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Transboundary Aquifer Yrenda – Toba – Tarijeño (Argentina,Bolivia, Paraguay): ground water-surface water relations.

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Integrated Management and Master Plan of the Rio Pilcomayo Basin.

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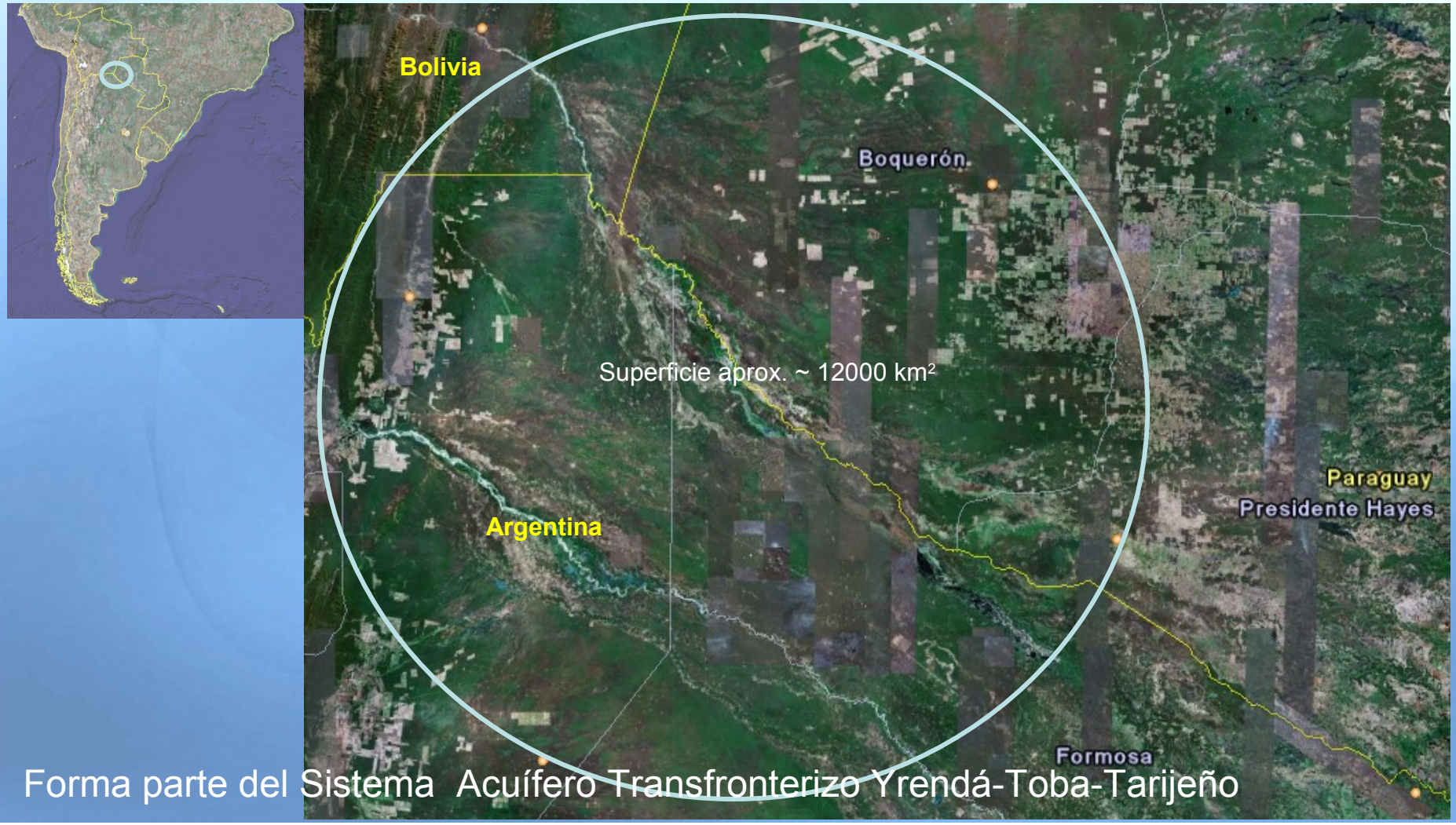
Objective:

Hydrogeological characterization of the aluviall fan of the Pilcomayo River.
Mathematical modelling of Groundwater Flow in the Yrendá – Toba – Tarijeño transboundary aquifer system

Study area

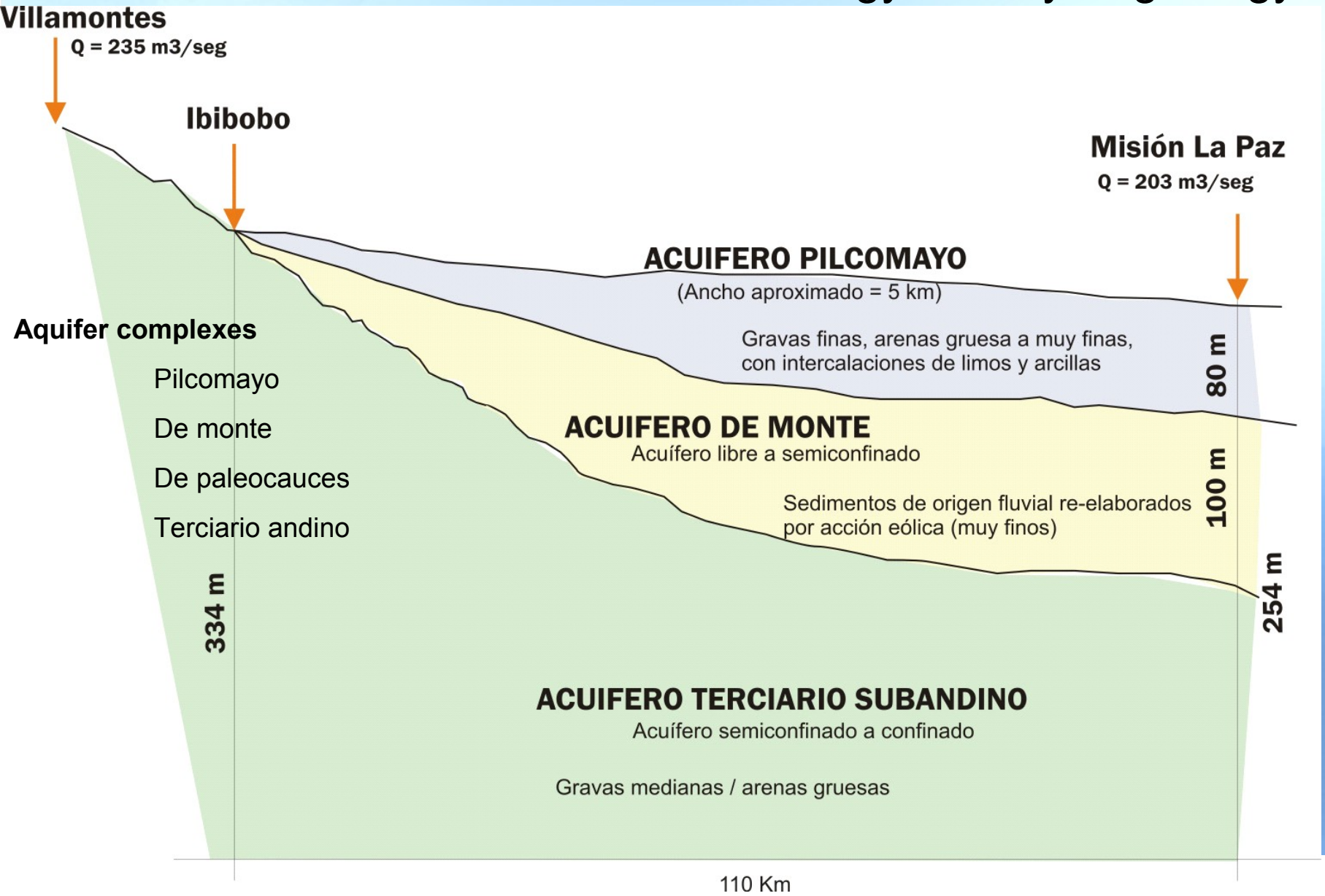


Forma parte del Sistema Acuífero Transfronterizo Yrendá-Toba-Tarijeño

Preliminar Conceptual Model

The preliminar conceptual model was defined considering data and information shared by the three countries.

