Class I Wells

EPA Region 6
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UIC Land Ban Coordinator
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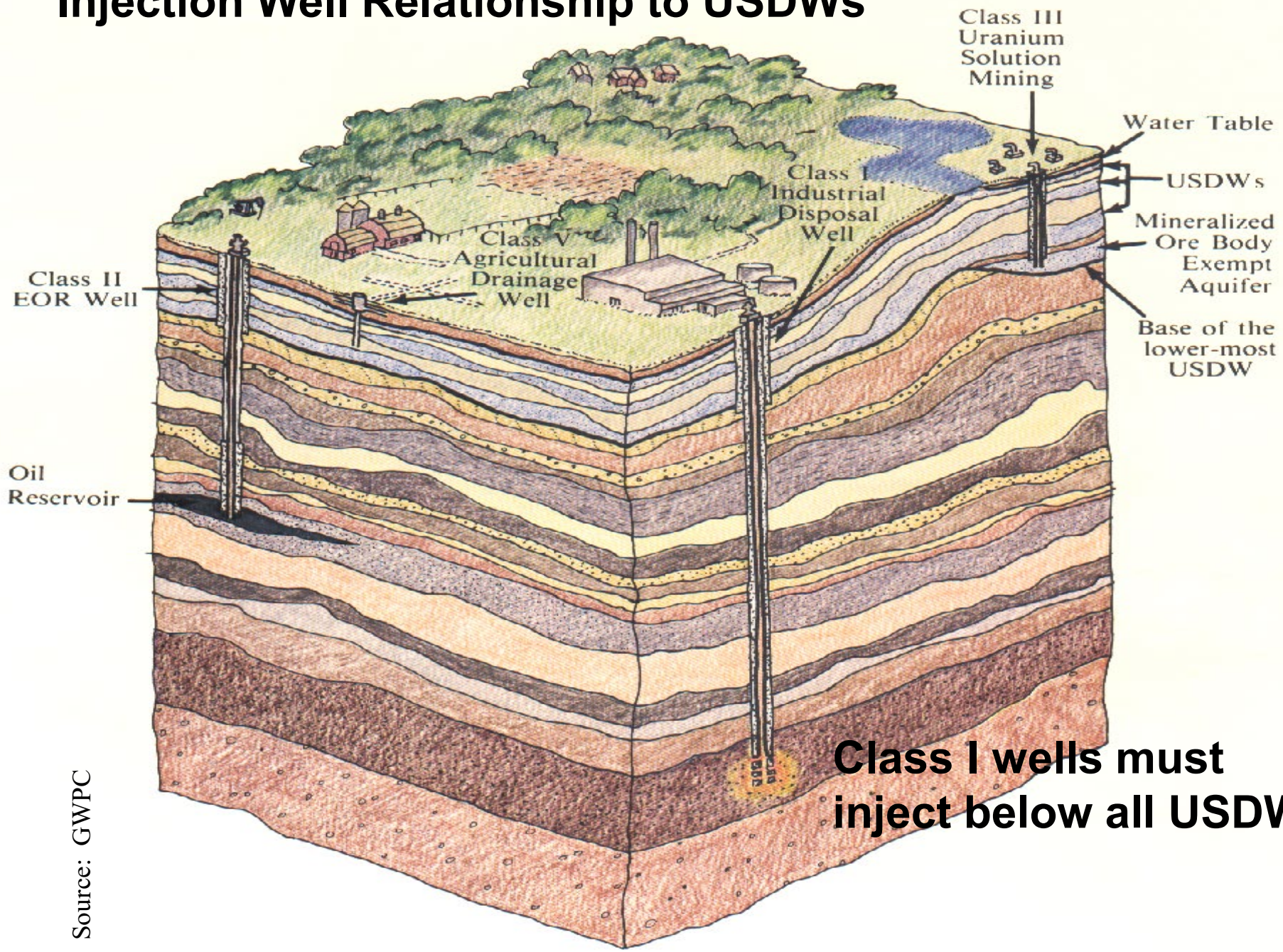
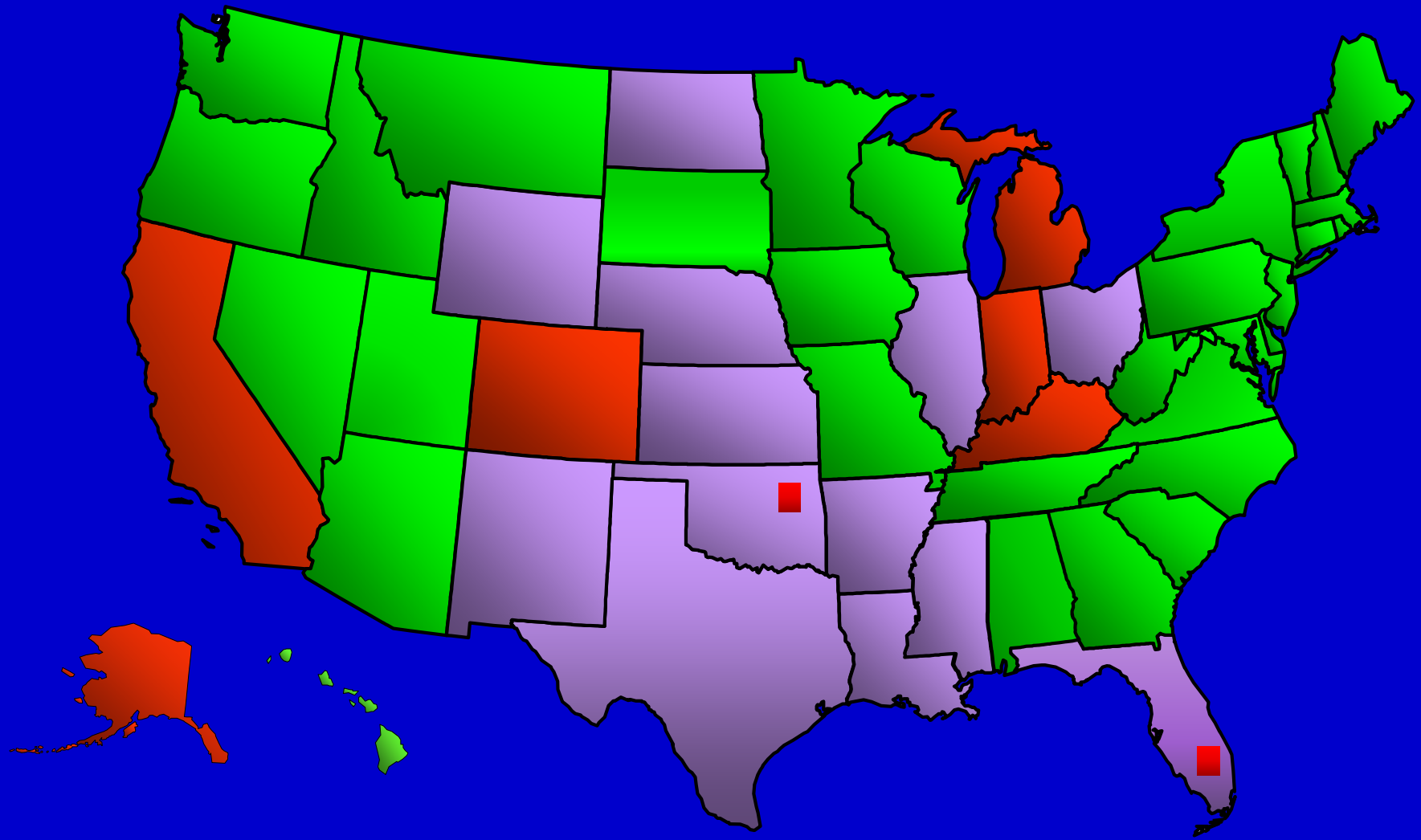
Injection Well Relationship to USDWs



Class I wells must inject below all USDWs

Source: GWPC

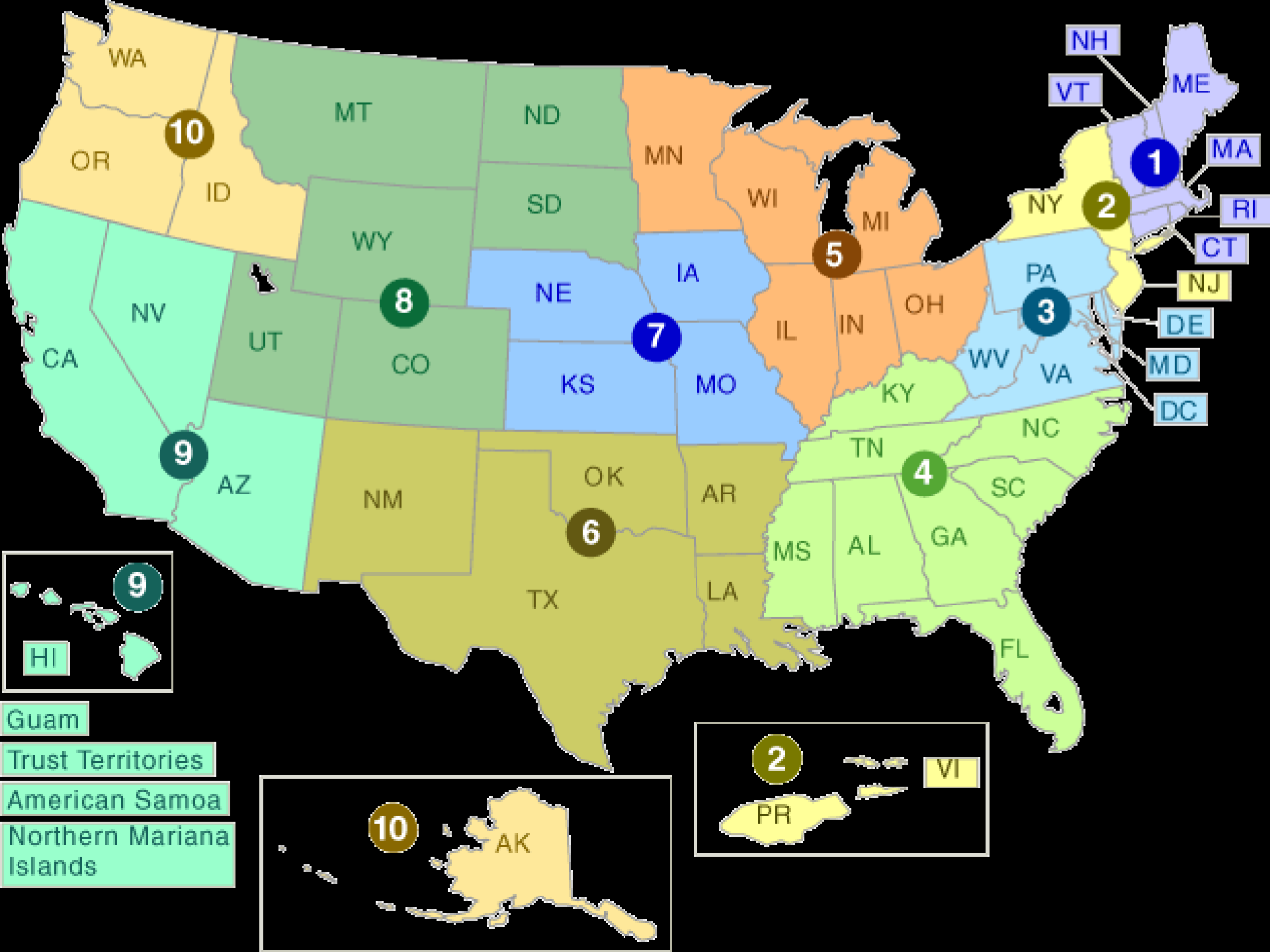
States With Class I Injection Wells



Primacy States with Class I Injection Wells

Direct Implementation States with Class I Injection Wells

States with No Class I Injection Wells


WA
OR
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MT
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NV
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IL
IN
OH
NY
2
PA
3
WV
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KY
TN
NC
4
SC
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AL
GA
FL
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1
MA
RI
CT
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DC
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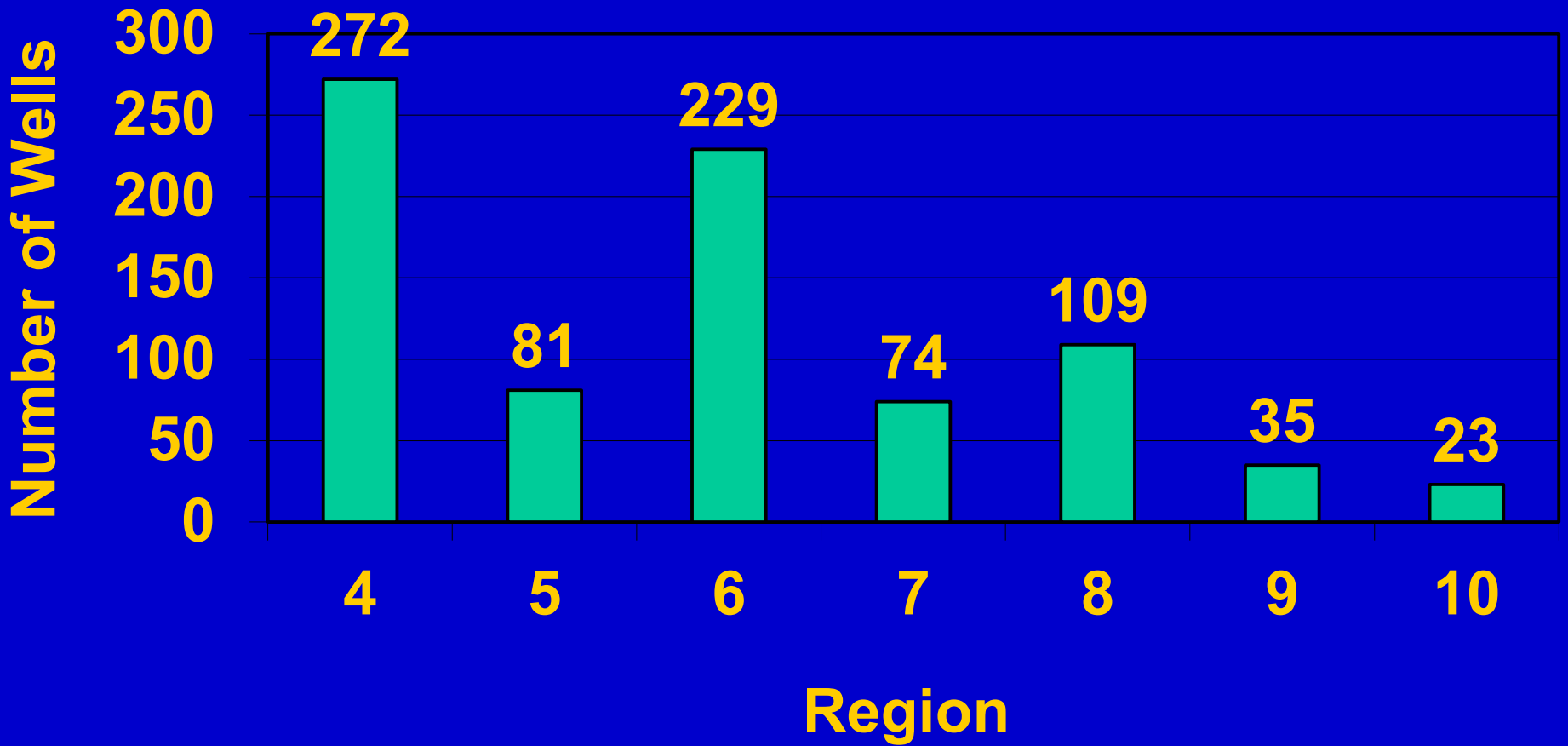
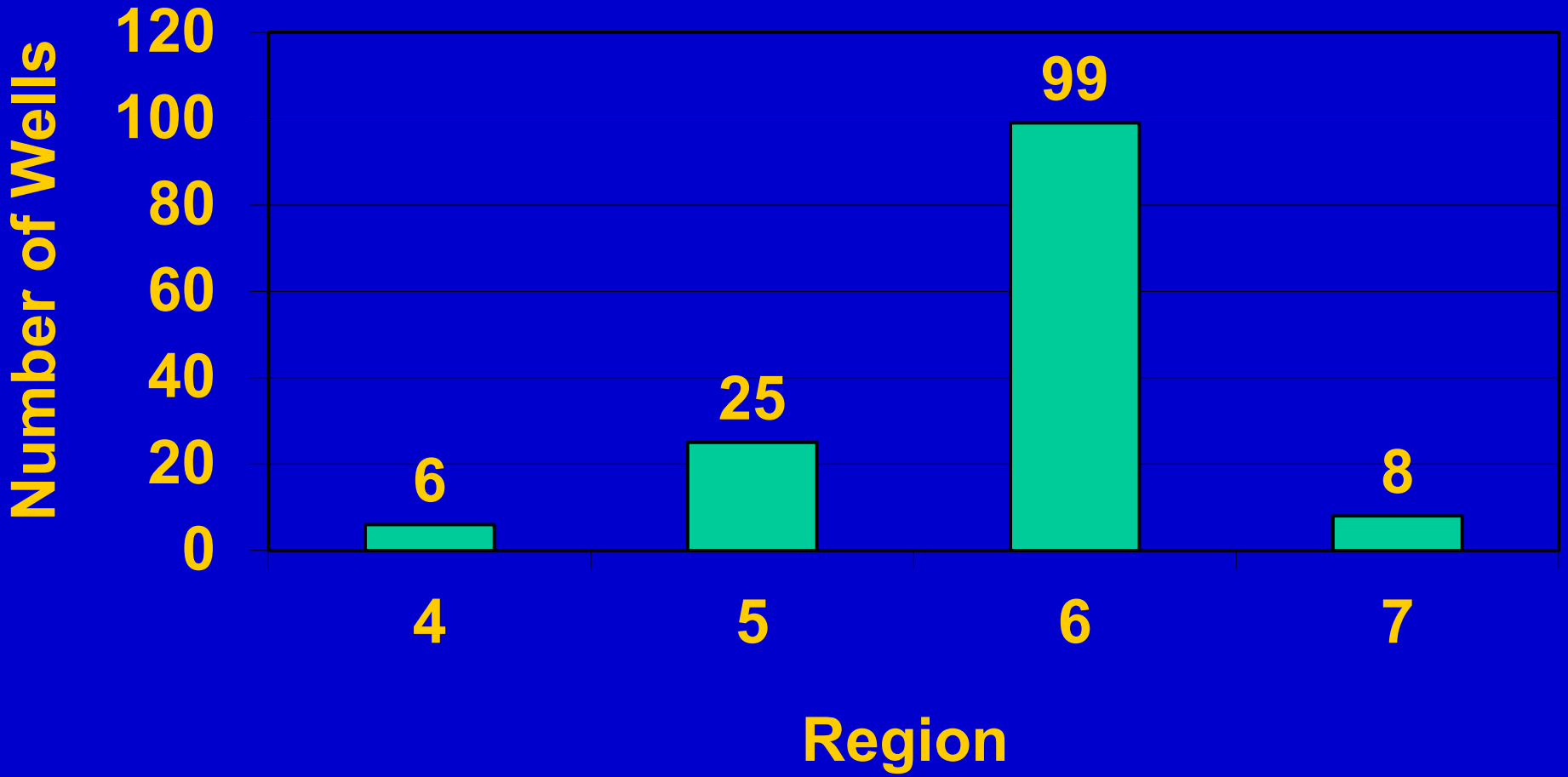
HI
Guam
Trust Territories
American Samoa
Northern Mariana Islands
10
AK
2
PR
VI

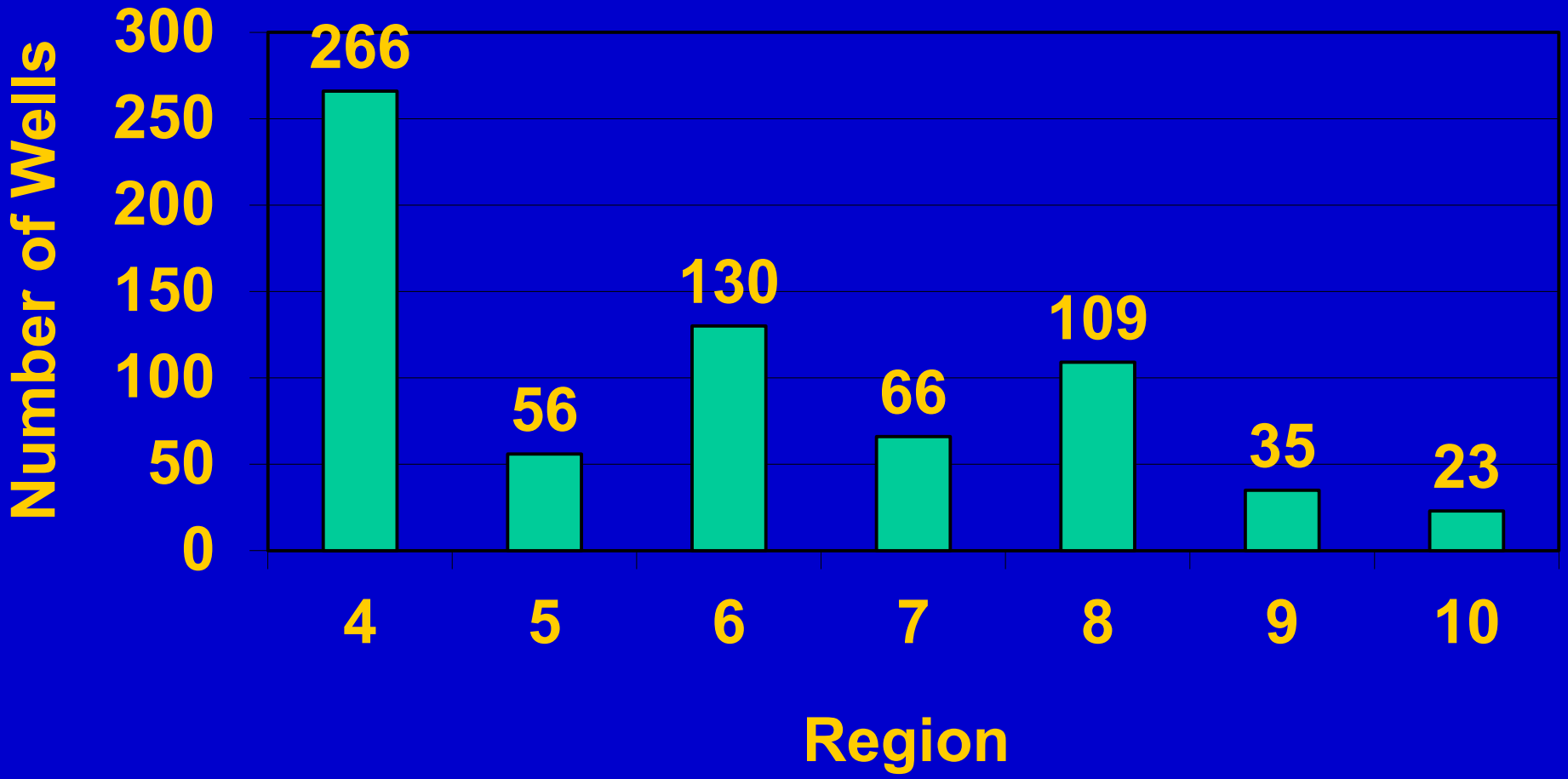
Class I Wells



Class I Hazardous Wells



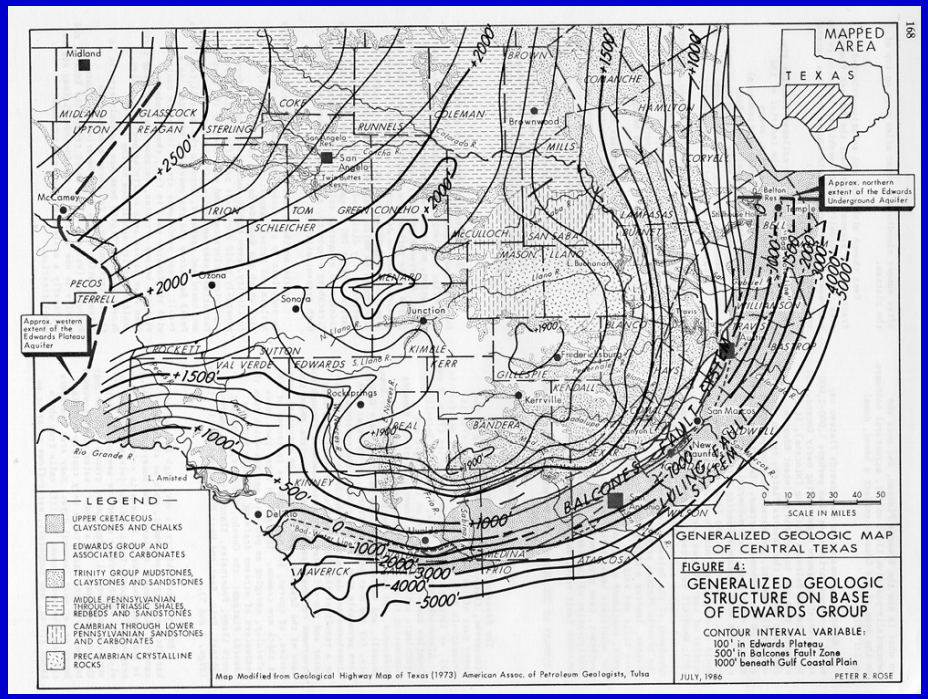
Class I Nonhazardous Wells

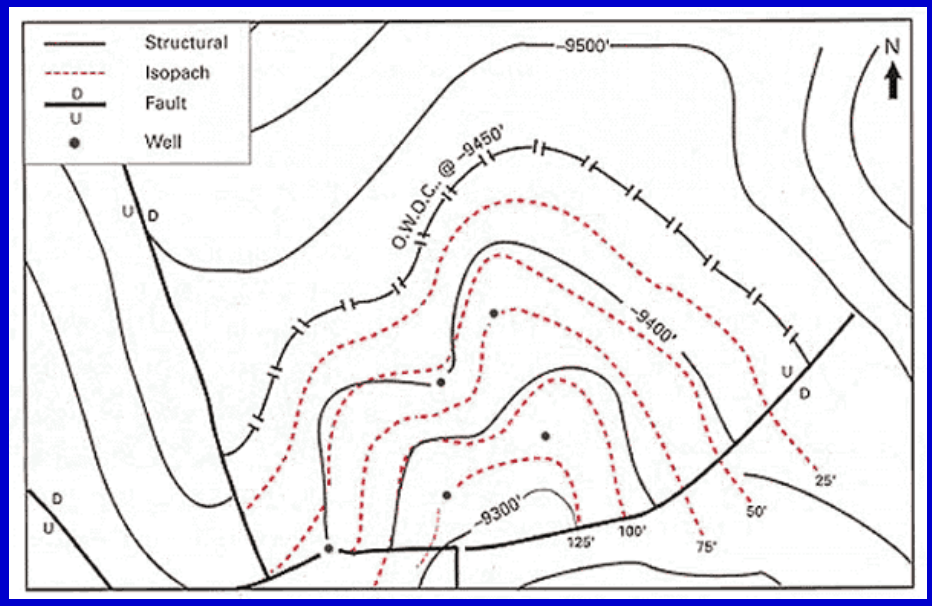


Class I Well Siting

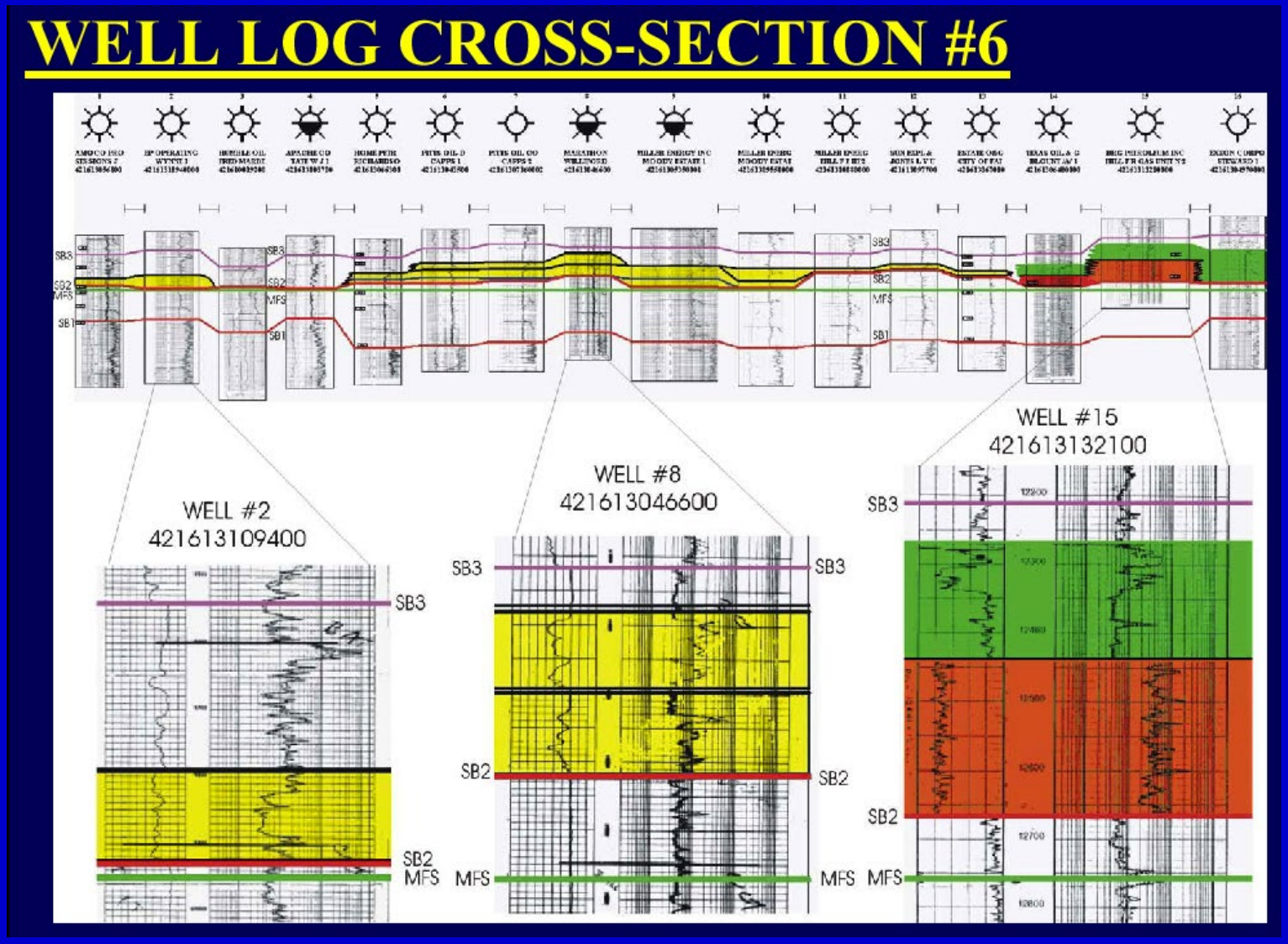
- Just because a State or EPA has UIC regulations a Class I well can't be constructed everywhere in the U.S.
- A permit/petition reviewer must evaluate:
  - Geology
  - Injection zone/interval properties
  - Area of review
  - Seismic activity (hazardous wells)

