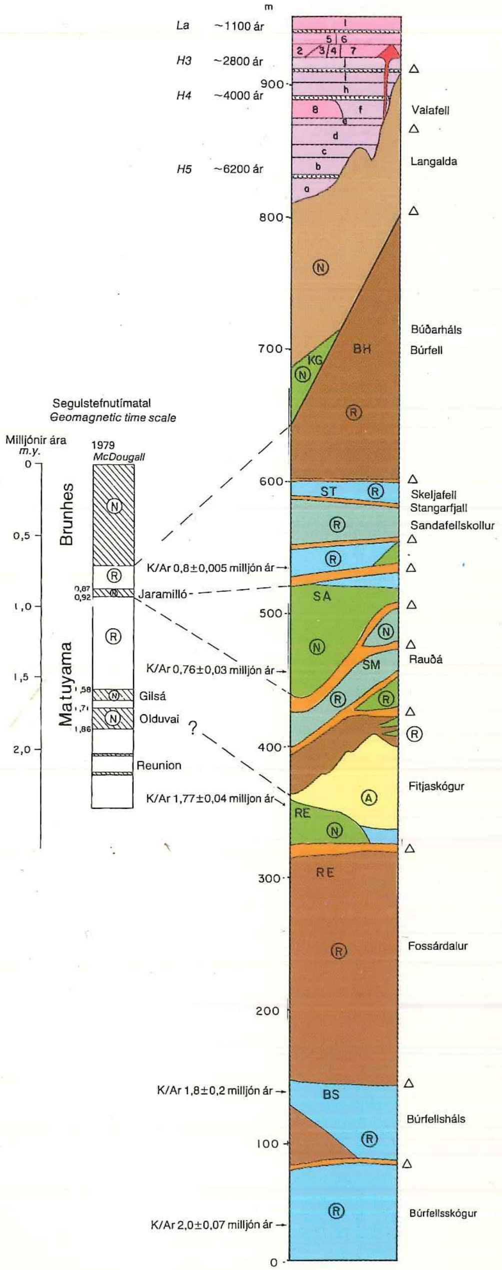
BÚRFELL - LANGALDA
Súlusnið / Strata column



SKÝRINGAR/*LEGEND*

- Þóleiít / *Tholeiite*
- Ólivínbasalt / *Olivine basalt*
- Dílabasalt / *Porphyritic basalt*
- Súrt berg / *Acid rock*
- Setberg / *Sedimentary rock*
- Móberg >0,7 milljón ára / *Hyaloclastites >0,7 m.y.*
- Móberg <0,7 milljón ára / *Hyaloclastites <0,7 m.y.*
- Tungnárhraun TH / *Tungnárhraun lava flow TH*
- Hraun frá Heklukerfi HH / *Hekla lava flows HH*
- Gígar / *Craters*

Myndanir/*Rock formations*

BS BÚRFELLSSKÓGSMYNDUN
RE REYKHOLTSMYNDUN
SA SANDAFELLSMYNDUN
ST STANGARFJALLSMYNDUN
KG BÚÐARHÁLSMYNDUN
BH KÖLDUKVÍSLARMYNDUN

△ Jökulberg / *Tillite horizon*

H3, H4, H5 Gjóskulög frá Heklu / *Tephra layers from Hekla used for correlation*

La Landnámslag / *Settlement tephra layer used for correlation*

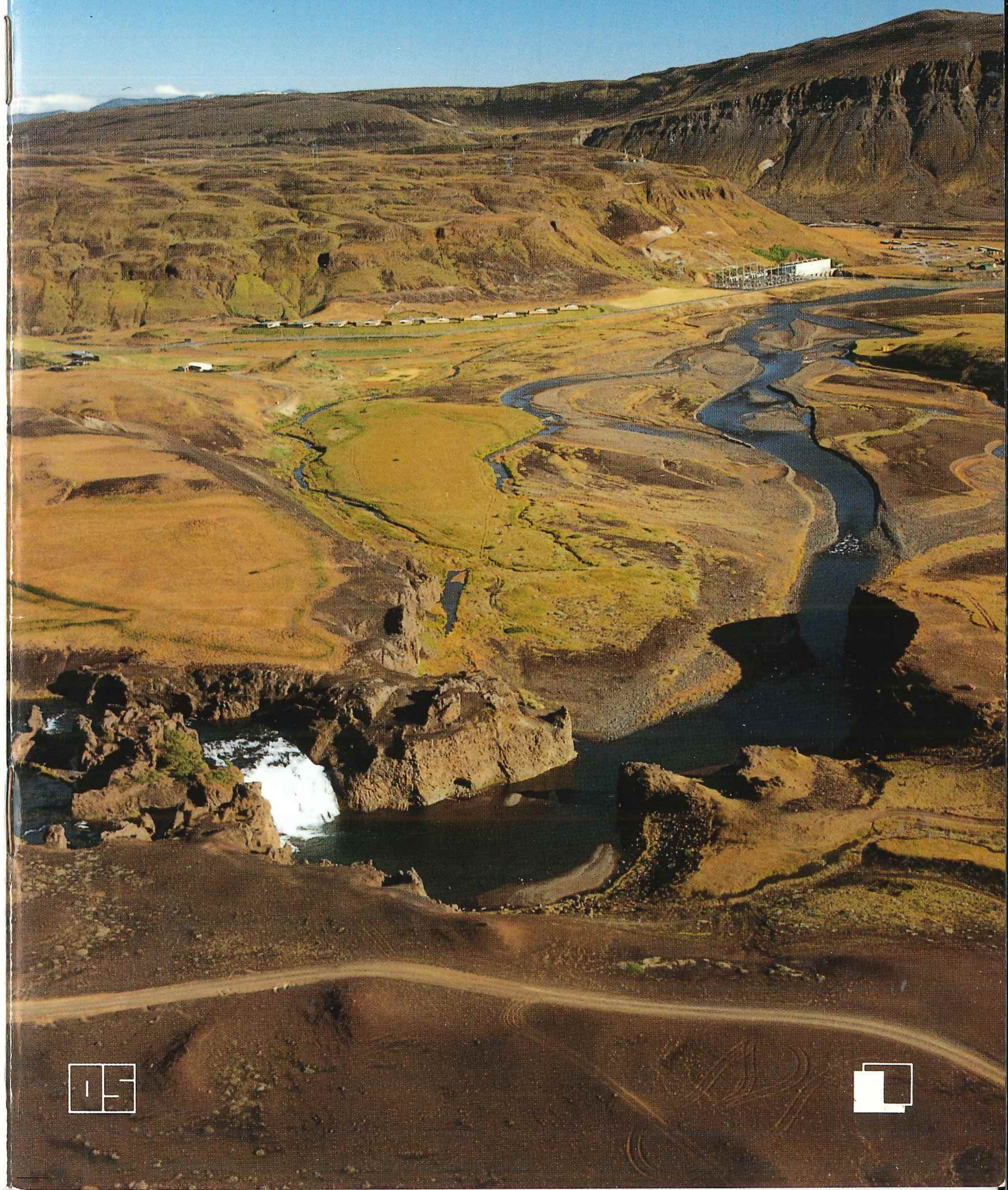
Segulstefna/*Geomagnetic polarity*

Ⓝ Rétt/*Normal*
Ⓡ Öfug/*Reverse*
Ⓐ Óviss/*Anomal*

STRATIGRAPHIC COLUMN

The figure shows a simplified section of the stratigraphic sequence of the mapped area. The reader faces the north and the main features are shown so that beds growing in thickness to the right are to be found mainly to the east on the bedrock map and vice versa. The oldest beds are found at the bottom, the youngest at the top. To the left of the column is a time scale based on geomagnetic reversals. The broken lines are drawn to show the most likely correlation between the time scale and the stratighrapic units, also supported by some potassium/argon datings. The uppermost part of the column shows the postglacial lava flows which originate either in the Veiðivötn or Hekla volcanic systems. Craters belonging to the latter system are within the boundary of the map. The lava flows have been dated by tephrochronological methods supported by carbon-14 datings.

