Environmental Considerations When Conducting Geothermal Feasibility Evaluations

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Overview

1. Why Evaluate Environmental Site Conditions
2. How Does One Evaluate Environmental Conditions
3. Case Study
4. Conclusions

Why Evaluate Environmental Conditions

1. Avoid Costly Mistakes
2. Protection of Sensitive Receptors
3. May render geothermal not feasible

Evaluating Environmental Conditions

1. The type of ground exchanger (open, closed, standing column well) drives the study
2. Ask if there are existing environmental conditions
3. Review Existing Reports, if available
4. Review On-line Databases
5. Commercial Databases, like EDR ($300)
6. Are there Environmental Issues at other sites in the area
7. Install Test Well to determine site geology
8. Examine Permitting Requirements-NPDES, UIC, Groundwater Discharge-
   May require water pre-testing and/or treatment
9. If soil or groundwater contamination, what is the extent.

Online Database Example

MassDEP

The Massachusetts Department of Environmental Protection

New Search | Export to Excel | Definitions | Print

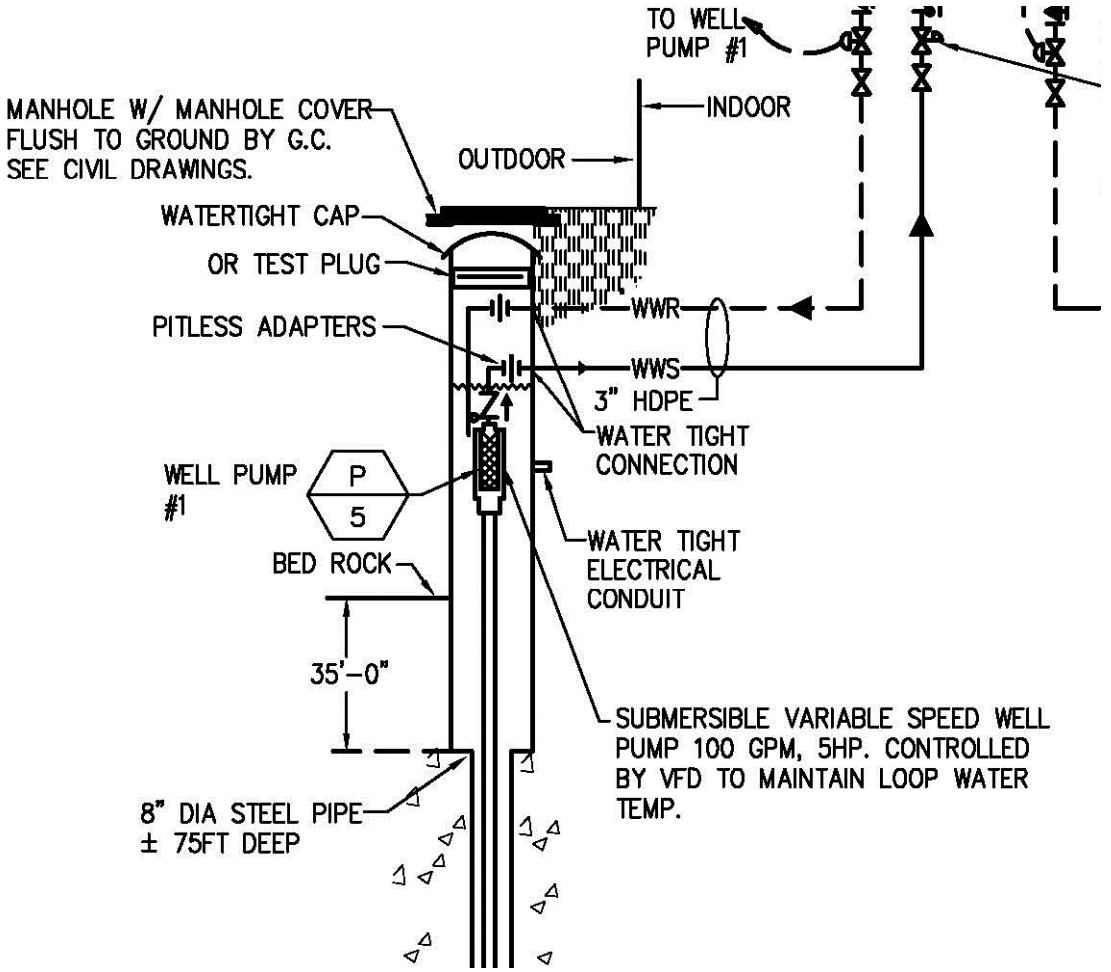
Reportable Release Lookup

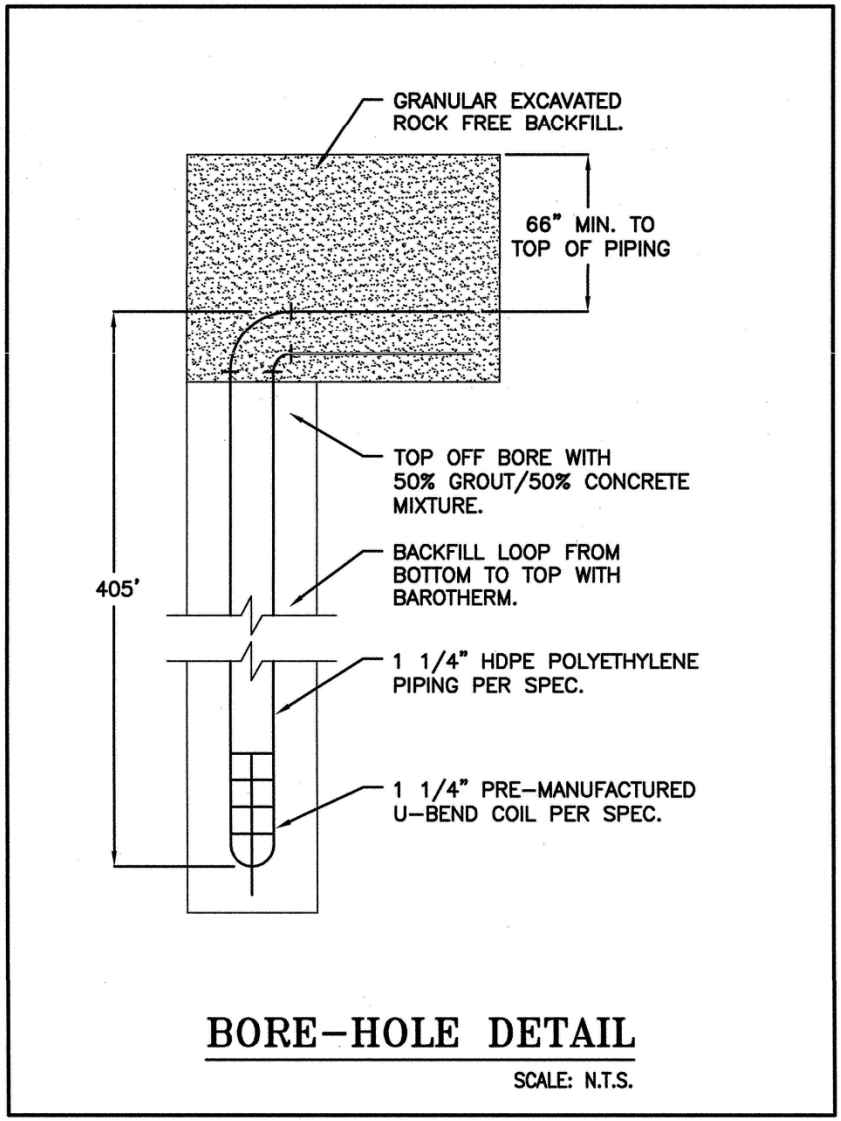
View Map

The search returned 459 results | Search Keywords >> 'QUINCY' | Sorted by: RTN | Data last updated: 03/25/2011

