Geothermal Resources of the Salton Sea

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Salton Sea Advisory Committee Meeting

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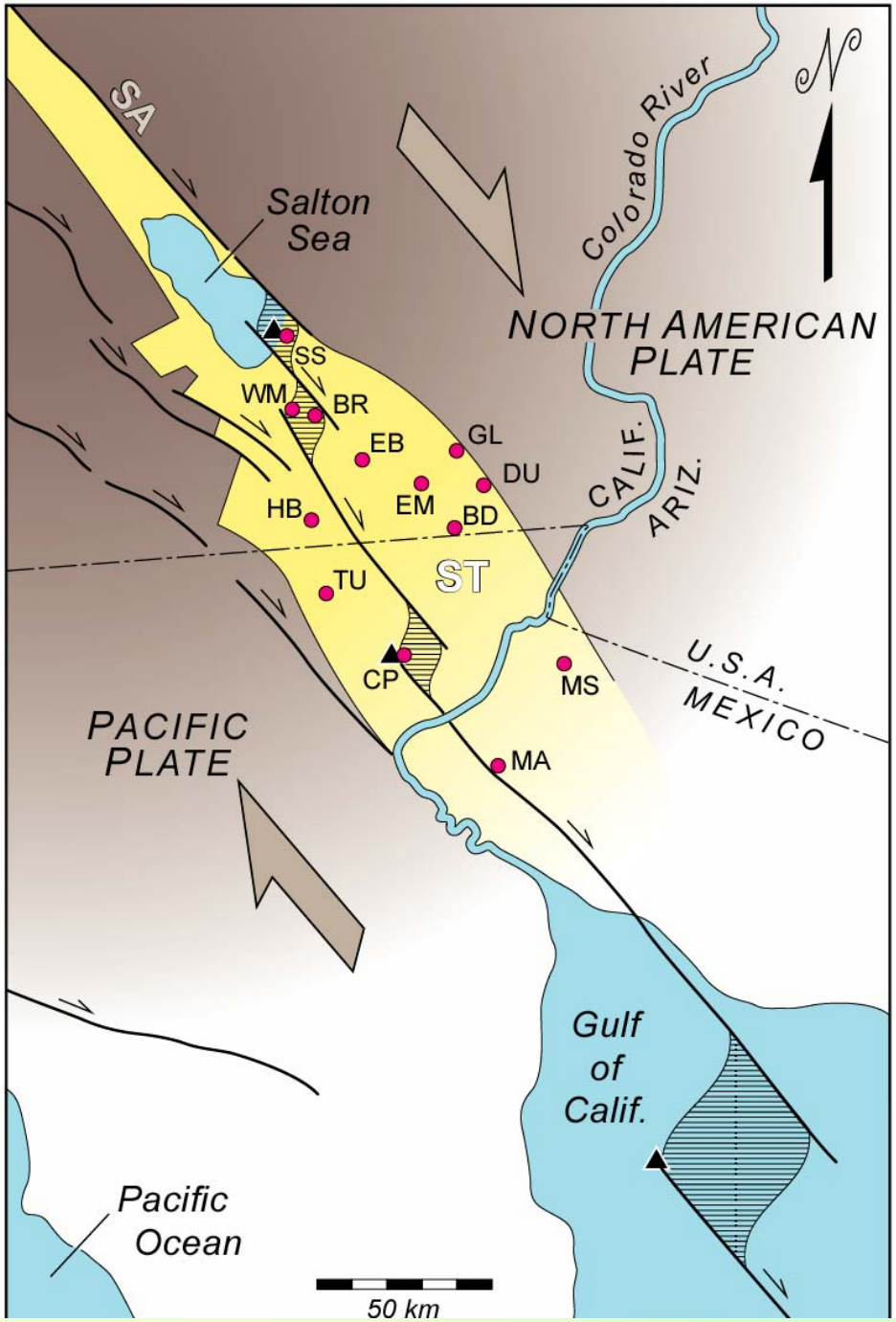
Geothermal Resources of the Salton Sea

- Geology of Salton Trough
- Surface Features of Salton Sea Geothermal System
- Salton Sea Geothermal Field
- Potential Applications of Using Geothermal Energy for Desalination

