

# SWIM & LAGOONS & AQUATIC FACILITIES QUALIFICATIONS





# PACE *background*

“*Creativity, innovation and advanced knowledge of water resources are cornerstones of our services leading to aesthetic, environmentally sustainable, and practical engineering solutions.*”

PACE (Pacific Advanced Civil Engineering, Inc.) is a specialized civil engineering firm formed in 1987 offering advanced water resource services worldwide. With 30 years of experience, we offer a wide range of engineering services related to water, wastewater, stormwater management and water resource permitting and regulatory compliance to ensure projects are both economically viable and environmentally sustainable. Our engineering approach focuses on maximizing value by creating multi-use infrastructure systems, cost-effective phasing strategies and systems that include environmental, aesthetic and recreation uses. PACE staff members include licensed professional engineers with PhDs, university instructors and policy-makers in the water resource arena.

## *lake forest swim lagoon*

LAKE FOREST, CA



**As a water resource sepciality-engineering firm, PACE's specialized areas of expertise include:**

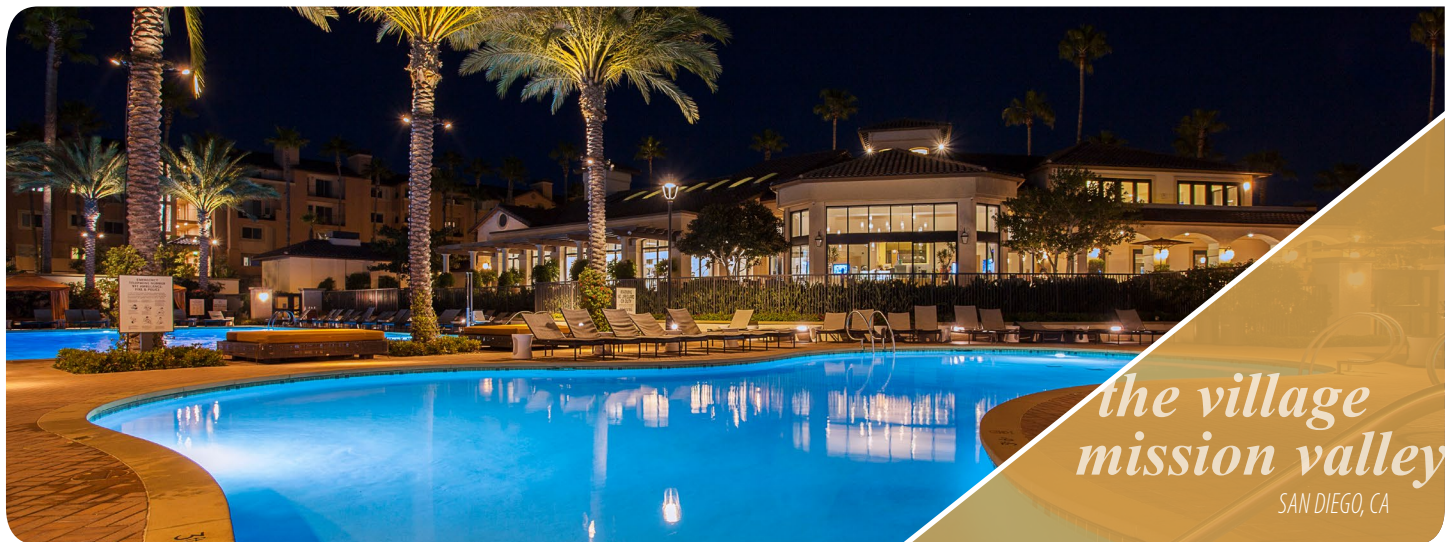
- ◆ Lake Systems / Water Features / Pools
- ◆ Lake / River / Wetland Restoration
- ◆ Water Quality Management
- ◆ Water and Wastewater Treatment
- ◆ Potable Water Storage and Distribution
- ◆ Reclaimed Water Storage and Distribution
- ◆ Stormwater Management
- ◆ River Engineering
- ◆ Floodplain Mapping
- ◆ Watershed Analysis / Planning
- ◆ GIS Water Resource Applications

# *aquatic facilities* DESIGN QUALIFICATIONS

The PACE team brings very specialized expertise and extensive experience on **swimming pool, spa pool, wading pool, and spray ground** that enables us to address the project objectives with comprehensive understanding of the cause and effect relationships of the activities that take place over time. The team is comprised of pool experts and water resource civil engineers.

The PACE team brings **extensive pool design**, which include the following areas:

- ◆ Swim Lagoons
- ◆ Lazy River
- ◆ Alternate Edge Conditions (Knife edge, Firm Flow, Skimmer, Gutter)
- ◆ Pool Structure (On Podium, Rooftop, On Grade)
- ◆ Utility Coordination (Power, Water, Sewer, Gas, Hot Water Loop)
- ◆ Finish Materials
- ◆ Signage Coordination
- ◆ Code Review
- ◆ Equipment Layout (Space Requirements, Pipeline Coordination)
- ◆ Water Treatment (UV, Salt Water Systems, PH Control, CO<sub>2</sub> Systems, Disinfection Systems)
- ◆ Controls
- ◆ Water play areas
- ◆ Pools and spas
- ◆ Fountains (interactive and ornamental)
- ◆ Water rides
- ◆ Manmade lakes
- ◆ Manmade streams
- ◆ Entry water features



**As part of the aquatic facility design, we apply innovation and creativity to address:**

- ◆ Concept
- ◆ Layout
- ◆ Water Chemistry Control
- ◆ Water Treatment Systems
- ◆ Filtration / Recirculation System
- ◆ Structure, Finish, Fittings, Cover and Accessories
- ◆ Health and Safety Considerations
- ◆ Hazardous Material (treatment chemicals) Storage Application

PACE is experienced in water feature design for parks/public space, residential developments, golf courses, resorts and commercial projects. Specific water feature engineering services include:

- ◆ Water feature layout and concept development
- ◆ Interactive feature instrumentation and controls
- ◆ Pump stations
- ◆ Water disinfection systems
- ◆ Water chemistry control
- ◆ Recirculation systems
- ◆ Water feature 3D modeling and animation
- ◆ Integrated stormwater management systems
- ◆ Water quality management systems
- ◆ Water feature forensics and expert witness consulting
- ◆ Water Feature assessments and consulting



# *unique qualifications*

PACE has substantial aquatic design experience and capabilities:

- ◆ With over 33 years of design, construction and operations experience in both design/bid and design/build settings PACE is extremely competent in minimizing construction costs while maintaining a high level of product quality.
- ◆ Expertise and current experience in design of large swim lagoon facilities.
- ◆ Design/build background has allowed PACE to deliver complete, quality projects, well within our Client's identified budgets which are intuitively easy to operate and maintain.
- ◆ Firm comprised of civil engineers who specialize in water resources provides a highly specialized expertise in wider applications of water quality and mechanical equipment (pumping, instrumentation/controls) that will be applied to the pools for the most efficient design solutions.
- ◆ Ability to provide innovative and sustainable design to meet USGBC LEED Standards.
- ◆ Advanced knowledge with various disinfection technologies for pool facilities to enhance the swim experience.

## *desert color swim lagoon*

ST. GEORGE, UT





# *energy* *efficiency approaches* INCLUDE THE FOLLOWING:

The PACE team is comprised of civil engineers who specialize in both recreational and municipal applications of water infrastructure and therefore have a vast understanding of pumps, energy demands, control systems and water quality needs. We apply this knowledge to develop smarter systems that minimize energy use and produce a smaller carbon footprint compared to traditional systems. We apply several methods to lower power use, gas use, operational costs and maintenance costs, including:

- ◆ **COGENERATION** 30 years of design, construction, and operations experience in design/bid/build and design/build settings. PACE Cogeneration for power and heating needs through the use of natural gas. These systems significantly reduce “on-grid” power demands, can be programmed for use at peak electricity demand times and reside on a very small footprint.
- ◆ **PRECISE PUMP SIZING** rather than “rule-of-thumb” approaches typically employed that result in excess energy use and costs.
- ◆ **INTELLIGENT PUMP CONTROLS** allowing for varied flow of pumps to minimize operating time and flow rates producing up to 40% energy savings over traditional systems.
- ◆ **INDIRECT OUTBOARD HEAT EXCHANGERS (IOHE)** which utilize a boiler and a heat exchanger to heat water and have higher efficiencies, are less costly to operate and maintain, and eliminate costly ventilation systems for combustion and heating.

## *hilton waikoloa* *village swim* *lagoon*

WAIKOLOA, HI





# SELECT *aquatic facilities* EXPERIENCE

PROJECT NAME	PROJECT LOCATION	DESIGN COMPONENTS
Lake Forest Swim Lagoon	Lake Forest, CA	0.5-acre swim lagoon with sand entry
Desert color Swim lagoon Water Quality Project	St. George, UT	2.4-acre swim lagoon with 3 sand beach entries
Perris Valley Aquatic Center Design Peer Review	Perris, CA	12-acre aquatic center with pools, water slides and lazy river
Hilton Waikoloa Village Swim Lagoon Boatway, and Pools	Waikoloa, HI	Natural ocean swim lagoon, saltwater boatway, 3 swimming pools, spas
Westin Maui Aquatic Facilities	Ka'anapali Beach, Maui, HI	25,000 SF meandering pool and underwater grotto, koi ponds, swan and flamingo features, 6 waterfalls, 2 waterslides
Sheraton Wild Horse Pass Resort Aquatic Facilities	Chandler, AZ	Main resort pool, waterslide, sports pool, wading pool, resort day spas, 1.5 mile Gila River replica
Terranea Resort Aquatic Facilities	Rancho Palos Verdes, CA	Pools, waterslide, 2 hot tubs, 2 cold plunge pools, interactive waterplay area, golf course lakes
Westin Mission Hills Resort Aquatic Facilities	Rancho Mirage, CA	Lagoon pool, 2 spas, waterfall, waterslide
Pelican Hill Resort Hotel & Villa Clubhouse Aquatic Facilities	Newport Coast, CA	Saltwater resort pool, activity pool, rim flow pool, wading pool, saltwater spa, and indoor spa
The Pointe Hilton at Squaw Peak Aquatic Facilities	Phoenix, AZ	Pool with freeform water falls, sport pool, spa, wading pool, waterslide and wading pool, lazy river
San Diego Marriott Aquatic Facilities Renovation	San Diego, CA	3,400 SF pool, 1,600 SF slide pool, 175 SF spa, 95 SF spa, two water walls, water play area, and water feature
Westin Denver International Airport Pool & Spa	Denver, CO	Pool and spa on 11th floor of Westin Denver International Airport Hotel
Limelight Hotel Pools	Ketchum, ID	Pool and hot tubs
Crystal Cove Community Pools	Newport Coast, CA	Lap pool, wading pool, hot tub, entry fountain
Irvine Company Spectrum Park Aquatic Facilities	Irvine, CA	3000 SF hour glass shaped pool, 2,700 SF oval shaped pool, 4,900 SF rectangular shaped pool and 5 spas and one wading pool
Grand Residence Marriott Aquatic Facilities	Keystone, CO	Saltwater pool with spray jets, spa with waterfalls and automatic covers
Westin Riverfront Aquatic Facilities	Avon, CO	Saltwater lap pool, 3 spas with infinity edges
Westin Monache Pool & Spa	Chandler, AZ	Pool and 2 hot tubs
Bluewater Casino & Resort Aquatic Facilities	Parker, AZ	Pool, waterslide and hot tub
The Village at Mammoth Lakes	Mammoth Lakes, CA	Pool, 2 hot tubs
Tamarack Resort Aquatic Facilities	Tamarack, ID	Pool with waterfall, 2 spas, 1 wading pool with beach entry and shooting jets, waterfall and stream feature
Village North Condominium Hyatt Resort Pool & Spa	Lake Tahoe, CA	Pool, 250 SF hot tub, 2 smaller hot tubs
City North Pools & Water Features	Phoenix, AZ	Pool and spa above parking garage, 2 fountains
Westin at Snowmass Village Pools & Water Features	Snowmass, CO	2 streams, 1 pool, 2 spas
South Hotel at Mammoth Lakes Pools & Water Features	South Hotel at Mammoth Lakes	1 rim flow saltwater pool, 3 spas, 2 waterfalls
Northstar Highlands Ritz Carlton Club Aquatic Facilities	Truckee, CA	Pool with zero edge entry, 2 spas, 1 wading pool, 2 indoor spas, lap pool