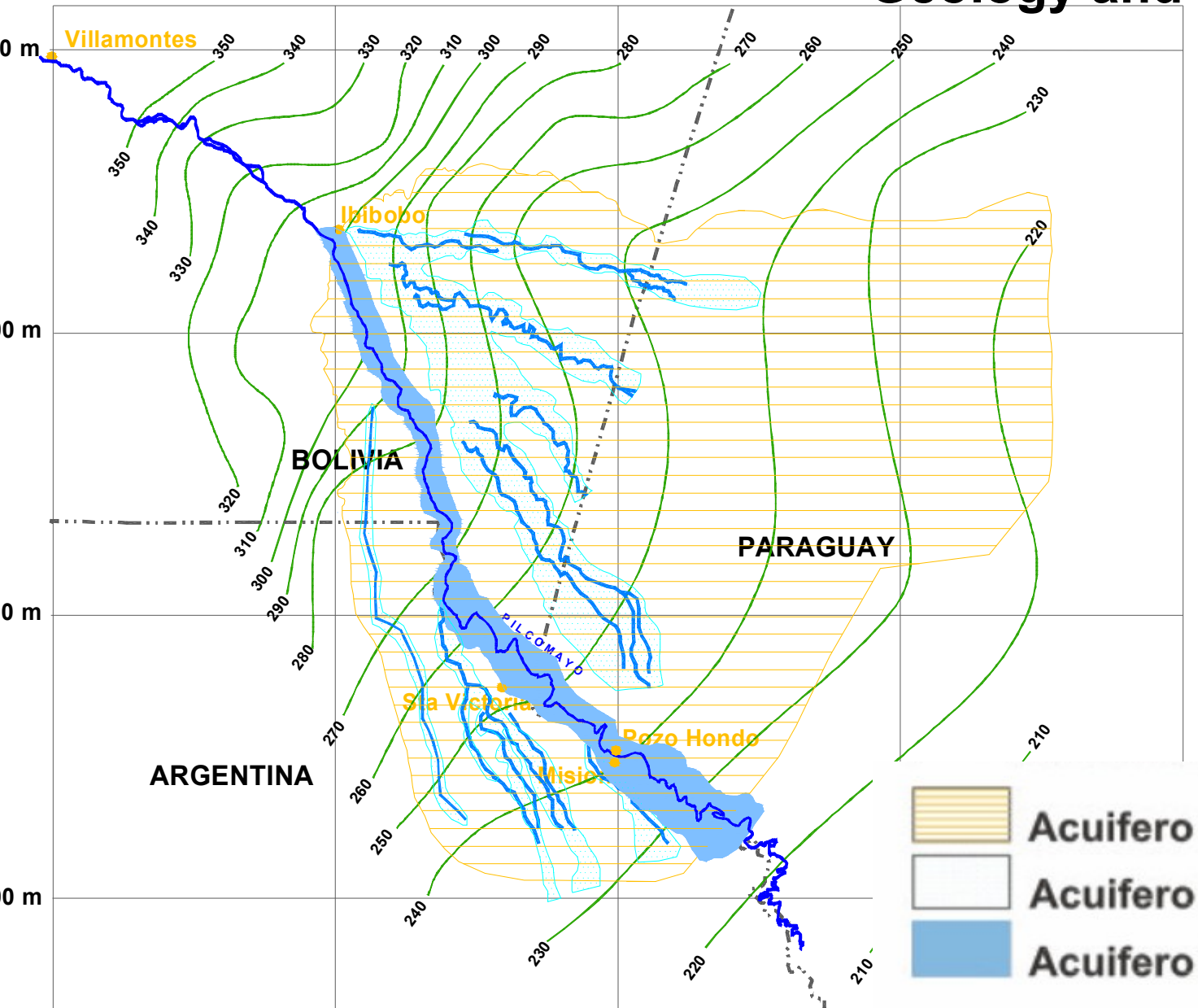
Geology and Hydrogeology.



