2) Map Projection

The map projection for the 1:100,000 scale data is well defined. The 1:100,000 scale data is presently stored in the following map projection:

PROJECTION UTM
UNITS METERS
SPHEROID CLARKE1880
YSHIFT 0.0000000000
XSHIFT 0.0000000000
PARAMETERS
15 00 00
-8 45 00

The spheroid keyword(Clark 1880) has the following value associations:
Clarke 1880; Semi-Major: 6378249.145 Semi-Minor 6356514.86955
A national defined horizontal datum called “Camacupa” is written on all map sheets, however it has not been possible to obtain enough information to properly define this datum and use it within the GIS at this time. Additional assistance from the IGCA and also special queries on the internet to map-projection related sites have not produced the necessary information. At this time, it is the viewpoint of the Project Team that no horizontal datum be specified.

3) Workflow overview

The digitizing of the paper maps for the 1:100,000 scale data were carried out using two methods.

Initially, color copies of the original paper maps were made. These color copies were used for the checking base. Next the original paper maps were scanned to produce a color raster image. The scanned data were then displayed using in-house created software called VecEdit, which allowed new data to be traced or input on top of the scanned raster data. All of the contours, topographic and benchmark features, as specified in the database specifications, were digitized and coded using this manner. This finished data was then checked using the color copies of the original maps. Quality control and checking at this time was mainly concerned with feature coding and accuracy.

Features not collected from the scanned raster images where collected by traditional

digitizing methods, with the original paper map as the digitizing source. Here too, the same in-house software was used for data capture and coding. The finished data was also checked using the color copies of the original maps. Here too, quality control and checking was mainly concerned with feature coding and accuracy.

The digitized data were then converted into Arc/Info format. Here the specific data layers were assembled and the representative topologic structure created. Next the data was transformed and projected using the map-projection previous described. Check plots were again produced and a final check was made.

At this stage in the Project, no edge-matching of data has been done because all of these features will be subject to updating and revision during the next phase of the Project. Presently all defined feature capture, topological data structuring, and feature attribute coding have been completed and checked at this time.

4) Interim deliverables

The interim deliverable data products at 1:100 000 scale will be the ARC/INFO Rev 7.21 formatted data coverages for all collected data, and sample check plots of each sheet within the project area only. The digital data will be delivered on CDROM.

5.2.8. "SPOT" Data Acquisition

In order to make secular change of 1:100,000 scale digital maps covering 120,000 km^2 in the next year's stage, JICA ordered the acquisition of the new "SPOT" images to the agent this year.

The total scene number covering whole area was 75 with 60 km x 60 km covers each scene duplicating 10% each side. During July 1997 through August 1998, 66 scenes were completed the data acquisition and another 7 scenes with some clouds were accepted under the condition of the submission of archives. As for the remaining 2 scenes were difficult to get good data, therefore JICA decided to apply their latest archives (Figure 5.2.7 / Table 5.2.5).

5.2.9. Preparation for "SPOT" Image Interpretation

For preparing the interpretation key of "SPOT" imagery at the time of implementation of secure change, the Study team collected the photos which are cover the items of application map symbols from air by helicopter. These photos are compiled as interpretation keys together with corresponding existing aerial photos portion and that SPOT imagery.

Then these interpretation keys are to apply for compilation of secure change of 1:100,000 scale digital maps.

Figure 5.2.7 Index of “SPOT” Imagery

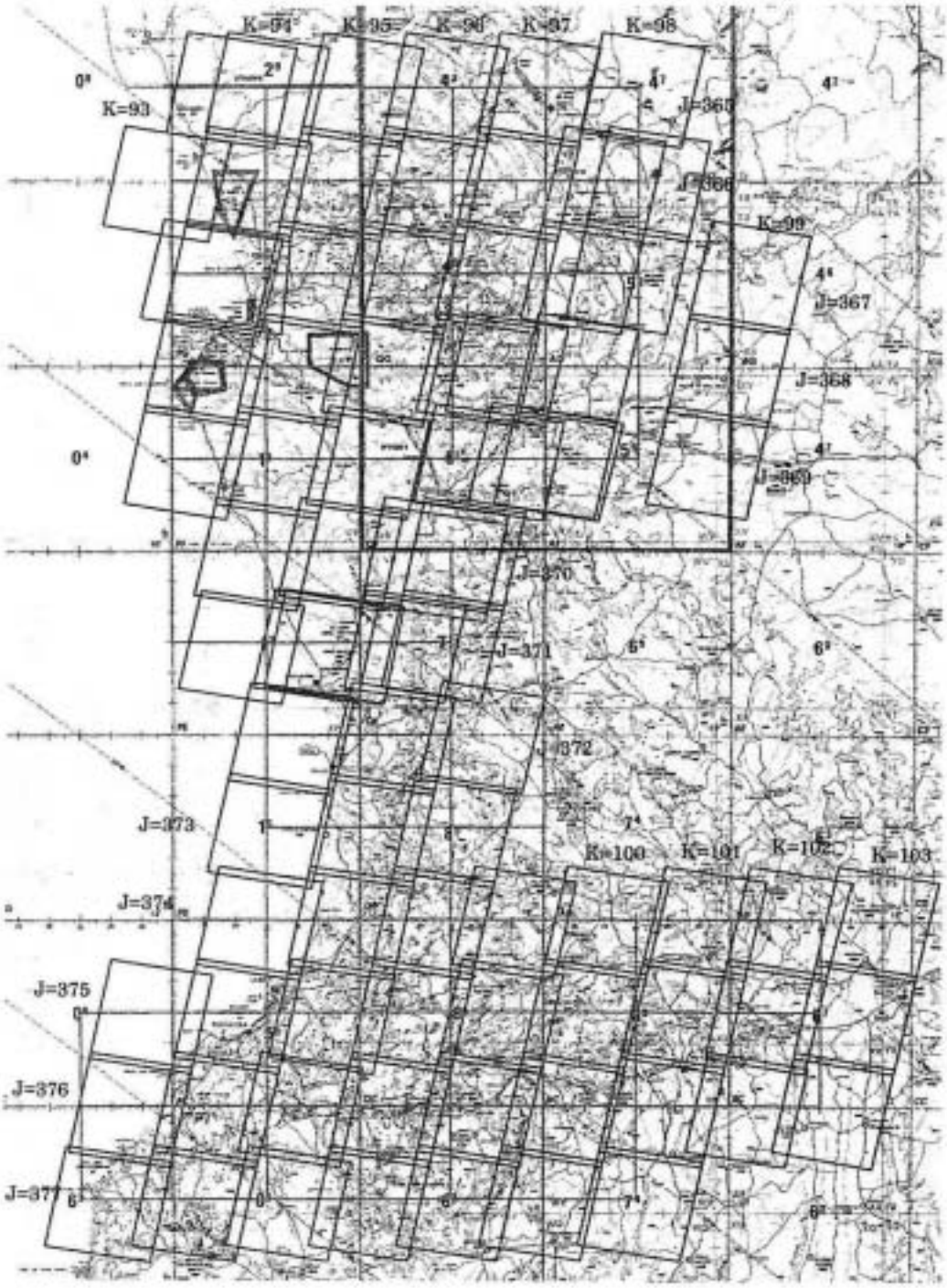


Table 5.2.5 - 1 Spot Imagery List (Image level; Panchromatic-1B)

No.	Spot No.	K/J No. K / J	Acquisition. Date	Incidence Angle	Cloud Coverage	Image Quality
1	2	93 / 365	97/09/01	L13.4	Less than 10%	Excellent
2	2	93 / 366	97/09/01	L13.4		
3	4	94 / 365*	98/07/09	L0.86	More than 10%	
4	4	94 / 366	98/06/18	L0.90	Less than 10%	
5	4	94 / 367*	98/06/08	L9.00	More than 10%	
6	4	94 / 368	98/06/18	L09.0	Less than 10%	
7	4	94 / 369	98/06/18	L09.0		
8	4	95 / 365	98/06/13	L04.9		
9	4	95 / 366	98/06/13	L04.9		
10	4	95 / 367	98/06/13	L04.9		
11	4	95 / 368	98/06/13	L04.9		
12	4	95 / 369	98/06/13	L04.9		
13	4	95 / 370	98/06/13	L04.9		
14	3	95 / 371*	93/12/07	R3.21	More than 10%	
15	4	95 / 375	98/06/13	L04.9	Less than 10%	
16	2	95 / 376	97/09/07	R0.73		
17	2	95 / 377	97/09/22	L12.8		
18	4	96 / 365	98/06/13	L08.6		
19	4	96 / 366	98/06/13	L08.6		
20	4	96 / 367	98/06/13	L08.6		
21	4	96 / 368	98/06/13	L08.6		
22	4	96 / 369	97/09/07	R07.3		
23	4	96 / 370	98/06/13	L08.6		
24	4	96 / 371*	98/08/26	L8.64	More than 10%	
25	4	96 / 372	98/06/13	L08.3	Less than 10%	
26	4	96 / 373	98/06/13	L08.3		
27	2	96 / 374	97/09/07	R07.3		
28	2	96 / 375	97/09/07	R07.3		
29	2	96 / 376	97/09/07	R07.3		
30	2	96 / 377	97/09/07	R07.3		
31	2	97 / 365	98/05/30	L4.57		
32	2	97 / 366	98/05/25	R3.57		
33	2	97 / 367	98/05/30	R4.57		
34	4	97 / 368*	98/06/29	R3.21		
35	2	97 / 369	97/09/07	R03.6		
36	2	97 / 370	96/07/18	R2.20		
37	4	97 / 371*	98/08/25	L4.25		
38	4	97 / 372	98/06/13	L12.7		
39	4	97 / 373	98/06/13	L12.7		
40	4	97 / 374	98/06/13	L12.7		
41	2	97 / 375	97/10/24	R11.3		
42	2	97 / 376	97/09/07	R03.6		
43	2	97 / 377	97/07/22	L04.7		

Table 5.2.5 – 2 Spot Imagery List (Image level; Panchromatic-1B)

