



GOBIERNO
DE ESPAÑA

MINISTERIO
PARA LA TRANSICIÓN ECOLÓGICA
Y EL RETO DEMOGRÁFICO



PAAS

Plan de acción
de aguas subterráneas



JORNADA TECNICA SOBRE IMPLANTACIÓN PLAN DE ACCIÓN DE AGUAS SUBTERRÁNEAS

Técnicas de investigación hidrogeológica y modelización de las aguas subterráneas

“Técnicas geofísicas para estudios hidrogeológicos regionales “

Ángel Granda Sanz

INTERNATIONAL GEOPHYSICAL TECHNOLOGY, SL

- Empresa española creada en 1989
- Minería , Hidrogeología , Geotecnia , Medio ambiente y Arqueología
- Experiencia internacional en más de 60 países





Estudio geofísico para el abastecimiento de agua a la mina de Oyu Tolgoi (Mongolia)





MINA DE OYU TOLGOI (Mongolia)

21.000 empleados

Cielo abierto + subterránea con 5 rampas hasta 1300 m de profundidad

200 Km de túneles

500.000 T/año de Cu

Procesa 100.000 T/día



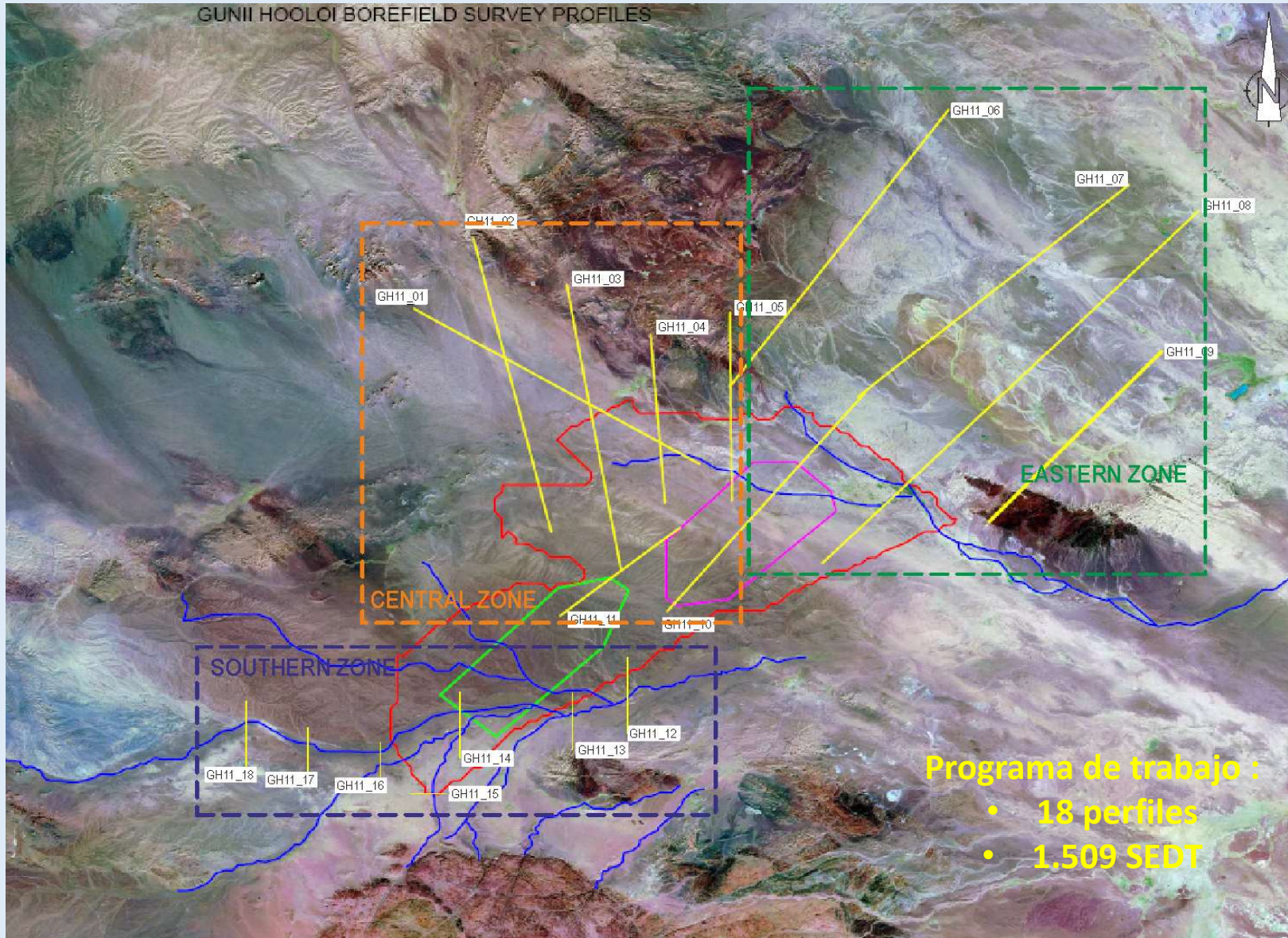
**Consumo de agua en los procesos
mineros y en la planta de tratamiento :
 $1,2 \text{ m}^3/\text{T} = 120.100 \text{ m}^3/\text{día}$**