BÚRFELL - LANGALDA
GEOLOGICAL MAPS



GLOSSARY

ACID ROCK: Igneous rock composed predominantly of light-coloured minerals of low specific gravity. SiO_2 is higher than 65%.

AQUIFER: A body of geological material which can yield water in significant quantities.

ARTESIAN BASIN: A regional geological feature to which water is confined under pressure greater than the atmospheric.

ARTESIAN GROUNDWATER: Water under confined conditions.

CONE SHEET: A dyke that is arcuate in plan and dips gently toward the center of an arc. It occurs in concentric sets which presumably converge (by projection) at a magmatic center.

DIP: The angle that a structural surface, e.g. a bedding or a fault plane makes with the horizontal, measured perpendicular to the strike of the structure (see also strike).

DRUMLIN: Elongated, streamlined ridge or hill mostly of glacial till, with its long axis parallel to the direction of the movement of the ice.

DYKE: A tabular igneous intrusion that cuts across the planar structures of the surrounding rock. Dykes are often associated with eruptions, as feeder dykes.

END-MORAINE: A ridge consisting of glacial till or drift, formed at a glacier margin, either by a glacial standstill or readvance.

ERRATIC: Large block transported by glacier ice, sometimes over a considerable distance from its place of origin.

ESKER: A long, sinuous ridge, consisting of glaciofluvial material that was deposited in a tunnel in or beneath a retreating glacier, or in a proglacial lake.

FAULT: A surface or zone of rock fracture along which there has been a displacement, from a few cm to a few km in scale.

GLOSSARY CONTINUED ON INSIDE BACK COVER

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Snorri Páll Snorrason: Pages 9 and 14

Front-page: Aerial photo looking east over the Hjálparfoss waterfall in Þjórsárdalur. Sámsstaðamúli, and the Búrfell Power Station are in the background.

BÚRFELL – LANGALDA

BEDROCK
3540B
Elsa G. Vilmundardóttir

SUPERFICIAL DEPOSITS
3540J
Ingibjörg Kaldal

HYDROGEOLOGY
3540V
Árni Hjartarson

INTRODUCTION

The National Energy Authority (NEA) and the National Power Company are jointly undertaking the geological mapping of the upper part of the Þjórsá drainage area. The maps are in the scale 1:50,000. Three types of geological maps are to be prepared because of the wealth of information. They are:

BEDROCK MAPS
MAPS OF SUPERFICIAL DEPOSITS
HYDROGEOLOGICAL MAPS

The first series of these maps were issued in 1983 (bedrock map) and 1986 (superficial deposits and hydrogeology). Their location is shown on the key map below.

Three hydro-power stations have been built within the Þjórsá drainage system so far, i.e.: Búrfell (210 MW), Hrauneyjafoss (210 MW), and Sigalda (150 MW).

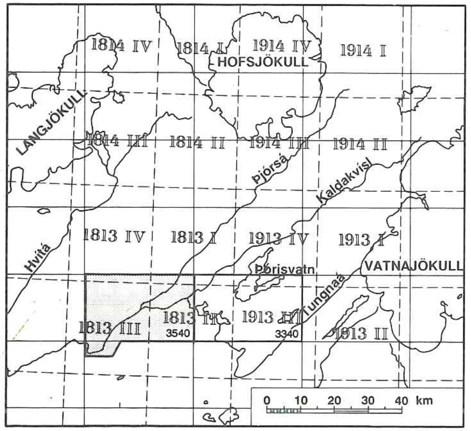
Lake Þórisvatn is the main reservoir for these power stations, and some rivers have been diverted into the reservoir by the dams of Kvíslaveita.

The upper part of the Þjórsá drainage system is within the uninhabited Central Iceland.

The field work, design and drafting of the maps was done by the geological mapping team at the Hydropower Division of the NEA. A great effort was made in order to establish standard colors and symbols as a basis for further geological mapping.

The maps of superficial deposits and the hydrogeology were made in accordance with this new standard, but the bedrock map was issued before the standard was fully developed. All later maps will be according to the new standard.

THE BASE MAP



The base map, showing contours, drainage systems, constructions, etc. is based on the NEA maps in the scale 1:20,000. Except that the south east corner is taken from maps in the scale 1:50,000 by the US Army Map Service, as this area is not covered by the NEA maps.

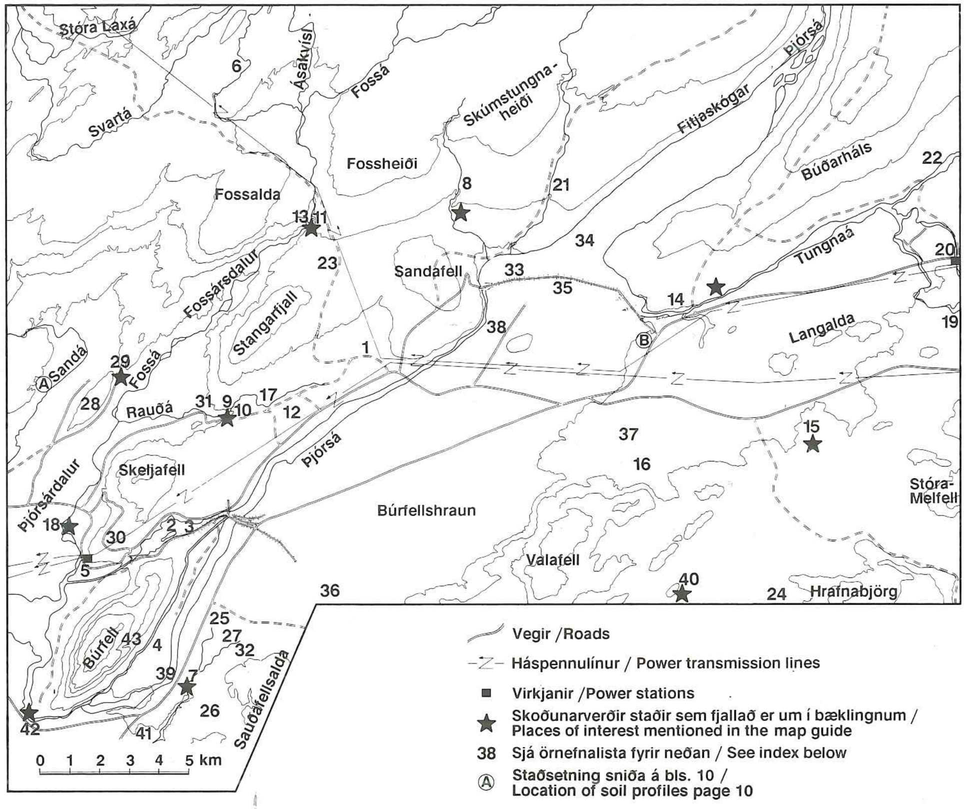
The map on the figure shows the boundaries of the NEA maps with solid lines. This map division was in use when the first geological maps were made. In the meantime the division of the maps has been altered as shown by the broken lines and the new map boundaries have been acknowledged by the NEA and the National Power Company as well as the Geodedic Survey of Iceland. The new division will be used on all maps that follow sheet 3340, but the geological and hydrogeological symbols will remain unchanged.