No.	Spot No.	K/J No. K / J	Acquisition. Date	Incidence Angle	Cloud Coverage	Image Quality
44	2	98 / 365	97/07/17	L01.1	Less than 10%	Excellent
45	4	98 / 366*	98/06/29	L0.50	More than 10%	|
46	4	98 / 367*	98/06/29	L0.50	More than 10%	|
47	2	98 / 368	97/07/17	L01.1	Less than 10%	|
48	2	98 / 369	97/07/17	L01.1	|	|
49	4	98 / 372	98/06/24	R07.3	|	|
50	2	98 / 373	97/07/17	L00.7	|	|
51	2	98 / 374	97/07/17	L00.8	|	|
52	2	98 / 375	97/07/17	L00.8	|	|
53	2	98 / 376	97/07/17	L00.8	|	|
54	2	98 / 377	97/07/17	L00.8	|	|
55	2	99 / 367	97/08/07	R00.7	|	|
56	2	99 / 368	97/08/07	R00.7	|	
57	2	99 / 369	97/08/07	R00.7	|	
58	2	99 / 374	97/07/17	R03.9	|	
59	2	99 / 375	97/09/02	R03.6	|	
60	2	99 / 376	97/09/02	R03.6		
61	2	99 / 377	97/09/02	R03.6		
62	2	100/ 374	97/08/07	L00.8		
63	2	100/ 375	97/08/07	L00.8		
64	2	100/ 376	97/08/07	L00.8		
65	2	100/ 377	97/08/07	L00.8		
66	2	101/ 374	97/08/07	L04.7		
67	2	101/ 375	97/08/07	L04.7	|	|
68	2	101/ 376	97/08/07	L04.7	|	|
69	2	101/ 377	97/08/07	L04.7	|	|
70	4	102/ 374	98/06/19	L00.2	|	|
71	4	102/ 375	98/06/19	L00.2	|	|
72	2	102/ 376	97/09/23	L00.8	|	|
73	2	103/ 374	97/07/28	R03.9	|	|
74	2	103/ 375	97/07/28	R03.9	|	|
75	2	103/ 376	97/07/28	R03.9	|	|

There are another archive data for the * marks

5.2.10 Peripheral Maintenance for GIS Equipment

Peripheral maintenance for GIS equipment is to set up a engine generator and air-conditioners at the GIS Operation room in fourth floor of MINOPU.

At this first plan, the capacity of a engine generator was enough for to supply all electric instruments including two air-conditioners, computers and these peripheral instruments at same time. However, there was no space founded for the large capacity's engine generator in MINOPU. Finally, the engine generator was changed to a small capacity one, as a emergency power supply, which can keep the minimum power supply for the closing of working computers at the time of sudden public power cut.

Accordingly, during the third phase field survey, one set of DENYO/DCA-13SPK(11.5kVA) was installed at the terrace room on the fourth floor with the floor reinforcement and the exhaust outer pipe.

Simultaneously, two set of air conditioners were set up in the GIS operation room, then switch box and seven wall socket with appropriate cables for computers operation were set up and wired with the engine generator.

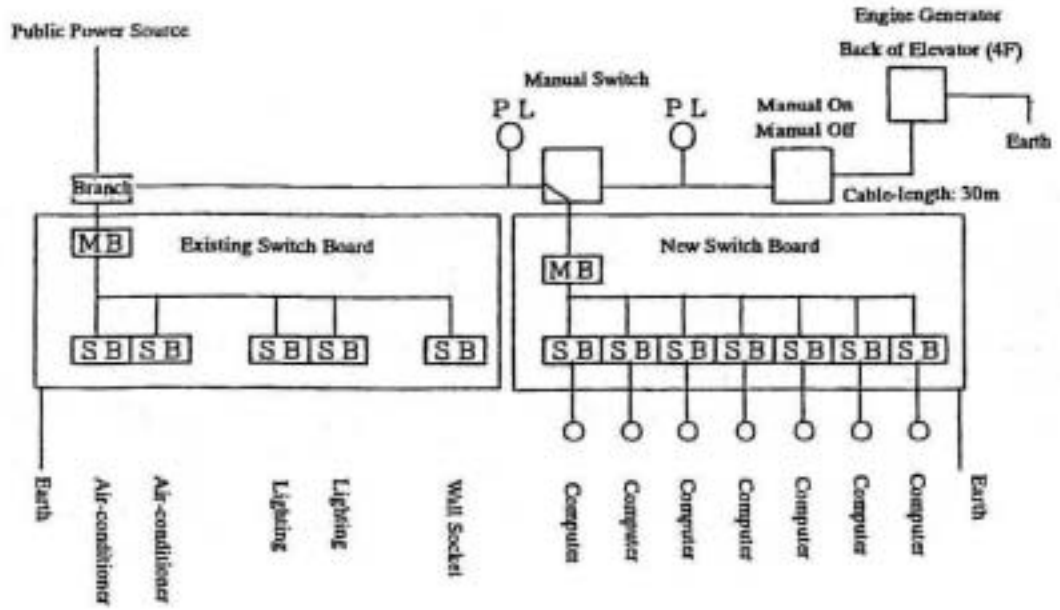


Figure 5.2.8 Electrical Design for GIS Room

In the case of operation, the public power supply circuit should be connected usually. At the time of public power cut, the manual switch of power supply should be change to the engine generator, then after this, the engine generator should be worked.

Conversely, in the case of public power restoration, stopping the engine generator, manual power supply switch should be changed to public power supply side.

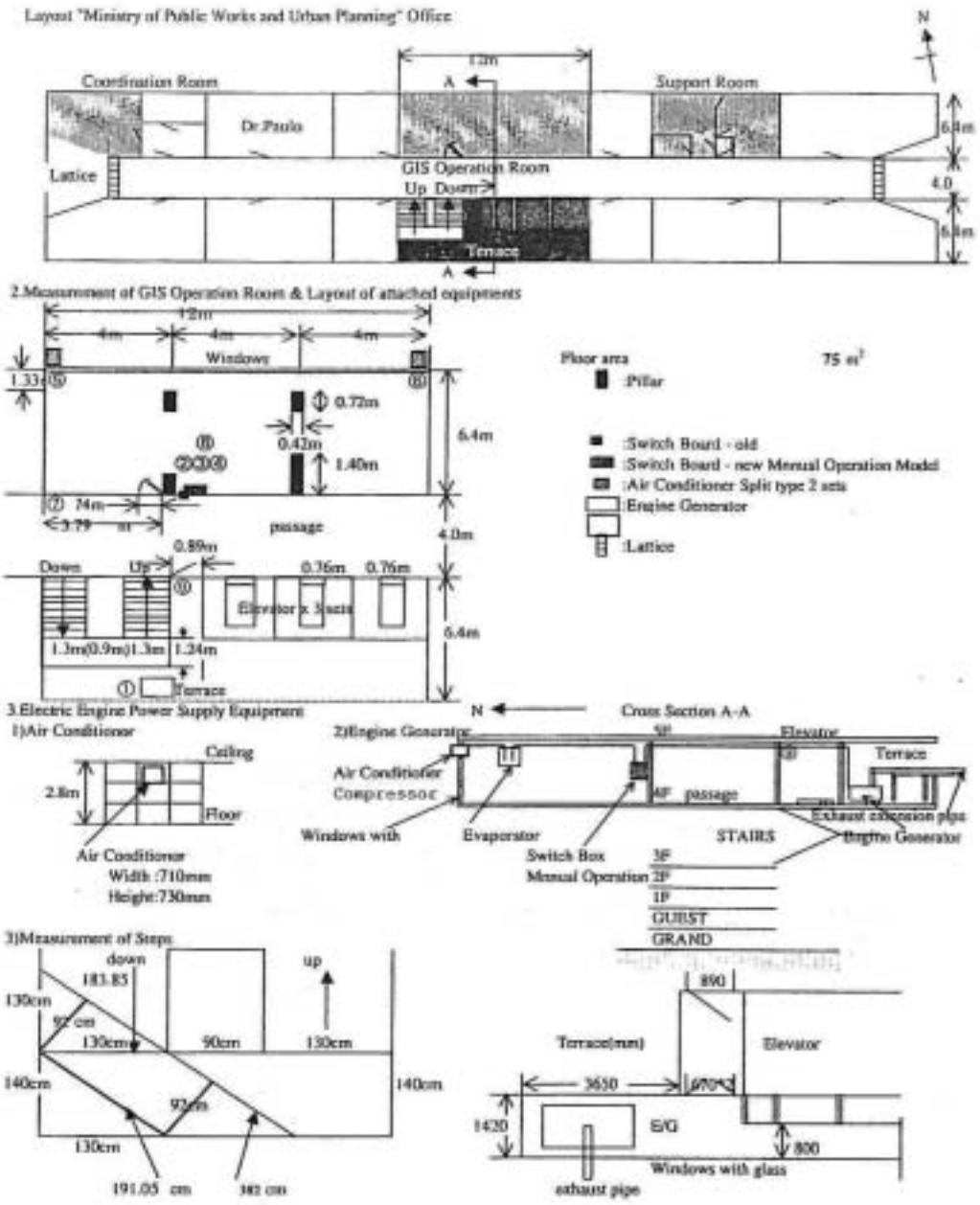


Figure 5.2.9 Illustration of GIS Room in MINOPU

5.3. The Third Year's Work (1999)

5.3.1. Draft Manual for Land-use Classification

Through this Study, the Land-use Maps of Luanda at a scale of 1:25,000 have to be prepared. Therefore, in this working period, the draft manual for land-use classification necessary for the successive fiscal year's fieldwork was prepared. The classification was classified in 28 items finally concerning the character of metropolitan area's land-use.

In future, if any city district redevelopment work for the urban area is implemented, it is necessary to correctly grasp the current circumstances of the city districts.

In this case, it will be important to investigate not only the natural conditions such as vegetation and the conditions of land utilization, but also the actual circumstances of buildings and public facilities used as the city functionality.

The 28 items in this classification were considered to serve as the basic materials for city redevelopment planning in the future.

Then this manual was prepared as a draft. Accordingly, before commencement the field work for land-use classification, this manual should be revised and agreed by Angolan side after the consultation with MINOPU.

5.3.2. Interpretation Keys for Satellite Images

In the Study, existing 1:100,000 scale map's features such as roads, villages,vegetation and their topologies were interpreted on the recent satellite images ("SPOT").

The keys necessary for the interpretation of satellite images for their up-data were sampled by comparing the existing maps of 1:100,000 scale and existing aerial photographs of 1:30,000 scale which were prepared pervious year and snap photos from air together with the satellite image data. For those places where interpretation was difficult or significant secular changes were observed. It was best to conduct the field verification. However, in the Study area at this time, it was impossible. If it was possible, there were some areas could not be approached for security reasons. These interpretation keys were collected and generated through the aerial verification using a air craft, and extract the typical areas using the "SPOT" satellite images within the Study area.

The interpretation keys prepared at this time were attached to the Progress Report 3.

5.3.3. Interpretation of Satellite Images

In order to check whether there is any problem on the “SPOT” images leased from JICA for the succeeding works in advance, attached information on the image acquisition (time the images were acquired, angle, and coverage) and the images were directly displayed on the computer using the quick look method. It was necessary to inspect the coverage state of the Study area and the tolerable amount of clouds and to confirm that there was no trouble for the succeeding study operations. If any serious problem exist, it was promptly reported to JICA and the measures were consulted with JICA.