Localización de la zona de estudio

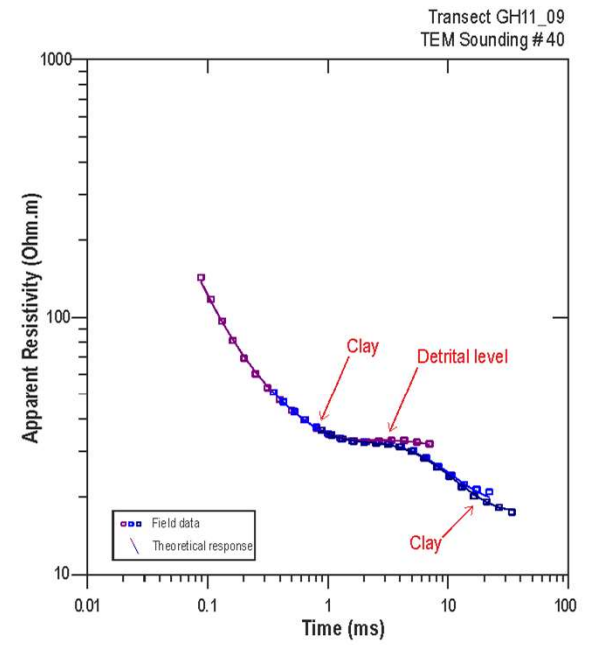
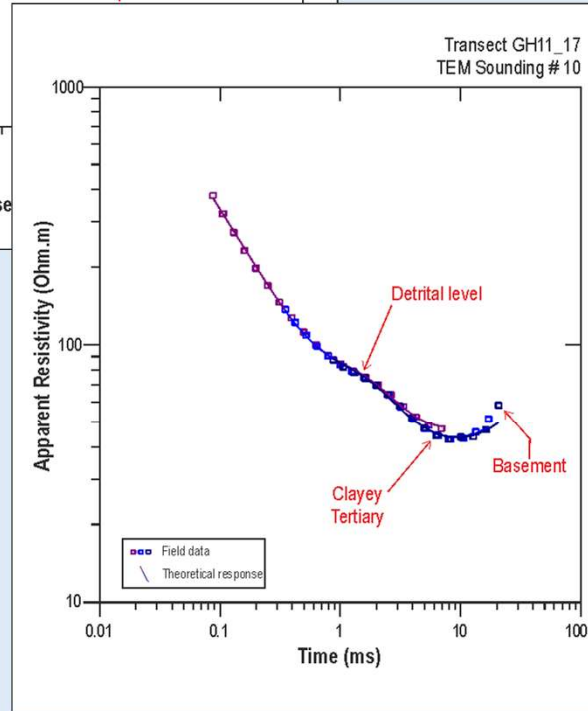
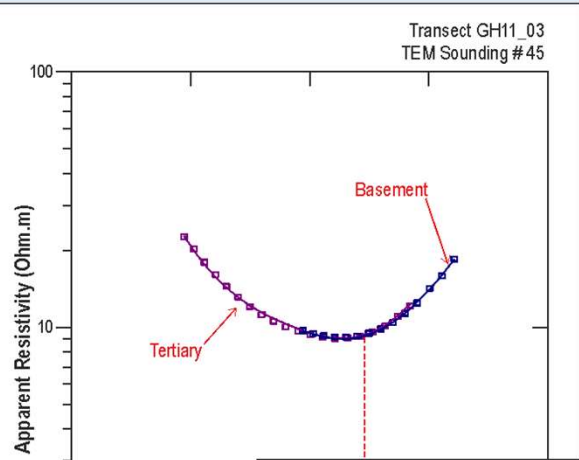
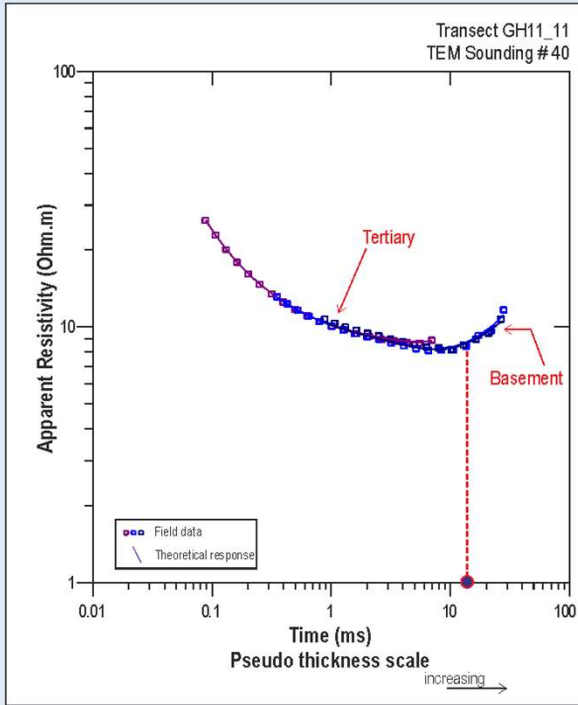


