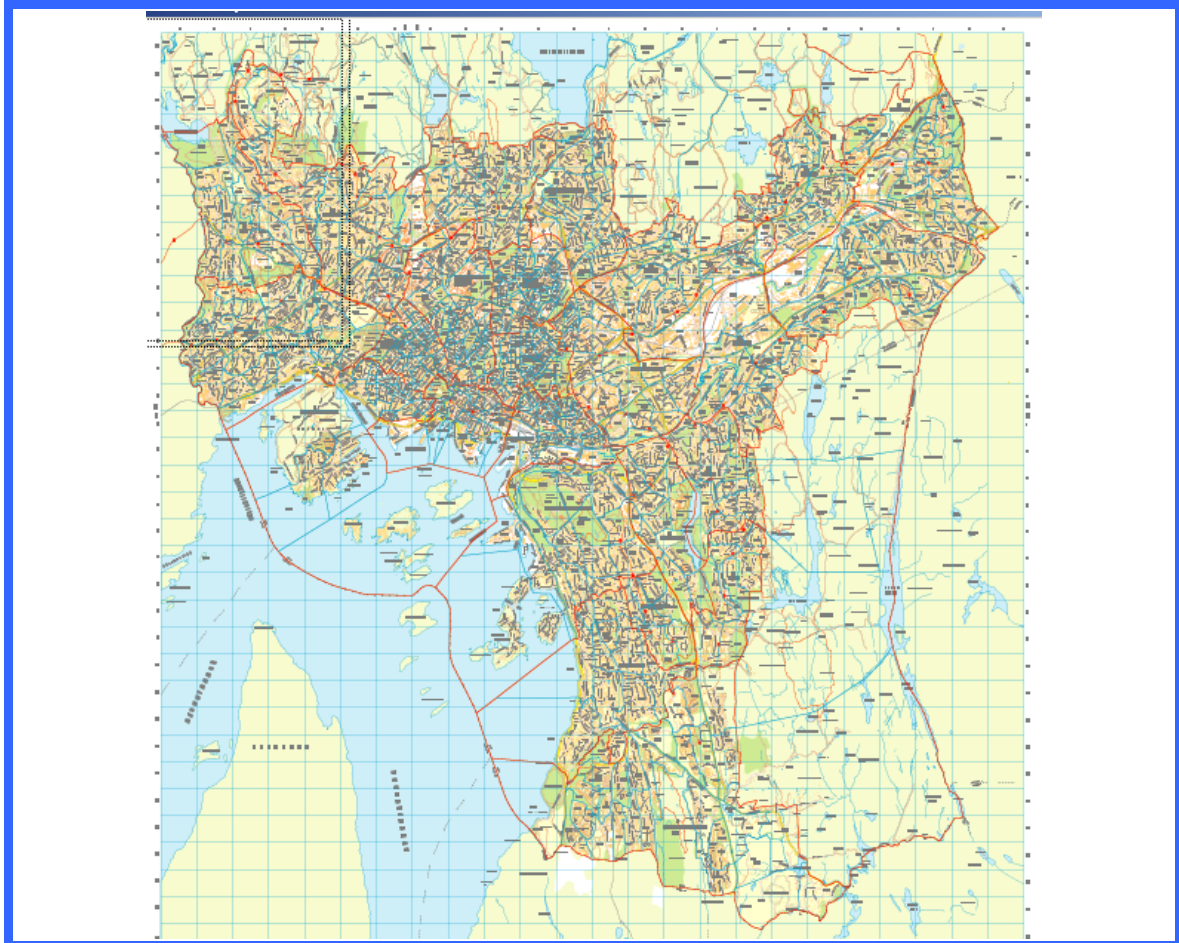# HAZUS APPLICATION TO OSLO MUNICIPALITY:
DATA DESCRIPTION

Prepared by

Sergio Molina-Palacios and Conrad Lindholm

At

NORSAR
PO Box 53, N-2027 Kjeller, Norway

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INDEX:

1. INTRODUCTION.

In order to apply HAZUS methodology to a real seismic risk study outside USA, the Oslo municipality was chosen as study region. The civil institutions were asked for neccesary information and we were provided with different ASCII and Arcview files which I will describe here.

2. NAME OF THE FILES.

Data Files:

➢ Be2001056d.xls; Be2001073d.xls; Be2001086d.xls.

➢ Norsar_bygg.res; norsar_meterialer.csv; norsar_nagr.csv; norsar_type.csv

The Excel files describe population data in the Oslo municipality classified by different categories.

On the other hand, the **.res* and **.csv* files describe building information in the Oslo municipality.

3. DESCRIPTION OF POPULATION DATA.

File: be2001056d.xls

This file collects the population data classified by districts (17 districts) and by age group (0-5, 6-12, 13-15, 16-19, 20-29, 30-39, 40-49, 50-66, 67-79 and + 80).
There are 3 tables: The first one contains the number of inhabitants in each district and in each group of age; the second one contains the percentage of inhabitants over the total population of the municipality and classified by district and group of age and the third one contains the percentage of inhabitants over the total population of each district and classified by group of age.
The classification in districts here is different from the Arcview information of districts and buildings so I have considered the Arcview information.

File: be2001073d.xls

This file collects the population data classified by districts, areas within each district and age group (the same age group as before).
There is a table containing the number of inhabitants in each district classified by area and age group and a table with the total of inhabitants in all the areas which form the Oslo municipality, also classified by age group.
As the area division is the same as shown in the Arcview files containing building information, this file has been used in order to calculate the total number of inhabitant in each district (27 districts shown in Arcview files).

Fichero: be2001086d.xls

This file collects the population data classified by district, census year and age group. There is a table for each district containing the total number of inhabitants who were include in the census in the years (1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001 and 2002), classified by age group. Also there is a table containing population in unknown districts and other table containing the total number of inhabitants in each district and classified by census year and age group.

4. DESCRIPTION OF BUILDING INFORMATION

File: norsar_bygg.res

This file collects building information related to the Oslo municipality. The file contains 87499 rows and 18 columns. The file cannot be opened in Excel (too many rows) so it has been opened with Access and exported to a DbaseIV file named *allbydel.dbf*.

The 18 columns (fields) of the building database are the following ones:

Byggnr. : Numerical code of each building. For example: 80487525

Status: Numerical code of value 2 (always).

Type: Numerical code related to the type of building. Numerical code description is given in the file *norsar_type.csv* . For example: 111 is a single house.

Naering: Alpha-numerical code of each developed activity. The code description is given in the file *norsar_nagr.csv* . For example: *X* means *Dwellings or Housing* and 3 means *Minery and Industry*. The code *1* means *Unknown*.

Fund: Numerical code related to the foundations of the building. The code description is given in the file *norsar_meterialer.csv*. For example: *3* means *Piles*.

Vertikal.: Numerical code related to vertical carrying construction. The code description is given in the file *norsar_meterialer.csv*.

Horisont.: Numerical code related to horizontal carrying construction. The code description is given in the file *norsar_meterialer.csv*.

Mat. iytterv: Numercial code related to building materials. The code description is given in the file *norsar_meterialer.csv*.

Ant. boliger: Number of appartments (homes, living area for one household).

Tot. Areal: Total Area (km^2)

Ant. etasjer: Number of flats.

Grunnareal: Foundations area (km^2).

Nord: North Coordinate (Norwegian reference system)

Ost: East Coordinate (Norwegian reference system)

Bydel: District (There is 27).

Valgkr.: Constituency.

Grunnkr.: Area code.

