# Floodplain Analyses and Drilling Reports for Camps Barkeley, Bowie, Mabry, Maxey, and Swift and Fort Wolters

# Interim Report

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# INTRODUCTION

The Bureau of Economic Geology (BEG) is conducting hydrologic and hydrogeologic studies of Texas National Guard training facilities at Camps Barkeley, Bowie, Mabry, Maxey, and Swift and Fort Wolters. These investigations, in conjunction with aquatic and biological surveys conducted by the Texas Parks and Wildlife Department, will provide information needed by the Texas National Guard to plan training and preparedness activities such that environmental resources will be protected and enhanced without compromising national security readiness.

This report presents interim results on floodplain analysis and drilling activities. Floodplain analysis results include 100-yr rainfalls, 100-yr flood hydrographs at camp and fort outlets, and maps of the 100-yr floodplain at each training facility. Our drilling results include well schematics, well schedules, and location maps.

Results are reported in 6 sections with each section discussing the drilling reports and floodplain mapping for an individual training facility. The methods section contains details about the procedures used to drill and complete the wells and map the floodplains.

# **METHODS**

# FLOODPLAIN ANALYSIS

Floodplain analysis involves determining the area adjacent to a river or stream that will flood for a specified return period (for example, a 100-year flood). The standard procedure is to determine the 100-yr flood at key points on the stream and use backwater computation to determine stages upstream (Linsley and others, 1982, p. 452). If available, the 100-yr flood is determined from stream-gage record. However, this data is typically lacking and regional frequency methods or loss rate and unit hydrograph applied to the 100-yr rainfall can be used (Linsley and others, 1982, p. 452). Because most of the camps lack stream-gage records, we used the loss rate and unit hydrograph method to estimate the 100-yr floodplain.

Our floodplain analysis consisted of (1) designing 100-yr 24 hr synthetic storms, (2) determining the 100-yr flood hydrographs at strategic points in the watersheds, (3) determining 100-yr flooding surfaces, and (4) mapping the 100-yr floodplains on 1:2400 USGS topographic maps.

To design the 100-yr 24 hr synthetic storms, we first used maps published by the U.S. Weather Bureau (Herschfield, 1961 as shown in Chow, 1964, p. 9-56) to determine the 100-yr 24 hr rainfall for each camp and fort. We then used these rainfall rates with the SCS Type II distribution (Bedient and Huber, 1988) to generate the storms.

To determine the 100-yr flood hydrographs, we used HEC-1 (Hydrologic Engineering Center, 1981) with SCS unit hydrographs (Soil Conservation Service, 1957) and Muskingum routing (McCarthy, 1938). Input to HEC-1 included: sub-basin drainage area, runoff curve numbers, basin lag, routing storage coefficient, and routing weight factor. Runoff curve numbers are used to define the unit hydrographs and are a function of soil type, vegetation, land use, antecedent moisture, and the hydrologic properties of the catchment surface. Basin lag, also called catchment lag, is the elapsed time, or response time, between rainfall and runoff occurrence and is partly a function of hydraulic length, catchment gradient, drainage density, and drainage patterns. The routing storage coefficient, or time constant, is a function of the channel reach length and the speed of the flood wave. The routing weight factor is a function of the flow and channel characteristics that affect the dispersion of the flood wave downstream.

We delineated detailed sub-watersheds and determined sub-watershed drainage area with ARC/INFO (ESRI, 1993). We calculated weighted curve numbers in ARC/INFO for each sub-watershed using STATSGO (Soil Conservation Service, 1991) digital hydrologic soil data and land use data assuming moderate antecedent moisture conditions ( $I_a = 0.25$  in). Because the majority of the watersheds were not gauged, we estimated the basin lag,  $t_p$ , using (Linsley and others, 1982, p. 224):

$$t_p = C_t \left(\frac{LL_c}{\sqrt{s}}\right)^n \tag{1}$$

where  $C_t$  is a constant that varies between 1.8 and 2.2 for units of miles (Snyder, 1938), L is the stream distance to the divide,  $L_c$  is the stream distance, n is 0.35 for valley drainage areas (Linsley and others, 1982, p. 225), and s is

the channel gradient. For this study, we chose a mean  $C_t$  value of 2.0. We assigned the routing storage coefficient as 0.20, a typical value for most natural streams (Linsley and others, 1982, p. 219). We measured L,  $L_t$ , and s from USGS 1:24000 topographic sheets. We estimated the routing travel time constant, K, using (Linsley and others, 1949, p. 465-541):

$$K = \frac{bL\sqrt{A}}{\sqrt{s}} \tag{2}$$

where A is the drainage area and b is a constant between 0.04 and 0.08 for L in miles and A in square miles. For this study, we chose a mean b value of 0.06. With the above data input into HEC-1, we modeled 100-yr flood hydrographs for sub-watersheds on or just outside the camps and fort. We recorded peak flows for these 100-yr flood hydrographs for assessing flooding depths.

We used HEC-RAS (Hydrologic Engineering Center, 1995) to estimate 100-yr flooding surfaces at the locations where we determined the flood hydrographs. Input to HEC-RAS included: topographic cross-sections at hydrograph locations, stream lengths between cross-sections, Manning's *n* values, discharge rates, and stream flow boundary conditions. We measured topographic cross sections from USGS 1:24000 topographic sheets perpendicular to the stream path. Using a map roll gauge, we measured stream lengths between cross sections from the topographic sheets. We assumed Manning's *n* values to be 0.06 on the banks (Hydrologic Engineering Center, 1995) and 0.05 in and near the stream channel. HEC-1 supplied the peak 100-yr discharge rates for each hydrograph location. We assigned the stream-flow boundary condition at the output end of the model as a critical depth boundary. In all simulations, we assumed subcritical flow. After inputting the above information, HEC-RAS determined the flood surface at each of the chosen locations.

We mapped the 100-yr floodplains by transcribing the 100-yr flood surfaces estimated by HEC-RAS onto USGS 1:24000 topographic sheets and interpolated between hydrograph locations. Once mapped, we digitized the floodplains in ARC/INFO GIS and printed maps.

# MONITOR WELL INSTALLATION

The installation of monitor wells at the camps and fort included (1) selecting and staking appropriate sites for well locations, (2) arranging access

to the well sites and, if needed, a source of water for the drill rig, (3) drilling the well, (4) developing the well, (5) installing casing, and (6) developing the cased well. Drilling sites were chosen to best investigate the hydrogeology of the sites and still be accessible to a drill rig. Hydrogeologic justifications for these locations are included in a former interim report (Fisher and Mace, 1995). Before staking the well sites, we contacted camp commanders to ensure the locations would not interfere with camp activities and were not located near any known buried utilities. We coordinated our drilling with the camps to ensure our activities would not interfere with training schedules.

We drilled the monitor wells with our Central Mine Equipment 75 drilling rig. Depending on the geology, we used hollow stem augering, solid stem boring, rotary/wet coring or a combination thereof to install the wells. Most wells were installed using hollow stem augering. A few wells required solid stem boring or rotary/wet coring due to the presence of hard rock. The drilling mud we used for solid stem boring and rotary/wet coring was biodegradable Super Mud. Where possible, we collected core and cuttings for inspection at our facilities.

Once the well was drilled, we augered or flushed the cuttings from the hole and developed the well with a bailer, usually removing 1 to 2 well-bore volumes of water. Well completion consisted of installing 2-inch diameter well screen and pipe, placing a sandpack around the screen, placing a bentonite seal above the sandpack, grouting to a few feet below land surface, installing a well guard, and cementing the guard in place with a well pad. We installed either 10 or 20 feet of 0.010-inch slotted screen in the wells. The sandpack consisted of 20/40 sand and straddled the screen. We installed locking above-ground well guards on each of the wells. Once the well was completed and the cement had dried, we developed the well again with a bailer or an electrical submersible pump.

# CAMP BARKELEY

#### **DRILLING REPORTS**

We drilled and completed two wells in the Vale Formation at Camp Barkeley. BARKELEY-1 is 53.5 ft deep, and BARKELEY-2 is 93.2 ft deep. These wells are located near the northern entrance to the camp (fig. 1). We used hollow stem augering to install both of these wells. Detailed well schematics and drilling reports are included in the appendix.

#### FLOODPLAIN ANALYSIS

Camp Barkeley does not contain substantial 100-yr floodplains. The only mapable floodplain, which barely extends from the stream bed, is on the small stream in the southern part of the camp (fig. 2). Owing to the steep slopes near the mesa, rainfalls may cause substantial sheet flows and runoffs that can fill nearby arroyos and erode the landscape. There is evidence of erosion due to runoff down the camp road up to the mesa. The 100-yr 24-hr rainfall is 8.5-in with a maximum SCS Type II distributed rainfall intensity of 3.61 in hr<sup>-1</sup> (fig. 3a). This 100-yr rainfall results in a maximum flow of 918 cfs in the northern stream (fig. 3b for point A in fig. 2) and 2538 cfs in the southern stream (fig. 3c for point B in fig 2).

## CAMP BOWIE

#### DRILLING REPORTS

We drilled and completed two wells on Camp Bowie: one in the Travis Peak Formation near the escarpment (BOWIE-2) and another in alluvium/Strawn Group near the camp boundary (BOWIE-1). These wells are located in the central and eastern parts of the camp (fig. 4). The well drilled into the Travis Peak Formation is 101.2 ft deep and screened from 81.2 to 101.2 ft. The well drilled into the alluvium/Strawn Group is 53.8 ft deep. We used hollow stem augering to install BOWIE-1. On BOWIE-2, we used hollow stem augering to drill through the shallow unconsolidated deposits and solid stem boring for the remainder of the hole. Drilling progress was delayed several times due to training on the camp and freezing conditions. Detailed well schematics and drilling reports are included in the appendix.

#### FLOODPLAIN ANALYSIS

Camp Bowie has several streams that drain into Pecan Bayou to the north-east. The floodplains exist as halos around the stream beds, generally becoming wider as they approach Pecan Bayou (fig. 5). Floodplains are wider

about higher order streams such as South Willis Creek, Lewis Creek, and Devils River. The 100-yr 24-hr rainfall is 9.5-in with a maximum SCS Type II distributed rainfall intensity of 4.04 in hr<sup>-1</sup> (fig. 6a). This 100-yr rainfall results in a maximum flow of 3693 cfs in the tributary to MacKinally Creek in the south (fig. 6b for point A in fig. 5), 7484 cfs for Devils River near the camp boundary (fig. 6c for point B in fig 5), and 3762 cfs for Lewis Creek near the camp boundary (fig. 6d for point C in fig 5).

# CAMP MABRY

#### **DRILLING REPORTS**

We drilled one well on Camp Mabry in the Edwards Group in the southern portion of the camp (fig. 7). This well (MABRY-1) is 151.5 ft deep and is open from 41.4 ft to 151.5 ft. Once hydraulic testing and water sampling is complete, we will complete the well with screen and casing so it can be used as a permanent monitoring well. We used solid stem boring and rotary/wet coring to drill the well. We had circulation losses and difficulty drilling through the 20 to 30 ft of surface fill which included boulders and tree stumps. We tested this fill zone before sealing it off with cemented casing. Once we set this surface casing, we entered the hole with a smaller rock bit. Owing to the hardness of the limestone, this bit was worn at a depth of 122 ft. We then entered the hole with a smaller bit to arrive at the total depth. Detailed well schematics and drilling reports are included in the appendix.

#### FLOODPLAIN ANALYSIS

Camp Mabry does not contain substantial 100-yr floodplains. The only mapable floodplains, which barely extend from the stream bed, are on the small streams that flow south into Lake Austin (fig. 8). Runoffs are slightly greater due to impervious cover and will increase as development continues on the camp. The 100-yr 24-hr rainfall is 10.0-in with a maximum SCS Type II distributed rainfall intensity of 4.25 in hr<sup>-1</sup> (fig. 9a). This 100-yr rainfall results in a maximum flow of 918 cfs in the western stream (fig. 9b for point A in fig. 8) and 2538 cfs in the eastern stream (fig. 9c for point B in fig 8).

# CAMP MAXEY

#### **DRILLING REPORTS**

We drilled and completed two wells at Camp Maxey (fig. 10) along a transect that incorporates a preexisting hand-dug well on the camp. One well (MAXEY-1) was drilled 53 ft into the Bonham Formation and the other (MAXEY-2A) is drilled 61.2 ft into the Eagle Ford Formation. We initially tried rotary/wet coring to install MAXEY-2 but had difficulty with the sides of the hole washing out and collapsing. We filled and sealed this uncompleted well and used hollow stem augering to install another well, MAXEY-2A, nearby. We used solid stem boring to install MAXEY-1. Detailed well schematics and drilling reports are included in the appendix.

## FLOODPLAIN ANALYSIS

Camp Maxey has several streams that either drain north into Pat Mayse Lake or south into Hick's Creek. Floodplains for these streams are not large and exist as halos around the stream beds, generally becoming wider downstream as they feed into Pat Mayse Lake (fig. 11). USGS topographic maps show a controlled flooding surface for Pat Mayse Lake. This surface extends minimally (less than 250 ft) into Camp Maxey. The 100-yr 24-hr rainfall is 9.75-in with a maximum SCS Type II distributed rainfall intensity of 4.14 in hr<sup>-1</sup> (fig. 12a). This 100-yr rainfall results in a maximum flow of 4452 cfs in the eastern tributary to Pat Mayse Lake (fig. 12b for point A in fig. 11), 688 cfs for the creek that drains into Lamar Lake (fig. 12c for point B in fig 11), and 1236 cfs for the northern tributary to Pat Mayse Lake near the camp boundary (fig. 12d for point C in fig 11).

