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An evaluation of the Norwegian network of weather stations.

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TITLE

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Abstract

The Norwegian Meteorological Institute's networks of temperature and precipitation measurements were evaluated by applying a combination of principal component analysis and cluster analysis on series of daily minimum temperature and daily precipitation. The aim of the combined analyses is to give a relative measure for the required density of meteorological measurements in different parts of the country, provided that the need for meteorological information of a certain detail is the same all over the country. The relative station densities resulting from the analyses were scaled by using WMO recommended minimum station densities in areas which apparently were climatologically homogeneous.

For temperature, the total number of stations in the resulting «optimal network» (212) was not very different from the number of stations used in the analysis (202). However, the actual station density along the coast is, at many places, higher than in the «optimal network» , while the station density in the inland generally is lower than in the «optimal network» . Concerning precipitation, the total number of stations in the «optimal network» (783) is considerably higher than the number of stations used in the analyses (568). Only parts of south-eastern Norway have station densities which are higher than the «optimal» ones. The largest station «deficits» are found in areas in northern Norway.

Methodical weaknesses make it necessary to adjust the above results somewhat. These adjustments will probably include an increase of the «optimal station density» in parts of northern Norway, both for temperature and precipitation. The «optimal density» of precipitation stations in western parts of the country may, on the other hand, be reduced.

The results from the statistical analyses should not be used as the only guidelines when designing future meteorological networks. In some areas (*e.g.* urban districts) meteorological information of higher spatial resolution is needed for special purposes. The general need for weather information from all parts of the country must thus be combined with such extra requirements. Finally, some kind of proportional reduction will usually have to be done, in order to meet economical limitations.

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An evaluation of the Norwegian network of weather stations.

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1. Introduction

The density of the official Norwegian network of weather stations is presently being validated for synoptic and climatological use. The present report is a contribution to this validation, based upon statistical analyses of existing series of daily minimum temperatures and daily precipitation sums. A combination of principal component analysis and cluster analysis is used, as recommended by Singleton and Spackman (1984). In this way, required station densities within different parts of the country, and for different meteorological variables, are calculated.

An advantage of basing suggested station densities on statistical analyses of existing data, is that the methods are objective. A disadvantage is that the results are dependent on the station density of the dataset used in the statistical analysis. *E.g.* if all stations in a mountain area are located in valleys, the climate of the mountain tops is not represented in the dataset, and the area will appear to be more homogeneous than it is. Consequently, the required station density will be underestimated. The result from the present analyses should thus not be used as the only indicator when recommending a station density for a certain variable. One should also know the topography in the actual area, and the positions of the stations used in the analyses. Besides, it is necessary to decide a scaling value, as the statistical analyses produce relative densities only.

One should also be aware that the aim of the present analyses is to define a station network which gives the best picture of the weather in Norway as a whole. This is not necessarily what we want, as we *e.g.* may need more detailed information in highly populated areas than in deserted mountain areas.

It is thus not our intention that the «required station densities» estimated in the present report should be considered as final, but rather that they could serve as a starting point for a further discussion about the future of our station network.

2. Methods

2.1 Background.

Singleton and Spackman (1984) estimated the required density of weather stations in different parts of United Kingdom by analysing daily meteorological observations from more than 700 stations. A 4-steps method was introduced:

1 - Principal component analysis (PCA) was applied to series of daily meteorological observations. (The term «factor analysis» is used by Singleton and Spackman, however we choose to call it PCA, which is in accordance with the terminology used by *e.g.* Preissendorfer(1988) and Joliffe (1990,1993)). It was found that 15 principal components accounted for more than 85% of the variance in the original datasets.

2 - Clusters of stations were identified by cluster analysis in the 15-dimensional room defined by the 15 first PC's. The number of clusters was chosen to be 40. The cluster number of each station was plotted on a map, and lines were drawn around groups of stations belonging to the same cluster. Areas defined in this way were suggested to be climatologically homogeneous areas. The stations from some clusters grouped nicely in one single area, while the stations from other clusters formed several groups. More than 40 groups were thus defined for most variables. For daily minimum temperature, more than 80 groups were defined, while about 60 groups were defined for daily rainfall, and only 40 were defined for daily sunshine.

3 - In order to get a numeric measure for the climatological complexity of different parts of the country, the map was divided by a 100 km x 100 km grid. The number of groups included in each grid square were counted. This was done for minimum- and maximum-temperature, for daily sunshine and rainfall. The larger of these numbers was divided by the land area within the grid square. This number (groups/km^2) was introduced as a relative measure for climatological complexity of the grid square, and thus a relative measure for required station density within the square.

4 - The relative numbers were finally scaled by referring to *Guide to climatological practices* (WMO 1960): «where the geographical conditions are fairly uniform, then one ordinary climatological station per 1000 km^2 will normally be sufficient ». The area having the lowest number of groups per km^2 was used as a reference area, and 1 station per 1000 km^2 was suggested there. In other grid squares, this density was multiplied by the ratio between groups per area in the actual square and groups per area in the reference square.

The method suggested by Singleton and Spackman (1984) has been used to evaluate the Norwegian station net. PCA and cluster analysis was applied on series of daily minimum temperature and daily precipitation sum. The temperature and precipitation analyses are presented in chapter 3 and 4, respectively. The scaling factor based upon WMO (1960) which was used by Singleton and Spackman (1984), was not used in the present analysis, as the recommendation of minimum station density has been revised since 1960 (WMO 1983 and 1994).

2.2 Principal component analysis

Principal component analysis (*e.g.* Preisendorfer 1988) is a technique for reducing a dataset consisting of many variables (x_1, x_2,...,x_p) to a set consisting of a smaller number of principal components (z_1, z_2 ..., z_m) whilst minimising the loss of variance in the dataset. The principal components (PC's) are linear functions of the variables:

$$(1) \qquad z_j = \sum_{i=1}^{p} \alpha_{ij} \, x_i \ ,$$

where the 'loadings' α_{ij} are constants constrained by a certain normalisation (*e.g.* $\sum_{i=1}^{p} \alpha_{ij}^2 = 1$).

The first PC is the linear function which has the maximum possible variance, the second PC is the linear function with maximum possible variance which is uncorrelated with the first PC, and so on. The loadings corresponding to the first PC thus form the first eigenvector of the covariance (or correlation) matrix of the variables x_1, x_2,...,x_p, while the loadings of the

subsequent PC's form the consecutive eigenvectors. How many PC's to include in an analysis, is a compromise between having a surveyable dataset and keeping as much as possible of the information in the original dataset. In the present analysis, 15 components had to be included in order to account for 85% of the variance in the precipitation dataset. For temperature, only 10 components were included, as this was sufficient to account for more than 95% of the variance in the dataset.

The SAS software procedures PRINCOMP and FACTOR (SAS Institute Inc. 1988) were used to perform the principal component analyses in the present report. The covariance matrixes of the variables were used rather than the correlation matrixes, as standardising the dataset would remove much of the variance which is of interest in the present investigation.

2.3 Cluster analysis

The purpose of cluster analysis is to place objects (in the present case: meteorological stations) in groups suggested from the data. In the present analyses, the stations were placed in disjoint clusters based upon the loadings of the principal components. For each station, these loadings may be interpreted as co-ordinates in a 10- or 15- dimensional space. The square distance between stations i and k in this space is given by the equation:

$$(2) \qquad d_{ik}^2 = \sum_{j=1}^{n} (\alpha_{ij} - \alpha_{kj})^2$$

where n is the dimension of the space (10 for temperature, 15 for precipitation). In each analysis, a predetermined number of clusters was produced by a method which Anderberg (1973) calls «nearest centroid sorting». The analyses were performed using the SAS software procedure FASTCLUS (SAS Institute Inc. 1988).

3. Analyses of daily minimum temperature

3.1 Data

The results from the present analyses depend on the station network which is used. The meteorological complexity of an area will be adequately described only if all types of local climate within the area (e.g. coast, inland, valley floor, valley slope, mountain top, etc.) are represented by at least one station. It is thus important to use as dense a network as possible. Consequently, data from the 1970s, when the number of climatological stations in Norway was at maximum, were used in the present investigation. It is also desirable to use data from a fairly long period, in order to include a large (and representative) spectre of different weather situations. In the present analysis, series of daily minimum temperatures from 202 stations during the 5 year period 1970 - 1974 were used. Relevant information of these 202 stations is given in Appendix 1 (Table A.1), and their approximate positions are shown in Figure 3.1.

3.2 Results from PCA and cluster analysis of daily minimum temperature

The 10 first principal component account for 96% of the variance in the dataset. At no station, less than 90% of the variance is accounted for.

Several cluster analyses were run in order to decide an optimal number of clusters. The number should be large enough to reveal local differences to some detail, but small enough to avoid a large number of «1 station clusters». The final number of minimum temperature clusters was 47. Table A.1 in Appendix shows, for each station, the cluster it belongs to according to the final analysis, and the percentage of the variance accounted for by the 10 first principal components . The cluster numbers were also plotted on a map, and lines were drawn around groups of stations belonging to the same cluster. Figure 3.2 shows these groups. Most clusters formed one group only. Two exceptions are a cluster which includes 2 mountain top stations more than 1800 m above sea level , and a cluster which includes coastal stations in the inner parts of 3 different fjords.

If the station network which was used in the statistical analyses is sufficiently dense, the groups in Figure 3.2 will define climatologically homogeneous regions. Even without a sufficiently dense network, the size and form of the groups give valuable information. The main impression is that, as far as the minimum temperature is concerned, the conditions along the coastline are quite homogeneous, while the conditions are changing more rapidly when moving from the coast into the inland. Mountainous inland areas with large height differences are inhomogeneous, while undulating inland landscapes are fairly homogeneous.

3.3 Recommended density of temperature measurements

If the groups define climatologically homogeneous regions, then number of groups per area is a relative measure for the climatological complexity of the area. In order to calculate this ratio for different parts of Norway, the country was divided by a 100 km x 100 km grid. The grid squares (Fig. 3.3) are denominated by letter-number combinations. The letters A through P are used to define the south-north position, while number 1 to 11 define the west-east position. Grid squares with land area less than 10 000 km^2 were combined with one or more neighbouring squares whenever the total area did not exceed 15 000 km^2. Area, number of groups, and number of groups per area for the grid squares are given in columns 2 - 4 in Table 3.1.

For temperature measurements, WMO (1983) recommends a maximum distance between neighbouring stations of 50 km in uniform terrain. According to Table 3.1 the most uniform area in Norway concerning minimum temperature is the area enclosed by grid squares D 4-5 (basically the middle part of Hedmark county). Assuming that this area complies with the WMO definition of being geographically fairly uniform, 0.4 stations per 1000 km is recommended here. The recommended densities for the other grid squares are calculated by multiplying this minimum density by the ratio between the climatological complexity of the actual grid square and the climatological complexity of D 4-5. The required densities are given in column 5 in Table 3.1, and in Figure 3.3. The numbers vary from the WMO minimum recommendation to the triple of this value. High values are found in inland mountainous areas with large variations in height above sea level.

Figure 3.1 Station map, temperature

Figure 3.2 Groups based upon analyses of minimum temperature.

Table 3.1 Information of the grid squares shown in figure 3.2.

Column 1: Grid square(s) letter-number code (figure 3.2).
Column 2: Approximate land area in the grid square(s).
Column 3: Number of groups in the grid square(s).
Column 4: Number of groups per area in the grid square(s).
Column 5: Required number of stations per area if 0.4 stations/10^3 km^2 is sufficient in squares D-4,5.
Column 6: Required number of stations in the grid square(s).
Column 7: Actual number of stations within the grid square(s) during 1970-74 (figure 3.1).
Column 8: Evt. station deficit when comparing the required and actual numbers of stations.
Column 9: Evt. station excess when compared the required and actual numbers of stations.

Grid square	Area x 10^3 km^2	Number of groups	Groups per 10^3 km^2	Required st. per 10^3 km^2	Required numb. of stations	Number of stat. 1970-74	Station deficit	Station excess
A-1,2	11.1	4	0.36	0.5	6	12	-	6
A,B-3	9.9	5	0.51	0.7	7	9	-	2
B-1	6.8	3	0.44	0.7	4	6	-	2
B-2	10.0	5	0.50	0.7	7	4	3	-
B-4	5.2	2	0.38	0.6	3	8	-	5
C-1	7.6	3	0.39	0.6	4	9	-	5
C-2	10.0	5	0.50	0.7	7	4	3	-
C-3	10.0	7	0.70	1.0	10	5	5	-
C-4,5	10.8	4	0.37	0.6	6	10	-	4
D-1	8.6	6	0.70	1.0	9	5	4	-
D-2	10.0	6	0.60	0.9	9	6	3	-
D-3	10.0	6	0.60	0.9	9	5	4	-
D-4,5	11.0	3	0.27	0.4	4	7	-	3
E-1	7.9	3	0.38	0.6	4	6	-	2
E-2	10.0	7	0.70	1.0	10	8	2	-
E-3	10.0	8	0.80	1.2	12	6	6	-
E-4,5	9.0	3	0.33	0.5	4	3	1	-
F-1,2	7.5	5	0.67	1.0	7	7	-	-
F-3	10.0	4	0.40	0.6	6	5	1	-
F-4	8.3	3	0.36	0.5	4	2	2	-
G-2,3,4,5	14.8	5	0.34	0.5	7	11	-	4
H-3,4,5	12.5	6	0.48	0.7	9	5	4	-
I-4,5	9.8	3	0.31	0.5	4	3	1	-
J-4,5,6	9.7	4	0.41	0.6	6	4	2	-
K-4,5,6	7.0	3	0.42	0.6	4	6	-	2
L-4,5,6	9.9	3	0.30	0.4	4	7	-	3
L,M-7	7.5	3	0.40	0.6	4	4	-	-
M-5,6	8.6	4	0.47	0.7	6	6	-	-
M,N-8	13.4	5	0.37	0.6	7	5	2	-
M,N-9	10.1	3	0.30	0.4	4	2	2	-
N-6,7	8.1	4	0.49	0.7	6	7	-	1
N,0-10,11	10.1	5	0.47	0.7	7	4	3	-
0-7,8	5.5	3	0.54	0.8	4	2	2	-
0-9	7.6	3	0.39	0.6	4	4	-	-
P-8,9,10,11	5.5	3	0.54	0.8	4	5	-	1