## Andy Komor, MS, PE

PRINCIPAL / WATER QUALITY

Andy Komor is a technical expert on engineering infrastructure having successfully performed engineering design, project management, and field services for over \$200 million in capital on over 40 completed water resource projects in the past ten years. His background as a researcher has led to four national presentations and technical papers. Mr. Komor is sought after as a technical expert for lake improvement projects including lake and reservoir water quality enhancements and new technology research and development, as well as water infrastructure, ocean and brackish water desalination, and groundwater recharge. His lake expertise extends into all aspects of lake projects including water quality monitoring and testing, wetlands design and functionality, recirculation and aeration design, and biological analysis of lake ecosystems. He has an excellent breadth and depth of experience in lake improvement and upgrade projects.

### EDUCATION

BS Civil Engineering,  
University of Minnesota, 1999

MS Civil and Environmental Engineering,  
Arizona State University, 2001

### YEARS OF EXPERIENCE

21 Years  
Joined PACE in 2000

### REGISTRATIONS

Professional Engineer – CA, AZ, LA

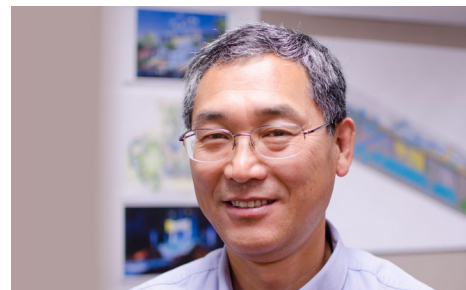
### Select Relevant Experience

- ◆ Desert Color Swim Lagoon Water Quality - St. George, UT
- ◆ Westlake Lake Renovation – Westlake Village, CA
- ◆ Lake Elsinore Water Quality Restoration – Riverside County, CA
- ◆ Harmony Lake Drinking Water Reservoir Design – Calgary, Alberta, Canada
- ◆ Talbert Lake Restoration Project – Huntington Beach, CA
- ◆ Castac Lake Water Quality Improvements – Tejon Ranch, CA

## Zirang Song, MS, PE

PROJECT MANAGER, VICE PRESIDENT, RECREATIONAL WATER DIVISION

Zirang Song has civil design/engineering experience spanning back to 1990. From concept to final design and specifications, his areas of expertise include all areas of water infrastructure including swimming pool filtration system design, lake system design, water storage, water feature/fountain design, pump station design, water conveyance, and construction management. He has specific water feature expertise in concept design, site grading, mechanical engineering design of aquatic facilities, electronic controls, telemetry, advanced disinfection systems and hydraulics. Other responsibilities include construction support and coordination.



### EDUCATION

MS International Construction Management,  
Nanyang Technological University, Singapore, 2000

BS Mechanical Engineering, Harbin Institute of  
Technology China, 1983

### YEARS OF EXPERIENCE

31 Years  
Joined PACE in 2000

### REGISTRATIONS

Professional Engineer – CA 2005 / 69315

### Select Relevant Experience

- ◆ Lake Forest Swim Lagoon – Lake Forest, CA
- ◆ Disneyland Hotel Pool Renovation – Anaheim, CA
- ◆ Sheraton Wild Horse Pass River Re-creation, Pools, Spas and Waterslide – Chandler, AZ
- ◆ Terranea Resort Pools, Spas and Water Features – Rancho Palos Verdes, CA
- ◆ Pelican Hill Recreation Center Pools and Spas – Newport Coast, CA
- ◆ City of Santa Ana Memorial Pool Renovation – Santa Ana, CA
- ◆ The Villages at Rancho El Dorado Lakes – Maricopa, AZ
- ◆ SilverRock Ranch Resort – La Quinta, CA





## Mark Krebs, PE

PRINCIPAL / QA/QC

Mark Krebs has engineering and construction experience with both public and private sector projects spanning back to 1988. He has been active in the planning, designing and construction quality control of dozens of water resource projects ranging from water features including manmade lakes, pools, fountains, and entry features, to water and wastewater systems and large-scale stormwater management / river flood protection.

### EDUCATION

BS Civil Engineering, Structures and Hydraulics,  
University of Kentucky, 1988

### YEARS OF EXPERIENCE

33 Years  
Joined PACE in 1989

### REGISTRATIONS

Professional Engineer – AZ, CA, CO, KY, NV, NM, UT

### Select Relevant Experience

- Lake Forest Swim Lagoon – Lake Forest, CA
- Point Hilton at Squaw Peak Aquatic Facilities – Phoenix, AZ
- Disneyland Hotel Courtyard Aquatic Facility & Water Play Area Renovation – Anaheim, CA
- Long Beach Aquarium of the Pacific Wave Fountain Rehabilitation – Long Beach, CA
- Santa Ana Memorial Pool Renovation – Santa Ana, CA
- San Diego Marriott Hotel Recreation Center Renovation – San Diego, CA
- SilverRock Ranch Resort – La Quinta, CA
- The Reserve Flood Control and Integrated Lake – Plan Desert, CA
- Golden Sand Lake – Hangzhou, China
- Arrowhead Ranch Lakes – Glendale, AZ

## Johan Perslow, PE

PRINCIPAL / SR. CONSULTING ENGINEER

Johan Perslow is a leading engineer in the water resources industry, businessman, and inventor. In 40 years Mr. Perslow has started up and established three successful water resource companies – PACE, PERC, and Pacific Aquascape. Clients look to PACE and Mr. Perslow to develop and implement concepts which are extremely creative and valuable, and they have a reputation in the market for delivering superior solutions to complex challenges. Mr. Perslow has been the principal designer, consultant, and construction manager for more than 800 state-of-the-art water-resource projects including wildly creative and appealing recreational water systems, recycled water systems, natural-based stormwater management and flood control systems, lake and pumping systems, irrigation-optimization systems, and tertiary water reclamation facilities. He has also been involved with the structural design of numerous interstate highway bridges and other complex structures such as a replacement design proposal for the World Trade Center in New York City. As PACE's Senior Consultant, Principal, and Founder, Mr. Perslow has been at the cutting edge of developing and applying new technology to solve unique water resource challenges.



### EDUCATION

Mathematics / Realgymnasium Junior College,  
Sweden, 1963

BS Civil Engineering/ Technical College of Orebro,  
Sweden, 1966

Graduate Studies in Economics & Marketing/  
University of Kentucky Louisville, 1968/69

Diploma in Advanced Concrete Construction/  
University of Technology, Stockholm, Sweden, 1970

BS Civil Engineering California State University,  
Long Beach, 1995

### YEARS OF EXPERIENCE

40+ Years Created PACE in 1984  
Created Pacific Aquascape in 1974  
Created PERCWater in 1998

### REGISTRATIONS

Professional Engineer – AZ, CA, CO, NV

### Select Relevant Experience

- The Pointe Hilton at Squaw Peak – Phoenix, AZ
- Sheraton Wild Horse Pass Resort – Phoenix, AZ
- Infinity Wave Pool Technology Development – Worldwide
- Waveyard Surf Wave Pool Technology Development – Worldwide
- Confederation Park Wild Waterworks Action River – Ontario, Canada
- San Alfonso Del Mar Resort Crystal Lagoon Consultation – Algarrobo, Chile
- Westin Maui Resort Pools – Ka'anapali, HI
- Hilton Waikoloa Lagoon and Pools – Waikoloa, HI
- JW Marriott Desert Springs Resort Pools – Palm Desert, CA



# DESERT COLOR SWIM LAGOON WATER QUALITY PROJECT

ST. GEORGE, UTAH



## PROJECT SCOPE

Desert Color is a new sustainable master-planned community in St. George, UT developed by Desert Color partnership team. The Desert Color community includes a 2.4-acre and 4-million-gallon man-made lagoon surrounded by residential and short-term rental units where residents and rental guests can enjoy the open waters of the lagoon night and day. PACE was the engineer-of-record for the man-made lagoon system. The programming of the lagoon includes 3 sand beach entries and shallow chaise lounges that surround an open body of turquoise blue water that is designed for recreational water activities year-round. Construction of the lagoon included seamed panels of RPE textured white liner that lines the entire footprint of the lagoon floor and precast concrete walls. The body of water is treated through a recirculation system of commercial pool sand filters, an onsite ozone generation

system, and a chlorine/acid feed injection system. The body of water has a 10-hour turnover rate at the deeper bodies of water and a 4-hour turnover rate at the shallower high-traffic beach entries. Underwater pool LED lights were installed in the lagoon walls and designed to illuminate different holiday and party-mode themes of the year.

### Advanced Elements:

- 2.4-Acre and 4-million-gallon man-made lagoon
- Three sand beach entries
- Includes textured white liner and precast concrete walls
- Sand filter treatment
- Onsite ozone generation system
- Chlorine/acid feed injection system
- Underwater pool led lights



# DESERT COLOR SWIM LAGOON WATER QUALITY PROJECT

ST. GEORGE, UTAH

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# LAKE FOREST SWIM LAGOON

LAKE FOREST, CALIFORNIA



## PROJECT SCOPE

PACE was contracted to perform the conceptual design, design development plans and construction documents to renovate the swim lagoon for the Lake Forest Community Association. The existing swim lagoon has severe water quality issues and was closed by the Orange County Health Care Agency due to issues related to clarity. PACE's design for the new 400,000 gallon, 20,000 square foot swim lagoon provides sand beach areas simulating a natural swimming environment. The pool water quality is significantly improved by the new design and has been commended by the Orange County Health Agency.

The design is maintenance-friendly and required innovative design to work with existing conditions. Also, the design of the beach shoreline prevents algae growth in the sand media by allowing disinfected water to be circulated through the sand. This design is part of a guaranteed maximum price contract with a contractor where PACE remains the engineer-of-record from concept through construction. PACE is also contracted to provide construction administration, as-built plans and an operations and maintenance manual.



