

## Developments at Bed Springs

Early one Friday evening, when you are just about ready to leave your consulting firm, Dawn Korleone, the recently elected mayor of Bed Springs, knocks on your door. She needs advice, and your firm has been highly recommended to her by a friend of his, Troy Mann.

Bed Springs needs to develop a new source of water. For years, whale watching at Marble Point, the beautiful quartz sand beaches adjacent to Bed Springs, and fishing from the old Prezzure Pier have been the mainstay of the town's economy, but Ms. Korleone expects the economy to change. "Bed Springs is entering a new high-tech era" claims Ms. Korleone. A new campus for the College of Reason, Intelligence, Science, and Educational Studies is to be constructed, and eyesores like the old pier will be torn down. Projections are for the population to increase four-fold in the coming decade. A 200 acre-foot increase in the annual water supply seems necessary. Two water options have been suggested to the mayor: 1) develop a series of groundwater wells on the south side of town, and 2) build a dam on the Liver River. The mayor wants you to take a look at the geology and get your opinion of the pros and cons of the proposed options. She also welcomes any other input you might provide.

Ms. Korleone heard about how well your firm did with a similar sort of projects. "I have much more information than you were provided with for those other cases! First, I have a map prepared by the renowned well logger Harold ("Hap") Hazard, and second, I have ten well logs prepared by the firm of Joe, Lee & Pitt." The map and the well logs are attached.

The mayor will be leaving for an important conference hosted by the Western Institute of Mayors and Politicians at 5:00 on Friday, May 15, 2015 and she needs to have your report with her on the plane so that she can discuss it at the conference. Failure on your part to provide the report by 4:00 on Friday, May 15, 2015 will result in your firm not getting paid (if this hint is too subtle see me). Although you emphasize that your firm specializes in highly detailed, extremely thorough projects and that 4 weeks is not much time for the type of work you are accustomed to doing, Ms. Korleone makes you an offer you cannot refuse and you accept it.