PRACTICAL USE OF THE MAPS

The maps could be of practical use in many ways:

- The bedrock maps show the foundations and aid the design of buildings above and below the surface.
- The maps of superficial deposits are of great use in locating and utilizing construction materials such as sand and gravel.
- The hydrogeological maps provide the characteristics of surface water and groundwater. They show the permeability of the bedrock, surficial water discharge, as well as springs and groundwater flow.
- The maps provide an important basis for many kinds of specialized research. They are also essential for the evaluation of natural hazards such as volcanic eruptions, floods, and landslides.
- In addition they are important for various planning and utilisation of land and the natural resources.
- Furthermore, the maps are useful for students, tourists and others who seek information on the geological history of the country.

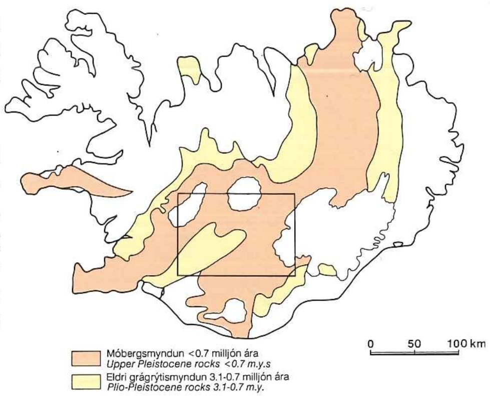
KEY MAP AND INDEX

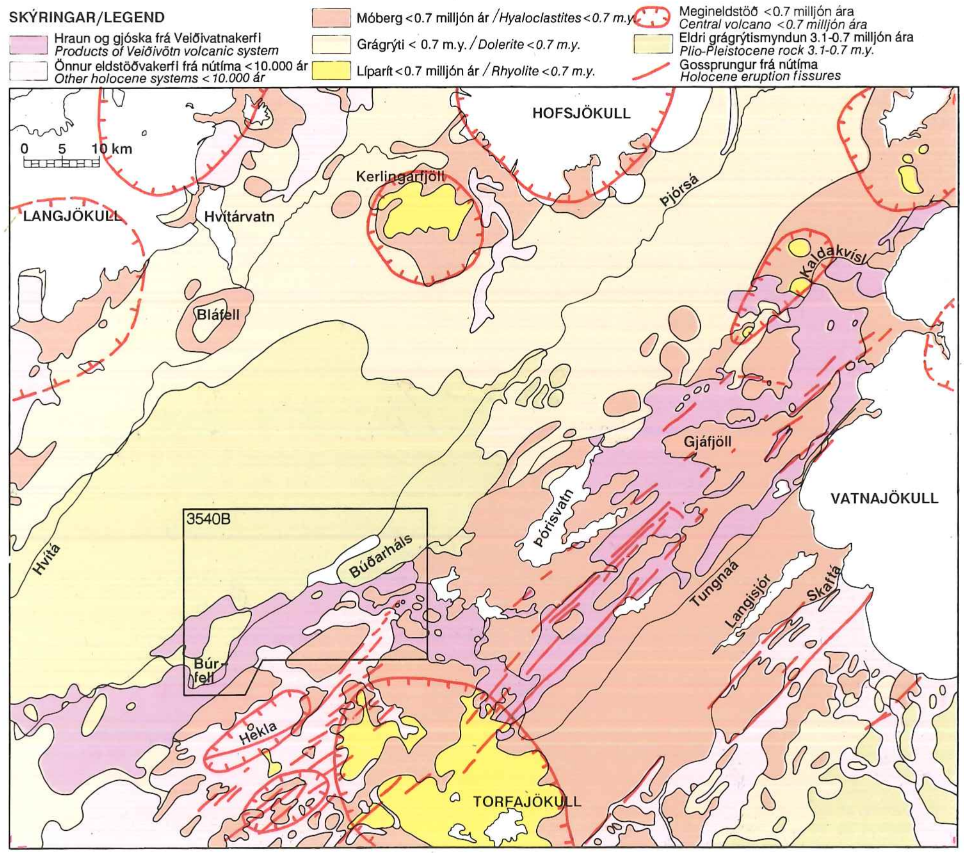


THE BEDROCK

The figure shows a simplified geological map of Iceland. The larger frame shows the area on the map below, and the smaller frame shows the mapped area.

The bedrock on the map below was formed during the Ice Age (Plio-Pleistocene and Holocene) and is less than 3.1 million years old. Climatic changes have been frequent with long periods of glaciation and shorter warmer interglacial periods. The stratigraphical column on the back cover shows schematically the main features of the bedrock geology.





PLIO-PLEISTOCENE ROCK 3.1-0.7 M.Y.

The area west of river Þjórsá belongs to the Plio-Pleistocene series (3.1-0.7 m.y.), and the part of it which lies within the boundaries of the map is between 2.0 and 0.7 m.y. The main dating techniques used in this work are: Mapping of geomagnetic reversals and potassium/argon dating of the rocks.

Remnants of an extinct central volcano are found in the valleys of Þjórsárdalur and Fossárdalur. The volcano is characterized by acid and intermediate rocks (rhyolites and andesites), cone sheets and prominent hydrothermal alteration on both sides of the Fossárdalur valley. The central volcano is thought to have been active around 1.5-2 million years ago.

Eight tillite horizons have been found in the Plio-Pleistocene series. Accumulation of volcanic material and erosion alternated throughout this period. During the glaciations, glaciers carved out valleys in the volcanic pile, especially near the boundaries between the highlands and the lowlands and hyaloclastite ridges were formed in subglacial eruptions.

Rivers eroded valleys between the hyaloclastite ridges during the interglacial periods, and also deposited silt, sand and gravel. Remains of their sediment load can be found in interbeds between the lava flows which gradually filled the valleys. The lava flows blocked the ivers and when the water later flowed over the hot lava surface, the rapidly cooled melt was frozen into a pattern of small irregular columnar joints, an example of which can be seen in the canyon ay the waterfall Háifoss (photo, p. 16).

HYALOCLASTITES YOUNGER THAN 0.7 MILLION YEARS

The youngest part of the hyaloclastite formations belongs to the Brunhes geomagnetic epoch which began 0.7 million years ago. The hyaloclastites are found at the southwestern limits of a great hyaloclastite area which belongs to the Eastern Volcanic Zone. In some places the hyaloclastites are covered by holocene lava flows from crater rows within the active zone. See the map on the facing page.

TECTONICS

Fissures and tectonic lineaments are abundant, but faults are rare. The biggest fault is found in the Þjófagil gorge in the southern part of Mount Búrfell. The Þjófagil fault strikes N70°E. Although NE-SW faults are most common, faults with N-S direction are also present.

HOLOCENE LAVA FLOWS

Since the last glaciation about 10,000 years ago, lavas have been erupted from fissures within the Eastern Volcanic Zone. Thirteen postglacial lava flows can be seen at the surface and at least another three are known from drillholes within the mapped area.

The lavas can be divided into two groups (bottom fig. p. 4). One group is the Tungnaárhraun lava flows which were erupted by the Veiðivötn volcanic system. The other group includes lava flows that were erupted by the Hekla volcanic system.

