

Borehole data import guide for Aarhus Workbench

.bor and .rkt file format descriptions

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1. INTRODUCTION

This manual contains a detailed description of:

- The standard format .bor of the input file concerning geological bore-hole data.
- The standard format .rtk of the legend file to describe lithology, RGB colors and rock description.
- The procedure to successfully import and edit borehole data in Aarhus Workbench.

Example files can be downloaded at http://www.ags-cloud.dk/Wiki/W_GuidesBoreholes

Version information

This manual is written for Aarhus Workbench 5.x

Reference

Aarhus Workbench is not freeware, but a demo version or a Viewer version is available by contacting Aarhus GeoSoftware at info@aarhusgeosoftware.dk.

2. .BOR FILE FORMAT: TECHNICAL DESCRIPTION

This file contains the geological borehole information and the suffix characterizing borehole file is .bor. A .bor file has to be an ASCII text file and tab and space can be used indifferently as delimiters.

One file can describe several boreholes. The only requirement is that all boreholes in the same .bor file needs to be characterized by the same: i) UTM zone; ii) geodetic system datum; and iii) vertical reference system.

Below is an example of a .bor file with description of each line below. Red text and numbers in the example are not part of the file; they are there just for explanatory purposes. There is another example in Appendix A.

Example of .bor file:

```
#      Text
1      $BOREHOLE
2      BoreholeNo=19ANL031
3      DrillDepth=139.13
4      Elevation=3.97
5      VerticalRef=DVR90
6      Location=Aarhus
7      Comments=AU
8      XUTM=611314.82
9      YUTM=5837931.41
10     UTMZone=32
11     Datum=EUREF89
12     Top      Bottom  LayerDescription  RockType  RGB          RockDescription
13     0.00     12.91   ""              li        (100,0,0)    "silt"
14     12.91    13.11   "vadose"        am        (200,0,0)    "compact silt"
15     13.11    16.66   ""              kl        (200,200,0)  "clay"
16     16.66    19.31   "capillary fr." za        (255,0,0)    "sand"
17     19.31    27.91   "water table"   za        (255,0,0)    "sand"
18     27.91    28.23   ""              za        (255,0,0)    "sand"
19     28.23    28.35   ""              kl        (200,200,0)  "clay"
20     .
21     .
22     .
23     112.91   119.41   ""              za        (255,0,0)    "sand"
24     119.41   125.61   ""              za        (255,0,0)    "sand"
25     125.61   139.13   ""              za        (255,0,0)    "sand"
26     $BOREHOLE
27     BoreholeNo=19ANL5145
28     DrillDepth=12.00
29     .
30     .
31     .
```

Line #	Description
1	the text \$BOREHOLE indicates the beginning of the portion of the file related to a single borehole. Similarly, the text \$BOREHOLE at line 26 shows that a new borehole description starts after that line.
2	Name of the borehole. It must be shorter than 11 characters.
3	Drill depth (borehole depth) in meters.
4	Surface elevation in meter. The value may be positive or negative. To work in units of depth below ground surface, set the surface elevation to zero. If an elevation other than zero is entered, the depth scale on the logs will be in terms of elevation.
5	Surface elevation reference. In Denmark you might want to use: 1) the Danish Vertical Reference and write: DVR90 or 2) the Danish Normal Zero (DNN). These are the only supported elevation systems. This is not a mandatory field. If you enter any other local vertical reference system code (e.g.: EVRF2007 or CVGD) or even xxx (it cannot be left blank), this reference system will not be interpreted, but the borehole will be still loaded correctly, but with no specific information about the vertical reference system.
6	Location of the borehole. This is a free text string. The length can be max 40 characters. This information will appear in the database and it is usually used to shortly describe the place where the borehole is located. This cannot be left blank.
7	A comment can be added here. It has to be shorter than 41 characters. It can be left blank.
8	UTM X coordinates
9	UTM Y coordinates
10	UTM zone. Positive number for northern hemisphere and negative for southern hemisphere. There can only be one UTM zone for each .bor file.
11	Datum of the coordinate system. There can be only one datum for each .bor file. A list of the currently supported datums are listed in Appendix B.
12	Information headers for the following lines. The columns: Top, Bottom, LayerDescription, and RockType are mandatory, while RGB and RockDescription are optional (see chapter 3 for an alternative and quicker way to use RGB and RockDescription). You can decide not to insert any information as LayerDescription, but still you have to write the quotation marks: "".
13-25	<p>Description of the geological layers.</p> <p>Top: The first layer has to start at 0 or higher, where 0 corresponds to the surface elevation in line 4. This is no matter if surface elevation is set to depth or elevation.</p> <p>Bottom: The bottom of the last layer has to be smaller or equal to borehole depth in line 3.</p> <p>LayerDescription "" outside the text. Also for an empty text. Max 256 characters.</p> <p>Rocktype can be max 2 characters and is case sensitive.</p> <p>RGB colors.</p> <p>RockDescription can be max 40 characters. "" is needed, also for an empty text. Text must be the same for layers with the same Rocktype to avoid confusion.</p>
26-28	Description of a new borehole starts