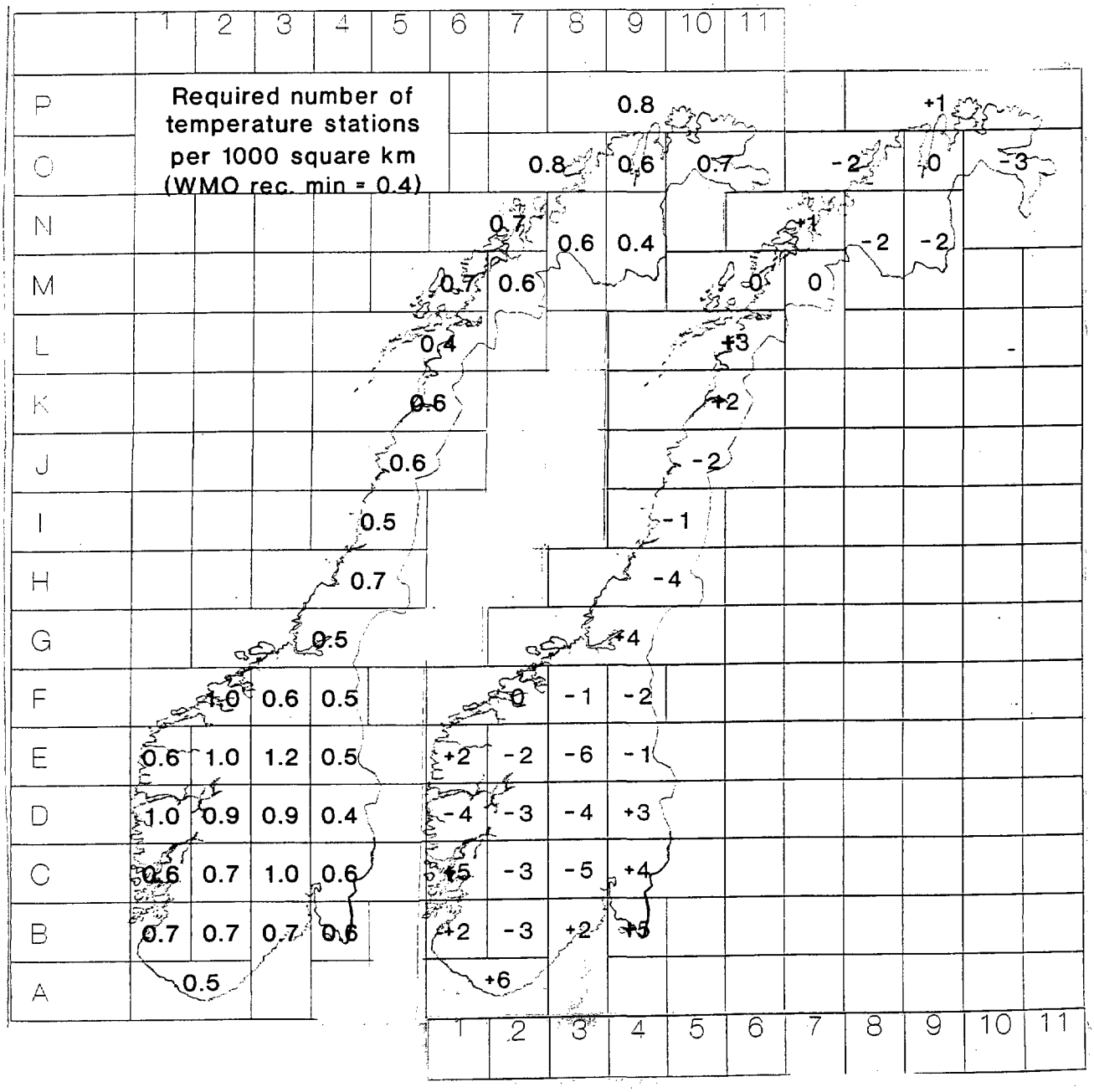

Figure 3.3 Required station densities, temperature measurements.

Figure 3.4 Station deficit/excess, minimum temperature.

The highest values are found in the mountains forming the transition zone between the south-eastern and the north-western parts of Southern Norway. The climatological inhomogeneity in this area is probably caused both by the differences between mountains, slopes and valleys, and by the variation within the area in the exposure for different types of atmospheric circulation.

When multiplying the estimate of required station density in a grid square by the land area within the square, an estimate for the required number of stations is found (Table 3.1, column 6). By comparing this to the number of stations used in the present investigation (Table 3.1, column 7), the station deficit (Table 3.1, column 8) or eventually the station excess (Table 3.1, column 9) is estimated. Adding up the estimates of required stations gives 212 stations, which is not very different from the number of stations which were observing temperature during 1970-74. This network was, however, not optimal from a pure meteorological point of view, as the station density was too low in some regions, while it was higher than necessary in other areas (Figure 3.4). The main feature seems to be a surplus of stations in many coastal areas, while there is a deficit of measurements in most inland regions. Adding up the «station deficit» gives a total deficit of 50 stations, while 40 stations may be removed without reducing the temperature information from the total network seriously.

One might thus conclude that moving 40 stations from «excess areas» to «deficit areas», would improve the network, provided that the locations in the «deficit areas» were wisely chosen. However, this is true only if the above analyses are based upon sufficient meteorological information, and if the need for meteorological information is the same in all areas. In chapter 5, it will be discussed whether this is the case.

4. Daily precipitation sum

4.1 Data

The set of daily precipitation data consists of series from 568 stations during 1991 - 1995. Relevant information of these 568 stations is given in Appendix 2 (table A2.1), and their approximate positions are shown in Figure 4.1.

4.2 Results from PCA and cluster analysis of daily precipitation

The 15 first principal components account for 87% of the variance in the dataset. At 92% of the stations, more than 70% of the variance is accounted for. However, at 10 stations, less than 60% of the variance is accounted for.

Several cluster analyses were run in order to decide an optimal number of clusters. The final number of clusters based upon daily precipitation was 49. Table A.2 in Appendix shows the cluster number for each station, as well as the percentage of the variance accounted for by the first 15 principal components. The cluster numbers were also plotted on a map, and Figure 4.2 shows the groups formed by the clusters. The main impression is that, as far as daily precipitation is concerned, the south-eastern part of the country is fairly homogeneous, while the conditions in the south-western part of the country is more complex. In this connection, it should be noted that, because the PCA is based upon the covariance matrix, stations in areas with large amounts of precipitation, and thus large variance, will dominate. The number of groups in western parts of the country may thus be somewhat exaggerated compared to the number of groups elsewhere. This will be commented further in the discussion in chapter 5.

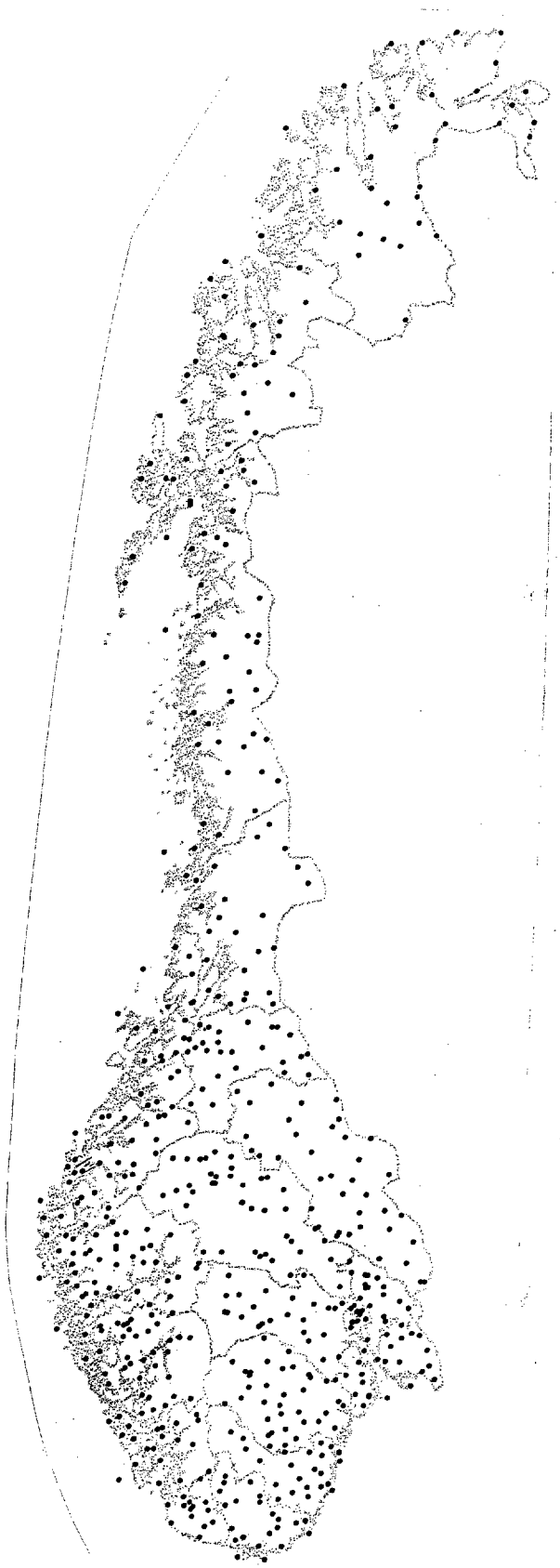

Figure 4.1 Station map, precipitation

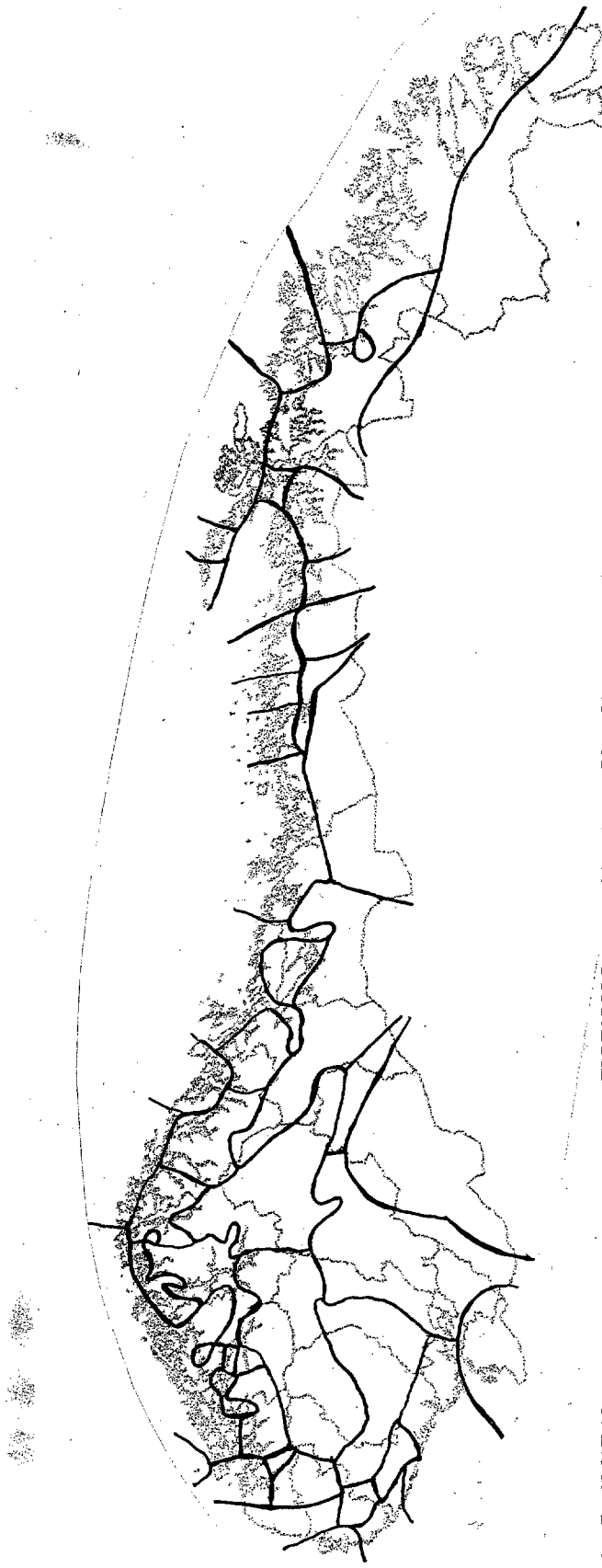

Figure 4.2 Groups based upon analyses of precipitation.

Table 4.2 Information of the grid squares shown in figure 3.2.

Column 1: Grid square(s) letter-number code (figure 3.2).
Column 2: Approximate land area in the grid square(s).
Column 3: Number of precipitation groups in the grid square(s).
Column 4: Number of precipitation groups per area in the grid square(s).
Column 5: Required number of stations per area if 1.1 stations/10^3 km^2 is sufficient in squares D-4,5.
Column 6: Required number of stations in the grid square(s).
Column 7: Actual number of stations within the grid square(s) during 1970-74 (figure 4.1).
Column 8: Evt. station deficit when comparing the required and actual numbers of stations.
Column 9: Evt. station excess when compared the required and actual numbers of stations.

Grid square	Area x 10^3 km^2	Number of groups	Groups per 10^3 km^2	Required st. per 10^3 km^2	Required numb. of stations	Number of stat. 1970-74	Station deficit	Station excess
A-1,2	11.1	7	0.63	3.9	43	29	14	-
A,B-3	9.9	4	0.40	2.5	24	31	-	7
B-1	6.8	6	0.88	5.4	37	22	15	-
B-2	10.0	4	0.40	2.4	24	21	3	-
B-4	5.2	2	0.38	2.4	12	14	-	2
C-1	7.6	6	0.79	4.8	37	23	14	-
C-2	10.0	4	0.40	2.4	24	17	7	-
C-3	10.0	2	0.20	1.2	12	22	-	10
C-4,5	10.8	3	0.28	1.7	18	37	-	19
D-1	8.6	4	0.47	2.8	24	23	1	-
D-2	10.0	4	0.40	2.4	24	16	8	-
D-3	10.0	3	0.30	1.8	18	17	1	-
D-4,5	11.0	2	0.18	1.1	12	20	-	8
E-1	7.9	6	0.76	4.6	37	23	14	-
E-2	10.0	5	0.50	3.1	31	21	10	-
E-3	10.0	5	0.50	3.1	31	20	11	-
E-4,5	9.0	2	0.22	1.4	12	9	3	-
F-1,2	7.5	3	0.40	2.4	18	19	-	1
F-3	10.0	5	0.50	3.1	31	26	5	-
F-4	8.3	4	0.48	2.9	24	12	12	-
G-2,3,4,5	14.8	4	0.27	1.7	24	25	-	1
H-3,4,5	12.5	4	0.32	2.0	24	14	10	-
I-4,5	9.8	3	0.31	1.9	18	11	7	-
J-4,5,6	9.7	5	0.52	3.2	31	12	19	-
K-4,5,6	7.0	4	0.57	3.5	24	6	18	-
L-4,5,6	9.9	7	0.71	4.3	43	16	27	-
L,M-7	7.5	4	0.53	3.3	24	10	14	-
M-5,6	8.6	3	0.35	2.1	18	7	11	-
M,N-8	13.4	3	0.22	1.4	18	5	13	-
M,N-9	10.1	2	0.20	1.2	12	8	4	-
N-6,7	8.1	3	0.37	2.3	18	9	9	-
N,0-10,11	10.1	2	0.20	1.2	12	11	1	-
0-7,8	5.5	1	0.18	1.1	6	2	4	-
0-9	7.6	2	0.26	1.6	12	5	7	-
P-8,9,10,11	5.5	1	0.18	1.1	6	5	1	-