RTN	City/Town	Release Address	Site Name/ Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type	Supporting Documents
3-0000005	QUINCY	555 SOUTHERN ARTERY RTE 3A	SUNOCO STATION	NONE	10/16/1985	REMOPS	2/21/2011	PHASE V			Files
3-0000102	QUINCY	15 CENTER ST	TEXACO STATION	NONE	1/15/1987	TIER 2	9/24/2007	PHASE II			Files
3-0000117	QUINCY	728 SOUTHERN ARTERY	QUINOIL TERMINAL	NONE	1/15/1987	RAO	8/8/1997	PHASE IV	C1		Files
3-0000128	QUINCY	1415-1439 HANCOCK ST	ONE PARKINGWAY BLDG	NONE	4/15/1988	DPS	5/22/2003				
3-0000144	QUINCY	15 LIBERTY ST	AMOCO STATION	NONE	1/15/1987	LSPNFA	3/10/1997				
3-0000414	QUINCY	97-103 HOLMES ST	ARCH GEAR FMR	NONE	1/15/1987	RAO	11/20/2006	PHASE IV	C1	Oil	Files
3-0000415	QUINCY	193-323 QUARRY ST	QUINCY QUARRIES FMR	NONE	1/15/1987	RAO	6/4/2004		A3	Oil	
3-0000416	QUINCY	RICCIUTI DR	YANKEE HEIGHTS DEVELOPMENT	NONE	1/15/1987	TIER1D	8/9/1995				
3-0000495	QUINCY	CENTER ST	CROWN COLONY PLACE	NONE	1/15/1987	TIER1D	8/9/1995				
3-0000536	QUINCY	97 EAST HOWARD ST	GENERAL DYNAMICS FMR	NONE	1/15/1987	RAO	4/30/2004	PHASE V	C1		Files
3-0000578	QUINCY	OFF 40 QUINCY AVE	BATES QUARRY FMR	NONE	1/15/1987	RAO	5/16/1994			Oil	
3-0000628	QUINCY	25 WEST HOWARD ST	EASTERN PEGGY ASSOCIATES	NONE	1/15/1990	RAO	3/22/1996	PHASE II	A2		
3-0000639	QUINCY	BENT TER	TOWN RIVER BENT TERRACE	NONE	1/15/1990	TIER1D	8/9/1996				
3-0000646	QUINCY	2 HANCOCK ST	MATHEWSON CORPORATION	NONE	4/15/1988	TIER 2	2/22/2008	PHASE IV			Files
3-0000723	QUINCY	571 HANCOCK ST	AMOCO STATION FMR 127	NONE	7/15/1990	RAO	6/13/1996	PHASE III	A2	Oil	Files

ALARES


TO WELL PUMP #1
INDOOR
MANHOLE W/ MANHOLE COVER FLUSH TO GROUND BY G.C. SEE CIVIL DRAWINGS.
OUTDOOR
WATERTIGHT CAP
OR TEST PLUG
WWR
PITLESS ADAPTERS
WWS
3" HDPE
WATER TIGHT CONNECTION
WELL PUMP #1
P
5
WATER TIGHT ELECTRICAL CONDUIT
BED ROCK
35'-0"
SUBMERSIBLE VARIABLE SPEED WELL PUMP 100 GPM, 5HP. CONTROLLED BY VFD TO MAINTAIN LOOP WATER TEMP.
8" DIA STEEL PIPE ± 75FT DEEP



BORE-HOLE DETAIL

SCALE: N.T.S.

