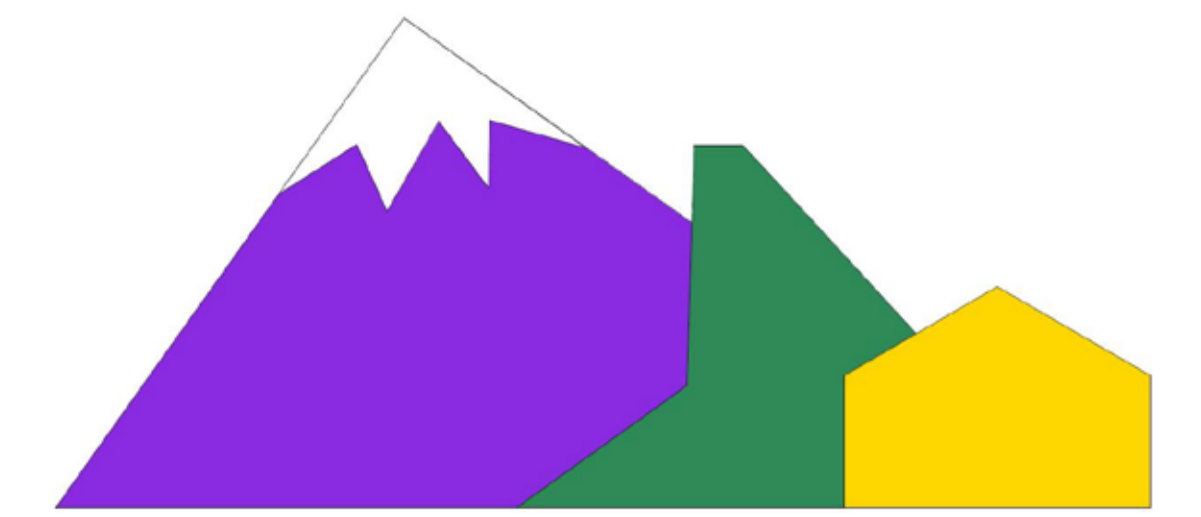


Avalanche protection measures in Iceland



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3. - 5. April 2019, Siglufjörður Iceland

Deflecting dams, catching dams and braking mounds

Government Construction Contracting Agency, Borgartún 7a, 105 Reykjavík
Ministry for the Environment and Natural Resources, Skuggasund 1, 101 Reykjavík

Snow avalanche protection											
	Type	Construction period	Upstream dam height	Dam length	Fill volume of dam		Type	Construction period	Upstream dam height	Dam length	Fill volume of dam
			m	m	m ³ x1,000				m	m	m ³ x1,000
Flateyri	D/L	1996–1998	15–20	1,200	750	Bolungarvík, 1	C/R	2008–2012	22	720	380
Flateyri	C/L	1996–1998	10	280	50	Ólafsfjörður	D/L	2009–2010	12,2–13,2	340	150
Siglufjörður, Strengsgil	D/L	1998–1999	15–18	700	400	Bolungarvík, 2	C/R	2011–2012	11,5	250	40
Siglufjörður, Jörundarskál	D/L	1998–1999	15–18	200	100	Ísafjörður, Kubbi	C/R	2011–2012	18	350	110
Norðfjörður, Drangagil	C/R	1999–2002	15	400	260	Norðfjörður, Tröllagil	C/R	2012–2015	18,5	640	280
Ísafjörður, Funi	C/R	1999–2002	10	100	30	Norðfjörður, Tröllagil	D/L	2012–2015	17	350	175
Ísafjörður, Seljalandadalur	D/L	2003–2004	13,5–16	700	370	Ísafjörður, Gleiðarhjalli, 1	C/R	2013–2015	14	310	130
Seyðisfjörður, Bjólfur	D/R	2003–2004	20	190	65	Patreksfjörður, Klif	C/R	2013–2015	12	325	70
Seyðisfjörður, Bjólfur	C/R	2003–2004	20	450	150	Fáskrúðsfjörður	D/C/R	2013–2014	7,5	200+70	7
Siglufjörður, Ríplar	C/R	2003–2008	up to 15	2,500	440	Ísafjörður, Gleiðarhjalli, 2	C/R	2014	0–14	185	40
Siglufjörður, Kálfur	D/L	2003–2008	9	200	9	Ísafjörður, Gleiðarhjalli, 3	C/R	2014–2015	5,7–7,3	150	15
Fljótisdalur, Teigsbjarg	C/R	2006–2007	9–13,5	60	40	Eskifjörður, Bleiksá	D/R	2014–2015	3,2	150	1
Bíldudalur, Búðargil	D/R	2008–2010	22	300+50	75						