# **CAMP SWIFT**

#### **DRILLING REPORTS**

We drilled and completed two wells in the Calvert Bluff Formation on Camp Swift. SWIFT-1 is located in the northern part of the camp (fig. 13) and is 57.1 ft deep in the sandy portion of the Calvert Bluff Formation. SWIFT-2 is located in the south-central part of the camp (fig. 13) near the USGS well field

and is 51 ft deep in the clayey portion of the Calvert Bluff Formation. We used solid stem boring to install SWIFT-1 and hollow stem augering to install SWIFT-2. Detailed well schematics and drilling reports are included in the appendix.

#### **FLOODPLAIN ANALYSIS**

Big Sandy Creek, McLaughlin Creek, and Dogwood Creek cross Camp Swift. U.S. Department of Housing and Urban Development (1977) published flood hazard boundaries for these creeks and their tributaries. We transferred the floodplains to USGS 1:24000 topographic sheets and better constrained the floodplains on the tributaries (fig. 14). Gaylord and others (1985, p. 44-49) summarized the stream flow characteristics for the Big Sandy Creek watershed. The U.S. Bureau of Land Management (1980, table 2-7, p. A4-5-A4-8) estimated the 100-yr flow at Big Sandy Creek on the west side of the camp to be 20,850 cfs, at mouth of McLaughlin Creek to be 6,780 cfs, and where Dogwood Branch crosses Highway 95 to be 4,470 cfs.

# FORT WOLTERS

#### DRILLING REPORTS

We drilled and completed two wells on Fort Wolters in the Mineral Wells Formation. WOLTERS-2A is 52.2 ft deep and is located in the southern part of the western arm of the fort (fig. 15). WOLTERS-1 is 73.9 ft deep and is located on a nearby mesa overlooking WOLTERS-2A (fig. 15). We initially tried rotary/wet coring to install WOLTERS-2 but had difficulty with losing circulation and having water flow from desiccation cracks at land surface near the hole and the drilling rig. We filled and sealed this uncompleted well and used hollow stem augering to install another well, WOLTERS-2A, nearby. On WOLTERS-1, we used hollow stem augering to install 9 ft of surface casing and hollow stem augering to reach total depth. Detailed well schematics and drilling reports are included in the appendix.

## FLOODPLAIN ANALYSIS

Two major streams, Rocky Creek and Rippy Branch, cross Fort Wolters. Fort Wolters is also cut by several minor creeks. These streams and creeks do not have major 100-yr floodplains. The floodplains exist as halos around the

stream beds, generally becoming wider downstream (fig. 16). Floodplains are wider about higher order streams such as Rocky Creek and Rippy Branch except where the floodplain has steep slopes. The 100-yr 24-hr rainfall is 9.0-in with a maximum SCS Type II distributed rainfall intensity of 3.83 in hr<sup>-1</sup> (fig. 17a). This 100-yr rainfall results in a maximum flow of 12,085 cfs in Rocky Creek near the fort boundary (fig. 17b for point A in fig. 16), 6516 cfs for Rippy Branch near the fort boundary (fig. 17c for point B in fig 16), and 3448 cfs for a northwest tributary to Rocky Creek (fig. 17d for point C in fig 16).

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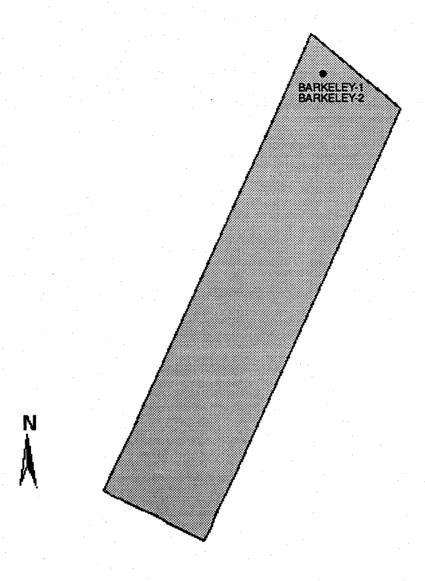


Figure 1. Monitor wells drilled on Camp Barkeley

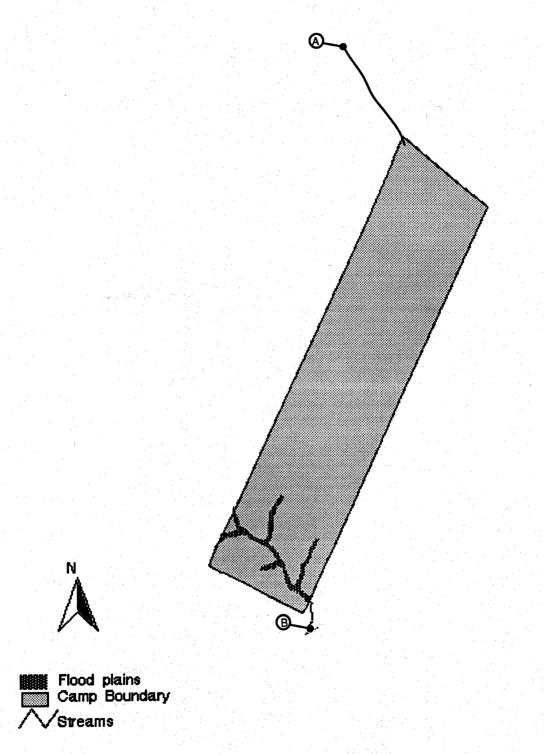


Figure 2. One-hundred year floodplains on Camp Barkeley. Points A and B refer to 100-yr flood hydrographs in figure 3.

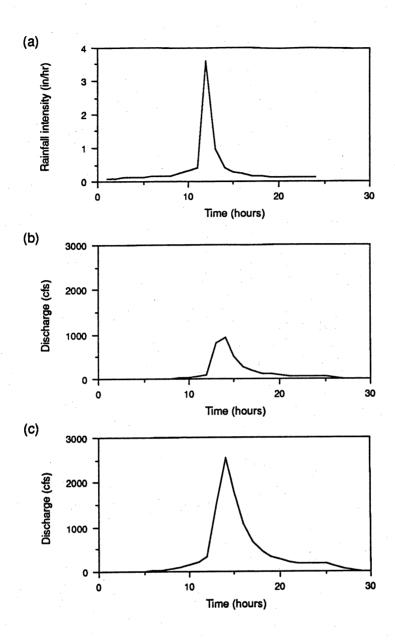


Figure 3. Flood hydrograph analysis for Camp Barkeley including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity, (b) 100-yr flood hydrograph for northern stream (point A, fig. 2), and (c) 100-yr flood hydrograph for southern stream (point B, fig. 2).

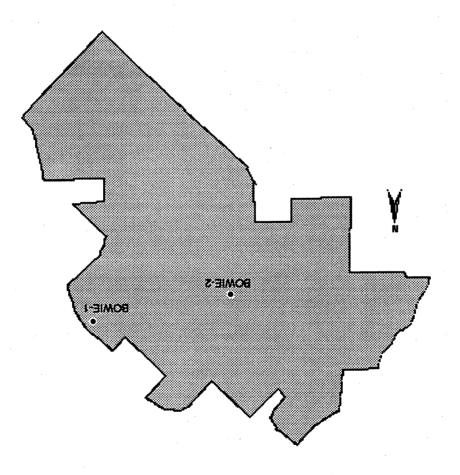


Figure 4. Locations of monitor wells drilled on Camp Bowie.

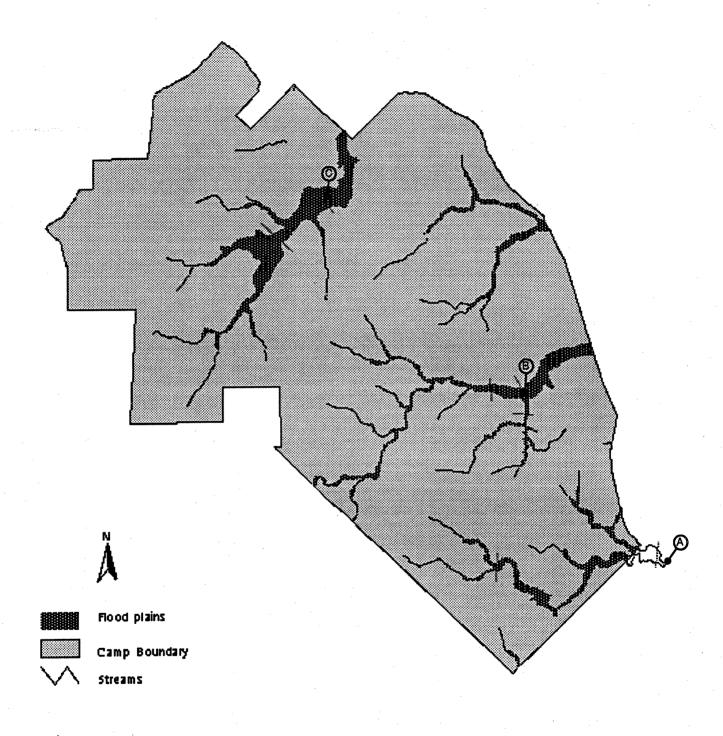


Figure 5. One-hundred year floodplains on Camp Bowie. Points A, B, and C refer to 100-yr flood hydrographs in figure 6.

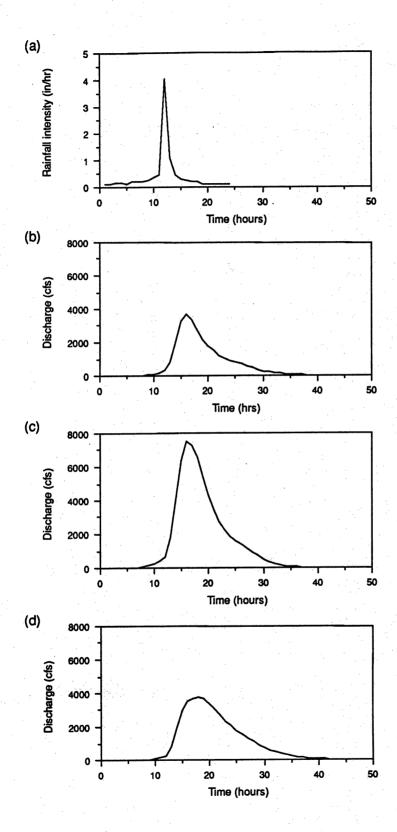


Figure 6. Flood hydrograph analysis for Camp Bowie including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and the 100-yr flood hydrographs near the camp boundary for (b) a tributary to MacKinally Creek (point A, fig. 5), (c) Devils River (point B, fig. 5), and (d) Lewis Creek (point C, fig. 5).

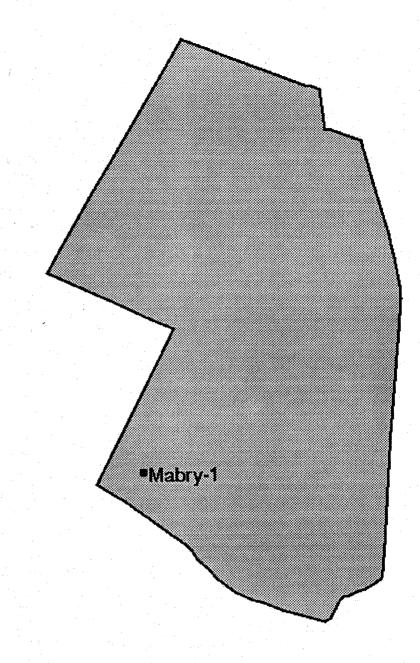


Figure 7. Moniter wells drilled on Camp Mabry.

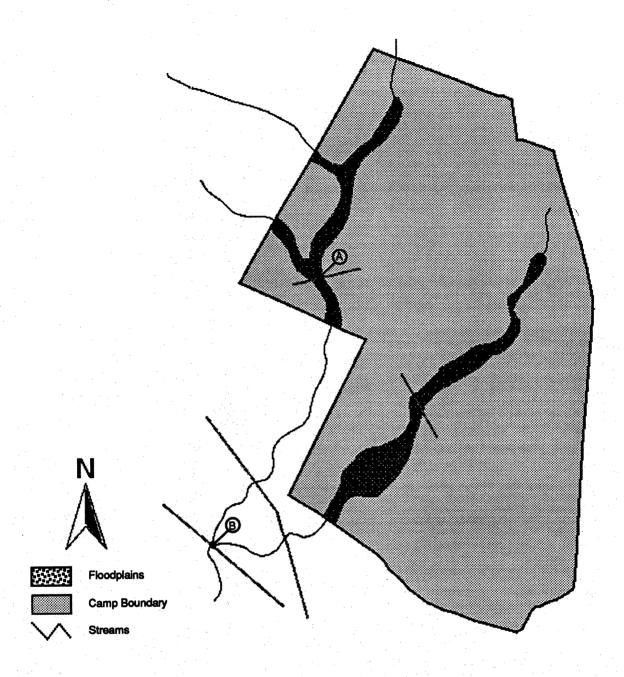


Figure 8. One-hundred year floodplains on Camp Mabry. Points A and B refer to 100-yr flood hydrographs in figure 9.

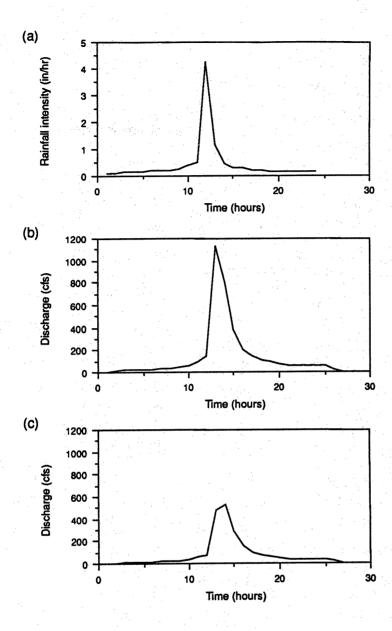


Figure 9. Flood hydrograph analysis for Camp Mabry including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and 100-yr flood hydrographs near the camp boundary for (b) the eastern stream (point A, fig. 8) and (c) the western stream (point B, fig. 8).