3. .RKT FILE FORMAT: TECHNICAL DESCRIPTION

Instead of specifying the color RGB codes and rock descriptions in the .bor file, it might be convenient to write a legend file. .rkt files can be used to speed up the lithotype definition procedure: instead of re-writing the description every time the same lithology is encountered in a borehole (like it can be done in the .bor file), in the .rkt file it is possible to describe a specific lithology simply once.

Below is an example of a .rkt file with description of each line below. Red text and numbers in the example are not part of the file; they are there just for explanatory purposes.

```
# Text
1 RockType RGB      RockShortDescription RockLongDescription
2
3
4 Ab      (255,0,0) "clay"          "Top of Rattlesnake Ridge Interbed"
5 ac      (0,255,0) "basalt"        "Aphanitic diktytaxitic"
6 aD      (0,0,255) "gravel"       "Well sorted. Diameter of 2 to 4 mm"
7 ae      (0,0,0)   "silt"         "With fine, rare quartz grains, and basalt clasts"
```

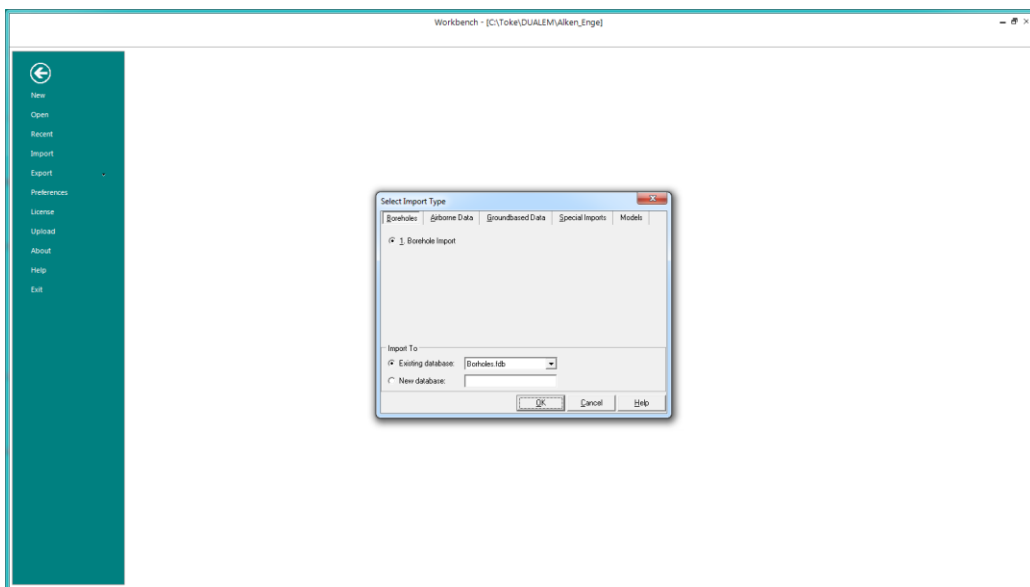
Line #	Description
1	Information headers for the following lines. The information cannot be changed.
2-3	Empty lines, just to show that they can be added.
4-7	<p>Layer information.</p> <p>Rocktype can be max 2 characters and is case sensitive.</p> <p>RGB colors.</p> <p>RockShortDescription can be max 40 characters. "" is needed, also for an empty text.</p> <p>RockLongDescription can be max 60 characters and is used to add further description of the layer. For an empty text, "" can be used.</p> <p>All fields are mandatory.</p>