Figure 5.3.1 Working Flow Chart
(1/100,000 Scale Digital Maps Updating)

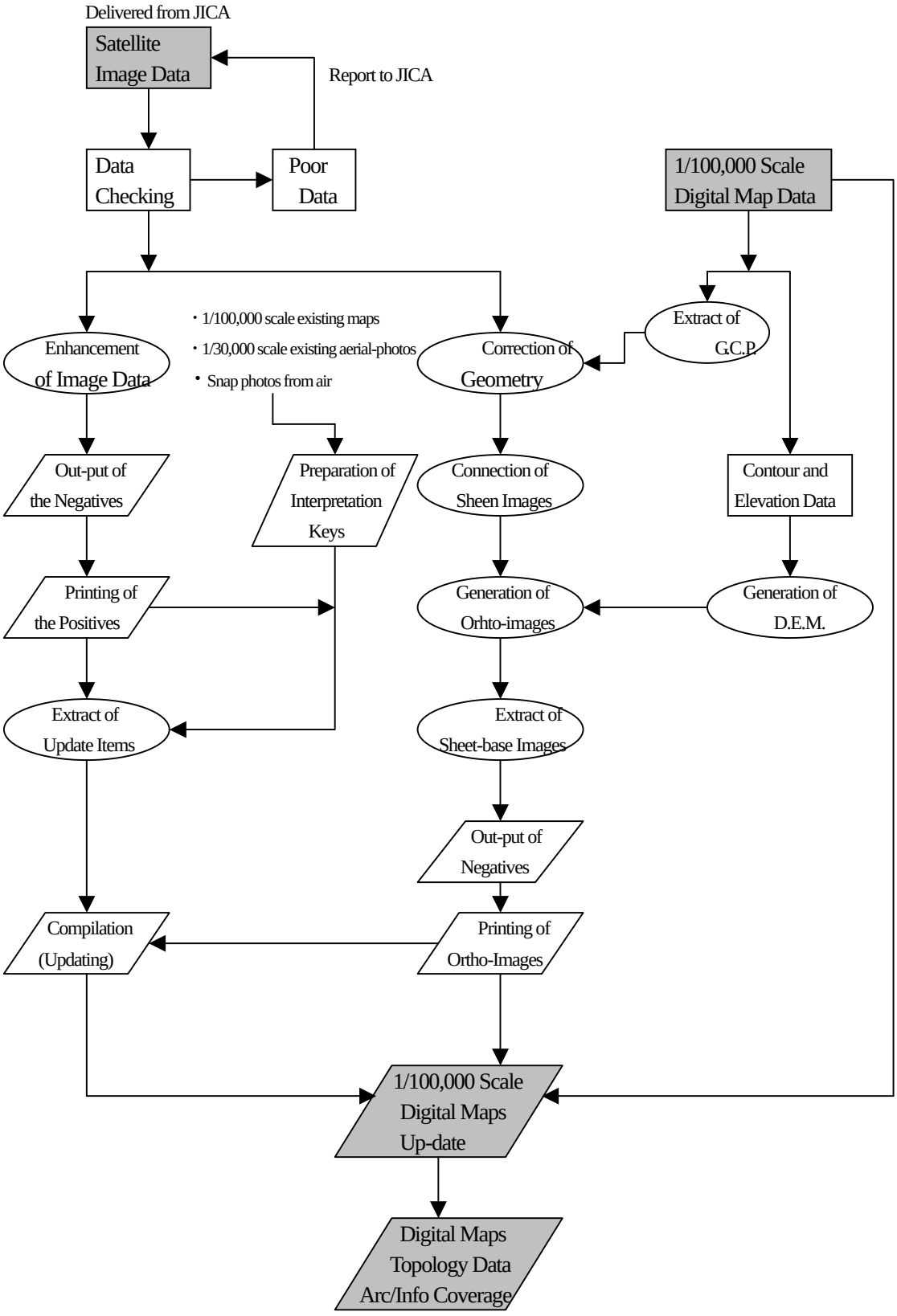
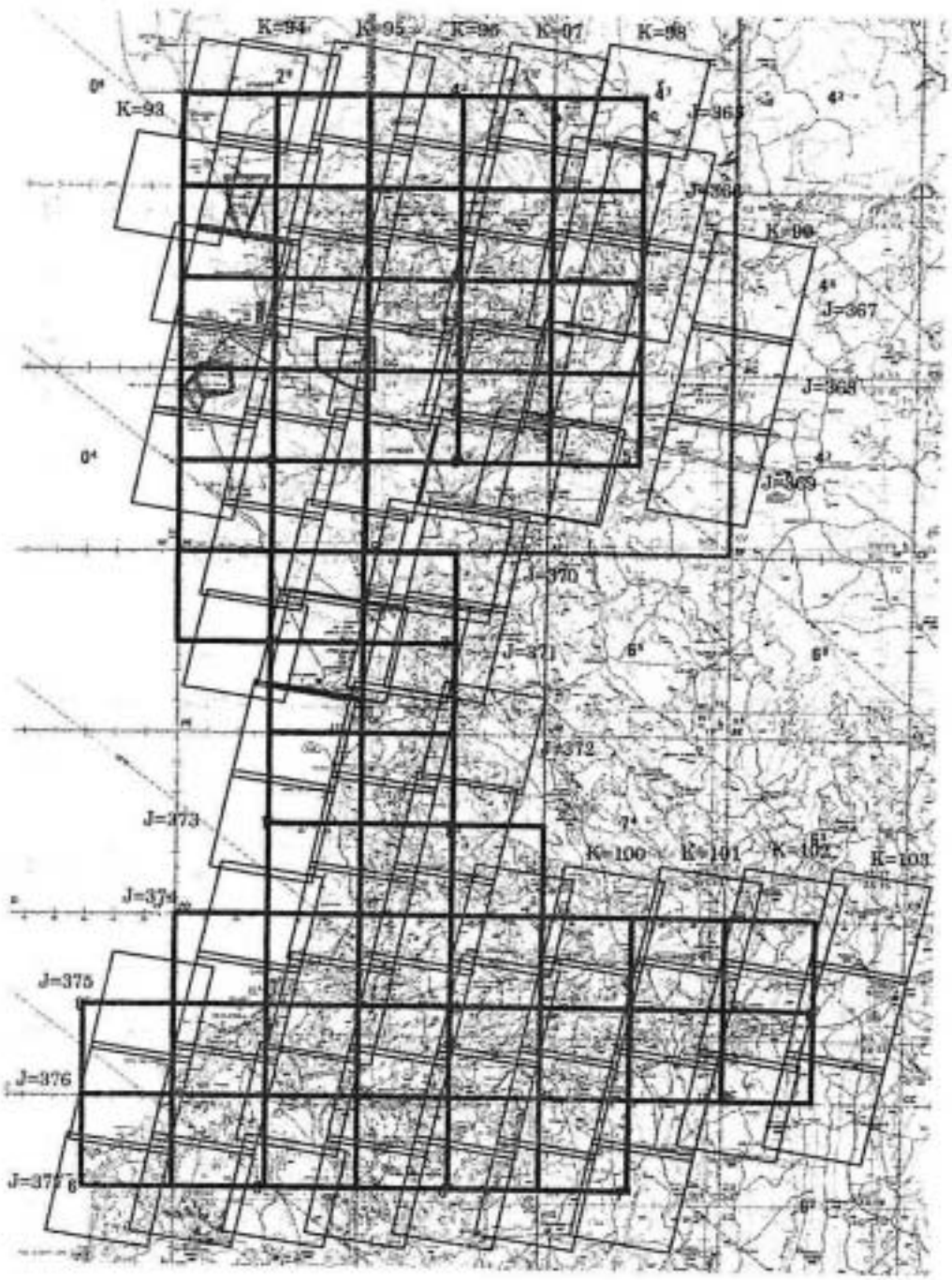


Figure 5.3.2 Satellite Images Used



The inspected and confirmed “SPOT” image data were processed for easy interpretation of vegetation and planimetric features such as by adjusting the luminance, density, and enhancement. Negatives were generated from the data using the film writing. From the generated negatives, enlarged images was generated for each scene with the scale of 1:100,000 for the preparation of interpretation keys and the site interpretation of update areas.

The topographic information and the information on planimetric features such as roads, canals, and small substances were comparatively interpreted with the existing topographic maps. The areas with secular changes were identified the images of these areas were interpreted based on the SPOT satellite images and the results of the interpretation keys, then classified, arranged, and recorded on the printed “SPOT” satellite images.

5.3.4. Preparation of Ortho-rectified Satellite Images

(1) Ortho-rectified image

Ortho-rectified images can be generated either by the same unit as the topographical maps (map-base ortho-rectification) or by the unit of the acquired scene of “SPOT” satellite images (scene-base ortho-rectification). In generating the ortho-rectified images for this time, the former map-base ortho was used. The reason was that, for extracting secular changes and digitizing the interpreted data on scene-base printed images, which are the main purpose of generating ortho-rectified images, generation of map-base ortho-rectification was more appropriate for the work because comparison with the existing topographic maps was easier.

(2) Generation of ortho-rectified imagery

1) Orientation work

An orientation element data of “SPOT” image is generated by selecting more than ten spots which are clear on the “SPOT” images, have no secular changes for each scene, and are the acquisition units of “SPOT” images, and by reading the coordinates of the selected spots on the existing maps, then the orientation work is conducted based on the orientation element data for each scene by giving the same ground coordinates of the target topographic maps to the “SPOT” image data.

2) Generation of digital altitude model

Digital terrain model (DTM) was generated by exacting and editing the areas (such as water surface) where the altitude is even) on the vector data of topographic data digitized by the digitization of existing maps and by inputting the altitude to the GIS software as the attribute data through the use of the conversion program.

In this case, for the purpose of preventing input errors or missing, each contour line was displayed on the screen for each color by paying sufficient consideration to the inconformity. In order check whether the DTM was correctly converted, extraction and correction of the locations with inconformity were conducted by generating contour lines from the DTM data and compare and inspect them.

Since the scenes covered by the existing maps and the "SPOT" scenes were not same, the a digital terrain model generated from the existing maps will be joined together to generate a joined digital altitude model covering the scenes of "SPOT" data. In this case, the input contour lines are joined together, but inconformity might occur when they are converted to the digital altitude model. Therefore, a digital terrain model covering the SPOT scenes must be generated by editing the digital terrain model while paying sufficient consideration to the inconformity.

5.3.5. Digitization of Update Date

The main process flow of this updating work involves displaying a section of the ortho-rectified image on the screen, overlaying that image with previously collected digital data (data created fiscal 1999) and then updating the existing digital data based on the change areas visible on the image.