D/L – deflecting dam, loose materials
C/L – catching dam, loose materials
D/R – deflecting dam, reinforced upper dam side
C/R – catching dam, reinforced upper dam side

Since the beginning of the twentieth century, snow avalanches and landslides in Iceland have caused 210 fatalities. Snow avalanches were responsible for 170 deaths, mostly in coastal villages situated below steep hillsides in narrow fjords.

In 1995, catastrophic avalanches in the villages of Súðavík and Flateyri claimed 34 lives and caused extensive economic losses. Consequently, the Icelandic government undertook a comprehensive assessment of avalanche risk. Protection measures were commissioned in potentially hazardous areas, and endangered property was purchased in some cases, in order to improve the safety of people and reduce losses caused by future avalanches.



Figure 1. Slushflow protection measures in the river Hlíðarendá in Eskifjörður, E-Iceland.



Figure 2. Slushflow protecting measures in Fáskrúðsfjörður, E-Iceland.



Figure 3. Deflecting dams at Flateyri, W-Iceland.

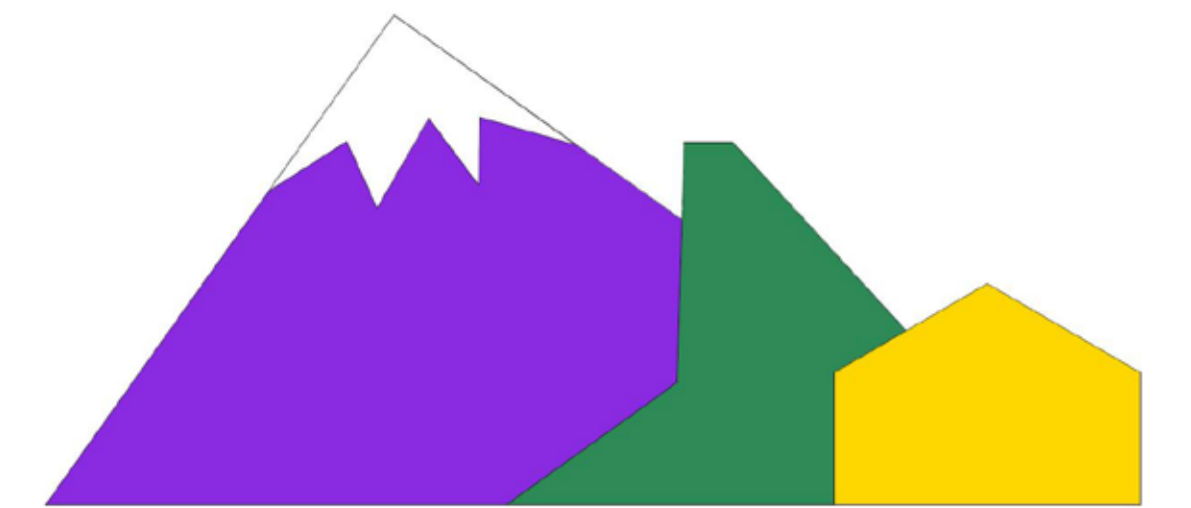


Figure 4. Catching dams in Siglufjörður, N-Iceland.



Figure 5. Catching dam, deflecting dam and braking mounds in Neskaupstaður, E-Iceland.