THE TUNGNAÁRHRAUN LAVA FLOWS were erupted on the Eastern Volcanic Zone, see bottom fig. p. 4. The lavas poured out in large fissure eruptions. The length of the eruptive fissures was often some tens of kilometers.

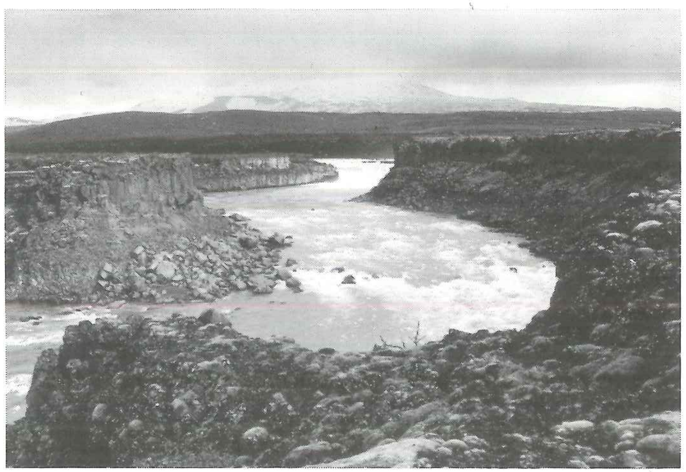
The Tungnaárhraun lavas differ in many ways from the Hekla lavas and they are easily distinguished. The Tungnaárhraun lavas are characterized by large (up to 12 mm) white crystals (phenocrysts) of plagioclase that grew in the magma prior to eruption.

Another notable character of the Tungnaárhraun lavas is their enormous size and distribution. Their volume varies from between 1 km^3 and up to at least 20 km^3, and the largest one flowed about 140 km away from its source.

THE HEKLA LAVAS that can be seen on the maps were erupted from the northernmost part of the Hekla fissure system, which is situated within the mapped area.

The lavas from the Hekla system are of various chemical composition, ranging from basaltic through intermediate to acid. The Hekla lavas within the boundaries of the map are all basaltic with the exception of an andesitic lava north of Sauðafellsalda.

The Hekla lavas are almost totally lacking in phenocrysts, which among other characteristics make them easily divided from the Tungnaárhraun lavas. The size and distribution of the Hekla lavas is also comparatively small. Their volume is commonly between 0.005 km^3 up to about 1 km^3.



THE ÞJÓFAFOSS WATERFALL is in the Þjórsá river southwest of Mount Búrfell, just before the river makes a narrow turn to the north. The canyon cuts into four of the Tungnaárhraun lavas. The lowest and the oldest lava which can be seen at the bottom is the greatest postglacial lava flow in Iceland, the so-called Þjórsárhraun lava.

Below the waterfall, some springs can be seen at low water level. Since the Búrfell hydropower station was built the river bed is almost dry most of the time because most of the river water is diverted through the the Búrfell power station and is returned to the Þjórsá river in the lowest part of the Fossá tributary.

THE VALAGJÁ explosive fissure is a series of three circular explosive craters that intersect one another.

Valagjá belongs to the Hekla volcanic system. The northeast end of the Hekla system is within the map. It consists of two almost parallel crater rows. The third crater row is just outside the map. The Valagjá and Heklutögl crater rows are found farthest to the west and the Heklutögl row is situated within the shallow valley between the Langalda and the Stóra-Melfell hyaloclastite hills. Tephrochronological investigations indicate that the Heklutögl crater row was active shortly before the settlement of Iceland, or about 1200 years ago. The youngest lava on the map originates in the easternmost crater row just outside the map. It was erupted in 1913.

SUPERFICIAL DEPOSITS

The map of superficial deposits show the extent and type of loose overburden covering the bedrock. During the last glaciation (Weichsel), which started 70 thousand years ago and lasted until 10 thousand years ago, Iceland was almost completely covered by glacier ice which sculptured the landscape through erosion and deposition. Sediments left by glaciers, such as till and glaciofluvium, are therefore the most prominent type of deposit on these maps. The most common sediments formed after the retreat of the glaciers consist of fluvial and windblown material as well as tephra and soil. Soil is only presented on the maps when it is more than 1/2 m thick or the underlying bedrock is of unknown kind. Thickness of the sediments is indicated on the maps when known from trenches or boreholes.

DEGLACIATION OF THE WEICHSELIAN ICE SHEET

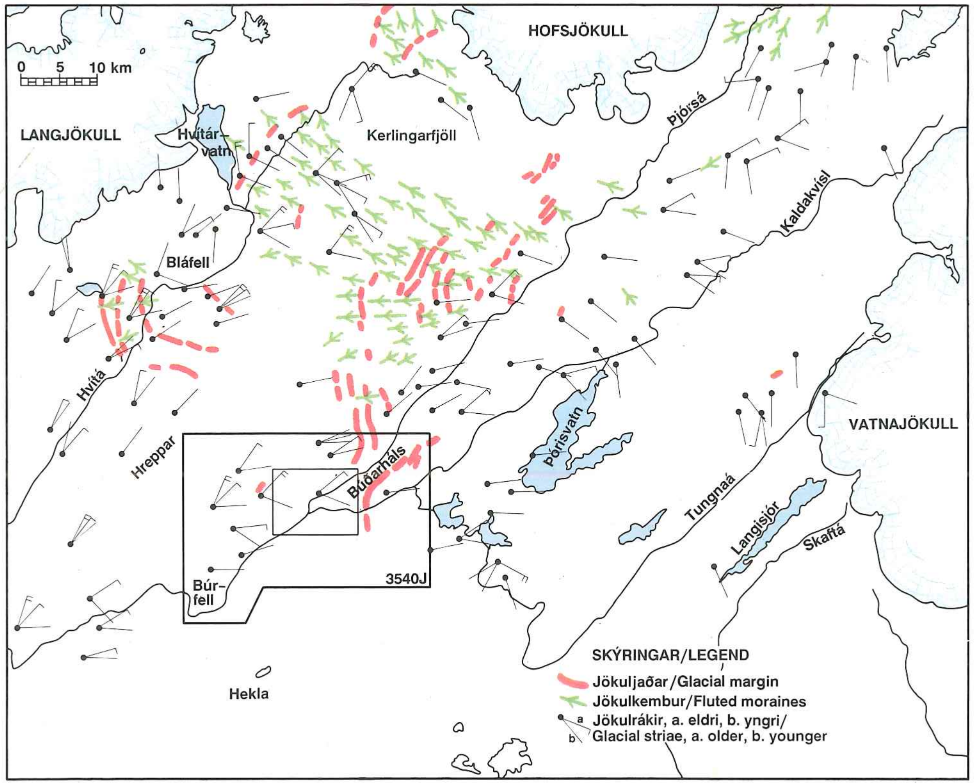
A thorough knowledge of the deglaciation history of the area is essential for the mapping of the superficial deposits, since most sediments suitable as construction materials were deposited at the margin of a retreating ice sheet. Mapping of glacial landforms such as fluted moraines and end-moraines, as well as glacial striae, is essential to establish a truthful picture of the retreat of the glacier. The map below shows the main features of the retreat of the glacier in Central South-Iceland. The glacial striae usually show the direction of the last glacier movement, but in many cases older striae are found too.

