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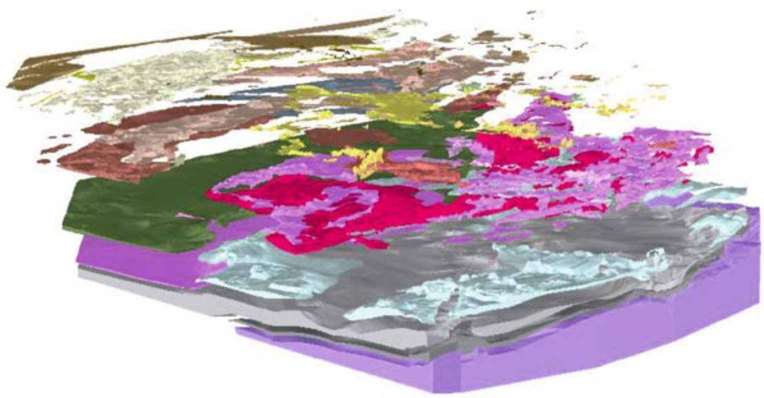
Model metadata report for the Forres GSI3D Superficial Deposits Model

Geology and Regional Geophysics Scotland

OR/14/057



BRITISH GEOLOGICAL SURVEY

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Front cover

Geological units exploded as shown in 3D window of GSI3D, vertical exaggeration x 5, looking northeast.

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1 Summary

This report describes the Forres GSI3D model which was built as part of the BGS research programme on Quaternary Mapping and Modelling in the north of Scotland. The Forres model encompasses part of the River Findhorn catchment which has been affected by severe flooding in recent years. The model was constructed as a basis for the development of groundwater flow models to provide information in respect to potential groundwater flooding in the Forres area.

2 Modelled volume, purpose and scale

The Forres GSI3D model was constructed to represent the superficial geology of the area highlighted in Figure 1. The superficial deposits model provides a calculated model framework for Zoom ground water modelling in relation to alleviating and preventing the threat of flooding in the River Findhorn catchment area, (MacDonald et al., 2008; Vounaki et al., 2011).

The model is suitable for scales around 1:10 000 or a lower resolution, down to a depth of -50m OD.

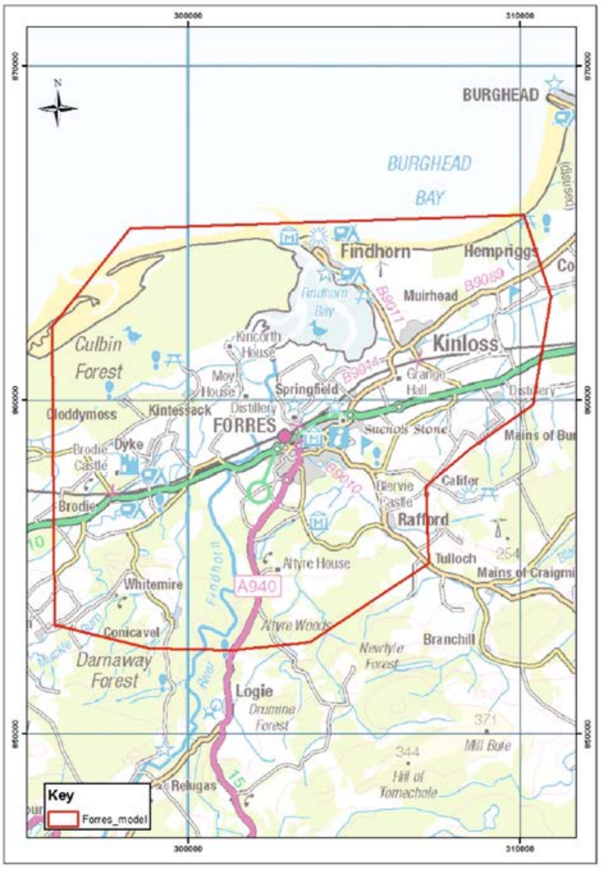

Figure 1: Map of the Forres model area.

3 Modelled surfaces/volumes

The Generalise Vertical Section (GVS) for the Forres model identifies 37 geological units in the model area, with further 7 lenses identified within the modelled units. The GVS was developed from lithostratigraphic units recorded on a new digital 1:10 000 scale superficial map produced following resurvey of the area from 2008-2011.

Three generic bedrock units, sandstone, metamorphic rock and conglomerate were also included in the model. The use of simple bedrock representation allows this superficial deposits model to be incorporated within a larger regional model in which similar generic lithological names for bedrock units were used.

