estimates per km (elasticity model)	**970**	600	**810**	660
Passenger estimates per km (Trip gen. - vision)	**2.190**	1.660	**1.750**	1.620
Catchment area today, inh. per km (400 m)	**1.950**	1.230	**2.060**	1.800
Catchment area, incl. growth potential per km	**3.910**	3.060	**3.720**	3.250
Frequency and capacity		++	++	++
Travel time improvement (min.)		+ (42)	**++ (32)**	**++ (33)**
Coherence		0	0	0
Urban growth potential		**+80 %**	+42 %	+37 %
Construction Cost – total cost index (BRT)		100 %	**84 %**	**88 %**
Construction Cost – total cost index (LRT)		100 %	**86 %**	**88 %**
Physical challenges and risks		÷	÷	÷
Operation costs Borgarlína (hours/year)	**33.000**	67.900	**52.500**	54.100
Bus savings		**+++**	++	++

3.2.1 Elimination of B-alignments

B3 scores among the lowest measuring catchment area, passenger numbers and growth potential. Compared to B2, which is the best scoring of the three alignments, B3 scores lower or similar on every aspect, and is hence eliminated from the process at this stage.

3.2.2 Recommendation of B-alignments

The shared part for the B corridor seems very promising and scores the highest passenger and catchment area levels across all the 16 alignments analysed.

B2 is performing as the best among the three full-length candidates on both passenger estimates and catchment areas as well as travel time improvement and cost wise. Therefore we recommend this alignment for further investigation and for the planning proposal.

B1 has significantly lower performance on most parameters compared to B2. However, a part of the new Regional Development Plan was to connect main cores/centres with a high-class public transport system. Furthermore, the corridor covers the biggest development potential the area east of Ártun. Here Borgarlína could play an important role in developing a full-scale transit oriented development. Based on these two aspect we recommend keeping B1 in the process and the planning proposal. However, we emphasize that much focus should be put into supporting measures for the Borgarlína if B1 is to attract a feasible level of passengers.

The recommendation hence is to bring B1 and B2 into the planning proposal and the further analysis of where to build the most appropriate Borgarlína infrastructure in the first phase.

