

# Water Problem Solved

## Air Base Installs Massive French Drain System

Using what some are calling the largest French drain ever constructed, Sheppard Air Force Base in Wichita Falls, Texas, has eliminated ponding between two of its runways. The swamp-like area attracts birds such as the Cattle Egret, which struck a T-38 supersonic fighter training jet and caused it to crash. Fortunately, the pilot and pilot-trainee safely ejected. The base reports about 50 bird-strikes a year.

In January 2018, Sheppard became the busiest joint-use airfield in the United States Air Force. It is also home for the city of Wichita Falls Municipal Airport. Sheppard AFB trains U.S. and NATO partner students to be combat pilots and for other occupations, including maintenance crews and air traffic controllers. Opened as an Army Air Corp base in 1941, Sheppard is now the largest and most-diversified training center in the Air Education and Training Command. Nearly 90,000 military personnel are trained each year at the base for the Air Force and 13 NATO nations.

During the early part of 2018, the corrugated metal pipe (CMP) drainage system around the landing strips was replaced because it failed, permitting water to rise to the surface and create ponds.

"It's a very interesting area out here because there are subterranean rivers that come from the west and go through the north end of the base, creating a swamp between two runways," explained Gary L. Wiggins, P.E., PAE, and project lead at Sheppard AFB. "The

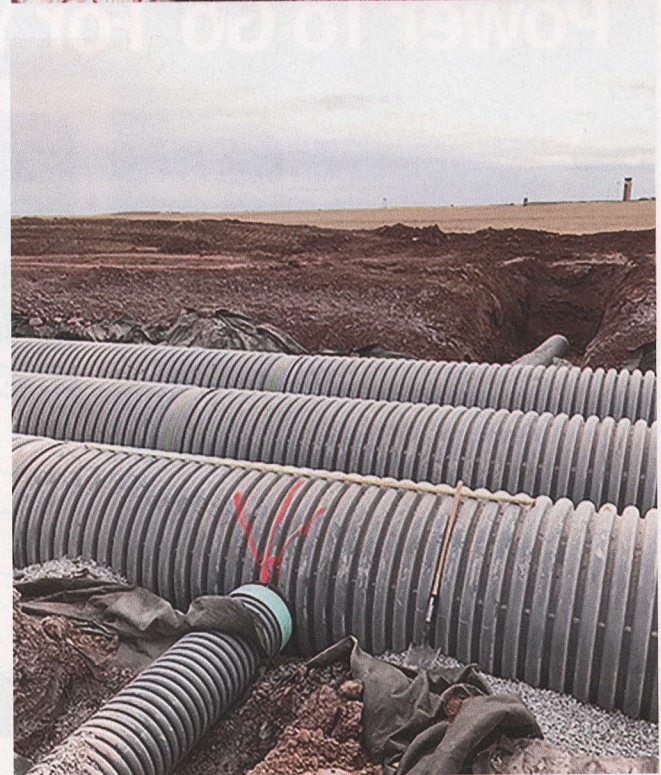
pipe was there to eliminate the ponding. The original non-perforated pipes were put in only about five years ago. The water would well up and come racing through that system using twin, 72-inch corrugated metal pipes, which were not banded together properly. We suspect that's why it failed, but the Air Force doesn't know whether it was the material or the installation, or a combination. These steel pipes were just beat up and pulled apart. It was a terrible mess."

The Air Force commissioned a study to determine the best type of underground drainage system. The recommendation was to use a French drain, but because such a system is usually smaller, typically using pipe from four to six inches in diameter, Wiggins had to find the proper pipe to replace the 72-inch diameter CMP pipe.

### A first

"Never in my career of some 30 years have I had to deal with a huge French drain like this," he said. "I've done a lot of road and pipe projects, but not a massive French drain. And neither had any of my colleagues. I had to do a lot of bird-dogging to find the right pipe."

Instead of two lines of 72-inch diameter CMP pipe, the replacement system would consist of three lines of 60-inch diameter thermoplastic pipe, which would be perforated. Additionally, there would be concrete structures every 1,000 feet for cleanout and to slow down the flow of water. Each line of the run was 7,200 feet,



**Top:** Failed five-year old corrugated metal pipe had to be removed and replaced. **Bottom:** The new system of thermoplastic pipe from Advanced Drainage Systems was used for the triple-runs of 60-inch diameter pipe, along with 18-inch pipe.

for a total of 21,600 linear feet of pipe.

"We used HP Storm pipe, and it is essentially the largest French drain we ever designed. The three 60-inch diameter pipes are side-by-side in a 26-foot-wide trench, and the bottom of the pipe is about 10 feet below grade so there's approximately four feet on top," Wiggins continued. "The pipe is perforated all around with 3/8-inch holes. Before, the steel pipe didn't have any pre-drilled perforations – the only perforations were the broken joints."

The HP Storm pipe from Advanced Drainage Systems Inc. is high-performance polypropylene (PP) pipe for gravity-flow storm drainage applications. The ADS design couples ad-

vanced polypropylene resin technology with a dual-wall profile design for greater stiffness and durability. The pipe is corrosion resistant and is unaffected by salts, chemicals and hot soils. It also meets or exceeds ASTM F2881 and AASHTO M330. From a federal perspective, polypropylene pipe is approved by the Army Corps of Engineers for storm drainage applications under Section 33 40 00 (Unified Facilities Guide Specifications). The Federal Aviation Authority (FAA) permits polypropylene pipe under airfield pavements per Item D-701, Pipe for Storm Drains and Culverts in AC 150/5370-10G (Standards for Specifying Construction of Airports).