# LAKE FOREST SWIM LAGOON

LAKE FOREST, CALIFORNIA

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# LAKE FOREST SWIM LAGOON

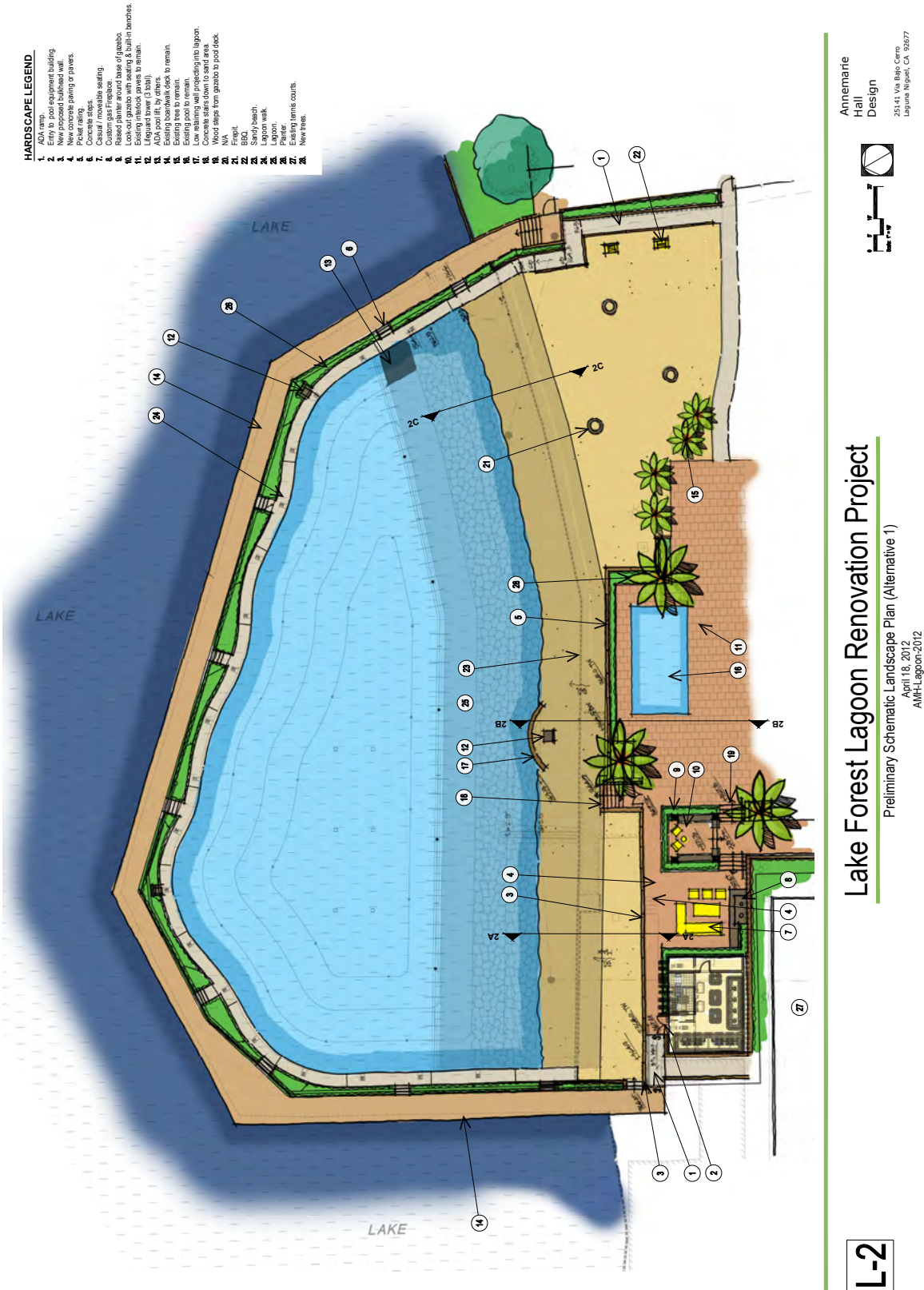
LAKE FOREST, CALIFORNIA





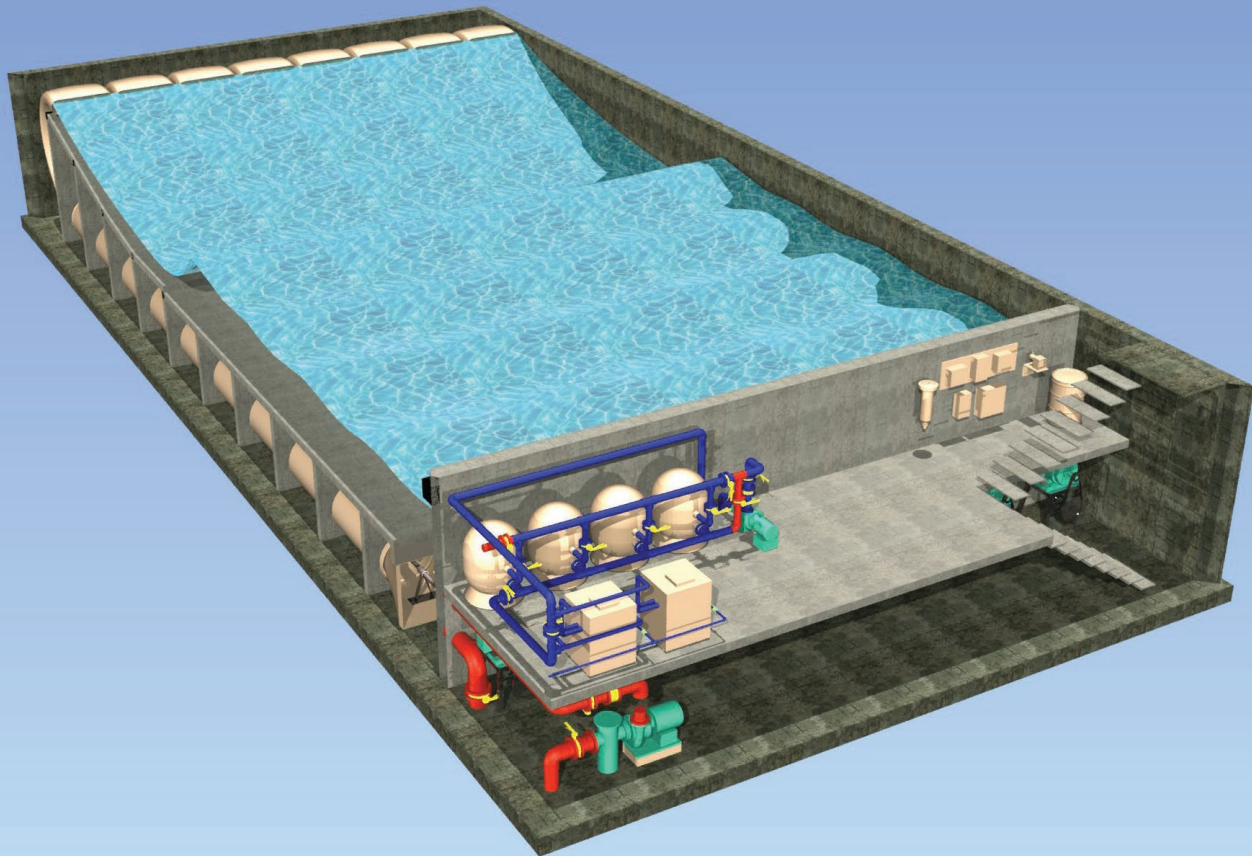
# LAKE FOREST SWIM LAGOON

LAKE FOREST, CALIFORNIA





# INFINITY WAVE POOL



## PROJECT SCOPE

PACE developed the Infinity Wave Pool to reproduce nature's standing wave and perfect it by making it bigger and faster. A standing wave, also known as a stationary wave, is a wave whose amplitude oscillates with time but has a stationary wave profile. An example of this phenomenon in nature is a hydraulic jump. This can be observed in rivers where large volumes of water pass over an obstruction. Surfers and kayakers often ride these waves producing a similar experience as riding a progressive wave or breaking wave. The Infinity Wave Pool by PACE contends to produce the largest standing wave ever created. The pool has a small footprint of 40 feet wide by 80 feet long. A series of propellers driven by electric motors push

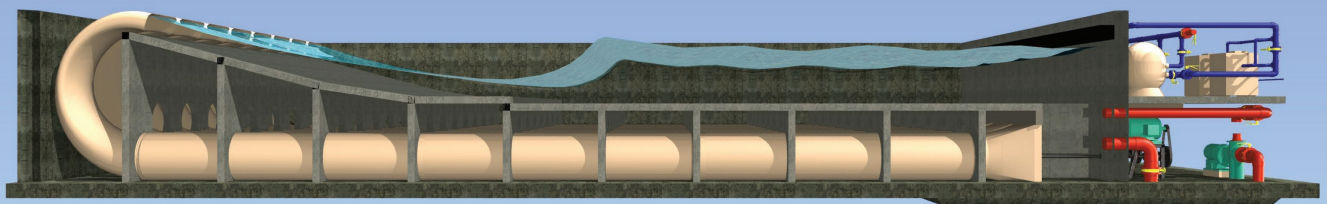
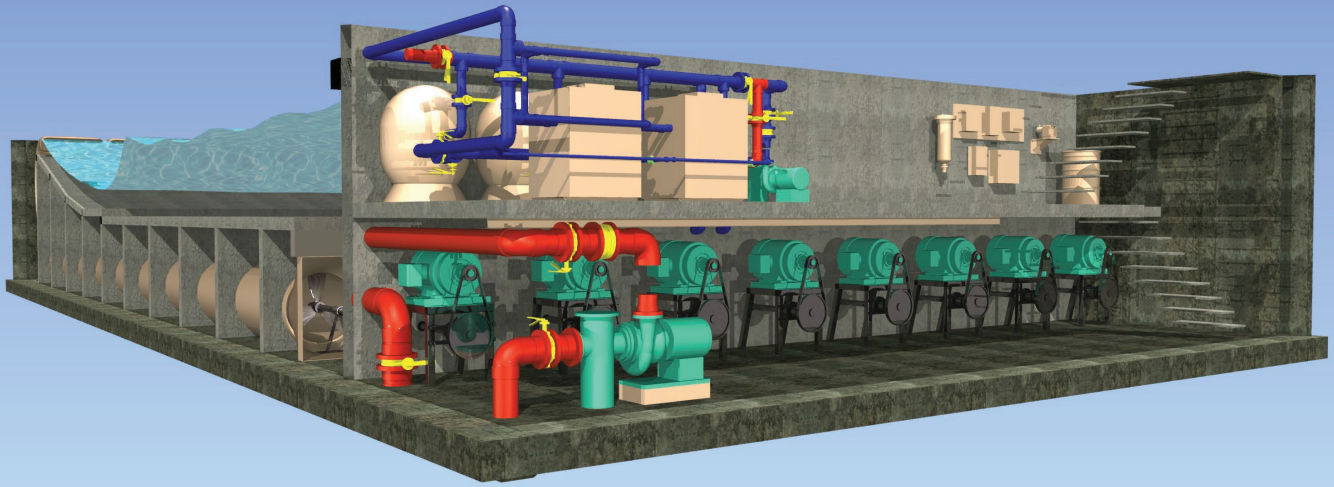
water through large underground pipes that deliver the water through custom nozzles at high velocity into the pool. The high-velocity water hits a hydraulic fin at the center of the pool, which slows down the flow and produces the hydraulic jump.