Geologic Maps

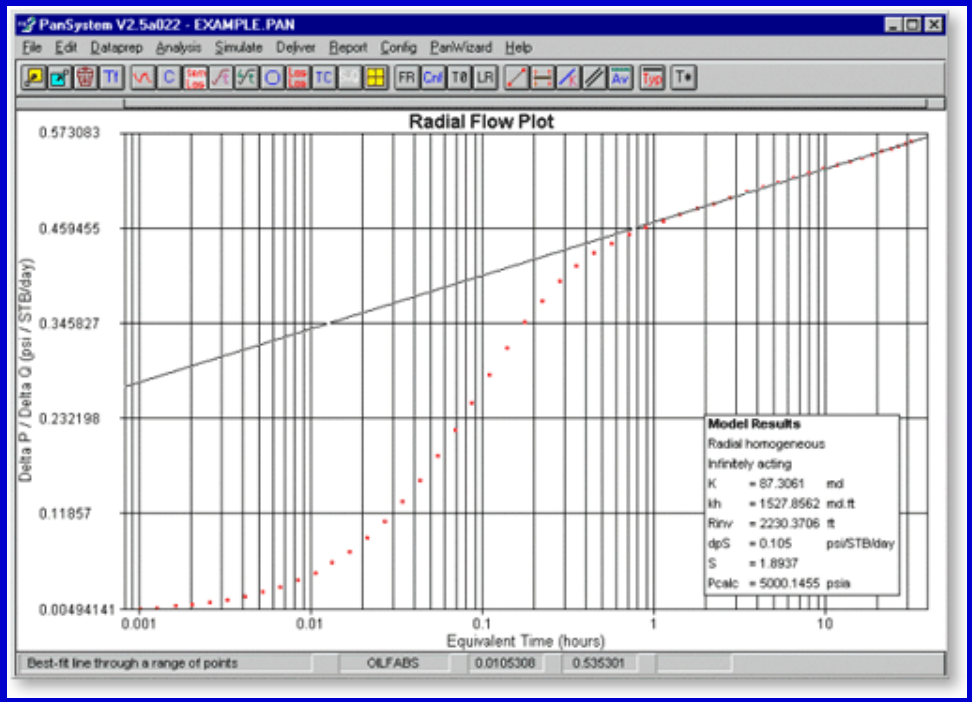




Injection Zone/Interval

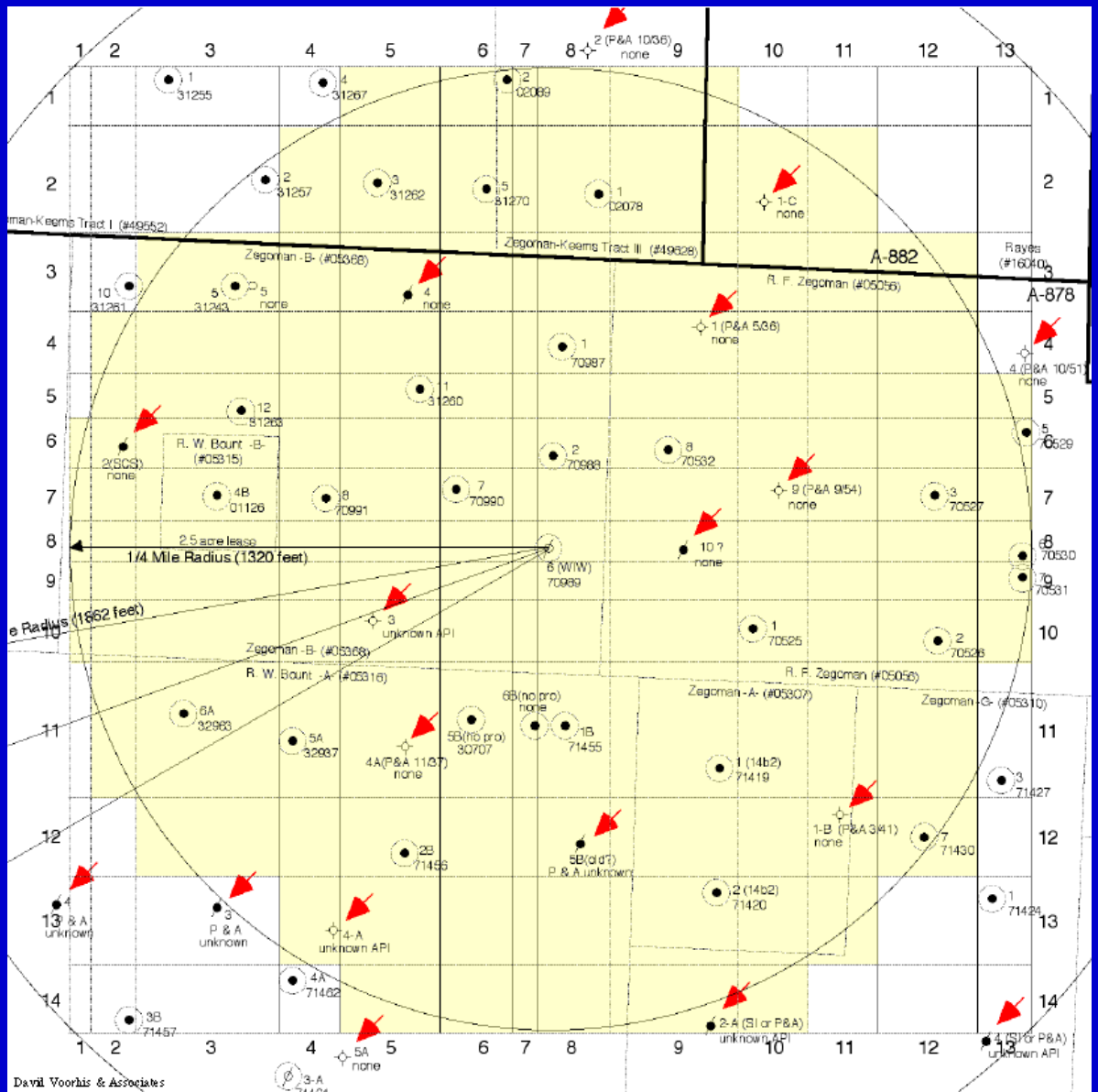


Injection Reservoir Properties

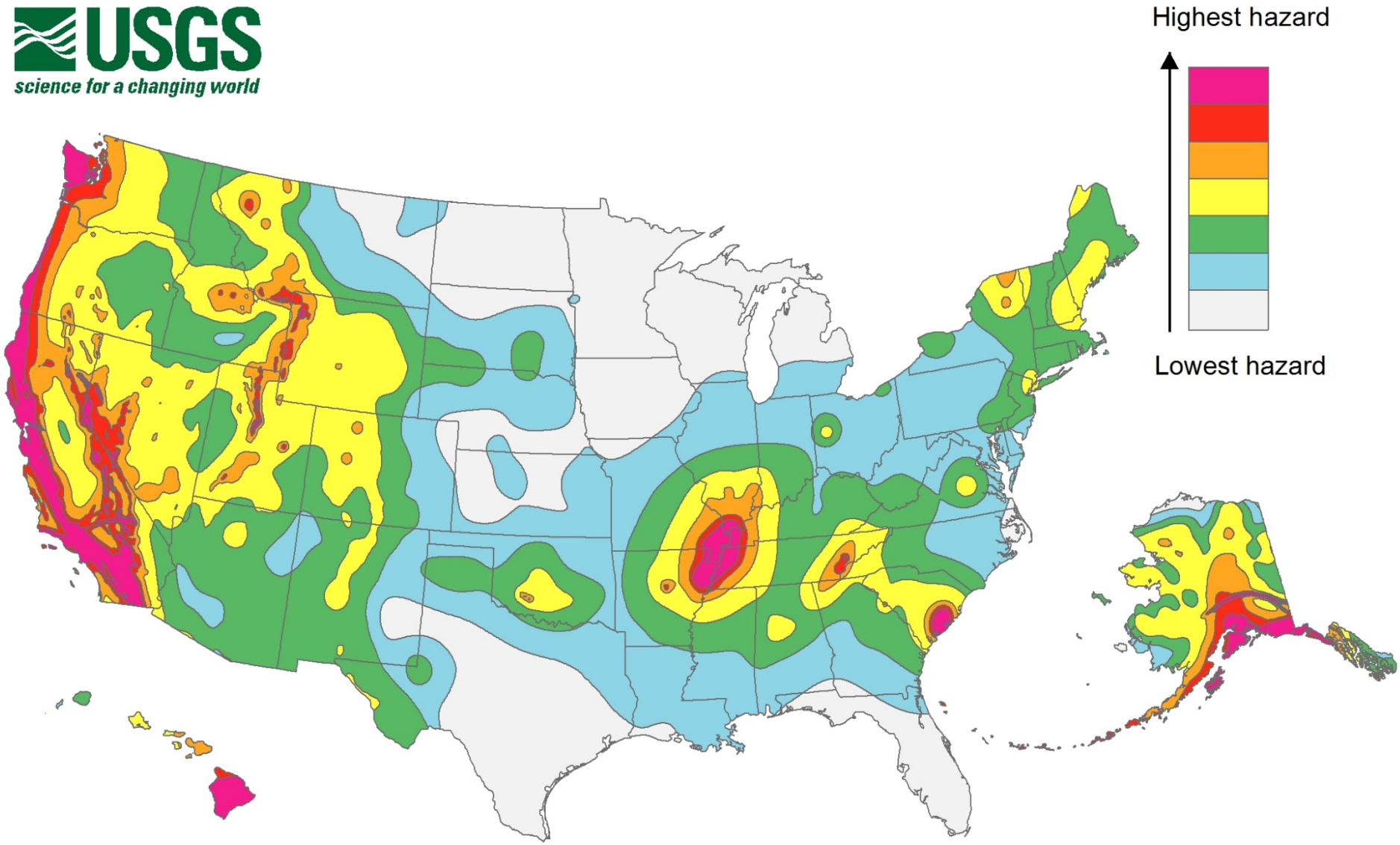


Well Cores in Aluminum Core Barrel

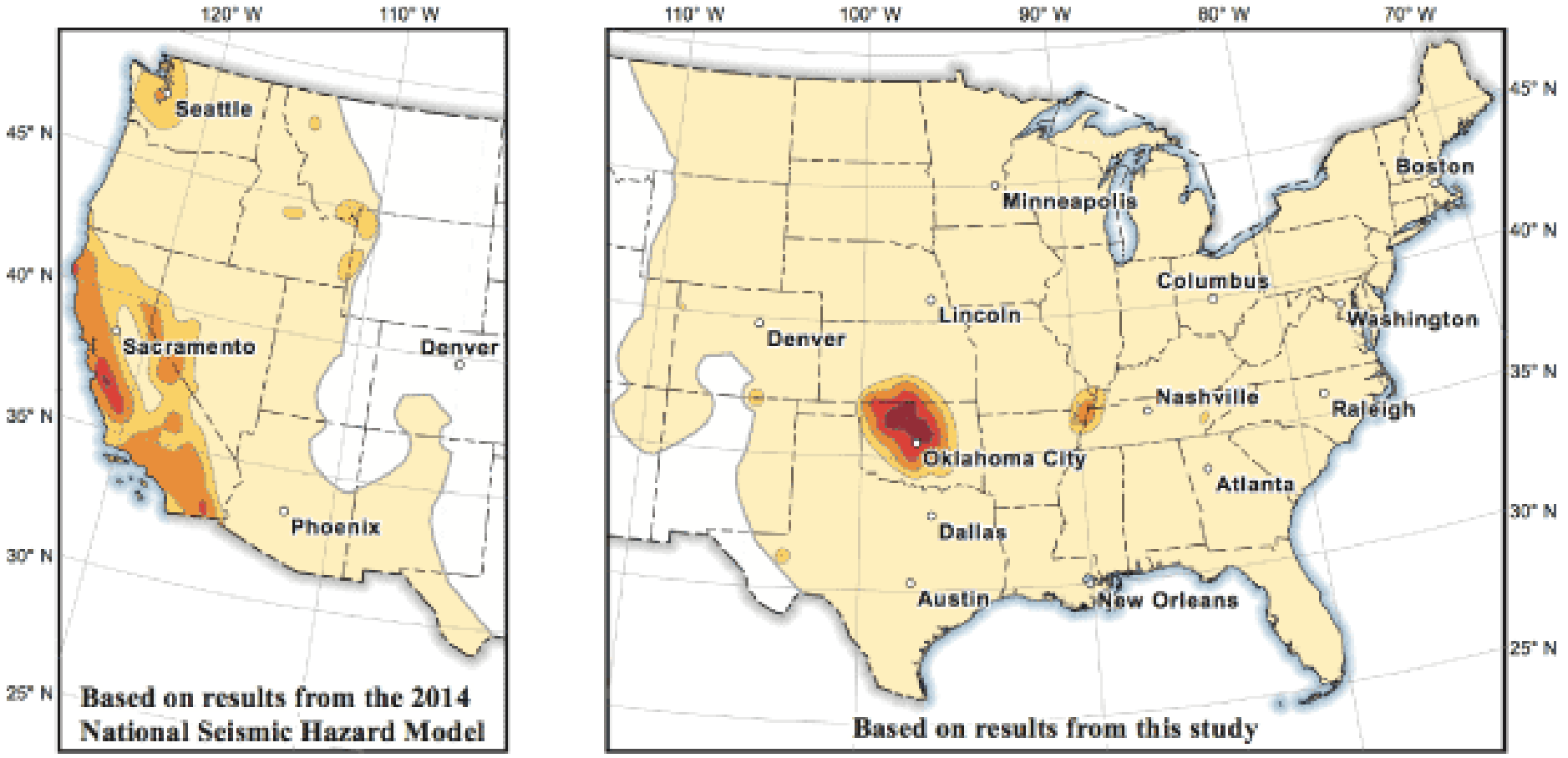
Area of Review



Seismic Hazards Map



USGS 2018 Earthquake Map Including Induced Seismicity



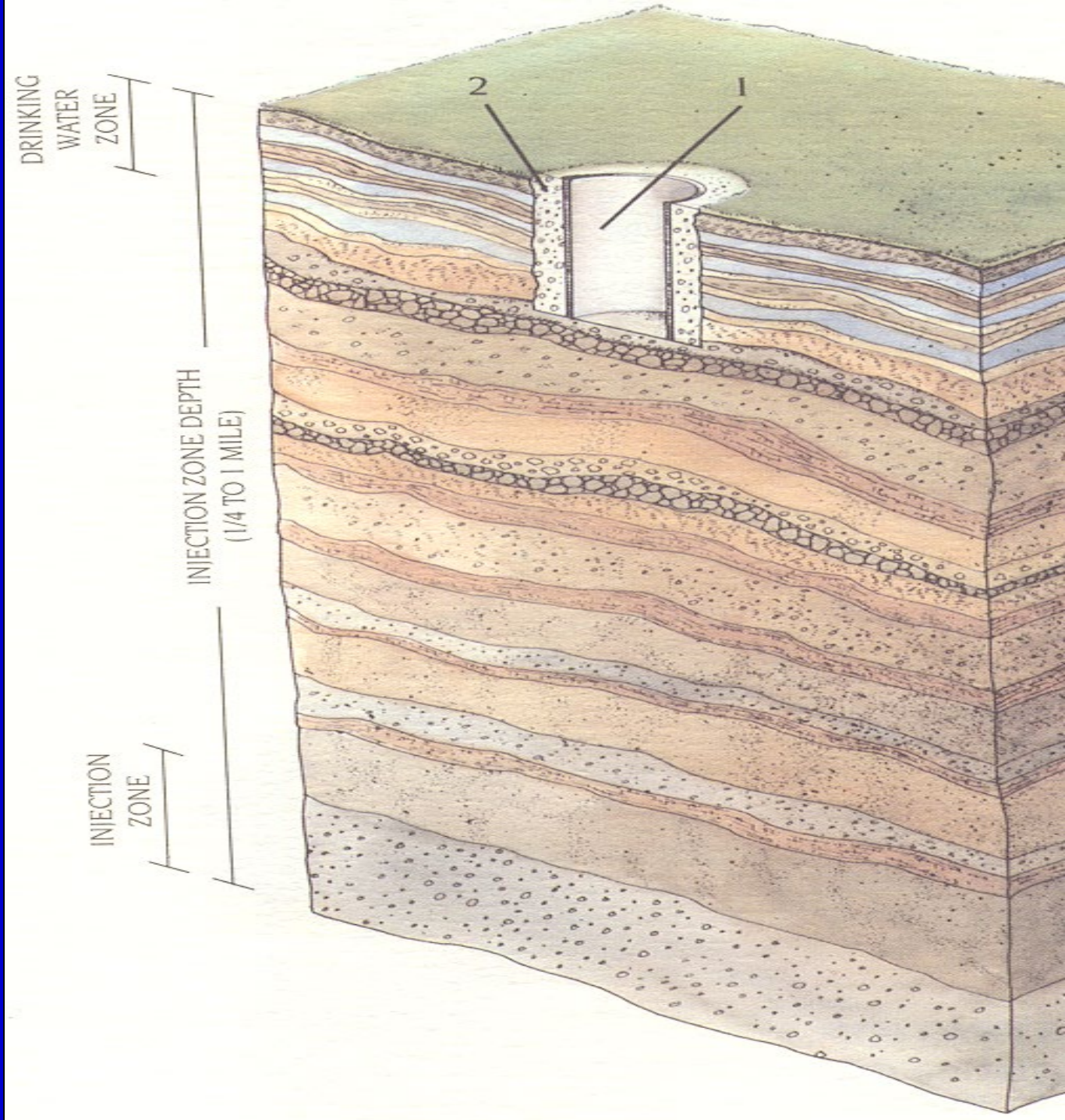
Chance of potentially minor-damage* ground shaking in 2018

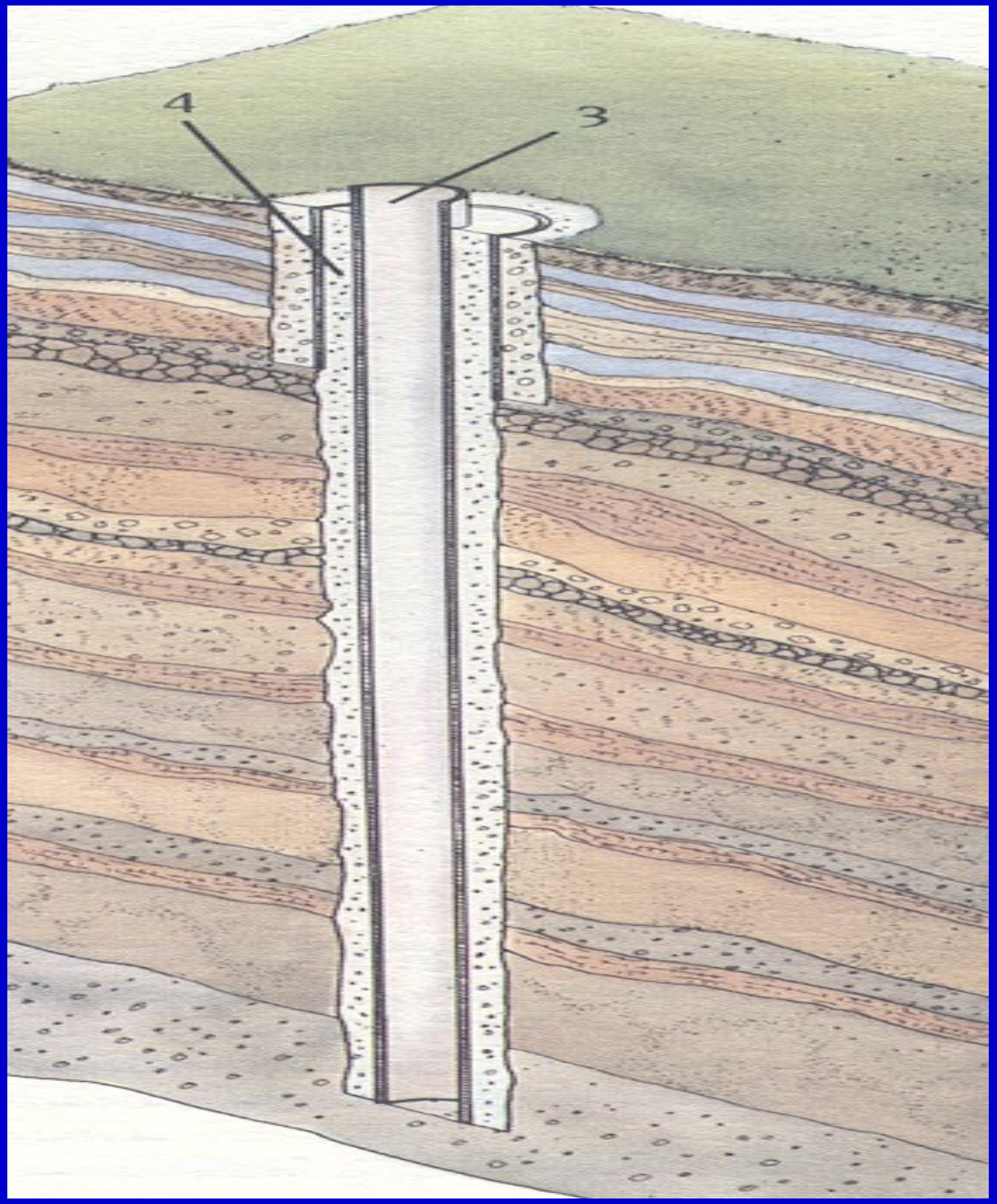
<1%	1% – 2%	2% – 5%	5% – 10%	10% – 14%

* equivalent to Modified Mercalli Intensity VI, which is defined as: "Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight."