name	lithostrat_code	code	geological_unit
mgr	MGR	MGR	Made ground
wmgr	WMGR	WMGR	Infilled ground
itdu	ITDU	ITDU	Intertidal deposits
trd	TRD	TRD	Tidal creek or river deposits
bchd	BCHD	BCHD	Present day beach deposits
samd	SAMD	SAMD	Salt marsh deposits
bsa	BSA	BSA	Blown sand
peat	PEAT	PEAT	Peat
lde	LDE	LDE	Lacustrine Deposits
sbdg	SBDG	SBDG	Storm beach deposits
alv1	ALV1	ALV1	Alluvium1
rtd1	RTD1	RTD1	River Terrace Deposits_1_Flandrian
rmdf1	RMDF1	RMDF1	First raised marine beach deposits
rmdf2	RMDF2	RMDF2	Second raised marine beach deposits
rmdf3	RMDF3	RMDF3	Third raised marine beach deposits
rmdf4	RMDF4	RMDF4	Fourth raised marine beach deposits
rtfdd	RTFDD	RTFDD	Raised tidal flat deposits_late Devensian
rmbdd	RMBDD	RMBDD	Raised marine deposits_late Devensian
rtd6	GFTD	GFTD	Glaciofluvial_terrace deposits_1
gfdd	GFDD	GFDD	Glaciofluvial fan and fan delta deposits
till1	TILL1	TILL1	Till1
gsg1	GSG1	GSG1	Glaciofluvial_sand_gravel_1
glld1	GLLD1	GLLD1	Glaciolacustrine_deposits_1
gsg2	GSG2	GSG2	Glaciofluvial_sand_gravel_2
gsg3	GSG3	GSG3	Glaciofluvial_sand_gravel_3
glld3	GLLD3	GLLD3	Glaciolacustrine_deposits_3
till4	TILL4	TILL4	Till4
gsg4	GSG4	GSG4	Glaciofluvial_sand_gravel_4
glld4	GLLD4	GLLD4	Glaciolacustrine_deposits_4
hmgd1	HMGD	HMGD	Hummock glacial deposits gravelly and sandy
ards	ARDS	ARDS	Ardersier Silts Formation
grhs	GRHS	GRHS	Grange Hill Sand Formation
mhsi	MHSI	MHSI	Milton Hill Silt Member
hrgs	HRGS	HRGS	Hempriggs Sand Member
egti	EGTI	EGTI	East Grange Till Member
till6	TILL6	TILL6	Till6
gsg6	GSG6	GSG6	Glaciofluvial_sand_gravel_6
sdst	SDST	SDST	Sandstone
cong	CONG	CONG	Conglomerate
metr	METR	UMPCC	Metamorphic_rock
peat1_top	PEAT1TOP1	PEAT1TOP1	Peat_lens_1
gsg_top	GSGTOP	GSGTOP	Glaciofluvial_lens
balt_top	BALTTOP	BALTTOP	Balmakeith_Till_lens
algr_top	ALGRTOP	ALGRTOP	Alturlie_Gravels_Formation_lens
rmbdd_top	RMBDDTOP	RMBDDTOP	Raised marine deposits_late Devensian_lens
egti_top	EGTITOP	EGTITOP	East Grange Till Member_lens
mhsi1_top	MHSI1TOP	MHSI1TOP	Milton Hill Silt Member_lens

Table 1: GVS showing modelled units for the Forres area.

4 Modelled faults

No faults were included in the model. The faulted conglomerate unit is drawn as a continuous, but stepped unit. No fault objects are modelled.

5 Model datasets

The data used to develop the Forres model is described below. Some general caveats regarding BGS datasets and interpretations are:

- Geological observations and interpretations are made according to the prevailing understanding of the subject at the time. The quality of such observations and interpretations may be affected by the availability of new data, by subsequent advances in knowledge, improved methods of interpretation, improved databases and modelling software, and better access to sampling locations.
- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated measuring techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.

5.1 RAW DATA

Raw data used to develop the Forres model include the digital terrain model, borehole data, digital geological map shapefiles, and records of exposures and trial pits. The file locations of the data used are given in Appendix 1.Digital Terrain Model (DTM) data

The DTM used for the Forres model is the NEXTMap® Digital Elevation Model (exported from the BGS data portal). Originally the DTM was imported at 10 m resolution from the data portal but problems were incurred possibly due to the file size being too large. The resolution was decreased to 25 m and the area of the DTM extended beyond the model area in each direction but was later clipped in GSI3D before computing volumes.

The Rock Head Elevation Model (RHEM) grid was also imported from the data portal and similar issues to the DTM occurred. Again the resolution was decreased to 25 m.

Data (Boreholes)

Borehole data were entered into the BGS corporate database, BGS Borehole Geology according to the project GVS. The borehole information was extracted via the Data Portal (10/07/2009) for the model area using interpreter ‘ECAL’ and in total there were 392 boreholes and trial pits. Boreholes were generally hung according to the DTM used, however where the DTM was affected by artefacts, e.g. trees, the boreholes were aligned with the contour values.

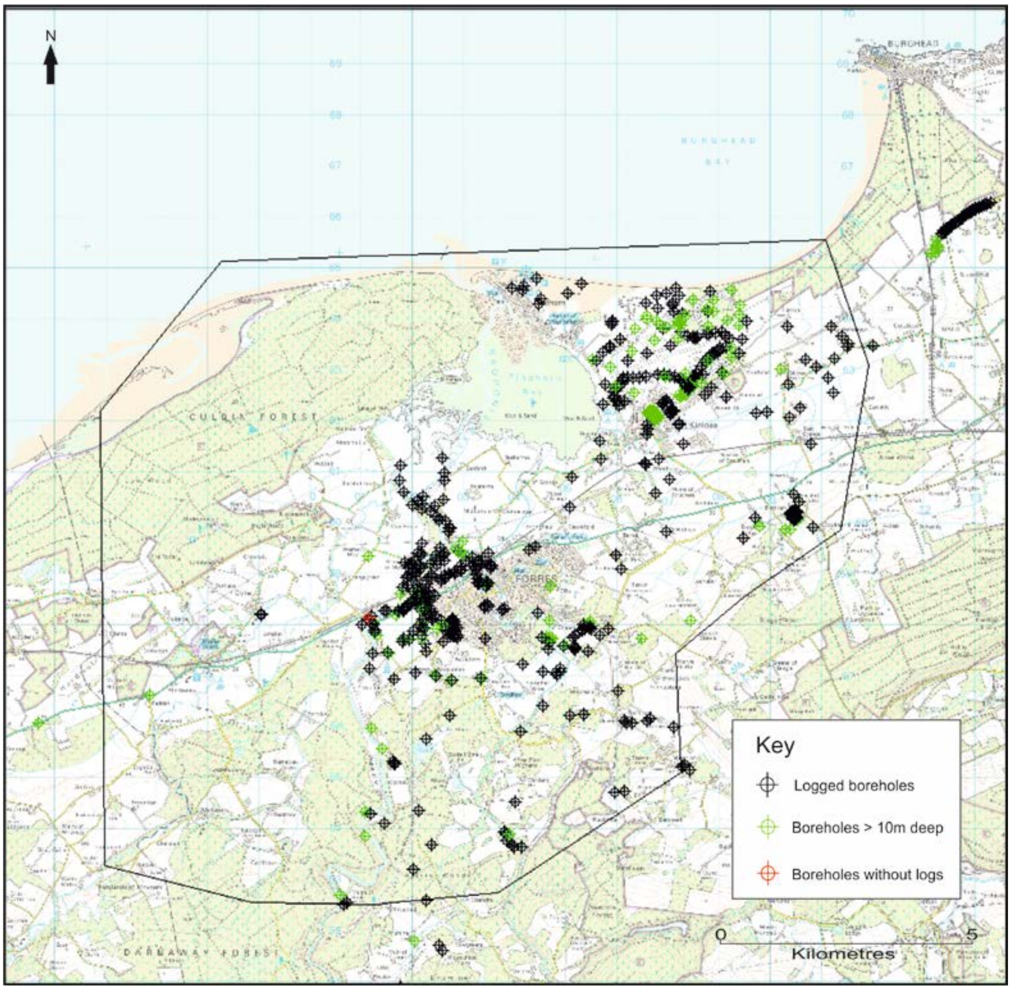

Figure 2: Location of boreholes (including field points and trial pits)