### Advanced Elements:

- Standing wave pool
- 40-feet wide by 80-feet long pool
- Propellers driven by electric motors push water through underground pipes
- High-velocity water hits the hydraulic fin to produce a hydraulic jump

# INFINITY WAVE POOL

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# HILTON WAIKOLOA VILLAGE SWIM LAGOON, POOLS & WATER FEATURES

WAIKOLOA, HAWAII



## PROJECT SCOPE

PACE provided design services as part of a design/build team led by Pacific Aquascape for the resort's pools, spas, and water features. The project includes a natural ocean swimming lagoon with natural sand beaches, a saltwater boatway with a

structured ecosystem and three swimming pools. The largest swimming pool has an area of 25,000 square feet. Other water features include several spas and saltwater waterfalls flowing into the ocean.



# HILTON WAIKOLOA VILLAGE SWIM LAGOON, POOLS & WATER FEATURES

WAIKOLOA, HAWAII

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# POINTE HILTON AT SQUAW PEAK

PHOENIX, ARIZONA



## PROJECT SCOPE

In an effort to distinguish themselves from the rest of the resort field, the Pointe Hilton at Squaw Peak took the initiative in being the first Phoenix area resort to incorporate the water playground element into their appeal to customers. An allure to visitors young and old, the water park boasts swimming pools, waterfalls, a lazy river for tubers, a spa, "tad pool", and a water slide.

PACE was responsible for all water feature designs incorporating the natural rock formation which has been the centerpiece for the area since the resort opened in 1977. These

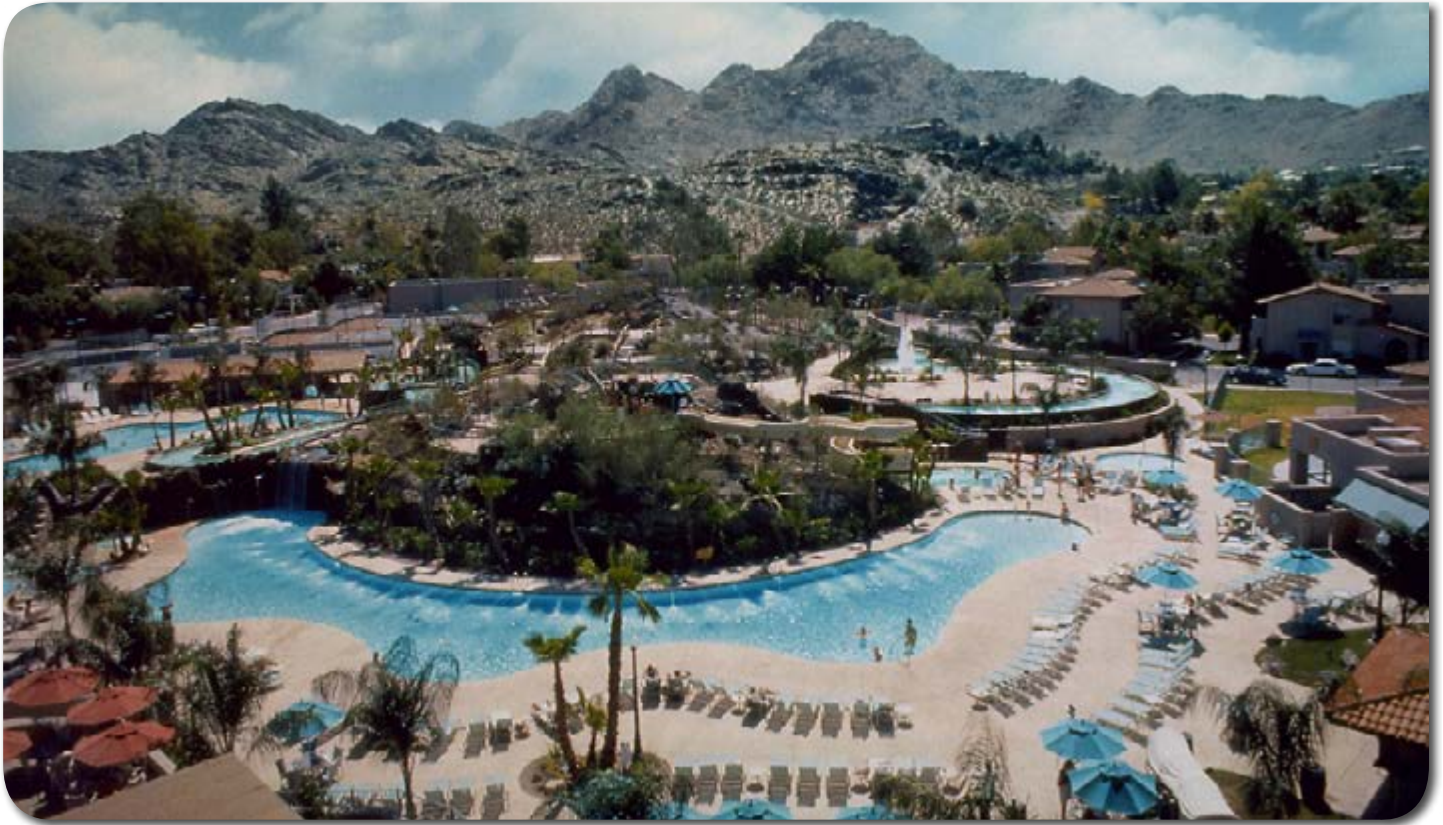
designs consisted of a 5,000 square foot free form swimming pool with free falling waterfalls crashing into it. A 2,000 square foot sport pool capable of having 2 water volleyball courts and also water basketball courts. A 90 square foot spa. A 250 square foot wading pool for the younger children. A 135 linear foot water slide dropping 18 vertical feet into a 300 square foot pool at the bottom. And the main attraction is the quarter mile long lazy river, "Rio Rico" ride which goes around the natural rock formation. All of PACE's designs were constructed by Pacific Aquascape, PACE's strategic partner.



# POINTE HILTON AT SQUAW PEAK

PHOENIX, ARIZONA

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# POINTE HILTON AT SQUAW PEAK

PHOENIX, ARIZONA

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# POINTE HILTON AT SQUAW PEAK

PHOENIX, ARIZONA

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# THE WESTIN MAUI

KA'ANAPALI BEACH, MAUI - HAWAII



## PROJECT SCOPE

Artistic conceptualization/engineering/design/construction for a \$4-million fast-track design/build project.

Rated as one of the world's top resorts, this Westin features one of the world's largest swimming pools, a 25,000-square-foot meandering pool and underwater grotto, as well as a 70,000-square-foot multilevel aquatic exhibit complex with two large koi ponds, swan and flamingo environments, a

recirculation and pumping system that provides 30,000 gpm to six waterfalls (the largest has an 18-foot drop and a 10,000-gpm flow) and two water slides. Purification systems utilize state-of-the-art ozone disinfection in the aquatic exhibit and chlorine disinfection in the pools. Extensive use of natural boulders and glass fiber-reinforced concrete rockwork maximizes the natural look of this manmade tropical paradise.



# THE WESTIN MAUI

KA'ANAPALI BEACH, MAUI - HAWAII

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## PROJECT SCOPE

PACE designed all the aquatic component design for the project including the hotel pools, interactive splash pad, Pacifica Club, Spa Club and golf course for this 5 star, high end ocean view resort project. The hotel pools consist of one 4,500 square foot freeform pool, one slide pool with a 120' x 20' slide, two 200 square foot spas, and one interactive waterplay fountain with 25 jets and color changing lights with a fogging effect. The Pacifica Club design includes a 16' x 60' two lane lap pool. The Spa Club has two hot tubs, two cold plunge pools and one 24' x 75' lap pool with three lanes for swimming. The golf course features two golf course irrigation / stormwater quality lakes totaling 1.5 acres.

PACE designed a 21' diameter circular interactive splash fountain, with 17 water nozzles and color changing LED light for each nozzle. The fountain nozzles and LED lights are controlled individually by sequenced programmable logic controllers. The

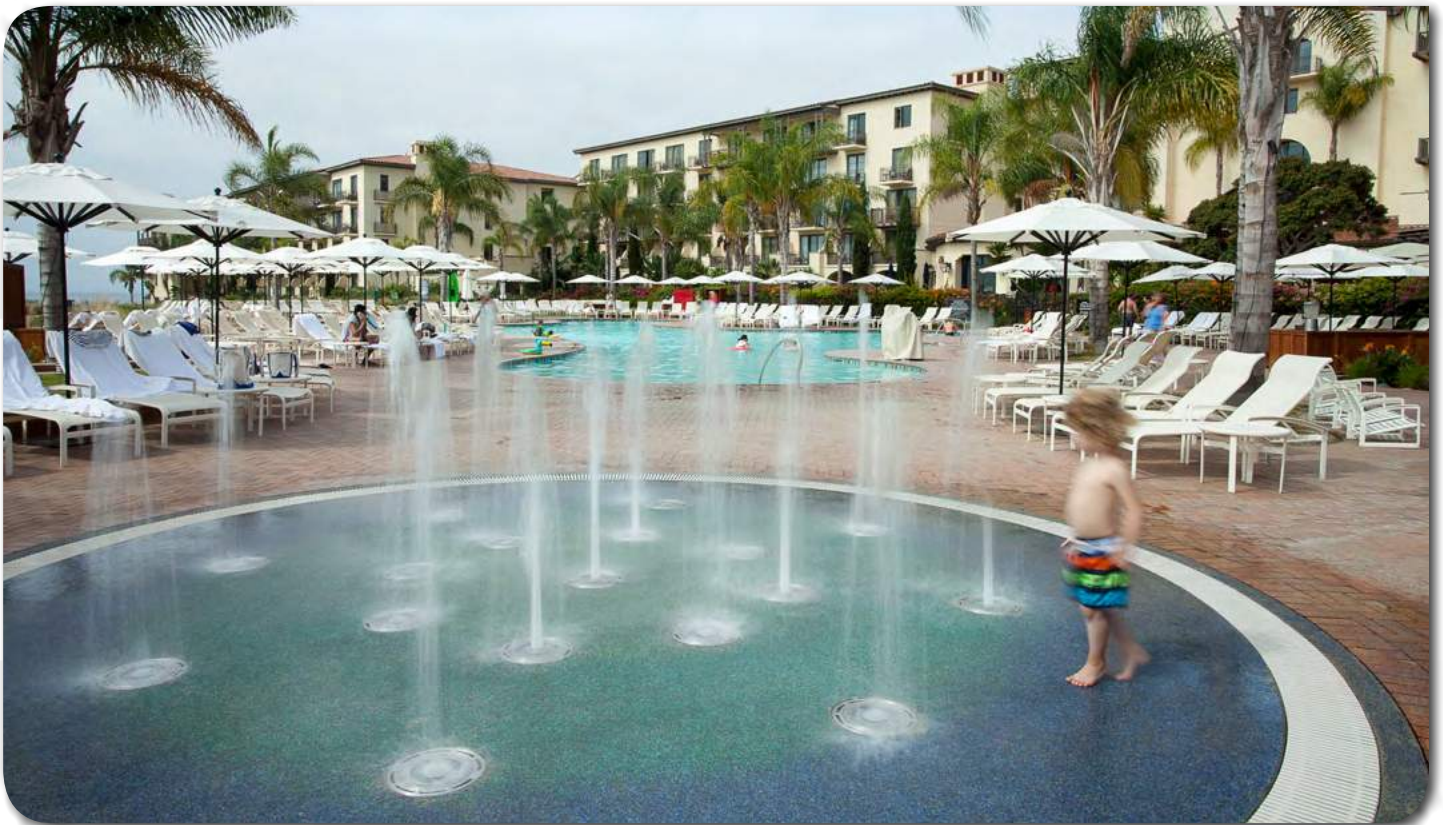
jet display height varies from zero to seven feet in height which was done through a variable frequency drive motor for the recirculation pumps. PACE also designed a surge tank which is required for proper water treatment for user safety. The tank was divided into two compartments, one that receive surface water from the fountain area and one that receives the filtered water from filtration system. This was done to accommodate the local Health Department requirements. The flow rate for each nozzle is 9 gpm and the velocity of water out of the nozzle is less than 20 feet per second for the safety of the users. The fountain equipment includes a 5 HP water jet pump coupled with additional cartridge filter to ensure water quality from the nozzles, one sand filter with a 1 horsepower filter pump, an automatic chlorine monitoring and dosing controller, chlorine feeder and pH adjustment system. All fountain equipment is installed together with other pool equipment in a main building.