4. IMPORT AND EDIT BOREHOLE INFORMATION IN AARHUS WORKBENCH

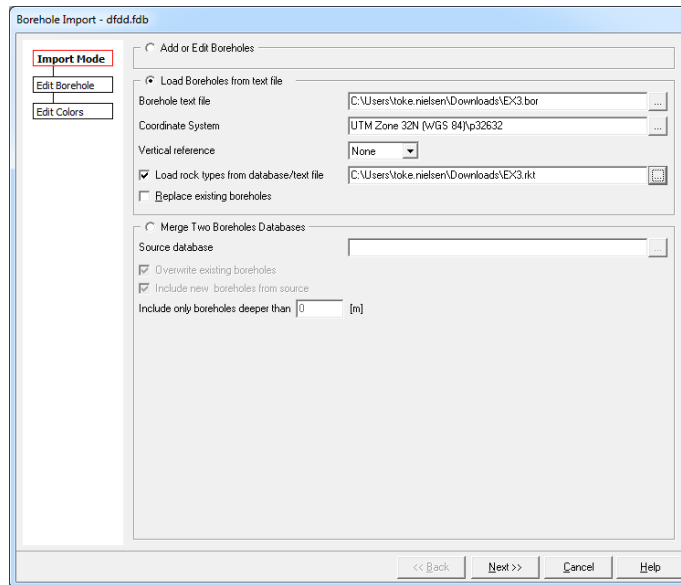
Import .bor and .rkt files in Aarhus Workbench

This section describes how to import .bor and .rkt files in Aarhus Workbench and to load the borehole information and the corresponding rock type descriptions.

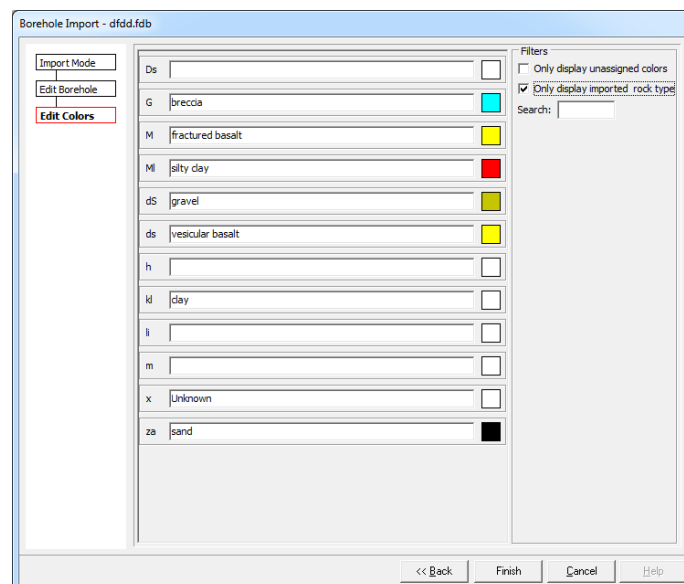
- 1) Go to file, press import and select Borehole import in the Boreholes tab (figure 1). Either you can add the boreholes to an existing database or you can create a new database. Press OK.



- 2) Select "Load Boreholes from text file", and select the .bor file. Choose the coordinate system and vertical reference system that fits the borehole data. If no vertical reference system is defined in the .bor file, choose "None" in the dropdown menu. If a .rkt legend file exist, tick the "Load rock types from database/text file" and load the rkt file. Press next



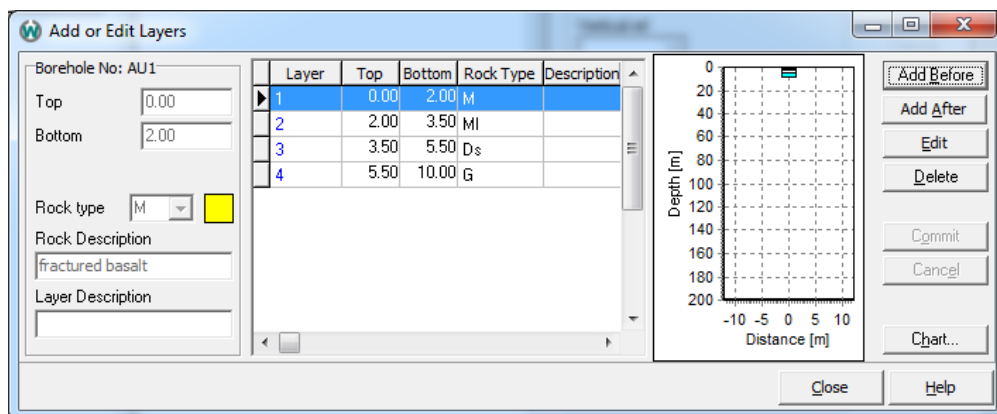
- 3) If the particular .bor file used does not contain the columns RGB and RockDescription, after pressing “Next”, no description and the same white color are associated to each rock type (Figure 3). It is possible to use the editing window in Figure 3 to modify manually the color (by left click on the squares on the right side of the central panel) and the rock description (by typing the description in the editable field next to the rock symbol). Press finish.