Data (Field Information/Points)

Field data points providing information on the deposits and their thickness were compiled into Excel tables and converted into '.bid' and '.blg' files for use in the modelling. Two different sources of field data were used: 1) information from old geological fieldslips and maps (Table 2) and, 2) map face notes and field observations from the recent field survey compiled from SIGMA mapping projects (Table 3).

Data (Geological)

Superficial, artificial and landform polygons were provided by the field geologists who had undertaken mapping in this area between 2008 and 2011. These files were provided as 3D shapefiles for use in GSI3D by CartoGIS. To convert a 2D-shapefile to a 3D-shapefile, software from the web was used and was imported into an Arc GIS project, converted and resaved.

Data (rasters and shapefiles)

Topographic maps at 1:10 000, 1:25 000 and 1:50 000 scales were extracted for the project area. 3D contours for the area are available as a shapefile but had to be converted into 2D using ARC, the same process for converting the geological linework.

GSI3D_ID	EASTING	NORTHING	START_HEIGHT
AGF_1	304423.0000000000	859528.0000000000	11.97
AGF_11	303281.2800000000	858821.2100000000	10.32
AGF_12	302734.9300000000	856207.4500000000	41.08
AGF_17	303424.5600000000	857732.2700000000	26.27
AGF_2	303443.8100000000	858759.8100000000	14.84
AGF_5	302619.9700000000	857669.4500000000	18.36
AGF_6	301651.2900000000	856929.0000000000	25.61
AGF_7	301139.5200000000	858092.4700000000	13.30
AGF_8	301206.3800000000	858159.3200000000	15.95
AGF_9	301026.5700000000	858004.8700000000	20.98
AGF10	303296.3700000000	858811.3300000000	10.63
CA3001	305192.0000000000	857778.0000000000	27.11
CA3003	304690.0000000000	858089.0000000000	35.25
CA3005	304451.0000000000	858230.0000000000	24.20
CA3007	304531.0000000000	857742.0000000000	31.39
CA3008	304169.0000000000	857216.0000000000	30.31
CA3009	304569.0000000000	856397.0000000000	42.03
CAA_10	305907.0000000000	863887.0000000000	8.33
CAA_3	301153.0000000000	858114.0000000000	13.94
CAA_36_LOG_2	301467.0000000000	854107.0000000000	60.07
CAA_41	304007.0000000000	854516.0000000000	67.21
CAA_44	304005.0000000000	853628.0000000000	83.63
CAA_45	304148.0000000000	853627.0000000000	87.98
CAA_46	303852.0000000000	853771.0000000000	97.84
CAA_51	305991.0000000000	859349.0000000000	40.57
CAA_54	306969.0000000000	859819.0000000000	42.22
CAA_58	306763.0000000000	860582.0000000000	17.26
CAA_7	304155.0000000000	864551.0000000000	7.17
CAA_81	306147.0000000000	856112.0000000000	53.27
CAA_9	304519.0000000000	864384.0000000000	6.91
CAA_92	300732.0000000000	852537.0000000000	95.27
CAA_93	304433.0000000000	864788.0000000000	5.96
CAA_96	303947.0000000000	853675.0000000000	86.00
CAA01082008104028	304125.4180000000	855893.7132000000	54.68
CAA01082008153227	303798.0000000000	853939.0000000000	85.06
CAA01082008155214	303839.1445000000	853896.3766000000	87.19
CAA01082008155517	303907.7766000000	853898.0505000000	96.81
CAA02082008122954	300596.0651000000	852703.0057000000	53.42
CAA02092008103101	305078.0298000000	860307.4570000000	13.18
CAA02092008153630	306572.6548000000	861149.7338000000	4.78
CAA02092008163055	307026.0000000000	860841.0000000000	10.76
CAA03092008095758	306037.5960000000	856707.0916000000	65.57
CAA04092008132540	309388.0000000000	862053.0000000000	35.79
CAA04092008165608	309588.0000000000	862251.0000000000	19.94
CAA05092008104812	308136.3775000000	862459.6605000000	8.44
CAA05092008122901	309349.0000000000	863852.0000000000	7.22
CAA05092008153719	309705.0000000000	863186.0000000000	29.32
CAA05092008182805	311006.3091000000	863467.4047000000	16.92
CAA05092008184210	310204.9784000000	863837.3442000000	16.98
CAA06092008093850	309570.6627000000	860407.2969000000	33.74
CAA06092008104758	309457.1524000000	860548.7961000000	31.59
CAA06092008115741	309849.4284000000	859908.2080000000	65.71
CAA06092008175521	308704.7647000000	860087.5212000000	39.47
CAA06092008175703	308798.9300000000	859928.0166000000	45.16
CAA06092008181311	308479.1699000000	859685.2367000000	41.66
CAA07092008094345	302021.2453000000	853199.2312000000	99.50
CAA07092008104345	302277.1275000000	852585.9170000000	124.89
CAA07092008130720	302036.8549000000	851797.0097000000	131.75
CAA07092008154158	302534.0527000000	851699.7069000000	141.59
CAA07092008155027	302583.1005000000	851604.2704000000	142.84
CAA07092008171134	301764.3161000000	850902.3308000000	147.26
CAA08092008105832	305358.6206000000	856230.4602000000	44.33
CAA08092008111546	305093.4535000000	856218.4966000000	59.18
CAA08092008115424	306187.2945000000	856063.6382000000	56.08
CAA08092008120249	306290.5334000000	856071.0124000000	62.33
CAA08092008134531	306591.3628000000	856103.3080000000	71.00
CAA08092008140905	306648.1770000000	856159.9114000000	72.72
CAA08092008154334	307107.6941000000	855985.7318000000	80.56
CAA08092008175024	307277.2946000000	855204.9561000000	96.00
CAA08092008175523	307334.1869000000	855241.8593000000	90.97
CAA08092008180936	307429.4757000000	855145.1470000000	93.11