Aquifer complexes

- Pilcomayo
- De monte
- De paleocauces
- Terciario andino

Geology and Hydrogeology



P = 880 mm

ETP = 1400 mm

Q = 240m3/s

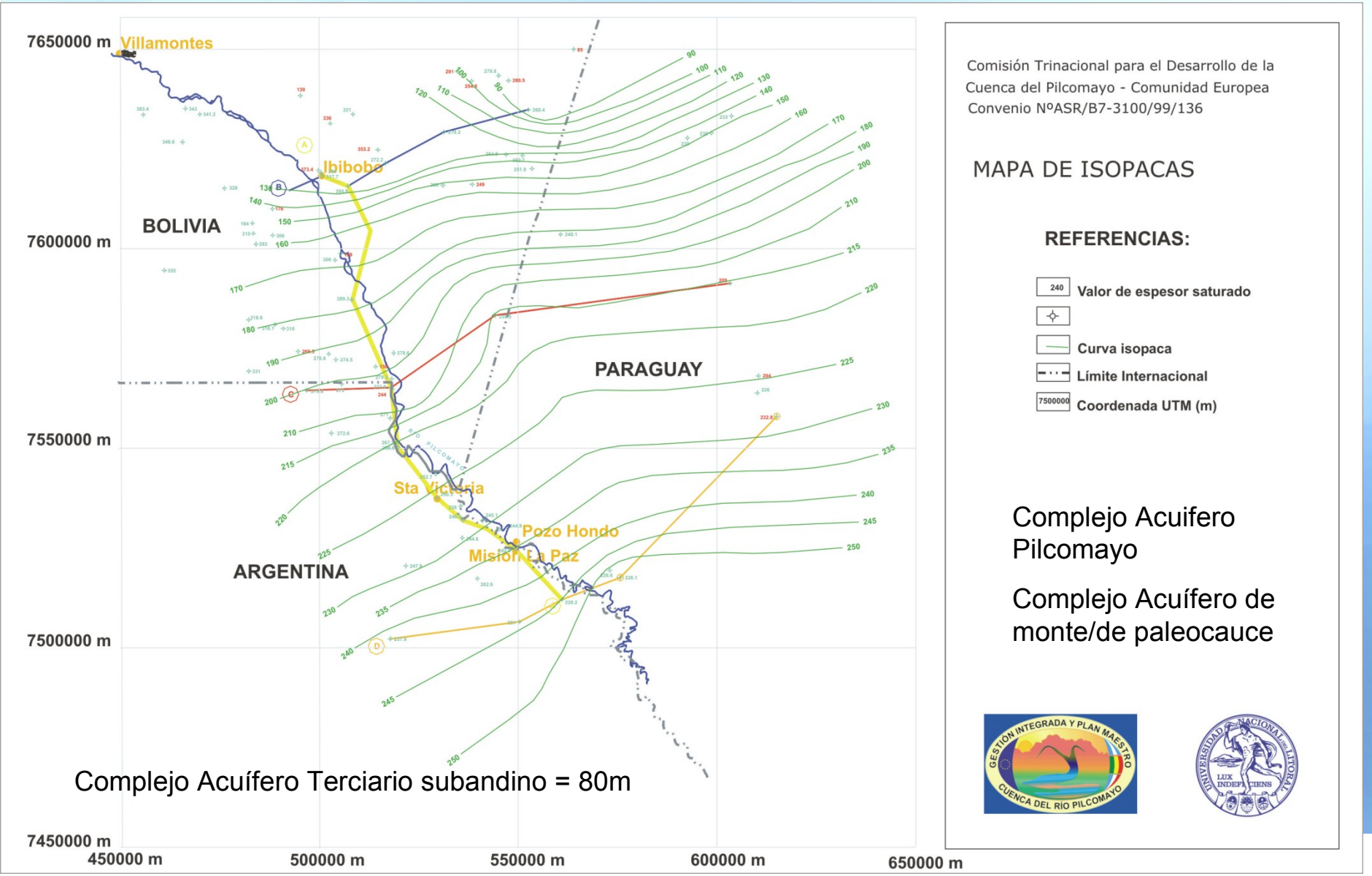
200m3/s

Acuifero de Monte

Acuifero de Paleocauce

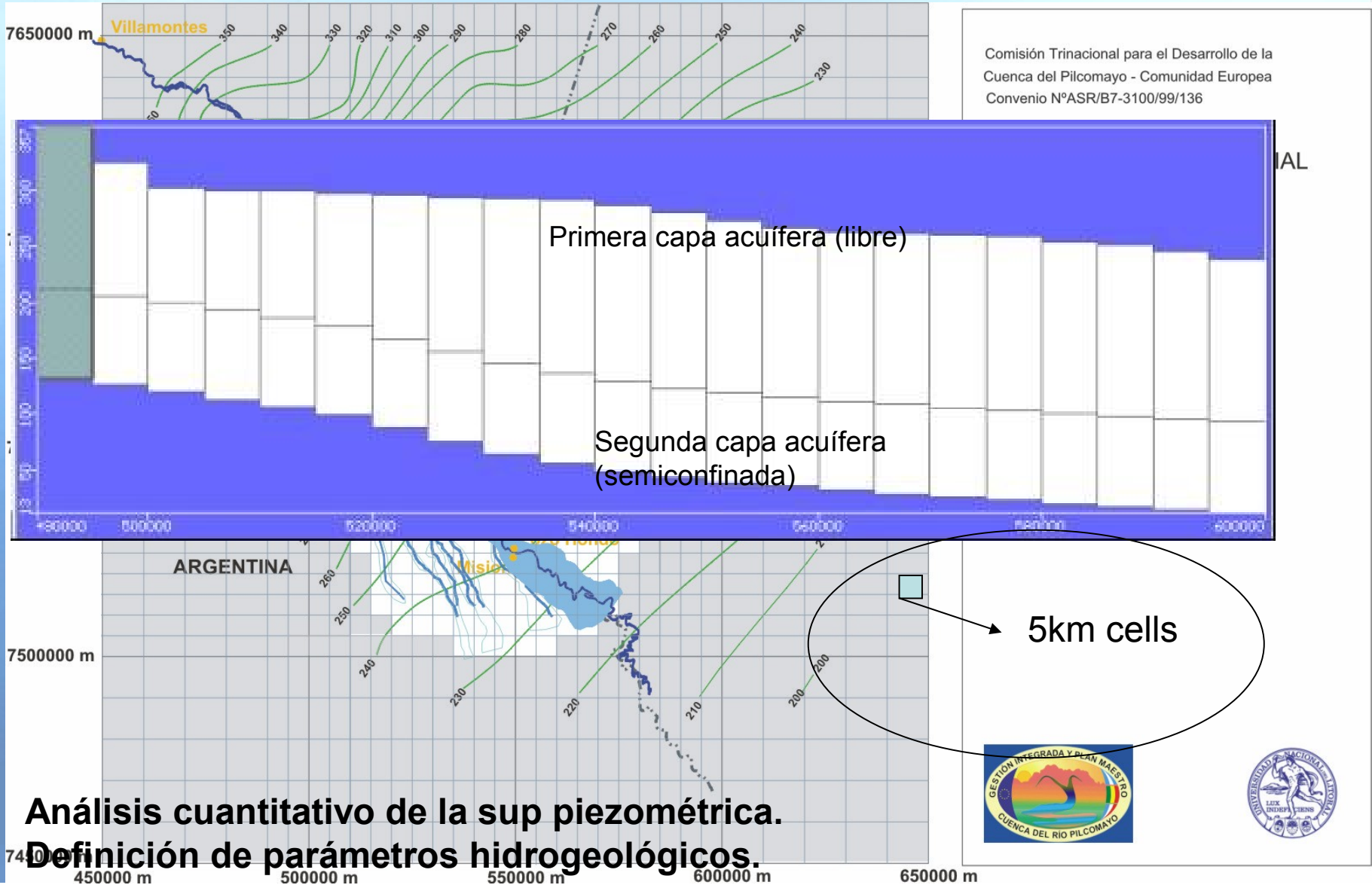
Acuifero Pilcomayo

Geology and Hydrogeology



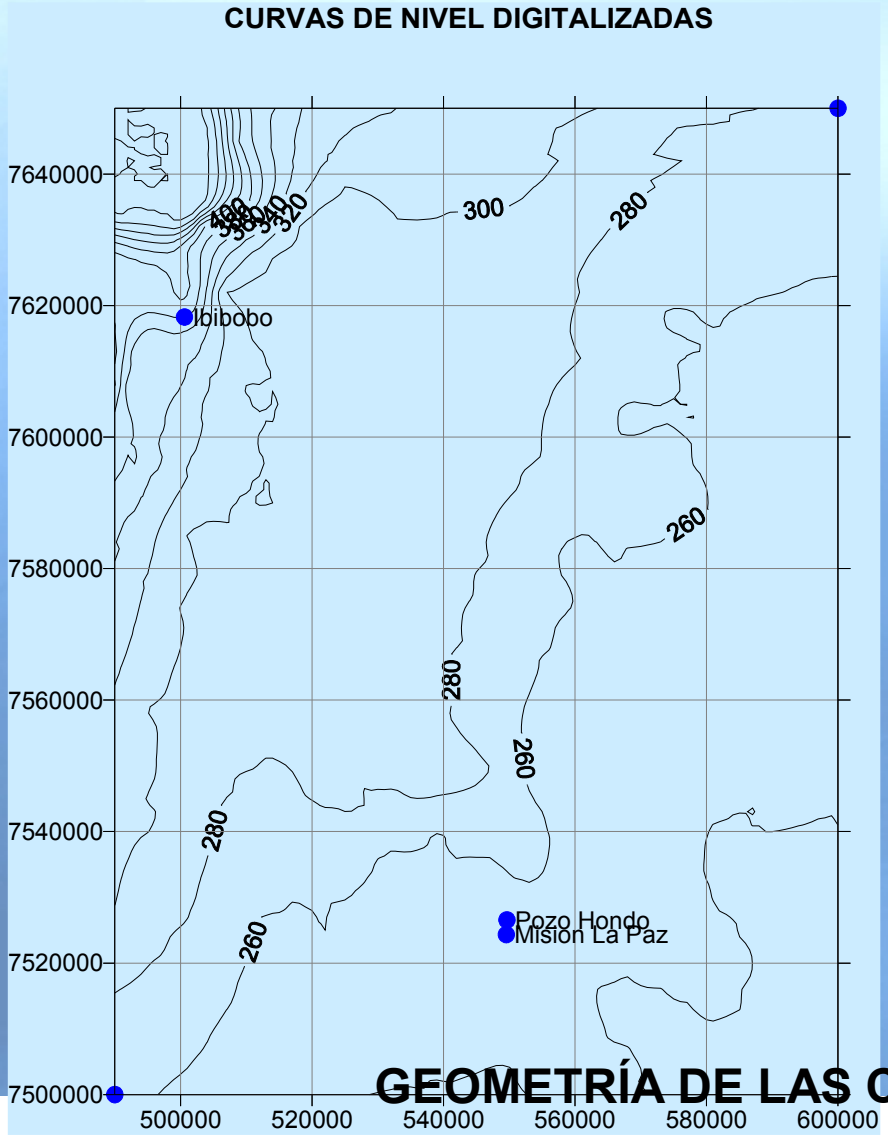
Complejo Acuífero Terciario subandino = 80m

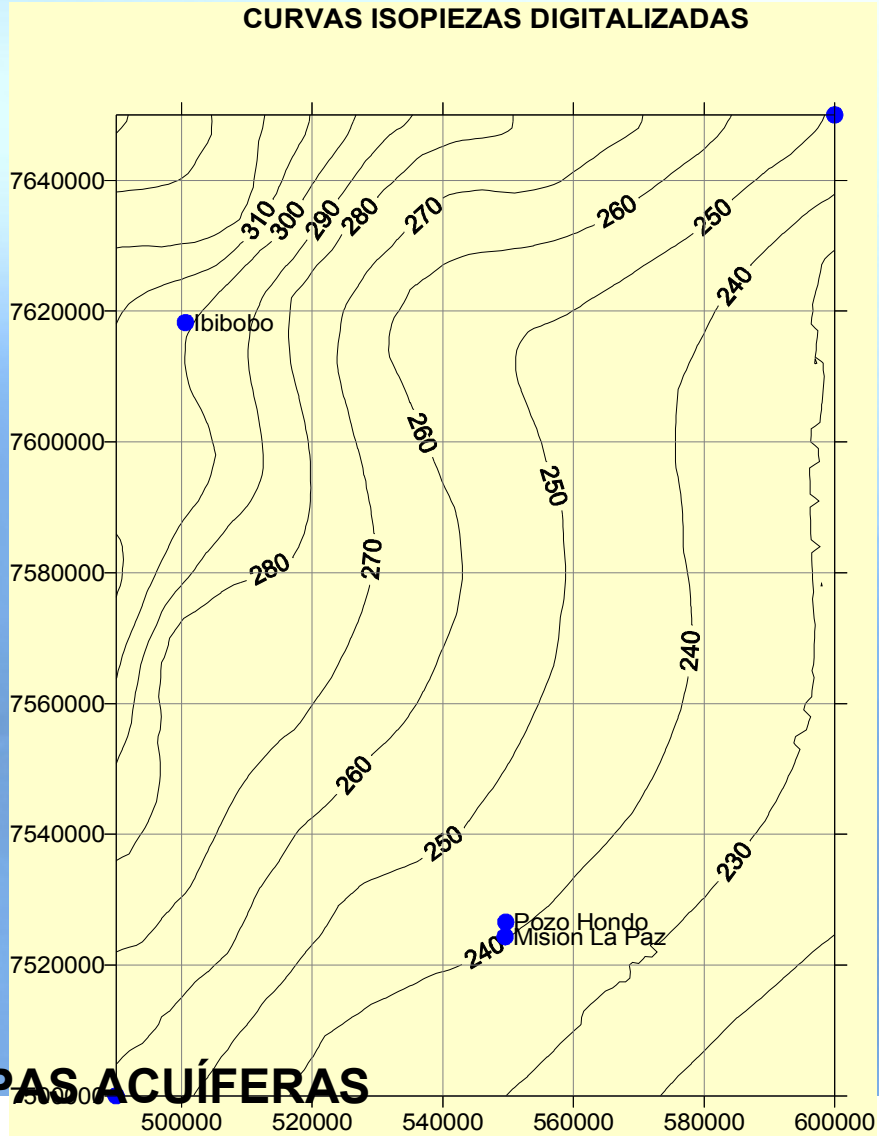
Preliminary Mathematical Modelling Implementation



Análisis cuantitativo de la sup piezométrica.
Definición de parámetros hidrogeológicos.