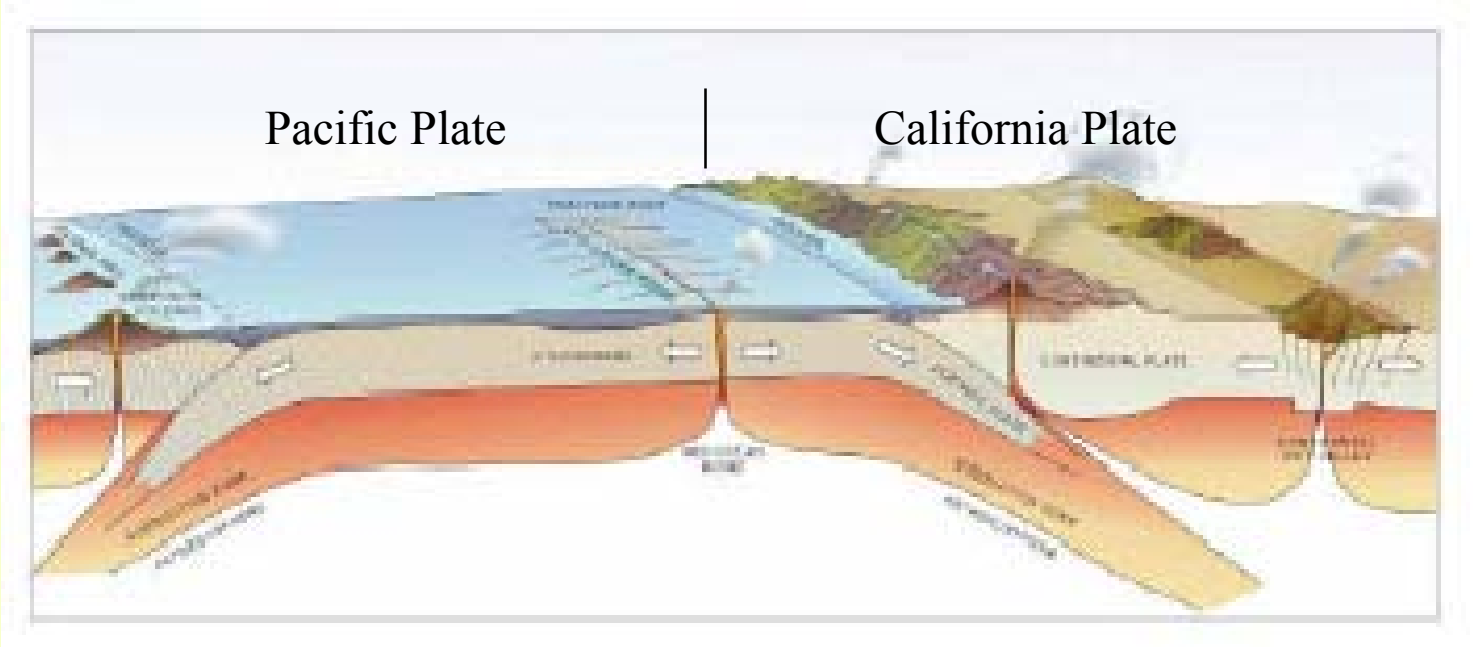
Geology of Salton Trough

- San Andreas Fault System
- Colorado River Delta

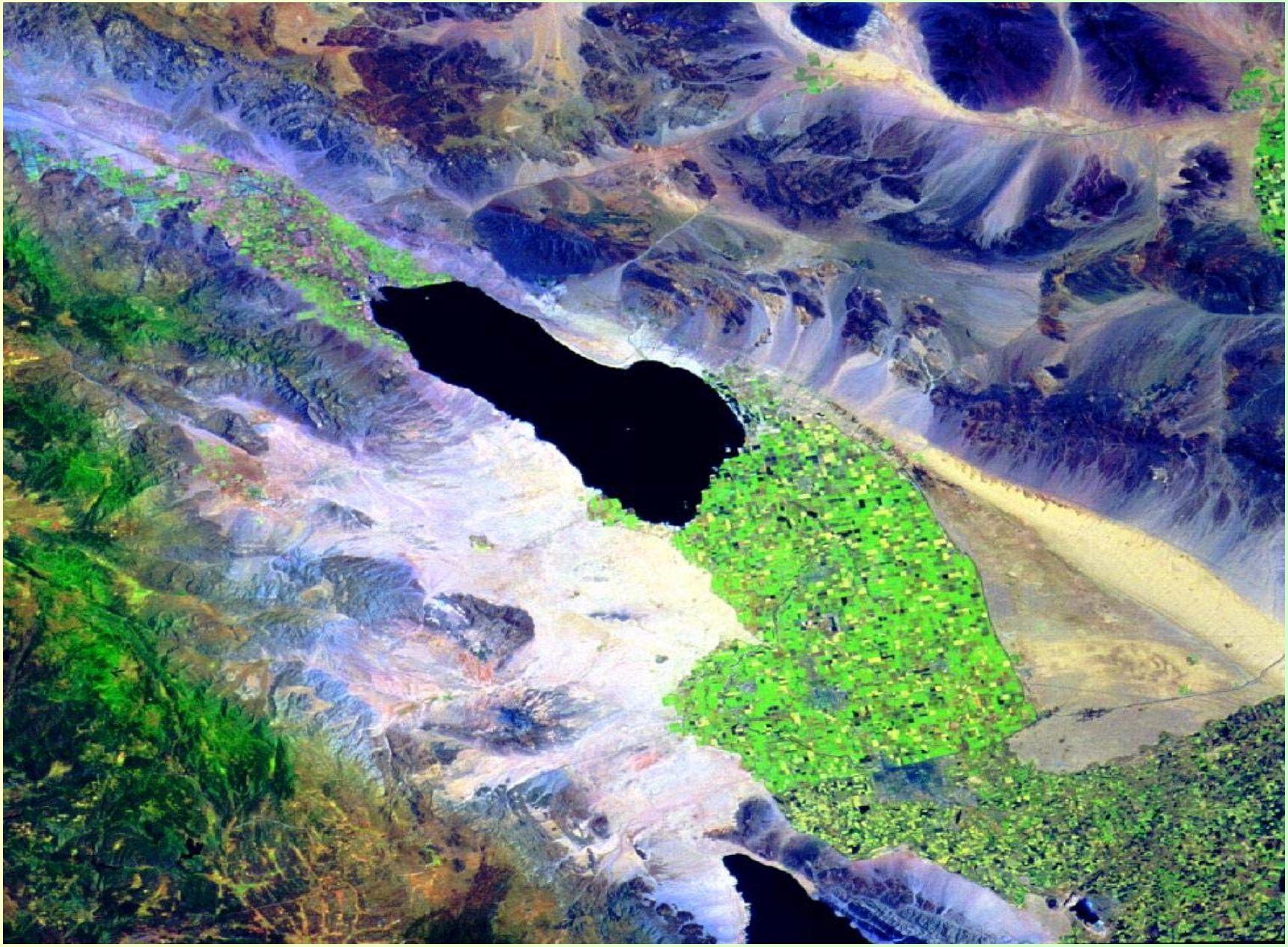

SA
Salton Sea
Colorado River
N
NORTH AMERICAN PLATE
SS
WM
BR
EB
GL
DU
EM
BD
HB
TU
ST
CP
MS
MA
CALIF.
ARIZ.
U.S.A.
MEXICO
PACIFIC PLATE
Gulf of Calif.
Pacific Ocean
50 km