# TERRANEA RESORT

RANCHO PALOS VERDES, CALIFORNIA

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# TERRANEA RESORT

RANCHO PALOS VERDES, CALIFORNIA

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# TERRANEA RESORT

RANCHO PALOS VERDES, CALIFORNIA

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# PELICAN HILL RESORT POOLS

NEWPORT COAST, CALIFORNIA



## PROJECT SCOPE

PACE provided civil, mechanical and electrical engineering design for the Villa Recreation Center and Inn area pools and spas at the Pelican Hills Development. PACE designed the pools, which were all skimmer pools with a typical pool coping edge, in the Villas Recreation Center and Inn Area. The Inn Area swimming pools have a surge tank (rim flow pool edge). Additionally, PACE performed an evaluation of disinfection systems alternatives, including saltwater treatment.

### VILLAS RECREATION CENTER:

- Swimming Pool (4,700 sq. ft.)
- Kids Pool (225 sq. ft.)
- Spa (100 sq. ft.)
- Mechanical Equipment Room below the pool deck

All above pools shall be skimmer pools with typical pool coping edge.

### INN AREA POOLS:

- 100-ft diameter rim flow swimming pool (7,854 sq. ft.)

- Kids Pool (800 sq.ft.)
- Spa #1 (80 sq.ft.)
- Spa #2 (100 sq. ft.)
- Mechanical Equipment Room (possibly below pool deck level).

The indoor spas at the inn area, which PACE was also contracted to design, includes:

- Men's Spa (120 sq. ft.)
- Women's Spa (120 sq. ft.)
- (2) Mechanical Equipment Rooms ( $\pm$  30 ft. from the spas located in the enclosed area)

### Advanced Features:

- The Coliseum pool is one of largest circular pools in the world, holding 380,000 gallons of water
- Salt water disinfection
- Rim flow
- Mechanical Equipment Room is below pool deck level



# PELICAN HILL RESORT POOLS

NEWPORT COAST, CALIFORNIA

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# PELICAN HILL RESORT POOLS

NEWPORT COAST, CALIFORNIA

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# PELICAN HILL RESORT POOLS

NEWPORT COAST, CALIFORNIA

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# DISNEYLAND HOTEL COURTYARD RENOVATIONS

ANAHEIM, CALIFORNIA



## PROJECT SCOPE

PACE provided engineering design for all the aquatic components of the Disneyland Hotel Courtyard Improvements project including the renovation of the Neverland Pool, design of the new North spa (200 sf), South spa (200 sf), Arroyo Pool (approximately 3500 sf), and the addition of a 4,000 square foot water play area called the Magical Springs Pool. The Magical Springs Pool has an 8' deep activity pool with water play components including geysers, pop jets, fountains, water pyrotechnics, four water slides and water slide structure including manmade rockwork that forms the base of the twenty four foot high water slide. The design involved in-depth

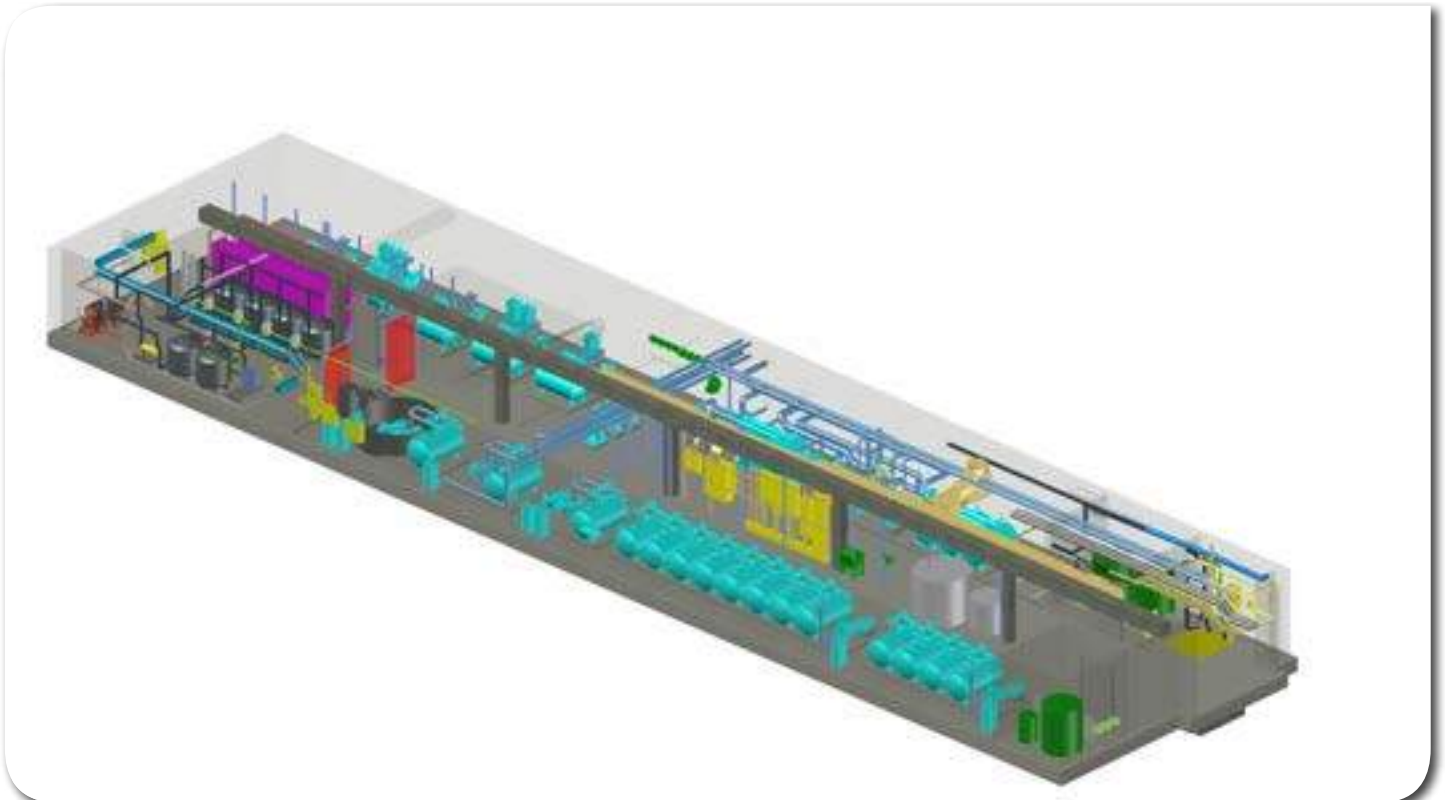
coordination with the project design team (architect, landscape architect, MEP, and structural) as well as the Disney project team including facilities, food and beverage, environmental, operations, and Walt Disney Imagineering. There were strict requirements for the operation of this new facility that went above and beyond that of current code requirements. Given extensive existing infrastructure at the hotel, the use of Civil 3D and BIM modeling supported the design process and difficult utility coordination that was needed by identifying and resolving potential conflicts with the renovation design components.



# DISNEYLAND HOTEL COURTYARD RENOVATIONS

ANAHEIM, CALIFORNIA

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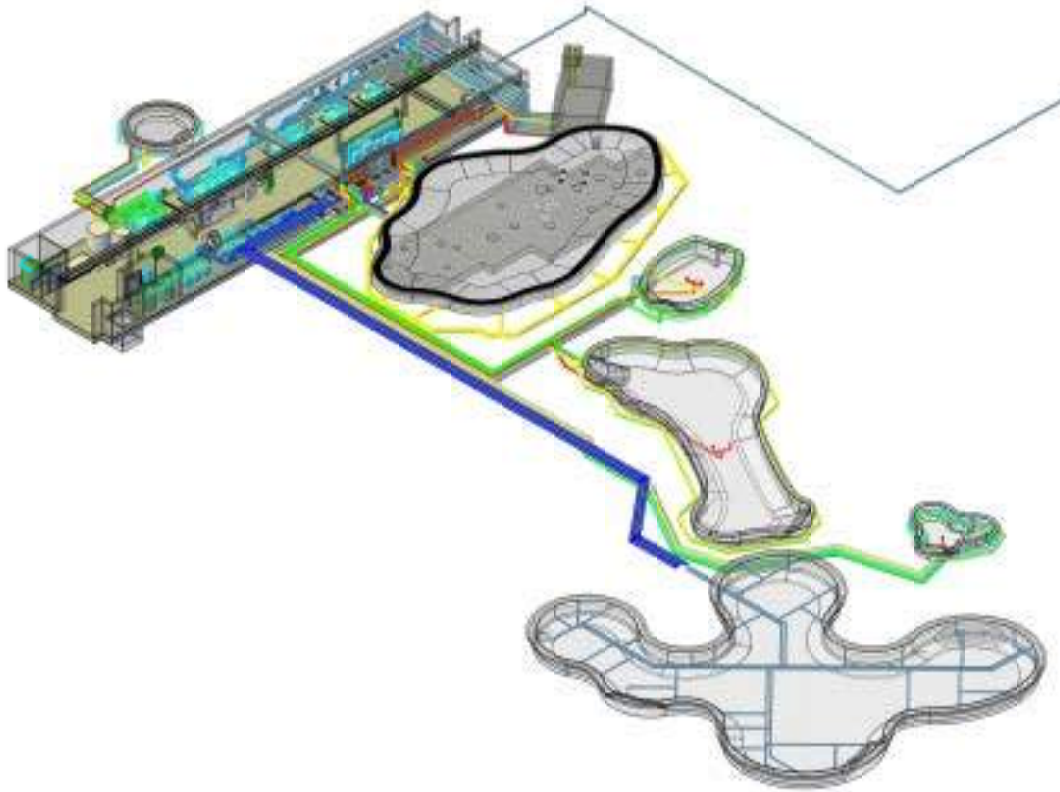