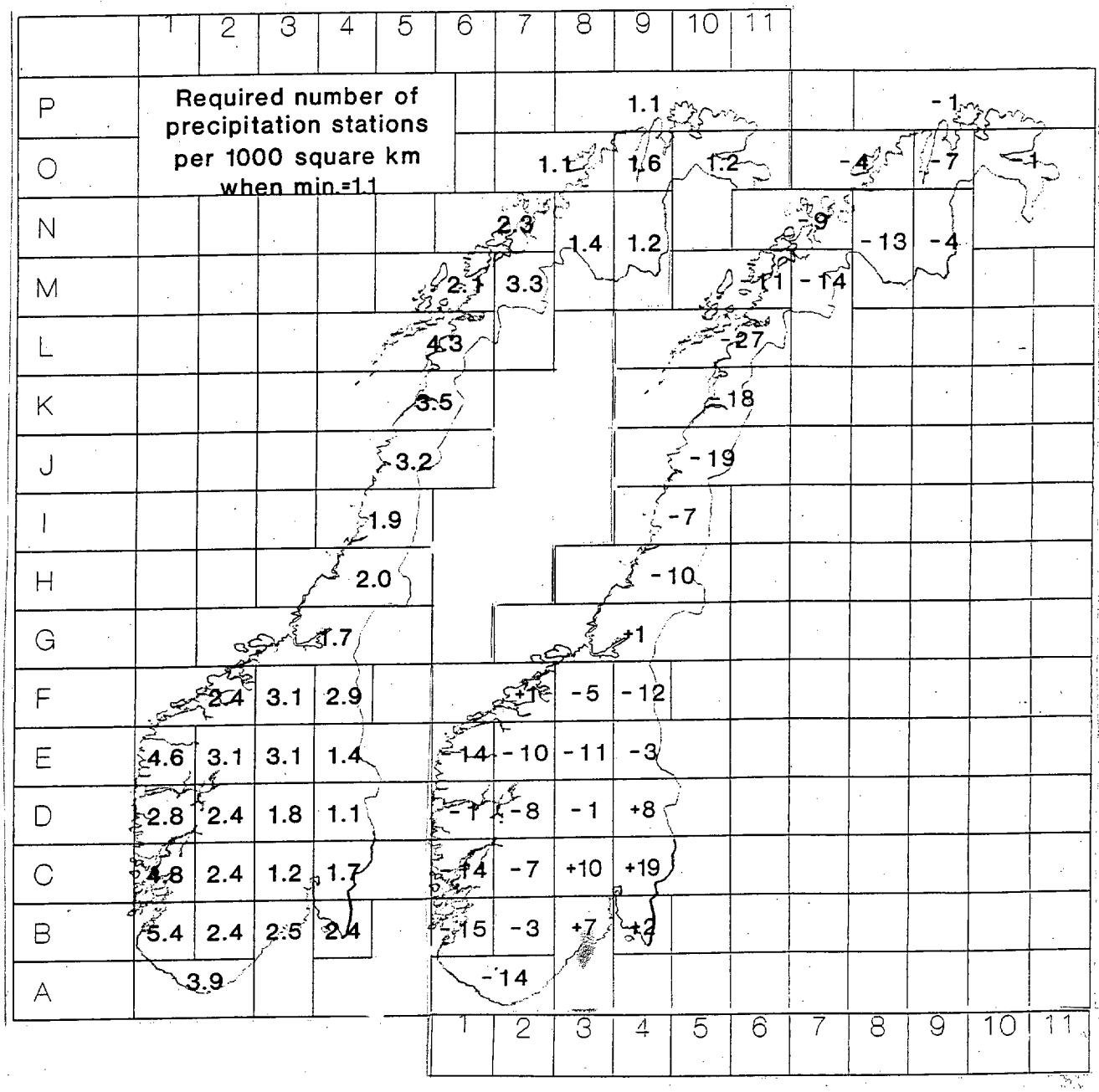

Figure 4.3 Required station densities, precipitation measurements.

Figure 4.4 Station deficit/excess, precipitation measurements.

4.3 Recommended density of precipitation measurements

Table 4.1 is analogous to Table 3.1, but it is based upon precipitation series. The number of groups per area was used as a relative measure expressing the complexity of the area concerning distribution of precipitation. Again, grid squares D 4-5 apparently were among the least complex areas, and the need for precipitation stations within these squares should thus be satisfied by some minimum recommended station density. *Guide to hydrological practices* (WMO 1994) suggests a minimum density of 1 precipitation station per 575 km^2 in «hilly/undulating» terrain. However, using this recommendation as a scaling factor in Table 4.1 would lead to a total requirement of 1138 precipitation stations at the Norwegian mainland. This includes a doubling of the present number of precipitation stations, which is certainly not possible within the economical frames for the Norwegian Meteorological Institute. In order to make a somewhat more realistic suggestion, we choose to base the calculations on a minimum of 1 station per 900 km^2, which is recommended for homogeneous coastal areas, and which is the absolute minimum station density recommended by *Guide to hydrological practices* (WMO 1994), except for polar/arid regions. Thus, the «required station densities» given in Table 4.1, column 5, and in Figure 4.3 are calculated using 1.1 precipitation stations per 1000 km^2 a as minimum station density. They vary from the WMO minimum recommendation to 5.4 stations per 1000 km^2. High values are found in western Norway, where topographic effects lead to large local variations in the precipitation amounts. The highest values are found in areas of western Norway where, in addition, minor variations in wind direction lead to large variations in the spatial precipitation pattern.

Table 4.1 column 6-9 give the estimate of the required number of stations, the actual number of stations used in the present investigation, and eventual station deficit or excess. Adding up the estimates of required stations gives a total of 783 precipitation stations, which is 215 more than the network used in the analyses. The station network was not optimal, and adding up the «deficit» column gives a total deficit of 263 stations. Adding up the «excess» column gives 48 stations, which thus, according to the analysis might be removed without reducing the information from the total network seriously. Figure 4.3 shows the station deficit or excess in different regions. Only parts of south-eastern Norway have «surplus» stations. The larger station «deficits» are found in Nordland and Troms counties.

5 Discussion and conclusions

5.1 Main questions

The aim of the combined principal component analysis and cluster analysis is to give a relative measure for the required density of meteorological measurements in different parts of a country, provided that the need for meteorological information of a certain detail is the same all over the country. One question is if the method really gives such a relative measure. Another question is how to transfer this relative information into absolute recommendations. A third question is if the need for meteorological information really is the same all over the country, and in case it isn't, how to combine the results from the above analyses with other relevant information. These aspects will be discussed in the following sections, prior to the final recommendations and concluding remarks.

5.2 The method.

Does the combination of principal component analysis and cluster analysis give a relative measure for the required density of meteorological measurements in different parts of Norway? Strictly speaking, the answer is yes only if the following conditions are satisfied.

* The input data should give a reasonable representation of the spatial variability of the actual weather element within all parts of the country.

In order to know if this condition is satisfied, it is necessary to compare the location and height above sea level of the existing stations, to the physiography of the area. Preliminary studies indicate that the «required station densities» in parts of the 3 northernmost counties of Norway are underestimated, because a majority of the station in these counties are coastal, or at least situated at relatively small heights above sea level. Particularly, this seems to have affected the results of the temperature analysis in Nordland and Troms, and the precipitation analysis in Finnmark.

* The principal components used in the cluster analysis should account for a reasonable amount of the variance at each station.

This is the case concerning minimum temperature (cf. Table A.1). However, at 10 of the precipitation stations, the 15 first principal components account for less than 60% of the variance (cf. Table A.2). This does not affect the final results if the «misfits» form their own groups in the cluster analysis. If they, on the other hand, end up in the same cluster as other stations, the result will be misleading. Of the 10 «misfit» stations, 6 are situated in Troms or Finnmark, and only one forms its own group. Thus, the spatial precipitation pattern in these counties is probably more complex than the results from the present analyses indicate.

* The variance at the individual stations should be of the same magnitude.

The reason for this is that series with large variance will influence the results more than series with small variance. For temperature, this is no problem. The variance contribution from inland series will normally be somewhat larger than the contribution from coastal series, but the magnitude is the same. For precipitation, on the other hand, there are areas in south-western Norway which at average receive more than 10 times as much precipitation as the most arid areas in south-eastern parts of the country. The variance is at maximum in the areas where the precipitation is at maximum. Thus the need for stations in western Norway may be somewhat exaggerated compared to the similar need in eastern parts of the country. Trying to solve the problem by basing the PCA on the correlation matrix rather than the covariance matrix, would raise the opposite problem, as a single rain shower in the most arid areas then could affect the results as much as hundreds of mm rain in western Norway. A better idea is probably to use some logarithmic transformation of the precipitation data.

* The number of clusters should be large enough to reveal local differences to some detail, but small enough to avoid a large number of «1 station clusters».

This has been taken care of by running several analyses for each element. It was stated that the final results are not very sensitive to this choice, as the results are «relative» and not «absolute» station densities.

The above discussion shows that additional information about the existing station network is needed when applying the results from the analyses as a relative measure for the required

density of meteorological measurements in different parts of Norway. Relevant information is position and elevation above sea level of existing stations, as well as the percentage of the variance at the station accounted for by the principal components which were used in the cluster analysis.

5.3 Getting from relative information to absolute recommendations.

In the present analyses, WMO minimum recommended station densities were used as scaling factors when calculating absolute recommended station densities (Table 3.1 and 4.1, column 5) from the relative values. These recommendations may certainly be used directly. However, the total number of stations will often be limited by economical reasons, and the question may be how to distribute a predetermined number of stations throughout the country. One possibility would be to reduce the station densities in all areas by the same factor. The «recommended network» for a certain weather element would then (ideally) represent the network *of a certain size* which would give the optimal information about this element in Norway as a whole. However, this network would in some areas have station densities below the WMO minimum recommended density. Another possibility is to use the WMO minimum recommended density as an absolute minimum, and thus not to reduce the station density in any grid square beneath this limit. Whichever principle is followed, it seems reasonable to recommend that all groups identified in the cluster analysis should be represented by at least one station.

5.4 The need for meteorological information.

The need for meteorological information is not the same all over the country. Extra information is often needed in connection with human activities or in areas which, for some reason, are of special interest. It is important that such extra needs are identified, and that an increased station density is recommended in these areas. (*E.g.* WMO (1994) recommends a density of 1 precipitation station per 10-20 km^2 in urban areas). On the other hand, detailed knowledge of the weather in uninhabited mountain areas may be of little practical use.

5.5 Conclusions

We suggested that a basic networks of temperature and precipitation measurements are defined based upon the results from the statistical analyses presented in chapter 3 and 4 in this report. However, the «recommended station densities» from figures 3.3 and 4.3 can not be used directly.

- First, the «recommended densities» should be adjusted according to the limitations of the station networks used in the analyses and the limitations of the analyses themselves (*cf.* section 5.2). For temperature measurements, it is sufficient to increase the «recommended densities» in areas where the network used in the analysis is obviously unrepresentative. For precipitation measurements, it may also be convenient to increase the densities in areas where one or more series are poorly described by the 15 first principal components. In addition, one should consider reducing the «recommended densities» somewhat in south-western parts of the country, where the average amounts of precipitation are large.

- Secondly, special needs for additional data should be identified (*cf.* section 5.4).

- Thirdly, some scaling will have to be introduced in order to keep the total number of stations within realistic limits (*cf.* section 5.3).

Finally, the suggested networks should be compared to the present ones. Station «deficit» or «excess» in grid squares (*cf.* Tab. 3.1 and 4.1, columns 8 and 9) will give an impression of the main weaknesses of the present networks of temperature and precipitation measurements. However, it is also necessary to consider the positions of the individual stations. «Enough» stations within a grid square does not guarantee that their location is «optimal».

Even if the suggested «optimal network» - for practical reasons - never will be realised, it should serve as a guideline when considering the location of new stations and the importance of replacing stations which are closed.

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APPENDIX

Table A.1.
Temperature stations during the 5 year period 1970-74, used for PCA and cluster analysis. CLTN means the cluster number related to daily minimum temperature, VARTN means the percentage of the variance accounted for by the single station.

