DB-2

WELL INVENTORY DATA BASE

WELL INVENTORY

1. METHOD OF WELL INVENTORY

1.1 INTRODUCTION

As a part of the study "Sustainable Groundwater Development for Bogotá Plain in the Republic of Colombia" developed by Japan International Cooperation Agency (JICA), the well inventory performed to prepare the database according to the collected existing well data from among relating organizations and companies responsible for groundwater development.

The objectives of the well inventory database is to collect existing well data that shall include items as: Location of well (coordinate), altitude of well, depth and diameter of wells, groundwater levels, yield of well, lithology of aquifer, year of well completion, existing water quality analysis result, among others. A specific objective of this inventory is to take data source to GIS database.

The existing information was selected and analyzed in the JICA study area, where extended from Muña reservoir (South) to Villapinzón (North) and from East Mountains to Facatativa (West). The JICA study area covers all CAR and DAMA jurisdiction.

1.2 COMPILATION OF INFORMATION

The compilation of the information was carried out in the following two phases. During the first phase the well information from DAMA was compiled to data form. DAMA has the information from of wells inside of Bogotá city perimeter. The query of DAMA files began on September 12 in 2001 and ended upon October 8 in 2001.

The second phase was carried out in CAR headquarters. During this phase the information from well inside of Bogotá Plain were covered. The additional information was compiled from Zipaquirá CAR office. The survey in Bogotá Car office began on October 16 in 2001 and ended upon December 1 in 2001. The beginning of the query files in Zipaquirá CAR office began on December 16 in 2001 and ended upon December 24 in 2001.

The compilation in both institutions consisted of the following items: reviewing the legal files, extracting technical information regarding well, such as well design, lithology, levels, chemistry data, pumping test among others, also information regarding the owner and well locations was captured. These selected technical information were copied to XEROX papers and All the information were captured and handled to the Microsoft Access 97 database.

After the data was stored to the database, the professionals reviewed most of all these information.

It was important that all the information captured in DAMA headquarters were incorporated into the database, at the contrary, from the information captured in CAR headquarters, pumping test, chemistry and land information were not incorporated into the database.

The general information for pumping test was incorporated into the database, and the actual pumping test data (time vs drawdown) was incorporated into Microsoft Excel files which name corresponded to the well name.

To incorporate the water quality data, the selection of the most relevant parameters was performed. Each parameter has its own predefined units and limits, which were used during the capture of the data.

Level measures were incorporated into the database, however most of this data is not referenced to a unique level, therefore the information is taken to treat carefully.

The following chapter describes the database.

The units of the International system were used for all databases with the exception of flow rate that is reported in l/s.

Appendix #1 presents a list of some of the files reviewed in Bogotá Car Office.

1.3 DATABASE STRUCTURE

The database was produced in a proper way that could meet most of INGEOMINAS and DAMA well forms. Those forms corresponded to the BNDH (stay in Spanish by Hydro geological Data of National Bank). However all the issues were not considered in those forms were translated into the database.

Because, CAR and IDEAM institutions required that the database handled just numeric field, all the BNDH that incorporated by text were translated to meet this condition.

The "Microsoft Access" data was prepared by the JICA study team. The forms and reports were developed in the "Microsoft Access 97" which worked with the linked table that is generated in "Microsoft Access 97" at the beginning of the application.

The final objective of the application in "Microsoft Access 97" is the preparation of the management tool for well data to incorporate the data easily, to avoid troubles for the numeric data and problems such as duplicate information or re-writing information. As a consequence, the database requires some changes to allow the editing of the data.

The database is composed by a general scheme that has the domain tables and the data scheme, which has the tables with the data, the data was captured in this project. The data base language is used in Spanish.

The domain tables have all the general information, which apply to different data, such as data regarding types, codes, method, and units, among others. The content of the domain tables was prepared specifically for the JICA study with having in mind IDEAM recommendations.

A review of the structure of domain tables is shown in the Appendix #2. The following is a list of the domain table and its content in the Table1.1

Table1.1 List of the domain table and its content

No.	Name of the table	Description
1	Clases	Contains a list of sediments and rocks which varies from sand trough claystone.
2	Geologia	Contains the ages for the sediments and rock of Bogotá plain. It is coded according to 1-Cuaternary, 2 quaternary-tertiary, 3. Tertiary and 4 Cretacic
3	Formaciones	Contains a list of the formations for each representative age coded in table "Geologia"
4	HG_ACTIVIDAD_ECONOMICA	This table covers some of the economic activity codified by DANE. Just the most relevant categories were selected for the data base.
5	HG_ANALISIS	Contains codes for the selected chemical analysis
6	HG_ANALISIS_TEMATICA	For each chemical analysis of the HG_ANALSIS this table contains the unit code and the range of variation
7	HG_CONDICION	It has different options for a well conditions which could be normal, dry, obstructed, in reserve, abandoned, closed, among others
8	HG_CONDICION MEDIDA	It has codes for the option if the well had been pumped out for more than 24 hour or for less than 24 hours
9	HG_DESTINO USO	Contains different used type with its corresponding code. For example, production, reserve, recharge, injection, piezometer
10	HG_DIAMETRO	Contains a list with different drill, and pipe diameter in inches which have a unique code. This code is employed in all diameter measured instead of the actual diameter
11	HG_DIAMETRO PARTICULAS	As the bit and pipe diameter, this table contains a codified diameter for the size of particles used in drilling work
12	HG_GEOFORMAS	Contains different land forms such as: alluvial plain, beach, dune, terrace, among other
13	HG_METODO	Contain different types of drilling method, for

