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Soapstone in the North
Quarries, Products and People
7000 BC – AD 1700

Gitte Hansen and Per Storemyr (eds)

UNIVERSITAS BERGENSIS
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Preface

This book has been a long time in the making. It is an outcome of the five Norwegian University Museums' joint research programme Forskning i Felleskap (FIF, 2010–2015), supported by the Research Council of Norway. FIF kindly facilitated a number of workshops and meetings between archaeologists, geologists and craftspeople, all with a common interest in premodern soapstone quarrying and use. The result is the chapters of this book, which are based on studies carried out over the last two decades and, for the most part, are published scientifically for the first time. We very much thank the authors for participating in this venture. We also thank several colleagues – archaeologists, geoscientists and craftspeople – that assisted the editors in peer-reviewing the chapters: Irene Baug, Birgitta Berglund, Laura Bunse, Poul Baltzer Heide, Richard Jones, Tor Grenne, Torbjørn Løland, Therese Nesset, Astrid J. Nyland, Lars Pilø, Kevin Smith, Lars F. Stenvik, Frans Arne Stylegard and Stephen Wickler; we are very grateful for the job you have done. Not least, thanks go to Tromsø University Museum, NTNU University Museum (Trondheim) and the University Museum of Bergen for their economic support in publishing the book.

Bergen/Hyllestad, Spring 2017
Gitte Hansen
Per Storemyr

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Gitte Hansen, Øystein J. Jansen and Tom Heldal

Soapstone Vessels from Town and Country in Viking Age and Early Medieval Western Norway. A Study of Provenance

In this study geological and archaeological data and analytic methods are combined and explored to find the geological source for 146 late Iron Age/Viking Age and early medieval soapstone vessels from the Hordaland region and the town of Bergen in western Norway. The dataset comprises archaeological and geological data relating to the vessels and to 38 soapstone quarries in the Hordaland region. The geological datasets are major and trace element and rare earth element data, as well as the geological setting of the Hordaland region. The archaeological datasets comprise information on the temporal and spatial contexts of the vessels and the quarries. The geochemical datasets are studied and categories established of geochemically based matches made between vessels and quarries. The reliability of these categories of match is then critically assessed through the application of other datasets. Subsequently, the match between individual vessels and regional quarries is given a provenance point-score that reflects the reliability of the provenance result. Through the interdisciplinary efforts provenancing results are obtained for 131 vessels. The success rate is thus high. The immediate social and historical implications of the provenancing results are briefly elaborated upon: previously undated quarries are now tentatively dated through vessel match; distinct quarry-districts that were in use during the late Iron Age/Viking Age and the early Medieval period have been discerned, and the contours of the organisation of the regional production of and trade in soapstone vessels during the Viking Age and the early Middle Ages are recognised. Finally, it is shown that late Iron Age/Viking Age rural households received vessels from areas from outside the Hordaland region to a much lesser degree than their early medieval urban counterparts.

Introduction

Soapstone, as used for vessels and building stone, was an important Norwegian resource in prehistory and the Middle Ages. Some 60 of Norway's c. 200 known soapstone quarries are located in the Hordaland region and soapstone quarrying is considered an important industry here during the Viking Age and the Middle Ages (Petersen 1951:349–369; Skjølsvold 1961:124–125; Bakka 1963:185–190; Lossius 1977). Abundant finds from archaeological excavations, as well as stray finds from rural sites and the medieval town of Bergen in western Norway, show that soapstone vessels were widely used in rural and urban households for cooking and storage. Still, in spite of the abundance of archaeological sources, the stone vessels, as well as the quarries, remain rather under-exploited assets in the study of the Viking Age and early medieval life. This is due not least to the lack of reliable and proper information on provenance. The present study combines and explores geological and archaeological data to find the geological source for 146 late Iron Age/Viking Age and early medieval soapstone vessels from the Hordaland region and the town of Bergen. At our disposal we have archaeological and geological data relating to the vessels and to 38 quarries in the Hordaland region, i.e., Hordaland County and Sogn and Fjordane County, south of Sognefjorden (one sampled quarry: Svanøy is located north of Sognefjorden). The geological datasets include major and trace element (MTE) measurements obtained by conventional X-ray fluorescence analyses (XRF), rare earth element (REE) data measured by inductively coupled plasma mass spectrometry (ICP-MS), and the geological setting of the Hordaland region. The archaeological datasets comprise information on the temporal and spatial context of the vessels and the quarries. Vessels and quarries are first matched through geochemistry and a number of categories of match are established based on the degree of resemblance between vessel and quarries. Next, the reliability of these match categories is evaluated through the application of archaeological data. Finally, based on this assessment, the individual vessels are given a score and divided into groups that express the reliability of the provenance suggested for the individual vessels. The immediate social and historical implications of the provenancing results and perspectives for further studies are briefly elaborated upon.

The problem of provenancing soapstone vessels

The provenancing of Viking Age and medieval soapstone vessels to large geographical regions by means of object typology has been carried out in earlier research. In her comprehensive study of soapstone products found in Viking Age Haithabu, Heid Gjøstein Resi concluded that the Haithabu vessels may stem from eastern Norway or south western Sweden (1979:131). With reference to Resi's observations on décor-elements on vessels, Irene Baug, in a recent study, suggested a provenance to eastern Norway for Viking Age vessels from the Kaupang site by the Oslo fjord in Norway (2011:329–331). Furthermore, in pioneering work on the typology of medieval vessels, Siri Myrvoll Lossius established that the medieval vessel type A is of western Norwegian origin and that the medieval vessel type C is derived from eastern Norway (1977:62–67; 1979:67–69). Also, Amanda Forster has provenanced vessels to large geographical regions in the Norse world through typological studies (2004). Still, due to the rather broadly defined vessel types, typology has been of limited use in high-resolution provenancing efforts. Studies based on the frequency of Viking Age vessel finds and the density of quarries have pointed to the Hordaland region as an important area for vessel production during the Viking Age (Petersen 1951:349–369; Skjølsvold 1961:124–125). With reference to examples of unfinished medieval type A vessels found close to quarry areas, Lossius has suggested that the Sørfjorden area in the Hordaland region was also an especially important production center in the Middle Ages. Furthermore, quarries in the Oslo area (Akershus County) have been pointed out as possible suppliers of medieval type C vessels, due to the frequency of these vessels in consumer contexts by the Oslo fjord (1977:62–67; 1979:67–69).

Applying visual geological approaches in provenancing efforts has proven difficult due to the inherent qualities of soapstone. For some types of soapstone, macroscopic features, such as the mineral composition or structural features may be useful indicators of provenance. Talc is the most important mineral in soapstone. Carbonate (predominantly magnesium rich- varieties such as magnesite) also occurs in most deposits as a major component, and chlorite and magnetite are also common. Amphibole, biotite and serpentine may occur in some deposits. However, due to the non-homogeneous nature of soapstone deposits, mineral composition can be an unreliable criterion for provenance, unless it is possible to find diagnostic minerals unique to a particular quarry or group of quarries.

Soapstone can be characterised by typical structural features: it may, for example, be brecciated (heavily veined), schistose or massive. Colour and grain size also have broad ranges of variability.

However, although specific typical features may predominate within a quarry, rapid changes occur, such as intercalating schistose and massive types. Thus, macroscopic features may be less useful for distinguishing quarries from each other. Furthermore, even in the cases where macroscopic features can clearly be linked to specific quarries, the small sizes of the vessels and vessel fragments recovered archaeologically makes macroscopic identification difficult or impossible. This means that, although a few deposits may be identified from their mineral composition or visual appearance, combinations of geochemical analyses and other datasets are needed in most cases for establishing reliable provenance.

Most soapstone deposits were formed by metamorphic alteration of ultramafic igneous rocks (Sturt et al. 2002). Ultramafic rocks, such as dunite and peridotite, can be transformed into serpentinite and soapstone, with the latter being the ultimate product of such an alteration process. A single deposit may comprise a variety of rocks at different stages of alteration, ranging from serpentinite to nearly pure talc schist. Soapstone may also form from mafic igneous rocks, such as gabbro. A problem with the geochemistry on soapstone is the mobility of elements in this type of alteration process. During the transport of ultramafic igneous bodies from the lower part of the earth's crust to the upper crust, steatisation involves reactions in the rock induced by hot aqueous fluids and carbon dioxide. Thus, the content of various elements in the rocks may not only reflect the composition of the ultramafic bodies themselves but also the geochemical influence from the wall rocks. In addition, local variations connected to fluids in shear zones and fractures may occur.

Geochemical studies of soapstone artefacts using MTE have been applied in some provenance studies. The first case in a Scandinavian context was made in connection with Resi's (1979) study of artefacts from Haithabu in northern Germany. Cluster analyses based on nine trace elements indicated a possibility that the 40 sampled artefacts might come from five different populations, all with a proposed/possible geological provenance to the Precambrian rocks of southern Scandinavia. Two of the populations could possibly be assigned to quarries in the Precambrian of eastern Norway and western Sweden respectively, while some quarries in Precambrian rocks were ruled out. Trace element data from two Swedish and seven Norwegian quarries made up the reference material (Alfsen & Christie 1979). In more recent years Santi and colleges (Santi et al. 2005; Santi et al. 2009) employed major and trace elements (Al, Mg, Fe, Cr, Si, Co, Ca and V) in a provenance study of medieval artefacts from Italy. Altogether, 28 vessels made of soapstone were analysed by inductively coupled plasma optical emission spectrometry (ICP-OES) (major elements) and ICP-MS (trace elements) and the values compared with corresponding measurements from two quarry areas in the Alps. The purpose of these studies was to link the vessels to quarry areas, not to specific quarries. The studies contributed to establishing the area by the ancient Valchiavenna quarries of the central Alps as a probable source of the artefacts.

REE data have also been applied in several studies. Richard Jones and colleagues (2007) assessed REE studies employed in the 1970s and 1980s, pointing out the limited success of some studies and several projects that had failed, mainly due to large intra-source variation and minor inter-source range of composition. In their paper, they presented a method for the chemical characterisation of soapstone (steatite) based on analyses of REE and some transition elements (Jones et al. 2007). This study demonstrated the ability to discriminate chemically between three of the known Viking Age sources in Shetland. Jones et al. (2006) applied REE analysis to 24 artefacts from the Kaupang site in Vestfold County, with reference material sampled from four large quarries in eastern Norway. It was possible to match three of the artefacts to the sampled quarries with some confidence, and through bivariate and multivariate analyses, it was possible to divide the artefacts into four groups that may represent different quarry areas (Jones et al. 2006; Baug 2011:329–331). It was thus considered possible to group and exclude sources through the REE data.

These previous studies, based on MTE and REE data, respectively, have been able to discriminate between source areas on rather large geographical scales, such as ‘Precambrian of eastern Norway and western Sweden’. In areas where relatively few optional quarries have been relevant, it has also been possible to exclude resource areas, which is, in itself, very useful. The size of the reference material, the database for quarries sampled for comparison, varies in these studies but, generally, the analysed reference material must be characterised as relatively sparse.

In this study, our aim is to find the origin of 146 vessels that have been found in a geographical area with a high density of quarries, with our reference material derived from 38 out of c. 60 known quarries in this region. Altogether, our data must be characterised as relatively extensive. MTE data are available from all quarries and objects, whereas REE data are available to a more limited extent. As a result, this study takes its point of outset on MTE data with subsequent applications of REE data for finer discrimination where such data is available. The combination of MTE and REE has, to the best of our knowledge, not been tested before on a similarly large scale (but see Forster & Jones this vol.) As an additional, and also to the best of our knowledge a new approach, we will assess the geochemically based matching results through the application of independent sets of archaeological and geographical data, considered within the context of the geological setting of the Hordaland region.

Sources and data

Figure 1 and Figure 2 show the datasets available for vessels and quarries. One hundred and forty-six objects from two archaeological assemblages are included in the study. The urban Bergen assemblage comprises 95 objects: 94 vessels and one piece of raw material waste (hereafter, the objects or the vessels). The urban vessels are confidently dated to between the late 11th century and c. 1170 (hereafter, the early Middle Ages) and stem from well-defined contexts in the secular parts of Bergen (for details on the dating methods and selection of archaeological sources from early Bergen, see Hansen 2005). The assemblage is considered representative of the vessels consumed in the secular parts of Bergen during the period at hand. They are denoted by the University Museum of Bergen’s inventory numbers with the prefix BRM (e.g., BRM 110/5651). The urban vessels have been classified in connection with the current study, in accordance with principles outlined by Vangstad (2003, this vol.).

The rural assemblage comprises 51 vessels from rural sites in the Hordaland region. The vessels are grave and stray finds dated to the late Iron Age/Viking Age through grave-context or by typology. Information on the spatial and temporal contexts and descriptions of the vessels comes from the University Museum of Bergen’s inventory (Gjenstandsbasen). The finds stem from sites across the whole Hordaland region and it is thus likely that they make up a fairly representative sample of vessels consumed in the region during the late Iron Age/Viking Age. The rural finds are denoted by inventory numbers with the prefix B (e.g., B6982/b). Compared to the urban objects, the rural counterparts are more roughly dated, and dating stray finds by typology certainly has its weaknesses, yet, for the level of detail employed here, we believe that a broad dating to the late Iron Age/Viking Age (hereafter, Viking Age) suffices. The rural vessels have not been reclassified in connection with the present study.

The quarry assemblage comprises data from 38 of c. 60 known soapstone quarries in the Hordaland region. Six quarries (Bergsholmen, Juadal, Klovsteinsjuvet, Russøy, Urda, and Vassenden) have been studied in some detail and the results documented in archive reports (Heldal et al. 2003). The remaining quarries have not been documented or studied in any detail. A systematic overview of important information such as for instance the quarries’ size or date is thus not available at the present. In connection with a previous project, samples from spoil heaps were collected from the 38 quarries.

Vessel extraction marks were registered in several of the quarries. A collection of stone samples was available from that previous project (Jansen et al. 2009). Many samples from the quarries had been analysed by different geochemical methods, among others, conventional XRF measurements of MTE and ICP-MS measurements of REE; they thus constitute a useful starting point as reference material for the present study.

The 146 vessels have been sampled and the quarry samples have been analysed further to supplement the reference material. The geochemical data at our disposal has thus been supplied at different periods of time and by different laboratories, for the most part it has not been previously published. MTE data was already available from the Department of Earth Sciences, University of Bergen (GEO/UIB) for many of the quarries. In 2007, the Geological Survey of Norway (NGU) supplied MTE data for all the 146 vessels and additional analyses from the quarries. For vessels, sampling was done by cutting a piece (minimum 11 g) of each vessel fragment to be analysed. Contaminated surfaces (soil/rust/carbon) were removed by rubbing with an iron file. Geological samples (about 50 g) from the quarry waste were cleaned mechanically by cutting saw and hammer to obtain fresh surfaces. All samples of vessels and the majority of the geological samples were crushed to powder at NGU and used for both XRF and ICP-MS analyses. MTE were mostly analysed using XRF at the laboratories of the NGU, but a minor amount of geological samples was analysed at GEO/UIB, at an early stage of the project. Powder tablets were made for the major element analyses, glass tablets for trace element analyses. We generally have one MTE sample for each vessel, from each quarry between one and 11 samples are available, with five to six samples as the most common number. Data can be found in Table 1 of the Appendix.

Similarly, REE data for 19 of the quarries was already available from GEO/UIB at the outset of our study. For the urban vessels, REE was supplied from GEO/UIB in 2010, and in 2014 REE was supplied for 27 rural vessels and for 11 additional quarries. The REE analyses were carried out by ICP-MS at GEO/UIB using Element 2/Element XR (Thermo). Altogether, REE data is now available for all of the vessels from urban contexts, 27 rural vessels, and 30 quarries. We have one REE sample from each of the 122 vessels while, for the quarries, the number of samples varies from one to nine. Data can be found in Table 2 of the Appendix.

The geographical locations of the sampled quarries and the find spots for rural vessels are also datasets to be included. In the University Museum of Bergen's inventory (see *Gjenstandsbasen*), information on the Universal Transverse Mercator (UTM) coordinates and address of the find spots of the vessels are linked to the geographical centre of the so-called named farm (Navnegård) (for explanation of this term see Øye 2004:96) where the vessel is found. In the present study, the named farm thus serves as a general spatial context/address for the rural vessels. For the majority of the quarries, the UTM coordinates of the location are derived from *Askeladden*, the Norwegian National Cultural Heritage Database, while UTM coordinates for the rest of the quarries were measured by a Global Positioning System (GPS) device.

The 38 sampled quarries are located within four main geological units (Figure 2). In *Unit 1/ Melange*, 16 quarries were sampled: Unit 1 is located in the area between Sognefjorden and Hardangerfjorden and consists of a late Proterozoic to Palaeozoic melange occurring near the base of a sequence of crystalline nappes emplaced during the Caledonian orogeny that occurred from the Ordovician to Early Devonian eras, about 490 to 390 million years ago. The unit consists mainly of phyllite and mica schist with minor greenschist and metagabbro, containing a large number of lenses of ultramafic rocks (serpentinite, soapstone and talc-schist), many of which were quarried for soapstone (Andersen et al. 2012). The melange has traditionally been interpreted as a tectonic

Figure 1. *Quarries and objects, available datasets. 1) Alternative quarry names found in the literature and in Askeladden are in (brackets). 2) Number of samples and readings for major and trace element (MTE) data supplied by Geological survey of Norway (NGU) or Department of earth Sciences (GEO/UIB). 3) Number of samples and readings for rare earth element (REE) data supplied by GEO/UIB. 4) Some coordinates are from Askeladden, other from our GPS measures. 5) Svanøy is located north of Sognefjorden. 6) Two samples were cut from one object.*

Quarry no.	Quarries[1] and objects	Geological Unit	MTE[2] NGU or GEO/UIB	REE[3] GEO/UIB	Askeladden Id./ UTM X and Y[4] coordinates 33N or projection in (brackets)
1	Arnafjord (Framfjord)	1	5/1	2	37014X 6793343Y
2	Baldersheim (Sørtveit)	1	5/2	5	Id:64089/ 12582X 6703150Y
3	Bergsholmen	1	5/1	5	Id:35539/ 30309X 6699274Y
4	Bergspytt (Nes – Bergspytt)	4	5/1	3	Id:97652/ 1965X 6684954Y
5	Bru	2	5/0	1	Id:105678/ 3634X 6714998Y
6	Digranes (Tussaholo)	3	5/0		Id:101837/ 31397X 6699614Y
7	Drebrekke	3	2/1		Id:112827/ 22253X 6712948Y
8	Flatabø (Øvre, Storemyr) Flatabø (Nedre)	3	3/1	1	Id:112521/ 23907X 6712893Y Id:112522/ 23784X 6713345Y
9	Froastad	2	4/0	1	18308X 6729057Y
10	Ingahogget	4	5/0	4	1202X 6667160Y
11	Juadal	1	6/5	4	17896X 6717640Y
12	Katlaberg (Katlabrotet)	1	1/0		Id:66433/ 28725X 6707537Y
13	Klauvsteinsberg (Klauvberg)	1	0/3	2	Id:159301/ 19049X 6764527Y
14	Klovsteinsjuvet (Osvåg)	4	4/2	4	Id:143976/ 10931X 6645177Y
15	Kvernes	1	6/3	6	338526X 6791592Y
16	Kvitno	3	5/1	1	Id:101838/ 31700X 6700798Y
17	Lysekloster	2	0/6	6	31700X 6700798Y
18	Melstveit	2	2/0		Id:97434/ 18359X 6726866Y
19	Munkahogget	1	1/0		Id:97619/ 11399X 6732348Y
20	Nygård	1	4/1	1	5874.9X 6732787Y
21	Rauberg (Gryteberget)	1	6/0	1	Id:141992/ 28578X 6785882Y
22	Raudesteinane	3	2/0	2	31288 X 6701868Y
23	Russøy	1	6/3	6	Id:66527/ 30848X/6698991Y
24	Sele	2	5/0		52425 X 6657881Y
25	Sjusete	2	4/0	1	Id:97497/ 4207X 6717907Y
26	Skare	4	4/0	1	Id:101886/ 31206X 6674184Y
27	Svanøy[5]	2	4/0		Id:64080/ 25409X 6858128Y
28	Sævråsvåg (Sæverås)	1	0/8	5	Id:99976/ 29103X 6772079Y
29	Tysse (Tøsse, Blautesteinberget)	4	3/0	3	Id:90157/ 11888X 6666332Y
30	Tyssedal (Værmålen 2)	3	1/0	1	35934X 6698813Y
31	Tyssøy (Skjervika)	2	7/0	6	Id:171674/ 43103X 6724518Y
32	Urda (Urdo)	2	4/4	6	Id:66742/ 51394X 6659423Y
33	Vargahola (Vargholet) (in-complete MTE dataset)	1	1/0		Id:45493/ (33V) 28968X 6707270Y
34	Vargavåg, north (Ferstad) Vargavåg, south (Halhjem)	1	6/0	9	Id:55238/ (33V) 29286X 6706695Y Id:25533/ (33V) 29428X 6706388Y
35	Vargavåg, gryte (Os, Halhjem)	1	0/3	4	Id:60558/ 29460X 6706504Y
36	Vassenden (Handegard)	3	5/0	2	Id:112001/ 23740X 6715735Y
37	Ådland (in-complete MTE dataset)	1	2/	3	11564X 6731639Y
38	Åkra	4	4/0	4	1691X 6662950Y
	Early Medieval: 95 urban vessels		96[6]	95	79 shards could be classified to vessel type A, B or C
	Viking Age: 51 rural vessels		51/0	27	None are classified to type

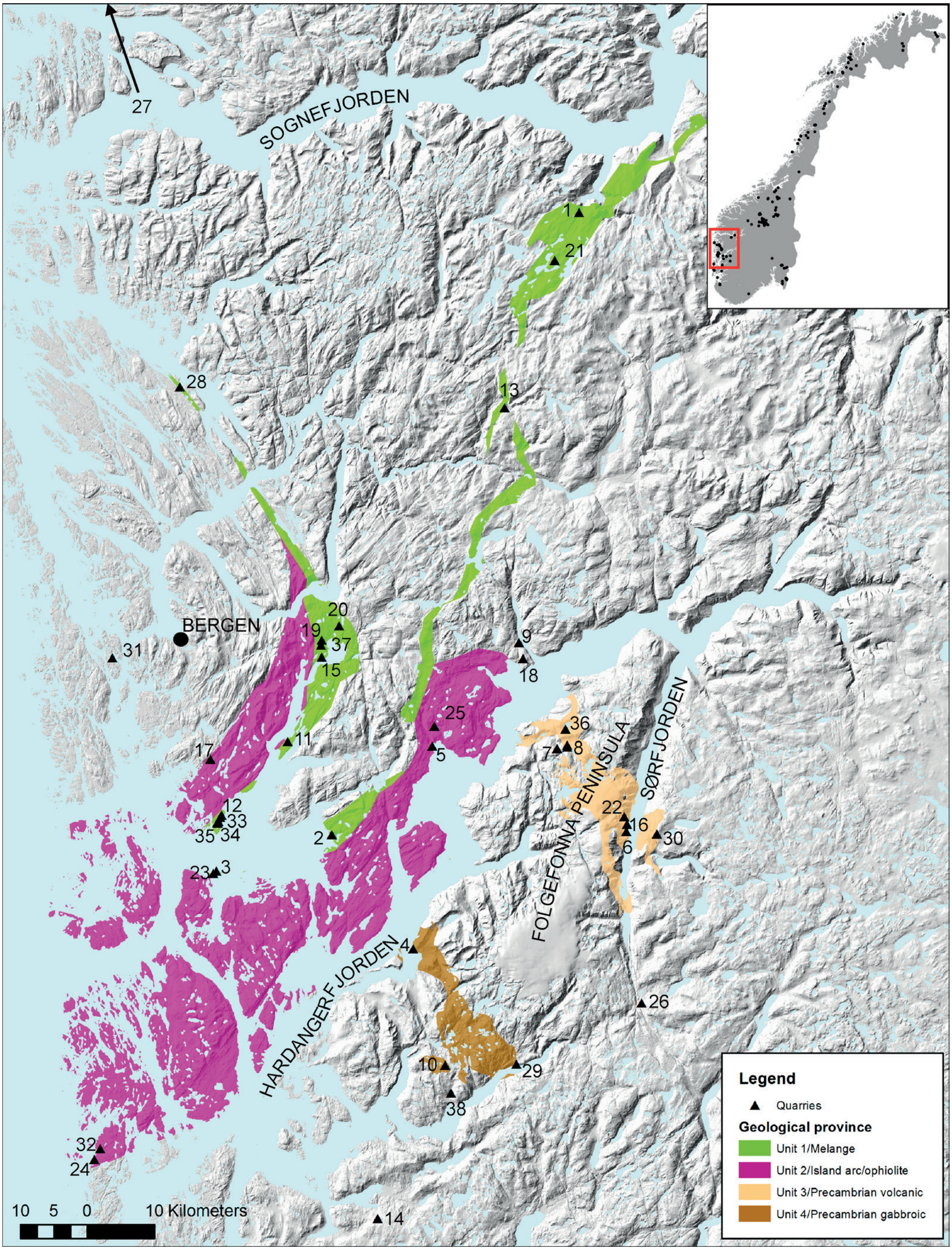


Figure 2. *The Hordaland region, 38 sampled quarries and the approximate location of the four geological units. For quarry names see Figure 1. (Geologic map partly based on Andersen et al. 2012).*

mixture of ophiolitic rocks and metasediments assembled during the Caledonian orogeny (Færseth et al. 1979; Thon 1985; Pedersen 1997). Andersen et al. (2012) later proposed the ultramafics of Unit 1 to be derived from the mantle by pre-Caledonian hyperextension of the Baltic shield. A Caledonian origin was, however, recently supported by Pedersen et al. (2015), thus indicating a common/similar origin of Unit 1 and Unit 2.

In *Unit 2 Island arc/ophiolite*, nine quarries have been sampled. Unit 2 is situated northwest of Hardangerfjorden and is characterised by dismembered ophiolites and island arc units. The two largest quarries in Unit 2, Urda and Lysekloster (Figure 2: 17, 32), are located in ultramafic bodies of the Lykling and Gulfjellet Ophiolites. Some minor quarries, mostly situated along the northwestern shores of Hardangerfjorden, are found in ultramafic lenses located within greenschists of island arc origin (Ragnhildstveit & Helliksen 1997; Ragnhildstveit et al. 1998; Andersen et al. 2012).

In *Unit 3/Precambrian* volcanic sequence, seven quarries have been sampled. Unit 3 is located southeast of Hardangerfjorden and consists of a volcanic sequence of metabasalts and metadacites called the Kinsarvik formation, dated to about 1540 (Sigmond 1998). The soapstone deposits are confined to ultramafic bodies occurring within the sequence. Most of these bodies have been transformed into serpentinite and soapstone and in some quarries a remnant core of serpentinite is found.

In *Unit 4/Precambrian gabbroic*, six quarries have been sampled. Unit 4 is located southeast of Hardangerfjorden and consists of gabbroic rocks embedded in gneisses and granites of Proterozoic age (Sigmond 1998). The soapstone deposits occur as steatised pods in the main bodies shown on the map (Figure 2) but are also found associated with small bodies not shown on the map.

The 38 sampled quarries make up about 63% of the known soapstone quarries in the Hordaland region. The 'missing' quarries are of varying size, including a few larger ones, but the four different soapstone-bearing geological units that make up the region are well represented among the 38 sampled ones. We expect that the four units display unique geochemical patterns to a certain extent, and that they collectively are representative of the Hordaland region. With the high share of sampled quarries we expect the sampled quarries to be representative for quarries in the Hordaland region on some level. We shall return to this below.

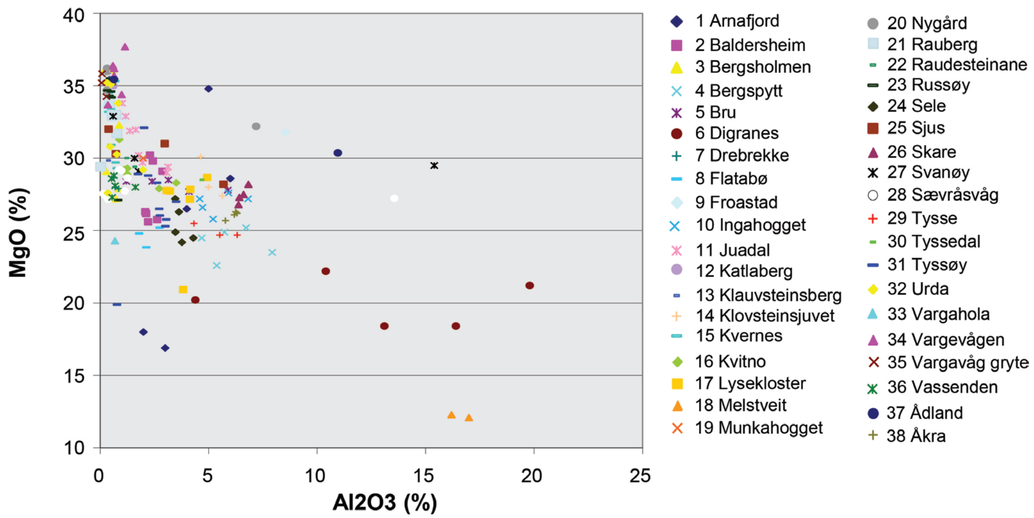
The way forward: methods and procedures

The analysis is carried out in several steps and for each step introductory tests have been performed to develop adequate procedures. In this respect the study has been a hermeneutic venture with a interdisciplinary approach at its core. Interpretation of the MTE data is, as already mentioned, the starting point. The first step is thus to match vessels and quarries through MTE; the vessels are divided into four match categories depending on the degree of MTE resemblance between vessel and quarries. The *method* behind the MTE based matches is then evaluated by testing results against the geological setting of the Hordaland region. Next, as step two, REE data is applied to the MTE based results, and new match categories are established. As the third step, the reliability of the MTE and MTE/REE based vessel match categories is then addressed and the MTE/REE based matches are evaluated through independent archaeological datasets. With these efforts, the general reliability of the various categories of geochemical vessel match is assessed. As a fourth and final step the individual vessels are given a point score and divided into six provenance groups that express the level of reliability of the individual provenancing result.

The analysis

Step 1: matching vessels and quarries through main and trace elements

An introductory test was run to find the combinations of MTE that worked best in distinguishing between the quarries. Some elements seemed more applicable than others and when combining ratios between eight elements (Al_2O_3/MgO, Co/Ni, Cr/Ni, Fe_2O_3/Ni and Zn/V) in bivariate plots, it was possible to see clusters of points that, to some degree, separated the quarries from each other (Heldal



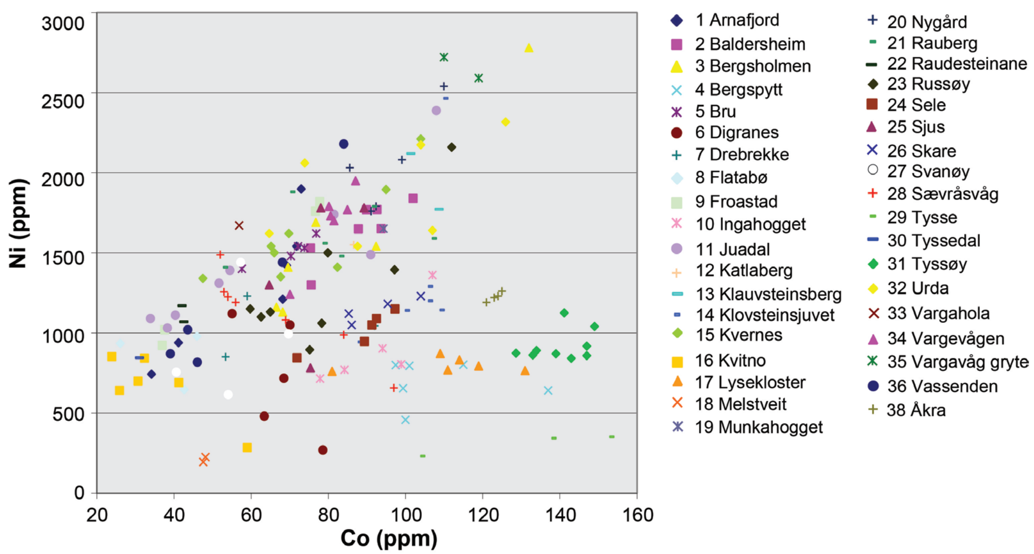
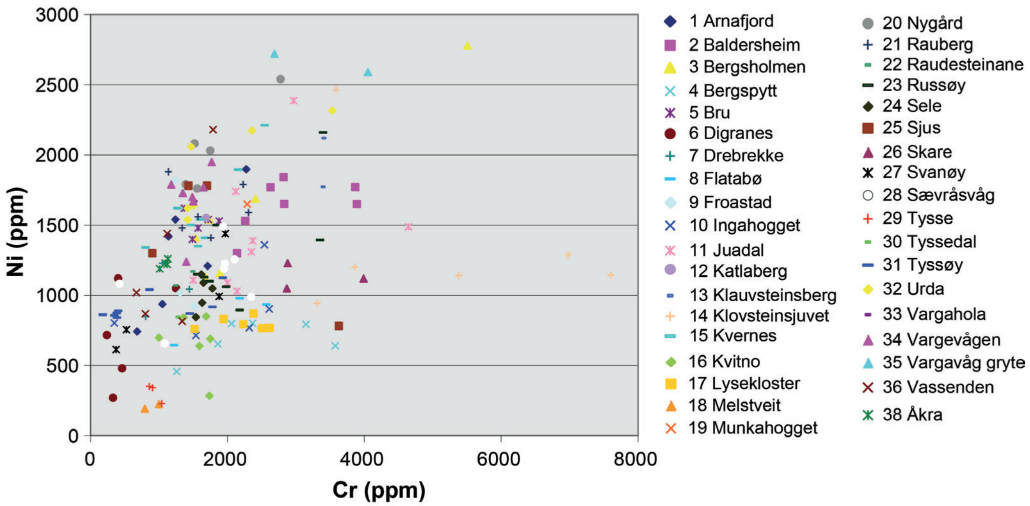


Figure 3a. *Al2O3/MgO ratios for the 38 sampled quarries.*

Figure 3b. *Co/Ni ratios for 37 sampled quarries (Ådland is not included due to incomplete Ni values).*



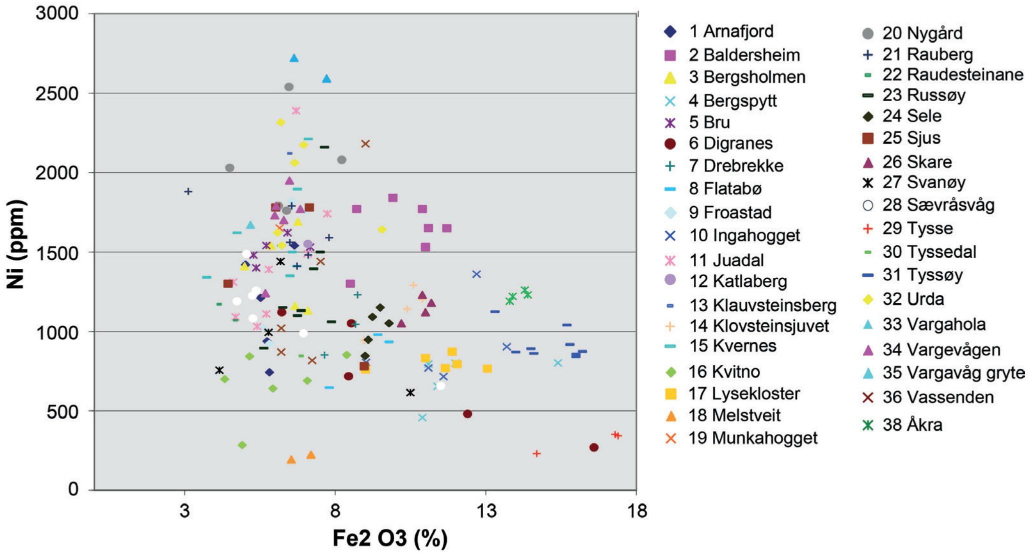


Figure 3c. *Cr/Ni ratios for 37 sampled quarries (Ådland is not included due to incomplete Ni values).*
Figure 3d. *Fe/Ni ratios for 37 sampled quarries (Ådland is not included due to incomplete Ni values).*

et al. 2008) (Figure 3a-e). Tests were also run to see if additional trace elements, especially As, Ba, and Sr, that occur in rather high and varying concentrations both in some vessels and quarries, were suitable for discrimination. The test results were, however, too inconsistent, perhaps due to the mobility of these elements in fluids at different stages in the steatisation process, and it was decided to disregard the elements.

There are some specific challenges when interpreting the MTE data. In particular, these relate to the lack of conformity regarding the measured values from each quarry, sometimes resulting in poorly defined clusters. Some clusters display an oval shape, some define a line (e.g., Åkra), or are

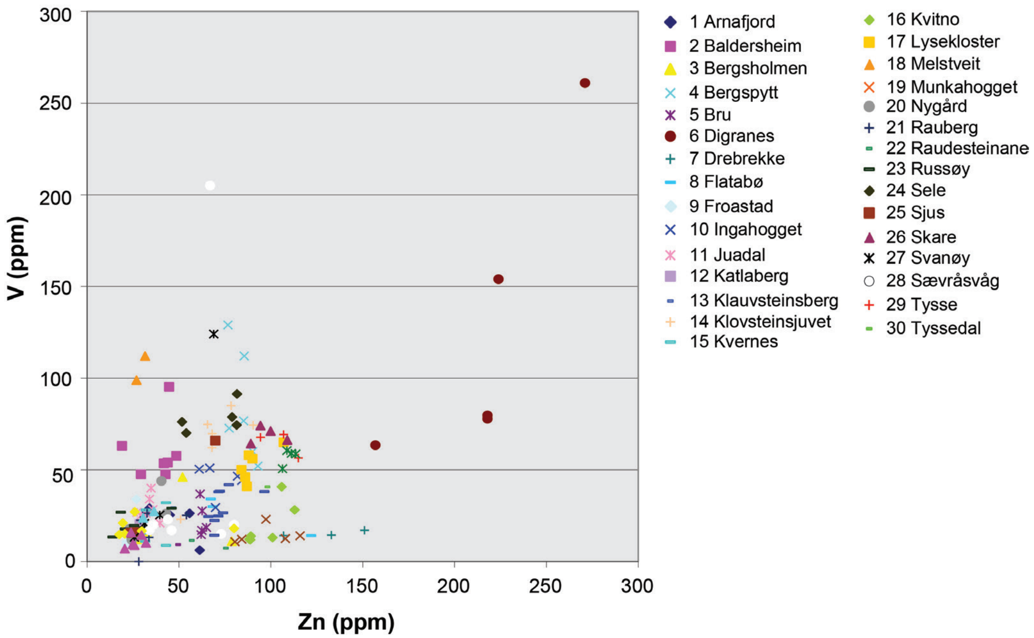


Figure 3e. *Zn/V ratios for the 38 sampled quarries.*

bimodal (two clusters from the same quarry, e.g., Froastad) while others show an irregular shape. Furthermore, some quarries with a generally well-defined cluster may contain one or two anomalous measurements plotting far from the cluster. For example, the Co/Ni values of Klovsteinsjuvet include a single anomalous value plotting far away from the rest, a result that makes us less confident in the 'cluster' (Figure 3b).

As a consequence we have, for the level of detail aimed at here, deemed the application of standard multi-component or statistical analysis on the MTE data unfruitful; in such analyses, anomalies/outliers are often disregarded. We wanted to keep the anomalies in our analyses; they could make a difference when distinguishing between many quarries in a small geographical area. Matches between the 146 vessels and the 38 quarries on the five element combinations have thus been made manually. This has been a time-consuming effort and, evidently, the decision of promising/poor match between vessels and quarries may have elements of subjectivity. Out of concern for this subjective element, the manually performed MTE matchmaking was carried out as a blind test; we neither took into consideration the temporal and spatial context of the vessels, nor the location of the quarries in relation to geological units during matchmaking.

Matches between vessels and quarries were considered valid on the specific element combination when the vessel plotted within or close to the cluster field of a quarry. An introductory test showed that, with matches on eight elements, it was often possible to single out quarries. There seems to be a breaking point around four elements, so that matches made on four or fewer elements exhibit inconsequential, or no, resemblance to the sampled quarries. With this insight, a match on eight elements is considered promising, whereas a match made on four or fewer elements is considered to be poor. By this procedure vessels were divided into categories according to the degree of match with the sampled quarries (see Figure 8 for the procedure):

- Vessels come out with a one-quarry match (1Q/MTE match) when only one quarry matches the vessel on the entire suite of eight MTE.
- When a vessel matches more than one quarry on the eight elements this results in the multiple-choice category (MC/MTE). Here, as we will see, the individual vessels match between two and eight quarries (MC2–8/MTE).
- Vessels that plot within the ratio of five to seven of the eight elements for one or more quarries are assigned to the category some regional match. These vessels match between one and four quarries (SRM1–4/MTE).
- Vessels that match the regional quarries on four or less of the eight elements are labelled poor regional match (PRM).

