"GROUP continues to operate as a true partner in looking out for the overall best interest of the business and the people."

Joseph Bob LaFleur, Shell NRM/Construction Execution Manager
Shell Energy and Chemicals Park

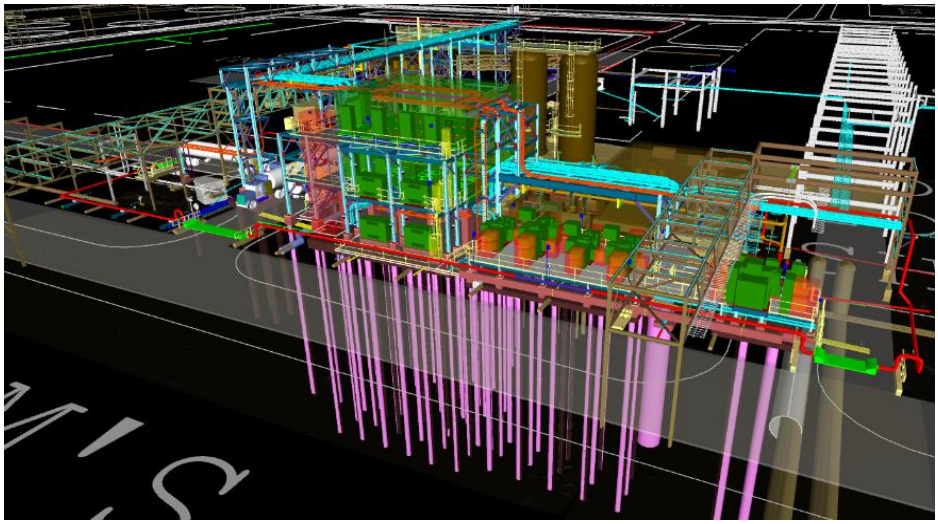
GROUP Contractors battled a timeline that was forever getting shorter at Shell's Norco refinery. The contractor's foundations and civil work would ultimately support a new electrical substation within the refinery's gasoline refining unit (GO1) and serve as a vital first step in Shell's plant-wide effort to reimagine and fortify its electrification.

Given the accelerated deadline, mandated to accommodate an upcoming major 2026 turnaround, the GROUP team had to maneuver a growing number of workers and large equipment quantities within an extremely limited work area (the main project footprint was only 6,500 square feet). There was literally no wiggle room in schedule or space, but they helped facilitate it all, self-performing the civil work with a 30- to 40-person crew at peak, working around the clock between two shifts, 24 hours a day. It helped to be the only contractor working at the time – and that they were already nested on site performing other projects – as they knew the site like the backs of their hands. "We knew what we were up against, the ground conditions etc. … everything from start to finish," says Chelsey Rodrigue, GROUP project manager.

The new substation comprises a relatively small footprint at the facility but is extremely important to the plant's functionality. "Once the turnaround timeframe was set, then it was all-hands-on deck," she adds. "The initial expectation from the owner was to throw as many people as we could at it to get it done, but we just couldn't do that because the design made the execution a maze. We were forced to work our way from one end to the other."

Feeling their Way Around

The Norco facility is some 100-plus years old, so in the beginning the Shell team wasn't sure what they'd find below ground. As a vital first step, the GROUP team began a significant, two-month-long exploratory effort. "It was massive endeavor," Rodrigue says. "We found some 30 different pipelines. There were also some deep, old anchors for flare tiedowns 10-foot square that we never found the true depth of, and nearly 15 roll off dumpsters full of concrete we pulled out of the ground. After the discovered piping was decontaminated by another nested piping contractor, we



pulled all of that out, backfilled the entire site with nearly 400 cubic yards of structural fill and built it back to a good, clean working surface."

It was only then that they could finalize their foundation plans, working hand in hand with the project engineer, S&B Engineers & Constructors, to devise an efficient pile design. GROUP collaborated with both S&B and Shell's Construction team through numerous model reviews. "Everything about this project was expedited," she adds. "As soon as they got the geotechnical report, we moved into exploratory work. And while we were doing exploratory work, we began talking about pile types, sizes and configurations. The project was so expedited we were receiving the approval sets, building our estimates and releasing materials while the drawings were being vetted."

The engineering team ultimately decided upon 122 piles consisting of three sizes of drill shafts and two sizes of auger cast piles. Auger cast piles were installed for large foundations and drilled shafts as independent foundations for the pipe racks. The pile types provided the best "on-demand" solution for Shell's accelerated schedule. "Within a week, we could have the materials onsite to start pile installation," she adds, "whereas if you were doing precast concrete piles, helical piles or something else the project would have had to sit idle for material procurement."

The team had successfully drilled and poured the first of three 80-foot-deep drilled shafts – taking an entire 12-hour day – when the concrete supplier's pump truck broke down prior to advancing with concrete placement. "Exhausting all options, we couldn't put concrete down and were forced to abandon the hole and backfill it," she adds. "This incident fell right during Easter weekend."

When the crew arrived back at the site, a void had formed in the soil around the shaft. It prompted a complete re-design that ultimately turned the three 30-inch-diameter by 80-foot-deep shafts into a single, massive 7-foot-diameter by 55-foot shaft.