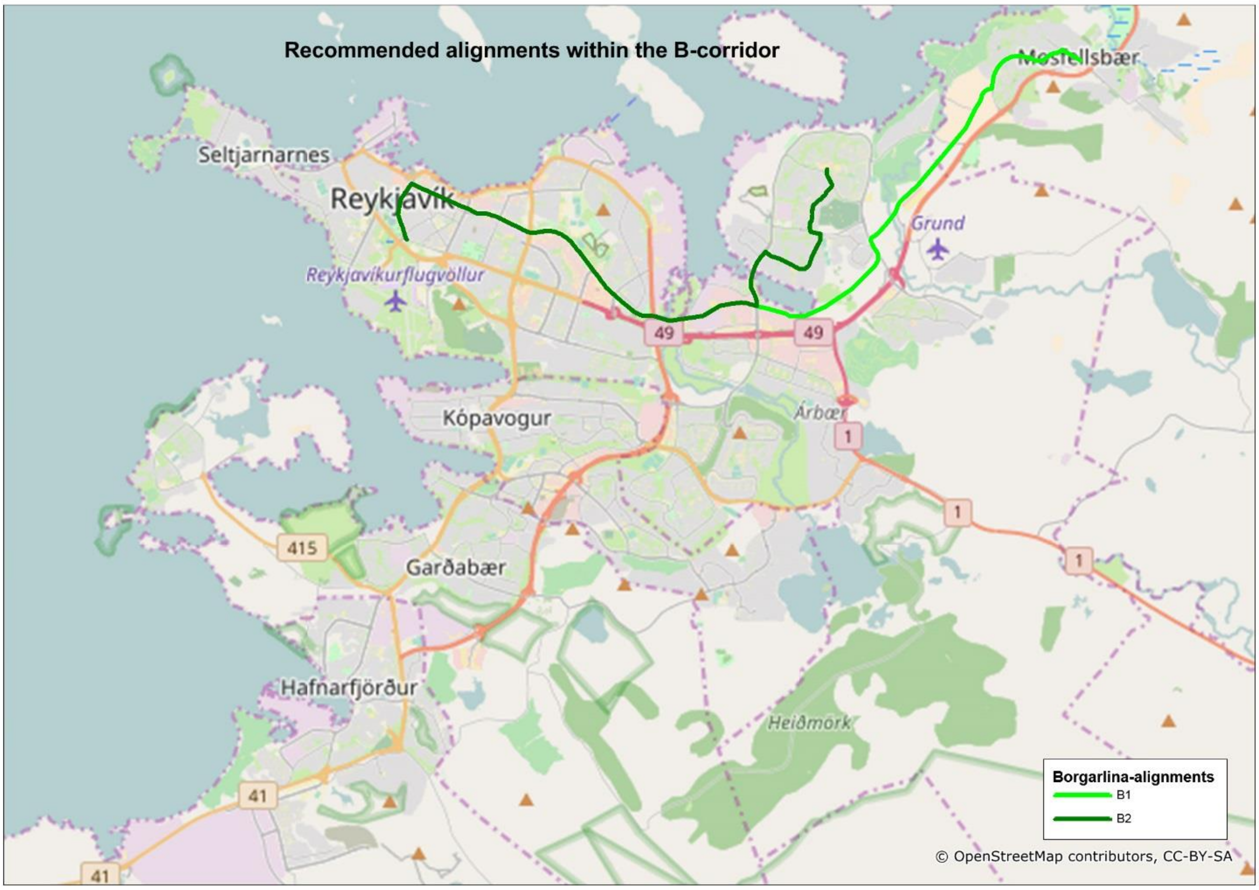


Figure 8 Recommended alignments within the B-corridor.

3.3 C-corridor

The C-corridor has five alignments that are analysed (see Figure 9). C1, C2 and C3 shows radial lines from the city centre to the southeast. C4 and C5 shows options for ring routes connecting the radial lines in the system.

- C1: Hlemmur, BSÍ, Reykjavik University, Hamraborg, , Smáralind, Mjódd and Breiðholt
- C2: Hlemmur, BSÍ, Kringlan, Skeifan, Vogabyggð, Mjódd and Breiðholt
- C3: Hlemmur, BSÍ, Reykjavik University, Hamraborg, Smáralind, Salir, Þing.
- C4: Hlemmur, BSÍ, Reykjavik University, Kársnes, Hamraborg, Smáralind, Mjódd, Vogabyggð, Suðurlandsbraut and Hlemmur
- C5: Hlemmur, University of Iceland, Kársnes, Hamraborg, Smáralind, Skógarsel, Mjódd, Vogabyggð, Sæbraut, Laugardalslaug and Hlemmur

Table 6 Characteristics of the five C-alignments.

	C1	C2	C3	C4	C5
Length (km)	14,2	11,0	13,7	17,8	20,6
Stops	21	17	18	25	29
Travel time (min)	36	28	32	43	50
Avr. speed (km/h)	23,7	23,7	25,4	24,7	24,7