Figure 4. *Results of match based on MTE data.*

Four categories of MTE based match	*Number of vessels n=146*
One quarry match (1Q/MTE)	38 = 26%
Multiple choice (MC2–8/MTE)	67 = 46%
Some regional match (SRM1–4/MTE)	24 = 16%
Poor regional match (PRM/MTE)	17 = 12%

As seen in Figure 4 it is possible to give a 1Q/MTE match for 38 (26%) of the 146 vessels. Sixty-seven (46%) are matched as an MC to between two and eight quarries (MC2–MC8/MTE). Twenty-four (16%) of the vessels have SRM with one to four quarries as candidates (SRM1–4/MTE) and 17 (16%) have PRM (PRM/MTE).

Evaluation of the methodological consistency of the manual MTE matching: The location of MC2–8 and SRM2–4 quarries within geological units

As a test of the methodological consistency the location of alternative quarry candidates for MC2–8 and SRM2–4 vessels in relation to the Hordaland region's four geological units was addressed. Behind the test is the assumption that quarries within the individual units may, at some level, have MTE compositions in common due to a shared geological history (see Alfsen & Christie 1979). If we have been able to differentiate between the units through the MTE match-making in the cases where several quarries came up as alternatives, this would be a barometer for the level of methodological consistency – and objectivity – in our manual blind-testing efforts. As a background for the test we first looked at the general MTE composition of quarries in the four geological units, to see if the quarries within each unit actually have geochemical traits in common.

MTE element composition of quarries in the four geological units

Unit 1: The majority of the ultramafic bodies in Unit 1 are described as low-Al, high-Mg mantle peridotites (Andersen et al. 2012). A similar Al/Mg ratio is recognised in most of the 16 sampled Unit 1 quarries (Figure 5a). This pattern of a high-clustering area is repeated for most of the quarries in the other discrimination diagrams, reflecting a common geochemical identity. A few Unit 1 quarries, however, form unique clusters while others do not display any clustering at all. Furthermore, some quarries with a generally well-defined cluster may contain one or two anomalies plotting far from the cluster.

Unit 2: Most of the nine sampled quarries display low-Al, high-Mg compositions similar to the Unit 1 quarries; they also cluster in similar areas as the majority of Unit 1 quarries in the other diagrams. The values of the Lysekloster and Tyssøy quarries appear in the outskirts of the high-cluster areas of Unit 1, while the values of Melstveit (see Figure 3 for cross reference to individual quarries), deviate markedly from the other quarries in Unit 2.

Unit 3 and *Unit 4*: The MTE values of the seven sampled quarries in Unit 3, as well as the six in Unit 4, have a tendency to cluster in the outskirts of the main cluster areas of Unit 1 and Unit 2

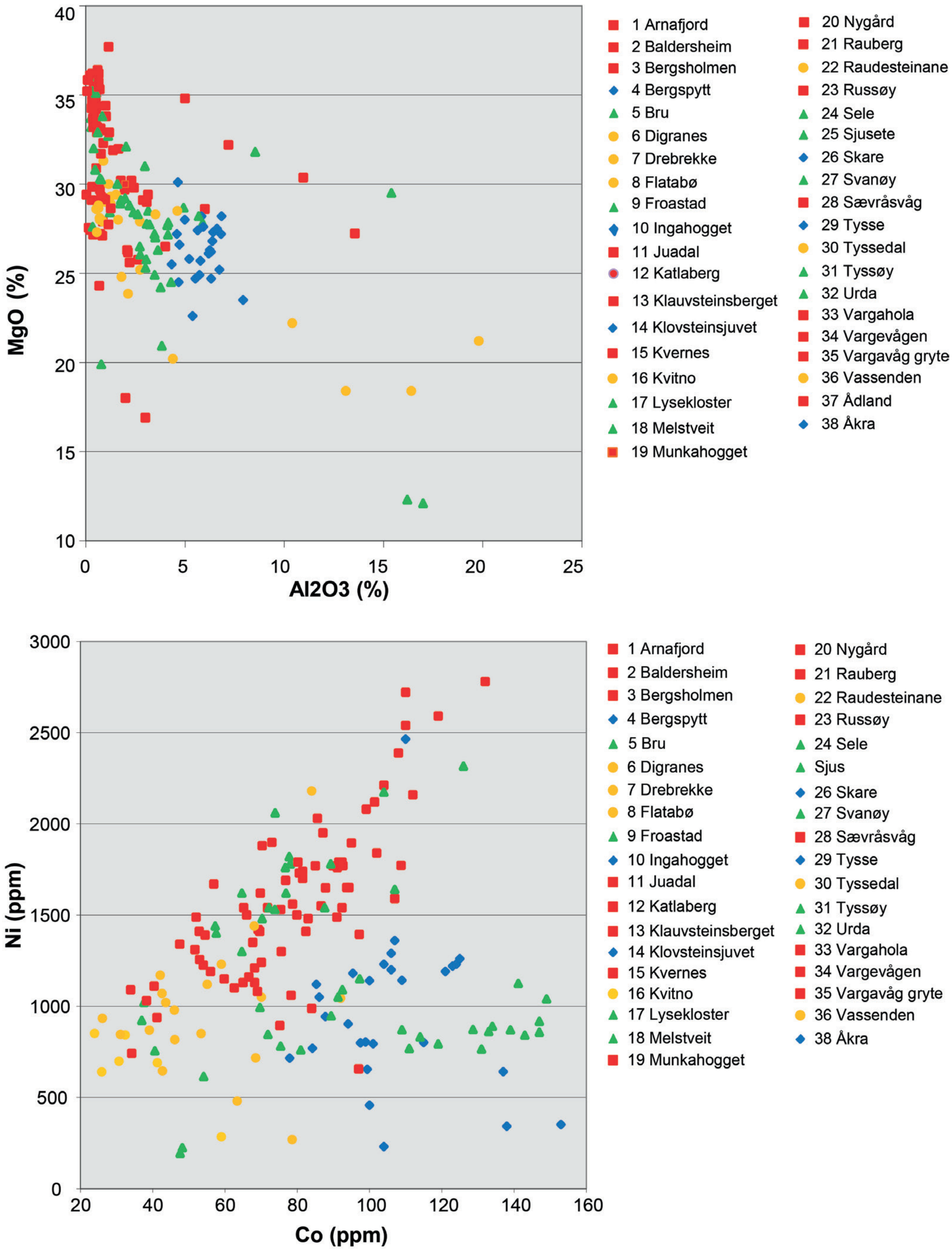
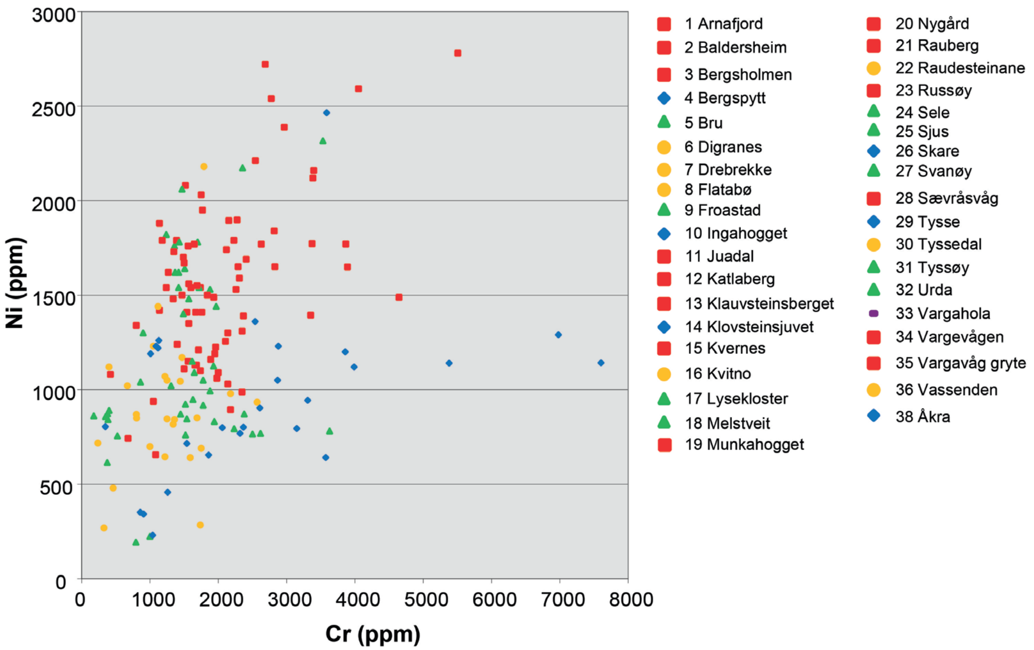
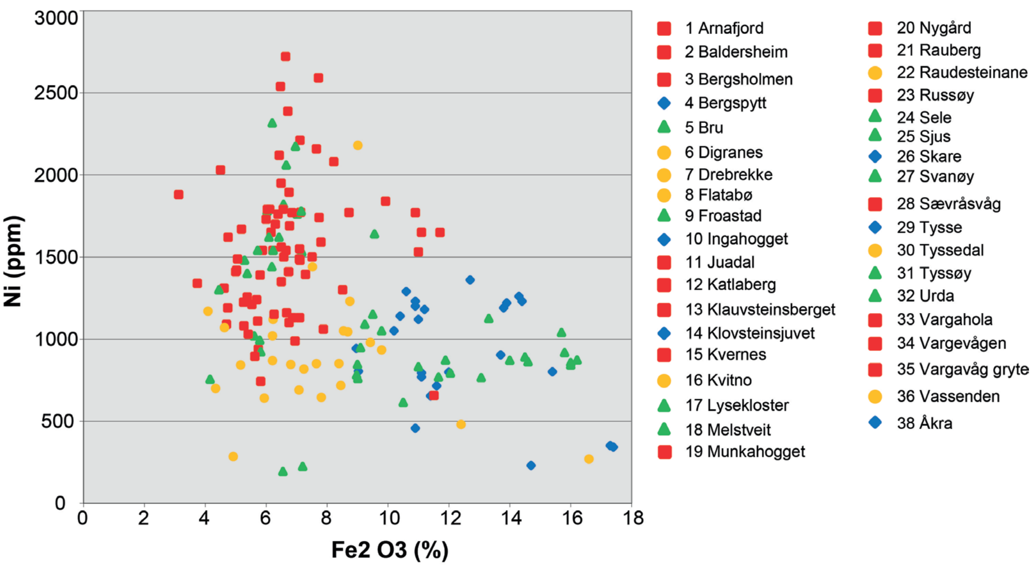


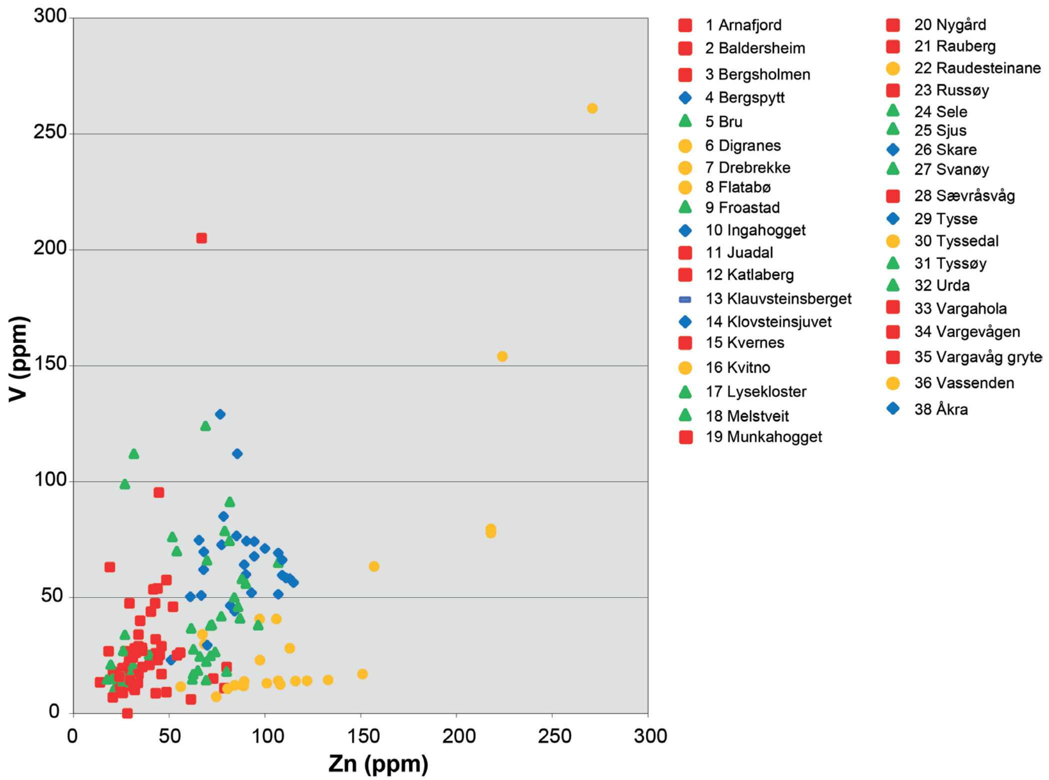
Figure 5a-e. *Al2O3/MgO, Co/Ni, Cr/Ni, Fe/Ni and Zn/V ratios for the sampled quarries. The quarries are divided in geological units: Unit 1/Melange (rectangular, red), Unit 2/Island/ophiolite (Triangle, green), Unit 3/Precambrian volcanic (Circle, orange), Unit 4/Precambrian gabbroic (Diamond, blue).*





quarries (Figure 5a–e) and Unit 4 quarries have a notable higher Al value than most others. Some quarries display a remarkably well-defined cluster (Åkra, Unit 4) for all discrimination diagrams, while others (e.g., Digranes, Unit 3 and Klovsteinsjuvet, Unit 4) are typically scattered over a large area in the plots.

To sum up, the majority of the Unit 1 quarries meet in a high cluster area on several bivariate plots. The Unit 2 quarries define some unique cluster areas, but the majority of the clusters overlap



with the Unit 1 quarries. This may be explained by the proposed Caledonian origin of the melange that makes up Unit 1 (Færseth et al. 1979; Thon 1985; Pedersen 1997; Pedersen et al. 2015), resulting in a common geological origin of Unit 1 and 2. The high degree of overlap between the MTE clusters of the quarries in Unit 1 and Unit 2 may make it difficult to distinguish between quarries in these two geological units and will thus not serve as good indicators of methodological consistency in the manually performed blind test matches. Unit 1 and Unit 2 are thus treated as one (Unit 1&2) in the test below. The tendency of the Unit 3 and the Unit 4 quarries to cluster in the outskirts or in separate areas of the main cluster areas of the Unit 1 and Unit 2 main cluster areas, is convenient when evaluating the methodological consistency in the manually performed MTE matchmaking.

The test

We now have a look at the location of alternative quarry candidates in the cases where vessels are matched with several quarries (MC2–8 and SRM2–4). We want to see if the vessels' alternative quarries are located within one or within several geological units. This will, to reiterate, be a barometer for the methodological consistency of the blind-test matchmaking efforts.

For 54 of the 67 MC/MTE vessels (80%) the alternative quarries are located within one geological unit or Unit 1&2 (Figure 6). This shows that we have been able to discriminate consistently between the geological units in these cases of manual blind test matching. The systematic correspondence between the location of alternative quarries and geological units shows that the blind test match based on eight elements has been carried out with a large degree of consistency.

The spatial patterns made up by the quarries that were associated with the 15 SRM2–5/MTE

Figure 6. *The location of the MC2–8/MTE and SRM2–4/MTE vessels' quarries in the geological units.*

MTE based vessel match category/quarries in different geological units	*'One unit' and Unit 1&2*	*Unit 1 and Unit 3*	*Unit 2 and Unit 4*	*Unit 3 and Unit 4*	*Unit1,Unit 2 and Unit 3*
Multiple choice (MC2–8/MTE) n=67	54 = 80%	9 = 13%	2 = 30%	-	2 = 83
Some regional match (SRM2–4/MTE) n=15	8 = 53%	3 = 20%	2 = 13%	2= 13%	-

vessels show that the alternative quarries associated with each of the vessels in eight of 15 cases (53%) are located within one geological unit or in Unit 1&2. There are thus less consistent spatial patterns discerned in the SRM/MTE matches than within the MC/MTE vessel matches. While this could suggest that the SRM matches were carried out in a less consistent way than the MC matches, this would be strange, since all categories of matches were identified through the same procedures. A more likely explanation is that, since the SRM match is made between vessels and quarries on fewer elements (between five and seven elements), the common denominator is less complex, permitting a vessel's geochemistry to fit in with more units. This is an interesting observation to which we are going to return below in the evaluation of the geochemically based matches.

Another interesting observation is the very fact that such a large share of the MC vessels systematically match quarries confined to individual units. This may convincingly suggest that, even if we are not able to make a match to an individual quarry, a match to a geological unit seems feasible. This is yet another observation to bear in mind in the further analyses.

Altogether then, the test shows that a very large share of the MC/MTE vessels matched quarries that are located within one geological unit; the same goes for a fair share of the quarries matched with SRM/MTE vessels. These trends lend general confidence to the methodological execution of the manually performed MTE matching between vessels and quarries. With this insight we will go on to step two in the analysis: the application of REE data to the MTE based matches.

Step two: application of REE data to the MTE based matches

We have REE data from 122 vessels and 30 quarries. In this part of the analysis, the vessels' REE patterns are compared with those of the relevant quarries suggested by the MTE analysis. Before doing so, a look at the available REE data from the quarries in the four geological units is necessary. We want to assess the degree of intra-source variation in REE contents within quarries where several samples have been analysed, as well as the degree of inter-source variation between the quarries within the respective geological units. This leads to an assessment of the weight with which REE can be applied to the MTE matches.

REE: a background

REE data are plotted in so-called normalised diagrams, where concentration in the sample divided by concentration in a chosen standard (Chondrite, Boynton 1984) is plotted on the Y axis and different elements are plotted on the X axis by increasing atomic number and thus forming profiles, a standard method in geochemistry. The REE profiles of the sampled quarries display a range of patterns varying from symmetrical or asymmetrical, convex downwards or convex upwards, or flat, and with more or less significant Europium (Eu) anomalies that range from positive to negative.

Unit 1: Eleven of the 16 Unit 1 quarries were matched with vessels through MTE. REE data is available from all of these 11 quarries, although for two of the quarries, REE data are rather

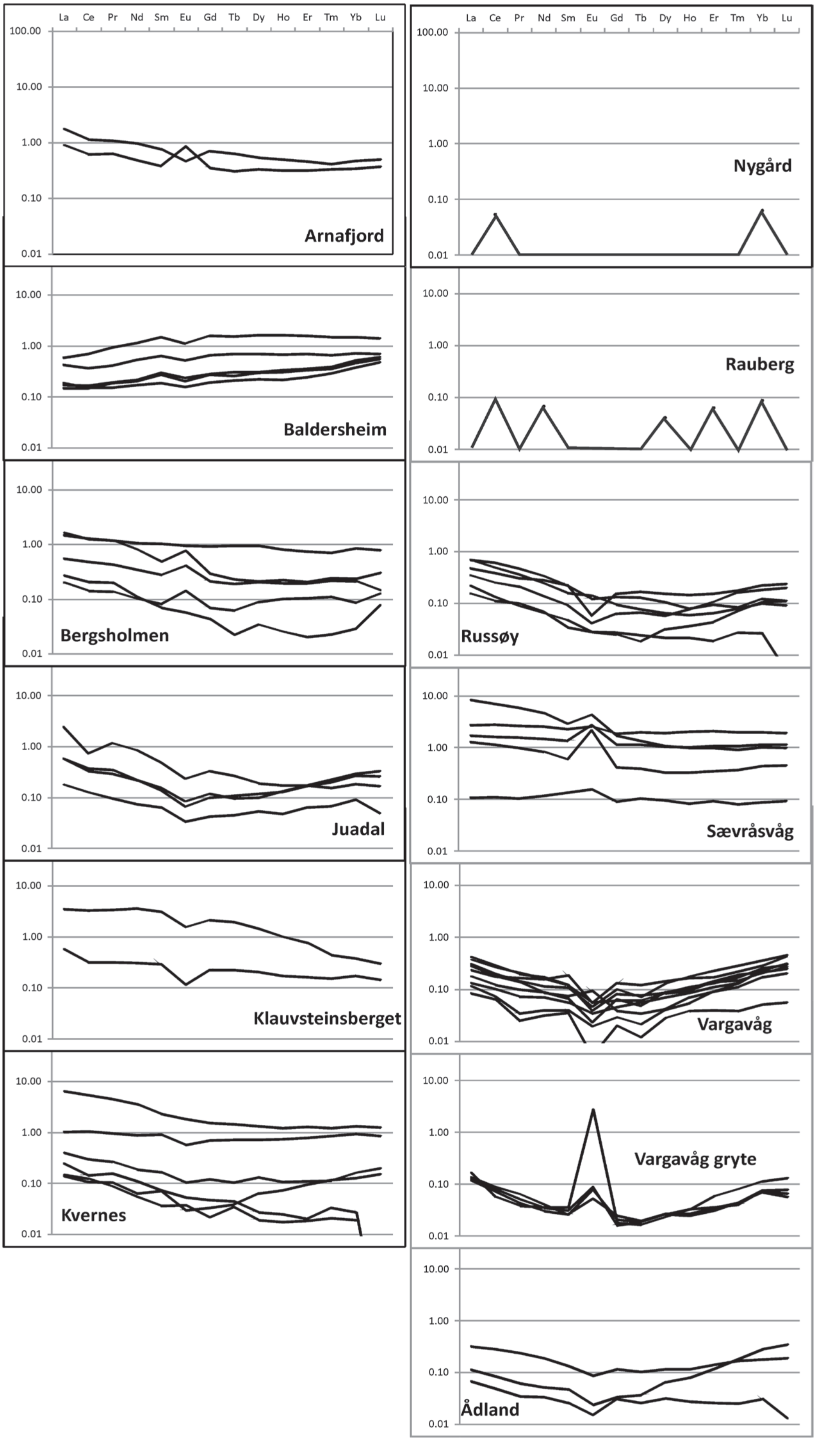


Figure 7a. *REE profiles of quarries in Unit 1.*

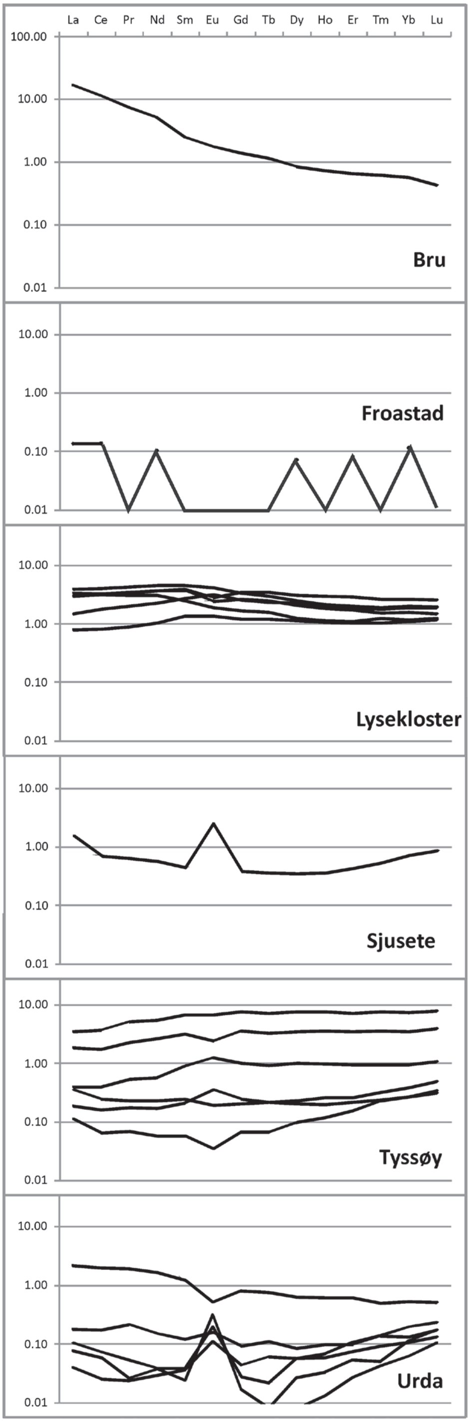


Figure 7b. *REE profiles of quarries in Unit 2.*

incomplete due to concentration below analytical detection limit (Nygård and Rauberg) (Figure 7a). The Bergsholmen, Kvernes, and Russøy quarries display a high degree of intra-source variation with a diverse range of profiles reflecting the internally inhomogeneous composition of the deposits. The remaining quarries display less intra-source variation, however; only the convex upwards profiles of Baldersheim and the U-shaped profiles of the Vargavåg quarries can be said to display little internal variation. Eu anomalies are common, both depleted (low values) and enriched (high values), and in some quarries both types are present. An example of highly contrasting Eu anomalies in nearby deposits is found in two of the neighbouring quarries, Vargavåg and Vargavåg gryte, situated about 100 metres from each other. At Baldersheim, the profiles display distinct REE profiles with a relative enrichment of the heavy REE elements (HREE) (right side of the diagram) quite different from all other Unit 1 quarries. Altogether, there are examples both of intra-source variation and of relatively little variation within the quarries in Unit 1. The REE profiles of the soapstone deposits in Unit 1 seem to reflect a varied and complex geological development with a range of different patterns present.

Unit 2: Eight of the nine Unit 2 quarries were matched with vessels through MTE. REE is available for six of these (Figure 7b). The Urda quarry shows an intra-source variation ranging from U-shaped profiles with marked positive Eu anomalies, to nearly flat or slightly light REE (LREE) enriched patterns with a small negative Eu anomaly. The characteristic REE pattern of the Lysekloster quarry displays little intra-source variation. Also the Tyssøy quarry's profiles show relatively little internal variation in REE patterns, but with a large range of concentrations and both small negative and positive Eu anomalies. Tyssøy shows a general enrichment of HREE, a rare trend among the sampled quarries, but still present in some quarries in all the units (e.g., Baldersheim in Unit 1, Flatabø and Raudesteinane in Unit 3 and Klovsteinsjuvet in Unit 4). From the quarries along Hardangerfjorden, only one REE sample is available for each (Bru, Froastad and Sjusete) and the degree of intra-source variation cannot be determined. Some REE were not detected in the Froastad quarry sample, but the available REE data may indicate a REE profile with similarities to Sjusete, although there are major differences in the concentrations. The profiles of the soapstone deposits in Unit 2 seem to reflect a complex geological situation, with both high and low intra-source variation. There also seems to be some degree of inter-source variation, although the sparse number of samples for some quarries requires that this observation be made with some reservations.

Unit 3: Five of the seven sampled quarries in Unit 3 matched vessels on MTE. REE data is available for four of these, and for one additional quarry that did not match any vessels (Figure 7c). Only one or two profiles are available for each quarry, making it hard to judge the degrees of intra-source variation. Three of the quarries display rather similar sub-horizontal profiles, including a large vessel quarry at Raudesteinane. Flatabø displays increased values of the HREE, a trend that is not shared with any other Unit 3 quarry. Eu anomalies are negative for all Unit 3 quarries. U-shaped REE profiles are not found in Unit 3. Apart from Flatabø, there is relatively little inter-source variation among the sampled Unit 3 quarries.

Unit 4: The six sampled quarries in Unit 4 matched vessels on MTE, and REE data is available for all of these (Figure 7d). Five of the quarries have more than one profile available and, with the exception of some variation in the profiles of Ingahogget and Klovsteinsjuvet, they display relatively little intra-source variation. Apart from the Åkra quarry and partly Klovsteinsjuvet, the REE profiles consistently show negative Eu anomalies. The content of REE is notably high in Unit 4, between 10 and 1 ppm. U-shaped REE profiles are not found in Unit 4. There is relatively little inter-source variation among the sampled Unit 4 quarries.

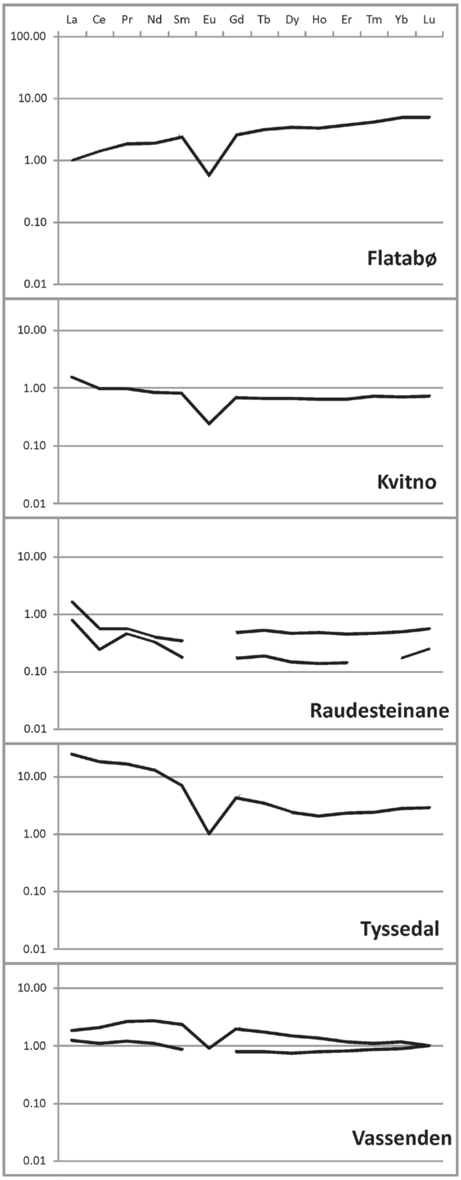


Figure 7c. *REE profiles of quarries in Unit 3.*

The limitations of the REE data for discrimination between quarries become clear from the above.

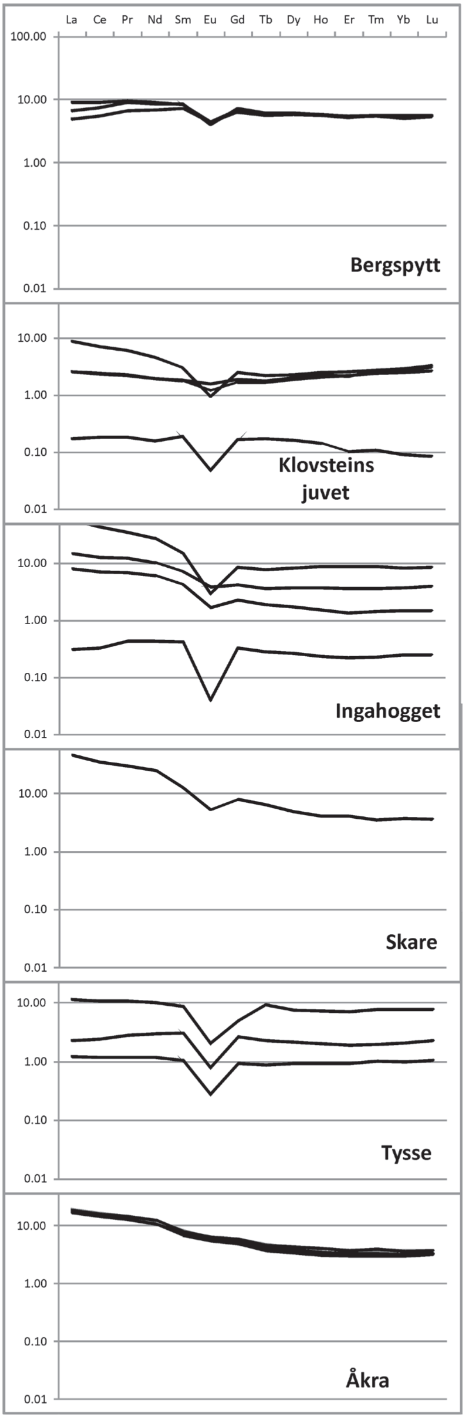


Figure 7d. *REE profiles of quarries in Unit 4.*

Intra-source profile variations prevail within all of the geological units, but to a lesser degree in Units 3 and 4. Some quarries with several REE profiles available display little internal variation, whereas many show internal profile variations reflecting the inhomogeneous composition of the rocks. With this variety in internal pattern displayed both on the level of geological units and on the level of individual quarries we do not find it feasible to make a positive match between a vessel and a quarry based on REE alone. Instead, however, quarries that have been matched with vessels through MTE can be rendered improbable/implausible through REE when vessel and quarry REE patterns do not show acceptable correspondence (for similar observations see Forster & Jones this vol.). With this procedure, the REE pattern of the vessels will be compared to that of their MTE matched quarries and the vessels are divided into categories according to their degree of match based on both MTE and REE. We hold as a premise that, if the REE patterns show acceptable correspondence, the reliability of the MTE match between vessel and quarry is strengthened. This premise is, as we will show, supported below.

The application of REE to the MTE matches

REE data is available for 122 vessels (Table 2 in the Appendix); however, since REE is not available for all quarries, REE is practically only available for 112 vessels and all their matching quarries. In 34 cases, then, REE data are not available for either vessels or all the relevant quarries. For these 34 cases, we consider the REE data to be inconclusive. When comparing the vessel's REE pattern with that/those of MTE matched quarries, the results are given as 1Q, MC2–8 or SRM1–4. The procedure and terminology is described below and shown in Figure 8:

- If the REE pattern of a quarry suggested in a 1Q/MTE match shows an acceptable degree of correspondence with that of the vessel, the match now qualifies as a 1Q match based on MTE&REE (1Q/MTE&REE).

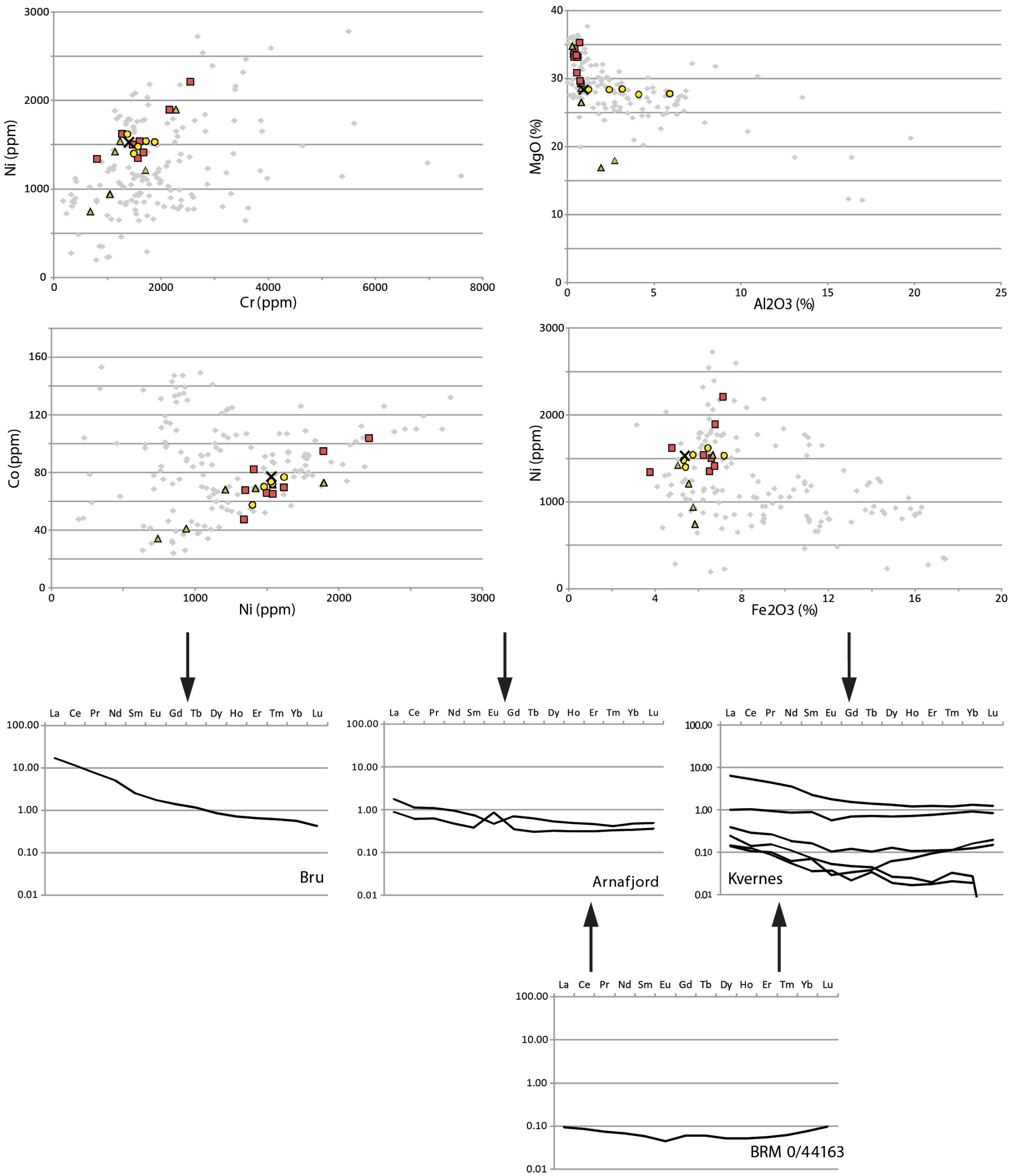


Figure 8. *The matchmaking history of the urban vessel (cross) BRM 0/44163. Three quarries came out as relevant during the MTE analysis: The MC3/MTE choice of quarries are Bru (square), Arnafjord (triangles) and Kvernes (circles). The vessel's REE pattern shows an acceptable degree of correspondence with profiles of the Arnafjord and Kvernes quarries, whereas Bru's profile differs considerably. Bru is thus rendered improbable, the number of eligible quarries is reduced to two, and BRM 0/44163 is now a vessel in the MC2/MTE&REE match category.*

- If the REE pattern of one or several alternative quarries suggested in an MC/MTE or an SRM/MTE match shows an acceptable degree of correspondence with that of the vessel, the match now qualifies as a 1Q match based on MTE&REE (1Q/MTE&REE) or an MC match based on MTE&REE (MC/MTE&REE), or an SRM match based on MTE&REE (SRM/MTE&REE).
- If one or all quarries suggested in a 1Q/MTE or MC/MTE match are rendered improbable by REE, quarries that have matched the vessel on between five and seven elements are tested if such have been identified during the MTE analysis. If any of these quarries have REE patterns with an acceptable degree of correspondence with that of the vessel, the match now qualifies as SRM based on MTE&REE (SRM/MTE&REE).
- If all quarries suggested by MTE as 1Q, MC or SRM are rendered improbable by REE, the vessel goes into the category PRM based on MTE and REE (PRM/MTE&REE).

Through these procedures it is possible to give a 1Q/MTE&REE-match for 43 (38%) of the 112 vessels/objects (Figure 9). Nineteen (17%) have an MC match with between two and five quarries (MC2–5/MTE&REE) and the number of relevant quarries is thus reduced in many cases. Eleven (10%) of the vessels have SRM with one or two quarries as candidates (SRM1–2/MTE&REE) and 37 (33%) now have a PRM.

Compared to the results based on MTE alone, we see that, when applying REE, a larger share of the vessels are now matched with only one quarry, and a larger share seem to have a poor match with the Hordaland region's quarries.

Figure 9. *Results of match based on MTE&REE data for 112 vessels.*

Five categories of match based on MTE&REE, where REE is available for vessels and all quarry alternatives	*MTE&REE n=112*
One quarry match (1Q/MTE&REE)	43 = 38%
Multiple choice (MC2–5/MTE&REE)	19 = 17%
Some regional match (SRM1/MTE&REE)	11 = 10%
Some regional match (SRM2/MTE&REE)	2 = 2%
Poor regional match (PRM)	37 = 33%

Step three: evaluating the reliability of the geochemically based match categories

The reliability of the categories of MTE and MTE/REE based matches is now assessed through five approaches. First, we will see how the categories of MTE based matches 'responded' to the application of REE. Then, independent sets of data will be drawn upon, while applying, among other, spatial analyses and Visual Impact Analysis (VIA). The aim of applying a VIA is to see if regular or random patterns are visible when independent sets of data are studied spatially (Emmelin 1984; Hansen 2008). In these analyses, vessel dates and find contexts, as well as the geological unit of quarries, are parameters drawn upon. The details are elaborated upon below. If regular patterns or trends in the spatial distribution of independent sets of data are discerned and these patterns coincide with patterns in the geochemically based matches, this may offer insight into the reliability of these matches between vessels and quarries. The typology of the urban vessels is also included in the evaluation.

Evaluation of the MTE based matches using REE

With the premise that REE profiles with an acceptable degree of correspondence strengthen the MTE based matches and that quarries can be rendered improbable through REE, an overview of how the categories of MTE based match 'responded' to the application of REE data gives an indication of the reliability of the categories of MTE based matches. This in turn provides guidance on how much trust to place in the 34 cases where REE are not available.