Before beginning this work, the ortho-rectified images are cut into quarters so that their size is smaller. This allows for faster display (roaming and zooming operations) by the software. These quarter section images retain their geo-referenced qualities.

These images are then displayed using specialized software created in-house for such updating and editing work. The software, VecEdit, provides rich functionality within a graphic interface (GUI) for display, updating and verification of the digital data.

To assist with the updating, changed areas and features were indicated on miler film, one per map sheet. This cursory interpretation was carried out by expert trained in image interpretation and provides a visual aid for the data input technician while they are looking at the screen. This miler film, a check plot of the digital (GIS) data and the original base map are then examined in unison before the technician edits the existing data.

The GIS data for this project is grouped into related layers. These layers contain either points, lines, polygons or a combination of polygons and lines. However, during the input of all this data, a combined feature layer of polygons and lines was created to make the complex task of data creation more easy. This layer has been designated as the "working cover" (cover meaning GIS layer in software terminology). This "working cover" contains all vegetation, hydrology, road, rail and built-up area features.

The individual data layers are then made by automatically extracting a specific group of data,

based on a range of feature codes, from the working cover and then finalizing that layers structure with some additional processing commands within the GIS system.

The major importance of the "working cover" is to allow all of the dependent data features to exist within one common "cover" that can be easily edited and updated by the technician. This reduces the amount of time needed to update the features, but more importantly reduces or improperly structured data at the time of editing/updating and thus eliminates the task of editing each layer independently.

Working on a per/sheet basis, the new data features or changed areas are then edited using the VecEdit software. These new features are added directly into the "working cover" based on each feature's coding scheme. After completion of the initial updating for the sheet the data from the "working cover" are extracted and placed into their individual layers. This operation is performed by using the GIS software. Next, check plots of all the data for the sheet are made and feature checking and quality assurance is performed. Any mistakes or incorrect features are then re-edited and the layer extraction, check plot and feature checking are performed again. These tasks were performed for all of the sheets in the entire study area.

The study team identified that the most significant areas of change between the original base maps and the ortho-rectified image data was in Luanda and the surrounding areas. Since there was such a significant amount of change, it was decided that the updates for Luanda and surrounding sheets be based on data collected during the air-photo part of this project. Thus, 1:25,000 scale vector data of Luanda was generalized and used as a new base to update the 1:100,000 scale map sheet. Vegetation and features for the surrounding area of Luanda were extracted from the ortho-rectified imagery.

5.3.6. Generation of the Topology Data for 1:100,000 Scale Digital Maps

This section will describe how the topological data for the 1:100,000 scale maps has been generated.

As described in section 5.3.5, much of the data preparation has taken place in the "working cover." The GIS data for this project is grouped into various related layers. These layers contain either points, lines, polygons or a combination of polygons and lines. However, during the input of all this data, a combined feature layer of polygons and lines was created to make the complex task of data creation more easy. This layer has been designated as the "working cover" (cover meaning GIS layer in software terminology).

This "working cover" contains all vegetation, hydrology, roads, rail and built-up area features. The individual data layers are then made by automatically extracting a specific group of data, based on a range of feature codes, from the working cover and then finalizing that layers structure with some additional processing commands found within the GIS system.

The major importance of the “working cover” is to allow all of the dependent data features to exist within one common “cover” that can be easily edited and updated by the technician. This reduces the amount of time needed to update the features, but more importantly reduces incorrect or improperly structured data at the time of editing/updating and thus eliminates the task of editing each layer independently.

The working cover is made up of points and arcs. Each of these points and arcs have specific codes as defined in the database schema. After editing of the “working cover” is complete, data is extracted from the “working cover” to form some of the other individual map data layers. For example, road data is extracted, by code, from the “working cover” in the form of arcs (lines), and then processed within the GIS and topological road layer data is created. In another example, hydrology data is in the form of both polygons and lines is created by extracting arcs and points from the working cover. The points are then processed in the GIS to become the “label points” or “centroids” of polygon water features. Where there are no points, the arcs that make up single line water features (small rivers and streams) remain. Uncoded polygons which may be formed inside the outline of the sheet are coded automatically to zero (0) because there was no initial label points extracted from the “working cover” for those areas.

Other data layers which are not inter-related to those features in the “working cover” are created separately. Examples of such layers may be independent point (symbol) features, or special text label points. These layers are still checked using the same rigorous quality control procedures as the other data layers, yet because these features are not part of the “working cover” their creation and management is considerably more simple.

Edge-matching of the data is performed on line and polygon layers. The majority of edge-matching work takes place in the “working cover” because of the number of layers present. Edge-matching work is normally carried out after edited features have been finished and verified. To facilitate edge-matching map sheets are merged into blocks of a manageable size, either 2 x 2 or 3 x 3. Edgematching is then performed manually by the technician between the previous sheet boundaries, within these new blocks. After edge-matching and polygon verification is complete, the blocks are split into their respective single sheets.

The structure of the final deliverable data will be in the form of a “map library.” This “map library” form is specific for the GIS software used in this project [Arc/Info Rev.7.x by ESRI Inc. (Redlands CA, USA)]. The concept behind the “map library” is to allow large amounts of tile based data to be more easily managed, viewed, plotted and queried. The data is only put into the “map library” once all of the edge-matching, checking and quality assurance tests have been completed. The map library uses a similar grouping found in the database to manage the different layers of data. The “working cover” is not inserted into the “map library”, but is provided in the final delivery as a starting point where future updates to the data can made.

While it is possible to edit data within the environment of the “map library” within certain software packages, it is usually easier and more robust to extract data from the “map library” make edits and updates, then process and re-insert the data back into the library. The functions for this set of procedures is contained within the “library management module” of the GIS software.

5.3.7. Map Data Composition on 1:100,000 Scale Digital Maps

Table 5.3.1, 5.3.2. provides a brief description of the contents of each of the data layers in the GIS database. This brief description will serve to highlight the various types of data for each layer. In the table, the “layer description” shows the main layer group description and also provides information on the type of data, being points, lines, shapes, complex (lines and shapes), and text data, etc. In the center of the table is the coverage name for the represented group. This is the official named datafile within the GIS database. Finally, the “data contents” section serves as a listing of the major types of feature data found within the representative layer group. References or notes describe any special characteristics or requirements of the data features within the respective layer.

A more comprehensive description of the entire GIS database can be found in Table 5.3.3 ~5.3.5 and additional Abbreviation Codes, Table 5.3.6 ~ 5.3.8.

5.3.8. Preparation of Draft Operation Manual for GIS

Draft operation manual for GIS was prepared for use in “Learning Arc/Info” as a part of Technology Transfer. This manual will briefly explain conceptual background, as well as the usage of project specific functions of GIS-Software Arc/Info. The data compiled in previous phase at a scale of 1:1,000,000 covering the whole country were used for exercises. The training data and this manual will be available for the counterpart agency for use in their “self-study”.

This operation manual was prepared as draft, therefore should be revised and added additional items at the final stage.

Table 5.3.1

Layer Description	Cover Name	Data Contents
Administration (Cartographic - Lines)	po_81_a	broken symbolized lines shown on the maps delineating admin boundaries, and national parks.
Administration (Shapes)	po_80_s	data from po_81_a will be made into polygons with the help and advising of the Counterpart agency. this data in polygon from does not yet exist in the GIS database.
Benchmarks and Elevation Points	bm_72_p	contains points with elevation data and additional geodetic control information if present.
Cities, Villages and Farms (Points)	pp_10_p	point features containing the names, number of houses, and other admin. related information as shown on the base maps.
Contours	ct_71_a	contour lines captured as shown on the base maps. Sometimes broken or incomplete in small instances, no additional editing was done to close or interpolate between or within areas not covered.
General Annotations (as codes)	an_90_p	a point with a numeric value that is linked by that value into the annotation table. Used to plot identical annotation abbreviation codes for point symbols.
General Annotations (as strings)	an_95_t	a point with a string value used to plot a unique annotation string at the specified point. A numeric anno_code value is also used for additional data clarification, but not usually plotted.
Hydrology (Annotation Labels)	dn_53_t	unique text strings and/or anno_code values
Hydrology (cartographic - lines)	dn_54_a	small line features on the map which serve only as cartographic symbology (rapids or waterfall) and should not be part of the GIS data
Hydrology (cartographic - points)	dn_54_p	small point features on the map which serve only as cartographic symbology (river heads, small rocks) and should not be part of the GIS data
Hydrology (cartographic shapes)	dn_56_s	larger area features on the map which serve only as cartographic symbology (sandbank symbols) and should not be part of the GIS data
Hydrology (complex)	dn_51_c	main water data, polygons and lines, all rivers, lakes.
Hydrology (points)	dn_52_p	primary water point features, wells, tanks, etc.

Table 5.3.2

Layer Description	Cover Name	Data Contents
Infrastructure (Points)	if_30_p	main man-made structures usually represented by point features on the map. An anno_code is present if annotation abbreviation exists.
Infrastructure (Shapes)	if_31_s	main urban areas, airports, large ruins and cemeteries.
Railway (Lines)	rr_23_a	rail road lines, sidings, and other track related features
Railway Facilities (Points)	rr_23_p	rail road point features include stations, loading docks, etc. (shown as small square point features on the maps)
Roads and Paths	rd_21_a	major road and transport linear data features
Road Facilities (Lines)	rd_22_a	road related features symbolized as lines; embankments and bridges over 100 meters
Road Facilities (Points)	rd_22_p	road related features symbolized as points; medium to small sized bridges, and culverts
Topographic Symbols (complex)	tp_73_c	cartographically symbolized area and line features, having no elevation data; dry river beds, geologic dikes, large rock slide areas.
Topographic Symbols (points)	tp_74_p	cartographically symbolized point features, having no elevation data; rock outcrops, sinks, peaks, caves.
Topography (Annotation Labels)	tp_75_t	unique text strings and/or anno_codes values
Utilities (Lines)	ut_35_a	power and energy related line features, oil pipelines, electric power lines, telephone lines.
Utilities (Points)	ut_35_p	power and energy related point features, oil and gas wells, electric power sub-stations
Vegetation Cover (cartographic - lines)	vg_64_a	cartographically symbolized features as a tree line or wind break, in a linear pattern
Vegetation Cover (complex)	vg_63_c	main vegetation polygon data
Vegetation Cover (Points)	vg_62_p	descriptive vegetation symbols showing canopy information, vegetation type, density, etc. (taken directly from the basemaps; not field verified)
Vegetation Cover (cartographic shapes)	vg_65_s	cartographically symbolized polygon features used to show marshes and swamps.

