



**IRF**

# **2011 GRAA**

**BOOK OF  
WINNING PROJECTS**

**International Road Federation**  
**- RECOGNIZING EXCELLENCE SINCE 1948 -**





# Chairman's Message

## Celebrating the Eleventh Year of the GRAA Program



On behalf of the International Road Federation and our international panel of judges, I would like to congratulate the winners of the 2011 IRF Global Road Achievement Awards (GRAA)! These individuals – and their organizations – join an elite group of innovators whose exemplary projects have received well-deserved recognition from their peers.

The Global Road Achievement Awards run through the very fabric of IRF's core objective: to gather expertise, technologies, and best practices from around the world to share with the global road community. This mission remains as valid in 2012 as it did in 1948 when visionary industry leaders first identified opportunities to provide coordinated input on post-war reconstruction programs.

There is little doubt that our industry has proved an invaluable contribution to sixty years of growing economies, accruing wealth, and better educated societies. Even as many parts of the world struggle with a financial crisis of unprecedented proportion, constructing and rehabilitating road infrastructure remains one of the most cost-effective ways to stimulate economic activity.

Unfortunately, much of what road builders do is lost or forgotten by the hundreds of millions of people who benefit so greatly from the work of the road development industry. This is precisely why IRF's Global Road Achievement Awards provide a rare opportunity to celebrate our industry's successes and highlight how our work helps achieve broader development goals.

With this year's edition, we will have recognized 91 projects from over thirty countries. I encourage members of the international road community to examine their accomplishments and encourage their participation in the 2012 competition.

Abdullah A. Al-Mogbel  
Chairman - IRF Washington



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# Quality Management

## Oregon State Bridge Delivery Program

### Delcan Corporation

In 2002, bridge conditions in Oregon were declining. Projections were made that 30% of Oregon's bridges would have weight restriction within 8-years, causing a productivity loss to Oregon's economy of \$123 billion including 88,000 jobs.

This "wake-up call" motivated the Oregon DOT (ODOT) to embark on the largest and most complex transportation program in their history: a \$1.3 billion effort to replace and repair 271 bridges throughout the state.

This 8-year program began in 2004; using both conventional and design-build contract delivery on 85 separate construction contracts. To meet a key program goal of maintaining freight mobility and traffic flow, a statewide corridor management framework was used in the planning and implementation.

Recognizing both the need for specialized expertise and the resource limitations within ODOT, the funding legislation (Oregon Transportation Investment Act...or OTIA III) mandated the outsourcing of the Program Management role. This allowed ODOT to focus its limited resources on providing a leadership role within the program, while conducting due-diligence oversight of the program management. With only 22 available staff to provide this function, a cost-effective and efficient quality oversight process had to be implemented to help ensure program goals were met.

To assist ODOT with this challenge, Delcan was retained in 2004. Together, they developed an innovative and comprehensive Quality Management Oversight System. Once implemented, this system measured the effectiveness and the performance of ODOT's Program Management Consultant.

It was critical for the Quality Management Oversight System to meet a key program goal of employing efficient and cost effective practices. Using a risk-based strategy coupled with a systematic approach aligned with ISO 19011 processes, a small staff of trained quality management professionals were able to effectively support ODOT staff in the oversight of the Program Management Consultant, while effecting measurable improvements in the management of the program.

The Quality Management Oversight System provided ODOT with a fact based, independent assessment of the effectiveness of the Program Management Consultant's activities. Its results were used by the Consultant to implement corrective actions and revise program procedures.

The OTIA III State Bridge Delivery Program has been recognized nationally with 28 awards for excellence and innovation. Since bridge conditions are a global concern, sharing this project's success internationally through the Global Roads Achievement Award's program makes it a contributor to IRF's mission..."Better Roads: Better World".



*"Delcan is honored to contribute to the IRF's mission of "Better Roads: Better World" by having our innovative approach to Quality Management recognized as a Global Road Achievement Award winner."*

Brian Stearman  
President, Delcan Corporation, Infrastructure, National Operations

# Construction Methodology

## Road and Bridges Rehabilitation / Huambo-Angola

### Exergia – Projectos de Engenharia S.A.

Communication routes and the road network constitute a vital infrastructure for the overall development of any country.

In Angola it was particularly important to address this since the 35-year armed conflict has led to a high state of degradation of the country's roads. The presence of landmines and the devastation caused by combat were significant impediments to its recovery.