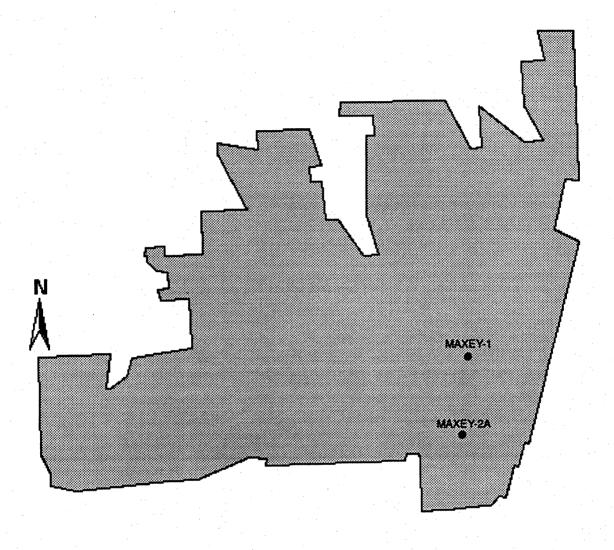


Figure 10. Location of monitor wells drilled on Camp Maxey.

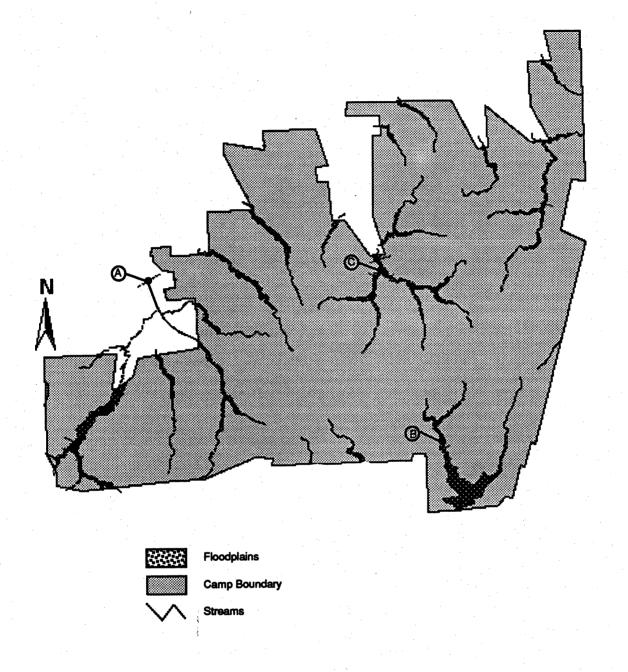


Figure 11. One-hundred year floodplains on Camp Maxey. Points A, B, and C refer to 100-yr flood hydrographs in figure 12.

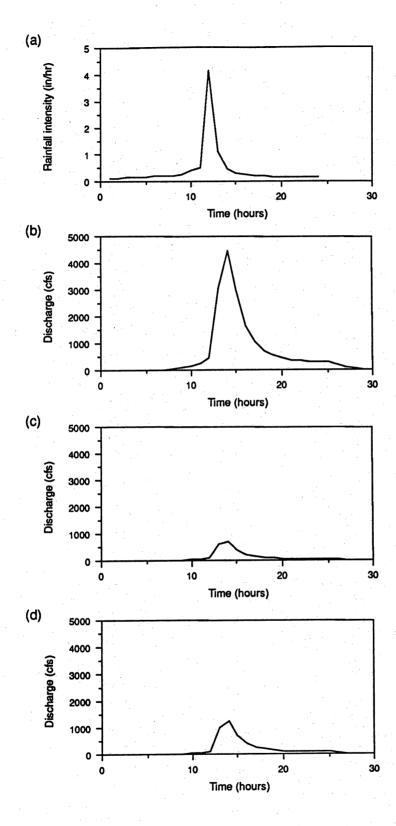


Figure 12. Flood hydrograph analysis for Camp Maxey including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and the 100-yr flood hydrographs near the camp boundary for (b) a north-west tributary to Pat Mayse Lake (point A, fig. 11), (c) the stream that feeds into Lamar Lake (point B, fig. 11), and (d) a northern tributary to Pat Mayse Lake (point C, fig. 11).

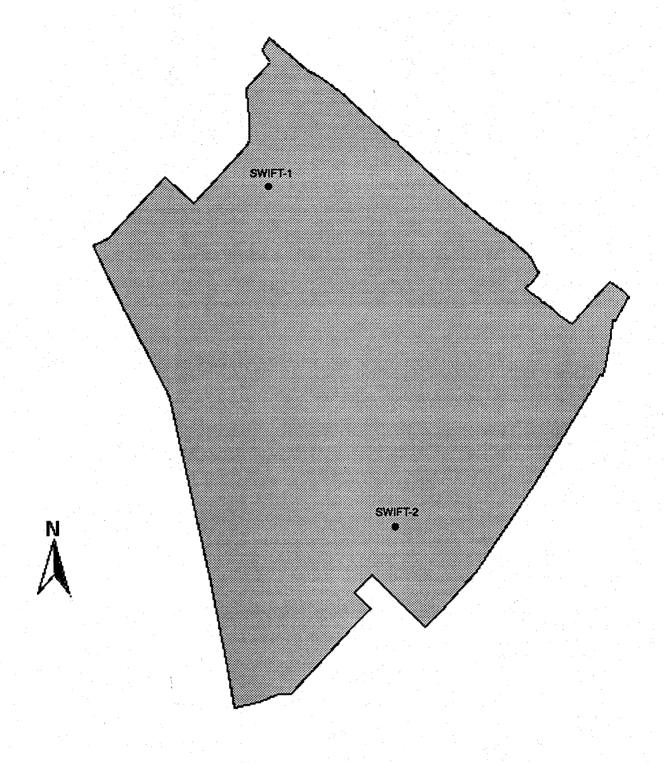


Figure 13. Location of monitor wells drilled on Camp Swift.

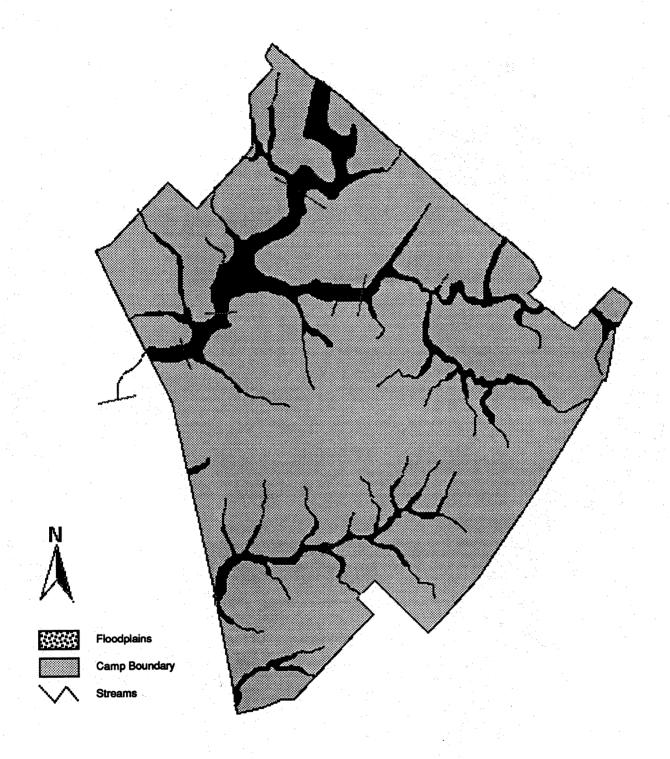


Figure 14. One-hundred year floodplains on Camp Swift.

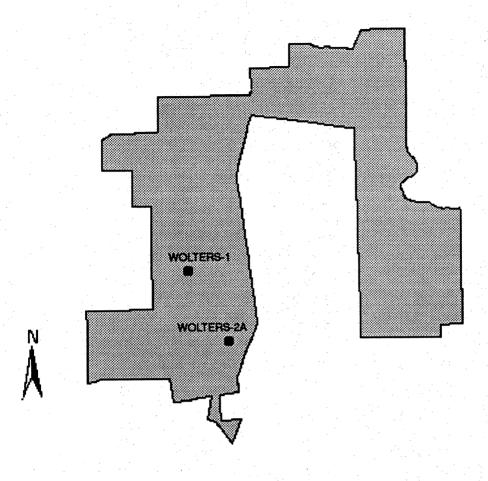


Figure 15. Location of monitor wells drilled on Fort Wolters.

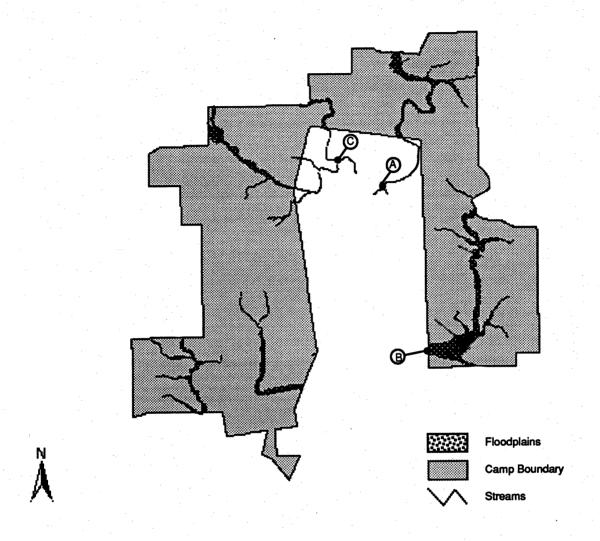


Figure 16. One-hundred year floodplains on Fort Wolters. Points A, B, and C refer to 100-yr flood hydrographs in figure 17.

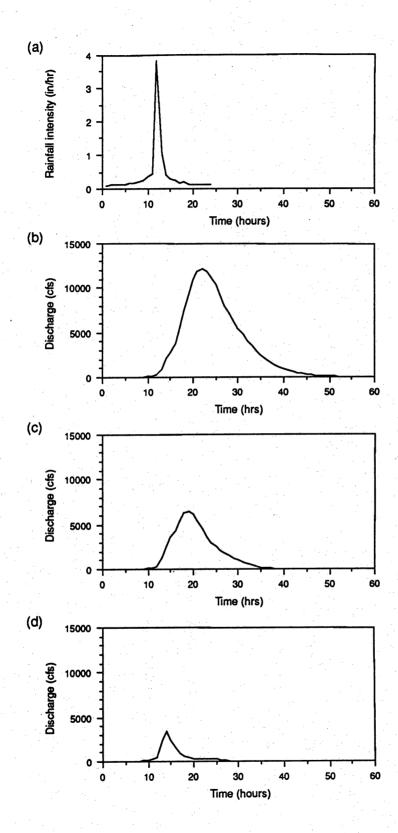


Figure 17. Flood hydrograph analysis for Fort Wolters including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and the 100-yr flood hydrographs near the camp boundary for (b) Rocky Creek (point A, fig. 16), (c) Rippy Branch (point B, fig. 16), and (d) a north-west tributary to Rocky Creek (point C, fig. 16).

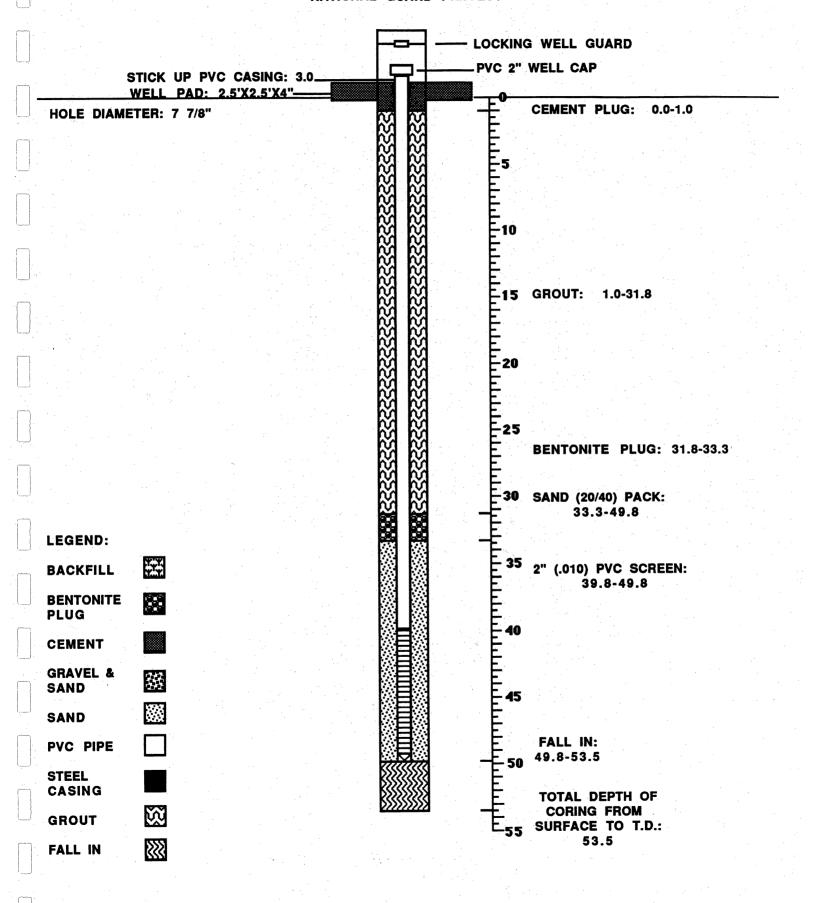
# Appendix

**Drilling Reports and Well Schematics** 

(Registered Driller Trainee)

(Licensed Well Driller)

#### WATER MONITOR SCHEMATIC CAMP BARKELEY #1 DRILL DATE: 12/3/95 NATIONAL GUARD PROJECT



hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I

understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal. COMPANY NAME University of Texas/Bureau of Economic Geology WELL DRILLER'S LICENSE NO. 3187-M (Type or Print)

ADDRESS

78701 P.O. Box X University Station Austin (Street or RFD) (City) Jordan Forman

Artesian flow

Depth

(Registered Driller Trainee)

12) PACKERS:

(Licensed Well Driller) Please attach electric log, chemical analysis, and other pertinent information, if available.