For the 38 1Q/MTE vessels (Figure 4), REE data was available for both vessel and relevant quarries in only 29 cases (Figure 10). For 16 of these (55%) there was an acceptable degree of correspondence between the REE pattern of the vessel and that of the quarry. In six cases (21%), quarries with five to seven elements in common with the vessels (SRM) had acceptable REE patterns, whereas for the remaining seven vessels (24%), no quarries were relevant and they were 'sent' to the PRM group. Altogether, then, 76% of the 1Q vessels had a REE profile that had an acceptable degree of correspondence with the quarries in the Hordaland region selected through matches on five to eight MTE, but 24% ended up as PRM.

For the 67 MC/MTE vessels, REE was available for vessel and all quarries in 52 cases. In six (12%) of these 52 cases, there was an acceptable degree of correspondence between the REE pattern of the vessel and those of each of the alternative quarry candidates. For 40 (77%) of the 52 MC vessels, one or more of the quarries were rendered improbable and the number of eligible quarries was reduced to between one and five. For two vessels, SRM/MTE quarries became eligible and had REE patterns with an acceptable degree of correspondence. Only four cases (8%) became PRM. Thus, 88% of the MC vessels had a REE profile that had an acceptable correspondence with that of one or more of the regional quarries selected through matches on eight MTE, while only 8% ended up as PRM.

Fifteen of the 24 SRM/MTE vessels had REE data as well as REE available for all quarry alternatives suggested through MTE match. For the six cases where only one quarry was a candidate (SRM1), REE rendered the quarry improbable in four cases. In three of the nine cases with alternative quarries (SRM2–5), the number of quarries was reduced. In the last six cases, the alternative quarries were considered improbable through REE. Altogether then, in five (33%) of the 15 SRM cases where REE data were available for both vessels and all involved quarries, there was acceptable correspondence

Figure 10. *Correspondence between match made through MTE and REE for 112 vessels.*

Correspondence between match made through MTE and REE	***Correspondence REE pattern all quarries involved = none rendered improbable through REE***	***Correspondence, for some quarries, some rendered improbable = number of quarries reduced through REE***	***Correspondence, with 5–7 element (SRM) quarries***	***No correspondence = all quarries rendered improbable through REE***
One quarry match (1Q) REE available for the vessel and quarry n=29	16 = 55%	0 = 0%	6 = 21%	7 = 24%
'Multiple choice' (MC2–9) REE available for all vessels and quarries n=52	6 = 12%	40 = 77%	2 = 4%	4 = 8%
'Some regional match' (SRM1) REE available for the vessel and quarry n=6	2 = 33%	0 = 0%	–	4= 66%
'Some regional match' (SRM2–5) REE available for the vessel and all quarries n=9	–	3 = 33%	–	6 = 66%

between the REE pattern of the vessel and that of one or more of the alternative quarries suggested through MTE.

If we can trust these numbers to be relevant for all the MTE matches, there is an 88% chance that one or more quarries in the MC/MTE match category would have had acceptable REE patterns and that only 8% of these matches would have ended up in the PRM/MTE&REE category. This implies that the MC/MTE matches are generally quite trustworthy. Regarding the 1Q/MTE vessels, it seems that matching a single quarry is difficult through MTE alone; as many as 45% of the matches to single quarries were dismissed through REE. Even if a large share of these vessels became SRM vessels, altogether one quarter of the 1Q matches ended up as PRM/MTE&REE. This suggests that 1Q/MTE matches should be considered less trustworthy on a general basis than the MC/MTE matches, and should be considered carefully with this in mind. This also applies to the SRM/MTE vessels, where 66% of the matches to the suggested quarries were rendered improbable by REE.

These results and insights are taken into consideration when giving individual vessels a provenance point score below. We will proceed to further evaluate the geochemically based matches through other datasets.

The distribution of match categories in rural versus urban assemblages

The rural vessels are, as we recall, from Viking Age contexts in the Hordaland region, whereas the urban vessels stem from early medieval Bergen. If there are systematic differences in the distribution of vessel match categories within the two vessel assemblages, and if these have 'independent' social and historical explanations, this may lend confidence to the geochemistry based match categories.

Figure 11 shows the distribution of the MTE and MTE&REE based match categories in the rural and urban assemblages. It is interesting to note that the rural assemblage has a notably smaller share of PRM match vessels than the urban counterpart. If we first look at numbers based on MTE alone, only one (2%) of the rural vessels does not find a matching quarry in the region, while in the urban assemblage the share is 16 vessels (17%). As a result of a chi square test (X2-test) (Siegel 1956:174-179, 249), the null-hypothesis of a random distribution of the match categories can be rejected on a highly significant level i.e. the probability of a random distribution causing the pattern is lower than 1%.

In the 11th and 12th centuries, Bergen was certainly connected to inter-regional networks of trade and exchange (Hansen 2005). It is not unlikely that households in Bergen would have had access to soapstone vessels through interregional networks to a higher degree than households in rural Viking Age Hordaland. If we accept this assumption, it would plausibly explain the differing distribution of the match categories, and lend support to the credibility of the PRM/MTE category in particular, and suggests that the poor match with the region's quarries is real. It also lends support to MTE based matches on a general level.

Turning to the distribution of PRM categories based on MTE&REE, the pattern with a higher

Figure 11.*Categories of MTE and MTE&REE matches for the rural and urban vessels.*

Four categories of match based on MTE (n=146 vessels) and on MTE&REE (n=112 vessels)	*MTE rural vessels n=51*	*MTE urban vessels n=95*	*MTE&REE rural vessels n=21*	*MTE&REE urban vessels n=91*
One quarry match (1Q)	19 = 37%	19 = 20%	13 = 61%	30 = 33%
Multiple choice (MC)	20 = 39%	47 = 49%	1 = 5%	18 = 20%
Some regional match (SRM)	11 = 22%	13 = 14%	5 = 24%	8 = 9%
Poor regional match (PRM)	1 = 2%	16 = 17%	2 = 10%	35 = 38%

share of PRM in the urban versus the rural vessel assemblage is strengthened; the urban share has increased to 38%, whereas only one more rural vessel is added to the PRM category (10%). Why has the urban share increased so much more than the rural? One factor may be that the number/share of rural vessels with available REE is small and statistics on small numbers can be hazardous. Again, however, the null-hypothesis of a random distribution of the match categories can be rejected on a highly significant level (1%). So the trend seems clear: hardly any of the rural 1Q, MC or SRM were considered improbable and sent to the PRM category by REE. And since the same methodological procedures have been followed on the two vessel assemblages, the trend should not be explained as a problem inherent in the analytic methods or data. Rather, the increased share of urban PRM matches may be given independent social and historical explanations; we would actually consider it very likely that there are more 'strangers' among the urban vessels than among the rural. If we accept this, the increased share of PRM among the urban vessels suggests that the ability of REE to render quarries improbable/implausible is real. It also lends support to the PRM/MTE&REE as trustworthy, in the sense that poor matches with the region's quarries are real. Furthermore, it lends strong general confidence to matches made on both MTE&REE. This insight is taken into consideration when giving individual vessels a provenance point score below.

The geographical location of quarries with matches to the rural versus the urban vessel assemblages

The geographical location of quarries that were matched with, respectively, rural Viking Age vessels and early medieval urban vessels as 1Q/MTE&REE or MC/MTE&REE matches is the next dataset to be addressed.

The spatial distribution of quarries that gave 1Q/MTE&REE-match to 43 rural and urban vessels shows clear trends. Regarding the quarries that match the 13 rural vessels, all quarries except one (that has matched three vessels) are located in the area southeast of Hardangerfjorden. Quarries that match the 30 urban vessels are all, except three (that have matched altogether four vessels), located northwest of this fjord.

A similar analysis of the 19 vessels with an MC2–5/MTE&REE match and their alternative quarries produced these patterns: for the single rural vessel that was matched with multiple quarries, all alternative quarries are located southeast of Hardangerfjorden. For 16 of the 18 urban MC vessels the alternative quarries are all located northwest of this fjord. The remaining two urban MC/MTE&REE vessels have matched quarries that are located on either side of the fjord. The trends in the spatial patterns formed by the MC/MTE&REE matches are accordingly similar to those formed by the 1Q MTE/REE matches: the majority of quarries matched with the urban vessels are located northwest of Hardangerfjorden and the majority of quarries that were matched with the rural vessels are located southeast of Hardangerfjorden.

The quarries have, with few exceptions, not been studied archaeologically; their social and historical context is thus not well established. The separate dates and contexts of the two object assemblages, however, coincide so well with the trends in the spatial pattern provided by the quarries that it is unlikely that the patterns are a product of methodological errors or qualities inherent the geochemical data. So we will argue that the coinciding patterns imply that the 1Q/MTE&REE and MC/MTE&REE matches are not random. They must have – so far unexplored – social and historical explanations, and this lends general support to the validity of 1Q/MTE&REE and MC/MTE&REE matches made between vessels and quarries. This insight is taken into consideration when giving individual vessels a provenance score below.

An important point is that the geographical area northwest of Hardangerfjorden corresponds to geological Unit 1&2, and the area southeast of the fjord corresponds to geological Unit 3 (the northern part of the Folgefonna peninsula) and Unit 4 (the southern part of the Folgefonna peninsula). If all quarries had been located within one unit/geological setting, the pattern would probably not be so clear. Thus, the geological setting is very favourable for the clear patterns discerned here.

The find location of 1Q and SRM/1 rural vessels versus the location of their quarry candidate

The transport distances between the find spot of 1Q and SRM1 rural vessels and their quarry candidate are addressed as yet another spatial approach to evaluate the geochemically based matches. Valleys probably constituted natural passageways over land, however, given the weight of soapstone, waterways (in particular, the fjords) must have been preferred (cf. Resi 1979:125). Topographic maps and tools in ArcGIS have been used to estimate the approximate transport distance along waterways or valleys between quarries and vessel find spots. Vessels that are found within a transport distance of 0–10 km from the quarry are, according to our definition, found *in the vicinity* of this quarry. If found within a transport distance of 11–30 km from the quarry, we consider the vessel as *local*. Vessels that are found beyond 30 km, but along a natural transport route between the quarry and the find spot of the vessel are considered *regional with favourable accessibility*. Vessels that are found further than 30 km away from the quarry candidate but not along a convenient transport route are labelled *regional*. When vessels are found in the vicinity or in the local area of their quarry candidate, we consider such a spatial circumstance as a strong indication that the match between vessel and quarry is trustworthy. If vessels are found further than 30 km from a quarry candidate, whether or not along a convenient transport route in relation to 'their' quarry this is, however, *not* considered to be an indication of a mismatch.

Three of the 13 rural 1Q/MTE&REE-vessels were found in the vicinity and two were found within the local area of their quarry (Figure 12). For five of these 13 1Q rural vessels, the find location of the vessels versus the location of their matching quarry thus lends strong support to the particular matches made and confidence to the 1Q/MTE&REE match category as a whole. Concerning the nine 1Q/MTE vessels where REE was not available for analysis, two vessels were found in the local area of their quarry. This lends strong support to these two 1Q/MTE matches in particular.

Addressing the five SRM1/MTE&REE vessels, three were found in the vicinity of their matching quarries, lending strong support to these three particular matches. Of the two SRM/MTE vessels, one was found in the vicinity of its matching quarry. This lends strong support to this particular match, and this spatial analysis suggests that some of the matches made on less than eight MTE may be reliable. This insight is taken into consideration when giving individual vessels a provenance score below.

Figure 12. *Distance between find spot for 1Q and SRM1 rural vessels and their quarry candidate.*

Transport distance between the find spot for 1Q and SRM/1 rural vessels and 'their' quarry	*Number of rural 1Q vessels n=13 MTE&REE*	*Number of rural 1Q vessels n=9 MTE*	*Number of SRM/1 rural vessels n=5 MTE&REE*	*Number of SRM/1 rural vessels n=2 MTE*
Vicinity of quarry (0–10 km)	3	0	3	1
Local area of the quarry (11–30 km)	2	2	0	0
Regional, (more than 30 km) but with *favourable accessibility* along transport route from quarry to vessel find spot	4	2	0	0
Regional (more than 30 km), but not along any natural transport route from quarry to vessel find spot	4	5	2	1

The typology of the urban vessels

Vessel typology may also provide interesting insights into the reliability of the geochemically based matches. The urban vessels, as already mentioned, have been classified in connection with the study. Vessels of the medieval types A and B were most likely produced in western Norway (Lossius 1977). It is not known whether differences among these types had functional or chronological significance, or whether both types were produced in the same quarries. We thus expected to find both types A and B within an assemblage of vessels quarried in the Hordaland region. Type C is, however, held to be of eastern Norwegian origin (Lossius 1977: 63–67) and if such vessels are among the urban vessels, their 'matching history' will be interesting for an assessment of the general reliability of the geochemically based matches (for an illustration of the vessel types see Vangstad this vol.).

Among the urban vessels, 79 could be classified according to type. Seventy were of type A, seven of type B and two were of the eastern Norwegian type C. Based on typology, there are thus only two obvious strangers in the urban assemblage. The inventory numbers of the type C vessels are shard (1) BRM 0/80455 and shard (2) BRM 110/5651. We shall have a look at their match history.

Shard 1 was assigned to the MC3/MTE category. Three different quarries, i.e., Ingahogget and Klovsteinsjuvet (in geological Unit 4) and Lysekloster (in Unit 2) all came out with a match on eight elements, while a fourth quarry (Sele in Unit 2) came in with a five element match. The three quarries that matched on eight elements did not have REE patterns with any acceptable degrees of correspondence to the vessel's REE pattern, so they were discarded in accordance with the principles outlined above. The fourth quarry, Sele, came up as an SRM1 alternative that was up for testing. Since we do not have REE data for Sele, the shard was classified as inconclusive during the REE analysis. Accordingly, it remained in the category MC3/MTE with the three eight-element quarries as alternatives, even if they quite likely should have been ruled out.

Shard 2 was assigned to the SRM2/MTE group by matches on six elements with the Ingahogget quarry (Unit 4) and with the Sele quarry (Unit 2) on five elements. The REE profile of Ingahogget had an acceptable degree of correspondence with the vessel's REE pattern; however, since Sele did not have REE data, this shard was also classified as inconclusive during the REE analysis and it remained in the SRM/MTE group. Had we not known the typology of the two shards they would not have been recognised as strangers through the analyses of geochemical data.

These two type C shards both have MTE compositions showing traits in common with two different geological units in the Hordaland region. These examples may imply that the geochemical composition of vessels that match quarries in more than one unit may find better or similar parallels in other parts of Norway as well. Geological knowledge (see Sturt et al. 2002) tells us that some of the Hordaland units may have equivalents in other parts of Norway, so we should probably not be too surprised. This calls for some attention and some scepticism regarding vessels matched with quarries in several geological units. One of the shards has an REE profile that is acceptable within a Hordaland regional context that may also call for attention and supports our supposition that discriminating between quarries cannot be based on REE alone. This insight is taken into consideration when giving individual vessels a provenance point score below.

Conclusion on step three: the evaluation of the general reliability of the geochemically based matches

The analyses of the distribution of, respectively, PRM/MTE and PRM/MTE&REE, match categories in the rural versus the urban assemblages lend support to the validity of REE in rendering quarries improbable/implausible. Our premise, that the application of REE data strengthens the MTE based matches, thus finds support.

The analyses have resulted in several categories of geochemically based matches between vessels and regional quarries. These categories may, if no other evidence supports the match, be used with varying degrees of confidence:

- 1Q/MTE: vessels that matched one quarry on eight MTE. The application of REE to these matches rendered many improbable, and showed that one must use the individual 1Q/MTE matches with caution if no additional data, such as the co-location of the find spot of the vessel and its matching quarry, can support the match.
- MC/MTE: vessels that matched several regional quarries on eight MTE. The application of REE to this category of matches showed that a high degree of trust can be placed in trends in the MC/MTE matches. It is thus quite likely that one of the quarries that matches the vessel's geochemistry may actually have delivered the vessel. If the vessel's matching quarries are all located within one geological unit it is considered likely that the vessel stems from this unit. As a contrast, the matching history of a MC/MTE type C vessel indicated that the geochemical composition of MC/MTE vessels with a match to quarries located in more than one geological unit may be so general that it fits with geological units outside the Hordaland region as well. Taking this observation into consideration, MC/MTE matches to quarries in more than one geological unit are regarded as less trustworthy.
- SRM/MTE: vessels that are matched with the regional quarries on between five and seven MTE. The application of REE to these matches deemed two thirds improbable, so the individual SRM/MTE matches must be perceived as uncertain if no additional data, such as the co-location of the find spot of the vessel and its matching quarry, can support the specific match. The matching history of a SRM/MTE type C vessel indicated that the geochemical composition of vessels with a match to quarries located in more than one geological unit may be so general that it fits into geological units outside the Hordaland region. Taking this observation into consideration, SRM/MTE matches to quarries in more than one geological unit are treated as untrustworthy.
- PRM/MTE: vessels that are matched with the regional quarries on four or fewer MTE. The over-representation of PRM/MTE among the urban vessels, compared to the rural, implies that the trends in the MTE based PRM matches may have some validity, making it likely that these vessels do not stem from regional quarries.
- 1Q/MTE&REE and MC/MTE&REE: vessels that matched one quarry or multiple quarries on eight MTE and that have an REE profile that has an acceptable degree of correspondence with the profile(s) of its matching quarry. The increased difference in the representation of 1Q/MTE&REE and PRM/MTE&REE among the urban vessels versus the rural assemblages, and the coinciding patterns in the geographical locations of quarries that matched respectively the rural and medieval 1Q/MTE&REE and MC/MTE&REE vessels all lend strong support to the validity in the trends of these two categories of geochemically based matches. Furthermore, the close distances between the find spots of some 1Q/MTE&REE rural vessels and their quarry candidates lend support to the validity of the match category on a general level and strong support to the concrete matches in particular. Matches with a single quarry are considered relatively well established, whereas provenance to the geological unit of the quarry is considered reliable.
- SRM/MTE&REE: vessels that match regional quarries on five to seven MTE. The close distances between some SRM/MTE&REE vessels and their matching quarries give strong support to these concrete matches in particular, and show that some matches made on less

than eight elements may be trustworthy when combined with REE.

- PRM/MTE&REE: vessels that matched regional quarries on four or less MTE, or had an REE profile without an acceptable correspondence to those of the quarries matched on five to eight elements. The fact that all the 1Q/MTE vessels that ended up as PRM/MTE&REE after the application of REE were urban vessels lends support to the geochemically based methods applied and thus suggests that the MTE&REE classification of these vessels as PRM is trustworthy on a general level.

Altogether, in spite of favourable evaluations of most of the geochemically based match categories, the matching history of two 'strangers', both type C vessels, showed that the geochemically based methods used here are not watertight. These two cases implied that the geochemical composition of vessels that match quarries in more than one geological unit may be so common or general that it finds parallels in other parts of Norway as well. One of the shards had a REE profile that would be acceptable in a Hordaland regional context, which also calls for attention and supports our supposition that discriminating between quarries cannot be based on REE alone. In any one case there will be the possibility of a false match.

Step four: the individual vessels are scored and divided into provenance groups

Based on the assessments above, the individual vessels are now given a point score to quantitatively express the reliability of their match/mismatch with the sampled quarries/the Hordaland region. The vessels can gain or lose points depending on their stepwise performance through steps one to three in the analysis above. For the score this principle has been followed (Figure 13): vessels that came out with a one 1Q result on eight MTE are given three points, vessels that came out with multiple quarries on eight MTE are given four points, vessels that came out with a score on five to seven MTE are given two points and PRM vessels (four or less elements) are given zero points. Vessels with a REE profile that shows an acceptable degree of correspondence with that of the matching quarry(ies) gain two points, whereas profiles without any acceptable degree of correspondence lose two points. If a vessel's find spot is in the vicinity of the matched quarry, this results in three added points; if in the local area two points are added. If vessels matched more than one quarry that are located in different geological units (treating Unit 1&2 as one) one point is deducted from the score. Finally, if the vessel is of type C, all points are lost.

All in all, the sum of points expresses the degree of reliability of the match between the vessel and the sampled quarries in the Hordaland region, based on geochemical and archaeological data and analytic methods. Thus, for the PRM vessels, a low score is an indication that it is trustworthy that the vessel is not from the sampled quarries in the region.

Provenance groups and provenancing results

Through use of the provenance points and an eye to the evaluation of the general reliability of the geochemically based match categories, the vessels can now be divided into six provenance groups, where the reliability of provenance is characterised as reliable, quite reliable or tentative (Figure 14).

- Group 1 comprises vessels from the category 1Q/MTE&REE, as well as SRM1/MTE&REE vessels that are found in the vicinity or local area of their matching quarry. These 49 vessels each have six to nine points. Within this group, provenance to a single quarry is considered quite reliable, whereas provenance to the geological unit of the quarry is considered reliable.
- Group 2 comprises 15 vessels from the categories 1Q/MTE and SRM1/MTE&REE. These vessels have three to four points. Within this group, provenance to the single quarry is considered to be tentative, whereas provenance to the geological unit of the quarry is considered quite reliable.

Figure 13. *Individual vessel's points, gained and lost.*

Vessel	*Points gained*	*Points lost*
1Q MTE (8 MTE in common with one quarry)	3	
MC MTE(8 MTE in common with several quarries)	4	
SRM MTE (5–7 MTE in common with one or more quarries)	2	
PRM MTE (4 or less MTE in common with the sampled quarries)		0
REE profile acceptable for quarries selected through 5–8 MTE	2	
1Q & MC & SRM: REE not in accordance with any quarry alternatives selected through 5–8 MTE		2
Quarry in the *vicinity* of 1Q and SRM1vessel's find spot	3	
Quarry *local* in relation to 1Q and SRM1vessel's find spot	2	
MC/MTE and SRM/MTE quarries in various geological units (treating Unit 1&2 as one)		1
MC/MTE&REE and SRM/MTE&REE quarries in various geological units (treating Unit 1&2 as one)		1
Typology, C vessel		All

- Group 3 comprises 17 vessels that have matched several quarries in the category MC/MTE&REE. The matching quarries are all located within the same geological unit or within Unit 1&2. The vessels have six points. Within this group, provenance to one of the quarries is considered quite reliable and provenance to the geological unit of the quarries is considered reliable.
- Group 4 comprises 10 vessels in the MC/MTE category where all alternative quarries are located within a single geological unit or within Unit 1&2. The vessels have three to four points. Within this group, provenance to one of the specific alternative quarries is considered to be tentative, whereas provenance to the geological unit of the quarry is considered quite reliable.
- Group 5 comprises 15 vessels that, for various reasons, have not passed the matching procedures without problems. The vessels have a point score of one to four, so some score quite well. However, for 14 of the 16 vessels in this group, REE data are not available for vessel or quarry, so they have not been able to go through the matching procedures with a robust set of data. Many of the vessels are matched to more than one quarry (MC/MTE&REE, MC/MTE, SRM/MTE and SRM/MTE&REE) and in many cases these quarries are located in different geological units. The reliability of the matches between vessels and the region's quarries can neither be established nor dismissed with any certainty.
- Group 6 comprises vessels in the PRM/MTE and PRM/MTE&REE vessel categories. These 40 vessels have zero or one point scores and it is considered quite reliable that they are not from the Hordaland region.

The aim of the study was to assess the provenance of 146 vessels from Viking Age rural Hordaland and early medieval Bergen. For 131 vessels, a reliable, quite reliable, or tentative provenancing result has been found. The list of provenancing results for the individual vessels, with provenance point score, group assignment and their origin/quarry(ies) is given in Figure 15, see Table 3 in the Appendix for full overview of provenancing result.

***Figure 14.** Six provenance groups established by use of the provenance 'point-sum' and an eye to the evaluation of the general reliability of the geochemically based match categories.*

Six provenance groups (n=146 vessels)	*Point sum*	*Provenance to the selected quarry*	*Provenance to one selected quarries*	*Provenance to geological unit*	*Not from the Hordaland region*
Group 1 (n=49)	6–9	Quite reliable		Reliable	
Group 2 (n=15)	3–4	Tentative		Quite reliable	
Group 3 (n=17)	6		Quite reliable	Reliable	
Group 4 (n=10)	3–4		Tentative	Quite reliable	
Group 5 (n=15)	1–4	Reliability neither established or dismissed	Reliability neither established or dismissed	Reliability neither established or dismissed	Reliability neither established or dismissed
Group 6 (n=40)	0–1				Quite reliable

***Figure 15.** Provenancing result for the 146 vessels, with provenance point score, group assignment and their origin/ quarry(s). Rural vessels with a B-prefix, urban vessels with a BRM-prefix.*

Object no.	**MTE**	**MTE & REE**	**Group 1–6**	**Quarry selected Group 1–6**	**Score**
BRM 0/42937	1Q	1Q	1	Kvernes	5
BRM 0/43530	NRM	NRM	6		0
BRM 0/43549	NRM	NRM	6		0
BRM 0/44163	MC3	MC2	3	Arnafjord/Kvernes	6
BRM 0/44650	SRM1	Quarry no REE	5	Digranes	2
BRM 0/44931	MC4	1Q	1	Urda	6
BRM 0/44934	MC7	MC5	3	Arnafjord/Bergsholmen/Juadal/Kvernes/Urda	6
BRM 0/44998	NRM	NRM	6		0
BRM 0/45373	1Q	NRM	6		1
BRM 0/45465	MC3	MC2	3	Bergsholmen/Kvernes	6
BRM 0/45548	MC2	1Q	1	Kvernes	6
BRM 0/45695	1Q	NRM	6		1
BRM 0/45792	MC3	1Q	1	Bergsholmen	6
BRM 0/45810	NRM	NRM	6		0
BRM 0/45843	NRM	NRM	6		0
BRM 0/45857	NRM	NRM	6		0
BRM 0/45938	NRM	NRM	6		0
BRM 0/46144	SRM1	SRM1	2	Baldersheim	4
BRM 0/54177	MC5	1Q	1	Kvernes	6
BRM 0/54478	MC2	1Q	1	Kvernes	6
BRM 0/54795	MC3	MC3	3	Kvernes/Urda/Bergsholmen	6
BRM 0/55200	SRM2	NRM	6		0
BRM 0/63018	1Q	NRM	6		1
BRM 0/63600	MC2	1Q	1	Bergsholmen	6
BRM 0/63801	1Q	1Q	1	Urda	5
BRM 0/63998	MC3	1Q	1	Urda	6
BRM 0/64002	MC3	1Q	1	Bergsholmen	5
BRM 0/64060	1Q	NRM	6		1

Object no.	MTE	MTE & REE	Group 1–6	Quarry selected Group 1–6	Score
BRM 0/64141	NRM	NRM	6		0
BRM 0/64255	NRM	NRM	6		0
BRM 0/64272	NRM	NRM	6		0
BRM 0/64393	MC2	1Q	1	Kvernes	6
BRM 0/64422	MC3	MC2	5	Bergsholmen/Vassenden	4
BRM 0/64487	MC3	1Q	1	Kvernes	6
BRM 0/64621	1Q	1Q	1	Baldersheim	5
BRM 0/64638	MC2	1Q	1	Kvernes	6
BRM 0/64641	MC3	1Q	1	Urda	6
BRM 0/64657	SRM1	NRM	6		0
BRM 0/64742	MC2	1Q	1	Russøy	6
BRM 0/64786	MC2	MC2	3	Sjusete/Urda	6
BRM 0/64803	SRM1	NRM	6		0
BRM 0/64828	MC2	MC2	3	Bergsholmen/Kvernes	6
BRM 0/64984	MC3	1Q	1	Kvernes	6
BRM 0/64994	MC3	1Q	1	Bergsholmen	6
BRM 0/65004	SRM2	NRM	6		0
BRM 0/65007	MC2	1Q	1	Bergsholmen	6
BRM 0/73087	NRM	NRM	6		0
BRM 0/73155	SRM3	SRM2	5	Arnafjord/Vassenden	2
BRM 0/73346	NRM	NRM	6		0
BRM 0/73353	NRM	NRM	6		0
BRM 0/73441	MC4	SRM1	2	Bru	4
BRM 0/75316	SRM3	NRM	6		0
BRM 0/75671	1Q	SRM1	2	Juadal	3
BRM 0/75767	MC3	MC3	5	Bergsholmen/Sævråsvåg/Vassenden	5
BRM 0/77526	1Q	1Q	1	Ingahogget	5
BRM 0/77531	MC4	1Q	1	Sævråsvåg	5
BRM 0/77564	SRM4	SRM1	2	Kvernes	4
BRM 0/77576	1Q	1Q	1	Sævråsvåg	5
BRM 0/79750	1Q	SRM1	2	Russøy	3
BRM 0/80155	MC3	1Q	1	Kvernes	6
BRM 0/80210	MC4	1Q	1	Sævråsvåg	6
BRM 0/80253	SRM1	NRM	6		0
BRM 0/80455	MC3	Quarry no REE	6	Ingahogget/Klovsteinsjuvet/Lysekloster/Sele	0
BRM 0/80803	MC6	MC4	3	Bergsholmen/Kvernes/Russøy/Sævråsvåg	6
BRM 0/80852	MC4	MC3	3	Kvernes/Rauberg/Vargavåg	6
BRM 0/80871	1Q	1Q	1	Bergspytt	5
BRM 0/81128	1Q	SRM1	2	Rauberg	3
BRM 0/81366	MC3	MC3	3	Bergsholmen/Kvernes/Rauberg	6
BRM 0/81374	MC3	NRM	6		2
BRM 0/85416	MC8	MC2	3	Rauberg/Vargavåg	6
BRM 0/85447	MC6	MC3	3	Bergsholmen/ Kvernes/ Russøy	6

Object no.	MTE	MTE & REE	Group 1–6	Quarry selected Group 1–6	Score
BRM 0/85448	MC8	MC4	3	Bergsholmen/Froastad/Kvernes/Russøy	6
BRM 0/85465	1Q	1Q	1	Sævråsvåg	5
BRM 0/85502	MC7	1Q	1	Urda	6
BRM 0/85503	MC8	MC5	3	Bergsholmen/Juadal/Kvernes/Russøy/Urda	6
BRM 0/85556	NRM	NRM	6		0
BRM 0/85580	SRM2	NRM	6		0
BRM 0/85591	MC8	MC4	3	Bergsholmen/Kvernes/Russøy/Sjusete	6
BRM 0/85635	1Q	NRM	6		1
BRM 0/86150	MC3	NRM	6		2
BRM 0/86199	MC2	1Q	1	Urda	6
BRM 0/86220	MC6	MC2	3	Bergsholmen/Sjusete	6
BRM 0/86878	NRM	NRM	6		0
BRM 3/697	1Q	1Q	1	Kvitno	6
BRM 3/702	1Q	SRM2	4	Kvitno/Vassenden	3
BRM 76/11041	MC4	NRM	6		2
BRM 76/11048 # 2	Same as #1	Same as #1			
BRM 76/11048 # 1	1Q	NRM	6		1
BRM 104/2180	MC3	1Q	1	Ingahogget	5
BRM 104/2299	MC2	MC2	3	Bergsholmen/Sævråsvåg	6
BRM 104/2356	NRM	NRM	6		0
BRM 110/5518	MC4	NRM	6		2
BRM 110/5651	SRM2	Quarry no REE	6		0
BRM 110/5959	1Q	NRM	6		1
BRM 110/6463	MC2	Quarry no REE	4	Urda/Vargehola	4
BRM 237/1277	SRM2	NRM	6		0
B4253	1Q	1Q	1	Kvitno	5
B4369	SRM2	Quarry no REE	5	Bergspytt/Digranes	1
B4432	1Q	Vessel no REE	2	Sævråsvåg	3
B4719	MC6	Vessel no REE	4	Bergsholmen/Kvernes/Rauberg/Russøy/Urda/ Vargavåg	4
B4836	1Q	1Q	1	Tysse	5
B6204	MC2	1Q	1	Bergspytt	9
B6982/b	MC3	Vessel no REE	4	Froastad/Juadal/Russøy	4
B7018	1Q	Vessel no REE	2	Sævråsvåg	3
B7019	1Q	Vessel no REE	2	Kvitno	3
B7105	SRM3	Vessel no REE	5	Nygård/Vargavåg gryte/Vassenden	1
B7829	1Q	1Q	1	Sævråsvåg	7
B7888	1Q	1Q	1	Klovsteinsjuvet	8
B7925	1Q	1Q	1	Kvitno	5
B7960	1Q	1Q	1	Kvitno	5
B8300	MC4	Vessel no REE	4	Drebrekke/Flatabø/Kvitno/Vassenden	4
B8308	MC4	1Q	1	Sævråsvåg	8
B8321	MC6	Vessel no REE	4	Bergsholmen/Katlaberg/Kvernes/Nygård/ Rauberg/Vargavåg	4

Object no.	MTE	MTE & REE	Group 1–6	Quarry selected Group 1–6	Score
B8995	SRM3	Vessel no REE	5	Bergsholmen/Juadal/Kvernes	2
B9976	SRM2	Quarry no REE	5	Digranes/Kvitno	2
B10270	1Q	Vessel no REE	2	Svanøy	3
B10454	SRM1	SRM1	2	Bergspytt	4
B10457	MC4	Quarry no REE	5	Drebrekke/Kvitno/Sævråsvåg/Vassenden	3
B10462/a	MC2	1Q	1	Vassenden	5
B10462/b	SRM1	Vessel no REE	1	Bergspytt	5
B10462/c	MC2	Vessel no REE	5	Sævråsvåg/Vassenden	3
B10462/d	SRM2	NRM	6		0
B10481	1Q	SRM1	1	Flatabø	5
B10655	1Q	SRM1	1	Kvitno	5
B10680/a	1Q	Vessel no REE	1	Åkra	5
B10680/b	1Q	Vessel no REE	2	Skare	3
B10697	1Q	Vessel no REE	2	Raudesteinarne	3
B10980	MC2	Vessel no REE	4	Kvernes/Rauberg	4
B11115	SRM2	Quarry no REE	5	Bergspytt/Digranes	1
B11116	MC2	Vessel no REE	5	Arnafjord/Kvitno	3
B11422	SRM1	Vessel no REE	5	Bergspytt	2
B11551/a	MC5	Quarry no REE	4	Juadal/Kvernes/Nygård/Urda/Vargavåg	4
B11564/g	MC3	Vessel no REE	5	Sævråsvågen/Raudesteinane/Vassenden	3
B11630	1Q	Vessel no REE	1	Sævråsvåg	5
B11636	MC5	Vessel no REE	5	Juadal/Kvernes/Nygård/Urda/ Vassenden	3
B11686	MC5	Vessel no REE	4	Bergsholmen/Juadalen/Rauberg/Russøy/Urda	4
B11797	1Q	1Q	1	Skare	5
B11815/b	1Q	1Q	1	Åkra	8
B11835	MC3	Quarry no REE	4	Arnafjord/Kvernes/Svanøy	4
B11867/a	SRM3	SRM1	1	Bergsholmen	6
B11868/b	SRM1	NRM	6		2
B11869/c	1Q	Vessel no REE	2	Sævråsvåg	3
B11878/a	MC2	1Q	1	Sævråsvåg	5
B12025/b	MC2	1Q	1	Vassenden	6
B12050/a	MC4	MC3	3	Bergspytt/Ingahogget/Klovsteinsjuvet	6
B12314	MC2	SRM1	2	Juadal	4
B12372	NRM	Vessel no REE	6		0

Immediate social and historical implications of the provenancing results, suggestions for further studies

Using the six provenance groups defined above, we want to pursue some of the provenancing results' immediate implications in social and historical terms. We also comment on directions for further studies. We hold as a premise that the provenancing results for individual vessels in Group 1 and Group 3 are quite reliable and that trends in the results (i.e., that more than one 'result' points in the same direction) in these groups are reliable. Furthermore, the provenancing results of individual vessels in Group 2 and Group 4 are held to be tentative, and, as such, cannot carry an argument alone. Whereas trends formed by vessels in these groups can support an argument. As mentioned initially, the urban assemblage is reliably dated and considered representative for vessel consumption among ordinary people in Bergen during the early Middle Ages. Being aware that the rural counterpart, with fewer and less well dated objects, may not be quite as representative for vessels consumed in the Hordaland region during the Viking Age, we nevertheless assume heuristically in the discussions below, that the rural assemblage is quite representative for vessels consumed in the area during the Viking Age.

Interesting spatial patterns emerged when coupling information on the contexts and dates of vessels versus their matching quarries. We want to pursue four areas of implications regarding the dating of activities in the quarries, the identification of distinct quarry-districts, the character of soapstone vessel production in the Hordaland region, and the existence of PRM vessels.

Dating production in the quarries

Previous research has pointed to the Hordaland region as an important area for vessel production during the Viking Age (Petersen 1951:349–369; Skjølsvold 1961:124–125) and it has been suggested that the Sørfjorden area in the Hordaland region was an especially important production center in the Middle Ages (Lossius 1977:62-67, 1979:67-69). Soapstone quarrying has thus been considered an important industry in the Hordaland region during prehistory and the Middle Ages, yet activity in the regional quarries has, with few exceptions, not been dated hitherto. Matches between a quarry and Viking Age or early medieval vessels may now allow us to date production in the quarry indirectly to at least these respective periods. In Figure 16, quarries that match rural and urban vessels in Group 1 and Group 2 are listed.

Twenty quarries are linked to vessels that were matched with only one eligible quarry. The quarries Bru, Juadal, Rauberg, Raudesteinane, Svanøy, and Tysse have only matched Group 2 vessels, so dates for activity in these quarries established indirectly through the vessels' dates are tentative and cannot stand alone. Activities in the remaining quarries with matches to Group 1 vessels may be dated with more confidence; the more matches to each quarry, the stronger the confidence in dating activities here. At Bergsholmen, Bergspytt, Kvitno, and Sævråsvåg, activity is dated indirectly to both the Viking Age and the early Middle Ages. At Flatabø, Klovsteinsjuvet Skare, Vassenden and Åkra, activity is dated at least to the Viking Age; while at Baldersheim, Ingahogget, Kvernes, Russøy, and Urda, matches with urban vessels date activity to at least the early Middle Ages.

The indirect dating of activity in individual quarries through vessel matches is interesting, even if some dates are tentative. The datasets alone cannot be used to determine when activity began or ended in the quarries. A better understanding of the time frame for the onset and end of production at the individual quarry sites may be obtained through future archaeological investigations in the quarries.

Figure 16. *Quarries that match vessels from the Viking Age and the Early Middle Age. Group 1 comprises vessels with a quite reliable provenance, Group 2 is tentatively provenanced.*

Quarries	***Rural vessels Group 1/Group 2. The Viking Age***	***Urban vessels Group 1/Group 2. The early Middle Ages***
Baldersheim		1/1
Bergsholmen	1/0	5/0
Bergspytt	2/1	1/0
Bru		0/1
Flatabø	1/0	
Ingahogget		2/0
Juadal	0/1	0/1
Klovsteinsjuvet	1/0	
Kvernes		9/1
Kvitno	4/1	1/0
Rauberg		0/1
Raudesteinane	0/1	
Russøy		1/1
Skare	1/1	
Svanøy	0/1	
Sævråsvåg	4/3	4/0
Tysse	1/0	
Urda		6/0
Vassenden (Handegård)	2/0	
Åkra	2/0	

Identifying quarry districts

Clear patterns were discerned in our assessments of the locations of quarries that had matches with Viking Age rural and early medieval urban vessels respectively. The map in Figure 17 shows the geographical locations of quarries across the Hordaland region and the frequencies of matches between rural or urban vessels at the quarries. Vessels in Groups 1, 2, 3, and 4 are included; thus, both single-quarry (Group1&2) and multiple-quarry (Group 3&4) matches with varying levels of reliability are drawn upon. Note that vessels that matched multiple quarries have a 'hit'-signature at every one of these quarries, so the Group 3&4 signatures do not represent individual vessels. The frequency of hits reflects degrees of geochemical similarity between the rural/urban vessel assemblages and quarries in case. One must recall that, in numbers, the rural vessels are only about half as many as their urban counterparts, so the number of 'rural hits' are understandably fewer than the urban hits. Furthermore, more trust can be placed in Group 1 and Group 3 hits than in Group 2 and Group 4 hits. Nevertheless, the map provides a good visual impression of the locations of quarries/quarry-areas with rural versus urban hits so that *general trends in the spatial and temporal patterns formed by the hits* can be identified.