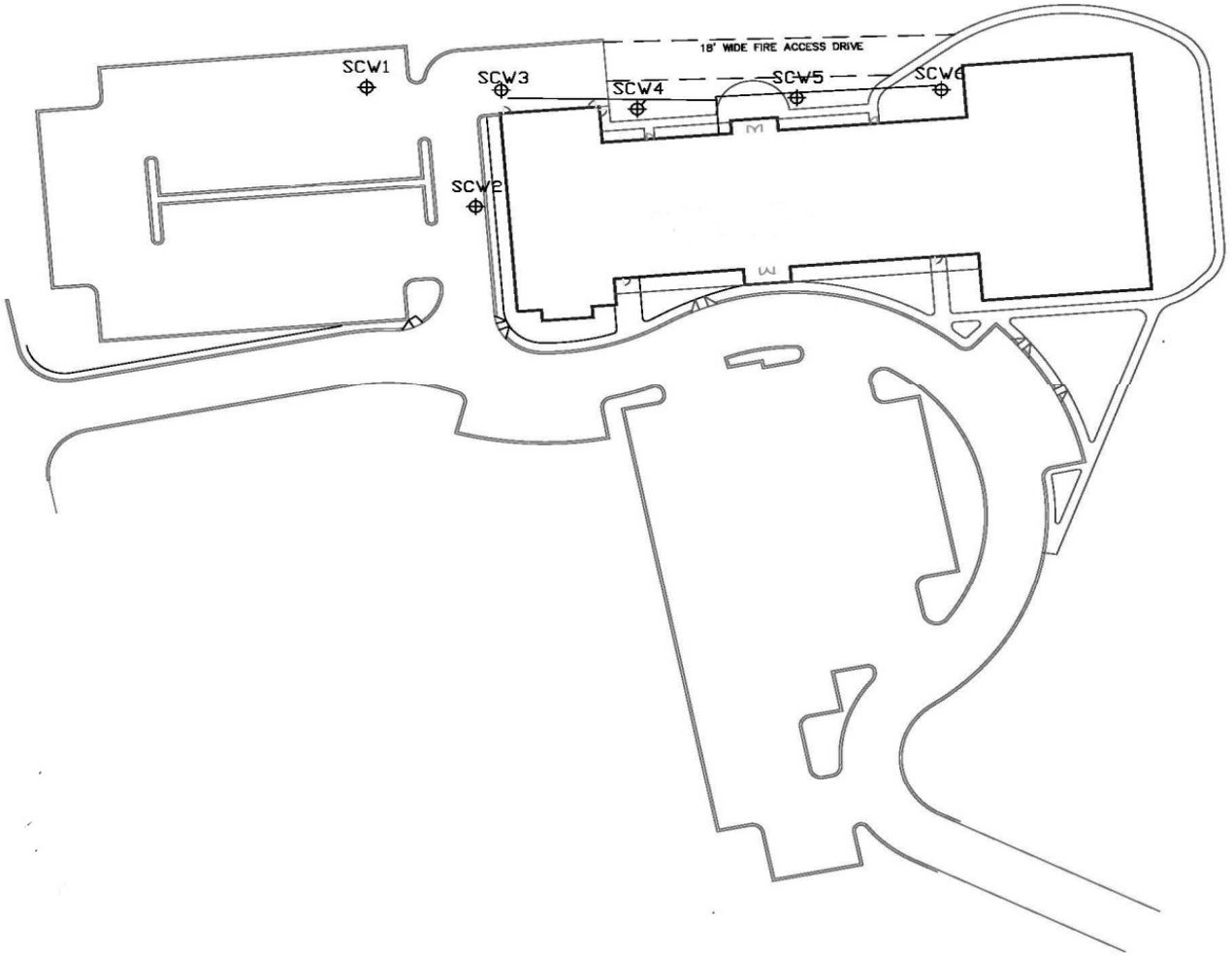
Open Loop

1. Must have understanding of hydrogeology.
2. Effects on aquifer both extraction and injection.
3. Must have understanding of water chemistry.