	CONTRUCCION	example rotation, jetting, percussion
14	HG_METODO_MEDIDA	Contains options for the method that could be use to measure the level, for example level meter, meter, pressure transductor, etc
15	HG_METODO_MEDIDA_ALTITUD	Options for the method used to determined the altitud of the well (maps, GPS, Survey campaign)
16	HG_METODO_MEDIDA_COORDENADAS	Same as above but for coordinate (maps, GPS, Survey campaign)
17	HG_METODOS LIMPIEZA	Codes for cleaning methods
18	HG_METODOS MEDIDA CAUDAL	Codes for flow measure method (volumetric, pitot, flow meter, among others)
19	HG_ORIGEN INFORMACION	Those codes determines if the information introduced to the data base comes form a report or from another data base
20	HG_REFERENCIA	It contains codes for the reference level used to measured the water level
21	HG_TIPO ACTIVIDAD	Options for economic activity
22	HG_TIPO ACUIFERO	Contain codes for aquifer types
23	HG_TIPO CAPTACION	
24	HG_TIPO CONSTRUCCION	Additional buildings such as lagoons, tank, reservoirs
25	HG_TIPO ESTADO	Options for the condition of the pump
26	HG_TIPO FILTRO	Codes for filter types
27	HG_TIPO FLUIDO	Codes for the possible fluids used during the drilling works such as bentonite, water, or oil
28	HG_TIPO INSTITUCION	Institution type (government, educational, research)
29	HG_TIPO MATERIAL	Material type for well casing (PVC, Stainless steal, Steal, Galvanizado)
30	HG TIPO NIVEL	Codes for level type 1 static level, 2 dynamic level
31	HG_TIPO PAR HIDRAULICO	Codes for hydraulic parameters
32	HG_TIPO_PTO AGUA	Type of water point (spring, well, big diameter well)
33	HG_TIPO REGISTRO	Log type
34	HG_TIPO REVESTIMIENTO	Codes for the wells design that includes drilling, casing, screen, cape, sanitary seal, gravel pack
35	HG_TIPO SELLO	Codes for different seal, (clay, concrete, soil)
36	HG_TIPO TRAMO	Interval type, this is if it is casing or just the drilling
37	HG_TIPO USO	Codes for different uses type for example, domestic, industrial, recreation, among others
38	HG_TIPOS ENERGIA	Energy type
39	HG_TIPOS PRUEBA	Codes for pumping test types
40	HG_TIPOS TRATAMIENTO	Codes for treatment used during well drilling
41	HG_TIPO TOPOGRAFIA	Codes for different types of topography aspects
42	HG_TRATAMIENTO ESPECIAL	Codes for special treatment using during well drilling

43	Palabra Clave	Code for each sediments or rock
44	VEREDAS	Codes for the towns
45	MUNICIPIOS	Codes for the municipality

Data tables conforms the data scheme and the data is compiled during the project. The tables are related through key fields of database, also they are related with the domain tables. The relations are defined in the database. A review of the tables and relations are included in Appendix #3.

The following list of the data tables in Table 1.2 is presented in the database.

Table 1.2 lists of the data tables in the database

No.	Name of the table	Description
1	1-ubicación del pozo	Contains the location of the well, coordinates, municipality, town, department, altitude.
2	2-Predio	Address of the land
3	2-Cédula	
4	2-Solicitante	Information about who request the permission to use groundwater
5	2-Representante	Information about who represent the solicitant
6	3-bibliografía	Bibliography
7	4-Instituciones	Institution
8	5-investigadores	Researcher
9	6-constructores	Drilling names
10	7-Marcas de equipos de registro	Log equipment company names
11	8- tipos de equipos de explotación	Pumping equipment types
12	9- Datos generales del punto del agua	Contain basic information of the well this is depth, condition, date of drilling, date of closing, among others
13	10- Equipos de explotación	Pumping equipment
14	11-Caudal de aforo	Flow measurement
15	12-Uso del punto	Water use
16	13-Propiedades del agua (campo)	Chemical properties of the water measured in the field
17	14-Otras investigaciones	Other researches
18	15-Pruebas de bombeo	Pumping test
19	17-Concesión legalización	Legal state of the well in the environmental institution (CAR, DAMA)
20	18- Variables hidráulicas	Hydraulics parameters
21	19- Construcción adicional	Additional construction (tank, reservoir, among others)
22	20- Nivel estático	Static level
23	21- Limpieza y desarrollo	Cleaning of the well
24	22- Geomorfología	Geomorphology
25	23- Tratamiento	Treatment
26	24- Diseño del pozo	Well design
27	25- Expediente	Legal file

28	27- Modelo Geofísica	Not used
29	28- Estratigrafía	Stratigraphy
30	29- Sellamiento	If the well had been close by any institution
31	30- Permiso de perforación	Drilling permission
32	31- Denuncia	The date when the owner reported the well
33	32- Inscripción	Inscription in the environmental institution
34	33- medidores	Flowmeter
35	34- Resoluciones	Legal dispositions from environmental authority
36	35- lectura del medidor	Flow meter readings
37	Litologia	Lithology
38	Quimica	Chemistry
39	Resumen	Summary

The relationship among all data tables is shown in Figure 1.1.

Figure 1.1 Relations between the main table and the data tables

The database is composed by seven main topics, which are: well location, land information, general conditions of the well, legal situation of the well, lithology and well design, periodic observations, and other topics.

(1) Table "1-Ubicación del pozo" stores the information about well location as shown in Figure1.2.

No	No. Identificació	Nombre	Corporac	Otra ide	Corpora	Este	Norte		Municipi	Vereda	Dep
200	227-IV -B-070025	AUTOLAVADO LAS DOS AVENDAS	DAMA	070025	DAMA	988461	1001486		9999	202	25
132	227-IV -B-090004	METROPOLITANA DE TRANSPORTE	DAMA	090004	DAMA	991025	1010054		9999	197	25
194	227-IV -B-090006	FRIGORIFICO SUIZO S.A. POZO # 2.	DAMA	090006	DAMA	990083	1010330		9999	197	25
131	227-IV -B-090007	H.B ESTRUCTURAS METALICAS	DAMA	09-0007	DAMA	990800	1010100		9999	197	25
205	227-IV -B-090009	COLFRIGOS S.A.	DAMA	090009	DAMA	992086	1010327		9999	197	25
140	227-IV -B-090028	INVERSIONES CUBILLOS PEREZ LTDA	DAMA	090028	DAMA	990536	1010778		9999	197	25
141	227-IV -B-090029	INVERSIONES CUBILLOS PEREZ LTDA	DAMA	090029	DAMA	990520	1010797		9999	197	25
463	227-IV -B-090031	INDUSTRIAS METALICAS ASOCIADAS IMAL S.A.	DAMA	09-0031	DAMA	991204	1010812		9999	197	25
139	227-IV -B-100003	ALIMENTOS EL JARDIN S.A	DAMA	100003	DAMA	995741	1010216		9999	202	25

Figure 1.2 Main key table in database

"1-Ubicación del punto" is the main table. To be able to incorporate information about a well it should have a record in table. Well ID, name, coordinates, municipality and town are some of the field recorded in this table.

This table contains fields to record Gauss coordinates (Bogotá system center 1'000. 000mE, 1'000. 000mN), fields for geographic coordinates (latitude, longitude), municipality, town, State, among other fields. This table is the most important table of

the database. The keyword for this table is the well id, actually this keyword is for all database since all tables are related among them by the well id.

The well id had been defined using BNDH structure; this is using the IGAG map at 1:25.000 map scale, followed by a name that described the well. INGEOMINAS has a consecutive number. However it was not able to use this number, instead of the name of the land (terrain) where the well was located.

The well id is a text format of 50 spaces with the following characteristic:
>000/L??/-L/-aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa;0 for example
227-III-A- LA ESTANCIA
246-I   -C-EL REFUGIO
This keyword does not allow duplicates values.

All the coordinates were incorporated as plain coordinates (Gauss projection).