In 2002, the Government of Angola created an extensive program of rehabilitation and reconstruction of the road system. As part of this program, the rehabilitation of the National Highway 120 was successfully completed recently. This road section forms part of the main road linking the capital Luanda and Huambo, one of the largest cities. It is used mainly by heavy vehicles.

After mine clearance of the existing route, its bridges and the surrounding areas, it was necessary to re-establish the traffic platform. This provided easier access for the people and their goods to the villages and to the ongoing redevelopment work. Since the country is in a reconstruction phase, it was necessary to overcome the shortage of materials and technical resources available, as well as the lack of a skilled national workforce qualified to deliver the work. Thus, efforts were made to adapt construction methodologies to the available materials for construction in the country, and to take advantage of the available non-specialized workforce, creating an exponential increase of employment.

In a first phase, care was taken to carry out the rehabilitation of the stretch of the road in order to meet and improve upon the original design. Some changes were introduced to ensure greater security and convenience in the circulation. The construction was accomplished by using existing materials from the surroundings areas, accompanied by strict validation and laboratory control to insure quality and performance.

Some stretches of this road pass through areas with a rugged terrain and some are located at high altitudes. There are areas where the soil can become waterlogged due to one particularly rainy season, changing the integrity of the site without warning. We inspected all of the conditions, the existing bridges and the bridge supports so that the projects were carried out in the correct order. Where possible existing structures were used, restoring them to ensure their reliability.

Since the Angolan Government budget is limited, due to the huge reconstruction and rehabilitation program, it was necessary to seek out solutions with the best price/quality ratio. The opening of this stretch of road has allowed people access to essential supplies of food, clothing and healthcare and there has been an exponential growth of the services and industries in the cities it serves.



*“Exergia is proud to be a member of the IRF and extremely proud to be the recipient of this award. We would like to thank the organization and our colleagues and peers for their commendation and for the opportunity to introduce our work to a global market. We believe that it is through organizations like the IRF that we can work together to insure the highest standards and deliver to the best of our abilities for such crucial work.”*

Dr. João Pinto Germano  
CEO, Exergia – Projectos de Engenharia S.A.

## Sudan Infrastructure Capacity Building Program

### The Louis Berger Group, Inc.

Under the U.S. Agency for International Development (USAID)-funded Sudan Infrastructure Services Program (SISP) and in collaboration with the Government of the Republic of South Sudan (formerly the Government of Southern Sudan), The Louis Berger Group, Inc. (LBG) provides a range of public infrastructure services and related technical assistance and procurement to strengthen South Sudanese infrastructure and institutional needs in support of the Comprehensive Peace Agreement. SISP is a wide-ranging program involving rehabilitation of the power supply, improvement of basic water and sanitation services, and the design, construction and maintenance of roads and bridges. Under the roads program, LBG has maintained and reconstructed over 550 kilometers of roads and constructed eight steel and concrete composite bridges ranging from 12 meters to 87 meters in length. As part of the roads program, SISP is reconstructing the vital Juba-Nimule road, which will not only reduce traffic times for local commuters but will also facilitate growth in international trade as a major logistics corridor to the capital. The infrastructure program has strengthened local economies throughout South Sudan and is credited with the creation of over 900 jobs.

Infrastructure improvements ordinarily result in more vehicles on the road and greater traffic speeds. Unfortunately, this leads to a higher risk of traffic accidents, particularly in communities lacking a history of traffic safety and education programs. To raise public awareness of road safety issues, USAID tasked LBG with implementing public education projects and assisting the

Ministry of Transport and Roads (MTR) in writing effective traffic regulations to reduce the incidence of dangerous driving. The Sudan Infrastructure Capacity Building Program provides road safety skills training to the public, plans and implements public road safety awareness programs, and assists MTR in establishing traffic regulations and mechanisms for their enforcement. Local road safety awareness programs are occurring across the region in collaboration with the Ministry of Interior and Ministry of Education. The road safety program is designed to prepare drivers for driving on paved roads, encourage them to exercise caution, and educate both pedestrians and drivers on how best to share the road. Advice for drivers includes guidance on obtaining a valid driver's license, education on the dangers of drunk driving, and information on what to do in the event of an accident. The end-goal is to reduce the incidence of dangerous driving and minimize road casualties.