Equipment Room Civil 3D Layout



# DISNEYLAND HOTEL COURTYARD RENOVATIONS

ANAHEIM, CALIFORNIA



Piping and Pools Civil 3D Layout





# DISNEYLAND HOTEL COURTYARD RENOVATIONS

ANAHEIM, CALIFORNIA

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# SHERATON WILD HORSE PASS RESORT

CHANDLER, ARIZONA



## PROJECT SCOPE

This unique project incorporates landscaping that interweaves nature and innovative design with six separate pools that appear to seamlessly blend into the adjacent man-made 1.5 mile long river feature to pay homage to the roots of the Gila River Indian community. Situated along the west side of the resort is a 5,000 SF Main Pool with a faux sand sloped entry,

a 3,600 SF sports pool, a 15 foot high winding water slide, a splash pool, kiddy pool and two spas. PACE also designed a signature rock formation and waterfall, which spans three floors in the hotel's main bar area, and signifies the origination of the river re-creation.



# SHERATON WILD HORSE PASS RESORT

CHANDLER, ARIZONA

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# SHERATON WILD HORSE PASS RESORT

PHOENIX, ARIZONA



## PROJECT SCOPE

This unique resort features a monumental tribute to the history of the Gila River Indian Community with a 1.5-mile manmade river that meanders throughout the Sheraton Wild Horse Pass Resort. The river re-creation features rapids, shallow areas, rock outcroppings, and manmade rock formations scattered along the river's edge with wetland planters and sand bars, all creating the appearance of a

naturally flowing desert river that ends in a 3.5-acre lake at the rear of the 550-room resort. The river's origin is inside the main hotel building with a dramatic waterfall over a two-story high manmade rock structure, which falls into a stream and then, in appearance only, flows into the resort pool, which also has a river form.



# SHERATON WILD HORSE PASS RESORT

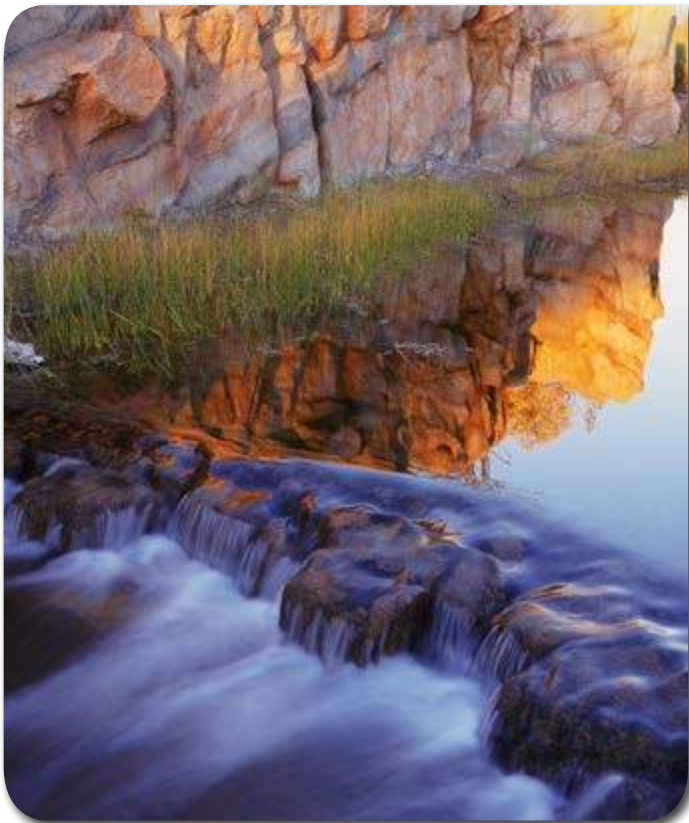
PHOENIX, ARIZONA





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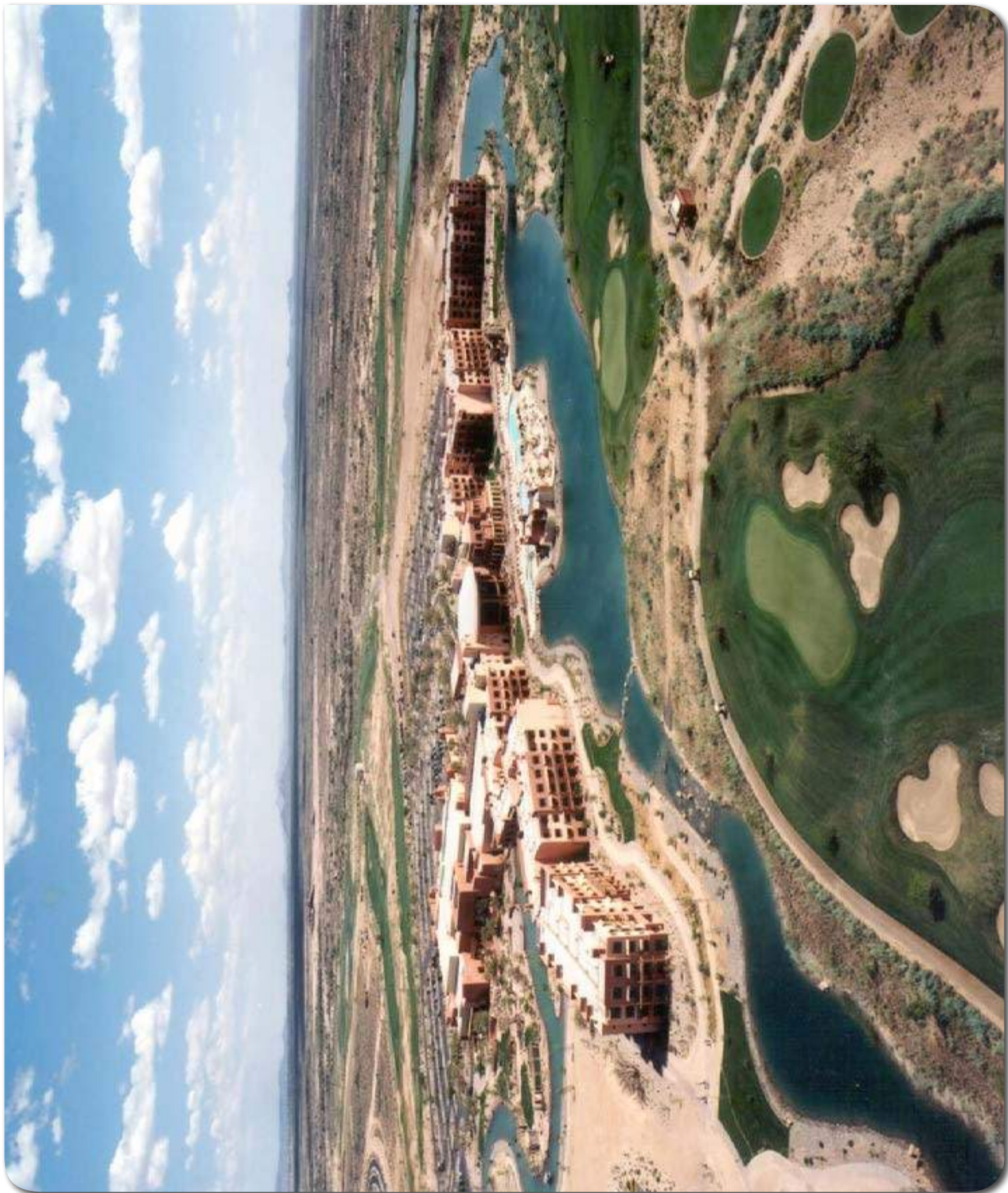
PHOENIX, ARIZONA





# SHERATON WILD HORSE PASS RESORT

PHOENIX, ARIZONA







## PROJECT SCOPE

PACE was contracted by Waveyard Development LLC to begin research, development and design on a project which will be the first outdoor super park adventure and resort destination. The Waveyard project will be located in Mesa, AZ, and features extreme sport venues for surfing and whitewater kayaking, as well as numerous other outdoor adventure experiences such as rafting, climbing, skateboarding, mountain biking, canoeing, volleyball, and boogie boarding.

The primary feature of the adventure park will be a surfing pool capable of generating world class waves ranging from 4' to 12' in height. PACE is tasked with designing the entire surfing pool as well as the pumping system and reservoir which will supply both the wave pool and the whitewater kayaking course. The pumping system will consist of several pumps with the ability to deliver a constant flow rate of approximately

1,700,000 gpm.

The design of the surfing pool has been underway for several months now. Research has been going on at PACE since June 2006, numerical modeling studies have been prepared by the University of Wisconsin, and the physical modeling process kicked off in October 2006. Information gained from research here at PACE and input from Dr. Qian Liao at the University of Wisconsin provided the technical basis for the Phase I physical modeling. The Phase I physical modeling process was recently completed at the end of December, 2006.

Phase I modeling focused on the size, shape, and configuration of the wave generating facility. This 4:1 scale model was 100' long, 8' wide and 8' in height and produced waves ranging from 1' to 3' corresponding to wave heights of 4' to 12' in the



full scale wave pool. Water was pumped from the pool into the WGF drop structure which was capable of holding up to 1800 gallons of water at a maximum depth of 10'. Once the tank was filled to the specified level, the gate at the bottom of the tank was opened and the surge of water generated waves ranging from 1' to 3' corresponding to wave heights of 4' to 12' in the full scale wave pool. Unfortunately nobody was able to surf in the Phase I physical model. Obstacles such as the 2x4's across the top of the tank, nails protruding from the walls and the sharp steel reef made it hazardous for surfing, swimming, or boogie boarding.

The primary objective of the Phase I physical modeling for the Wave Generating Facility (WGF) was to observe the relationships between design parameters and the wave height generated. Design parameters such as the geometric configuration of the drop structure, potential energy of the water in the drop structure, height of the release gate, and depth in the pool were measured and compared to the wave height generated for each test. By analyzing these relationships we can determine the optimum combination of parameters that will produce a world class 12' wave.