Injection Well Technology

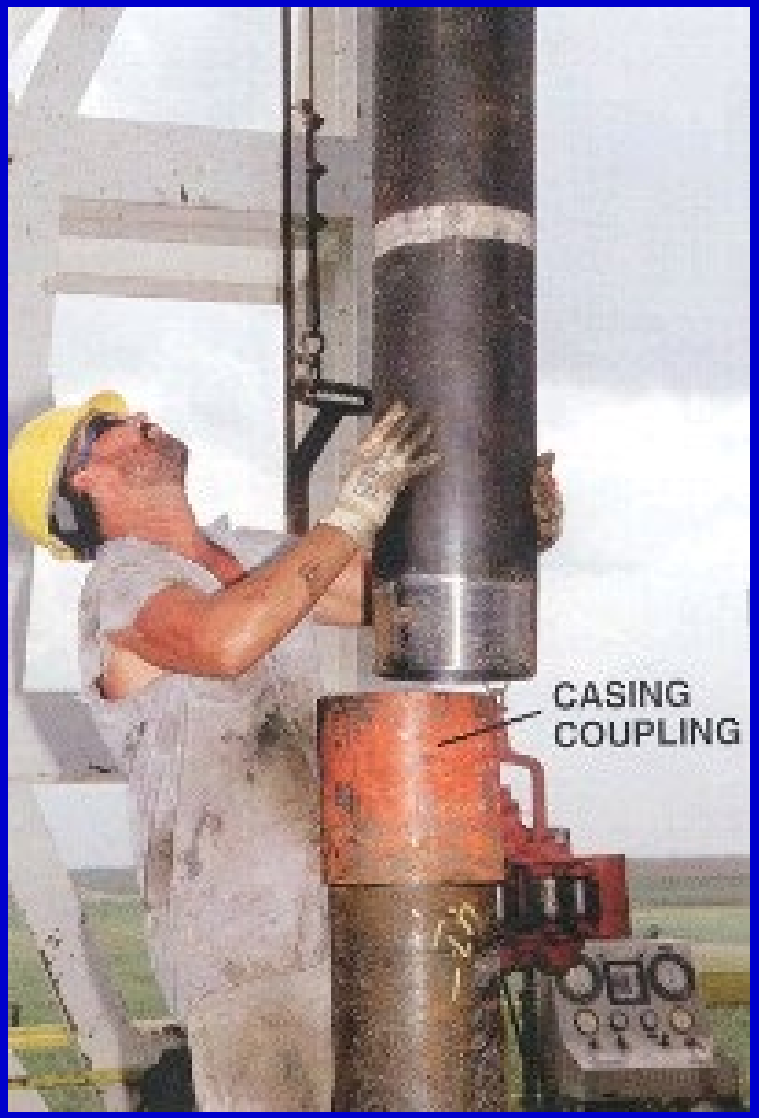
1st Step: Surface Casing





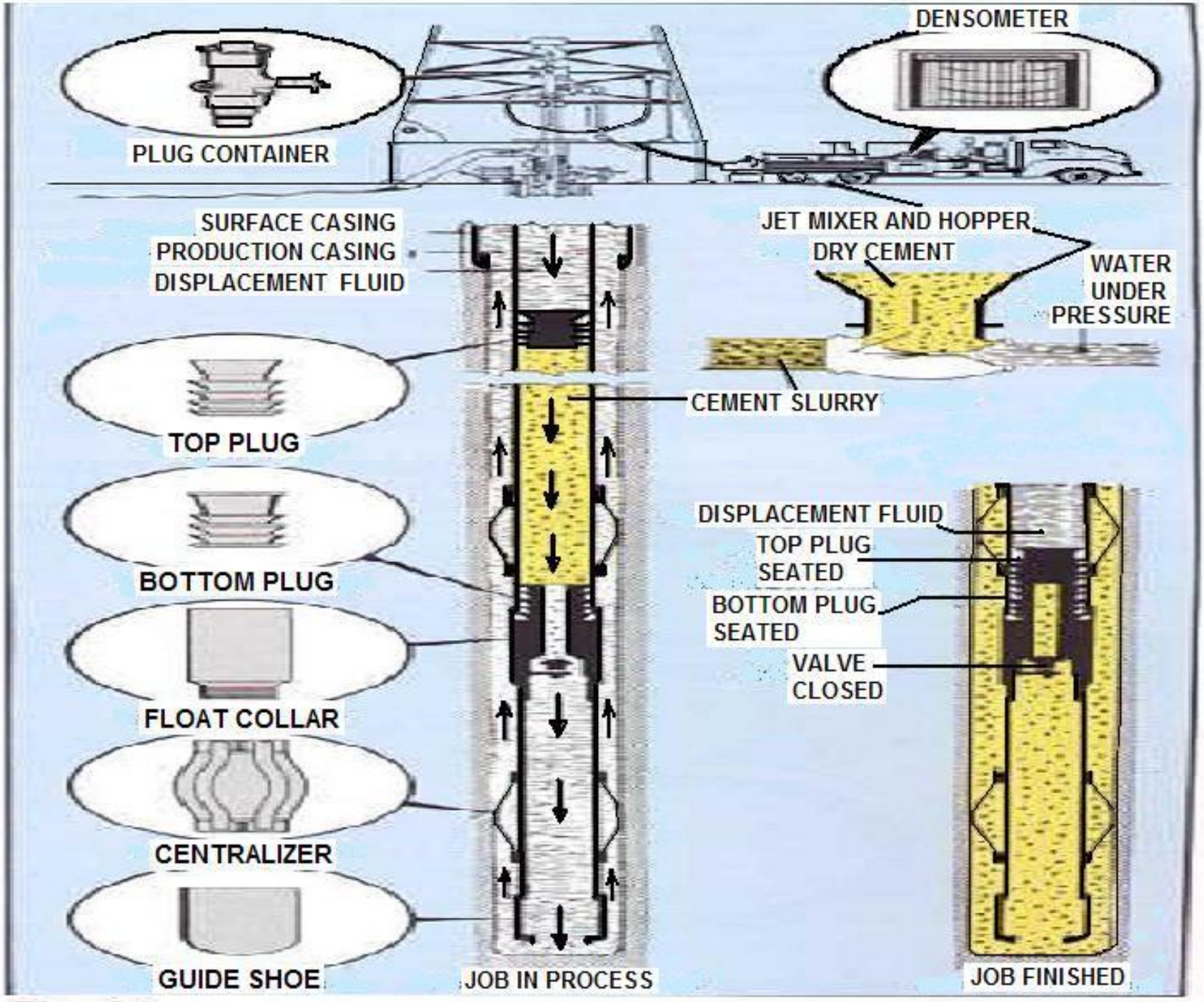
2nd Step: Long-String Casing

Installing Casing

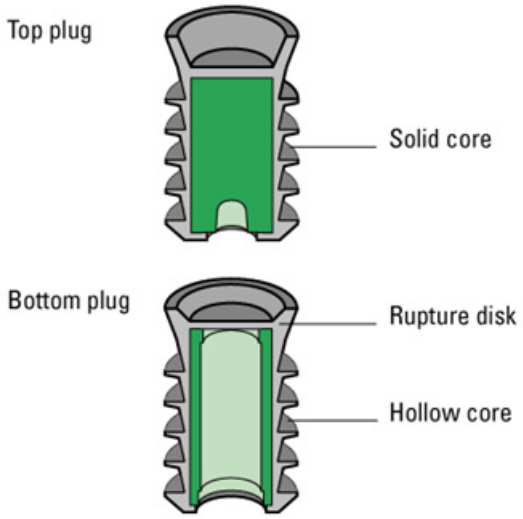


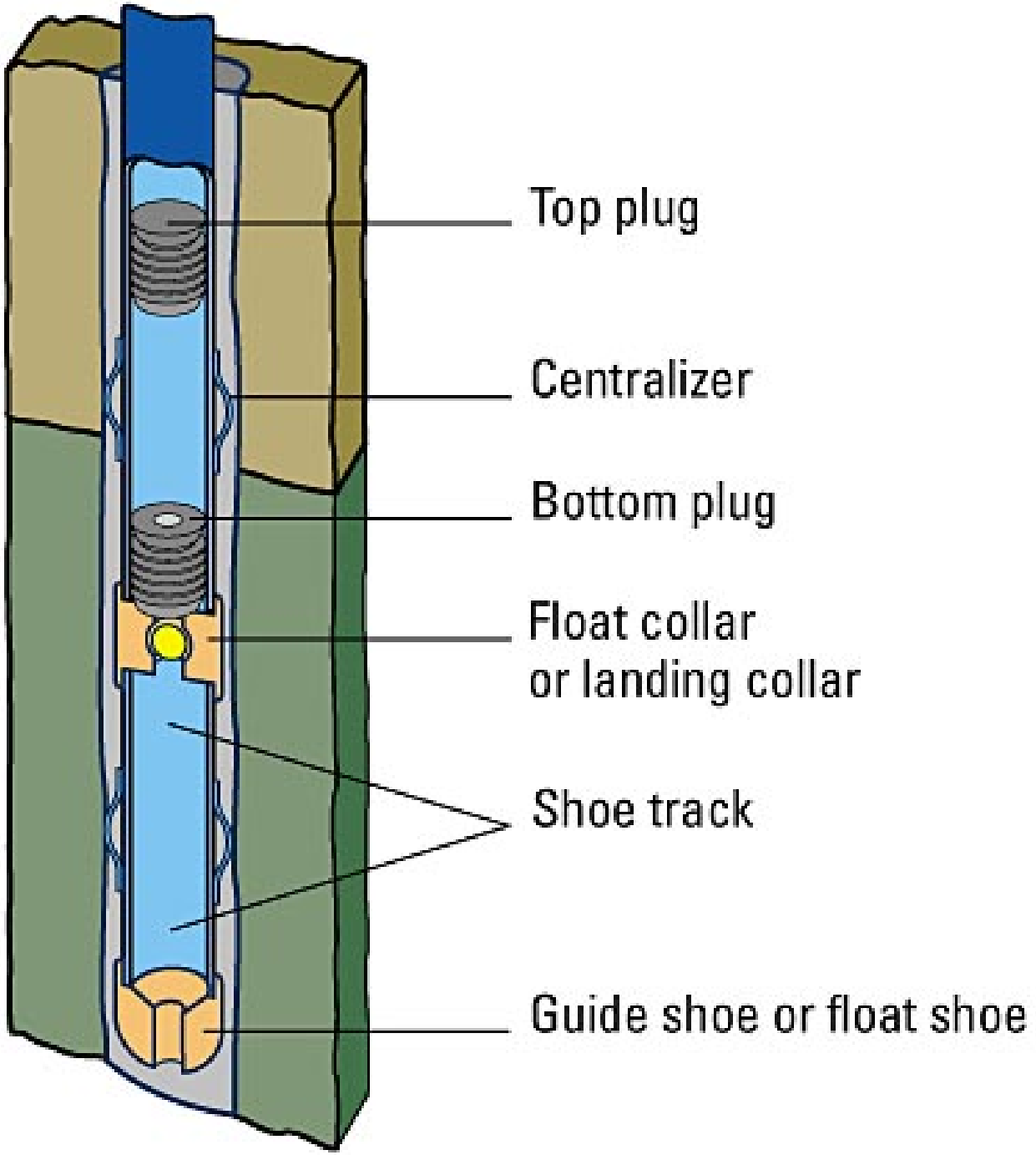
Casing with Centralizer

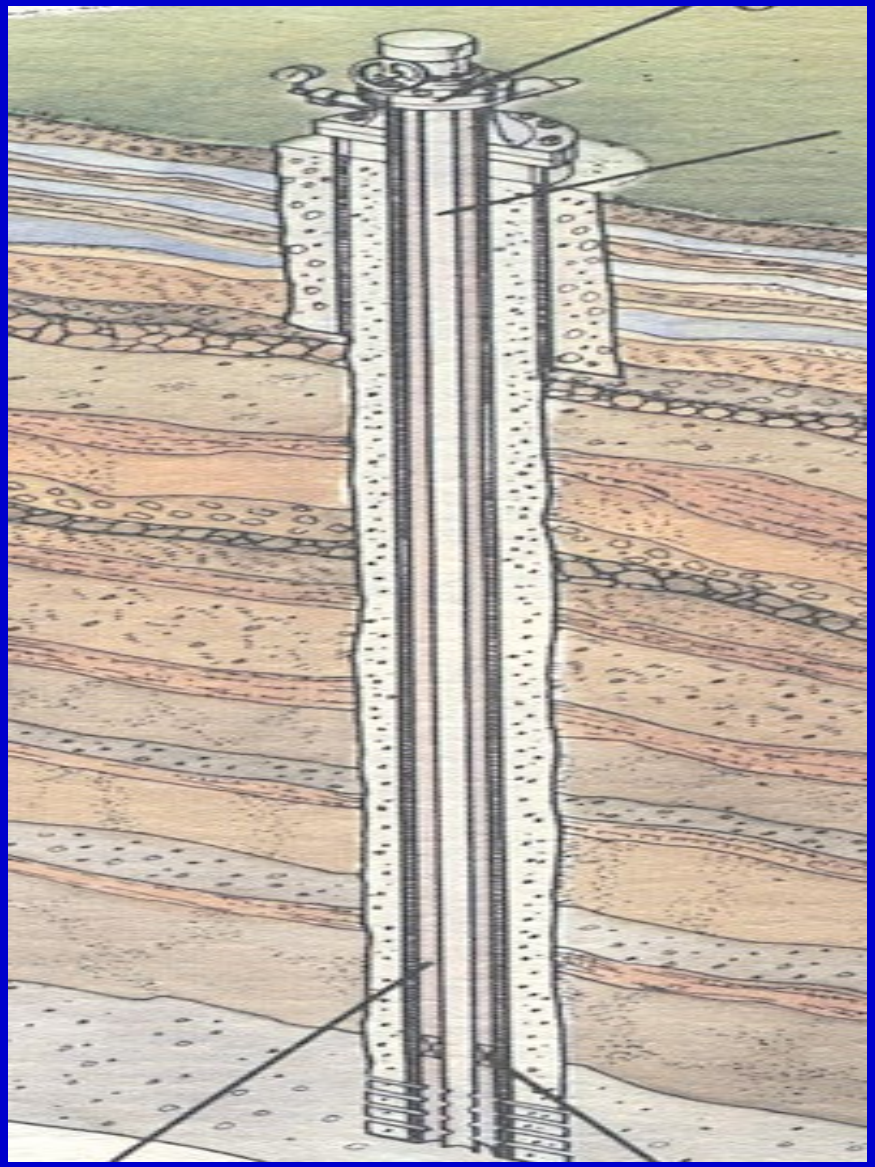
Cementing Operation


DENSOMETER
PLUG CONTAINER
SURFACE CASING
PRODUCTION CASING
DISPLACEMENT FLUID
JET MIXER AND HOPPER
DRY CEMENT
WATER UNDER PRESSURE
CEMENT SLURRY
TOP PLUG
BOTTOM PLUG
FLOAT COLLAR
CENTRALIZER
GUIDE SHOE
JOB IN PROCESS
DISPLACEMENT FLUID
TOP PLUG SEATED
BOTTOM PLUG SEATED
VALVE CLOSED
JOB FINISHED