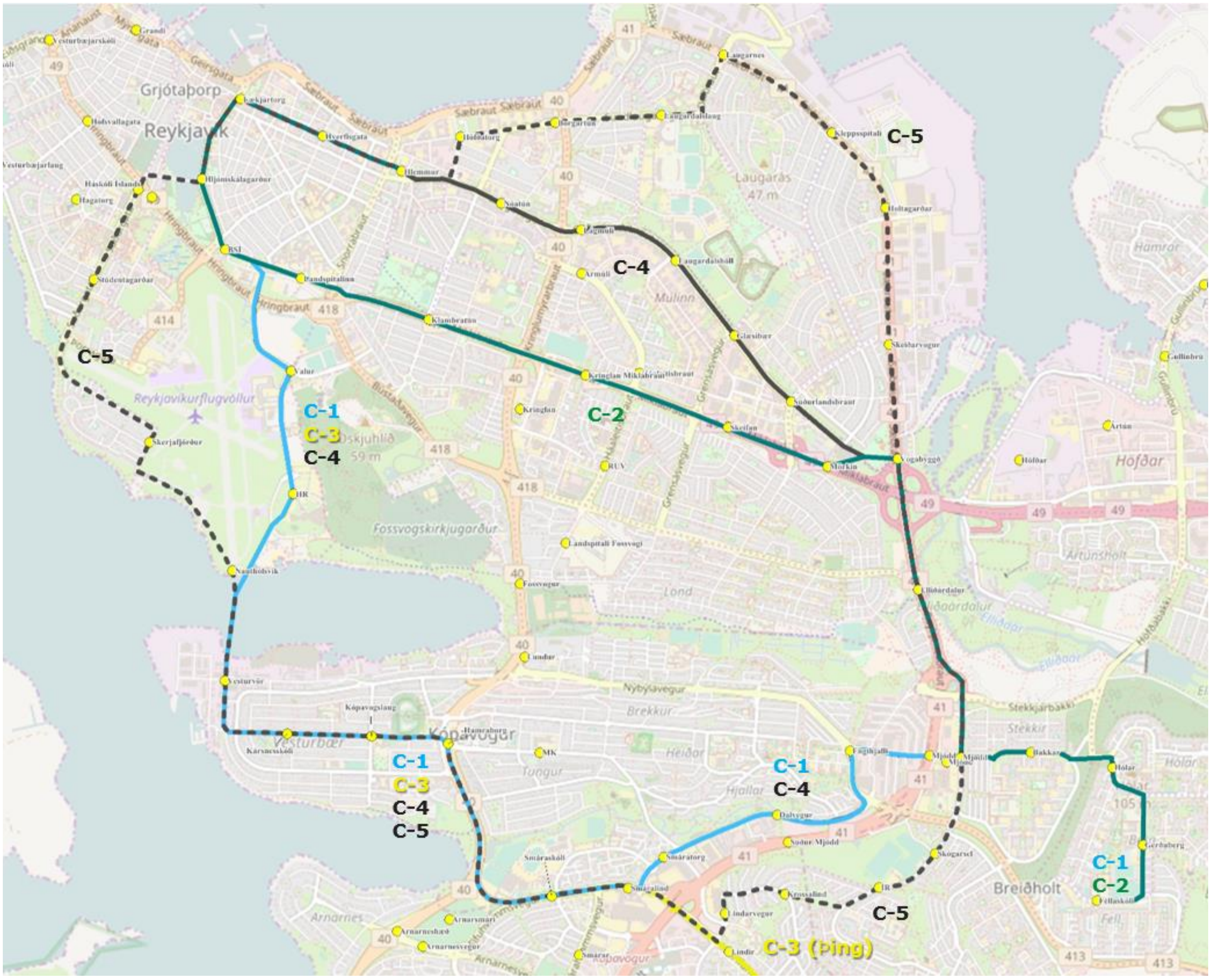


Figure 9 C-corridor alignments.

Table 7 MCA-results for the five alignments within the C-corridor.

Criteria	C1	C2	C3	C4	C5
Passenger estimates per km (elasticity model)	770	**980**	760	660	590
Passenger estimates per km (Trip gen. - vision)	**1.650**	**1.640**	**1.710**	1.450	1.170
Catchment area today, inh. per km (400 m)	2.060	**2.530**	1.850	1.520	1.680
Catchment area, incl. growth potential per km	**3.300**	**3.690**	**3.130**	2.750	2.630
Frequency and capacity	++	+++	++	++	++
Travel time improvement (min.)	0 (36)	**++ (28)**	**++ (32)**	+ (43)	÷ (50)
Coherence	+	+	+	**++**	**++**
Urban growth potential	+37 %	+30 %	**+43 %**	**+42 %**	+36 %
Construction Cost – total cost index (BRT)	100%	**74%**	**89%**	128%	140%
Construction Cost – total cost index (LRT)	100 %	**93 %**	98 %	113 %	122 %
Physical challenges and risks	÷÷÷	÷÷	÷÷÷	÷÷÷	÷÷÷
Operation costs Borgarlína (hours/year)	58.600	**45.000**	52.500	70.300	81.300
Bus savings	**+++**	**+++**	**+++**	+	0

3.3.1 Elimination of C-alignments

C4 and C5 performs lower than the other C-alignments for passenger estimates and catchment areas. In addition the construction costs of these alignments are high and the bus saving potential is assessed to be low. Hence we recommend eliminating these alternatives for the further analysis. We would however like to emphasise the importance of good bus service connecting the radial lines – it just does not seem to have potential for a full scale Borgarlína.

C1 and C2 are similar in start- and end destination and the only difference is whether to serve Smáralind, Kársnes and the city airport area or Skeifan and Kringlan on the route between Mjódd and BSÍ. Comparing these two alignments C2 proves to have the highest passenger estimate and catchment area, while travel time, construction and operation costs also favours this alignment. The risks on C1 crossing Kársnes and the city airport should also be taken into account. Hence we recommend C2 as the best option to bring into the planning proposal, while C1 is eliminated.