Table 2: Field points shown as a bid file for use in GSI3D

CAA_GSI3D_	THICKNESS_	MAPPED_UNIT	GSI3D_UNIT	DESCRIPTION
NJ16SW_1	9.14	GRHS	GRHS	Pyellow sand
NJ16SW_2	0.60	GRHS	GRHS	till
NJ16SW_2	0.80	GRHS	GRHS	sand
NJ16SW_3	7.00	GRHS	GRHS	sand w c partings
NJ16SW_4	0.30	GRHS	GRHS	pebbly sand
NJ16SW_4	0.90	GRHS	GRHS	brown till
NJ16SW_4	3.95	GRHS	GRHS	contorted RB silt_clay
NJ16SW_5	1.22	PEAT	PEAT	peat
NJ16SW_6	1.22	PEAT	PEAT	peat
CAA05092008153719	1.10	GRHS	GRHS	sand_ pebbly and silty
CAA05092008153719	1.20	GRHS	GRHS	Brown Till
CAA05092008153719	1.70	GRHS	GRHS	silty sand
CAA05092008153719	4.20	GRHS	GRHS	sand
NJ06SE_6	7.92	GRHS	GRHS	sand
NJ06SE_7	5.00	GRHS	GRHS	sand
CAA05092008122901	0.80	GLLD	GLLD	sandy silt
NJ06SE_8	1.32	RMDF2	RMDF2	silty clay on thin sand
NJ06SE_9	1.83	RMDF2	RMDF2	silt
CAA04092008132540	1.20	GRHS	MHSI	Rbsandy silt MHSI
CAA04092008165608	2.50	GRHS	EGTI	RB sandy Till EGTI
NJ06SE_10	0.45	GFSD	GSG1	pebbly sand
NJ06SE_10	1.75	GFSD	GSG1	bedded sand_ gravel
NJ06SE_11	2.74	STOB	SBDG	shingle _ sand
NJ06SE_12	1.20	BSA	BSA	blown sand
NJ06SE_12	2.20	RMDF1	RMDF1	sandy raised b
CAA26072008140344	1.05	RMDF3	RMDF3	fine shingle on silty or Sand
CAA26072008133811	1.20	RMDF3	RMDF3	thinly interbedded S_g
CAA_10	3.50	BSA	BSA	blown sand
CAA_10	4.50	RMDF3	RMDF3	sandy raised b
CAA_93	2.50	RMDF1	RMDF1	shingle beach ridge
CAA_9	0.60	RMDF1	RMDF1	gravel raised beach
CAA_7	0.60	RMDF1	RMDF1	shingle beach ridge
CAA02092008163055	1.80	RMBDD	RMBDD	Silty sand
CAA02092008163055	2.10	ARDS	ARDS	grey sand
CAA_58	1.90	RMBDD	RMBDD	silty sand with boulder lags
CAA_58	2.40	ARDS	ARDS	grey silty sand scat boulders
NJ06SE_13	0.70	RMDF2	RMDF2	silty s on gritty sand
NJ06SE_14	1.00	RMDF2	RMDF2	silty clay
CAA_51	2.30	GFSD	GSG1	yellow br sand micacacous
CAA_54	1.30	GRHS	GRHS	r b damp silty sand _ till
CA3008	3.00	GFTD	GFTD	sand _ gravel
NJ05/NW_NE_15	1.30	PEAT	PEAT	Peat
NJ05/NW_NE_16	1.30	PEAT	PEAT	Peat
NJ05/NW_NE_17	1.30	PEAT	PEAT	
NJ05/NW_NE_18	1.30	PEAT	PEAT	
CA3001	1.00	PEAT	PEAT	Peat
CA3001	2.30	LDE	LDE	Clay _ silt
CA3003	20.00	GFIC	GSG2	sand _ gravel
CA3005	1.50	RTD	RTD1	gravel on sand
CA3007	1.50	GFIC	GSG2	sand _ gravel
CA3009	2.50	GFIC	GSG2	cobble gravel
NJ05/NW_NE_19	5.00	TILL	TILL2	red brown till
NJ05/NW_NE_19	15.00	PQU_CRYST	META	psammite
CAA_3	0.00	PQU_SEDM	SDST1	cornstone
CAA29072008173809	6.00	TILL	TILL2	red brown till
CAA29072008165424	4.00	TILL	TILL2	red brown till
CAA_81	2.50	GFSD	GSG1	sandy cobble gravel
CAA08092008192605	1.50	GFSD	GSG1	sandy cobble gravel
CAA01082008153227	1.50	TILL	FINT	brown basal till
CAA_46	6.00	TILL	TILL6	Red brown sandy Dmm
CAA_96	1.00	GLLD	GLLD5	G Lake sediment
CAA_44	1.30	TILL	TILL6	red-brown sandy basal till
CAA_45	0.80	GFDD	GFDD	boulder gravel
CAA_45	3.00	TILL	TILL6	red-brown sandy basal till
CAA_41	1.50	GFSD	GSG1	cobble and pebble gravel
CAA_36_LOG_2	1.70	TILL	TILL2	Till, stiff dark red brown
CAA_36_LOG_2	2.90	GSG	GSGBASE	sandy gravel lens
CAA_36_LOG_2	4.70	GSG	GSGBASE	sand
CAA_36_LOG_2	7.00	TILL	TILL3	till strong red brown
CAA_92	2.00	GFSD	GSG1	terraced glacio fluvial gravel
AGF_1	5.00	ARDS	ARDS	yellowish brown massive fine sand

Table 3: Field points shown as a blg file for use in GSI3D

Additional Data

Five cross sections from MacDonald *et al.* (2007), constructed to assess lithological variation within part of the study region, were examined prior to modelling (an example section is provided in Figure 3). Four of these sections were imported as jpeg images into the modelling project to help guide cross-section construction.