Specific implementations at the grassroots level include road traffic signage; pedestrian crossing painting; billboards; road safety events; public service announcements; and meetings with target groups such as schoolchildren, the elderly, taxi and bus operators, truck drivers, motorcyclists, and traffic police. LBG has worked extensively with MTR to develop a robust road safety program at the government level as well, which includes establishing a road safety unit within MTR, expanding public awareness campaigns, developing human resource capacity, building a road safety database, developing vehicle safety standards, and developing and implementing safe traffic flow procedures



*“The International Road Federation is well known and respected in the international road infrastructure community and LBG is honored to be recognized by the IRF and our professional colleagues with this award. Perhaps more importantly, we are excited with this opportunity to share the accomplishments of our field team in South Sudan whose hard work on the project, collaboration with the local community and commitment to our client USAID led to achieving project success.”*

Eric Dean Cook, PE,  
Program Manager, The Louis Berger Group, Inc.

# Traffic Management & ITS

## Hong Kong Route 8 Traffic Control and Surveillance

### Delcan Corporation

Route 8 is part of the strategic network that connects the eastern part of Hong Kong to the International Airport. This 13.5km dual 3-lane road section consists of four tunnels with contra-flow and tidal-flow capabilities, one bridge with the second longest cable-stayed span in the world, and sections of highways. To achieve efficient operations of this crucial link, an advanced TCSS is implemented. The Route 8 TCSS is currently the most advanced TCSS in the world. A total of 1,800 traffic control field devices, including video imaging vehicle detectors, variable message signs, variable speed limit signs, matrix lane control signals, tunnel lane control signals, traffic signals, various sizes of prismatic signs, flashing beacons, etc., are under its control. The system, with automatic incident detection function and rule-based intelligence for traffic management, has been in full operation since December 2009. The contract value for the Route 8 TCSS is US\$35 million.

The scope of services for the Route 8 TCSS included:

- Supply and installation of traffic control field devices and communications network;
- Design and development of incident management facilities, including video imaging detection, over-height vehicle detection system;
- Design and development of automatic incident detection (AID) system, including incident, congestion and queue detection algorithm;

- Design and development of software for traffic control and monitoring system;
- Design and development of software language for rule-based and pre-defined response plans;
- Interface with adjacent TCSS to allow interface coordination of over 200 traffic control devices within the interface area;
- Interface with other systems, including central monitoring and control systems, toll system supervisory control and data acquisition system (SCADA), and wind and bridge structural health monitoring system, etc.;
- Design and development of a user friendly and graphical user (GUI) man-machine interface; and
- TCSS operator training, etc.

The unique characteristics and key benefits of the Route 8 TCSS include the ability to offer the motorists and the public transport users a reliable route to the Hong Kong International Airport; the ability to proactively manage non-recurrent and recurrent congestion by balancing traffic in the road network through diversion routes and/or tidal flow inside the tunnels; and, significant savings in travel time and fuel costs.

In recognition of the benefits of the Route 8 project, the Hong Kong Transportation Department is planning for implementation of similar rule-based logics in the upcoming ITS projects.



*“An intelligent system to manage over 1,800 traffic control devices in 4 tunnels and 1 bridge – The Route 8 TCSS is one of the most comprehensive rule-based system that provides various forms of active traffic management.”*

Rex Lee  
Vice President, Systems, Delcan Corporation

## Sheikh Zayed Bridge Project

### Municipality of Abu Dhabi City

The Municipality of Abu Dhabi City represented the realisation of a vision shaped by the Founding Father of the UAE, the late His Highness Sheikh Zayed bin Sultan Al Nahyan.

A stunning gateway to the world's richest city, the Sheikh Zayed Bridge is an iconic landmark to benefit and be enjoyed by Abu Dhabi's citizens, residents and visitors – today and for many generations to come.

The project epitomises excellence in design creativity, innovation and sustainability. It is a deserving recipient of this award, in recognition of the tremendous work of the talented and dedicated individuals who conceived and delivered the world's most complex bridge.

Following the selection of High-Point Rendel as design consultants for the project, the Government of Abu Dhabi decided that the crossing should be a spectacular landmark and consequently, in 1997, the world-renowned British-Iraqi architect Zaha Hadid was appointed to develop a special aesthetic concept.