At this point, the project could have been delayed by three weeks while GROUP and engineering collectively worked to a resolution and resulted in a negative ripple effect on the rest of the schedule. However, GROUP's team was able to quickly reconfigure their execution plan and keep auger cast pile installation moving forward (which was the second critical path). Once both the auger cast and drilled shafts were complete, the civil crew began foundation work on the deep foundations crew's heels.

About 75 percent of the auger cast piles were augured well above grade, necessitating that the GROUP team perform a

mass excavation once they were in place. “The original and more efficient plan was to mass excavate prior to pile installation as the varying elevations of each pile cap, but because of the earlier shaft redesign we had to flip the plan and install everything from grade and then go back and excavate afterwards. Because of the way the site was set up, we couldn't get equipment down there. We had to pivot.”

There were other foundation challenges – the original plan called for an electrical team to temporarily disconnect the power to a cable tray running over one of the drilled shaft locations, but two weeks prior to the scheduled work situations changed and the outage could no longer take place. “We couldn’t move it, so the engineers were forced to redesign it,” Rodrigue says. “S&B accelerated the design process and turned two shafts into four with a bigger pile cap.” Even with the sudden shift, the shafts were re-designed and successfully installed under the same original schedule, with no extension.

A Malleable & Collaborative Approach

Throughout much of the work, the project followed a predictable routine. When issues arose, S&B would quickly provide a solution (usually within 24 hours) and the GROUP team would execute the path forward. GROUP operated day and night shift supervisors, as well as separate superintendents for auger cast, drilled shafts and civil construction. Every day, each 12-hour shift would stay an additional hour to brief the next crew about their progress and next steps. Shell representatives would attend the meeting to ensure there were no obstacles to getting the work done.

Most of the daily and weekly meetings were held on site to abide by Shell’s expectation that the management team be physically located on site. GROUP used Primavera 6 for scheduling and Navis works model reviews for construction execution, but face-to-face meetings and phone calls were the rule of the day given the urgency of the work. “The project timeline really didn't allow for us to be fancy,” Rodrigue says. “It was Shell’s expectation that we use the basic principles of communication to make sure that nothing stopped us. We’d pick up the phone, call the right people and get any roadblocks removed.”

About a month into the deep foundation work, GROUP began civil work, working multiple areas at a time with a crew of 20 during the day and 15 at night. Most of the foundations required a significant below-ground pile cap ranging from 2 to 3 feet thick. “As we poured them, we backfilled everything to get it back up to grade and eliminate the various elevations within a small footprint,” she adds. The primary substation foundation pile cap were topped with 24 12-foot-tall concrete piers, a necessary final step toward achieving the project’s primary goal – to elevate the electrical substation and protect it from the elements. “The piers had to be at a consistent elevation with no deviations,” Rodrigue says. “We ultimately achieved a 3/8-inch deviation, made possible by a lot of surveying and quality verification.”

Getting concrete to the site was a particular challenge. GROUP had to close the main feeder road into the plant each time they made a pour, since they could only access pour sites with a pump truck from the road. Each time, GROUP's spotter flaggers would assist in diverting traffic to other routes.

There were some 30 concrete trucks running at peak, with several pours occurring in the early morning hours. Sequencing the concrete pours required strategic planning due to the abundance of formwork in a small footprint.

No Room for Error

Material deliveries had to be precisely sequenced to ensure there were no delays, so GROUP partnered with dependable vendors, many of which they'd done business for years. "As soon as we were given the approval for a certain area, we had to get the materials quickly," she says. "Our reinforcing steel vendor got us 125 tons within two to three weeks of the order. In the end, there were some 366 anchor bolts, 760 cubic yards of concrete and 756 cubic yards of grout placed on this project."

Shell assisted in assuring the materials made it to the jobsite without issue by coordinating opening other lesser used entrance gates with a security guard. This was a tremendous help to ensure grout and concrete arrived with the maximum time of workability. Also, much of the re-steel had to be staged in a laydown yard 2 blocks away from the jobsite, as there was no real estate available at the immediate work site to stage. This required GROUP to haul to and from laydown yard to jobsite frequently.

A heighted level of productivity was the goal, although that was frequently under threat. For example, the team had to side-step some 36 consecutive days of lightning delays in a single month. "Fortunately, we had day and night shifts, so many times where one would be lacking the other could make it up," Rodrigue says. "We'd already built that into the plan as a contingency, but it still became a huge challenge because we were working in deep excavations in the rain and had to dewater more than we wanted. It was always a mess."

The GROUP team tracked productivity twice daily, once for each shift, and the cost and schedule were synced with Shell's cost reporting system on a weekly basis. In the end, "it boiled down to just good old-fashioned communication and face-to-face discussions," she adds. "Everything was symmetrical and systematic. We had to work X to get to Y to get to Z."

The GROUP team maintained a full-time quality control manager and full-time surveyor on site who were solely dedicated to the project. "They verified everything as we went along," she says. "That way we could catch any deficiencies early. They were that secondary set of eyes and were extremely beneficial to this project's success." GROUP had some hi-tech help along the way, relying upon an abundance of surveying tools such as Trimble Total Stations.

In the end, GROUP's work was completed on budget and on schedule, and they remained on-site to assist until the day the two-story substation building was delivered. "Through it all, we never lost sight of the critical dates to be met," Rodrigue says. "Our job was to make sure that our scope was completed timely to accommodate Shell's critical timeline, and we did just that."