The Marina Heights project in Tempe, AZ, is the regional headquarters of State Farm Insurance, who also serves as its anchor tenant. This is a mixed-use project with the lion’s share of office space being leased by one tenant, State Farm. The primary development stakeholders were Sunbelt Holdings, Ryan Companies, and Arizona State University (ASU). Ryan Companies is a national construction company founded in Minnesota and was also acting as the general contractor, in addition to their development interests.

The project is located on the south bank of the Tempe Town Lake in the heart of Tempe, and directly adjacent to the football stadium for ASU. The project is situated between a busy city road, Rio Salado Boulevard, on one side; a new apartment development also nearing the construction phase on another; and an empty parcel on the third. The fourth side, not the least of which, was the longest tangential stretch along the Marina Heights project and intersected the slope of the earthen levee for the Salt River and Tempe Town Lake. The levee is a multi-jurisdictional flood control structure and so governed by intergovernmental agreements between the City of Tempe and the Flood Control District of Maricopa County. Because the development intersected the slope of the levee, all construction was subject to review and permitting by both government agencies. The project site was surrounded by appreciable volumes of university vehicular and pedestrian traffic. Groundwater, with a perched water table, was pres-

Fig. 1: Aerial view of Buesing Corp.’s mass excavation, shoring, and shotcrete finish wall work in progress
ent just a few feet (meters) below the bottom of the proposed garage excavations. The site also had historical wildcat dumping decades ago; thus, sorting and then legal disposal of debris was required from the beginning of the site work.

The proposed project plan by the development team included a parking garage with a 19 acre (77,000 m²) footprint, two levels below street grade approximately 24 ft (7 m) deep, podium layout construction, with five individual glass office towers within the garage footprint. The total office space of the five buildings was 2 million ft² (190,000 m²), and 60,000 ft² (5500 m²) of retail space. The development was proposed to maximize the land parcels and therefore the below-grade garage footprint was pushed out to near the property lines, requiring shoring systems to be installed at the wall line—or, in other words, at the back of the proposed perimeter finish wall. In 2013, the project was initially programmed to be constructed at a project cost of $600 million to deliver shell buildings and completed sitework. Subsequent scopes and contracts were to include build-to-suit space and furnishings for the buildings. These final scopes are being finalized and completed, and will be ready for occupancy this spring of 2017. Occupancy of some building spaces began sometime last year. The size of this project in terms of dollars and area is the largest ever in the metropolitan Phoenix, AZ, area, just edging out CityScape, where Buesing also performed the three similar scopes in 2008.

Once the Marina Heights land closed escrow, the pressure was on to begin construction. Ryan Companies solicited budget pricing based on preliminary schematic drawings to more than three bidders for the sitework, shoring, and concrete/shotcrete walls. Buesing was successful in being awarded all three of these scopes on this project and swiftly began collaborating with the project team on all aspects, including removals, mass excavation, shoring/earth retention, and shotcrete finish walls. In this process, we refined the guaranteed maximum price (GMP) type budgets for contract, and collaborated on detailed schedules and work plans. Buesing began sitework within 2 weeks of being awarded the contract because of the fast-track nature of this project.

Although mass excavation, sorting and hauling debris, hauling excess soil, and shoring all began in late July 2013, the concrete trade subcontractor (Suntec Concrete) was immediately behind Buesing starting the concrete mat foundations, interior columns and shear walls, and perimeter wall reinforcing bar installations. By November 2013, we began installing shotcrete finish walls in some limited areas while we were still excavating and shoring in other areas. It is also interesting to note that our temporary shoring system included a 4 in. (100 mm) thick shotcrete facing, which required daily crews to keep the shoring operation on schedule. Therefore, oftentimes we were installing shotcrete facing for shoring with one crew and installing the permanent, perimeter shotcrete finish walls on the perimeter with a second crew.

**SHOTCRETE WALLS**

The structural or finish perimeter walls for the below-grade garage were initially designed to be conventional form-and-
pour concrete construction, with a 6000 psi (40 MPa) concrete design mixture. Buesing submitted pricing for shotcrete installation of these perimeter walls as a value engineering alternative to the form-and-pour construction, showing both a time and cost savings to the project. For synergy of cost control, scheduling, and overall coordination of scope, our contract for these shotcrete finish walls was directly with Suntec instead of Ryan Companies. Through this collaboration process, our wall installation was performed in six phases over the span of 12 months (November 2014). To accelerate the schedule and help accommodate the aggressive schedule by Suntec, Buesing increased its crew size by 20% from what is typical, and worked 9- to 10-hour-long days, and frequently worked Saturdays.

An extensive mockup panel was constructed to evaluate and test the various integral components, an appreciably more robust mockup panel than typical. The mockup structure included the soil nail heads for shoring, the complete waterproofing system, reinforcing bar installed per plans, an inside corner, and an outside corner. As planned, the actual shotcrete finish wall was installed atop the completed waterproofing system, which was installed over our

Fig. 5: Rod, float, and trowel work to tolerance wall thickness to ground wires

Fig. 6: Applying a light broom finish

Fig. 7: Completed shotcrete finish walls in the background (CIP columns by concrete subcontractor in foreground)
temporary shotcrete shoring facing system. The shoring served as the back form for the perimeter finish wall in most cases, and there was also back forming required to be installed by Suntec above our shoring to achieve design elevations around the perimeter. The perimeter finish wall design included horizontal corbels and notches for the intermediate floor. All columns were designed away from the perimeter so there were no pilasters (in-wall columns). The shotcrete installed, met, or exceeded the 6000 psi (40 MPa) design requirement. Both construction joints and scored control joints were implemented in our shotcrete installation. A wood float finish followed by a light broom drag was selected as the final shotcrete wall finish.

Buesing met or exceeded the requirements and expectations of the 6000 psi (40 MPa) design mixture, the quality control testing, finish, and schedule. The shotcrete scope(s) that we performed on this project was intense, working alongside a robust concrete operation by Suntec that included multiple tower cranes and a steady stream of concrete ready-mix deliveries. All in all, the project was successful because of early and effective planning, and hard work by our employees on the project, certainly inclusive of the shotcrete crew.

About the Company

Buesing Corporation is a Phoenix-based construction contractor that performs a variety of civil and site work services for multiple markets. It has served the construction industry since 1965, beginning in Minnesota, and moving to Arizona in 1986. It owns a wide variety of equipment that is well maintained at the company’s shop or by two shifts of mobile mechanics. Buesing works on many high-profile projects and for some of the largest developers and general contractors. Although shotcrete is a fraction of their business, they have become a leader in the market, providing shotcrete services for the construction and shoring projects they are awarded, as well as an ancillary service. For years, one of the company’s successful formulas has been to self-perform mass excavation, shoring (earth retention), and shotcrete finish or structural walls on numerous basements or below-grade garages in Phoenix and Tucson.

Kevin Somerville graduated from Arizona State University in the construction management program in 1990 and immediately began a career at Dames & Moore that later merged with URS, both of which are international engineering/geotechnical/consulting/environmental firms. Somerville was a lead estimator, construction manager, spec writer, scheduler, design task leader, and project manager and rotated those responsibilities through the years from project to project. He has his engineering-in-training certificate as he has worked with civil and structural engineers daily during his 13-year career there. Somerville joined Buesing Corp. in May 2002 as the Chief Estimator. He was instrumental in bringing the shoring design-build services to Buesing Corp. in 2003 with his engineering background. Somerville became Vice President of Estimating & Business Development/Marketing in 2005. Last year, Bill Kelton joined the company as VP of the estimating department, and Somerville is currently VP of Business Development/Marketing, while still an integral part of estimating.