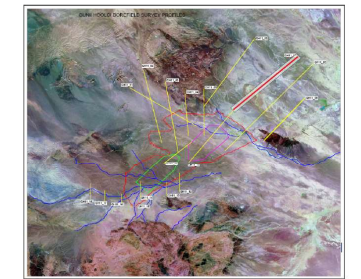
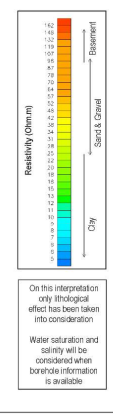
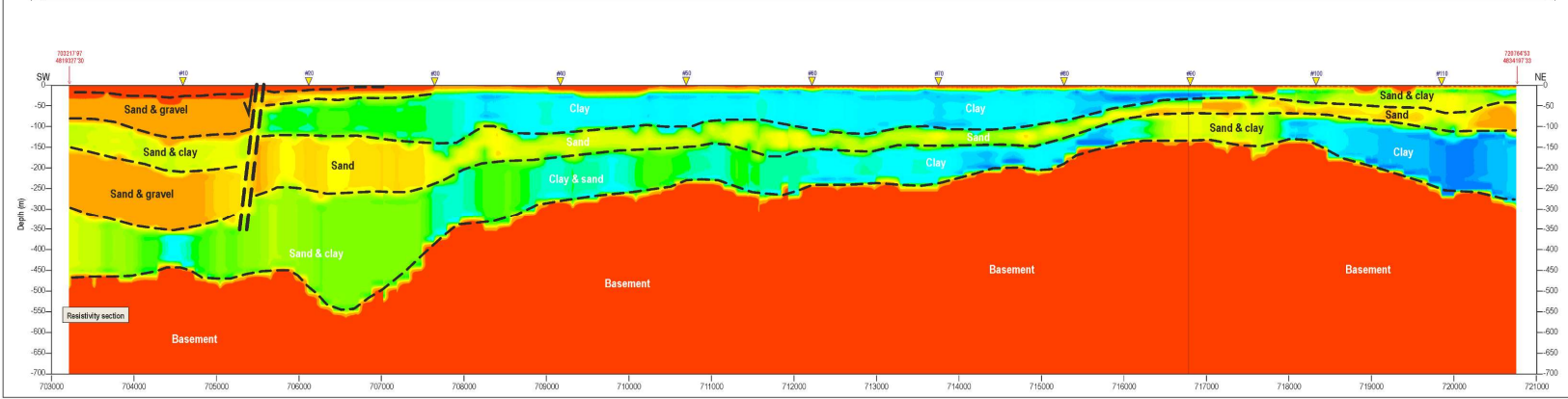
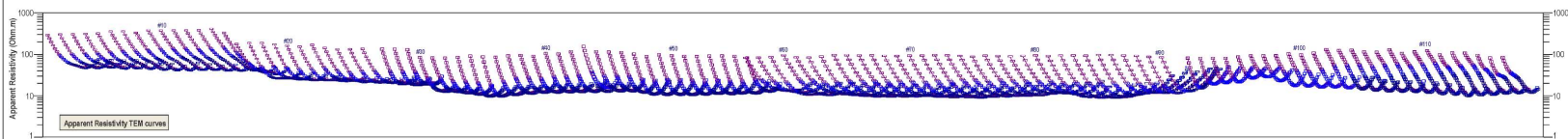
GUNII HOOLOI BOREFIELD SURVEY PROFILES





Programa de trabajo :