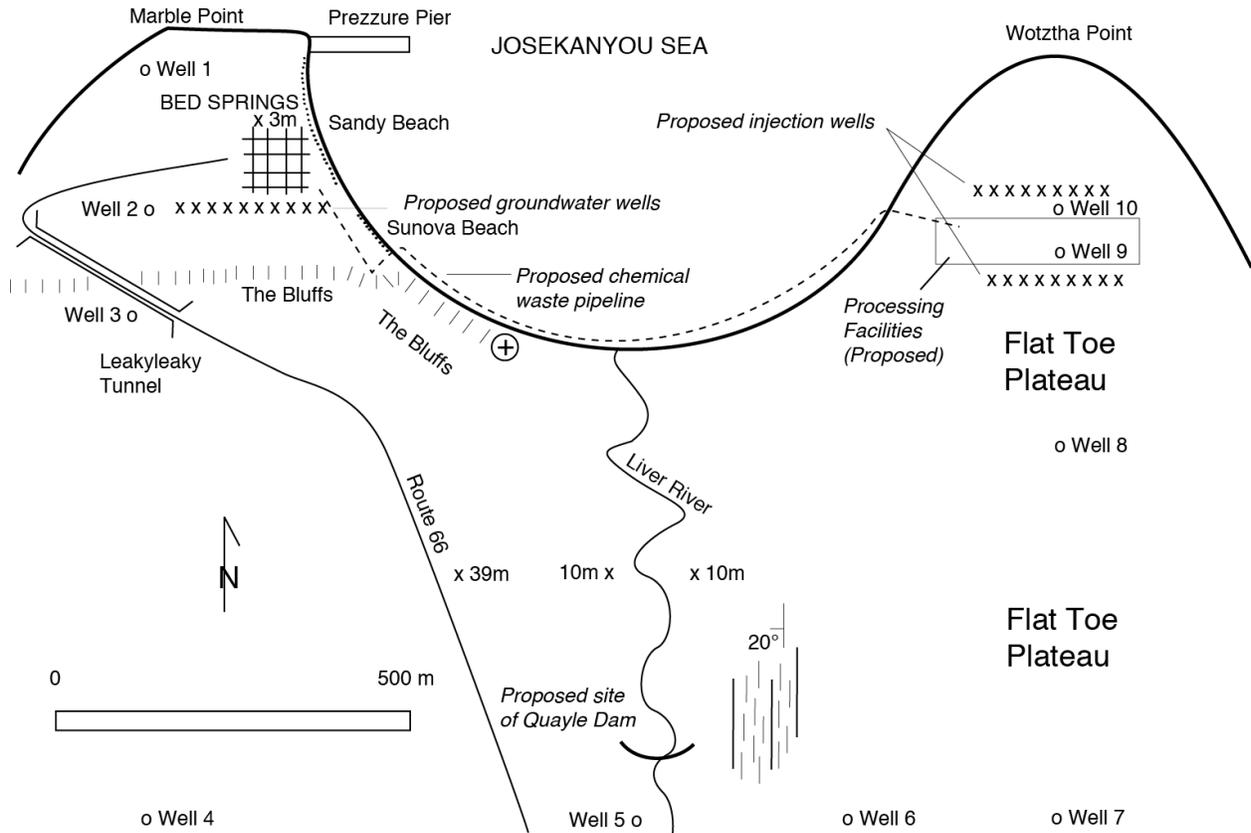
The mayor is about to leave when you notice the facility labeled "Proposed injection wells." She says, "That is where the Unforgiven Nasty Waste Injection Site Experiment was done." The mayor has discussed this with another friend of hers, Clint Westwood. "Clint says that the site has a series of deep injection wells that will be used to inject toxic aqueous chemicals deep underground. It will keep the stuff out of the two aquifers we plan to use if we go for the groundwater wells. The wells north of the site extend to 500 meters depth, and the ones on the south side extend to 300 meters depth."

In this project, provide your evidence for your conclusions so that Mayor Korleone can defend the final position she takes as best she can, and indicate who in your firm is responsible for the different sections of your report.

