

Alarp.. Underground



ALARP™ UNDERGROUND

ALARP was founded on its passion for the Underground. From the environment into which it is carved to the final patrons, Governments, Operational Management and Stakeholders ALARP experts stand together to deliver pragmatic outcomes.

ALARP's independent, expert, trusted and proven expertise assists its clients to make underground infrastructure visions reality.

ALARP™ delivers bespoke teams to deliver tailored specific governance frameworks, pragmatic designs, independent verification, training, exercises, investigations and operational procedures to meet their clients' needs.

The time frames for underground project delivery are extremely demanding. Underground construction programs are arguably the most demanding on earth. From extreme weather, stringent commercial arrangements, complex changing labour market conditions, complex supply chains, regulatory and logistics challenges, the underground is a uniquely demanding work environment. ALARP experts have assisted their clients to overcome these challenges and many others internationally for more than a decade.

ALARP clients are provided access to eminent, accredited subject matter experts famous for getting underground jobs done from around the world. Our

experts are trusted by governments and corporations. Our experts have provided solutions for some of the world's most demanding underground infrastructure in all continents.

Under the supervision of ALARP's world experts, clients are provided options to solve difficulties encountered by Stakeholders from inception of a project through to completed operations. ALARP provides option for converting specialist advice into solutions. From field based analysis, performance audits, to operational safety and all facets of underground programs between, ALARP delivers bespoke solutions for assessing and protecting life, property and the environment underground



A cornerstone of ALARP's success is its proven ability to convert the technical / legal / engineering / scientific interfaces necessarily demanded for the underground into reality. Our international team includes access to scientists, engineers, facilities maintenance, medical experts, investigators, business management process experts, health and safety, communications, planning and legal experts through the ALARP™ world network of accredited experts.

ALARP Review Solutions

ALARP is often briefed to review complex problems for its clients and provide solutions. From insurance assessment for under sea tunnels at desalinisation plants to new road tunnel designs and construction phases and beyond to specialist advice for standards applications to meet the numerous levels of regulation both internally and externally for projects. ALARP's bespoke teams are focused upon practical solutions that really work. We provide advice and convert it into reality - in the field, in real life.

ALARP Operations Solutions

At ALARP we focus upon practical solutions that really work. We provide

advice and convert it into reality - in the field, in real life. The interface between construction and operations is often the most difficult phase of a project.

To open Hamad International Airport safely, ALARP trained, certified and deployed more than 600 specialist operational safety personnel including the GCC's first tunnel safety officers. More than 110 full scale emergency exercises were conducted with QCDD and/or QCAA in the tunnels and other airport buildings to prove the systems actually worked. ALARPs focus on robust scientific based solutions delivered through qualified, trained, focused, committed, and articulate specialists.

Likewise in Albania ALARP provided bespoke solutions in problem analysis, environmental investigations, training and deployment of fire life safety officers to meet the unique operational needs of twin bore 5.5 kilometre road tunnels as they transitioned between construction into operations.

ALARP provides 'Real Life Solutions' because the underground environment demands nothing less to ensure safety for its ultimate users.

ALARP™ Underground

ALARP™ accredited experts have a proven track record for providing governance, operational, technical and remedial solutions for complex underground and above ground life, property and environmental challenges throughout the World

Internationally:

ALARP experts have been solving subsurface problems internationally for more than 10 years. ALARP was founded with a network of experts recognising the widening gap between legal and engineering translation as disciplines became more specialised with a fast paced increase in ambitious subsurface works program. ALARP's tunnel experts have been responsible for solving a broad range of underground issues including: facilitating the safe operations of road tunnels, facilitating operational safety for high risk tunnel traffic during construction, satisfying regulatory requirements for accredited public operations, providing ventilation sufficiency assessments, conducting traffic studies, developing safe operating procedures, conducting full scale emergency exercises with first responders and emergency services, providing communications solution, auditing systems, liaising with government departments, provided risk reports, management briefings, entrusted with bringing tunnels into operation safely.

ALARP also provide key advice for underground works experiencing water inundation together with geological site inspections and review of testing for major commercial/residential development including water leaks in tunnels, water leaks in constructed caverns, foundation sufficiency analysis. Assessing potential karst geohazards and their impact on foundations and subsurface design.