- 18 perfiles
- 1,509 SEDT







Gunii Hooloi Borefield Survey Transects

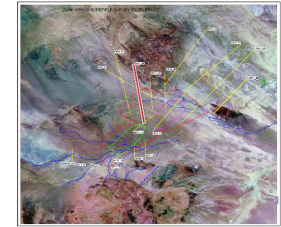
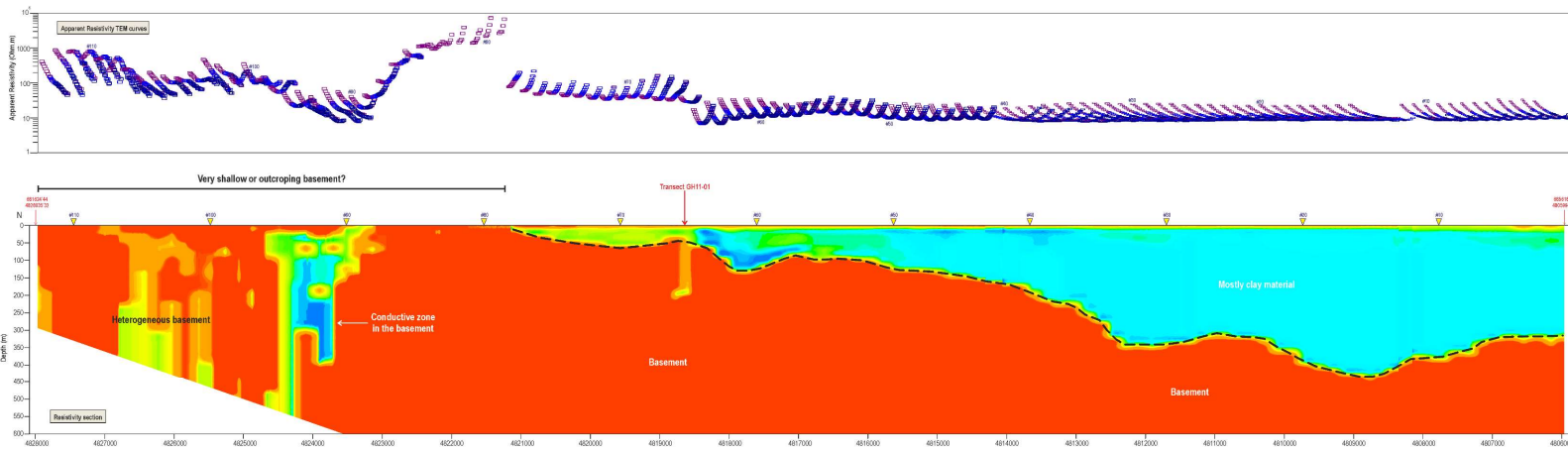



T.E.M. Soundings Geophysical Survey
In Gunii Hooloi Borefield, Oyu Tolgoi (Mongolia).
Resistivity section for Transect GH11_07

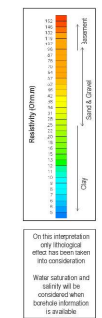
Consultants	Date	Scale	Sheet
 	February 2, 2012	Hs. 1:25,000 Vs. 1:5,000	7

On this interpretation
 effect has been taken
 into consideration

Water saturation and
 salinity will be
 considered when
 borehole information
 is available



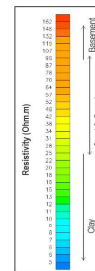
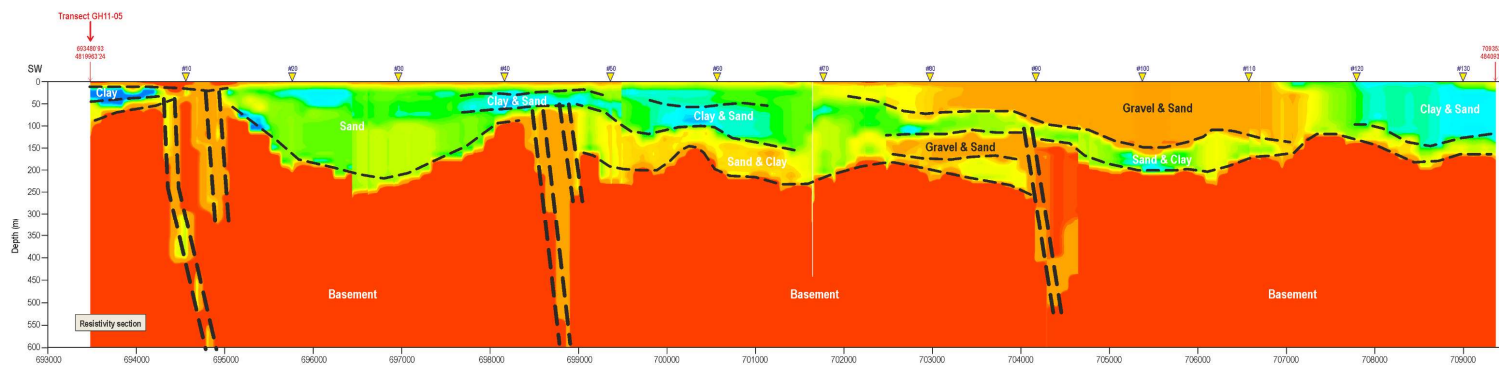
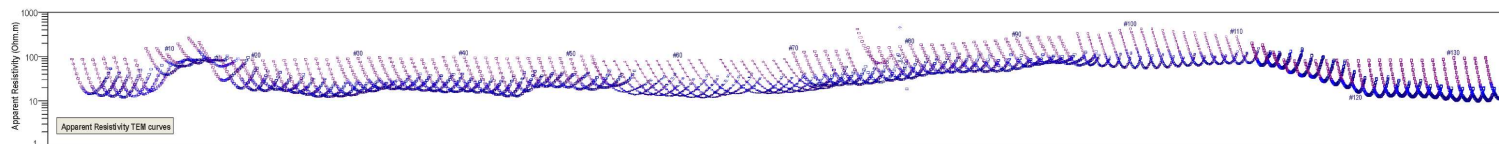
Guni Hooloi Borefield Survey Transects