James Doss (Signed)

(Signed)

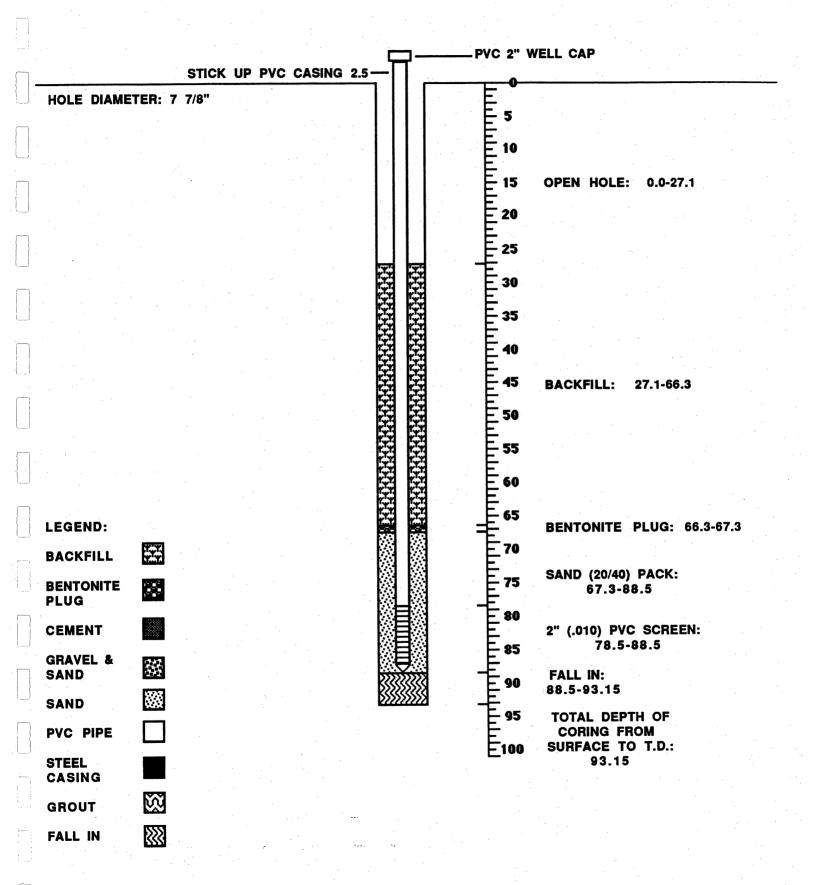
constituents?

☐ No

Was a chemical analysis made? ☐ Yes

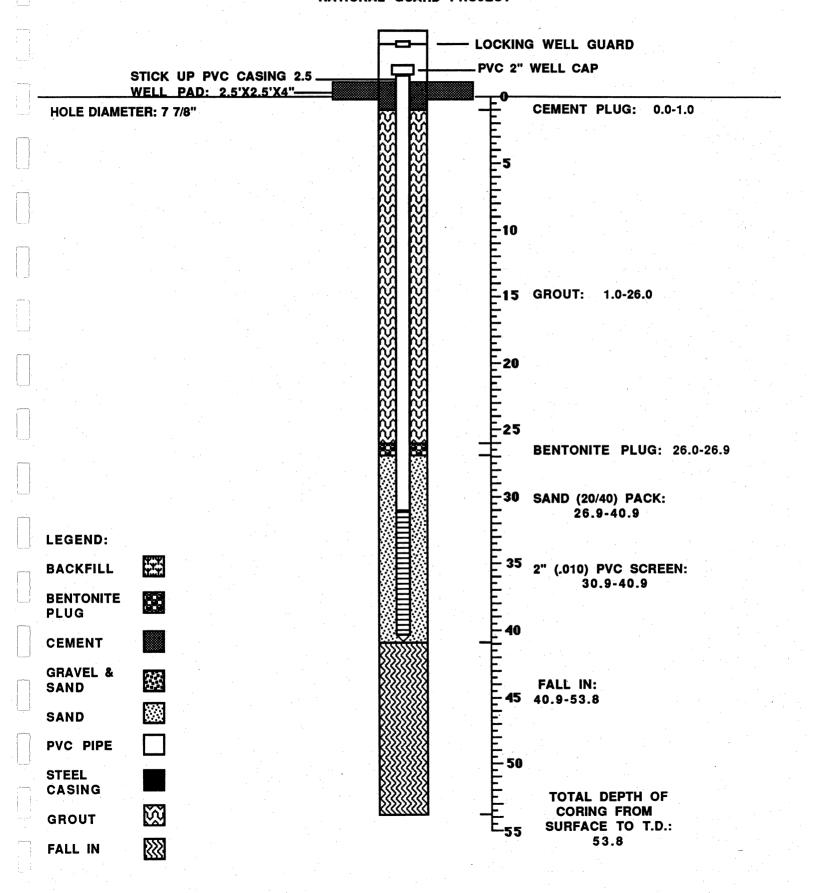
☐ Yes

#### WATER MONITOR SCHEMATIC CAMP BARKELEY #2 DRILL DATE: 2/14/95 NATIONAL GUARD PROJECT



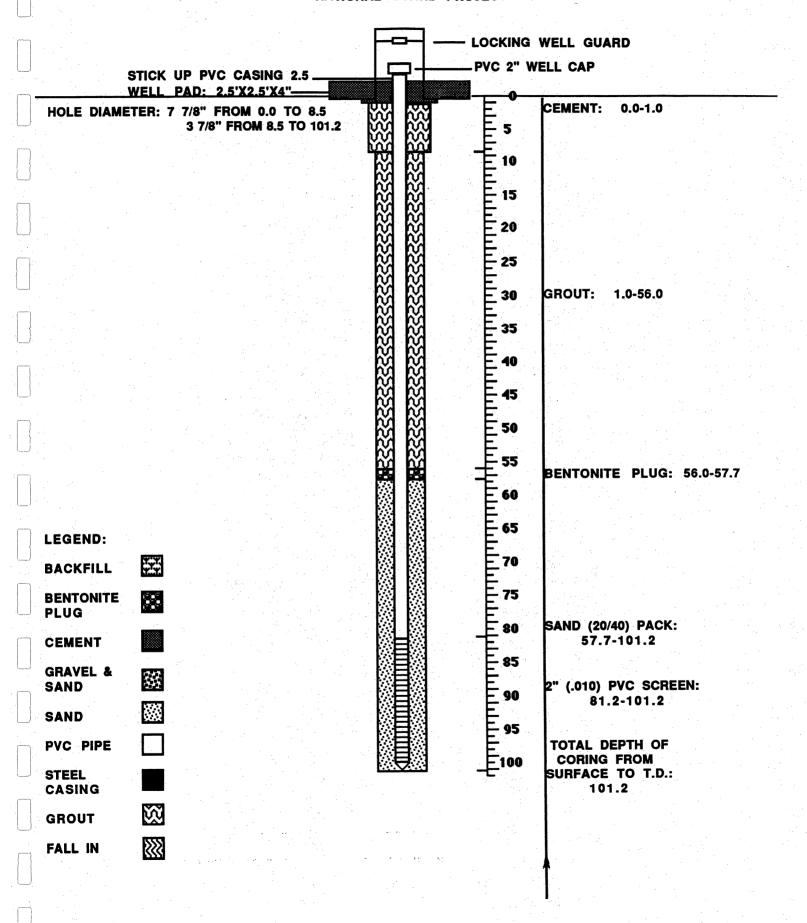
Brown (City Monitor Jection □ Demitted to	Publishe The The Street	Box 521 (Street of decoration of the complex of the	Texas (State)  (State)  Hental Solidate  Pessential Solidate  Western Solidate  Augared  Dietion (Condition (C	I Boring watering I No leck): Id Rotary Cable Tool Check): I Gravel Pac erval from WELL SCRE etc. commercial VC riser	Zip)  ☐ Domes ☐ Testwo ☐ Driver ☐ Bored ☐ Jetter ☐ Ope	GRID stic ell n d - on Hole - Other _ ft. to	(State) # 41-   5)   31° 38'   98° 54'   •	17-9 42 27  N
Brown (City Monitor Jection    In    Sche    Che	Publishe TN DR SSINGS Ne or Use	(Street of decision of the complete com	Texas (State)  (State)  Hental Solidate  Pessential Solidate  Western Solidate  Augared  Dietion (Condition (C	(2   I Boring   watering	(City) -9734 Zip) Domes Service Bored Jetter	GRID  stic ell  n d - on Hole Other ft. to  Setting From 2.5 Above Surface	(State) # 41-   5)   31° 38'   98° 54'   •	(Zip) 17-9 42" 2"  N t Wall  Gage Casting Screen .010
(City Monitor Jection   John	Publication Public	Environmic Supply NRCC?  SILLING MET Air Rotary Air Hammer Other  Tehole Comp Underreame Gravel Packet A, BLANK PII W Perl., ed 1 - 2" 3 - 2" 1 - 2"	Texas (State)  De- Yes HOD (Ch  Augared  Detion (Cod  give inter PE, AND PE, AND PE, Slotted, on Mig., if  x 5' P' x 10' F x 10' F	(2   I Boring   watering	□ Domes □ Doriver □ Driver □ Bored □ Jetted	GRID  stic ell  n d - n Hole Other ft. ti  Setting From 2.5 Above Surface	# 41-   5)   31° 38'   98° 54'   •	17-9  42" 2"  N  Gage Casting Screen .010
(City Monitor Jection   John	Publication Public	Environm lc Supply NRCC?  ILLING MET Air Rotary Air Hammer Other  Tehole Comp Underreame Gravel Packed A, BLANK PII W Scree  1 - 2" 3 - 2" 1 - 2"	(State)  leental Solidaria  De- Yes  HOD (Ch  Augared  Dietion (Ch  d give inter PE, AND Slotted, con Mfg., if  x 5' P'  x 10' F  x 10' F	(2   I Boring   watering	Zip)  ☐ Domes ☐ Testwo ☐ Driver ☐ Bored ☐ Jetter ☐ Ope	n Hole Other ft. to Setting From 2.5 Above Surface	5) 31° 38° 98° 54'  Straight  G (ft.)  To 0.9	42" 2"  N  tt Wall  Gage Casting Screen .010
Adonitor lection Dimitted to Dial Cin. Dial Cin. Dial Cin. Dia Cin	Public The	ic Supply NRCC?  ILLING METI Air Rotary Air Hammer Other  rehole Comp Underreame Gravel Packed B, BLANK Pii W Steel, Perf., Screet 1 - 2" 3 - 2" 1 - 2"	PE, AND Solution (Cod   Dietion (Cod	I Boring watering I No leck): Id Rotary Cable Tool Check): I Gravel Pac erval from WELL SCRE etc. commercial VC riser	□ Domes  ☑ Testwee  □ Driver  ☑ Bored  □ Jettee  □ Opee  ★ed [	on Hole Other ft. to A: Setting From 2.5' Above Surface	31° 38' 98° 54'   Straight  G (ft.)  To  0.9	Gage Casting Screen
che c. bbl- black cin. 2" 2" 2" 2"	Publishe TN DR SS	ic Supply NRCC?  ILLING METI Air Rotary Air Hammer Other  rehole Comp Underreame Gravel Packed B, BLANK Pii W Steel, Perf., Screet 1 - 2" 3 - 2" 1 - 2"	PE, AND Piastic, of Siotted, on Mig., if x 10' F x 10' F	watering ( No	☐ Driver ☐ Bored ☐ Jette ☐ Ope ☐ teen DAT	on Hole Other ft. to A: Setting From 2.5' Above Surface	31° 38' 98° 54'   Straight  G (ft.)  To  0.9	Gage Casting Screen
che c. Dia (in.) 2" 2" 2" 2"	b b b b b b b b b b b b b b b b b b b	AIRCC?  AIR Rotary AIr Hammer Other  rehole Comp Underreame Gravel Packed B, BLANK PII W Steel, Perf., Scree  1 - 2"  3 - 2"  1 - 2"	HOD (Ch  Augared  digive inte  PE, AND  Piastic, Siotted, an Mig., if  x 5' P'  x 10' F  x 10' F	□ No  leck):  Id Rotary Cable Tool  Check):  ☐ Gravel Pac erval from  WELL SCRE etc. commercial  VC riser  PVC riser	☐ Driver ☑ Bored ☐ Jette ☐ Ope ☐ when the control of the control	on Hole Other ft. to A: Setting From 2.5 Above Surface	98° 54°  Straight  G (ft.)  To  0.9	Gage Casting Screen
che c. bbl- bia (in. 2" 2" 2"	DROUGH NEW NO.	Air Rotary Air Hammer Other  rehole Comp Underreame Gravel Packec  A, BLANK PII  W Perf., ed 1 - 2" 1 - 2" 1 - 2"	HOD (Ch  Mu Augared  Dietion (Cod  d give inte  PE, AND Slotted, con Mfg., if  x 5' P'  x 10' F	check):  Id Rotary Cable Tool  Check):  Gravel Pace Gravel Commercial  VC riser  VC riser	⊠ Bored □ Jette □ Ope  ked □  EEN DAT	d hn Hole Other ft. tr	Straigh  O  G (ft.)  To  0.9	Gage Casting Screen
che c. bbl- cin, 2" 2" 2" 2"	Boo If G	Air Rotary Air Hammer Other  rehole Comp Underreame Gravel Packed B, BLANK Pii W Steel, Perf., Scree  1 - 2"  3 - 2"  1 - 2"	Augared  Detelon (Cod   God	check): Gravel Pacerval from WELL SCRE etc. commercial VC riser	⊠ Bored □ Jette □ Ope  ked □  EEN DAT	d hn Hole Other ft. tr	g (ft.) To 0.9	Gage Casting Screen
che c. bbl- Dia (in. 2" 2" 2" 2"	Boo Grand New Order No.	Air Hammer Other  rehole Comp Underreame stravel Packed  B. BLANK Pii W Steel, Perf., Scree  1 - 2"  3 - 2"  1 - 2"	Augared  Dietion (Cod  d give inter  PE, AND  Piastic, (Siotted), in Mig., if  x 5' P'  x 10' F	Cable Tool  Check):  Gravel Pacerval from  WELL SCRE  etc. commercial  VC riser  PVC riser	☐ Jette	on Hole Other ft. to A: Setting From 2.5' Above Surface	g (ft.) To 0.9	Gage Casting Screen
che c. bbl- Dia (in. 2" 2" 2" 2"	If GASING	rehole Comp Underreame Gravel Packed B, BLANK Pli W Steel, Perf., Scree 1 - 2" 3 - 2" 1 - 2"	Augared  Dietion (Cod	Check):  Gravel Pacerval from WELL SCRE etc. commercial VC riser	□ Ope	on Hole Other ft. to A: Setting From 2.5' Above Surface	g (ft.) To 0.9	Gage Casting Screen
che c. bbl- Dia (in. 2" 2" 2" 2"	If G ASING Vision Vision N	rehole Computer Value of the Computer Value	bletion (Cod Cod Cod Cod Cod Cod Cod Cod Cod Cod	gravel Pacerval from WELL SCRE etc. commercial VC riser PVC riser	ked [	Setting From 2.5' Above Surface	g (ft.) To 0.9	Gage Casting Screen
che c. bbl- Dia (in. 2" 2" 2" 2"	If G ASING Use Use N	Underreame siravel Packed  B. BLANK PII W Steel, Perf., Scree  1 - 2"  3 - 2"  1 - 2"	d give interpe, AND PE, AND Plastic, c Slotted, c on Mfg., if  x 5' P' x 10' F	gravel Pacerval from WELL SCRE etc. commercial VC riser PVC riser	ked [	Setting From 2.5' Above Surface	g (ft.) To 0.9	Gage Casting Screen
Dia   (in.)   2"   2"   2"   2"	If G	Street Packet Packet Packet Packet Perf., Screet 1 - 2" 3 - 2" 1 - 2"	d give interperation of give interperation of give interperation of given in the properation of given in the given in th	well screets.  etc. etc. commercial  VC riser	EEN DAT	ft. to A: Setting From 2.5 Above Surface	g (ft.) To 0.9	Gage Casting Screen .010
Dia   (in.)   2"   2"   2"   2"	Ne or Use	Steel, Perf., Scree 1 - 2" 3 - 2" 1 - 2"	PE, AND Plastic, of Slotted, of Mfg., if  X 5' P'  X 10' F	WELL SCRE etc. commercial VC riser PVC riser	EN DAT	Setting From 2.5 Above Surface	g (ft.) To 0.9	Casting Screen
Dia   (in.)   2"   2"   2"   2"	Ne or Use	Steel, Perf., Scree 1 - 2" 3 - 2" 1 - 2"	Plastic, e Slotted, e en Mfg., if x 5' P' x 10' F x 10' F	etc. etc. commercial VC riser VC riser		From 2.5' Above Surface	To 0.9	Casting Screen
2" 2" 2" 2"	N N N	Perf., Scree 1 - 2" 3 - 2" 1 - 2"	Slotted, on Mfg., if x 5' P' x 10' F x 10' F	etc. commercial VC riser PVC riser		From 2.5' Above Surface	To 0.9	Casting Screen
2" 2" 2" 2"	N N N	1 - 2" 3 - 2" 1 - 2"	x 5' P' x 10' F x 10' F	VC riser PVC riser		2.5' Above Surface	0.9	Screen .010
2" 2" 2"	N N	3 - 2" 1 - 2"	x 10' F x 10' F	PVC riser		Surface		
2" 2"	N	1 - 2"	x 10' F			nal	30.9	.010
2"	·N	<del></del>				U.3		
		1 - 2"		PVC scre	en	30.9	40.9	.010
•			x 6" pc	oint			· · · · · · · · · · · · · · · · · · ·	
	Ce Dis	mented by stance to sept	Hand Por Drill Crew tic system	ured V n field lines on	r other co			
					Ce_ton_			
	_ [	Specified :	Surface S	Slab Installed	[Rule 33	38.44 (2) (A)		
	(	Specified :	Steel Slee	eve Installed	[Rule 33	38.44 (3)(A)]		
	ı	☐ Pitless Ad	apter Use	ed [Rule 338	8.44 (3)(b)	)]		
	ſ	☐ Approved	Alternativ	e Procedure	Used [F	Rule 338.71]		
	1) W	ATER LEVE	iL:					
		_	<del></del>	_ ft. below l		ce	Date _	
_		Artesian flow			_gpm.			
	2) P	ACKERS:		T	уре			Depth
				· 				
-		<u> </u>	<u>-</u>					· ·
ed for com	pletio	n and resubm	nittal.				nd belief. I	: .
Δι	stin				Texa	s	<b>787</b> 0	1
							(Zip)	
_							Joi	rdan Forma
9	th and all of led for com	Me Ce Dis Me 10) S  11) V  12) P  th and all of the s led for completion  Ty WELL DE	Cemented by Distance to sep  Method of verific  10) SURFACE CC  Specified  Specified  Pittess Ad  Approved  11) WATER LEVE  Static level  Artesian flow  12) PACKERS:  th and all of the statements he led for completion and resubm  WELL DRILLER'S LIC  Austin (City)	Method used Hand Po Cemented by Drill Crew Distance to septic system Method of verification of a  10) SURFACE COMPLETION Specified Steel Sies Pitless Adapter Use Approved Alternative  11) WATER LEVEL: Static level Artesian flow  12) PACKERS:  th and all of the statements herein are the for completion and resubmittal.  QY WELL DRILLER'S LICENSE NO Austin (City)	Cemented from Surface ft. to 1.0 ft. to ft.	Cemented from Surface ft. to 1.0 ft.	Cemented from Surface ft. to 1.0 ft. No. of Sacks ft. to ft. to ft. No. of Sacks Method used Hand Poured  Cemented by Drill Crew  Distance to septic system field lines or other concentrated of Method of verification of above distance N/A  10) SURFACE COMPLETION  Specified Surface Slab Installed [Rule 338.44 (2) (A) Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]  Pitless Adapter Used [Rule 338.44 (3)(b)]  Approved Alternative Procedure Used [Rule 338.71]  11) WATER LEVEL:  Static level ft. below land surface Artesian flow gpm.  12) PACKERS: Type  th and all of the statements herein are true to the best of my knowledge a sed for completion and resubmittal.  By WELL DRILLER'S LICENSE NO. 3187-M  Austin Texas (City) (State)	Cemented from Surface ft. to 1.0 ft. No. of Sacks Used ft. to ft. No. of Sacks Used ft. to ft. No. of Sacks Used ft. No. of Sacks Us