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLTN	VARTN
19710	ASKER	595137	102622	163	ASKER	AKERSHUS	4	97
19480	DØNSKI	595402	103007	59	BÆRUM	AKERSHUS	2	96
04870	EGNERFJELL	600400	111600	247	SØRUM	AKERSHUS	4	98
19400	FORNEBU	595356	103695	10	BÆRUM	AKERSHUS	2	97
04780	GARDERMOEN	601239	110481	202	ULLENSAKER	AKERSHUS	3	97
04930	HVAM	600600	112300	162	NES	AKERSHUS	3	97
17850	ÅS	594000	104700	95	ÅS	AKERSHUS	2	98
40900	BJÅEN	593849	072660	927	BYKLE	AUST-AGDER	17	95
39690	BYGLANDSFJORD - SOLBAKKEN	584003	074606	212	BYGLAND	AUST-AGDER	20	95
40140	HYLESTAD - BROKKE	590600	073000	443	VALLE	AUST-AGDER	20	95
38140	LANDVIK	582000	083100	6	GRIMSTAD	AUST-AGDER	20	94
35860	LYNGØR FYR	583801	090902	4	TVEDESTRAND	AUST-AGDER	13	97
36560	NELAUG	583949	083788	142	ÅMLI	AUST-AGDER	20	96
36200	TORUNGEN FYR	582300	084751	12	ARENDAL	AUST-AGDER	13	97
26480	BUSKERUD	595300	095400	58	MODUM	BUSKERUD	18	96
29770	DAGALI - FAGERLUND	602500	082700	871	HOL	BUSKERUD	15	97
26890	DRAMMEN - MARIENLYST	594423	101212	3	DRAMMEN	BUSKERUD	2	98
25590	GEILO - GEILOSTØLEN	603104	081209	810	HOL	BUSKERUD	15	97
24960	GOL - STAKE	604305	085693	542	GOL	BUSKERUD	15	97
25730	HAUGASTØL	603100	075200	988	HOL	BUSKERUD	15	97
28360	KONGSBERG II / III	594000	093900	171	KONGSBERG	BUSKERUD	18	97
28800	LYNGDAL I NUMEDAL	595454	093157	288	FLESBERG	BUSKERUD	18	97
24870	NESBYEN II	603400	090800	165	NES	BUSKERUD	16	96
93140	ALTA LUFTHAVN	695865	233811	3	ALTA	FINNMARK	38	98
95350	BANAK	700360	245940	5	PORSANGER	FINNMARK	38	96
95430	BRENNELV	700400	250700	35	PORSANGER	FINNMARK	38	97
99150	BUGØYFJORD	695100	292500	8	SØR-VARANGER	FINNMARK	46	97
97350	CUOVDDATMOHKKI	692202	242600	286	KARASJOK	FINNMARK	45	98
94500	FRUHOLMEN FYR	710560	235970	13	MÅSØY	FINNMARK	38	94
94260	HAMMERFEST RADIO	704100	234000	69	HAMMERFEST	FINNMARK	38	93
94700	HELNES FYR	710380	261380	33	NORDKAPP	FINNMARK	42	96
97250	KARASJOK	692800	253060	129	KARASJOK	FINNMARK	45	98
93710	KAUTOKEINO II	690100	230204	330	KAUTOKEINO	FINNMARK	40	98
99370	KIRKENES LUFTHAVN	694400	295400	89	SØR-VARANGER	FINNMARK	46	97
94900	KISTRAND II	702700	251300	10	PORSANGER	FINNMARK	38	97
97080	LEVAJOK - EVJEN	695400	262500	112	DEATNU-TANA	FINNMARK	44	96
92700	LOPPA	702030	212800	10	LOPPA	FINNMARK	38	90
98400	MAKKAUR FYR	704203	300408	9	BÅTSFJORD	FINNMARK	42	95
99530	PASVIK	690980	291490	54	SØR-VARANGER	FINNMARK	47	98
96800	RUSTEFJELBMA	702402	281201	9	DEATNU-TANA	FINNMARK	43	97
93900	SIHCAJAVRI	684502	233202	382	KAUTOKEINO	FINNMARK	41	98
96400	SLETNES FYR	710504	281307	8	GAMVIK	FINNMARK	42	94
93300	SUOLOVUOPMI	693530	233190	374	KAUTOKEINO	FINNMARK	39	96
98550	VARDØ	702203	310509	14	VARDØ	FINNMARK	42	93
08850	ALVDAL	620200	104700	485	ALVDAL	HEDMARK	1	97
00700	DREVSJØ	615323	120288	672	ENGERDAL	HEDMARK	1	95
06040	FLISA	603704	120102	184	ÅSNES	HEDMARK	3	97
07010	HAUGEDALSHØGDA	610955	112655	240	ÅMOT	HEDMARK	3	97
12550	KISE PA HEDMARK	604600	104800	128	RINGSAKER	HEDMARK	7	97
07550	LØSSET	612200	112300	262	ÅMOT	HEDMARK	3	96
02900	SKOTTERUD	595900	120700	150	EIDSKOG	HEDMARK	3	96
12090	STAUR FORSØKSGÅRD	604400	110600	153	STANGE	HEDMARK	7	95
66830	SÆTER I KVIKNE	623700	101500	543	TYNSET	HEDMARK	28	95
08710	SØRNESSET	615322	100921	739	STOR-ELVDAL	HEDMARK	5	96
09600	TYNSET	621800	104500	483	TYNSET	HEDMARK	6	96
05650	VINGER	601319	120168	175	KONGSVINGER	HEDMARK	3	97
50540	BERGEN - FLORIDA	602300	052002	12	BERGEN	HORDALAND	21	96
50560	BERGEN - FREDRIKSBERG	602400	051900	41	BERGEN	HORDALAND	21	96
50460	FANA FORSØKSSTASJON	601560	052120	48	BERGEN	HORDALAND	22	94
25840	FINSE	603602	073006	1224	ULVIK	HORDALAND	17	95
50500	FLESLAND	601740	051400	48	BERGEN	HORDALAND	22	94
49910	HJELTNES	603400	065600	60	ULVIK	HORDALAND	22	96

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLTN	VARTN
50300	KVAMSKOGEN	602360	055480	408	SAMNANGER	HORDALAND	17	95
52300	MODALEN	605000	055600	104	MODALEN	HORDALAND	22	96
50130	OMASTRAND	601302	055902	2	KVAM	HORDALAND	22	96
51670	REIMEGREND	604110	064460	590	VOSS	HORDALAND	17	94
48330	SLÅTTERØY FYR	595450	050440	15	FITJAR	HORDALAND	21	95
49490	ULLENSVANG FORSØKSGARD	601900	063900	12	ULLENSVANG	HORDALAND	22	96
51590	VOSS - BØ	603870	062970	125	VOSS	HORDALAND	22	96
63300	AURSJØEN	622400	083400	869	NESSET	MØRE OG ROMSDAL	9	95
59610	FISKÅBYGD	620617	053500	41	VANYLVEN	MØRE OG ROMSDAL	25	93
61040	HILDRE	623622	061944	13	HARAM	MØRE OG ROMSDAL	25	93
62650	HUSTAD II	625800	070900	26	FRÆNA	MØRE OG ROMSDAL	25	90
64260	KRISTIANSUND N	630700	074500	48	KRISTIANSUND	MØRE OG ROMSDAL	26	96
62490	ONA - HUSØY	625200	063200	8	SANDØY	MØRE OG ROMSDAL	26	93
60830	SKODJE	623000	064100	26	SKODJE	MØRE OG ROMSDAL	25	95
65370	SMØLA - MOLDSTAD	632519	080385	30	SMØLA	MØRE OG ROMSDAL	9	94
60200	STRANDA - HELSEM	621800	064800	84	STRANDA	MØRE OG ROMSDAL	25	96
63500	SUNNDAL	623300	090600	195	SUNNDAL	MØRE OG ROMSDAL	9	96
59800	SVINØY FYR	621970	051620	38	HERØY	MØRE OG ROMSDAL	26	95
60500	TAFJORD	621401	072500	15	NORDDAL	MØRE OG ROMSDAL	23	92
60650	VALLDAL - LINGE	621800	071400	50	NORDDAL	MØRE OG ROMSDAL	23	95
60990	VIGRA	623370	060690	22	GISKE	MØRE OG ROMSDAL	26	96
59710	ØRSTAVIK - VELLE	621243	060945	35	ØRSTA	MØRE OG ROMSDAL	25	94
70910	BERG I SNÅSA II	641500	122500	127	SNÅSA	NORD-TRØNDELAG	30	97
72850	HØYLANDET	643600	121600	22	HØYLANDET	NORD-TRØNDELAG	30	96
70850	KJØBLI I SNÅSA	640950	122870	195	SNÅSA	NORD-TRØNDELAG	29	96
75600	LEKA	650585	114213	47	LEKA	NORD-TRØNDELAG	31	92
72140	NAMDALSEID - BØGSET	641300	111300	85	NAMDALSEID	NORD-TRØNDELAG	30	95
73490	NORDLI - BRATTVOLD	642700	134300	462	LIERNE	NORD-TRØNDELAG	30	94
70360	SULSTUA	634000	120100	251	VERDAL	NORD-TRØNDELAG	29	95
69100	VÆRNES	632755	105611	12	STJØRDAL	NORD-TRØNDELAG	27	96
87110	ANDØYA	691780	160880	10	ANDØY	NORDLAND	33	92
82290	BODØ VI	671645	142601	11	BODØ	NORDLAND	31	95
86760	BØ I VESTERÅLEN II	683793	142778	12	BØ	NORDLAND	33	92
80700	GLOMFJORD	664860	135888	39	MELØY	NORDLAND	31	94
85780	GLÅPEN FYR	675300	130300	31	MOSKENES	NORDLAND	33	94
83120	GRØTØY	675000	144700	6	STEIGEN	NORDLAND	33	96
86520	KLEIVA I SORTLAND	683883	151733	23	SORTLAND	NORDLAND	33	96
81450	KLETKOVFJELL	671000	150200	801	SKJERSTAD	NORDLAND	33	92
86260	KVALNES I LOFOTEN	682100	135800	10	VESTVÅGØY	NORDLAND	33	95
77420	MAJAVATN III	651080	132520	339	GRANE	NORDLAND	32	93
77190	MOSJØEN - MOSAL	655100	131200	4	VEFSN	NORDLAND	31	94
80610	MYKEN	664580	122930	17	RØDØY	NORDLAND	33	94
84790	NARVIK II	682800	173000	32	NARVIK	NORDLAND	35	94
79400	NERDAL I RANA	661600	135900	31	RANA	NORDLAND	31	96
80100	NORD-SOLVÆR	662210	123867	7	LURØY	NORDLAND	33	94
85950	SKOMVÆR FYR	672500	115300	18	RØST	NORDLAND	33	92
85380	SKROVA FYR	680902	143905	11	VÅGAN	NORDLAND	33	96
82650	VALLJORD	672170	153570	3	SØRFOLD	NORDLAND	31	94
77950	VARDEFJELL	655300	131800	634	VEFSN	NORDLAND	31	93
81620	ØVRE SALTDAL	665800	151800	26	SALTDAL	NORDLAND	34	93
21670	AUST-TORPA II	605600	100700	485	NORDRE LAND	OPPLAND	14	97
15720	BRÅTÅ	615440	075160	712	SKJÅK	OPPLAND	11	97
21240	FLUBERG - RØEN	604700	101200	159	SØNDRE LAND	OPPLAND	7	97
16610	FOKSTUA II	620687	091724	972	DOVRE	OPPLAND	9	96
15540	GJEILO I SKJÅK	615200	082700	378	SKJÅK	OPPLAND	12	96
12640	LILLEHAMMER III	610500	102900	271	LILLEHAMMER	OPPLAND	7	98
23500	LØKEN I VOLBU	610700	090400	525	ØYSTRE SLIDRE	OPPLAND	15	97
13670	SKÅBU - STORSLÅEN	613091	092294	890	NORD-FRON	OPPLAND	9	97
54730	VARDEN - FILEFJELL	611100	080900	1012	VANG	OPPLAND	15	97
13540	VINSTRA - SOLSTAD	613500	094700	249	NORD-FRON	OPPLAND	8	96
14600	VÅGÅ-KLONES	615200	090600	371	VÅGÅ	OPPLAND	10	97
11500	ØSTRE TOTEN	604200	105200	264	ØSTRE TOTEN	OPPLAND	7	97
14690	ØVRE TESSA	614928	085757	746	VÅGÅ	OPPLAND	11	97
23160	ÅBJØRSBRÅTEN	605510	091741	639	NORD-AURDAL	OPPLAND	15	97
18700	OSLO - BLINDERN	595656	104324	94	OSLO	OSLO	2	98
18950	TRYVASSHØGDA	595912	104120	514	OSLO	OSLO	4	96
45900	FISTER	591060	060410	1	HJELMELAND	ROGALAND	22	94
46910	NEDRE VATS	592904	054504	64	VINDAFJORD	ROGALAND	22	94
43340	NORDRE EIGERØY	582603	055400	63	EIGERSUND	ROGALAND	21	95
44080	OBRESTAD FYR	583955	053332	24	HÅ	ROGALAND	21	93
46610	SAUDA	593892	062180	5	SAUDA	ROGALAND	22	95
47200	SKUDENES II	590894	051400	2	KARMØY	ROGALAND	21	95
44560	SOLA	585306	053822	7	SOLA	ROGALAND	22	94

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLTN	VARTN
43500	UALAND - BJULAND	583282	062127	196	LUND	ROGALAND	21	94
47300	UTSIRA FYR	591846	045270	55	UTSIRA	ROGALAND	21	95
55430	BJØRKEHAUG I JOSTEDAL	613850	071635	324	LUSTER	SOGN OG FJORDANE	24	95
55230	FANARÅKEN	613100	075400	2062	LUSTER	SOGN OG FJORDANE	19	91
55840	FJÆRLAND - SKARESTAD	612612	064635	10	BALESTRAND	SOGN OG FJORDANE	24	96
55160	FORTUN	613000	074203	27	LUSTER	SOGN OG FJORDANE	24	96
57180	FØRDE I SUNNFJORD II	612800	055100	41	FØRDE	SOGN OG FJORDANE	25	96
57750	KINN	613400	044800	10	FLORA	SOGN OG FJORDANE	26	95
59100	KRÅKENES FYR	620210	045920	41	VÅGSØY	SOGN OG FJORDANE	26	95
55780	LEIKANGER	611100	065200	53	LEIKANGER	SOGN OG FJORDANE	23	97
54130	LÆRDAL - TØNJUM	610370	073100	36	LÆRDAL	SOGN OG FJORDANE	24	95
58700	OPPSTRYN	615600	071360	201	STRYN	SOGN OG FJORDANE	23	93
58070	SANDANE	614727	061114	51	GLOPPEN	SOGN OG FJORDANE	25	96
52860	TAKLE	610160	052310	38	GULEN	SOGN OG FJORDANE	22	95
53100	VANGSNES	611035	063873	51	VIK	SOGN OG FJORDANE	23	95
66710	BERKÅK II	625000	100100	441	RENNEBU	SØR-TRØNDELAG	28	96
71990	BUHOLMRÅSA FYR	642401	102703	18	OSEN	SØR-TRØNDELAG	26	93
10400	RØROS	623404	112302	628	RØROS	SØR-TRØNDELAG	6	95
68300	SELBU	631200	110700	197	SELBU	SØR-TRØNDELAG	27	95
65950	SULA FYR	635100	082800	28	FRØYA	SØR-TRØNDELAG	26	94
68170	TRONDHEIM - TYHOLT	632500	102600	113	TRONDHEIM	SØR-TRØNDELAG	27	97
71650	VALLERSUND	635100	094400	4	BJUGN	SØR-TRØNDELAG	26	95
69070	VENNAFJELL	631900	105600	688	SELBU	SØR-TRØNDELAG	26	95
65100	VINJEØRA	631242	085958	9	HEMNE	SØR-TRØNDELAG	27	93
71550	ØRLAND III	634202	093608	10	ØRLAND	SØR-TRØNDELAG	26	95
69000	ØVRE JERVAN	632000	103900	176	TRONDHEIM	SØR-TRØNDELAG	27	95
33060	DALEN I TELEMARK II	592700	080000	77	TOKKE	TELEMARK	14	95
31970	GAUSTATOPPEN	595100	084000	1828	TINN	TELEMARK	19	93
32100	GVARV	592300	091100	26	SAUHERAD	TELEMARK	18	95
34120	JOMFRULAND FYR	585192	093585	12	KRAGERØ	TELEMARK	13	98
31610	MØSSTRAND	595100	080400	948	VINJE	TELEMARK	15	95
37230	TVEITSUND	590163	083124	252	NISSEDAL	TELEMARK	20	95
34500	VEFALL I DRANGEDAL	590000	091300	67	DRANGEDAL	TELEMARK	20	96
89350	BARDUFOSS	690354	183241	76	MÅLSELV	TROMS	36	96
87350	BORKENES	684629	161144	36	KVÆFJORD	TROMS	33	97
89950	DIVIDALEN	684670	194260	228	MÅLSELV	TROMS	37	94
87790	EVENSKJER	683500	163500	7	SKÅNLAND	TROMS	33	95
88900	GIBOSTAD	692101	180405	12	LENVIK	TROMS	33	97
91330	KVESMENES/KVESMENES-RYENG	691500	195900	37	STORFJORD	TROMS	36	95
88680	LEIRKJOSEN	693300	175500	9	LENVIK	TROMS	33	96
91260	LYNGSEIDET IV	693400	201400	3	LYNGEN	TROMS	35	97
90080	MESTERVIK	692006	185364	22	BALSFJORD	TROMS	35	97
91190	NORD-LENANGEN	695500	200900	27	LYNGEN	TROMS	33	94
91750	NORDREISA	694447	210141	1	NORDREISA	TROMS	35	95
92350	NORDSTRAUM I KVÆNANGEN	695002	215306	6	KVÆNANGEN	TROMS	38	96
87420	SANDSØY I SENJA III	685600	164100	45	BJARKØY	TROMS	33	97
88000	TENNEVOLL	684400	174800	22	LAVANGEN	TROMS	36	94
90800	TORSVÅG FYR	701474	193003	21	KARLSØY	TROMS	33	93
90450	TROMSØ	693923	185570	100	TROMSØ	TROMS	33	97
90490	TROMSØ - LANGNES	694060	185480	8	TROMSØ	TROMS	33	94
89800	ØVERBYGD	690107	191682	78	MÅLSELV	TROMS	37	95
39040	KJEVIK	581201	080409	12	KRISTIANSAND	VEST-AGDER	20	95
41660	KONSMO - EIKELAND	581500	071900	260	AUDNEDAL	VEST-AGDER	20	95
39170	KRISTIANSAND S	581000	075900	22	KRISTIANSAND	VEST-AGDER	20	94
41770	LINDESNES FYR	575900	070290	13	LINDESNES	VEST-AGDER	21	96
42160	LISTA FYR	580660	063410	14	FARSUND	VEST-AGDER	21	95
41110	MANDAL II	580280	072740	138	MANDAL	VEST-AGDER	21	95
39100	OKSØY FYR	580402	080305	9	KRISTIANSAND	VEST-AGDER	13	97
27500	FERDER FYR	590160	103180	6	TJØME	VESTFOLD	13	97
27450	MELSOM	591380	102090	26	STOKKE	VESTFOLD	2	97
27410	MÅKERØY	590947	102641	43	TJØME	VESTFOLD	13	97
27470	TORP	591200	101600	90	SANDEFJORD	VESTFOLD	4	98
03410	EIDSBERG II	593000	111700	141	EIDSBERG	ØSTFOLD	2	98
17290	JELØY	592631	103563	12	MOSS	ØSTFOLD	13	97
03150	KALNES	591892	110293	56	FREDRIKSTAD	ØSTFOLD	2	97
01130	PRESTEBAKKE	585958	113230	157	HALDEN	ØSTFOLD	2	95
17150	RYGGE	592298	104729	40	RYGGE	ØSTFOLD	2	96