Phase 2 modeling focuses on the design of the entire wave pool system including the reef configuration, shoreline protection, secondary wave disturbance etc. This physical model was constructed at a site near Phoenix, AZ. The 8:1 scale model had a wave generator 20' wide and a pool length of 110' and produced a wave between 12" to 20" and is built to resemble the entire layout of the surfing pool. This system was designed with 10 separate wave chambers. The model controls were developed using a programmable controller to provide various wave shapes through sequencing the separate wave chambers. This control system allowed the operation of various wave patterns to determine the waves. This model enables us to analyze important design features such as the effects of reef configuration on the wave quality, the potential for undesirable wave action due to reflection and refraction, and wave energy dissipation along the shoreline of the wave pool. These critical factors will be used in determining the final design layout of the surfing wave pool.

The Waveyard Phase 3 model was a 10:1 scale model had a wave generator 5' wide and a pool length of 25' and will produce 9" to 12" waves. This system was designed with 12 separate wave chambers and utilizes air tanks and valves to produce the wave. The control system used in the Phase 3 model was an upgrade from Phase 2 to provide a more complete and simplistic approach to the production of the wave. The system controls used sensors to regulate and fire the wave. The system also provided the capability to produce various wave forms including a diamond shape and others.



Phase 1 Model



Phase 2 Model





Phase 3 Model

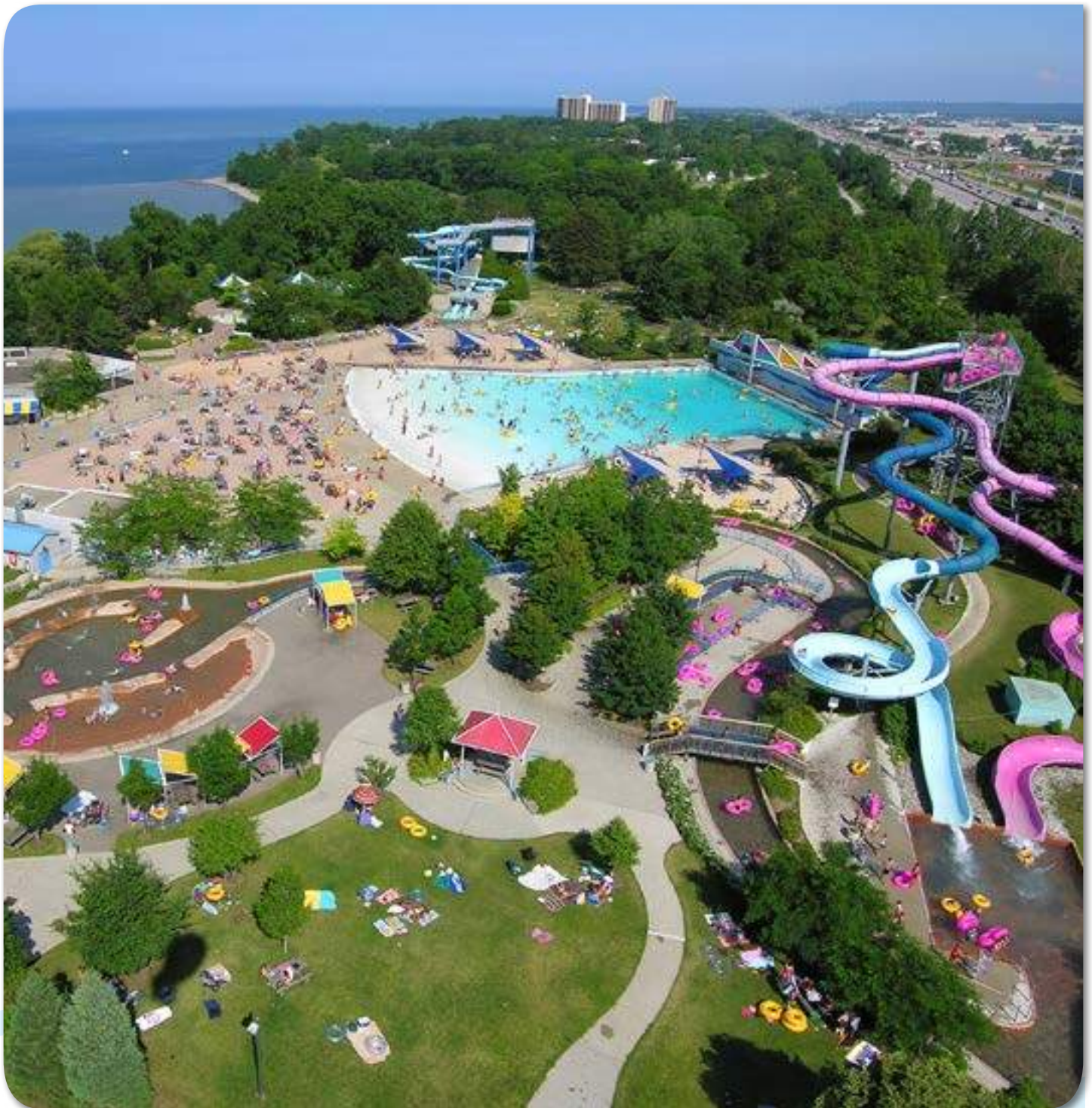






# CONFEDERATION PARK WILD WATERWORKS ACTION RIVER

ONTARIO, CANADA



## PROJECT SCOPE

Water Park with Lazy River: PACE was part of a design/build team for an action river with interactive fountains at a publically-owned and operated waterpark. The park includes (3) separate water play features showcasing fountain structures, geysers, and cannons, each provided with electric valves for

intermittent operation. The project also includes 2200 l.f. lazy river with positive carved and colored artificial rock shoreline, heating, gas chlorination and chemistry feed, automatic fill device, plumbing and backwash.



# CONFEDERATION PARK WILD WATERWORKS ACTION RIVER

ONTARIO, CANADA

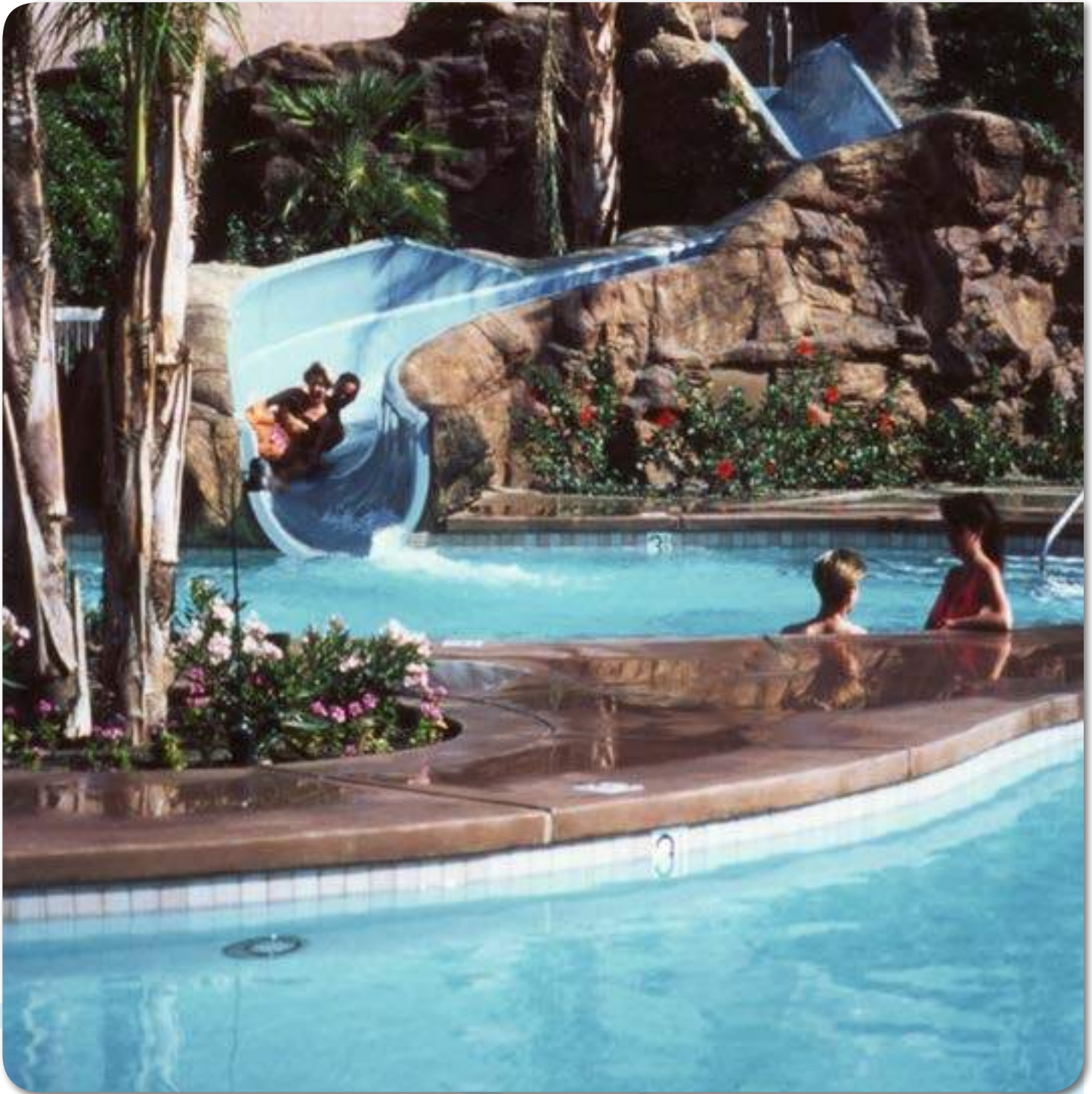
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# WESTIN MISSION HILLS RESORT WATER ATTRACTIONS

RANCHO MIRAGE, CA



## PROJECT SCOPE

PACE provided preliminary planning and engineering design services for this \$154 million 360 acre resort in Rancho Mirage. PACE's focal water feature, a 7,000 square foot lagoon-style Las Brisas pool, includes:

- two whirlpool spas

- a soothing waterfall
- a water slide with a thrilling 11-foot "S" curve
- underwater lighting
- a biofiltration system that provides high quality water with low maintenance



# WESTIN MISSION HILLS RESORT WATER ATTRACTIONS

RANCHO MIRAGE, CA

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# WESTIN MISSION HILLS RESORT WATER ATTRACTIONS

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# WESTIN MISSION HILLS RESORT WATER ATTRACTIONS

RANCHO MIRAGE, CA

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# DANCINGGREEN

TULA OBLAST, RUSSIA



## PROJECT SCOPE

The DancingGreen is a large resort development located about an hour's drive outside of Moscow, Russia, which will provide up to 4,000 visitors a day an adventure-themed vacation experience. The entire layout of the DancingGreen Resort is arranged to interweave the recreational infrastructure with the natural conditions of the site. In the park, wildlife and the manmade environment join together to ensure a comfortable coexistence of the world of man and the world of nature.

