Solid Foundation for Business District

TerraFirma's groundwater system supports 100 Saint Paul development

By Sue Rose

TerraFirma Earth Technologies installed an innovative dewatering and ground water treatment system at 100 Saint Paul, a retail and office development in the rapidly expanding Cherry Creek business district. The firm has made Denver a permanent home to a satellite office.

TerraFirma Earth Technologies was selected by general contractor GE Johnson to install a groundwater control system and innovative groundwater collection and treatment system designed by Terracon in the heavily travelled Cherry Creek business district in Denver, Colorado. TerraFirma, an elite groundwater control contractor, is the newest arrival among top-tier players in Denver's burgeoning construction sector. The firm has opened a permanent satellite office in the Denver Tech Center.

A SURPRISE ON THE JOBSITE

When ground was broken in February, 2014, neither GE Johnson, 100 Saint Paul, LLC (owner), nor the geotechnical consultant Terracon, could predict unforeseen conditions that would require on-the-spot installation of additional dewatering features than were originally designed. TerraFirma worked congruently with the owner, general contractor, and design consultants to come up with an innovative, supplemental dewatering system that averted delays and minimized costs.

According to TerraFirma's Giles, the original design included widely spaced deepwell dewatering wells meant to maximize drawdown, while minimizing the rate of groundwater flow, in an effort to prevent migration of potentially contaminated groundwater from adjacent properties. The modified system meant adding mini-vacuum wells directly adjacent to the building's elevator pits and a permanent dewatering sump pit that TerraFirma was able to custom design on the job, making for a unique hybrid of dewatering methods to better suit the actual soil and jobsite conditions.

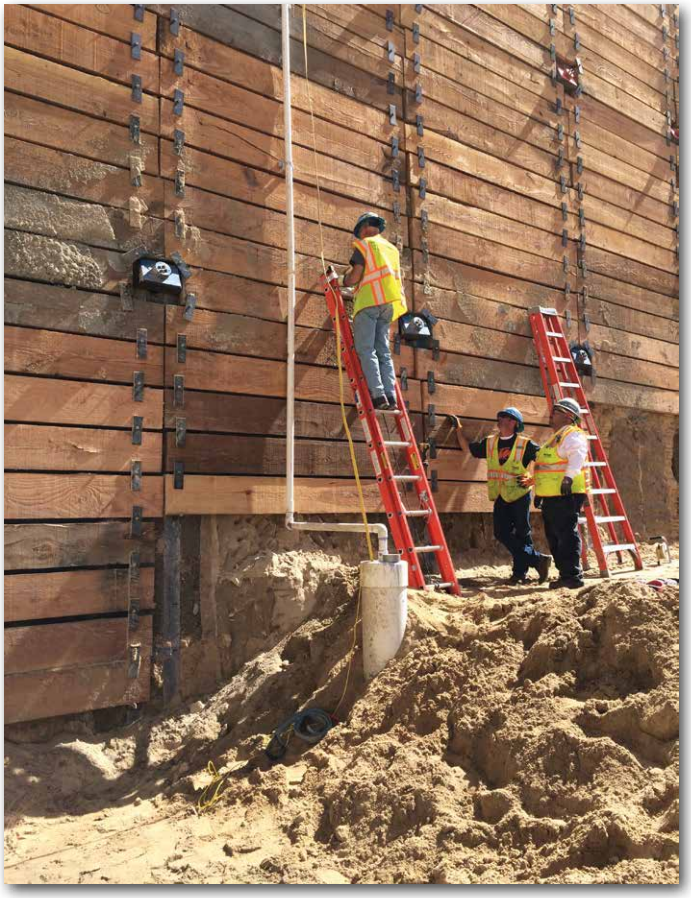
Electrical submersible pumps were placed near the bottom of each dewatering well.

TerraFirma's president David Giles explains, "Usually when we pump water from the ground, we pipe it directly to a storm sewer drain. However, there was concern that this ground water was contaminated from three sources: chemicals from a dry cleaning business, hydrocarbons from a previously demolished fuel station, and dissolved metals, which occur naturally in the earth.

"By isolating the supplemental dewatering to just those few areas needing it, we saved precious time and reduced costs. Also, by limiting supplemental dewatering efforts to just those few areas, we reduced the required

About The Author

David Giles and partners Josh Peltier and Mike Giles founded TerraFirma Earth Technologies in 2004 with the mandate of elevating the quality and professionalism of the dewatering industry. Headquartered in Houston, TerraFirma helps owners and contractors throughout the United States maintain acceptable groundwater levels for both temporary projects and permanent installations. Contact TerraFirma's Denver representative, Mike Giles, at 720.893.0556 or by fax 720.893.0557. President David Giles can be reached at 281.720.1212. For more information, visit www.tfearth.com.