# WATER MONITOR SCHEMATIC CAMP BOWIE #1 DRILL DATE: 1/25/96 NATIONAL GUARD PROJECT



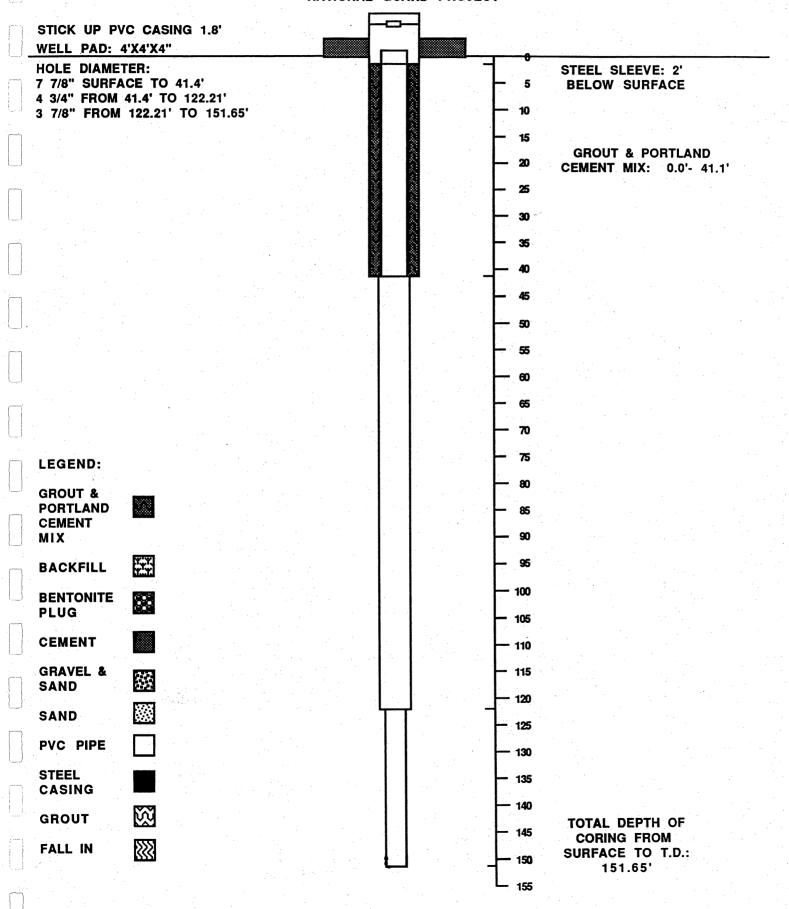
		State of WELL R	EPORT			P.O. Box	k 13087 s 78711-308	ry Council 7
		Camp B	owie #2					
1) OWNER Texas Nation		ADDRESS	<u>P.O. E</u>	Sox 5218	Austir			78763
2) ADDRESS OF WELL:	(Name)			(Street or RFD)	(City)		(State)	(Zip)
	Camp Bowie Rt. 3 Box 18		wnwood		6801-9734	GRID	* <u>41-</u>	17-8
<del></del>	(Street, RFD or other)		(City)	(State)	(Zip)	<del></del>	16	<del></del>
3) TYPE OF WORK (Check):  ⊠ New Well □ Deepening		tion 🗆 Injection	n 🗆 Public				5) 31° 38'	0"
☐ Reconditioning ☐ Plugging	If Public Supply well, were	plans submitte	d to the TNR	ICC? Yes -	No		98° 55'	35"
6) WELL LOG:	DIAMETER OF HOLI		7) DRIL	LING METHOD (Check):	☐ Drive	n		
Date Drilling: Started 1/11 19 96	Dia. (in.) From (ft.) 7 7/8 Surface	To (ft.) 8.5	—	ir Rotary   Mud Rot	-			•
Completed 2/8 19 96	7 7/8 Surface 3 7/8 8.5	101.2	_	lir Hammer ⊠ Cable Other Augared	Tool   Jette	KO .		ĵ
		11 15 15 15 15				<del>-</del>		
From (ft.) To (ft.)	Description and color of formation	on material	8) Bore	hole Completion (Check	): De	n Hole	⊠ Straigh	nt Wall
0.0 8.5	Brown topsoil			Inderreamed	vel Packed	Other _	<u> </u>	<del></del>
3.5 19.6	Weathered limestone	9	If Gra	wel Packed give interval .	from	ft. 1	to	1
19.6 24.6	Red stone, chert		CASING,	BLANK PIPE, AND WELL	L SCREEN DAT	A:		
24.6 25.2	Soft clay with sandst	one	Dia. New	Steel, Plastic, etc. Perf., Slotted, etc.		Settin	g (ft.)	Gage Casting
25.2 76.4	Red sand, small peb	bles	(in.) Used		nercial	From	То	Screen
76.4 95.2	Brown sands with gre	ey clay	2" N	PVC Schedule 4	40 riser	2.5 Above Surface	81.2	
95.2 101.2	Brown clay, pebbles		2" N	PVC Schedule 4	40 screen	81.2	101.2	.010
			Meth	ented from 4* Above Surface ft. to ft. to od used Hand Poured ented by Drill Crew		No. of Sacks		3.5
/Use rever	se side if necessary)			nce to septic system field	lines or other co	ncentrated o	contamination	n N/A f
13) TYPE PUMP:	ubmersible   Cylinder		Meth	od of verification of above				
Depth to pump bowls, cylinder,	let etc		⊠	Specified Surface Slab In	stalled [Rule 3:	38.44 (2) (A	)]	
Deput to partip bowis, cylinder,	, jot, 600.,	<u>n.</u>	⊠	Specified Steel Sleeve In	stalled [Rule 33	38.44 (3)(A)		
				Pitless Adapter Used [R	lule 338.44 (3)(b)	)]		
14) WELL TESTS:  Type test:  Pump	Baller   Jetted			Approved Alternative Pro	cedure Used [F	Rule 338.71]	<u> </u>	
Yield: gpm with	ft. drawdown after	hrs.	11) WA	TER LEVEL:				
15) WATER QUALITY: Did you knowingly penetrate any constituents?	strata which contained undesirable			atic level ft. l	below land surfa gpm.	ice	Date _ Date _	
			12) PAG	CKERS:	Туре		C	epth
☐ Yes ☐ No Type of water?	Depth of strata							
Was a chemical analysis made								
The tentorinom analysis inau			all of the stat	tements herein are true to	the best of my k	nowledge a	nd belief. I	
hereby certify that this well was drilled bunderstand that failure to complete items	1 thru 15 will result in the log(s) be Texas/Bureau of Economic	ing returned for	completion a	and resubmittal. LER'S LICENSE NO		187-M		
hereby certify that this well was drilled bunderstand that failure to complete items  COMPANY NAME University of	1 thru 15 will result in the log(s) be Texas/Bureau of Economic (Type or Print)	ing returned for	Completion &	and resubmittal.	3	187-M	· · · · · · · · · · · · · · · · · · ·	1
hereby certify that this well was drilled bunderstand that failure to complete items  COMPANY NAME University of	1 thru 15 will result in the log(s) be Texas/Bureau of Economic	ing returned for	completion a	and resubmittal.		187-M s	7870 <sup>-</sup>	1