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Supporting structures and snow fences

Government Construction Contracting Agency, Borgartún 7a, 105 Reykjavík
Ministry for the Environment and Natural Resources, Skuggasund 1, 101 Reykjavík

Supporting structures

	m ²	m	Type	Completed
Siglufjörður				
Grindagil	732	210	snow bridges/nets	1996
Phase 1	2,170	620	snow bridges	2003
Phase 2	6,397	1,525	snow bridges	2015
Phase 3	9,438	2,272	snow bridges	2018
Ólafsvík				
Tvísteinahlíð	1,373	366	snow bridges	2009
Neskaupstaður				
Tröllagil	6,675	1,845	snow bridges	2013
Drangagil	4,140	940	nets	2002
Ísafjörður				
Kubbi	6,018	1,892	snow bridges	2018
Patreksfjörður				
Brellur	720	240	snow fences	2018

Since 2003, supporting structures, snow fences, windbreakers and snow nets have been installed in five locations in Iceland, i.e. Siglufjörður, Neskaupstaður, Ísafjörður, Ólafsvík and Patreksfjörður. The total structure length is 9.7 km.



Figure 1. Windbreaker in Siglufjörður, N-Iceland.



Figure 2. Supporting structures in Ólafsvík, W-Iceland.



Figure 3. Supporting structures in Siglufjörður, N-Iceland.



Figure 4. Supporting structures in Ísafjörður, NW-Iceland.



Figure 5. Snow nets in Neskaupstaður, E-Iceland.



Figure 6. Supporting structures in Neskaupstaður, E-Iceland.



Figure 7. Snow fences in Patreksfjörður, NW-Iceland.

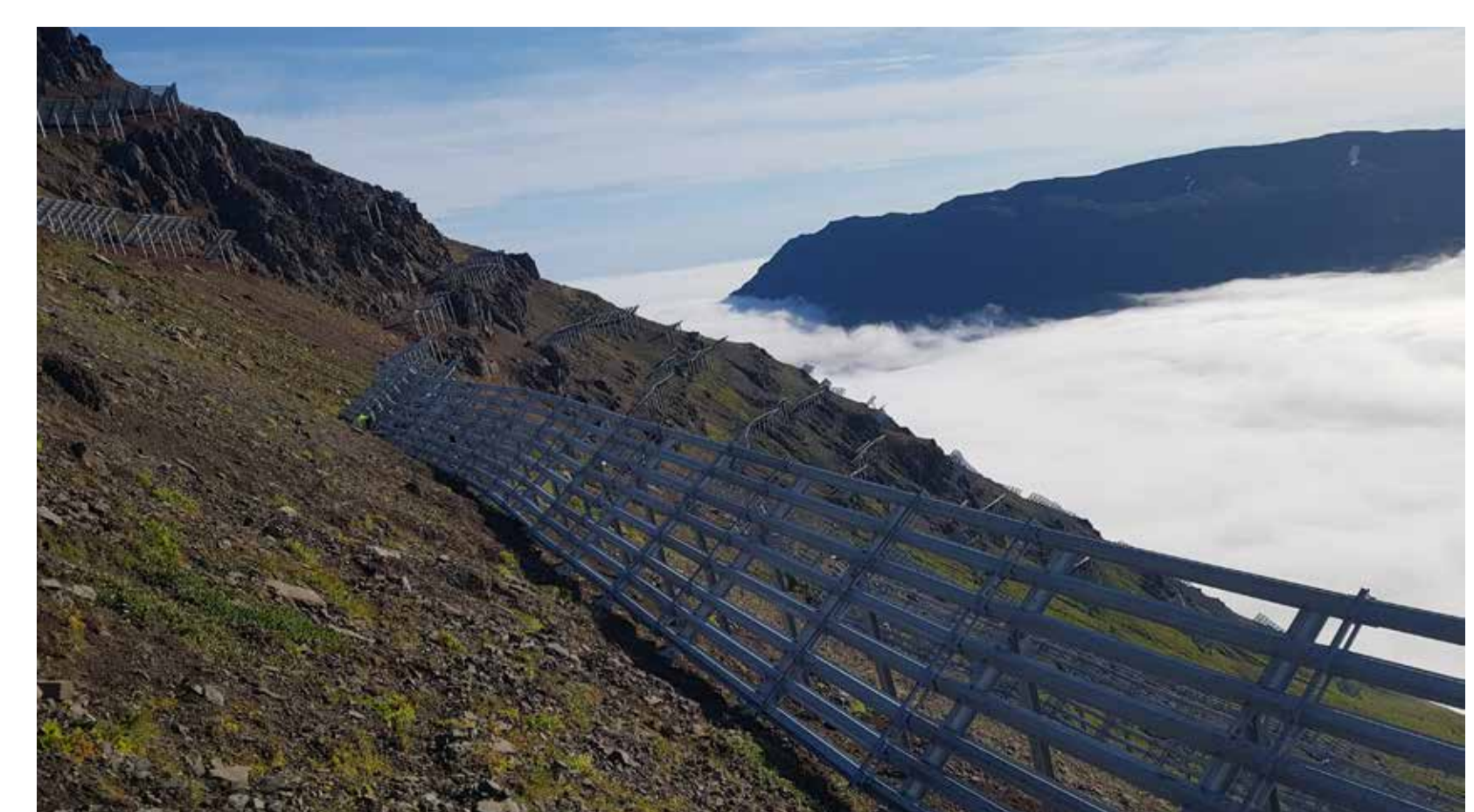
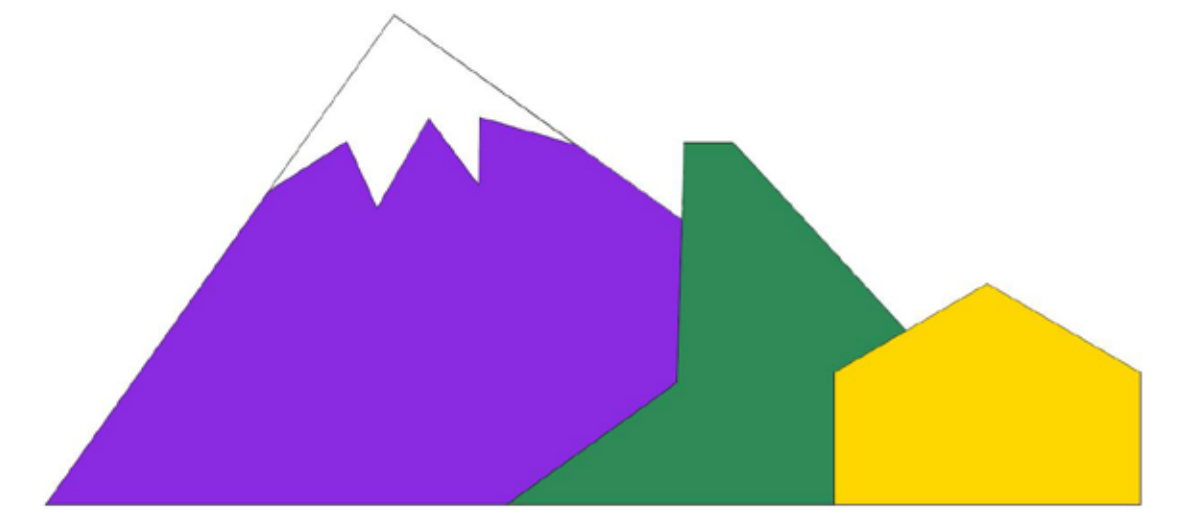