Table A.2.
Precipitation stations during the 5 year period 1991-95, used for PCA and cluster analysis. CLRR means the cluster number related to daily precipitation sum, VARRR means the percentage of the variance accounted for by the single station.

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLRR	VARRR
19710	ASKER	595137	102622	163	ASKER	AKERSHUS	2	82
02610	BJØRKELANGEN II	595343	113400	135	AURSKOG HØLAND	AKERSHUS	4	79
17740	DRØBAK - ULLERUD	594005	103871	76	FROGN	AKERSHUS	2	87
19480	DØNSKI	595402	103007	59	BÆRUM	AKERSHUS	2	90
11120	EIDSVOLL VERK	601790	110980	181	EIDSVOLL	AKERSHUS	2	86
04050	ENEBAKK	594583	110843	163	ENEBAKK	AKERSHUS	4	81
04070	FLATEBY	594906	110926	189	ENEBAKK	AKERSHUS	2	86
19400	FORNEBU	595356	103695	10	BÆRUM	AKERSHUS	2	86
04730	FURUSMO	600983	110676	200	ULLENSAKER	AKERSHUS	2	88
04780	GARDERMOEN	601239	110481	202	ULLENSAKER	AKERSHUS	2	90
19490	GJETTUM	595438	103097	67	BÆRUM	AKERSHUS	2	87
04440	HAKADAL - BLIKSRUDHAGAN	600586	105187	174	NITTEDAL	AKERSHUS	2	87
11080	HJÆRA	601687	111245	178	EIDSVOLL	AKERSHUS	2	87
04940	HVAM - TOLVHUS	600603	112401	159	NES	AKERSHUS	2	80
11240	JEPPEDALEN	602269	105507	480	HURDAL	AKERSHUS	2	89
11350	ROGNLIEN	602962	105893	394	HURDAL	AKERSHUS	2	86
04850	RÅNÅSFOSS	600161	111966	134	SØRUM	AKERSHUS	2	82
02170	SETTEN	594703	114032	174	AURSKOG HØLAND	AKERSHUS	4	79
04260	SKEDSMO - HELLERUD	595867	105861	148	SKEDSMO	AKERSHUS	2	86
11050	SVANFOSS	601286	112149	127	NES	AKERSHUS	2	83
04740	UKKESTAD	601045	110306	187	NANNESTAD	AKERSHUS	2	89
36060	ARENDAL BRANNSTASJON	582803	084564	44	ARENDAL	AUST-AGDER	9	89
39840	AUSTAD - EKRON	585748	074105	207	BYGLAND	AUST-AGDER	7	88
40900	BJÅEN	593849	072660	927	BYKLE	AUST-AGDER	7	85
40200	BROKKE KRAFTSTASJON	590753	073078	270	VALLE	AUST-AGDER	7	88
39690	BYGLANDSFJORD - SOLBAKKEN	584003	074806	212	BYGLAND	AUST-AGDER	6	91
40420	BYKLE - KULTRAN	592110	072081	599	BYKLE	AUST-AGDER	7	86
36490	BØYLEFOSS	583580	084312	63	FROLAND	AUST-AGDER	8	93
38380	DOVLAND	583136	080248	259	BIRKENES	AUST-AGDER	10	91
35090	EIKELAND	584827	090595	42	GJERSTAD	AUST-AGDER	8	93
35200	GJERSTAD I AUST-AGDER	585316	085695	240	GJERSTAD	AUST-AGDER	8	90
39550	HANNÅSMYRAN	583105	074417	190	EVJE OG HORNNES	AUST-AGDER	10	92
38450	HEREFOSS	583103	082121	85	BIRKENES	AUST-AGDER	8	94
40270	HOMME	591429	073280	364	VALLE	AUST-AGDER	7	85
37040	KATTERÅS	585063	083966	227	ÅMLI	AUST-AGDER	6	92
35860	LYNGØR FYR	583801	090902	4	TVEDESTRAND	AUST-AGDER	8	84
38600	MYKLAND	583800	081698	245	FROLAND	AUST-AGDER	6	88
36560	NELAUG	583949	083788	142	ÅMLI	AUST-AGDER	8	92
36300	REIERSØL	582818	083694	42	FROLAND	AUST-AGDER	8	93
38420	RISLÅ	582549	081801	66	BIRKENES	AUST-AGDER	8	92
35340	RISØR BRANNSTASJON	584314	091267	36	RISØR	AUST-AGDER	8	90
36880	SMELAND	585660	081218	310	ÅMLI	AUST-AGDER	6	91
36200	TORUNGEN FYR	582300	084751	12	ARENDAL	AUST-AGDER	5	85
38800	TOVDAL	584758	081406	227	ÅMLI	AUST-AGDER	6	88
35590	VEGÅRSHEI - SPILLING	584570	085202	170	VEGÅRSHEI	AUST-AGDER	8	93
24100	ASK PÅ RINGERIKE	600836	101062	77	RINGERIKE	BUSKERUD	2	70
29790	DAGALI II	602471	082674	828	HOL	BUSKERUD	6	80
26380	EGGEDAL III	601483	092076	293	SIGDAL	BUSKERUD	6	86
26160	FOSSUM I MODUM	595405	095209	105	MODUM	BUSKERUD	6	84
25640	GEILO	603190	080969	841	HOL	BUSKERUD	7	80
25590	GEILO - GEILOSTØLEN	603104	081209	810	HOL	BUSKERUD	7	77
24600	GRIMELI I KRØDSHERAD	600826	093582	367	KRØDSHERAD	BUSKERUD	6	88
24770	GULSVIK IV	602338	093438	149	FLÅ	BUSKERUD	2	81
26670	HAKAVIK	593753	095727	21	ØVRE EIKER	BUSKERUD	6	88
25100	HEMSEDAL - HØLTO	605226	083194	648	HEMSEDAL	BUSKERUD	7	77
26240	HIÅSEN I SIGDAL	600073	093060	402	SIGDAL	BUSKERUD	6	86
20250	HOLE	600654	101781	66	RINGERIKE	BUSKERUD	2	70
19850	HURUM	593440	102952	122	HURUM	BUSKERUD	5	83
28370	KONGSBERG IV	593978	093900	168	KONGSBERG	BUSKERUD	6	84
28800	LYNGDAL I NUMEDAL	595454	093157	288	FLESBERG	BUSKERUD	6	88
22610	MO I ÅDAL	603369	095933	160	RINGERIKE	BUSKERUD	2	86
30220	MYKLE	592503	094224	430	KONGSBERG	BUSKERUD	6	92
24880	NESBYEN - SKOGLUND	603411	090732	167	NES	BUSKERUD	2	84
29230	NORE	601603	085788	378	NORE OG UVDAL	BUSKERUD	6	87

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLRR	VARRR
24210	SOKNA II	601430	095557	140	RINGERIKE	BUSKERUD	2	86
19200	STORFLÅTAN I NORDMARKA	600751	102862	462	RINGERIKE	BUSKERUD	2	86
29600	TUNHOVD	602782	084515	870	NORE OG UVDAL	BUSKERUD	2	74
29310	UVDAL II	601609	084679	486	NORE OG UVDAL	BUSKERUD	6	87
29350	UVDAL KRAFTVERK	601530	084234	648	NORE OG UVDAL	BUSKERUD	6	85
25240	VATS	604116	081896	800	ÅL	BUSKERUD	7	79
28920	VEGGLI	600311	090925	243	ROLLAG	BUSKERUD	6	90
25320	ÅL III	603832	083396	706	ÅL	BUSKERUD	7	78
96000	ADAMSELV KRAFTVERK	702413	264166	19	LEBESBY	FINNMARK	48	70
93140	ALTA LUFTHAVN	695865	233811	3	ALTA	FINNMARK	48	64
95350	BANAK	700360	245940	5	PORSANGER	FINNMARK	41	71
98060	BERLEVÅG - BAKKETUN	705200	290006	19	BERLEVÅG	FINNMARK	48	64
99450	BJØRNSUND	692704	300415	28	SØR-VARANGER	FINNMARK	41	74
95610	BØRSELV - HØGBAKKEN	701924	253282	13	PORSANGER	FINNMARK	48	69
94500	FRUHOLMEN FYR	710560	235970	13	MÅSØY	FINNMARK	48	63
94700	HELNES FYR	710380	261380	33	NORDKAPP	FINNMARK	48	64
97690	ISKORASJOHKA	691489	254167	153	KARASJOK	FINNMARK	41	66
97320	JERGOL	692411	243938	230	KARASJOK	FINNMARK	41	80
93500	JOTKAJAVRE	694527	235605	389	ALTA	FINNMARK	41	79
97250	KARASJOK	692800	253060	129	KARASJOK	FINNMARK	41	79
99370	KIRKENES LUFTHAVN	694400	295400	89	SØR-VARANGER	FINNMARK	41	77
99690	LANABUKT	694462	302871	15	SØR-VARANGER	FINNMARK	41	64
96220	LEBESBY - KARLMYHR	703489	265963	18	LEBESBY	FINNMARK	48	70
92700	LOPPA	702030	212800	10	LOPPA	FINNMARK	48	71
98400	MAKKAUR FYR	704203	300408	9	BÅTSFJORD	FINNMARK	48	70
97580	MOLLESJOHKA	693396	242347	382	KARASJOK	FINNMARK	41	74
96930	POLMAK	700487	275875	30	DEATNU-TANA	FINNMARK	41	81
94130	PORSA II	702395	233754	38	KVALSUND	FINNMARK	48	74
97110	PORT	694561	261061	115	KARASJOK	FINNMARK	41	67
96800	RUSTEFJELBMA	702402	281201	9	DEATNU-TANA	FINNMARK	41	72
93900	SIHCAJAVRI	684502	233202	382	KAUTOKEINO	FINNMARK	41	56
96970	SIRBMA	700113	272483	51	DEATNU-TANA	FINNMARK	41	74
94180	SKAIDI	702597	243048	62	KVALSUND	FINNMARK	48	59
98650	SKALLELV	701131	302032	16	VADSØ	FINNMARK	41	72
95270	SKOGANVARRE II	695026	250536	74	PORSANGER	FINNMARK	41	66
99500	SKOGFOSS	692238	294168	55	SØR-VARANGER	FINNMARK	41	77
96400	SLETNES FYR	710504	281307	8	GAMVIK	FINNMARK	48	56
93300	SUOLOVUOPMI	693530	233190	374	KAUTOKEINO	FINNMARK	41	74
97150	VALJOK	694151	255578	132	KARASJOK	FINNMARK	41	72
98550	VARDØ	702203	310509	14	VARDØ	FINNMARK	41	62
95900	VEIDNES I LAKSEFJORD	703962	263541	6	LEBESBY	FINNMARK	48	62
99330	VEINES I NEIDEN	694223	291514	44	SØR-VARANGER	FINNMARK	41	77
98850	VESTRE JAKOBSELV	700652	292028	11	VADSØ	FINNMARK	41	76
08720	ATNASJØ	615341	100850	749	STOR-ELVDAL	HEDMARK	2	66
08770	ATNDALEN - ERIKSRUD	615835	100173	731	FOLLDAL	HEDMARK	28	71
08450	ATNDALEN - RØNNINGEN	614749	103017	535	STOR-ELVDAL	HEDMARK	1	71
09870	BLANKTJERNMOEN I KVIKNE	622597	102504	690	TYNSET	HEDMARK	3	59
00700	DREVSJØ	615323	120288	672	ENGERDAL	HEDMARK	1	76
00770	ELLEFSPLASS	621224	112715	713	TOLGA	HEDMARK	1	79
06620	ELVERUM - FAGERTUN	605468	113569	230	ELVERUM	HEDMARK	1	81
07830	ELVÅL	615588	110359	276	RENDALEN	HEDMARK	1	78
08130	EVENSTAD - ØVERENGET	612432	110858	255	STOR-ELVDAL	HEDMARK	1	82
07900	FINSTAD	620628	110302	513	RENDALEN	HEDMARK	1	81
06040	FLISA	603704	120102	184	ÅSNES	HEDMARK	1	75
09100	FOLLDAL	620759	100290	709	FOLLDAL	HEDMARK	3	69
00600	GLØTVOLA	615065	115101	696	ENGERDAL	HEDMARK	1	79
12310	HAMAR VANNVERK	604862	110128	132	HAMAR	HEDMARK	2	77
07010	HAUGEDALSHØGDA	610955	112655	240	ÅMOT	HEDMARK	1	85
00420	HEGGERISET - NORDSTRAND	614111	115990	481	ENGERDAL	HEDMARK	1	79
12200	JØNSBERG LANDBRUKSSKOLE	604506	111239	218	STANGE	HEDMARK	2	77
66850	KVIKNE I ØSTERDAL	623580	101629	550	TYNSET	HEDMARK	3	75
00060	LINNES	613351	122964	564	TRYSIL	HEDMARK	1	77
02950	MAGNOR	595803	121264	154	EIDSKOG	HEDMARK	2	69
05800	MELDALEN	602356	122146	293	GRUE	HEDMARK	1	67
12520	NES PÅ HEDMARK	604749	105753	205	RINGSAKER	HEDMARK	2	76
05350	NORD-ODAL	602332	113361	147	NORD-ODAL	HEDMARK	2	82
07570	NORDRE LØSSET	612341	112234	256	ÅMOT	HEDMARK	1	84
10100	OS I ØSTERDAL	623100	110132	788	OS	HEDMARK	28	67
07250	OSSJØEN	611501	114486	450	ÅMOT	HEDMARK	1	83
00100	PLASSEN	610813	123031	333	TRYSIL	HEDMARK	1	74
12250	ROKO	604637	112890	324	LØTEN	HEDMARK	2	76
06490	RUNDBERGET	604902	120552	347	VÅLER	HEDMARK	1	77
12960	SJUSJØEN - STORÅSEN	610988	104258	930	RINGSAKER	HEDMARK	1	80