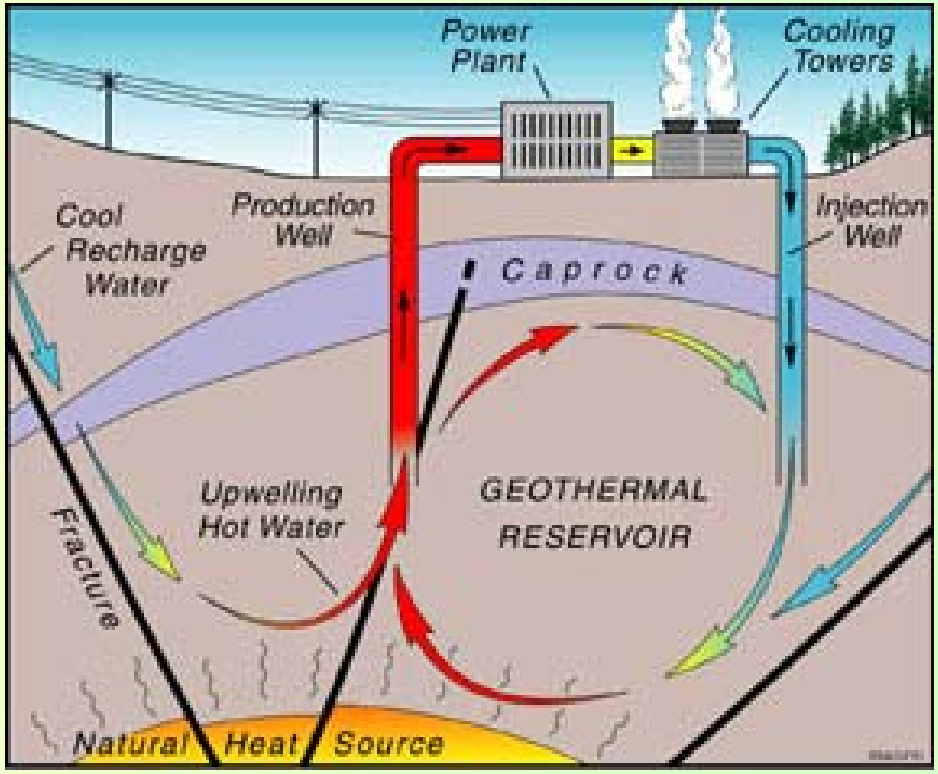
California Plate

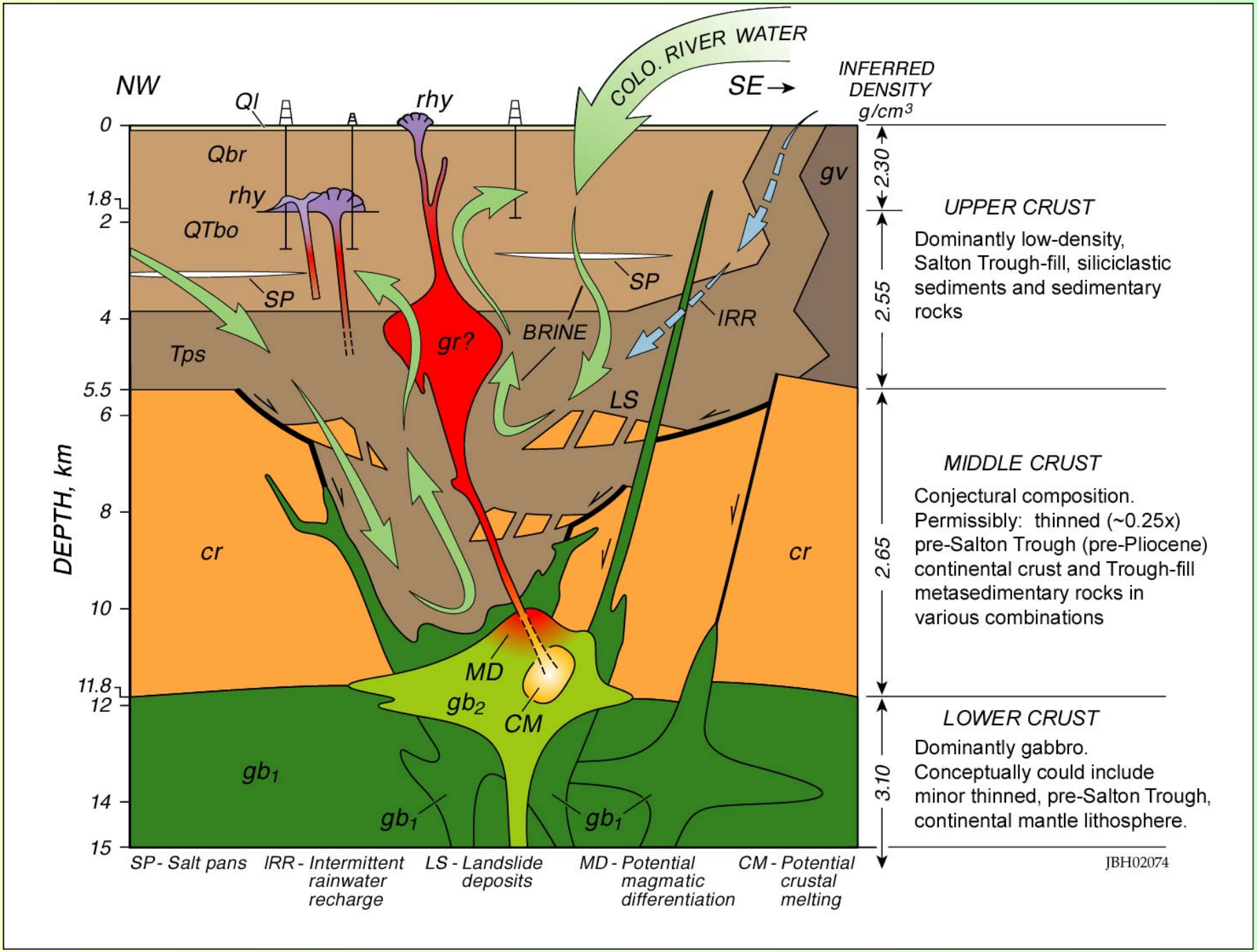
W E



N
Colorado River delta
Colorado River




Power Plant
Cooling Towers
Cool Recharge Water
Production Well
Injection Well
Caprock
Upwelling Hot Water
GEOTHERMAL RESERVOIR
Fracture
Natural Heat Source

