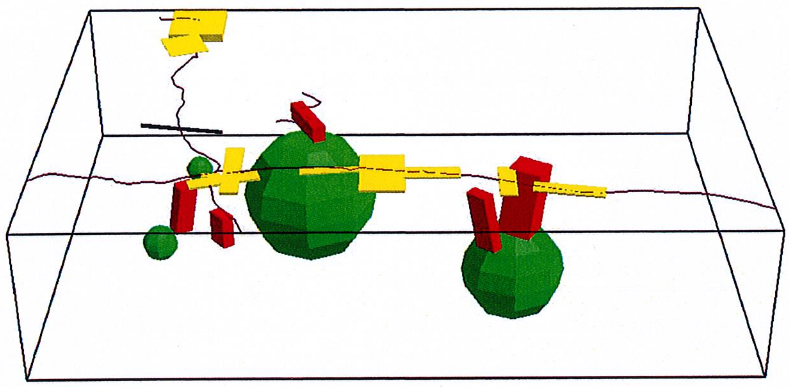
GRAVITY SURVEY OF MAFIC ROCKS AT BILLDAL



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Degree of Bachelor of Science
with a major in Earth Sciences
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Abstract

Billdal in southwestern Sweden, is an area dominated by two main rock types, Askim granite and gabbro. Their density difference makes gravity survey an ideal method to help map the location of gabbro bodies which are not close to the surface. With the use of Modelvision, it will also be possible to estimate their volume and get an image of the gabbro plutons in the area. The gravity anomaly results go from a minimum of -1.83 mgal in the northern part to a maximum of 5.77 mgal, located in the central area of Lindås. Several different gabbro models are proposed to explain this extreme gravitaty anomaly.

Key words: Gravity anomaly, gabbro, Askim granite, modelling, ModelVision.

Introduction

Geophysics is one of geology's most valuable tools as it can penetrate the surface and give us information about what there is down below. Today geophysical methods can even give 3D images of the subsurface. Most of the geophysical methods have a large price tag but in comparison with drilling all are price efficient. In this thesis a gravity survey will be used to estimate the extent and the volume of a gabbro body. This gabbro has intruded into a just slightly older granite (granodiorite), both units belong to the Kungsbacka bimodal suite. The studied area is about 10 km^2 and located in Billdal 20 km due south of Gothenburg.

The study area is part of the southwestern Scandinavian province, more specifically the western gneiss segment. The bedrock around Billdal is according to Lundegårdh & Sandgren (1953) dominated by askimgranite, a "granite with coarse microcline eyes, grey red to dark red grey, most frequently schistose", although recent geochemical research shows that the Askim granite is geochemically similar to a granodiorite, and thus has a higher density than other granites (E. Sturkell, personal communication 29 may 2021 and Leksell & Wennerholm, 2018). There is also a smaller area dominated by gabbro and some diabase dikes in the surface. It is thought that there is some underlying gabbro bodies under the granite in the area, both of which would have been formed in 1340-1300 Ma, in between the Gothian orogeny (1660–1520 Ma) and the Sweconorwegian orogeny (1140–900 Ma) (E. Sturkell, personal communication, 8 may 2021).

The first systematic mapping of the Billdal area was performed by Lundegårdh & Sandgren (1953). It was Lundegård who made the bedrock map. In the Billdal–Snipen area several smaller bodies of gabbro in a granitic background are shown in the map. The observations and the petrological descriptions are good, however some of the interpretations are now obsolete. Tectonical processes were common and produced some schistose gneissic granite with a a NW-SE foliation. ESE-WNW diabase dykes were also formed as a consequence of this tectonical activity (Hegardt, Cornell, Hellström & Lundqvist, 2007).

The aim of this paper is to estimate the volume of gabbro and thus, further our geologic knowledge of the area and be a contribution to the interpretation of the geologic history of the region.

Method

The material for this thesis comprises of gravity anomaly data and bedrock mapping data, both existing and newly collected in the field during April 2021. Altitude information originates from the LIDAR database, which is complemented by mapping data from the Swedish Geological Survey (SGU). Gravity anomaly data from 2019 and 2020 are used in the study. The previous data consist of 250 gravity anomalies mostly located on a 4 km long east –west profile from the sea and eastwards. While the data from the N-S profile and the Lindås area was taken from the 19/4 until the 25/4, mainly from bike lanes in the area (fig. 1).

Figure 1. Billdal

The first five days were used to identify the rocks in the outcrops in order to get an idea of the geology of the area and to establish the exact altitude of all the points, this latter part being the most time craving one (it took 4 – 5 days). The altitude was calculated by using a fix point with an absolute altitude and then measuring the relative difference to other points with a levelling instrument (fig. 2).

Figure 2. Levelling instrument

The two last days were used to measure the gravity of the selected points, this was done using a gravimeter (fig. 3). The raw gravimetric data was then corrected in Excel by using drift, Bouguer, free air correction, terrain and latitude correction, which are the usual ones when using gravimetry. The used calculations can be found later in this chapter.

The anomalies show the difference in gravity between the measured values and a reference one, in this case the gravimetric pull of Askim granite (chemically a granodiorite), the most common rock in the area, its density being 2.72 g/cm3. Values close to 0 mgal therefore suggest a high presence of this rock.

Figure 3. Gravimeter

After correcting the gravity anomalies to a more accurate value, the data was then imported into ModelVision, a program that estimates 3D bodies with the gravity anomalies. ModelVision can be used to match the real measured gravity anomalies to the virtual anomalies some geometrical objects would cause. The blue line seen in figure 4 is the virtual anomaly values that can be changed depending on the properties, form and location of the geometrical objects representing the gravity pull of different bodies of clay, diabase and gabbro and the black line is the actual gravity anomaly values in the E-W profile.

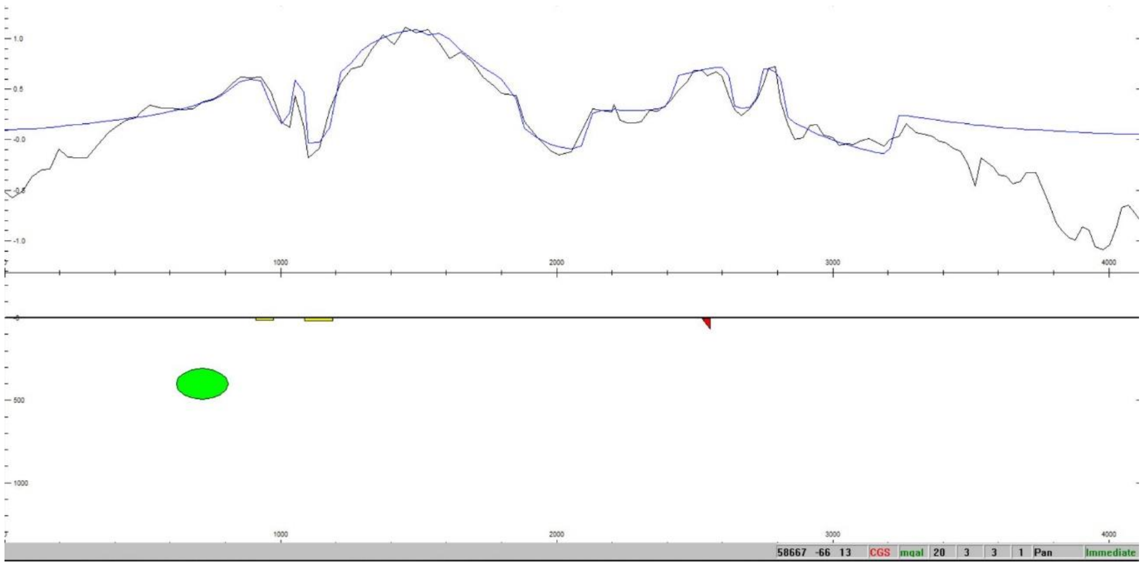

Figure 4. E-W gravity anomaly profile in ModelVision. Note most of the bodies are not intersected in the profile and therefore not shown.

Gravity corrections

Terrain correction

For the terrain correction the 2 m spaced LIDAR data base was used. The average elevation for each sector out to the F zone at 984 m distance was determined. The modulus value of average elevation of each sector and the gravity measuring point is calculated. Each sector gives a terrain correction value, and all sectors is summed to give the total terrain correction for the gravity point.

Drift correction

dkorr = ((B1-B2) / T1) * T2

where
B1 = The first base reading of the day.
B2 = The second base reading of the day.
T1 = Time difference in minutes between B1 and B2.
T2 = Time difference in minutes between B1 and the actual gravimetry point.

Final drift correction

gd = (P+dkorr – B1) * S

where
P = The actual reading of gravimetry point.
dkorr = The drift correction factor.
B1 = The first base reading of the day.
S = The gravimeter constant. The gravimeter used present the value directly in mgal so the scaling constant is set to 1.

Bouguer and free air correction

gbf = H * (0.3086 - 0.04191 * D)

where
gbf = Bouguer-free air correction factor
H = Height difference between the measured point and the base (in meters).
D = Average density of the rocks in the area. (g/cm3)

Often calculated together with the terrain correction.

Latitude correction with theoretical g

gteor. = 978031.846 * (1 + 0.005278895 sin2(λ) + 0.000023462 sin4(λ))
where
gteor. = the theoretical gravitational value for the latitude of the measured point. (mgal).
☐ = The latitude of the measured point in degrees, with 3 decimals.

The finale Bouguer anomaly (BA) with all the values put together

$g_{BA} = g_d + g_{bf}$ + (gb.teor. – gm.teor.) + TC

g_{BA} = Bouguer anomaly [mgal]

g_d = observed gravity value (drift corrected)

g_{bf} = Bouguer-free air correction factor

TC = Terrain correction

Results

Altitude

In figure 5 the measured altitudes can be seen in the map. This part is crucial to get an accurate gravity anomaly, since it is the factor that affects it the most.

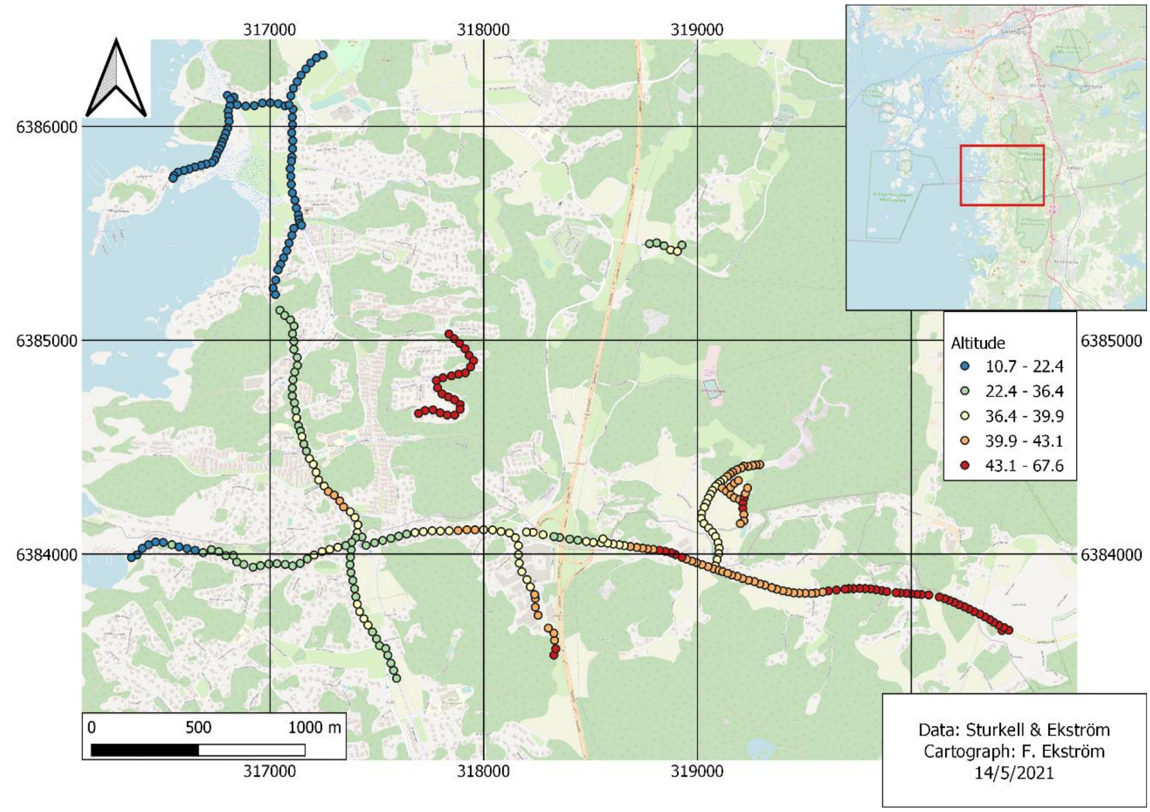

Figure 5. Map with the altitude of all the gravimetry points.

<u>Gravity anomalies</u>

In figure 6 we can see the gravity anomaly values and their location, after being corrected. The complete raw data and its operations could not be included in this paper due to its big size, but is available in an excel file.

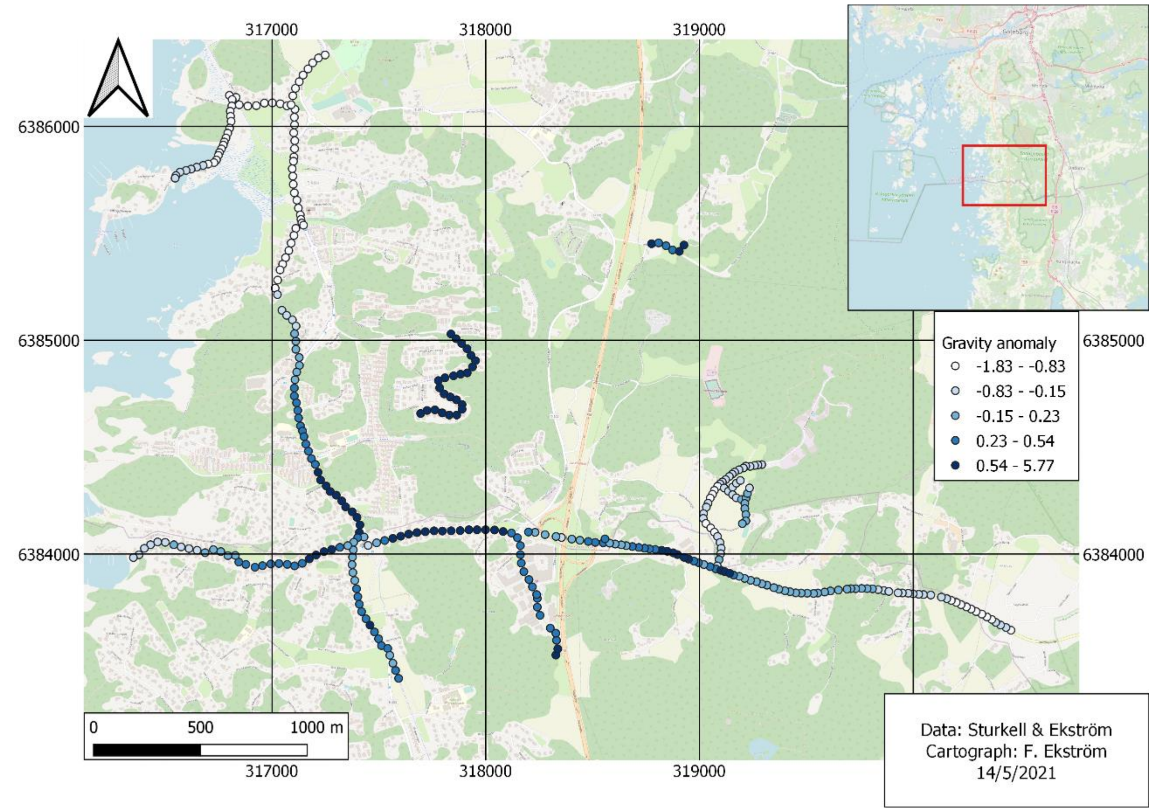

Figure 6. Map with all the gravity anomalies.