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLRR	VARRR
02910	SKOTTERUD - BERGSTAD	595919	120838	153	EIDSKOG	HEDMARK	2	77
00290	TÅGMYRA	612497	120410	557	TRYSIL	HEDMARK	1	78
00730	VALDALEN	620485	121040	794	ENGERDAL	HEDMARK	1	78
12600	VEA	605717	104088	161	RINGSAKER	HEDMARK	2	78
06440	VERMUNDSJØEN	604178	122221	230	ÅSNES	HEDMARK	1	69
05650	VINGER	601319	120168	175	KONGSVINGER	HEDMARK	2	75
06550	ØRBEKKEDALEN	610282	115339	513	ELVERUM	HEDMARK	1	81
07660	ÅKRESTRØMMEN	614180	111235	260	RENDALEN	HEDMARK	1	74
50540	BERGEN - FLORIDA	602300	052002	12	BERGEN	HORDALAND	18	93
53180	BRANDSET	604763	064157	460	VOSS	HORDALAND	18	91
51400	BREKKHUS	604419	060863	202	VOSS	HORDALAND	18	94
51470	BULKEN	603876	061341	323	VOSS	HORDALAND	18	91
48050	BØMLO - FINNÅS	594386	051441	23	BØMLO	HORDALAND	18	89
49630	EIDFJORD	602801	070434	5	EIDFJORD	HORDALAND	7	86
49580	EIDFJORD - BU	602803	065163	165	EIDFJORD	HORDALAND	7	89
52400	EIKANGER - MYR	603738	052285	72	LINDÅS	HORDALAND	18	93
47820	EIKEMO	595148	061695	178	ETNE	HORDALAND	16	94
52170	EKSINGEDAL	604816	060901	450	VAKSDAL	HORDALAND	18	95
47500	ETNE	593960	055801	35	ETNE	HORDALAND	17	91
50450	FANA - STEND	601640	051989	54	BERGEN	HORDALAND	18	91
48250	FITJAR - PRESTBØ	595500	051898	24	FITJAR	HORDALAND	18	90
52110	FJELLANGER II	604795	060396	456	VAKSDAL	HORDALAND	18	94
52750	FRØYSET	605088	051304	13	MASFJORDEN	HORDALAND	18	85
52220	GULLBRÅ	604973	061500	579	VAKSDAL	HORDALAND	18	94
50150	HATLESTRAND	600253	055434	45	KVINNHERAD	HORDALAND	17	89
52600	HAUKELAND	604949	053439	196	MASFJORDEN	HORDALAND	21	96
52440	HOLSNØY - LANDSVIK	603633	050354	27	MELAND	HORDALAND	18	90
48450	HUSNES	595189	054637	13	KVINNHERAD	HORDALAND	18	91
53160	JORDALEN - NÅSEN	605404	064365	614	VOSS	HORDALAND	18	93
49550	KINSARVIK	602235	064429	108	ULLENSVANG	HORDALAND	7	90
50300	KVAMSKOGEN	602360	055480	408	SAMNANGER	HORDALAND	22	88
49070	KVÅLE	601678	062294	342	JONDAL	HORDALAND	19	85
49750	LISET	602541	071654	748	EIDFJORD	HORDALAND	7	80
48090	LITLABØ - DALE	594756	052591	35	STORD	HORDALAND	18	90
47600	LITLEDAL	593944	060391	83	ETNE	HORDALAND	17	93
52640	MATRE KRAFTSTASJON	605244	053562	7	MASFJORDEN	HORDALAND	21	95
52290	MODALEN II	605046	055720	114	MODALEN	HORDALAND	21	94
50050	NEDRE ÅLVIK	602595	062526	18	KVAM	HORDALAND	7	93
50130	OMASTRAND	601302	055902	2	KVAM	HORDALAND	18	93
47890	OPSTVEIT	595140	060113	38	KVINNHERAD	HORDALAND	16	94
51670	REIMEGREND	604110	064460	590	VOSS	HORDALAND	20	88
48500	ROSENDAL	595946	060167	54	KVINNHERAD	HORDALAND	17	88
46450	RØLDAL	594986	064954	393	ODDA	HORDALAND	16	93
46460	RØLDAL KRAFTVERK	594934	064913	390	ODDA	HORDALAND	16	94
50350	SAMNANGER	602784	055363	370	SAMNANGER	HORDALAND	18	94
48330	SLÅTTERØY FYR	595450	050440	15	FITJAR	HORDALAND	18	84
47450	STRAUMØY	593923	052611	37	SVEIO	HORDALAND	18	91
50250	TYSSE	602249	054592	41	SAMNANGER	HORDALAND	22	93
49350	TYSSEDAL I	600719	063365	32	ODDA	HORDALAND	20	82
47750	VINTERTUN	595466	063069	395	ODDA	HORDALAND	16	95
51590	VOSS - BØ	603870	062970	125	VOSS	HORDALAND	20	89
51250	ØVSTEDAL	604132	055788	316	VOSS	HORDALAND	18	95
50080	ØYSTESE - BORGE	602274	061156	108	KVAM	HORDALAND	18	93
65150	AUREDALEN	631666	083647	179	AURE	MØRE OG ROMSDAL	31	85
59560	BRANDAL	622409	060050	17	HAREID	MØRE OG ROMSDAL	25	92
60890	BRUSDALSVATN II	622789	062385	27	ÅLESUND	MØRE OG ROMSDAL	25	88
62900	EIDE PÅ NORDMØRE	625349	072343	49	EIDE	MØRE OG ROMSDAL	27	94
61850	EIKESDAL	622842	081064	39	NESSET	MØRE OG ROMSDAL	26	88
59670	EKSET I VOLDA	621007	060208	58	VOLDA	MØRE OG ROMSDAL	23	90
61820	ERESFJORD	623981	080638	14	NESSET	MØRE OG ROMSDAL	26	90
59610	FISKÅBYGD	620617	053500	41	VANYLVEN	MØRE OG ROMSDAL	23	91
60300	GEIRANGER	620460	072629	419	STRANDA	MØRE OG ROMSDAL	26	87
60620	GRØNNING	621976	073085	312	NORDDAL	MØRE OG ROMSDAL	26	89
63530	HAFSÅS	623057	085864	698	SUNNDAL	MØRE OG ROMSDAL	28	84
64460	HALSAFJORD II	625857	081456	12	TINGVOLL	MØRE OG ROMSDAL	27	86
61040	HILDRE	623622	061944	13	HARAM	MØRE OG ROMSDAL	25	85
61170	HJELVIK I ROMSDAL	623697	071264	21	RAUMA	MØRE OG ROMSDAL	26	82
62700	HUSTADVATN	625453	071472	80	FRÆNA	MØRE OG ROMSDAL	27	94
64700	INNERDAL	624333	084747	403	SUNNDAL	MØRE OG ROMSDAL	26	84
62160	ISTAD KRAFTSTASJON	624857	074213	15	MOLDE	MØRE OG ROMSDAL	27	89
60400	NORDDAL	621486	071449	28	NORDDAL	MØRE OG ROMSDAL	26	88
62480	ONA II	625158	063237	13	SANDØY	MØRE OG ROMSDAL	25	79
64900	RINDAL	630228	091323	231	RINDAL	MØRE OG ROMSDAL	30	82

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLRR	VARRR
60710	STORDAL - OVERØYE	622460	071298	398	ØRSKOG	MØRE OG ROMSDAL	26	92
60210	STRANDA VEGSTASJON	621890	065593	79	STRANDA	MØRE OG ROMSDAL	26	89
63420	SUNNDALSØRA III	624050	083353	6	SUNNDAL	MØRE OG ROMSDAL	26	87
64800	SURNADAL	630030	090068	39	SURNADAL	MØRE OG ROMSDAL	30	90
59800	SVINØY FYR	621970	051620	38	HERØY	MØRE OG ROMSDAL	25	52
59900	SÆBØ	621219	062806	21	ØRSTA	MØRE OG ROMSDAL	23	90
60500	TAFJORD	621401	072500	15	NORDDAL	MØRE OG ROMSDAL	26	87
64550	TINGVOLL - HANEM	625043	081790	69	TINGVOLL	MØRE OG ROMSDAL	26	88
61550	VERMA	622052	080326	247	RAUMA	MØRE OG ROMSDAL	28	83
60990	VIGRA	623370	060690	22	GISKE	MØRE OG ROMSDAL	25	85
63100	ØKSENDAL	624113	082547	47	SUNNDAL	MØRE OG ROMSDAL	26	90
60800	ØRSKOG	622873	064920	4	ØRSKOG	MØRE OG ROMSDAL	26	73
59710	ØRSTAVIK - VELLE	621243	060945	35	ØRSTA	MØRE OG ROMSDAL	23	93
60970	ÅLESUND III	622857	061209	136	ÅLESUND	MØRE OG ROMSDAL	25	88
64580	ÅLVUNDFJORD	625008	083128	5	SUNNDAL	MØRE OG ROMSDAL	26	87
61350	ÅNDALSNES	623395	074064	20	RAUMA	MØRE OG ROMSDAL	26	87
72250	BANGDALEN	641992	113269	62	NAMSOS	NORD-TRØNDELAG	29	84
69960	BURAN	634322	113273	182	LEVANGER	NORD-TRØNDELAG	29	78
69660	FROSTA - JUBERG	633514	104560	45	FROSTA	NORD-TRØNDELAG	29	81
69230	HEGRA II	632641	111538	33	STJØRDAL	NORD-TRØNDELAG	29	82
70850	KJØBLI I SNÅSA	640950	122870	195	SNÅSA	NORD-TRØNDELAG	29	80
69470	KOPPERÅ	632375	115048	294	MERÅKER	NORD-TRØNDELAG	29	71
75600	LEKA	650585	114213	47	LEKA	NORD-TRØNDELAG	34	87
71280	LEKSVIK - MYRAN	634118	103682	138	LEKSVIK	NORD-TRØNDELAG	32	88
75100	LIAFOSS	645032	115741	44	NÆRØY	NORD-TRØNDELAG	34	91
72100	NAMDALSEID	641501	111200	86	NAMDALSEID	NORD-TRØNDELAG	29	85
74800	NAMSVATN	645913	133516	498	RØYRVIK	NORD-TRØNDELAG	33	87
73500	NORDLI - HOLAND	642676	134317	433	LIERNE	NORD-TRØNDELAG	33	71
75020	OTTERØY	643145	111732	36	NAMSOS	NORD-TRØNDELAG	34	86
72650	OVERHALLA - UNNSET	642890	115039	26	OVERHALLA	NORD-TRØNDELAG	29	80
69410	ROTVOLL	631636	114836	587	MERÅKER	NORD-TRØNDELAG	29	77
75270	RØRVIK - ENGAN	645285	111500	15	VIKNA	NORD-TRØNDELAG	34	85
74510	SANDÅMO	645523	131090	216	NAMSSKOGAN	NORD-TRØNDELAG	33	82
71150	SELAVATN	635914	105229	296	VERRAN	NORD-TRØNDELAG	32	89
70480	SKJÆKERFOSSEN	635035	120139	110	VERDAL	NORD-TRØNDELAG	29	86
75550	SKLINNA FYR	651214	105979	23	LEKA	NORD-TRØNDELAG	34	64
73250	SØRLI	641460	134624	370	LIERNE	NORD-TRØNDELAG	33	69
73800	TUNNSJØ	644105	133941	376	LIERNE	NORD-TRØNDELAG	33	77
70820	UTGÅRD	640700	114439	50	STEINKJER	NORD-TRØNDELAG	31	81
75150	VAL LANDBRUKSSKOLE	644721	112525	22	NÆRØY	NORD-TRØNDELAG	34	78
70500	VERA	634804	122324	368	VERDAL	NORD-TRØNDELAG	29	83
69100	VÆRNES	632755	105611	12	STJØRDAL	NORD-TRØNDELAG	29	78
69550	ØSTÅS I HEGRA	632925	112132	175	STJØRDAL	NORD-TRØNDELAG	29	82
86950	ALSVÅG I VESTERÅLEN II	685488	151276	18	ØKSNES	NORDLAND	47	89
87110	ANDØYA	691780	160880	10	ANDØY	NORDLAND	47	85
84450	ANKENES	682251	172482	249	NARVIK	NORDLAND	43	84
78350	BARDAL	661304	132350	39	LEIRFJORD	NORDLAND	36	91
86850	BARKESTAD	684904	144812	3	ØKSNES	NORDLAND	47	89
81080	BEIARN - NAUSTVOLD	670157	143455	15	BEIARN	NORDLAND	39	90
84070	BJØRKÅSEN	681925	164724	80	BALLANGEN	NORDLAND	42	90
82290	BODØ VI	671645	142601	11	BODØ	NORDLAND	41	81
78100	DREVJA	655992	132500	63	VEFSN	NORDLAND	35	91
79740	DUNDERLANDSDALEN	663041	145445	154	RANA	NORDLAND	35	89
77270	FALLMOEN	654013	131604	70	GRANE	NORDLAND	33	86
78770	FAMVATNET	654779	142924	510	HATTFJELLDAL	NORDLAND	33	77
83550	FINNØY I HAMARØY	680004	153659	53	HAMARØY	NORDLAND	41	90
80700	GLOMFJORD	664860	135888	39	MELØY	NORDLAND	38	95
79710	GRØNFJELLDAL	661835	145000	327	RANA	NORDLAND	33	79
79640	GRØNLIGROTTEN	662522	141443	83	RANA	NORDLAND	35	93
81730	JUNKERDAL	664807	153472	210	SALTDAL	NORDLAND	39	57
82560	KJERRINGØY - STRANDÅ	673258	145270	22	BODØ	NORDLAND	41	91
83500	KRÅKMO	674758	155924	76	HAMARØY	NORDLAND	42	90
78250	LEIRFJORD	660402	125495	53	LEIRFJORD	NORDLAND	36	93
81250	LEIRÅMO	664560	143480	217	BEIARN	NORDLAND	39	90
85540	LEKNES I LOFOTEN	680843	133659	13	VESTVÅGØY	NORDLAND	46	79
84960	LILAND	682881	165314	19	EVENES	NORDLAND	43	85
80200	LURØY	662338	131123	115	LURØY	NORDLAND	37	99
81770	LØNSDAL	664458	152700	511	SALTDAL	NORDLAND	39	63
77420	MAJAVATN III	651080	132520	339	GRANE	NORDLAND	33	82
79480	MO I RANA III	661884	140970	51	RANA	NORDLAND	33	87
84800	NARVIK III	682829	173000	17	NARVIK	NORDLAND	43	86
85660	REINE	675592	130550	17	MOSKENES	NORDLAND	45	99
85180	RINBØ	682245	154544	6	LØDINGEN	NORDLAND	44	95