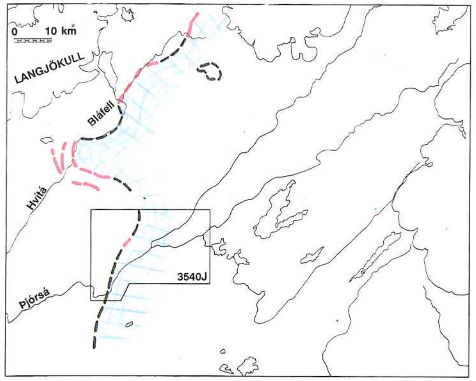
The oldest end-moraine on the present map is a short but prominent moraine ridge near the Háifoss waterfall. The age succession of striae behind the moraine indicate an ice movement, first towards southwest but finally towards northwest. This moraine cannot be traced any further but a suggested location of the glacier margin is presented on the opposite page.

Next in age are the end-moraines in Fitjaskógar. These represent the oldest members of successive rows of nearly parallel end moraines along the Þjórsá river. Glacial striae and fluted moraines in connection with these moraines indicate that as the glacier retreated inland, the ice movement shifted progressively to the northwest. This could mean that the ice divide was moving southwards.

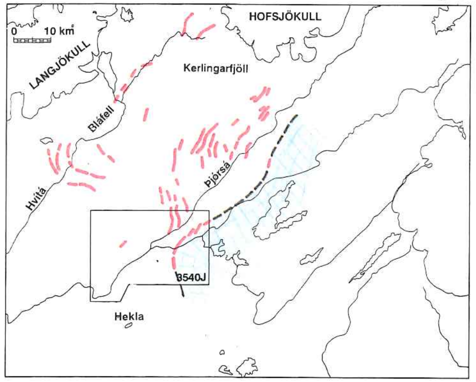
The youngest end-moraine is on the Búðarháls ridge, 2 km upstream from the ford at Hald in the Tungnaá river (see photo on p. 16). This moraine can be traced for 10 km along the ridge.

The exact age of the end-moraines is not known. The ice retreated from the Búði end moraine in Southern Iceland 10,000 years ago. When the oldest Tungnaá lava was erupted 8000 years ago, the highland must have been icefree like at present. A Pre-Boreal age for the end-moraines seems a reasonable assumption.

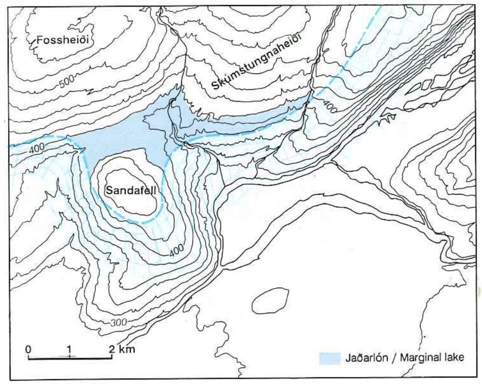




The map beside shows a possible reconstruction of the stage when the Háifoss end-moraine was formed. The Hreppar highland was almost icefree and at the margin, the towering mount Bláfell dominated the scene. The Kjölur area was inundated by a large glacier dammed lake. Some glacier remnants must also have been left on the mountains presently covered by Langjökull.



This map shows a possible reconstruction of the glacier margin as the Búðarháls end-moraine (photo on p. 16) was formed. When the ice margin was at the south slope of the ridge, a sublglacial eruption took place producing large amounts of ash and pumice, found as terraces in connection with the end-moraine. At many places inside the reconstructed Búðarháls-glacier-front, the same tephra is found mixed with till.



When the ice margin had retreated from the Skúmstungnaheiði, a small proglacial lake was formed between the ice margin and Sandafell to the south, and Fossheiði and Skúmtungnaheiði to the north. A prominent terrace can be seen at 400 m elevation, especially at Fremri-Skúmstungnaá river where the main sediment deposition took place. As the glacier retreated the lake level fell and remnants of a lower terrace can be seen at the Fremri-Skúmstungnaá river. For location see the map on the opposite page.

DATING OF LAVA FLOWS

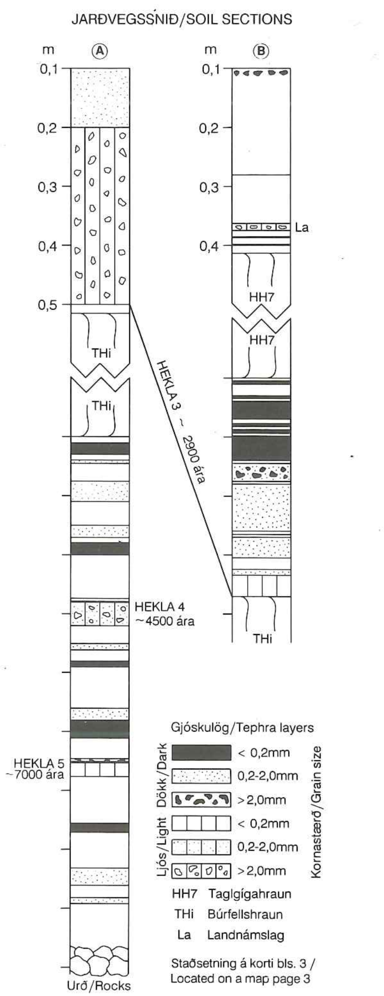
It is important to know the age of the individual lava flows and the most useful method is to examine and identify the tephra layers in the soil on the surface and below the lava flows. The soil in the mapped area is rich in tephra. An eruption in Hekla lead to desolation of farms in the Þjórsárdalur valley in the 12th century. The most useful layers for correlation are the following four acid tephra layers from Mount Hekla:

HEKLA 1104 about 900 years old
HEKLA-3 ca. 2900 years old
HEKLA-4 ca. 4500 years old
HEKLA-5 ca. 7000 years old

The so-called Landnámslag (Settlement layer) approximately 1100 years old is also useful for the dating of the lavas.

Since field investigations are still being carried out, new data is continuously added to the previous knowledge of the area. This is the reason why some difference can be found regarding the dating of the lavas between the bedrock map (1983) and the map of superficial deposits, (1986).

The figure is meant to give an idea of how the approximate ages of the lava flows can be worked out by correlation with tephra layers of known ages. The sections show for instance that the Búrfellshraun lava is slightly older than the tephra layer HEKLA-3 but considerably younger than the tephra layer, HEKLA-4.

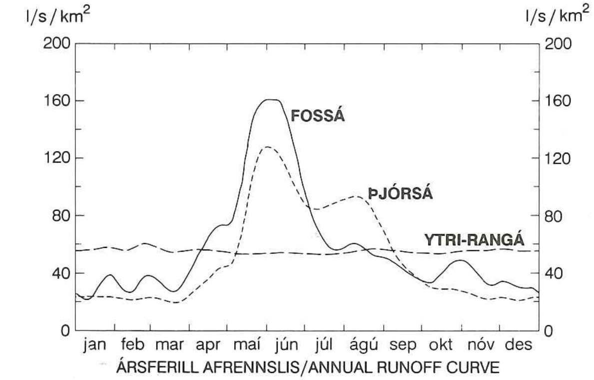


THE PUMICE QUARRIES: On both sides of the Thjórsá river east of Mount Búrfell there are thick layers of light tephra from the Hekla volcano. The HEKLA-3 layer is thickest. Near Fossabrekkur the total tephra thickness is 10.5 m, and HEKLA-3 alone is nearly 5 m thick. Since 1970, pumice has been quarried for export, with the main quarries near Fossabrekkur on the eastern side of Thjórsá, and opposite the Þjófagil canyon on the west side (the photo). Pumice has also been quarried north of Mount Reykholt in Thjórsárdalur.