Discussion

This part will analyze the gravity anomaly values along the N-S and E-W profiles as well as the meandering one in the middle of the map, in the area of Lindås. Since the Lindås profile is not a straight line, ModelVision gives an unclear and confusing x profile, therefore a straight profile on an interpolated map was instead used.

Another reason to create an interpolated map is because the gravity anomalies just represent the value for a point, and it can be helpful to get a more regional picture with an interpolation map, as seen in figure 7. There, it is clear that the highest values are in the Lindås profile.

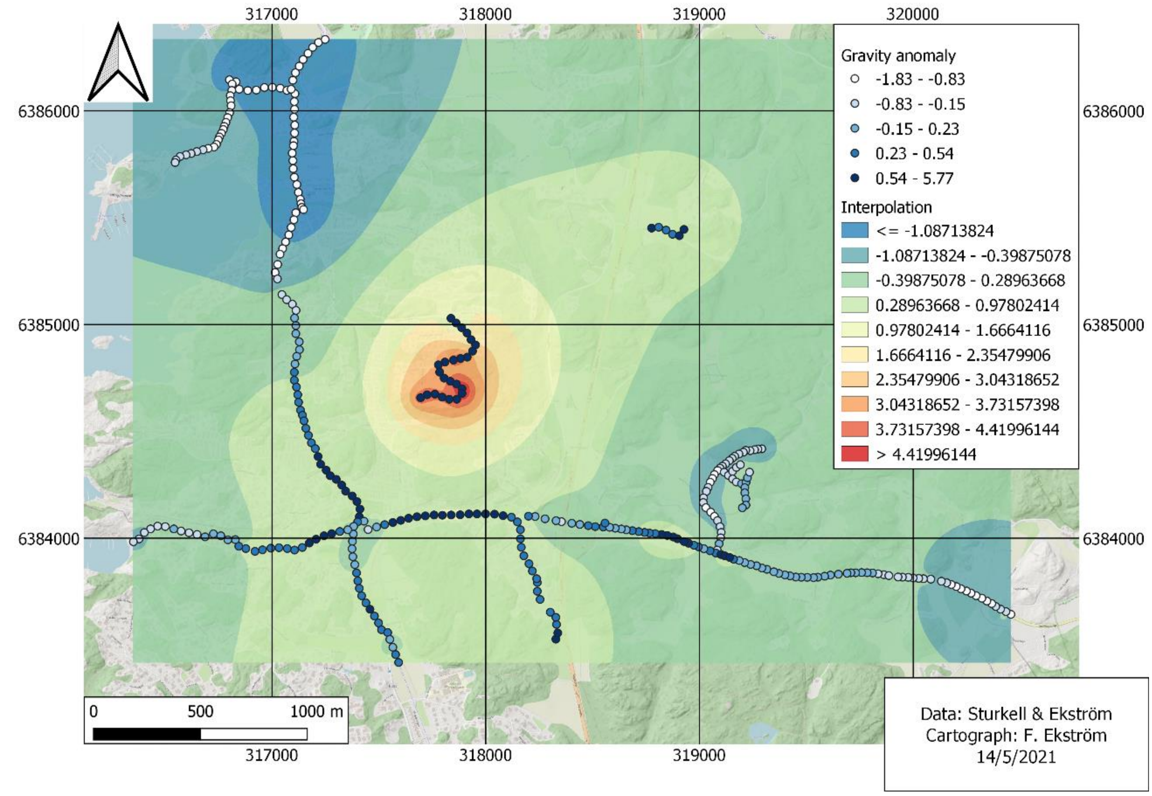

Figure 7. Map with interpolation of gravity anomalies.

<u>N-S profile</u>

In the N-S profile (fig. 8), the values are very low in the northernmost part, which according to SGU:s soil map (fig. 9) could be due to the presence of sediments, such as clay, sand and peat. Their lower densities; 1.6 g/cm^3 for dry clay, 1.45 g/cm^3 for dry fine sand and 0.6 g/cm^3 for peat (Engineering ToolBox, 2010), are the reason why the gravity anomalies are negative. According to SGU (fig. 10, 2021) , some of the sedimentary layers under the profile are up to 50 m deep, which would explain the extreme negative values. The rock bed at the beginning is also dominated by a non-bearing feldspat phenocrysts granite (the so called B-granite) instead of the Askim granite, as can be seen in figure 11. The lower density of granite with respect of Askim granite, could also be a contribution to the low anomaly values at the start of the N-S profile.

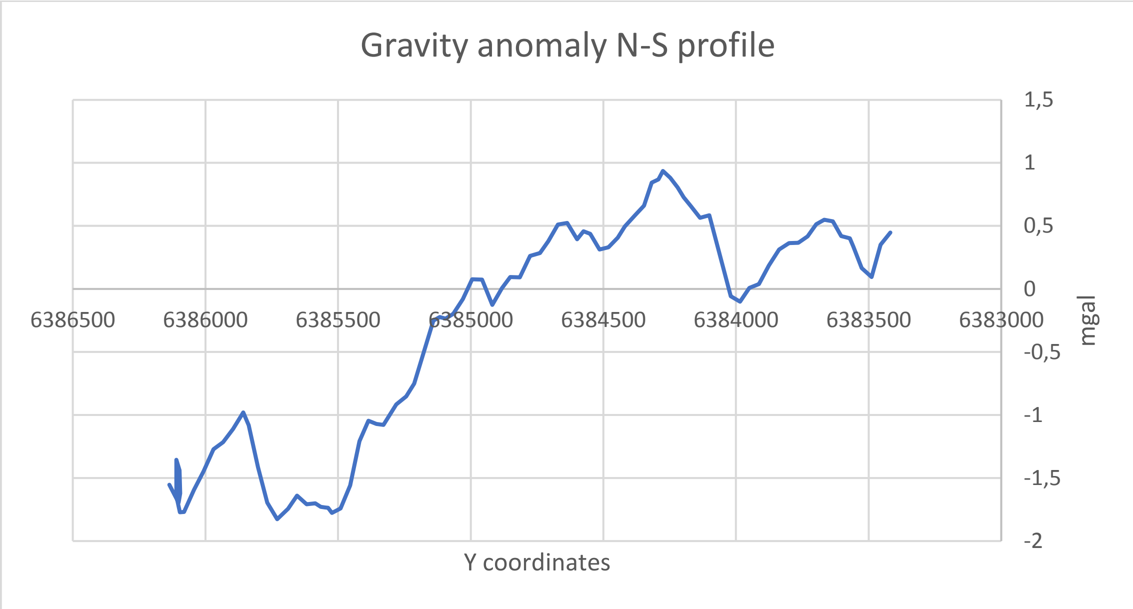

Figure 8. Graph with the gravity anomalies in the N-S profile

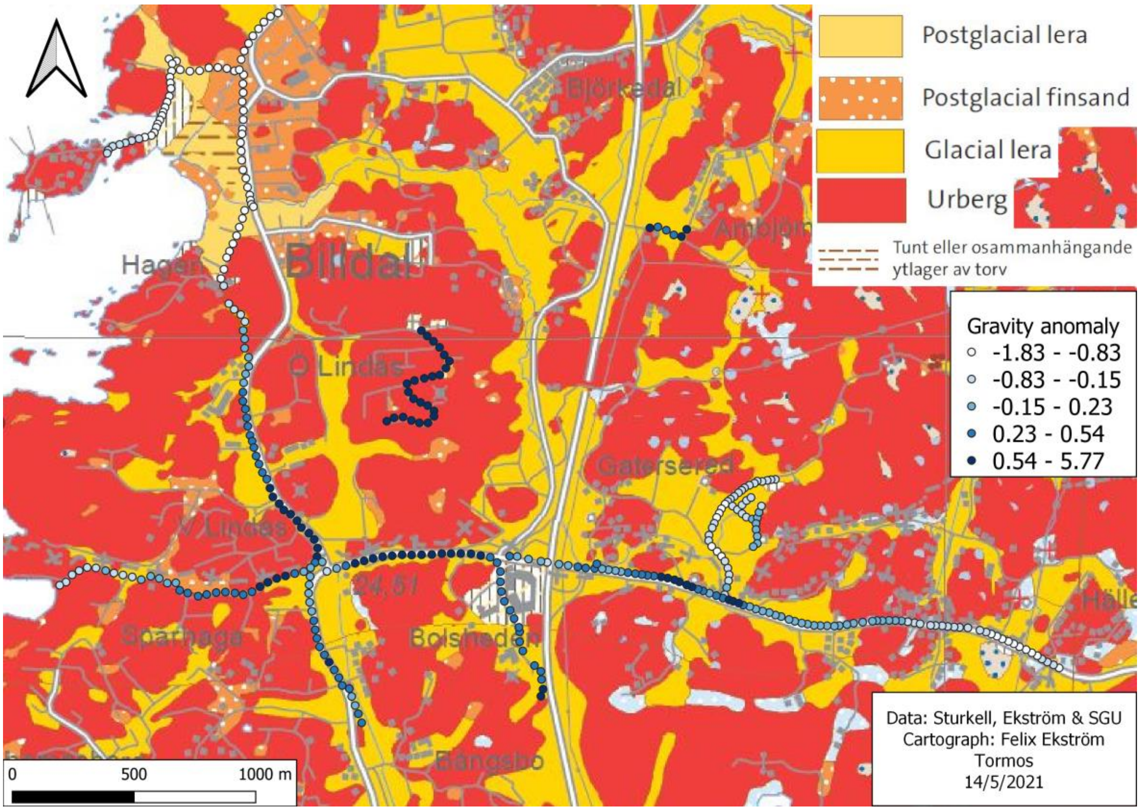

Figure 9. Map with the gravity anomalies and the regional geology in the surface. *Background created with SGU's kartvisare.* (Ekström, Sturkell & SGU, 2021)

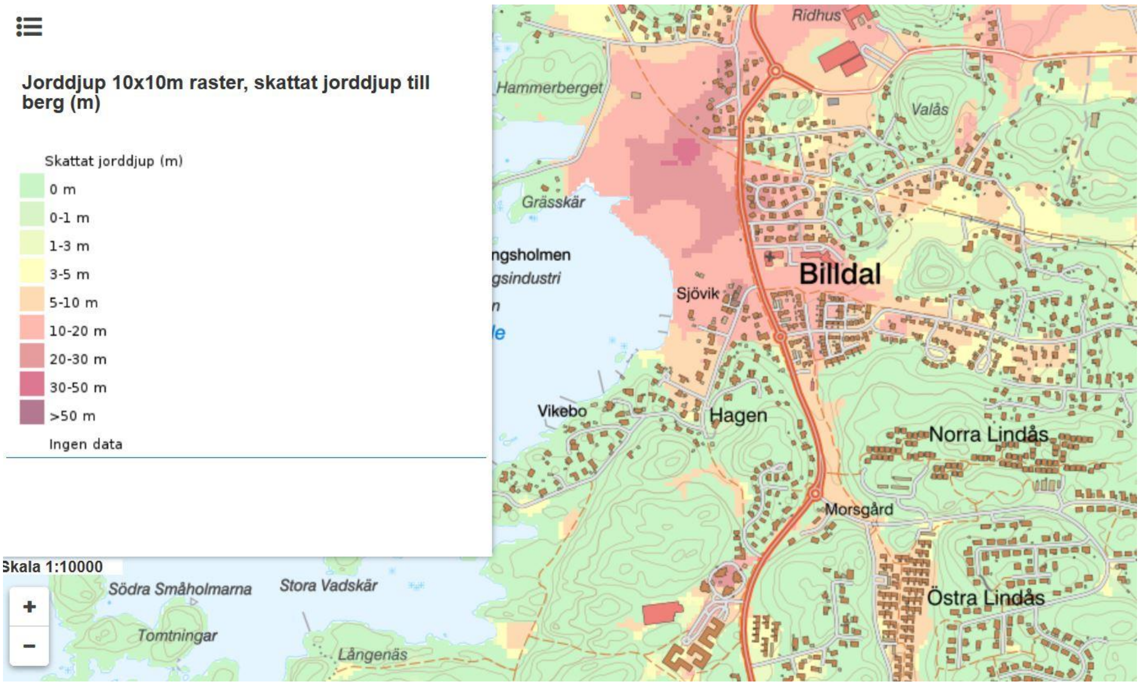

Figure 10. Map with the depth until ground rock (SGU 2021).

When the profile reaches the part of the map with ground rock on the surface (fig. 9), the gravity anomaly increases and becomes positive, and becomes highest after passing a diabase dyke and arriving at a gabbro unit (fig. 11), almost showing 1 mgal of anomaly before the crossroads. After this, the clay present at the top of the ground (fig. 9) decreases the gravity anomaly until becoming negative again before a small increase at almost the end of the profile. The total variation in the profile is approximately 3 mgal, which illustrates the different geology of the profile.

The soil filled valleys give a negative anomaly (mass deficit) and will affect the anomalies locally. The gravity survey and modelling can give good estimates on the volume of the valley. But to do so the measurements must reach well out from the soiled filled valley.