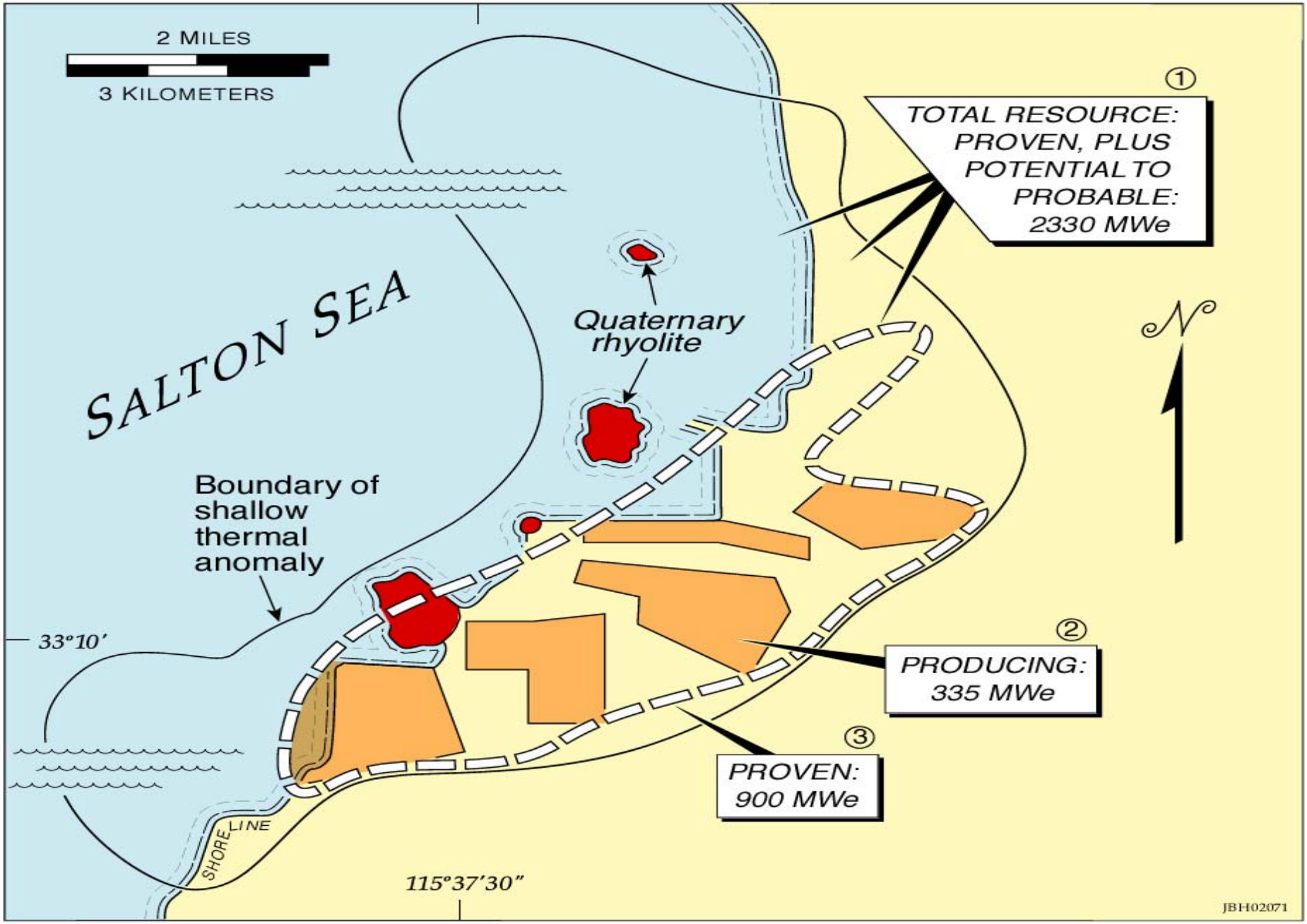

NW
SE →
COLO. RIVER WATER
INFERRED DENSITY g/cm³
DEPTH, km
0
1.8
2
4
5.5
6
8
10
11.8
12
14
15
Ql
rhy
Qbr
rhy
QTbo
SP
SP
Tps
gr?
BRINE
IRR
LS
gv
cr
cr
MD
gb2
CM
gb1
gb1
gb1
2.30
2.55
2.65
3.10
UPPER CRUST
Dominantly low-density, Salton Trough-fill, siliciclastic sediments and sedimentary rocks
MIDDLE CRUST
Conjectural composition. Permissibly: thinned (~0.25x) pre-Salton Trough (pre-Pliocene) continental crust and Trough-fill metasedimentary rocks in various combinations
LOWER CRUST
Dominantly gabbro. Conceptually could include minor thinned, pre-Salton Trough, continental mantle lithosphere.