HYDROGEOLOGY

RIVERS

Icelandic rivers can be divided into three groups, direct-runoff rivers, spring-fed rivers and glacial rivers. Rivers of each type are shown on the hydrogeological map. The graph shows the different characters of these river types as reflected in their annual runoff fluctuations during the years 1974 – 1983. The rivers are Fossá (solid line), Ytri Rangá (broken line) and Þjórsá, upstream of the Sultartangi reservoir (dotted line).



Þjórsá, Tungnaá and Kaldakvísl are glacial rivers. They are, however, all mixed with direct-runoff rivers and spring-fed rivers. Their runoff is characterized by low winter runoff, flooding in the spring and high proportion of glacial meltwater runoff in the summer. The reservoirs at Hrauneyjafoss, Sigalda and Þórisvatn even out the fluctuations of Tungnaá, and the Sultartangi reservoir changes the natural flow of the Þjórsá river.

The bedrock of the Skúmstungnaheiði and Fossheiði moorland is comparatively old and rather impermeable. There is the origin of direct-runoff rivers such as Fossá and Skúmstungnaá. The Fossá graph is typical for a direct-runoff river and shows clearly how the spring floods dominate their flow pattern.

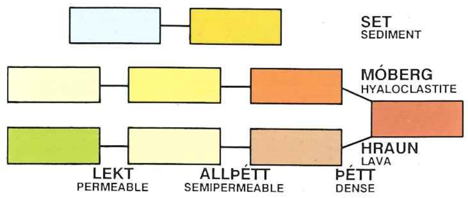
The spring-fed rivers often originate in lava fields. The main spring area of Ytri-Rangá is at Rangárbotnar. The even groundwater flow through the lavas makes the river stable throughout the year. The graph shows that the river is unaffected by short term weather fluctuations.

NAME	*LENGHT km*	*CATCHMENT km^2*	*FLOW m^3/s*	*DEGREE*	*TYPE*
Þjórsá at Búrfell	*158*	*6380*	*310*	*1*	*D+G+S*
Sandá	*20*	*93*		*2*	*D*
Fossá	*43*	*223*	*7*	*2*	*D+S*
Rauðá	*15*	*38*	*1*	*3*	*S+D*
Ásakvísl	*9*	*13*		*3*	*D*
Eystri-Svartá	*12*	*15*		*3*	*D*
Bjarnalækur	*7*			*2*	*G+S*
Fremri Skúmstungnaá	*8*	*20*		*2*	*D*
Innri Skúmstungnaá	*17*	*50*		*2*	*D*
Kaldakvísl	*109*	*1740*		*3*	*G+S+D*
Tungnaá at Sultartangi	*129*	*3470*	*171*	*2*	*G+S*
Ytri-Rangá at Ófærugil	*3,5*		*16*	*1*	*S*
Helliskvísl	*variable*			*0*	*D*

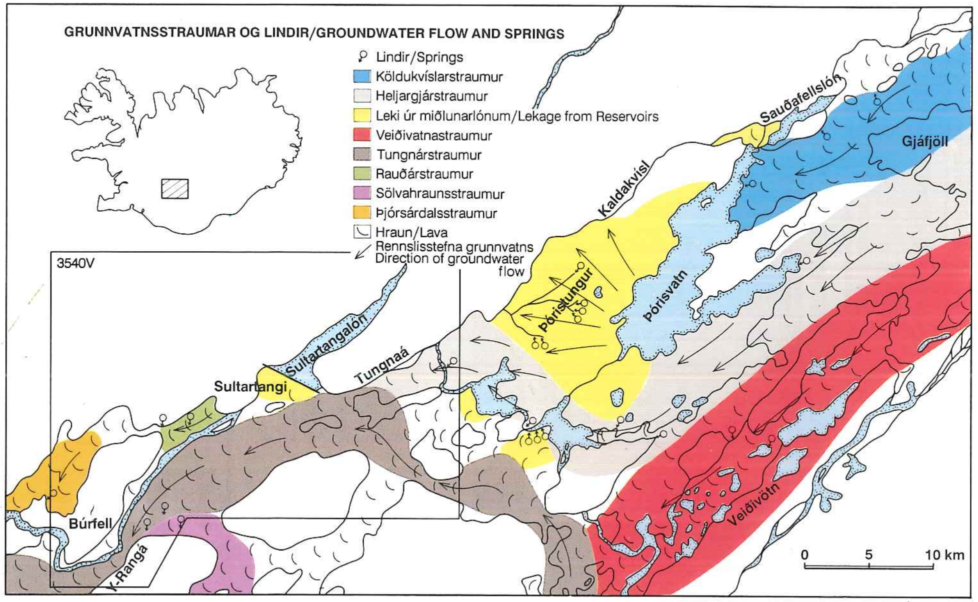
S = Spring-fed river, D =Direct-runoff river, G = Glacial river. The degree of the river indicates if it is a main river or a tributary one. 1. degree is a main river, 2. degree is a tributary to the main river, 3. degree a tributary to a tributary river.

THE COLORS OF THE HYDROGEOLOGICAL MAP

The colors show permeability of the geological formations according to a modified international scale. As for unconsolidated layers, light blue shows permeable layers, whereas light brown shows dense or unpermeable layers. Two-color rows demonstrate the relevant nature of the bedrock. The upper one indicates rocks with fairly homogeneous transmissivity in every direction as is the case in hyaloclastites, pillow lavas and columnar jointed basalts. The lower color row indicates rocks having higher horizontal than vertical transmissivity, as is the case in a regularly bedded basaltic pile. Dark brown color indicates impermeable rocks.



THE MAIN GROUNDWATER STREAMS AND GROUNDWATER TEMPERATURES



The groundwater on the hydrogeological map can be divided into several separate streams. Most of them originate outside the map. The greatest one is the groundwater stream of of the Tungnárhraun lava. It is affected by geothermal activity in the Landmannalaugar high temperature field. This is indicated by an unusually high groundwater temperature, of 5-8°C. In the Suðurbotnar springs of Ytri-Rangá, the groundwater stream of the Sölvahraun lava appears. It is very rich in dissolved solids that are derived from the Hekla volcanic area. The small groundwater stream of the Rauðá river seeps through the lava fields of Haf, south and west of the Sandafell hill. The groundwater stream of the Þjórsárdalur valley is a leakage in the Þjórsárdalur lava mostly originating from the Fossá river. The groundwater streams outside the lava fields are all very small.

GROUNDWATER

SPRING AREAS Rangárbotnar with a total discharge of 16 m^3/s is among the greatest spring areas in the country. It can be divided into three parts, each with its special character. Their names are Fossabrekkur, Norðurbotnar and Suðurbotnar.

Fossabrekkur or Slopes of cascades derived their name from a line of voluminous springs in the shallow gorge og Ytri Rangá. The spring water cascades into the river. Their total discharge is 3.0-3.5 m^3/s of 5.6°C of groundwater.

The Norðurbotnar area is at a depression at the border of Búrfellshraun lava, TH-i, and Kvíslahraun lava, TH-f. Numerous springs, some of them with artesian head, make up 10 - 11 m^3/s of 4.0°C groundwater.

The Suðurbotnar area is much smaller than the Norðurbotnar area.

The uppermost springs, many of them artesian, are issued out at the edge of the Sölvahraun lava. Farther downstream the main springs of this area appear at the border of Kvíslahraun lava. Altogheter they yield 2-3 m^3/s of 4.0-4.5°C of groundwater.

Chemical analyses show that the water in Suðurbotnar has three times higher concentration of dissolved solids than water from the other areas.