5. DESCRIPTION OF ARCVIEW FILES

The coordinate system used in order to represent Oslo municipality information in Arcview is a local rectangular system, squared in a grid, as shown in Figure 1. The size of the cells is 800 units in the X-axis (E-W) and 600 units in the Y-axis. There is 7 cells starting from the origin towards the W (from A to G) and 17 cells from the origin to the E (from A to R). There is 20 cells starting from the origin toward the S (from 1 to 20) and 14 cells from the origin towards the N (from 1 to 14). That is the size of the grid is 19200 m wide (E-W) and 20400 m height (N-S).
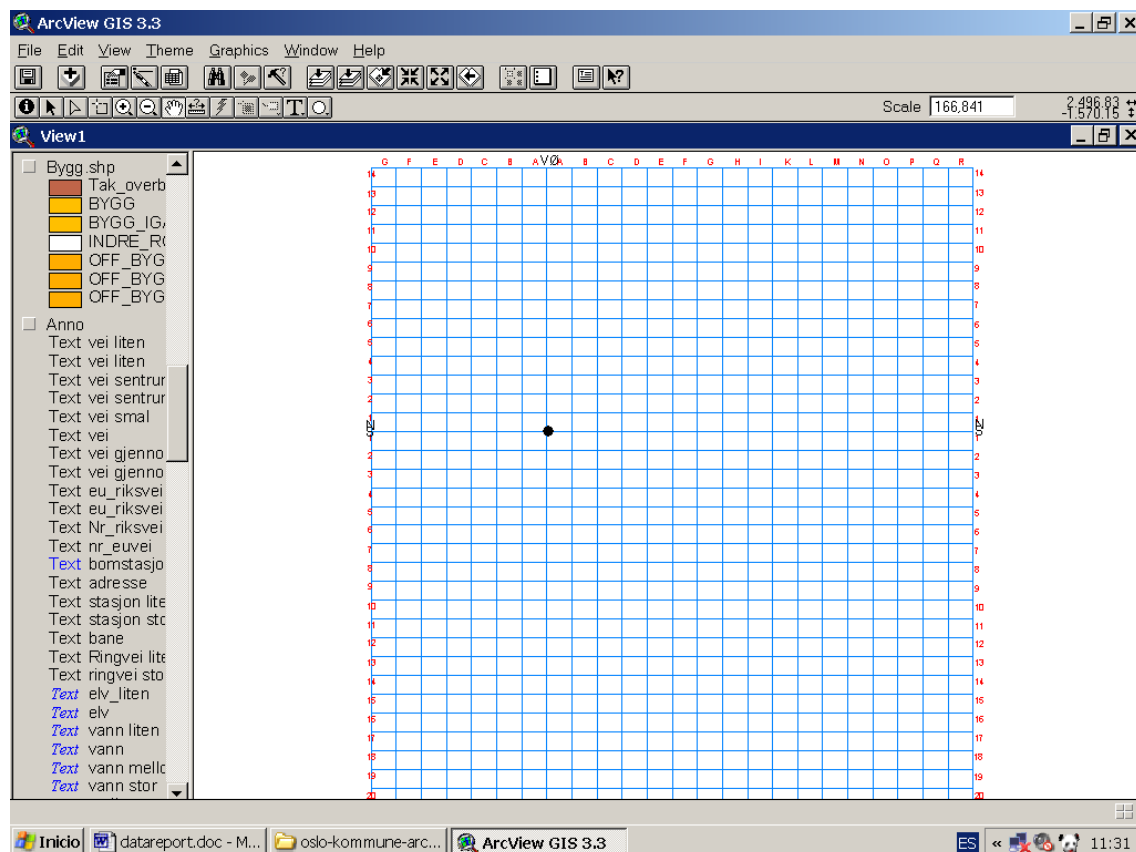

Figure 1. Rectangular coordinate system in which Oslo municipality information is projected. The black dot is the coordinate origin.

The Oslo municipality is divided in 27 districts (bydeler) as shown in Figure 2. This districts are also divided in areas of lesser size (Grunnkr.) as shown in Figure 3. Table 1 shows each district and its area divisions.

Number	Name	Area divisions
1	Bygdøy Frogner	5601 a 5603; 5701; 601 a 611; 501 a 504; 301 a 303; 701; 708 a 710 = 26
2	Uranienborg / Majorstuen	308; 612 a 614; 702 a 707; 801 a 809; 901 a 913 = 32
3	St. Hanshaugen / Ullevål	202 a 204; 1001; 1101 a 1106; 1201 a 1211; 1301 a 1304; 1401 a 1403; 1501 a 1504; 1709; 4505; 4510; 4605 a 4606 = 37
4	Sagene / Torshov	1404 a 1406; 1601 a 1607; 1701 a 1708; 1801 a 1802; 1901 a 1908; 2001 a 2006; 2009 a 2012; 2102 = 39
5	Grünerlokka / Sofienberg	206 a 210; 1305; 2007 a 2008; 2201 a 2209; 2301 a 2313; 2402 a 2407; 2410 = 37
6	Gamle Oslo	2401; 2408 a 2409; 2501 a 2506; 2601 a 2610; 2701 a 2706; 2801 a 2804; 2901; 3501; 3514 = 32
7	Ekeberg Bekkelaget	2805; 3001 a 3010; 3502 a 3505; 3509; 3513 = 17
8	Nordstrand	3101 a 3106; 3011 a 3012; 3201 a 3202; 3306; 3407 = 12
9	Sondre Nordstrand	3203 a 3215 ; 3301 a 3305 ; 3307 a 3318 = 30
10	Lamberseter	3401 a 3403; 3405 a 3406; 3408 a 3409; 3416; 3107 = 9
11	Bøler	3410 a 3411; 3413 a 3415; 3417; 3609; 3610 a 3611 = 9
12	Manglerud (sin numerar en mapa)	3506 a 3508; 3510 a 3512; 3404; 3412; 3601 a 3604 =12
13	Østensjø	3605 a 3608; 3612 a 3615; 3617 a 3618; 3706; 3709; 3711 = 13
14	Helsfyr Sinsen	2101; 2103 a 2109; 3616; 4201 a 4206; 4208; 4210; 4302 a 4306 = 22
15	Hellerud	3701 a 3705; 3707 a 3708; 3710; 3712 a 3721; 4207 = 19
16	Furuset	3801 a 3821; 3910 a 3913 = 25
17	Stovner	3902 a 3904; 3906 a 3909; 3914 a 3923; 4008 = 18
18	Romsås	3901; 3905; 4010; 4012 a 4013 = 5
19	Grorud	4001 a 4007; 4009; 4011; 4014 a 4018; 4114 = 15
20	Bjerke	4101 a 4113; 4115 a 4116; 4118 a 4122; 4209; 4301; 4307 = 23
21	Grefsen Kjelsås	4117; 4401 a 4410; 4413 a 4418 = 18
22	Sogn	4411; 4501 a 4504; 4506 a 4509; 4511 a 4513; 4607 a 4608; 4610 = 15
23	Vinderen	4601 a 4604; 4609; 4611; 4701 a 4702; 4704 a 4705; 4904 a 4906; 4908; 5001 a 5004 = 18
24	Røa	4801 a 4802; 4901 a 4903; 4907; 4909 a 4912; 5005 a 5006; 5007 a 5008; 5201 a 5205; 5209 = 20
25	Ullern	4703; 4706; 4803 a 4806; 5206 a 5208; 5210; 5301 a 5303; 5401 a 5406; 5501 a 5504 = 23
26	Sentrum (not numbered in map)	101 a 105; 201; 205; 211; 304 a 307; 309 a 310; 401 = 15
27	Marka (not numbered in map)	5101 a 5103; 5801 a 5805; 5901 a 5902; 6001 a 6002; 6004; 6005; 6007 = 15

Table 1. Districts and area divisions in Oslo municipality. Red numbers indicate area division outside Oslo municipality limits.