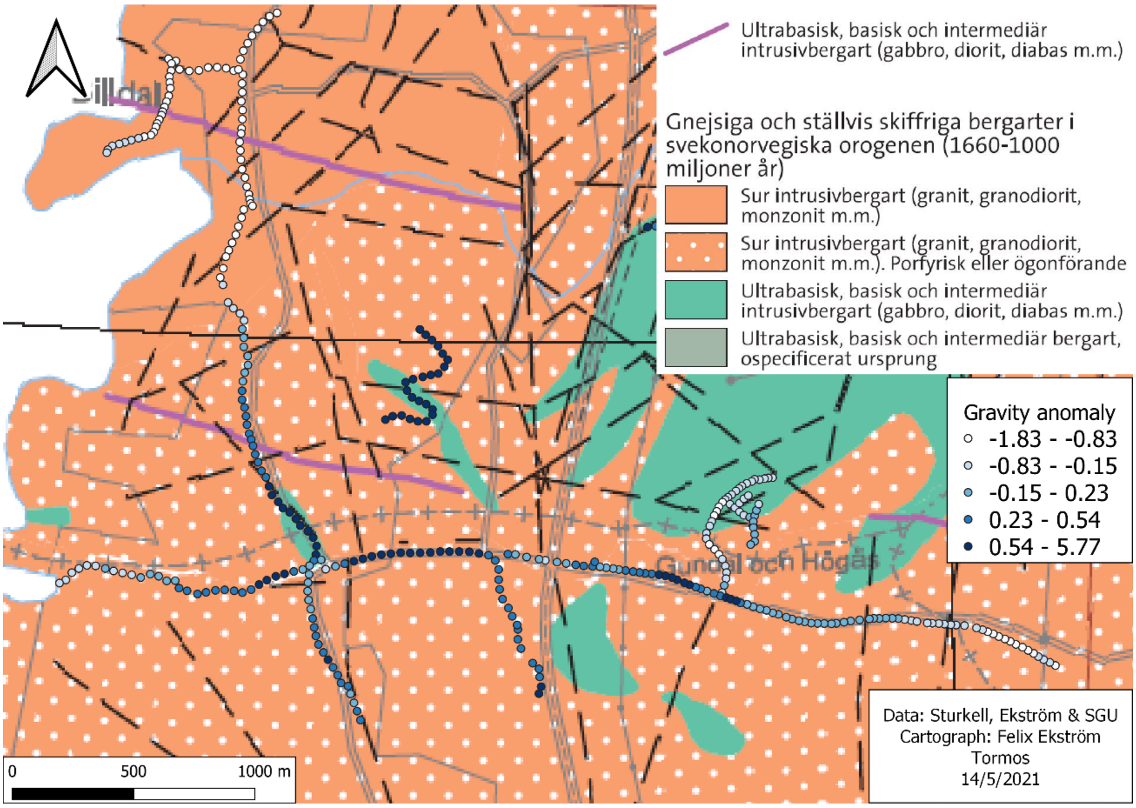

Figure 11. Map with the gravity anomalies and the igneous rocks in the area in the background. Background created with SGU's kartvisare. (Ekström, Sturkell & SGU, 2021)

<u>E-W profile</u>

In the E-W profile (fig. 12), the values vary a bit less in comparison with the N-S ones, just 1.5 mgal from minimum to maximum. With a topography similar to a valley, with clay underneath and groundrock to the sides of the profile, the anomaly values depend on the thickness of the clay and how deep it is to the groundrock. This contrasts to the values of the previous profile with more homogeneous areas, where there was only clay or groundrock around. What is interesting is that a short N-S profile that crosses the gabbro gives unexpected low values (fig. 6). A closer look at the geology of the area (fig. 9) shows that the clay on top causes the decrease in the anomaly values.

In general the anomaly is positive in the area, which together with the geology map (fig. 11) indicates the presence of some gabbro bodies.

The west to east profile passes over the Askims group of rock, which are granite-granodiorite-gabbro (E. Sturkell, personal communication 15 May 2021). The gravity base point is in the centre of the massive and have a terrain corrected base anomaly is about 1 mgal. The crystalline bedrock at the surface around the base points is a granite (granodiorite) but nearby outcrops of gabbro are present. It is possible some gabbro is very near the basepoint. This places the base point within the subsurface gabbro body. In both ends of the profile the anomaly approaches null. This is most likely to be attributed to a lower influence from the gabbro body as it is further away. The profile follows roads both on bedrock and sediments (fig. 9). The road has been built along valleys as it is the straightforward way. Some of the sudden dips (fig. 12) are represented by the valley at Snipen and the second dip is located at Bolsheden, both located close to crossroads with little bedrock in the vicinity.

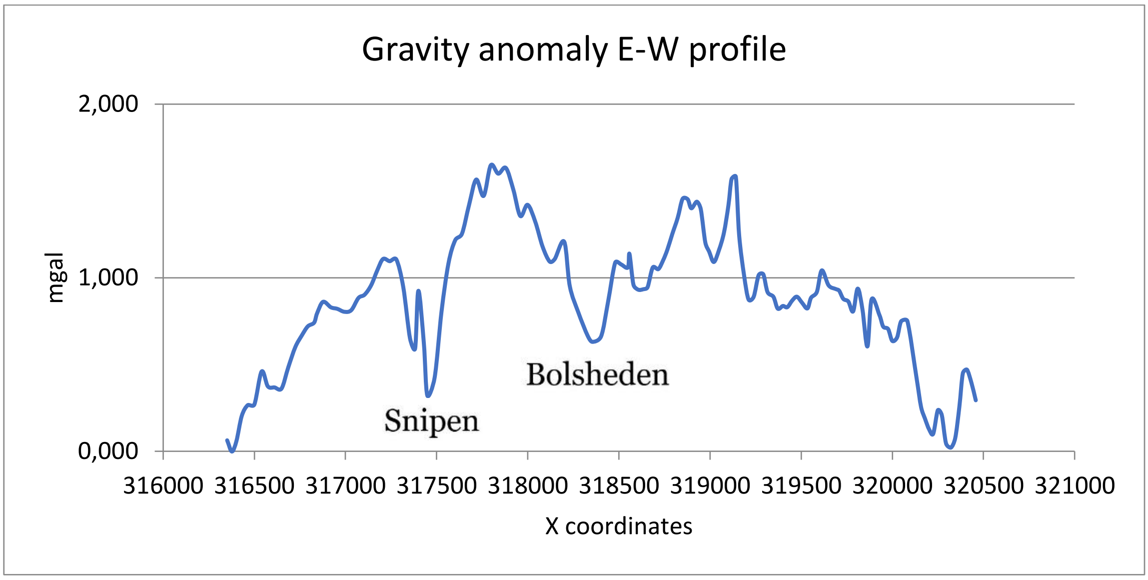

Figure 12. Graph the gravity anomalies in the E-W profile

<u>Lindås profile</u>

The meandering profile in the middle of the map (fig. 13) gives the highest anomaly values, almost 6 mgal at a point. The very high values and the gabbro present in the map (fig. 11), suggests that a large pluton could be located underneath.

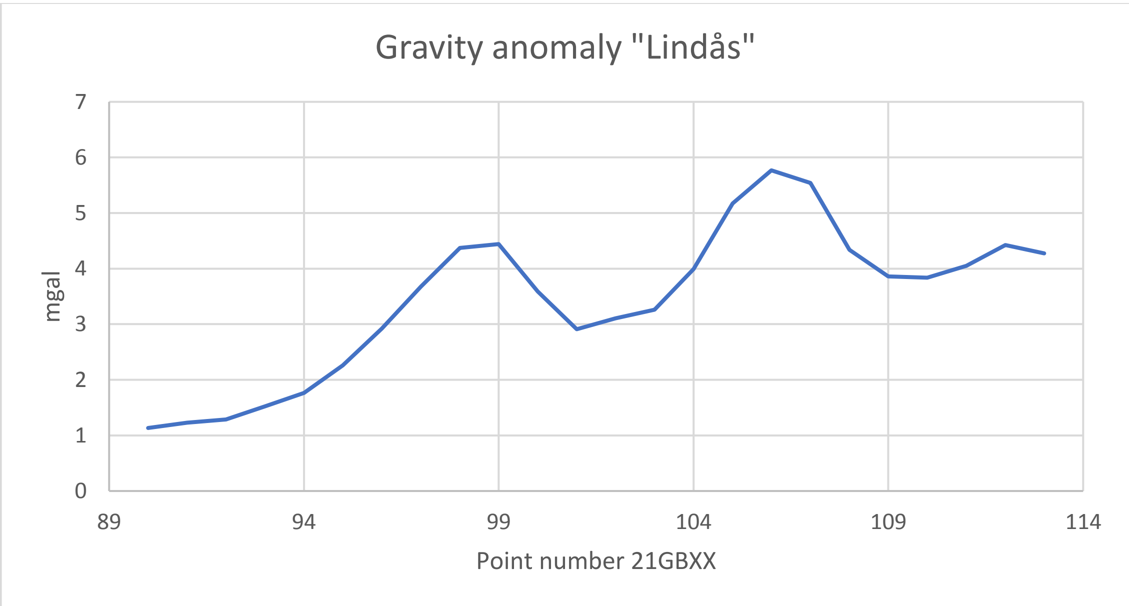

Figure 13. Graph with the gravity anomalies in the N-S profile

<u>Modelvision – profiles</u>

Modelvision works better with long and straight lines, therefore, the smaller ones that did not give much information and the ones that had negative values, were discarded in this part of the research.

Bearing in mind the location of the gabbro and diabase in fig. 11 and their associated higher gravity anomalies in the graphs, the presence of several gabbro bodies and dykes in the area is certain. Some other gabbro bodies and dykes can also be estimated even though there is no indication in the groundrock map (fig. 11), but the high gravity anomalies suggests that they are under the granite. After changing the location, depth, dip, and other parameters, the virtual and real gravity anomaly lines start coming closer to each other. The addition of clay covers on at the surface according to fig. 9 and the depth indicated in fig. 10, helps to completely match the gravity anomalies.

The diabase in the dykes have in principle the same density as the gabbro. This circumstance makes no detectable contrast. In the central area, a huge gabbro body underlies a thin cover of granite (granodiorite). In this area no distinct anomaly can be attributed by the dyke as the gabbro overshadows it all. However, in the northern part of the north to south profile (Fig. 8) an anomaly of 0.8 mgal is caused by an east–west trending dyke. This dyke has intruded in a granite (gneissic) with a density of 2.65 g/cm^3.

In fig. 14, all the profiles were put together and a proposition of the possible location and size of some of the clay covers, gabbro bodies and dykes can be seen.

The used densities of the rock bodies are diabase 2.99 g/cm3, gabbro 2.95 g/cm3 and askim granite 2.72 g/cm3, according to measurements made by Sturkell (personal communication, 10 may 2021). In the Lindås area, the density of gabbro was modelled also with a higher density, due to the difficulty of accurately modelling the anomalies with a lower density. Green spheres represent the gabbro bodies, red tabular bodies are gabbro dykes, yellow tabular bodies are clay covers and black tabular bodies are diabase dykes. The used densities can be seen in table 1.

Table 1

Rock type or sediment	*Density (g/cm^3)*
Gabbro	2.95-3.1
Diabase	2.99
Askim granite (granodiorite)	2.72
Granite	2.65
Clay	1.6

The areas dominated with negative values were not modelled, because the focus of this work is to identify just mafic rock bodies and calculate their volume.

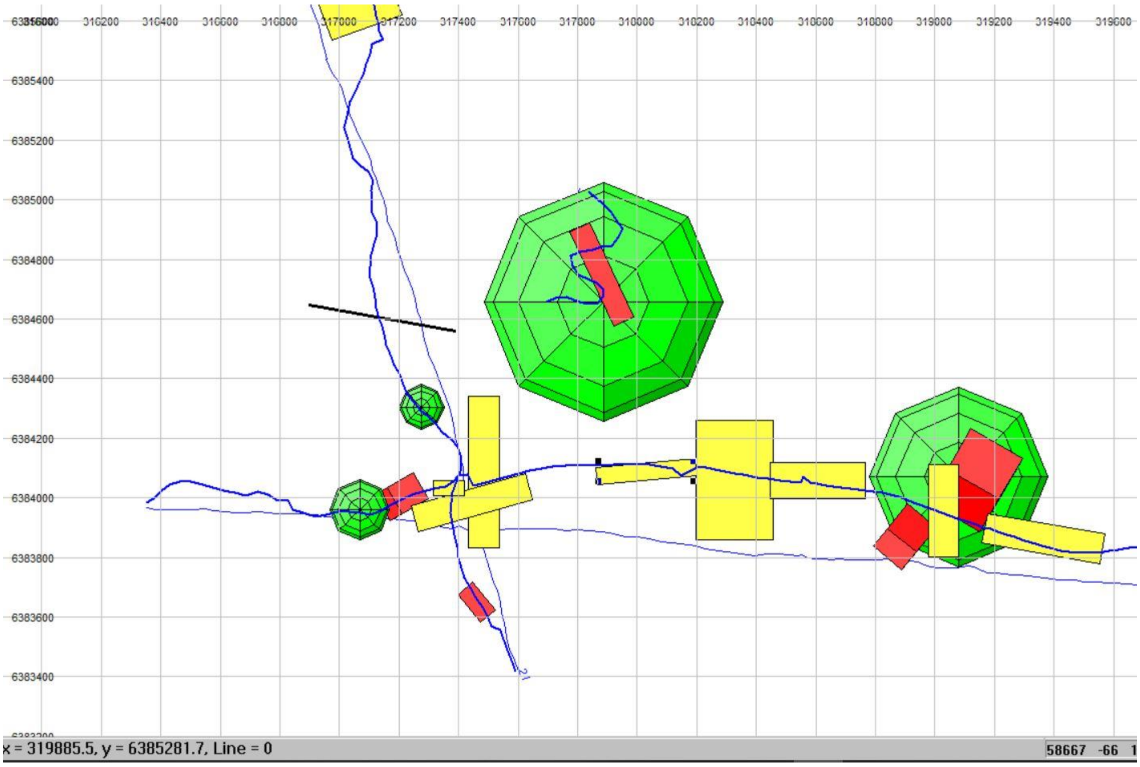

Figure 14. Estimated location and size of some geological bodies in the area, made with ModelVision.

The E-W (fig.15), Lindås (fig. 16) and the N-S (fig. 17) profiles in Moldelvision show how accurate the modelled bodies are. The extreme anomaly values of the Lindås profile were very difficult to match and further observations and gravity measurements would be necessary to be able to model the area more accurately. An alternative profile is used later in this chapter to try to get a better estimation.