The map shows that the hits for rural vessels fall primarily southeast of Hardangerfjorden in the northern part of the Folgefonna peninsula and by Sørfjorden (i.e., within geological Unit 3, for a cross reference to quarry names and units, see Figure 1 and Figure 2), and in the southern part of the Folgefonna peninsula, which is equivalent to geological Unit 4. As most of the hits here are from Group 1 vessels, this trend is considered reliable. Some Group 3&4 vessel-hits are also found southeast of Hardangerfjorden and lend additional support to the trend formed by Group 1&2 hits here. Northwest of Hardangerfjorden (the area covered by geological Unit 1&2) the rural hits are fewer, however, since some stem from Group 1 vessels, it is considered reliable that rural vessels were quarried northwest of the fjord. In addition, rural Group 3&4 hits are documented northwest of Hardangerfjorden and these hits lend additional support to the trend based on Group 1&2 hits. In particular, Group 1&2 hits are frequent in the Sævråsvåg quarry (no. 28) in the most northwestern part of the Hordaland region.

The patterns suggest that, in the Viking Age, the quarries southeast of Hardangerfjorden on the Folgefonna peninsula and by the Sørfjorden area were the most important suppliers of vessels to rural households in the Hordaland region. Some quarries in the area northwest of Hardangerfjorden, however, also produced rural vessels and among these the Sævråsvåg quarry stands out. The Folgefonna peninsula/Sørfjorden area producers were thus not alone in producing vessels for rural Viking Age Hordaland households.

The early medieval urban vessel hits also form a very distinct spatial pattern, with the vast majority being located in areas northwest of Hardangerfjorden, (geological Unit 1&2). Only a few hits are linked to quarries southeast of this fjord. One Group 1 vessel is matched with the Kvitno quarry (no. 16) by Sørfjorden at the Folgefonna peninsula and, while it is the only hit to a quarry in geological Unit 3, it should not be ignored. The others are Group 1 hits to the Ingahogget (no. 10) and Bergspytt (no. 4) quarries in the southern part of the Folgefonna peninsula (geological Unit 4). The spatial pattern of hits formed by urban vessels from Groups 1 to 4, coupled with the well-substantiated dates of the urban vessel assemblage, strongly suggests that quarries in the area northwest of Hardangerfjorden became Bergen's main suppliers of soapstone vessels during the early Middle Ages. It seems that some quarries at the Folgefonna Peninsula and by Sørfjorden were still active and made some few deliveries to Bergen in this period.

The implications of these patterns are that quarries in the general Sørfjorden area seem to have been important producers of vessels for rural Viking Age households in the Hordaland region, while quarries in the area northwest of Hardangerfjorden, with the exception of the Sævråsvåg quarry, delivered vessels to a lesser extent at this time. In the early Middle Ages, quarries in areas northwest of Hardangerfjorden became the main suppliers of vessels to Bergen, while quarries southeast of this fjord made relatively few deliveries to Bergen. This stands in stark contrast to previous perceptions that the Sørfjorden area continued to be an important production centre from the Viking Age into the Middle Ages (Lossius 1977:62–67).

Rural/Viking Age and urban/early medieval households thus got their vessels, generally, from quarries located in two different geographic areas. In fact, one may suggest that distinct quarry districts existed in the Viking Age and the early Middle Ages: one of these quarry districts (hereafter Quarry District A) comprised the Folgefonna peninsula and the Sørfjorden area, while the second district (hereafter Quarry District B) was found in the area northwest of Hardangerfjorden. These observations add a whole new level of detail to the picture of the regions' production of soapstone vessels in the Viking Age and the early Middle Ages

Based on the available evidence, it cannot be established whether the production of vessels in District A declined dramatically by the end of the Viking Age and the transition to the Middle Ages, or whether this area simply did not deliver vessels in any quantity to the early medieval urban community at Bergen. Did production decline or did the district's producers not engage in exchange-networks involving town/Bergen-connected actors? These are interesting questions that must be pursued on a broader canvas in future research. Refined dating of the quarries obtained through further archaeological investigations, factors such as restraints and possibilities offered by the natural topography, the size of the quarries/soapstone outcrops, the demand for new types of products such as stone for monumental buildings in the early Middle Ages, as well as land-ownership, should all be considered in seeking answers to these new questions.

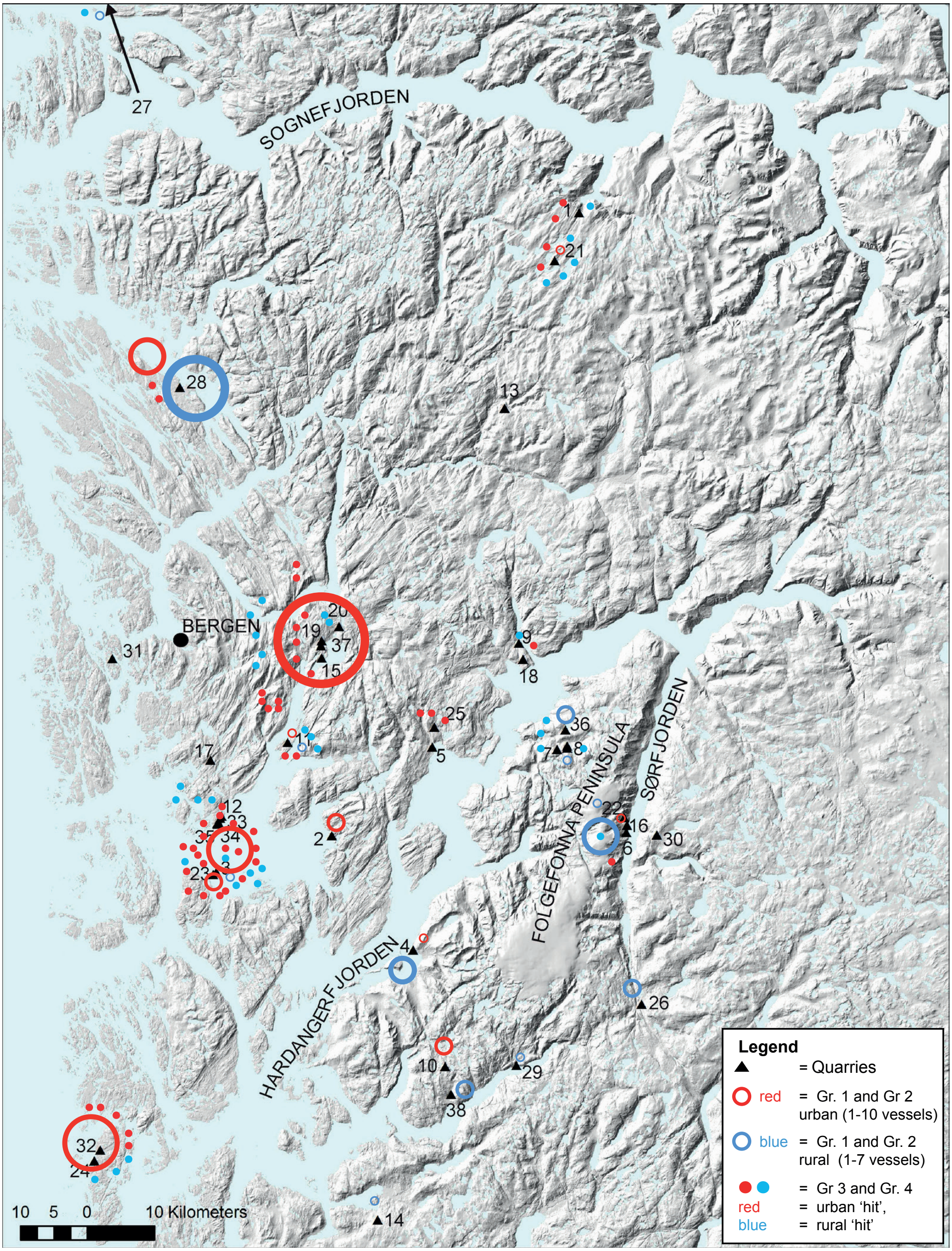


Figure 17. *Map with rural and urban vessel match and 'hits' on quarries in the Hordaland region. The map provides a visual impression of the locations of quarries/quarry-districts with rural versus urban 'hits'. Cross reference for quarry names and geological units see Figure 1 and Figure 2. Red = Urban, blue = rural. O= vessel Group 1 and 2. A 'solid dot' represents one 'hit' on the quarry for Group 3 and 4 vessels with a multiple choice of quarries.*

The character of vessel production during the Viking Age and the early Medieval period

Assessing transport distances between quarries and rural vessel find spots produced some interesting insights by which we believe that we are starting to discern patterns in the regional organisation of production and trade in soapstone vessels during the Viking Age. Furthermore, the general find spot of early medieval vessels (i.e., Bergen) can also be included in the discussion, adding time depth to the analysis. The question asked here is, thus, what was the character of vessel production: did the quarries produce vessels for consumers in their immediate vicinity, in the local area, in the wider rural parts of the Hordaland region, or did they produce for consumers in Bergen? The criteria for distance categories, or one might rephrase and say *consumer* categories, are those used in the assessment above: if vessels were found within 0–10 km of the quarry, the consumers are considered to be from a household in the *vicinity* of this quarry. If a vessel is found within a distance of 11–30 km from the quarry, the consumers are considered *local*. If vessels are found more than 30 km from the quarry or in Bergen, the consumers are considered *regional*. We are aware of the hazards of circular reasoning when including, in this analysis, rural vessels for which the distance between the vessel's find spot and a quarry location was also used as a dataset for provenancing. However, with awareness of the uncertainties inherent in making individual matches to individual quarries, we have nonetheless looked for trends in the material. To explore those trends with the least uncertainty, we only discuss quarries with one or more Group 1 vessel-matches, using quarries with only Group 2 vessels merely to support trends identified through stronger sets of vessel-to-quarry matches. Figure 18 shows the different categories of consumers that quarries in the Hordaland region serviced. The categories are related to transport distances between quarries and the find spots of matching rural and urban Group 1 and Group 2 vessels. The quarries are now listed within their geographical location in Quarry Districts A (geological Units 3 or 4) or B (Unit 1&2).

During the Viking Age, evidence suggests that three quarries delivered vessels to households in their vicinities. These quarries are found in District A, and include Bergspytt, Klovsteinsjuvet and Åkra. We also have several examples of quarries that probably delivered vessels to households in the local area. These quarries are located in both District A (Flatabø, Kvitno and Åkra) and District B (Bergsholmen and Sævråsvåg). Some quarries, such as Kvitno, Vassenden, Skare, and Tysse in District A and Sævråsvåg in District B, seem to have delivered vessels to households throughout the broader region in addition to those located nearby. During the early Middle Ages, Bergspytt, Ingahogget and Kvitno in District A and Baldersheim, Bergsholmen, Kvernes, Russøy, Sævråsvåg, and Urda in District B may have delivered vessels to Bergen consumers.

It seems to have been common for quarries to deliver vessels to households in the vicinity or in the local area during the Viking Age. However, some quarries appear to have produced for households in the wider region as well. At Sævråsvåg, Kvitno, and perhaps also Bergspytt (where Viking Age regional distribution is shown through a Group 2 vessel only) there may be a continuation in the production for regional consumers from the Viking Age into the early Medieval period.

Skjølsvold suggested that the Viking Age production of soapstone vessels was organized both as household production and as production for sale (Skjølsvold 1961:96–107). With a definition of household production as production of goods to be consumed by one's own household and professional production as production of goods for consumption outside one's own household (see Hagen 1994; Hansen 2005), it may tentatively be suggested that stoneworkers in the quarries that delivered vessels to households in the vicinity of the quarry were producing for their own household needs, perhaps as part of a self-subsistence economy. In contrast, stoneworkers in quarries that produced for local and regional consumers, must have been professional craftspeople that produced for a wide market.

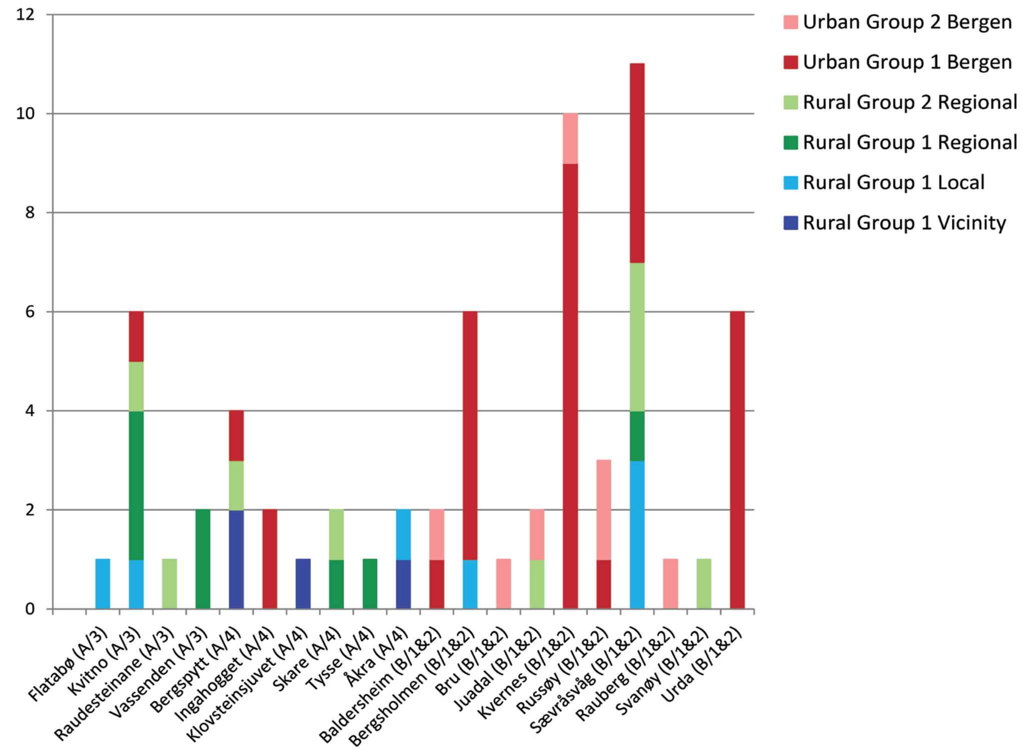


Figure 18. *Consumer categories for quarries of that delivered vessels during the Viking Age and the early Middle Ages. Ordered by quarry district (A/3/4) = District A/Geological unit 3 or 4. (B) = District A/Geological unit 1&2. The Y-axis denotes the number of vessels assigned to the quarry.*

Following this model, we suggest that, during the Viking Age, in addition to household production, professional production of vessels was carried out to a wide extent in District A, and to a lesser extent in District B, with the Sævråsvåg quarry as a distinct exception to the general picture. This lends empirical support to Skjølsvolds model for Viking Age soapstone production.

During the early Middle Ages, professional production was carried out in District B. At the same time some professional production was still taking place in District A but- it may seem to a much lesser extent, and mainly in quarries that already had traditions for professional production and regional distribution during the previous period of time.

Perhaps this is too simple a model, and the realities of Viking Age, as well as of early medieval quarry activities, were more complex. However, the contours of the organisation of regional production and trade in soapstone vessels during the Viking Age and the early Middle Ages can now to be discerned, refined and debated. In future research, they should be discussed on a broad background. Relevant information, such as quarry sizes and the amount of extraction undertaken through the centuries would add valuable data and insights, if investigated through new archaeological field work.

Interesting questions to be addressed may also concern the distribution of vessels from quarry to consumer: how, exactly, did products wind up in rural Hordaland, or in urban Bergen's households? Who owned the quarries? Who were involved in the extraction, sale and distribution of vessels? Were vessels sold/exchanged directly between producers and consumers or were there middle men/ middle-institutions? Where and how did distribution take place? Was it organised at the quarries, at the farmsteads of the quarriers, or in local or regional markets? In Bergen? Did this change over time?

Poor regional match: rural versus urban vessels

Finally, we briefly address the PRM vessels. Figure 19 shows the distribution of the six groups defined by vessel provenance within the rural and the urban assemblages. As a result of a X2-test (Siegel 1956:174-179, 249), the null-hypothesis of a random distribution of the match categories can be rejected on a highly significant level i.e. the probability of a random distribution causing the pattern is lower than 1%. It is especially Group 6, the vessels that have poor matches with the sampled regional quarries, that calls for immediate attention.

There may be an unknown number of vessels with poor regional match hiding in the rural Group 5, due to the high share of Group 5 vessels in this assemblage. Consequently, the share of rural vessels with poor regional match may be somewhat higher than the 6% figure suggested in Figure 19. Within the urban assemblage, however, the share of vessels with poor regional match is considered quite realistic and it seems safe to conclude that about one-third of the soapstone vessels used or discarded in early medieval Bergen may have come to the town from quarries beyond the Hordaland region. It also feels quite safe to conclude that even if we do not have particularly exact numbers for establishing the proportion of non-regional vessels that came to Hordaland's rural households during the Viking Age, they were relatively speaking much less numerous than were seen in Bergen during the following centuries.

The cross disciplinary approach of our study not only has the ability to, with some certainty, rule out regional quarries as the origin of vessels consumed in the Hordaland region and Bergen, the approach also indirectly helps identify soapstone vessels that must have come through trade or other means of exchange from distant quarries, even if those vessels' origin cannot yet be identified. It would be interesting, in future research, to extend the reference material to include quarries from other regions beyond Hordaland.

Identifying anomalies that need explanation, where trade or other exchange mechanisms may be the answer, is in itself an important result that in future research may have a bearing on our understanding of not only domestic interregional relations, but also of international relations between Norway and the rest of Scandinavia and the North Atlantic Isles in the Viking Age and early Middle Ages.

Final remarks

The aim of the present study was to provenance 146 late Iron Age/Viking Age and early medieval soapstone vessels from the Hordaland region and from the town of Bergen. At our disposal we had archaeological and geological data relating to the vessels and to 38 quarries from the Hordaland region. Through interdisciplinary efforts we have been able to obtain provenancing results that are considered to be reliable, quite reliable, or tentative for 131 vessels. The success rate is thus high. There

Figure 19. *Provenance groups within the rural and urban vessel assemblages.*

Six provenance groups based on MTE, REE, typology, transport distance and Geological unit-coherence	*Rural vessels n=51*	*Urban vessels n=95*
Group 1	19 = 37%	30 = 32%
Group 2	9 = 18%	6 = 6%
Group 3	1 = 2%	16 = 17%
Group 4	8 = 17%	2 = 2%
Group 5	11 = 22%	4 = 4%
Group 6	3 = 6%	37 = 39%

is no doubt that the combination of several sets of geological and archaeological data and analytic methods have been essential to achieving these results. The provenancing results are fresh datasets, they have provided immediate insights that have social and historical implications and should be pursued on a wide scale in future research: previously undated quarries are now tentatively dated through vessel matching; distinct quarry-districts that were in use during the Viking Age and the early Medieval period have been discerned; contours of the organisation of regional production and trade in soapstone vessels during the Viking Age and the early Middle Ages are now substantiated, and it is seen that Viking Age rural households received fewer vessels from areas beyond the Hordaland region than their early medieval urban counterparts. The study has been an interdisciplinary venture all the way. Geology and archaeology are two disciplines that have much in common; we interpret patterns in complex and rarely 'complete' datasets. As interpretations are always up for discussion, the disciplines are dynamic: what may be perceived as solid today may be challenged tomorrow.

Acknowledgements

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Appendix

Table 1a. *Major element data for quarries and vessels expressed as % element.*

Quarry	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
1 Arnafjord # 1															12	UIB
1 Arnafjord # 12	47,2	2,72	5,74	0,017	18,0	9,86	0,23	0,047	0,168	-0.01	16,4	100	-1	-1	-1	99
1 Arnafjord # 16	45,8	1,93	5,82	0,028	16,9	11	-0.1	0,098	0,231	-0.01	18,2	99,9	-1	-1	3,6	100
1 Arnafjord # 2	45,5	0,798	5,53	-0.01	26,5	6,08	-0.1	-0.01	0,078	-0.01	12,7	97	-1	-1	-1	96
1 Arnafjord # 3	32,9	0,282	6,65	-0.01	34,8	0,153	-0.1	-0.01	0,111	-0.01	24,3	99,3	-1	-1	-1	97
1 Arnafjord # 9	59,2	0,783	5,03	-0.01	28,6	-0.01	-0.1	-0.01	0,031	-0.01	4,57	98,2	-1	-1	-1	98
2 Baldersheim # 1	39,3	2,3	9,92	0,086	30,2	1,09	-0.1	-0.01	0,115	-0.01	15,2	98,2	-1	-1	-1	101
2 Baldersheim # 2	33,7	2,21	8,51	0,075	25,6	10	-0.1	-0.01	0,144	-0.01	19	99,2	-1	-1	-1	102
2 Baldersheim # 3	35,8	2,43	11,1	0,089	29,8	1,87	-0.1	-0.01	0,164	-0.01	17,2	98,5	-1	-1	-1	103
2 Baldersheim # 4	42,6	2,08	11	0,076	26,3	5,2	-0.1	-0.01	0,089	-0.01	11,8	99,1	-1	-1	-1	104
2 Baldersheim # 5	41,3	2,88	10,9	0,139	29,1	1,15	-0.1	-0.01	0,106	-0.01	12,5	98,1	-1	-1	-1	105
2 Baldersheim # 21	44,5	2,12	11,71	0,08	26,2	4,13	0,04	0,02	0,07	0,01	10,36	54,71			10,894	UIB
2 Baldersheim # 19	49,4	2,63	8,72	0,11	25,8	1,03	ND	ND	0,11	0,01	12,05	50,42			9,152	UIB
3 Bergsholmen # 2	55,0	0,733	5,88	-0.01	27,2	1,91	-0.1	-0.01	0,062	-0.01	7,08	98	-1	-1	-1	106
3 Bergsholmen # 3	54,9	0,854	5	-0.01	27,9	1,9	-0.1	-0.01	0,039	-0.01	7,19	97,8	-1	-1	-1	107
3 Bergsholmen # 4	27,3	0,209	6,77	-0.01	36,1	0,211	-0.1	-0.01	0,115	-0.01	28,4	99,1	-1	-1	-1	108
3 Bergsholmen # 5	37,8	0,877	6,67	-0.01	32,3	1,06	-0.1	-0.01	0,05	-0.01	20,3	99	-1	-1	-1	109
3 Bergsholmen # 7	27,2	0,286	7,1	-0.01	29,1	7,97	-0.1	-0.01	0,246	-0.01	26,2	98,1	-1	-1	-1	110
3 Bergsholmen # 1															15	UIB
4 Bergspytt # 10	44,9	5,73	11,1	0,547	24,9	4	0,25	0,037	0,126	0,032	7,21	98,9	-1	2,4	17,6	114
4 Bergspytt # 13	45,3	4,68	12	0,425	24,5	4,61	0,23	0,031	0,142	0,035	6,74	98,7	-1	1,2	17,5	115
4 Bergspytt # 2	44,8	5,38	15,4	0,651	22,6	4,58	0,42	0,052	0,13	0,052	4,5	98,6	-1	1,5	17	111
4 Bergspytt # 4	41,3	7,93	10,9	0,298	23,5	5,63	0,17	0,019	0,21	0,04	8,04	98,1	-1	1	32,8	112
4 Bergspytt # 5	45,4	6,73	11,4	0,3	25,2	3,79	0,1	0,024	0,14	0,056	6,3	99,3	-1	1,1	32,5	113
4 Bergspytt # 1															25	UIB
5 Bru # 1	55,5	3,15	5,72	0,03	28,5	0,078	-0.1	-0.01	0,061	0,012	5,46	98,5	-1	2	8,1	116
5 Bru # 2	53,0	4,1	6,42	0,069	27,7	0,533	-0.1	-0.01	0,073	0,046	5,69	97,7	-1	5,5	73	117
5 Bru # 3	57,9	1,21	5,38	-0.01	28,4	0,011	-0.1	-0.01	0,034	-0.01	4,87	97,9	-1	-1	5,8	118
5 Bru # 4	56,4	2,4	5,29	0,012	28,4	0,022	-0.1	-0.01	0,047	0,013	5,21	97,9	-1	-1	1,4	119
5 Bru # 5	49,6	5,89	7,17	0,037	27,8	0,193	-0.1	0,01	0,078	0,01	6,6	97,5	-1	-1	11,7	120
6 Digranes # 1	41,1	16,4	12,4	0,911	18,4	1,15	-0.1	0,023	0,128	0,288	8,23	99	1,1	11,3	88,3	120
6 Digranes # 10	28,2	19,8	16,6	1,18	21,2	1,17	-0.1	0,017	0,176	0,222	9,79	98,4	4,1	16,4	168	123
6 Digranes # 11	54,7	4,39	6,23	0,358	20,2	10,4	0,12	0,211	0,14	-0.01	3,03	99,6	1,8	4,9	252	124
6 Digranes # 12	49,0	13,1	8,45	0,607	18,4	2,49	-0.1	0,031	0,117	0,105	6,93	99,3	-1	9,5	126	125
6 Digranes # 2	44,7	10,4	8,54	0,48	22,2	6,87	-0.1	0,036	0,146	0,03	5,83	99,3	-1	8,2	105	122
7 Drebrekke # 2	54,6	0,855	8,75	0,062	27,9	1,04	-0.1	0,083	0,179	0,016	4,96	98,5	-1	-1	-1	297
7 Drebrekke # 3	55,5	0,699	7,65	0,046	28,0	1,82	-0.1	0,04	0,141	-0.01	4,85	98,8	-1	-1	-1	298
7 Drebrekke # 1	57,9	0,64	8,68	0,05	28,7	0,89	n.d	0,05	0,17	0,03	4,92	101,73			13	UIB

Table 1a. *(Continued)*

Quarry	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
8 Flatabø # 1	55,1	1,8	9,42	0,044	24,8	3,46	-0.1	0,016	0,276	0,014	3,14	98,1	-1	2,2	-1	130
8 Flatabø # 2	53,5	2,74	9,79	0,059	25,2	2,37	-0.1	0,012	0,262	-0.01	4,06	98,1	-1	2,8	-1	131
8 Flatabø # 3	57,8	1,01	7,81	0,026	29,0	0,528	-0.1	0,166	0,164	0,015	3,1	99,7	-1	-1	-1	132
8 Flatabø # 29	56,1	2,13	8,44	0,05	23,9	4,44	ND	0,01	0,22	0,02	3,6	42,76				UIB
9 Froastad # 1	43,1	8,54	5,61	0,012	31,8	-0.01	-0.1	-0.01	0,037	-0.01	9,09	98,2	-1	-1	-1	133
9 Froastad # 2	46,0	1,13	5,82	-0.01	32,7	0,102	-0.1	-0.01	0,078	-0.01	13,6	99,5	-1	-1	-1	134
9 Froastad # 3	35,7	0,251	7,02	-0.01	33,7	0,496	-0.1	-0.01	0,105	-0.01	22	99,4	-1	-1	-1	135
9 Froastad # 4	39,3	0,271	6,57	-0.01	33,2	0,509	-0.1	-0.01	0,089	-0.01	19,7	99,7	-1	-1	-1	136
10 Ingahogget # 1	49,2	5,92	9,03	0,209	27,6	0,047	-0.1	0,012	0,054	0,024	6,59	98,9	-1	-1	25,4	140
10 Ingahogget # 2	38,8	4,59	12,7	0,179	27,2	2,29	-0.1	0,012	0,173	0,051	12,9	98,8	-1	-1	15,9	141
10 Ingahogget # 4	49,4	4,72	11,1	0,15	26,6	0,27	-0.1	-0.01	0,035	-0.01	6,51	98,8	-1	-1	7,9	142
10 Ingahogget # 5	44,3	6,82	13,7	0,154	27,2	-0.01	-0.1	-0.01	0,049	0,016	6,94	99,2	-1	-1	15	143
10 Ingahogget # 6	47,5	5,21	11,6	0,252	25,8	1,42	-0.1	-0.01	0,068	-0.01	7,18	99,1	-1	-1	15,9	144
11 Juadal # 1	34,5	1,02	7,74	-0.01	33,8	0,137	-0.1	-0.01	0,054	-0.01	22,4	99,8	-1	-1	-1	145
11 Juadal # 10	42,8	1,18	5,8	-0.01	32,9	0,231	-0.1	-0.01	0,058	-0.01	16,5	99,4	-1	-1	-1	147
11 Juadal # 11	53,5	3,13	5,41	-0.01	29,4	0,531	-0.1	0,011	0,02	-0.01	6,79	98,7	-1	-1	-1	148
11 Juadal # 12	47,8	3,07	4,7	0,028	29,0	2,7	-0.1	0,114	0,053	0,029	11,3	98,8	-1	-1	4,3	149
11 Juadal # 13	48,3	1,37	5,72	-0.01	31,9	0,067	-0.1	-0.01	0,034	-0.01	12,6	100	-1	-1	-1	150
11 Juadal # 2	57,2	1,77	4,62	-0.01	30,2	-0.01	-0.1	-0.01	-0.01	-0.01	5,72	99,5	-1	-1	-1	146
11 Juadal # 1/UIB	56,0	1,96	4,78	0,01	29,7	0,87	n.d	n.d	0,02	0,01	6,53	99,619				UIB
11 Juadal # 2/UIB	40,9	0,75	6,71	0,01	33,1	0,1	n.d	n.d	0,06	0,01	19,46	100,811			15	UIB
11 Juadal # 3/UIB	43,8	1,64	7,09	0,01	32,0	0,14	0,13	0,02	0,09	n.d	15,89	100,8			15	UIB
11 Juadal # 2/2/UIB															15	UIB
11 Juadal # 3/3/UIB															15	UIB
12 Katlaberg # 1	28,4	0,617	7,1	-0.01	35,0	1,66	-0.1	-0.01	0,127	-0.01	25,9	98,8	-1	-1	-1	UIB
13 Klauvsteinsberg # 2	49,2	0,31	6,28	0,01	29,8	0,56	ND	ND	0,08	0,01	14,68	51,77				UIB
13 Klauvsteinsberg # 3	38,0	0,4	7,13	0,01	35,6	0,47	ND	0	0,07	0,27	17,98	61,92			7,644	UIB
13 Klauvsteinsberg # 1	39,3	0,32	6,43	0,01	35,9	0,04	ND	ND	0,08	0,01	18,24	61,03			8,058	UIB
14 Klovsteinsjuvet # 3	40,5	5,83	10,6	0,105	28,2	1,84	-0.1	-0.01	0,099	0,011	9,92	97,1	-1	-1	3,7	152
14 Klovsteinsjuvet # 5	40,7	5,64	8,96	0,084	27,4	3,73	-0.1	-0.01	0,142	-0.01	11,3	98	-1	-1	4,4	153
14 Klovsteinsjuvet # 6	39,2	4,99	10,4	0,094	28,0	2,66	-0.1	0,011	0,141	0,012	12,2	97,8	-1	-1	4,2	154
14 Klovsteinsjuvet # 8	42,3	4,64	10,9	0,059	30,1	0,844	-0.1	-0.01	0,09	-0.01	9,04	98	-1	-1	4,1	155
14 Klovsteinsjuvet # 3															11	UIB
14 Klovsteinsjuvet # 4															15	UIB
15 Kvernes # 10	60,0	0,761	4,75	-0.01	29,3	0,01	-0.1	-0.01	0,022	-0.01	4,67	99,5	-1	-1	-1	156
15 Kvernes # 11	60,2	0,713	3,74	-0.01	29,7	-0.01	-0.1	-0.01	-0.01	-0.01	4,77	99,1	-1	-1	-1	157
15 Kvernes # 20	37,8	0,368	6,58	-0.01	33,6	0,128	-0.1	-0.01	0,069	-0.01	20,3	98,8	-1	-1	-1	158
15 Kvernes # 21	34,4	0,378	6,5	-0.01	33,2	1,83	-0.1	-0.01	0,111	-0.01	22,8	99,2	-1	-1	-1	159

Table 1a. *(Continued)*

Quarry	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
15 Kvernes # 22	35,6	0,405	6,22	-0.01	34,5	0,121	-0.1	-0.01	0,055	-0.01	22,2	99,2	-1	-1	-1	160
15 Kvernes # 23	44,5	0,527	6,73	-0.01	30,9	1,91	-0.1	-0.01	0,135	-0.01	14,9	99,7	-1	-1	-1	161
15 Kvernes # 1	40,0	0,58	7,89	0,02	33,2	2,29	n.d	n.d	0,11	0,01	17,09	100,829				UIB
15 Kvernes # 2	40,8	0,7	7,11	0,01	35,3	0,83	n.d	n.d	0,08	0,01	15,67	100,205			14	UIB
15 Kvernes # 3	42,7	0,51	6,75	0,01	33,4	1,62	n.d	n.d	0,12	n.d	16,49	101,336			14	UIB
16 Kvitno # 1	58,6	1,26	4,34	0,071	29,3	0,042	-0.1	-0.01	0,023	0,01	4,77	98,5	-1	1,1	-1	162
16 Kvitno # 10	51,5	0,885	5,94	0,016	31,3	0,78	-0.1	0,011	0,084	-0.01	7,32	98	-1	-1	-1	166
16 Kvitno # 5	55,6	2,72	7,08	0,087	27,9	0,983	-0.1	0,015	0,132	-0.01	4,55	99	-1	-1	7	163
16 Kvitno # 6	53,4	3,51	8,39	0,223	28,3	0,75	-0.1	0,013	0,164	-0.01	4,69	99,4	-1	1,2	26,5	164
16 Kvitno # 7	58,3	1,25	5,16	0,038	28,9	1,2	-0.1	-0.01	0,078	-0.01	4,33	99,3	3,2	-1	-1	165
16 Kvitno # 1/UIB	60,4	1,12	4,92	0,06	29,2	0,21	n.d	n.d	0,05	0,01	4,57	100,231			11	UIB
17 Lysekloster # 1	41,2	4,93	13,06	0,25	28,7	1,47	n.d	n.d	0,18	0,04	11,53	101,097			19	UIB
17 Lysekloster # 10	37,4	3,07	11	0,26	27,8	4,93	n.d	n.d	0,2	0,03	16,17	100,585			23	UIB
17 Lysekloster # 11	38,1	3,22	11,89	0,19	27,7	4,69	n.d	n.d	0,16	0,03	14,69	100,352			21	UIB
17 Lysekloster # 12	47,4	4,16	11,66	0,46	27,8	1,96	n.d	n.d	0,14	0,03	8,02	101,386			21	UIB
17 Lysekloster # 13	40,9	4,14	12,05	0,24	27,2	3,04	n.d	n.d	0,17	0,04	11,95	99,536			16	UIB
17 Lysekloster # 14	39,0	3,83	9,01	0,19	20,9	12,8	n.d	0,01	0,21	0,02	14,41	100,115			20	UIB
18 Melstveit # 1	44,6	16,2	6,55	0,086	12,3	14,5	1,2	0,091	0,103	-0.01	4,26	99,8	-1	-1	-1	167
18 Melstveit # 2	45,3	17	7,2	0,114	12,1	12,4	1,56	0,068	0,096	-0.01	3,41	99,1	-1	-1	-1	168
19 Munkahogget # 1	52,5	1,98	6,16	-0.01	30,0	1,41	-0.1	-0.01	0,041	-0.01	7,54	99,6	-1	-1	-1	169
20 Nygård # 1	33,6	0,364	6,39	-0.01	35,2	0,073	-0.1	-0.01	0,087	-0.01	22,7	98,5	-1	-1	-1	172
20 Nygård # 2	45,4	7,19	4,5	-0.01	32,2	-0.01	-0.1	-0.01	0,015	-0.01	8,74	98,2	-1	-1	-1	173
20 Nygård # 3	31,7	0,322	6,12	-0.01	36,0	0,109	-0.1	-0.01	0,108	-0.01	24,3	98,7	-1	-1	-1	174
20 Nygård # 4	29,7	0,323	8,22	-0.01	36,2	0,105	-0.1	-0.01	0,108	-0.01	25,3	100	-1	-1	-1	175
20 Nygård # 1/UIB	35,8	0,31	6,47	0,01	34,7	0,23	n.d	n.d	0,1	0,01	22,91	100,156			15	UIB
21 Rauberg # 1	41,9	0,593	6,5	-0.01	33,0	0,169	-0.1	-0.01	0,042	-0.01	17,4	99,8	-1	-1	-1	182
21 Rauberg # 1/UIB	38,8	0,564	6,74	<0.01	32,9	0,246	<0.1	<0.01	0,095	<0.01	20	99,4	<1	<1		UIB
21 Rauberg # 2/UIB	60,5	0,031	3,13	<0.01	29,4	<0.01	<0.1	<0.01	0,017	<0.01	4,58	97,7	<1	<1		UIB
21 Rauberg # 3/UIB	43,5	0,768	6,56	<0.01	31,7	0,076	<0.1	<0.01	0,037	<0.01	15,9	98,6	<1	<1		UIB
21 Rauberg # 5/UIB	42,6	0,729	7,8	<0.01	33,0	0,045	<0.1	0,01	0,159	<0.01	13,9	98,2	<1	<1		UIB
22 Rauberg # 4/UIB	34,2	0,429	7,11	<0.01	33,8	0,395	<0.1	0,012	0,108	<0.01	23,5	99,6	1,1	<1		UIB
22 Raudesteinane # 1	57,8	1,52	4,63	0,012	29,4	0,022	-0.1	-0.01	0,02	-0.01	5,1	98,5	-1	-1	-1	183
22 Raudesteinane # 2	58,8	1,15	4,09	0,015	30,0	0,012	-0.1	-0.01	0,015	-0.01	5	99,1	-1	-1	-1	184
23 Russøy # 12	31,8	0,454	6,87	-0.01	35,5	0,391	-0.1	-0.01	0,174	-0.01	24,4	99,6	-1	-1	-1	291
23 Russøy # 1	34,4	0,507	6,75	-0.01	34,6	0,961	-0.1	-0.01	0,111	-0.01	21,2	98,5	-1	-1	-1	185
23 Russøy # 10	33,0	0,494	7,88	-0.01	35,4	0,1	-0.1	-0.01	0,11	-0.01	21,2	98,3	-1	-1	-1	188
23 Russøy # 13	35,0	0,534	6,26	-0.01	34,2	0,099	-0.1	-0.01	0,123	-0.01	22,4	98,6	-1	-1	-1	189
23 Russøy # 2	34,0	0,526	7,51	-0.01	35,1	0,318	-0.1	-0.01	0,122	-0.01	21,2	98,8	-1	-1	-1	186