Inspired by the asymmetric arch shapes of desert sand dunes, Zaha Hadid created a scheme for a stunning, triple-arched bridge featuring a fusion of bridge forms that incorporated a box girder deck supported on, and suspended off, fluid continuous arches. Close collaboration between architect and designer to develop the 'dune' concept was essential to ensure its structural feasibility and buildability.

The architectural concept posed three major design challenges. Firstly, the deck was required to form a continuous, seamless ribbon throughout its length, so that it appears to float over the Maqta channel. Next, the two decks were to be separated with minimal visual obstruction, resulting in an open appearance to the outside edge of the deck structure. This creates a striking feature, which is enhanced by a stunning, computer-controlled lighting scheme. Finally, the arches and piers needed to form a continuous flowing line, with curves in three dimensions emerging from the ground at each end of the bridge, and moving from between the twin decks at the mainland end to outside the decks as the bridge approaches the island side. The remarkable result is a bridge structure with clean and uninterrupted lines that is unique in its range of forms.

Abu Dhabi is a modern city shaped by an ancient culture. Its strategic policies are grounded by three basic elements of sustainability – the natural environment, economic development and cultural heritage. The Sheikh Zayed Bridge embraces all three of these elements. It is representative of local sand dunes, and blends into Abu Dhabi's natural environment. It will contribute to Abu Dhabi's economic prosperity whilst maintaining a visual link between the city and the surrounding landscape – a strong form that incorporates historical, architectural shapes that are unique to Arab society.



*“The bridge would herald further achievements for the UAE, which would place the nation among the most advanced countries in the world. The bridge which bears the name of our father, the late Sheikh Zayed bin Sultan Al Nahyan, is more than a link between two points. It is a symbol for the continuous development process started by the late Sheikh Zayed and an evidence to our determination to pursue the goals of Plan Abu Dhabi 2030.”*

His Highness Sheikh Khalifa bin Zayed Al Nahyan  
President of the UAE

# Technology, Equipment and Manufacturing

## SWAROTUBE: Advanced Tunnel Lighting

### SWAREFLEX GmbH, Austria

Since the year of 1950 Swareflex GmbH, a company and brand of the Swarovski group, has been constructing reliable and long-life reflectors with retro-reflecting glass elements for various applications. As worldwide traffic dramatically increased over the past decades, a need for more advanced traffic-safety products has emerged. Today traffic safety experts demand highly efficient, active, yet energy-saving guidance and lighting solutions. As a market leader in this field, Swareflex strives to steadily improve traffic safety by researching and developing technical innovations based on its 60 year industry-experience.

One of Swareflex' latest product innovations is SwaroTube, an active street- and tunnel-lighting system – leveraging both latest LED technology and Swareflex unique experience in reliable and long-lasting mobility systems.

Traditional tunnel lighting systems are characterized by light sources with poor energy efficiency and flickering as well as irritating light-and-dark changes. SwaroTube combines the advantages of cutting-edge and power-saving LED technology with Swareflex' long experience in developing accurate optics made out of glass and highly reliable housings. The edge of differentiation and innovation of Swareflex' SwaroTube system is the use of tailored precision-glass-lenses, mounted in front of each high brightness LED light of a SwaroTube light engine.

The SwaroTube traffic-lighting system consists of:

- 1100 mm light-engine with 30 up to 60 energy-efficient high-brightness LEDs and project-tailored precision-glass-lenses, generating a luminous flux up to 25.000 Lumen.
- Aluminum housing with adjustable ceiling hanger assembly holding the SwaroTube light-engines and all wiring and
- Control-units and power-supplies for easy maintenance access discharged from the light engine.

Possible applications for SwaroTube range from tunnels to parking facilities, public-transportation stations and industrial structures such as hangars, wharfs or even stadiums. SwaroTube is not just a product – it is a unique solution – pushing the boundaries of what today's intelligent light planning and design can achieve. Swareflex' philosophy is to develop individual solutions hand in hand with its customers. This ensures the system to be tailored to the customer's needs and the desired light-setting to be realized. Known for its high standards in customer care, Swareflex is dedicated to support its clients in all project stages: from the initial idea, to planning, consulting, on-site training and installation all the way to post-installation and system maintenance.

Swareflex' products meet the highest requirements in quality and endurance - even under the most extreme environmental conditions. The company is ISO 9001 and ISO 14001 certified and committed to a responsible use of natural resources by designing its products as energy-saving and environmental-friendly as possible.