The file *allbydel.dbf* has been divided into 27 different files (one file by each district) so it has been possible to compile some information about each district. That information appears in the appendix at the end of this report.

Also all the urban area (Tettsted) of the Oslo municipality is included into the 26 first districts, so the district 27 is outside the urban area, as shown in Figure 4.
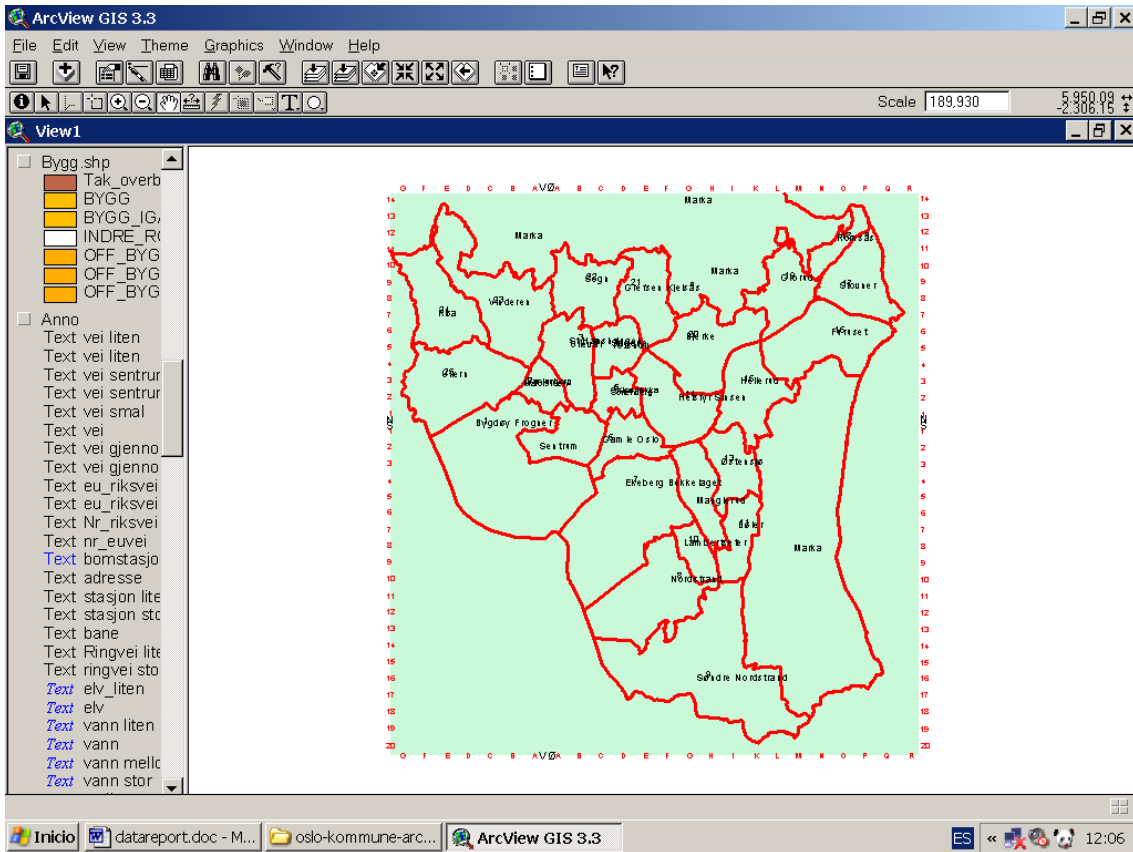
Figure 2. Districts of the Oslo municipality.
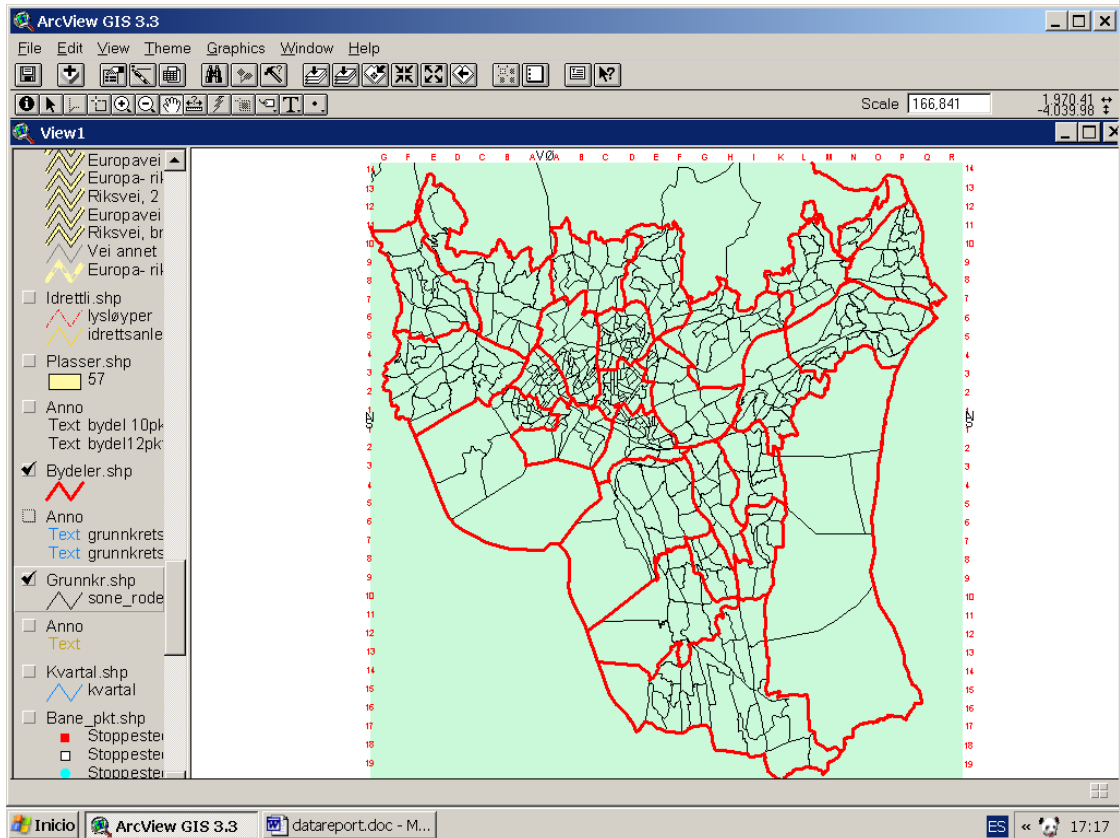
Figure 3 Area division of each district.
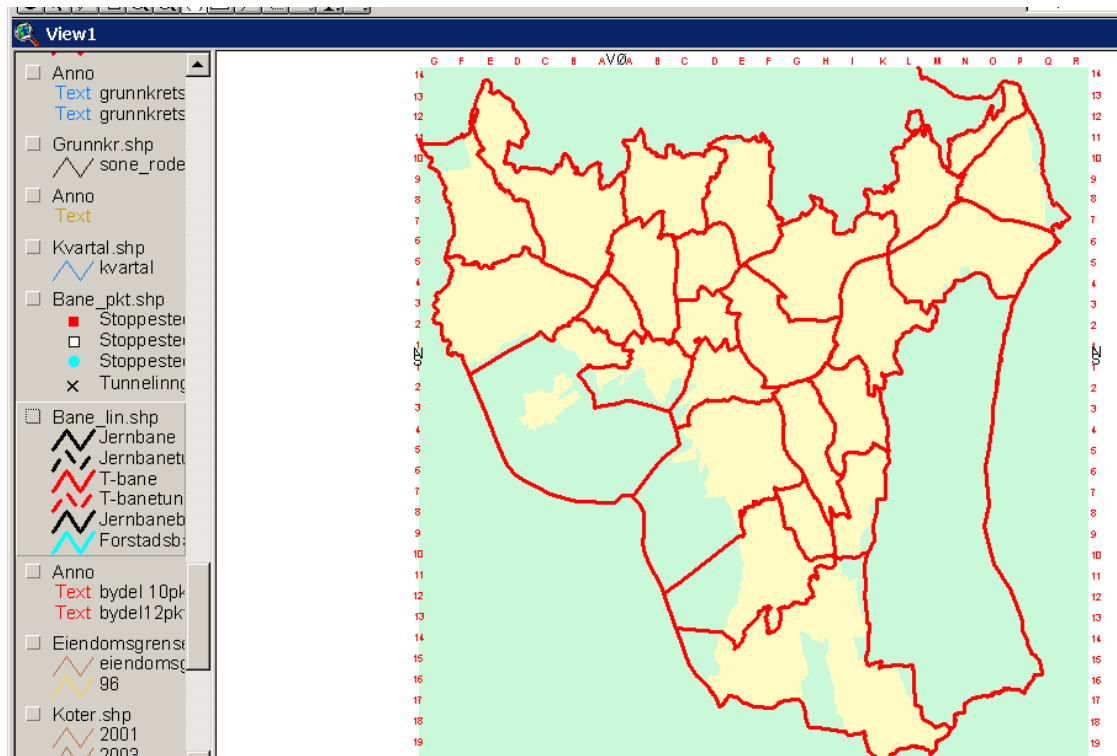
Figure 4. Urban area (Tettsted) in Oslo municipality (dark yellow colour).