Table 1a. *(Continued)*

Quarry	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
23 Russøy # 4	42,2	0,835	5,63	-0.01	27,1	7,83	-0.1	-0.01	0,114	-0.01	15,9	99,7	-1	-1	-1	187
23 Russøy # 1/UIB	41,3	0,44	6,58	n.d	34,3	1,29	n.d	n.d	0,07	0,01	17,11	101,032				UIB
23 Russøy # 2/UIB	34,0	0,45	7,65	0,01	35,2	0,34	n.d	n.d	0,13	n.d	21,91	99,395			15	UIB
23 Russøy # 10/UIB	38,5	0,33	7,29	0,01	34,7	0,07	ND	ND	0,09	0,01	18,92	61,4			7,043	UIB
24 Sele # 1	46,5	3,63	9,24	0,289	26,3	3,71	-0.1	0,014	0,083	0,122	10,3	100	-1	2	25,6	190
24 Sele # 2	49,7	3,46	9,5	0,279	27,2	1,9	-0.1	0,018	0,052	0,127	7,76	100	-1	1,8	24,4	191
24 Sele # 3	45,1	3,77	9	0,26	24,2	6,6	-0.1	0,013	0,11	0,125	9,98	99,2	-1	2	23,8	192
24 Sele # 4	36,1	3,47	9,1	0,296	24,9	8,01	-0.1	0,012	0,164	0,134	16,5	98,7	-1	1,7	23,9	193
24 Sele # 5	42,3	4,3	9,79	0,37	24,5	5,16	-0.1	-0.01	0,091	0,171	11,8	98,5	-1	2,4	30,7	194
25 Sjusete # 1	28,7	0,395	7,15	0,013	32,0	4,96	-0.1	-0.01	0,24	-0.01	25,8	99,3	-1	1,4	-1	195
25 Sjusete # 2	48,0	5,69	8,97	0,075	28,2	0,087	-0.1	-0.01	0,102	-0.01	6,7	97,8	-1	-1	3,7	196
25 Sjusete # 3	43,7	0,722	6,03	-0.01	30,3	3,72	-0.1	-0.01	0,107	-0.01	14,4	99,1	-1	-1	-1	197
25 Sjusete # 4	54,5	2,98	4,45	0,014	31,0	0,018	-0.1	-0.01	0,032	-0.01	5,86	98,8	-1	-1	-1	198
26 Skare # 3	37,7	6,38	11	0,478	26,8	4,44	-0.1	0,046	0,151	0,114	11,8	99	-1	-1	33,3	199
26 Skare # 4	38,0	6,61	10,9	0,393	27,5	3,51	-0.1	0,022	0,144	0,093	11,8	99,1	-1	-1	27,9	200
26 Skare # 5	36,4	6,42	10,2	0,41	27,3	4,08	-0.1	0,084	0,155	0,099	12,4	97,6	-1	-1	30,3	201
26 Skare # 6	39,4	6,84	11,2	0,445	28,2	2,59	-0.1	0,029	0,135	0,103	10,9	99,7	-1	-1	30,1	202
27 Svanøy # 1	58,0	1,59	4,16	-0.01	30,0	0,011	-0.1	-0.01	-0.01	-0.01	5,26	99,1	-1	-1	-1	206
27 Svanøy # 2	43,5	0,604	6,19	-0.01	32,9	0,107	-0.1	-0.01	0,035	-0.01	16,4	99,8	-1	-1	-1	207
27 Svanøy # 3	32,8	15,4	10,5	0,049	29,5	-0.01	-0.1	-0.01	0,071	-0.01	10,7	99,1	-1	-1	-1	208
27 Svanøy # 4	55,0	1,77	5,79	-0.01	29,1	0,867	-0.1	-0.01	0,058	-0.01	6,59	99,3	-1	-1	-1	209
28 Sævråsvåg # 10	42,4	1,14	5,26	0,02	27,7	8,41	n.d	n.d	0,13	n.d	16,05	100,777			11	UIB
28 Sævråsvåg # 11	59,3	0,98	6,95	0,01	29,1	0,16	n.d	n.d	0,03	0,01	4,7	100,986			11	UIB
28 Sævråsvåg # 12	46,5	1,26	4,74	0,02	28,6	6,65	n.d	n.d	0,09	n.d	14,21	101,834			8	UIB
28 Sævråsvåg # 13	34,4	13,56	11,51	1,64	27,2	2,33	n.d	n.d	0,17	0,22	9,6	100,38			143	UIB
28 Sævråsvåg # 14	43,6	0,22	5,38	0,01	27,4	8,15	n.d	n.d	0,12	0,01	15,85	100,713			10	UIB
28 Sævråsvåg # 2	39,7	0,37	5,06	0,01	27,2	10,36	n.d	n.d	0,13	n.d	18,8	101,298			10	UIB
28 Sævråsvåg # 3	60,7	0,15	5,27	0,01	27,6	3,25	n.d	n.d	0,08	0,01	3,94	100,699			11	UIB
28 Sævråsvåg	42,6	0,87	5,23	0,02	29,2	6,39	n.d	0,01	0,13	0,01	16,77	101,173				UIB
29 Tysse # 1	44,8	4,33	17,3	0,205	25,5	0,505	-0.1	-0.01	0,206	0,063	5,52	98,4	-1	-1	8,4	210
29 Tysse # 2	39,1	6,32	17,4	0,214	24,7	2,31	-0.1	0,017	0,233	0,027	7,04	97,5	-1	-1	43,8	211
29 Tysse # 3	45,5	5,52	14,7	0,252	24,7	3,33	0,24	0,035	0,219	0,081	5,19	99,8	-1	-1	32,4	212
30 Tyssedal # 6	52,5	4,61	6,81	0,202	28,5	0,05	-0.1	-0.01	0,056	0,022	5,91	98,7	-1	2,6	52,4	213
31 Tyssøy # 1	37,9	2,72	14	0,034	26,5	4,59	-0.1	-0.01	0,152	-0.01	13,1	99	-1	-1	-1	214
31 Tyssøy # 10	29,0	2,62	16	0,042	28,3	4,35	-0.1	0,015	0,258	-0.01	20	101	-1	-1	-1	220
31 Tyssøy # 2	45,9	3,5	14,6	0,059	27,0	0,559	-0.1	-0.01	0,022	-0.01	7,04	98,7	-1	-1	-1	215
31 Tyssøy # 3	35,1	1,74	14,5	0,024	28,9	3,54	-0.1	-0.01	0,19	-0.01	15,6	99,6	-1	-1	-1	216
31 Tyssøy # 6	30,8	3,01	16	0,04	25,3	6,95	-0.1	-0.01	0,171	-0.01	17,6	99,9	-1	-1	-1	217

Table 1a. *(Continued)*

Quarry	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
31 Tyssøy # 8	38,4	2,03	15,7	0,101	32,1	0,603	-0.1	-0.01	0,165	-0.01	10,1	99,2	-1	-1	-1	218
31 Tyssøy # 9	28,5	2,21	15,8	0,059	28,8	4,65	-0.1	-0.01	0,299	-0.01	19,5	99,9	-1	-1	-1	219
31 Tyssøy # 27	49,3	0,78	13,23	0,05	19,9	3,54	ND	0	0,2	ND	13,06	50,75				UIB
31 Tyssøy # 14	36,9	2,75	13,31	0,03	26,0	5,38	ND	ND	0,16	0	14,42	62,09			10,664	UIB
31 Tyssøy # 10/UIB	41,4	3,05	16,21	0,05	25,8	2,47	ND	ND	0,07	0,01	10,06	57,69			9,471	UIB
32 Urda # 17	34,4	0,472	6,23	-0.01	30,8	6,5	-0.1	-0.01	0,123	-0.01	20,9	99,5	-1	-1	-1	221
32 Urda # 18	22,1	0,615	9,56	0,013	36,0	0,368	-0.1	-0.01	0,337	-0.01	30,2	99,2	-1	-1	-1	222
32 Urda # 19	36,9	0,5	6,66	-0.01	35,1	0,05	-0.1	-0.01	0,061	-0.01	20,5	99,9	-1	-1	-1	223
32 Urda # 20	41,5	0,834	6,09	-0.01	33,8	0,205	-0.1	-0.01	0,025	-0.01	16,6	99,1	-1	-1	-1	224
32 Urda # 5	33,4	0,32	6,96	n.d	35,2	0,85	n.d	n.d	0,12	0,01	24,39	101,075			14	UIB
32 Urda # 1	57,9	0,77	4,04	0,03	30,3	1,25	n.d	n.d	0,04	0,01	6,89	100,859				UIB
32 Urda # 14	61,8	0,35	6,2	0,01	27,6	0,03	n.d	n.d	0,03	0,01	4,33	100,094			11	UIB
32 Urda # 2	57,5	1,98	5,61	0,01	29,2	0,19	n.d	n.d	0,04	0,01	5,48	99,714				UIB
33 Vargahola # 1	28,7	0,683	5,19	-0.01	24,3	15,5	-0.1	0,013	0,25	-0.01	25,8	101	5	-1	-1	231
34 Vargavågen # 1	32,7	0,65	6,3	-0.01	36,2	0,08	-0.1	-0.01	0,077	-0.01	24,2	100	-1	-1	-1	225
34 Vargavågen # 2	26,9	1,15	5,69	-0.01	37,7	0,104	-0.1	-0.01	0,134	-0.01	28,5	100	-1	-1	-1	226
34 Vargavågen # 3	35,9	0,995	6	-0.01	34,4	0,064	-0.1	-0.01	0,046	-0.01	21	98,6	-1	-1	-1	227
34 Vargavågen # 4	32,9	0,649	6,85	-0.01	35,7	0,071	-0.1	-0.01	0,075	-0.01	23,8	100	-1	-1	-1	228
34 Vargavågen # 5	32,7	0,594	6,49	-0.01	36,4	0,063	-0.1	-0.01	0,093	-0.01	22,2	98,6	-1	-1	-1	229
34 Vargavågen # 6	38,0	0,361	6,04	-0.01	33,7	0,636	-0.1	-0.01	0,152	-0.01	20,6	99,4	-1	-1	-1	230
35 Vargavåg Gryte # 1	31,8	0,09	7,67	0,01	35,8	0,33	n.d	n.d	0,11	0,02	25,91	101,429				UIB
35 Vargavåg Gryte # 3	31,8	0,07	7,72	0,01	35,2	0,27	n.d	n.d	0,11	0,02	25,38	100,297			14	UIB
35 Vargavåg Gryte # 4	34,6	0,29	6,64	n.d	34,3	0,89	n.d	n.d	0,11	n.d	24,17	100,661			15	UIB
36 Vassenden # 1	57,2	0,528	7,24	0,031	28,6	0,715	-0.1	-0.01	0,118	-0.01	4,83	99,3	-1	-1	-1	292
36 Vassenden # 2	54,8	0,553	6,21	0,031	27,3	3,56	-0.1	-0.01	0,117	0,102	5,05	97,8	-1	-1	-1	293
36 Vassenden # 3	54,4	0,642	7,52	0,036	28,8	0,401	-0.1	-0.01	0,126	-0.01	5,55	97,4	-1	-1	-1	294
36 Vassenden # 4	56,5	0,695	6,21	0,031	28,1	2,71	-0.1	-0.01	0,109	0,057	4,75	99,1	-1	-1	-1	295
36 Vassenden # 5	52,5	1,63	9,01	0,053	28,0	1,27	-0.1	-0.01	0,118	-0.01	6,05	98,7	-1	-1	-1	296
37 Ådland # 1	30,6	0,64	7,96	0,01	35,4	0,13	n.d	n.d	0,2	n.d	26,61	101,356				UIB
37 Ådland # 2	42,2	10,96	8,49	0,02	30,4	n.d	n.d	n.d	0,06	0,01	9,17	100,935				UIB
38 Åkra # 1	41,5	6,31	13,9	0,391	26,2	2,48	-0.1	0,018	0,16	0,089	9,12	100	-1	1,2	35,7	232
38 Åkra # 2	40,5	6,19	14,4	0,351	26,1	2,34	-0.1	0,018	0,167	0,09	9,14	99,3	-1	1,1	33,8	233
38 Åkra # 3	39,6	5,78	13,8	0,319	25,7	3,29	-0.1	0,022	0,181	0,086	10,4	99,3	-1	1,1	30	234
38 Åkra # 4	41,7	6,25	14,3	0,357	26,3	1,91	-0.1	0,018	0,172	0,088	8,82	99,8	-1	1,3	32,4	235
Vessels, urban																
BRM 0/42937	54,5	0,958	4,56	0,011	28,0	0,018	-0.1	-0.01	-0.01	0,02	5,13	97,9	-1	-1	-1	1
BRM 0/43530	45,7	3,43	12,2	0,16	24,5	3,07	-0.1	-0.01	0,199	0,015	8,17	97,5	-1	-1	13,3	2

Table 1a. *(Continued)*

Vessels, urban	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
BRM 0/43549	44,3	6,24	12	0,213	17,2	0,572	-0.1	0,145	0,129	0,343	15,9	97,1	-1	-1	11,8	3
BRM 0/44163	58,6	0,926	5,36	-0.01	28,4	0,034	-0.1	-0.01	0,036	0,017	5,2	98,6	-1	-1	-1	4
BRM 0/44650	40,2	7,59	15,1	0,105	23,4	4,95	-0.1	0,028	0,199	0,395	7,02	99	-1	-1	12	5
BRM 0/44931	59,3	0,714	5,45	-0.01	28,0	0,14	-0.1	0,02	0,032	0,022	5,08	98,8	-1	-1	-1	6
BRM 0/44934	40,5	0,539	6,21	-0.01	32,2	0,524	-0.1	-0.01	0,06	-0.01	17,6	97,7	-1	-1	-1	7
BRM 0/44998	37,1	1,62	13	0,096	28,0	3,57	-0.1	-0.01	0,18	0,051	15	98,7	-1	-1	3,8	8
BRM 0/45373	49,3	0,673	5,54	-0.01	27,0	5,04	-0.1	-0.01	0,123	-0.01	11,6	99,4	-1	-1	-1	9
BRM 0/45465	58,1	0,966	4,75	-0.01	29,3	0,035	-0.1	-0.01	0,015	0,019	5,16	98,4	-1	-1	-1	10
BRM 0/45548	59,5	0,722	5,01	-0.01	28,1	0,079	-0.1	0,015	0,029	0,175	5,36	99	-1	-1	-1	11
BRM 0/45695	38,8	5,56	7,97	0,082	28,3	4,56	-0.1	-0.01	0,121	0,015	13,2	98,7	-1	-1	1,2	12
BRM 0/45792	57,5	1,2	5,61	-0.01	28,2	0,042	-0.1	-0.01	0,048	-0.01	5,14	97,8	-1	-1	-1	13
BRM 0/45810	36,6	6,13	11	0,356	26,0	4,72	-0.1	-0.01	0,179	0,046	14,1	99,2	-1	-1	-1	14
BRM 0/45843	46,1	5,73	9,1	0,271	25,3	4,17	0,11	0,028	0,155	0,068	7,36	98,4	-1	-1	21,3	15
BRM 0/45857	52,9	5,21	7,95	0,447	24,8	0,25	-0.1	3,09	0,071	-0.01	3,62	98,4	-1	4,8	11,5	16
BRM 0/45938	32,3	1,96	8,56	0,021	23,2	10,5	-0.1	0,015	0,152	0,094	18	94,9	-1	-1	-1	17
BRM 0/46144	51,9	3,49	10,3	0,191	25,9	1,58	-0.1	0,027	0,298	-0.01	5,04	98,8	-1	1,9	23,2	18
BRM 0/54177	36,2	0,266	7,32	-0.01	31,9	0,96	-0.1	-0.01	0,193	0,01	21,6	98,5	-1	-1	-1	19
BRM 0/54478	59,4	0,718	4,92	-0.01	28,9	0,033	-0.1	-0.01	0,028	-0.01	5	99,1	-1	-1	-1	20
BRM 0/54795	59,4	0,534	5,1	-0.01	28,6	0,013	-0.1	-0.01	0,045	-0.01	4,72	98,5	-1	-1	-1	21
BRM 0/55200	55,2	0,974	6,96	0,044	26,4	0,242	-0.1	0,085	0,114	0,099	7,87	98,1	1,6	-1	2,3	22
BRM 0/63018	57,9	1,01	4,45	-0.01	27,2	2,46	-0.1	0,032	0,062	1,14	4,02	98,3	-1	-1	-1	23
BRM 0/63600	59,3	0,957	4,89	-0.01	28,3	0,108	-0.1	0,033	0,054	0,217	4,13	98	-1	-1	1,4	24
BRM 0/63801	58,8	0,897	5,18	-0.01	27,6	1,2	-0.1	0,038	0,044	0,42	4,12	98,3	15,9	-1	-1	25
BRM 0/63998	57,0	1,18	5,04	0,012	28,7	1,03	-0.1	-0.01	0,08	-0.01	6,18	99,3	-1	-1	-1	26
BRM 0/64002	58,1	0,806	5,28	-0.01	28,1	0,244	-0.1	-0.01	0,034	0,025	5,02	97,7	-1	-1	-1	27
BRM 0/64060	58,8	0,633	5	0,023	26,7	3,33	-0.1	-0.01	0,102	-0.01	4,07	98,7	-1	-1	-1	28
BRM 0/64141	43,9	4,48	10,2	0,197	25,9	3,31	-0.1	-0.01	0,14	0,083	9,59	97,8	-1	-1	18,9	29
BRM 0/64255	54,1	4,17	8,17	0,325	24,9	0,448	-0.1	2,87	0,075	0,016	3,26	98,4	3,3	4,8	99,3	30
BRM 0/64272	54,8	1,99	14,5	0,114	24,5	0,973	-0.1	0,058	0,277	0,323	2,35	99,9	-1	-1	5,4	31
BRM 0/64393	58,9	0,456	3,95	0,019	29,5	0,028	-0.1	-0.01	0,06	0,012	5,22	98,2	-1	-1	-1	32
BRM 0/64422	56,9	0,89	5,93	-0.01	28,0	1,05	-0.1	-0.01	0,051	-0.01	5,57	98,4	-1	-1	-1	33
BRM 0/64487	59,2	0,424	4,54	0,016	28,6	0,047	-0.1	0,038	0,04	0,057	5,18	98,2	-1	-1	-1	34
BRM 0/64621	36,4	3,29	8,34	0,036	26,4	7,75	-0.1	-0.01	0,126	0,036	16,3	98,7	-1	-1	-1	35
BRM 0/64638	57,6	1,34	5,09	0,014	28,4	0,111	-0.1	0,011	0,034	0,019	5,04	97,7	-1	-1	-1	36
BRM 0/64641	54,1	3,15	4,64	0,012	27,7	1,13	-0.1	0,037	0,071	0,923	6,44	98,3	-1	-1	-1	37
BRM 0/64657	41,5	8,92	10,2	0,551	26,8	1,27	-0.1	-0.01	0,085	0,235	7,94	97,4	4,6	3,4	76,5	38
BRM 0/64742	27,5	0,548	8,64	-0.01	34,8	0,187	-0.1	-0.01	0,047	-0.01	28,2	100	-1	-1	-1	39
BRM 0/64786	55,6	2,29	5,6	0,014	27,7	0,916	-0.1	0,016	0,073	0,089	5,97	98,3	-1	-1	-1	40

Table 1a. *(Continued)*

Vessels, urban	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
BRM 0/64803	39,9	3,88	7,98	0,127	25,3	6,73	-0.1	0,031	0,124	0,016	13,6	97,8	-1	-1	-1	41
BRM 0/64828	37,7	0,354	6,82	-0.01	32,8	0,724	-0.1	-0.01	0,138	0,012	20,6	99,1	-1	-1	-1	42
BRM 0/64984	42,3	0,392	4,77	-0.01	26,7	8,68	-0.1	-0.01	0,105	-0.01	16,8	99,7	-1	-1	-1	43
BRM 0/64994	57,4	1,63	4,4	0,015	28,9	0,491	-0.1	-0.01	0,061	-0.01	5,25	98,2	-1	-1	-1	44
BRM 0/65004	41,6	1,14	6,43	0,029	25,7	7,55	-0.1	-0.01	0,172	0,024	13,8	96,5	-1	-1	-1	45
BRM 0/65007	57,7	0,975	5,65	-0.01	28,3	0,501	-0.1	-0.01	0,036	-0.01	5,36	98,5	-1	-1	-1	46
BRM 0/73087	39,5	1,89	10,9	0,133	30,0	0,579	-0.1	-0.01	0,108	0,441	14,9	98,5	-1	-1	2,1	47
BRM 0/73155	50,5	1,53	5,71	0,02	27,6	3,21	-0.1	0,011	0,08	-0.01	9,1	97,8	-1	-1	2,2	48
BRM 0/73346	49,7	1,57	6,66	0,025	28,0	2,7	-0.1	-0.01	0,056	-0.01	8,49	97,3	-1	-1	-1	49
BRM 0/73353	35,3	0,56	5,12	-0.01	24,7	11,4	-0.1	-0.01	0,277	-0.01	21,2	98,6	-1	-1	-1	50
BRM 0/73441	57,7	0,988	5,61	0,012	28,4	0,362	-0.1	-0.01	0,061	-0.01	5,03	98,3	-1	-1	4,8	51
BRM 0/75316	53,7	0,586	6,52	-0.01	26,3	0,788	-0.1	0,031	0,123	2,95	6,78	97,9	-1	-1	-1	52
BRM 0/75671	54,1	2,85	5,13	0,029	28,6	0,948	-0.1	0,08	0,041	0,029	7,03	99	-1	-1	1,4	53
BRM 0/75767	58,2	0,702	5,2	-0.01	28,2	0,528	-0.1	-0.01	0,04	-0.01	5,17	98	-1	-1	-1	54
BRM 0/77526	39,8	4,16	8,34	0,136	25,7	6,13	-0.1	-0.01	0,116	-0.01	12,8	97,2	-1	-1	-1	55
BRM 0/77531	36,2	0,489	6,1	-0.01	31,4	3,22	-0.1	-0.01	0,091	0,033	21,2	98,9	-1	-1	2,7	56
BRM 0/77564	56,2	0,979	5,16	-0.01	28,9	1,12	-0.1	-0.01	0,035	0,012	6,74	99,3	-1	-1	-1	57
BRM 0/77576	32,5	0,381	4,77	-0.01	27,6	10,2	-0.1	-0.01	0,194	0,015	23,5	99,2	-1	-1	-1	58
BRM 0/79750	35,6	7,48	8,03	0,114	31,9	0,22	-0.1	-0.01	0,067	0,011	15,4	98,8	-1	-1	3	59
BRM 0/80155	35,9	0,471	5,86	-0.01	34,1	0,13	-0.1	-0.01	0,076	-0.01	21,9	98,5	-1	-1	1,4	60
BRM 0/80210	21,6	0,518	6,66	-0.01	30,3	7,91	-0.1	-0.01	0,364	-0.01	31,8	99,2	-1	-1	1,6	61
BRM 0/80253	32,8	1,6	8,68	0,076	23,5	10,4	-0.1	-0.01	0,198	0,085	18,1	95,5	-1	-1	3,6	62
BRM 0/80455	41,2	4,61	9,24	0,174	26,5	3,85	-0.1	0,196	0,131	0,07	11,2	97,2	-1	2,1	57,1	63
BRM 0/80803	40,0	0,57	6,06	-0.01	31,7	2,65	-0.1	-0.01	0,106	-0.01	18,6	99,8	-1	-1	-1	64
BRM 0/80852	31,6	0,741	6,7	-0.01	32,5	2,18	-0.1	-0.01	0,11	-0.01	24,5	98,3	-1	-1	-1	65
BRM 0/80871	40,0	6,1	11,5	0,325	26,2	3,69	-0.1	0,011	0,13	0,039	11,8	99,8	-1	-1	12,9	66
BRM 0/81128	50,4	0,774	5,49	-0.01	27,4	4,58	-0.1	-0.01	0,11	0,012	10,9	99,6	-1	-1	-1	67
BRM 0/81366	57,5	0,793	5,63	-0.01	29,2	0,04	-0.1	-0.01	0,033	-0.01	5,09	98,3	-1	-1	-1	68
BRM 0/81374	48,6	0,575	5,35	-0.01	26,9	4,46	-0.1	-0.01	0,106	-0.01	10,9	97	-1	-1	-1	69
BRM 0/85416	28,8	0,175	7,54	-0.01	34,3	0,147	-0.1	-0.01	0,113	-0.01	26,8	98	-1	-1	-1	70
BRM 0/85447	31,3	0,352	6,79	-0.01	35,0	0,118	-0.1	-0.01	0,097	-0.01	25,5	99,2	-1	-1	-1	71
BRM 0/85448	33,8	0,452	6,36	-0.01	34,6	0,15	-0.1	-0.01	0,109	-0.01	23,7	99,2	-1	-1	-1	72
BRM 0/85465	42,9	0,622	4,85	-0.01	26,2	8,37	-0.1	-0.01	0,146	-0.01	16,3	99,4	1,2	-1	-1	73
BRM 0/85502	35,5	0,398	6,42	0,011	32,5	0,286	-0.1	-0.01	0,097	-0.01	22,6	97,9	-1	-1	-1	74
BRM 0/85503	35,8	0,437	6,29	-0.01	34,1	0,081	-0.1	-0.01	0,08	-0.01	22,4	99,2	-1	-1	-1	75
BRM 0/85556	41,7	9,56	9,74	0,291	28,2	0,5	-0.1	0,012	0,056	0,064	8,96	99,2	-1	4,6	128	76
BRM 0/85580	53,7	0,359	5,22	-0.01	27,3	0,883	0,39	0,159	0,093	0,056	10,4	98,5	-1	-1	-1	77
BRM 0/85591	35,1	0,337	6,35	-0.01	34,0	0,152	-0.1	-0.01	0,086	-0.01	22,7	98,8	-1	-1	-1	78

Table 1a. *(Continued)*

Vessels, urban	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
BRM 0/85635	43,0	0,574	5,73	-0.01	29,1	2,88	-0.1	0,014	0,068	0,012	15,4	96,8	-1	-1	-1	79
BRM 0/86150	57,7	1,64	5,24	0,01	28,9	0,031	-0.1	-0.01	0,03	-0.01	5,23	98,9	-1	-1	-1	80
BRM 0/86199	57,7	1,57	5,81	0,015	28,2	0,021	-0.1	0,012	0,038	-0.01	5,14	98,5	-1	-1	-1	81
BRM 0/86220	34,8	0,316	6,32	-0.01	31,6	2,88	-0.1	-0.01	0,112	0,011	23,4	99,4	-1	-1	-1	82
BRM 0/86878	37,6	3,79	11,6	0,264	29,7	1,42	-0.1	-0.01	0,17	0,02	15	99,4	-1	-1	14	83
BRM 3/697	58,9	0,555	3,43	0,014	29,2	0,637	-0.1	0,013	0,044	0,269	6,02	99,2	-1	-1	-1	84
BRM 3/702	47,7	1,32	5,7	0,036	27,1	4,94	-0.1	-0.01	0,09	0,011	10,7	97,6	-1	-1	-1	85
BRM 76/11041	44,4	0,932	5,2	-0.01	26,8	6,87	-0.1	-0.01	0,131	-0.01	14,5	98,8	-1	-1	-1	86
BRM 76/11048 # 1	58,1	1,67	3,27	0,012	30,4	0,121	-0.1	-0.01	0,012	-0.01	5,54	99,1	-1	-1	-1	87
BRM 76/11048 # 2	30,4	14,8	10	1,42	30,4	0,055	-0.1	-0.01	0,076	-0.01	11,4	98,5	-1	-1	6	300
BRM 104/2180	43,0	4,48	11,6	0,214	26,4	2,94	-0.1	-0.01	0,151	0,03	9,86	98,7	-1	-1	10,3	88
BRM 104/2299	43,2	0,637	5,12	-0.01	26,3	7,69	-0.1	-0.01	0,138	-0.01	15,3	98,4	-1	-1	2,7	89
BRM 104/2356	43,0	3,71	7,75	0,173	26,6	4,99	-0.1	-0.01	0,12	0,081	10,6	97,1	-1	-1	14,8	90
BRM 110/5518	32,8	0,622	7,32	-0.01	33,0	0,987	-0.1	-0.01	0,156	-0.01	24,1	99,1	-1	-1	-1	91
BRM 110/5651	39,8	4,51	9,66	0,282	25,6	5,39	-0.1	0,023	0,157	0,138	13	98,6	-1	-1	33,6	92
BRM 110/5959	58,7	1,12	5,19	-0.01	28,3	0,043	-0.1	-0.01	0,058	-0.01	4,9	98,4	-1	-1	1,5	93
BRM 110/6463	45,2	0,426	5,66	-0.01	26,2	5,62	-0.1	-0.01	0,173	0,02	12,7	96	-1	-1	-1	94
BRM 237/1277	53,3	1,34	5,71	0,017	26,8	0,343	-0.1	0,06	0,026	1,12	10,5	99,2	-1	-1	-1	95
Vessels, rural																
B4253	59,5	0,67	3,78	0,035	29,9	0,071	-0.1	-0.01	0,025	-0.01	4,83	98,8	-1	-1	-1	236
B4369	46,0	6,56	11,2	0,107	23,9	5,44	0,11	0,018	0,183	0,017	5,65	99,2	-1	-1	8,4	237
B4432	58,0	0,715	6,2	-0.01	28,5	0,125	-0.1	0,028	0,173	0,028	4,98	98,8	-1	1,4	-1	238
B4719	33,4	0,487	6,8	-0.01	34,7	0,104	-0.1	-0.01	0,096	-0.01	23,3	98,9	-1	-1	-1	239
B4836	43,7	5,11	16,5	0,221	26,2	0,3	-0.1	0,019	0,139	0,026	6,17	98,4	-1	-1	16,3	240
B6204	44,1	5,83	15,6	0,471	26,3	2,18	0,1	0,031	0,223	0,05	5,57	100	-1	2	30,2	299
B6982/b	32,7	0,18	5,94	-0.01	35,9	0,104	-0.1	-0.01	0,119	-0.01	25	99,9	-1	-1	-1	241
B7018	53,5	1,3	7,47	0,02	28,3	0,02	-0.1	-0.01	0,094	-0.01	6,82	97,6	-1	-1	-1	242
B7019	56,7	0,462	6,77	0,016	28,0	0,492	-0.1	-0.01	0,072	0,02	5,38	97,9	-1	-1	-1	243
B7105	55,5	0,952	9,53	0,034	26,5	1,03	-0.1	-0.01	0,113	-0.01	4,48	98,2	-1	-1	11,7	244
B7829	54,6	1,1	10,3	0,032	25,7	1,78	-0.1	-0.01	0,231	0,089	4,63	98,6	-1	-1	-1	245
B7888	52,1	3,22	7,74	0,105	28,6	0,191	-0.1	-0.01	0,078	0,051	6,61	98,7	-1	-1	20,3	246
B7925	58,0	1,43	4,97	0,051	28,8	0,281	-0.1	-0.01	0,046	-0.01	4,94	98,6	-1	-1	-1	247
B7960	59,3	0,277	5,26	-0.01	29,5	0,052	-0.1	-0.01	0,127	-0.01	4,6	99,1	-1	-1	-1	248
B8300	57,8	0,351	7,71	-0.01	27,3	1,13	-0.1	-0.01	0,234	0,014	3,33	98	-1	-1	-1	249
B8308	56,2	1,88	5,81	0,012	27,2	2,46	-0.1	0,01	0,103	-0.01	4,96	98,7	-1	-1	-1	250
B8321	32,7	0,212	6,24	-0.01	35,7	0,131	-0.1	-0.01	0,092	0,032	25	100	-1	-1	-1	251
B8995	51,2	1,12	9,47	0,024	30,5	0,021	-0.1	-0.01	0,026	-0.01	6,22	98,6	-1	-1	-1	252
B9976	41,4	11,9	7,17	0,052	26,7	5,94	0,22	0,061	0,167	-0.01	7,41	101	-1	-1	-1	253
B10270	41,3	9,99	8,95	0,319	30,2	0,323	-0.1	-0.01	0,116	0,048	9,19	101	-1	2	22	255

Table 1a. *(Continued)*

Vessels, rural	SiO[2]	Al[2]O[3]	Fe[2][3]	TiO[2]	MgO	CaO	Na[2]O	K[2]O	MnO	P[2]O[5]	LOI	Total	Mo	Nb	Zr	NGU/UIB
B10454	39,2	7,6	17,9	0,655	25,5	1,69	-0.1	0,019	0,216	0,046	7,05	100	-1	-1	26,9	256
B10457	58,1	0,6	6,76	0,013	28,0	0,634	-0.1	0,025	0,172	-0.01	3,84	98,2	-1	-1	-1	257
B10462/b	40,8	9,17	12,5	0,445	26,7	0,312	-0.1	-0.01	0,138	0,014	8,03	98,1	-1	-1	-1	259?
B10462/c	54,4	0,663	6,83	0,018	29,0	0,124	-0.1	-0.01	0,115	0,128	7,57	99	-1	-1	-1	260?
B10462/a	58,5	0,4	6,32	-0.01	29,0	0,8	-0.1	0,012	0,138	-0.01	4,11	99,2	-1	-1	-1	258?
B10462/d	38,6	4,34	14,7	0,229	28,9	0,247	-0.1	-0.01	0,206	0,042	11,9	99,2	-1	-1	20,4	261?
B10481	53,4	2,85	7,31	0,057	27,3	2,33	-0.1	-0.01	0,15	-0.01	5,44	98,9	-1	-1	13,3	262
B10655	55,5	0,792	7,21	0,031	28,1	1,51	-0.1	0,034	0,205	0,024	5,46	98,9	-1	-1	-1	263
B10680/a	43,3	6,17	15,7	0,337	25,6	1,05	-0.1	0,023	0,146	0,049	6,71	99	-1	-1	31,1	264?
B10680/b	42,0	7,69	11	0,406	28,0	1,18	-0.1	0,033	0,094	0,107	8,98	99,5	-1	-1	28	265?
B10697	58,8	0,772	3,95	0,014	29,3	0,483	-0.1	-0.01	0,028	-0.01	4,68	98	-1	-1	-1	266
B10980	48,0	0,194	3,29	-0.01	28,7	5,94	-0.1	0,011	0,065	0,013	12,9	99,1	-1	-1	-1	267
B11115	53,3	3,03	12,8	0,238	24,2	1,41	-0.1	-0.01	0,218	0,026	4,46	99,7	-1	-1	9,3	269
B11116	57,1	1,02	5,26	0,031	29,6	0,648	-0.1	-0.01	0,071	-0.01	5,36	99,1	1,2	-1	-1	270
B11422	46,4	5,72	15,6	0,402	24,2	0,235	-0.1	0,017	0,411	0,076	5,49	98,6	-1	2,2	34	272
B11551/a	39,3	1,07	10,4	0,023	32,0	0,236	-0.1	-0.01	0,124	0,01	16,4	99,6	1,5	-1	1,2	273
B11564/g	57,9	0,514	5,1	0,01	28,6	0,122	-0.1	-0.01	0,123	0,143	4,87	97,5	-1	-1	-1	274
B11630	51,8	3,96	7,98	0,059	28,1	0,06	-0.1	-0.01	0,116	-0.01	5,95	98	-1	-1	-1	275
B11636	55,7	1,36	6,98	0,01	28,3	0,011	-0.1	-0.01	0,061	0,076	5,37	97,9	-1	-1	-1	276
B11686	35,8	1,05	8,17	0,013	32,4	0,774	-0.1	0,032	0,119	0,607	21,4	100	-1	-1	-1	277
B11797	38,8	6,9	11,3	0,45	27,6	2,51	-0.1	0,042	0,131	0,127	10,4	98,2	-1	-1	31,7	278
B11815/b	42,6	6,43	14,8	0,269	26,0	1,52	-0.1	0,022	0,132	0,095	7,23	99,1	-1	-1	24,5	279
B11835	54,2	1,98	6,62	0,05	29,4	0,319	-0.1	0,023	0,074	0,012	5,76	98,4	-1	-1	14,7	280
B11867/a	43,2	1,73	7,76	0,014	30,9	0,067	-0.1	-0.01	0,124	0,1	13,9	97,8	-1	-1	-1	281
B11868/b	48,7	1,72	7,22	0,028	30,0	0,328	-0.1	-0.01	0,116	0,041	10	98,2	-1	-1	-1	282
B11869/c	45,2	0,342	9,35	-0.01	29,0	0,055	-0.1	-0.01	0,177	0,141	13,4	97,7	-1	-1	-1	283
B11878/a	40,8	2,89	7,79	0,02	28,1	2,45	0,3	0,045	0,115	0,042	17,6	100	-1	-1	-1	284
B12025/b	55,2	1,48	7,84	0,013	29,5	0,147	-0.1	0,116	0,168	0,041	4,23	98,9	-1	-1	-1	285
B12050/a	44,4	7,28	11,9	0,301	25,9	1,94	0,2	0,224	0,176	0,042	7,24	99,6	-1	-1	18,4	286
B12314	48,2	3,26	7,48	0,027	29,5	0,018	-0.1	-0.01	0,041	-0.01	9,08	97,6	-1	-1	-1	287
B12372	49,1	2,97	10,7	0,203	28,5	1,63	-0.1	0,017	0,182	0,04	6,81	100	-1	-1	-1	288

Table 1b. *Trace element data for quarries and vessels expressed as ppm element.*

Quarry	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
1 Arnafjord # 1	n.d	84	7				2276	29						34	71	1898		73		UIB
1 Arnafjord # 12	1,1	72	2,7	-2	-4	26,3	1050	26,2	71	-5	-0.02	-10	6,5	55,8	-2	938	20,7	41,2	-20	99
1 Arnafjord # 16	1,3	75,4	5,6	-2	-4	26,4	680	25,3	47	-5	-0.02	-10	5	45,1	-2	742	14,6	34,2	-20	100
1 Arnafjord # 2	-1	77,7	1,1	-2	-4	23,5	1710	25,9	24	-5	0,092	-10	4,3	31,7	47,7	1210	31,9	68,2	-20	96
1 Arnafjord # 3	-1	-1	-1	-2	-4	20,4	1240	11,8	95	-5	0,044	-10	2,8	26,3	4	1540	35,2	71,8	-20	97
1 Arnafjord # 9	-1	-1	-1	-2	-4	20,6	1140	6,1	-10	-5	-0.02	-10	3,6	61,4	-2	1420	34,9	69,2	-20	98
2 Baldersheim # 1	-1	6,5	-1	-2	-4	21,1	2820	47,5	28	13,6	-0.02	-10	5,1	42,7	38,6	1840	41,7	102	-20	101
2 Baldersheim # 2	1,5	68,7	1,5	-2	-4	21,3	2140	47,5	-10	-5	-0.02	-10	4,8	29,3	15	1300	26,1	75,6	-20	102
2 Baldersheim # 3	-1	12,6	1,1	-2	-4	20	2830	57,6	19	15,1	-0.02	-10	5,3	48,6	10,4	1650	38,2	93,7	-20	103
2 Baldersheim # 4	-1	57,2	1,2	-2	-4	22,2	2260	53,9	-10	6,8	0,032	-10	5,4	43,9	16,1	1530	32,7	75,4	-20	104
2 Baldersheim # 5	-1	6,8	-1	-2	-4	21,1	2630	53,5	21	10,6	-0.02	-10	5,7	41,8	20	1770	34	89,9	-20	105
2 Baldersheim # 21	ND	45,774					3892,281	95,242						44,649	31,1	1649		87,818		UIB
2 Baldersheim # 19	ND	6,584					3868,053	63,101						19,066	30,7	1771		92,655		UIB
3 Bergsholmen # 2	-1	39,9	1,2	-2	-4	21,5	1740	11	-10	-5	0,058	-10	3,3	78,8	10	1540	32	92,4	-20	106
3 Bergsholmen # 3	-1	47,8	-1	3	-4	22,6	1540	16,3	-10	-5	-0.02	-10	3,6	32,5	-2	1410	33,4	69,6	-20	107
3 Bergsholmen # 4	-1	1,6	-1	-2	-4	21,6	2410	11,8	-10	-5	0,032	-10	2,3	24	9,3	1690	34,2	76,8	-20	108
3 Bergsholmen # 5	-1	10,3	-1	-2	-4	19,4	1890	9,4	-10	5,8	0,038	-10	3,1	22,1	-2	1160	23,9	66,6	-20	109
3 Bergsholmen # 7	-1	122	1,3	-2	-4	20,9	1680	12	-10	-5	0,101	-10	2,8	27,2	31,4	1130	23,5	68,2	-20	110
3 Bergsholmen # 1	n.d	30	n.d				5508	46						52	48	2780		132		UIB
4 Bergspytt # 10	7,6	60,5	2	-2	-4	20,2	3150	112	-10	14,1	-0.02	13	10,1	85,6	7,3	794	12,7	101	-20	114
4 Bergspytt # 13	9,3	62,2	2,1	2,2	-4	21,6	2060	72,7	-10	9,2	0,024	-10	8,2	77,4	14,3	799	12,9	97,5	-20	115
4 Bergspytt # 2	8	48,5	1,6	3,2	-4	20,4	2370	129	-10	16,9	0,07	14	9,2	76,7	98,8	801	10,4	115	-20	111
4 Bergspytt # 4	13,1	97,2	1,7	3,9	9,6	23,6	1260	59,9	-10	5,2	-0.02	-10	11,7	90,1	-2	457	-5	100	-20	112
4 Bergspytt # 5	8,3	23,3	1,7	-2	8,5	22,2	1860	76,6	-10	7,4	0,055	-10	10,6	85,2	4,1	654	8,7	99,4	-20	113
4 Bergspytt # 1	9	31	10				3575	52						93	28	641		137		UIB
5 Bru # 1	-1	-1	-1	-2	-4	21,4	1720	18,5	-10	-5	-0.02	-10	7,2	65	-2	1540	33,1	72,2	-20	116
5 Bru # 2	2,3	4,1	-1	-2	-4	19,6	1370	27,6	-10	-5	-0.02	-10	8,1	62,7	-2	1620	36,5	76,9	-20	117
5 Bru # 3	-1	-1	-1	-2	-4	19,1	1490	16,9	-10	-5	-0.02	-10	4	62,5	-2	1400	34	57,6	-20	118
5 Bru # 4	-1	-1	-1	-2	-4	21,1	1570	14,6	-10	-5	-0.02	-10	5,7	62,1	-2	1480	34,8	70,3	-20	119
5 Bru # 5	-1	-1	-1	-2	-4	20,4	1880	36,7	-10	-5	-0.02	-10	11	61,5	-2	1530	35,1	73,8	-20	120
6 Digranes # 1	20,4	2,9	2,2	3,9	10,1	19,9	462	154	-10	19	-0.02	-10	25,5	224	-2	480	-5	63,4	29	120
6 Digranes # 10	36,9	4,9	1,8	8,9	20	20,8	328	261	15	35,3	-0.02	17	30,4	271	20,1	269	-5	78,6	89	123
6 Digranes # 11	13,4	6,6	3	3,5	-4	22	402	63,4	-10	12,4	-0.02	20	8,9	157	-2	1120	27,5	55,1	-20	124
6 Digranes # 12	24,2	6,3	2,2	4,4	10,7	22,3	238	77,8	-10	11	-0.02	11	21	218	-2	717	13,2	68,5	113	125
6 Digranes # 2	21,6	4,5	1,9	2,9	8	21,3	1250	79,6	-10	12,2	-0.02	13	17,7	218	-2	1050	21,9	70,1	-20	122
7 Drebrekke # 2	1,3	15,3	6,6	-2	-4	20,2	1050	14,4	743	-5	-0.02	-10	3,8	133	-2	1230	30,3	59	-20	297
7 Drebrekke # 3	2,8	14,3	3,5	-2	-4	21,3	805	14,1	314	-5	-0.02	-10	3,8	107	-2	850	21,4	53,4	-20	298
7 Drebrekke # 1	n.d	15	14				1445	17						151	n.d	1044		92		UIB