(2) The land information is stored in table "2-Predio", information regarding address and well location is stored in this table. Tables "2-solicitante" and "2-Representate" are linked to this table through an ID code.

(3) The general well information is covered in table "9-datos generales". This tables covers the information such as type of point (well, big diameter well, spring), well depth, drilling company, date of drilling, date of closing, actual condition of the well, among others.

(4) Data regarding legal condition is stored in tables: "17-concesión/legalización", "25-Expediente", "29-Sellamiento". Those tables contain the information about the amount of authorized water to be extracted from the well, authorized period for the extraction, and the closing ordinances for some wells.

(5) Lithology and well design are stored in two independent tables so called "26-Litología" y "24-diseño del pozo". In the lithology table, a record represents depth to depth about the lithology characteristics of the site where the well was drilled. It includes a column with a key number that represents the type of sediments that are describes in the record. This key number will allow to perform query for one specific type of sediments as shown in Figure 1.3.

Figure 1.3 Menu window of lithology information
The lithology information is captured using two main forms. One that record top and base depth of the interval with its lithology description, and another (the showed above) that add to the description a key-work which allow to perform correlation's and query.

(6) Periodic observations are stored in a series of tables that handle, in a independent way, different frequently measured for a well, for example, level, flow rate, pumping test, water quality parameters, water quality parameters measured in the field, hydraulic variables, water use, cleaning and flow meter readings.

(7) Finally, there is a series of tables that store specific data for each well that is not frequently reported in. These categories can be classified, additional construction, geomorphology, pumping equipment, treatment during the cleaning process, among others.

1.4 FORMS

The forms should be considered as the windows of the data tables. The forms cover all the tables and its attributes, as a consequence using them it is possible to introduce all data required into the database. All forms are available through the switchboard of the database as shown in Figure 1.4.

Figure 1.4 Data specification of Well
The well design is recorded using the shown form. The diameter is handled with codes rather than with the actual size.

1.4.1   FORMS FOR THE DOMAIN TABLES

The forms prepared for the domain tables are simple forms because each form covers just one table. The forms are generated automatically, using the name of the column as the text for the label. After the generation, the design of some forms can be adapted manually.

Domain tables as shown in Figure 1.5 are generally tables that have less than twenty records and just one record is show at the time.

Figure 1.5 Main form in Database
This is the presentation of the main form of the database. It handles all the items that can be recorded in the database. Each part has a linked form that requires the specific information for the selected item.

One special table is the lithology table "clases" that have all lithologic codes used to the classified sediments. The form for this table was prepared to separate due to some reasons since it was be able to show more records than one record for the presentations.

1.4.2   FORMS FOR DATA

The forms for the data tables are based on more than one table. Therefore its structure is a little more complicated than the domain form. The forms are generated automatically but it requires to be modified manually to combine form and sub forms.

1.5   VALIDATION RULE

Forms is used to incorporate the information inside the database and this has validation rule, also data tables have some basic validation rules. According to the validation rules, the follow is used to the data tables:

- Diameters and thickness of casing should be greater or equal zero.

- Well depth should be a value greater or equal zero. Therefore all depths are considered positive values.

- Daily regime use of the well should be a value between 0 and 24 hours.

- The number of days that the well is used during the week should be a value within 0 and 7 days.

- Conductivity and STD values should be a value bigger or equal zero

- Ph Value should be between 0 and 10 units

- Period of time authorized for the government institutions should be between 0 and 180 months. This is a 15 year period is the maximum value allowed.

- The geographic coordinates (latitude and longitude) have simple validation rules such as: degree should be a value between 0 and 180, minutes and seconds values should be within the range of 0 and 60. The altitude should also be a value between 0 and 4000 msn.

- The duration of well cleaning process should be a value between 0 and 120 hr.

Validation rules are also incorporated inside many forms of the database. Those validation rules are more complex and cover restrictions as:

- Static level should be less or equal to well's depth.

- Each hydraulic variable has an allowed range of values, which is verified using a sub-form with the minimum and maximum value for the corresponding parameter.

- Water quality parameters also contain validation rules. Because, each parameter has its own range of variability, a sub-form that verifies and informs to the user, this variability range, was introduced to the hydrochemistry form.

On the other hand, most of the user's option were established and fixed to a list. Consequently the validation rule is incorporated to the form since the user can not add any additional option to this list.

1.6 GRAPHIC FILES

Base on the compiled information about lithology and well design, a figure was generated for each well which have well logs. The curves of the well log (resistivity (short and long), spontaneous potential and gamma log) were digitized by using a commercial program. The well log was digitized with taking consideration of the scales as showed in the compiled log. The figure in Figure 1.6 shows the values of the well log.

Those files were compiled to a graphic by using the commercial software of Log Plot 2000. The bellow figure is an example of the generated figure.

Cross logs for some well with a log information were produced. The cross log is based on the captured information in the Microsoft Access database and the digitized log as shown in Figure 1.7.

Figure 1.6 The value of well log

Figure 1.7 A graphic file of the cross log

1.7 QUALITY CONTROL

At the end when the collected data was introduced to the database, the professional people reviewed approximately 70% of all data and the information was feed to the database with checking directly to the source document of XEROX copies.

Also cross-checking were performed among some variables, especially for well design and lithology. Diameters, depth in lithology, depth in well design and well depth was cross-checked.

2. RESULTS

2.1 WELL INVENTORY AT CAT AND DAMA

2.1.1 RESULTS

In the well inventory at CAR and DAMA around the Bogota plain, 1661 wells were captured to database as shown in Table 2.1. This shows some statistics in the process performed to compile collected well data:

Table 2.1 Recorded results of JICA well inventory

ITEM	VALUE
CAR	
Total query files	1240
Files in IDEAM database	137
Total Xerox copy files for detailed revision	927
Total of files that did not correspond to GW	10
Files which could not be determined if there is a well or not (requesting permission for exploration, beginning legalization process)	163
Total number of well recorded into the database	1412
Well without coordinates	202
Well with log	334
Total number of well with "concession"	666
DAMA	
Total query files	206
Reviewed files that have form filled out by DAMA	128
Total well recorded into the database	249
Total well without coordinates	1
Well with log	28
Well with "concession"	184
Total number of well recorded into the MS Access 97 data base	***1661***