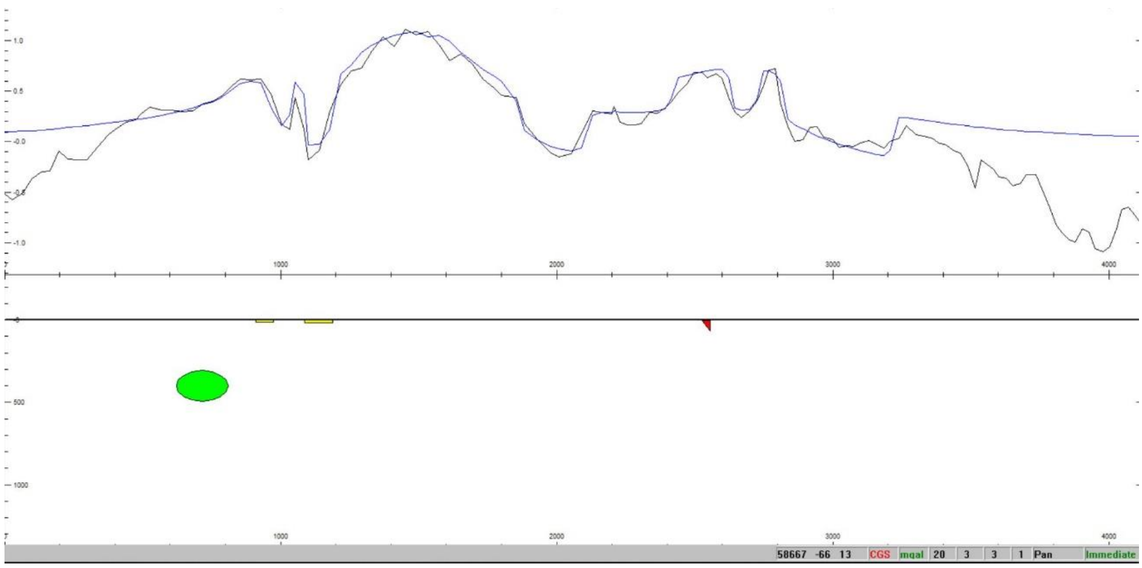

Figure 15. E-W gravity anomaly profile in ModelVision.

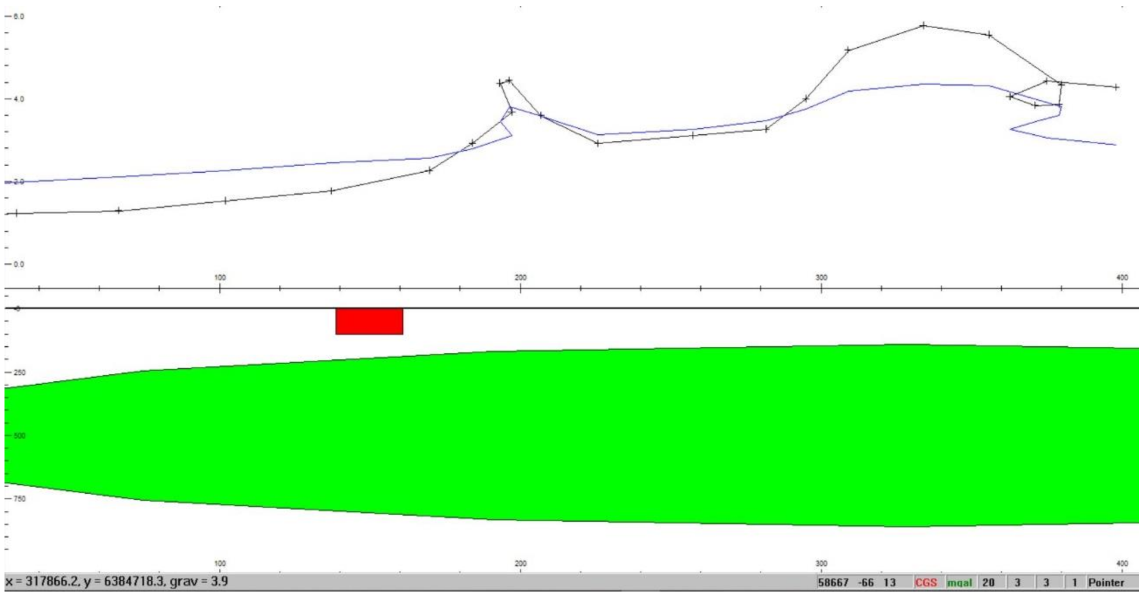

Figure 16. Lindås gravity anomaly profile in ModelVision.

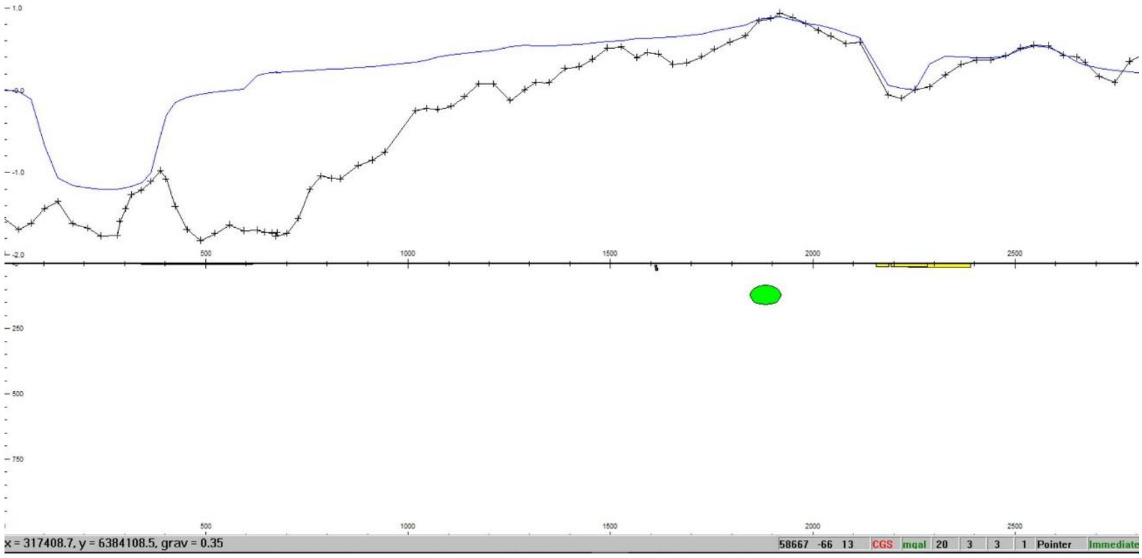

Figure 17. S-N gravity anomaly profile in ModelVision.

In the following figures we can see a 3D model of how the mafic bodies in the area could look like (fig, 18, 19 and 20). The profiles are represented by red lines.

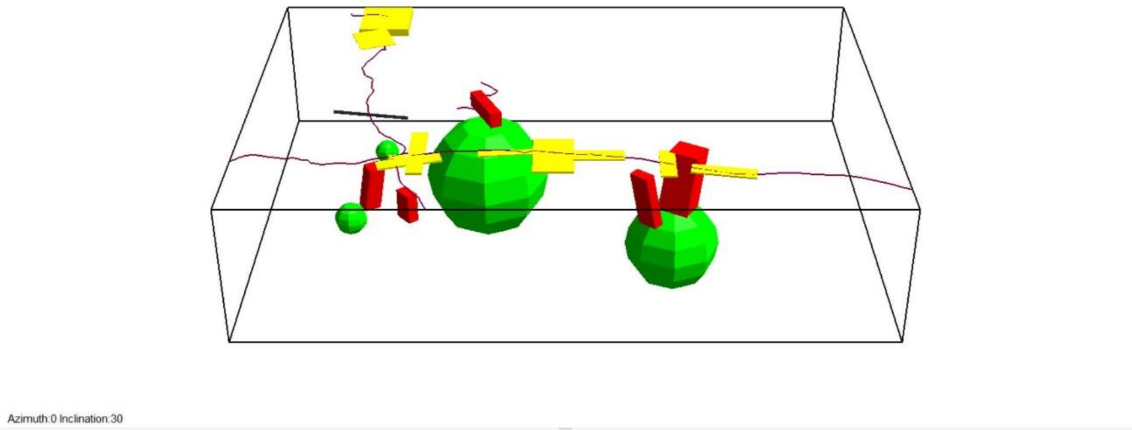

Figure 18. 3D model of some geological bodies in the area, made with ModelVision. Green = Gabbro pluton. Red = Gabbro dykes. Yellow = Clay. Black = Diabase dyke.

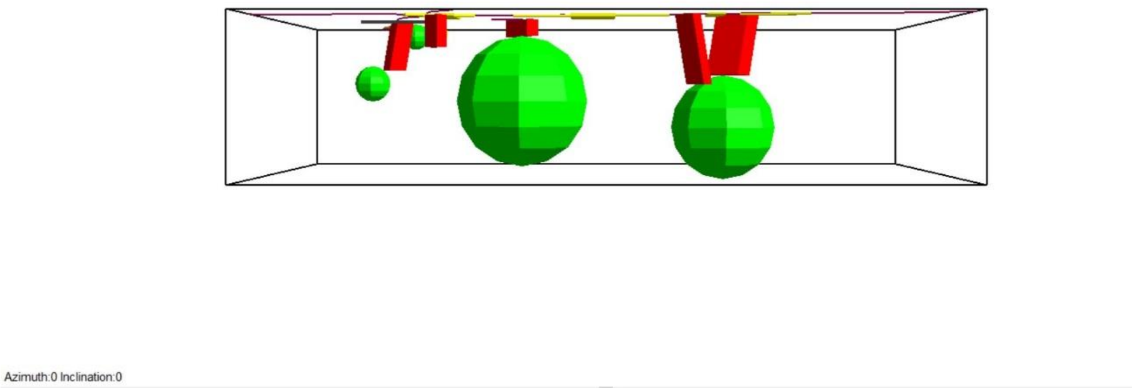

Figure 19. 3D model of some geological bodies in the area, made with ModelVision. Green = Gabbro pluton. Red = Gabbro dykes. Yellow = Clay. Black = Diabase dyke.

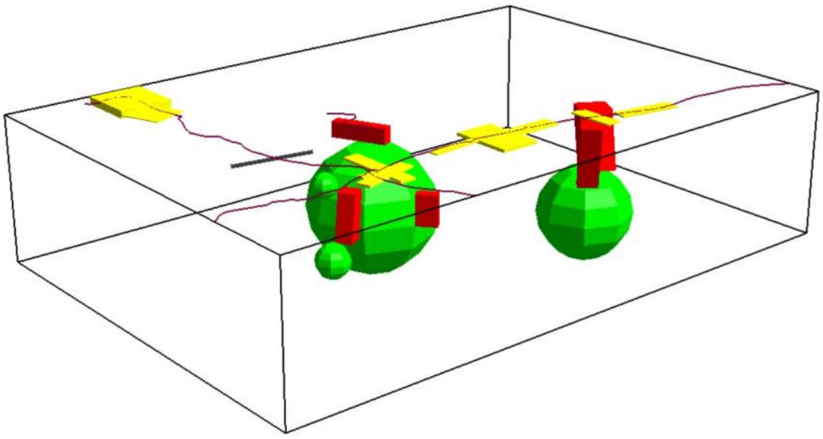

Figure 20. 3D model of some geological bodies in the area, made with ModelVision. G = Gabbro pluton. R = Gabbro dykes. Y = Clay. Black = Diabase dyke.

<u>Estimated rock bodies</u>

Table 2. Location, size and other properties of the estimated rock bodies.

Nr (ordered in size)	Body	X	Y	Depth (m)	Radius (m)/dip (degrees)	Density (g/cm3)	Volume (m3)
1	Gabbro sphere	317886	6384658	500	400 m	3.2	2.69E+08
2	Gabbro sphere	319079	6384069	650	300 m	2.95	1.13E+08
3	Gabbro sphere	317067	6383960	400	100 m	2.95	4.26E+06
4	Gabbro sphere	317276	6384305	120	75 m	2.95	1.80E+06
1.1	Gabbro dyke	317946	6384872	0-150	90°	3.2	2.64E+06
2.1	Gabbro dyke	319167	6384113	0-350	70°	2.95	1.09E+07
2.2	Gabbro dyke	318857	6383777	5-500	75°	2.95	3.78E+06
3.1	Gabbro dyke	317235	6384054	16-350	80°	2.95	2.72E+06
0.1	Gabbro dyke	317461	6383649	20-180	90°	2.95	1.42E+06
Diab.1	Diabase dyke	317256	6384626	0-100	85°	2.99	5.70E+04

Dyke 2.1 means that it is associated with gabbro body 2.

The total volume of mafic rocks under the surveyed profiles would then be approximately 4.10 *10^8 m3.

The depth and the radius of the bodies were hard to estimate, since there is little available information about these factors. In addition, the symmetric nature of the geometrical bodies used in the program will most likely not match with the reality of the regional geology, but should be seen as an estimation.

The different densities for sphere 1 and its dyke are due to the impossibility of matching the virtual anomaly values with the real ones with a 2.95 g/cm^3 density, therefore a higher value was chosen, which still is according to GeoSci (2017) in the range of usual densities for that rock.

Alternative Lindås profile

Due to the difficulty to match the gravity anomalies with ModelVision in the Lindås profile and in order to try to get a more accurate model, a new profile was made in a NW-SE direction using the interpolation map (fig. 21). The profile is located so it starts and ends in areas with low values and goes through the highest values in the middle of the map. It was also important to put it close to gravity measurements, to improve the accuracy data. The resulting graph can be seen in figure 22.