Table 5.3.3

Layer Description	English	Layer Name	Layer Number	Layer Type	Cover Name	ID_CODE	Additional Items 1	additional items 2	additional items 3	additional items 4	additional items 5	I.G.C.A Number
Administration (Cartographic - Lines)	Country Boundary	po	91	a	po_91_a	9101						258?
Administration (Cartographic - Lines)	Provincial Boundaries	po	91	a	po_91_a	9102						259
Administration (Cartographic - Lines)	National Park Boundaries	po	91	a	po_91_a	9110						
Administration (Shapes)	Country Boundary	po	90	a	po_90_a	9001						
Administration (Shapes)	Provincial Boundaries	po	90	a	po_90_a	9002						259
Administration (Shapes)	National Park Boundaries	po	90	a	po_90_a	9010						
Benchmarks and Elevation Points	national control point	bm	72	p	bm_72_p	7301	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				1
Benchmarks and Elevation Points	Auxiliary Geodetic Point	bm	72	p	bm_72_p	7302	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				4
Benchmarks and Elevation Points	Astronomical Point	bm	72	p	bm_72_p	7303	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				6
Benchmarks and Elevation Points	Leveling Point	bm	72	p	bm_72_p	7307	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				7
Benchmarks and Elevation Points	prominent altitude heights	bm	72	p	bm_72_p	7170	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				170
Benchmarks and Elevation Points	median altitude heights	bm	72	p	bm_72_p	7171	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				171
Benchmarks and Elevation Points	principal pass elevations	bm	72	p	bm_72_p	7174	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				174
Benchmarks and Elevation Points	non-principal pass elevations	bm	72	p	bm_72_p	7175	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				175
Benchmarks and Elevation Points	bythemetric point	bm	72	p	bm_72_p	7173	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				173
Benchmarks and Elevation Points	elevation point in river	bm	72	p	bm_72_p	7119	SPOT [4,6,F,2]	TEXT_STR [80,60,C]				119
Benchmarks and Elevation Points	Depth Sounding	bm	72	p	bm_72_p	7120	SPOT [4,6,F,2]					158
Cities, Villages and Farms (Points)	Major Cities Point Labels	pp	10	p	pp_10_p	1010	RANK [1,2,I]	NAME [30,31,C]	DWELLINGS [4,5,I]	CMD [1,2,I]	ANNO_CODE [4,5,I]	
Cities, Villages and Farms (Points)	Settlements, Villages, and Farms Point Labels	pp	10	p	pp_10_p	1020	RANK [1,2,I]	NAME [30,31,C]	DWELLINGS [4,5,I]	CMD [1,2,I]	ANNO_CODE [4,5,I]	
Contours	principal contours 250m	ct	71	a	ct_71_a	7101	SPOT [4,6,F,2]					168 a
Contours	intermediate contours 50m	ct	71	a	ct_71_a	7102	SPOT [4,6,F,2]					168 b
Contours	auxiliary contours 25m	ct	71	a	ct_71_a	7103	SPOT [4,6,F,2]					168 c
Contours	ocean shoreline	ct	71	a	ct_71_a	7105	SPOT [4,6,F,2]					
Contours	escarpments/faults	ct	71	a	ct_71_a	7180	SPOT [4,6,F,2]					180 a
Contours	Bathymetric Iso-Lines	ct	71	a	ct_71_a	7106	SPOT [4,6,F,2]					167
General Annotations (as codes)	general annotations / abreveations (as codes)	an	90	p	an_90_p	9090	ANNO_CODE [4,5,I]					
General Annotations (as strings)	general annotations / abreveations (as strings)	an	95	t	an_95_t	9595	ANNO_STR [80,60,C]	ANNO_CODE [4,5,I]	TEXT_FONT [0,7,I]	TEXT_SIZE [2,3,I]		
Layer Description	**English**	**Layer Name**	**Layer Number**	**Layer Type**	**Cover Name**	**ID_CODE**	**Additional Items 1**	**additional items 2**	**additional items 3**	**additional items 4**	**additional items 5**	**I.G.C.A Number**
Hydrology (Annotation Labels)	Perennial Rivers (Wide as polygon)	dn	53	t	dn_53_t	5301	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	lake,pond	dn	53	t	dn_53_t	5305	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	temporary lake	dn	53	t	dn_53_t	5309	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	Ocean, Bay or Harbor	dn	53	t	dn_53_t	5300	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	Wide Temporal Rivers Names	dn	53	t	dn_53_t	5303	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	Canal <with a proper name>	dn	53	t	dn_53_t	5311	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	Waterfalls/Rapids <with proper name>	dn	53	t	dn_53_t	5313	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (Annotation Labels)	Lighthouse <proper name>	dn	53	t	dn_53_t	5315	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]				
Hydrology (cartographic - lines)	Waterfall; Rapids	dn	54	a	dn_54_a	5401	ANNO_CODE [4,5,I]					133
Hydrology (cartographic - points)	River Head/ River Source	dn	54	p	dn_54_p	5406	ANNO_CODE [4,5,I]					145 a) b)
Hydrology (cartographic - points)	Lighthouse	dn	54	p	dn_54_p	5410	ANNO_CODE [4,5,I]					159
Hydrology (cartographic - points)	Beacon/Fog Light	dn	54	p	dn_54_p	5411	ANNO_CODE [4,5,I]					160
Hydrology (cartographic - points)	Small Sand Bars	dn	54	p	dn_54_p	5412	ANNO_CODE [4,5,I]					150
Hydrology (cartographic - points)	Exposed Rocks	dn	54	p	dn_54_p	5413	ANNO_CODE [4,5,I]					154
Hydrology (cartographic shapes)	Sandbanks	dn	56	a	dn_56_a	5601						104
Hydrology (complex)	Ocean Shoreline	dn	51	a	dn_51_c	5000	TYPE [4,5,I]	TEXT_STR [60,62,C]	ANNO_CODE [4,5,I]			
Hydrology (Complex)	river	dn	51	a	dn_51_c	5101	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			108
Hydrology (complex)	temporary river	dn	51	a	dn_51_c	5103	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			103
Hydrology (complex)	canal width 10-60m	dn	51	a	dn_51_c	5104	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			110
Hydrology (complex)	canal width 3-10m	dn	51	a	dn_51_c	5114	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			114
Hydrology (complex)	Stream	dn	51	a	dn_51_c	5102	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			108
Hydrology (complex)	Temporary Stream	dn	51	a	dn_51_c	5108	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			103
Hydrology (complex)	ditches (intermittent)	dn	51	a	dn_51_c	5115	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			115 a) b)
Hydrology (complex)	Water Pipeline (above ground)	dn	51	a	dn_51_c	5117	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			136
Hydrology (complex)	Water Pipeline (underground)	dn	51	a	dn_51_c	5118	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			139
Hydrology (complex)	Wide river	dn	51	a	dn_51_c	5112	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			106
Hydrology (complex)	lake,pond	dn	51	a	dn_51_c	5105	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			116
Hydrology (complex)	temporary lake	dn	51	a	dn_51_c	5109	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			like 103
Hydrology (complex)	Salt beds; Salt Pans	dn	51	a	dn_51_c	5122	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			36
Hydrology (complex)	open ocean	dn	51	a	dn_51_c	5100	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			
Hydrology (complex)	Steep Cliffs without beach	dn	51	a	dn_51_c	5421	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			106
Hydrology (complex)	Dam	dn	51	a	dn_51_c	5402	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			136
Hydrology (complex)	canal width 10-60m (under construction)	dn	51	a	dn_51_c	5106	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			112
Hydrology (complex)	Wide temporal river	dn	51	a	dn_51_c	5113	TYPE [4,5,I]	TEXT_STR [60,60,C]	ANNO_CODE [4,5,I]			
Hydrology (points)	Principal Wells in Desert Areas	dn	52	p	dn_52_p	5201	ANNO_CODE [4,5,I]					140
Hydrology (points)	Well	dn	52	p	dn_52_p	5202	ANNO_CODE [4,5,I]					141
Hydrology (points)	Well with motor	dn	52	p	dn_52_p	5203	ANNO_CODE [4,5,I]					142 b
Hydrology (points)	Well with windmill	dn	52	p	dn_52_p	5204	ANNO_CODE [4,5,I]					142 a
Hydrology (points)	Water Storage/ Water Tank	dn	52	p	dn_52_p	5205	ANNO_CODE [4,5,I]					144