Also, Figure 5 shows the communication lines. Railways are in black colour, railway tunnels are in black dashed colour, railway bridges in yellow colour; T-bane lineas (green colour) and T-bane tunnels (green dashed colour) and local trains railways (tramways).

On the other hand we have information related to the streets, roads, … in the Oslo municipality (senterl.shp) with their labels as shown in Figure 6.

Other Arcview shapefiles contain the building distribution (Bygg.shp), as shown in Figure 7 (zoomed), church location (kirkepkt.shp), sport installations (Idrettli.shp), the squares or open areas (Plasser.shp), the blocks (Kvartal.shp), the property limits (Eiendomsgrenser.shp), height curves (koter.shp and hoydekurver.shp), water limits contours (vannko.shp and vannfl.shp) and feeding activity areas (naeringsomr.shp), as shown in Figure 8 and 9.

Finally, other Arcview shapefiles contain soil information related to the depth of the sediments and drilling places, as shown in Figure 10 and the places with outcropping rock, as shown in Figure 11.
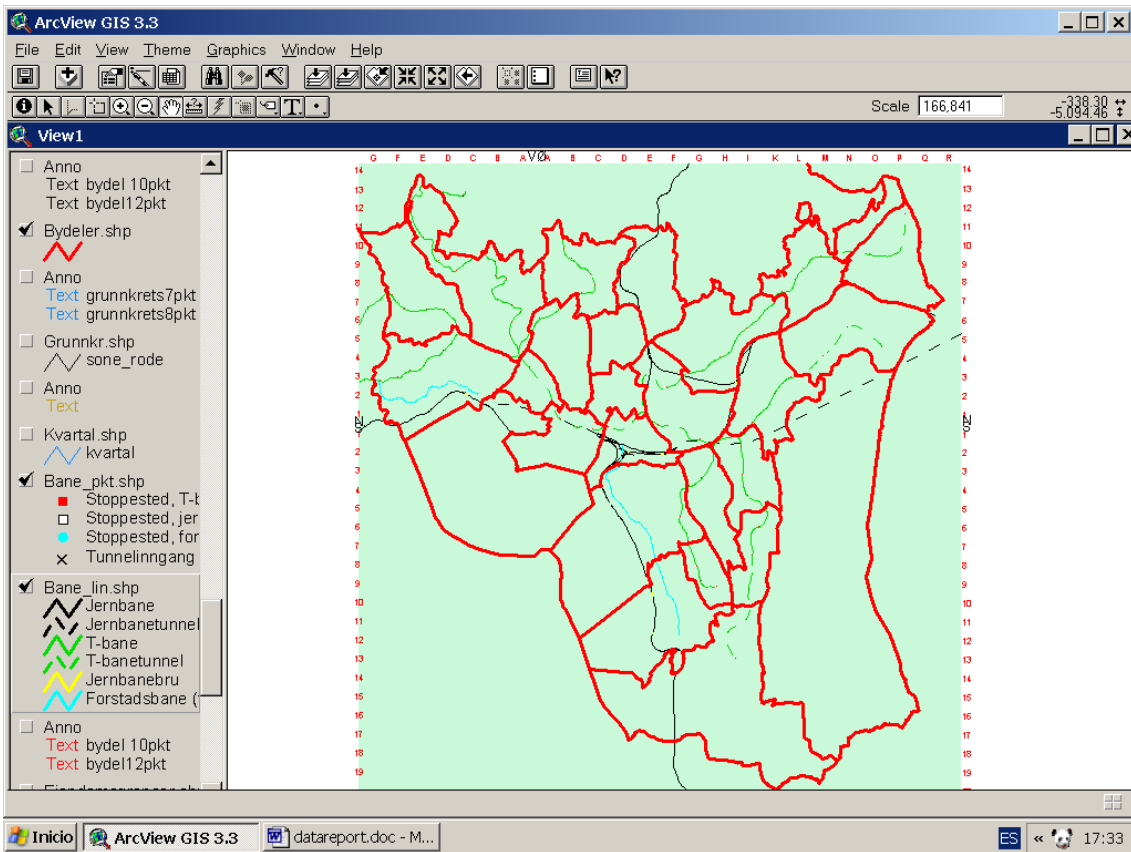
Figure 5 Transportatin Systems (Railways, tramways, and T-bane).