5. Manual editing of existing borehole information

Existing borehole information can be also edited directly by selecting “Add or Edit Boreholes” option in the import window. Here it is possible to:

- Modify every borehole parameter e.g. UTM coordinates, location, comments, etc.
- Select a symbol representing the borehole in the map (“Map Symbol”).
- Load an appropriate rock type description file (.rkt) by means of “Load rock types”.
- Visualize the existing layer and add new ones (“Add layers”). In the window that pops up after clicking “Add Layers”, the characteristics and the descriptions of each layers can be also modified. Any modification of color and description of a rock type made via this window for a specific layer will be transferred consistently to the same rock type through the entire database.
- Select “Add” instead of “Editing”, then information of a completely new borehole can be entered.
- Once a borehole database has been loaded into Aarhus Workbench, it is possible to modify the rock descriptions and colors directly from the database explorer tree by selecting the borehole database and press “change colors”.



6. Import borehole information from existing database

It is also possible to import information from an existing database. This option can be used by ticking “Merge Two Borehole Databases” in the import window, and selecting a target database. Then the boreholes in the pointed database will be added (if “Include new boreholes from source” is active) to those already present in the original database. In case of intersection between the information in the two databases, if the option “Overwrite existing boreholes” is selected, in the resulting database the original information will be substituted by the corresponding information in the pointed database.

It is possible to specify the boreholes added to the original database by deciding what their minimum drill depth is. By writing 20 m, only the boreholes deeper than 20 m will be added. The default value is 0 m. This means that, by default, all boreholes are merged into the resulting database.

In the present version of Aarhus Workbench only .fdb databases can be merged.

7. APPENDIX A: ANOTHER .BOR EXAMPLE

Below, another example of .bor file is reported. It consists of three boreholes:

- 1: BoreholeNo=654321. Both RGB values and Rock-Description have been specified. In particular, all lithotypes are defined by using no rock description.
2. BoreholeNo=666.111 is characterized by two not adjacent layers: from 1.0 to 5.0 m depth, and from 10.0 to 12.0 m depth.
- 3: BoreholeNo=555.12A. The optional description inputs are not present and the corresponding headers have not been included.

```
$BOREHOLE
BoreholeNo=654321
DrillDepth=124
Elevation=22.45
VerticalRef=DVR90
Location=Boring ved Boulstrup
Comments=
XUTM=554318.27
YUTM=9876547.99
UTMZone=32
Datum=EUREF89
Top Bottom LayerDescription RockType RGB RockDescription
0 2.0 " " m (255,255,255) " "
2.0 3.5 " " ml (255,255,255) " "
3.5 5.5 " " ds (255,0,0) " "
5.5 10.0 " " g (255,255,255) " "
$BOREHOLE
BoreholeNo=666.111
DrillDepth=12
Elevation=22.45
VerticalRef=DVR90
Location=Boring ved Boulstrup
Comments=
XUTM=554318.27
YUTM=9876547.99
UTMZone=32
Datum=EUREF89
Top Bottom LayerDescription RockType RGB RockDescription
1.0 5.0 "" m (255,255,255) " "
10.0 12 "" h (0,255,255) "sand 75 with gravel 20; weak cementation"
$BOREHOLE
BoreholeNo=555.12A
DrillDepth=7
Elevation=22.45
VerticalRef=DVR90
Location=Boring ved Boulstrup
Comments=
XUTM=554318.27
YUTM=9876547.99
UTMZone=32
Datum=EUREF89
Top Bottom LayerDescription RockType
0 2.0 " " m
```

