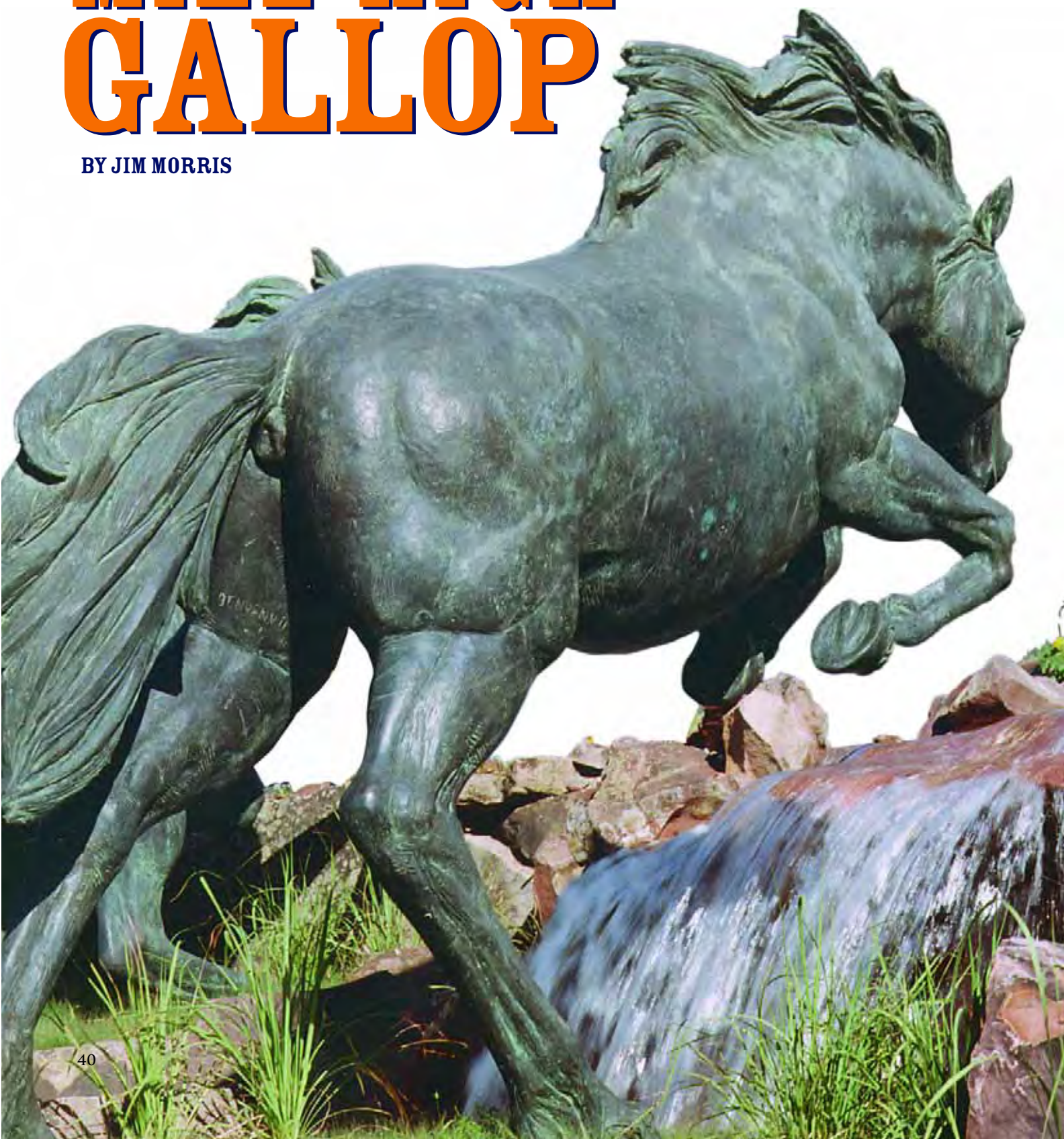
MILE-HIGH GALLOP

BY JIM MORRIS



Located at the entrance to the new home for the National Football League's Denver Broncos, this unique vertical watershape is the combination of ambitious visual design, massive bronze sculptures, complex cascades, rugged rockwork and delicate alpine landscaping – and all Jim Morris and his staff at Natural Pools & Waterfalls of Denver had to do was figure out how to make a grand concept work.

IT'S NOT EVERY DAY you get the chance to work on a project that's going to be seen around the world by millions of people for decades to come.

That was exactly the opportunity that came our way in October 1999, when we were asked by the Denver Broncos to construct an elaborate waterfeature at Invesco Field at Mile High, a brand-new stadium that opened at the beginning of the 2001 football season.