Figure 2.1 shows the spatial distribution of the JICA well inventory compiled from the information of CAR and DAMA.
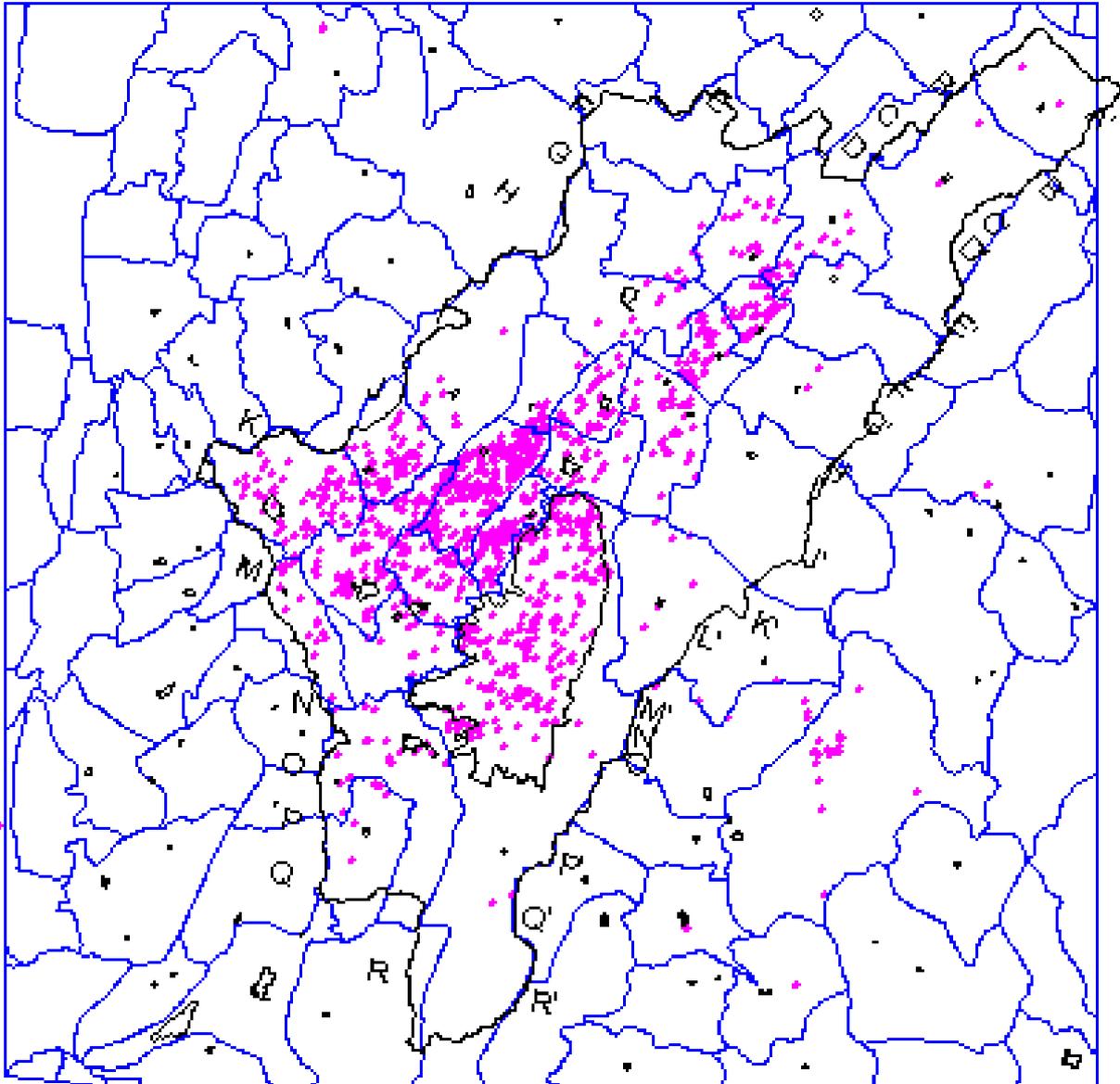
Figure 2.1 Spatial distribution of well inventaried by JICA using CAR and DAMA files.

The histogram of well depth shown in Table 2.2 and Figure 2.2 is presented by the captured information in the database. As shown in this histogram, most of well depth ranges to 100 meters and 150 meters. The minimum value corresponds to big diameter wells. The maximum depth of well value is 666 meters. A detailed map is shown in Figure1 in Appendex No1.

Table 2.2 Histogram of well depth presented by the captured information in the database

Clase	Frecuencia	% acumulado	Clase	Frecuencia	% acumulado
0	0	.00%	100	596	41.94%
50	152	10.70%	150	286	62.07%
100	596	52.64%	50	152	72.77%
150	286	72.77%	200	123	81.42%
200	123	81.42%	250	82	87.19%
250	82	87.19%	300	67	91.91%
300	67	91.91%	350	40	94.72%
350	40	94.72%	400	27	96.62%
400	27	96.62%	500	18	97.89%
450	16	97.75%	450	16	99.01%
500	18	99.01%	550	9	99.65%
550	9	99.65%	650	2	99.79%
600	1	99.72%	700	2	99.93%
650	2	99.86%	600	1	100.00%
700	2	100.00%	0	0	100.00%
750	0	100.00%	750	0	100.00%
800	0	100.00%	800	0	100.00%
850	0	100.00%	850	0	100.00%
900	0	100.00%	900	0	100.00%
950	0	100.00%	950	0	100.00%
1000	0	100.00%	1000	0	100.00%
y mayor...	0	100.00%	y mayor...	0	100.00%

Depth well histogram (sample 1421 wells)

Mean= 136.03 m
Minimum= 4 m
Maximum= 666 m
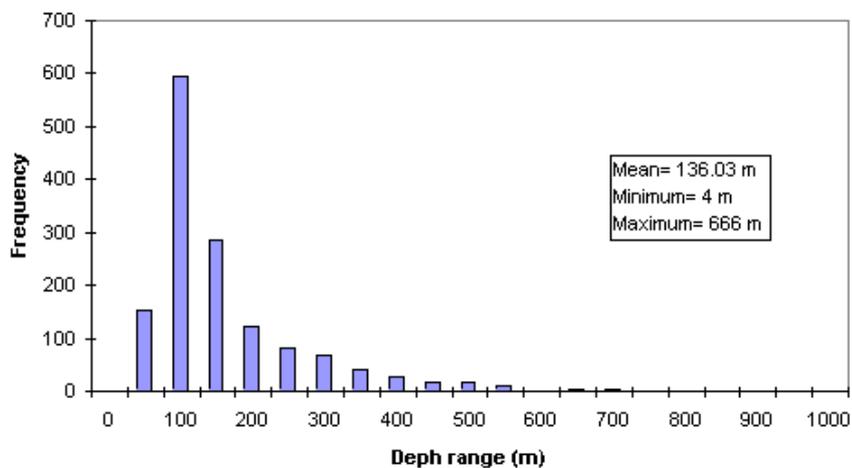
Figure 2.2 Histogram of well depth presented by the captured information in the database

There were 1421 wells in the compiled data although 1654 wells have depth information. However just 171 wells with provision of depth information do not have any map coordinates. It is very important to mention it because those wells without map coordinates have an averaged depth of 118 meters. There is a well which have 540 meters depth without location information.