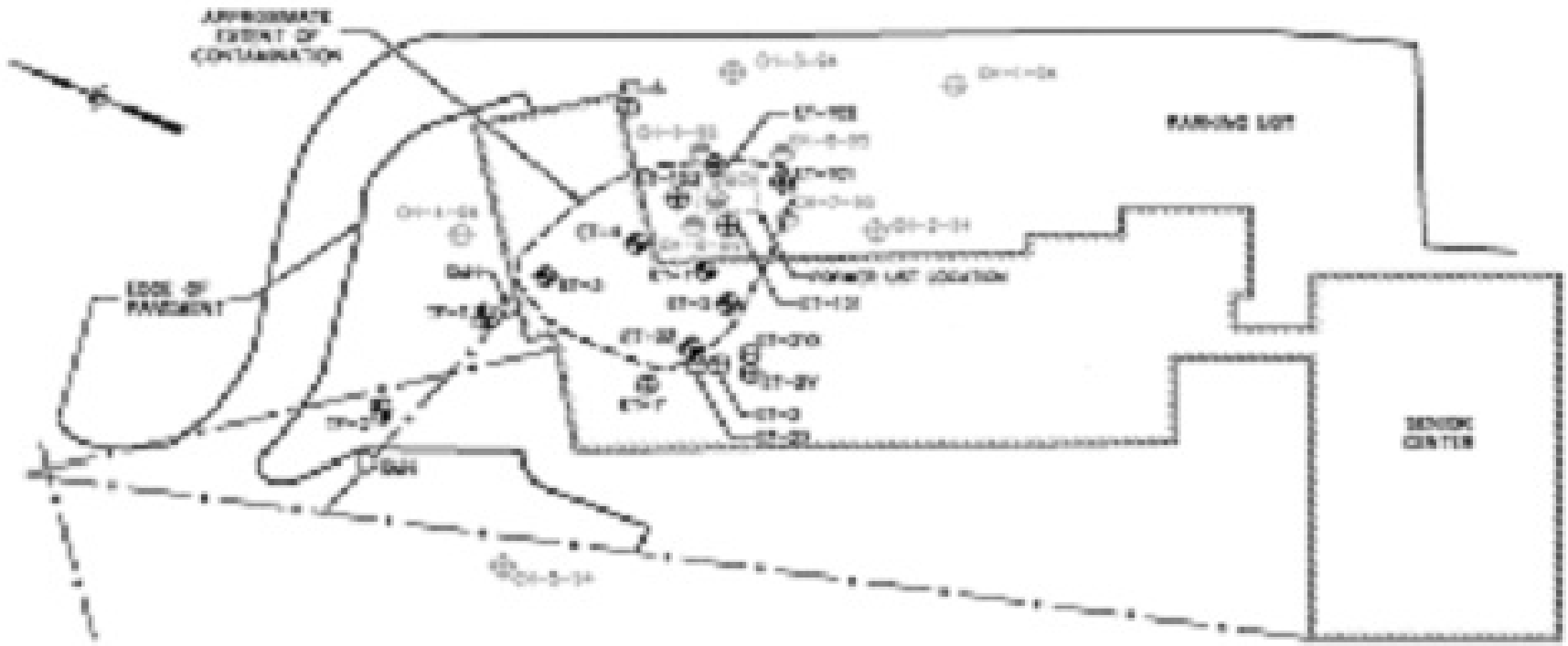
CASE STUDY

1. City developing site as a community center
2. Existing building had a fuel oil leak from underground storage tank.
3. The site has on-going groundwater monitoring and an activity and use limitation.
4. Oil is present beneath existing building slab on water table.
5. Bedrock is present at surface at the site.
6. Design for new building includes geothermal heating and cooling using Standing Column Wells to 1500 feet. Water from wells discharge to storm drain.
7. An Environmental site evaluation for the geothermal design was not conducted.

CASE STUDY



CASE STUDY


APPROXIMATE EXTENT OF CONTAMINATION
EDGE OF PAVEMENT
PARKING LOT

What Happened

1. Alares was hired as LSP to prepare a soil management plan for construction.
2. Alares reviewed construction documents to evaluate new foundation plan.
3. Noticed design drawings included standing column wells.
4. Asked if environmental assessment for wells was conducted.
5. No evaluation of site geology, permits, or environmental conditions had been conducted.
6. Construction Documents went out for public bid.
7. Geothermal designer added two additional Standing Column Wells for No-Bleed
8. Questions still unanswered concerning bedrock flow characteristics, i.e., installation of wells could worsen site conditions during well development.

What Happened

1. Owner decided to change design to conventional HVAC system.
2. Costs for geothermal design approximately $30k.
3. Owner now has negative view of geothermal.

Conclusions

1. Get environmental professional with geothermal experience involved early in the design.
2. Person conducting feasibility evaluation must have understanding the method of geothermal earth couples and how subsurface conditions could be affected.
3. Evaluate Permit requirements.
4. Environmental conditions can be managed.
5. Not all sites are appropriate for geothermal.