2.0 3.5 " " ml
3.5 7 " " ds

8. APPENDIX B – SUPPORTED DATUMS

"Swedish National System 2.5 Gon W (RT 90 7 parameters)\p2400"	"UTM Zone 15N (WGS 84)\p32615"
"British National Grid\p27700"	"UTM Zone 15S (WGS 84)\p32715"
"Irish Transverse Mercator Grid 65\p29900"	"UTM Zone 16N (WGS 84)\p32616"
"Netherlands National System\p28992"	"UTM Zone 16S (WGS 84)\p32716"
"UTM Zone 28N (ED 50)\p23028"	"UTM Zone 17N (WGS 84)\p32617"
"UTM Zone 29N (ED 50)\p23029"	"UTM Zone 17S (WGS 84)\p32717"
"UTM Zone 30N (ED 50)\p23030"	"UTM Zone 18N (WGS 84)\p32618"
"UTM Zone 31N (ED 50)\p23031"	"UTM Zone 18S (WGS 84)\p32718"
"UTM Zone 32N (ED 50)\p23032"	"UTM Zone 19N (WGS 84)\p32619"
"UTM Zone 33N (ED 50)\p23033"	"UTM Zone 19S (WGS 84)\p32719"
"UTM Zone 34N (ED 50)\p23034"	"UTM Zone 20N (WGS 84)\p32620"
"UTM Zone 35N (ED 50)\p23035"	"UTM Zone 20S (WGS 84)\p32720"
"UTM Zone 36N (ED 50)\p23036"	"UTM Zone 21N (WGS 84)\p32621"
"UTM Zone 37N (ED 50)\p23037"	"UTM Zone 21S (WGS 84)\p32721"
"UTM Zone 38N (ED 50)\p23038"	"UTM Zone 22N (WGS 84)\p32622"
"UTM Zone 31N (Euref 89)\p25831"	"UTM Zone 22S (WGS 84)\p32722"
"UTM Zone 32N (Euref 89)\p25832"	"UTM Zone 23N (WGS 84)\p32623"
"UTM Zone 33N (Euref 89)\p25833"	"UTM Zone 23S (WGS 84)\p32723"
"GK Zone 2 (DHDN)\p31466"	"UTM Zone 24N (WGS 84)\p32624"
"GK Zone 3 (DHDN)\p31467"	"UTM Zone 24S (WGS 84)\p32724"
"GK Zone 4 (DHDN)\p31468"	"UTM Zone 25N (WGS 84)\p32625"
"GK Zone 5 (DHDN)\p31469"	"UTM Zone 25S (WGS 84)\p32725"
"UTM Zone 1N (WGS 84)\p32601"	"UTM Zone 26N (WGS 84)\p32626"
"UTM Zone 1S (WGS 84)\p32701"	"UTM Zone 26S (WGS 84)\p32726"
"UTM Zone 2N (WGS 84)\p32602"	"UTM Zone 27N (WGS 84)\p32627"
"UTM Zone 2S (WGS 84)\p32702"	"UTM Zone 27S (WGS 84)\p32727"
"UTM Zone 3N (WGS 84)\p32603"	"UTM Zone 28N (WGS 84)\p32628"
"UTM Zone 3S (WGS 84)\p32703"	"UTM Zone 28S (WGS 84)\p32728"
"UTM Zone 4N (WGS 84)\p32604"	"UTM Zone 29N (WGS 84)\p32629"
"UTM Zone 4S (WGS 84)\p32704"	"UTM Zone 29S (WGS 84)\p32729"
"UTM Zone 5N (WGS 84)\p32605"	"UTM Zone 30N (WGS 84)\p32630"
"UTM Zone 5S (WGS 84)\p32705"	"UTM Zone 30S (WGS 84)\p32730"
"UTM Zone 6N (WGS 84)\p32606"	"UTM Zone 31N (WGS 84)\p32631"
"UTM Zone 6S (WGS 84)\p32706"	"UTM Zone 31S (WGS 84)\p32731"
"UTM Zone 7N (WGS 84)\p32607"	"UTM Zone 32N (WGS 84)\p32632"
"UTM Zone 7S (WGS 84)\p32707"	"UTM Zone 32S (WGS 84)\p32732"
"UTM Zone 8N (WGS 84)\p32608"	"UTM Zone 33N (WGS 84)\p32633"
"UTM Zone 8S (WGS 84)\p32708"	"UTM Zone 33S (WGS 84)\p32733"
"UTM Zone 9N (WGS 84)\p32609"	"UTM Zone 34N (WGS 84)\p32634"
"UTM Zone 9S (WGS 84)\p32709"	"UTM Zone 34S (WGS 84)\p32734"
"UTM Zone 10N (WGS 84)\p32610"	"UTM Zone 35N (WGS 84)\p32635"
"UTM Zone 10S (WGS 84)\p32710"	"UTM Zone 35S (WGS 84)\p32735"
"UTM Zone 11N (WGS 84)\p32611"	"UTM Zone 36N (WGS 84)\p32636"
"UTM Zone 11S (WGS 84)\p32711"	"UTM Zone 36S (WGS 84)\p32736"
"UTM Zone 12N (WGS 84)\p32612"	"UTM Zone 37N (WGS 84)\p32637"
"UTM Zone 12S (WGS 84)\p32712"	"UTM Zone 37S (WGS 84)\p32737"
"UTM Zone 13N (WGS 84)\p32613"	"UTM Zone 38N (WGS 84)\p32638"
"UTM Zone 13S (WGS 84)\p32713"	"UTM Zone 38S (WGS 84)\p32738"
"UTM Zone 14N (WGS 84)\p32614"	"UTM Zone 39N (WGS 84)\p32639"
"UTM Zone 14S (WGS 84)\p32714"	"UTM Zone 39S (WGS 84)\p32739"
	"UTM Zone 40N (WGS 84)\p32640"