Table 1b. *(Continued)*

Quarry	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
8 Flatabø # 1	5,2	5,6	1,7	-2	-4	20,3	2180	29,9	257	5,5	-0.02	-10	7,2	68,4	-2	979	12,9	46	-20	130
8 Flatabø # 2	2,7	3,2	1,5	-2	-4	20,6	2570	34,1	121	-5	-0.02	-10	9,7	67,4	-2	934	16,2	26,1	-20	131
8 Flatabø # 3	2	-1	12,4	-2	-4	22,5	1220	14,1	160	5,4	-0.02	15	4,9	122	-2	645	11,9	42,7	-20	132
8 Flatabø # 29																				UIB
9 Froastad # 1	-1	-1	-1	-2	-4	19,4	1310	33,9	24	-5	-0.02	-10	13,7	26,9	-2	1020	21,5	37,6	-20	133
9 Froastad # 2	-1	-1	-1	-2	-4	19,9	1520	20,9	76	-5	-0.02	-10	4,6	29,9	2,4	922	20,8	37	-20	134
9 Froastad # 3	-1	3,5	-1	-2	-4	20,6	1360	10,8	-10	-5	-0.02	-10	2,1	21,5	7,8	1760	41,7	76,7	-20	135
9 Froastad # 4	-1	3,5	-1	-2	-4	19,8	1240	9,1	-10	-5	-0.02	-10	2,1	21,3	6,5	1820	38,4	77,8	-20	136
10 Ingahogget # 1	9,8	-1	1,2	-2	4,1	23	348	29,4	12	13,7	-0.02	-10	7,7	69,9	4	804	16,8	98,9	25	140
10 Ingahogget # 2	2,4	15,3	1,7	-2	-4	22,8	2540	46,5	102	7,8	-0.02	-10	7,4	81,9	16,6	1360	28,1	107	-20	141
10 Ingahogget # 4	-1	-1	1,2	-2	-4	21,2	2320	50,9	-10	9,4	0,218	-10	8,1	66,8	134	769	10,1	84,2	-20	142
10 Ingahogget # 5	2,1	-1	1,4	-2	-4	21,5	2610	44,1	-10	9,5	-0.02	-10	9,8	84,2	11,6	903	14,8	94,1	-20	143
10 Ingahogget # 6	4	8	1,2	-2	-4	20,3	1540	50,3	-10	17,9	-0.02	-10	7,7	61,1	6,1	715	7,6	77,9	-20	144
11 Juadal # 1	-1	-1	-1	-2	-4	20,7	2120	26,8	285	7,5	-0.02	-10	3,3	27,2	4,5	1740	41,4	81,5	-20	145
11 Juadal # 10	-1	3,4	-1	-2	-4	21,3	2370	26,2	922	5,5	-0.02	-10	5,4	32	-2	1390	32,5	54,5	-20	147
11 Juadal # 11	-1	12,5	1,2	-2	-4	22,5	2140	40	268	8,5	-0.02	-10	8,6	34,9	46,1	1030	24,5	38,3	-20	148
11 Juadal # 12	-1	80,2	1,3	-2	-4	22,3	2000	28,3	378	5,3	-0.02	-10	7,4	35,8	-2	1090	27,3	33,9	-20	149
11 Juadal # 13	-1	-1	-1	-2	-4	21,5	1500	20,9	410	-5	-0.02	-10	5,3	39,7	-2	1110	23,5	40,4	-20	150
11 Juadal # 2	-1	-1	-1	-2	-4	21,2	2350	25,3	259	-5	0,048	-10	5,9	29,5	35,7	1310	33,2	51,7	-20	146
11 Juadal # 1/UIB																				UIB
11 Juadal # 2/UIB	n.d	n.d	7				2967	34						34	6	2388		108		UIB
11 Juadal # 3/UIB	n.d	n.d	n.d				4646	25						43	20	1488		91		UIB
11 Juadal # 2/2/UIB	n.d	n.d	7				2967	34						34	6	2388		108		UIB
11 Juadal # 3/3/UIB	n.d	n.d	n.d				4646	25						43	20	1488		91		UIB
12 Katlaberg # 1	-1	32,5	-1	-2	-4	22,6	1690	20,3	16	5,7	-0.02	-10	2,8	28,7	-2	1550	35,9	86,6	-20	UIB
13 Klauvsteinsberg # 2																				UIB
13 Klauvsteinsberg # 3	ND	ND					3374,374	28,197						44,875	ND	1772		109		UIB
13 Klauvsteinsberg # 1	ND	ND					3385,683	17,751						33,983	ND	2120		101		UIB
14 Klovsteinsjuvet # 3	1,9	19,3	1,1	-2	-4	23,3	6980	85	-10	10,5	0,059	-10	8,5	78,4	113	1290	30,4	106	-20	152
14 Klovsteinsjuvet # 5	2,7	36,2	1,7	-2	-4	23,4	3310	74,7	-10	6,9	0,038	-10	7,2	65,6	124	943	21,2	87,8	-20	153
14 Klovsteinsjuvet # 6	4	28,3	2,1	-2	-4	23,4	5380	74,3	-10	11,4	0,048	18	7,5	90,4	124	1140	25,6	100	-20	154
14 Klovsteinsjuvet # 8	-1	10,7	1,2	-2	-4	23,1	3860	69,7	-10	14,1	0,056	-10	6,9	68,1	147	1200	21,9	106	-20	155
14 Klovsteinsjuvet # 3	n.d	n.d	7				3587	23						51	n.d	2464		110		UIB
14 Klovsteinsjuvet # 4	6	39	n.d				7603	62						68	102	1142		109		UIB
15 Kvernes # 10	-1	-1	-1	-2	-4	21,7	1270	11	-10	-5	-0.02	-10	2,9	31,6	-2	1620	37,3	69,8	-20	156
15 Kvernes # 11	-1	-1	-1	-2	-4	21	800	8,7	35	-5	-0.02	-10	2,9	43	-2	1340	31,9	47,5	-20	157
15 Kvernes # 20	-1	-1	-1	-2	-4	20,7	1470	13,6	184	-5	-0.02	-10	2,7	28,5	4,3	1500	34,2	66	-20	158

Table 1b. *(Continued)*

Quarry	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
15 Kvernes # 21	-1	27	-1	-2	-4	21,5	1570	12,7	61	-5	-0.02	-10	2,9	28,8	9,7	1350	29,1	67,7	-20	159
15 Kvernes # 22	-1	-1	-1	-2	-4	19,4	1600	13	110	-5	-0.02	-10	2,3	27,2	2,7	1540	37,8	65,2	-20	160
15 Kvernes # 23	-1	27,3	1,1	-2	-4	21,5	1670	15,4	54	-5	-0.02	-10	3,2	29,8	34,4	1410	31,2	82,4	-20	161
15 Kvernes # 1																				UIB
15 Kvernes # 2	5	19	n.d				2544	32						43	18	2211		104		UIB
15 Kvernes # 3	5	37	5				2154	28						32	19	1895		95		UIB
16 Kvitno # 1	-1	-1	-1	-2	-4	22,1	1000	13,8	529	-5	-0.02	-10	3,9	89,2	-2	699	20,2	30,7	-20	162
16 Kvitno # 10	-1	4,6	-1	-2	-4	20,7	1590	12,1	340	-5	0,032	-10	4,8	88,3	4,3	640	12,6	25,9	-20	166
16 Kvitno # 5	2,1	-1	1,2	-2	-4	19,9	1750	28,1	697	-5	-0.02	-10	6,1	113	-2	690	18,4	41,3	-20	163
16 Kvitno # 6	3,4	1,1	1,5	-2	-4	19,8	1690	40,7	962	5,6	-0.02	-10	8,2	106	-2	851	19,6	23,9	-20	164
16 Kvitno # 7	1,2	8,3	1	-2	-4	20,3	1360	11,8	817	-5	-0.02	-10	4,2	88,9	-2	842	27,6	32,4	-20	165
16 Kvitno # 1/UIB	n.d	n.d	5				1738	13						101	n.d	284		59		UIB
17 Lysekloster # 1	6	27	n.d				2502	56						90	13	765		131		UIB
17 Lysekloster # 10	7	71	n.d				1943	41						87	10	831		114		UIB
17 Lysekloster # 11	6	90	n.d				2380	46						86	24	871		109		UIB
17 Lysekloster # 12	8	28	n.d				2619	58						88	9	768		111		UIB
17 Lysekloster # 13	6	51	n.d				2233	50						84	n.d	793		119		UIB
17 Lysekloster # 14	10	46	n.d				1521	65						107	27	760		81		UIB
18 Melstveit # 1	1,2	117	3,5	2,1	-4	20,3	795	98,9	11	21,3	-0.02	19	10,9	26,9	-2	193	-5	47,6	-20	167
18 Melstveit # 2	2,1	123	2,5	-2	-4	19	1000	112	-10	25,3	-0.02	21	12,3	31,6	5,4	224	-5	48,2	-20	168
19 Munkahogget # 1	-1	37,3	-1	-2	-4	20,6	2290	17,1	-10	-5	-0.02	-10	5,1	24,9	184	1650	42,5	94,3	-20	169
20 Nygård # 1	-1	-1	-1	-2	-4	19,6	1560	12,4	-10	5,9	-0.02	-10	2,2	24,3	2,7	1760	43,7	91,1	-20	172
20 Nygård # 2	-1	-1	-1	-2	-4	21,1	1750	43,9	-10	9,7	-0.02	-10	10,2	40,5	-2	2030	48	85,6	-20	173
20 Nygård # 3	-1	-1	-1	-2	-4	21,4	1390	11,6	-10	-5	-0.02	-10	2,2	24,4	2,9	1790	41,8	92,4	-20	174
20 Nygård # 4	-1	-1	-1	-2	-4	20,8	1520	17,7	-10	-5	-0.02	-10	2,3	23,1	3,8	2080	47,9	99,1	-20	175
20 Nygård # 1/UIB	n.d	6	n.d				2777	26						43	9	2539		110		UIB
21 Rauberg # 1	-1	-1	-1	-2	-4	20,2	1570	22,4	60	7,3	-0.02	-10	3,1	29,1	4,8	1560	40,5	78,7	-20	182
21 Rauberg # 1/UIB		3,4	<1	<2	<4	7,9	1760	18,7	132	5,3	<0.02	<10	<1	31,8	4,8	1410	<5	52,9	<20	UIB
21 Rauberg # 2/UIB		<1	<1	<2	<4	8,7	1140	<5	<10	<5	<0.02	<10	<1	28,2	<2	1880	<5	70,3	<20	UIB
21 Rauberg # 3/UIB		<1	<1	<2	<4	7,3	2230	26,2	116	5,9	<0.02	<10	<1	32,7	5,4	1790	<5	91,5	<20	UIB
21 Rauberg # 5/UIB		<1	<1	<2	<4	7,8	2310	25,1	48	6,8	<0.02	10	<1	54,1	5,2	1590	<5	107	<20	UIB
22 Rauberg # 4/UIB		6,2	<1	<2	<4	9	1340	13,1	87	<5	<0.02	<10	<1	33,7	2,1	1480	<5	83	<20	UIB
22 Raudesteinane # 1	-1	-1	-1	-2	-4	20,2	1220	7,2	114	-5	-0.02	-10	7,6	74,6	-2	1070	23,6	42,6	-20	183
22 Raudesteinane # 2	-1	-1	-1	-2	-4	21,1	1470	11,5	26	-5	-0.02	-10	6,1	56	-2	1170	32,6	42,1	-20	184
23 Russøy # 12	-1	2,3	-1	-2	-4	20,3	1660	18,3	12	-5	0,032	12	2,7	30,8	4,8	1130	28,2	65	-20	291
23 Russøy # 1	-1	15,1	-1	-2	-4	20,8	1740	17,7	17	6,7	-0.02	-10	2,6	20,7	2,8	1100	25,8	62,6	-20	185
23 Russøy # 10	-1	-1	-1	-2	-4	21	1980	19,5	53	6,6	-0.02	-10	3	25,6	3,4	1060	21,9	78,3	-20	188
23 Russøy # 13	-1	-1	-1	-2	-4	20,9	1560	15,6	11	5,7	0,025	-10	2,8	23,7	-2	1150	23,4	59,8	-20	189

***Table 1b.** (Continued)*

Quarry	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
23 Russøy # 2	-1	3	-1	-2	-4	21	1840	18,2	-10	5,9	0,028	-10	3,2	33,9	12,9	1500	36,3	79,9	-20	186
23 Russøy # 4	-1	122	1,2	-2	-4	24,7	2180	13,4	-10	-5	-0.02	-10	4,5	13,9	-2	894	23,3	75,2	-20	187
23 Russøy # 1/UIB																				UIB
23 Russøy # 2/UIB	n.d	7	6				3398	29						46	21	2159		112		UIB
23 Russøy # 10/UIB	ND	ND					3353,714	26,812						18,39	8,33	1394		97,2		UIB
24 Sele # 1	3,8	123	2,1	-2	-4	29	1650	78,7	-10	9,6	-0.02	11	6,9	79	-2	1090	19,4	92,5	-20	190
24 Sele # 2	3,4	70,1	1,8	-2	-4	24,8	1620	74,4	-10	8,6	-0.02	-10	6,6	81,5	-2	1150	25,1	97,3	-20	191
24 Sele # 3	3,8	190	2,3	-2	-4	21,1	1540	70	14	7,2	-0.02	-10	6,4	54	26,5	845	16,8	71,9	-20	192
24 Sele # 4	4	259	2,5	2,5	-4	22,3	1630	76,1	-10	6,4	-0.02	14	7	51,7	3,2	947	19,3	89,4	-20	193
24 Sele # 5	3,6	161	2	-2	-4	22,5	1780	91,3	-10	10,8	-0.02	15	8,3	81,7	2,3	1050	18,6	91,3	-20	194
25 Sjusete # 1	-1	133	1,4	-2	-4	21,9	1700	15,6	-10	-5	-0.02	30	2,9	24,3	15	1780	37,6	78,1	-20	195
25 Sjusete # 2	-1	-1	1	-2	-4	20,9	3630	66	-10	9,7	-0.02	-10	7,6	69,8	91,4	781	12,5	75,4	-20	196
25 Sjusete # 3	-1	223	1,6	-2	-4	21,9	1430	15,6	-10	-5	-0.02	-10	3,9	23,6	9,7	1780	46,2	89,3	-20	197
25 Sjusete # 4	-1	-1	-1	-2	-4	20,7	902	16	-10	-5	-0.02	-10	6,3	25,7	5,3	1300	29,5	64,7	-20	198
26 Skare # 3	8,5	93	6,4	-2	-4	19,6	3990	74,1	42	8,6	0,049	16	11,6	94,4	18,7	1120	27,9	85,3	-20	199
26 Skare # 4	7,4	86,2	3,5	2	-4	20,2	2880	66,2	-10	10,5	-0.02	14	9,8	109	6,1	1230	25,1	104	-20	200
26 Skare # 5	7,2	87,9	8,1	-2	-4	22,1	2870	64,2	17	9,4	0,029	27	9,4	89,2	11,9	1050	20,7	86,1	-20	201
26 Skare # 6	6,4	52,5	4,2	-2	-4	20,5	3220	71,1	28	9,6	-0.02	15	10	100	4,2	1180	24,5	95,4	-20	202
27 Svanøy # 1	-1	-1	-1	-2	-4	18,8	524	13,2	12	-5	-0.02	-10	4,6	25,8	-2	755	16,5	40,6	-20	206
27 Svanøy # 2	-1	-1	-1	-2	-4	19,8	1970	20,7	77	5,1	-0.02	-10	3	31,2	4,7	1440	30,1	57,3	-20	207
27 Svanøy # 3	-1	-1	1,1	-2	-4	18,7	375	124	-10	13,1	-0.02	-10	23,7	69	-2	614	9,7	54,1	-20	208
27 Svanøy # 4	-1	19	-1	-2	-4	20,4	1880	25,3	-10	6,5	0,023	-10	5	39,6	10,4	993	23,7	69,7	-20	209
28 Sævråsvåg # 10	5	122	n.d				1962	23						44	23	1225		54		UIB
28 Sævråsvåg # 11	5	5	5				2348	20						80	n.d	988		84		UIB
28 Sævråsvåg # 12	6	134	n.d				1950	20						36	n.d	1190		56		UIB
28 Sævråsvåg # 13	6	14	7				1084	205						67	7	656		97		UIB
28 Sævråsvåg # 14	n.d	116	n.d				2106	17						46	7	1256		53		UIB
28 Sævråsvåg # 2	6	149	n.d				1935	17						34	13	1488		52		UIB
28 Sævråsvåg # 3	n.d	6	6				422	15						73	n.d	1081		69		UIB
28 Sævråsvåg																				UIB
29 Tysse # 1	2,1	-1	1,1	2,4	-4	21	860	56,4	-10	14	-0.02	17	8,7	115	29,7	351	-5	153	-20	210
29 Tysse # 2	8,9	9,3	1,2	3,3	-4	19,6	908	69,2	-10	13,2	0,045	-10	11	107	39,4	342	-5	138	-20	211
29 Tysse # 3	14,7	11,7	1,7	2,6	-4	19	1040	67,7	-10	15,5	-0.02	-10	8,5	94,4	-2	230	-5	104	-20	212
30 Tyssedal # 6	3,1	-1	-1	-2	-4	19,7	1250	40,7	227	5,3	-0.02	-10	7,5	97,2	-2	845	17,3	31,1	-20	213
31 Tyssøy # 1	-1	37,5	1	2	-4	18,3	1450	24,8	13	6,2	0,037	-10	5,6	71,5	143	870	14,9	139	-20	214
31 Tyssøy # 10	-1	40,8	1,4	-2	-4	19,9	386	24,5	-10	6,2	0,031	-10	5,2	66	99,7	841	12,8	143	-20	220
31 Tyssøy # 2	-1	4,5	1,2	-2	-4	19,3	179	26,5	11	10,9	-0.02	-10	5,5	74	8,5	861	13,9	133	-20	215
31 Tyssøy # 3	-1	31,2	1,4	-2	-4	19,1	403	14,3	14	-5	-0.02	-10	4,2	69,3	34,6	890	15,3	134	-20	216

Table 1b. *(Continued)*

Quarry	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
31 Tyssøy # 6	-1	41,1	1,3	-2	-4	18,2	351	22,3	12	8,8	-0.02	-10	5,6	69,4	72,8	857	16,5	147	-20	217
31 Tyssøy # 8	-1	5,6	1,3	-2	-4	19,2	862	38,1	16	14,1	0,031	13	4,7	96,5	86,1	1040	20	149	-20	218
31 Tyssøy # 9	-1	37,4	1,2	2,8	-4	19,5	1780	38,3	10	8,5	0,058	-10	5,4	72,3	128	917	12,4	147	-20	219
31 Tyssøy # 27																				UIB
31 Tyssøy # 14	ND	45,145					1931,841	41,898						77,209	255	1125		141		UIB
31 Tyssøy # 10/UIB	ND	17,307					380,529	37,9						71,554	74	873		129		UIB
32 Urda # 17	-1	86,4	1,1	-2	-4	18,8	1420	15	62	-5	-0.02	-10	2,8	20,6	4,8	1540	34,1	87,6	-20	221
32 Urda # 18	-1	5,3	1,2	-2	-4	20,5	1510	16,6	11	5,8	0,298	-10	2,7	29,8	3,7	1640	34	107	-20	222
32 Urda # 19	-1	-1	-1	-2	-4	19,2	1470	14,6	-10	-5	-0.02	-10	2,1	17,6	2,2	2060	47,5	73,9	-20	223
32 Urda # 20	-1	1,5	-1	-2	-4	19,9	1420	21	36	6,4	-0.02	-10	2,7	19,5	-2	1620	38,5	64,7	-20	224
32 Urda # 5	n.d	11	8				2357	27						26	10	2173		104		UIB
32 Urda # 1																				UIB
32 Urda # 14	n.d	5	6				3533	18						80	30	2316		126		UIB
32 Urda # 2																				UIB
33 Vargahola # 1	3,5	170	1,8	-2	-4	25,9	1500	9,2	-10	-5	0,045	-10	3,2	48,6	135	1670	36,6	56,9	-20	231
34 Vargavågen # 1	-1	-1	-1	-2	-4	20,4	1490	9,4	-10	5	-0.02	-10	2,6	24,9	-2	1700	39	81,5	-20	225
34 Vargavågen # 2	-1	-1	-1	-2	-4	19,1	1400	8,8	-10	-5	-0.02	-10	3	25,8	-2	1240	31,3	70,1	-20	226
34 Vargavågen # 3	-1	-1	-1	-2	-4	19,4	1350	10,1	-10	6	-0.02	-10	2,8	32,1	-2	1730	37,9	80,6	-20	227
34 Vargavågen # 4	-1	-1	-1	-2	-4	20	1650	15,8	-10	7	-0.02	-10	2,5	24	2,8	1770	36,5	85	-20	228
34 Vargavågen # 5	-1	-1	-1	-2	-4	18,5	1770	14,4	-10	-5	-0.02	-10	2,6	29,7	-2	1950	46,2	87,1	-20	229
34 Vargavågen # 6	-1	2,3	-1	-2	-4	19,7	1180	6,9	-10	-5	-0.02	-10	2,8	20,6	2,4	1790	39,6	80,2	-20	230
35 Vargavåg Gryte # 1																				UIB
35 Vargavåg Gryte # 3	n.d	7	n.d				4053	27						36	18	2591		119		UIB
35 Vargavåg Gryte # 4	n.d	10	n.d				2688	24						31	15	2721		110		UIB
36 Vassenden # 1	-1	2,6	-1	-2	-4	20,3	1340	14	376	-5	0,046	-10	3	116	3,9	817	19	46,1	-20	292
36 Vassenden # 2	2,4	21,9	1,2	-2	-4	19,1	671	10,7	-10	-5	0,061	-10	3,1	80,5	3,6	1020	26	43,6	-20	293
36 Vassenden # 3	-1	4,6	-1	-2	-4	19,5	1120	12,5	36	-5	0,039	-10	3,1	108	4,7	1440	36,6	68,1	-20	294
36 Vassenden # 4	1,4	13,4	-1	-2	-4	20,1	802	12,1	-10	-5	0,041	-10	3,6	84,2	3,6	869	23,6	39,1	-20	295
36 Vassenden # 5	-1	6,8	1,1	-2	-4	18,8	1790	23	-10	-5	0,259	-10	5,4	97,4	15,7	2180	56,2	84	-20	296
37 Ådland # 1																				UIB
37 Ådland # 2																				UIB
38 Åkra # 1	5,7	75,6	2,1	2,3	-4	19,3	1120	59,6	-10	9,2	-0.02	11	10	109	10,8	1220	20,9	123	-20	232
38 Åkra # 2	5,5	66	1,8	-2	-4	17,3	1090	58,1	-10	8,3	-0.02	13	9,6	113	20,7	1230	23,2	124	-20	233
38 Åkra # 3	5,1	99,9	2,3	2,3	-4	19,6	1010	51,4	-10	7,1	-0.02	12	9,2	107	42,2	1190	24	121	-20	234
38 Åkra # 4	5,9	60,9	1,9	2,4	-4	20	1130	58,4	-10	10	-0.02	27	9,8	111	56,6	1260	21,8	125	-20	235
Vessels, urban.																				**NGU-lab no**
BRM 0/42937	-1	1,1	-1	-2	-4	20,9	1410	18,3	-10	-5	0,072	-10	3	31,9	-2	1720	44	81,9	-20	1
BRM 0/43530	-1	41	-1	2,2	-4	20,2	3570	63,9	-10	10,4	0,13	-10	8,3	152	25,9	1840	42,1	109	-20	2
BRM 0/43549	4,1	47,4	7,3	-2	-4	22	3550	105	-10	17,6	2,64	43	8,6	124	102	1180	23,1	142	-20	3

Table 1b. *(Continued)*

Vessels, urban	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
BRM 0/44163	-1	1,9	-1	-2	-4	20,6	1400	14,2	-10	-5	0,087	-10	3,8	47,8	2,7	1530	35,2	77,3	-20	4
BRM 0/44650	1,7	166	2,2	3,4	-4	21,1	50,4	31,5	-10	7,9	0,157	38	8	120	-2	481	-5	137	-20	5
BRM 0/44931	-1	3,1	-1	-2	-4	35,4	1550	15,8	-10	-5	-0.02	-10	2,8	76,1	-2	1460	37,5	69,7	-20	6
BRM 0/44934	-1	5,5	-1	-2	-4	24,7	1630	15	59	-5	0,038	-10	3,9	35,8	16	1500	37,4	68,2	-20	7
BRM 0/44998	2,9	49,3	1,6	-2	-4	23	3430	39,3	-10	5,9	0,065	-10	6	136	29,2	1350	31	118	-20	8
BRM 0/45373	-1	48,4	1	-2	-4	25	1520	18	-10	-5	0,061	-10	3,4	30,9	5,5	1480	37,1	70,2	-20	9
BRM 0/45465	-1	1,5	-1	-2	-4	22,5	1370	12,7	-10	-5	0,086	-10	4	28,9	-2	1490	39,1	78,7	-20	10
BRM 0/45548	-1	22,3	-1	-2	-4	20,9	1050	9,9	-10	5,1	0,171	16	3,2	29,6	-2	1420	38,1	67,5	-20	11
BRM 0/45695	1,4	26,4	1,8	-2	-4	23,7	2070	61,3	-10	7,9	0,144	12	7,5	42	9,6	1430	29,4	96,5	-20	12
BRM 0/45792	-1	-1	-1	-2	-4	21,9	1530	14,3	-10	-5	0,045	-10	4,1	73,8	-2	1630	36,6	77,9	-20	13
BRM 0/45810	-1	-1	-1	-2	-4	20,2	1500	14,1	-10	-5	0,04	-10	4,3	71,8	-2	1600	44	76,4	-20	14
BRM 0/45843	6,5	34,7	1,3	-2	-4	23,9	2190	88,3	-10	12,5	0,581	15	9,2	67,4	15,1	1340	30,2	81,4	-20	15
BRM 0/45857	9,7	-1	135	-2	4,3	21,9	1310	48,9	-10	6,4	-0.02	104	11,5	136	-2	1300	29	63,9	27	16
BRM 0/45938	-1	127	2	-2	-4	22,4	3180	36	-10	-5	1,65	24	4,1	43,1	94,8	1370	27,2	101	-20	17
BRM 0/46144	2,8	3,5	1,7	-2	-4	23,7	1930	42,7	-10	-5	0,05	31	8,5	105	-2	1230	24,8	68,5	-20	18
BRM 0/54177	-1	13,2	-1	-2	-4	21,8	1650	12,6	98	-5	0,062	-10	2,4	47,6	10	1430	28,6	65,7	-20	19
BRM 0/54478	-1	-1	-1	-2	-4	22,7	867	8,1	-10	-5	-0.02	-10	3,1	28,2	5,3	1440	38,8	69,4	-20	20
BRM 0/54795	-1	-1	-1	-2	-4	23,9	1350	17,3	-10	-5	-0.02	-10	3,5	41,6	-2	1520	36,3	72,6	-20	21
BRM 0/55200	-1	12,8	2,5	-2	-4	23,9	5110	39,9	78	-5	0,866	12	6,4	201	34,1	1240	25,4	88,1	-20	22
BRM 0/63018	6,4	53,1	1,4	-2	-4	37,4	1860	14,7	10	8,2	0,139	14	4,4	63,3	7,7	1790	44,5	92,1	-20	23
BRM 0/63600	-1	19,1	1,4	-2	-4	23,7	1670	15,7	-10	-5	-0.02	65	4,4	76,2	-2	1450	35,5	75,8	-20	24
BRM 0/63801	-1	20,5	1,4	-2	-4	32,6	1650	10,9	-10	-5	0,109	-10	4,7	51,4	61,3	2130	54,3	96	-20	25
BRM 0/63998	-1	11	-1	-2	-4	23,6	1470	13,5	-10	-5	-0.02	-10	3,9	52,4	-2	1520	35,9	78,4	-20	26
BRM 0/64002	-1	4,2	-1	-2	-4	23,7	1230	7,7	11	-5	0,029	-10	3,7	69,7	3,6	1200	31,7	58,8	-20	27
BRM 0/64060	-1	2,8	-1	-2	-4	24	581	7,2	16	-5	-0.02	-10	4,2	88,2	-2	933	26,5	34,7	-20	28
BRM 0/64141	1,9	26,3	-1	-2	-4	21,1	1660	70,8	-10	12,8	0,305	-10	7,7	93,6	38,5	1380	31,7	82,9	-20	29
BRM 0/64255	13,4	1,4	240	2,6	10,1	24,2	1130	23,8	15	-5	-0.02	67	11,4	140	-2	1550	34,3	74,4	39	30
BRM 0/64272	-1	33,7	4,3	-2	-4	28,7	3440	63,5	-10	14,5	0,115	52	7,7	195	-2	1070	16,6	91,1	-20	31
BRM 0/64393	-1	-1	1,4	-2	-4	58,7	1860	9,6	180	-5	0,023	-10	3,4	61,6	2,6	1430	31,3	74,7	-20	32
BRM 0/64422	-1	16,2	-1	-2	-4	26,3	1730	13,2	11	-5	0,073	-10	4	62,7	12,4	1280	33,8	69,4	-20	33
BRM 0/64487	-1	4,2	1,1	-2	-4	24,4	1610	7,7	-10	-5	0,221	-10	3,6	59,8	8,5	1190	28,6	58,3	-20	34
BRM 0/64621	-1	65,2	1,5	-2	-4	24,1	4950	53,8	-10	8	0,108	-10	5,5	39,2	-2	1530	33	99,9	-20	35
BRM 0/64638	-1	2	1,5	-2	-4	24,9	1130	15	536	-5	-0.02	-10	4,2	43	-2	1340	36,7	47,4	-20	36
BRM 0/64641	-1	111	1,1	-2	-4	20,6	1650	23,2	11	9,3	0,149	157	7	63,5	321	1640	39,5	66	-20	37
BRM 0/64657	12,6	6,6	1,2	3	-4	23,3	1300	178	-10	13,1	0,206	-10	15,3	111	27,4	699	11,2	47	-20	38
BRM 0/64742	-1	1,1	1,1	-2	-4	22,5	1470	15,7	-10	5,1	0,033	-10	3,3	23,3	5,1	1130	24	67,5	-20	39
BRM 0/64786	-1	14,3	1,3	-2	-4	21,3	1780	25,5	-10	-5	0,138	21	5,9	52,3	3,7	1780	39,3	76,9	-20	40
BRM 0/64803	-1	65	1,8	-2	-4	22,4	4910	53,2	-10	6,1	0,107	14	5,7	39,3	-2	1520	32,2	101	-20	41
BRM 0/64828	-1	25	-1	-2	-4	22,3	1190	11,9	-10	-5	-0.02	-10	3,2	29,1	6,8	1450	39,5	74	-20	42

Table 1b. *(Continued)*

Vessels, urban	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
BRM 0/64984	-1	92,9	1,2	-2	-4	28,5	1030	12,4	-10	-5	0,026	-10	3,2	25,1	-2	1340	33,5	67,4	-20	43
BRM 0/64994	-1	2,6	-1	-2	-4	23,3	1350	10	-10	-5	-0.02	-10	4,9	33,8	-2	1360	35,5	67,9	-20	44
BRM 0/65004	-1	124	1,5	-2	-4	26,1	2000	24	181	-5	0,14	-10	5,3	42,6	19,5	1230	27	39,5	-20	45
BRM 0/65007	-1	8,1	-1	-2	-4	21,7	1710	13,2	-10	-5	0,056	-10	4,2	59,3	7,2	1120	25,6	59,3	-20	46
BRM 0/73087	-1	24,2	1,2	-2	-4	20,5	800	5,1	-10	-5	0,04	-10	5	26,2	-2	970	35,7	51,2	-20	47
BRM 0/73155	-1	24,9	1,4	-2	-4	20	840	5,7	-10	-5	0,038	-10	5,2	26,2	-2	979	35,7	52,3	-20	48
BRM 0/73346	-1	8,9	-1	-2	-4	24,4	359	37,2	-10	5,7	0,073	-10	4,4	35	110	1360	33,5	104	-20	49
BRM 0/73353	2,5	178	1,7	-2	-4	46,3	1280	7,4	-10	-5	-0.02	-10	3,7	51	-2	1410	33,3	66,2	-20	50
BRM 0/73441	-1	54,9	-1	-2	-4	23,6	1140	14,2	-10	-5	0,082	687	4,2	38,2	5,6	1540	31,6	51,5	-20	51
BRM 0/75316	-1	56,4	1,3	-2	-4	28,5	2420	22,3	123	-5	0,037	50	3,9	282	6,3	1780	36,9	63,3	-20	52
BRM 0/75671	-1	20	1	-2	-4	19,4	926	5,9	-10	-5	0,027	-10	5,5	27,6	-2	1030	34,4	54,2	-20	53
BRM 0/75767	-1	8,5	-1	-2	-4	22,9	1380	9,3	12	-5	-0.02	-10	3,6	76,9	5,5	1200	25,4	60	-20	54
BRM 0/77526	-1	21,7	1,2	-2	-4	22,8	1810	48,4	-10	8,8	0,123	-10	5,8	53,5	158	675	12,2	68,3	-20	55
BRM 0/77531	-1	47,2	1,1	-2	-4	22,5	1130	9,9	-10	-5	0,038	-10	6,1	35,8	4,9	1070	41,3	46,9	-20	56
BRM 0/77564	-1	18,6	-1	-2	-4	23,3	1460	27,2	-10	-5	0,047	-10	4,9	34,6	3,6	1660	33,9	75,4	-20	57
BRM 0/77576	-1	857	4,5	3,2	-4	27,5	911	10,4	-10	-5	0,142	-10	3,5	22,7	2,7	1150	26,8	45	-20	58
BRM 0/79750	-1	48,9	1,1	-2	-4	25	1250	12,6	-10	-5	0,046	-10	6,1	36,5	9	1090	43,4	50,5	-20	59
BRM 0/80155	-1	37,6	-1	-2	-4	22,9	1540	15,2	-10	-5	0,028	-10	6,4	38,5	5,6	1210	37,7	55,5	-20	60
BRM 0/80210	-1	37,6	1	-2	-4	22,9	1560	15,3	10	-5	0,026	-10	6,3	39,1	6	1220	40,7	55,4	-20	61
BRM 0/80253	3,8	152	1,9	-2	-4	22,2	3070	38,2	-10	-5	0,688	13	7,3	104	85	716	13,5	90,3	-20	62
BRM 0/80455	7,6	163	12,1	-2	-4	23,9	2980	43,5	-10	5,3	0,079	19	7,7	84,8	13,8	956	19,1	79,7	-20	63
BRM 0/80803	-1	34,5	1	-2	-4	23,9	1260	12,3	17	-5	0,041	-10	3,6	29,6	16,8	1190	27,7	58,6	-20	64
BRM 0/80852	-1	25,8	-1	-2	-4	23,9	1310	10,5	-10	-5	-0.02	-10	4	22,6	-2	1410	27,3	77,2	-20	65
BRM 0/80871	4,3	48,8	1,6	-2	-4	21,5	1770	93,2	-10	15	0,025	11	9,2	71	24,6	904	20	108	-20	66
BRM 0/81128	-1	44,2	-1	-2	-4	26	1550	19,5	-10	-5	0,06	-10	4,3	30,2	3,4	1590	36,9	73,7	-20	67
BRM 0/81366	-1	-1	-1	-2	-4	22,1	1380	14,8	-10	-5	0,065	-10	4,1	24,9	-2	1620	35,7	72,4	-20	68
BRM 0/81374	-1	32,8	-1	-2	-4	23,9	1530	16,3	-10	-5	0,059	-10	4	25,6	11,8	1630	39,3	68,1	-20	69
BRM 0/85416	-1	-1	-1	-2	-4	23,7	1630	19,2	-10	-5	0,036	-10	2,7	27,2	19,5	1610	37,1	90,8	-20	70
BRM 0/85447	-1	-1	-1	-2	-4	81	1990	18	-10	-5	0,122	-10	3	29,5	6,2	1660	36,8	83,5	-20	71
BRM 0/85448	-1	1,2	-1	-2	-4	23,8	1550	10,3	-10	-5	0,036	-10	3	25,9	4	1550	31,9	75,3	-20	72
BRM 0/85465	-1	158	1,3	-2	-4	31,5	1090	7,4	37	-5	-0.02	-10	3,1	31,1	-2	1260	28,2	51,5	-20	73
BRM 0/85502	-1	3,6	1,4	-2	-4	86,5	1410	17,9	-10	-5	0,154	-10	2,9	31,5	11,3	1850	48,9	84,8	-20	74
BRM 0/85503	-1	1,1	-1	-2	-4	23,1	1820	16,3	-10	5,9	0,03	-10	2,6	34	6,8	1690	37,9	79,8	-20	75
BRM 0/85556	1,5	2,9	1,2	-2	-4	23,1	947	48,2	352	20,8	-0.02	12	12,7	38,7	-2	2060	35,5	110	-20	76
BRM 0/85580	-1	37,6	4	-2	-4	23,1	2170	16,3	69	8,2	3,77	21	2,7	41,6	183	2750	66,4	111	-20	77
BRM 0/85591	-1	1,8	-1	-2	-4	31,9	1900	17	-10	-5	0,176	-10	2,8	28,1	5,5	1660	37,7	83,5	-20	78
BRM 0/85635	-1	77,6	1,4	-2	-4	24,4	2270	17,8	248	-5	0,759	-10	2,9	59,2	-2	2250	51,6	90,5	-20	79
BRM 0/86150	-1	-1	-1	-2	-4	22,2	1590	12,5	12	-5	-0.02	-10	4,7	58,1	3,7	1470	32,4	60,2	-20	80