3.3.2 Recommendation of C-alignments

C2 is recommended due to higher catchment area and passenger potential.

C3 is recommended due to potential high passenger numbers and the travel time improvement. They both has good conditions for bus savings.

C3 still has the risk of whether the Reykjavík city airport is ready to be transformed within the early stages of the Borgarlína project and whether the bridge between Kársnes and the Reykjavík city airport will be build. But this alignment seems as the most appropriate for a Kársnes-city airport connection due to the radial routing and offering direct bus service to both the Reykjavík city centre and Smáralind.

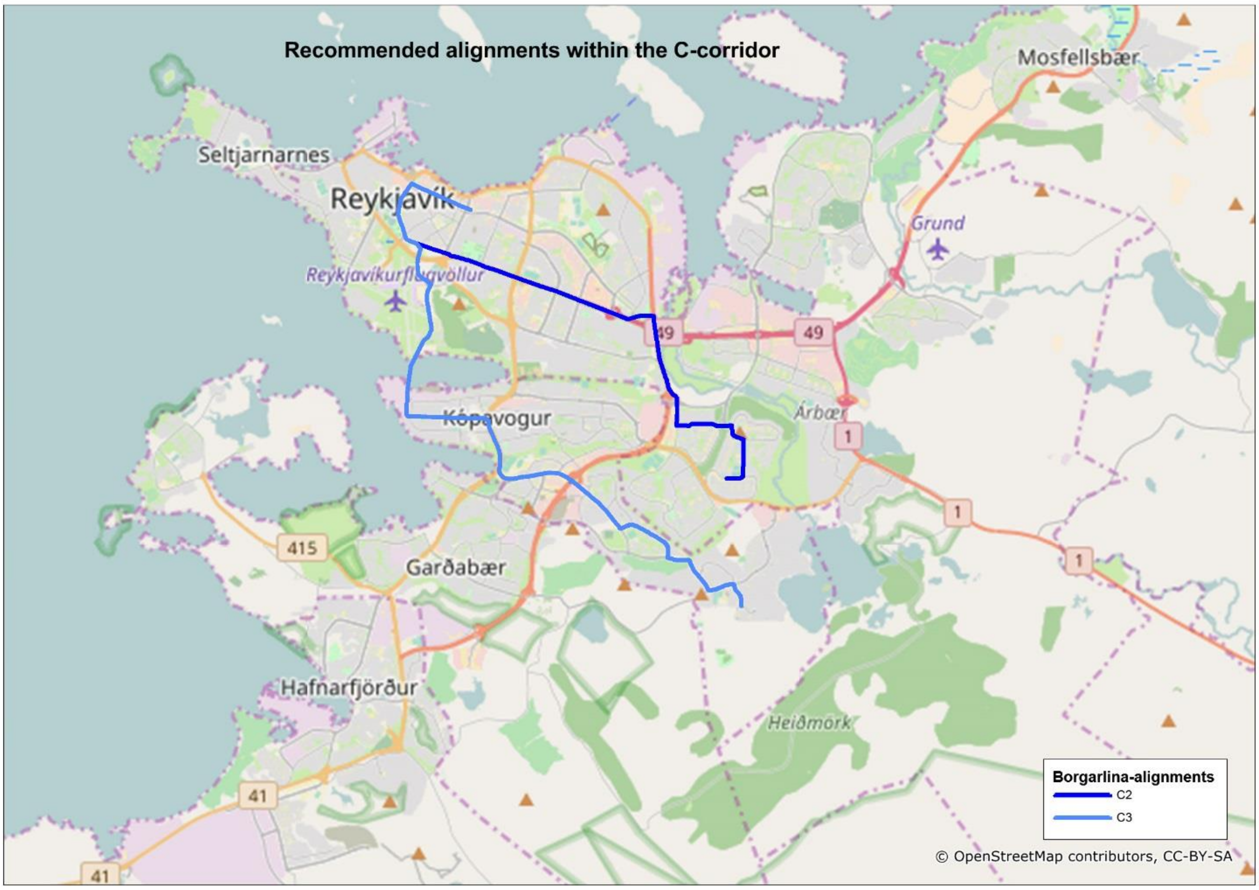


Figure 10 Recommended alignments within the C-corridor.