*“Swareflex’ mission is to improve traffic safety through innovative products and solutions. Thus we are truly honored to be presented with the 2011 IRF GRAA Award in the category of ‘Technology, Equipment and Manufacturing’. As a long-standing member of the IRF this achievement will encourage us to continue our mission and R&D activities in order to make the world’s traffic safer and more pleasant for its participants.”*

Adil Atak  
Business Development Manager, Swareflex GmbH

# Maintenance Management

## TxDOT Pavement Management Program

### Texas Department of Transportation

More than ever before citizens are demanding accountability. For State highway agencies, critical decisions are made every day that affect the overall performance and operating costs of their highways. In this environment, poor decisions can be very costly. Information from TxDOT's Pavement Management Program provides the department with an effective way to get better performance out of our pavements with less cost by providing valuable information to the appropriate decision-makers.

TxDOT's Pavement Management Program implemented in 2009-2010 consists of four major elements:

- A Four Year Pavement Management Plan provides TxDOT with a mechanism to predict pavement conditions based on a specified funding level and project specific plan. The resulting report consists of a summary of the number of lane miles that each district plans to treat as Preventive Maintenance (PM), Light, Medium or Heavy Rehabilitation and the impact that those treatments will have on pavement condition. These predictions are based on deterioration models.
- A Deterioration Prediction Model built upon a family of basic deterioration models where a statistical analysis is carried out to analyze the deterioration rate distribution for different pavement structure types and highway functional classifications. As a result, nine broad groups of basic deterioration models are defined. These nine groups are found to have distinctive deterioration rates; and therefore a different set of models have been developed for each group.
- Peer Reviews to create uniformity and efficiency across the state became very evident. The sharing of best practices was a driving force in the Peer Review program. Districts are selected for review based on lower or declining pavement condition scores. A team composed of four District Engineers and the Director of the Maintenance Division conducted the reviews over a 3-day period in each district.
- A Budget Optimization Tool that alleviates duplicate effort and human error, allows the user to review budgets at a hierarchical budget level aiding in scenario planning, can be reviewed by all levels of management and includes a module in which unfunded projects are accumulated and prioritized for quick implementation when additional funds become available and /or unforeseen circumstances occur.



*“Good roads equal economic growth in Texas. To that end, the TxDOT team did an exemplary job of developing an outstanding plan of best practices to address critical highway maintenance issues around the state. TxDOT employees work daily to provide a quality transportation system, one that assures seamless access and mobility for the citizens of Texas. We’re proud of the team, and we’re pleased to accept this prestigious award.”*

Phil Wilson  
Executive Director, TxDOT

# Program Management

## South Interoceanic Road

### Concesionaria Interoceánica Sur Tramo 2, S.A. / Concesionaria Interoceánica Sur Tramo 3, S.A

IIRSA Sur Concessionaire – Stretches 2 and 3, builds, provides maintenance and operates through concessions on the 649 km of road that crosses the Cusco and Madre de Dios Departments in the South of Peru, in the Andean and Jungle zones, project known as Interoceanic Road. As part of the IIRSA Sur in Peru, which is 2,500 km long and connects the Pacific Ocean to Acre in Brazil, this is the first paved road infrastructure connecting these countries. It is a remarkable advance in the economical, cultural and social integration between these countries and opens a large range of opportunities.

On August 8, 2005, the Work Contract and Maintenance Concession of the Interoceanic Road – Stretches 2 and 3 of the “Plan of Action for Integration South America - IIRSA” were approved. The strategic function of this project was to consolidate the integration of coast-mountain-forest of the South region of Peru and its regional complementarily with North and Northeast in Brazil. The project opens a new outlet to the Brazilian agro industry to the Asian market and the Brazilian market to Peruvian agricultural and industrial products.