On the interpretation only lithological data has been taken into consideration. Water saturation and salinity will be considered when borehole information is available.

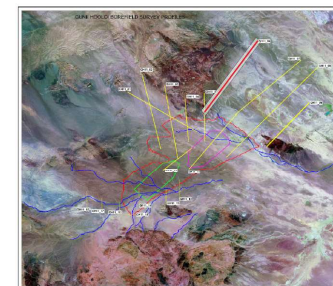
T.E.M. Soundings Geophysical Survey
in Guni Hooloi Borefield, Oyu Tolgoi (Mongolia)
Resistivity section for Transect GH11_03



Client	Date	Scale	Sheet
Guni Borefield	February 2012	1:50,000	3



On this interpretation only lithological effect has been taken into consideration.



Water saturation and salinity will be considered when borehole information is available.

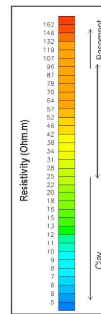
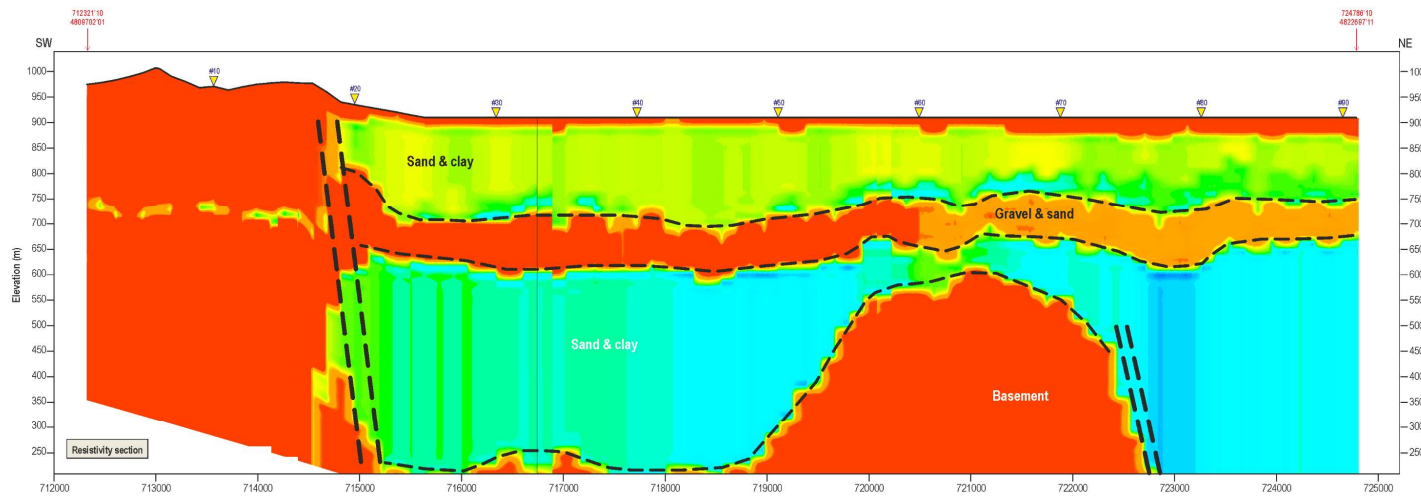
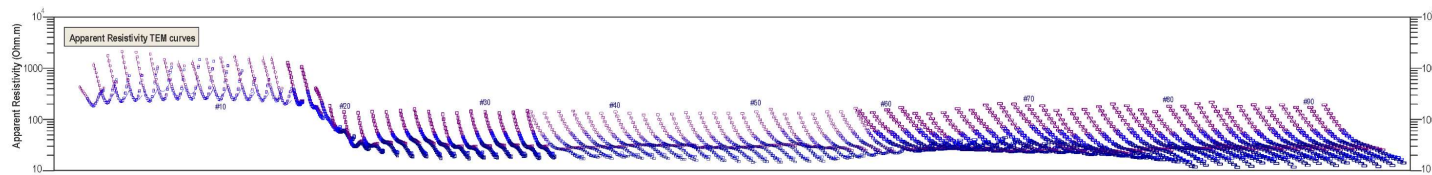