Table 5.3.4

Layer Description	English	Layer Name	Layer Number	Layer Type	Cover Name	ID_CODE	Additional Items 1	additional items 2	additional items 3	additional items 4	additional items 5	I.G.C.A Number
Infrastructure (Points)	small structures (huts – as small black circles)	if	30	p	if_30_p	3001	ANNO_CODE [4,5,0]					10
Infrastructure (Points)	Factories and firms without smokestacks	if	30	p	if_30_p	3002	ANNO_CODE [4,5,0]					34 a(b)
Infrastructure (Points)	Factories and firms with smokestacks	if	30	p	if_30_p	3003	ANNO_CODE [4,5,0]					33 a
Infrastructure (Points)	Airfields	if	30	p	if_30_p	3013	ANNO_CODE [4,5,0]					58
Infrastructure (Points)	Tower Like Constructions	if	30	p	if_30_p	3015	ANNO_CODE [4,5,0]					63
Infrastructure (Points)	Mines and quarries (operational)	if	30	p	if_30_p	3020	ANNO_CODE [4,5,0]					35
Infrastructure (Points)	Mines and quarries (abandoned)	if	30	p	if_30_p	3021	ANNO_CODE [4,5,0]					36
Infrastructure (Points)	Church	if	30	p	if_30_p	3022	ANNO_CODE [4,5,0]					13
Infrastructure (Points)	Chapel	if	30	p	if_30_p	3023	ANNO_CODE [4,5,0]					14
Infrastructure (Points)	Simple Tower Like Constructions	if	30	p	if_30_p	3014	ANNO_CODE [4,5,0]					62
Infrastructure (Points)	Isolated Structures	if	30	p	if_30_p	3006	ANNO_CODE [4,5,0]					9
Infrastructure (Points)	Cemetery, small, as a point feature	if	30	p	if_30_p	3025	ANNO_CODE [4,5,0]					65a,b
Infrastructure (Points)	Ruin, as a point feature	if	30	p	if_30_p	3027	ANNO_CODE [4,5,0]					12a
Infrastructure (Points)	Monument	if	30	p	if_30_p	3028	ANNO_CODE [4,5,0]					67
Infrastructure (Points)	Weather Station	if	30	p	if_30_p	3031	ANNO_CODE [4,5,0]					54
Infrastructure (Shapes)	Built up areas, major cities	if	31	a	if_31_a	3110	ANNO_CODE [4,5,0]					17
Infrastructure (Shapes)	Built up areas, suburban	if	31	a	if_31_a	3111	ANNO_CODE [4,5,0]					18
Infrastructure (Shapes)	Built up areas, rural and other	if	31	a	if_31_a	3112	ANNO_CODE [4,5,0]					21
Infrastructure (Shapes)	Airports	if	31	a	if_31_a	3115	ANNO_CODE [4,5,0]					58
Infrastructure (Shapes)	Airport Runway or Taxiway	if	31	a	if_31_a	3116	ANNO_CODE [4,5,0]					
Infrastructure (Shapes)	Cemetery, as a shape	if	31	a	if_31_a	3118	ANNO_CODE [4,5,0]					65c
Infrastructure (Shapes)	Ruins, large areas	if	31	a	if_31_a	3120	ANNO_CODE [4,5,0]					12b
Railway (Lines)	railway (single track)	rr	23	a	rr_23_a	2301	ANNO_CODE [4,5,0]					71
Railway (Lines)	railway (double track)	rr	23	a	rr_23_a	2302	ANNO_CODE [4,5,0]					70
Railway Facilities (Points)	Principal Railway Stations	rr	23	p	rr_23_p	2372	ANNO_CODE [4,5,0]					72
Railway Facilities (Points)	Loading Docks and Platforms	rr	23	p	rr_23_p	2373	ANNO_CODE [4,5,0]					73
Layer Description	**English**	**Layer Name**	**Layer Number**	**Layer Type**	**Cover Name**	**ID_CODE**	**Additional Items 1**	**additional items 2**	**additional items 3**	**additional items 4**	**additional items 5**	**I.G.C.A Number**
Road Facilities (Lines)	embankments and cuts (for roads)	rd	22	a	rd_22_a	2200	TYPE [1,1,1]					74
Road Facilities (Lines)	Bridge over 100 meters	rd	22	a	rd_22_a	2209	TYPE [1,2,1]	COMPRIMENTO [2,3,0]	LARGURA [2,3,0]	TONELADEM [3,4,1]		127
Road Facilities (Points)	Bridge over 3 but under 100 meters	rd	22	p	rd_22_p	2201	TYPE [1,2,1]	COMPRIMENTO [2,3,0]	LARGURA [2,3,0]	TONELAGEM [3,4,1]		126
Road Facilities (Points)	Bridge under 3 m. and Culverts or Drainage Pipes	rd	22	p	rd_22_p	2203	TYPE [1,2,1]	COMPRIMENTO [2,3,0]	LARGURA [2,3,0]	TONELAGEM [3,4,1]		87
Roads and Paths	first order roads	rd	21	a	rd_21_a	2101	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		83
Roads and Paths	paved road(under construction)	rd	21	a	rd_21_a	2101	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		88
Roads and Paths	unpaved road	rd	21	a	rd_21_a	2102	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		86
Roads and Paths	unpaved road (under construction)	rd	21	a	rd_21_a	2112	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		86
Roads and Paths	unpaved path	rd	21	a	rd_21_a	2103	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		
Roads and Paths	path for cart	rd	21	a	rd_21_a	2104	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		90
Roads and Paths	foot path	rd	21	a	rd_21_a	2105	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		91
Roads and Paths	highways	rd	21	a	rd_21_a	2110	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		82
Roads and Paths	Road Connectors in Built up Areas	rd	21	a	rd_21_a	2115	TYPE [1,2,1]	PAV_LARGURA [2,2,0]	EST_LARGURA [2,2,1]	STR[9,9,C]		
Topographic Symbols	dry riverbeds	tp	73	a	tp_73_c	7169						189
Topographic Symbols	dry riverbeds	tp	73	a	tp_73_c	7169						189
Topographic Symbols	areas of steep rocks	tp	73	a	tp_73_c	7196						198 b
Topographic Symbols	rock slide areas	tp	73	a	tp_73_c	7192						182
Topographic Symbols	natural dikes (geologic dike)	tp	73	a	tp_73_c	7197	ANNO_CODE [4,5,0]					187
Topographic Symbols	pit, depression	tp	74	p	tp_74_p	7193	ANNO_CODE [4,5,0]					183
Topographic Symbols	peak	tp	74	p	tp_74_p	7194	ANNO_CODE [4,5,0]					194
Topographic Symbols	relief features	tp	74	p	tp_74_p	7195	ANNO_CODE [4,5,0]					195
Topographic Symbols	cave and grotto entrances	tp	74	p	tp_74_p	7196	ANNO_CODE [4,5,0]					196
Topographic Symbols	isolated rock outcrops	tp	74	p	tp_74_p	7178	ANNO_CODE [4,5,0]					179
Topographic Symbols	isolated rocks serving as points of reference	tp	74	p	tp_74_p	7177	ANNO_CODE [4,5,0]					177
Topography (Annotation Labels)	island <proper name>	tp	75	l	tp_75_l	7501	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	hill or mountain <proper name>	tp	75	l	tp_75_l	7503	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	hill <proper name>	tp	75	l	tp_75_l	7506	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	hill <proper name>	tp	75	l	tp_75_l	7507	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Peninsula <proper name>	tp	75	l	tp_75_l	7508	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	peak <proper_name>	tp	75	l	tp_75_l	7511	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Point <proper_name>	tp	75	l	tp_75_l	7513	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Mountain Range <proper_name>	tp	75	l	tp_75_l	7515	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Top <proper_name>	tp	75	l	tp_75_l	7517	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Valley <proper_name>	tp	75	l	tp_75_l	7519	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Reach <proper name>	tp	75	l	tp_75_l	7520	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Dry River bed <proper_name>	tp	75	l	tp_75_l	7521	TEXT_STR [60,60,C]					
Topography (Annotation Labels)	Area Names	tp	75	l	tp_75_l	7525	TEXT_STR [60,60,C]					

Table 5.3.5

Layer Description	English	Layer Name	Layer Number	Layer Type	Cover Name	ID_CODE	Additional Items 1	additional items 2	additional items 3	additional items 4	additional items 5	LGIC A Number
Utilities (Lines)	Telephone/Telegraph Lines	ul	35	a	ul_35_a	3550	AMIND_CODE [4,5,0]					53
Utilities (Lines)	Power Transmission Lines	ul	35	a	ul_35_a	3548	AMIND_CODE [4,5,0]					48, 49
Utilities (Lines)	Above ground pipelines	ul	35	a	ul_35_a	3544	AMIND_CODE [4,5,0]					44
Utilities (Lines)	Underground pipelines	ul	35	a	ul_35_a	3545	AMIND_CODE [4,5,0]					45
Utilities (Points)	Gas and Petroleum Burning Towers	ul	35	p	ul_35_p	3539	AMIND_CODE [4,5,0]					39
Utilities (Points)	Gas and Petroleum Wells	ul	35	p	ul_35_p	3540	AMIND_CODE [4,5,0]					40
Utilities (Points)	Gas and Fuel Storage Areas	ul	35	p	ul_35_p	3541	AMIND_CODE [4,5,0]					41
Utilities (Points)	Filling Station/ Gas Stand	ul	35	p	ul_35_p	3542	AMIND_CODE [4,5,0]					42
Utilities (Points)	Power Station, Power Generating Station	ul	35	p	ul_35_p	3546	AMIND_CODE [4,5,0]					46
Utilities (Points)	Power Sub-Stations and Transformers	ul	35	p	ul_35_p	3547	AMIND_CODE [4,5,0]					47
Utilities (Points)	Radio and Television Broadcasting Stations	ul	35	p	ul_35_p	3550	AMIND_CODE [4,5,0]					50
Utilities (Points)	Radio and Television Transmission Tower	ul	35	p	ul_35_p	3551	AMIND_CODE [4,5,0]					51
Utilities (Points)	Telephone and Telegraph Office	ul	35	p	ul_35_p	3552	AMIND_CODE [4,5,0]					52
Vegetation Cover (cartographic - lines)	Planted Tree Line (wind break)	vg	64	a	vg_64_a	6431						200
Vegetation Cover (complex)	Vegetation and soil boundary	vg	63	a	vg_63_a	6331						199
Vegetation Cover (complex)	Sandy or barren areas	vg	63	a	vg_63_a	6305						
Vegetation Cover (complex)	Forest	vg	63	a	vg_63_a	6310						
Vegetation Cover (complex)	Palm Woods	vg	63	a	vg_63_a	6311						
Vegetation Cover (complex)	Shrub with a mixture of others	vg	63	a	vg_63_a	6312						
Vegetation Cover (complex)	Grassland	vg	63	a	vg_63_a	6316						
Vegetation Cover (complex)	Grassland with a mixture of shrub	vg	63	a	vg_63_a	6318						
Vegetation Cover (complex)	Grassland with a mixture of trees	vg	63	a	vg_63_a	6317						
Vegetation Cover (complex)	Grassland with a mixture of shrub and trees	vg	63	a	vg_63_a	6318						
Vegetation Cover (complex)	Cultivated Land	vg	63	a	vg_63_a	6325						231
Vegetation Cover (complex)	Cultivation with a mixture of others	vg	63	a	vg_63_a	6326						
Vegetation Cover (complex)	Coffee Plantation	vg	63	a	vg_63_a	6330						230 a(b)(c)
Vegetation Cover (complex)	Sugar Cane Plantation	vg	63	a	vg_63_a	6331						230
Vegetation Cover (complex)	Orchard	vg	63	a	vg_63_a	6332						232
Vegetation Cover (complex)	Other Plantation	vg	63	a	vg_63_a	6339						
Vegetation Cover (complex)	Mangrove	vg	63	a	vg_63_a	6346						226
Vegetation Cover (complex)	Marsh or Swamp (inaccessable)	vg	63	a	vg_63_a	6346						226
Vegetation Cover (complex)	Marsh or Swamp (accessable)	vg	63	a	vg_63_a	6348						227
Vegetation Cover (complex)	Salt Marsh/Salt Pan (inaccessable)	vg	63	a	vg_63_a	6347						228
Vegetation Cover (complex)	Salt Marsh/Salt Pan (accessable)	vg	63	a	vg_63_a	6348						229
Vegetation Cover (Points)	Forest Cover/Canopy information	vg	62	p	vg_62_p	6201	TYPE[1,3,C	ALTURA [2,3,I]	ESPESSURA [4,0,F,2]	DBT_ENTRE [2,3,I]		212,213
Vegetation Cover (cartographic shapes)	Marsh or Swamp (accessable)	vg	65	a	vg_65_a	6575						227
Vegetation Cover (cartographic shapes)	Salt Marsh/Salt Pan (accessable)	vg	65	a	vg_65_a	6572						229