3.4 D-corridor

The D-corridor has three alignments that are analysed (see Figure 11);

- D1: Eiðistorg, Ánanaust, Grandi, and Lækjartorg
- D2: Eiðistorg, Hringbraut, University of Iceland and BSÍ
- D3: Eiðistorg, Nesvegur, University of Iceland and BSÍ

Table 8 Characteristics of the three D-alignments.

	D1	D2	D3
Length (km)	2,9	3,3	3,2
Stops	5	6	6
Travel time (min)	7	8	8
Avr. speed (km/h)	25,8	24,8	24,1

Figure 11 D-corridor alignments.

Table 9 MCA-results for the five alignments within the D-corridor.

Criteria	D1	D2	D3
Passenger estimates per km (elasticity model)	810	**1.110**	970
Passenger estimates per km (Trip gen. - vision)	1.470	**1.630**	1.270
Catchment area today, inh. per km (400 m)	3.200	**3.510**	2.700
Catchment area, incl. growth potential per km	3.820	**4.890**	3.830
Frequency and capacity	+++	+++	+++
Travel time improvement (min.)	+++ (7)	+++ (8)	+++ (8)
Coherence	++	++	++
Urban growth potential	+17 %	**+40 %**	**+44 %**
Construction Cost – total cost index (BRT)	**100 %**	127 %	127 %
Construction Cost – total cost index (LRT)	100 %	105 %	102 %
Physical challenges and risks	0	0	0
Operation costs Borgarlína (hours/year)	**10.800**	13.000	13.600
Bus savings	0	0	0

3.4.1 Elimination of D-alignments

D1 and D3 is eliminated. See arguments below.

3.4.2 Recommendation of D-alignments

D2 is performing higher than D1 and D3 looking at both catchment area and passenger estimates. This is the best argument for recommending the D2 and thereby eliminating D1 and D3. For the other criteria the three alignments are not differing much.

The passenger numbers are the reason for investing in Borgarlína combined with the transit-oriented development, which D2 offers with a high urban growth potential.