"It's also a particularly strong



More than 21,000 linear feet of 60-inch-diameter pipe was placed in the 26-foot wide trench to create a French drain to provide drainage between two active U. S. Air Force runways at Sheppard Air Force Base.



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pipe," Wiggins added. "It was shocking to me to find a plastic - polypropylene - that is so strong. And we also needed that strength. Around here we have a condition of expansive clays, bentonite clays, that shrink and swell. At times, these pipes and the joints are under tremendous pressure. The stress concentration on pipes and joints can pull them apart."

The entire project took fewer than 100 work days and was done by Barlovento LLC (Dothan, Ala.).

### New direction

"We dug out and replaced two 72-inch pipes because they failed from bad joints and are not really the product for this application," explained James

Garner, Barlovento's quality control manager on the job.

"We replaced it with three, wide 60-inch pipes. I think it's better suited because it's perforated. The joints on it are regular bell and spigot, and they go together excellently."

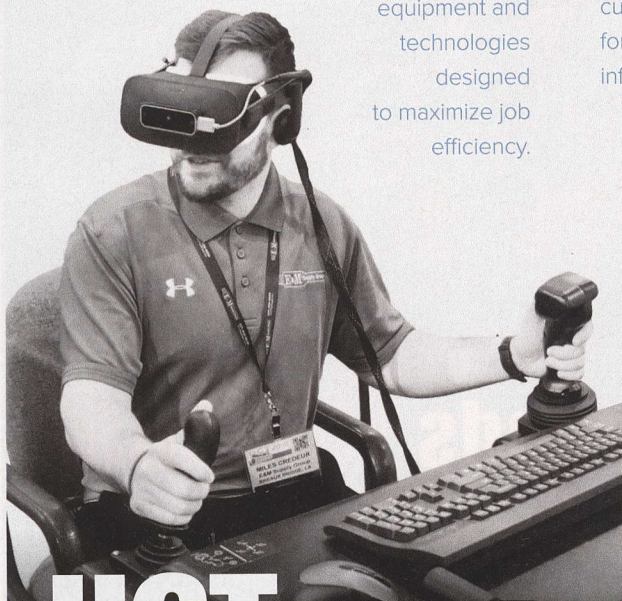
The installation crew from Barlovento's sub-contractor, Profiles LLC (Newton, AL), consisted of eight laborers and three equipment operators using GPS coordinates as a guide.

According to Craig Holland, onsite superintendent on the project for Barlovento, "I told my guys that I've been in this business for close to 30 years, and this job is of the magnitude of something I've never seen before. I tell my labor hands who are in their early 20s that

Pilots practice touch-and-go maneuvers in a T-38 Talon at Sheppard Air Force Base. T-38 is a two-seat, twin-engine supersonic jet used to train pilots in the international Euro-NATO Joint Pilot Training Program. (U.S. Air Force photo/Danny Webb)



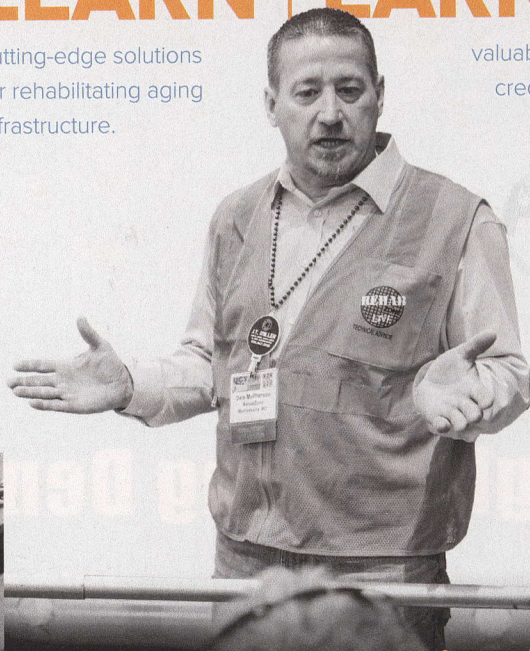
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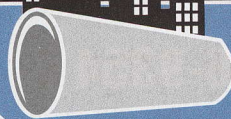
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they might go the rest of their career and never see another job like this. You're talking close to four miles of pipe in a very wide trench. The project required 38,000 tons of stone for backfill."

Even with the scope of the job being so vast, installation was quick. "It went better than we expected," Holland stated. "Our original plan was to shoot for 100 feet a day. We were probably getting 150 feet or more. Even connecting to the concrete structures that were specified for cleanout and to slow down the water was fast using inserta tees, and there were 29 of them on this job."

Additionally, branch runs of 18-inch diameter HP Storm pipe were put in to take care of

surface water flowing longitudinal to and laterally across the three main 60-inch pipes. Connecting the 18-inch to the 60-inch pipe was done using inserta tees that provided a fast way of doing the water-tight lateral service connections.

"This local surface water must also be collected and routed to the main trunk lines," Wiggins explained, "so intermittently along the length of the French drain system there are surface catch basins (CBs) spaced on either side or directly above the three 60-inch runs to collect and route this water to the mains. These CBs are spaced about every 250 linear feet throughout the project length."

The trench was lined with a geotextile fabric, which also

enveloped the pipe to prevent fines from contaminating the backfill and slowing water entering the pipe.

The base will continue to replace and install more drainage. "We're going to be doing more pipes," Wiggins said. "There are probably 15 of these 72-inch pipelines that converge 1,500 to 2,000 feet south of this location. We'll be opening that up in the future and replacing those pipes that are having similar failures. It was good to find the remedy for this ponding situation."

**FOR MORE INFORMATION:**

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