Table 5.3.5

Table 5.3.6

Anno_code	Anno_str	Anno_desc_port	Anno_desc_eng
9999	NA	NA	see an_90_p (used as a check flag)
9590	NA		National Park <proper name>
9591	NA		dry lake name with black text color
9592	NA		marsh, or tidal swamp name
9596	NA		used as check flag for Bridge name
9597	NA		All CAPS unknown text string
9598	NA		CAP/small unknown text string
8210	Parq. Nac.	Parque Nacional (nome proprio)	National Park <proper name>
8887	aband.	Abandonado	abandoned
8888	avar.	Avariado	damaged
8889	destr.	Destruido(s)	destroyed
5122	sal.	Agua salobre (nos rios lagos e nascentes)	salty water
5205	tanq.	Tanque	tank
5501	nasc.	Nascente	river head IGCA 145 a
5502	nasc.	Nascente	river head IGCA 145 b
5503	Poco	Poco	well
5504	poco seco	Poco seco	dry well
5520	alc.	Fonte alcalina	alkaline spring
5522	term.	Fonte de aguas termais	thermal spring
5530	albuf	Albufeira	lagoon
5535	rap.	Rapido (sem nome proprio)	rapids
5540	prof.	Profundidade	depth
5550	ancor.	Ancoradouro	anchorage
5551	hang. barc.	Hangar para barcos	boat house
5552	jang.	Jangada	roped raft across river
5553	porto	Porto	port
5554	trav.	Travessia a barco	boat crossing
5555	vau	Vau	ford-river crossing
5556	repr.	Repressa	dam
5560	P	Pedra (leito do rio pedregoso)	stony river bed
dn_51_a	Canal	Canal (nome proprio)	Canal <proper name>
dn_51_a	Rio	Rivers (nome proprio)	all Rivers <proper name>
dn_51_a	Raicho	Raicho (nome proprio)	all streams or brooks <proper name>
5300	Baia	Baia (nome proprio)	Bay <proper name>
5300	Costa	Costa (nome proprio)	Coast < proper name>
5300	Gol.	Golfo (nome proprio)	Gulf <proper name>
5301	Rio	Rio (nome proprio)	River (as a shape) <proper name>
5305	Lag.	Lagoa (nome proprio)	Lake <proper name>
5306	Lag.	Lagoa (nome proprio)	Lake <proper name> (black text color)
5309	Lag.		Temporary Lake <proper name>
5313	Qued.	Queda (nome proprio)	waterfall <proper name>
5315	Farol	Farol (nome proprio)	Lighthouse <proper name>
5317	Enseada	Enseada (nome proprio)	Cove - Inlet <proper name>
5319	Pant.	Pantano (nome proprio)	marsh -- swamp <proper name>
5320	Pantano	Pantano (nome proprio)	marsh -- swamp <proper name> (black text color)
5321	Praia	Praia (nome proprio)	beach - seashore <proper name>

Table 5.3.7

Anno_code	Anno_str	Anno_desc_port	Anno_desc_eng
3005	cub.	Cubata(s)	hut
3007	casa(s)	Casa(s)	home(s)
3008	isol.	Isolada (casa)	isolated house
3020	mina	Mina	mine
3027	ruin	Ruina	ruins
3029	mon.	Monumento	monument
3031	est. met.	Estaco meterologica	weather station
3032	esc.	Escola	school
3033	inst.	Instituto	institute
3034	aerod.	Aerodromo	airfield
3035	aerop.	Aeroporto	airport
3036	aviac.	Aviaco	aviation - flying??
3037	hang.	Hangar	hanger -- airplane hanger
3040	bombeir.	Bombeiros	fire station
3041	clin.	Clinica	clinic
3042	hosp.	Hospital	hospital
3043	hot.	Hotel	hotel
3044	orf.	Orfanato	orphanage
3045	sanat.	Sanatorio	sanitarium
3046	conv.	Convento	convent
3047	cemit.	Cemiterio	cemetery -- graveyard
3048	v. com.	Vala comum	paupers grave (unmarked cemetery)
3049	tum.	Tumulo	tomb
3050	acuc.	Fabrica de acucar	sugar factory
3051	arroz	Cultura de arroz - Fabrica de descasque	rice field - rice milling factory
3052	cafe	Fabrica de cafe	coffee factory
3053	confec.	Fabrica de confeccoes	clothes factory
3054	cons.	Fabrica de conserva	storage warehouse
3055	dep. cer.	Deposito de cereais	cereal or grain storage facility
3056	est. merc.	Estaco de mercadoria	commodity station??
3057	fibroc.	Fabrica de fibrocimento	reinforced concrete factory
3058	gas	Fabrica de gas	gas factory
3059	ol.	Fabrica de oleos	oil factory
3060	pap.	Industrial de papel	paper industry
3061	pesc.	Pescaria (sem nome proprio)	fish market (no name)
3062	raco	Fabrica de raco	food factory
3063	text.	Fabrica Textil	textile factory
3064	trat. agua	Estaco de tratamento de agua	water treatment facility
3065	alp.	Alpendre	shed
3066	const.	Construco	building
3067	depos.	Deposito	storage
3068	edif.	Edificio(s)	building/structure
3069	viv.	Viveiro	nursery, fish farm
3072	sond.	Torre de sondagem	sounding tower (loadspeaker tower?)
3073	observ.	Observatorio	observatory -- astronomical
3075	autod.	Autodromo	race track
3076	desp.	Campo de desportos	sports camp
3077	estad.	Estadio	stadium
3078	pisc.	Piscina	swimming pool
3080	aviar.	Aviarios	henhouse
3081	leit.	Granja leiteira	dairy farm
3082	quint.	Quintal ou quinta	place for drying tea leaves
3083	lact.	Fabrica de lacticinios	dairy production factory
3084	silo	Silo	silo
3085	agua	Torre elevada	elevated water tower
3086	apead.	Apeadeiro	railroad station / dock
3087	est. fer.	Estaco ferroviaria	railroad station
3088	tun.	Tunel	tunnel
3089	viad.	Viaduto	viaduct
3094	marm.	Marmore (material de extracco)	marble quarry
3301	acamp.	Acampamento	military camp
3302	bomb.	motobomba.	munitions storage
3303	com. front.	Sede de comando de fronteira	border command station
3304	estl. nav	Estaleiro Naval	navy shipyard
3305	ft.	Forte	Fort
3306	g. flor.	Casa guarda florestal	forest guard house
3307	guar.	Guarita	sentry box -- guard house

Table 5.3.8

Anno_code	Anno_str	Anno_desc_port	Anno_desc_eng
3308	quart.	Quartel	barracks
3233	Fortal.	Fortaleza (nome proprio)	Fortress – Fort <proper name>
3205	S.to	Santo(a) (nome proprio)	(holy sacred) religious name
3210	cais	Cais	platform <rail or maritime>
3212	Cruz.	Cruzeiro (name proprio)	monument (religious) <proper name>
3214	Pesc.	Pescaria (nome proprio)	fish market <proper name>
7140	astr.	Ponto astronomico	astronomical point (observation point)
7141	cav.	Caverna	cavern – cave
7142	gruta	Gruta	grotto
7143	leito	Leito seco	dry riverbed
7144	rocha(s)	Rocha(s)	Rock
7145	Ter.	Terra (dique)	earthen dam – dike
7146	vale	Vale	valley
7147	D	Duro (leito do rio)	dry riverbed
7148	L.	Lodoso (terreno)	muddy terrain
7501	Ilha(s)	Ilha(s) (nome proprio)	island <proper name>
7503	m.	Monte - morro - montanha	hill or mountain <proper name>
7505	Montel.	Monticulo (nome proprio)	hill < proper name>
7507	Out.	Outeiro (nome proprio)	hill <proper name>
7509	Pen.	Peninsula (nome proprio)	Peninsula <proper name>
7511	Pico	Pico (nome proprio)	peak <proper name>
7513	Ponta	Ponta (nome proprio)	Point < proper name>
7515	serra	Serra (nome proprio)	Mountain Range <proper name>
7517	Cima	Cima (nome proprio)	top <proper_name>
7519	vale	Vale (nome proprio)	valley <proper_name>
1010	C.C.	Comissariado Comunal	Communal Commissioner
1020	C.M.	Comissariado Municipal	Municipal Commissioner
3092	CHE	Central Hidroelectria	hydro electric power station
3095	combust.	Deposito de combustiveis e lubrificantes	Fuel and Lubricant Storage
3096	petrol.	Torre - poco de petroleo - rifinaria	oil refinery
3097	of. auto	Oficina de reparaco de automoveis e tractores	car and tractor repair
3546	cent. el.	Central electrica	electric power station
3547	c.tr.	Cabine de transformaco	electrical transformer cabin??
3550	emos.	Emissora de radio	radio transmitter
3551	rad.	Montagem de radio	radio tower