The project architect – HNTB Sports of Kansas City, Mo. – had developed the initial sketch and concept for the unique watershape. As is the case with many of the plans received from project architects, however, this one was long on ideas and woefully short on details. All we knew to start with was that they wanted a sloped watershape that would serve as the platform for seven larger-than-life sculptures of bronze broncos that would appear to be bounding up mountainous terrain leading to the stadium's south entrance.

The project was to be a gift from the Broncos' CEO Pat Bowlen to the citizens of Denver, who had funded the construction of the stadium. The result is a work of art, now aptly known as "The Broncos," that has already been seen by fans of the National Football League throughout the country and, indeed, around the world.

A BREATHTAKING SETTING

That visibility is all well and good, but bringing the project to fruition was a challenge that called for a great deal of ingenuity, patience and cooperation.

To set the scene: Invesco Field at Mile High is a publicly funded facility operated by Denver's Metropolitan Football Stadium District. Unlike many stadiums constructed in recent years that have sought to recapture the asymmetrical charm of legendary sports venues of eras gone by, Invesco Field is a sleek modern marvel of stainless steel and glass.

There are four main entrances to the stadium. "The Broncos" were to be located in the center of the flight of stairs ascending to the south entrance.

Initial discussions among the project manager, architect and general contractor recognized that they would need someone in the loop who could design and build this sort of elaborate natural watershape. We had worked before with Turner Construction, the general contractor, and they recommended us.

From the start, it was clear that it would be up to us to figure out all the specifics of design and engineering that would be required to make the watershape happen on schedule for the stadium's opening in August 2001. Along the way, we worked closely with Turner Construction, with project manager R.M. "Dudi" Beretti of the Stadium Management Co. and with Fred Hare of Sta-Rite Industries, who crafted the hydraulic design.

The space in which we were to work measured 35 feet wide by 72 feet long, rising 14 feet on a gentle slope. In this span, we were to set up a reinforced shotcrete structure that would contain the rocks, landscaping, lighting, water systems and the seven broncos, which had been made in Florence, Italy, by renowned sculptor Sergio Benvenuti. The seven figures were chosen in homage to the Bronco's legendary quarterback John Elway, who wore jersey number 7.

By the time we became involved, the basic dimensions of the space as well as the poses, sizes and relative positions of the sculptures had already been established.

HEAVY LIFTING

Turner Construction was first on site. As part of the stadium's structure, they set up the massive concrete slab that would support the weight of the rocks as well as the seven concrete plinths upon which the broncos would be placed. A thick vinyl liner was placed over the foot-thick slab to waterproof the entire structure and ensure that the adjoining stairs would not be undermined by any water that might escape

PRELIMINARIES: By the time we arrived on site, the general contractor had set up a platform for our work as well as the support structures for the seven bronco sculptures (A). We came in and put down

Our challenge was to create a lively, crashing stream that would befit the energy expressed by the broncos. By design, the rockwork and landscaping were to resemble as closely as possible the upper alpine terrain found in the nearby Rocky Mountains. The horses were to be positioned so as to appear to be bounding up this incline into the stadium, arriving along with the fans who would move right alongside them.

From the moment we set eyes on the plan, we knew this would be a watershape that, although beautiful and elegant in many respects, was by no means to be subtle or retiring: Rather, it would be a thunderous cascade, a set of waterfalls splashing wildly over huge boulders at a volume of about 850 gallons per minute.

es in diameter were plumbed in a variety of locations throughout the vessel. The shell was then shot and finished with a brownish red plaster that included large cobbled aggregate pieces to give the base an earthen appearance.

Even before we installed the boulders, the appearance was that the stadium had been built around this location, and not vice versa. Those boulders, more than 150 tons of Colorado Navajo Moss Rock quarried locally, were trucked in and set near the job-site in preparation for placement with a 50-ton crane. This particular rock was selected for its rustic appearance and for its ability to withstand

the vessel.

With the slab, plinths and liners in place, our company began preparations for the vessel itself.

The entire composition is contained within a shotcrete shell made much like a swimming pool. Before we could build the shell, however, we had to build an earthen grade atop the liner using Class 6 compaction material. We set the soil in six-inch lifts, testing each for compression, and ended up with an overall depth ranging from five to six feet, respectively, from bottom to top.

On this base, we built the steel cage using half-inch steel. Suction and return lines ranging between four and eight inch-

freeze/thaw conditions in Denver's often-brutal winters.

It was at this point in the project that a great deal of the *specific* design work took place. Working closely on site with project manager Beretti – a gentleman I came to respect and admire greatly – we carefully positioned and repositioned the boulders in and around the plinths where we knew the broncos would later stand. We began by selecting large, structural boulders to create the basic contours and transitions for the various cascades. Some smaller accent boulders and landscape boulders were also added during this initial set of placements.