Table 1b. *(Continued)*

Vessels, urban	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
BRM 0/86199	-1	-1	-1	-2	-4	21,9	1010	17,7	-10	-5	-0.02	-10	5	51,9	-2	1480	34,1	71,3	-20	81
BRM 0/86220	-1	43,7	1	-2	-4	24	1430	11,6	-10	-5	0,1	-10	2,6	31,5	2,4	1640	40,9	77,2	-20	82
BRM 0/86878	2,2	24,5	1,1	-2	-4	21,2	1950	58,5	-10	11,5	0,11	10	7,4	95,1	5,8	925	16,2	124	-20	83
BRM 3/697	1,4	37,1	-1	-2	-4	22,2	1180	10,6	-10	-5	0,173	21	3,2	134	18,3	361	10,2	28,6	-20	84
BRM 3/702	-1	73,1	1	-2	-4	21,5	2110	29,7	97	-5	0,102	-10	5,2	41,9	6,5	876	22,2	38,3	-20	85
BRM 76/11041	3	133	1,3	-2	-4	25	1480	13,6	-10	-5	0,053	-10	4	35,6	24,5	1060	28,7	58	-20	86
BRM 76/11048 # 1	-1	1,3	-1	-2	-4	21,8	234	9,7	-10	-5	-0.02	-10	3,5	40,3	-2	1310	32,8	70,8	-20	87
BRM 76/11048 # 2	-1	-1	-1	-2	-4	19,7	784	111	-10	30,8	0,086	14	13,9	58,4	-2	826	15,7	103	-20	300
BRM 104/2180	3	28	1,3	-2	-4	20,8	1700	60,1	-10	10,7	0,068	-10	9,5	94,9	16,7	891	18,2	98,1	-20	88
BRM 104/2299	-1	153	1,6	-2	-4	22,2	1450	11,5	-10	-5	0,133	-10	3,4	28,5	40,7	1190	27	61	-20	89
BRM 104/2356	2,5	45,7	1	-2	-4	20,3	2000	47,4	-10	9,3	0,598	14	7,1	64,9	36,9	1360	33,9	80,2	-20	90
BRM 110/5518	-1	15,1	-1	-2	-4	44,7	1840	18,8	660	5,5	0,082	-10	4	29,6	-2	1440	34	60,3	-20	91
BRM 110/5651	7,2	120	2,2	-2	-4	22,7	2060	85,6	13	12,4	0,055	-10	7,8	109	24,3	891	16,8	76,8	-20	92
BRM 110/5959	-1	-1	-1	-2	-4	20,2	1310	10,9	-10	-5	-0.02	-10	4,2	72,8	-2	1620	36,7	74,2	-20	93
BRM 110/6463	-1	445	2,8	-2	-4	23,4	1210	13,4	-10	-5	0,491	-10	3,9	30,5	8	1650	41,7	58,6	-20	94
BRM 237/1277	6,5	68	2	-2	-4	96,9	2440	29,8	-10	9,3	0,023	64	4,9	256	28,4	1470	37	57,3	62	95
Vessels, rural																				
B4253	-1	-1	-1	-2	-4	20,2	927	10	429	-5	-0.02	-10	3,4	73,6	-2	451	12,2	36,8	-20	236
B4369	-1	23,5	1,1	-2	-4	20	1900	114	59	15,9	-0.02	11	9,3	65,9	-2	508	-5	51,7	-20	237
B4432	-1	-1	2,2	-2	-4	19,2	2320	11,3	43	-5	-0.02	26	5	116	-2	1240	25,1	81,8	-20	238
B4719	-1	-1	-1	-2	-4	19,9	1850	12,5	97	-5	-0.02	-10	2,5	37,4	2,3	1490	37,4	80,2	-20	239
B4836	6,5	1,6	2,3	2,6	-4	18,7	1130	68,4	-10	18	-0.02	66	8,7	140	28,3	385	-5	156	-20	240
B6204	4,7	19,9	2,7	2,4	-4	21,3	1130	69,2	11	7,7	0,039	20	10,8	113	22,9	605	6,4	91,8	-20	299
B6982/b	-1	1,5	-1	-2	-4	19,6	1260	6,5	327	-5	-0.02	11	2,2	32,2	-2	992	21	63,2	-20	241
B7018	-1	1	1,5	-2	-4	19	2250	29,5	977	7,3	-0.02	13	3,7	47,4	2,5	825	15	67,7	-20	242
B7019	-1	10,6	-1	-2	-4	20,1	2180	10,9	29	-5	0,439	-10	3,2	90,5	78,4	288	-5	26,8	-20	243
B7105	-1	-1	1,4	-2	-4	19,3	3970	52	-10	-5	0,13	-10	4	67,5	48,1	2540	51,1	77,3	-20	244
B7829	-1	18,9	1,3	-2	-4	22	1910	30,6	-10	16,7	-0.02	70	3,7	82,8	-2	672	10,3	74	-20	245
B7888	-1	1,1	1,2	-2	-4	19,8	3990	46,5	11	6,6	0,154	-10	7,2	57,9	78,5	966	20,8	71,3	-20	246
B7925	-1	-1	-1	-2	-4	18,4	1060	13,8	131	-5	-0.02	-10	3,8	112	-2	466	9,6	25,5	-20	247
B7960	-1	-1	1,3	-2	-4	19,9	1180	7,6	631	-5	-0.02	-10	2,9	127	-2	284	-5	25,4	-20	248
B8300	1,4	2,7	1,6	-2	-4	17,5	899	8	171	-5	-0.02	-10	3,7	113	-2	737	15	54,6	-20	249
B8308	-1	8,7	-1	-2	-4	20	1610	20,7	-10	-5	0,039	-10	5,6	27,1	12,7	1420	32,1	59,8	-20	250
B8321	-1	3,1	-1	-2	-4	19,7	1540	11,3	-10	-5	-0.02	18	2,1	32,4	-2	1710	40,3	81,2	-20	251
B8995	-1	-1	-1	-2	-4	23,1	3300	51,7	-10	15,4	-0.02	-10	4,1	63,1	-2	2550	54,5	116	-20	252
B9976	-1	3,3	1,4	-2	-4	18,3	1190	79,5	-10	23,3	-0.02	-10	7,2	132	-2	322	-5	77,5	-20	253
B10270	2,5	2,7	-1	-2	-4	19,6	52,9	120	-10	21,2	-0.02	15	12,3	78,4	-2	485	7,3	47	-20	255

***Table 1b.** (Continued)*

Vessels, rural	Y	Sr	Rb	U	Th	Pb	Cr	V	As	Sc	S	Ba	Ga	Zn	Cu	Ni	Yb	Co	Ce	NGU/UIB
B10454	4,8	76,2	1,9	2,5	-4	18,9	1950	94,4	-10	13,6	-0.02	24	13,7	148	74,7	806	5,5	131	-20	256
B10457	-1	1,7	2,2	-2	-4	19,4	928	12,3	44	7	-0.02	-10	4,1	99,4	-2	834	18,4	60,8	-20	257
B10462/b	-1	-1	1,5	-2	-4	19,2	4450	185	14	34,5	-0.02	26	11,5	89,7	-2	434	-5	73	-20	259?
B10462/c	-1	5,9	1,3	-2	-4	22,5	866	15,1	302	7,1	-0.02	29	2,9	65,6	-2	1350	28,8	82,2	-20	260?
B10462/a	-1	2,4	1,6	-2	-4	19,6	906	8,8	506	-5	-0.02	-10	3,4	74,9	-2	908	19,5	58,3	-20	258?
B10462/d	1,6	4	1,6	-2	-4	19,4	2220	75,6	16	16,7	-0.02	43	9,2	127	16,9	1030	19,9	124	-20	261?
B10481	11,7	3,3	1,1	-2	-4	18,7	1660	54,8	720	5,6	0,058	17	6,4	102	10,8	583	8	33,6	-20	262
B10655	2,3	13	1,3	-2	-4	19,4	1730	20,2	16	-5	0,022	-10	4,3	52,6	13,1	639	14,5	37,3	-20	263
B10680/a	4,5	8	2	2,2	-4	20,4	962	50,3	-10	7,9	-0.02	-10	9,1	133	40,1	1040	20,5	123	-20	264?
B10680/b	7,3	25,6	3,5	-2	-4	19,4	3210	73,6	23	11,8	-0.02	13	10,8	117	16,8	1080	22,9	94,7	-20	265?
B10697	-1	-1	-1	-2	-4	17,8	1300	7,2	-10	-5	-0.02	-10	3,1	52,9	20,3	987	23,8	42,7	-20	266
B10980	-1	48,7	1,2	-2	-4	18,5	866	5,4	500	-5	0,026	-10	2,4	23,4	12,3	1690	38,7	57,5	-20	267
B11115	4,1	1,6	1,5	-2	-4	17,9	2370	220	-10	21,4	0,069	12	8	126	30,9	455	-5	65,5	-20	269
B11116	1,3	5	-1	-2	-4	19,7	1420	14,5	762	-5	0,108	-10	4,1	72,2	33,4	460	7,5	19,9	-20	270
B11422	4,6	2,2	1,9	2,7	-4	21,3	1520	46,8	-10	9,4	-0.02	-10	9,3	172	2,2	1210	14,4	96,3	-20	272
B11551/a	-1	5,7	-1	-2	-4	22,4	3430	28,4	-10	7,8	-0.02	-10	3,7	42,9	-2	2510	55,8	112	-20	273
B11564/g	-1	2,4	-1	-2	-4	22	1320	7,7	-10	-5	0,033	13	3,4	70,9	27	998	24,1	47,4	-20	274
B11630	-1	-1	-1	-2	-4	20,5	1580	28,9	283	-5	-0.02	10	7,9	69,7	-2	926	18	60	-20	275
B11636	-1	3,8	-1	-2	-4	23,1	2250	24,5	-10	-5	0,05	11	4,3	61,2	7	2540	63,4	81,3	-20	276
B11686	-1	25,9	1,9	-2	-4	27,8	2580	20,8	-10	-5	-0.02	209	3,3	39,7	2,3	1520	37,9	76	-20	277
B11797	6,7	127	4,3	2,2	-4	23,7	2930	72,2	43	9,3	0,034	37	9,9	91,3	22,6	999	20,9	73,6	-20	278
B11815/b	5	12	1,9	-2	-4	20,9	1610	64,6	75	9,8	-0.02	19	10	110	6,3	1230	27,5	106	-20	279
B11835	-1	2,3	2,2	2,6	-4	21,1	1320	15,2	-10	-5	-0.02	-10	7	63,1	8,6	710	16,1	36,1	-20	280
B11867/a	-1	3,3	-1	-2	-4	38,4	1710	23,6	13	8,9	-0.02	36	4	139	2,7	1390	37,9	81	-20	281
B11868/b	-1	7,2	-1	-2	-4	42,8	2880	34,1	-10	17,2	-0.02	24	3,9	106	-2	593	12	77,4	-20	282
B11869/c	-1	1,7	-1	-2	-4	31,9	2910	16,3	385	-5	-0.02	53	2,5	98,1	-2	1010	22,7	81,6	-20	283
B11878/a	-1	62,4	-1	-2	-4	22,6	1280	9,3	64	-5	-0.02	22	2,5	59,8	4,2	989	20,9	60,4	-20	284
B12025/b	-1	-1	8,6	-2	-4	20,9	1920	15,9	403	-5	-0.02	-10	4,8	130	-2	974	21,9	52,8	-20	285
B12050/a	1,5	-1	1,6	-2	-4	19,7	2120	59	45	11,2	-0.02	15	8,5	95,7	135	1070	22,8	110	-20	286
B12314	-1	-1	-1	-2	-4	22,7	2210	69,5	-10	9,2	-0.02	-10	5,3	46,5	3,7	1160	30,6	81,2	-20	287
B12372	-1	8	-1	-2	-4	21,5	2780	59,2	-10	17	0,026	18	4,6	68,6	39,9	370	-5	69,5	-20	288

Table 2. *Rare earth element data for quarries and vessels.*

Quarry no. and sample no. Samples n= 100	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Lab no. GEO/ UIB
1 Arnafjord # 1	0,8820	0,6172	0,6266	0,4774	0,3769	0,8493	0,3470	0,3032	0,3265	0,3145	0,3141	0,3330	0,3437	0,3656	icp296
1 Arnafjord # 2	1,7507	1,1328	1,0789	0,9549	0,7498	0,4572	0,7088	0,6319	0,5379	0,4943	0,4587	0,4139	0,4744	0,4932	icp1832
2 Baldersheim # 3	0,1682	0,1649	0,1919	0,2132	0,2930	0,2376	0,2807	0,3030	0,3037	0,3310	0,3503	0,3922	0,5149	0,6050	icp198
2 Baldersheim # 2	0,5879	0,7005	0,9325	1,1266	1,4730	1,1011	1,5742	1,5243	1,6299	1,6052	1,5822	1,4960	1,4938	1,3975	icp199
2 Baldersheim # 1	0,1478	0,1477	0,1841	0,2005	0,2708	0,2047	0,2692	0,2533	0,2951	0,3037	0,3292	0,3500	0,4629	0,5418	icp200
2 Baldersheim # 4	0,4229	0,3607	0,4119	0,5333	0,6308	0,5185	0,6460	0,6915	0,6980	0,6782	0,6862	0,6639	0,7206	0,7026	icp910
2 Baldersheim # 5	0,1839	0,1500	0,1496	0,1697	0,1864	0,1546	0,1904	0,2088	0,2214	0,2156	0,2405	0,2907	0,3723	0,4688	icp911
3 Bergsholmen # 2	1,4770	1,2916	1,1913	1,0616	1,0198	0,9492	0,9324	0,9548	0,9532	0,8064	0,7331	0,7085	0,8579	0,7880	icp201
3 Bergsholmen # 3	0,5565	0,4770	0,4343	0,3508	0,2793	0,4023	0,2146	0,1915	0,2054	0,1940	0,1943	0,2158	0,2099	0,1443	icp202
3 Bergsholmen # 5	0,2023	0,1409	0,1359	0,1004	0,0826	0,1428	0,0688	0,0627	0,0877	0,1018	0,1031	0,1109	0,0852	0,1263	icp503
3 Bergsholmen # 6	0,2694	0,2036	0,1995	0,1108	0,0695	0,0580	0,0433	0,0222	0,0338	0,0252	0,0203	0,0225	0,0290	0,0766	icp504
3 Bergsholmen # 7	1,6560	1,2375	1,1687	0,8049	0,4826	0,7586	0,2917	0,2325	0,2142	0,2212	0,2043	0,2458	0,2395	0,3032	icp505
4 Bergspytt # 2	4,9276	5,4641	6,6944	6,8172	7,2574	4,2471	6,3916	5,6470	6,0081	5,7064	5,2782	5,5602	5,0158	5,4040	icp510
4 Bergspytt # 3	6,7517	7,5434	8,9340	8,5999	8,4792	3,9687	7,2371	6,1000	6,1976	5,8822	5,4401	5,6807	5,3302	5,5330	icp511
4 Bergspytt # 1	9,0607	9,0543	9,5296	9,1482	8,4002	4,4398	6,8210	5,6939	5,7523	5,6419	5,2291	5,5848	5,5704	5,7082	icp298
5 Bru # 1	16,6452	11,1881	7,3443	5,0550	2,4718	1,7415	1,3938	1,1603	0,8540	0,7242	0,6619	0,6173	0,5646	0,4348	icp3020
8 Flatabø # 1	0,9968	1,4097	1,8197	1,8917	2,3385	0,5714	2,5637	3,1224	3,4565	3,3148	3,6762	4,1358	4,8995	4,9379	icp3021
9 Froastad # 1	0,1355	0,1374	0,0000	0,1033	0,0000	0,0000	0,0000	0,0000	0,0714	0,0000	0,0810	0,0000	0,1148	0,0000	icp3022
10 Ingahogget # 1	57,6306	42,7169	35,1285	27,3339	14,7125	2,9336	8,3764	7,6413	8,2081	8,8516	8,6562	8,7032	8,2619	8,4461	icp308
10 Ingahogget # 2	7,9175	6,9634	6,8843	6,1426	4,1503	1,6925	2,2922	1,8594	1,7010	1,5408	1,3524	1,4508	1,4739	1,4899	icp309
10 Ingahogget # 3	14,7874	12,4940	12,1506	10,3761	7,0353	3,8121	4,1796	3,6461	3,7104	3,6682	3,6272	3,6228	3,6984	3,9128	icp310
10 Ingahogget # 4	0,3063	0,3319	0,4341	0,4350	0,4152	0,0397	0,3322	0,2783	0,2644	0,2298	0,2168	0,2244	0,2488	0,2490	icp311
11 Juadal # 11	2,3791	0,7353	1,1703	0,8425	0,4808	0,2342	0,3251	0,2681	0,1899	0,1744	0,1725	0,1560	0,1808	0,1669	icp192
11 Juadal # 10	0,5778	0,3730	0,3479	0,2204	0,1534	0,0828	0,1170	0,0960	0,0984	0,1328	0,1750	0,2248	0,2898	0,3319	icp193

Table 2. *(Continued)*

Quarry	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
11 Juadal # 2	0,5667	0,3273	0,2889	0,2182	0,1366	0,0668	0,0999	0,1070	0,1189	0,1301	0,1688	0,2010	0,2664	0,2595	icp181
11 Juadal # 1	0,1793	0,1241	0,0959	0,0741	0,0641	0,0337	0,0430	0,0449	0,0542	0,0481	0,0634	0,0673	0,0917	0,0487	icp182
13 Klauvsteinsberget # 1	0,5749	0,3166	0,3141	0,3060	0,2864	0,1137	0,2229	0,2252	0,2026	0,1737	0,1600	0,1516	0,1722	0,1448	icp914
13 Klauvsteinsberget # 3	3,4784	3,3411	3,4145	3,5547	3,1073	1,5309	2,0974	1,9270	1,4662	0,9900	0,7538	0,4411	0,3747	0,3002	icp916
14 Klovsteinsjuvet # 1	2,5587	2,3877	2,2635	1,9782	1,7676	1,2073	1,6943	1,6942	1,8743	2,0978	2,1896	2,4165	2,4854	2,6710	icp321
14 Klovsteinsjuvet # 2	2,5641	2,3588	2,2078	1,9715	1,8205	1,5544	1,8858	1,7522	1,9875	2,2610	2,1722	2,6679	2,7497	3,0870	icp322
14 Klovsteinsjuvet # 3	0,1748	0,1813	0,1822	0,1572	0,1870	0,0479	0,1658	0,1698	0,1604	0,1424	0,1025	0,1070	0,0895	0,0844	icp323
14 Klovsteinsjuvet # 4	8,6999	7,0043	6,0569	4,6347	3,0074	0,9246	2,4700	2,1902	2,2986	2,4598	2,5414	2,7333	2,9049	3,2710	icp324
15 Kvernes # 1	6,3491	5,4143	4,4936	3,5732	2,3066	1,8040	1,5460	1,4261	1,3238	1,2039	1,2662	1,2174	1,3374	1,2633	icp184
15 Kvernes # 3	1,0118	1,0521	0,9584	0,8660	0,8927	0,5595	0,6976	0,7203	0,7062	0,7295	0,7729	0,8436	0,9296	0,8501	icp189
15 Kvernes # 10	0,2445	0,1424	0,1564	0,1104	0,0734	0,0528	0,0470	0,0439	0,0270	0,0249	0,0199	0,0332	0,0270	0,0001	icp194
15 Kvernes # 11	0,1465	0,1252	0,0877	0,0548	0,0362	0,0367	0,0214	0,0340	0,0189	0,0171	0,0182	0,0208	0,0191	-0,0052	icp196
15 Kvernes # 20	0,1405	0,1068	0,1023	0,0628	0,0707	0,0294	0,0335	0,0387	0,0631	0,0726	0,0947	0,1153	0,1256	0,1503	icp524
15 Kvernes # 21	0,3943	0,2936	0,2659	0,1856	0,1652	0,1025	0,1213	0,1026	0,1304	0,1078	0,1112	0,1142	0,1589	0,1965	icp525
16 Kvitno # 1	1,5219	0,9907	0,9756	0,8377	0,8090	0,2407	0,6852	0,6553	0,6617	0,6380	0,6436	0,7300	0,7053	0,7259	icp297
17 Lysekloster # 1	3,4051	3,1376	3,0631	3,0350	2,4603	1,9129	1,7017	1,5669	1,2290	1,1169	1,1162	1,2477	1,1772	1,2391	icp62
17 Lysekloster # 10	3,8915	4,0495	4,2829	4,5216	4,5495	4,1105	3,3176	2,9715	2,4653	2,1085	2,0158	1,8675	2,0128	1,9373	icp63
17 Lysekloster # 11	1,5038	1,7635	2,0074	2,2487	2,7017	3,2056	2,5254	2,3088	2,2764	1,9546	1,9067	1,7751	1,8823	1,8857	icp64
17 Lysekloster # 12	3,3861	3,2581	3,4999	3,6705	3,6274	2,3789	2,6137	2,4931	2,0447	1,8104	1,7435	1,5284	1,5987	1,5002	icp65
17 Lysekloster # 13	0,7948	0,8057	0,8931	1,0428	1,3588	1,3754	1,1887	1,2119	1,1362	1,0790	1,0293	1,0273	1,1005	1,1730	icp66
17 Lysekloster # 14	2,9944	3,1397	3,4016	3,6768	3,8557	2,7953	3,4824	3,5076	3,1100	2,9612	2,8600	2,6310	2,6501	2,5254	icp67
20 Nygård # 1	0,0000	0,0524	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0622	0,0000	icp3023
21 Rauberg # 1	0,0000	0,0854	0,0000	0,0667	0,0000	0,0000	0,0000	0,0000	0,0404	0,0000	0,0619	0,0000	0,0861	0,0000	icp3024
22 Raudesteinane # 1	1,6161	0,5656	0,5574	0,4050	0,3436	0,0000	0,4749	0,5274	0,4627	0,4875	0,4476	0,4630	0,4976	0,5590	icp3025

Table 2. *(Continued)*

Quarry	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
22 Raudesteinane # 2	0,7903	0,2376	0,4508	0,3250	0,1795	0,0000	0,1737	0,1899	0,1460	0,1393	0,1429	0,0000	0,1722	0,2484	icp3026
23 Russøy # 2/UIB	0,6889	0,4858	0,3611	0,2404	0,1569	0,1393	0,0950	0,0772	0,0638	0,0591	0,0651	0,0790	0,0996	0,0908	icp176
23 Russøy # 2	0,2143	0,1348	0,0884	0,0655	0,0476	0,0283	0,0248	0,0180	0,0316	0,0363	0,0430	0,0714	0,1059	0,1122	icp177
23 Russøy # 1/UIB	0,6875	0,6071	0,4685	0,3352	0,2164	0,1204	0,1343	0,1299	0,1069	0,0794	0,0951	0,0835	0,1214	0,1103	icp187
23 Russøy # 13	0,3458	0,2492	0,2116	0,1384	0,0926	0,0411	0,0620	0,0664	0,0569	0,0760	0,1067	0,1610	0,1801	0,1969	icp195
23 Russøy # 11	0,1521	0,1130	0,0989	0,0694	0,0339	0,0278	0,0272	0,0241	0,0219	0,0216	0,0188	0,0272	0,0268	0,0050	icp197
23 Russøy # 10	0,4714	0,3805	0,3044	0,2821	0,2212	0,0574	0,1542	0,1657	0,1526	0,1470	0,1520	0,1787	0,2230	0,2382	icp909
25 Sjusete # 1	1,5032	0,6881	0,6311	0,5550	0,4359	2,4354	0,3784	0,3586	0,3478	0,3621	0,4286	0,5247	0,7081	0,8696	icp3027
26 Skare # 1	45,2258	34,9134	30,0656	24,6333	12,3128	5,1701	7,9073	6,4557	4,9037	4,0947	4,1238	3,5185	3,7033	3,6646	icp3028
28 Sævråsvåg # 10	1,6838	1,6269	1,5822	1,4855	1,3623	2,6940	1,1411	1,1367	1,0335	1,0155	1,0799	1,0834	1,1472	1,1352	icp68
28 Sævråsvåg # 11	0,1078	0,1101	0,1056	0,1156	0,1366	0,1579	0,0891	0,1033	0,0965	0,0837	0,0921	0,0808	0,0870	0,0932	icp69
28 Sævråsvåg # 12	2,6740	2,7886	2,6511	2,5221	2,2536	2,5375	1,8743	1,9899	1,9126	1,9963	2,0671	1,9461	1,9951	1,9014	icp70
28 Sævråsvåg # 14	1,2932	1,1414	0,9963	0,8402	0,5800	2,1625	0,4193	0,3868	0,3324	0,3273	0,3520	0,3717	0,4452	0,4572	icp72
28 Sævråsvåg	8,2461	7,0065	5,8442	4,6580	2,8851	4,2567	1,6964	1,3518	1,0633	0,9825	0,9740	0,8917	1,0057	0,9720	icp205
29 Tysse # 1	2,2415	2,4123	2,8303	2,9682	3,0983	0,7748	2,6627	2,2504	2,1428	2,0324	1,8995	1,9834	2,0550	2,2505	icp325
29 Tysse # 2	1,2081	1,1644	1,1933	1,1687	1,0391	0,2728	0,9402	0,8836	0,9422	0,9359	0,9227	1,0033	0,9993	1,0557	icp326
29 Tysse # 3	11,4771	10,6880	10,7671	10,0754	8,8234	2,0434	4,8748	9,1041	7,5248	7,2458	7,1237	7,7579	7,8116	7,6964	icp327
30 Tyssedal # 1	24,5000	18,3540	16,3525	13,0950	6,8923	0,9796	4,1853	3,3966	2,3820	2,0613	2,3286	2,4074	2,7751	2,8882	icp3030
31 Tyssøy # 1	0,3955	0,3900	0,5361	0,5668	0,9021	1,2526	1,0054	0,9252	1,0128	0,9796	0,9495	0,9357	0,9566	1,0584	icp312
31 Tyssøy # 2	0,1130	0,0648	0,0688	0,0567	0,0577	0,0340	0,0666	0,0677	0,0975	0,1168	0,1529	0,2299	0,2682	0,3411	icp313
31 Tyssøy # 3	0,1868	0,1618	0,1756	0,1705	0,2116	0,3526	0,2407	0,2131	0,2280	0,2575	0,2560	0,3156	0,3809	0,4909	icp314
31 Tyssøy # 4	1,8106	1,7089	2,2959	2,5967	3,1369	2,4377	3,5806	3,2363	3,4647	3,6046	3,4728	3,5447	3,4118	3,8720	icp315
31 Tyssøy # 5	3,4793	3,6763	5,0809	5,5054	6,7777	6,7424	7,4833	7,0576	7,5075	7,5475	7,1899	7,5397	7,4475	7,8568	icp316
31 Tyssøy # 6	0,3522	0,2470	0,2323	0,2264	0,2418	0,1892	0,2029	0,2153	0,2013	0,1987	0,2144	0,2389	0,2684	0,3084	icp907

Table 2. *(Continued)*

Quarry	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
32 Urda # 15	0,1045	0,0714	0,0529	0,0383	0,0385	0,1925	0,0278	0,0220	0,0562	0,0673	0,1071	0,1422	0,1947	0,2312	icp499
32 Urda # 16	0,0763	0,0577	0,0263	0,0370	0,0237	0,3159	0,0165	0,0080	0,0266	0,0327	0,0528	0,0505	0,1141	0,1731	icp500
32 Urda # 1/UIB	2,1471	1,9645	1,8940	1,6433	1,2089	0,5029	0,8009	0,7483	0,6223	0,6200	0,6163	0,4958	0,5241	0,5052	icp204
32 Urda # 2/UIB	0,1807	0,1704	0,2116	0,1496	0,1190	0,1581	0,0912	0,1095	0,0837	0,0983	0,0985	0,1374	0,1319	0,1750	icp206
32 Urda # 14	0,0402	0,0252	0,0235	0,0294	0,0363	0,1090	0,0430	0,0604	0,0561	0,0594	0,0755	0,0929	0,1074	0,1321	icp74
32 Urda # 5	0,0068	0,0037	#VERDI!	0,0026	-0,0001	0,1397	#VERDI!	0,0016	0,0077	0,0131	0,0269	0,0419	0,0622	0,1023	icp73
34 Vargavåg # 1	0,1768	0,1221	0,0991	0,0887	0,0663	0,0230	0,0638	0,0480	0,0881	0,1060	0,1445	0,1894	0,2130	0,2475	icp299
34 Vargavåg # 2	0,3047	0,1954	0,1419	0,1137	0,1087	0,0458	0,0983	0,0699	0,1265	0,1779	0,2259	0,2885	0,3618	0,4522	icp300
34 Vargavåg # 4	0,4154	0,2830	0,1953	0,1701	0,1223	0,0390	0,0813	0,0756	0,0856	0,1117	0,1320	0,1730	0,2575	0,2978	icp301
34 Vargavåg # 5	0,2323	0,1764	0,1667	0,1575	0,1876	0,0550	0,1319	0,1204	0,1448	0,1656	0,1691	0,2238	0,2835	0,4234	icp302
34 Vargavåg # 6	0,1150	0,0715	0,0346	0,0394	0,0397	0,0192	0,0287	0,0210	0,0412	0,0545	0,0901	0,1294	0,2314	0,3143	icp303
34 Vargavåg # 7	0,0825	0,0649	0,0247	0,0317	0,0349	0,0052	0,0197	0,0118	0,0280	0,0383	0,0398	0,0383	0,0517	0,0566	icp304
34 Vargavåg # 8	0,3668	0,2612	0,2059	0,1600	0,1189	0,0553	0,0601	0,0614	0,0829	0,0928	0,1379	0,1479	0,2009	0,2718	icp305
34 Vargavåg # 9	0,1307	0,1016	0,0727	0,0707	0,0558	0,0343	0,0451	0,0554	0,0696	0,0858	0,1102	0,1333	0,2367	0,3100	icp306
34 Vargavåg # 10	0,2796	0,1784	0,1387	0,0864	0,0748	0,0943	0,0387	0,0348	0,0419	0,0701	0,0900	0,1110	0,1730	0,2010	icp307
35 Vargavåg gryte 4	0,1647	0,0568	0,0382	0,0361	0,0359	2,7745	0,0177	0,0162	0,0231	0,0321	0,0586	0,0791	0,1147	0,1295	icp178
35 Vargavåg gryte 3	0,1330	0,0879	0,0639	0,0399	0,0252	0,0775	0,0204	0,0185	0,0258	0,0248	0,0314	0,0432	0,0685	0,0572	icp179
35 Vargavåg gryte 1	0,1254	0,0799	0,0510	0,0349	0,0306	0,0870	0,0158	0,0183	0,0260	0,0325	0,0362	0,0407	0,0729	0,0646	icp183
35 Vargavåg gryte 2	0,1159	0,0720	0,0423	0,0303	0,0263	0,0514	0,0243	0,0196	0,0268	0,0266	0,0344	0,0435	0,0750	0,0787	icp190
36 Vassenden # 3	1,2581	1,0965	1,1967	1,0917	0,8769	0,0000	0,7799	0,7806	0,7547	0,7799	0,8048	0,8642	0,8804	0,9938	icp3031
36 Vassenden # 4	1,8645	2,1015	2,6311	2,6950	2,3590	0,8980	1,9305	1,7300	1,5000	1,3649	1,1857	1,1111	1,1675	0,9938	icp3032
37 Ådland # 1/UIB	0,0677	0,0493	0,0349	0,0333	0,0259	0,0149	0,0311	0,0261	0,0321	0,0277	0,0257	0,0252	0,0305	0,0130	icp185
37 Ådland # 2/UIB	0,1117	0,0847	0,0616	0,0512	0,0472	0,0238	0,0337	0,0364	0,0649	0,0802	0,1201	0,1815	0,2795	0,3454	icp186
37 Ådland # 1	0,3155	0,2862	0,2371	0,1875	0,1343	0,0877	0,1149	0,1033	0,1167	0,1142	0,1416	0,1699	0,1806	0,1880	icp203

Table 2. *(Continued)*

Quarry	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
38 Åkra # 1	18,9881	16,2525	14,7237	12,0545	8,1861	6,2582	5,8929	4,7245	4,2205	4,0627	3,7430	3,6009	3,6957	3,7044	icp317
38 Åkra # 2	17,2808	14,5780	13,0017	10,8424	7,3102	5,7394	5,1661	4,2065	3,8509	3,5586	3,2979	3,3274	3,2076	3,2851	icp318
38 Åkra # 3	16,9963	14,5588	12,9003	10,7114	6,8645	5,5743	4,8902	3,7549	3,3935	3,0942	3,0107	3,0247	2,9727	3,2392	icp319
38 Åkra # 4	18,6366	16,0673	14,5018	12,4312	8,0487	6,5260	5,8689	4,6292	4,3629	4,0296	3,7622	4,0223	3,5748	3,7742	icp320
Urban vessels	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**	
BRM 0/42937	0,0728	0,0513	0,0387	0,0342	0,0178	0,0379	0,0148	0,0123	0,0121	0,0118	0,0135	0,0085	0,0104	0,0098	icp1737
BRM 0/43530	1,3589	1,7473	1,9169	2,0605	1,8621	0,7901	1,5258	1,3073	1,1712	1,1031	1,1553	1,1353	1,2310	1,3233	icp1738
BRM 0/43549	3,6522	3,6844	3,1836	2,9863	2,6605	1,8855	2,7339	2,7838	2,7822	2,8065	2,8976	2,8677	2,9373	3,1085	icp1739
BRM 0/44163	0,0937	0,0857	0,0752	0,0687	0,0587	0,0448	0,0595	0,0608	0,0517	0,0514	0,0552	0,0627	0,0773	0,0983	icp1740
BRM 0/44650	10,2829	9,3052	7,8980	6,3727	3,5105	2,4391	2,2857	1,7183	1,2539	1,0614	1,0395	0,9150	0,9324	1,0139	icp1741
BRM 0/44931	0,9366	0,7092	0,5512	0,4804	0,3756	0,1979	0,3859	0,2818	0,2272	0,1868	0,1664	0,1322	0,1198	0,1510	icp1742
BRM 0/44934	0,1837	0,1468	0,1245	0,0919	0,0723	0,0549	0,0742	0,0662	0,0760	0,0644	0,0628	0,0766	0,0801	0,0937	icp1743
BRM 0/44998	12,3279	10,2530	8,6271	6,9925	4,3207	0,8373	2,9079	2,4285	1,9806	1,6735	1,6419	1,4765	1,5513	1,6752	icp1744
BRM 0/45373	1,0035	0,6776	0,4788	0,3785	0,2524	0,2495	0,2814	0,3002	0,3808	0,4962	0,6443	0,9648	1,2786	1,4510	icp1745
BRM 0/45465	0,0312	0,0255	0,0197	0,0179	0,0135	0,0171	0,0144	0,0187	0,0132	0,0146	0,0173	0,0188	0,0182	0,0228	icp1746
BRM 0/45548	0,6806	0,4870	0,3958	0,3073	0,1959	0,1230	0,1624	0,1305	0,1277	0,1201	0,1135	0,0947	0,0996	0,1004	icp1747
BRM 0/45695	0,2082	0,2131	0,3551	0,4582	0,5443	0,5070	0,5799	0,5826	0,5886	0,5647	0,5897	0,5550	0,5967	0,6514	icp1748
BRM 0/45792	0,2820	0,2104	0,1552	0,1272	0,0754	0,0354	0,0493	0,0427	0,0453	0,0373	0,0414	0,0385	0,0427	0,0653	icp1749
BRM 0/45810	2,1167	2,1288	2,2695	2,4339	2,6110	2,7556	2,1497	1,8084	1,4787	1,1507	1,0540	0,9598	1,0373	1,0692	icp1750
BRM 0/45843	3,3861	3,3345	3,9596	4,3787	4,7365	2,5395	4,4948	4,4141	4,3259	4,0264	4,0680	3,8756	3,8453	3,6893	icp1751
BRM 0/45857	33,8488	24,5595	18,8451	13,6215	7,3451	1,3338	4,0609	2,8864	2,0110	1,6624	1,8350	1,8149	1,9670	2,0521	icp1752
BRM 0/45938	3,6557	1,2859	0,9318	0,7191	0,3691	0,3619	0,3288	0,2469	0,2256	0,2064	0,2181	0,2016	0,2268	0,2426	icp1753
BRM 0/46144	0,9877	1,2025	1,3677	1,5520	1,7648	0,6222	1,8713	1,8944	2,0668	2,1034	2,1651	2,3238	2,5625	2,5885	icp1754

Table 2. *(Continued)*

Vessels, urban	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
BRM 0/54177	0,1864	0,1131	0,0794	0,0641	0,0397	0,0632	0,0348	0,0402	0,0328	0,0337	0,0446	0,0603	0,0775	0,1115	icp1755
BRM 0/54478	0,1283	0,0906	0,0744	0,0553	0,0413	0,0278	0,0426	0,0548	0,0512	0,0532	0,0452	0,0483	0,0428	0,0583	icp1756
BRM 0/54795	0,0389	0,0290	0,0238	0,0194	0,0183	0,0138	0,0169	0,0159	0,0109	0,0100	0,0122	0,0136	0,0141	0,0194	icp1757
BRM 0/55200	0,7995	0,6871	0,7155	0,6821	0,5871	0,1043	0,4861	0,4059	0,3653	0,3544	0,3566	0,3516	0,3514	0,4059	icp1758
BRM 0/63018	5,4592	4,4539	3,7019	3,1450	3,0531	3,5889	3,1625	3,3510	3,3584	3,0925	3,0216	2,8101	2,5368	2,1253	icp1759
BRM 0/63600	0,1758	0,1392	0,0957	0,0848	0,0479	0,4104	0,0664	0,0768	0,0637	0,0716	0,0642	0,0620	0,0692	0,0842	icp1760
BRM 0/63801	0,5258	0,4493	0,3037	0,2518	0,1795	0,1311	0,1684	0,1553	0,1815	0,2025	0,2627	0,2960	0,4054	0,4808	icp1761
BRM 0/63998	0,5260	0,3729	0,3526	0,3223	0,2676	0,0592	0,2593	0,2592	0,3088	0,3373	0,4330	0,4653	0,5483	0,6502	icp1762
BRM 0/64002	0,3981	0,2618	0,1499	0,1147	0,0814	0,0377	0,0542	0,0550	0,0494	0,0403	0,0398	0,0392	0,0434	0,0579	icp1763
BRM 0/64060	0,5992	0,2437	0,2847	0,3058	0,3534	0,0796	0,4193	0,4341	0,5138	0,6518	0,8868	1,2147	1,7918	2,2451	icp1764
BRM 0/64141	3,7829	3,8737	3,8498	3,6686	2,9397	0,9442	2,3004	1,9468	1,6229	1,4325	1,3812	1,1315	1,1101	1,1484	icp1765
BRM 0/64255	85,4755	62,4624	48,2846	36,1201	19,1479	2,0778	11,1390	7,9559	5,3546	4,1781	4,2284	3,7867	4,0800	3,9512	icp1766
BRM 0/64272	1,4999	1,3474	1,2989	1,2583	0,9544	0,5600	0,6959	0,6003	0,5988	0,5925	0,6845	0,7975	0,9568	1,0364	icp1767
BRM 0/64393	0,3987	0,3278	0,2328	0,1786	0,1219	0,0526	0,1050	0,1283	0,1119	0,1076	0,1211	0,1425	0,1998	0,2312	icp1768
BRM 0/64422	0,1537	0,1459	0,0986	0,0922	0,0592	0,0560	0,0546	0,0596	0,0588	0,0472	0,0474	0,0544	0,0505	0,0802	icp1769
BRM 0/64487	0,2261	0,2245	0,1055	0,0828	0,0585	0,0336	0,0521	0,0669	0,0504	0,0488	0,0534	0,0757	0,1088	0,1254	icp1770
BRM 0/64621	0,4226	0,3514	0,3770	0,3904	0,4926	0,7956	0,5962	0,6352	0,6445	0,6234	0,6371	0,5988	0,6558	0,6481	icp1771
BRM 0/64638	0,2488	0,1885	0,1244	0,1113	0,0759	0,0767	0,0590	0,0674	0,0618	0,0518	0,0614	0,0587	0,0688	0,0783	icp1772
BRM 0/64641	0,7248	0,5890	0,4569	0,3720	0,2703	1,0704	0,2194	0,1873	0,1976	0,2442	0,2897	0,3119	0,4128	0,5132	icp1773
BRM 0/64657	35,1720	23,5043	21,6381	17,6943	11,9668	1,9756	9,7543	8,1285	7,1969	6,3772	6,1038	5,4702	4,9960	4,8907	icp1774
BRM 0/64742	4,4320	2,8712	2,2267	1,5869	0,8240	0,2999	0,5015	0,4060	0,2872	0,3090	0,3830	0,4515	0,5503	0,5910	icp1775
BRM 0/64786	0,4417	0,3410	0,3424	0,3072	0,3313	0,2002	0,2840	0,2584	0,2774	0,3095	0,3294	0,3460	0,3722	0,4016	icp1776
BRM 0/64803	1,5036	1,1851	1,0703	0,9942	0,9993	0,7428	1,1061	1,0378	1,0280	0,9919	0,9937	0,8328	0,8295	0,9172	icp1777
BRM 0/64828	0,3639	0,2933	0,2441	0,2098	0,1484	0,1137	0,1222	0,1104	0,1009	0,1092	0,1254	0,1415	0,1927	0,2057	icp1778