Table 5.3.9

Angola 1:25,000 Scale Schema & Codes

Last Updated: Jan 18, 2002

Layer Description	English	Layer Name	Layer Number	Layer Type	Cover Name	ID_CODE	Additional Items 1	additional Items 2	additional Items 3	additional Items 4	additional Items 5	I.G.C.A Number
Administration (Shapes)	Provincial Boundaries	po	80	s	po_80_s	8002	PROVINCIA_STR [80,80,C]	DISTRICT_STR [80,80,C]				209
Administration (Shapes)	Ocean Area	po	80	s	po_80_s	8999						
Benchmarks and Elevation Points	National Control Point	bm	72	p	bm_72_p	7301	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	POINT_TEXT_STR [60,60,C]	VIS_FLAG [1,1,I]		1
Benchmarks and Elevation Points	Spot Heights	bm	72	p	bm_72_p	7308	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	POINT_TEXT_STR [60,60,C]	VIS_FLAG [1,1,I]		4
Benchmarks and Elevation Points	Depth Sounding	bm	72	p	bm_72_p	7310	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	POINT_TEXT_STR [60,60,C]	VIS_FLAG [1,1,I]		158
Contours	Ocean shoreline	ct	71	a	ct_71_a	7300	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	DSP_FLAG [1,1,I]			190 a
Contours	Principal contours 25 m	ct	71	a	ct_71_a	7101	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	DSP_FLAG [1,1,I]			190 b
Contours	Intermediate contours 5 m	ct	71	a	ct_71_a	7102	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	DSP_FLAG [1,1,I]			190 c
Contours	auxiliary contours 2.5 m	ct	71	a	ct_71_a	7103	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	DSP_FLAG [1,1,I]			
Contours	Bathymetric iso-Lines	ct	71	a	ct_71_a	7309	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	DSP_FLAG [1,1,I]			197
Contours	Outer Boundary	ct	71	a	ct_71_a	7999	SPOT [4,0,F,2]	SPOT_TEXT_STR [60,60,C]	DSP_FLAG [1,1,I]			190 a
Other Topographic Linear Features	Dam	ct	73	a	ct_73_a	3423						
Other Topographic Linear Features	Embankments	ct	73	a	ct_73_a	7111						190 a
Other Topographic Linear Features	Cuts	ct	73	a	ct_73_a	7112						190 a
Other Topographic Linear Features	Cliffs, escarpments	ct	73	a	ct_73_a	7190						190 a
Other Topographic Linear Features	Natural Dikes	ct	73	a	ct_73_a	7197						190 a
Dry Rivers and Wadies (complex,arcs)	Outline for Dry Rivers and Wadies	lg	73	c	lg_73_c	7199						190 a
Dry Rivers and Wadies (complex,arcs)	Promiment Dry Streams	lg	73	c	lg_73_c	7189						190 a
Dry Rivers and Wadies (complex,arcs)	Smaller Dry Streams	lg	73	c	lg_73_c	7170						190 a
Dry Rivers and Wadies (complex,polygons)	Dry Rivers and Wadies	lg	73	c	lg_73_c	7199						190 a
Hydrology (complex,arcs)	Ocean Shoreline	dr	51	c	dr_51_c	5001						
Hydrology (complex,arcs)	Major River	dr	51	c	dr_51_c	5101						108
Hydrology (complex,arcs)	Smaller River	dr	51	c	dr_51_c	5102						103
Hydrology (complex,arcs)	Adas river (outline)	dr	51	c	dr_51_c	5103						110
Hydrology (complex,arcs)	Lake (outline)	dr	51	c	dr_51_c	5104						114
Hydrology (complex,arcs)	Major Temporary River	dr	51	c	dr_51_c	5107						106
Hydrology (complex,arcs)	Medium Temporary River	dr	51	c	dr_51_c	5108						123
Hydrology (complex,arcs)	Smaller Temporary River	dr	51	c	dr_51_c	5109						119 a(b)
Hydrology (complex,arcs)	Temporary lake	dr	51	c	dr_51_c	5110						130
Hydrology (complex,arcs)	Canal width 10m wide (outline)	dr	51	c	dr_51_c	5114						129
Hydrology (complex,arcs)	Canal width 3m wide	dr	51	c	dr_51_c	5115						128
Hydrology (complex,arcs)	Water Pipeline (above ground)	dr	51	c	dr_51_c	5117						118
Hydrology (complex,arcs)	Water Pipeline (underground)	dr	51	c	dr_51_c	5118						see 103
Hydrology (complex,arcs)	Salt Pan outline	dr	51	c	dr_51_c	5123						28
Hydrology (complex,arcs)	Reservoir outline	dr	51	c	dr_51_c	5409						
Hydrology (complex,arcs)	Outter Boundary	dr	51	c	dr_51_c	5999						190
Hydrology (complex,polygons)	Non Water Polygons	dr	51	c	dr_51_c	0						136
Hydrology (complex,polygons)	Open Ocean	dr	51	c	dr_51_c	5000						136
Hydrology (complex,polygons)	Wide River	dr	51	c	dr_51_c	5102						112
Hydrology (complex,polygons)	Lakes	dr	51	c	dr_51_c	5104						
Hydrology (complex,polygons)	Temporary Wide Rivers	dr	51	c	dr_51_c	5106						
Hydrology (complex,polygons)	Temporary Lakes	dr	51	c	dr_51_c	5110						
Hydrology (complex,polygons)	Canals width 10m wide	dr	51	c	dr_51_c	5114						
Hydrology (complex,polygons)	Salt Pans	dr	51	c	dr_51_c	5123						
Hydrology (complex,polygons)	Reservoirs	dr	51	c	dr_51_c	5409						
Hydrology (cartographic shapes)	Sand banks	dr	56	s	dr_56_s	5621						134
Infrastructure (Points)	Small Rail Stations (as point)	if	30	p	if_30_p	3304						10
Infrastructure (Points)	Hut (cubata)	if	30	p	if_30_p	3011						34 a(b)
Infrastructure (Points)	Tower	if	30	p	if_30_p	3015						33 a
Infrastructure (Points)	Church	if	30	p	if_30_p	3022						29
Infrastructure (Points)	Airport	if	30	p	if_30_p	3116						63
Infrastructure (Points)	Gas Well	if	30	p	if_30_p	3040						35
Infrastructure (Points)	Gas Tank	if	30	p	if_30_p	3041						36
Infrastructure (Points)	Gas Station	if	30	p	if_30_p	3042						15
Infrastructure (Points)	Power Sub-Station	if	30	p	if_30_p	3047						14
Infrastructure (Points)	Radio Station	if	30	p	if_30_p	3055						62
Infrastructure (Points)	Antenna	if	30	p	if_30_p	3301						8
Infrastructure (Points)	Market	if	30	p	if_30_p	3058						60a,b
Infrastructure (Points)	Weather Station	if	30	p	if_30_p	3059						12a
Infrastructure (Points)	Watch Tower	if	30	p	if_30_p	3060						61

Table 5.3.9

Table 5.3.10

Layer Description	English	Layer Name	Layer Number	Layer Type	Cover Name	ID_CODE	Additional Items 1	additional Items 2	additional Items 3	additional Items 4	additional Items 5	I.G.C.A Number
Infrastructure (Points)	Water Tank	if	30	p	if_30_p	5205						54
Infrastructure (Points)	Water Tower	if	30	p	if_30_p	5206						54
Infrastructure (Points)	Lighthouse	if	30	p	if_30_p	5412						54
Infrastructure Buildings (Polygons)	Open Areas in Buildings/Courtyards	if	32	a	if_32_a	0	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Train Stations	if	32	a	if_32_a	3304	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Factories with Smokestacks	if	32	a	if_32_a	3003	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Houses/Villas	if	32	a	if_32_a	3010	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Regular Buildings	if	32	a	if_32_a	3012	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Church	if	32	a	if_32_a	3002	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Factory	if	32	a	if_32_a	3003	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Ruins/Abandoned Buildings	if	32	a	if_32_a	3565	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Weather Station	if	32	a	if_32_a	3566	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	School	if	32	a	if_32_a	3561	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Hospital	if	32	a	if_32_a	5302	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Hotel	if	32	a	if_32_a	3563	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Stadium	if	32	a	if_32_a	3566	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Arms?	if	32	a	if_32_a	3566	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Fixelation?	if	32	a	if_32_a	3567	ANNO_CODE [4,5,0]					54
Infrastructure Buildings (Polygons)	Munitions Storage?	if	32	a	if_32_a	3568	ANNO_CODE [4,5,0]					54
Infrastructure (Polygons)	Built up areas, major cities	if	31	a	if_31_a	3110						17
Infrastructure (Polygons)	Built up areas, suburban	if	31	a	if_31_a	3111						18
Infrastructure (Polygons)	Airport Runway or Tarmac	if	31	a	if_31_a	3116						
Infrastructure (Polygons)	Cemetery, as a shape	if	31	a	if_31_a	3563						68c
Infrastructure (Polygons)	Markets	if	31	a	if_31_a	3564						129
Infrastructure (Polygons)	Sports Grounds	if	31	a	if_31_a	3564						129
Railway (Lines)	Railway active	rr	23	a	rr_23_a	2301						71
Railway (Lines)	Railway abandoned	rr	23	a	rr_23_a	2302						70
Railway (Lines)	Railway sidings	rr	23	a	rr_23_p	2303						72
Roads and Paths (Lines)	First Order Roads	rd	21	a	rd_21_a	2101	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		83
Roads and Paths (Lines)	Dirt Paved Roads	rd	21	a	rd_21_a	2102	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		88
Roads and Paths (Lines)	Unpaved paths	rd	21	a	rd_21_a	2103	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		86
Roads and Paths (Lines)	Path for carts/tracks	rd	21	a	rd_21_a	2104	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		90
Roads and Paths (Lines)	Foot path	rd	21	a	rd_21_a	2105	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		91
Roads and Paths (Lines)	Narrow Urban Streets	rd	21	a	rd_21_a	2107	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		92
Roads and Paths (Lines)	Centerline of rd_poly coverage	rd	21	a	rd_21_a	2108	TYPE [1,2,I]	PAV_LARGURA [2,2,I]	EST_LARGURA [2,2,I]	STR[8,9,C]		
Roads (Polygons)	Wide Urban Roads	rd	22	a	rd_22_a	2250	TYPE [1,2,I]	COMPRIMENTO [2,3,I]	LARGURA [2,3,I]	TONELAGEM [3,4,I]		87
Roads (Polygons)	Bridges	rd	22	a	rd_22_a	2202	TYPE [1,2,I]	COMPRIMENTO [2,3,I]	LARGURA [2,3,I]	TONELAGEM [3,4,I]		87
Utilities (Lines)	Above ground pipelines	ut	35	a	ut_35_a	3543						44
Utilities (Lines)	Power Transmission Lines	ut	35	a	ut_35_a	3548						48, 49
Vegetation Cover (Polygons)	Non-Vegetated Areas	vg	63	a	vg_63_a	6301						199
Vegetation Cover (Polygons)	Sandy Terrain	vg	63	a	vg_63_a	6306						
Vegetation Cover (Polygons)	Forest	vg	63	a	vg_63_a	6310						
Vegetation Cover (Polygons)	Palm Woods	vg	63	a	vg_63_a	6311						
Vegetation Cover (Polygons)	Grassland	vg	63	a	vg_63_a	6312						
Vegetation Cover (Polygons)	Grassland with a mixture of shrub	vg	63	a	vg_63_a	6316						
Vegetation Cover (Polygons)	Grassland with a mixture of trees	vg	63	a	vg_63_a	6317						
Vegetation Cover (Polygons)	Grassland with a mixture of shrub an	vg	63	a	vg_63_a	6318						
Vegetation Cover (Polygons)	Cultivated Land	vg	63	a	vg_63_a	6325						231
Vegetation Cover (Polygons)	Cultivation with a mixture of others	vg	63	a	vg_63_a	6326						
Vegetation Cover (Polygons)	Orchard	vg	63	a	vg_63_a	6332						233
Vegetation Cover (Polygons)	Other Plantation	vg	63	a	vg_63_a	6333						
Vegetation Cover (Polygons)	Median Strip/Parks	vg	63	a	vg_63_a	6334						235
Vegetation Cover (Polygons)	Mangrove	vg	63	a	vg_63_a	6340						225
Vegetation Cover (Polygons)	Marsh or Swamp (Inaccessable)	vg	63	a	vg_63_a	6343						226
Vegetation Cover (Polygons)	Marsh or Swamp (accessable)	vg	63	a	vg_63_a	6348						227

Table 5.3.10