Faults within the cross-sections have been interpreted from the district geologist's field observations and knowledge.

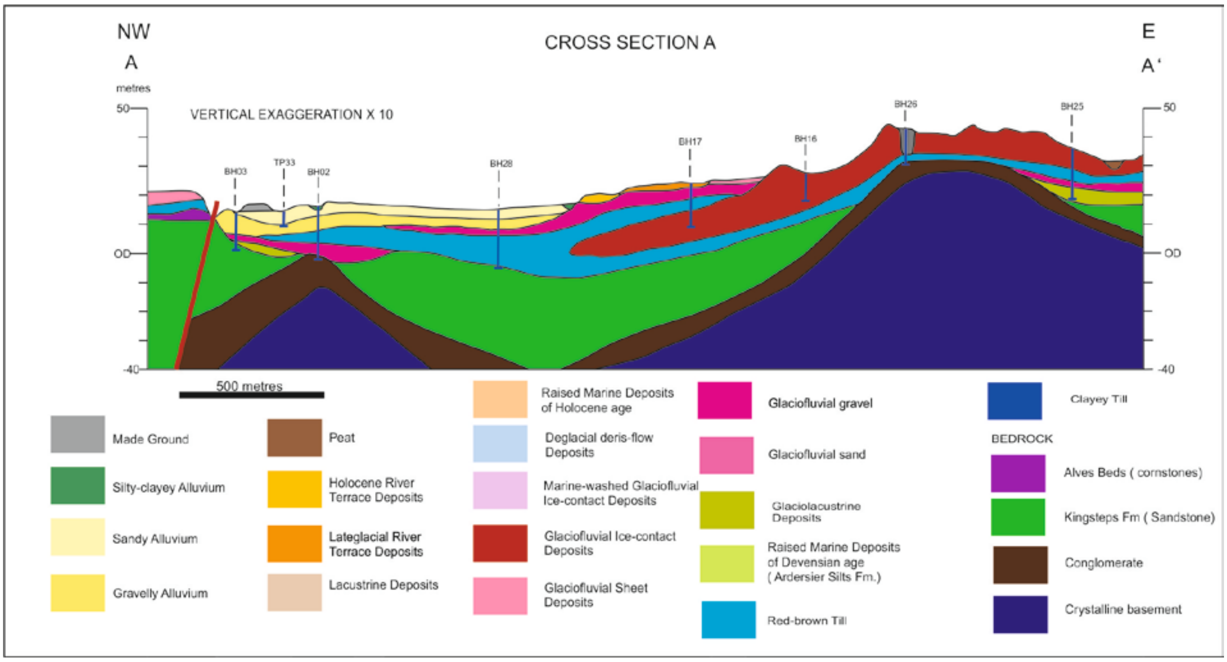

Figure 3: Pilmuir cross section extracted from MacDonald *et al.* (2007).

6 Dataset integration

All data were brought together in the GSI3D modelling software where it can be viewed and interrogated in 2D and 3D.

7 Model development log

In total 49 cross sections were constructed within the Forres GSI3D model (Figure 3); 19 sections trended north-east to south-west and 21 trended north-west to south-east. Five helper sections were constructed to address particular issues, such as a lack of data or to constrain a geological unit.

Detailed model development log is included in Appendix 1.