According with the information, 318 wells in 1654 wells have information about date of drilling construction and just 16 wells have that of closing date. Figure 2.3 presents the

behavior of well drilling date. 848 wells in the total of 1654 wells have legal authorization to be used.
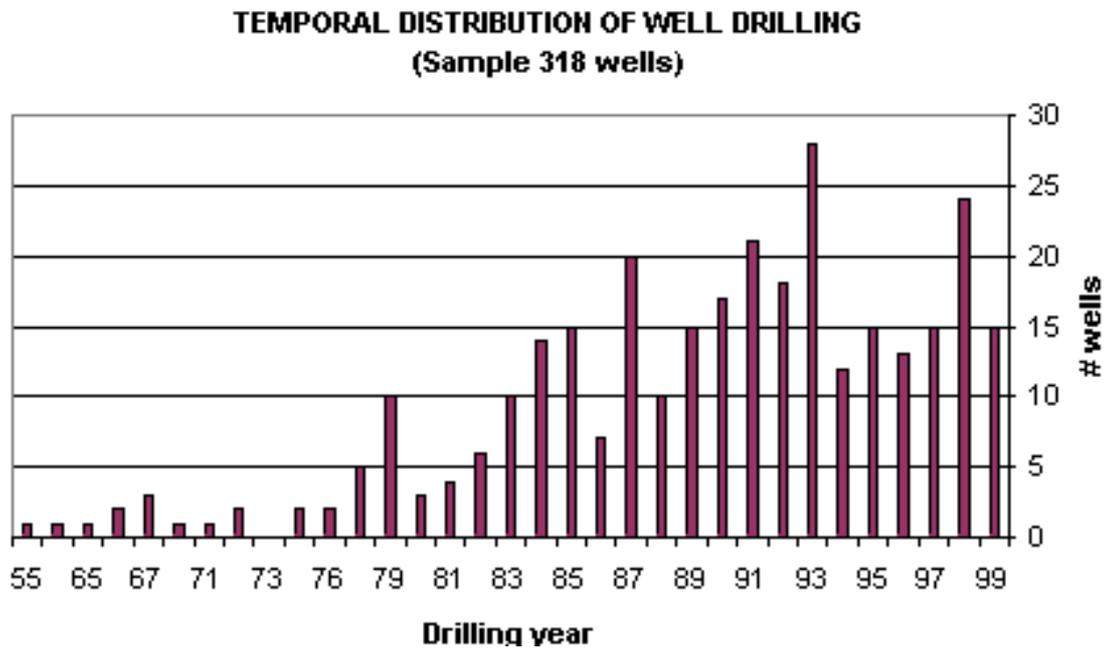
Figure 2.3 Time series of well distribution of well drilling

2.1.2 ISSUES

There were different issues during the feeding of the database. Mainly, the troubles are caused by the accessibility to the original files. In this situation, there are some points about issues:

   The first problem is to determine the place where there are files that have some information about wells, since CAR who is one of the government institution that manage the field, does not count with a list, or data base that show the related files about ground water. Therefore, it is necessary to review files to find out one well file from some files which there are different water topics in. Most of them are related files about superficial water. As a consequence, it was necessary to take much time to review files. The time was increased exponentially.

After this aspect was some how overcome, troubles regarding the technical quality of the data were found out. Well location is one of most present problems. There are many wells that do not have any map coordinates or location map as the basic data although there are some wells with good technical information but without basic data.

To solve this location problem, it was decided to assign to use both of the coordinate in those wells and in topographic map of IGAC.

In those cases, a IGAG map UUU-UUU-U was assigned and coordinates of 999m E and 999mN were feed to this records. According with the final database a total of 203 wells does not have coordinates.

Although the information was compiled directly form CAR files, there are many wells which have problems in its coordinates. Some data caused by mistaken type probably. But others are just unexplainable.

There are many problems caused by the quality of the technical information reported to the CAR by well owner.

A lack of a filter of the received information reported by well owner allow increasing trash information in stead of help, these exaggerated information bound any efforts to understand, to measure and to manage ground water resources.

2.1.3   RECOMMENDATIONS

- To actualize the well inventory by a field survey, use quality controls for parameters.

- Process and verify the information as soon as the user gives the technical data to the authority.

- The regulator authorities can easily implement to the internal organization.

- The information management should be carried out under professional expertise

- A change in the forms of JICA database will allow to directly edit the information in the database.

2.2   RESULTS OF INGEOMINAS DATA

INGEOMINAS has a well database with a total of 3724 wells, 566 springs and 961 big

diameter wells. Some of those water points have information regarding well design, lithology, levels and flows. At the moment INGEOMINAS database is going on processing of quality control and making the information clean, as a consequence, just 1000 wells in 3724 wells had been cleaned during the process. INGEOMINAS database have some of the problems, regarding coordinates same as CAR files.