SP - Salt pans
IRR - Intermittent rainwater recharge
LS - Landslide deposits
MD - Potential magmatic differentiation
CM - Potential crustal melting
JBH02074

Surface Features of Salton Sea Geothermal System

- Rhyolite Domes
- Mud Pots/Volcanoes

Salton Sea Geothermal Field

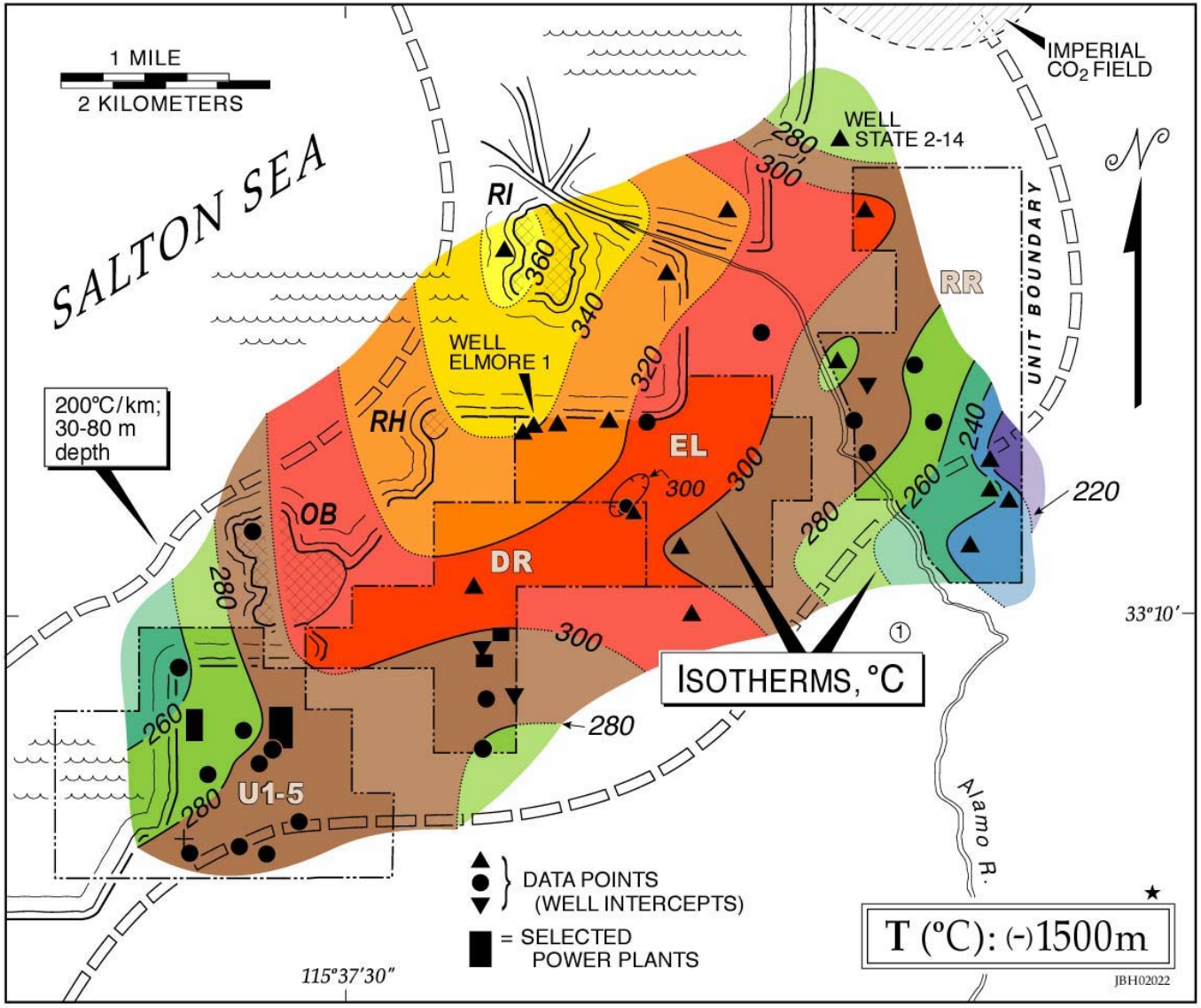
- Began Producing in 1982
- Current Installed Capacity is 335 MWe
- 9 Power Plants
- All plants operated by CalEnergy Operating Corp.
- Unit 6 (185 MWe) on line in 2006
- Unit 7 (185 MWe) on line in 2008-9?
- Probable Resource is 2330 MWe (2002 paper)