Casing Cementing Operations





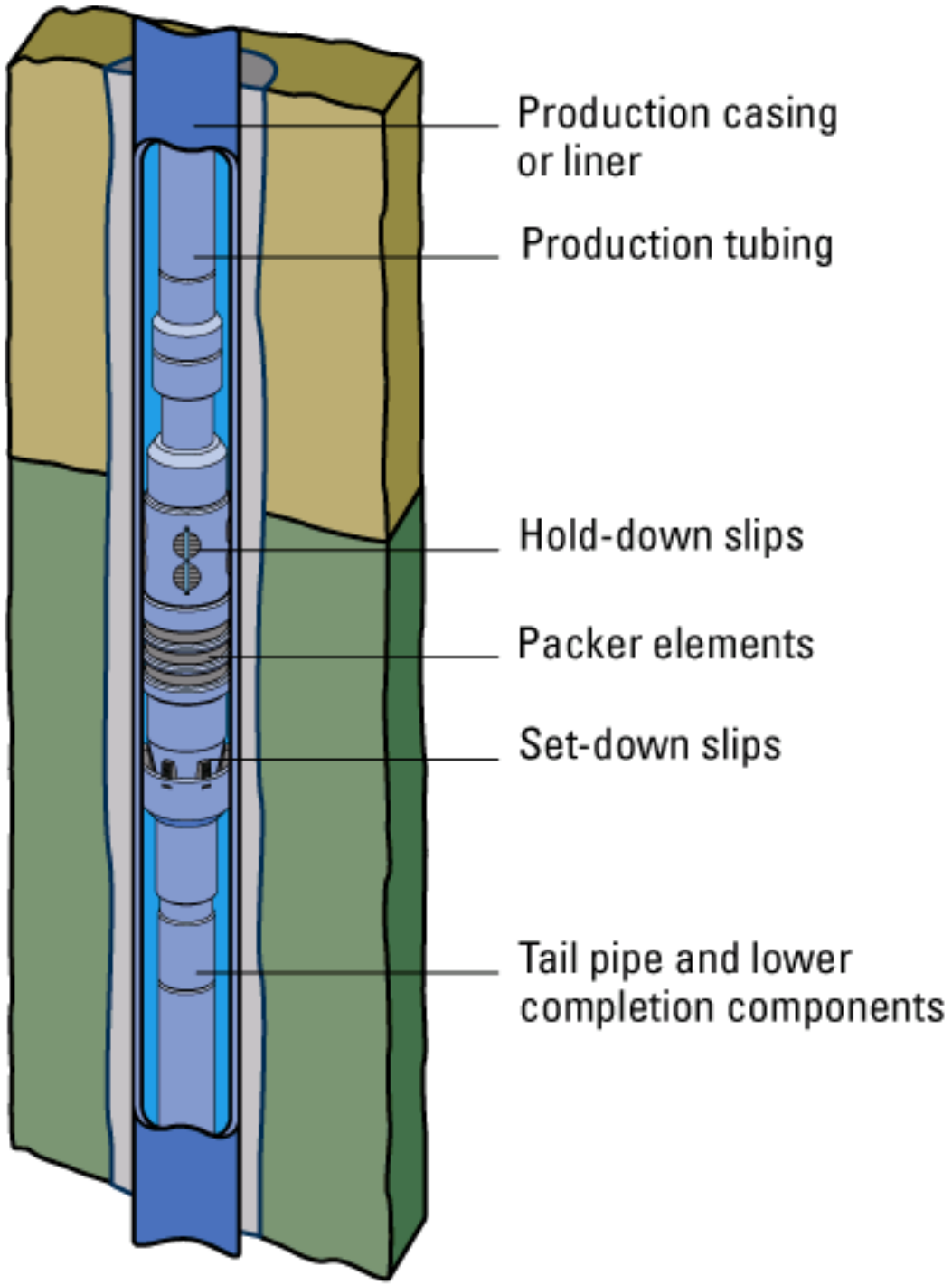


3rd Step: Tubing and Packer

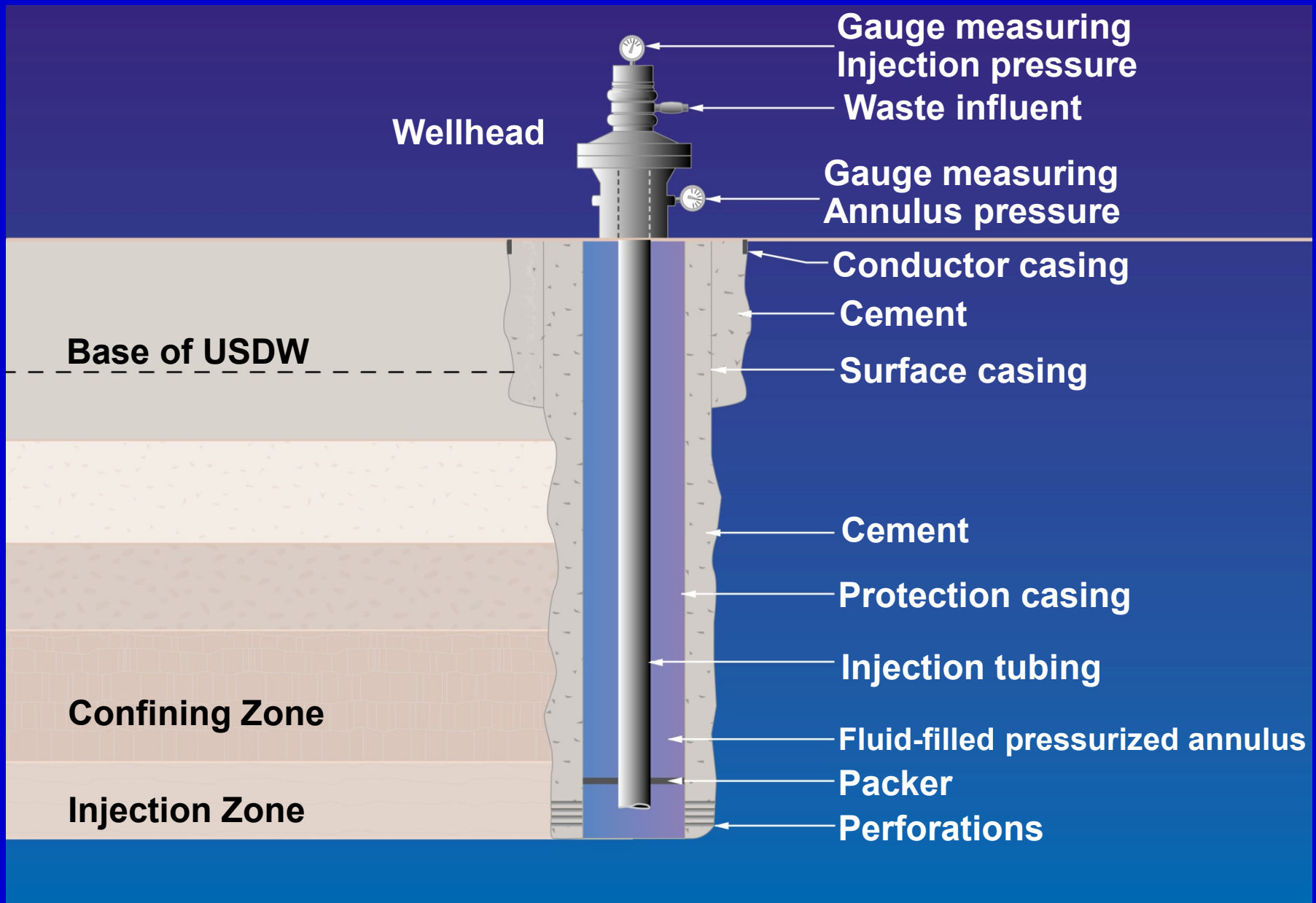
Tubing and Packers

Running a Packer

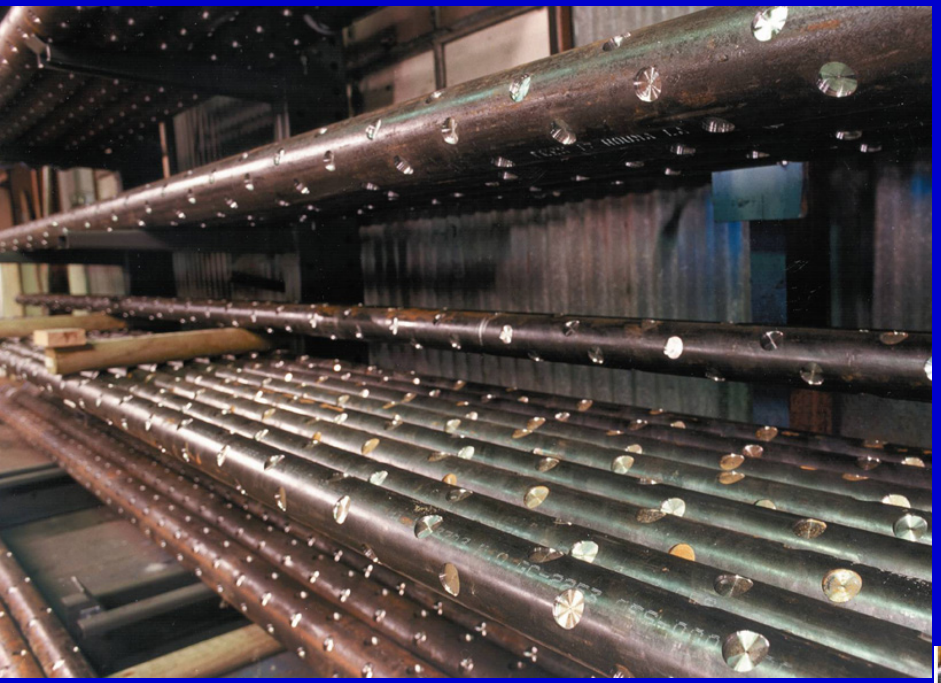
Packer Installed in Casing

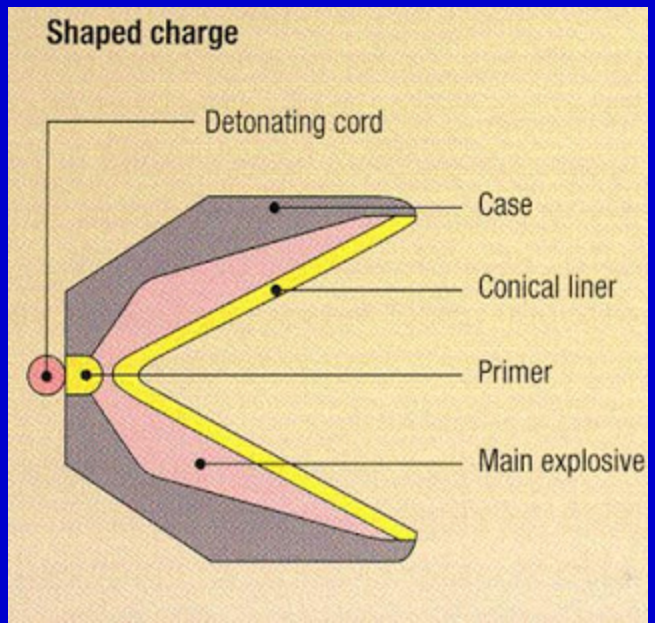


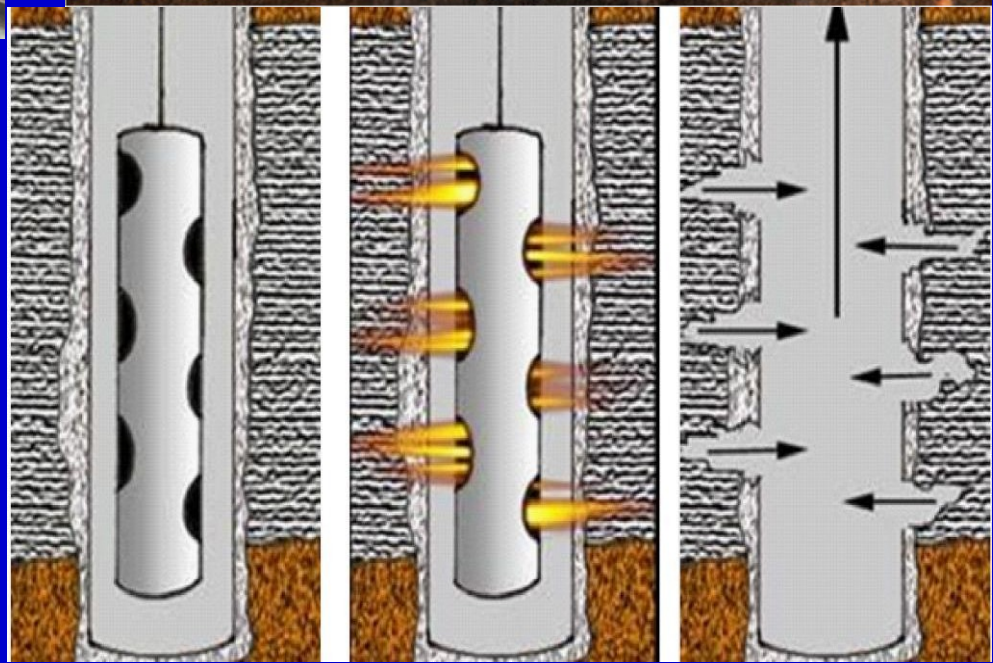
Class I Well Construction



Perforating

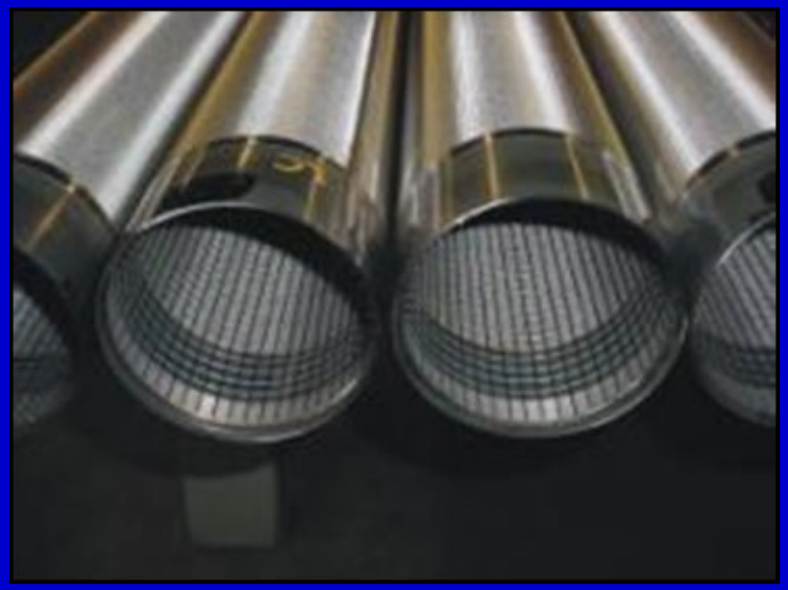


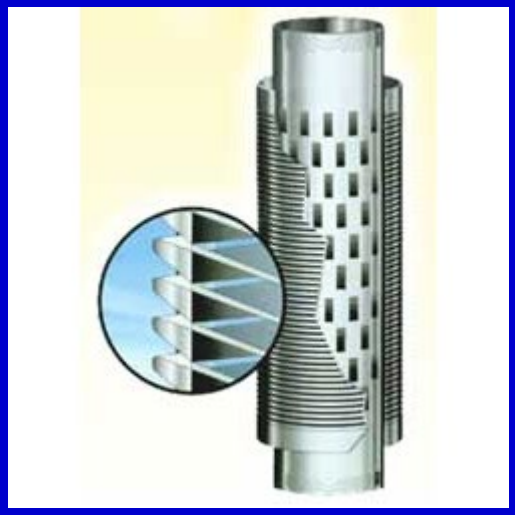


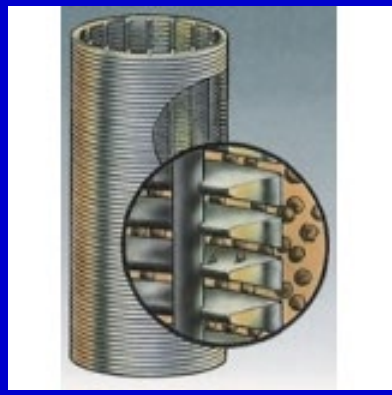


Running a Well Screen

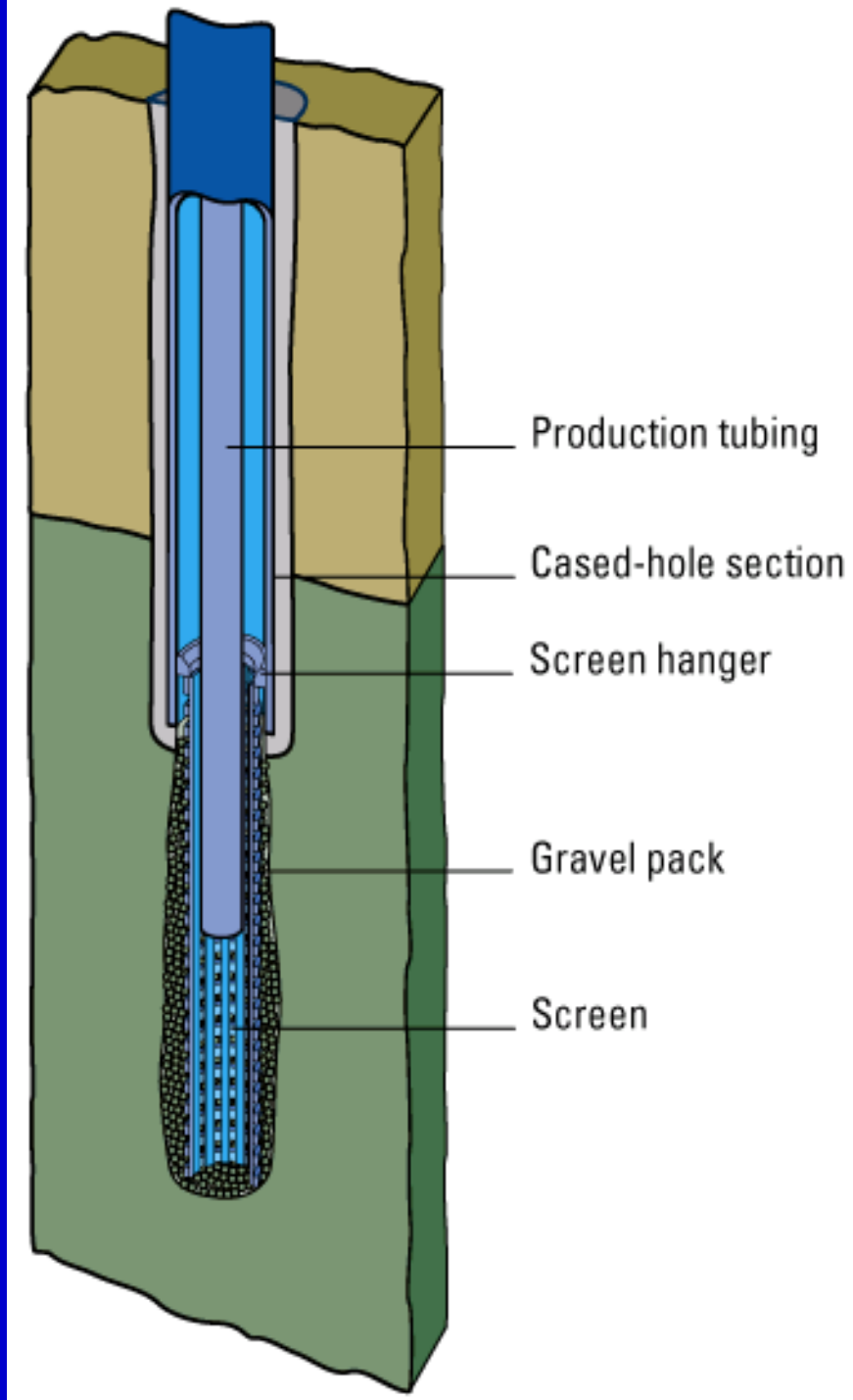
Well Screens

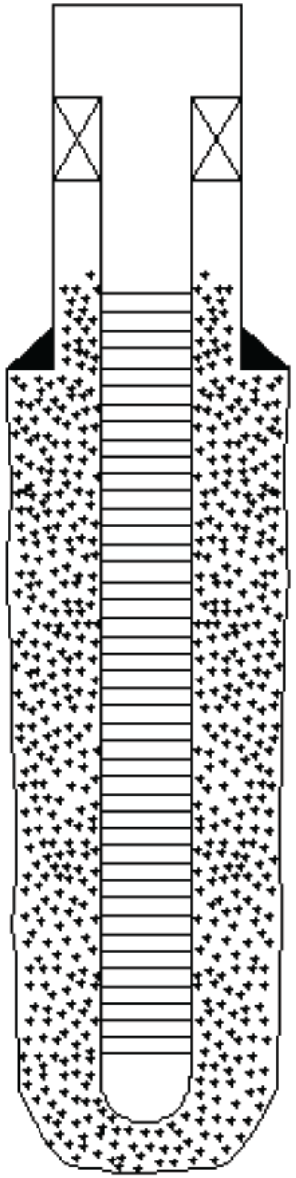




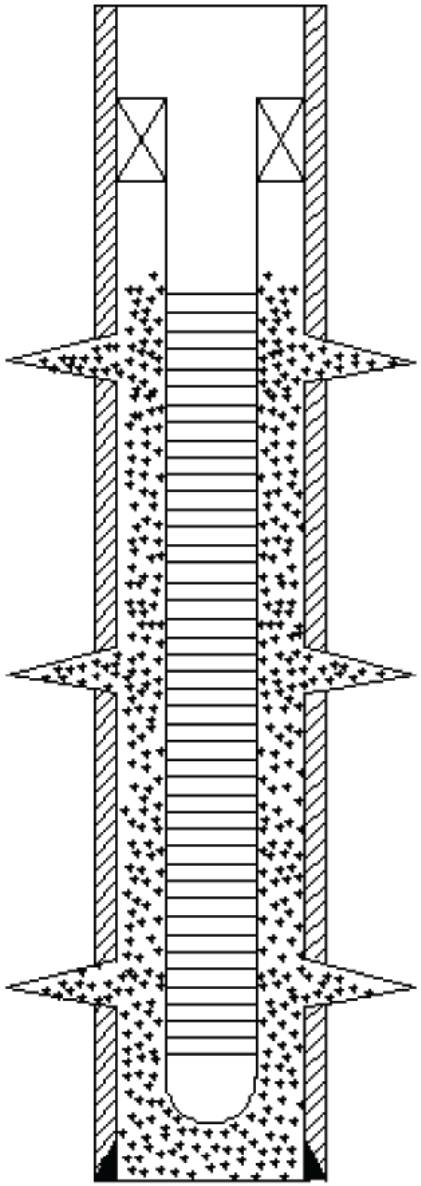


Screen and Gravel Pack Completion



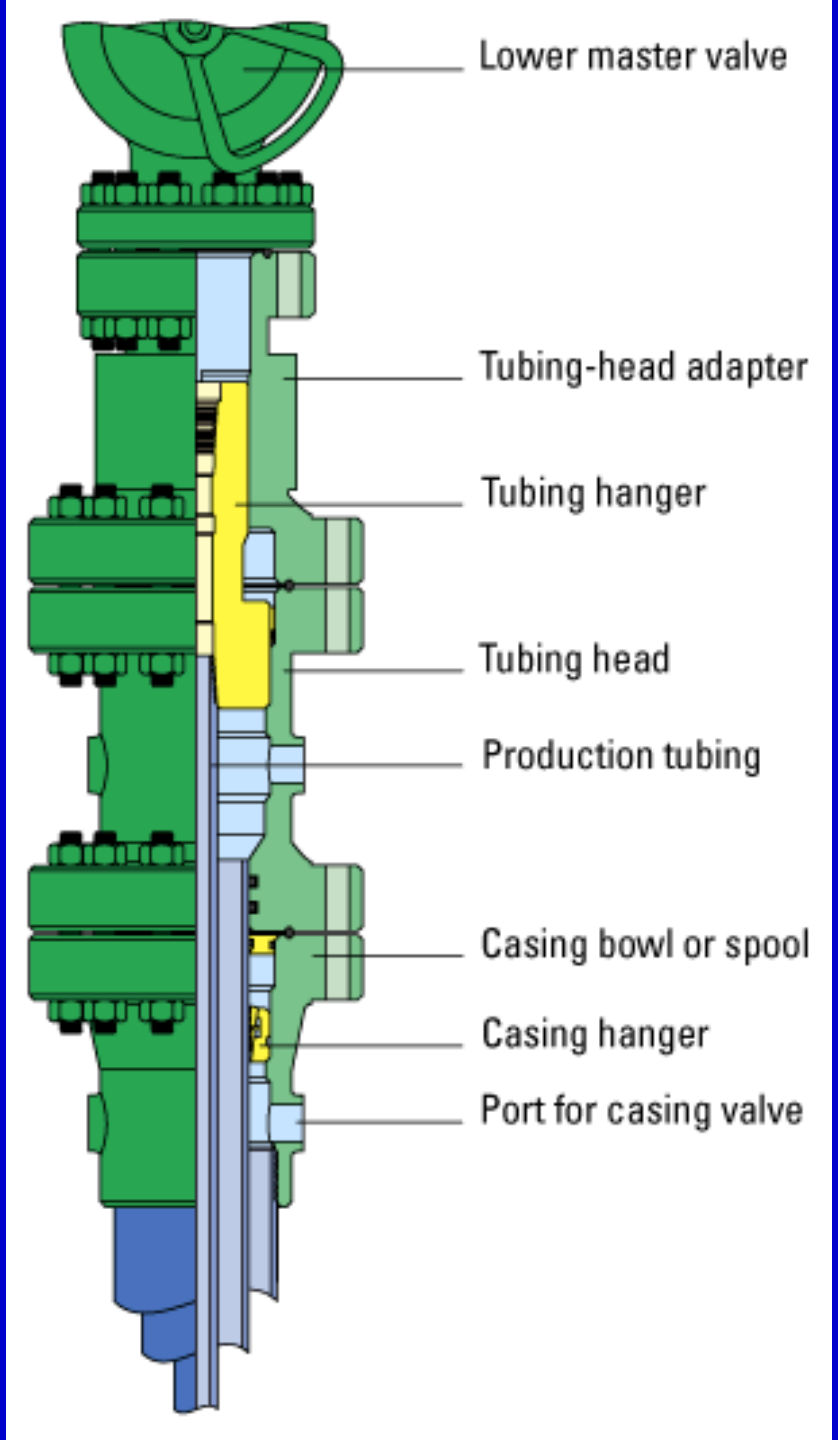


Openhole
gravel pack



Cased-hole
gravel pack

Wellhead Showing Tubing and Casing Hangers

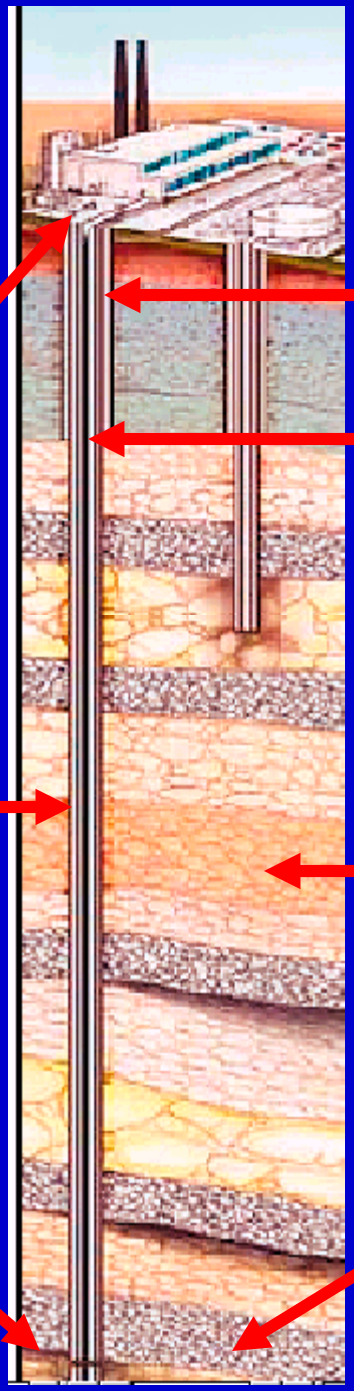


Deep Well Safeguards

Monitoring injection pressure and flow rate helps ensure peak efficiency and regulatory compliance

Protective concrete and steel barriers continue to protect the injection zone

Waste solution is sealed in the injection zone, much like oil and gas deposits are trapped for millions of years

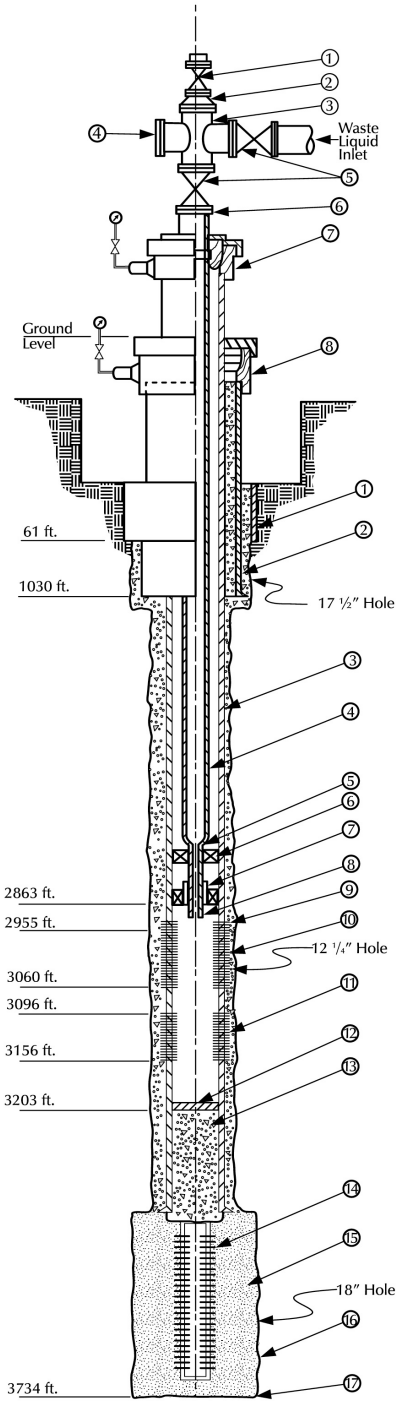


Double barriers of concrete and steel protect drinking water

Pressurized annulus fluid is monitored 24 hours a day to protect against leaks

Impermeable rock, up to several hundred feet thick, prevents upward flow of wastes

Over time, wastes are neutralized or reduced in hazard by the forces of nature



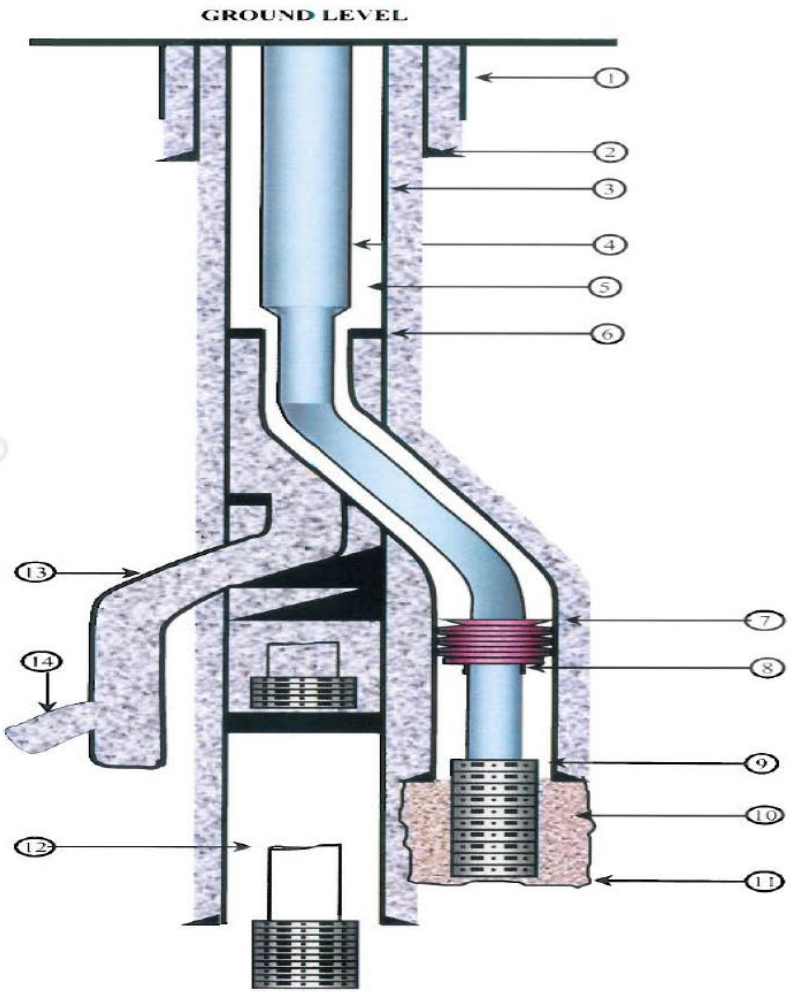
WELLHEAD DETAILS

1. Flanged Valve - 4" Series 600, with 4" pipe adapter on top
2. Reducer - 6" x 4" Series 600
3. Flow Cross - 6" Series 600
4. Blind Flange - 6" Series 600
5. Wing Valve - 6" Series, full opening
6. Flange - below valve, 5.75" I.D.
7. Tubinghead - Cameron 10" - 3,000 psi x 9 5/8" top flange is type MH with pack-off on 7" tubing; grease packing is put through 1" hole on the side of the flange
8. Casinghead: Cameron 12" - 3000 psi x 13 5/8"

BELOW GROUND DETAILS

1. Conductor Casing: 20", 3/8" wall thickness driven to 61'±
2. Surface Casing: 13 3/8", 48 lb/ft, 8rd, H-40, set at 1,030'±
3. Protection Casing: 9 5/8", 47 lb/ft, 43.5 lb/ft and 36 lb/ft
4. Injection Tubing: 6 joints of 7", 23 lb/ft, K-55, LT&C, 8rd; 1 crossover, 7", 26 lb/ft, K-55, LT&C box and buttress; 35 joints of 7", 26 lb/ft, K-55, buttress; 1 crossover, 7", 26 lb/ft, K-55, buttress box and LT&C; 29 joints of 7", 26 lb/ft, K-55, LT&C, 8rd, set at 2,831'±
5. Crossover - 7" LT&C x 4 ½"EUE 8rd at 2,831'± - 2,832'±
6. Packer - Guiberson 9 5/8" x 4 ½" Uni VI, LD. 3.98", set at 2,832'± to 2,840'±
7. Old Injection Tubing: 7", 23 lb/ft, left at 2,845'± - 2,855'± with the old packer TTW "LH" 9 5/8" x 7", left at 2,855'± - 2,863'±
8. Tail Pipe: 1 joint, 4 ½" EUE, 8rd with a mule shoe, at 2,870'±
9. Perforations - 2,955'± - 2,985'±, 4 SPF 0" Phasing added 12/17/91
10. Perforations - 2,986'± - 3,060'±
11. Perforations - 3,096'± - 3,156'±
12. Rubber packer element at 3,198'±
13. Plugged Back Depth - 3,203'±
14. Screen: Howard Smith 0.020 gauge, stainless steel 316
15. Gravel Pack - Abandoned
16. Hole - Underreamed to 18" - abandoned
17. Total Depth - 3,734'±

Sidetracked Well



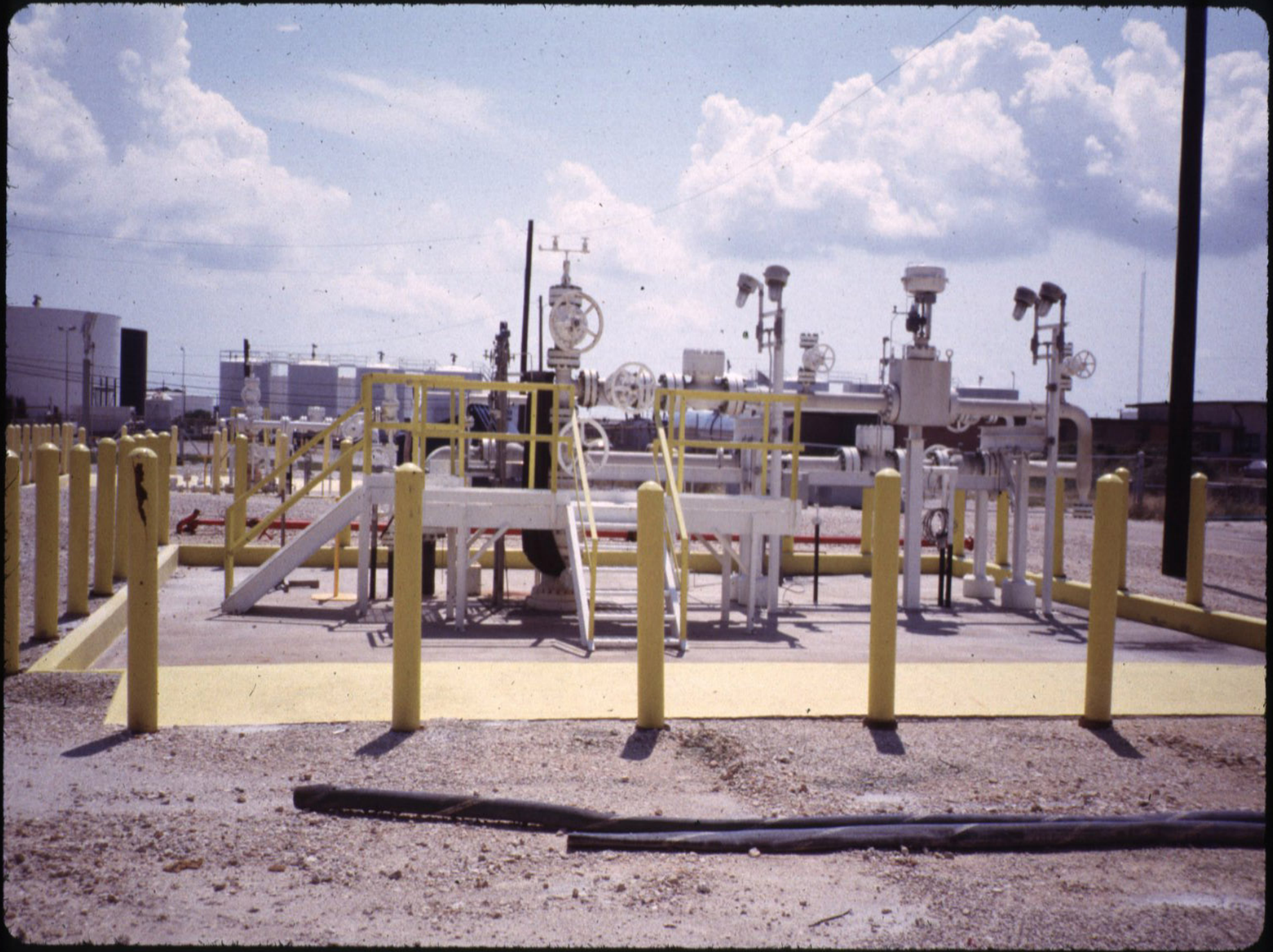
KB = 25' (GL)
GL = 13.8 (MSL)
All depths RKB

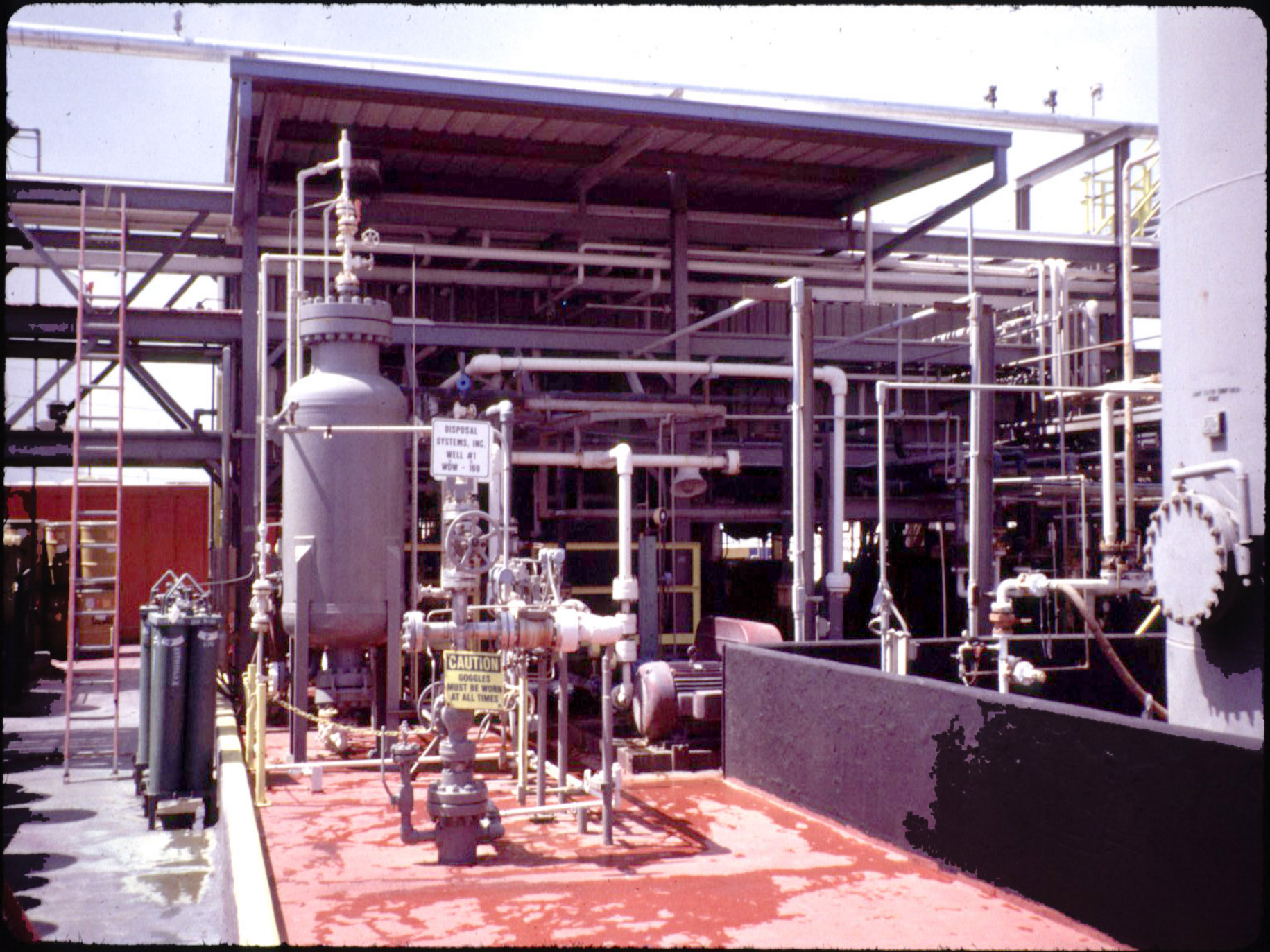
COMPLETION DETAIL

1. 20" Conductor Casing driven to 90 ft.
2. 13-3/8" Surface Casing @ 1627', set in 17.5" hole: 1627 ft of 54.5 lb/ft K-55 ST & C; Cemented with 990 sx of Halliburton light + 2% $CaCl_2$, 800 sx 50/50 Pozmix + 2% $CaCl_2$, 180 sx Class A.
3. 9-5/8" Protection Casing @ 4847', set in 12.25" hole: 4847 ft of 40 lb/ft K-55 LT&C; Cemented with 1460 sx Halliburton light and 200 sx Class H.
4. Injection Tubing: 7" 26 lb/ft K-55 8rd X 5-1/2" 15.5 lb/ft K-55 LT&C with X/O @ 2578'.
5. Annular Fluid: 9.1 ppg NaCl brine + 10 gal ANHIB.
6. 7-5/8" Protection Liner from 2661' to 4258'; 26.4 lb/ft P-110; Lead cement is 237 bbl standard + 0.5% Halad 344 & 0.7% HR7, mixed @ 14.5 ppg. Tail cement is 129 bbl Premium + 0.3% Halad @ 16.4 ppg.
7. Injection Packer @ 4082': 7-5/8" X 5-1/2" TIW "LH"
8. TIW Overshot (4' polished bore) from 4091' - 5000'; Top of polished riser at 4095'.
9. 4-1/2" Injection Screen: 9.50 lb/ft Incoloy 825 blank from 4095' to 4225'; 25 ga.HWS Incoloy 825 wire-wrapped screen from 4225' to 4354'. 15" Bow Spring Centralizers @ 4270' & 4354'. Bullplug @ 4354' to 4355'.
10. Gravel pack sand: 12/20 mesh; Open hole underreamed to 22" AHS
11. Total Depth: 4356'
12. Abandoned Completion
13. Abandoned Sidetrack - casing was section milled and cemented with 7 plugs:
    - 5 bbl premium cement from 4209' to 4252'
    - 14 bbl premium cement from 4120' to 4209'
    - 9.5 bbl premium cement from 4052' to 4120'
    - 15.5 bbl premium cement from 3876' to 4052'
    - 14 bbl premium cement from 3753' to 3876'
    - 26.5 bbl premium cement from 3482' to 3753'
    - 40.5 bbl premium cement from 2920' to 3482'
14. Abandoned Sidetrack (4250' to 4182') Cemented with 5.6 bbl premium cement

Revised by:
drawing not

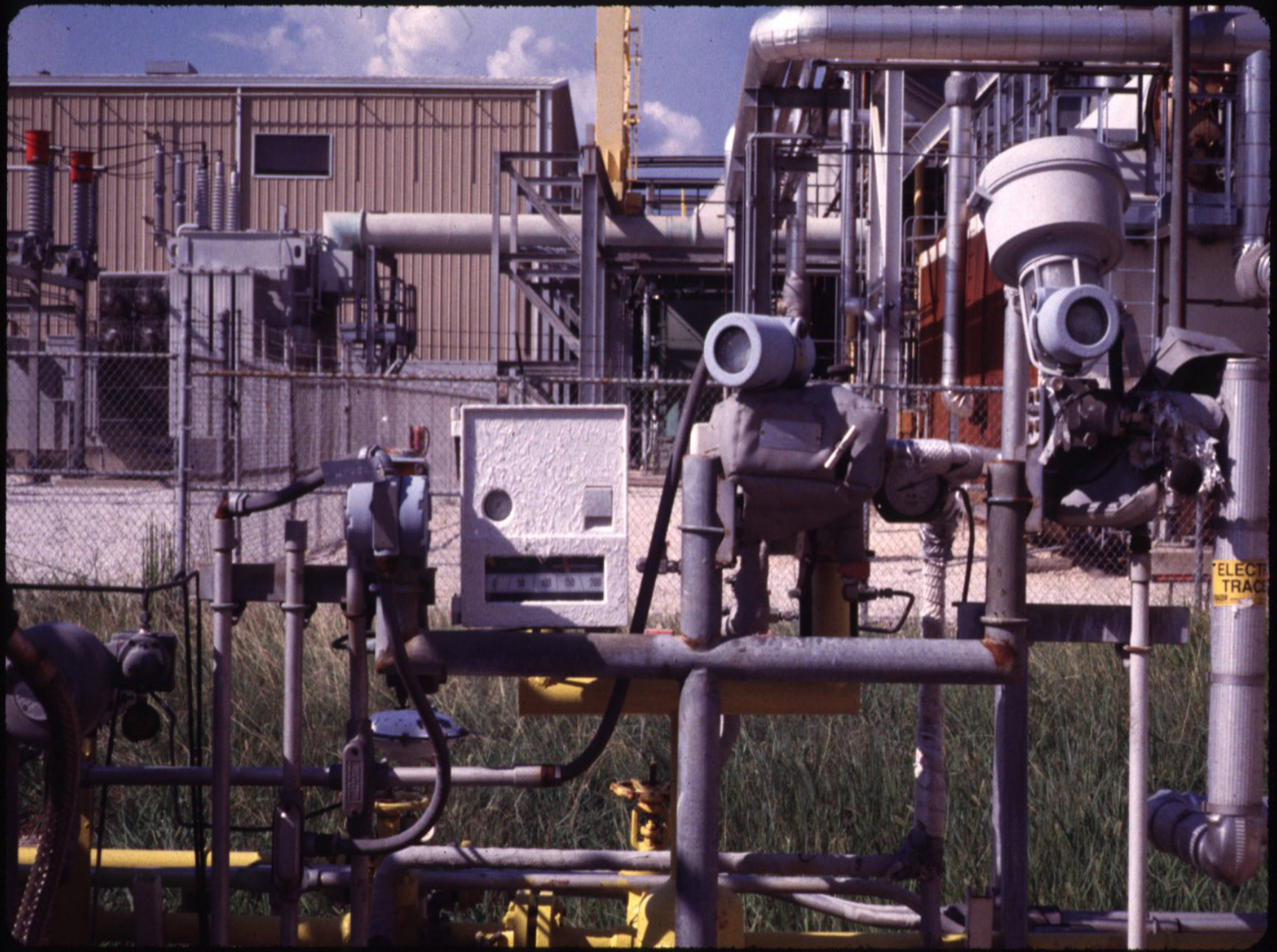
Figure 3: Injection Well No. 1 Sidetrack No. 1