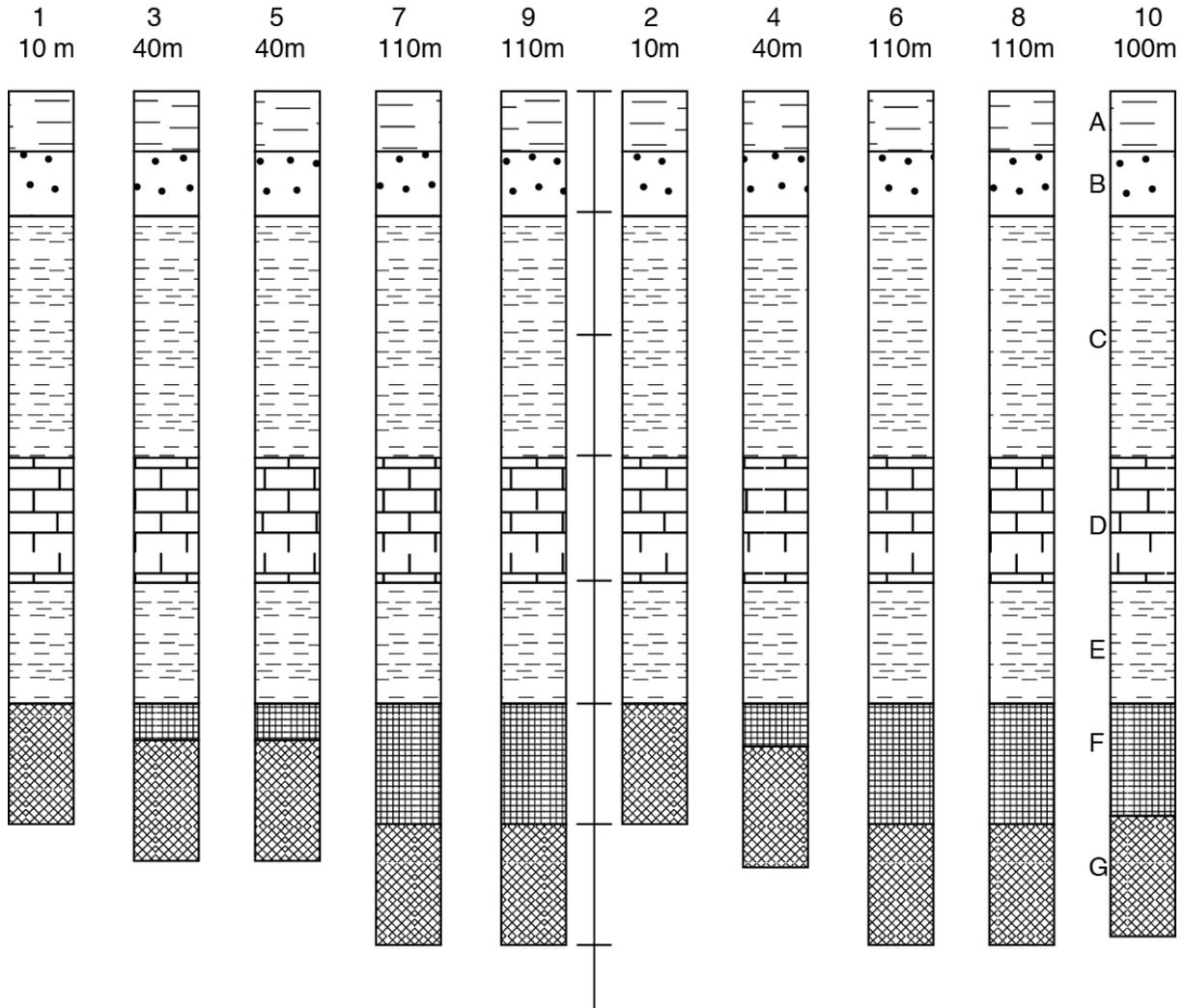
Possibly useful additional information obtained from drill cores

Limestone and sandstone	Clays
$\rho_{\text{saturated}} = 2400 \text{ kg/m}^3$	$\rho_{\text{saturated}} = 2200 \text{ kg/m}^3$
$\rho_{\text{unsaturated}} = 2168 \text{ kg/m}^3$	$\rho_{\text{unsaturated}} = 1867 \text{ kg/m}^3$
$e_0 = \text{initial void ratio} = 0.25$	$e_0 = \text{initial void ratio} = 0.50$
$k = \text{hydraulic conductivity} = 1 \times 10^{-6} \text{ m/sec}$	$k = \text{hydraulic conductivity} = 6 \times 10^{-9} \text{ m/sec}$
$m_v = \text{coeff. of volume change}$ Unavailable	$m_v = \text{coeff. of volume change}$ $= 3.4 \times 10^{-7} \text{ Pa}^{-1}$

MAP OF THE BEDSPRINGS ENVIRONS  
BY HAROLD HAZARD, 1992



DRILL LOGS FOR WELLS IN THE BED SPRINGS AREA  
(COURTESY OF JOE, LEE & PITT)



Logger's Notes

- 1 Logs listed by even and odd well numbers
- 2 100% recovery of core
- 3 All units are horizontal where intersected by boreholes
- 4 Elevation of ground surface is listed below well number
- 5 Description of units in well #10:
  - A Clay. Late Pleistocene based on fossil snails at top of unit.
  - B Sand.
  - C Clay. Black.
  - D Limestone. Vuggy.
  - E Clay. Brown.
  - F Sylvite. Very pale red.
  - G Anhydrite, gypsum, and halite
- 6 All wells intersect the water table 5m below the ground surface.

Vertical Scale