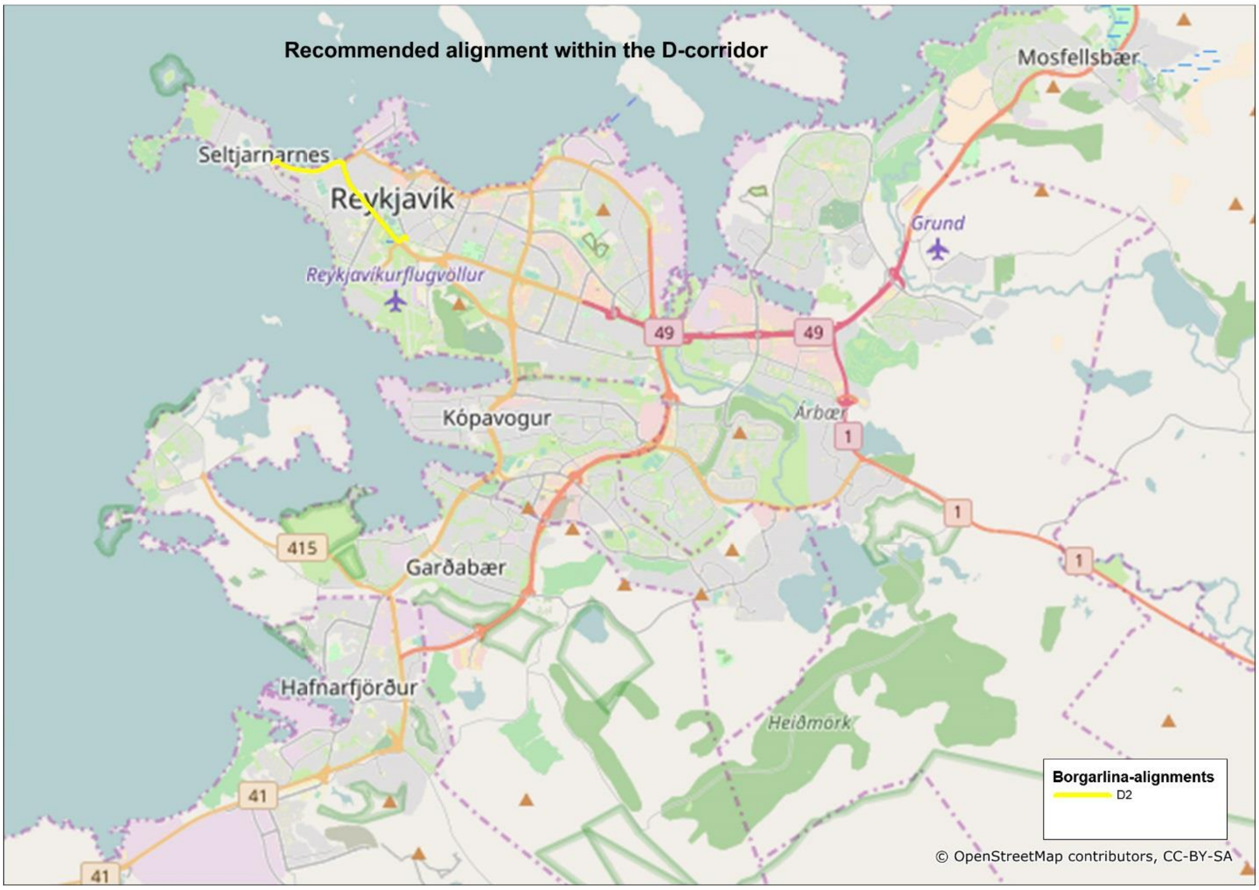


Figure 12 Recommended alignment within the D-corridor.

4 Recommendation for further process

Based on the MCA seven alignments are recommended to be presented as part of the planning proposal and for the further analyse. This ends up recommending the most appropriate first phase to be build and possible next phases of the Borgarlína.