#### WATER MONITOR SCHEMATIC CAMP BOWIE #2 DRILL DATE: 2/8/96 NATIONAL GUARD PROJECT



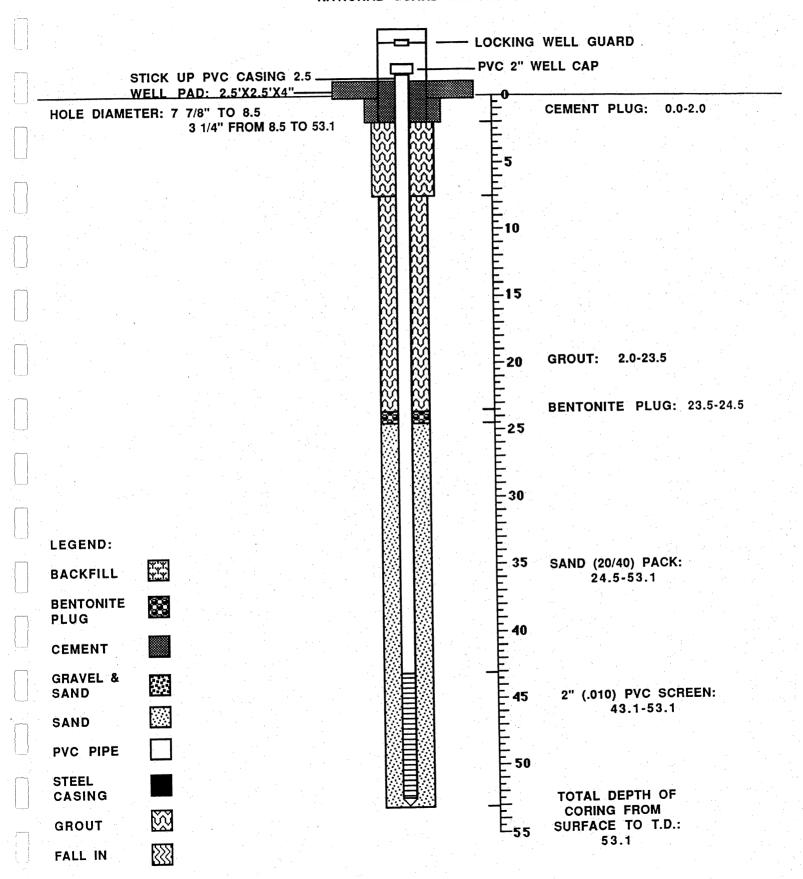
	ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side		State o	REPO	ORT			P.O. Bo	<b>8 78711-308</b>	
ال.			Camp N	abry	#1					
	1) OWNER Texas Natio	nal Guard (Name)	ADDRESS		P.(	O. Box 5218 (Street or RFD)	Austi (City)		Tx (State)	78763 (Zip)
I	2) ADDRESS OF WELL: County <u>Travis</u>	Camp Mabry 2210 W. (Street, RFD or other)	35th Street	lusti (Cliy)	<b>n</b>	Texas (State		GRI	o# <u>58</u>	3-42-6
	3) TYPE OF WORK (Check):  ⊠ New Well □ Deepening □ Reconditioning □ Plugging	4) PROPOSED USE (Ch	rigation 🗆 injectio	or n 🗆	Public \$	Environmental So			5) 30° 18' 97° 45'	
	6) WELL LOG: Date Drilling: Started 10/11 19 95 Completed 19	DIAMETER OF H Dia. (in.) From (ft.) 7 7/8 Surface 4 3/4 41. 3 7/8 122.2	To (ft.) 41. 122.2 151.45	7)	Al		heck): Drive	1		•
	From (ft.) To (ft.) N/A	Description and color of form Rock Bitted	nation material	8)		nole Completion ( nderreamed		en Hole  Other	⊠ Straigh	
5			<u> </u>		If Gra	vel Packed give in	terval from	ft.	to	ft
1					New	Steel, Plastic	WELL SCREEN DAT , etc.	<del></del>	ng (ft.)	Gage
1				Dia (in.)	or Used	Perf., Slotted	, etc. if commercial	From	To	Casting Screen
				4"	N	4 1/2" - 4"x	10' PVC Riser	1.8 Above Surface	41.4'	
				9)		ENTING DATA:  AT Above Surface		No. of Sack	· · · · · · · · · · · · · · · · · · ·	4
	/Úse rever	se side if necessary)			Ceme	nted by Drill Cre		oncentrated	contamination	on N/A ft.
		ubmersible   Cylinder		10	-	od of verification of	above distance N/A	\		
	Other Depth to pump bowls, cylinder	, jet, etc.,	ft.		×	Specified Surface	Slab Installed [Rule 3	38.44 (2) ( <i>A</i>	<b>\)</b> ]	
1	14) WELL TESTS:	Bailer ☐ Jetted				Pitiess Adapter Us	seve Installed [Rule 3 sed [Rule 338.44 (3)(t sive Procedure Used [	<b>)</b> )]		
	Yield: gpm with	ft. drawdown after	hrs.	11	) WA	TER LEVEL:				
	15) WATER QUALITY: Did you knowingly penetrate any constituents?	strata which contained undesir	able			atic level	ft. below land surfa	<b>ace</b>	Date _	
	☐ Yes ☐ No Type of water?	Depth of strata		12	PAC	KERS:	Туре			Depth
_	Was a chemical analysis mad		) and that each and	all of	he etc	ements herein are	true to the best of my	knowledae :	and belief. I	
	understand that failure to complete items	by me (or under my supervisions at thru 15 will result in the log(s)  Texas/Bureau of Econol (Type or Print)	s) being returned for	comp	letion a	und resubmittal.		3187-M		
]	ADDRESS P.O. Box X	University Station (Street or RFD)		Aus (City	)		Texa (Sta	IS ate)	7870 (Zip)	
	(Signed)	(Licensed Well Driller)	James Doss	- : -	_	pertinent informa		ed Driller Tr		rdan Forma

### WATER MONITOR SCHEMATIC CAMP MABRY #1 DRILL DATE: 10/11/95 NATIONAL GUARD PROJECT



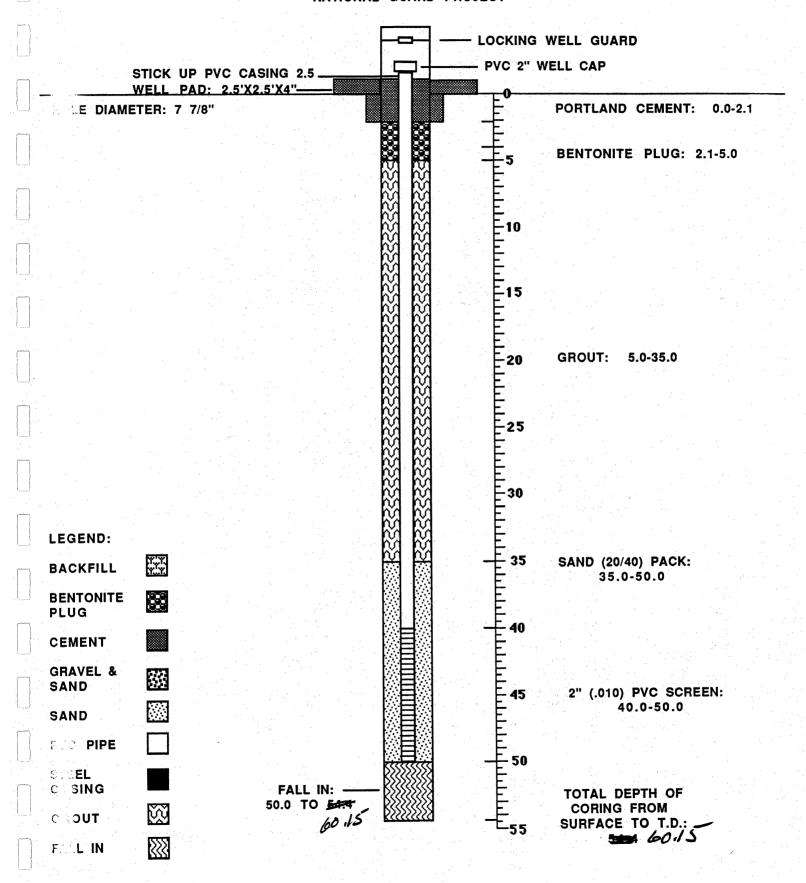
ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side  WELL RE					Texas Water Well Drillers Advisory Council P.O. Box 13087 Austin, Texas 78711-3087 512-239-0530					
	Camp V	axe	/#1							
1) OWNER Texas National Guard	ADDRESS	P	О. В	ox 5218		Austin	1	Tx	78763	
(Name)				(Street or RFD)	<del> </del>	(City)		(State		
2) ADDRESS OF WELL: County Lamar Camp Maxey Rt. 1 Bo (Street, RFD or other)	ox 169 Po	(City)		Texa:			) GRID	#1	7-12-5	
A TURE OF WORK (Obs.)					·	-		5)		
3) TYPE OF WORK (Check):  A) PROPOSED USE (  New Well □ Deepening □ Industrial □	·		_	Environmental S		] Domes				
	Irrigation   Injectio			—	-	Testwe	Hi	33° 47'	40"	
	II, were plans submitte	a to tr	BINH	CC? Yes	□ No			95° 32	31"	
6) WELL LOG: DIAMETER OF		7)	DRILL	ING METHOD (C	heck):	Driver	1			
Date Drilling:         Dia. (In.)         From (ft.)           Started         11/11         19 95         7 7/8         Surface	To (ft.) 8.5		_	. –		Bored				
Completed 11/11 19 95 3 1/4 8.5	53.		∐ AI			_ Jetted	1		,↑●	
							-	1	N	
From (ft.) To (ft.) Description and color of to	rmation material	8)	Boreh	ole Completion (	(Check):	☐ Ope	n Hole	Straig	ht Wall	
N/A ROCK BITTED			□ U	nderreamed	☐ Gravel Pack	ed [	Other			
			If Grav	rel Packed give in	terval from		ft. to		ft.	
		CAS		LANK PIPE, AND						
			New	Steel, Plastic	, etc.	П	Setting	(ft.)	Gage	
		Dia (in.)	or Used	Perf., Slotted, Screen Mfg.,	, etc. If commercial	.	From	То	Casting Screen	
		2"	N	PVC Sched	dula 40 - 20	·	2.5 Above Surface	43.1	.010	
<del></del>		2"	N	PVC Sched			43.1	53.1	.010	
<del></del>		_	•••	T VO SCHE	Jule 40 - 10		40.1	<u> </u>	.0.0	
		- : -								
			OFM	NTINO DATA	(D) do 000 444	433				
		9)	CEME	INTING DATA:	[Rule 338.44(	וני				
		-		4° Above						
			Ceme	nted from Surface	ft. to 2.0	t. N	lo. of Sacks	Used	_3	
					ft. to	t. N	lo. of Sacks	Used	·	
			Metho	d used Hand Po	oured					
			Ceme	nted by Drill Cre	w		·			
(Use reverse side if necessary)			Distan	ce to septic system	m field lines or o	other con	centrated co	ontaminati	on <u>N/A</u> ft.	
13) TYPE PUMP:			Metho	d of verification of	above distance	NA				
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder		10	) SUR	FACE COMPLET	ION		***			
☐ Other			•							
Depth to pump bowls, cylinder, jet, etc.,	ft.		⊠ :	Specified Surface	Slab Installed	[Rule 33	8.44 (2) (A)]			
	<u> </u>		⊠ :	Specified Steel Sk	eve Installed	Rule 33	B.44 (3)(A)]			
40 WELL TROPO			. 🗆 1	Pitiess Adapter Us	sed [Rule 338.	14 (3)(b)				
14) WELL TESTS:				Approved Alternat	ive Procedure I	leed IR	ula 338 711		,	
Type test: Pump Bailer Detted			، ب	TPPIOVOG ANGINGE	1001100000000	11				
Yield: gpm with ft. drawdown after	hrs.	11	) WAT	ER LEVEL:						
				•				_		
15) WATER QUALITY: Did you knowingly penetrate any strata which contained under the contained under the	sirahle			tic level	ft. below la		<b>:8</b>	Date		
constituents?	SII ELAG		Arte	sian flow		gpm.		Date		
☐ Yes ☐ No		12	) PAC	KERS:	Тур	ю	···········		Depth	
Type of water? Depth of strata										
Was a chemical analysis made?□ Yes □ No										
hereby certify that this well was drilled by me (or under my supervision					true to the best	of my kr	owledge an	d belief. I		
inderstand that failure to complete items 1 thru 15 will result in the log	g(s) being returned for	compl	etion ar	nd resubmittal.						
COMPANY NAME University of Texas/Bureau of Econ	omic Geology	WELI	L DRILL	ER'S LICENSE N	Ю	31	87-M			
(Type or Print)		۸	tin.			Tovos		7870	1	
ADDRESS P.O. Box X University Station	e de sur la	Aus (City)				Texas (State		/ <u>0/U</u> (Zlp)	<u> </u>	
(Street or RFD)	Ismas Doss					Cuali	-,		rdan Forman	
(Licensed Well Driller)	James Doss	(aign	<del></del>		(R	egistered	Driller Train		Juli I Villiali	
						•		•		
Please attach electric lo	g, chemical analysis	, and	other p	ertinent informat	ion, if available	D.				