The difference between JICA data base and INGEOMINAS data base is due to the fact that JICA data is based on well that are legal. There are wells that the owner has done any processes for government to know the existence of the well. At the contrary INGEOMINAS data handled the legal well and the illegal wells.
Figure 2.4 shows the spatial distribution of the wells from INGEOMINAS database.
A detailed map is shown in Figure2 in Appendex No1.
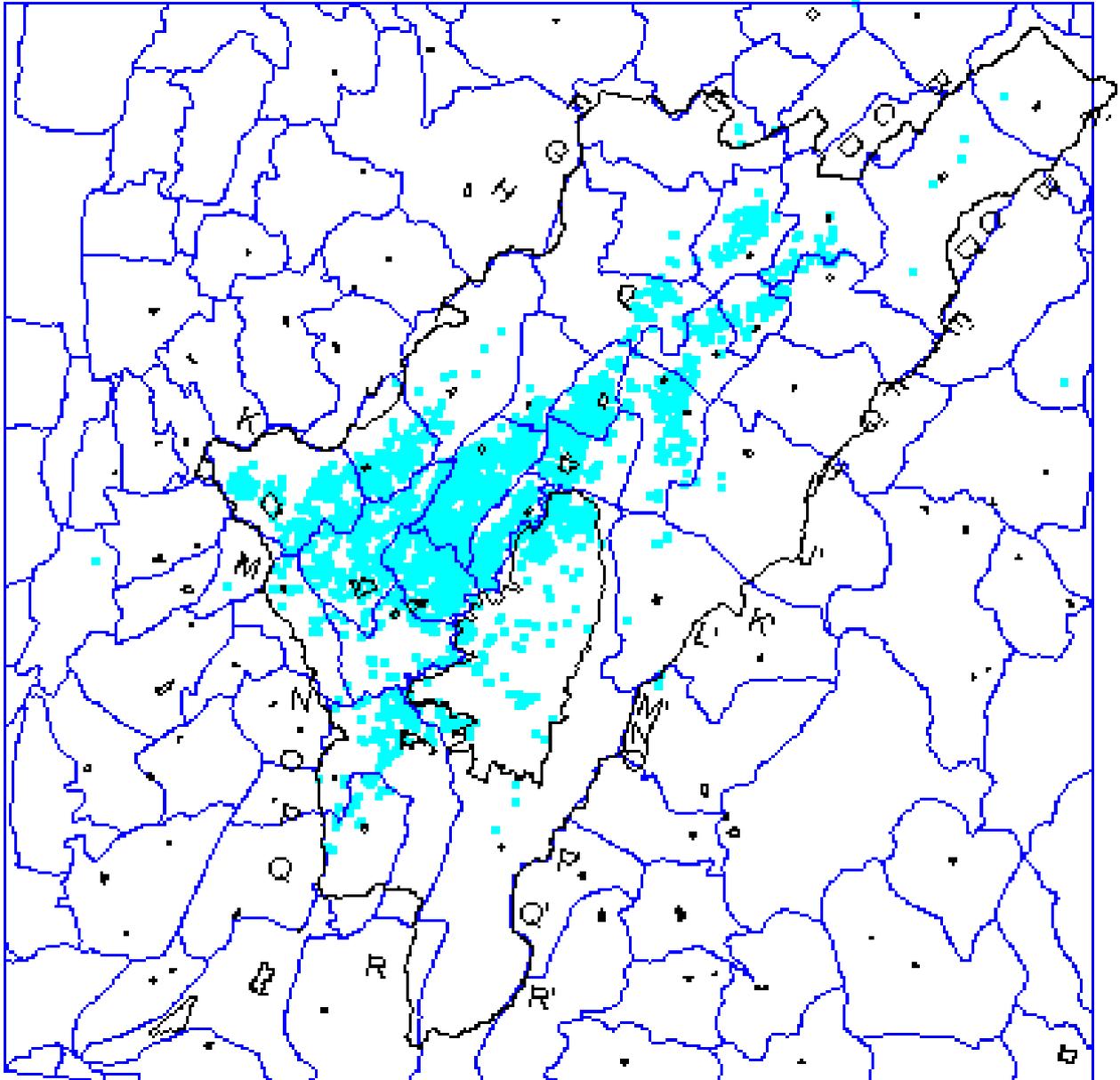
Figure 2.4 Spatial distribution of well inventoried by INGEOMINAS.

2.3 JUCTION OF JICA DATA BASE AND INGEOMINAS DATABASE

In order to compare with the existing database (JICA AND INGEOMINAS), a screening process was carried out beyond both databases. The main tables of both databases were joined in one big table that had the most important and relevant parameters such as well name, coordinates, depth, owner and land. Also two additional columns were added to show from which database come the data and if the well was duplicated in both databases. The final table has a total of 5385 wells, 1661 wells from JICA database and 3724 wells from INGEOMINAS database.

The following process was carried out over this table:

1- Wells were ordered by map coordinates of North and East and all the wells to show the same coordinates were classified as duplicated.

2- Wells were ordered by name and wells to show the same name were classified as duplicated

3- Wells were ordered by owner and by land and matching wells were classified as duplicates.

Map coordinates of matching well were not easy due to differences in the employed measurement method. As a consequence, the distance between each well and all other wells from data base was calculated, and the well that it is a maximum of 400 meters far from the initial well was reviewed to make an effort to correlate other parameters (owner, land, depth) which allow to determined duplicates wells.

After this comparison, a total of 373 wells in 1661 JICA wells were determined to decide duplications probably. It is an important note that some of these wells did not necessarily match in all the parameters, however they were selected because either land or coordinates could be indicated duplicated wells.

Appendix No. 6 shows JICA wells which there were duplicated wells (373 wells) to be identified probably.

Figure2.5 show the result of the junction of those data base and the cleaning processes performed, there are 373 wells to be considered duplications probably. A detailed map is shown in Figure3 in Appendex No1.
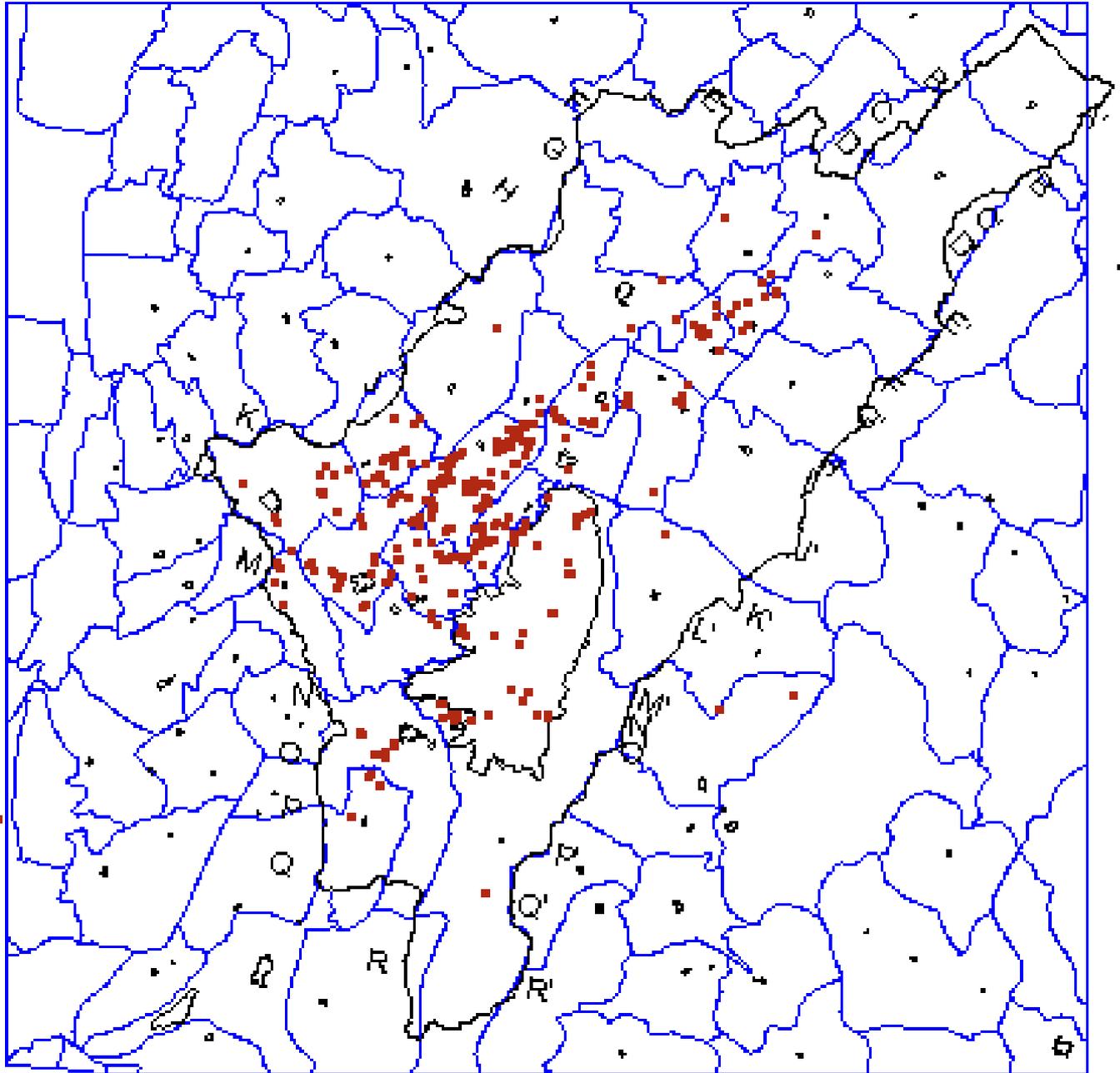
Figure 2.5 Spatial distribution of JICA well identified as duplicated in INGEOMINAS data base.