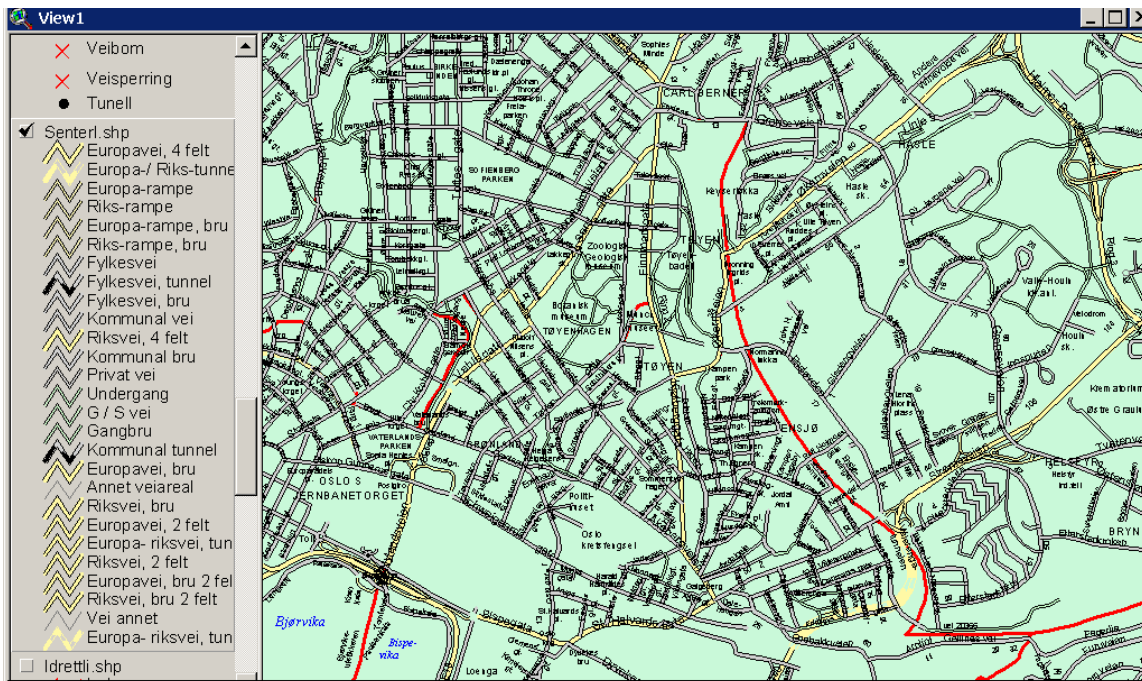
Figure 6. Roads, streets and highways in Oslo municipality.
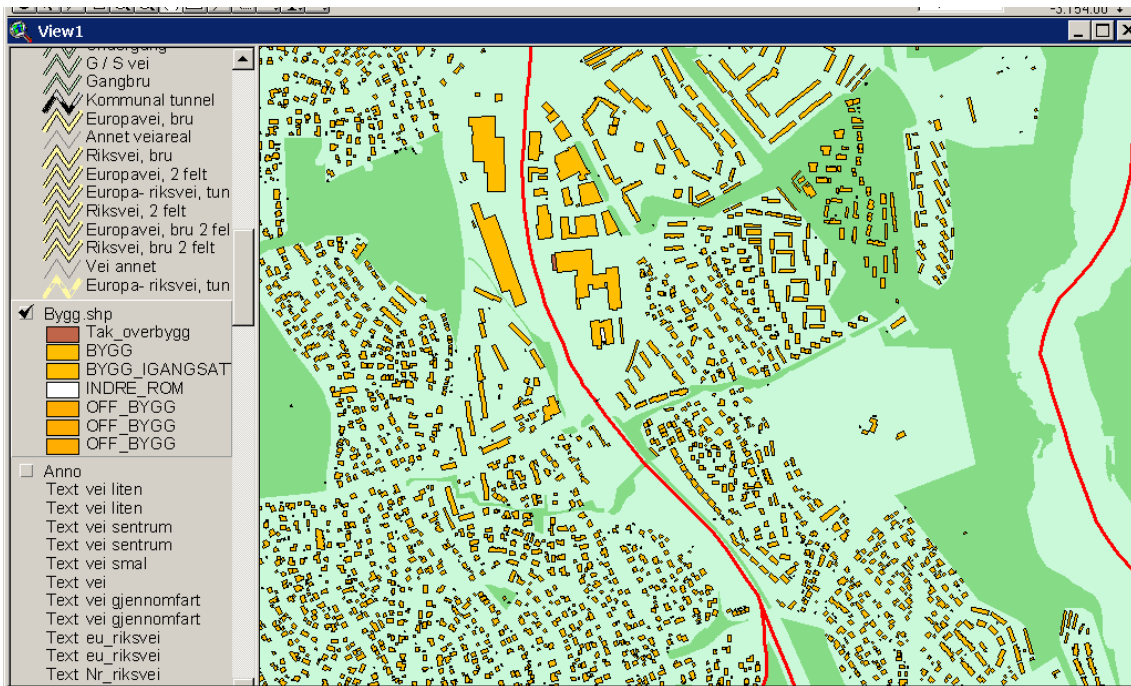
Figure 7 Building distribution.
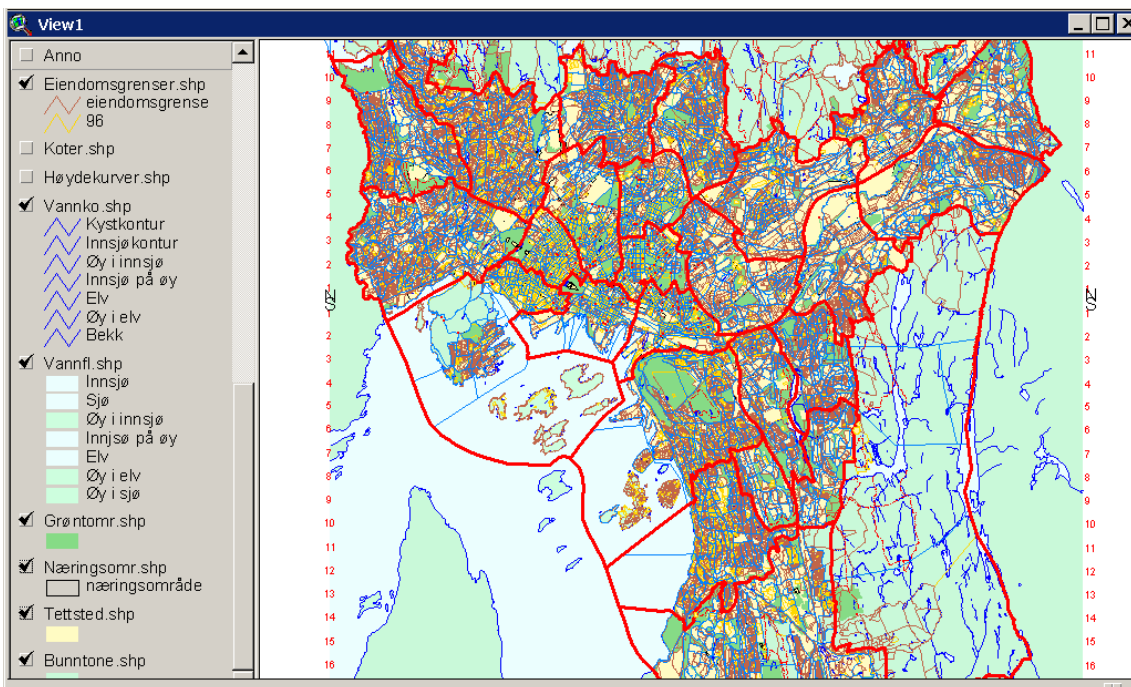
Figure 8 Some shapefiles related to the block division, property limits, water limits, green areas, feeding activity areas, etc.
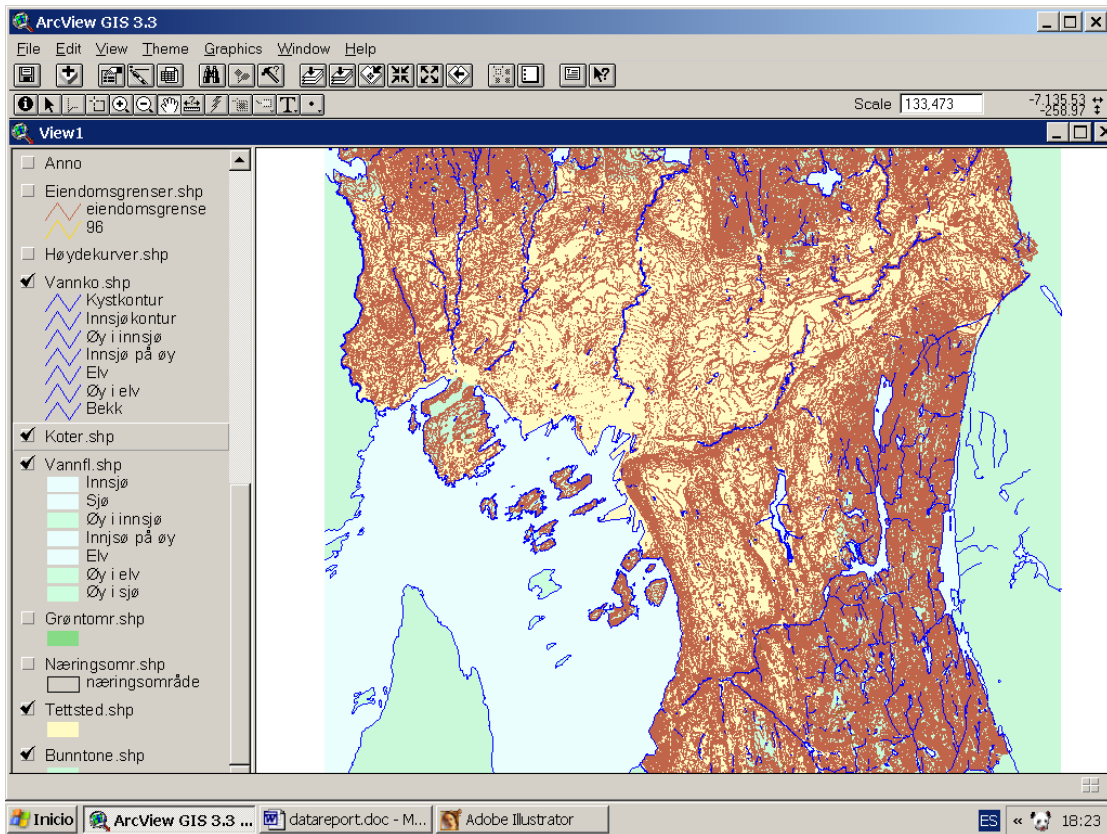
Figure 9 Height Curves and water limits.
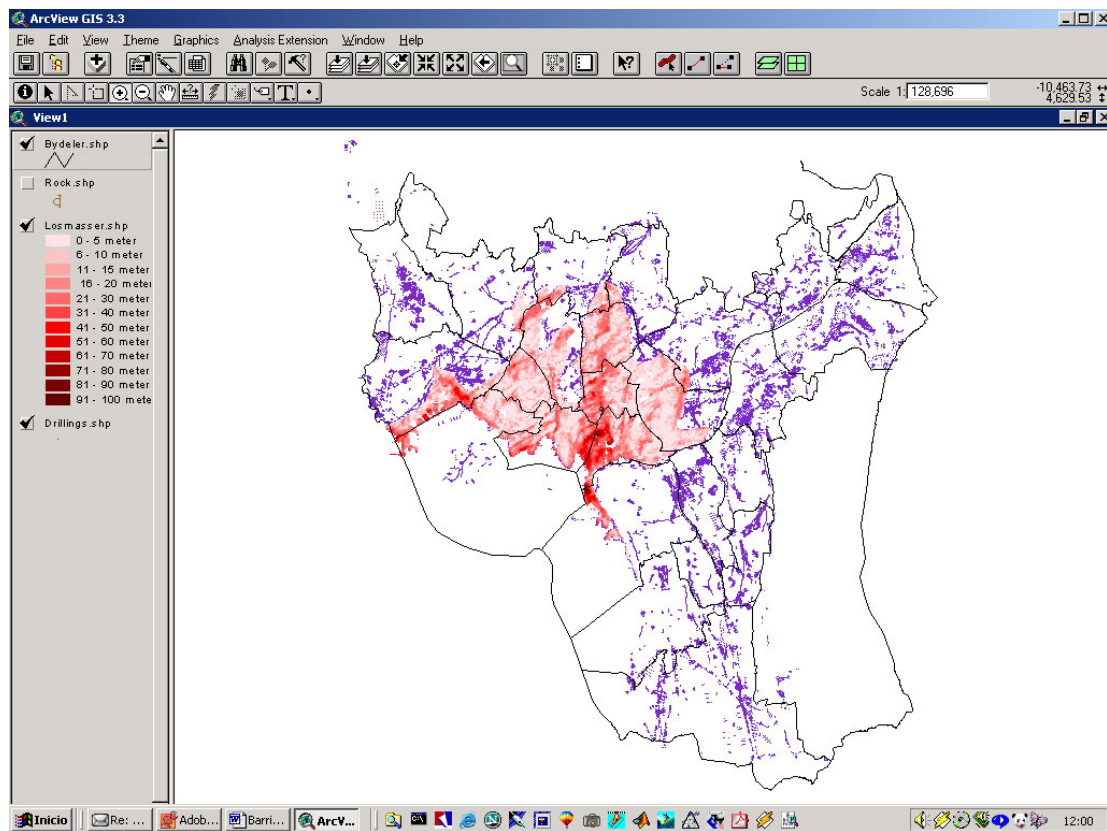
Figure 10. Depth of the sediments and drilling sites
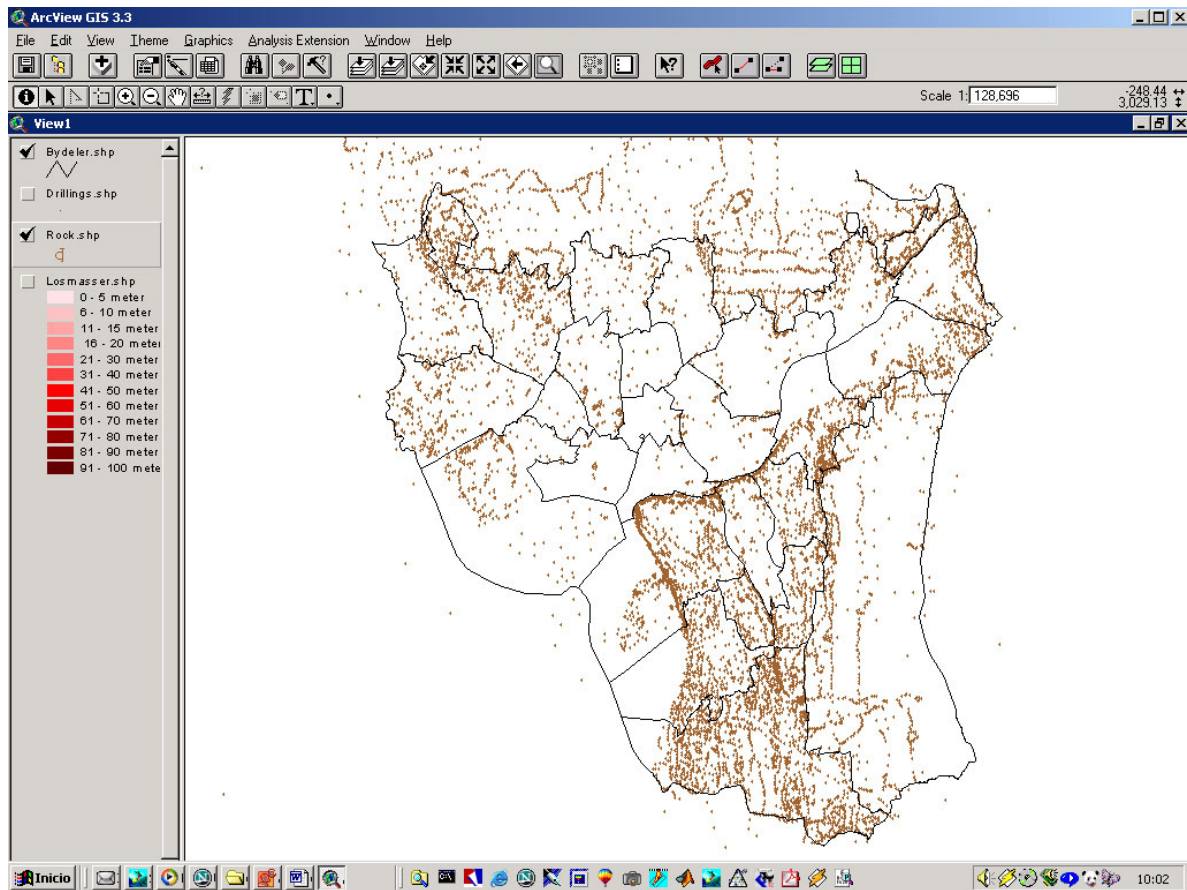
Figure 11. Sites with outcropping rock.