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78850	RØSSVATN - HEGGMO	655462	141633	399	HEMNES	NORDLAND	33	91
81680	SALTDAL	665093	151894	81	SALTDAL	NORDLAND	39	62
84190	SKJOMEN - STIBERG	681258	173097	29	NARVIK	NORDLAND	43	76
85380	SKROVA FYR	680902	143905	11	VÅGAN	NORDLAND	41	74
86500	SORTLAND	684202	152501	3	SORTLAND	NORDLAND	47	89
83300	STEIGEN	675536	150692	26	STEIGEN	NORDLAND	41	87
81900	SULITJELMA	670809	160427	142	FAUSKE	NORDLAND	40	75
77850	SUSENDAL	652151	141563	498	HATTFJELLDAL	NORDLAND	33	69
77750	SUSENDAL - BJORMO	653070	140130	265	HATTFJELLDAL	NORDLAND	33	87
76250	SØMNA - STEIN	651780	121008	19	SØMNA	NORDLAND	34	83
83880	SØRFJORD KRAFTVERK	680375	163553	5	TYSFJORD	NORDLAND	42	90
86470	SØRKLEIVDALEN	683931	153641	91	SORTLAND	NORDLAND	47	90
80950	TENNHOLMEN FYR	671812	132994	14	BODØ	NORDLAND	41	72
78610	TUSTERVATNET II	654981	135440	439	HEMNES	NORDLAND	33	90
83520	TØMMERNESET	675386	155204	70	HAMARØY	NORDLAND	42	94
85200	YTTERSTAD	682016	154032	8	LØDINGEN	NORDLAND	44	93
76100	ØKSNINGØY	650737	122242	17	BINDAL	NORDLAND	34	82
11900	BIRI	605716	103583	190	GJØVIK	OPPLAND	2	83
15720	BRÅTÅ	615440	075160	712	SKJÅK	OPPLAND	3	80
15430	BØVERDAL	614319	081466	701	LOM	OPPLAND	3	75
11710	EINAVATN	603573	103852	406	VESTRE TOTEN	OPPLAND	2	84
13700	ESPEDALEN	612500	093208	752	SØR-FRON	OPPLAND	3	84
21860	ETNEDAL - ØYEN S.	615996	093410	486	ETNEDAL	OPPLAND	2	83
23420	FAGERNES	605920	091420	365	NORD-AURDAL	OPPLAND	2	83
16610	FOKSTUA II	620687	091724	972	DOVRE	OPPLAND	3	71
13050	GAUSDAL - SKOGLI	611629	101225	647	GAUSDAL	OPPLAND	2	82
11610	GJØVIK	604789	104115	154	GJØVIK	OPPLAND	2	84
14710	GROV	614874	090091	808	VÅGÅ	OPPLAND	3	80
22730	HEDAL I VALDRES II	603719	094372	480	SØR-AURDAL	OPPLAND	2	85
13450	HOVDGRENDA	613988	095856	666	RINGEBU	OPPLAND	2	62
16270	HØVRINGEN	615341	092843	935	SEL	OPPLAND	3	69
16740	KJØREMSGRENDI	620563	090276	626	LESJA	OPPLAND	3	82
16790	LESJA - SVANBORG	620635	085523	551	LESJA	OPPLAND	3	82
61770	LESJASKOG	621390	082240	621	LESJA	OPPLAND	28	82
15090	LOM - AUKRUST	614908	082926	495	LOM	OPPLAND	3	74
16850	LORA - LEIRMO	621008	083871	621	LESJA	OPPLAND	3	73
20520	LUNNER	601766	103482	372	LUNNER	OPPLAND	2	84
21770	NORD TORPA - STAUM	610022	095900	526	NORDRE LAND	OPPLAND	2	85
22950	NORD-AURDAL II	605527	092526	452	NORD-AURDAL	OPPLAND	2	85
21360	ODNES	604805	100704	156	NORDRE LAND	OPPLAND	2	83
13640	OLSTAPPEN	613065	092445	687	NORD-FRON	OPPLAND	2	82
14550	PRESTSTULEN	615529	090079	823	VÅGÅ	OPPLAND	3	81
22840	REINLI	605011	092960	628	SØR-AURDAL	OPPLAND	2	71
14050	SJOA	614057	093348	330	SEL	OPPLAND	2	78
15660	SKJÅK	615411	081034	432	SKJÅK	OPPLAND	3	74
15480	SKJÅK II	615267	082830	372	SKJÅK	OPPLAND	3	72
13670	SKÅBU - STORSLÅEN	613091	092294	890	NORD-FRON	OPPLAND	2	76
13310	SØRE BREKKOM	612777	101906	780	RINGEBU	OPPLAND	1	71
16240	TOLSTADÅSEN	614917	092329	656	SEL	OPPLAND	3	75
23850	TYINKRYSSET	611205	081308	864	VANG	OPPLAND	3	81
23720	VANG I VALDRES	610756	083492	477	VANG	OPPLAND	3	67
13420	VENABU	613901	100665	930	RINGEBU	OPPLAND	1	73
21680	VEST-TORPA II	605620	100229	550	NORDRE LAND	OPPLAND	2	86
13100	VESTRE GAUSDAL	612069	094639	580	GAUSDAL	OPPLAND	2	81
14580	VÅGÅMO - N.GRINDSTUGU	615241	090557	371	VÅGÅ	OPPLAND	3	80
14690	ØVRE TESSA	614928	085757	746	VÅGÅ	OPPLAND	3	83
23160	ÅBJØRSBRÅTEN	605510	091741	639	NORD-AURDAL	OPPLAND	2	86
18500	BJØRNHOLT I NORDMARKA	600306	104119	360	OSLO	OSLO	2	89
19100	KJELSÅS I SØRKEDALEN	600224	103586	319	OSLO	OSLO	2	85
18450	MARIDALSOSET	595814	104760	173	OSLO	OSLO	2	88
18160	NORDSTRAND	595237	104755	118	OSLO	OSLO	2	81
18700	OSLO - BLINDERN	595656	104324	94	OSLO	OSLO	2	86
18960	TRYVASSHØGDA II	595920	104133	528	OSLO	OSLO	2	89
45600	BJØRHEIM I RYFYLKE	590460	060150	64	STRAND	ROGALAND	15	89
43360	EGERSUND	582716	060018	4	EIGERSUND	ROGALAND	13	87
47390	HAUGESUND - ROSSABØ	592381	051768	25	HAUGESUND	ROGALAND	18	87
44520	HELLAND I GJESDAL	584535	060089	280	GJESDAL	ROGALAND	15	95
43450	HELLELAND	583219	060991	94	EIGERSUND	ROGALAND	13	94
44160	HOGNESTAD	584173	053362	19	TIME	ROGALAND	13	83
46850	HUNDSEID I VIKEDAL	593418	055979	159	VINDAFJORD	ROGALAND	16	92
44760	IMS	585433	055803	2	SANDNES	ROGALAND	15	94
45350	LYSEBOTN	590341	063896	9	FORSAND	ROGALAND	14	94
45200	LYSEFJORDEN	590092	062594	4	FORSAND	ROGALAND	14	94

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44960	MADLAND	584661	060516	297	GJESDAL	ROGALAND	15	95
43810	MAUDAL	584597	062219	311	GJESDAL	ROGALAND	12	95
46910	NEDRE VATS	592904	054504	64	VINDAFJORD	ROGALAND	18	92
47020	NEDSTRAND	592070	054784	10	TYSVÆR	ROGALAND	18	89
46400	NESFLATEN	593898	064922	72	SULDAL	ROGALAND	16	95
44900	OLTEDAL	584985	060340	44	GJESDAL	ROGALAND	15	87
44600	RENNESØY - GALTA	590790	053640	19	RENNESØY	ROGALAND	15	85
46150	SAND I RYFYLKE II	592874	061657	25	SULDAL	ROGALAND	16	92
46610	SAUDA	593892	062180	5	SAUDA	ROGALAND	17	93
47090	SKJOLD - FRØVIK	593020	053754	5	VINDAFJORD	ROGALAND	18	90
44560	SOLA	585306	053822	7	SOLA	ROGALAND	15	85
46300	SULDALSVATN	593532	064854	333	SULDAL	ROGALAND	16	94
44800	SVILAND	584911	055521	230	SANDNES	ROGALAND	15	93
44480	SØYLAND I GJESDAL	584098	055938	263	GJESDAL	ROGALAND	15	94
43500	UALAND - BJULAND	583282	062127	196	LUND	ROGALAND	13	92
46050	ULLA	592276	063166	200	SULDAL	ROGALAND	16	95
47300	UTSIRA FYR	591846	045270	55	UTSIRA	ROGALAND	7	67
43540	ØRSDALEN	584067	062129	70	BJERKREIM	ROGALAND	12	93
53700	AURLAND	605419	071211	15	AURLAND	SOGN OG FJORDANE	7	73
55430	BJØRKEHAUG I JOSTEDAL	613850	071635	324	LUSTER	SOGN OG FJORDANE	3	84
54500	BORLO	610445	075732	502	LÆRDAL	SOGN OG FJORDANE	7	79
57480	BOTNEN I FØRDE	613217	060361	237	FØRDE	SOGN OG FJORDANE	3	95
58480	BRIKSDAL	614167	064858	40	STRYN	SOGN OG FJORDANE	3	86
56650	DALE I SUNNFJORD II	612124	052416	51	FJALER	SOGN OG FJORDANE	20	94
57850	DAVIKNES	615357	053252	178	BREMANGER	SOGN OG FJORDANE	23	92
57680	EIKEFJORD	613533	052832	30	FLORA	SOGN OG FJORDANE	20	93
57660	EIMHJELLEN	613849	054898	170	GLOPPEN	SOGN OG FJORDANE	23	94
55840	FJÆRLAND - SKARESTAD	612612	064635	10	BALESTRAND	SOGN OG FJORDANE	20	93
55160	FORTUN	613000	074203	27	LUSTER	SOGN OG FJORDANE	3	82
53130	FRESVIK	610416	071638	32	LEIKANGER	SOGN OG FJORDANE	7	86
56800	GAULAR	611968	054788	79	GAULAR	SOGN OG FJORDANE	20	92
57990	GJENGEDAL	613959	055691	230	GLOPPEN	SOGN OG FJORDANE	23	93
57610	GRYTA	612954	052764	34	NAUSTDAL	SOGN OG FJORDANE	20	84
57780	GRØNDALEN	614156	053450	105	FLORA	SOGN OG FJORDANE	24	94
56560	GUDDAL	611480	053163	71	FJALER	SOGN OG FJORDANE	21	94
55550	HAFSLO	611758	071146	246	LUSTER	SOGN OG FJORDANE	3	86
56960	HAUKEDAL	612535	062274	329	FØRDE	SOGN OG FJORDANE	20	93
58960	HORNINDAL	620019	063907	340	HORNINDAL	SOGN OG FJORDANE	23	90
56520	HOVLANDSDAL	611374	052583	89	FJALER	SOGN OG FJORDANE	21	94
56010	HØYANGER VERK	611303	060357	5	HØYANGER	SOGN OG FJORDANE	20	94
58400	INNVIK	615102	063760	32	STRYN	SOGN OG FJORDANE	3	85
58120	KLAKEGG - BOLSET	613623	063089	187	JØLSTER	SOGN OG FJORDANE	3	94
56320	LAVIK	610673	053282	31	HØYANGER	SOGN OG FJORDANE	20	91
55390	LEIRDAL	612843	071281	378	LUSTER	SOGN OG FJORDANE	20	80
54130	LÆRDAL - TØNJUM	610370	073100	36	LÆRDAL	SOGN OG FJORDANE	7	76
54600	MARISTOVA	610656	080216	806	LÆRDAL	SOGN OG FJORDANE	7	83
58320	MYKLEBUST I BREIM	614281	063699	315	GLOPPEN	SOGN OG FJORDANE	3	88
53410	MYRDAL IV	604411	070731	855	AURLAND	SOGN OG FJORDANE	20	72
58780	NORDFJORDEID - NYMARK	615514	060242	34	EID	SOGN OG FJORDANE	23	90
52990	ORTNEVIK	610652	060837	4	HØYANGER	SOGN OG FJORDANE	20	86
57110	OSLAND VED STONGFJORDEN	612595	051326	100	ASKVOLL	SOGN OG FJORDANE	21	93
56280	RØRVIKVATN VED VADHEIM	611298	054508	350	HØYANGER	SOGN OG FJORDANE	21	94
58070	SANDANE	614727	061114	51	GLOPPEN	SOGN OG FJORDANE	3	85
58880	SINDRE	615543	063251	118	STRYN	SOGN OG FJORDANE	3	90
57390	SKEI I JØLSTER	613456	062953	205	JØLSTER	SOGN OG FJORDANE	3	93
55730	SOGNDAL - SELSENG	612006	065607	421	SOGNDAL	SOGN OG FJORDANE	20	88
59450	STADLANDET	620886	051284	75	SELJE	SOGN OG FJORDANE	25	85
57810	SVELGEN II	614625	051793	3	BREMANGER	SOGN OG FJORDANE	23	91
52860	TAKLE	610160	052310	38	GULEN	SOGN OG FJORDANE	21	95
59200	ULVESUND	615798	050830	1	VÅGSØY	SOGN OG FJORDANE	25	83
55670	VEITASTROND	612872	070210	172	LUSTER	SOGN OG FJORDANE	3	91
53080	VIK - VANGE	610478	063504	30	VIK	SOGN OG FJORDANE	20	86
53070	VIK I SOGN III	610432	063511	65	VIK	SOGN OG FJORDANE	20	85
56400	YTRE SOLUND	610028	044055	3	SOLUND	SOGN OG FJORDANE	18	66
57770	YTTERØYANE FYR	613430	044090	26	FLORA	SOGN OG FJORDANE	18	72
57940	ÅLFOTEN II	614992	054012	24	BREMANGER	SOGN OG FJORDANE	23	85
68420	AUNET	630337	113417	302	TYDAL	SØR-TRØNDELAG	29	81
10600	AURSUND	624043	112727	685	RØROS	SØR-TRØNDELAG	28	75
66730	BERKÅK - LYNGHOLT	624904	100103	475	RENNEBU	SØR-TRØNDELAG	29	80
71900	BESSAKER	641470	101967	12	ROAN	SØR-TRØNDELAG	31	73
71750	BREIVOLL	635506	102490	94	ÅFJORD	SØR-TRØNDELAG	32	92
10740	BREKKEN	623871	115278	710	RØROS	SØR-TRØNDELAG	28	70
68000	BYNESET	632334	100700	98	TRONDHEIM	SØR-TRØNDELAG	31	79