"UTM Zone 40S (WGS 84)\p32740"	"UTM Zone 6 (NAD 83)\p26906"
"UTM Zone 41N (WGS 84)\p32641"	"UTM Zone 7 (NAD 83)\p26907"
"UTM Zone 41S (WGS 84)\p32741"	"UTM Zone 8 (NAD 83)\p26908"
"UTM Zone 42N (WGS 84)\p32642"	"UTM Zone 9 (NAD 83)\p26909"
"UTM Zone 42S (WGS 84)\p32742"	"UTM Zone 10 (NAD 83)\p26910"
"UTM Zone 43N (WGS 84)\p32643"	"UTM Zone 11 (NAD 83)\p26911"
"UTM Zone 43S (WGS 84)\p32743"	"UTM Zone 12 (NAD 83)\p26912"
"UTM Zone 44N (WGS 84)\p32644"	"UTM Zone 13 (NAD 83)\p26913"
"UTM Zone 44S (WGS 84)\p32744"	"UTM Zone 14 (NAD 83)\p26914"
"UTM Zone 45N (WGS 84)\p32645"	"UTM Zone 15 (NAD 83)\p26915"
"UTM Zone 45S (WGS 84)\p32745"	"UTM Zone 16 (NAD 83)\p26916"
"UTM Zone 46N (WGS 84)\p32646"	"UTM Zone 17 (NAD 83)\p26917"
"UTM Zone 46S (WGS 84)\p32746"	"UTM Zone 18 (NAD 83)\p26918"
"UTM Zone 47N (WGS 84)\p32647"	"UTM Zone 19 (NAD 83)\p26919"
"UTM Zone 47S (WGS 84)\p32747"	"UTM Zone 20 (NAD 83)\p26920"
"UTM Zone 48N (WGS 84)\p32648"	"UTM Zone 21 (NAD 83)\p26921"
"UTM Zone 48S (WGS 84)\p32748"	"UTM Zone 22 (NAD 83)\p26922"
"UTM Zone 49N (WGS 84)\p32649"	"UTM Zone 23 (NAD 83)\p26923"
"UTM Zone 49S (WGS 84)\p32749"	"UTM Zone 29 (NAD 83)"
"UTM Zone 50N (WGS 84)\p32650"	"AMG Zone 48 (AGD 66)\p20248"
"UTM Zone 50S (WGS 84)\p32750"	"AMG Zone 49 (AGD 66)\p20249"
"UTM Zone 51N (WGS 84)\p32651"	"AMG Zone 50 (AGD 66)\p20250"
"UTM Zone 51S (WGS 84)\p32751"	"AMG Zone 51 (AGD 66)\p20251"
"UTM Zone 52N (WGS 84)\p32652"	"AMG Zone 52 (AGD 66)\p20252"
"UTM Zone 52S (WGS 84)\p32752"	"AMG Zone 53 (AGD 66)\p20253"
"UTM Zone 53N (WGS 84)\p32653"	"AMG Zone 54 (AGD 66)\p20254"
"UTM Zone 53S (WGS 84)\p32753"	"AMG Zone 55 (AGD 66)\p20255"
"UTM Zone 54N (WGS 84)\p32654"	"AMG Zone 56 (AGD 66)\p20256"
"UTM Zone 54S (WGS 84)\p32754"	"AMG Zone 57 (AGD 66)\p20257"
"UTM Zone 55N (WGS 84)\p32655"	"AMG Zone 58 (AGD 66)\p20258"
"UTM Zone 55S (WGS 84)\p32755"	"AMG Zone 48 (AGD 84)\p20348"
"UTM Zone 56N (WGS 84)\p32656"	"AMG Zone 49 (AGD 84)\p20349"
"UTM Zone 56S (WGS 84)\p32756"	"AMG Zone 50 (AGD 84)\p20350"