3. OPERATION OF WELL INVENTORY DATABASE

3.1 USAGE OF THE FORM TO REGISTER NEW WELLS

When the user wants to add a new well into the database he/she must use the form "1-Ubicación del punto" which is the main form of the database. To select a new record the user must click on the adding record button ⊞ which is located in the left-lower part of the main screen in Figure 3.1:

Figure 3.1 Form of the main screen of "1-Ubicación del punto"

Once the user had select a new record the presentation of this main form is as shown in Figure 3.2. It handles all the items that can be recorded into the database. Each part has a linked form that handles the specific information for the selected item.

There are necessary fields in the upper part of the form, without this information (well name, coordinates, altitude) the record can not be saved, therefore the user should fill out this information at first, after this operation is done it does not matter the order in which the information is feed. Moreover the themes does not have to be covered at one time, if more information is found after the record had been created, the user can go back to the record and to add the data. When filling the main form for the idwell of "No. Identificación" THE USER MUST ADD THE SPACES TO FOLLOW THE INGEOMINAS FORMAT. For example if the name of the well is 227-I-A-FLORES INVENTADA, the user should write 227 - I -A- FORES INVENTADA. If the name of the well begin with a number (IGAC map 1:10.000, or another reason), the user should write 227-I   -A-1 FORES INVENTADA.

Figure 3.2 Main form of the well inventory database

3.1.1   TEXT FIELDS

Those fields are identified by the convenction shown in Figure 3.3.

Figure 3.3 Window of text fields

In this type of field the user is allowed to add data by direct typing of the information on it. It is very important to be carefully when to fill this type of fields since it allows any entry, and the probability to take a mistake will increase much. Some of those text field stores the numeric data and other text data, but all of them are directly typed by the user. Fields are coordinates, well address, well name are classified in this type of fields.

3.1.2 COMMAND BUTTONS

These buttons allow the user to see the linked forms. The command button is identified by the symbol shown in Figure 3.4:

Figure 3.4 Command button

The name on the button indicated the form to display.

3.1.3 OPTION BUTTON

The option button fixes all the possibilities for the user and he/she must select, by clicking on the circle, the option matches the information that is going to be added as shown in Figure 3.5.

Figure 3.5 Option button

3.1.4 SELECTION FIELDS

For those fields where the information could be the same for many wells, the database use selection fields, which are identified by the symbol shown in Figure 3.6.

Figure 3.6 Blank window for selection fields

When the user clicks on the arrow the options for the selection are displayed as shown in Figure 3.7.
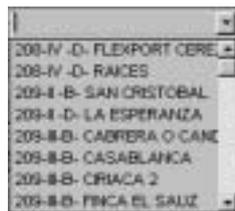
Figure 3.7 Lists of selection fields

The user must click on the arrow, see the options and click on the desired one.

Some selection's fields present two parts: one shows a code and one shows the statement in front of the meaning of that code as shown in Figure 3.8. The meaning of this code is just for information porpoise since the database stores the code. That is the case for field municipality, small town, economic activity, and others.
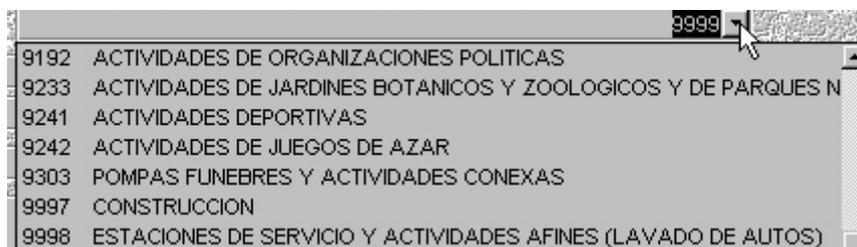
Figure 3.8 Registration of the well code and description

From the selection fields, the idwell field is special, since it automatically updated so that way the user does not have to make any selection, being avoid types for this important field.
Selection fields for the user to need to add new data have each buttons that allow to add the necessary information.
After the data had been added, the user could go back to the initial selection field and

the user also can see the data feed to the database as shown in Figure 3.9.

Figure 3.9 Example of filled form about the applicant

For example, if the user is filling out the information about the applicant, he/she could select the name from the selection field "solicitante" by using the arrow to scroll all available data. If the applicant is not on that list, the user must go to the button "AGREGAR SOLICITANTE" (To add applicant) and the user fills out the specific form to be displayed in the form. Once the information of this form is completed, the user must go back to the selection field "solicitante" and select the applicant for that well.
For all selection fields that are linked to add buttons, the user MUST ADD THE NEED INFORMATION AND GO BACK TO SELECT THE DATA IN THE CORRESPONDING SELECTION FIELD.

3.1.5   LITHOLOGY FORMS

The lithology information is captured to use two main forms. One records the top and the base depth of the interval with its lithology description shown in Figure 3.10.
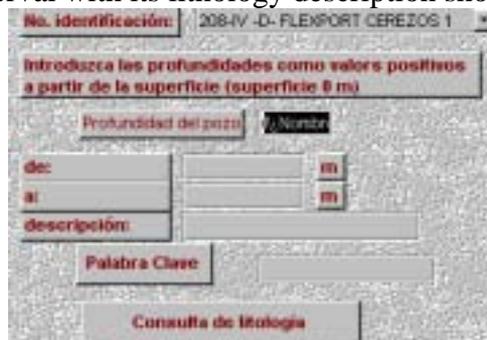
Figure 3.10 Definite window of Lithology form

Another is shown in the bellow figure. This adds to describe a key-work which performs correlations and queries. This form is activated when the user click on PALABRA CLAVE show in Figure 3.11.

Figure 3.11 Lithology forms

In this form the user should click on the category as shown in the left part of the form for the best fixed data, and when it is done some options appears at the right part of it, the user should click in the one that best match the data. After both selections had been done, the user should close the form and continue with the information of the lithology form.