① Beneath shallow thermal anomaly

② Five parcels within proven sector

③ Sector enclosed by open-dashed line



① Dotted where projected between or beyond unit boundaries

NOTE: Ground level = (-)69 m

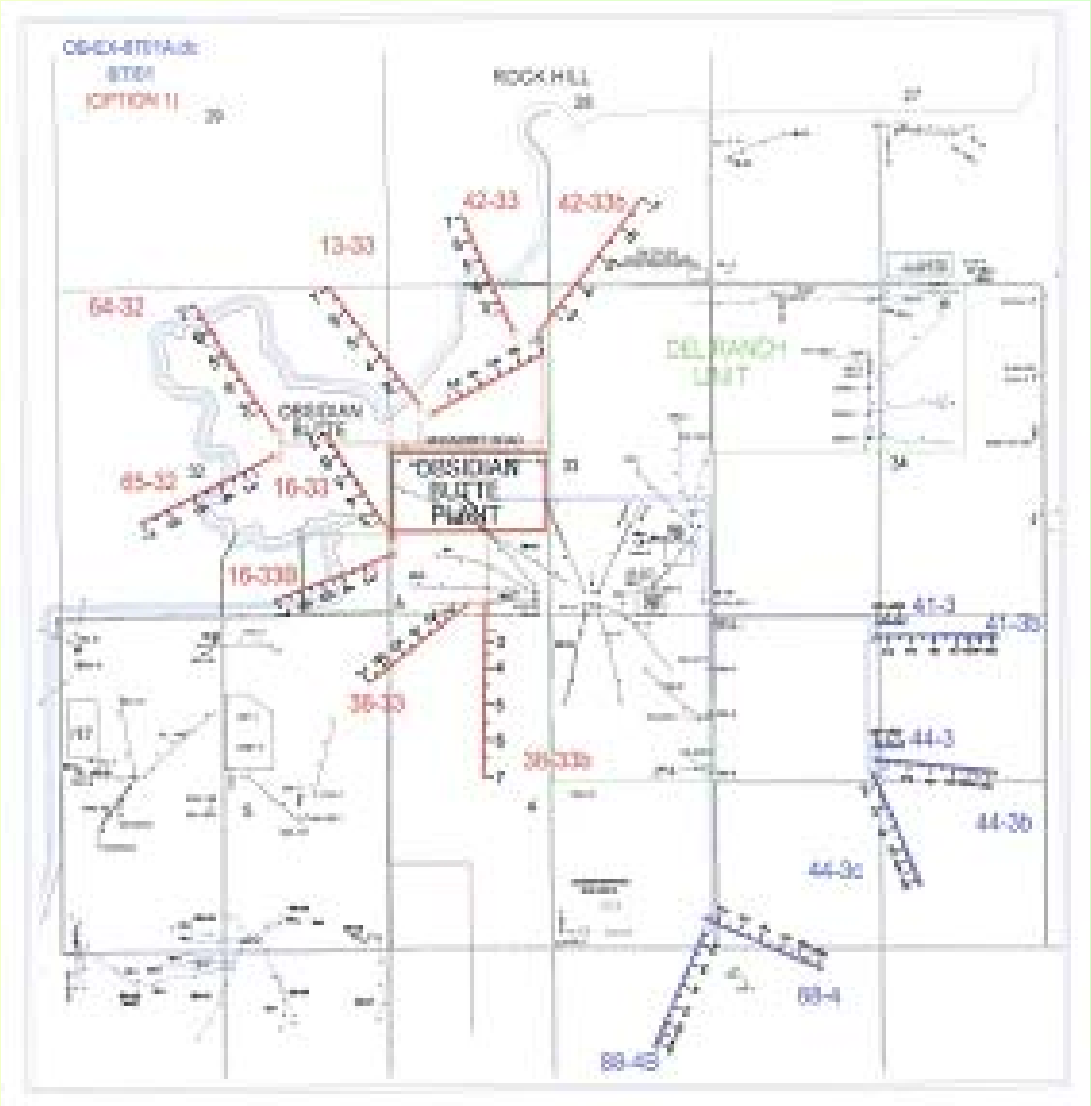
★(-)4922 ft

Total Dissolved Solids

(Typical Weight %)