# WATER MONITOR SCHEMATIC CAMP MAXEY #1 DRILL DATE: 11/11/95 NATIONAL GUARD PROJECT



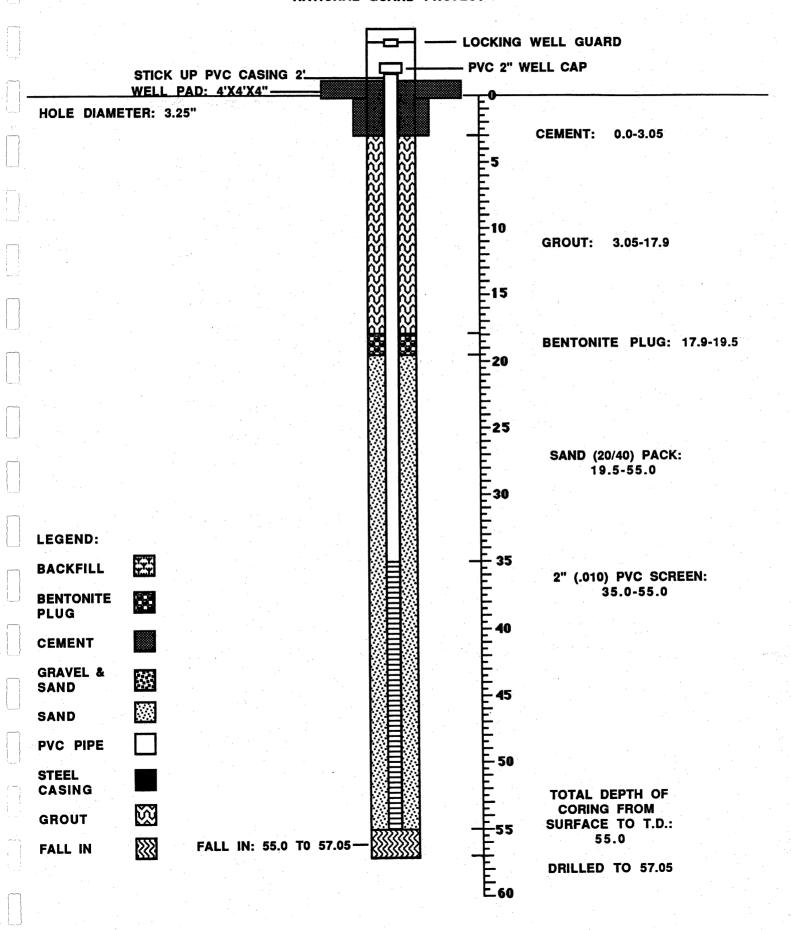
ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side	TNRCC, P.O. Box 13087, Austin, 1	State of WELL	of Te			Texas Wate	P.O. Box	ers Adviso : 13087 : 78711-308	
		Camp M					312-23		
1) OWNER Texas Natio	onal Guard				Sox 5218	Austir		Tx	78763
·/ Cirilar	(Name)		' <u></u>	. <u>U.</u> E	(Street or RFD)	(City)	<u> </u>	(State)	
2) ADDRESS OF WELL:	Same Mayou Dt 1 Day 166	ο Β	d						
County <u>Lamar</u> <u>C</u>	Camp Maxey Rt. 1 Box 169 (Street, RFD or other)	9 F	(City)		Texas (State)	75473-0169 (Zip)	grid	1/	<b>'-12-8</b>
3) TYPE OF WORK (Check):  ⊠ New Well □ Deepening	4) PROPOSED USE (Check)	: ⊠ Moni on □ Injectio			Environmental Soil Boring			5)	
☐ Reconditioning ☐ Plugging	If Public Supply well, were I	pians submitt	ed to th	e TNR	CC? Yes 1	No ·		33° 46'	57"
6) WELL LOG:	DIAMETER OF HOLE		7)	DRIL	ING METHOD (Check):	☐ Driver	)	95° 32'	38"
Date Drilling:	Dia. (in.) From (ft.)	To (ft.)	1	□ A	r Rotary 🖂 Mud Rota	ry 🛭 Bored			
Started 11/7 19 95	7 7/8 Surface	7.2	] .	□ A	r Hammer 🛛 Cable T	ool 🗆 Jette	d .		
Completed 11/11 19 95	3 1/4 7.2	60.15	4	□ <b>0</b>	ther		_ :		۱ .
From (ft.) To (ft.)	Description and color of formation	material	8)	Borel	noie Completion (Check)	. Dpe	n Hole	✓ Straight	nt Wall
.0 7.2	Red & grey clay			u u	nderreamed	el Packed [	Other _		
.2 30.0	Red clay, large rocks,	gravel.	1	If Gra	vel Packed give interval	. from	ft. 1	<b>b</b>	
	some fractures		CA	SING, E	BLANK PIPE, AND WELL	SCREEN DATA	<b>A:</b>		
0.0 43.7	Light tan clay with sar	nd &	Die	New	Steel, Plastic, etc.		Settin	g (ft.)	Gage
	black mottled clay		Dia (in.)	or Used	Perf., Slotted, etc. Screen Mfg., if comm	ercial	From	To	Casting Screen
3.7 48.6	Light tan clay with sar	nd mottl-	2"	N	5 - 2" x 10' PVC	ricor	2.5' Above Surface	40.0	.010
J.7 40.0	ed with grey clay	ia motti	2"	N	2 - 2" x 10' PVC		40.0	50.0	.010
8.6 <b>53.</b> 5	Washed out sand		-	- 1	2-2 X 10 F VO	1961	40.0	30.0	.010
		N/	+	-					
3.5 60.15	Large pebbles, tan cla shale, brown clay	ly, grey	-		NTING DATA: [Rule	338.44(1)]			
					d used Hand Poured onted by Drill Crew	ft. P	lo. of Sacks	. Osed	
(Use reve	rse side if necessary)		7	Distar	nce to septic system field li	nes or other co	ncentrated (	contamination	on N/A
13) TYPE PUMP:			]	Metho	od of verification of above o	distance N/A			
	Submersible   Cylinder		10		FACE COMPLETION				
☐ Other			'	,					
Depth to pump bowls, cylinde	r let etc	ft.		×	Specified Surface Slab Ins	tailed [Rule 33	8.44 (2) (A	)]	
		14-			Specified Steel Sleeve Ins	talled [Rule 33	8.44 (3)(A)		
					Pitiess Adapter Used [Ru	ie 338.44 (3)(b)	]		
14) WELL TESTS:  Type test:  Pump	Baller   Jetted				Approved Alternative Proc	edure Used [F	lule 338.71]		
Yield: gpm with	ft. drawdown after	hrs.	11	) WA	TER LEVEL:			<del></del>	<del></del>
			-		Ala laval	alam land		Dat-	
15) WATER QUALITY: Did you knowingly penetrate an	y strata which contained undesirable				*	elow land surfa	<b>C4</b>	Date _	·
constituents?	y water within without the Moon allo			Art	esian flow	gpm.		Date _	
			12	) PAC	KERS:	Туре			epth
☐ Yes ☐ No	Depth of strata							<del> </del>	
☐ Yes ☐ No Type of water?	Debat Ot su ana.		1			1.0			<u> </u>
			-						
Type of water?  Was a chemical analysis may	de?_ Yes		L						
Type of water?  Was a chemical analysis management of the chemical analysis management of the chemical analysis management of the chemical analysis of the chemical analysis and chemical analysis of the chemical analysis o	de? Yes No  by me (or under my supervision) and is 1 thru 15 will result in the log(s) bein	ig returned fo	r comp	letion a	nd resubmittal.			nd belief. I	
Type of water?  Was a chemical analysis management of the chemical analysis management of the chemical analysis management of the chemical analysis of the chemical analysis and chemical analysis of the chemical analysis o	de?□ Yes □ No	ig returned fo	r comp	letion a	nd resubmittal.		nowledge a	nd belief. I	
Type of water?  Was a chemical analysis management of the chemical analysis management of the chemical analysis and chemical analysis analysis and chemical analysis and chem	by me (or under my supervision) and is 1 thru 15 will result in the log(s) bein Texas/Bureau of Economic (Type or Print)	ig returned fo	r comp	letion a L DRILI	nd resubmittal.		187-M	7870	1
Type of water?  Was a chemical analysis management of the chemical analysis management of the chemical analysis and chemical analysis analysis and chemical analysis and chem	by me (or under my supervision) and is 1 thru 15 will result in the log(s) bein Texas/Bureau of Economic (	ig returned fo	r comp _ WELI	letion a L DRILI stin	nd resubmittal.	3	187-M S		1

### WATER MONITOR SCHEMATIC CAMP MAXEY #2A DRILL DATE: 11/11/95 NATIONAL GUARD PROJECT



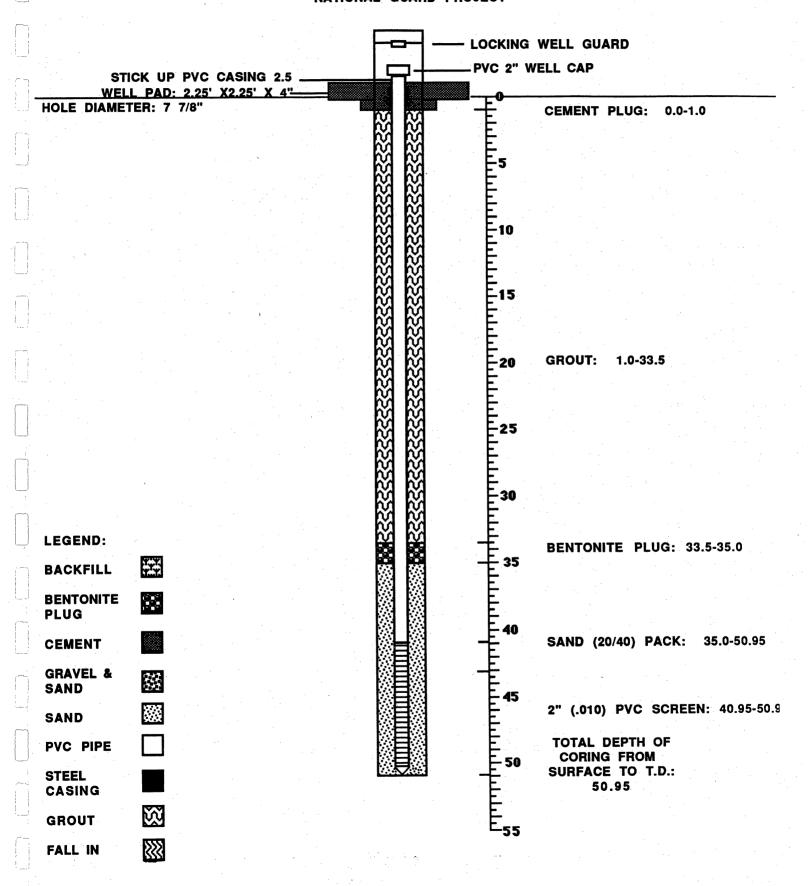
Privilege Notice on Reverse Side WELL		ORT		Texas Water Well Drillers Advisory Counci P.O. Box 13087 Austin, Texas 78711-3087 512-239-0530				
Camp	Swift	#1						
1) OWNER Texas National Guard Address	s	P.C	). Box 5218	Austi			78763	
(Name) 2) ADDRESS OF WELL:			(Street or RFD)	(City	)	(State	) (Zip)	
County Bastrop Camp Swift Rt. 2, Box 151-X (Street, RFD or other)	Bastro (City)	p qc	<u>Texas</u> 78 (State)	602-9737 (Zip)	7 GRID	# <u>58</u>	3-46-8	
3) TYPE OF WORK (Check):  New Well Deepening Industrial Irrigation Inject Reconditioning Plugging If Public Supply well, were plans submit	ion 🗆	Public S		<u> </u>		5) 30° 17' 97° 18'	1.7	
6) WELL LOG:  Date Drilling: Started 10/31 19 95  Completed 11/1 19 95  DIAMETER OF HOLE  Dia. (in.) From (ft.) To (ft.)  3 1/4 Surface 57.05	7)	□ Aiı	ING METHOD (Check):  Rotary	_	d		Ŋ	
From (ft.) To (ft.) Description and color of formation material	8)		ole Completion (Check):		en Hole	⊠ Straigi	ht Wall	
N/A Rock Bitted	-	_	. —					
	-		el Packed give interval		ft. t	0	<del></del>	
	CA	SING, B	Steel, Plastic, etc.	CREEN DAT	FA: Setting	o /ft \	Gage	
	Dia	or Used	Perf., Slotted, etc. Screen Mfg., if comme	rdal	From	To	Casting Screen	
	(in.) 2"			<del></del>	2' Above	35.0 '	Scieen	
	2"	N	PVC Schedule 40		Surface	55.0'	.010	
	-	N	PVC Schedule 40	) - 20	35.0'	55.0	.010	
							-	
(Use reverse side if necessary)  13) TYPE PUMP:  Turbine	10	Cemei Distan Metho ) SUR	d used Hand Poured  The print of the print o	es or other costance N/A alled [Rule 3 alled [Rule 3	338.44 (2) (A) 138.44 (3)(A)] b)]	contaminati		
Yield: gpm with ft. drawdown after hrs.	11	) WAT	ER LEVEL:					
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable				low land surf	ace	Date _		
constituents?	-		esian flow	gpm.				
☐ Yes ☐ No Type of water? Depth of strata  Was a chemical analysis made?☐ Yes ☐ No	-   - 12	PAC	KERS:	Туре			Depth	
I hereby certify that this well was drilled by me (or under my supervision) and that each ar understand that fallure to complete items 1 thru 15 will result in the log(s) being returned to company name  University of Texas/Bureau of Economic Geology (Type or Print)	or comp	letion a	nd resubmittal.		knowledge a	nd belief. I		
	Aus	tin		Texa		7870	1	
a a a visit suit auto	<u> Au</u>			1000	19	7070		
ADDRESS P.O. Box X University Station (Street or RFD) (Signed)  James Do	(City	)			ate)	(Zip)	ordan Form	