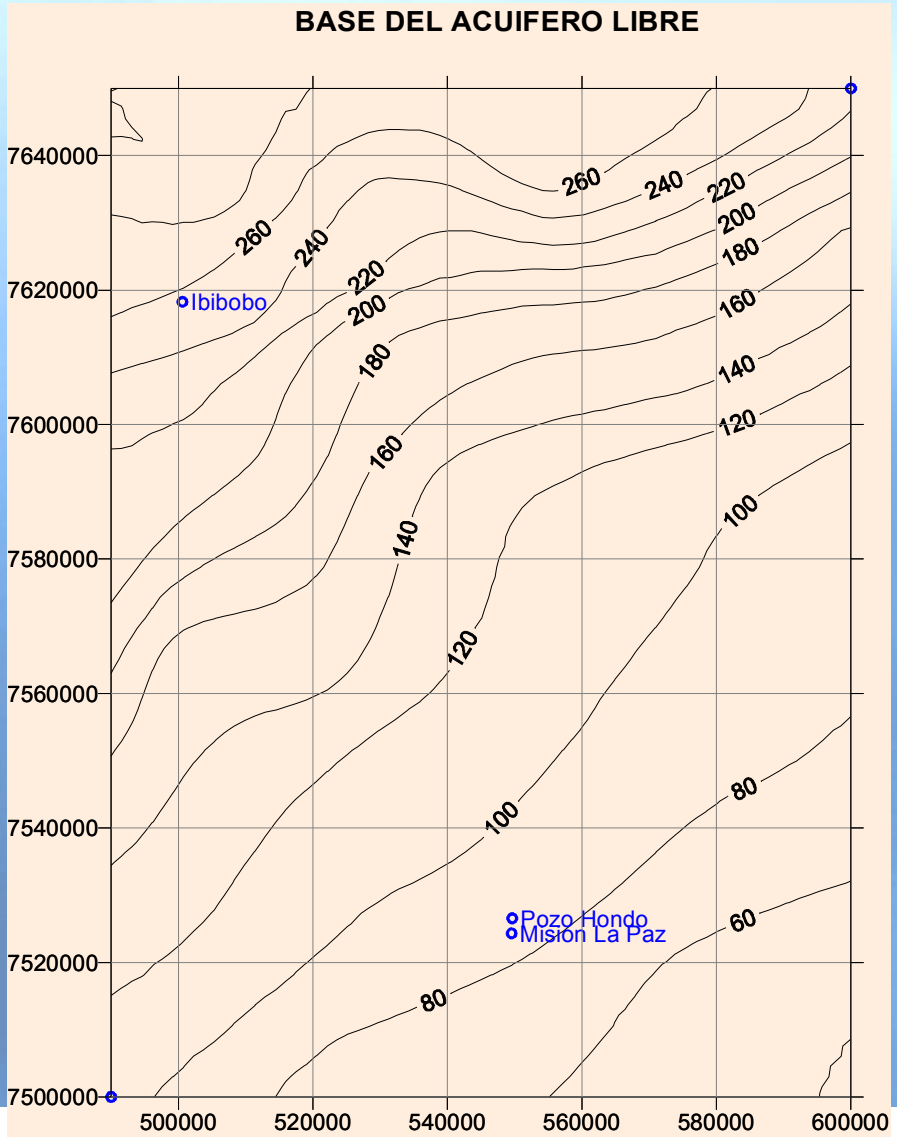
Mathematical modelling.