Table 2. *(Continued)*

Vessels, urban	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
BRM 0/64984	0,7726	0,6575	0,5501	0,4817	0,4850	0,7236	0,5474	0,5886	0,6338	0,6108	0,6582	0,6580	0,6611	0,5584	icp1779
BRM 0/64994	2,4261	1,9193	1,2654	0,8868	0,5054	0,3393	0,3650	0,2867	0,2330	0,2058	0,2131	0,1917	0,2150	0,2310	icp1780
BRM 0/65004	1,6084	1,2953	1,1051	0,9353	0,8815	1,5108	0,7141	0,6003	0,5700	0,5009	0,5285	0,4979	0,5778	0,6079	icp1781
BRM 0/65007	0,0926	0,0830	0,0570	0,0458	0,0510	0,0479	0,0366	0,0496	0,0378	0,0318	0,0344	0,0327	0,0328	0,0478	icp1782
BRM 0/73087	1,7258	1,2298	1,0316	0,9219	0,7533	0,5104	0,6477	0,5960	0,5294	0,4688	0,4995	0,5431	0,5902	0,7180	icp1783
BRM 0/73155	1,2546	1,0431	0,8780	0,7224	0,5891	0,4262	0,5555	0,5531	0,5640	0,5594	0,6036	0,6328	0,7287	0,7201	icp1784
BRM 0/73346	0,7920	0,6821	0,6291	0,5712	0,5139	0,6830	0,4785	0,4520	0,4624	0,4551	0,4449	0,4294	0,4509	0,4723	icp1785
BRM 0/73353	0,7508	0,6607	0,5259	0,4980	0,4732	0,4499	0,5808	0,6512	0,9708	1,3039	1,6650	2,0485	2,3329	2,2711	icp1786
BRM 0/73441	3,8656	2,5932	1,7850	1,1795	0,5176	11,0025	0,3245	0,2457	0,1885	0,1629	0,1828	0,1697	0,1652	0,1915	icp1787
BRM 0/75316	3,8085	2,3809	1,7470	1,3986	0,7492	0,6678	0,5208	0,3865	0,3284	0,3035	0,2965	0,2590	0,2569	0,2670	icp1788
BRM 0/75671	0,2531	0,2426	0,2272	0,1924	0,1564	0,1145	0,1734	0,1548	0,1550	0,2146	0,2553	0,3099	0,3945	0,5238	icp1789
BRM 0/75767	0,0859	0,0696	0,0617	0,0541	0,0628	0,0592	0,0491	0,0414	0,0406	0,0337	0,0400	0,0384	0,0424	0,0523	icp1790
BRM 0/77526	0,3059	0,3334	0,3516	0,4469	0,6731	0,5012	0,9022	0,8900	0,9352	0,8870	0,8499	0,7522	0,7603	0,8258	icp1791
BRM 0/77531	0,1457	0,0954	0,0710	0,0452	0,0316	0,5999	0,0346	0,0310	0,0251	0,0296	0,0338	0,0490	0,0647	0,0956	icp1792
BRM 0/77564	0,1537	0,1137	0,1006	0,0972	0,1183	0,1066	0,1204	0,1232	0,1306	0,1369	0,1426	0,1615	0,1810	0,2052	icp1793
BRM 0/77576	3,6894	3,1005	2,5350	1,9384	1,1344	2,6410	0,7836	0,6428	0,5520	0,4940	0,5598	0,5710	0,6624	0,6743	icp1794
BRM 0/79750	5,7026	3,6652	2,5654	1,8850	0,9058	0,1273	0,5672	0,3449	0,2478	0,2365	0,3166	0,3044	0,3756	0,4691	icp1795
BRM 0/80155	0,1321	0,0950	0,0796	0,0600	0,0400	0,0369	0,0429	0,0574	0,0571	0,0758	0,0962	0,1109	0,1643	0,1903	icp1796
BRM 0/80210	0,5748	0,3858	0,3752	0,4182	0,5184	0,6885	0,5065	0,4257	0,4012	0,3648	0,3526	0,3422	0,3592	0,4049	icp1797
BRM 0/80253	4,9493	4,3138	4,4240	4,6314	3,8270	1,0437	3,0275	2,7326	2,4832	2,4998	2,6872	2,8533	3,2283	3,7694	icp1798
BRM 0/80455	38,7323	27,6733	20,8361	16,3133	9,9333	5,8639	6,5869	5,4852	4,6646	4,2201	4,1762	3,7654	4,1531	4,2857	icp2933
BRM 0/80803	0,9397	0,6862	0,5410	0,4498	0,2899	0,2944	0,2245	0,2123	0,1944	0,2044	0,2068	0,1992	0,2468	0,2723	icp1800
BRM 0/80852	0,6809	0,5458	0,4485	0,3698	0,2486	0,2259	0,2111	0,2171	0,2282	0,2666	0,3363	0,3822	0,5083	0,5555	icp1801
BRM 0/80871	2,2709	2,2439	2,3189	2,5006	2,6175	2,7800	2,0866	1,7493	1,4070	1,1074	1,0547	0,9198	1,0061	1,0470	icp1802

Table 2. *(Continued)*

Vessels, urban	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
BRM 0/81128	0,3606	0,2636	0,2251	0,2178	0,2015	0,2725	0,2026	0,2100	0,2461	0,3267	0,4747	0,6506	0,9559	1,1396	icp1803
BRM 0/81366	0,1140	0,0699	0,0650	0,0528	0,0585	0,0868	0,0547	0,0692	0,0568	0,0518	0,0640	0,0630	0,0642	0,0707	icp1804
BRM 0/81374	0,3243	0,2689	0,2273	0,2191	0,2017	0,1279	0,2364	0,2477	0,2805	0,3653	0,5045	0,6447	0,8175	0,9480	icp1805
BRM 0/85416	0,1946	0,1397	0,1061	0,0989	0,0786	0,0433	0,0673	0,0658	0,0677	0,0732	0,0959	0,1143	0,1494	0,2107	icp1806
BRM 0/85447	1,4630	0,8436	0,5645	0,3398	0,1420	0,1398	0,0826	0,0611	0,0516	0,0448	0,0612	0,0704	0,0918	0,1154	icp1807
BRM 0/85448	0,1934	0,1336	0,0856	0,0642	0,0546	0,0307	0,0250	0,0230	0,0262	0,0188	0,0279	0,0313	0,0446	0,0880	icp1808
BRM 0/85465	0,8442	0,6011	0,4766	0,3940	0,2923	0,7216	0,2258	0,2228	0,2271	0,2347	0,2616	0,2851	0,3531	0,4239	icp1809
BRM 0/85502	0,2477	0,1599	0,1310	0,1233	0,1093	0,0645	0,1117	0,1185	0,1297	0,1826	0,2656	0,3948	0,4878	0,5233	icp1810
BRM 0/85503	0,2989	0,2173	0,1694	0,1245	0,0910	0,0553	0,0598	0,0660	0,0472	0,0555	0,0594	0,0710	0,0849	0,1138	icp1811
BRM 0/85556	22,3011	14,3991	10,2709	7,8968	3,9172	0,2972	2,3606	1,5881	1,0797	0,9171	0,9283	0,8150	0,9279	1,0766	icp1812
BRM 0/85580	19,2471	13,4777	9,7734	6,5574	3,0008	2,0399	1,4558	1,0217	0,6037	0,4202	0,3825	0,2055	0,1547	0,1456	icp1813
BRM 0/85591	0,3377	0,2282	0,1561	0,1124	0,0716	0,0855	0,0524	0,0450	0,0436	0,0439	0,0489	0,0555	0,0793	0,1188	icp1814
BRM 0/85635	0,5729	0,3822	0,2676	0,1957	0,1284	0,4673	0,0835	0,0912	0,0742	0,0682	0,0685	0,0700	0,0727	0,0880	icp1815
BRM 0/86150	0,1986	0,1636	0,1217	0,0998	0,0612	0,0397	0,0368	0,0339	0,0248	0,0269	0,0251	0,0243	0,0295	0,0365	icp1816
BRM 0/86199	0,2711	0,1979	0,1508	0,1257	0,0866	0,0425	0,0804	0,0829	0,0855	0,0837	0,0733	0,0740	0,0703	0,0755	icp1817
BRM 0/86220	0,1684	0,1217	0,0855	0,0620	0,0352	0,1047	0,0217	0,0221	0,0185	0,0178	0,0205	0,0292	0,0382	0,0560	icp1818
BRM 0/86878	2,1520	2,0034	1,9611	1,9222	1,6419	1,3285	1,2153	1,0043	0,7958	0,6669	0,6712	0,6844	0,8279	0,9891	icp1819
BRM 3/697	1,2983	0,7898	0,7198	0,6792	0,7037	0,2716	0,8837	0,9626	0,9902	0,9543	0,9167	0,8432	0,8140	0,7135	icp1820
BRM 3/702	1,7674	1,6420	1,6524	1,5668	1,4103	0,6102	1,2104	1,1180	0,9887	0,8848	0,8357	0,7690	0,8229	0,8167	icp1821
BRM 76/11041	1,0353	1,1723	1,3664	1,5161	1,8487	0,9885	1,9711	2,1100	2,2314	2,1781	2,2476	2,2614	2,3333	2,2393	icp1822
BRM 76/11048 # 1	0,1050	0,0865	0,0659	0,0722	0,0729	0,0624	0,0805	0,0741	0,0844	0,0858	0,0806	0,0790	0,0755	0,0799	icp1823
BRM 76/11048 # 2		0,0879		0,1000	0,0769	0,0816	0,0656		0,0621		0,0667		0,0526		icp2989
BRM 104/2180	4,4514	4,1764	3,9257	3,7247	3,0337	1,7992	2,0889	1,6360	1,2258	0,9949	0,9117	0,8141	0,8200	0,8165	icp1824
BRM 104/2299	0,8820	0,6912	0,5839	0,4992	0,4447	2,1816	0,3629	0,3403	0,3031	0,2488	0,2424	0,2453	0,2673	0,2661	icp1825

Table 2. *(Continued)*

Vessels, urban	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**	**NGU/UIB**
BRM 104/2356	9,3376	8,4116	7,5446	6,4700	4,0273	1,2934	2,7581	2,2773	1,9150	1,7152	1,7125	1,5500	1,6290	1,6983	icp1826
BRM 110/5518	0,1758	0,1439	0,1264	0,1117	0,0957	0,0871	0,0876	0,0947	0,1010	0,1211	0,1491	0,2061	0,2730	0,3320	icp1827
BRM 110/5651	10,2533	9,2756	8,9584	8,5559	7,5877	5,4625	6,0547	5,3462	4,6380	4,1693	3,9639	3,6907	3,9275	3,8379	icp1828
BRM 110/5959	0,0666	0,0585	0,0473	0,0486	0,0504	0,0362	0,0411	0,0386	0,0370	0,0370	0,0401	0,0399	0,0517	0,0715	icp1829
BRM 110/6463	2,0729	1,1285	0,8945	0,7560	0,5751	1,4874	0,4346	0,3743	0,3217	0,3166	0,3542	0,3910	0,4836	0,5551	icp1830
BRM 237/1277	167,9021	83,0073	63,9306	43,2528	17,3589	8,8137	9,7949	6,9337	4,2468	3,5341	3,6017	2,7445	2,7294	2,6537	icp1831
Vessels, rual	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**	
B4253	0,2581	0,2921	0,3033	0,2950	0,2821	0,0816	0,2780	0,2532	0,2453	0,1671	0,2762		0,2967	0,3416	icp2934
B4369	0,9581	1,1980	1,2623	1,2833	1,1692	1,1701	0,9768	1,0127	0,8882	0,8078	0,8571	0,7407	0,9713	1,0559	icp2935
B4836	18,4548	12,5124	12,3770	10,4433	7,1231	1,6190	4,4826	3,6076	3,1770	2,8273	2,8333	2,5617	2,6124	2,5466	icp2938
B6204	12,5677	14,6411	15,8443	14,8950	9,3231	6,0272	5,8842	4,9367	3,8137	3,5515	3,4429	2,9938	3,3397	3,3540	icp2988
B7829	0,9323	0,8354	0,7213	0,6250	0,5077	0,9252	0,4788	0,4219	0,4068	0,3760	0,4524	0,3704	0,6746	0,7143	icp2943
B7888	4,7129	3,8069	3,2377	2,6733	1,8462	0,3537	1,3359	1,1603	1,0590	0,9053	0,9143	0,7099	0,8852	0,8696	icp2944
B7925	0,0935	0,2042	0,2705	0,3383	0,4051	0,1361	0,3900	0,4008	0,3913	0,3064	0,3762	0,2469	0,4163	0,4348	icp2945
B7960	0,5065	0,5396	0,4262	0,3367	0,3333	0,1224	0,2973	0,3376	0,2950	0,1950	0,2286		0,2775	0,2484	icp2946
B8308	0,3516	0,3936	0,5492	0,6417	0,8308	0,9524	0,6988	0,7173	0,6304	0,5710	0,6905	0,5864	0,8182	0,8696	icp2948
B9976	0,8742	1,3465	1,5902	1,5950	1,4103	1,7415	1,0695	1,0338	0,9348	0,7939	0,7571	0,4321	0,5646	0,4969	icp2951
B10454	10,4000	11,2710	12,2623	12,9633	8,6667	6,4218	5,4672	4,5148	3,4783	3,0641	2,6048	2,0988	2,0431	1,8634	icp2954
B10457	1,4452	1,3403	0,9344	0,7783	0,6564	0,4490	0,5598	0,5696	0,4938	0,3203	0,3619	0,1852	0,3923	0,3727	icp2955
B10462/a	0,5516	0,5347	0,5656	0,4600	0,4308	0,2313	0,2896	0,2954	0,2205	0,1114	0,1857		0,1914	0,1863	icp2956
B10462/d	3,0871	2,6894	2,5738	2,5500	2,2974	2,2041	1,8340	1,7089	1,4565	1,2256	1,2095	1,0494	1,2584	1,4907	icp2959
B10481	1,4226	2,0012	2,8279	3,4550	4,6923	1,1156	5,9730	6,3291	6,3323	5,9331	5,5762	5,4321	5,3732	4,8447	icp2960
B10655	1,5000	1,5470	1,4590	1,4717	1,6821	0,4762	1,7490	1,9831	1,9224	1,7549	1,6476	1,4198	1,6555	1,3975	icp2961
B11115	1,2097	1,9369	2,9180	3,6367	3,5590	1,6054	3,1004	3,1013	3,1584	3,0641	3,1952	3,3333	3,7990	3,8820	icp2967

Table 2. *(Continued)*

Vessels, rual	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	NGU/UIB
B11551/a	3,3613	2,2562	2,2049	1,7567	1,0051	0,4354	0,5830	0,4008	0,2733	0,1811	0,3095	0,1852	0,4593	0,5901	icp2971
B11797	50,6452	38,2921	31,8443	25,7167	13,4051	8,8163	8,2973	6,7932	5,1894	4,8329	4,7381	3,9198	4,0000	4,1615	icp2976
B11815/b	8,3290	7,2401	6,7049	6,1950	4,5949	2,5986	3,3475	3,1857	2,6398	2,4373	2,5000	2,0988	2,4019	2,2050	icp2977
B11835	0,1129	0,1597		0,1350	0,0821	0,1088	0,1042	0,1055	0,1056		0,1095		0,1675	0,2174	icp2978
B11867/a	0,2161	0,1931		0,1667	0,1282	0,5170	0,1274	0,1055	0,1056		0,1238		0,1579	0,2174	icp2979
B11868/b	0,3258	0,3552	0,2951	0,2917	0,2462	0,4626	0,2201	0,1899	0,2019	0,1671	0,2619		0,3014	0,3727	icp2980
B11878/a	0,7484	0,6176	0,5410	0,4700	0,3385	0,9524	0,2510	0,2743	0,2267	0,1253	0,2286		0,2297	0,2174	icp2982
B12025/b	0,8710	0,6757	0,4836	0,3900	0,3436	0,1497	0,4324	0,5696	0,6522	0,6685	0,7571	0,8025	1,0718	1,0248	icp2983
B12050/a	2,9000	3,2822	3,0000	2,9500	2,4615	1,6599	2,0270	1,9620	1,6242	1,5738	1,5905	1,2654	1,6507	1,6770	icp2984
B12134	0,4677	0,4047	0,3361	0,2700	0,1949	0,1361	0,1660	0,1477	0,1304		0,1476		0,1770	0,2174	icp2985

***Table 3.** Provenancing result, in detail, for the individual 146 vessels.*

Object no.	**MTE code**	**MTE Quarry**	**Code MTE & REE code** Qu=Quarry, Ve=Vessel	**MTE & REE quarries** NC=Not conclusive, Ve=Vessel	**Transport distance** RTR=Regional on transport route	**Geological unit MTE**	**Geological unit MTE&REE**	**Vessel type**	**Score points**	**Sum score points**	**Group 1–6**
BRM 0/42937	1Q	Kvernes 8/Urda 5	1Q	Kvernes		1	1	?	3+2	5	1
BRM 0/43530	NRM	NRM	NRM			0	0	A	0	0	6
BRM 0/43549	NRM	NRM	NRM			0	0	A	0	0	6
BRM 0/44163	MC3	Arnafjord 8/Bru 8/Kvernes 8	MC2	Arnafjord/Kvernes		1/2	1	A	4+2	6	3
BRM 0/44650	SRM1	Digranes 5	Qu no REE	NC		3	-	A	2	2	5
BRM 0/44931	MC4	Arnafjord 8/Bergsholmen 8/Bru 8/Urda 8	1Q	Urda		1/2	2	A	4+2	6	1
BRM 0/44934	MC7	Arnafjord 8/Bergsholmen 8/Froastad 8/Juadal 8/ Kvernes 8/Sjusete 8/Urda 8/Svanøy 5	MC5	Arnafjord/Bergsholmen/Juadal/ Kvernes/Urda		1/2	1/2	A	4+2	6	3
BRM 0/44998	NRM	NRM	NRM				0	A	0	0	6
BRM 0/45373	1Q	Bergsholmen 8/Bru 6	NRM			1	0	?	3-2	1	6
BRM 0/45465	MC3	Bergsholmen 8/Kvernes 8/Sjusete 8	MC2	Bergsholmen/Kvernes		1/2	1	A	4+2	6	3
BRM 0/45548	MC2	Kvernes 8/Sævråsvåg 8/Bergsholmen 7	1Q	Kvernes		1	1	A	4+2	6	1
BRM 0/45695	1Q	Sjusete 8	NRM			2	0	?	3-2	1	6
BRM 0/45792	MC3	Bergsholmen 8/Bru 8/Urda 8	1Q	Bergsholmen		1/2	1	A	4+2	6	1
BRM 0/45810	NRM	NRM	NRM				0	A	0	0	6
BRM 0/45843	NRM	NRM	NRM				0	A	0	0	6
BRM 0/45857	NRM	NRM	NRM				0	A1	0	0	6
BRM 0/45938	NRM	NRM	NRM				0	B	0	0	6
BRM 0/46144	SRM1	Baldersheim 6	SRM1	Baldersheim		1	1	A	2+2	4	2
BRM 0/54177	MC5	Bergsholmen 8/Juadalen 8/Kvernes 8/Sjusete 8/ Urda 8/Froastad 6/Vass 5	1Q	Kvernes		1/2	1	B	4+2	6	1
BRM 0/54478	MC2	Kvernes 8/Sjusete 8/Bergsholmen 6/Bru 6	1Q	Kvernes		1/2	1	A	4+2	6	1
BRM 0/54795	MC3	Kvernes 8/Urda 8/Bergsholmen 8/Bru 7	MC3	Kvernes/Urda/Bergsholmen		1/2	1/2	A	4+2	6	3
BRM 0/55200	SRM2	Bergsholmen 6/Russøy 5	NRM			1	0	A	2-2	0	6

Table 3. *(Continued)*

Object no.	MTE code	MTE Quarry	Code MTE & REE code Qu=Quarry, Ve=Vessel	MTE & REE quarries NC= Not conclusive, Ve=Vessel	Transport distance RTR=Regional on transport route	Geological unit MTE	Geological unit MTE&REE	Vessel type	Score points	Sum score points	Group 1–6
BRM 0/63018	1Q	Kvernes 8	NRM			1	0	A	3-2	1	6
BRM 0/63600	MC2	Bergsholmen 8/Bru 8/Kvernes 6/Sjusete 6	1Q	Bergsholmen		1/2	1	A	4+2	6	1
BRM 0/63801	1Q	Urda 8/Klauvsteinsberget 5	1Q	Urda		2	2	A	3+2	5	1
BRM 0/63998	MC3	Bru 8/Kvernes 8/Urda 8/Sævråsvåg 7	1Q	Urda		1/2	2	A	4+2	6	1
BRM 0/64002	MC3	Bergsholmen 8/Sævråsvågen 8/Vassenden 8/ Arnafjord 6	1Q	Bergsholmen		1/3	1	A	4+2-1	5	1
BRM 0/64060	1Q	Vassenden 8	NRM			3	0	A	3-2	1	6
BRM 0/64141	NRM	NRM	NRM				0	A	0	0	6
BRM 0/64255	NRM	NRM	NRM				0	B?	0	0	6
BRM 0/64272	NRM	NRM	NRM				0	A	0	0	6
BRM 0/64393	MC2	Bergsholmen 8/Kvernes 8/Sævråsvåg 7	1Q	Kvernes		1	1	A	4+2	6	1
BRM 0/64422	MC3	Bergsholmen 8/Sævråsvåg 8/Vassenden 8/Russøy 6/ Sjusete 6	MC2	Bergsholmen/Vassenden		1/3	1/3	A	4+2-1	5	5
BRM 0/64487	MC3	Bergsholmen 8/Kvernes 8/Sævråsvåg 8/Arnafjord 6/ Raudesteinarne 5	1Q	Kvernes		1	1	A	4+2	6	1
BRM 0/64621	1Q	Baldersheim 8	1Q	Baldersheim		1	1	A	3+2	5	1
BRM 0/64638	MC2	Kvernes 8/Sævråsvåg 8/Juadal 7/Arnafjord 6	1Q	Kvernes		1	1	A	4+2	6	1
BRM 0/64641	MC3	Arnafjord 8/Bru 8/Urda 8/Kvernes 5	1Q	Urda		1/2	2	A	4+2	6	1
BRM 0/64657	SRM1	Svanøy 6	NRM			2	0	A	2-2	0	6
BRM 0/64742	MC2	Bergsholmen 8/Russøy 8	1Q	Russøy		1	1	B	4+2	6	1
BRM 0/64786	MC2	Sjusete 8/Urda 8/Arnafjord 5/Nygård 5	MC2	Sjusete/Urda		2	2	A	4+2	6	3
BRM 0/64803	SRM1	Baldersheim 6	NRM			1	0	?	2-2	0	6
BRM 0/64828	MC2	Bergsholmen 8/Kvernes 8/Russøy 7	MC2	Bergsholmen/Kvernes		1	1	A	4+2	6	3
BRM 0/64984	MC3	Bergsholmen 8/Kvernes 8/Sjusete 8/Urda 6	1Q	Kvernes		1/2	1	A	4+2	6	1

Table 3. *(Continued)*

Object no.	**MTE code**	**MTE Quarry**	**Code MTE & REE code** Qu=Quarry, Ve=Vessel	**MTE & REE quarries** NC= Not conclusive, Ve=Vessel	**Transport distance** RTR=Regional on transport route	**Geological unit MTE**	**Geological unit MTE&REE**	**Vessel type**	**Score points**	**Sum score points**	**Group 1–6**
BRM 0/64994	MC3	Bergsholmen 8/Juadalen 8/Sævråsvåg 8/Bru 6/ Urda 5	1Q	Bergsholmen		1	1	A?	4+2	6	1
BRM 0/65004	SRM2	Juadal 6/Svanøy 5	NRM			1	0		2-2	0	6
BRM 0/65007	MC2	Bergsholmen 8/Sævråsvåg 8	1Q	Bergsholmen		1	1	A	4+2	6	1
BRM 0/73087	NRM	NRM	NRM				0		0	0	6
BRM 0/73155	SRM3	Arnafjord 6/Sævråsvåg 7/Vassenden 5	SRM2	Arnafjord/Vassenden		1/3	1/3	A	2+2-1	3	5
BRM 0/73346	NRM	NRM	NRM				0		0	0	6
BRM 0/73353	NRM	NRM	NRM				0	A	0	0	6
BRM 0/73441	MC4	Kvernes 8/Sævråsvåg 8/Urda 8/Vargahola 8/Bru 6	SRM1	Bru		1/2	2	A	4+2	6	2
BRM 0/75316	SRM3	Bergsholmen 5/Russøy 5/Vassenden 5	NRM			1/3	0	A	2-2-1	0	6
BRM 0/75671	1Q	Sævråsvåg 8/Juadalen 5	SRM1	Juadal		1	1	A	3+2	5	2
BRM 0/75767	MC3	Bergsholmen 8/Sævråsvåg 8/Vassenden 8/ Kvernes 6	MC3	Bergsholmen/Sævråsvåg/Vas-senden		1/3	1/3	A	4+2-1	5	5
BRM 0/77526	1Q	Ingahogget 8/Lysekloster 6/ Sele 6	1Q	Ingahogget		4	4	A	3+2	5	1
BRM 0/77531	MC4	Juadal 8/Raudesteinane 8/Svanøy 8/Sævråsvåg 8/ Arnafjord 6	1Q	Sævråsvåg		1/2/3	1	B	4+2-1	5	1
BRM 0/77564	SRM4	Bergsholmen 5/Bru 5/Kvernes 5/Urda 5	SRM1	Kvernes		1/2	1	A	2+2	4	2
BRM 0/77576	1Q	Sævråsvåg 8	1Q	Sævråsvåg		1	1	A	3+2	5	1
BRM 0/79750	1Q	Sævråsvåg 8	SRM1	Russøy		1	1	A	3+2	5	2
BRM 0/80155	MC3	Bergsholmen 8/Kvernes 8/Russøy 8/Sævråsvåg 5/ Vargavåg gryte 5	1Q	Kvernes		1	1	A	4+2	6	1
BRM 0/80210	MC4	Bergsholmen 8/Kvernes 8/Russøy 8/Sævråsvåg 8/ Vassenden 6	1Q	Sævråsvåg		1	1		4+2	6	1
BRM 0/80253	SRM1	Lysekloster 6	NRM			2	0	A	2-2	0	6
BRM 0/80455	MC3	Ingahogget 8/Klauvsteinsjuvet 8/Lysekloster 8/ sele 5	Qu no REE	NC		2/4	-	C	4-1-all	0	6

Table 3. *(Continued)*

Object no.	**MTE code**	**MTE Quarry**	**Code MTE & REE code** Qu=Quarry, Ve=Vessel	**MTE & REE quarries** NC= Not conclusive, Ve=Vessel	**Transport distance** RTR=Regional on transport route	**Geological unit MTE**	**Geological unit MTE&REE**	**Vessel type**	**Score points**	**Sum score points**	**Group 1–6**
BRM 0/80803	MC6	Bergsholmen 8/Kvernes 8/Russøy 8/Sjusete 8/ Svanøy 8/Sævråsvåg 8	MC4	Bergsholmen/Kvernes/Russøy/ Sævråsvåg		1/2	1	A	4+2	6	3
BRM 0/80852	MC4	Bergsholmen 8/Kvernes 8/Rauberg 8/Vargavåg 8	MC3	Kvernes/Rauberg/Vargavåg		1	1	B	4+2	6	3
BRM 0/80871	1Q	Bergspytt 8/Ingahogget 6	1Q	Bergspytt		4	4	A	3+2	5	1
BRM 0/81128	1Q	Bergsholmen 8/Kvernes 7, Rauberg 7	SRM1	Rauberg		1	1	B	2+2	4	2
BRM 0/81366	MC3	Bergsholmen 8/Kvernes7/Rauberg 7/Bru 6/Urda 5	MC3	Bergsholmen/Kvernes/Rauberg		1	1	A	4+2	6	3
BRM 0/81374	MC3	Bergsholmen 8/Kvernes 8/Urda 8/Sævråsvåg 5	NRM			1/2	0	B	4-2	2	6
BRM 0/85416	MC8	Bergsholmen 8/Juadal 8/Kvernes 8/Rauberg 8/ Russøy 8/Sjusete 8/Urda 8/Vargavåg 8	MC2	Rauberg/Vargavåg		1/2	1	A	4+2	6	3
BRM 0/85447	MC6	Bergsholmen 8/Juadal 8/Kvernes 8/Rauberg 8/ Russøy 8/Urda 8/Froastad 5/Sjusete 5/Vargavågen 7	MC3	Bergsholmen/ Kvernes/ Russøy		1/2	1	A	4+2	6	3
BRM 0/85448	MC8	Bergsholmen 8/Froastad 8/Juadal 8/Kvernes 8/ Rauberg 8/Russøy 8/Urda 8/Vargavåg 8/Bru 5	MC4	Bergsholmen/Froastad/Kvernes/ Russøy		1/2	1/2	A	4+2	6	3
BRM 0/85465	1Q	Sævråsvåg 8/Kvernes 6	1Q	Sævråsvåg		1	1		3+2	5	1
BRM 0/85502	MC7	Froastad 8/Kvernes 8/Nygård 8/Rauberg 8/Sjusete 8/Urda 8/Vargavåg 8/Bergsholmen 7/Juadalen 7	1Q	Urda		1/2	2		4+2	6	1
BRM 0/85503	MC8	Bergsholmen 8/Juadal 8/Kvernes 8/Rauberg 8/ Russøy 8/Sjusete 8/Urda 8/Vargavåg 8/Froastad 7/ Nygård 7	MC5	Bergsholmen/Juadal/Kvernes/ Russøy/Urda		1/2	1/2	A	4+2	6	3
BRM 0/85556	NRM	NRM	NRM				0	A	0	0	6
BRM 0/85580	SRM2	Urda 7/Vargavåg gryte 7	NRM			1/2	0	A	2-2	0	6
BRM 0/85591	MC8	Bergsholmen 8/Juadal 8/Kvernes 8/Rauberg 8/ Russøy 8/Sjusete 8/Urda 8/Vargavåg 8/Froastad 5/ Munkahogget 5/Nygård 7	MC4	Bergsholmen/Kvernes/Russøy/ Sjusete		1/2	1/2	A	4+2	6	3
BRM 0/85635	1Q	Urda 8/Klauvsteinsberget 5/Kvernes 6/Vass 5	NRM			2	0	A	3-2	1	6
BRM 0/86150	MC3	Bru 8/Urda 8/Sævråsvåg 8/Juadalen 6/ Svanøy 6	NRM			1/2	0		4-2	2	6
BRM 0/86199	MC2	Bru 8/Urda 8/Arnafjord 6/Kvernes 6/Rauberg 6	1Q	Urda		2	2	A	4+2	6	1

Table 3. *(Continued)*

Object no.	MTE code	MTE Quarry	Code MTE & REE code Qu=Quarry, Ve=Vessel	MTE & REE quarries NC= Not conclusive, Ve=Vessel	Transport distance RTR=Regional on transport route	Geological unit MTE	Geological unit MTE&REE	Vessel type	Score points	Sum score points	Group 1–6
BRM 0/86220	MC6	Bergsholmen 8/Kvernes 8/Juadal 8/Rauberg 8/ Sjusete 8/Urda 8	MC2	Bergsholmen/Sjusete		1/2	1/2	A	4+2	6	3
BRM 0/86878	NRM	NRM	NRM				0	A	0	0	6
BRM 3/697	1Q	Kvitno 8/Svanøy 5	1Q	Kvitno		3	3	A	3+3	6	1
BRM 3/702	1Q	Svanøy 8/Kvitno 7/Vassenden 5	SRM2	Kvitno/Vassenden		2	3	A	3+2	5	4
BRM 76/11041	MC4	Bergsholmen 8/Russøy 8/Svanøy 8/Sævråsvåg 8/ Froastad 6/Juadalen 5	NRM			1	0	A	4-2	2	6
BRM 76/11048 sample 2	BRM 76/ # 2	BRM 76/ # 2 (Sævråsvåg)	BRM 76/ #2								
BRM 76/11048 sample 1	1Q	Sævråsvåg 8/Kvernes 6	NRM			1	0		3-2	1	1
BRM 104/2180	MC3	Bergspytt 8/Ingahogget 8/Lysekloster 8	1Q	Ingahogget		2/4	4	A	4+2-1	5	1
BRM 104/2299	MC2	Bergsholmen 8/Sævråsvåg 8	MC2	Bergsholmen/Sævråsvåg		1	1	A	4+2	6	3
BRM 104/2356	NRM	NRM	NRM				0	A	0	0	6
BRM 110/5518	MC4	Bergsholmen 8/Juadalen 8/Kvernes 8/Rauberg 8/ Urda 7	NRM			1	0	?	4-2	2	6
BRM 110/5651	SRM2	Ingahogget 6/Sele 5	Qu no REE	NC		2/4	-	C	2-1-All	0	6
BRM 110/5959	1Q	Bru 8/Sævråsvåg 6	NRM			2	0	A	3-2	1	6
BRM 110/6463	MC2	Urda 8/Vargehola 8	Qu no REE	NC		1/2	-	A	4	4	4
BRM 237/1277	SRM2	Svanøy 6/Sævråsvåg 6	NRM			1	0	A	2-2	0	6
B4253	1Q	Kvitno 8	1Q	Kvitno	Reg.	3	3	-	3+2	5	1
B4369	SRM2	Bergspytt 7/Digranes 6	Qu no REE	NC		3/4	-	-	2-1	1	5

Table 3. *(Continued)*

Object no.	**MTE code**	**MTE Quarry**	**Code MTE & REE code** Qu=Quarry, Ve=Vessel	**MTE & REE quarries** NC= Not conclusive, Ve=Vessel	**Transport distance** RTR=Regional on transport route	**Geological unit MTE**	**Geological unit MTE&REE**	**Vessel type**	**Score points**	**Sum score points**	**Group 1–6**
B4432	1Q	Sævråsvåg 8/Bergsholmen 6/ Urda 5/Vassenden 7	Ve no REE	Ve no REE	Reg.	1	-	-	3	3	2
B4719	MC6	Bergsholmen 8/Kvernes 8/Rauberg 8/Russøy 8/ Urda 8/Vargavåg 8	Ve no REE	Ve no REE		1/2	-	-	4	4	4
B4836	1Q	Tysse 8	1Q	Tysse	RTR	4	4	-	3+2	5	1
B6204	MC2	Bergspytt 8/Tysse 8	1Q	Bergspytt	Vicinity	4	4	-	4+2+3	9	1
B6982b	MC3	Froastad 8/Juadal 8/Russøy 8/Sævråsvåg 6	Ve no REE	Ve no REE	Local	1/2	-	-	4+2	6	4
B7018	1Q	Sævråsvåg 8/Drebrekke 5/Svanøy 6	Ve no REE	Ve no REE	Reg.	1	-	-	3	3	2
B7019	1Q	Kvitno 8/Flatabø 7	Ve no REE	Ve no REE	Reg.	3	-	-	3	3	2
B7105	SRM3	Nygård 5/Vargavåg gryte 5/Vassenden 5	Ve no REE	Ve no REE		1/3	-		2-1	1	5
B7829	1Q	Sævråsvåg 8/Flatabø 7/Ingahogget 5	1Q	Sævråsvåg	Local	1	1	-	3+2+2	7	1
B7888	1Q	Klauvsteinsjuvet 8/Bergsholmen 5/Sele 5	1Q	Klauvsteinsjuvet	Vicinity	4	4	-	3+2+3	8	1
B7925	1Q	Kvitno 8	1Q	Kvitno	Reg.	3	3	-	3+2	5	1
B7960	1Q	Kvitno 8	1Q	Kvitno	Reg.	3	3	-	3+2	5	1
B8300	MC4	Drebrekke 8/Flatabø 8/Kvitno 8/Vassenden 8	Ve no REE	Ve no REE		3	-	-	4	4	4
B8308	MC4	Bergsholmen 8/Kvernes 8/Rauberg 8/Sævråsvåg 8/Bergspytt 6/Urda 6	1Q	Sævråsvåg	Local	1	1	-	4+2+2	8	1
B8321	MC6	Bergsholmen 8/Katlaberg 8/Kvernes 8/Nygård 8/ Rauberg 8/Vargavåg 8/Froastad 5	Ve no REE	Ve no REE		1	-	-	4	4	4
B8995	SRM3	Bergsholmen 7/Juadal 6/Kvernes 6	Ve no REE	Ve no REE		1	-	-	2	2	5
B9976	SRM2	Digranes 6/Kvitno 6	Qu no REE	NC		3	-	-	2	2	5
B10222b	S Fj 1Q	Sævråsvåg 8/Kvernes 7	S Fj SRM1	Kvernes	Local	1	S Fj.	-	3+2+2	7	2

Table 3. (Continued)

Object no.	**MTE code**	**MTE Quarry**	**Code MTE & REE code** Qu=Quarry, Ve=Vessel	**MTE & REE quarries** NC=Not conclusive, Ve=Vessel	**Transport distance** RTR=Regional on transport route	**Geological unit MTE**	**Geological unit MTE&REE**	**Vessel type**	**Score points**	**Sum score points**	**Group 1–6**
B10270	1Q	Svanøy 8	Ve no REE	Ve no REE	Reg.	2	-	-	3	3	2
B10454	SRM1	Bergspytt 6	SRM1	Bergspytt	Reg.	4	4	-	2+2	4	5
B10457	MC4	Drebrekke 8/Kvitno 8/Sævråsvåg 8/Vassenden 8	Qu no REE	NC	RTR	1/3	-	-	4-1	3	5
B10462a	MC2	Sævråsvåg 8/Vassenden 8/Drebrekke 7	1Q	Vassenden	RTR	1/3	3	-	4+2-1	5	1
B10462b	SRM1	Bergspytt 6	Ve no REE	Ve no REE	Vicinity	4	-	-	2+3	5	1
B10462c	MC2	Sævråsvåg 8/Vassenden 8/Bergsholmen 5/Russøy 5	Ve no REE	Ve no REE	RTR	1/3	-	-	4-1	3	5
B10462d	SRM2	Bergspytt 5/Tyssøy 6	NRM			2/4	0	-	2-2-1	0	6
B10481	1Q	Kvitno 8/Flatabø 6	SRM1	Flatabø	Local	3	3	-	3+2+2	7	1
B10655	1Q	Flatabø 8/Kvitno 6	SRM1	Kvitno	Local	3	3	-	3+2+2	7	1
B10680a	1Q	Åkra 8/Bergspytt 7/Tyssøy 6	Ve no REE	Ve no REE	Local in rel. to 1Q/MTE quarry	4	-	-	3+2	5	1
B10680b	1Q	Skare 8/Sævråsvåg 5	Ve no REE	Ve no REE	RTR	4	-	-	3	3	2
B10697	1Q	Raudesteinarne 8/Kvernes 6, Kvitno 6, Sævråsvåg 7	Ve no REE	Ve no REE	Reg.	3	-	-	3	3	2
B10980	MC2	Kvernes 8/Rauberg 8/Bru 6/Sævråsvåg 5/Vargavåg gryte 5	Ve no REE	Ve no REE		1	-	-	4	4	4
B11115	SRM2	Bergspytt 5/Digranes 5	Qu no REE	NC		3/4	-	-	2-1	1	5
B11116	MC2	Arnafjord 8/Kvitno 8	Ve no REE	Ve no REE	Reg.	1/3	-	-	4-1	3	5
B11422	SRM1	Bergspytt 5	Ve no REE	Ve no REE	Reg.	4	-	-	2	2	5
B11551a	MC5	Juadal/Kvernes/Nygård/Urda/Vargavåg/Bergsholmen 7	Qu no REE	NC		1/2	-	-	4	4	4

Table 3. *(Continued)*

Object no.	**MTE code**	**MTE Quarry**	**Code MTE & REE code** Qu=Quarry, Ve=Vessel	**MTE & REE quarries** NC= Not conclusive, Ve=Vessel	**Transport distance** RTR=Regional on transport route	**Geological unit MTE**	**Geological unit MTE&REE**	**Vessel type**	**Score points**	**Sum score points**	**Group 1–6**
B11564g	MC3	Sævråsvågen 8/Raudesteinane 8/Vassenden 8/Arnafjord 6	Ve no REE	Ve no REE		1/3	-	-	4-1	3	5
B11630	1Q	Sævråsvåg 8/Kvitno 5/Sele 6/Sjusete 6/Tyssedal 5/Vass 6	Ve no REE	Ve no REE	Local	1	-	-	3+2	5	1
B11636	MC5	Juadal 8/Kvernes 8/Nygård 8/Urda 8/Vassenden 8	Ve no REE	Ve no REE		1/2/3	-	-	4-1	3	5
B11686	MC5	Bergsholmen 8/Juadalen 8/Rauberg 8/Russøy 8/Urda 8	Ve no REE	Ve no REE		1/2	-	-	4	4	4
B11797	1Q	Skare 8	1Q	Skare	Reg.	4	4	-	3+2	5	1
B11815b	1Q	Åkra 8/Ingahogget 5	1Q	Åkra	Vicinity	4	4	-	3+2+3	8	1
B11835	MC3	Arnafjord 8/Kvernes 8/Svanøy 8	Qu no REE	NC	Reg.	1/2	-	-	4	4	4
B11867a	SRM3	Baldersheim 6/Bergsholmen 6/Juadal 6	SRM1	Bergsholmen	Local	1	1	-	2+2	4	1
B11868b	SRM1	Lysekloster 6	NRM		Local	2	0	-	2-2+2	2	6
B11869c	1Q	Sævråsvåg 8/Flatabø 7	Ve no REE	Ve no REE	RTR	1	-	-	3	3	2
B11878a	MC2	Sævråsvåg 8/Vassenden 8	1Q	Sævråsvåg	RTR	1/3	1	-	4+2-1	5	1
B12025b	MC2	Vassenden 8/Flatabø 8/Sævråsvåg 6	1Q	Vassenden	RTR	3	3	-	4+2	6	1
B12050a	MC4	Bergspytt 8/Ingahogget 8/Klåvsteinsjuvet 8/Skare 8	MC3	Bergspytt/Ingahogget/Klåvsteinsjuvet		4	4	-	4	4	3
B12314	MC2	Baldersheim 8/Sjusete 8/Juadalen 6	SRM1	Juadal	Reg.	1/2	1	-	2	2	2
B12372	NRM	NRM	Ve no REE	Ve no REE			-	-	0	0	6

Soapstone in the North. Quarries, Products and People. 7000 BC – AD 1700

Soapstone is a remarkable rock. While it is soft and very workable, it is also durable and heat-resistant, and with a high heat-storage capacity. These properties have been recognised and valued around the world since prehistoric times, and soapstone has been used for a multitude of purposes, ranging from everyday household utensils to prestigious monuments and buildings. This book addresses soapstone use in Norway and the North Atlantic region, including Greenland. Although the majority of the papers deal with the Iron Age and Middle Ages, the book spans the Mesolithic to the early modern era. It deals with themes related to quarries, products and associated people and institutions in a broad context. Recent years have seen a revival of basic archaeological and geological research into the procurement and use of stone resources. With its authors drawn from the fields of archaeology, geosciences and traditional crafts, the anthology reflects cross-disciplinary work born of this revival.

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