DISPOSAL
SYSTEMS, INC.
WELL #1
WDW - 169
CAUTION
GOGGLES
MUST BE WORN
AT ALL TIMES


DOCKER AREA


DEEPWELL #2
CORE PRESSURE
DEEPWELL #2
ANNULUS PRESSURE

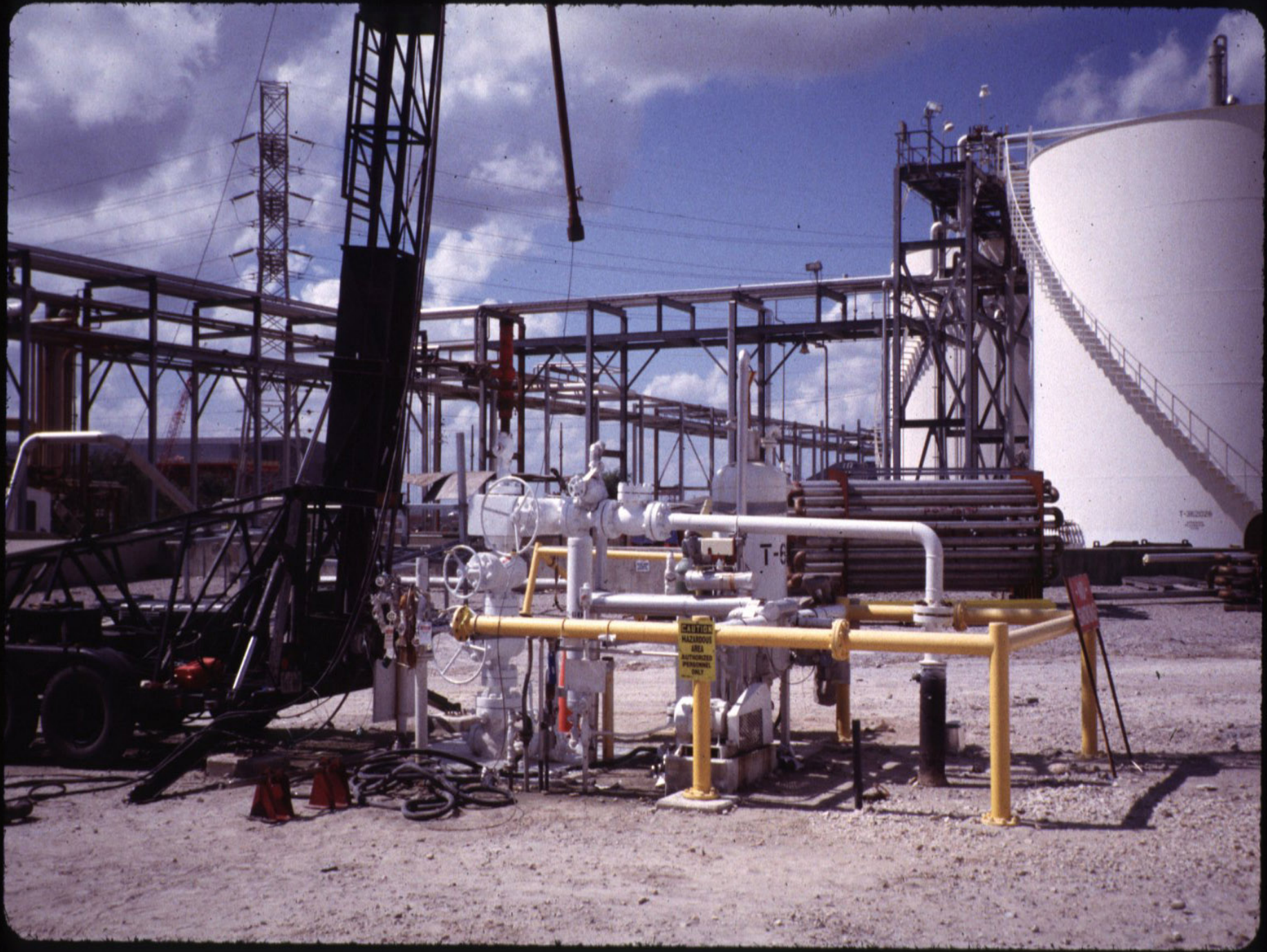



R 68980
HAZARDOUS
KNAACK

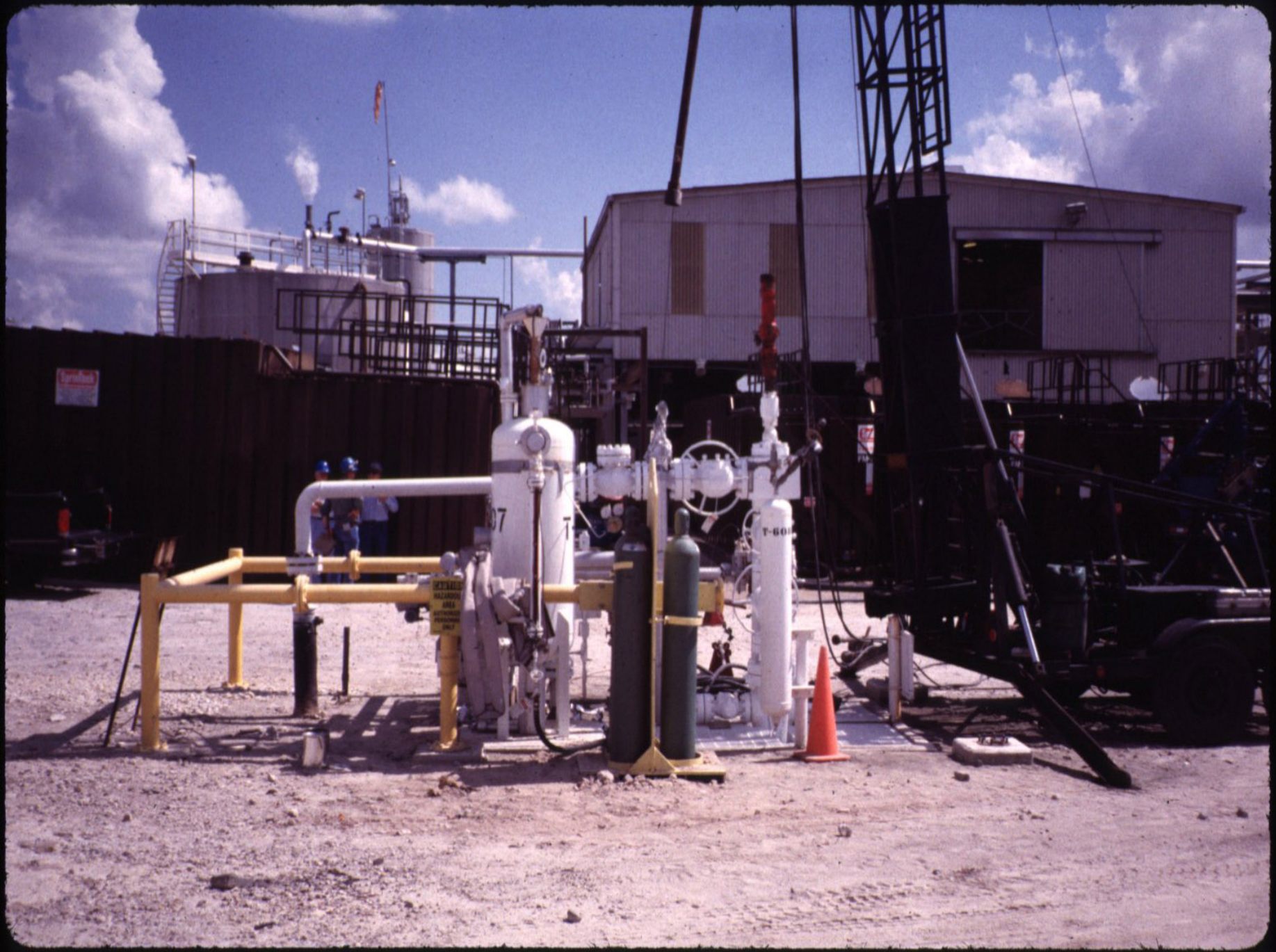

TNRCC PERMIT
TANK NO. 22
R 68980
POSM II
W. W TK
HAZARDOUS
WASTE

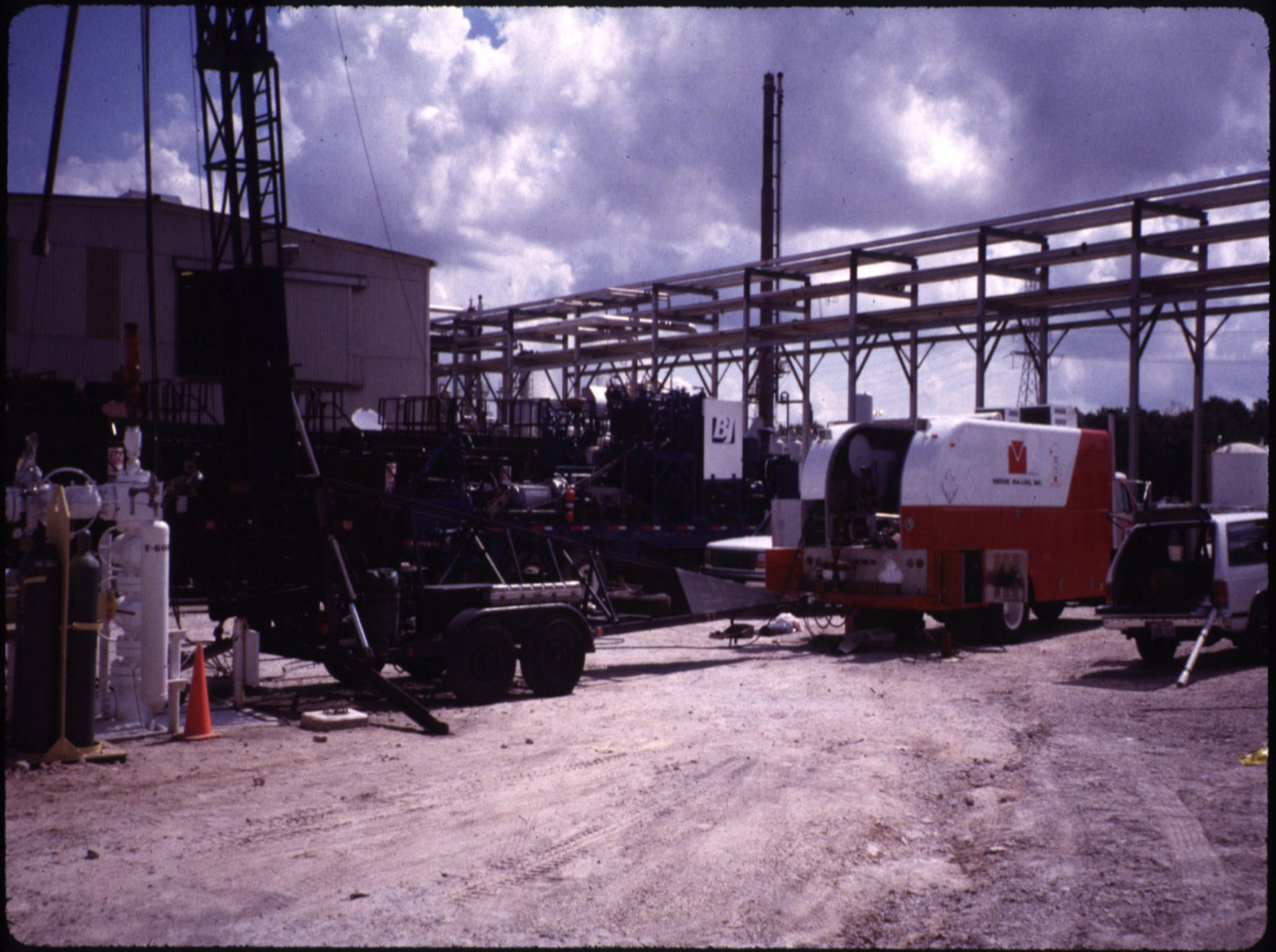

DANGER

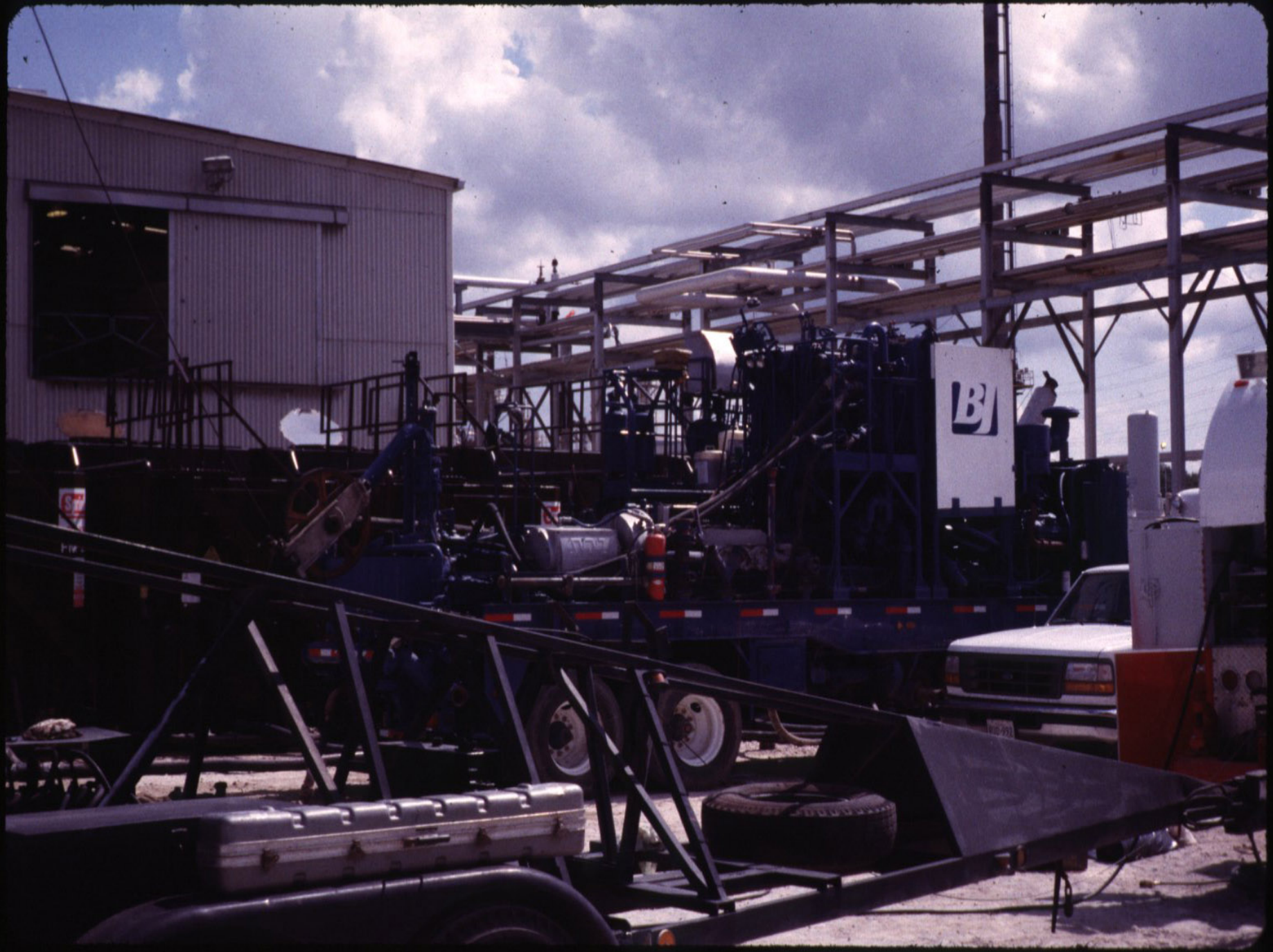

T-60
NO
SMOKING


CAUTION
HAZARDOUS
AREA
AUTHORIZED
PERSONNEL
ONLY


T-60
508

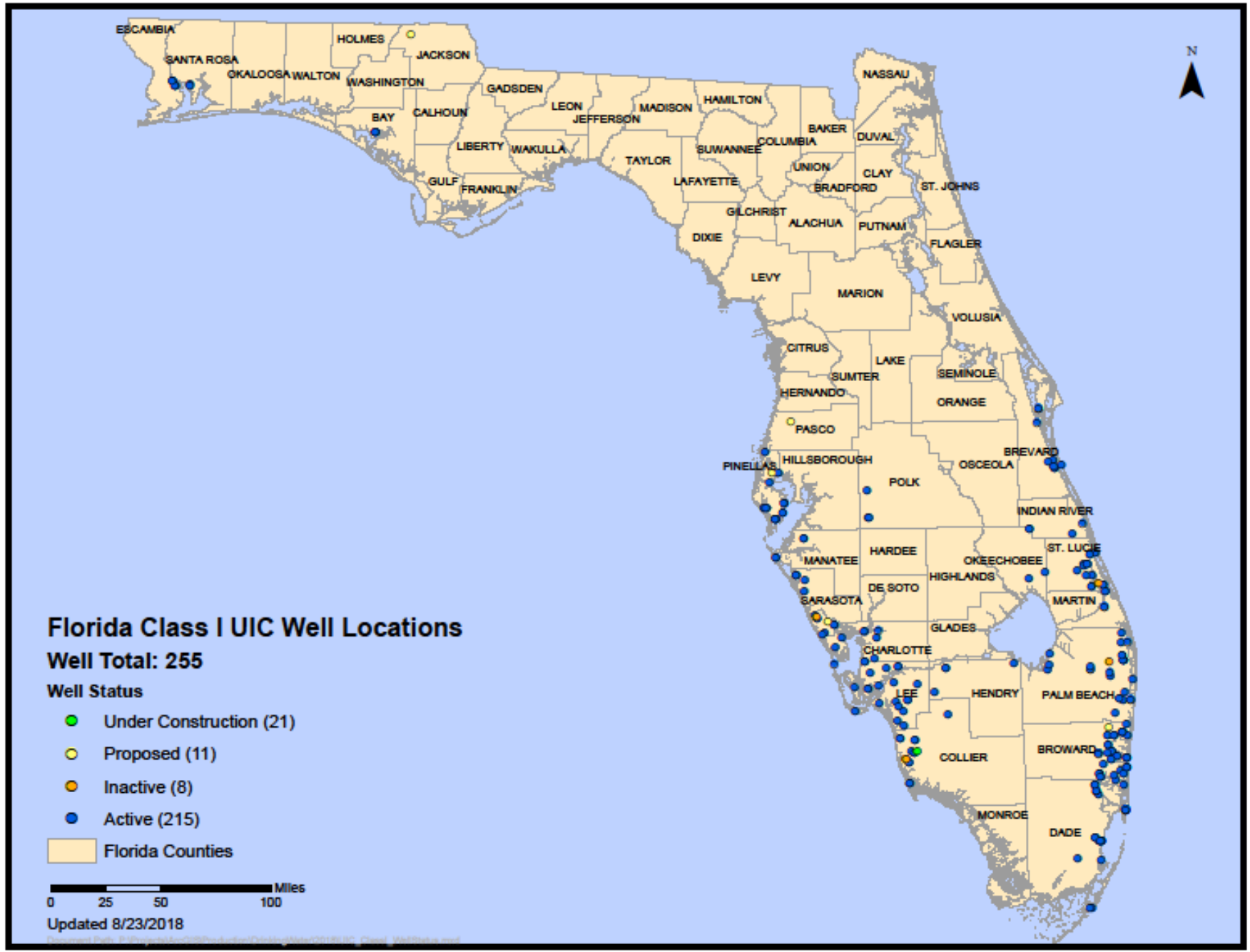




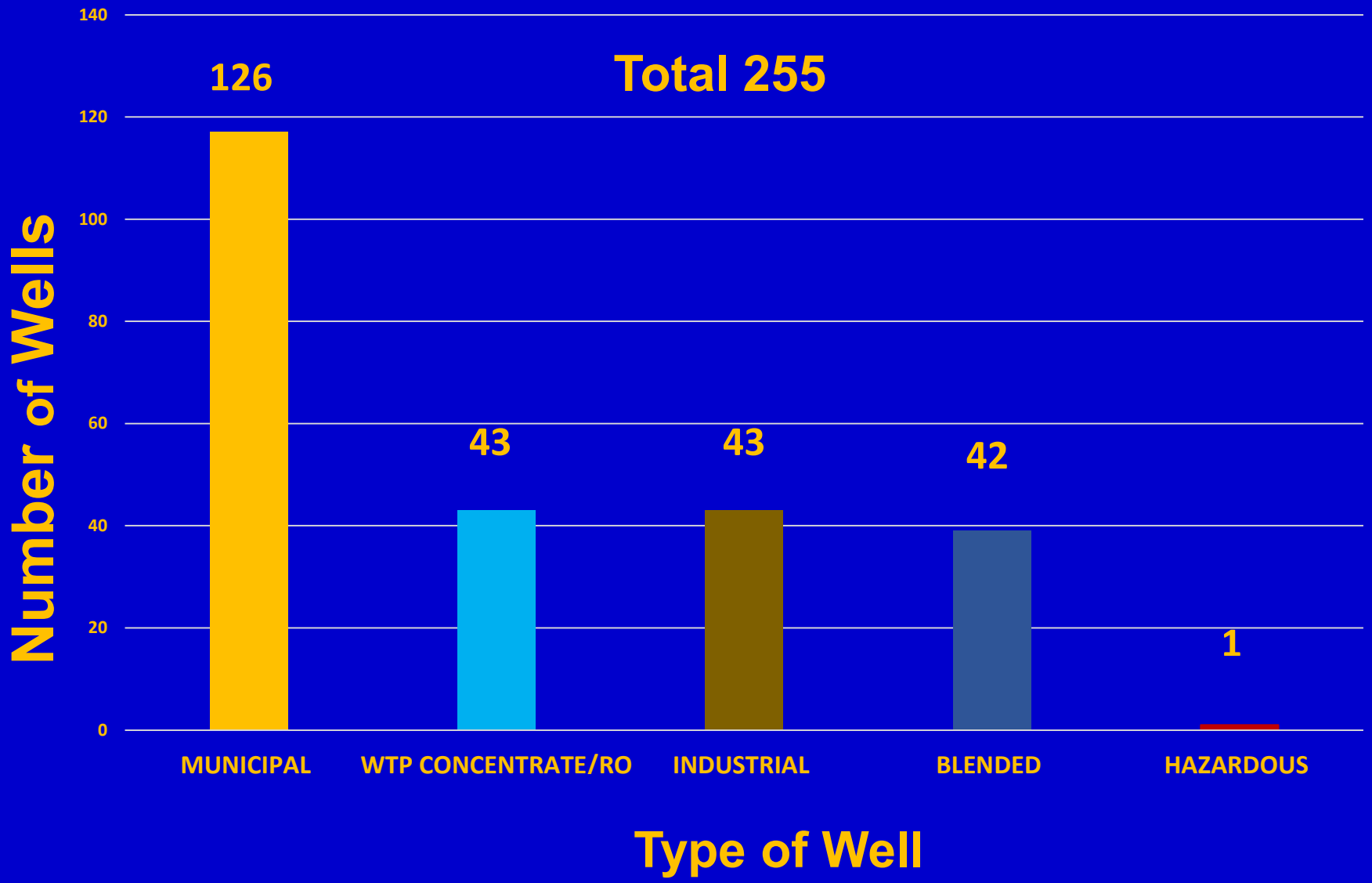


Class I Municipal Wells

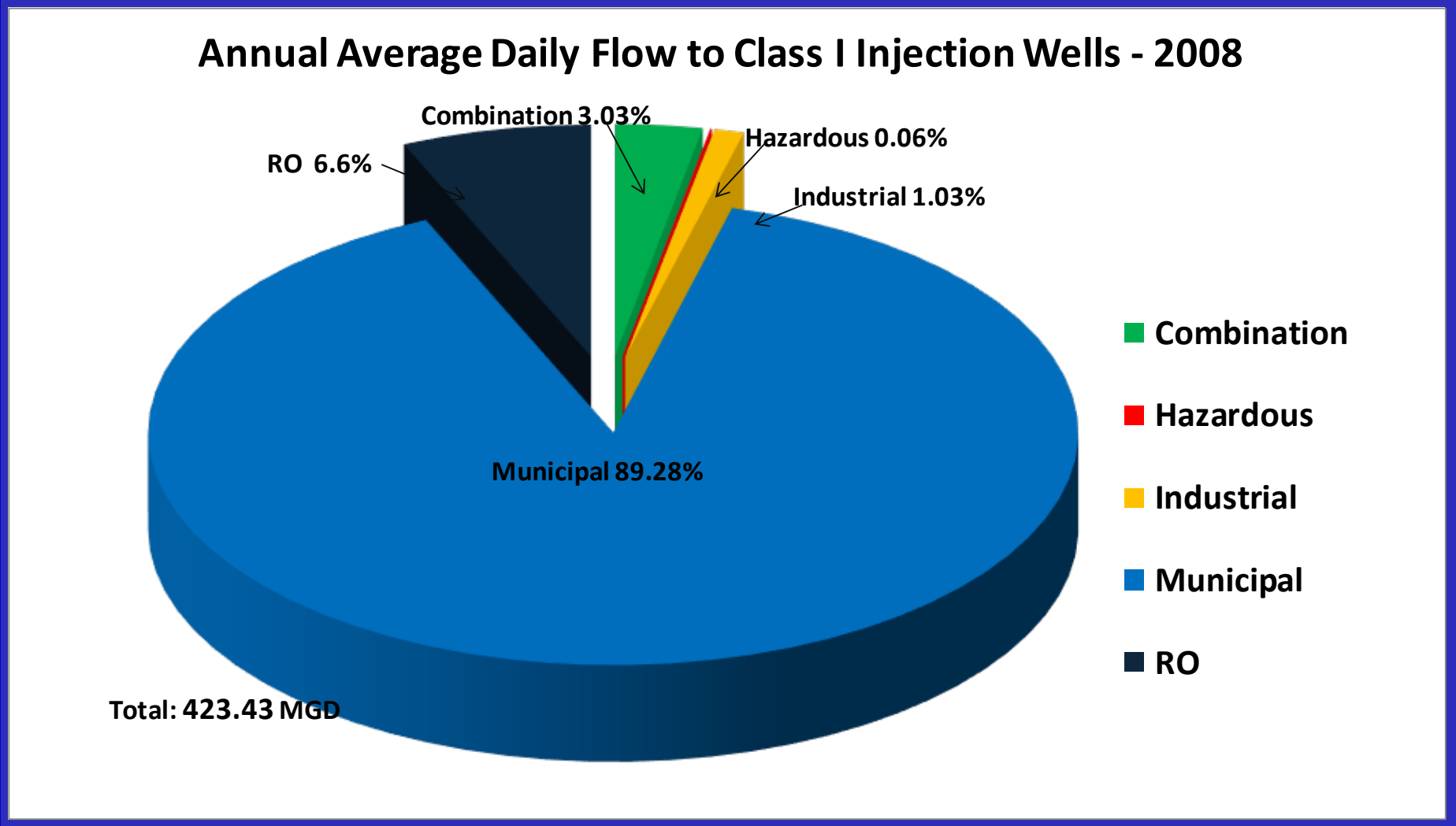
Florida Class I Well Locations



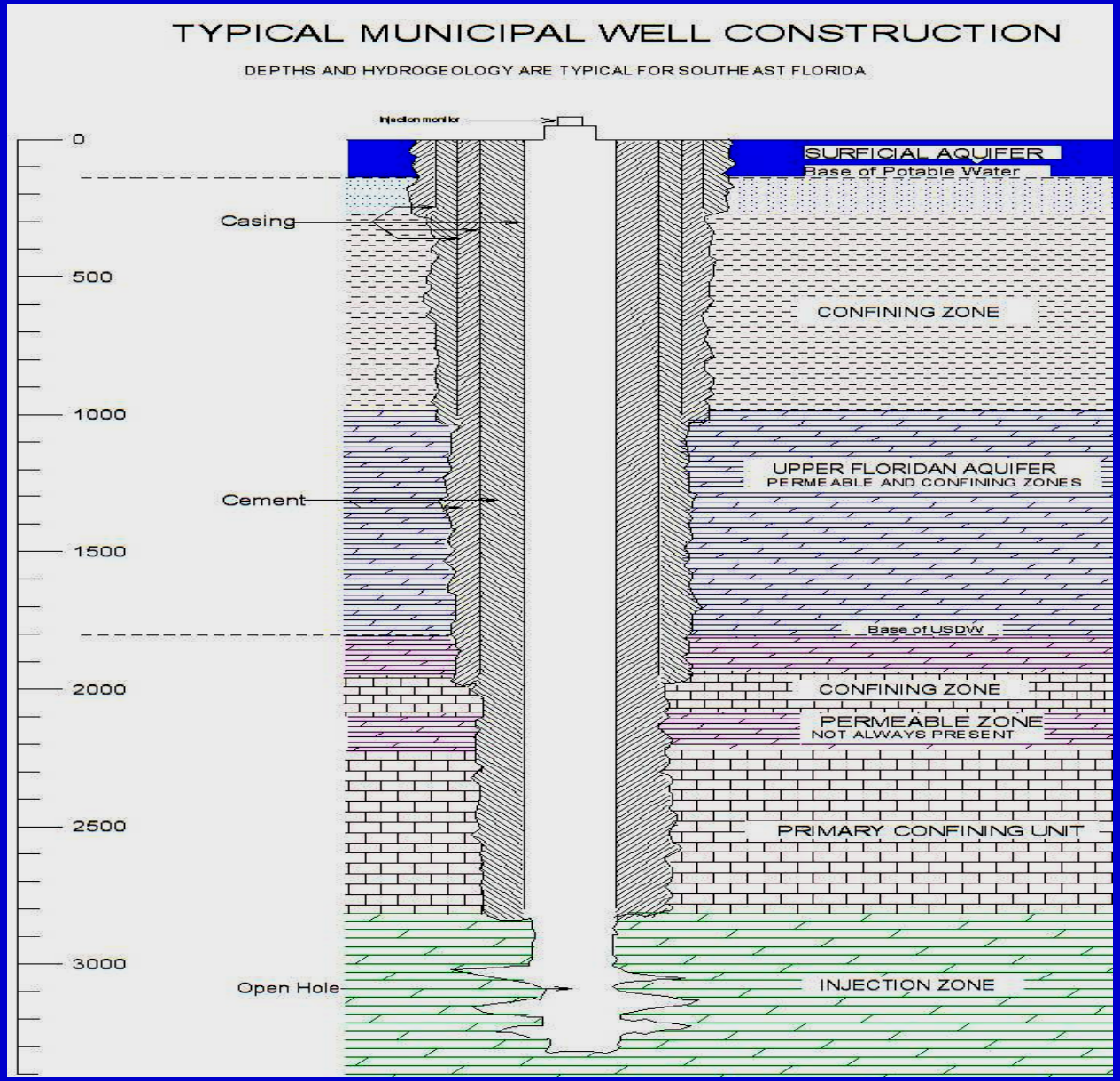
Florida Class I Injection Wells by Type



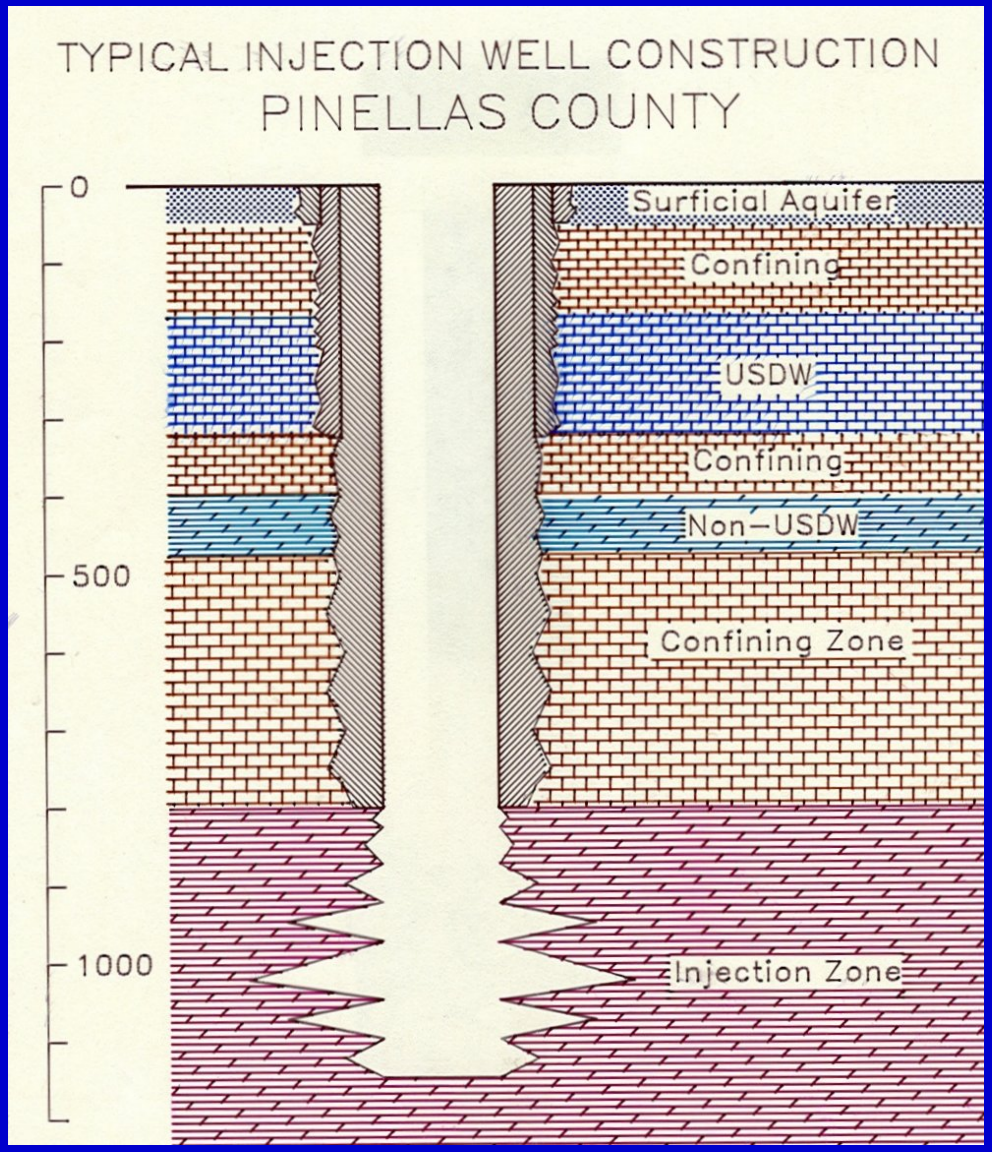
Florida Class I Wells Annual Flow



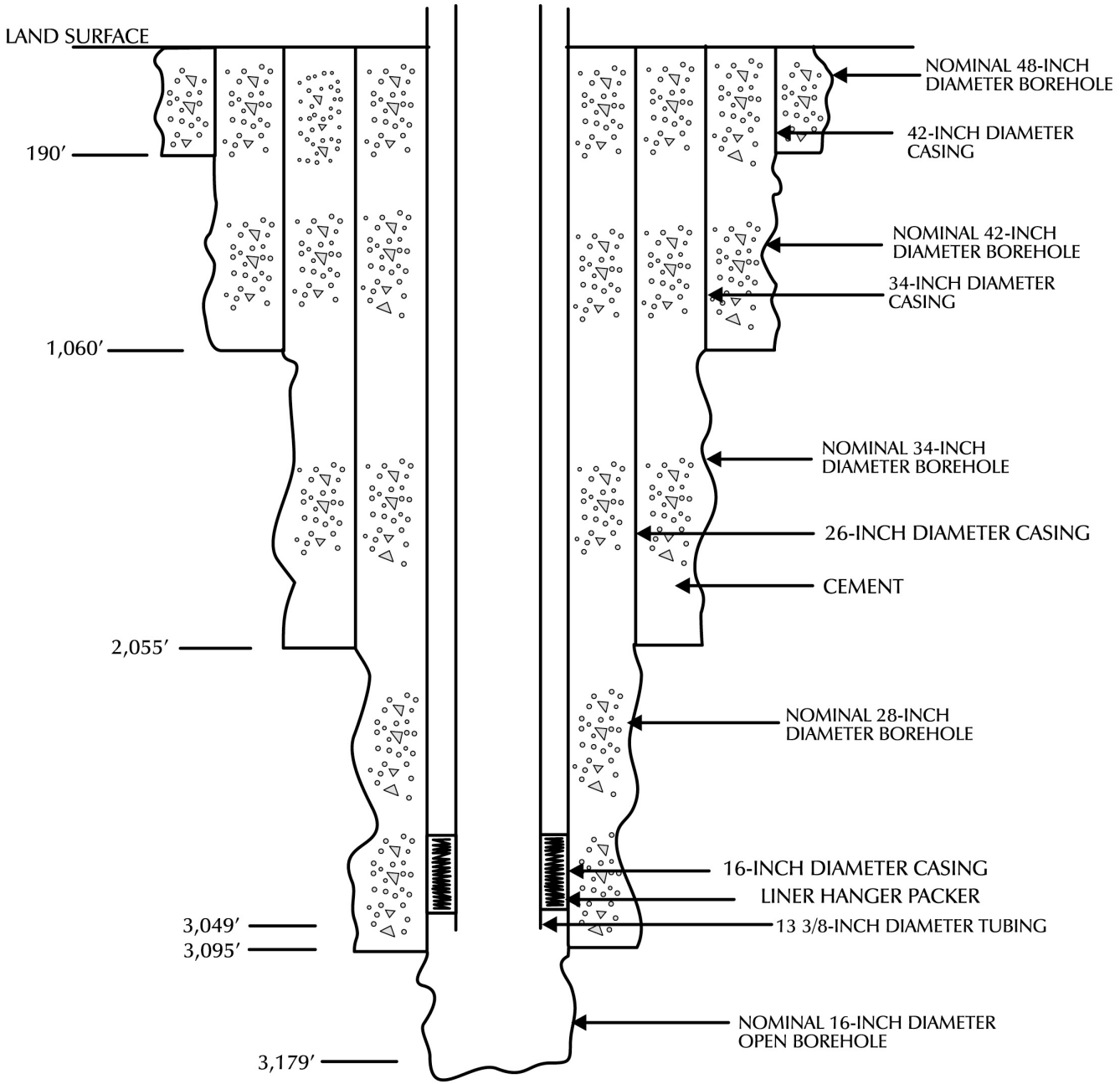
General Class I Design SE Florida



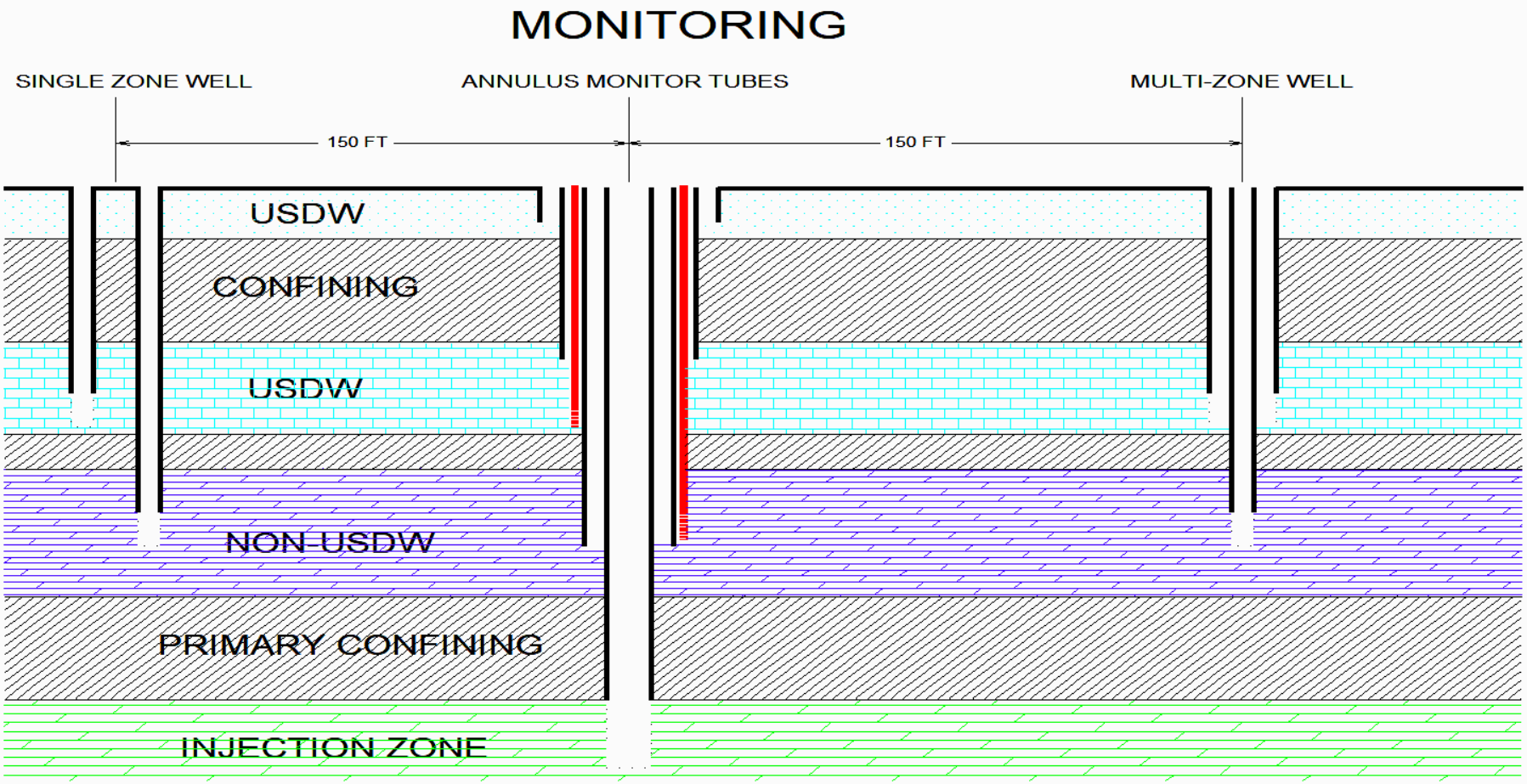
General Class I Design
St. Petersburg



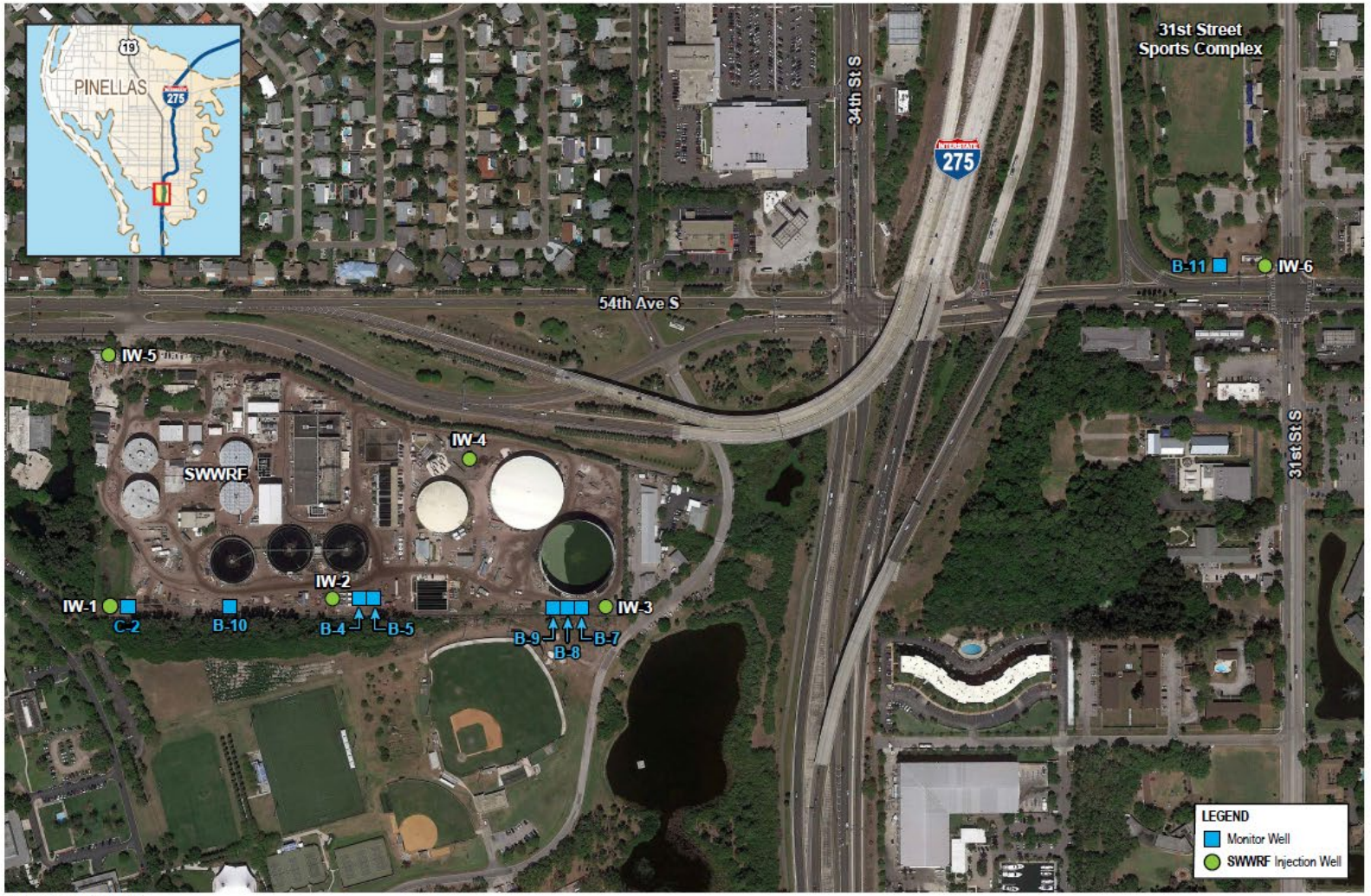
INJECTION WELL IW-1



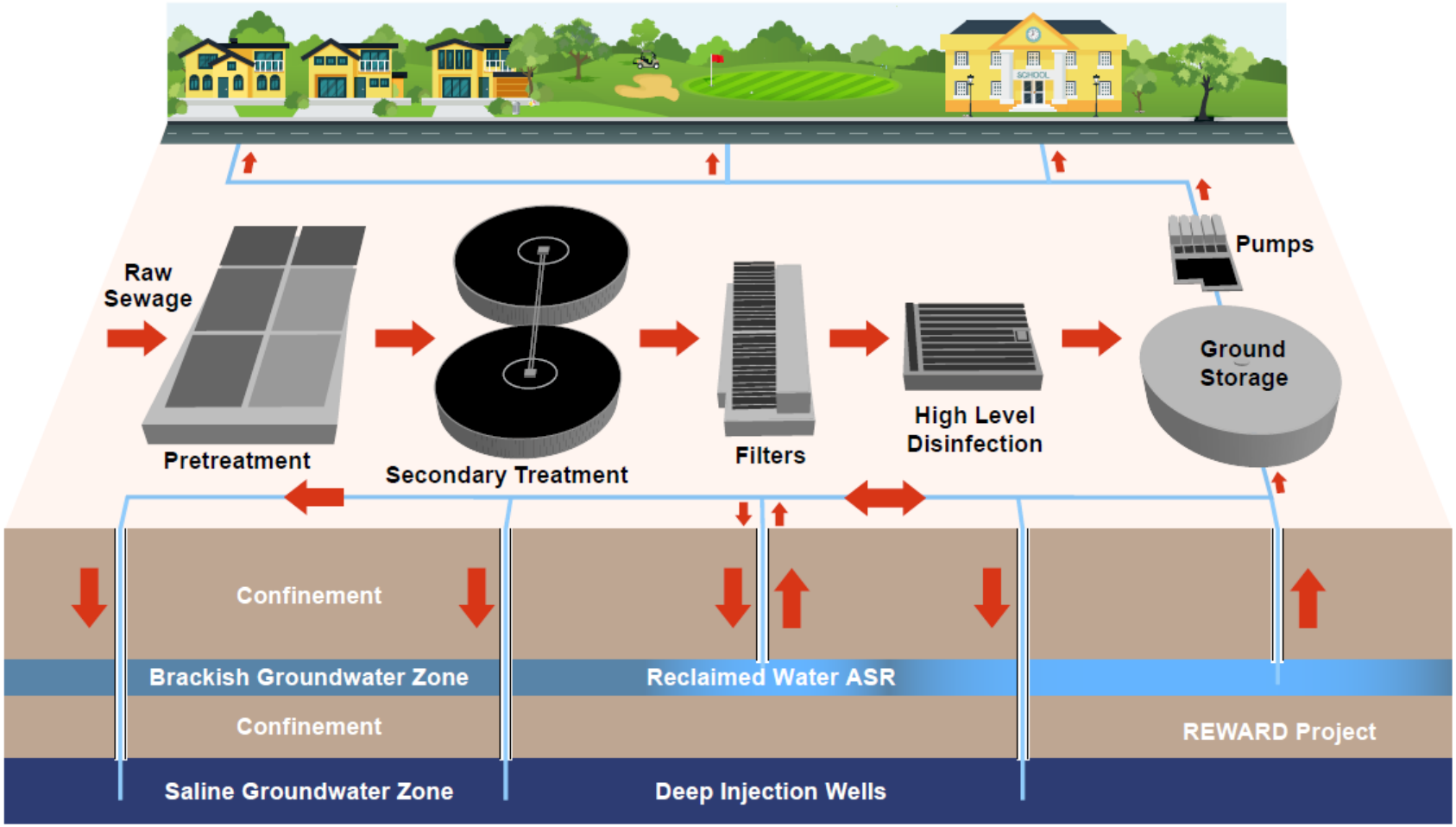
Florida Class I Facility Monitor Well Designs



St. Petersburg SW Water Reclamation Facility



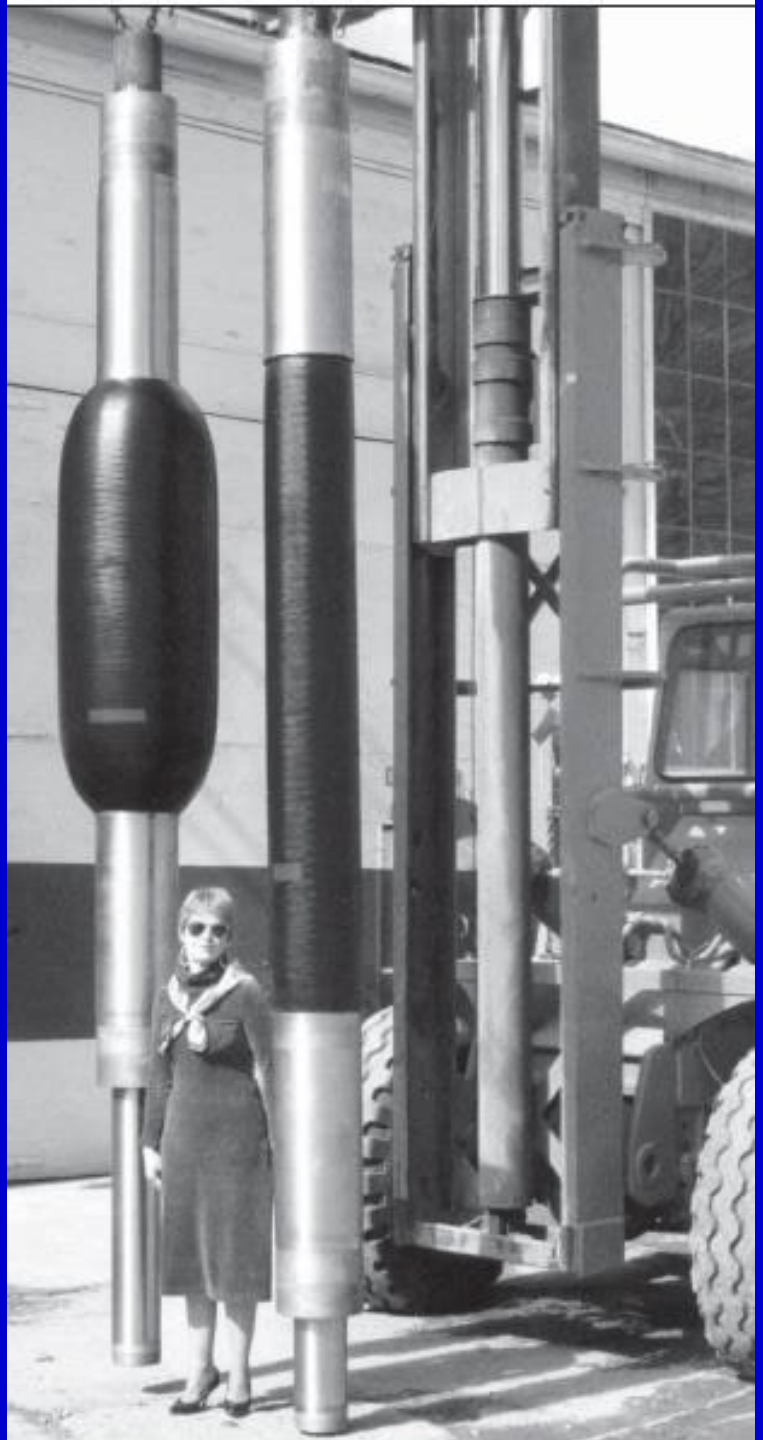
St. Petersburg Water Reclamation Facility Treatment Process



City of St. Petersburg Treatment and Reclaimed Water Reuse Process

Installing Fiberglass Tubing

Injection Well Packer




EXIT


SKYTRAK

Drinking Water Treatment Residual Disposal Wells

- Residuals may be generated by the following water treatment processes:
  - Presedimentation
  - Coagulation, flocculation, and sedimentation
  - Precipitative softening
  - Filtration, microfiltration, and ultrafiltration
  - Membrane desalination
  - Ion exchange
  - Activated carbon (adsorption process)

From EPA publication EPA 820-R-11-003, Drinking Water Treatment Plant Residuals Management Technical Report, September 2011

Desalination and Nanofiltration Concentrate Injection Wells

- Associated with drinking water plants
- Membrane technology
- Desalination; for use with high salinity source waters
  - Reverse Osmosis
- Nanofiltration; for use with mildly brackish source waters or to remove organic material, soften water, etc.
- Lower injection pressures than municipal wells
- Often are used 24/7 if there is no other drinking water source

Potential Concentrate Issues

- pH extremes
- Corrosivity (brackish and salt water)
- Scale forming
- Suspended solids
- Bacterial activity/biofouling
- Chemical imbalances between injectate and formation water

Well Plugging

Locations subject to well plugging

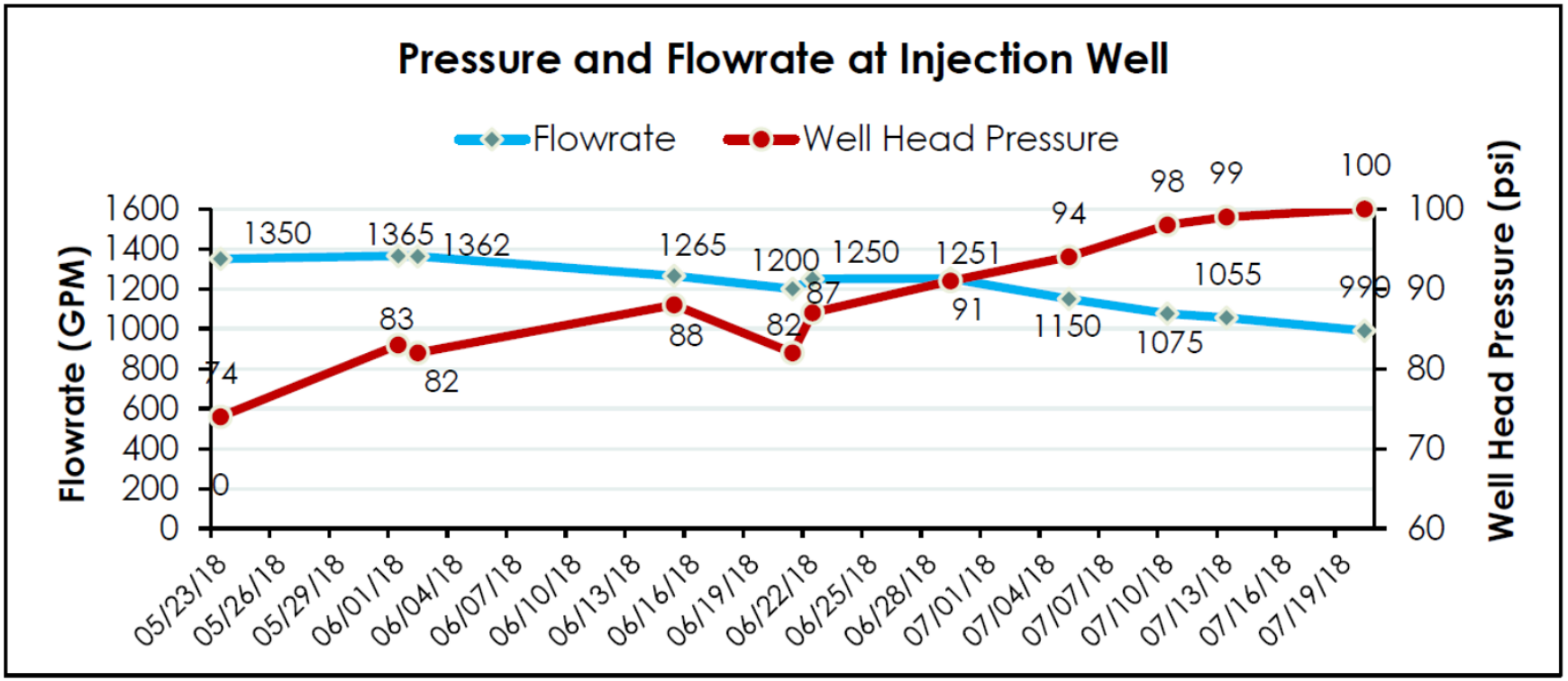
- Piping from water source to wellhead
- Inside of injection tubing/casing
- Injection zone pore space

Precipitate Buildup in Injectate Piping System

Precipitate Buildup in Injectate Piping System

Precipitate Buildup in Injectate Piping System

Well Head Injection Pressure Response to Plugging



Class I Well
Hazardous and Nonhazardous Summary

Well Requirements	Nonhazardous	Hazardous
AoR (Area of Review)	¼ mile	2 miles
Casing and Cement	Prevent fluid movement into or between USDWs	Surface and longstring cemented to the surface
Tubing and Packer	Required except for municipal wells	Required
Injection Pressure	Below fracture pressure	Below fracture pressure
Annulus Pressure	Approved by director	Exceeds injection pressure
MIT (Mechanical Integrity Test)	Every 5 years	Annually or workover

Class I Well
Hazardous and Nonhazardous Summary

Well Requirements	Nonhazardous	Hazardous
Borehole Fluid Movement	Every 5 years	Every 5 years
RAT (Radioactive Tracer)	Not required	Annually bottomhole
Casing Inspection Log	Not required	At Director discretion every 5 years or during workover
Continuous Monitoring (inj pr, rate & vol, & ann pr)	Yes	Yes, plus injection fluid temperature
Automatic Alarm and shut-off system	Not required	Required
Continuous Corrosion Monitoring	Not required	Required
Falloff Tests	Annually	Annually

Types of Class I Inspections

- Construction
  - Open hole logging of the well