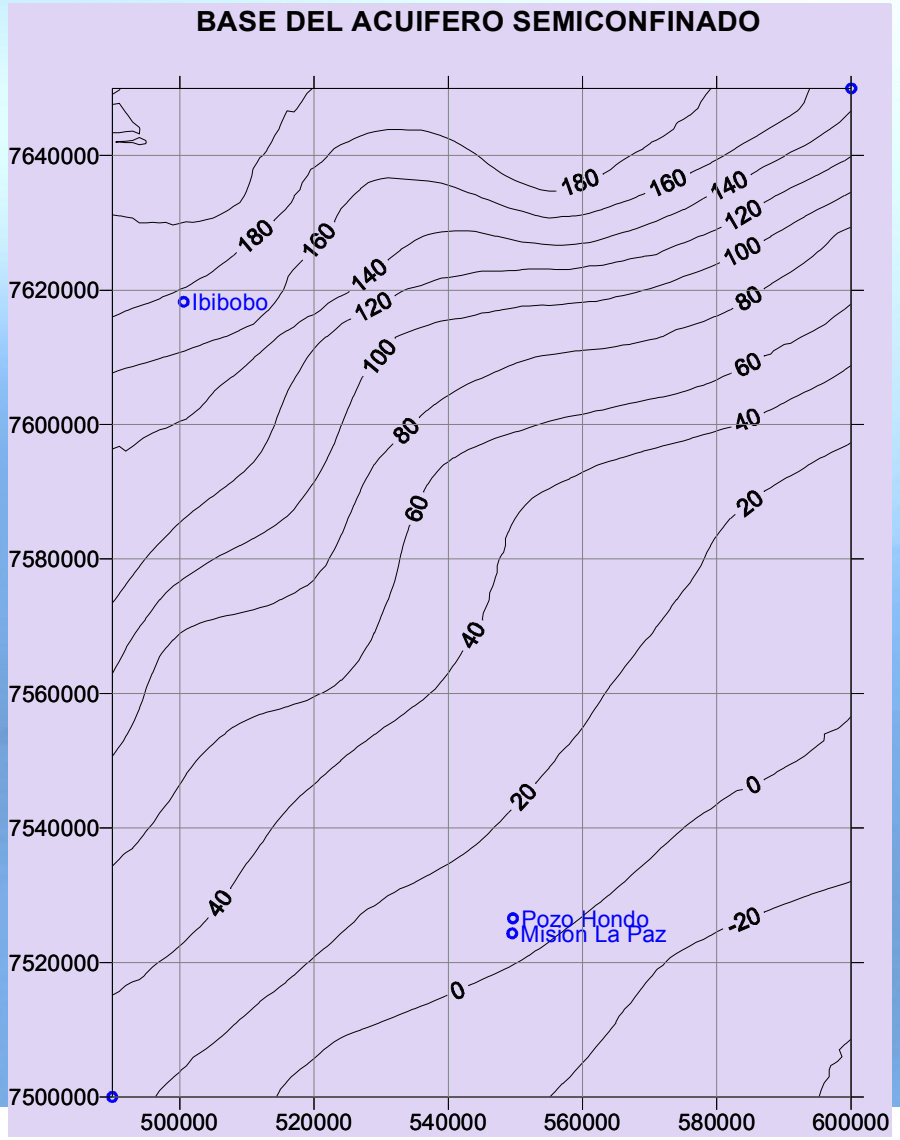




GEOMETRÍA DE LAS CAPAS ACUÍFERAS

GEOMETRY OF THE AQUIFER SYSTEM



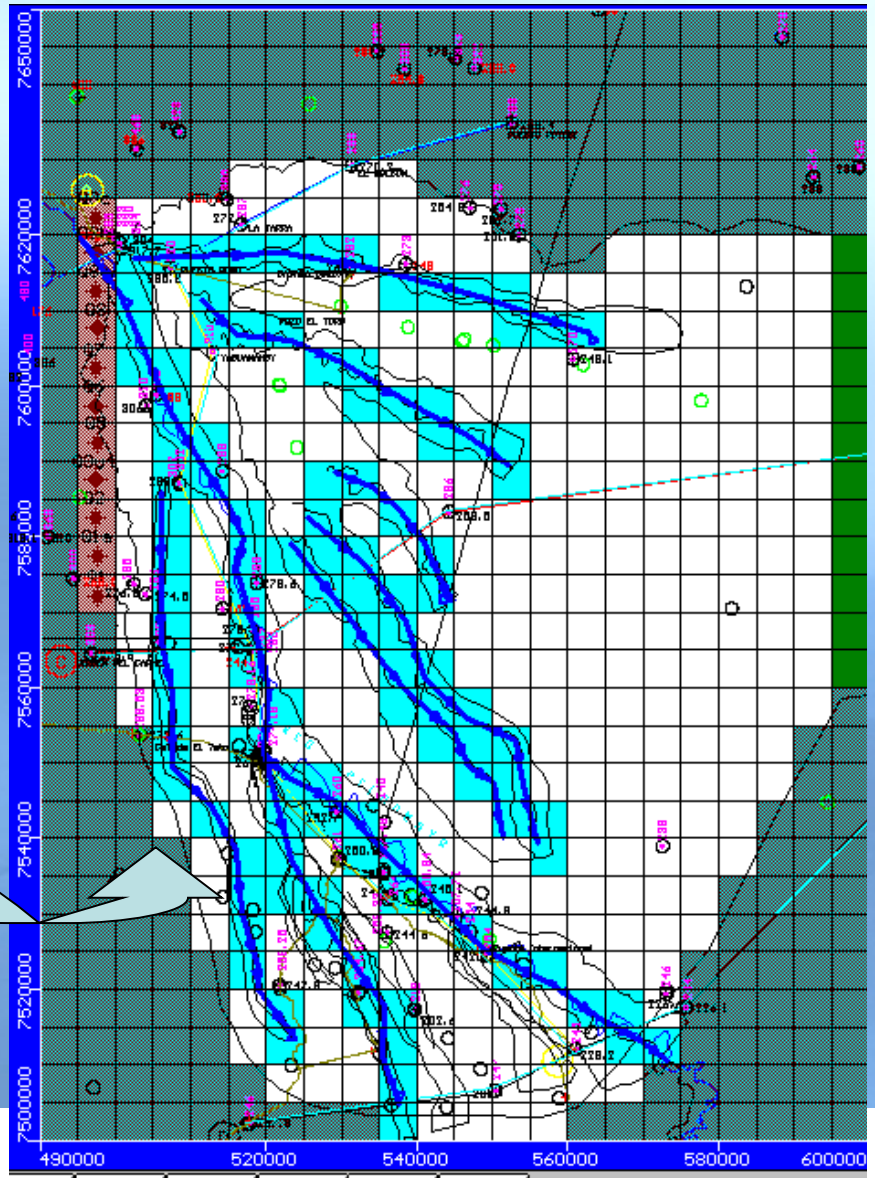


Border conditions

Fregional flow

Constant Gradient

Ríiver channel

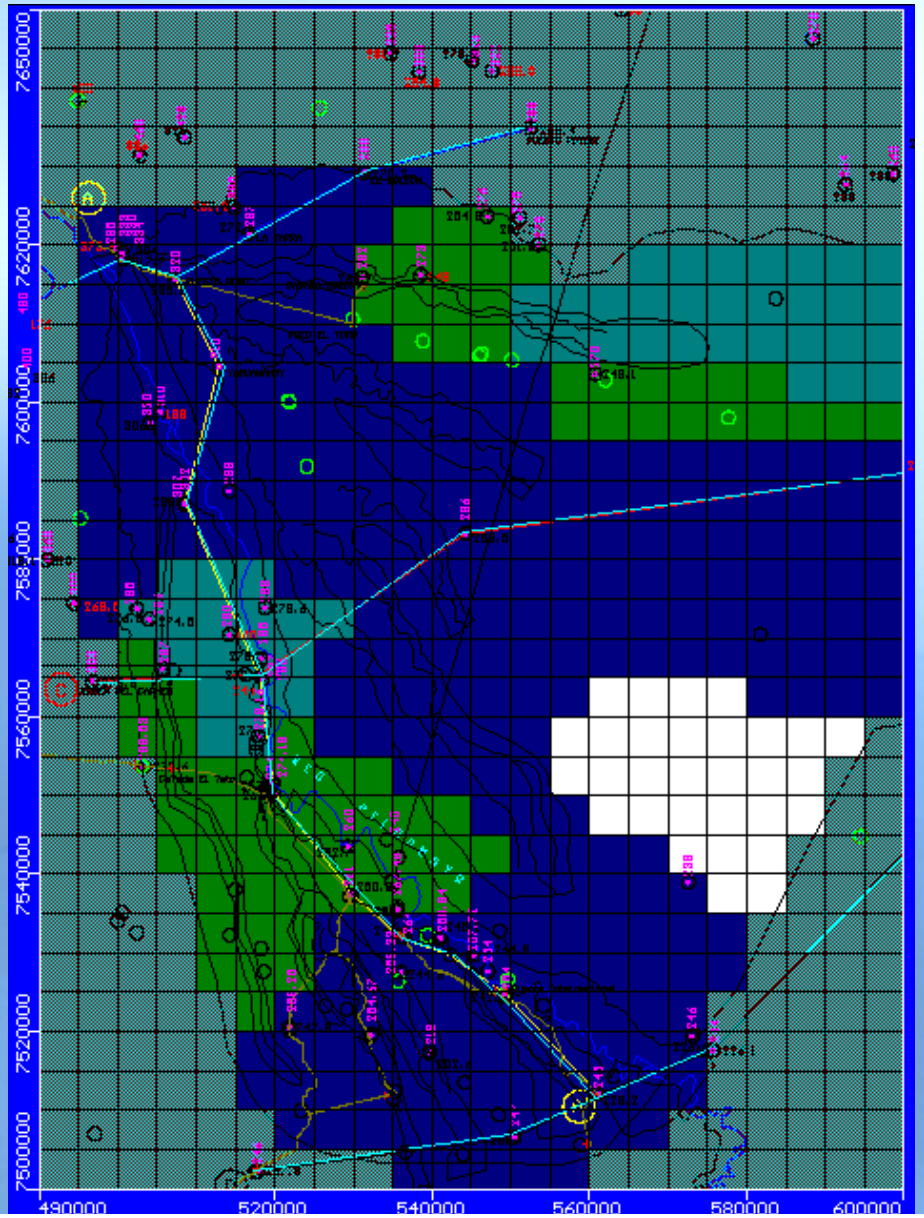


Parámetros

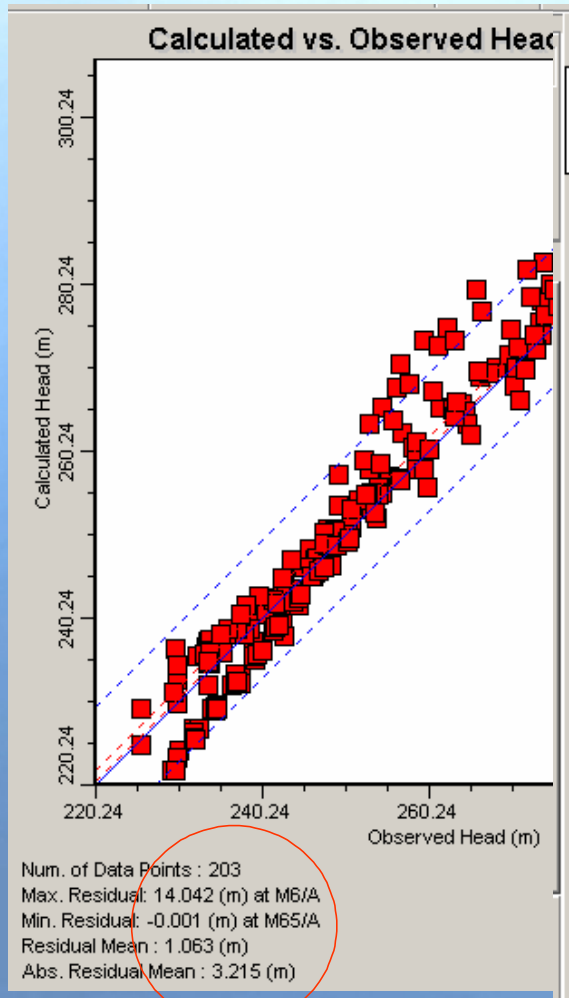
Conductivity

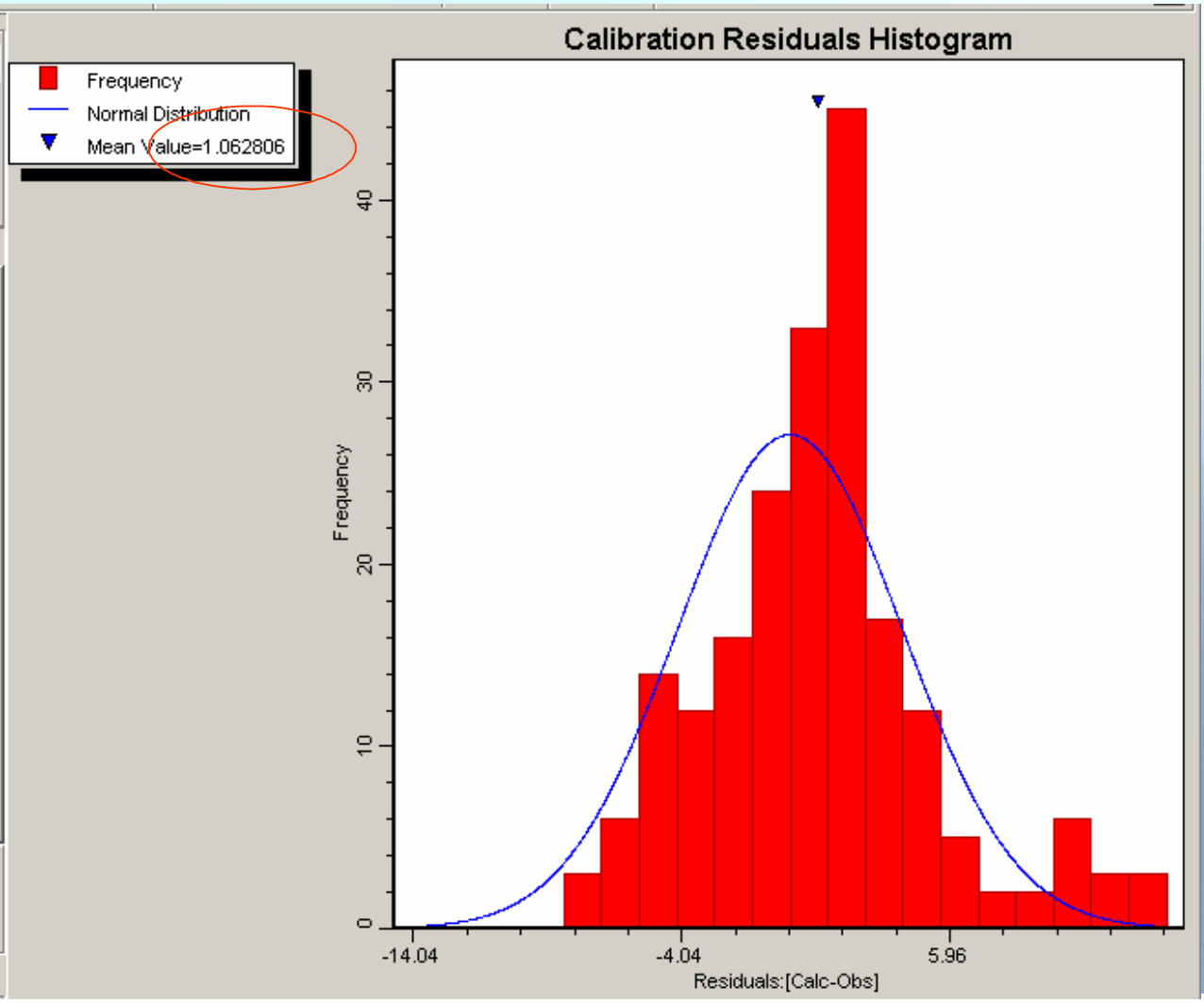
Zone	Kx [m/d]	Ky [m/d]	Kz [m/d]	Active	Distribution Array
1	0.2	0.2	0.2	☑	☐
2	0.35	0.35	0.35	☑	☐
3	0.75	0.75	0.75	☑	☐
4	1.25	1.25	1.25	☑	☐

Nro. de tubo	i (m/m)	T (m^2/d)	K (m/d)	v (m/d)
I	0,00121	107,0	0,537	0,00051
II	0,00100	81,9	0,405	0,00036
II	0,00084	50,9	0,275	0,00025
IV	0,00078	55,6	0,288	0,00024
V	0,00081	45,2	0,223	0,00020
VI	0,00082	57,5	0,277	0,00023
VII	0,00087	73,8	0,342	0,00028
VIII	0,00090	138,2	0,701	0,00048