Figure 8. Supporting structures in Siglufjörður, N-Iceland.

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Upcoming projects

Government Construction Contracting Agency, Borgartún 7a, 105 Reykjavík
Ministry for the Environment and Natural Resources, Skuggasund 1, 101 Reykjavík

Examples of projects in the planning stage:

Catching dams and braking mounds under Urðarbotnar and Sniðgil and Nes- and Bakkagil in Neskaupstaður, E-Iceland. Deflecting dams and catching dams at Urðir, Hólar and Mýrar in Patreksfjörður, NW-Iceland, at Aldan and Bakkar in the Bjölfur area in Seyðisfjörður, E-Iceland, and in several areas in Bíldudalur, NW-Iceland. Deflecting dams in Tálknafjörður, NW-Iceland, and supporting structures in Siglufjörður, N-Iceland, and in Hnífsdalur, NW-Iceland. Furthermore, some torrent protection measures in the rivers Lambeyrará and Grjóta in Eskifjörður, E-Iceland.



Figure 1. Planned catching dams and braking mounds under Urðarbotnar and Sniðgil and Nes- and Bakkagil in Neskaupstaður, E-Iceland.

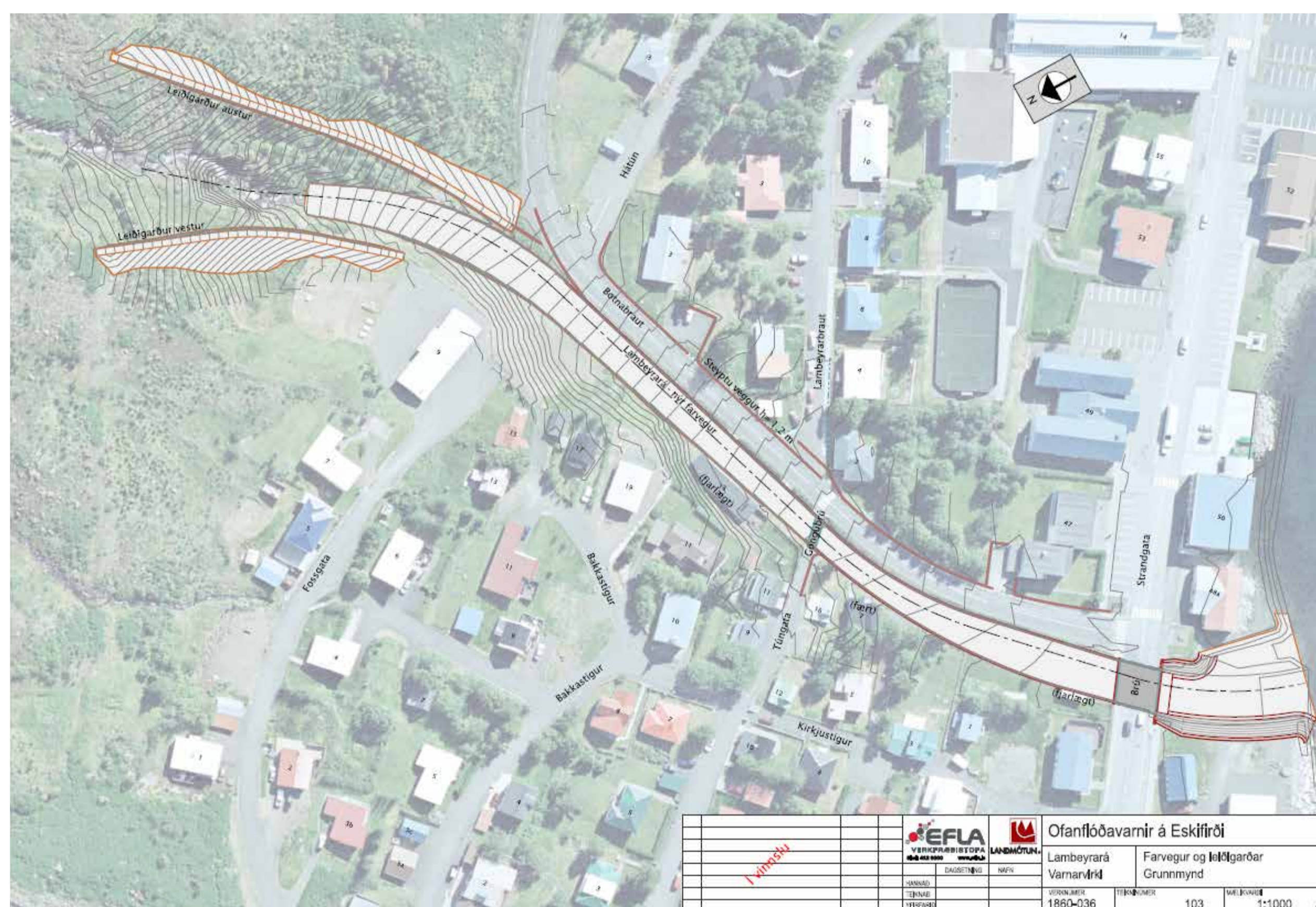


Figure 2. Planned slushflow protection measures in the river Lambeyrará in Eskifjörður, E-Iceland.



Figure 3. Planned deflecting dams and catching dams in Patreksfjörður, NW-Iceland.



Figure 4. Planned deflecting dams and catching dams in Seyðisfjörður, E-Iceland.



Figure 5. Plan for phase 4 of supporting structures in Siglufjörður, N-Iceland.