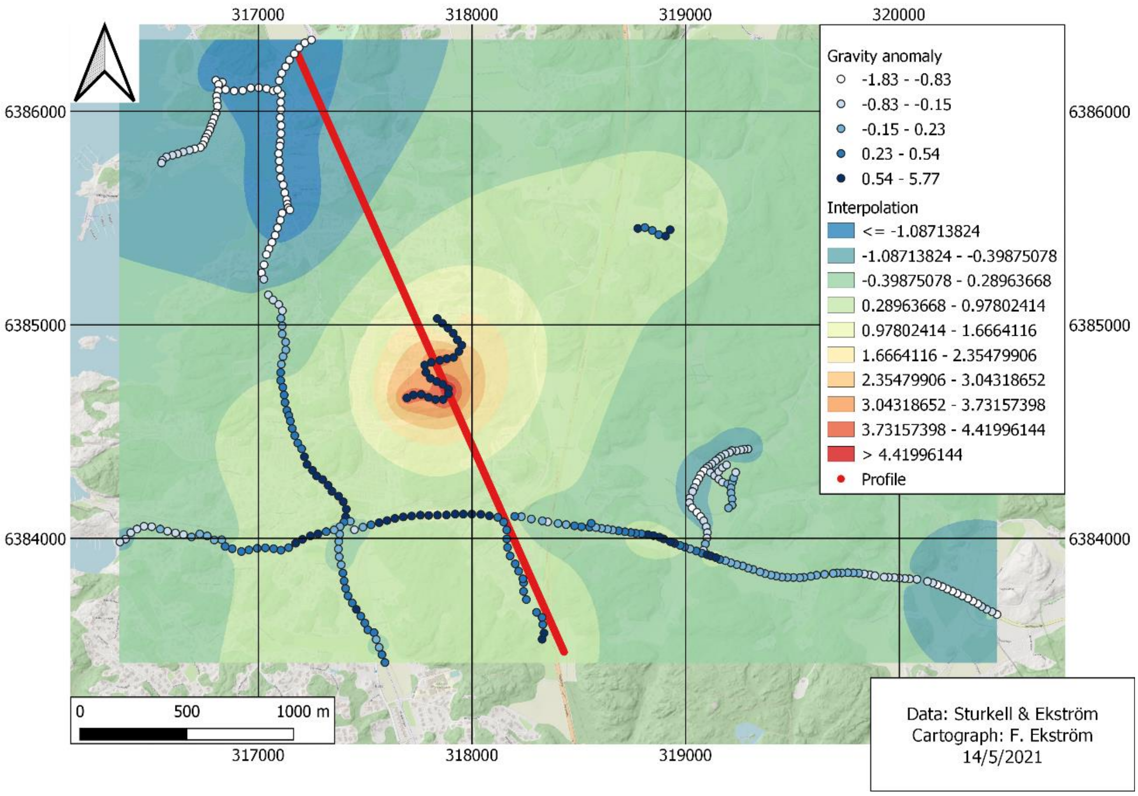

Figure 21. Map with the interpolation data and the location of the profile

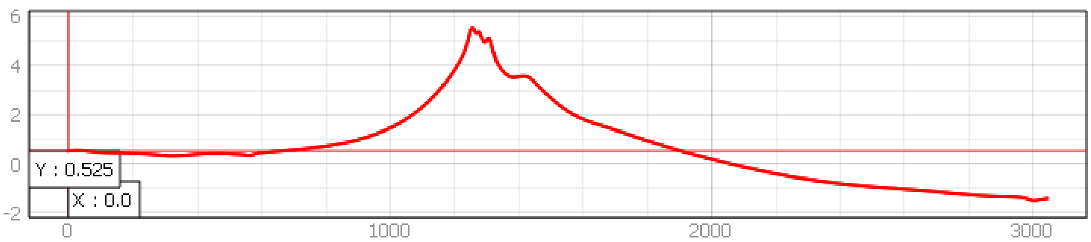

Figure 22. Gravity anomaly values of the profile.

The objective is to try to recreate the almost 6 mgal anomaly in the middle of the profile with a different body type. Due to the narrow spike, a geometrical body with more parameters that can be closer to a real intrusive plutonic body is chosen this time, a cone, or circular pipe (fig. 24). Two different densities were used, 2.95 g/cm^3 like in the rest of the gabbro bodies and 3.1 g/cm^3, due to the difficulty to match it with the gravity anomalies. Therefore, two different gabbro bodies are proposed.

<u>Gabbro with the normal, 2.95 g/cm^3 density</u>

Using the density values obtained from measurements in the area gives us an enormous cone, which does not really match the interpolated data and is probably not correct (figure 23, 24 and 25). This body would have a volume of almost 1.5 km^3. The red body represents a granite with lower density (2.65 g/cm^3) than the askim granite (2.72 g/cm^3) which would cause a negative anomaly in the area. The location of the granite without feldspate phenocrystalls can be better appreciated in figure 11.

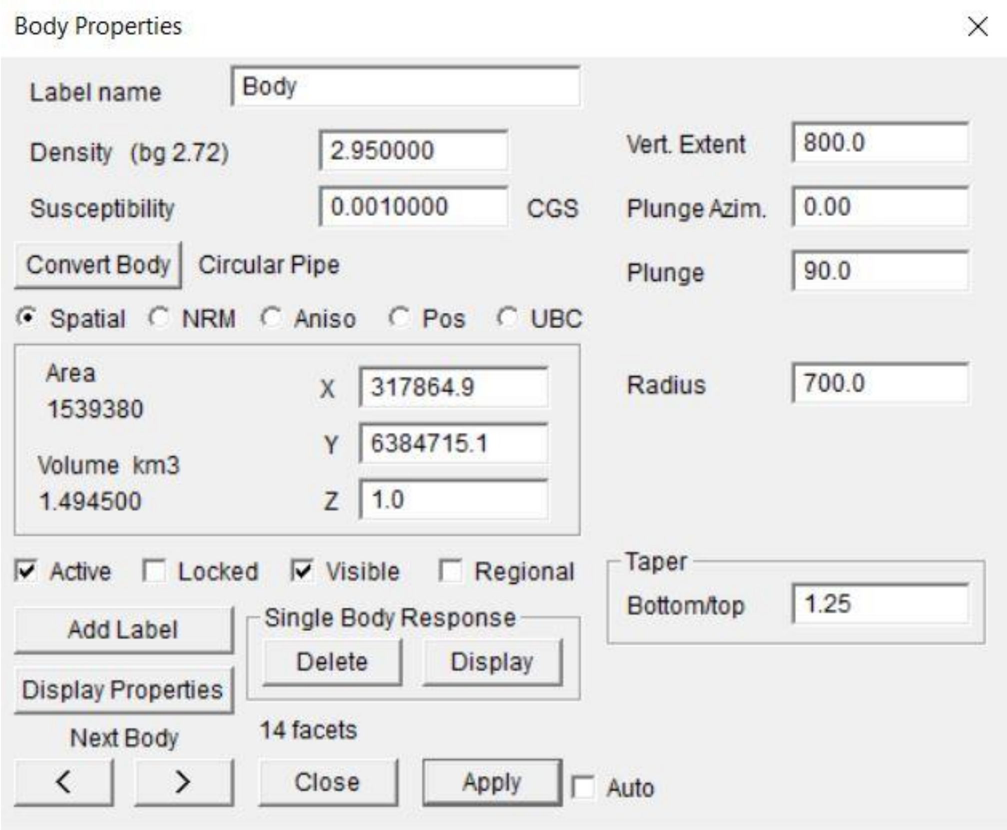

Figure 23. Parameters of the suggested gabbro body

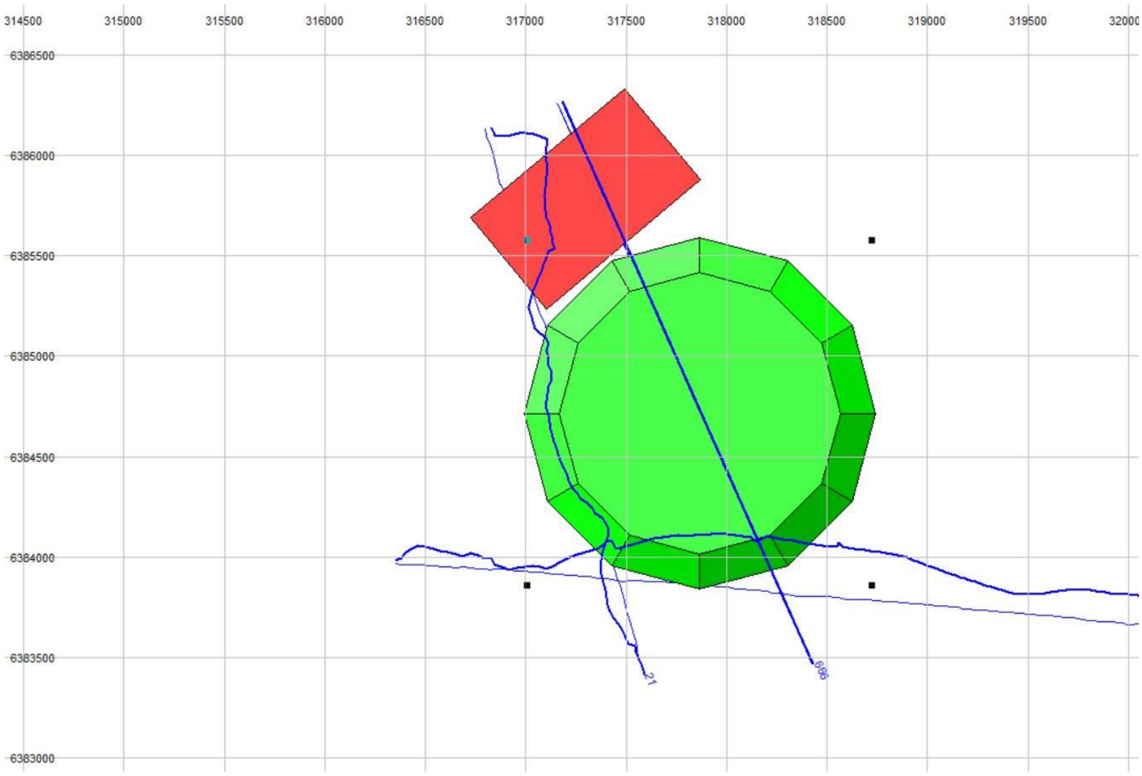

Figure 24. Estimated location and size of the gabbro and granite body in the area, made with ModelVision. Green = Gabbro. Red = Granite with lower density

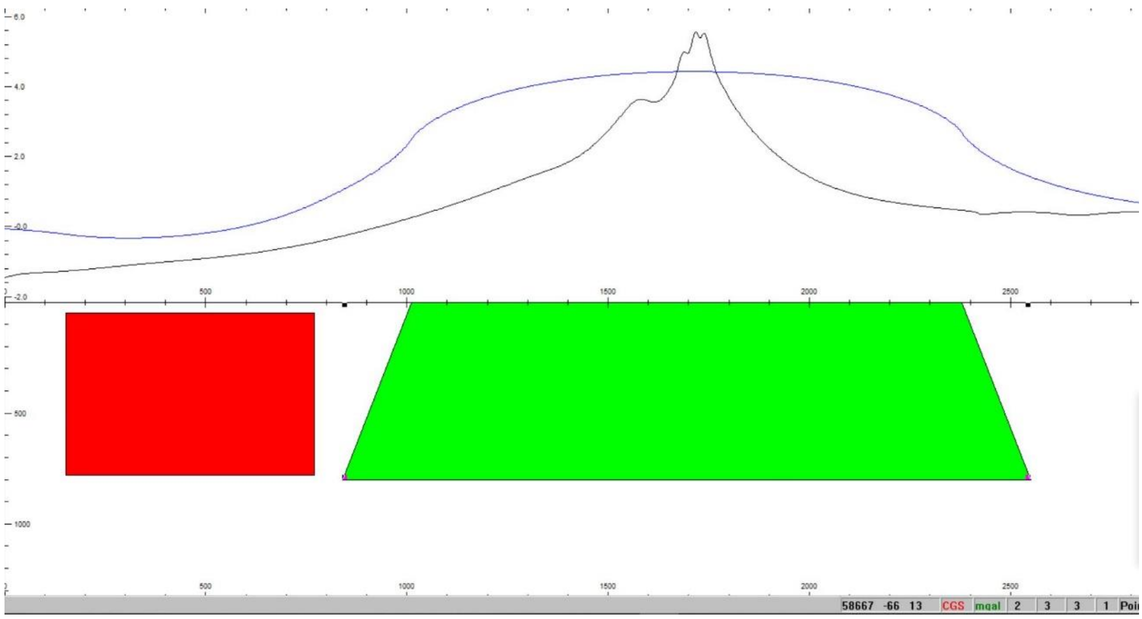

Figure 25. S-N gravity anomaly profile in ModelVision. Green = Gabbro. Red = Granite with lower density

These parameters improve somewhat the matching of the virtual gravity anomaly values (blue line) with the interpolated gravity anomaly values (black line) as seen in figure 25, a closer match than with the previous model (figure 16). The volume of the alternative body is larger than the sum of the previous Lindås sphere and dyke model, sphere 1 and dyke 1.1. in table 1, probably due to the fact that the virtual gravity anomaly line is closer to match the real values.

<u>Gabbro with a higher, 3.1 g/cm^3 density</u>

When using the higher 3.1 g/cm^3 density, which still fits into the gabbro density spectrum, the modelling is more accurate. However, there is not proof of this density in the area. The blue line seen in figure 26 matches the highest gravity anomaly we struggled to reach in the previous Lindås profile, but the anomaly values are too high before and after this extreme value. Since the profile is made with interpolation data, this does not mean that the gravity values are completely right, because it is an estimation based on the limited available data. Further gravimetry should be done around the area to obtain more reliable values. The volume of the body is smaller, since a higher density gives the same anomaly with a lower volume, almost 0.5 km^3 (figure 27). The location and depth of the volume can be seen in figures 26 and 28. A 3d model of the gabbro and the lower density granite body can be seen in figure 29.

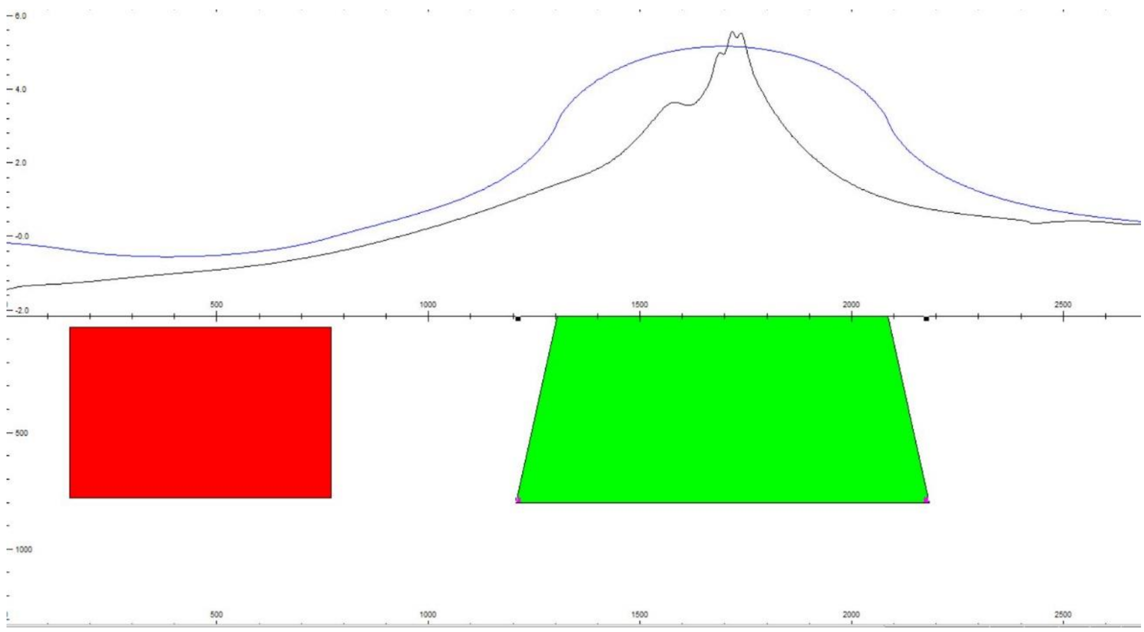

Figure 26. S-N gravity anomaly profile in ModelVision. Green = Gabbro. Red = Granite