These southernmost springs are considered to originate in the Hekla area, while the springs in Norðurbotnar and Fossabrekkur are thought to belong to a groundwater stream in the Tungnárhraun lavas originating farther upstream.

The reason for the presence of such great springs at Rangárbotnar is that here the lavas have flowed through a fairly narrow pass in a valley whereby the cross-section area is substantially narrowed from what it is farther upstream.

The water can be said to be squeezed out of the lavas when the groundwater stream passes this bottle-neck.

THE HJÁLP SPRINGS. At the Hjálp waterfall there are springs discharging around 1 m^3/s. The Þjórsárdalur lava in which rootless cones are common, is rich in scoria and very permeable. At the Hjálp falls, the Fossá river leaves the lava and here at the lava border the springs appear. Some of the springs can hardly be seen except at low water level in Fossá, whereas the rest forms the brooks that meander on the alluvial plain in front of the Búrfell Power Station (see cover).

THE RAUÐÁ SPRINGS. River Rauðá originates in several brooks from the Fossheiði moor and the Sandafell hill. West of Sandafell, Rauðá normally disappears into the lava plains around Haf. There the river bed is dry exept in floods. The river reappears at the end of the Hellisskógagljúfur canyon. The yield is around 0.3 m³/s and the temperature is 3.0°C.

The springs at the Gjáfoss falls create a natural setting of exeptional beauty (photo p. 16). The discharge is 0.6 m³/s and the temperature 2.9-3.0°C. At the ruins of the ancient farm Stöng, the flow of Rauðá is approximately 1 m³/s.

THE BJARNALÆKJARBOTNAR SPRING AREA is located in the basin presently occupied by the the Bjarnalón reservoir. A small spring river, Bjarnalækur, flowed along the lava border east of Mount Búrfell to the Þjórsá river upstream from the Þjófafoss fall, in the same channel as is now used for the spill of Bjarnalón. Several springs are issuing at the bank of the spillway but at present they are seldom detectable because of the muddy glacial water of the spill. An old discharge measurement shows that the springs of Bjarnalækjarbotnar issued around 0.75 m³/s.

WATERFALLS

NAME	*RIVER*	*HEIGHT*
Þjófafoss	*Þjórsá*	*11 m*
Tröllkonuhlaup	*Þjórsá*	*6 m*
Hjálp	*Fossá*	*13 m*
Háifoss	*Fossá*	*121,6 m*
Granni	*Fossá*	*um 120 m*
Gjárfoss	*Rauðá*	
Tangafoss	*Tungnaá*	*disappeared*
Hrauneyjafoss	*Tungnaá*	

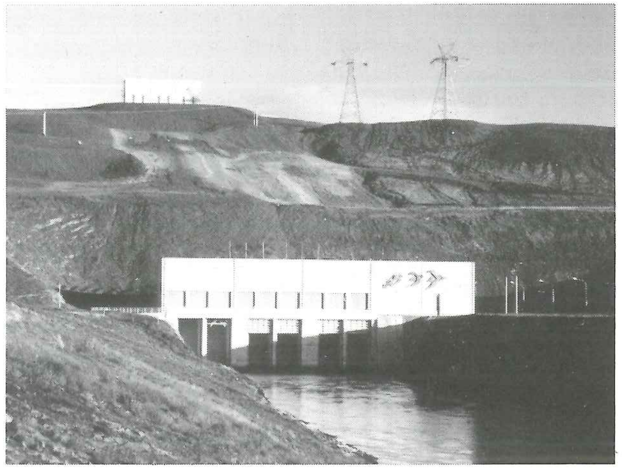
The Tröllkonuhlaup waterfalls in River Þjórsá. The photo shows the falls in a flood. Due to diversion of water into the Búrfell Power Station the water course is usually dry.

THE GEOTHERMAL HEAT

Springs of geothermal water are known in two places within the mapped area, i.e. the Reykver thermal spring in the Þjórsárdalur valley and a warm spring at the river of Fremri-Skúmstungnaá. Latter one has not been seen in recent years, so it is probably covered by the river sediment. The Reykholtshver thermal spring is 71-72°C, and its flow is 19 l/s. Nowadays the water is utilised in the swimming pool that was built by the National Power Company in the early seventies. The geothermal gradient is rather high in this area. For example, it is 28°C/100m in the boreholes at Sandafell.

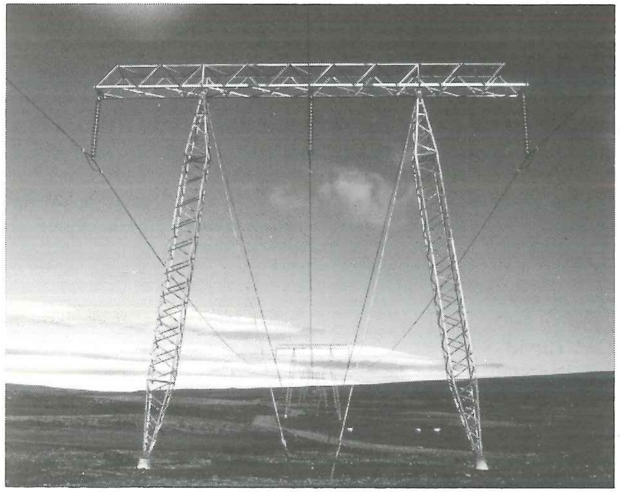
THE HYDRO-POWER STATIONS

THE HRAUNEYJAFOSS POWER STATION (210 MW): A dam was built in the Tungnaá river 1.5 km upstream from the Hrauneyjafoss waterfall. The reservoir is 9 km². The water is diverted through a 1 km long headrace canal across the Fossalda hill to an intake and goes in three 272 m long penstocks to the powerhouse. The head is 88 m. The station has 3 70 MW generating units and started operating in 1981. A 1 km long tailrace canal leads to the Tungnaá river.



THE SULTARTANGI DAM: The dam, which is 6100 m long, was built in 1982-1983 for a maximum water level at 297 m a.s.l. and a regulated storage of 50 GL. Besides regulating the water flow, the dam reduces the ice formation in the Thjórsá river and the need for flushing of ice past the Búrfell power station. The result is increased capacity in power production. The Sultartangi dam will later be a part of a hydro power station at the Sandafell hill.

THE BÚRFELL POWER STATION (210 MW): The river Þjórsá is diverted into the Bjarnalón reservoir (1km²) and by a 1064 m long tunnel through the Sámstaðamúli mountain and two penstocks to the powerhouse on the Fossá river. The head is about 119 m. The station has 6 35 MW generating units. Three generators were started in 1969, the fourth unit in 1971 and the last two units in 1972. From the dam a 1.9 km long ice sluice canal runs to the Bjarnalækur brook.



THE POWER TRANSMISSION LINES: 220 kV transmission lines run from the Sigalda power station to Hrauneyjafoss and Búrfell. Other 220 kV lines run from Búrfell to the Reykjavík area and to the aluminium smelter plant at Straumsvík. One 220 kV line runs from Hrauneyjafoss to the ferro-silicon plant at Grundartangi. A 132 kV line connects Sigalda with the south-east of Iceland.

THE HÁIFOSS WATERFALL: The river Fossá splits into two branches just before it falls off the cliffs of Fossheiði. The higher of the two falls is Háifoss, which is the next highest continuous waterfall in Iceland, 122 m high. It can be seen from a long distance. The other waterfall, Granni can only be seen from close by. At the high cliff, thick sedimentary beds can be seen in the lower half. They are a part of the so-called Reykholt formation. Near the top, a sequence of lava flows are seen. The cliff can be reached either on foot across the Stangarfjall mountain, or by following the track just above the waterfall. From the track there is a short walk downhill to the waterfall and on the slope, a stony end-moraine is worth a visit (see also p. 8).