Going deeper. TerraFirma's well modification in progress. Wells must be lowered as excavation advances.

TerraFirma utilizes Holland's Rotary Lobe wellpoint pump for its mini-vacuum well dewatering system. The traditional deepwell dewatering wells can be seen in the background.

amount of groundwater to be pumped, thereby reducing the risk of pulling in contaminants identified on adjacent properties during the investigative phase of the project."

Brian Lawrenson, GE Johnson's superintendent, adds, "The project is situated in the heart of Cherry Creek, with very little or no laydown. TerraFirma worked with us during the logistical challenges we faced daily. Due to the complexity of the site excavation and ever-changing conditions, GE Johnson had TerraFirma install two areas of vacuum-well assemblies to provide additional localized dewatering. TerraFirma reacted quickly to these unforeseen conditions and was able to minimize the impact to the construction schedule."

A CLOSER LOOK

The final dewatering system included 11 extraction wells, 1 injection well, 42 mini-vacuum wells, 3 perimeter HDPE groundwater discharge manifold lines, and a groundwater treatment system. "It was first time I have seen such a unique groundwater collection and treatment system design in my 28 years in this business," says Giles. "It was much easier and less expensive to design and install this at the outset,

Completed installation of the PVC mini-vacuum well- assembly following drilling of the borehole, utilizing track mounted Geoprobe hollow stem drilling rig.

Placement of the PVC dewatering well assembly following drilling of the bore hole with the track mounted Watson drilling rig.

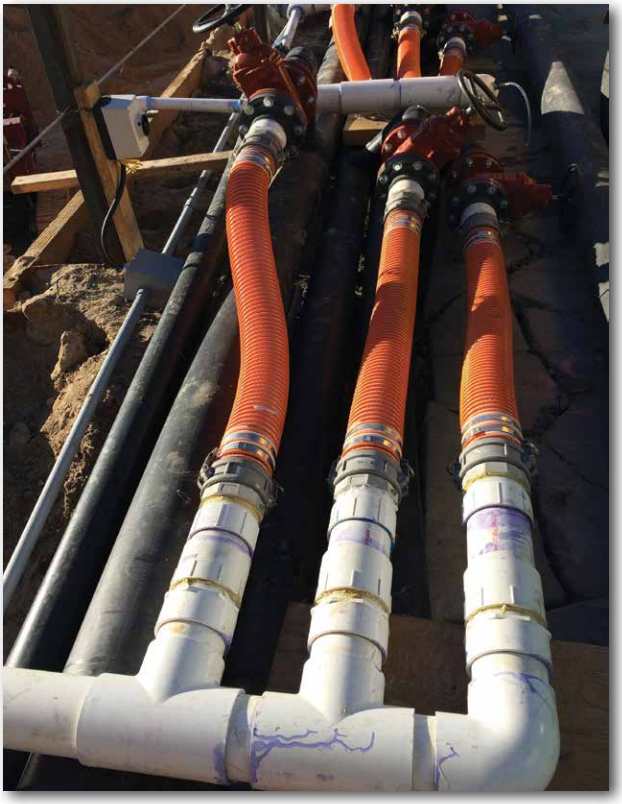
just to cover the possibility that it would be needed. Had we not planned in advance for the three possible discharge routes and needed them, it would have been expensive to do so later. Terracon deserves credit for a really unique design."

According to Giles, in the end Terracon's samplings were all within limits, and the water didn't have to be redirected away from the sewer. The injection wells will remain in place after completion of the construction and incorporated into a separate, permanent dewatering system.

EXPERTISE IN ACTION

David Cross of 100 Saint Paul, LLC, was pleased with the result. "TerraFirma brought a high level of expertise and extensive knowledge base to the table when we hit the bottom of the hole. They were instrumental in bringing about a speedy resolution to unforeseen subsurface conditions to the benefit of the general contractor and the project owner."

100 Saint Paul, a Class A office and retail development, is scheduled for tenant occupancy in the summer of 2015. As of November 18th, the steel



Unique, innovative groundwater collection lines allowed clean groundwater to be directed to the city storm sewer drain, contaminated-treatable ground water to an onsite groundwater treatment system, or contaminated, untreatable groundwater to be re-injected back into the ground, to its original source.

Safety meeting. TerraFirma provides ongoing training and certification for its crew members. All safety initiatives are continuously reviewed and updated to keep employees proficient in new safety policies and procedural methods. The firm calls this plan "Target Zero", and its goal is to achieve zero accidents and injuries during every dewatering project.

structure rises to eight levels above grade over three below-grade parking levels. TerraFirma's past deep excavation projects include athletic stadiums, hospitals, high-rise facilities, transportation facilities, airports, tunnels, power plants, dams, waterways, petrochemical plants, and municipal infrastructure sites such as pumping stations, treatment plants, as well as sewer and gas pipelines. ■