# WATER MONITOR SCHEMATIC CAMP SWIFT #1 DRILL DATE: 11/1/95 NATIONAL GUARD PROJECT



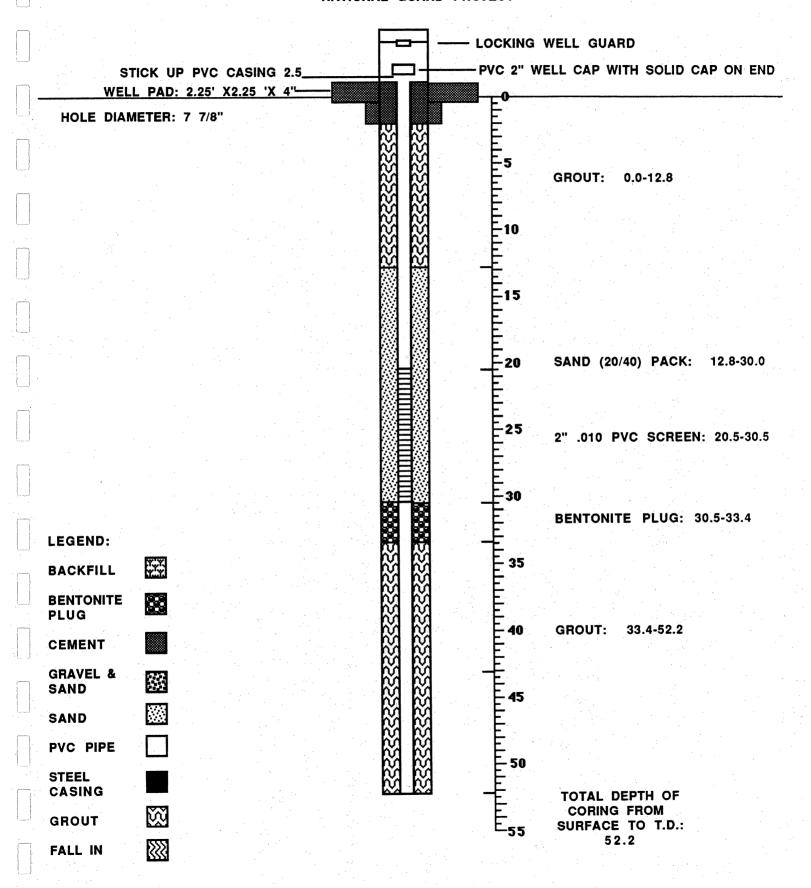
	ate of T	PORT		Aust	P.O. Box in, Texas 512-239	78711-308	7
	amp Swi						
1) OWNER Texas National Guard AD (Name)	DRESS		P.O. Box 5218 (Street or RFD)	Austin			78763
2) ADDRESS OF WELL:			(Sireet or NPD)	(City)		(State)	(Zip)
County Bastrop Camp Swift Rt. 2, Box 151-	Bast			<u>2-9737</u>	GRID	<b>*</b> 58	-54-3
(Street, RFD or other)	(Cit	<u>y)</u>	(State)	Zip)		7	
3) TYPE OF WORK (Check): 4) PROPOSED USE (Check):	Monitor		Environmental Soil Boring	☐ Domesti	<b>C</b>	5)	
☑ New Well ☐ Deepening ☐ Industrial ☐ Irrigation ☐	Injection [			☐ Testwell	*	•	
☐ Reconditioning ☐ Plugging If Public Supply well, were plans	submitted to	the TNR	CC? Yes No			30° 14'	32"
6) WELL LOG: DIAMETER OF HOLE		7) DRII	LING METHOD (Check):	☐ Driven	<del> </del>	97° 17'	
Date Drilling: Dia. (in.) From (ft.) To (f		• .	ir Rotary   Mud Rotary	☐ Bored		"	•
Started 1/3 19 96 7 7/8 Surface 50.9	95		ir Hammer	☐ Jetted	4		
Completed 1/3 19 96		Ø C	other Augered				1
				<del></del>			
From (ft.) To (ft.) Description and color of formation mate	riai	•	hole Completion (Check):	☐ Open		⊠ Straigh	t Wali
0.0 13.5 Light brown sand			Inderreamed   Gravel Pa	cxea	Other		
13.5 23.5 Light brown, red and grey		If Gra	vel Packed give Interval from	n	ft. t	0	<del></del>
23.5 28.5 Dark brown clay with sand	1 c		BLANK PIPE, AND WELL SCR	EEN DATA:			
28.5 48.5 Light black flakey sand & c	clay Dia	New or	Steel, Plastic, etc. Perf., Slotted, etc.		Setting	) (ft.)	Gage Casting
48.5 50.75 Grey and dark brown clay	(in.	.) Used			From	То	Screen
50.75 50.95 Grey rock	2"	N	PVC Schedule 40 -	50'	5 Above Surface	40.9	
	2"	N	PVC Schedule 40 -		40.9	50.9'	.010
			1.70 00.11000110 10				
(Use reverse side if necessary)  13) TYPE PUMP:  Turbine		Dista Metho 10) SUF	ented by Drill Crew  noe to septic system field lines of the control of above distance of the completion of above distance COMPLETION  Specified Surface Slab Installed Specified Steel Sleeve Installed Pitless Adapter Used [Rule 33]	N/A Rule 338	44 (2) (A)	]	n <u>N/A</u>
Type test: Pump Bailer Jetted		· · ·	Approved Alternative Procedure	Used [Rul	e 338.71]		
		11\ WA	<del></del>				
Yield: gpm with ft. drawdown after hrs.		117. WA	TER LEVEL:				
		•		land surface		Date	
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable		Ste	atic level ft. below			-	
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?		Ste	atic level ft. below tesian flow	_gpm.		Date _	onth
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No		Ste	atic level ft. below tesian flow			Date _	epth
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No Type of water? Depth of strata		Ste	atic level ft. below tesian flow	_gpm.		Date _	epth
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No		Ste	atic level ft. below tesian flow	_gpm.		Date _	epth
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No Type of water? Depth of strata Was a chemical analysis made? No I hereby certify that this well was drilled by me (or under my supervision) and that eaunderstand that failure to complete items 1 thru 15 will result in the log(s) being return to company NAME University of Texas/Bureau of Economic Geole	ach and all o	Art  12) PAG  of the state opposition a	atic level ft. below tesian flow CKERS:	gpm.  Type  est of my kno		Date _	epth
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  ☐ Yes ☐ No Type of water? ☐ Depth of strata  Was a chemical analysis made?☐ Yes ☐ No  I hereby certify that this well was drilled by me (or under my supervision) and that eaunderstand that failure to complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the log(s) being return the complete items 1 thru 15 will result in the	ach and all corned for con	Art 12) PAC of the state of the	atic level ft. below tesian flow CKERS:	gpm. Type set of my kno	wledge ar	DateD	
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No Type of water? Depth of strata  Was a chemical analysis made? Hereby certify that this well was drilled by me (or under my supervision) and that eaunderstand that fallure to complete items 1 thru 15 will result in the log(s) being return company name  University of Texas/Bureau of Economic Geole (Type or Print)  ADDRESS P.O. Box X University Station	ach and all corned for con	Str. Art. 12) PAG. of the state	atic level ft. below tesian flow CKERS:	_gpm. Type  set of my kno 318 Texas	wledge ar	DateD	
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No Type of water? Depth of strata  Was a chemical analysis made? Yes No  I hereby certify that this well was drilled by me (or under my supervision) and that exunderstand that failure to complete items 1 thru 15 will result in the log(s) being return company name  University of Texas/Bureau of Economic Geole (Type or Print)  ADDRESS P.O. Box X University Station  (Street or RFD)	ach and all dirried for con	Standard Sta	atic level ft. below tesian flow CKERS:	gpm. Type set of my kno	wledge ar	DateD  and belief. I  7870 (ZIp)	
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?  Yes No Type of water? Depth of strata  Was a chemical analysis made? Hereby certify that this well was drilled by me (or under my supervision) and that equinderstand that failure to complete items 1 thru 15 will result in the log(s) being return company name  University of Texas/Bureau of Economic Geole (Type or Print)  ADDRESS P.O. Box X University Station (Street or RFD)	ach and all corned for con	Standard Sta	atic level ft. below tesian flow CKERS:	_gpm. Type  set of my kno 318 Texas	wledge ar 37-M	DateD  and belief. I  7870** (Zip)  Jor	

### WATER MONITOR SCHEMATIC CAMP SWIFT #2 DRILL DATE: 1/3/96 NATIONAL GUARD PROJECT



ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side	State of WELL R	EPC	RT					er Well Drille P.O. Box ustin, Texas 512-239	: 13087 78711-308	· .
	Fort Wol	ers :	ŧZA					· · · · · · · · · · · · · · · · · · ·		· · · · ·
1) OWNER Texas National Guard (Name)	ADDRESS	_ <u>P</u>	.O. E		18 t or RFD)	<del></del>	Aust (City		Tx (State)	78763 (Zlp)
2) ADDRESS OF WELL: County Parker Fort Wolters Rt. 4 Bldg 120	2 Mine	ral V	Vells		Texa (State		6067-950 (Zlp)	) <u>0</u> GRID	<b>*</b> 31	-16-3
3) TYPE OF WORK (Check): 4) PROPOSED USE (Check):	n 🗆 Injection	or n 🗆 I	Public :	Supply	mental S	oil Boring -watering	□ Dom		5) 32° 52' 98° 2' 6	
6) WELL LOG: DIAMETER OF HOLE  Date Drilling: Dia. (in.) From (ft.)  Started 12/4 19 95 7 7/8 Surface  Completed 12/5 19 95	To (ft.) 52.	ז	_ A	r Rotary r Hamm	_	Aud Rotar Cable To		d	•	Ŋ
From (ft.) To (ft.) Description and color of formation 0.0 3.5 Brown top soil	material	8)	100	nole Cor nderrear	• ,	(Check):	□ Op oi Packed	oen Hole	⊠ Straigh	t Wall
3.5 18.5 Tan clay with caliche			If Gra	vel Pack	ed give in	terval	. from	ft. 1	<b>10</b>	
18.5 23.5 Clay, gravel, sand, wa	iter	CAS					SCREEN DA			-
23.5 52.2 Shale and sand			New	Ste	el, Plastic	, etc.		Settin	g (ft.)	Gage
LO.O OELE OHIGIO GITG GATTO		Dia (in.)	Or Used		f., Slotted een Mfg.,	, etc. If comme	ercial	From	То	Casting Screen
		2"	N	PVC	Sche	dule 40	0 - 20'	2.5 Above Surface	20.5	
	•	2"	N	PVC	Sche	dule 40	0 - 10'	20.5	30.5	.010
		2"	N	PVC	Sche	dule 40	0 - 20'	30.5	50.2	<del></del>
(Use reverse side if necessary)  13) TYPE PUMP:			Metho Ceme		Hand F	ft. to Poured ew em field lin	ft.  nes or other o	No. of Sacks No. of Sacks concentrated of	s Used	on <u>N/A</u> f
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other		10	) SUF	FACE (	OMPLE	TION		338.44 (2) (A	N	
Depth to pump bowls, cylinder, jet, etc.,	_ ft.		Ø	Specifie	d Steel S	leeve Insi	talled [Rule	338.44 (3)(A)		
14) WELL TESTS:  Type test:			. –				le 338.44 (3)( edure Used	(b)] [Rule 338.71]	1	
Yield: gpm with ft. drawdown after	hrs.	11	) WA	TER LE	VEL:					
		ļ .	Sta	tic level		ft b	elow land sur	face	Date _	
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?			Ar	esian flo	w		gpm.		Date _	
Did you knowingly penetrate any strata which contained undesirable		12		•	w					epth .
Did you knowingly penetrate any strata which contained undesirable constituents?    Yes   No		12		esian fic	<b>W</b>		gpm.			Depth
Did you knowingly penetrate any strata which contained undesirable constituents?    Yes	ng returned for	all of	the state	esian flo CKERS: ements and resul	herein ar	e true to ti	gpm. Type	knowledge a 3187-M	Ind belief. I	
Did you knowingly penetrate any strata which contained undesirable constituents?    Yes	ng returned for	all of	the state letion a	esian flo CKERS: ements and resul	herein ar	e true to ti	gpm. Type he best of my	3187-M as	7870	
Did you knowingly penetrate any strata which contained undesirable constituents?    Yes	ng returned for	all of comp WEL Aus	the state etion at L DRIL	esian flo CKERS: ements and resul	herein ar	e true to ti	gpm. Type he best of my Tex (Si	3187-M	7870 (ZIp)	

## WATER MONITOR SCHEMATIC FORT WOLTERS #2A DRILL DATE: 12/5/95 NATIONAL GUARD PROJECT



Please attach electric log, chemical analysis, and other pertinent information, if available.

# WATER MONITOR SCHEMATIC FORT WOLTERS #1 DRILL DATE: 12/1/95 NATIONAL GUARD PROJECT