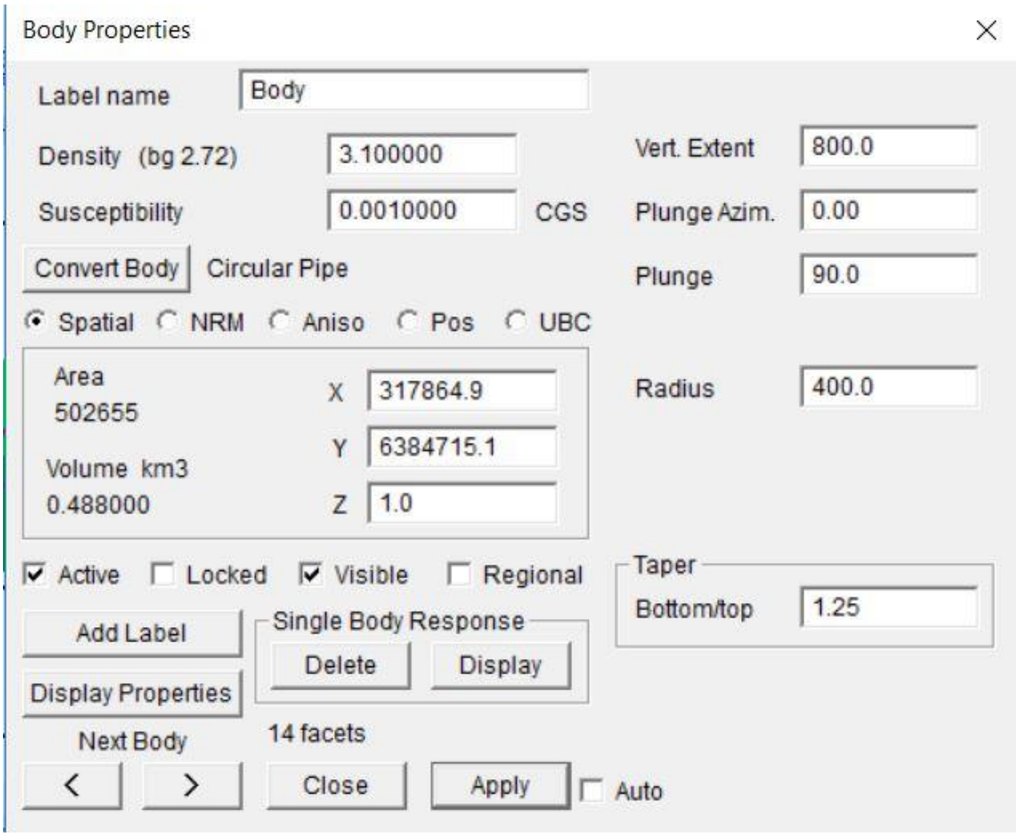

Figure 27. Parameters of the suggested gabbro body

Figure 28. Estimated location and size of some geological bodies in the area, made with ModelVision. Green = Gabbro. Red = Granite

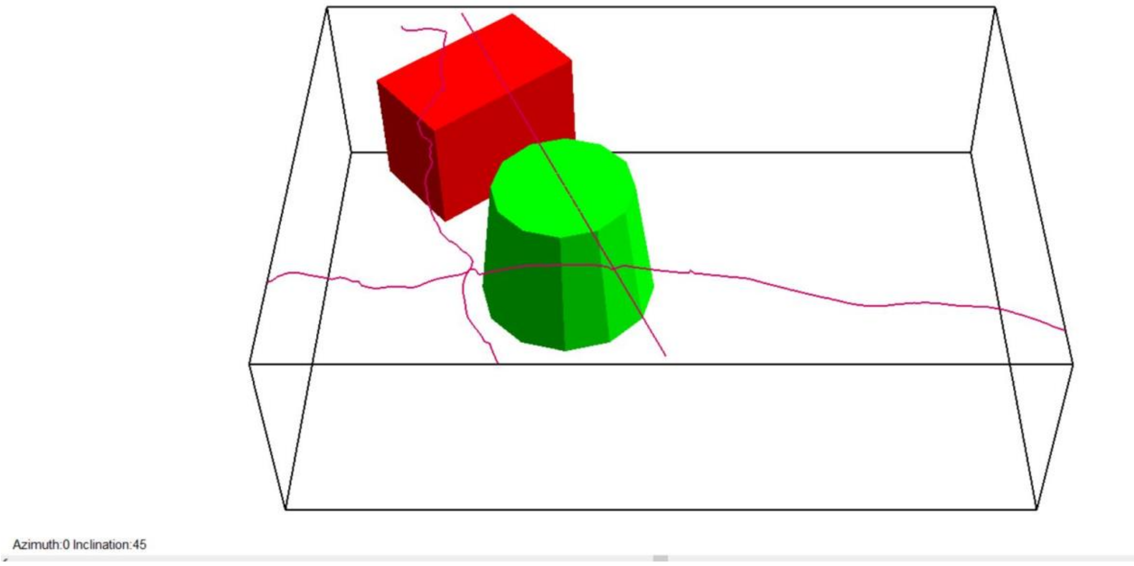

Figure 29. 3D model of some geological bodies in the area, made with ModelVision. Green = Gabbro. Red = Granite

Conclusion

To sum up, gravity surveys are a simple but work intensive, and non-disruptive way of providing more information about the geology of an area, especially useful in urban areas. After the hypothesis of the different possible locations, densities and volumes of the gabbro bodies made in this paper, further investigations with other methods could contribute to shed more light into the regional geology, be it with more geophysics or core drilling. What we know after this investigation is that there is a large (being the highest vaule 5.76 mgal, and with the potential of even higher values) positive gravimetric anomaly in the Lindås area, very probable due to the presence of a big gabbro pluton underneath it.

Doing more gravity surveying profiles across different areas of Billdal would help provide more detailed information about the geology of the area. Due to the challenge of correctly modelling the Lindås area, further surveying to the east of the profile and to the north of the E-W profile with a large area of gabbro would be a great addition to this investigation.

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Appendix 1

Gravity anomaly values for each point. SWEREF99 TM is the coordinate system.

Point	X	Y	G (mgal)	H (m)
19GB001	319291.5	6384418	-0.74736	40.696
19GB002	319273.6	6384417	-0.67214	40.58433
19GB003	319258	6384414	-0.59621	40.48833
19GB004	319237	6384409	-0.73372	40.31933
19GB005	319216.8	6384411	-0.65911	40.39183
19GB006	319205.6	6384402	-0.68904	40.234
19GB007	319184.8	6384394	-0.53328	40.1975
19GB008	319164.8	6384383	-0.37705	40.1155
19GB009	319153.1	6384373	-0.32368	40.0125
19GB010	319140.2	6384363	-0.51197	39.911
19GB011	319122.5	6384348	-0.57426	39.751
19GB012	319107.2	6384337	-0.66993	39.606
19GB013	319096.2	6384327	-0.74469	39.5145
19GB014	319085	6384317	-0.85835	39.3875
19GB015	319070	6384297	-0.91268	39.313
19GB016	319061	6384279	-0.86217	39.26
19GB017	319050.4	6384261	-0.8534	39.1435
19GB018	319040.5	6384237	-0.80545	39.0095
19GB019	319032.2	6384219	-0.74566	38.8495
19GB020	319018.9	6384189	-0.71792	38.4305
19GB021	319017.8	6384166	-0.79437	37.9455
19GB022	319030.2	6384143	-0.837	37.339
19GB023	319052.4	6384122	-0.85905	37.10525
19GB024	319070.3	6384102	-0.86808	36.90475
19GB025	319084.2	6384082	-0.77856	37.49575
19GB026	319096.3	6384053	-0.728	38.02275
19GB027	319101.7	6384026	-0.56647	38.02425
19GB028	319099.3	6384001	-0.32433	38.00075
19GB029	319091.8	6383973	-0.07121	37.92975
19GB030	319082.9	6383944	-0.1451	37.80675
19GB031f	319076.2	6383930	0.401673	41.11
19GB032	319100.5	6383923	0.555864	41.001
19GB033	319118.1	6383917	0.708841	41.1455
19GB035f	316800.1	6386145	-1.07577	11.988
19GB036	316813.2	6386125	-1.06511	11.662
19GB037	316811.2	6386096	-1.08167	11.561
19GB038	316803.9	6386071	-0.95663	11.648
19GB039	316805.6	6386047	-0.95736	11.8385
19GB040	316808.1	6386024	-0.98899	12.0245
19GB041	316801.4	6385992	-0.88624	11.706
19GB042	316792.2	6385968	-0.93117	11.397
19GB043	316784	6385946	-0.99016	11.225
19GB044	316775.8	6385927	-1.04544	11.343

19GB045	316771.6	6385913	-1.03611	11.3455
19GB046	316762.9	6385894	-0.99396	11.3375
19GB047	316753.5	6385878	-0.96633	11.3465
19GB049	316748.5	6385864	-0.9486	11.2415
19GB050	316739.6	6385843	-0.89929	11.4045
19GB051	316728	6385830	-0.86015	11.3205
19GB052	316700.8	6385824	-0.84121	11.258
19GB053	316677.1	6385817	-0.61672	11.634
19GB054	316647.4	6385809	-0.56146	11.746
19GB055	316621	6385800	-0.60471	11.611
19GB056	316597.3	6385794	-0.66538	11.432
19GB057	316569	6385786	-0.65624	11.372
19GB058	316550.1	6385770	-0.60489	11.428
19GB059f	316546.1	6385758	-0.61477	10.663
19GB060	318549.4	6384052	0.272117	37.731
19GB061	318512.3	6384054	0.291122	37.18
19GB062	318479.7	6384058	0.303026	36.443
19GB063	318440.3	6384064	0.077149	35.7
19GB064	318402.4	6384069	-0.11928	35.247
19GB065	318354.4	6384077	-0.14873	35.62
19GB066	318328.6	6384081	-0.11179	36.398
19GB067	318277.2	6384090	0.024887	37.232
19GB068	318230.6	6384101	0.177306	37.643
19GB069	318199.7	6384102	0.434785	38.391
19GB071	320082.5	6383808	-0.32905	52.251
19GB072	320048.4	6383810	-0.32759	52.42
19GB072b	320026.1	6383812	-0.41669	52.297
19GB073	319999.7	6383814	-0.43438	52.1265
19GB074	319976.9	6383816	-0.36234	51.9445
19GB075	319949.8	6383817	-0.34609	51.626
19GB076	319929.3	6383818	-0.27807	51.4095
19GB077	319863.3	6383829	-0.45469	49.8005
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19GB082	320409.1	6383667	-0.65026	52.6105
19GB083	320386.7	6383680	-0.66908	52.2965
19GB084	320367.7	6383693	-0.8587	51.8455
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19GB086	320321.7	6383719	-1.0881	51.5345
19GB087	320294.6	6383730	-1.06096	51.346
19GB088	320271.2	6383742	-0.8951	51.501
19GB089	320249.4	6383752	-0.86476	51.5485
19GB090	320224	6383762	-0.99551	51.4405
19GB091	320201.8	6383773	-0.96802	51.2525
19GB092	320178.7	6383783	-0.90222	51.5225

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19GB098	319809.9	6383837	-0.11593	48.3975
19GB099	319784.8	6383838	-0.08741	47.649
19GB100	319758.6	6383839	-0.02967	46.89
19GB101	319730.9	6383837	-0.01308	46.0855
19GB102	319708.5	6383838	0.034644	45.467
19GB103	319690.5	6383835	0.045121	44.85745
19GB104	319650.4	6383831	0.067634	44.29495
19GB106	319115.6	6384308	-0.22166	42.409
19GB107	319135.6	6384293	-0.3658	42.256
19GB108	319154.9	6384277	-0.29675	41.8115
19GB109	319172.2	6384263	-0.27986	41.944
19GB110	319196.8	6384255	-0.14199	42.6065
19GB111	319217.6	6384260	0.091461	43.1445
19GB112	319224.5	6384283	-0.07541	42.823
19GB113	319234.4	6384309	-0.15924	42.823
19GB114	319212.1	6384236	0.096307	43.6095
19GB115	319212.1	6384212	0.133398	43.4775
19GB116	319217.1	6384184	0.102013	43.0935
19GB117	319217.4	6384155	0.092877	42.7375
19GB118	319200.7	6384142	-0.01991	41.8455
19GB119	319154.7	6384313	-0.35807	42.4005
19GB120	319172.8	6384331	-0.36111	42.4535
19GB121	319191.3	6384344	-0.25177	42.4315
19GB122	318775.9	6385451	0.583974	35.554
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19GB126	318905.9	6385416	0.829521	37.604
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19GB141	319266.6	6383871	0.143629	41.38595
19GB142	319239.2	6383877	0.020714	41.39745
19GB143	319211.3	6383885	0.006319	41.15445
19GB144	319186.3	6383895	0.148379	41.33645
19GB145	319159.5	6383901	0.380364	41.11045
19GB146	319141.3	6383909	0.719558	41.07245
19GB147	319049.3	6383941	0.30338	41.151
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19GB149	318995.1	6383959	0.297041	41.873
19GB150	318974	6383967	0.435593	42.415
19GB151	318949.1	6383976	0.627585	42.8175
19GB152	318927.6	6383984	0.671065	43.299
19GB153	318897.2	6383997	0.63314	43.556
19GB154	318877.3	6384005	0.684994	43.571
19GB155	318849.2	6384013	0.687413	43.646
19GB156	318822.7	6384017	0.578843	43.452
19GB157	318792.8	6384021	0.485044	43.043
19GB158	318766.1	6384024	0.395664	42.407
19GB159	318742.9	6384027	0.334795	41.568
19GB160	318716.2	6384031	0.283032	40.77
19GB161	318685.7	6384035	0.292748	40.202
19GB162	318657.3	6384039	0.17902	39.5945
19GB163	318634.3	6384043	0.167799	39.234
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20GB005	318302	6383653	0.472532	41.8265
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20GB010	318238	6383810	0.247696	40.0865
20GB011	318218	6383846	0.273049	39.8165
20GB012	318202	6383880	0.461302	39.8995
20GB013	318178	6383917	0.491312	39.6545
20GB014	318166	6383957	0.488975	39.3645
20GB015	318162	6383997	0.370996	39.069
20GB016	318162	6384039	0.311418	38.411
20GB017	318148	6384076	0.459873	38.1295
20GB018	318120	6384098	0.528726	39.104
20GB019	318081	6384105	0.618926	39.6505
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20GB022	317959	6384113	0.805363	40.237
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20GB024	317880	6384109	1.089204	39.9445
20GB025	317838	6384108	1.061229	39.713
20GB026	317797	6384107	1.111504	39.474
20GB027	317758	6384108	0.939161	38.7825
20GB028	317717	6384104	1.037795	37.999
20GB029	317678	6384100	0.894532	37.119
20GB030	317639	6384093	0.731638	36.215
20GB031	317602	6384083	0.698108	34.9375
20GB032	317565	6384073	0.568174	33.508
20GB033	317527	6384063	0.294787	32.365
20GB034	317489	6384052	-0.08267	31.3605
20GB035	317449	6384040	-0.17675	32.347
20GB036	317430	6384079	0.126204	33.8035
20GB037	317400	6384076	0.432732	36.0815
20GB074	317382	6384055	0.118112	35.231
20GB075	317354	6384039	0.17269	36.174
20GB076	317317	6384031	0.464751	37.142
20GB077	317279	6384021	0.621552	37.827
20GB078	317243	6384011	0.608768	37.51
20GB079	317206	6383995	0.617356	37.709
20GB080	317174	6383977	0.54812	36.037
20GB081	317141	6383956	0.460886	34.787
20GB082	317105	6383944	0.40217	33.649
20GB083	317071	6383951	0.380058	33.014
20GB084	317032	6383955	0.307575	32.381
20GB085	316994	6383953	0.295181	32.033
20GB086	316955	6383945	0.308121	32.051
20GB087	316920	6383938	0.314128	32.01
20GB088	316877	6383951	0.343067	33.116
20GB089	316844	6383962	0.271864	32.087
20GB090	316828	6383993	0.21612	31.437
20GB091	316793	6383992	0.191624	30.844
20GB092	316760	6384011	0.134507	28.31
20GB093	316725	6384020	0.066101	26.351
20GB094	316686	6384006	-0.05427	24.288
20GB095	316649	6384017	-0.18061	22.407
20GB096	316611	6384025	-0.1778	22.185
20GB097	316574	6384033	-0.17432	22.313
20GB098	316540	6384043	-0.09164	23.821
20GB099	316500	6384054	-0.28744	19.057
20GB100	316464	6384056	-0.29491	17.995
20GB101	316431	6384043	-0.36144	16.025
20GB102	316402	6384026	-0.50934	14.2375
20GB103	316377	6383996	-0.57482	13.0875