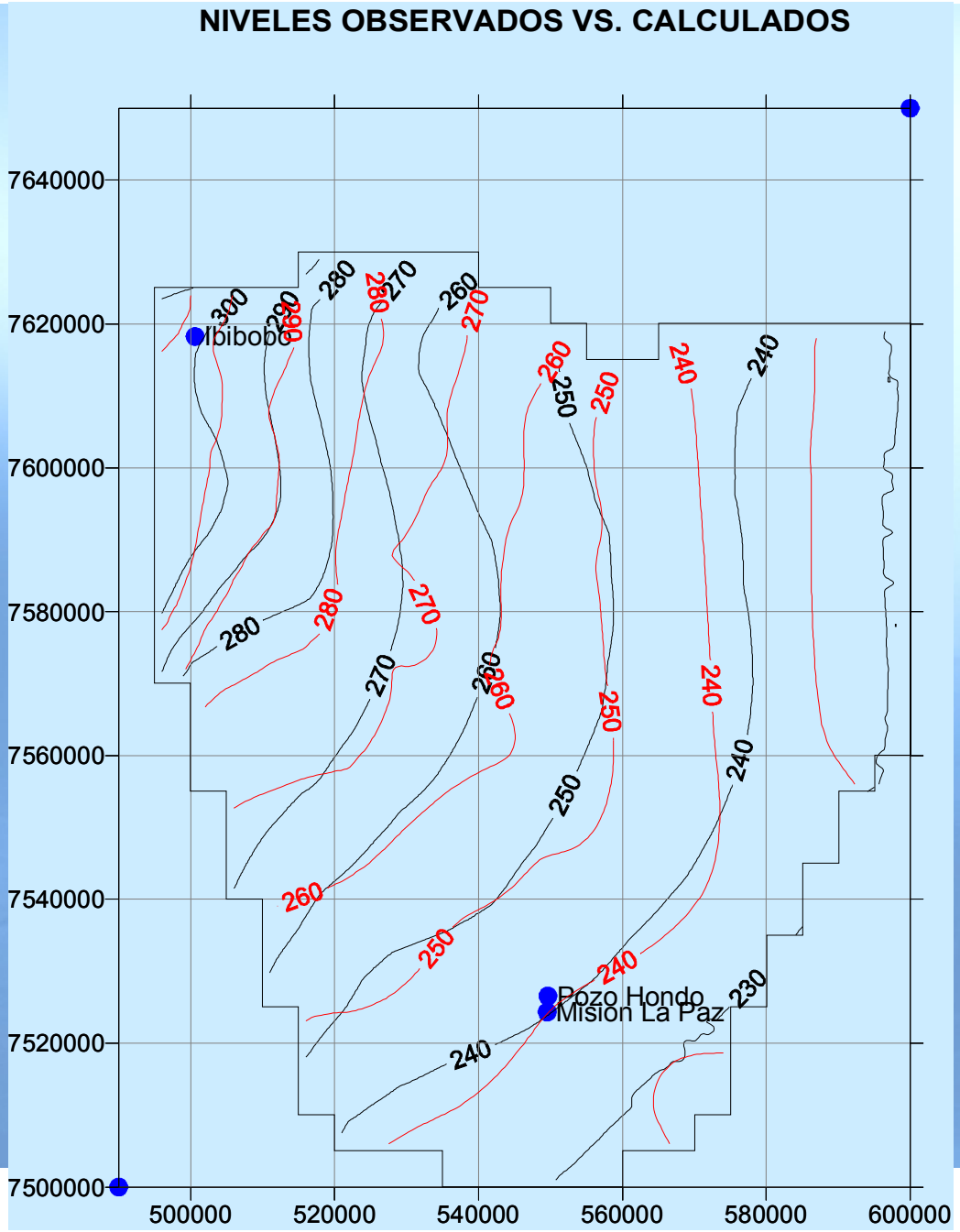


Calibration

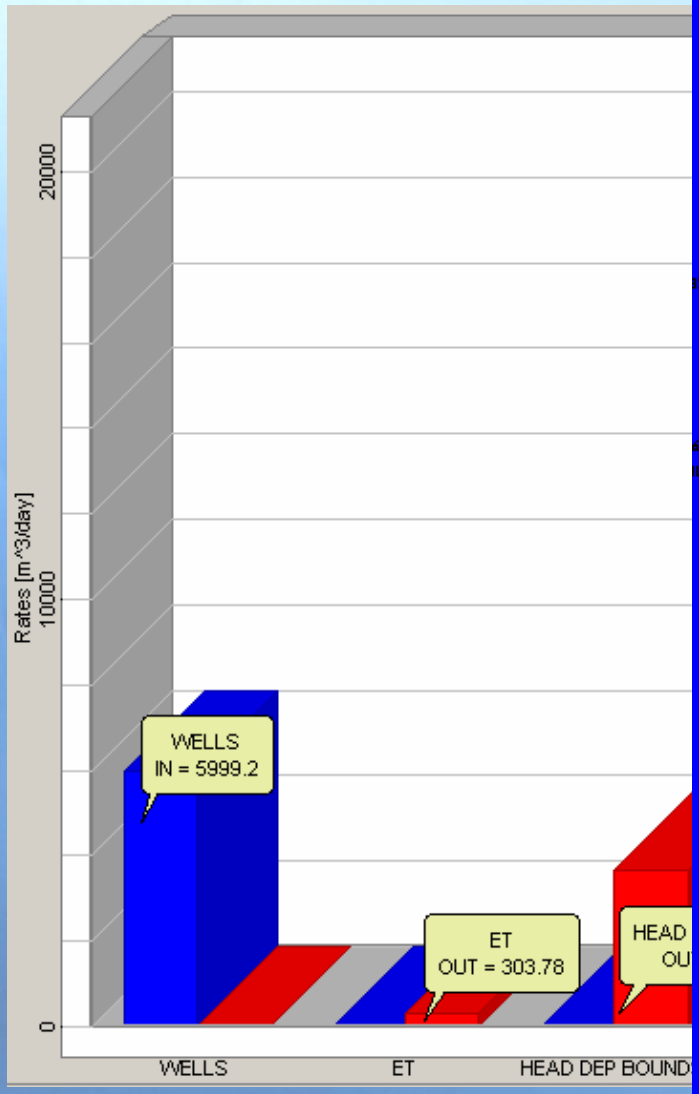


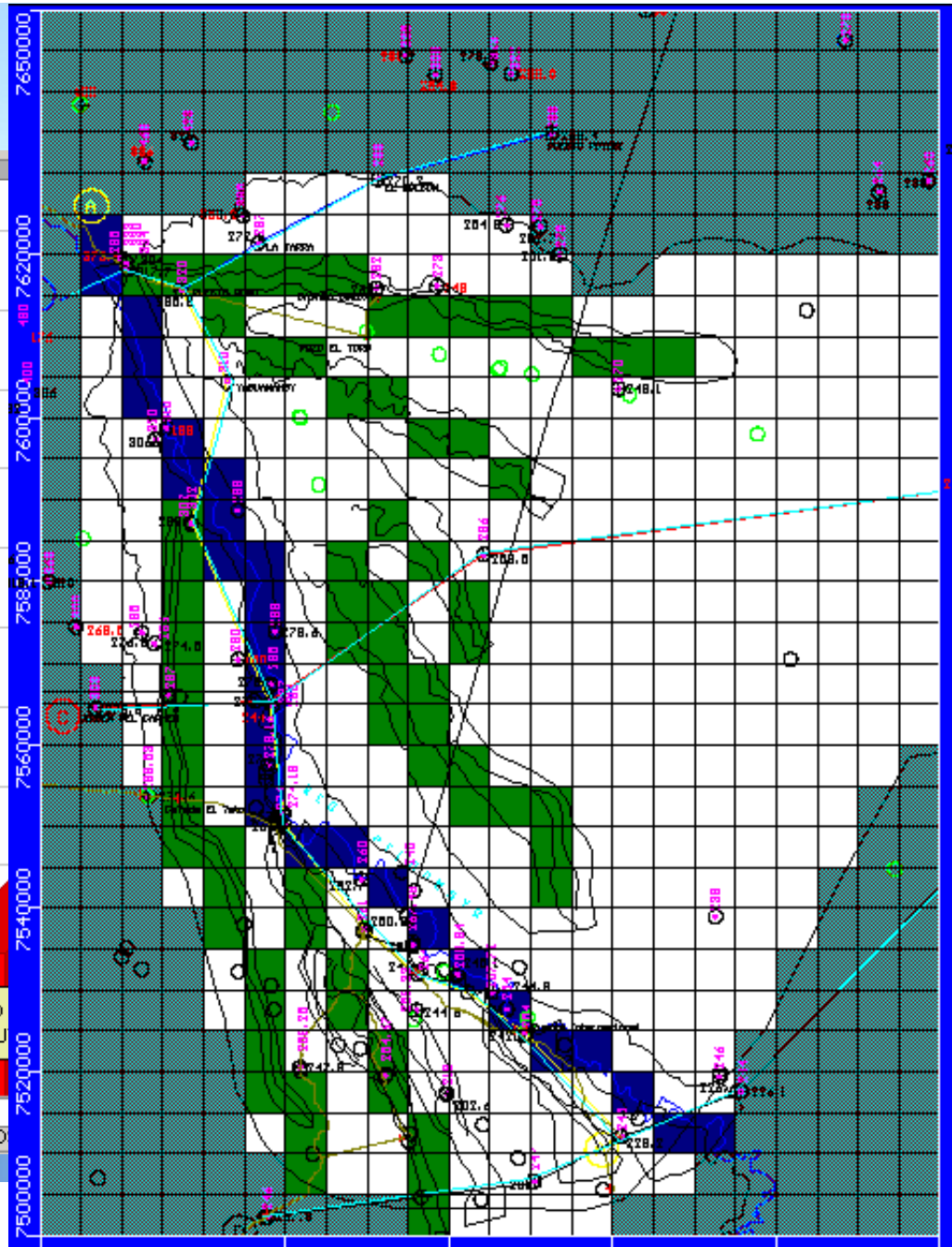


Calibration:



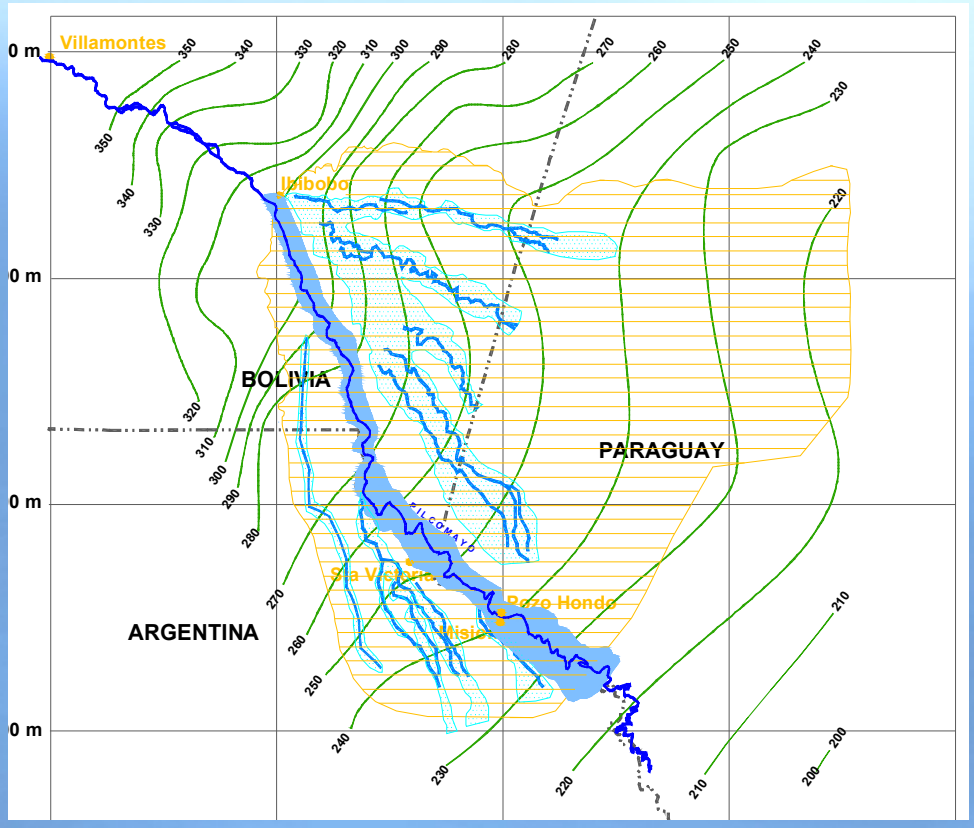
Balances


Rates [m^3/day]
20000
10000
0
WELLS
IN = 5999.2
ET
OUT = 303.78
HEAD
OU
WELLS
ET
HEAD DEP BOUND

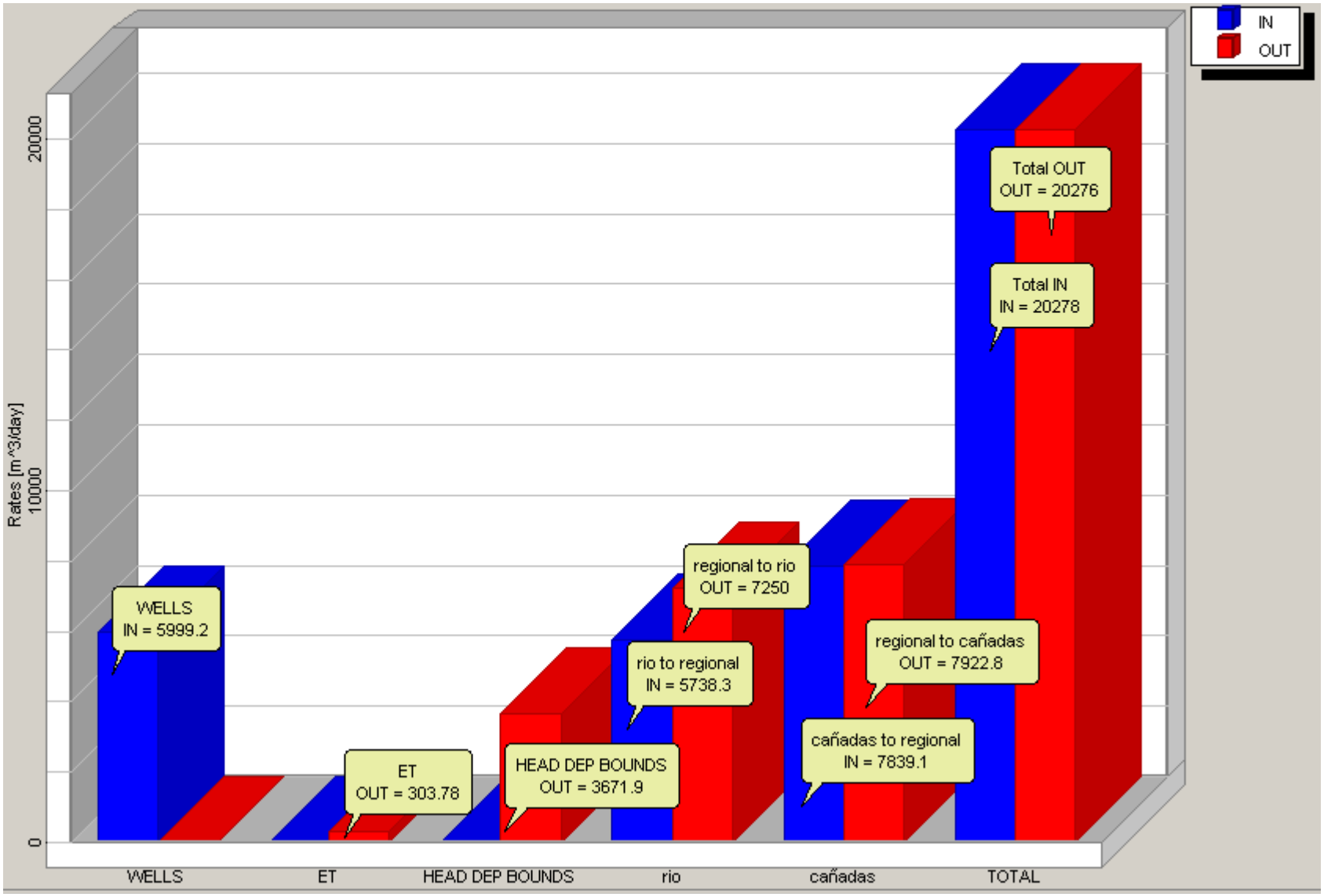

7650000
7620000
7600000
7580000
7560000
7540000
7520000
7500000

Conclusions

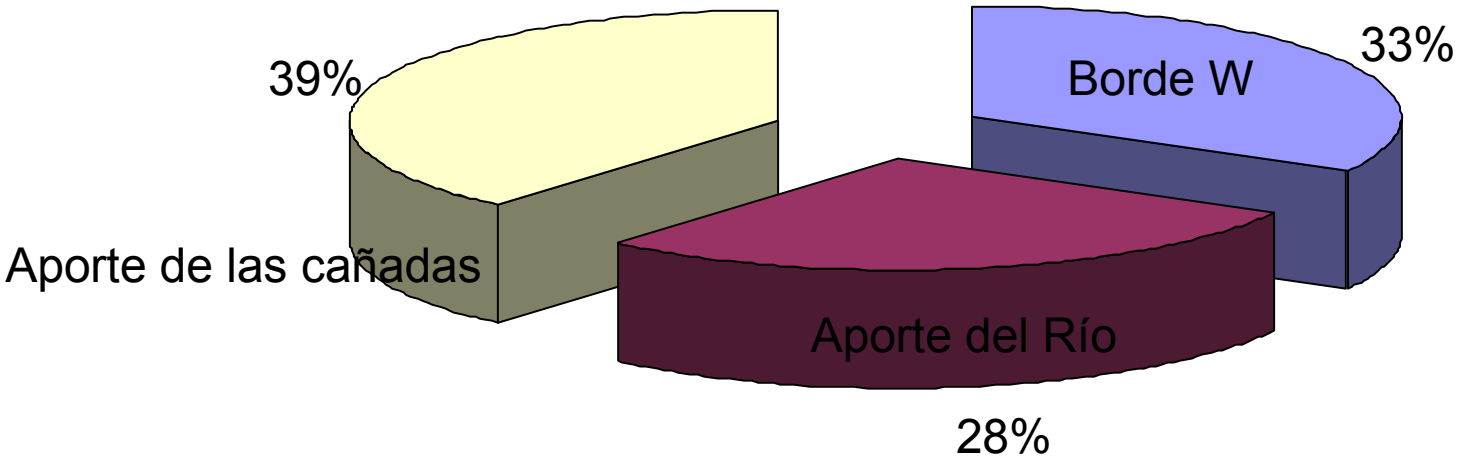
The hydrogeological dinamics of the SAYTT is very complex. There are relations of influence – efluence between the river and the aquifer.



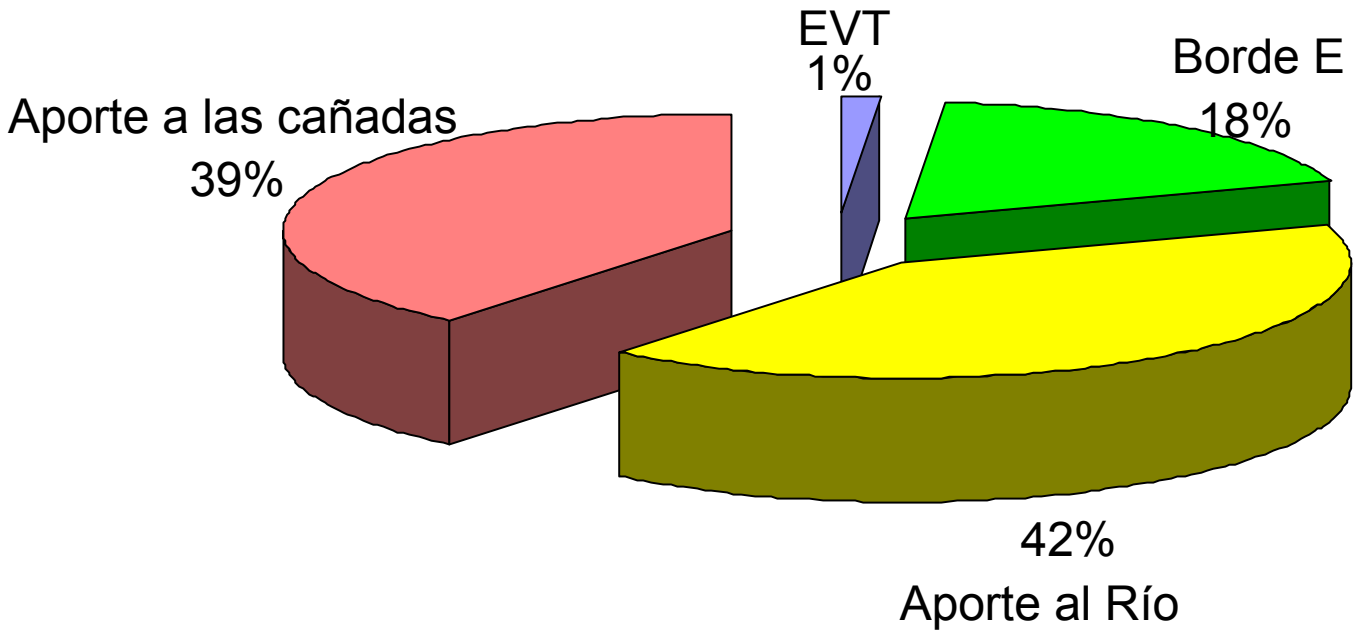
Balance


IN
OUT
Rates [m^3/day]
20000
10000
0
WELLS
IN = 5999.2
ET
OUT = 303.78
HEAD DEP BOUNDS
OUT = 3671.9
rio to regional
IN = 5738.3
regional to rio
OUT = 7250
cañadas to regional
IN = 7839.1
regional to cañadas
OUT = 7922.8
Total IN
IN = 20278
Total OUT
OUT = 20276
WELLS
ET
HEAD DEP BOUNDS
rio
cañadas
TOTAL

Input to the aquifer system



Output of the aquifer system



Concluding remarks

- The groundwater flow composition was defined.
- The bidireccional relation between surface and groundwater was quantify, fact that was not taken into account up to the moment.
- Continue working on these bases will be essential to generate the plans for regional development and appropriate legal tools for the utilization and sustainable management.
- As a result of that it will be possible to protect biodiversity, prevent desertification, and to identify and prevent the effects of the climatic change. All of this will be a genuine benefit to the inhabitatnts of this wide region.

Thank you!!!

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