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67450	ENDALSVOLL	624924	102724	606	MIDTRE GAULDAL	SØR-TRØNDELAG	29	80
67770	HALTDALEN III	625405	111035	290	HOLTÅLEN	SØR-TRØNDELAG	29	78
71850	HALTEN FYR	641038	092438	16	FRØYA	SØR-TRØNDELAG	31	71
65220	HEMNE	631553	090023	133	HEMNE	SØR-TRØNDELAG	30	87
65600	HITRA	633741	084413	23	HITRA	SØR-TRØNDELAG	31	79
66210	HOSTON	631105	093579	203	ORKDAL	SØR-TRØNDELAG	30	88
66250	HØLONDA	630693	100112	360	MELHUS	SØR-TRØNDELAG	31	79
00900	LANGEN	622608	115118	685	RØROS	SØR-TRØNDELAG	1	43
67150	LEINSTRAND	631968	101642	13	TRONDHEIM	SØR-TRØNDELAG	31	85
66030	LENSVIK	633001	094988	15	AGDENES	SØR-TRØNDELAG	30	84
68330	LIEN I SELBU	631254	110694	255	SELBU	SØR-TRØNDELAG	29	83
67200	LUNDAMO	630879	101929	50	MELHUS	SØR-TRØNDELAG	29	85
66190	LØFTEN	631157	094800	160	ORKDAL	SØR-TRØNDELAG	30	85
68270	LØKSMYR	631430	102612	165	MELHUS	SØR-TRØNDELAG	29	85
63750	MJØEN	093872	093449	512	OPPDAL	SØR-TRØNDELAG	28	73
68450	NEA KRAFTVERK	630191	114090	441	TYDAL	SØR-TRØNDELAG	29	83
66580	NERSKOGEN II	624603	093412	803	OPPDAL	SØR-TRØNDELAG	29	78
71350	RISSA	633824	100765	30	RISSA	SØR-TRØNDELAG	32	93
10400	RØROS	623404	112302	628	RØROS	SØR-TRØNDELAG	28	69
67540	RØSBJØRGEN	625955	103136	330	MIDTRE GAULDAL	SØR-TRØNDELAG	29	84
65450	SANDSTAD	633127	090566	20	HITRA	SØR-TRØNDELAG	31	77
68340	SELBU - STUBBE	631235	110705	242	SELBU	SØR-TRØNDELAG	29	85
66070	SKJENALDFOSSEN I ORKDAL	631770	094490	84	ORKDAL	SØR-TRØNDELAG	30	86
71370	SLIPER	633856	101103	158	RISSA	SØR-TRØNDELAG	32	94
66100	SONGLI	631980	093870	300	ORKDAL	SØR-TRØNDELAG	30	87
68840	STUGUDAL - KÅSEN	625369	115182	730	TYDAL	SØR-TRØNDELAG	29	72
67240	STØREN - VÅRVOLL	630273	101756	65	MIDTRE GAULDAL	SØR-TRØNDELAG	29	84
65940	SULA	635080	082800	5	FRØYA	SØR-TRØNDELAG	31	66
65270	SØVATNET	631372	092102	306	HEMNE	SØR-TRØNDELAG	30	93
10900	VAULDALEN	623833	120171	830	RØROS	SØR-TRØNDELAG	1	68
65100	VINJEØRA	631242	085958	9	HEMNE	SØR-TRØNDELAG	30	92
65110	VINJEØRA II	631245	095982	47	HEMNE	SØR-TRØNDELAG	30	91
71550	ØRLAND III	634202	093608	10	ØRLAND	SØR-TRØNDELAG	31	83
71810	ÅFJORD - MOMYR	640602	103176	280	ÅFJORD	SØR-TRØNDELAG	32	92
63580	ÅNGÅRDSVATNET	624030	091187	596	OPPDAL	SØR-TRØNDELAG	28	83
30860	BERGELIGREND	595320	090354	514	TINN	TELEMARK	6	87
30370	BESSTUL I GJERPEN	592682	093231	460	SKIEN	TELEMARK	6	90
34600	DRANGEDAL	590588	090428	82	DRANGEDAL	TELEMARK	6	90
34400	FARSJØ	585801	091882	48	KRAGERØ	TELEMARK	5	89
37300	FJALESTAD	590966	082395	344	NISSEDAL	TELEMARK	7	84
37500	FOLDSÆ	591949	080926	532	FYRESDAL	TELEMARK	7	85
37750	FYRESDAL	591022	080232	315	FYRESDAL	TELEMARK	7	88
37800	FYRESDAL - LAUVDAL	591092	080706	499	FYRESDAL	TELEMARK	7	89
32780	HØIDALEN I SOLUM	590866	091603	113	SKIEN	TELEMARK	6	87
32900	HØYDALSMO	592986	081242	572	TOKKE	TELEMARK	7	90
37650	KILEGREND	590056	081651	287	FYRESDAL	TELEMARK	6	93
32850	KVITESEID - MOEN	592438	082853	77	KVITESEID	TELEMARK	7	83
32200	LIFJELL	592730	090223	354	BØ	TELEMARK	6	85
31660	MOGEN	600109	075488	954	VINJE	TELEMARK	7	73
31620	MØSSTRAND II	595042	081084	977	VINJE	TELEMARK	7	81
31600	MØSVATN - FØRNES	595203	080505	960	VINJE	TELEMARK	7	76
31570	MØSVATN - HAUG	594891	080843	942	VINJE	TELEMARK	7	83
30530	NOTODDEN	593300	091585	34	NOTODDEN	TELEMARK	6	85
30260	PORSGRUNN BRANNSTASJON	590832	093900	12	PORSGRUNN	TELEMARK	5	87
34900	POSTMYR I DRANGEDAL	591588	084650	464	DRANGEDAL	TELEMARK	6	87
33250	RAULAND	594228	080219	715	VINJE	TELEMARK	7	82
31410	RJUKAN	595275	083458	300	TINN	TELEMARK	6	85
32310	SELJORD PRESTEGÅRD	592957	083793	397	SELJORD	TELEMARK	6	76
30320	SKIEN - ELSTRØM	591195	093537	13	SKIEN	TELEMARK	5	87
30570	SVÆLGFOSS III	593489	091558	96	NOTODDEN	TELEMARK	6	85
31080	TESSUNGDALEN - BAKKHUS	600776	084220	762	TINN	TELEMARK	6	84
30810	TINNOSDAMMEN	594341	090155	191	NOTODDEN	TELEMARK	6	83
36970	TOVSLID	590356	075906	599	FYRESDAL	TELEMARK	7	86
31900	TUDDAL	594472	084860	464	HJARTDAL	TELEMARK	6	86
37230	TVEITSUND	590163	083124	252	NISSEDAL	TELEMARK	6	91
34790	TØRDAL II	590889	084764	162	DRANGEDAL	TELEMARK	6	90
33560	VINJESVINGEN	593767	074860	471	VINJE	TELEMARK	7	84
37450	VRÅDAL - HOLTE	591911	082590	257	KVITESEID	TELEMARK	7	84
32350	ÅMOTSDAL	593887	082261	567	SELJORD	TELEMARK	7	86
89350	BARDUFOSS	690354	183241	76	MÅLSELV	TROMS	43	77
88100	BONES I BARDU	683874	181473	230	BARDU	TROMS	43	77
87350	BORKENES	684629	161144	36	KVÆFJORD	TROMS	43	80
88660	BOTNHAMN	693108	172498	10	LENVIK	TROMS	41	86

STNO	NAME	LAT	LON	HASL	COMMUNITY	COUNTY	CLRR	VARRR
89950	DIVIDALEN	684670	194260	228	MÅLSELV	TROMS	41	47
90900	FUGLØYKALVEN FYR	701900	200930	37	KARLSØY	TROMS	48	58
87940	GRATANGEN III	684160	172547	16	GRATANGEN	TROMS	43	83
88460	GRUNNFARNES	691808	165777	5	TORSKEN	TROMS	47	79
90650	GRUNNFJORD - STAKKEN	700083	193470	7	KARLSØY	TROMS	48	79
88690	HEKKINGEN FYR	693605	175025	14	LENVIK	TROMS	41	80
91520	MANNDALEN	692924	203168	55	KÅFJORD	TROMS	43	73
90080	MESTERVIK	692006	185364	22	BALSFJORD	TROMS	43	86
89110	MÅLSELV - GRUNDNES	691622	183219	3	MÅLSELV	TROMS	41	81
92350	NORDSTRAUM I KVÆNANGEN	695002	215306	6	KVÆNANGEN	TROMS	48	63
91300	OTEREN	691536	195258	12	STORFJORD	TROMS	49	87
91930	REISADALEN - BJØRKLI	693019	212769	98	NORDREISA	TROMS	43	60
91370	SKIBOTN - FOSSBAKK	692210	201610	5	STORFJORD	TROMS	43	55
90200	STORSTEINNES I BALSFJORD	691484	191386	27	BALSFJORD	TROMS	43	84
89500	SÆTERMOEN II	685164	182025	114	BARDU	TROMS	43	80
90800	TORSVÅG FYR	701474	193003	21	KARLSØY	TROMS	41	60
90450	TROMSØ	693923	185570	100	TROMSØ	TROMS	41	86
90490	TROMSØ - LANGNES	694060	185480	8	TROMSØ	TROMS	41	86
91110	ULLSFJORD II	693624	194851	6	TROMSØ	TROMS	48	85
89800	ØVERBYGD	690107	191682	78	MÅLSELV	TROMS	43	79
42720	BAKKE	582473	063959	75	FLEKKEFJORD	VEST-AGDER	13	95
41370	BJELLAND KRAFTVERK	582361	073149	110	MARNARDAL	VEST-AGDER	10	92
42250	FEDAFJORDEN II	581691	064910	26	KVINESDAL	VEST-AGDER	13	96
41200	FINSLAND	581908	073563	275	SONGDALEN	VEST-AGDER	10	93
42650	FLEKKEFJORD	581708	063912	5	FLEKKEFJORD	VEST-AGDER	13	93
39040	KJEVIK	581201	080409	12	KRISTIANSAND	VEST-AGDER	9	91
41820	KVÅVIK	580802	070293	4	LYNGDAL	VEST-AGDER	11	93
41180	LAUDAL KRAFTSTASJON	581475	073088	45	MARNARDAL	VEST-AGDER	10	95
41770	LINDESNES FYR	575900	070290	13	LINDESNES	VEST-AGDER	11	78
42160	LISTA FYR	580660	063410	14	FARSUND	VEST-AGDER	11	81
41550	LJOSLAND - MONEN	584728	072113	504	ÅSERAL	VEST-AGDER	12	89
41110	MANDAL II	580280	072740	138	MANDAL	VEST-AGDER	11	90
39220	MESTAD I ODDERNES	581292	075345	151	KRISTIANSAND	VEST-AGDER	10	93
39100	OKSØY FYR	580402	080305	9	KRISTIANSAND	VEST-AGDER	9	84
42520	RISNES I FJOTLAND	583946	065679	348	KVINESDAL	VEST-AGDER	12	94
42920	SIRDAL - TJØRHOM	585325	065091	500	SIRDAL	VEST-AGDER	12	93
41450	SKJERKA	583336	072269	263	ÅSERAL	VEST-AGDER	12	91
42890	SKREÅDALEN	584929	064292	474	SIRDAL	VEST-AGDER	12	96
42790	TONSTAD - FINSÅ	583954	064219	54	SIRDAL	VEST-AGDER	12	95
42810	TONSTAD - NETTFED	583986	064265	55	SIRDAL	VEST-AGDER	12	94
41640	VIGMOSTAD	581333	072024	38	LINDESNES	VEST-AGDER	10	95
42950	ØVRE SIRDAL	585678	065516	582	SIRDAL	VEST-AGDER	12	91
41480	ÅSERAL	583702	072519	278	ÅSERAL	VEST-AGDER	12	93
27500	FERDER FYR	590160	103180	6	TJØME	VESTFOLD	5	79
27800	HEDRUM	591174	095809	31	LARVIK	VESTFOLD	5	90
27920	LARDAL - HÆRLAND	592504	095663	121	LARDAL	VESTFOLD	5	88
30000	LARVIK	590318	100163	28	LARVIK	VESTFOLD	5	89
27300	RAMNES	592144	101487	44	RAMNES	VESTFOLD	5	90
27070	ROVE	592949	101776	79	HOLMESTRAND	VESTFOLD	5	90
27600	SANDEFJORD	590784	101265	6	SANDEFJORD	VESTFOLD	5	86
27720	SANDEFJORD - BRØNNUM	590711	101205	34	SANDEFJORD	VESTFOLD	5	89
27770	STOKKE - SOLLI	591700	101200	90	STOKKE	VESTFOLD	5	89
01400	BREKKE SLUSE	590886	113359	114	HALDEN	ØSTFOLD	4	82
17500	FLØTER	592982	110085	131	VÅLER	ØSTFOLD	4	86
03450	HAGA I EIDSBERG	593197	111787	99	EIDSBERG	ØSTFOLD	4	90
01230	HALDEN	590735	112332	8	HALDEN	ØSTFOLD	4	80
01080	HVALER	590216	110311	17	HVALER	ØSTFOLD	4	79
03780	IGSI I HOBØL	593815	110287	144	HOBØL	ØSTFOLD	4	81
03150	KALNES	591892	110293	56	FREDRIKSTAD	ØSTFOLD	4	85
17250	MOSS	592604	104000	31	MOSS	ØSTFOLD	5	84
01130	PRESTEBAKKE	585958	113230	157	HALDEN	ØSTFOLD	4	77
17150	RYGGE	592298	104729	40	RYGGE	ØSTFOLD	4	86
01650	STRØMSFOSS SLUSE	591805	113964	113	AREMARK	ØSTFOLD	4	85
03500	SVARVERUD I EIDSBERG	593203	113138	182	EIDSBERG	ØSTFOLD	4	88
03930	TRØGSTAD	593961	112399	158	TRØGSTAD	ØSTFOLD	4	86
01950	ØRJE	592886	113910	123	MARKER	ØSTFOLD	4	88