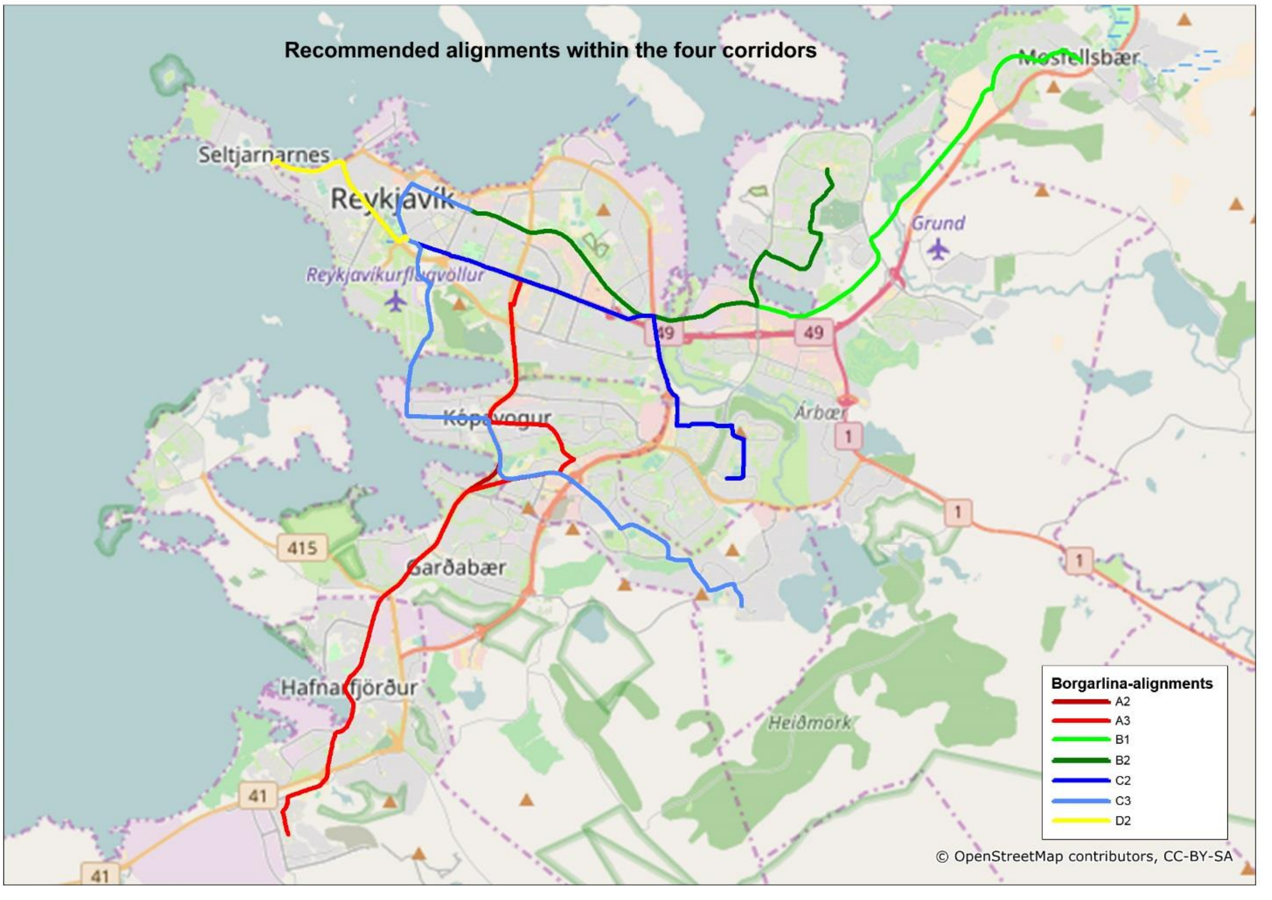


Figure 13 Recommended alignment within the four corridors.

Table 10 MCA-results for the five alignments within the four corridors.

Criteria	A2	A3	B1	B2	C2	C3	D2
Passenger estimates per km (elasticity model)	800	700	600	810	980	760	1.110
Passenger estimates per km (Trip gen. - vision)	1.460	1.520	1.660	1.750	1.640	1.710	1.630
Catchment area today, inh. per km (400 m)	1.900	1.910	1.230	2.060	2.530	1.850	3.510
Catchment area, incl. growth potential per km	2.810	2.830	3.060	3.720	3.690	3.130	4.890
Frequency and capacity	++	++	++	++	+++	++	+++
Travel time improvement (min.)	+++ (34)	+ (41)	+ (42)	++ (32)	++ (28)	++ (32)	+++ (8)
Coherence	0	+	0	0	+	+	++
Urban growth potential	+35 %	+34 %	+80 %	+42 %	+30 %	+43 %	+40 %
Construction Cost – total cost index (BRT)	99%	103%	100 %	84 %	74%	89%	127 %
Construction Cost – total cost index (LRT)	99 %	105 %	100 %	86 %	93 %	98 %	105 %
Physical challenges and risks	÷	÷	÷	÷	÷÷	÷÷÷	0
Operation costs Borgarlína (hours/year)	55.600	66.600	67.900	52.500	45.000	52.500	13.000
Bus savings	+++	+++	+++	++	+++	+++	0

4.1 BRT or LRT

The decision of whether to discuss BRT (bus rapid transit) or LRT (light rail) depends on many things – but in the end the passenger numbers and the costs (operation and construction) is the heaviest arguments for this decision.

Bergen looked into the key figures for light rails around Europe and found a benchmark that is used for them to decide whether to decide for a BRT or LRT system. This benchmark is looking at the passenger numbers per km and secondary the number of inhabitants within a 400 m catchment area.

The primary benchmark in Bergen is:

- +3.500 passengers/km: Clear LRT recommendation

- +2.000 passengers/km: Possible light rail if other major motives speaks for it;

  - high chance of further development
  - the wish to lift an area
  - create a possible system effect

- +1.000 passengers/km: BRT recommendation

The secondary benchmark in Bergen is:

- +2.000 inhabitants/km (400 m catchment area): Possible light rail

None of the Borgarlína alignments gets near the threshold for clear LRT recommendation. Some of the alignments are close to the lower threshold (+2.000 passengers per km) that could argue for a possible LRT recommendation and the mutual part of the B alignment (BSÍ – Hlemmur) reach it, using the vision model for estimating the passenger numbers. But none are even close that benchmark using the elasticity model.

The passenger numbers clearly argues for a BRT – depending on the passenger estimate model. The vision model clearly argues for a BRT and the elasticity model are close to a BRT recommendation.

This argues for that the BRT system to be build, and strongly be supported by measures that are required to boost the passenger potential, such that future development to LRT is possible. This means that Borgarlína should be supported by densification (transit oriented development) around the high-class public transport stations, prioritising the public transport at the expense of the car traffic, restrictive parking policy and strategy and make the good conditions for supporting the high-class public transport (feeder bus service, bike and ride, walking paths, park and ride etc.) to become a success.