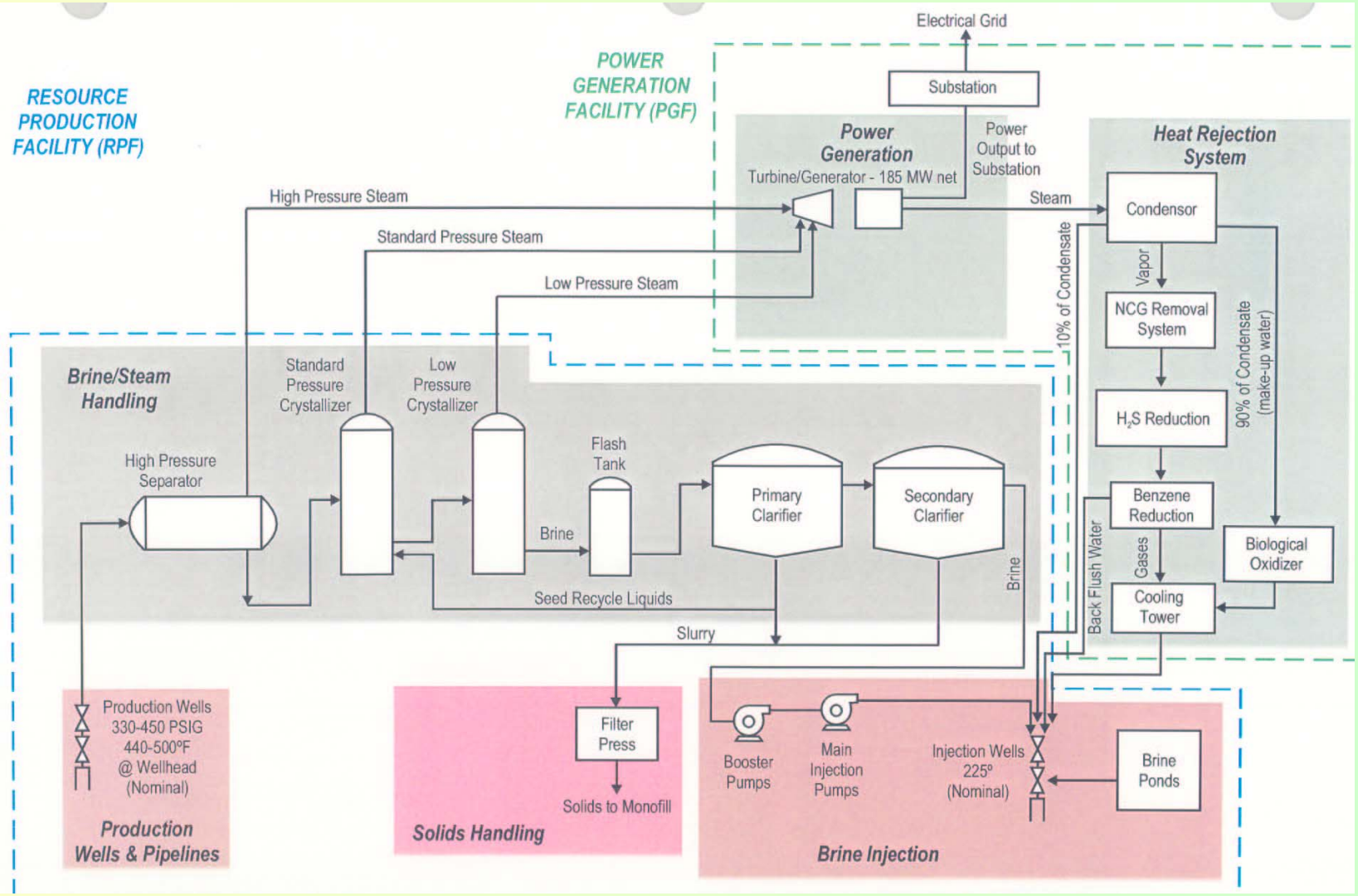
Chloride	15.40
Sodium	5.27
Calcium	2.65
Potassium	1.65
Carbon Dioxide	0.17
Iron	0.15
Manganese	0.14
Zinc	0.05
Silica	0.05
Other	0.16
Total Dissolved Solids & Gases	**25.69**