Odebrecht is the leader of the consortium and immediately after the award of the contract, started a process to build a strong and long term relationship with the local actors, based on its Entrepreneurial Technology, the TEO (Tecnología Empresarial Odebrecht). A

confident, honest and transparent relationship was created and the following strategy adopted by the consortium consolidated as a peaceful, organized and very well won process. Since then, the construction jobs were developed, in extremely difficult circumstances, crossing over 4,850 meters over sea level and in the hot and humid jungle, many programs were designed, including

- Community Relationship
- Land-use Negotiation
- Local Workforce Hiring
- Project Exit and Completion
- Health and Education Support
- Local Production and Local Skills Development

Finally, the consortium started the iSur initiative in 2008. Supported by Odebrecht, IDB and CAF, this initiative implements 16 projects in 4 guidelines: Responsible Tourism, Ecobusiness, Conservation and Governance. This effort is the result of an alliance with Conservation International, Pronaturaleza Foundation and Odebrecht together with local governments, NGOs and contractors to make this infrastructure a real instrument of local development. Currently, more than 20,000 people are direct beneficiaries of iSur.



*“We are very proud to be recognized for our IIRSA Sur Project. The project opened a new trade outlet to the Brazilian agro industry and to Peruvian agricultural and industrial products. Right now, more than 20,000 people are direct beneficiaries of iSur”*

Lucía Tagata Silva  
Odebrecht

## Simulating Asphalts on the Molecular Level

University of Rhode Island, Rhode Island

Department of Transportation, URI Transportation Center

This project began in 2003 with support from the Rhode Island Department of Transportation (RIDOT) and the University of Rhode Island Transportation Center (URITC) as a new approach for developing mechanistic insights about asphalt materials.

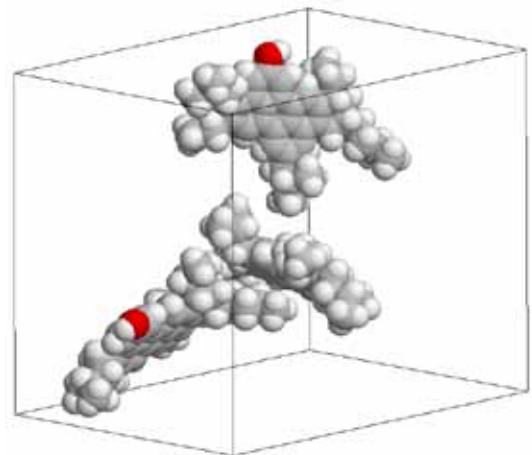
Pavement specifications for asphalts are based on mechanical properties that are expected to provide good road performance. The bitumen that comprises the asphalt binder contains millions of chemical compounds, and the distributions of molecule size and polarity reflect the asphalt crude oil source and chemistry. The ways these individual compounds inherent to asphalts contribute to physical and mechanical properties are not well understood, however. This impairs engineering improvements to asphalt chemistry and makes effective asphalt modification a combination of art and science. A better understanding of asphalt addresses this limitation.

Molecular simulations use statistical computations of how molecules move and respond on the nanoscale in order to predict macroscale mechanical properties. Typically molecular simulations are applied to liquids and crystals; using these methods for asphalts extended the complexity beyond prior systems. Using interactions, correlations, and microstructures that are computed among molecules in appropriately complex model systems, one can infer an understanding of how molecules control properties within the

true asphalts used in pavements. Understanding this chemistry–mechanics link in more detail is expected to enable new approaches for devising additives and asphalt modification strategies.

Results from this research have provided insights about mechanisms within asphalts and influenced the asphalt research community. The simulations demonstrated that large molecules such as asphaltenes relax together to control temperature-dependent rheology. Other researchers have initiated their own molecular simulations and have used the resulting model asphalts to investigate questions about asphalt healing and asphalt–aggregate interface structure. Molecular simulations are now discussed as a possible approach to test conflicting proposed mechanisms of asphalt mechanics.

Follow-up research aims to connect results among models at different scales to quantify mastic–aggregate forces and other inputs to finite element models of pavements. This multiscale combination of pavement mechanics models will provide a route for predicting how chemical distinctions among bitumens influences pavement performance, aging, and distress.



*“By using realistic molecules, asphalt molecular simulations can directly test hypothesized mechanisms on a level that cannot be obtained readily in direct experiments.”*

Michael L. Greenfield  
Associate Professor of Chemical Engineering, University of Rhode Island



# **2012 Competition Open**

**Deadline for submissions: May 31, 2012**

The benefits of winning the IRF Award include the presentation of a crystal trophy at the IRF Annual Awards Luncheon, recognition in World Highways Magazine, and a summary of your project in the IRF GRAA Book of Winning Projects.

For additional information, please contact [communications@irfnews.org](mailto:communications@irfnews.org) or call us at +1 703 535 1001.



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# GLOBAL

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