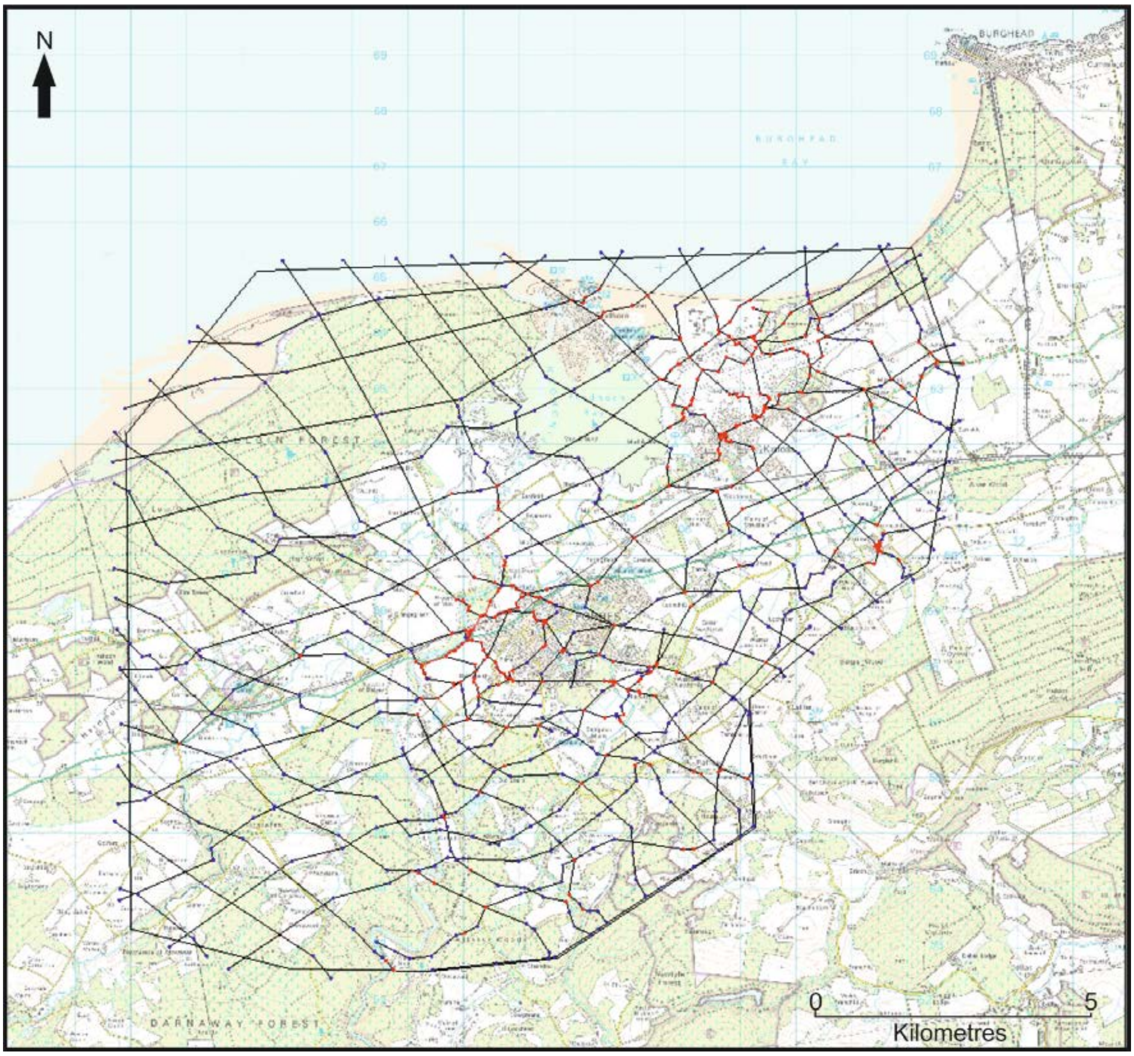

Figure 4: Location of cross sections drawn for 3D model

8 Model workflow

The methodology for construction of models in GSI3D is described in detail by Kessler et al. (2008; http://nora.nerc.ac.uk/3737/1/OR08001.pdf). It principally involves construction of cross-sections between the best quality borehole data, (Figure 5), followed by envelope construction around the limits of the geological units.

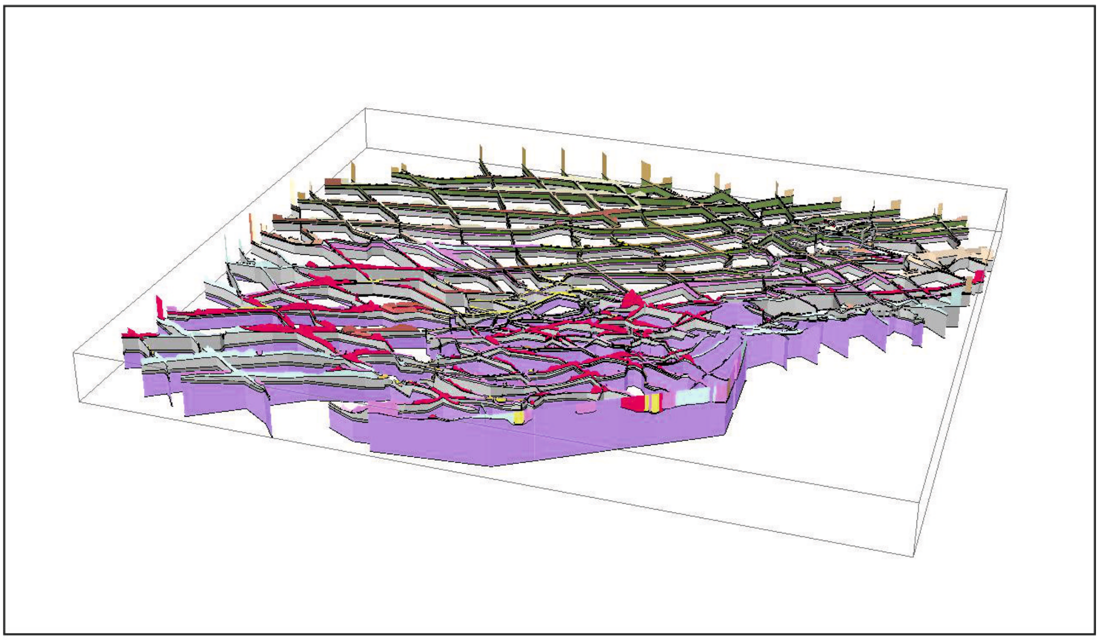

Figure 5: Cross sections shown in 3D window of GSI3D, looking to the north. Sections have a five times vertical exaggeration.

9 Model assumptions and limitations

- Best endeavours (quality checking procedures) were employed to minimise data entry errors but given the diversity and volume of data used, it is anticipated that occasional erroneous entries will still be present (e.g. borehole location).
- The model does not reflect the full complexity of the superficial deposits geology. In reality, surfaces have been subjected to more glacitectonic deformation than is represented in the model.
- The NEXTMap® Digital Elevation Model may contain artefacts such as trees or artificial structures such as pylons. If any of these artefacts were found during the modelling then the effects of these were minimised in the model as much as possible.
- The start heights of boreholes used might differ significantly from the NEXTMap® Digital Elevation Model. When modelling, these differences were taken account of by assessing the year the borehole was drilled and assessing the location of the borehole against other data such as historical maps. Therefore the modeller used their own judgment in some areas if the stratigraphy in the borehole did not match the modern day topography and changes in the subsurface (quarrying, landfill etc).
- The thin nature of some superficial deposits means that these units are poorly shown in visualisations of the 3D model (e.g. in the Lithoframe Viewer 3D window). A substantial number of additional cross-sections (‘helper sections’) are needed to improve the calculation of thin deposits.
- The heights of raised marine deposits resulting from past sea-level changes were assumed.

- There was a lack of borehole information in the west part of the model, thus this part of the model is heavily reliant on mapping.