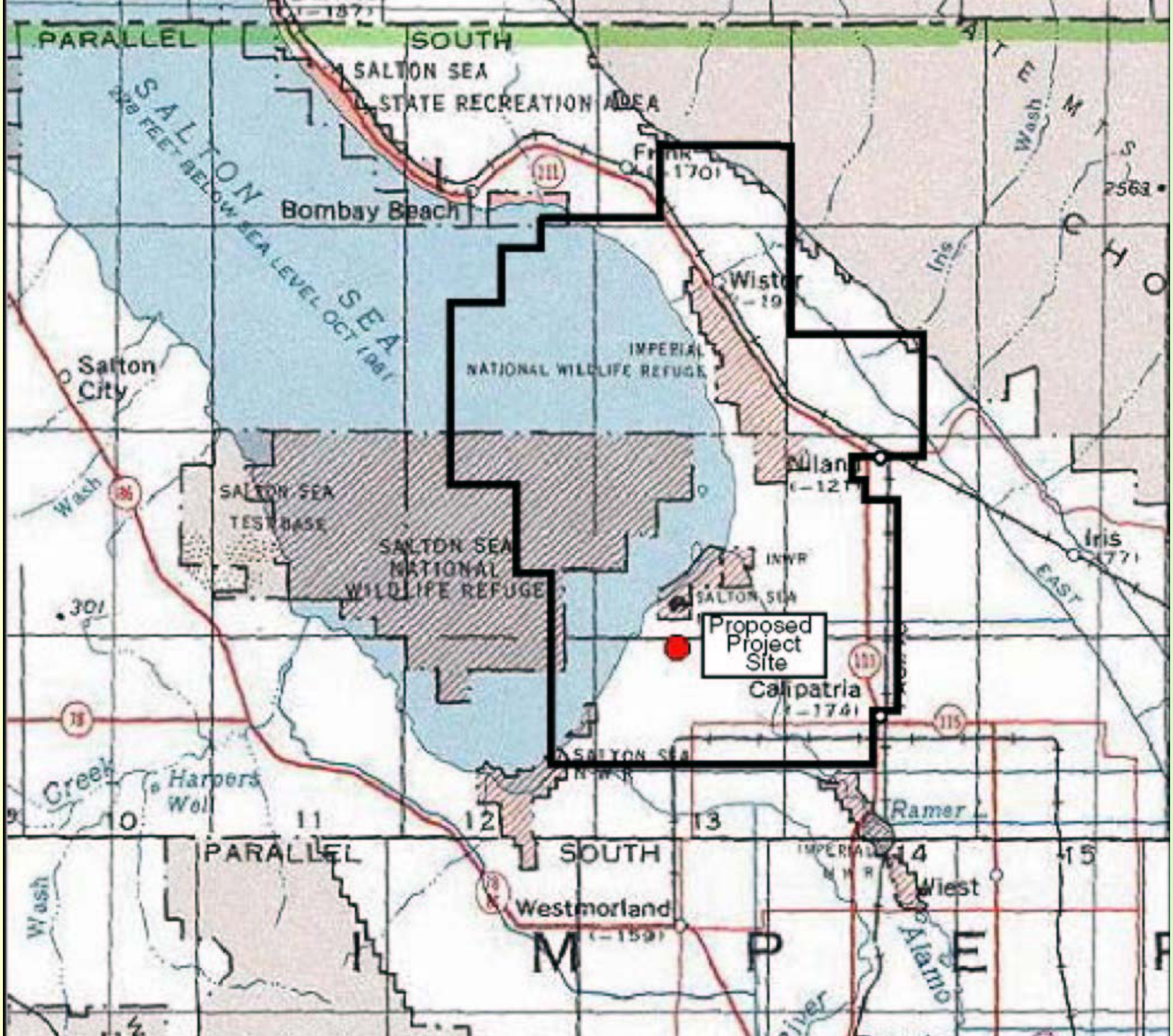
2
3
4
5
6
7
8


OPTION 11
ROCK HILL
42-33
42-33b
13-33
64-32
DEL RANCH UNIT
OBSIDIAN BUTTE
OBSIDIAN BUTTE PLANT
65-32
16-33
16-33b
41-3
41-3b
36-33
36-33b
44-3
44-3b
44-3c
68-4
68-4b

Potential Applications of Using Geothermal Energy for Desalination

- Vertical Tube Evaporation Technology
- “Dune” Delta T Principle


RESOURCE PRODUCTION FACILITY (RPF)
POWER GENERATION FACILITY (PGF)
Electrical Grid
Substation
Power Generation
Turbine/Generator - 185 MW net
Power Output to Substation
Heat Rejection System
High Pressure Steam
Standard Pressure Steam
Low Pressure Steam
Steam
Condensor
10% of Condensate
Vapor
NCG Removal System
90% of Condensate (make-up water)
H2S Reduction
Benzene Reduction
Gases
Back Flush Water
Biological Oxidizer
Cooling Tower
Brine/Steam Handling
Standard Pressure Crystallizer
Low Pressure Crystallizer
High Pressure Separator
Flash Tank
Brine
Primary Clarifier
Secondary Clarifier
Seed Recycle Liquids
Slurry
Production Wells 330-450 PSIG 440-500°F @ Wellhead (Nominal)
Production Wells & Pipelines
Filter Press
Solids to Monofill
Solids Handling
Booster Pumps
Main Injection Pumps
Injection Wells 225° (Nominal)
Brine Ponds
Brine Injection


PARALLEL
SOUTH
SALTON SEA
STATE RECREATION AREA
SALTON SEA
228 FEET BELOW SEA LEVEL OCT 1981
Bombay Beach
Frink
Wister
IMPERIAL
NATIONAL WILDLIFE REFUGE
Salton City
SALTON SEA
TEST BASE
SALTON SEA
NATIONAL
WILDLIFE REFUGE
Niland
INWR
SALTON SEA
Proposed
Project
Site
Calipatria
Iris
EAST
Wash
Harpers
Well
Creek
Ramer L.
Westmorland
Wiest
Alamo
PARALLEL
SOUTH
10
11
12
13
14
15
301
2563

The End