20GB104	316351	6383983	-0.5142	14.3375
21GB001	316831	6386136	-1.55325	12.018
21GB002	316846	6386101	-1.69444	12.045
21GB003	316886	6386095	-1.62133	11.654
21GB004	316926	6386097	-1.43844	11.7065
21GB005	316964	6386109	-1.3557	11.9225
21GB006	317001	6386110	-1.62605	12.1345
21GB007	317038	6386106	-1.67683	12.5685
21GB008	317069	6386096	-1.77181	12.9265
21GB009	317107	6386080	-1.76862	13.0945
21GB010	317104	6386043	-1.59498	12.9415
21GB011	317105	6386007	-1.44592	12.7925
21GB012	317101	6385970	-1.27097	12.7145
21GB013	317106	6385933	-1.21573	12.7535
21GB014	317105	6385896	-1.11058	12.6475
21GB015	317102	6385857	-0.97953	12.5785
21GB016	317100	6385837	-1.07989	12.5335
21GB017	317094	6385802	-1.41279	12.342
21GB018	317097	6385767	-1.69609	12.151
21GB019	317099	6385729	-1.8269	11.928
21GB020	317104	6385689	-1.74261	11.787
21GB021	317116	6385655	-1.6392	12.007
21GB022	317123	6385618	-1.7088	12.021
21GB023	317132	6385586	-1.70123	12.224
21GB024	317135	6385565	-1.72794	12.1595
21GB025	317139	6385548	-1.73488	12.2855
21GB026	317147	6385538	-1.73516	12.6355
21GB027	317111	6385523	-1.77604	12.4815
21GB028	317102	6385490	-1.7425	12.43
21GB029	317089	6385454	-1.55887	12.471
21GB030	317078	6385419	-1.20682	12.516
21GB031	317063	6385386	-1.04589	12.768
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21GB035	317014	6385243	-0.85197	15.311
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21GB037	317046	6385140	-0.25083	25.7715
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21GB039	317095	6385095	-0.23547	28.3455
21GB040	317112	6385066	-0.19773	29.2525
21GB041	317105	6385030	-0.08128	30.6575
21GB042	317111	6384995	0.075768	32.4925
21GB043	317111	6384957	0.074743	32.6405
21GB044	317127	6384919	-0.12563	32.1815
21GB045	317128	6384882	0.005814	34.1035

21GB046	317115	6384851	0.094231	34.6425
21GB047	317107	6384815	0.091262	34.9335
21GB048	317104	6384776	0.262444	35.3405
21GB049	317104	6384739	0.284904	35.6495
21GB050	317114	6384707	0.378662	35.9345
21GB051	317120	6384671	0.511345	36.2705
21GB052	317124	6384636	0.524406	36.4355
21GB053	317133	6384599	0.394386	36.1745
21GB054	317142	6384575	0.457356	36.3935
21GB055	317149	6384549	0.438108	36.8535
21GB056	317158	6384514	0.313173	35.7245
21GB057	317170	6384481	0.33136	34.5615
21GB058	317184	6384446	0.407623	36.6365
21GB059	317202	6384419	0.496276	38.1825
21GB060	317215	6384382	0.582637	37.6235
21GB061	317227	6384346	0.661004	39.0795
21GB062	317253	6384318	0.842408	39.7305
21GB063	317272	6384292	0.868421	40.8175
21GB064	317300	6384275	0.936058	42.3315
21GB065	317326	6384248	0.881112	42.3135
21GB066	317344	6384220	0.806762	40.2325
21GB067	317375	6384197	0.726135	39.4795
21GB068	317397	6384171	0.658703	38.6575
21GB069	317411	6384136	0.563314	38.3915
21GB070	317408	6384100	0.583491	37.975
21GB071	317380	6384019	-0.05814	35.2935
21GB072	317376	6383985	-0.09996	35.3305
21GB073	317374	6383950	0.007491	35.4925
21GB074	317378	6383913	0.039686	35.4705
21GB075	317387	6383876	0.184892	35.4415
21GB076	317395	6383837	0.313036	35.5395
21GB077	317401	6383800	0.36401	36.0295
21GB078	317408	6383765	0.365493	36.4055
21GB079	317419	6383730	0.416633	36.6735
21GB080	317439	6383697	0.512555	36.8935
21GB081	317458	6383667	0.548935	36.4395
21GB082	317479	6383635	0.537391	35.0885
21GB083	317498	6383603	0.420457	33.7965
21GB084	317512	6383571	0.401563	32.7905
21GB085	317541	6383558	0.334675	31.6555
21GB086	317551	6383526	0.164592	31.5715
21GB087	317565	6383489	0.093468	31.4625
21GB088	317578	6383455	0.3499	31.3945
21GB089	317592	6383418	0.44703	31.3205
21GB0090	317837	6385029	1.133729	51.474
21GB0091	317861	6385007	1.227365	52.753

21GB0092	317887	6384985	1.287427	55.37
21GB0093	317912	6384960	1.523207	56.797
21GB0094	317931	6384929	1.764684	57.194
21GB0095	317952	6384904	2.259186	58.596
21GB0096	317938	6384875	2.922219	60.46
21GB0097	317913	6384847	3.673277	62.583
21GB0098	317882	6384841	4.373371	64.619
21GB0099	317849	6384833	4.440101	64.674
21GB0100	317809	6384824	3.588015	62.43
21GB0101	317778	6384811	2.912774	60.669
21GB0102	317784	6384777	3.106737	60.671
21GB0103	317805	6384749	3.263032	61.106
21GB0104	317834	6384734	3.993738	63.128
21GB0105	317863	6384721	5.174923	66.331
21GB0106	317889	6384699	5.768232	67.597
21GB0107	317889	6384677	5.543294	66.739
21GB0108	317864	6384650	4.33795	63.4645
21GB0109	317829	6384650	3.860699	62.3875
21GB0110	317796	6384660	3.835028	62.0495
21GB0111	317762	6384674	4.048433	62.4735
21GB0112	317725	6384671	4.422292	63.1125
21GB0113	317695	6384657	4.272994	62.4355
21GB0114	317089	6386101	-1.73217	13.6695
21GB0115	317097	6386143	-1.61669	13.8775
21GB0116	317109	6386178	-1.39528	14.2825
21GB0117	317127	6386209	-1.19671	14.7285
21GB0118	317145	6386240	-1.30911	14.5985
21GB0119	317168	6386269	-1.50002	14.6505
21GB0120	317190	6386297	-1.52475	14.7775
21GB0121	317217	6386320	-1.52188	15.1965
21GB0122	317248	6386334	-1.38931	16.0755

Appendix 2

Altitude calculation

Grässkär19 apr 21													
										Dif.	meter	altitude	point
												11.988	fix91756
19GB035(fix)	133.8	130.8	21GB001	3.0	21GB001	124.0	127.0	19GB035f	3.0	0.0	0.030	12.018	21GB001
21GB001	150.0	147.3	21GB002	2.7	21GB002	150.6	153.3	21GB001	2.7	0.0	0.027	12.045	21GB002
21GB002	129.5	168.6	21GB003	-39.1	21GB003	177.2	138.1	21GB002	-39.1	0.0	-0.391	11.654	21GB003
21GB003	151.5	146.2	21GB004	5.3	21GB004	148.3	153.5	21GB003	5.2	0.1	0.053	11.707	21GB004
21GB004	181.6	160.0	21GB005	21.6	21GB005	160.3	181.9	21GB004	21.6	0.0	0.216	11.923	21GB005
21GB005	163.6	142.4	21GB006	21.2	21GB006	140.0	161.2	21GB005	21.2	0.0	0.212	12.135	21GB006
21GB006	182.1	138.7	21GB007	43.4	21GB007	133.1	176.5	21GB006	43.4	0.0	0.434	12.569	21GB007
21GB007	178.9	143.1	21GB008	35.8	21GB008	142.0	177.8	21GB007	35.8	0.0	0.358	12.927	21GB008
21GB008	182.6	165.8	21GB009	16.8	21GB009	165.8	182.6	21GB008	16.8	0.0	0.168	13.095	21GB009
21GB009	155.4	170.7	21GB010	-15.3	21GB010	171.6	156.3	21GB009	-15.3	0.0	-0.153	12.942	21GB010
21GB010	151.6	166.5	21GB011	-14.9	21GB011	162.2	147.3	21GB010	-14.9	0.0	-0.149	12.793	21GB011
21GB011	146.5	154.3	21GB012	-7.8	21GB012	150.3	142.5	21GB011	-7.8	0.0	-0.078	12.715	21GB012
21GB012	151.9	148.0	21GB013	3.9	21GB013	146.7	150.6	21GB012	3.9	0.0	0.039	12.754	21GB013
21GB013	157.1	167.7	21GB014	-10.6	21GB014	170.0	159.4	21GB013	-10.6	0.0	-0.106	12.648	21GB014
21GB014	133.0	139.9	21GB015	-6.9	21GB015	142.3	135.4	21GB014	-6.9	0.0	-0.069	12.579	21GB015
21GB015	151.5	156.0	21GB016	-4.5	21GB016	155.4	150.9	21GB015	-4.5	0.0	-0.045	12.534	21GB016
21GB016	199.0	93.6	fix	105.4	fix	107.3	212.8	21GB016	105.5	-0.1	1.055	13.588	fix
21GB017	177.8	158.6	21GB016	19.2	21GB016	153.7	172.8	21GB017	19.1	0.1	0.192	12.342	21GB017
21GB018	173.1	154.0	21GB017	19.1	21GB017	155.7	174.8	21GB018	19.1	0.0	0.191	12.151	21GB018
21GB019	176.9	154.6	21GB018	22.3	21GB018	150.1	172.4	21GB019	22.3	0.0	0.223	11.928	21GB019
21GB020	170.8	156.7	21GB019	14.1	21GB019	158.1	172.2	21GB020	14.1	0.0	0.141	11.787	21GB020
21GB021	147.5	169.5	21GB020	-22.0	21GB020	168.8	146.8	21GB021	-22.0	0.0	-0.220	12.007	21GB021
21GB022	169.2	170.6	21GB021	-1.4	21GB021	171.5	170.1	21GB022	-1.4	0.0	-0.014	12.021	21GB022

21GB023	146.3	166.6	21GB022	-20.3	21GB022	169.8	149.5	21GB023	-20.3	0.0	-0.203	12.224	21GB023
21GB024	165.9	159.4	21GB023	6.5	21GB023	163.1	169.5	21GB024	6.4	0.1	0.065	12.160	21GB024
21GB025	146.1	158.7	21GB024	-12.6	21GB024	169.7	157.1	21GB025	-12.6	0.0	-0.126	12.286	21GB025
21GB026	119.8	154.8	21GB025	-35.0	21GB025	171.5	136.5	21GB026	-35.0	0.0	-0.350	12.636	21GB026
21GB025	163.1	143.5	21GB027	19.6	21GB027	144.8	164.4	21GB025	19.6	0.0	0.196	12.482	21GB027
21GB027	171.1	176.2	21GB028	-5.1	21GB028	175.2	170.0	21GB027	-5.2	0.1	-0.051	12.430	21GB028
21GB028	173.5	169.4	21GB029	4.1	21GB029	163.4	167.5	21GB028	4.1	0.0	0.041	12.471	21GB029
21GB029	161.9	157.4	21GB030	4.5	21GB030	152.8	157.3	21GB029	4.5	0.0	0.045	12.516	21GB030
21GB030	175.8	150.6	21GB031	25.2	21GB031	141.7	166.9	21GB030	25.2	0.0	0.252	12.768	21GB031
21GB031	179.7	159.8	21GB032	19.9	21GB032	155.0	174.9	21GB031	19.9	0.0	0.199	12.967	21GB032
21GB032	176.2	149.1	21GB033	27.1	21GB033	147.8	174.9	21GB032	27.1	0.0	0.271	13.238	21GB033
21GB033	201.6	116.9	21GB034	84.7	21GB034	104.2	188.9	21GB033	84.7	0.0	0.847	14.085	21GB034
21GB034	214.1	91.5	21GB035	122.6	21GB035	97.8	220.4	21GB034	122.6	0.0	1.226	15.311	21GB035
21GB035	275.0	57.6	21GB036	217.4	21GB036	79.2	296.7	21GB035	217.5	-0.1	2.175	17.486	21GB036
21GB036	297.3	6.4	sten	290.9	sten	5.9	296.8	21GB036	290.9	0.0	2.909	20.395	sten
										0.0			
stenen	224.3	31.3	flp1	193.0	flp1	49.9	240.3	sten	190.4	2.6	1.917	22.312	flp1
flp1	275.7	15.7	flp2	260.0	flp2	53.4	227.5	flp1	174.1	85.9	2.171	24.482	flp2
flp2	194.7	110.0	21GB037	84.7	21GB037	75.7	248.9	flp2	173.2	- 88.5	1.290	25.772	21GB037
				537.7					537.7	0.0	5.377	25.772	21GB037
21GB037	273.3	103.2	21GB038	170.1	21GB038	102.5	272.6	21GB037	170.1	0.0	1.701	27.473	21GB038
21GB038	197.7	110.4	21GB039	87.3	21GB039	108.2	195.5	21GB038	87.3	0.0	0.873	28.346	21GB039
21GB039	199.3	108.6	21GB040	90.7	21GB040	104.1	194.8	21GB039	90.7	0.0	0.907	29.253	21GB040
21GB040	211.0	70.5	21GB041	140.5	21GB041	70.2	210.7	21GB040	140.5	0.0	1.405	30.658	21GB041
21GB041	222.6	39.1	21GB042	183.5	21GB042	41.9	225.4	21GB041	183.5	0.0	1.835	32.493	21GB042
21GB042	204.2	189.4	21GB043	14.8	21GB043	187.8	202.6	21GB042	14.8	0.0	0.148	32.641	21GB043