  - Running casing and cementing
  - Running tubing and packer
  - Perforating or gravel pack installation
- Mechanical Integrity (MIT)
  - Annulus pressure test
  - Radioactive tracer test
  - Temperature log
- Ambient Monitoring
  - Pressure falloff test
  - Monitoring well sampling
- Compliance
  - Records review
  - Examination of wellhead and surface equipment
- Workover
  - Well repair
  - Well treating/stimulation
- Plugging
  - Observe final MIT testing
  - Observe setting of plugs

Region ____ Solid Waste Registration No. _____ Inspection Date(s) _____ ***

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
UNDERGROUND INJECTION CONTROL (UIC) CHECKLIST

Company Well No. _____ NOR unit No. _____ UIC Permit No. _____

Section A – PRE-INJECTION FACILITIES

1. Are facilities injecting solid wastes including hazardous and/or nonhazardous wastes? N/A___ YES___NO

Note: Wells used for hazardous wastes or non-hazardous waste, either from industrial or municipal facilities, are classified as Class 1 wells [331.11 (a)(1)]. In general, this checklist applies to Class 1 wells.

2. Are the facilities injecting only waste as described in the UIC permit? N/A___ YES___NO___

3. Are pre-injection facilities (tank units and surface impoundments) covered under the applicable UIC or RCRA Permit? YES___NO___

4. If no, are pre-injection facilities (tank units and surface impoundments) covered under the solid waste registration and exempted from RCRA permitting requirements?[335.6 (c)] N/A___ YES___NO___

5. Describe pre-injection facilities: _____

6. Is any evidence present of fires and explosions or other releases to the environment from solid waste units or other on-site sources? [335.4 / 26.121] N/A_____NO YES___

Note: If yes, refer to Generator Checklist for reviewing follow up actions.

Section B-- UIC FACILITIES

1. Is a legible sign with company name, company well number and Commission permit number posted at the well site? [331.66(b)(1)] N/A___ YES___NO___

2. Is an all weather road to the well installed and maintained? [331.66 (b)(2)] N/A___ YES___NO___

3. Is wellhead painted (if appropriate), and maintained in good working order without leaks? [331.66(b)(3)] N/A___ YES___NO___

4. Make the following observations for onsite gauges and provice comments for noncompliance:

No.	Parameter (units)	Gauge Reading	Recorder Reading	Permit Limit	Compliant?
a.	**Surface Inj. pressure (psig)**				N/A___ YES___NO___
b.	**Annulus pressure (psig)**				N/A___ YES___NO___
c.	**Differential pressure (psi)**				N/A___ YES___NO___
d.	**Injection flow rate (gpm)**				N/A___ YES___NO___
e.	**Inj. Fluid temp (degree F)**				N/A___ YES___NO___
f.	**pH (S.U.)**				N/A___ YES___NO___
e.	**Fluid density (g/cubic cm)**				N/A___ YES___NO___

COMMENTS: _____

Operating, monitoring and testing requirements

5. Are injection fluids sampled and analyzed sufficiently to yield representative data about characteristics? [331.64(b)/ 331.64(b)(1)/ 331.64(b)(1)(A)/ 331.64(h)(1)(B)/ 331.64(h)(1)(C)/ 331.64(h)(2)/ 331.64(h)(3)/ 331.64(b)(4) /146.68(a)] N/A___ YES___NO___

Note: Waste stream analysis must be performed according to the permittee=s approved Waste Analysis Plan, at a frequency of at least once per year, and whenever there are processes or operating changes that may significantly alter the waste physical or chemical characteristics. The RCRA waste analysis plan may address the UIC wastes. The facility should develop and follow a written Waste Analysis Plan [331.64(b)(1)]

6. See the boxed notes under this item concerning what is considered as continuous. Are **continuous** recording devices used to monitor and record injection tubing pressures, injection flow rates, injection volumes, tubing long string casing annulus pressure and volume, and any other data (differential pressure, pH, specific gravity, or other) specified by the permit? [331.64(d) / 146.67(f)] N/A_____ YES NO___

1. Pneumatic or analog controllers, monitoring instruments and recording devices remain as acceptable technology for satisfying the continuous monitoring and recording requirements.