THE END-MORAINE IN BÚÐARHÁLS: From the road to Hrauneyjafoss power station along the east bank of the Tungnaá river, a belt of large boulders can be seen in the Búðarháls ridge on the opposite side of the river, about 1 km upstream from the ferry. This is an end-moraine from a short standstill in the recession of the glacier. The glacier was at this time situated southeast of Búðarháls (map on p. 9). The view is towards north and the glacier movement was from the right.

GJÁIN: The Gjáin canyon, is carved into the bedrock by water erosion. It is most likely a former course of the Þjórsá river, but nowadays a small river, Rauðá, a tributary to Fossá is flowing through the canyon where the Gjáfoss waterfall is found. About 3200 years before present the so-called Þjórsárdalshraun lava flowed down the Gjáin canyon and into the Þjórsárdalur valley. It forced the Þjórsá river out of its former course to find its present one east of Búrfell.

GLOSSARY CONTINUED FROM INSIDE FRONT COVER

FLUTED MORAINE: Long, parallel ridges in till. Can be several hundred meters long and are parallel to the direction of movement of a former glacier.

GLACIAL STRIAE: Fine, straight, parallel furrows in bedrock surface made by scratching of rock fragments at a base of a moving glacier. Often more than one set of direction can be seen on the same rock surface as older striae can be preserved in hollows and on the lee side.

GLACIAL TILL: Sediment deposited by a glacier. The till is a heterogeneous mixture of clay, sand, gravel and boulders, most often unstratified.

GLACIOFLUVIAL DEPOSIT: Deposit left by glacial rivers in the vicinity of a glacier margin. GROUNDWATER BARRIER: A barrier not detectable on the surface i.e. a dyke or a hyaloclastic ridge, over which a groundwater stream cannnot flow.

GROUNDWATER DIVIDE: A border separating groundwater streams.

HYALOCLASTITE: Igneous, granular rock that is formed in a subaquatic or subglacial eruption.

INTERMEDIATE ROCK: Igneous rock that is transitional between basaltic and acid generally having a SiO_2 content of 54 to 65 %.

INTRUSION: The process of emplacement of magma in preexisting rock and the rock mass so formed.

LANDSLIDE: see rockslide.

OLIVINE BASALT: A group of alkaline basalts that contain olivine in addition to their other components, often associated with needle formed plagioclase crystals in the groundmass.

POROSITY: The ratio of the volume of the interstices in a given quantity of a porous medium.

PORPHYRITIC BASALT: A basalt with phenocrysts of plagioclase and often also olivine. Phenocrysts make at least 3% of volume. ROCKSLIDE: A sudden and rapid downward movement of a segment of bedrock from a mountain slope. Also the mass of rock moved by a rockslide.

ROOTLESS CONES: Scoriaceous hills often with a crater like depression found in lava flows as the rootless cones in Þjórsárdalur. Rootless cones are formed when molten lava flows over land saturated with water. The water vapour gets overheated below the lava and causes steam explosions.

STRIKE: The direction or trend that a structural surface, e.g. a bedding or fault plane takes as it intersects the horizontal.

SURFACE WATER DIVIDE: A border separating the waters flowing into different rivers or river basins.

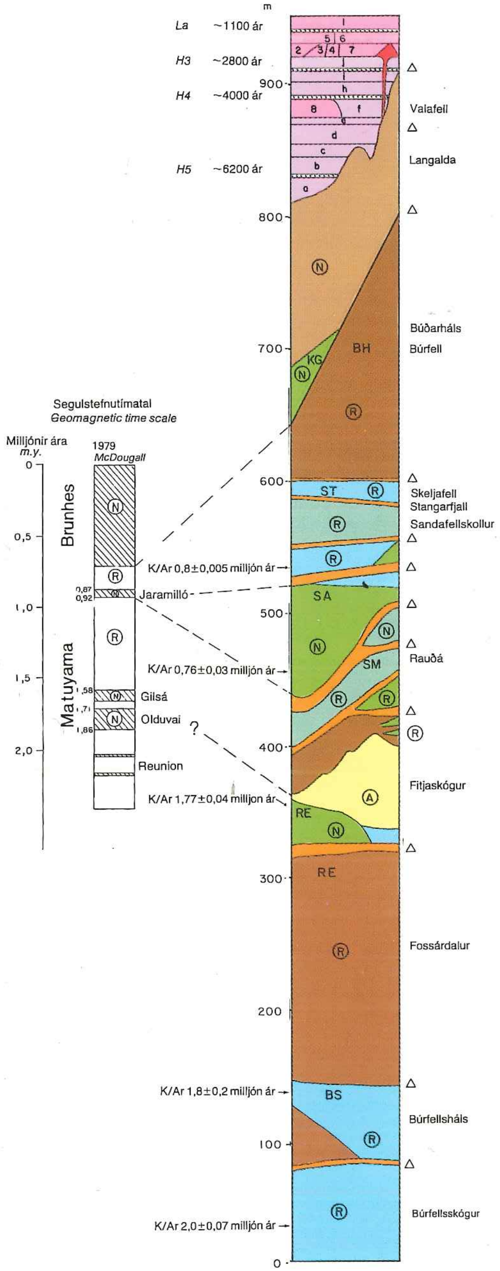
THOLEIITE: Finegrained or glassy basalt most often lacking in phenocrysts.

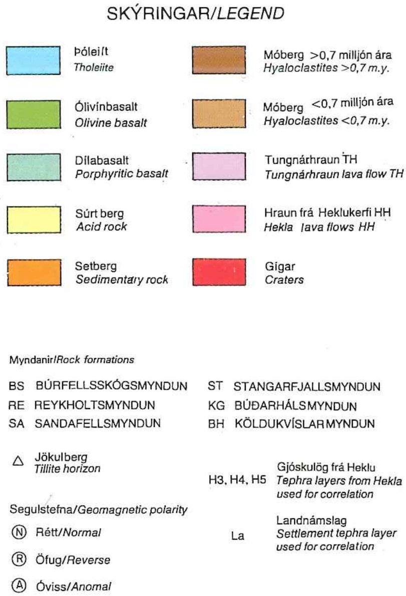
UNCONFORMITY: A substantial break or gap in the geological record where a rock unit is overlain by another that is not next in the stratigraphical succession.

WATER DIVIDE: A border separating catchment areas.

WEATHERED MATERIAL: Deposit formed by destructive erosional processes on the earth surface. In Iceland frost action is the main process.

BÚRFELL - LANGALDA
Súlusnið / Strata column





STRATIGRAPHIC COLUMN

The figure shows a simplified section of the stratigraphic sequence of the mapped area. The reader faces the north and the main features are shown so that beds growing in thickness to the right are to be found mainly to the east on the bedrock map and vice versa. The oldest beds are found at the bottom, the youngest at the top. To the left of the column is a time scale based on geomagnetic reversals. The broken lines are drawn to show the most likely correlation between the time scale and the stratighrapic units, also supported by some potassium/argon datings. The uppermost part of the column shows the postglacial lava flows which originate either in the Veiðivötn or Hekla volcanic systems. Craters belonging to the latter system are within the boundary of the map. The lava flows have been dated by tephrochronological methods supported by carbon-14 datings.