21GB043	102.8	148.7	21GB044	-45.9	21GB044	148.4	102.5	21GB043	-45.9	0.0	-0.459	32.182	21GB044
21GB044	222.3	30.1	21GB045	192.2	21GB045	31.2	223.4	21GB044	192.2	0.0	1.922	34.104	21GB045
21GB045	126.1	116.3	fix	9.8	fix	120.0	129.7	21GB045	9.7	0.1	0.097	34.201	fix
													o
21GB045	184.1	130.2	21GB046	53.9	21GB046	130.4	184.3	21GB045	53.9	0.0	0.539	34.643	21GB046
21GB046	154.9	125.8	21GB047	29.1	21GB047	123.2	152.3	21GB046	29.1	0.0	0.291	34.934	21GB047
21GB047	167.8	127.1	21GB048	40.7	21GB048	128.3	169.0	21GB047	40.7	0.0	0.407	35.341	21GB048
21GB048	171.8	140.9	21GB049	30.9	21GB049	138.1	169.0	21GB048	30.9	0.0	0.309	35.650	21GB049
													o
21GB049	169.3	140.8	21GB050	28.5	21GB050	145.6	174.1	21GB049	28.5	0.0	0.285	35.935	21GB050
21GB050	172.8	139.2	21GB051	33.6	21GB051	146.7	180.3	21GB050	33.6	0.0	0.336	36.271	21GB051
21GB051	177.6	161.1	21GB052	16.5	21GB052	170.9	187.4	21GB051	16.5	0.0	0.165	36.436	21GB052
21GB052	145.7	171.8	21GB053	-26.1	21GB053	177.8	151.7	21GB052	-26.1	0.0	-0.261	36.175	21GB053
21GB053	160.2	138.3	21GB054	21.9	21GB054	138.1	160.0	21GB053	21.9	0.0	0.219	36.394	21GB054
21GB054	200.9	154.9	21GB055	46.0	21GB055	163.1	209.1	21GB054	46.0	0.0	0.460	36.854	21GB055
21GB055	110.1	223.0	21GB056	-112.9	21GB056	228.8	115.9	21GB055	-112.9	0.0	-1.129	35.725	21GB056
21GB056	102.1	218.4	21GB057	-116.3	21GB057	220.5	104.2	21GB056	-116.3	0.0	-1.163	34.562	21GB057
21GB057	256.9	49.4	21GB058	207.5	21GB058	52.7	260.2	21GB057	207.5	0.0	2.075	36.637	21GB058
21GB058	246.4	91.8	21GB059	154.6	21GB059	92.4	247.0	21GB058	154.6	0.0	1.546	38.183	21GB059
21GB059	157.3	213.2	21GB060	-55.9	21GB060	213.7	157.8	21GB059	-55.9	0.0	-0.559	37.624	21GB060
21GB060	212.0	66.4	21GB061	145.6	21GB061	65.7	211.3	21GB060	145.6	0.0	1.456	39.080	21GB061
21GB061	208.7	143.6	21GB062	65.1	21GB062	142.1	207.2	21GB061	65.1	0.0	0.651	39.731	21GB062
21GB062	234.1	125.4	21GB063	108.7	21GB063	126.1	234.8	21GB062	108.7	0.0	1.087	40.818	21GB063
21GB063	221.1	69.7	21GB064	151.4	21GB064	66.4	217.8	21GB063	151.4	0.0	1.514	42.332	21GB064
21GB064	159.7	139.3	fix	20.4	fix	139.2	159.6	21GB064	20.4	0.0	0.204	42.536	fix
													o
21GB065	158.6	136.4	fix	22.2	fix	137.0	159.2	21GB065	22.2	0.0	0.222	42.314	21GB065
21GB066	232.3	24.2	21GB065	208.1	21GB065	23.5	231.6	21GB066	208.1	0.0	2.081	40.233	21GB066
21GB067	175.2	99.9	21GB066	75.3	21GB066	98.5	173.8	21GB067	75.3	0.0	0.753	39.480	21GB067
21GB068	207.1	124.9	21GB067	82.2	21GB067	128.3	210.5	21GB068	82.2	0.0	0.822	38.658	21GB068

21GB069	146.6	120.0	21GB068	26.6	21GB068	122.5	149.1	21GB069	26.6	0.0	0.266	38.392	21GB069
21GB070	188.5	146.9	21GB069	41.6	21GB069	148.2	189.9	21GB070	41.7	-0.1	0.417	37.975	21GB070
fix	106.4	126.8	21GB070	-20.4	21GB070	127.3	106.9	fix	-20.4	0.0	-0.204	38.179	fix
													0
flp2	212.2	75.5	fix	136.7	fix	74.4	211.2	flp2	136.8	-0.1	1.368	36.812	flp2
flp1	224.7	68.7	flp2	156.0	flp2	71.0	227.0	flp1	156.0	0.0	1.560	35.252	flp1
													0
													0
													0
													0
FLP1	145.2	141.0	21GB071	4.2	21GB071	143.3	147.5	FLP1	4.2	0.0	0.042	35.294	21GB071
21GB071	160.7	157.0	21GB072	3.7	21GB072	161.6	165.3	21GB071	3.7	0.0	0.037	35.331	21GB072
21GB072	167.9	151.7	21GB073	16.2	21GB073	152.3	168.5	21GB072	16.2	0.0	0.162	35.493	21GB073
21GB073	161.3	163.5	21GB074	-2.2	21GB074	166.2	164.0	21GB073	-2.2	0.0	-0.022	35.471	21GB074
21GB074	157.2	160.1	21GB075	-2.9	21GB075	166.2	163.3	21GB074	-2.9	0.0	-0.029	35.442	21GB075
21GB075	158.0	148.2	21GB076	9.8	21GB076	154.1	163.9	21GB075	9.8	0.0	0.098	35.540	21GB076
21GB076	183.8	134.8	21GB077	49.0	21GB077	131.4	180.4	21GB076	49.0	0.0	0.490	36.030	21GB077
21GB077	186.5	148.9	21GB078	37.6	21GB078	147.0	184.6	21GB077	37.6	0.0	0.376	36.406	21GB078
21GB078	167.8	141.0	21GB079	26.8	21GB079	142.0	168.8	21GB078	26.8	0.0	0.268	36.674	21GB079
21GB079	184.4	162.4	21GB080	22.0	21GB080	163.2	185.2	21GB079	22.0	0.0	0.220	36.894	21GB080
21GB080	154.5	199.9	21GB081	-45.4	21GB081	198.8	153.4	21GB080	-45.4	0.0	-0.454	36.440	21GB081
21GB081	89.1	224.2	21GB082	-135.1	21GB082	224.8	89.7	21GB081	-135.1	0.0	-1.351	35.089	21GB082
													0
21GB082	82.3	211.5	21GB083	-129.2	21GB083	210.4	81.2	21GB082	-129.2	0.0	-1.292	33.797	21GB083
21GB083	82.2	182.8	21GB084	-100.6	21GB084	185.1	84.5	21GB083	-100.6	0.0	-1.006	32.791	21GB084
21GB084	82.6	196.1	21GB085	-113.5	21GB085	186.6	73.1	21GB084	-113.5	0.0	-1.135	31.656	21GB085
21GB085	142.5	150.9	21GB086	-8.4	21GB086	151.6	143.2	21GB085	-8.4	0.0	-0.084	31.572	21GB086

21GB086	143.1	154.0	21GB087	-10.9	21GB087	153.7	142.8	21GB086	-10.9	0.0	-0.109	31.463	21GB087
21GB087	147.5	154.3	21GB088	-6.8	21GB088	154.1	147.3	21GB087	-6.8	0.0	-0.068	31.395	21GB088
21GB088	150.6	158.0	21GB089	-7.4	21GB089	159.9	152.5	21GB088	-7.4	0.0	-0.074	31.321	21GB089
21GB089	235.5	2.5	fpl4	233.0	fpl4	15.3	248.3	21GB089	233.0	0.0	2.330	33.651	fpl4
fpl4	229.6	103.1	tri	126.5	tri	96.4	222.9	fpl4	126.5	0.0	1.265	34.916	tri
													0
Fix	89.5	130.8	21GB090	-41.3	21GB090	131.2	89.9	Fix	-41.3	0.0	-0.413	51.474	21GB090
21GB090	185.0	57.1	21GB091	127.9	21GB091	58.7	186.6	21GB090	127.9	0.0	1.279	52.753	21GB091
21GB091	266.7	5.0	21GB092	261.7	21GB092	19.8	281.5	21GB091	261.7	0.0	2.617	55.370	21GB092
21GB092	250.6	107.9	21GB093	142.7	21GB093	108.5	251.2	21GB092	142.7	0.0	1.427	56.797	21GB093
													0
													0
21GB093	166.1	126.4	21GB094	39.7	21GB094	129.7	169.4	21GB093	39.7	0.0	0.397	57.194	21GB094
21GB094	206.2	66.0	21GB095	140.2	21GB095	67.7	207.9	21GB094	140.2	0.0	1.402	58.596	21GB095
21GB095	246.2	59.8	21GB096	186.4	21GB096	58.8	245.2	21GB095	186.4	0.0	1.864	60.460	21GB096
21GB096	265.3	53.0	21GB097	212.3	21GB097	50.7	263.0	21GB096	212.3	0.0	2.123	62.583	21GB097
21GB097	265.9	62.3	21GB098	203.6	21GB098	62.2	265.8	21GB097	203.6	0.0	2.036	64.619	21GB098
21GB098	184.3	178.8	21GB099	5.5	21GB099	177.6	183.1	21GB098	5.5	0.0	0.055	64.674	21GB099
21GB099	61.7	286.1	21GB100	-224.4	21GB100	281.9	57.5	21GB099	-224.4	0.0	-2.244	62.430	21GB100
21GB100	35.4	211.5	21GB101	-176.1	21GB101	211.6	35.5	21GB100	-176.1	0.0	-1.761	60.669	21GB101
21GB101	139.7	139.5	21GB102	0.2	21GB102	136.0	136.2	21GB101	0.2	0.0	0.002	60.671	21GB102
21GB102	170.1	126.6	21GB103	43.5	21GB103	122.2	165.7	21GB102	43.5	0.0	0.435	61.106	21GB103
21GB103	237.4	35.2	21GB104	202.2	21GB104	34.8	237.0	21GB103	202.2	0.0	2.022	63.128	21GB104
21GB104	254.4	97.7	flp	156.7	flp	82.2	238.9	21GB104	156.7	0.0	1.567	64.695	flp
flp	228.7	65.1	21GB105	163.6	21GB105	62.8	226.4	flp	163.6	0.0	1.636	66.331	21GB105
21GB105	242.9	116.3	21GB106	126.6	21GB106	110.6	237.2	21GB105	126.6	0.0	1.266	67.597	21GB106
21GB106	112.1	197.9	21GB107	-85.8	21GB107	208.5	122.7	21GB106	-85.8	0.0	-0.858	66.739	21GB107
21GB107	1.5	260.2	flp	-258.7	flp	285.0	26.2	21GB107	-258.8	0.1	-2.588	64.152	flp
flp	121.5	190.2	21GB108	-68.7	21GB108	202.0	133.3	flp	-68.7	0.0	-0.687	63.465	21GB108

21GB108	84.7	192.4	21GB109	-107.7	21GB109	188.0	80.3	21GB108	-107.7	0.0	-1.077	62.388	21GB109
21GB109	124.7	158.5	21GB110	-33.8	21GB110	155.6	121.8	21GB109	-33.8	0.0	-0.338	62.050	21GB110
21GB110	170.3	127.9	21GB111	42.4	21GB111	127.2	169.6	21GB110	42.4	0.0	0.424	62.474	21GB111
21GB111	198.9	135.0	21GB112	63.9	21GB112	132.1	196.0	21GB111	63.9	0.0	0.639	63.113	21GB112
21GB112	127.6	195.3	21GB113	-67.7	21GB113	192.2	124.5	21GB112	-67.7	0.0	-0.677	62.436	21GB113
													0
21GB106	143.4	147.1	Rör 24	-3.7	Rör 24	147.5	143.8	21GB106	-3.7	0.0	-0.037	67.560	Rör 24
													0
21GB114	110.1	167.6	21GB009	-57.5	21GB009	166.2	108.7	21GB114	-57.5	0.0	-0.575	13.670	21GB114
21GB115	147.0	167.8	21GB114	-20.8	21GB114	170.6	149.8	21GB115	-20.8	0.0	-0.208	13.878	21GB115
21GB116	136.6	177.1	21GB115	-40.5	21GB115	177.9	137.4	21GB116	-40.5	0.0	-0.405	14.283	21GB116
21GB117	132.3	176.9	21GB116	-44.6	21GB116	183.1	138.5	21GB117	-44.6	0.0	-0.446	14.729	21GB117
21GB118	192.5	179.5	21GB117	13.0	21GB117	179.7	192.7	21GB118	13.0	0.0	0.130	14.599	21GB118
21GB119	133.8	139.0	21GB118	-5.2	21GB118	137.7	132.5	21GB119	-5.2	0.0	-0.052	14.651	21GB119
21GB120	143.2	155.9	21GB119	-12.7	21GB119	157.7	145.0	21GB120	-12.7	0.0	-0.127	14.778	21GB120
21GB121	136.6	178.5	21GB120	-41.9	21GB120	180.4	138.5	21GB121	-41.9	0.0	-0.419	15.197	21GB121
21GB122	97.5	185.4	21GB121	-87.9	21GB121	187.0	99.1	21GB122	-87.9	0.0	-0.879	16.076	21GB122
flp1	47.5	180.9	21GB122	-133.4	21GB122	180.9	47.5	flp1	-133.4	0.0	-1.334	17.410	flp1