10 Model images

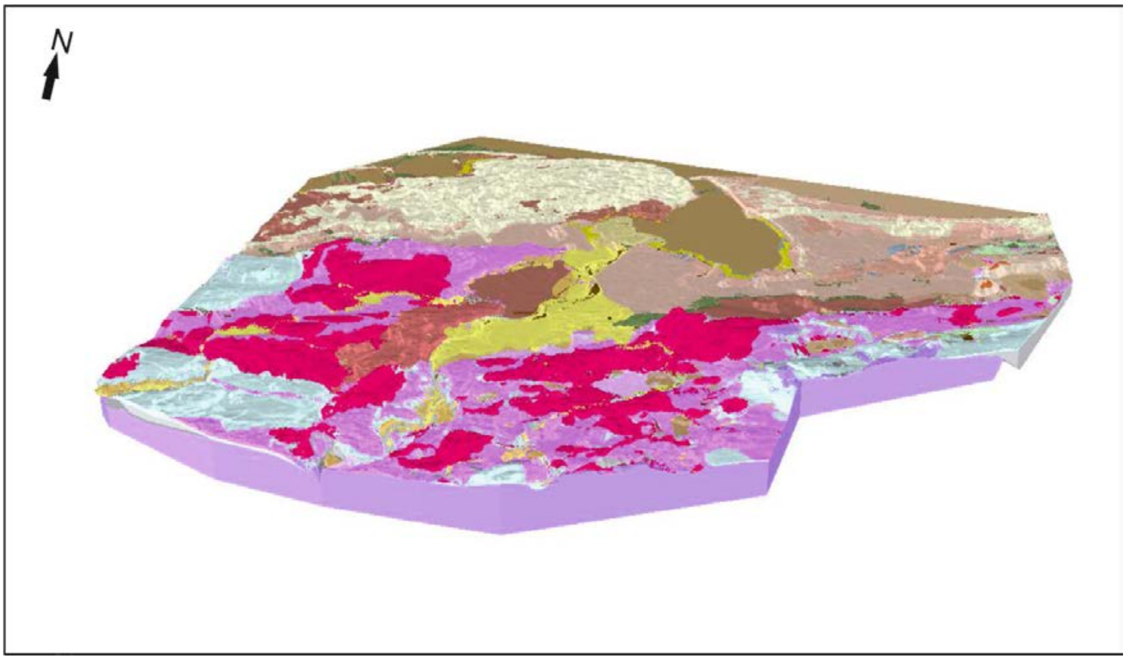

Figure 6: Geological units as seen in 3D window, vertical exaggeration x 5

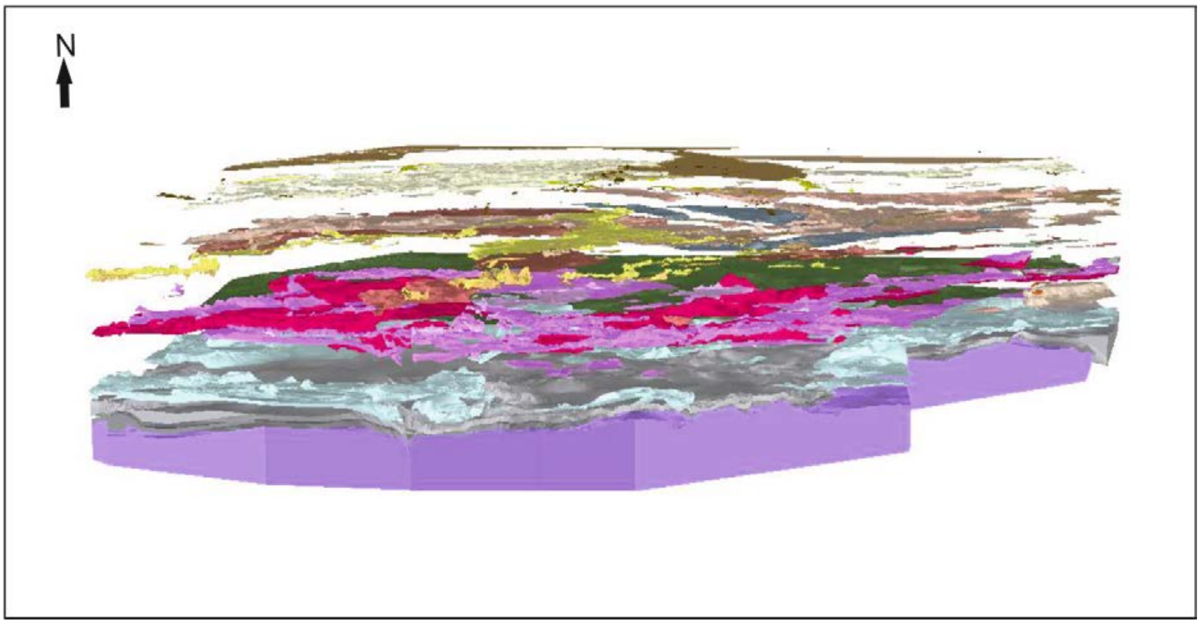

Figure 7: Exploded geological units as seen in 3D window, vertical exaggeration x 5

Appendix 1

Data Preparation for Forres GSI3D Superficial Model

All raw data files are stored in the folder:

W:\Teams\QES\QMMP\Data\MorayNessBasin_Data\Data\MorayNess-Region\GSi3D\ForessLocalModelBaselineData

GVS file:

ForessLocalModelBaselineData \MorayNess_gvs_V9.gvs

Legend file:

ForessLocalModelBaselineData \MorayNess_legend_V3.gleg

File created and colours/textures based on Clyde modelling work.

Extra geological units were added, used on the new digital 10k superficial map of the area and checked all units in the GVS are represented in the legend file.

The BGS rgb colours were taken from new superficial map into the legend. This was achieved by opening layerfile of superficial polygons in GIS project, double click on box showing the colour of a particular unit in the key at the side, in a new window where you would change the colour of a unit click to get the pull-down menu of standard colours and then click on 'more colours', current rgb values will be listed here, copy rgb values into the legend file.