T.E.M. Soundings Geophysical Survey
in Gunii Hoolai Borefield, Oyu Tolgoi (Mongolia).

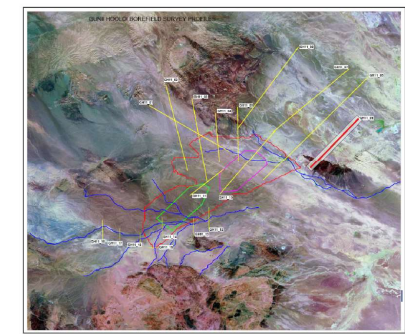
Resistivity section for Transect GH11_08

Consultants	Date	Scale	Sheet
 	February 2 012	As 1:25,000 Vs 1:5,000	6



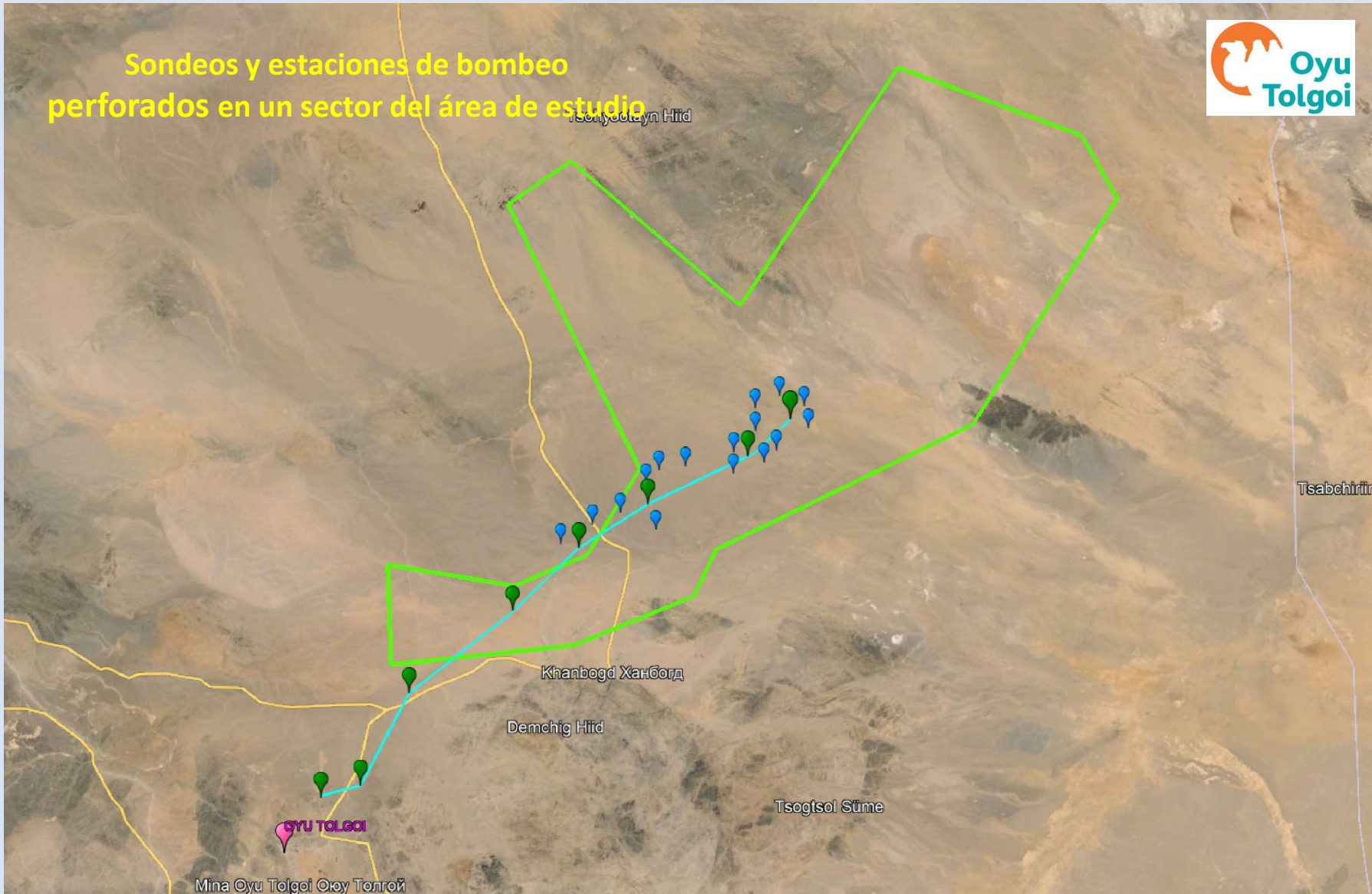
On this interpretation only lithological effect has been taken into consideration