2. For continuous monitoring of well operating parameters that involves periodic sampling of an electronic signal for the purpose of control and/or recording, the minimum sampling frequency is once every 15 seconds.

3. All monitored points whose value exceeds a permit parameter must be recorded. The following are the minimums for electronic recording devices which will satisfy the Acontinuous recording» requirements:
   a. The minimum recording frequency of the average or instantaneous value is once every 15 minutes.
   b. Electronic data recording devices should record based on a deviation of greater than ± 4%from the previously monitored value (based on typical accuracy of electronic instrumentation, see Program Policy Point No.1 for details). If no deviation occurs, the minimum recording frequency for this type of device is once per hour.

4. Where Class I non-commercial disposal well permits do not address the frequency for monitoring of pH and specific gravity, the minimum measurement frequency which satisfies continuous monitoring is once per day as long as there is little variation in these characteristics. More frequent monitoring is in order for streams whose characteristics can change quickly.

5. If primary monitoring system failure occurs due to power failure or other reasons, an operator should perform manual monitoring and record keeping at least every 15 minutes for a well in service, or at least every hour for a well that is out of service. Instances of manual monitoring should be reported on the quarterly self reporting forms (monthly forms for commercial wells).

7. Is annulus pressure maintained at least 100 psi greater than the injection tubing pressure to prevent leaks from the well into unauthorized zones and to detect well malfunctions? [331.63(e) / 146.67(c)]
   N/A___ YES___NO__

During well start-ups, shut-downs and **documented** operating changes (switching pumps, annulus pressure system, filters, instruments and others), the differential pressure may be less than 100 psi for periods up to 15 minutes. These situations must be documented in the facility=s operating records.

8. Are annulus fluid volume changes regularly observed by the facility operator and records maintained? [331.64(d) / 146.67 (f)]
   N/A___ YES___NO__

Annulus fluid tank level, when used, must be checked and recorded on a regular basis (daily) in lieu of continuous recording of annulus volumes.

***

9. Are pressure gauges installed and maintained in proper working order at all times? [331.64(c)] N/A___ YES___NO___

Note: The difference in parameter values between a wellhead gauge and recorder which measure the same parameter must be within 4% of full-scale for the gauge or 40 psi, which ever is less. The injection tubing pressure gauge should be on the waste feed line to the well, anywhere between the last injection pump and the wellhead; the annulus pressure gauge location should be on the annulus pressure system equipment, anywhere from the annulus pot to the annulus space at the wellhead; inspectors should verify communication between each gauge and corresponding pressure sensing device.

10. Are recorders installed and maintained in proper working order? [331.64(d)] N/A___ YES___NO___

Note: The difference in parameter values between a wellhead gauge and recorder which measure the same parameter must be within 4% of full scale for the gauge or 40 psi, whichever is less.

11. Are recorders and other required instruments housed in weatherproof enclosures? [331.64(d)] N/A___ YES___NO___

12. Are automatic alarms and shutoff devices installed and operational? [331.64(d)(1) / 146.67(f)(1)] N/A ___ YES___NO___

13. If no, has owner/operator certified that a trained operator will be on location and able to respond to alarms when an operating parameter is exceeded? [231.64(d)(2) / 146.67(f)(2)] N/A___ YES___NO___

Note: Auto shutoff is not required if owner/operator certifies to Commission that trained operators are always present when well is operating.

14. Has an automatic alarm or shutoff system triggered since the last state investigation? N/A ___ YES___NO___

Note: If yes, investigate the corrective actions taken by the facility and comment: _____

15. Are corrosion monitoring tests if required by permit performed and recorded? [331.64(g)(1),331.64(g)(1)(A),331.64(g)(1)(B),331.54(g)(1)(C),146.68(c),146.68(c)(1),146.68(c)(2), 146.68(c)(2)(i),146.68(c)(2)(ii),146.68(c)(2)(iii),146.68(c)(3),146.68(c)(3)(i),146.68(c)(3)(ii)] N/A___ YES___NO___

Note: Methods prescribed by EPA in 40 CFR 146.68 (c)(1)-(3) for corrosion monitoring should be used; waiver of quarterly corrosion monitoring based on demonstration of noncorrosivity of the subject wastes must be accomplished through a permitting process (new, renewed, or amended permits) that includes opportunity for notice and comment.

16. Are all gauges, pressure sensing and recording devices tested and calibrated quarterly? [331.63(g)] N/A___ YES___NO___

Section C-- RECORDS REVIEW

Region ____ Solid Waste Registration No. _____ Inspection Date(s) _____ ***

1. Are monthly and quarterly injection data submitted using the Commission self-reporting form as required by permit and rules? [331.65(e)(1) for noncommercial facilities] or [331.65(e)(2) /146.69 (a)/ 146.69(b) for commercial facilities] N/A___ YES___NO___

2. Are complete and accurate records maintained as required by permit and rules? [331.67(a)] N/A___ YES___NO___

Note: For purposes of determining the accuracy in reporting, allowable discrepancy (deviation) between reported and actually recorded data is defined as 10%. The recordkeeping includes 1). all permitted parameters [331.67 (a)(1)], 2). periodic well tests like injection fluid analysis, mechanical integrity, and bottom hole pressure determinations [331.67 (a)(2)], and 3). all shut-in periods and times that emergency measures were used [331.67 (a)(3)].

3. Are records available for review by Commission representatives? [331.67(b)] N/A___ YES___NO___

4. Are all records retained throughout the active life of the well and three years following the abandonment? [331.67(c)] N/A___ YES___NO___

Note: For the following questions 5 through 8, if answer is no, follow up with the Field Operations Division UIC team (Region 14 Corpus Christi) to investigate the problem.

5. Has an injection zone annual report been submitted with December self reported data? [331.65(c)(3) / 331.65(c)(3)(A)/ 331.65(c)(3)(B) / 331.65(c)(3)(C) / 331.65(c)(3)(D)/ 331.65(c)(3)(E) / 331.65(c)(2)(F)] N/A___ YES___NO___

a. Did the facility receive an approval letter from the Commission? N/A___ YES___NO___

6. Did permittee notify Commission and get approval before beginning any well workovers that require taking well out of service? [331.63(i)] N/A___ YES___NO___

7. Has annual mechanical integrity been demonstrated by annulus pressure test and radioactive tracer survey? [331.64(e)(1)/ 146.68(d)(1)] N/A___ YES___NO___

8. Has an annual pressure falloff test been performed? [331.64(h)(2)/ 146.68(e)(1)] N/A___ YES___NO___

a. Did the facility receive an approval letter from the Commission? N/A___ YES___NO___

9. Does permittee currently have sufficient financial assurance to meet permit requirements? [331.142] N/A YES NO

Note: Check the amount of financial security required by permit and note the assurance amount as adjusted for the current year: $_____

Note: Compliance with financial security requirements should be determined prior to inspection by file review or consultation with Financial Assurance Section staff.

Region ____ Solid Waste Registration No. _____ Inspection Date(s) _____ ***

Section D– ABANDONED WELLS

1. Is a permanent marker with permit number, date abandoned, and company name placed at the abandoned well? [331.46(l)] N/A___ YES___NO___

2. Are all required monitoring parameters concerning post closure care for abandoned wells performed and reported? [331.46, 331.68 / 146.72 (b) (c)] N/A___ YES___NO___

Section E-- SELF REPORTED DATA-RECORDS REVIEW

The allowable discrepancy between reported and recorded data is defined as 10%. Any time that the recording system is not working and a 10% discrepancy is likely to occur, the operator should take immediate actions to correct the problem. While corrective actions are being taken, any backup system including manual measurements should be used.

Report within 24 hours incidents which could reasonably be interpreted as leakage of injected waste from the injection zone and/or contamination of underground sources of drinking water (USDWs) including losses of well mechanical integrity. Reporting within 24 hours is not required if support systems fail (annulus pumps, continuous monitoring, injection pumps, etc.) and if there is no reasonable evidence that an internal well failure has occurred that resulted in leakage of waste from the injection zone or into USDWs.

Operators should report (using the self-reporting form) the lowest monthly annulus differential pressure occurrence that exceeds 15 minutes, whether or not the occurrence constitutes a permit violation. Additionally, operators should report all occurrences of annulus differential pressure which violate permit requirements.

Review of Self Reported Data for _____ (month, year).

(Note: Complete the following table per monthly review of records.)

No	Parameter (Units)	Reported Value	Observed Value	Permit Value	Compliant?
1.	**Max. Surface Inj. Pressure (psig)** [331.63(c), 331.64(c)&(d), 331.65(c), 331.67(a)(1)(A) / 146.69(a)(2)]				N/A___ YES___NO___
2.	**Min. Annulus Pres. (psig)** [331.63(c), 331.64(c)&(d), 331.65(c), 331.67(a)(1)(B) / 146.69(a)(2)]				N/A___ YES___NO___
3.	**Min. Differential Pres. (psig)** [331.63(c), 331.65(c)]				N/A___ YES___NO___
	Max. Injection Rate				

*** An entry in this column indicates corrective action or comment needed. UIC Checklist Page 6, Revised 10/28/2010

Region ___ Solid Waste Registration No. _____ Inspection Date(s) _____

***

No	Parameter (Units)	Reported Value	Observed Value	Permit Value	Compliant?
4.	**(gpm)** [331.63(l), 331.64(d), 331.65(c), 331.67(a)(1)(C)]				N/A___ YES___NO___
5.	**Monthly Avg. Injection Rate (gpm)** [331.63(f)], 331.65(c)				N/A___ YES___NO___
6.	**Total Injection Vol. (mgals/month)** [331.65(c)/331.67(a)(1)(D)/ 146.69(a)(4)]				N/A___ YES___NO___
7.	**Minimum pH (S.U.)** [331.63(h), 331.65(c), 331.66(c)(1)/146.69(a)(b)]				N/A___ YES___NO___
8.	**Max. Fluid Density (g/cc)** [331.63(h), 331.65(c) / 146.69(a)(6)]				N/A___ YES___NO___
9.	**Inj. Fluid Temp. (degree F)** [331.64(d), 331.65(c), 331.66(c)(1) / 146.69(a)]				N/A YES___NO___
10.	**Other Permit Parameters** [331.63(h)]				N/A___ YES___NO___

Pen Colors and Conversion Factors (optional) _____

COMMENTS:
(Use additional comment sheet if necessary)

*** **An entry in this column indicates corrective action or comment needed.** UIC Checklist Page 7, Revised 10/28/2010

Hazardous Waste

- **Hazardous waste** is managed under the Resource Conservation and Recovery Act (RCRA) authority
- **Characteristic Waste** – A waste that exhibits any of the characteristics listed in 40 CFR 261 Subpart C which are:
  - **Ignitability**
    - **EPA Waste Code D001**
  - **Corrosivity (2≥pH≥12.5)**
    - **EPA Waste Code D002**
  - **Reactivity**
    - **Reacts violently with water (explosive)**
    - **EPA Waste Code D003**
  - **Toxicity**
    - **Exhibits toxicity when tested by the Toxicity Characteristic Leaching Procedure (TCLP) or (TC)**
    - **Numerous EPA Waste Codes (e.g., Arsenic D004, Lead D008, Mercury D009, Silver D011, and Benzene D018)**

Hazardous Waste

- **Listed Hazardous Waste**– A waste that is specifically listed in 40 CFR Part 261, Subpart D.
- **Mixture Rule**– Any waste that is mixed with a listed hazardous waste becomes hazardous and any waste mixed with a characteristic hazardous waste is hazardous if the resultant mixture is still characteristically hazardous.

Land Disposal Restrictions

- RCRA §3004(k) prohibits land disposal of untreated waste in:
  - Landfills
  - Surface impoundments
  - Waste piles
  - **Injection wells**
  - Land treatment facility
  - Salt dome
  - Salt bed formation
  - Underground mine
  - Cave
- Regulate liquid hazardous waste or free liquids associated with the treatment of hazardous waste

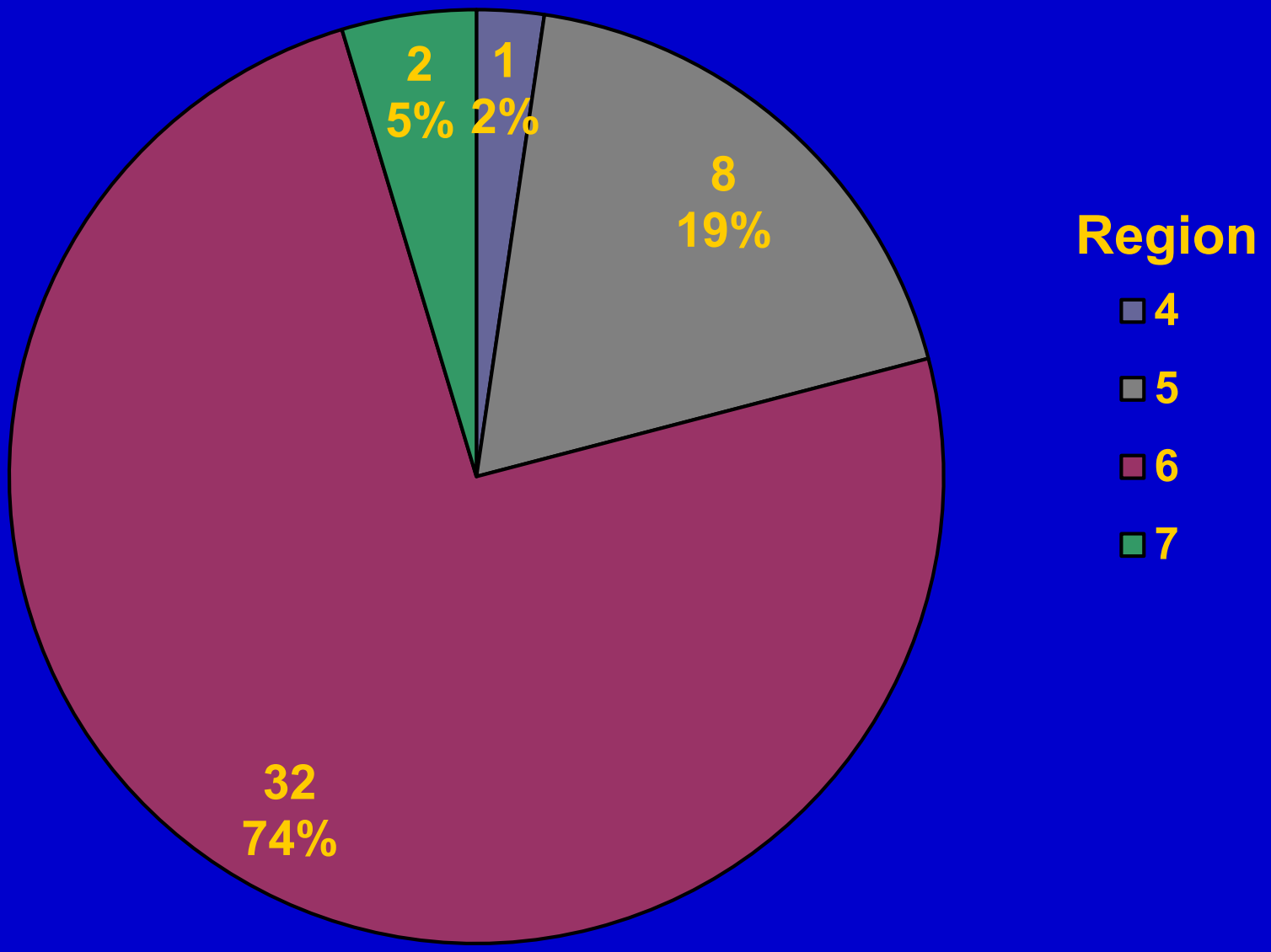
No Migration

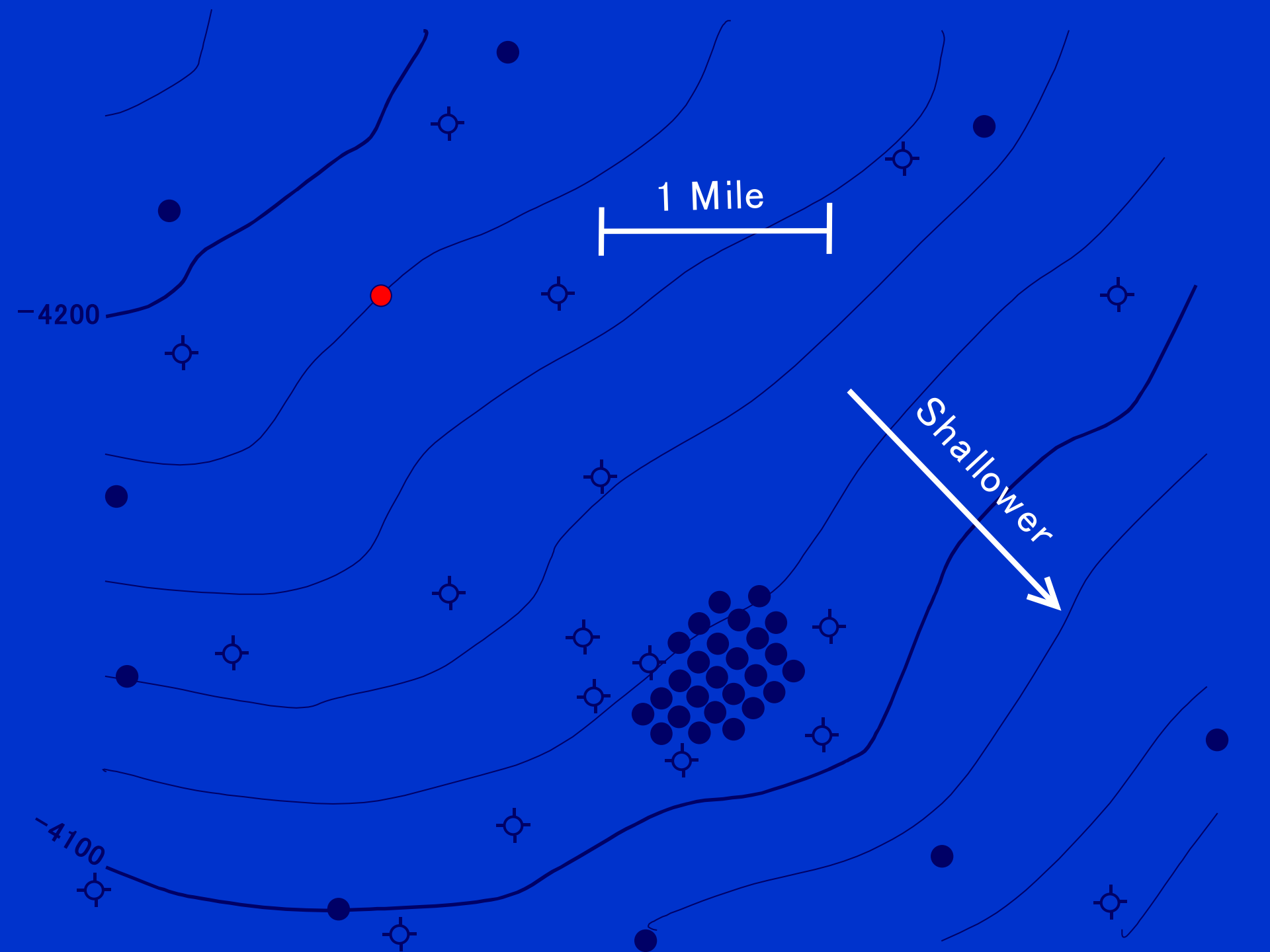
- RCRA 1984 HSWA amendments banned the land disposal (including injection) of hazardous waste, unless:
  - The waste is treated to meet specific concentration or technology-based standards ***or***
  - The hazardous waste is disposed of in a land disposal unit that has an approved "no migration" petition

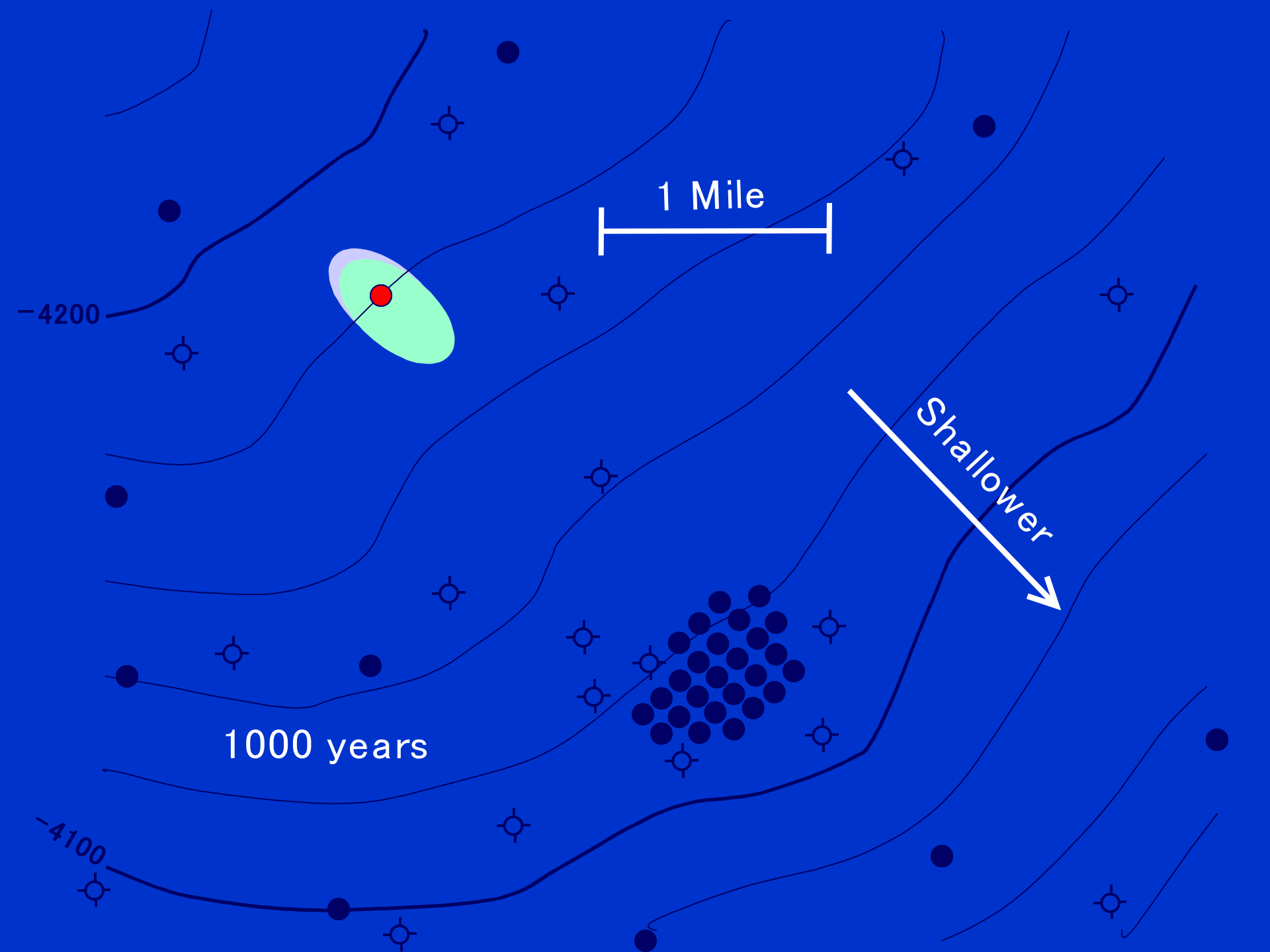
No Migration Petition Review

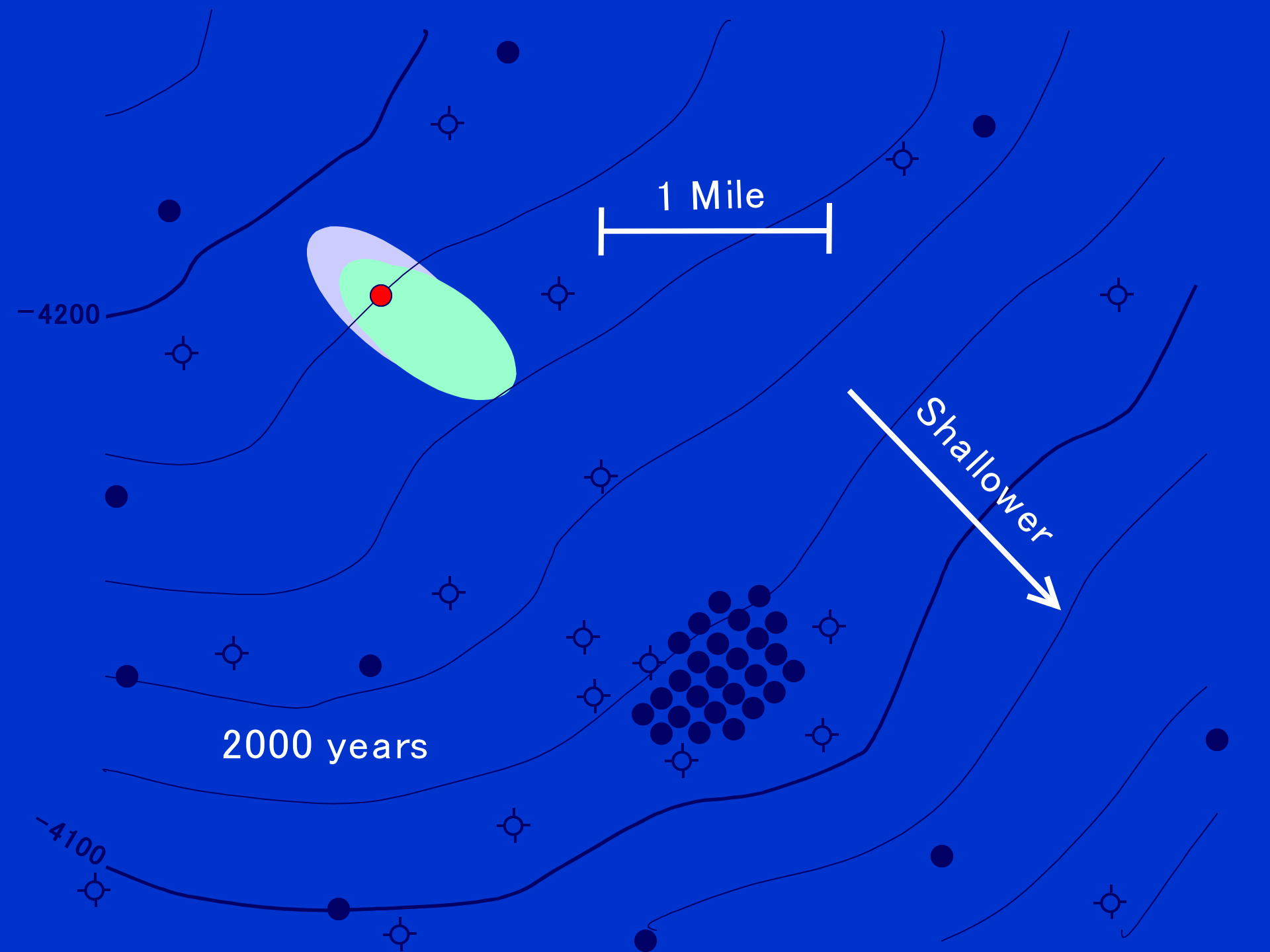
- ✓ Engineer/Geologist team review
- ✓ Local and regional geology are reviewed
- ✓ Mathematical waste movement and pressure buildup models evaluated
- ✓ Artificial penetrations are reviewed
- ✓ Forty-five day public comment period (since hazardous waste) for proposed approval – public notice published in local paper and mailed to adjacent landowners, local officials, and other government agencies
- ✓ Public hearing held locally if there is significant public interest (30 day notice of any hearing)
- ✓ Final approval notice published in *Federal Register*