3.1.6   WELL DESIGN FORM

The well design is recorded by the form as shown in Figure 3.12. ***The diameter is handled with codes rather than with the actual size***.

Figure 3.12 Well design form

3.2 USAGE OF THE FORM TO DISPLAY INFORMATION

When the main form is used to see the available information for a specific well rather than to store data for a new well, it is very important to have in mind the following aspects:

(1) When a specific theme is selected, the form of this theme will be opened and if the selected well has information regarding to this theme, the data will be displayed immediately in the form. For example, if the user wants to know the legal file to which the well information belongs, he/she just has to click in the theme "expediente" (legal file) and the information will be displayed, as it is shown in Figure 3.13.
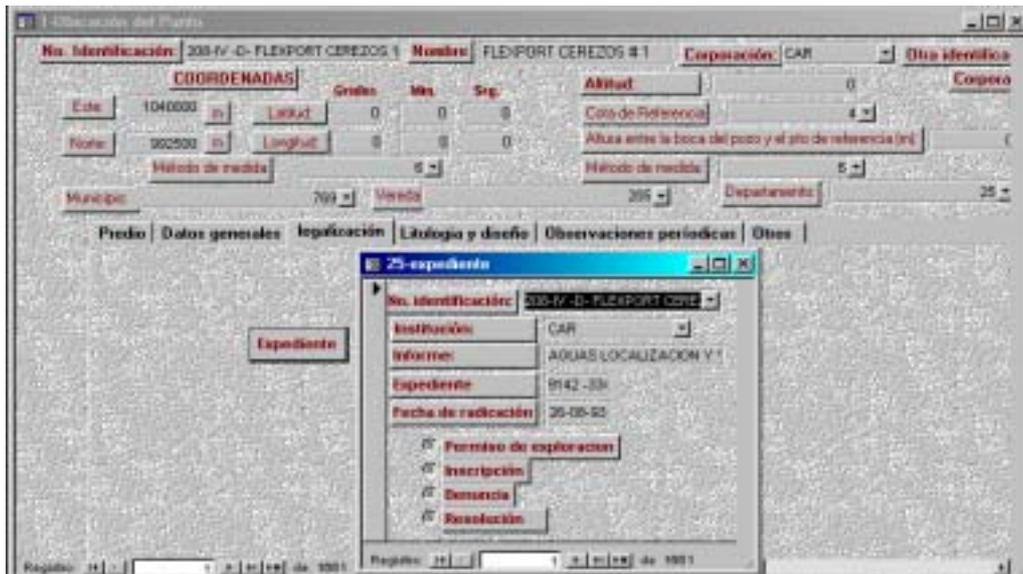
Figure 3.13 Example of registration about legal file

(2) However, if the selected well does not have information about the theme, the theme form will be opened, but the name of the well in the theme will not be corresponded to the selected well as shown in the below. For example, if the user wants to know and if the well had been closed, he/she has to click on the button "sellamiento" (closing) and the information will be displayed in Figure 3.14.
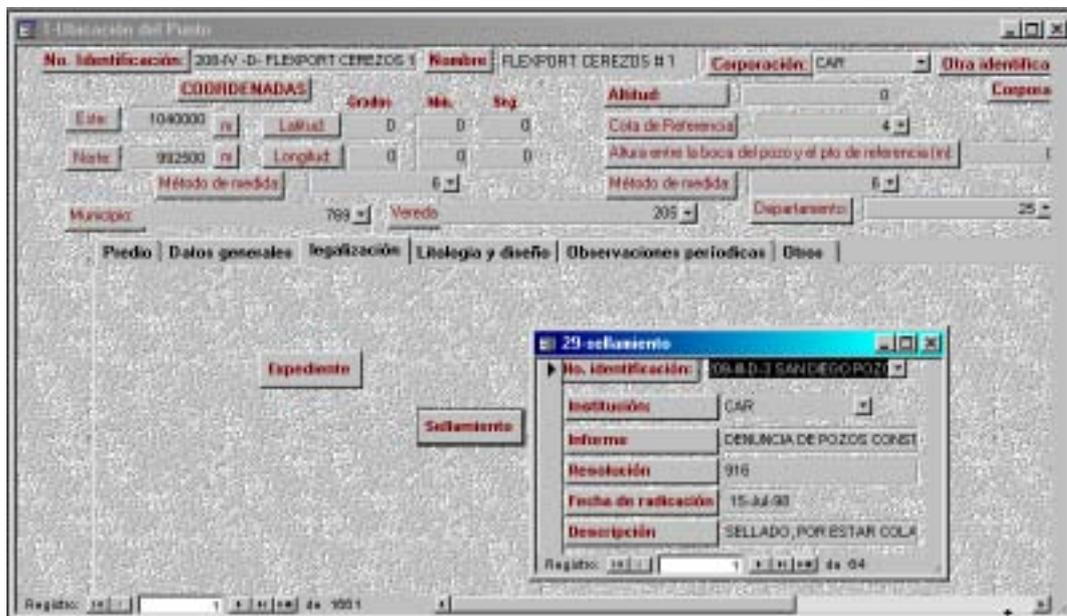

Figure 3.14 Example of registration about the closing information of well

In this case of the well, "208-IV -B- FLEXPORT CEREZOS 1" had not been closed, and the form "29-sellamiento" appears with other well name (209-III-D-3 SAN DIEGO POZO 2) rather than with the selected one. This will indicate to the user that the well 208-IV -B- FLEXPORT CEREZOS 1 does not have information about this theme (the well had not been closed).

If the user wants to add information about this theme for the selected well, he/she

must use double click on the field idwell "No. Identificación" in order to generate a new record. The new record automatically will assign the name of the well and the need information can be added as shown in Figure 3.15.

Figure 3.15 Example of registration of new well information

3.3 QUERY

The database has some specific query available for the user. Some of data such as lithology, well design, stratigraphy and chemical data are available in the form to add the data. To use them the user should click on the command button and the available information will be displayed as shown in Figure 3.16.

Figure 3.16 Query form

Figure 3.17 Other query in the database

Other queries are available from the query box of the database. The user should use double click on the query name to use them. Then the result will be show up in the window as shown in Figure 3.17. Some of those queries are part of the forms and these need specific parameter to use.

The queries

- Diseño

- Consulta-Resumen-reg

- Tabla compilada

can be used directly and show summarized information from the database. Diseño query presents all the wells that have well design with the correspondence among codes, diameters and material types. CONSULTA-RESUMEN-REG query presents a summary of the available information for all wells inside the database. The result from this query is presented in the Appendix No. 4 of this report. The query TABLA COMPILADA, presents the most important information for the wells stored in the database. The result of this query was used during the joint process with INGEOMINAS data base information.