Water saturation and salinity will be considered when borehole information is available

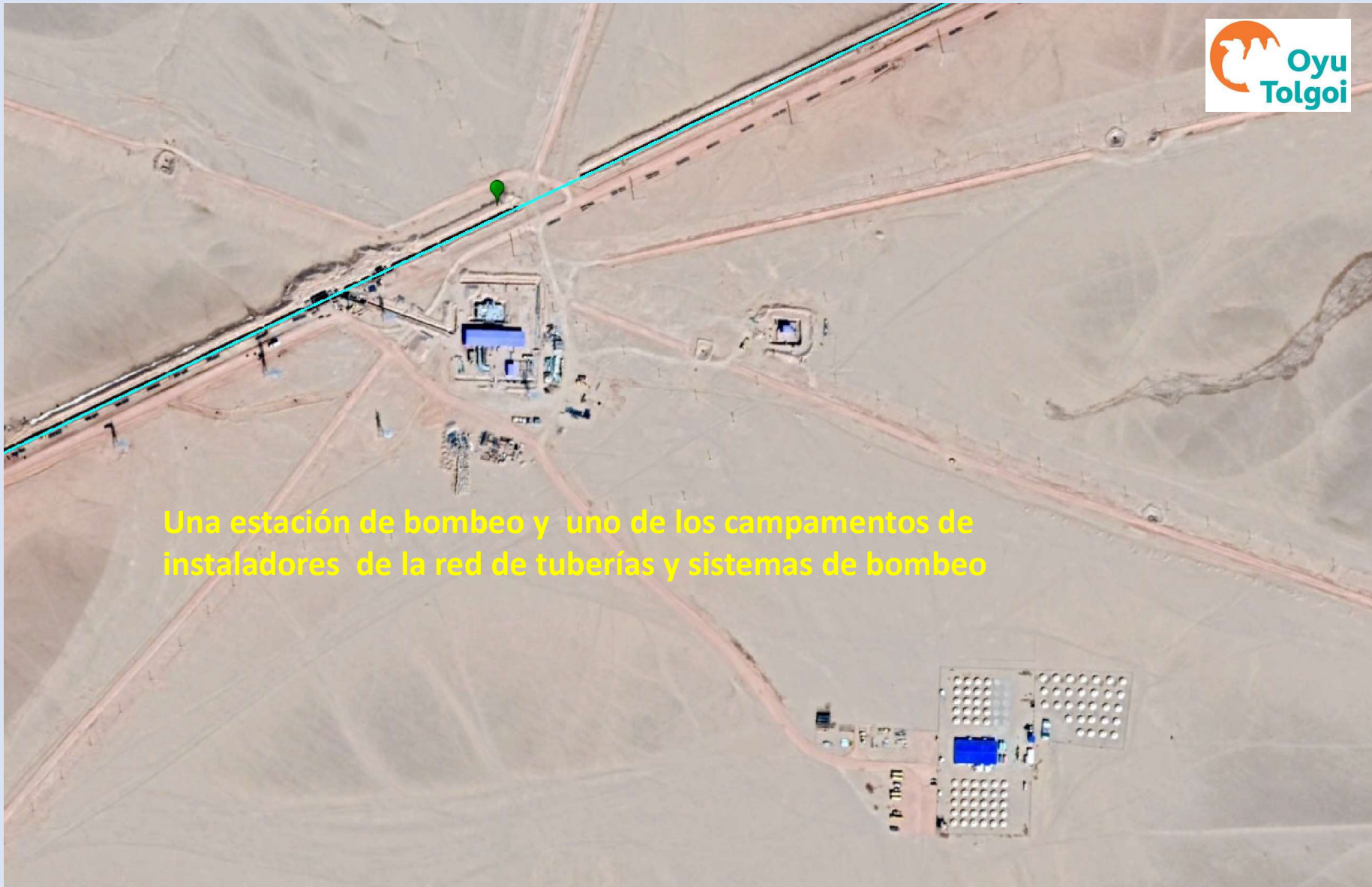


T.E.M. Soundings Geophysical Survey in Guni Hooloi Borefield, Oyu Tolgoi (Mongolia).			
Resistivity section for Transect GH11_09			
Consultants 	Date February 2012	Scale Hs_1:25,000 Vs_1:5,000	Sheet 9