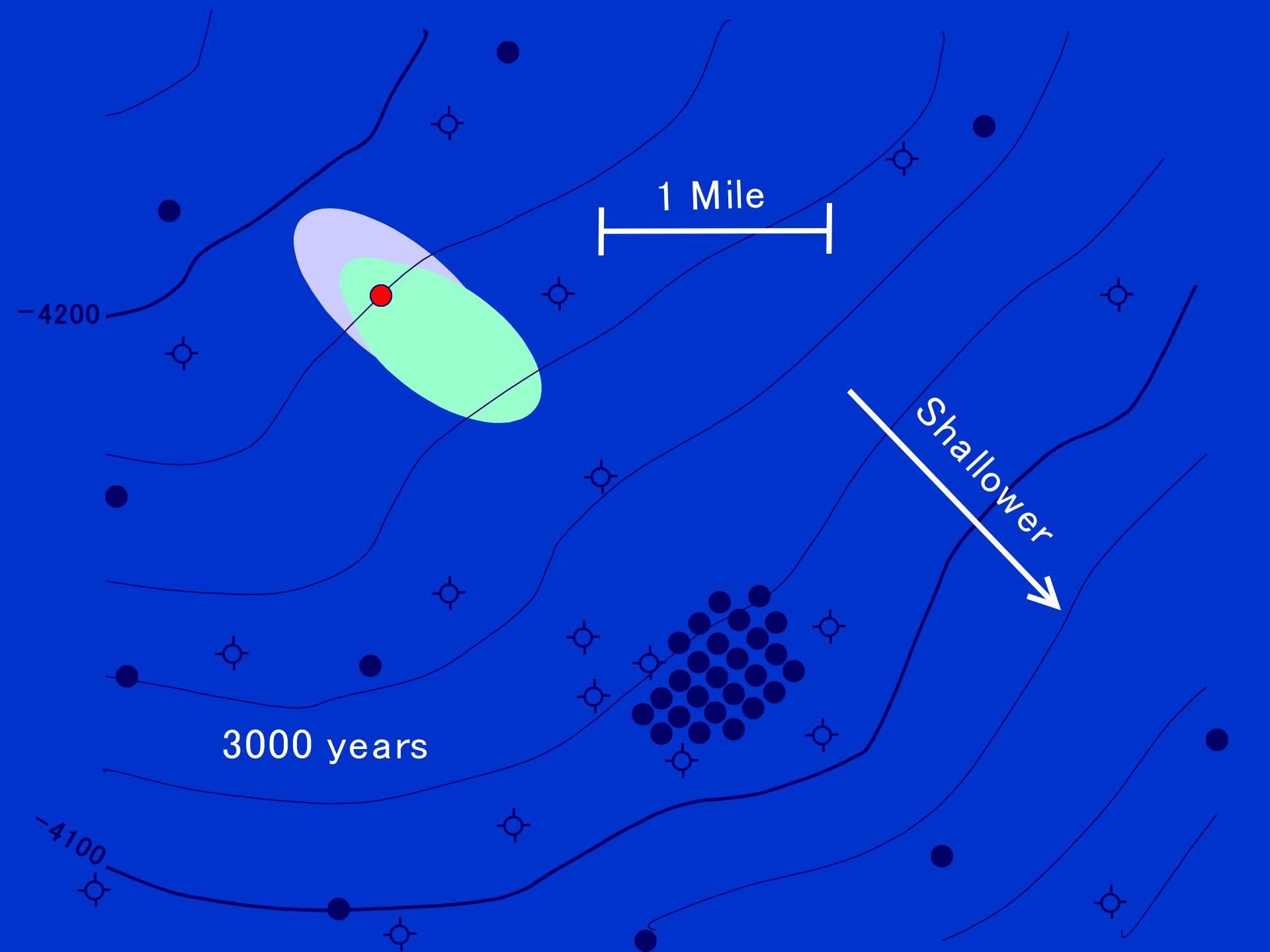
Active No Migration Petitions




1 Mile
-4200
Shallower
-4100


1 Mile
-4200
Shallower
1000 years
-4100


1 Mile
-4200
Shallower
2000 years
-4100


1 Mile
-4200
Shallower
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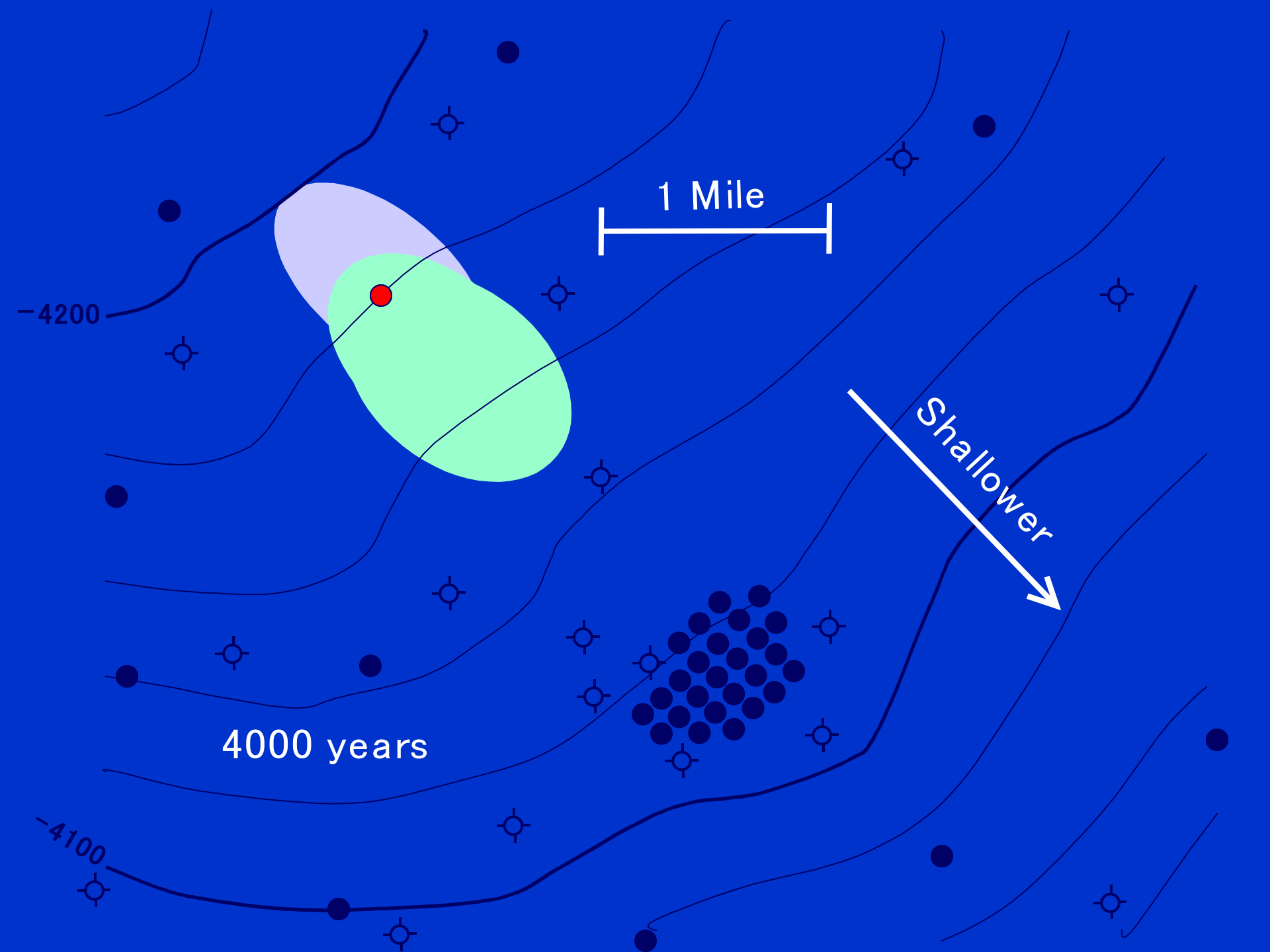
-4100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Shallower
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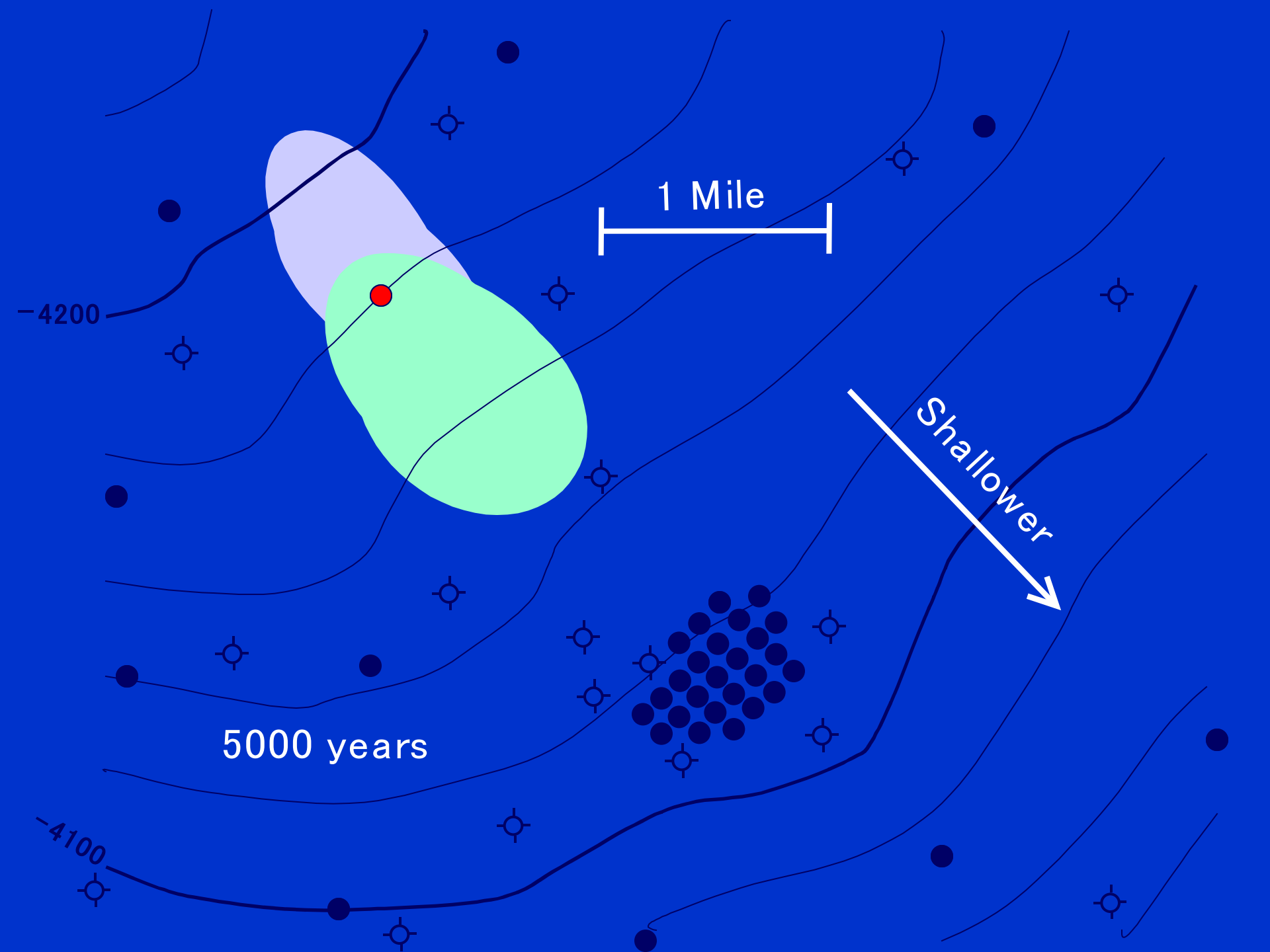
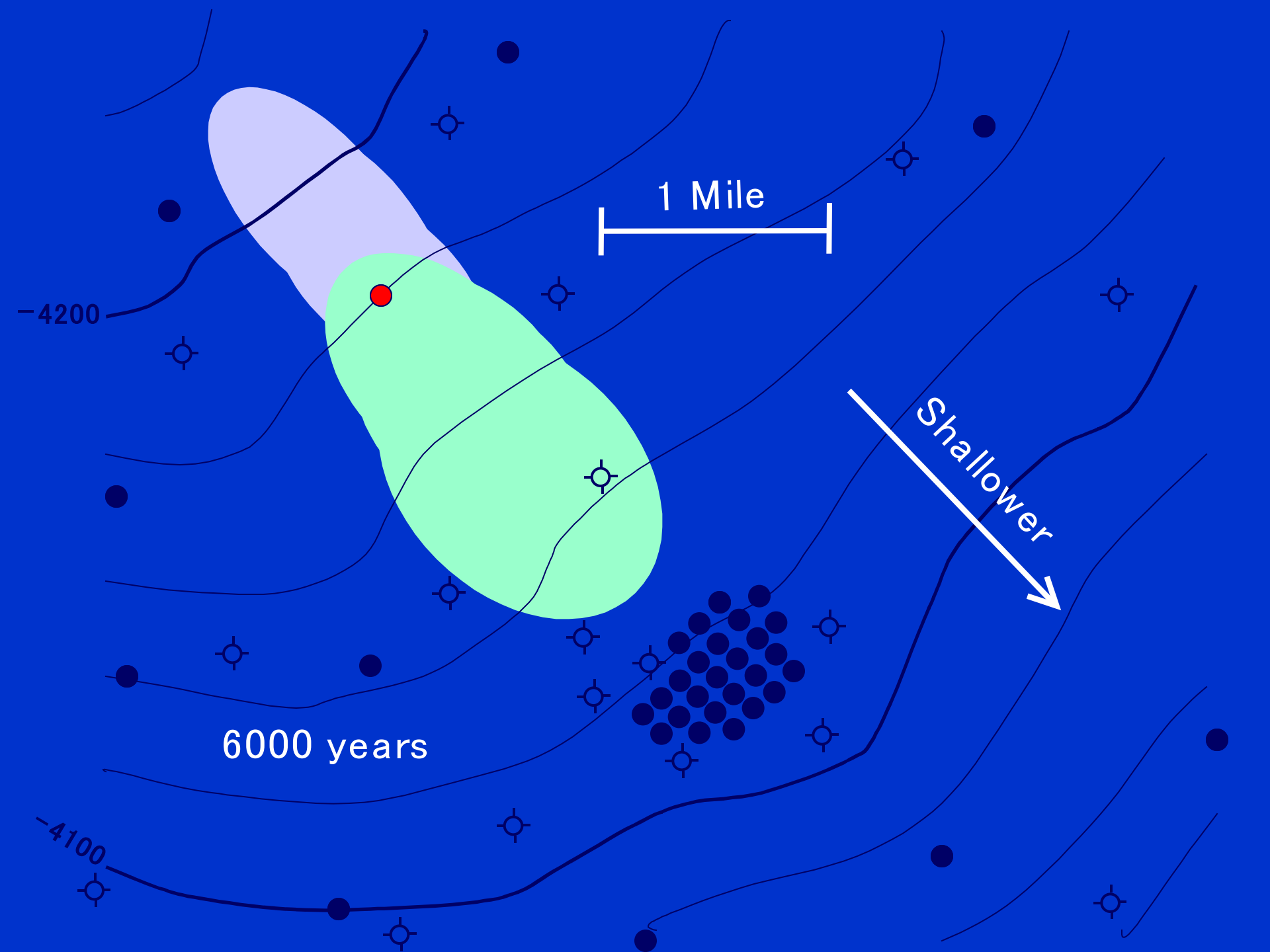
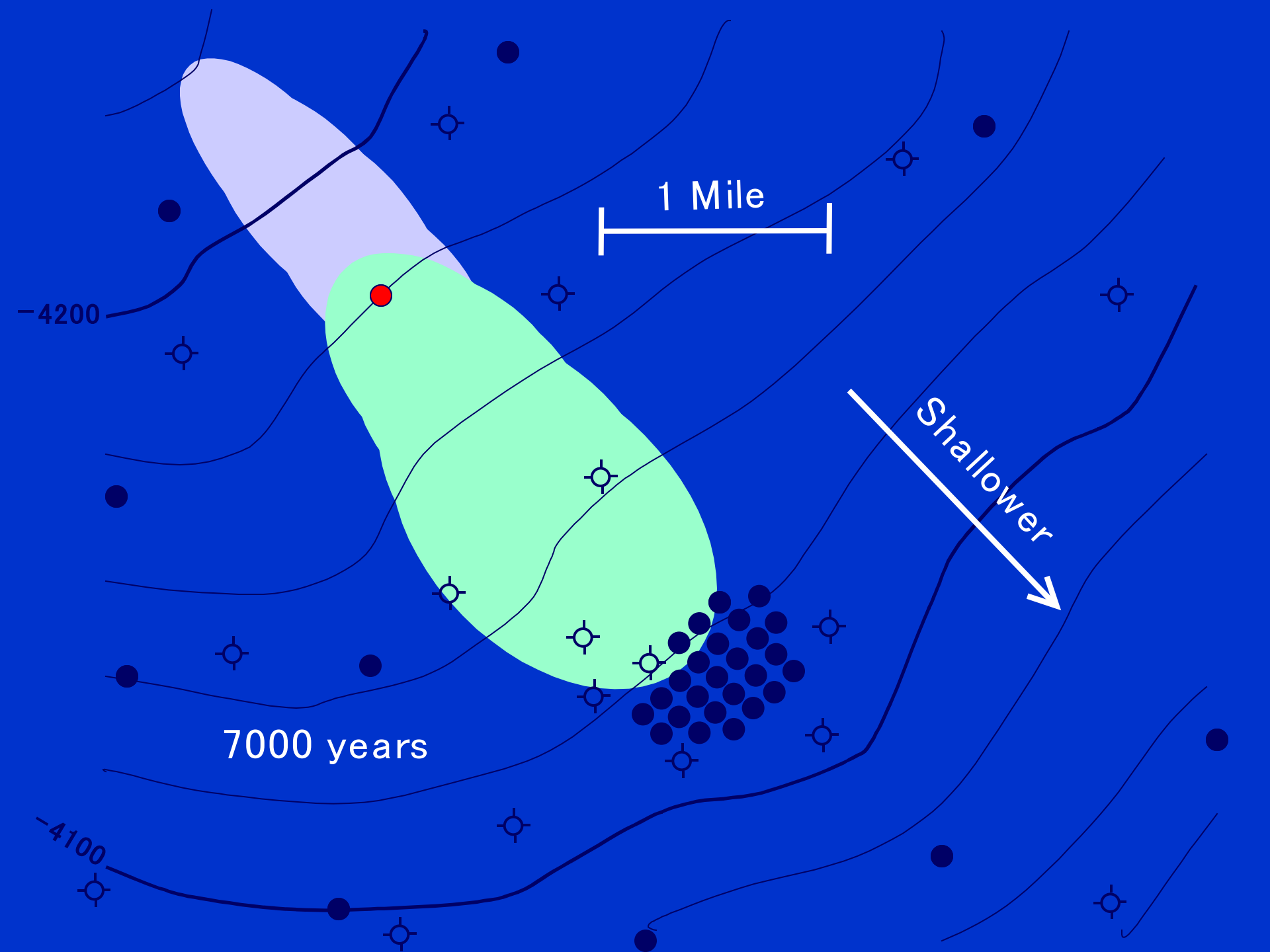
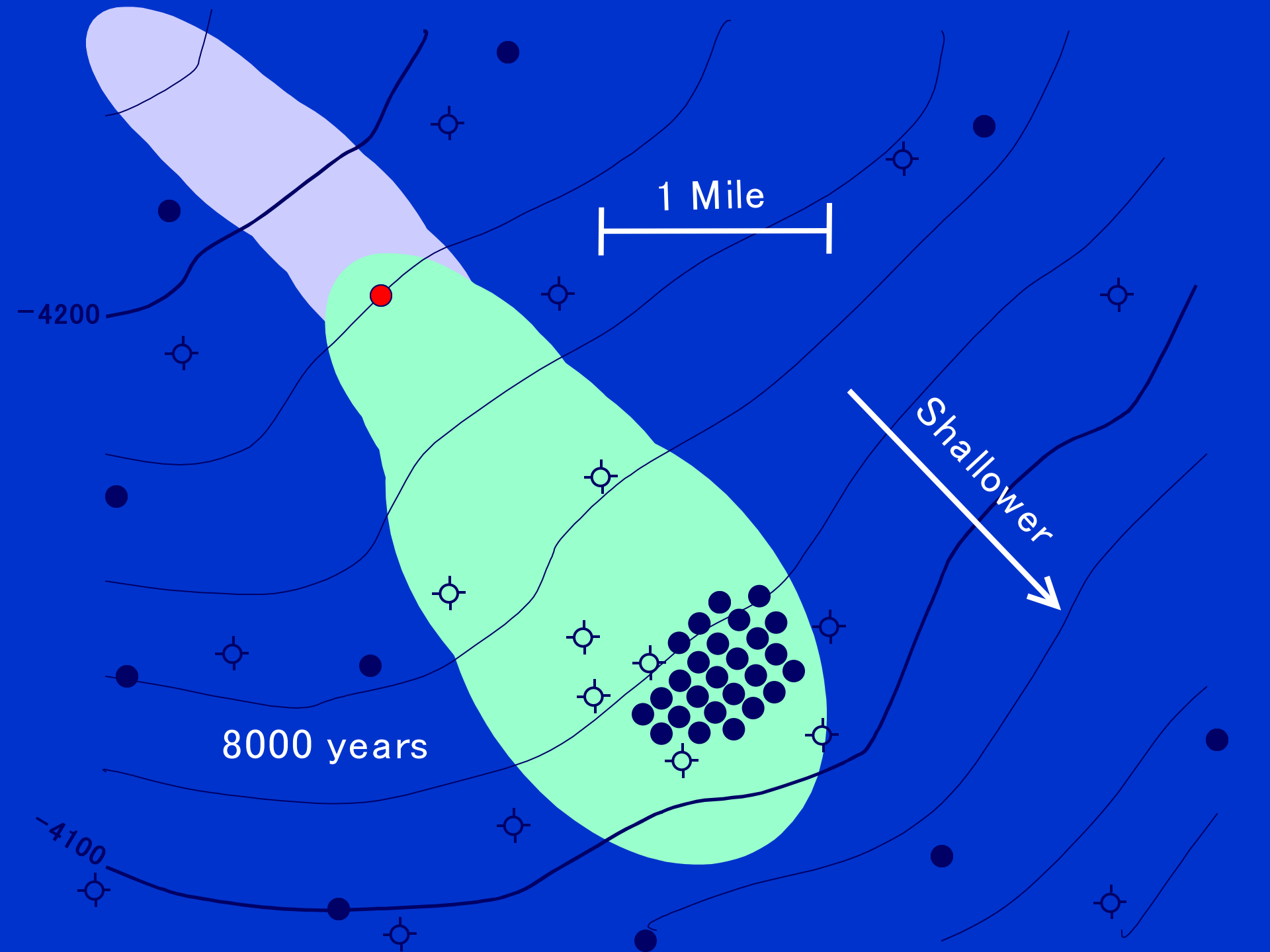
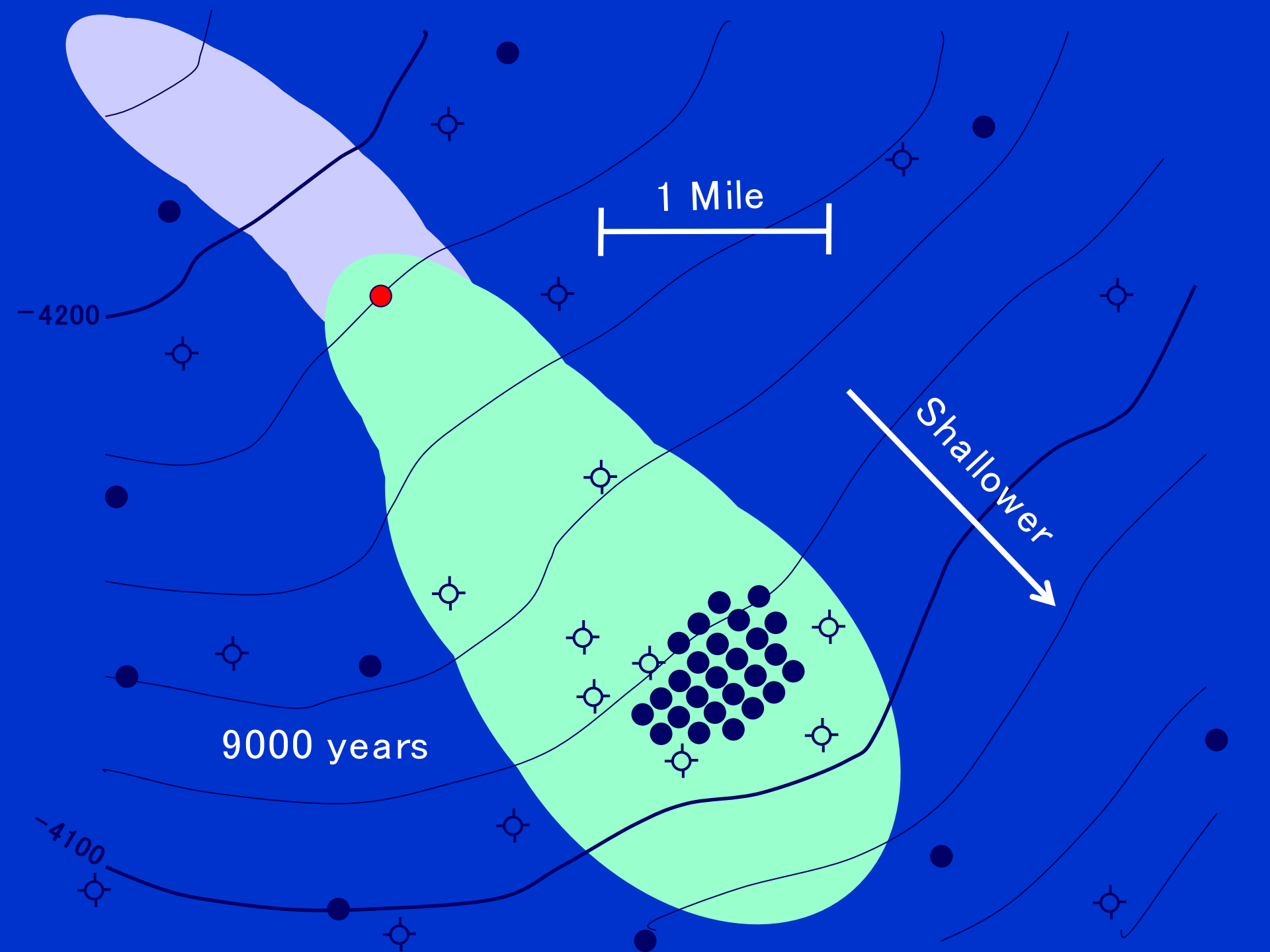
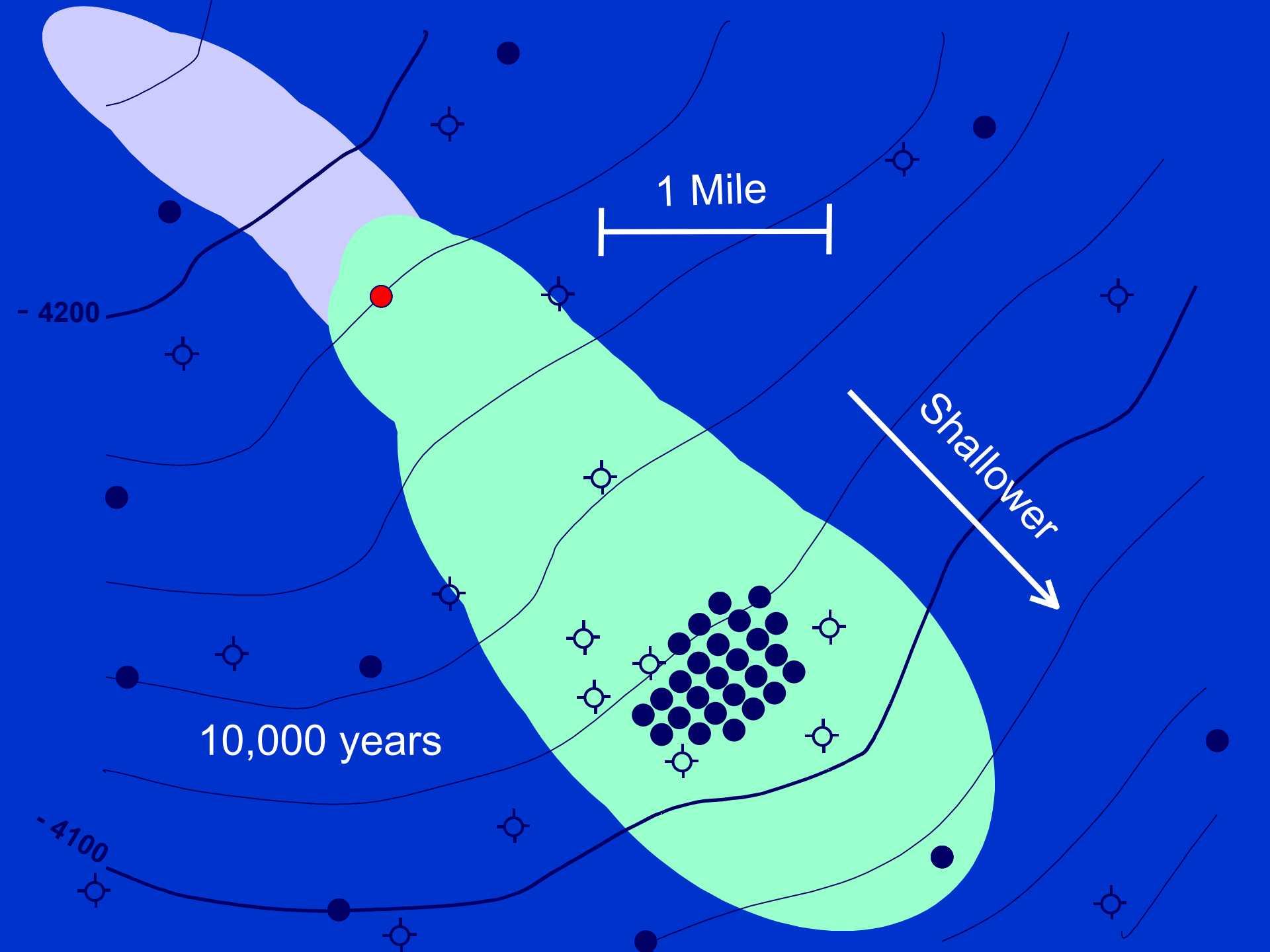

1 Mile
-4200
Shallower
5000 years
-4100


1 Mile
-4200
Shallower
6000 years
-4100


1 Mile
-4200
Shallower
7000 years
-4100


1 Mile
Shallower
8000 years
-4200
-4100


1 Mile
-4200
Shallower
9000 years
-4100


1 Mile
- 4200
Shallower
10,000 years
- 4100

Petition Compliance

- Facility is in compliance with their petition approval conditions – EPA performs petition compliance inspections to ensure that facility is in compliance with these conditions

- Annual falloff testing analysis indicates that approved petition modeling input parameters and pressure buildup projections are still conservative

- Annual radioactive tracer survey documents that all hazardous waste is being emplaced in the injection interval and the bottomhole cement has no channels