6. CONCLUSIONS

The information provided is enough to start an application of HAZUS methodology to Oslo municipality. Anyway, the following steps will be followed in the next report:

1. Divide each district into several "census tracts" according to the HAZUS methology and taking into consideration the information given in the Annex.

2. Creation of Arcview Shape files according to the HAZUS format. That is, appropiate coordinate system, closed shapes, polylines, etc.

3. Classification of the building materials and techniques according to the HAZUS building inventory classification.

4. Link DbaseIV files to the Arcview Shape files with all the neccesary information to achieve a seismic risk study using the HAZUS methodology.

ANNEX

DISTRICT INFORMATION:

AREA DIVISION, POPULATION AND NUMBER OF BUILDINGS

District	Area Code	Inhabitantes	Buildings
Bigdøy Frogner 1 26 areas 20498 inhabitants 2754 buildings	301	783	53
	302	1009	59
	303	507	42
	501	1202	61
	502	859	70
	503	728	38
	504	1369	83
	601	989	102
	602	556	111
	603	1050	180
	604	742	80
	605	823	39
	606	1086	59
	607	932	56
	608	854	54
	609	652	85
	610	888	27
	611	833	75
	701	734	59
	708	217	17
	709	480	43
	710	19	16
	5601	226	67
	5602	1459	548
	5603	1496	728
	5701	5	3
Uranienborg/ Majorstuen 2 32 areas 24094 inhabitants 1700 buildings	308	555	62
	612	923	61
	613	1150	170
	614	4	21
	702	876	75
	703	689	97
	704	770	67
	705	493	32
	706	283	21
	707	509	90
	801	752	107
	802	682	45
	803	857	51
	804	761	50
	805	870	50
	806	1169	62
	807	397	59
	808	959	56
	809	902	43
	901	997	55
	902	598	33
	903	721	32
	904	649	38
	905	782	32
	906	792	64
	907	965	45
	908	852	26
	909	942	40
	910	509	17
	911	1115	24
	912	895	33
	913	676	42

District	Area Code	Inhabitantes	Buildings
	202	235	36
	203	888	81
	204	562	110
	1001	889	41
	1101	618	43
	1102	698	104
	1103	639	45
	1104	838	25
	1105	490	51
	1106	707	35
	1201	1069	65
	1202	711	39
	1203	855	36
	1204	1042	75
	1205	601	34
St. Hanshaugen / Ullevål	1206	630	41
	1207	991	45
3	1208	795	83
	1209	969	132
37 areas	1210	0	6
28678 inhabitants	1211	351	25
2914 buildings	1301	639	50
	1302	799	56
	1303	1458	40
	1304	823	43
	1401	850	34
	1402	698	40
	1403	1153	88
	1501	700	44
	1502	961	58
	1503	939	71
	1504	596	118
	1709	40	19
	4505	2165	486
	4510	782	165
	4605	106	75
	4606	1391	375

District	Area Code	Inhabitantes	Buildings
	1404	774	14
	1405	919	49
	1406	1020	125
	1601	506	21
	1602	538	23
	1603	458	6
	1604	728	14
	1605	1308	49
	1606	582	62
	1607	716	86
	1701	277	22
	1702	982	69
	1703	627	25
	1704	563	21
	1705	452	10
	1706	974	30
Sagene / Torshov	1707	673	17
	1708	974	20
4	1801	822	68
	1802	410	67
39 areas	1901	508	40
28129 inhabitants	1902	1572	77
1605 buildings	1903	525	40
	1904	1431	47
	1905	1183	46
	1906	563	43
	1907	911	54
	1908	676	43
	2001	739	51
	2002	1182	113
	2003	500	42
	2004	706	39
	2005	536	34
	2006	684	45
	2009	1137	29
	2010	732	51
	2011	0	1
	2012	241	5
	2102	0	7

District	Area Code	Inhabitantes	Buildings
	206	744	51
	207	658	67
	208	383	48
	209	537	92
	210	699	74
	1305	427	40
	2007	1027	54
	2008	763	12
	2201	831	53
	2202	849	52
	2203	394	27
	2204	468	13
	2205	496	28
	2206	789	65
	2207	856	101
Grünerløkka / Sofienberg	2208	1485	202
	2209	1	8
5	2301	1266	51
	2302	950	50
37 areas	2303	901	56
26857 inhabitants	2304	954	49
1845 buildings	2305	649	89
	2306	740	80
	2307	568	38
	2308	858	36
	2309	624	42
	2310	691	44
	2311	852	44
	2312	1056	82
	2313	748	49
	2402	554	36
	2403	465	23
	2404	1045	23
	2405	871	16
	2406	1653	42
	2407	0	7
	2410	5	1

District	Area Code	Inhabitantes	Buildings
Gamle Oslo 6 32 areas 25682 inhabitants 1674 buildings	2401	1181	64
	2408	875	46
	2409	646	14
	2501	1607	77
	2502	558	43
	2503	1040	49
	2504	1063	55
	2505	439	42
	2506	1506	25
	2601	1028	41
	2602	1127	31
	2603	837	51
	2604	720	25
	2605	890	26
	2606	825	22
	2607	1052	149
	2608	638	63
	2609	509	48
	2610	359	36
	2701	510	18
	2702	941	55
	2703	1736	126
	2704	782	137
	2705	512	102
	2706	271	19
	2801	272	35
	2802	890	69
	2803	815	42
	2804	1207	51
	2901	45	33
	3501	478	76
	3514	323	4
Ekeberg Bekkelaget 7 17 areas 16775 inhabitants 6008 buildings	2805	1010	219
	3001	268	34
	3002	0	32
	3003	332	150
	3004	511	145
	3005	928	376
	3006	1431	688
	3007	904	444
	3008	766	362
	3009	1402	476
	3010	1395	595
	3502	1295	308
	3503	1544	692
	3504	1408	334
	3505	2085	884
	3509	543	128
	3513	953	141

District	Area Code	Inhabitantes	Buildings
Nordstrand 8 12 areas 17445 inhabitants 6499 buildings	3011	409	203
	3012	1786	557
	3101	1537	642
	3102	1909	774
	3103	2275	883
	3104	1875	924
	3105	963	406
	3106	1506	300
	3201	2435	710
	3202	545	270
	3306	1565	559
	3407	640	271
Sondre Nordstrand 9 30 areas 32070 inhabitants 7133 buildings	3203	1336	213
	3204	1074	20
	3205	946	208
	3206	1527	620
	3207	1331	314
	3208	1663	400
	3209	1880	442
	3210	2570	451
	3211	2217	251
	3212	5	6
	3213	653	148
	3214	22	27
	3215	1667	491
	3301	1303	270
	3302	76	26
	3303	227	98
	3304	1198	372
	3305	846	352
	3307	1382	414
	3308	0	0
	3309	1377	287
	3310	2783	568
	3311	47	13
	3312	22	6
	3313	68	7
	3314	811	41
	3315	106	155
	3316	1429	625
	3317	3496	306
	3318	8	2