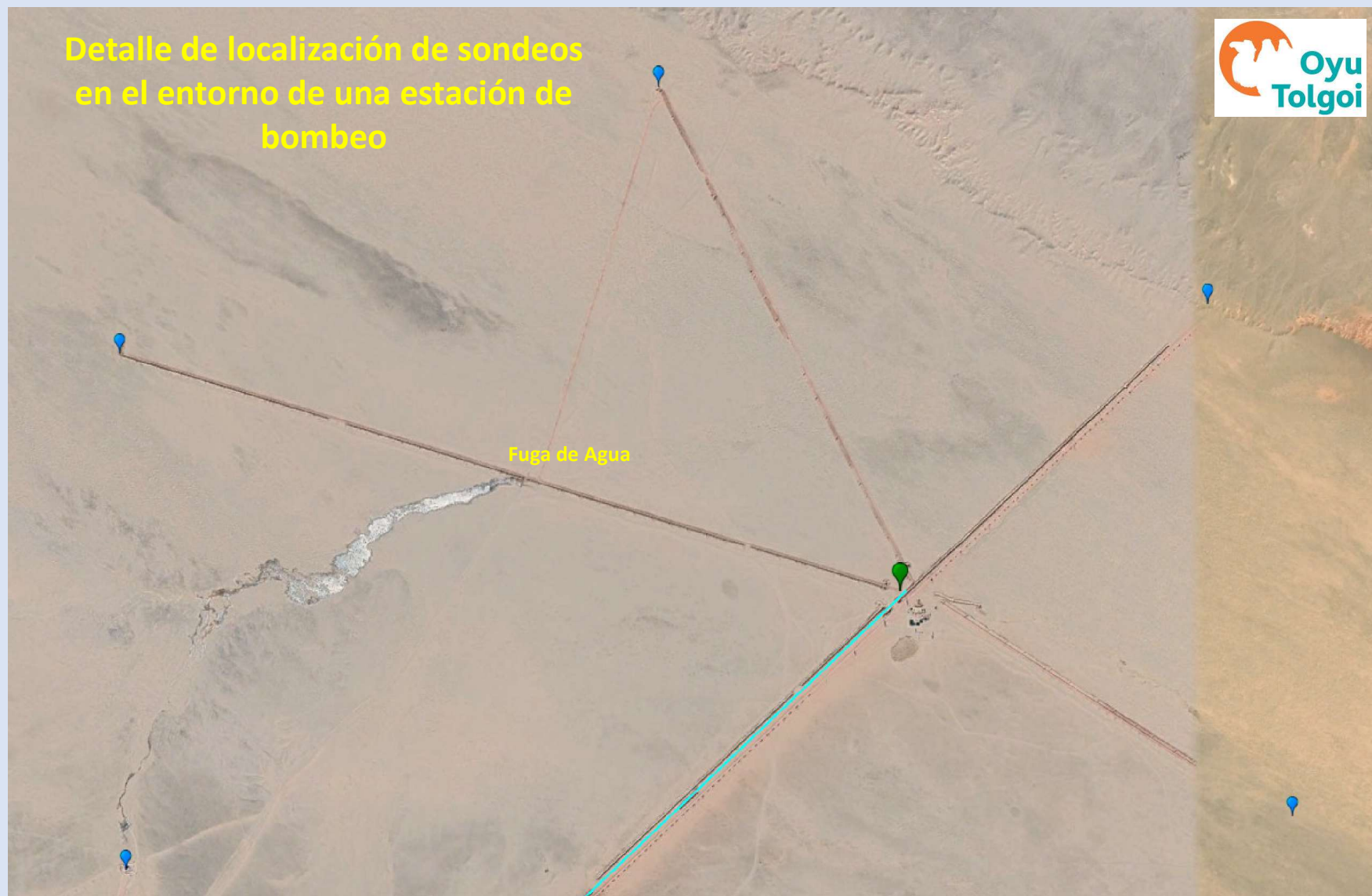
Sondeos y estaciones de bombeo perforados en un sector del área de estudio



Una estación de bombeo y uno de los campamentos de instaladores de la red de tuberías y sistemas de bombeo



Detalle de localización de sondeos
en el entorno de una estación de
bombeo



Equipo técnico del estudio









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**A fecha de hoy
seguimos haciendo estudios geofísicos en Oyu Tolgoi**