"UTM Zone 57N (WGS 84)\p32657"	"AMG Zone 51 (AGD 84)\p20351"
"UTM Zone 57S (WGS 84)\p32757"	"AMG Zone 52 (AGD 84)\p20352"
"UTM Zone 58N (WGS 84)\p32658"	"AMG Zone 53 (AGD 84)\p20353"
"UTM Zone 58S (WGS 84)\p32758"	"AMG Zone 54 (AGD 84)\p20354"
"UTM Zone 59N (WGS 84)\p32659"	"AMG Zone 55 (AGD 84)\p20355"
"UTM Zone 59S (WGS 84)\p32759"	"AMG Zone 56 (AGD 84)\p20356"
"UTM Zone 60N (WGS 84)\p32660"	"AMG Zone 57 (AGD 84)\p20357"
"UTM Zone 60S (WGS 84)\p32760"	"AMG Zone 58 (AGD 84)\p20358"
"UTM Zone 3 (NAD 27 for Alaska)\p26703"	"MGA Zone 48 (GDA 94)\p28348"
"UTM Zone 4 (NAD 27 for Alaska)\p26704"	"MGA Zone 49 (GDA 94)\p28349"
"UTM Zone 5 (NAD 27 for Alaska)\p26705"	"MGA Zone 50 (GDA 94)\p28350"
"UTM Zone 6 (NAD 27 for Alaska)\p26706"	"MGA Zone 51 (GDA 94)\p28351"
"UTM Zone 7 (NAD 27 for Alaska)\p26707"	"MGA Zone 52 (GDA 94)\p28352"
"UTM Zone 8 (NAD 27 for Alaska)\p26708"	"MGA Zone 53 (GDA 94)\p28353"
"UTM Zone 9 (NAD 27 for Alaska)\p26709"	"MGA Zone 54 (GDA 94)\p28354"
"UTM Zone 10 (NAD 27 for US)\p26710"	"MGA Zone 55 (GDA 94)\p28355"
"UTM Zone 11 (NAD 27 for US)\p26711"	"MGA Zone 56 (GDA 94)\p28356"
"UTM Zone 12 (NAD 27 for US)\p26712"	"MGA Zone 57 (GDA 94)\p28357"
"UTM Zone 13 (NAD 27 for US)\p26713"	"MGA Zone 58 (GDA 94)\p28358"
"UTM Zone 14 (NAD 27 for US)\p26714"	"French Lambert I Carto\p27581"
"UTM Zone 15 (NAD 27 for US)\p26715"	"French Lambert II Carto\p27582"
"UTM Zone 16 (NAD 27 for US)\p26716"	"French Lambert III Carto\p27583"
"UTM Zone 17 (NAD 27 for US)\p26717"	"French Lambert I Nord\p27591"
"UTM Zone 18 (NAD 27 for US)\p26718"	"French Lambert II Centre\p27592"
"UTM Zone 19 (NAD 27 for US)\p26719"	"French Lambert III Sud\p27593"
"UTM Zone 3 (NAD 83)\p26903"	"Longitude / Latitude (WGS 84)\p4326"
"UTM Zone 4 (NAD 83)\p26904"	"Longitude / Latitude (ED 50)\p4230"
"UTM Zone 5 (NAD 83)\p26905"	"Longitude / Latitude (NAD 27 for Continental US)\p4267"

"Longitude / Latitude (NAD 83)\p4269"
"UPS South Zone\p32761"