District	Area Code	Inhabitantes	Buildings
Lambertseter 10 9 areas 10264 inhabitants 920 buildings	3107	120	50
	3401	616	314
	3402	1113	39
	3403	976	76
	3405	1377	82
	3406	978	54
	3408	2450	137
	3409	2360	58
	3416	274	110
Bøler 11 9 areas 13266 inhabitants 1889 buildings	3410	2667	335
	3411	389	87
	3413	1620	209
	3414	1955	64
	3415	2277	207
	3417	1234	44
	3609	1022	444
	3610	862	249
	3611	1240	250
Manglerud 12 12 areas 12530 inhabitants 2599 buildings	3404	763	232
	3412	770	175
	3506	844	277
	3507	1017	196
	3508	2277	65
	3510	2	18
	3511	738	284
	3512	1723	214
	3601	2254	824
	3602	1124	25
	3603	324	68
	3604	694	221
Østensjø 13 13 areas 15524 inhabitants 2813 buildings	3605	178	46
	3606	2530	763
	3607	985	192
	3608	2643	503
	3612	711	311
	3613	1591	280
	3614	2494	78
	3615	2841	59
	3617	925	399
	3618	261	27
	3706	194	122
	3709	51	17
	3711	120	16

District	Area Code	Inhabitantes	Buildings
Helsfyr Sinsen 14 22 areas 20840 inhabitants 1947 buildings	2101	1404	64
	2103	683	20
	2104	428	6
	2105	696	12
	2106	885	15
	2107	829	8
	2108	715	79
	2109	453	20
	3616	29	61
	4201	1532	183
	4202	1098	90
	4203	1863	38
	4204	35	50
	4205	2245	56
	4206	1024	444
	4208	1636	45
	4210	1341	28
	4302	83	75
	4303	854	302
	4304	0	50
	4305	2598	166
	4306	409	135
Hellerud 15 19 areas 15712 inhabitants 2103 buildings	3701	7	33
	3702	1072	43
	3703	1500	92
	3704	526	120
	3705	1598	37
	3707	772	285
	3708	1284	385
	3710	4	1
	3712	72	75
	3713	123	33
	3714	1966	35
	3715	1445	174
	3716	1047	0 (12 in map)
	3717	616	227
	3718	1087	303
	3719	3	26
	3720	2131	86
	3721	141	20
	4207	318	128

District	Area Code	Inhabitantes	Buildings
Furuset 16 25 areas 29295 inhabitants 4528 buildings	3801	41	78
	3802	706	40
	3803	1348	160
	3804	2512	95
	3805	482	120
	3806	765	352
	3807	702	19
	3808	923	319
	3809	1450	28
	3810	553	12
	3811	1859	150
	3812	1013	297
	3813	2438	58
	3814	11	16
	3815	1298	48
	3816	1068	255
	3817	1801	144
	3818	1845	53
	3819	1479	134
	3820	992	26
	3821	832	31
	3910	1335	509
	3911	1273	565
	3912	350	151
	3913	2219	868
Stovner 17 18 areas 21356 inhabitants 2802 buildings	3902	352	152
	3903	2279	92
	3904	822	174
	3906	2250	39
	3907	2428	35
	3908	1165	453
	3909	1494	435
	3914	1325	204
	3915	400	211
	3916	196	64
	3917	1658	22
	3918	1530	181
	3919	1854	17
	3920	1114	31
	3921	1051	55
	3922	1003	384
	3923	374	185
	4008	61	68
Romsås 18 5 areas 6722 inhabitants 99 buildings	3901	189	13
	3905	20	5
	4010	1936	27
	4012	2170	31
	4013	2407	23
Grorud 19 15 areas 17390 inhabitants 2881 buildings	4001	1716	61
	4002	1325	535
	4003	1138	25
	4004	1472	120
	4005	15	87
	4006	762	185
	4007	1434	524
	4009	1635	236
	4011	88	34
	4014	873	300
	4015	1479	376
	4016	2609	45
	4017	1208	41
	4018	1191	82
	4114	445	230

District	Area Code	Inhabitantes	Buildings
Bjerke 20 23 areas 23386 inhabitants 3819 buildings	4101	1145	416
	4102	1184	132
	4103	2079	58
	4104	1030	112
	4105	5	5
	4106	1319	396
	4107	1755	584
	4108	1286	532
	4109	1848	192
	4110	1144	176
	4111	1091	39
	4112	1044	13
	4113	1958	59
	4115	864	102
	4116	490	123
	4118	706	31
	4119	762	30
	4120	1024	23
	4121	1453	337
	4122	19	23
	4209	98	122
	4301	1074	298
	4307	8	16
Grefsen Kjelsås 21 18 areas 18106 inhabitants 4949 buildings	4117	63	32
	4401	454	99
	4402	1857	494
	4403	1878	732
	4404	676	194
	4405	1181	70
	4406	1146	382
	4407	1473	398
	4408	1116	385
	4409	929	355
	4410	631	248
	4412	412	22
	4413	528	148
	4414	778	287
	4415	887	334
	4416	998	264
	4417	1512	186
	4418	1587	319
Sogn 22 15 areas 16013 inhabitants 4350 buildings	4411	1189	254
	4501	1388	241
	4502	1330	557
	4503	895	345
	4504	912	354
	4506	1091	287
	4507	1781	474
	4508	1179	366
	4509	1663	689
	4511	1127	226
	4512	886	223
	4513	579	85
	4607	578	122
	4608	1125	47
	4610	290	80

District	Area Code	Inhabitantes	Buildings
Vinderen 23 18 areas 19408 inhabitants 7005 buildings	4601	1535	623
	4602	1702	579
	4603	1243	512
	4604	621	184
	4609	729	153
	4611	1231	447
	4701	1140	471
	4702	1288	468
	4704	944	248
	4705	974	371
	4904	1336	516
	4905	1401	504
	4906	1388	428
	4908	223	87
	5001	1122	412
	5002	260	112
	5003	1776	675
	5004	495	215
Røa 24 20 areas 21282 inhabitants 4733 buildings	4801	933	249
	4802	4	17
	4901	957	65
	4902	643	71
	4903	1398	551
	4907	1659	355
	4909	91	24
	4910	985	18
	4911	1421	75
	4912	1439	285
	5005	1022	417
	5006	46	7
	5007	491	16
	5008	2411	103
	5201	1295	353
	5202	1479	595
	5203	1237	484
	5204	1288	513
	5205	1633	477
	5209	850	58
Ullern 25 23 areas 26606 inhabitants 6520 buildings	4703	978	302
	4706	1307	411
	4803	1222	345
	4804	884	311
	4805	1324	272
	4806	819	238
	5206	1519	324
	5207	1151	84
	5208	726	334
	5210	1309	194
	5301	742	285
	5302	1330	479
	5303	1296	324
	5401	1686	212
	5402	1351	500
	5403	1498	506
	5404	1984	415
	5405	1270	437
	5406	85	47
	5501	1232	103
	5502	842	184
	5503	1610	76
	5504	441	137

District	Area Code	Inhabitantes	Buildings
Sentrum 26 15 areas 1274 inhabitants 799 buildings	101	12	14
	102	104	113
	103	41	91
	104	61	68
	105	54	75
	201	189	66
	205	142	123
	211	62	45
	304	420	11
	305	2	11
	306	22	94
	307	128	48
	309	18	4
	310	4	17
	401	15	19
Marka 27 15 areas 1629 inhabitants 611 buildings	5801	3	0
	5802	6	2
	5803	11	1
	5804	30	3
	5805	49	14
	5101	245	23
	5102	94	13
	5103	267	63
	5901	196	84
	5902	9	3
	6001	46	22
	6002	306	177
	6004	16	1
	6005	28	1
	6007	323	204