Bid file:

Made up of two parts: borehole information entered into SOBI (interpreter code ECAL) and field information (collected by mapping geologists and recorded in MIDAS + notes recorded from old geological field slips and maps).

i) Borehole information. This was exported from SOBI via the Data Portal (intranet) for the area to be modelled (selecting: 'sobi-NextMap-CEH' for start height information, 'ECAL x3 as BOGE author and 'all boreholes' from BOGE) creates a .bid and a .blg file for the 492 boreholes.

ii) ii) Field information: original data held in an Excel table with 3 sheets of information (sheet 1: info from old geological field slips and maps, sheet 2: map face notes from MIDAS from mapping geologists, sheet 3: bedrock information (not relevant for this model). Sheets 1 and 2 collated into a single sheet in a new excel table. This was double checked and once approved that interpreted codes were correct these were given a map number e.g. NJ05NW to any entries that didn't have an unique number (i.e. those with single numbers). All codes in upper case (they wouldn't colour up in GSI3D in lower case because colours taken from legend file and all codes in upper case in there). This sheet was then split into two, separating data for a .bid file and a .blg file. Bid file requires a list of unique numbers plus x, y, z values. Only x and y values were extracted from MIDAS, z values needed to be found. Z values were generated automatically by GIS team (created 3d-shapefile of points in Arc using dtm, and exported values as a dbf file, which could then be opened in excel). Any duplicate field point entries were deleted approximately150 field points.

iii) Added i) and ii) together to make whole .bid file, path show at top of this section

N.B. don't have any symbols (e.g. '+' or ',') in file names

Blg file:

similar to above

Note that need separate row for each geological unit when recording downhole information. GSI3D uses the base of each unit, so if data is recorded as a sequence of thicknesses these must be converted to depths below the top of the section.

DTM, surface grid:

ForessLocalModelBaselineData\From Data Portal (10thJuly'09)\ Forres_NEXTMAP_DTM_25m.asc

NextMap dtm; tried exporting 10m dtm from Data Portal (Intranet), but problems downloading (probably too big a file and system couldn't cope), Clyde project uses 25m or 50m resolution. So currently using 25m resolution which imports okay. Note that the dtm extends beyond the model area in each direction, clip in GSI3D before computing volumes.

RHEM, rockhead grid:

ForessLocalModelBaselineData\From Data Portal (10thJuly'09)\ Forres_NEXTMAP_RHEM_25m.asc

As for dtm grid.

Geological linework:

ForessLocalModelBaselineData\Geological linework\From Lesley Oliver\

Morayness_supd_2d.shp + Morayness_art_2d.shp + Morayness_landf_2d.shp

Need superficial, artificial and landform polygons/linework as shapefiles

Requested from the CartoGIS office

Note that the files need to be 2D-shapefiles not 3D-shapefiles as often received from the CartoGIS office. Usually tell if this is the problem when trying to import the file into GSI3D and you can't see any of the attribution headings to choose 'lexicon'.

To convert a 2D-shapefile to a 3D-shapefile software was ontained from the web, which was imported into Arc GIS project, converted and resaved.

BGS RGB colours can be seen in the GIS project if you get a layer file of the polygons from the CartoGIS office

Project area:

ForessLocalModelBaselineData\Model area\Forres_model.shp

Shapefile exported from Arc

.Jpg's:

i) Topographic maps.

ForessLocalModelBaselineData\Topo maps\From Jenn\Forres_OS10kbw_2_(85%).jpg

ForessLocalModelBaselineData\Topo maps\From Jenn\Forres_OS25k_(90%).jpg

ForessLocalModelBaselineData\Topo maps\From Jenn\Forres_OS50k.jpg

1:10k(B&W and reduced resolution), 1:25k and 1:50k topo maps of model area were cropped to project area. General/tourist map can be downloaded through the Data Portal when extracting borehole information. N.B. all .jpg's must have an associated world file for importing into GSI3D, in .jpgw format not .jgw as comes out automatically from Arc. Keep file size under 20,000KB where possible otherwise GSI3D becomes very slow or falls over.

ii) Cross-sections.

ForessLocalModelBaselineData\Pilmuir Cross Sections\Pilmuir_sections_for_GSI3D\Use these cropped 24bit rgb rasters for GSI3D\simplified_Xsection_A_(cropped).jpg

Single image of 5 cross-sections were taken from the BGS Pilmuir report for importing into GSI3D. Sections were crop so there was a single section per image, then clipped exactly to their limits. (In GSI3Dv2.6 top right and bottom left x,y,z values need to be known. In GSI3Dv3 draw a new section line along the line of the jpg section (import a semi-transparent, georectified plan view of the section lines, jpg) then right click on section, hover over 'raster' and click on 'import raster backdrop' you need to know the z values and work out the length of the section (W)). Images must be in '24 bit RGB' format not '32 bit CMYK' format. All these images were converted into the correct format in Corel Photo-Paint.

iii) Air photos. Not used in this model, air photos already used to compile the current geological linework.

Contour data:

W:\Teams\QES\QMMP\Data\MorayNessBasin_Data\Data\MorayNess-Region\GSi3D\ForessLocalModelBaselineData\Contours\Use these 2d-files in GSI3D

3d contour line data for the area was available as a 3D-shapefile. This was converted in Arc from a 3D-shapefile into a 2D-shapefile as was also undertaken for the geological linework.

References

British Geological Survey holds most of the references listed below, and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at: http://geolib.bgs.ac.uk.

Kessler, H., Mathers, S.J., Sobisch, H-G and Neber, A..2008. GSI3D – The software and methodology to build systematic near-surface 3-D geological models. (Version 2) *British Geological Survey Open Report*, OR/08/001 144pp.

MacDonald, A M., Hughes, A G., Mansour, M., Finlayson, A., Lapworth, D J., Auton, C A and Graham, M T., 2007. Groundwater and Flood Alleviation in Pilmuir, Morayshire. *British Geological Survey Commissioned Report*. CR/07/135, 74pp.

MacDonald, A M., Hughes, A G., Vounaki, T., Graham, M T., Lilly, A., Mansour, M and Stephens, C A., 2008. Groundwater and the Forres (River Findhorn & Pilmuir) Flood Alleviation Scheme, Morayshire. British Geological Survey Commissioned Report. CR/08/023[N], 94pp.

Vounaki, T., Hughes, A., MacDonald, A., 2011. Regional and catchment scale groundwater models of the superficial deposits underlying the Moray Ness area : Initial results. *British Geological Survey Open Report*. OR/11/024. 28pp