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POOLING RESOURCES

It's easy to define the general nature of this boulder-placement process in a sentence or two, but it would take volumes to describe the process in detail because of the continuous adjustments that occurred over a long period as the project progressed.

a liner to protect the adjacent stairways from any possible undermining (B), then added soil to create rough contours (C) before setting up the shotcrete shell (D) and moving in the boulders (E).

As is the case with so many naturalistic waterfeatures, the lion's share of the design work occurs intuitively on site. This project was no exception, and the process of placing rocks and creating the waterways all proceeded slowly and deliberately. Through this stretch, the support we received from a variety of sources was critically important – and none of it more significant than the hydraulic design and engineering work done by Fred Hare.

The water system starts with a large pond at the top of the system that overflows onto two large boulders. In this way, the headwaters have a natural look and avoid the look of water emerging from behind a weir, seemingly from nowhere. The pond is irregularly shaped, with large and small boulders obliterating its edges. A total of 24 two-inch returns in the floor essentially lift the water up and over the pond's downslope edge.

As the water cascades downward throughout the falls, the flow is augmented in key places by 20 returns of varying sizes. By combining these return locations with varying rock formations, we created a series of random pools, cascades and riffles throughout the system that enhance its natural appearance. All the water flows to an eight-inch drain at the bottom of the run and is re-circulated using a 15 horsepower pump.

The heated system is designed to run 24 hours a day, seven days a week, 365 days a year at a constant 70 degrees, which creates an interesting steam effect in the dead of winter.

As we worked on the waterfalls, there was constant discussion about the horses, where they would be placed, where the boulders would be set and how the water would flow around them. Before we set the main boulders, we measured the horses in all dimensions and did all we could to think through every detail before committing ourselves to any specific placements.

Over and over again, we'd temporarily place the boulders, reposition them until we were absolutely certain – and then remove them to prepare shelves of mortar and lay down the rock chips that we used to adjust the rocks as we lowered them into their final positions.

Once the boulders were placed, we attended to details, filling gaps with smaller rocks and colored mortar to create various channels and pools. Finally, we were ready – and the horses were craned into position before being bolted and welded into place. From that point on, we started applying finishing touches to watershaping and landscaping.

The broncos must be visible at night, so we set up a variety of fiberoptic lights and low-voltage halogen lamps throughout the area.

This incremental, on-site work was highly intuitive, but extremely purposeful at the same time as we created visually interesting water effects. In one spot, for example, a horse appears to be jumping into the water: At the point where the hoof meets the water's surface, we installed a small spray jet to make it seem as though the hoof is generating the splash.

Roman Fountains of Albuquerque, N.M., designed the spray jets for the horse-hoof splash. That company's technical support and ability to produce the specialty component needed for the effect in rapid order was much appreciated.

A PHOTO FINISH

The fine-tuning on the project lasted a number of weeks as we continued to adjust the placement of smaller boulders and began to add the landscaping.

The plantings on this project are fairly austere, in keeping with the rugged mountain terrain we were emulating. The plant life consists mostly of buffalo grass and some small wildflowers, all species that are indigenous to the area. This subtlety in the plantings contrasts with the boldness of the rockwork and sculptures in an interesting and beautiful way.

Of course, the broncos must be visible at night, so we also set up a variety of fiberoptic lights and low-voltage halogen lamps throughout the area. There's up- and down lighting and a variety of

THE BIG ROUNDUP: Moving the horses into position was a delicate operation that involved plenty of care and patience, but their relative positions had been

planned from the outset, so it was largely a matter of getting things right (F). Still, it was exciting watching the magnificent bronzes being lowered into place (G).

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NECK AND NECK: The completed composition offers a dramatic invitation to come watch the Denver Broncos defeat their opponents (H). Many of those attending the game approach the stadium via the main-entrance staircases that flank the waterfeature and get the distinct impression that they're bounding toward the stadium alongside the broncos (I-J).


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spots and fills designed to accentuate the rocky terrain and, especially, to highlight the galloping horses. Ultimately, the lighting effects are subtle and unobtrusive – and quite effective.

Work continued on the project right up to the stadium's dedication ceremonies on August 4, 2001 – a gala event attended by civic leaders, the media, several Denver Bronco players and fans. At the center of the festivities were the broncos, now formally dedicated and donated to the citizens of Denver.

In the time since, the Broncos (the football team) have taken up residence in their new stadium and I've had the pleasure numerous times of seeing the horses gallop up the cascade on television broadcasts of the team's home games. Team officials have also told us that the watershape has now become something of a gathering point for pedestrians who stroll by during the week.

In that light, I guess it's no surprise that the Denver Metro Convention & Visitors Bureau placed a photo of the "The Broncos" on the cover of its 2001/2002 Official Visitors Guide – signifying, I believe, that this singular watershape has become more than just a point of pride for a pool builder, but for an entire community as well.

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