DancingGreen will include a large man-made lake, man-made trout streams, man-made kayak course, indoor water park, nature center, hotel and dachas, and a wide variety of activities organized around the theme of outdoor adventure. PACE provided site general civil engineering and water resources design services for the DancingGreen resort. Included in the design services:





## Lake Design:

- Layout, depth, grading
- Liner
- Shoreline
- Water Quality
- Mechanical Circulation
- Water Supply
- Islands
- Wetlands
- Streams and Waterfalls

## Water Park and Swim Lagoon:

- Site Layout
- Lagoon Capacity and Usage
- Mechanical Design

## Lake and Water Activities:

- Water Taxi
- Boating
- Fishing
- Fishing habitats
- Nature Tours
- Rope Tow
- Kids Fishing Ponds
- Fly Fishing Streams
- Kayak Course Design
- Trout Stream and Hatchery Planning
- Swim Beach (part of Water Park Anchor scope)
- Forest Streams

## Site Civil and Planning:

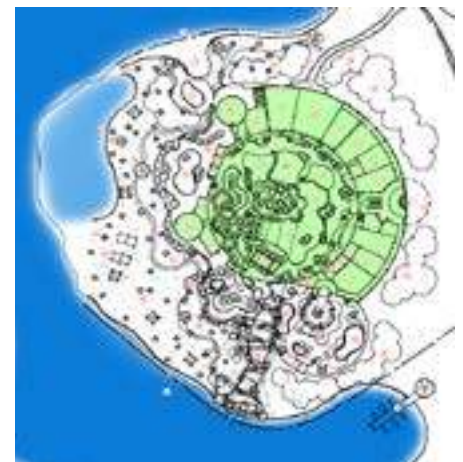
- Civil Site Layout of Master Plan
- Mass Grading Plan
- Rough Grading Plan
- Finish Grading Plan
- Earthwork Balance
- Road, Trail and Boat Circulation Plan
- Coordination of Russian Geotechnical Consultant
- Road Layout (Horizontal and Vertical)
- Coordination w/ Landscape Architect Regarding Irrigation
- Layout of Perimeter Fence

## Stormwater Management:

- On-site Drainage Master Plan
- Yamnitsa Brook Flood Plain Analysis and Drainage Plan
- Oka River Flood Protection
- Existing Easements (Oka, Forest, Yamnitsa)
- Bank Protection / Levee
- Evaluation of Watershed and Hydrology

## Water and Wastewater Infrastructure:

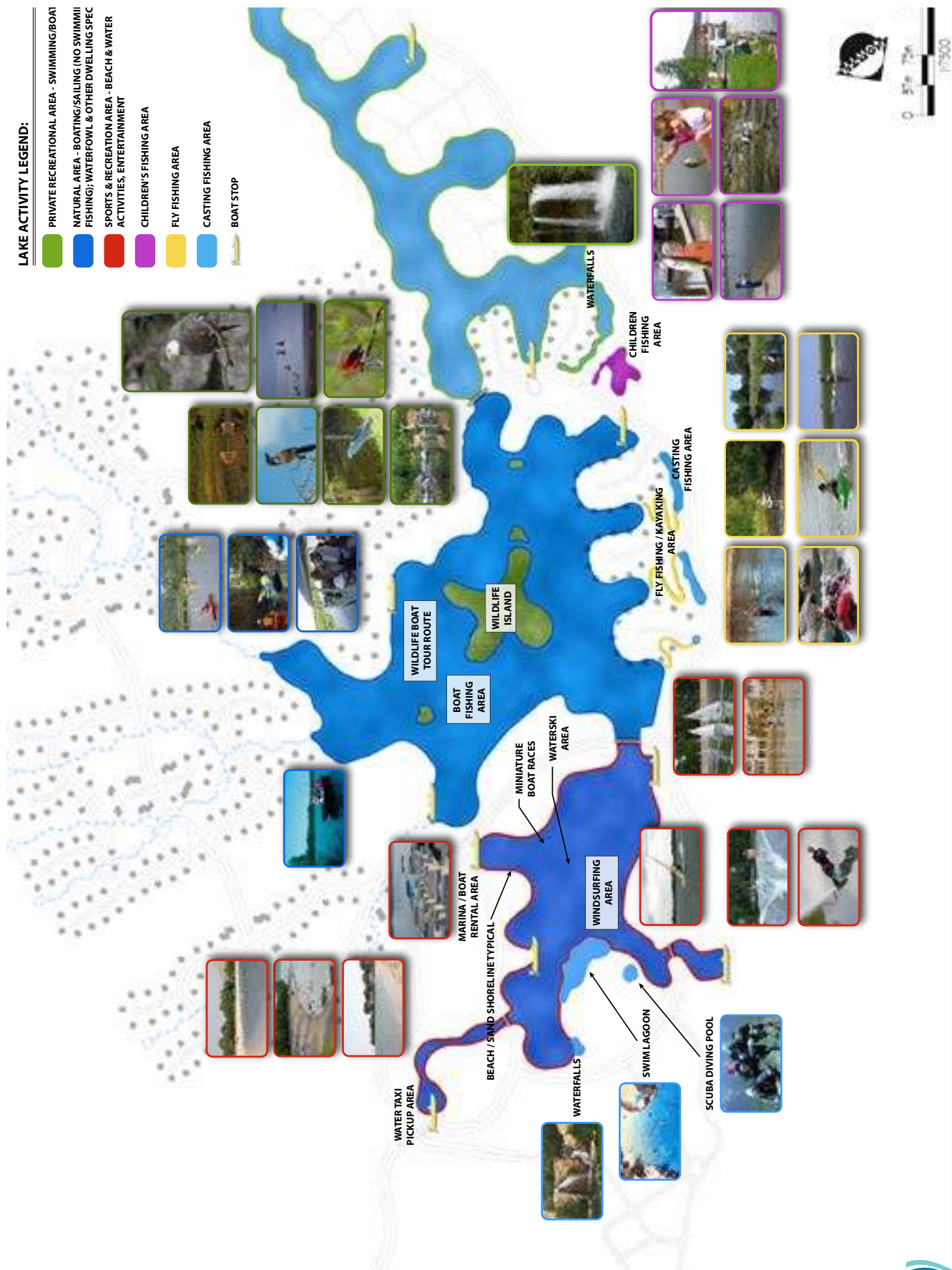
- Potable Water Supply and Treatment
- Potable Water Storage and Distribution
- Fire Suppression Storage, Distribution, Hydrants
- Wastewater Collection, Pumping
- Wastewater Treatment (Reclamation)
- Reclaimed Water Reuse and Discharge
- Site Utility Layout



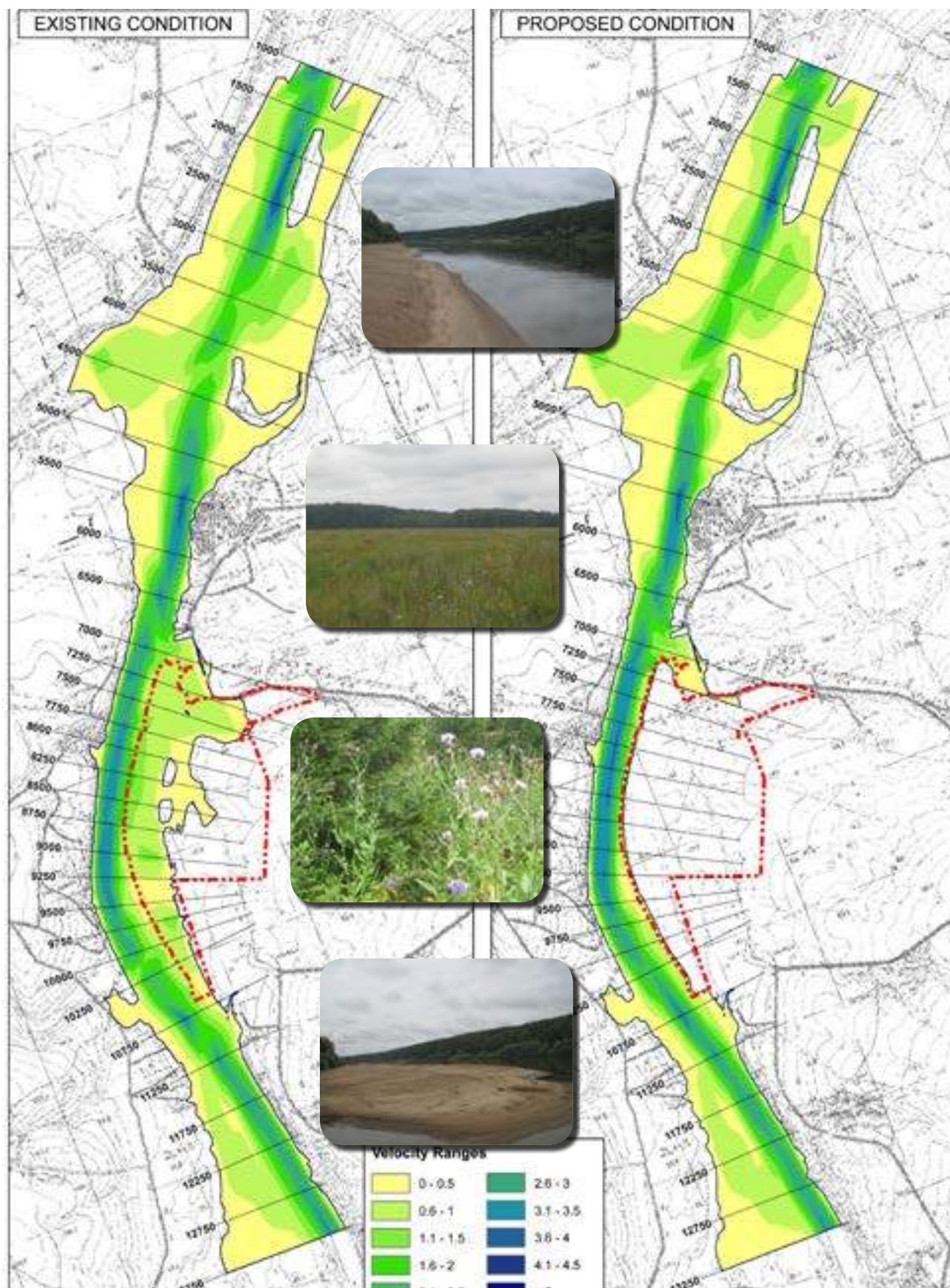
PACE is also the lead designer for all man-made lakes, streams, and other water features at DancingGreen. The large lake will be divided into three main areas, each with unique water quality requirements and recreational amenities. In addition to serving as a primary recreational and aesthetic feature of the site, the lake will serve as the stormwater treatment facility for the entire site, and PACE has designed advanced treatment systems into the lake to maintain exceptional water quality despite the presence of stormwater runoff, people, and wildlife in the lake.

In addition to services directly related to the many water-related aspects of the project, PACE is providing consulting and design services related to site layout, grading, recreational programs, transportation, attracting wildlife, and aesthetics on the site. Our extensive experience with resorts, man-made lake communities, and a wide range of environmentally-conscious projects gives us unique insight into the methods in which a project can be designed with nature in mind, to enhance, rather than damage the natural environment, provide both a great experience for the visitor and a healthy environment for generations to come.













[WWW.PACEWATER.COM](http://WWW.PACEWATER.COM)

OFFICE LOCATIONS: FOUNTAIN VALLEY, CA - SCOTTSDALE, AZ - BEIJING, CHINA