ALARP experts can formulate innovative subsurface hazard and remediation assesment programs for clients investigating and delivering major projects for the underground. These proposals may include satellite deformation modelling, microgravity, seismic and electrical analysis of subsurface hazards as well as state of the art waterproofing, geo-support and geotechnical solutions.

Examples of ALARP Underground Work Around the World

Rail

Formulating contractual requirements recognising various standards for each set of unique project circumstances; overseeing emergency exercises as independent specialists; auditing designs; evaluating tenders; sitting as independent verifiers or as part of a challenge teams; formulating safe operational procedures for existing and under construction projects; providing key advice on subsurface metros; evaluating emergency egress sufficiency; rollingstock evaluation from a subsurface operational safety perspective; staff procurement, training, assessment and review; independent



disaster investigations; providing key advice to the European Union Parliament Inquiry into safe tunnels; facilitated forum to review construction options for safe operations (Portugal); investigated arson, terrorist attacks (Madrid, New York, London, Melbourne, Hong Kong, Deagu).

Road

Autonomous provision of fully safe tunnel including; insurance procurement and review, drafting regulatory framework, drafting and implementing governance requirements, training tunnel safety officer for Thirra Tunnel in Albania including selection of workforce, drawing safe operations procedures, overseeing management structure pursuant to the EU Directive for Road Tunnels, training, conducting full scale exercises, and safe opening operations.

Underground Transport Interchanges and Carparks

- Safe integration of subsurface bus station/rail (Finland, Australia)
- Review of active suppression systems for subsurface spaces

Geology

- Extensive experience in fielding mapping, ground investigations and development of geotechnical 'ground models', design, and analysis.
- Geological field mapping, sampling, specifications of laboratory testing and reports. (Mexico)
- Mapping, condition survey design input for a NATM cavern-tunnel complex in limestone, sandstone and marl (Libya)

ALARP UNDERGROUND TECHNICAL SOLUTIONS



Expert advice demands conversion into technical solutions. ALARP bespoke teams of technical experts provide clients with direct accountability between expert advice and delivery of technical solutions. Examples include:

Operations

- Safety Audits
- Communications
- Development of 'realistic' operational procedures
- Full scale exercises
- Operational Safety Reviews
- Human/machine interface
- Systems Reviews
- Human Factors
- Upgrade Plans

Sub-surface / Transport

- Peer review/challenge
- Fire life safety
- Construction and operational safety
- Concept design
- Modal interfaces
- Human factors
- Risk management
- Liability management

System Performance

- Black-box complex system performance optimisation
- Electro-mechanical system analysis
- Life safety system performance
- Fire-fighting system analysis

Human Safety

- Evacuation performance analysis
- Human factors
- Security
- Tenability analysis

Sub-surface

- Ground water ingress control and remediation
- Fluid dynamics, ventilation, stability
- Contractual risk management
- Technical auditing
- GIS interpretation
- Satellite image interpretation
- Micro gravity survey and interpretation
- Three dimensional laser analysis of complex structures
- Near field radar ground penetration analysis
- Groundwater flow analysis and management
- Geological survey
- Seismic survey
- Seismic risk analysis

Technical Works

- Creation of databases and related information systems
- Data entry and data management
- Training and deployment of specialist technicians for complex technical tasks
- Development and optimisation of Standard Operating Procedures and Works Procedures (SOP's & WP's)

Subsurface Facilities Maintenance

- Audit and supervision of complex technical projects
- Performance assessment and operational reviews

Environment

- Pollution risk assessment and abatement
- Toxicology
- Contamination control
- Site remediation
- Comprehensive Environmental Impact Assessment including Health Impact Assessment
- Waste Management
- Environmental Management System (EMS)
- Aquifer and groundwater management.
- Environmental assessments
- Planning and regulation

ALARP is uniquely able to integrate technical information into project specifications, construction supervisions, audits, performance indicators, regulatory reform, regulatory compliance, governance and liability in technical regulatory and engineering contexts. ALARP experts are contributing authors of many of the underground standards for the world (e.g. NFPA 130 and NFPA 502, Code of Practice for Subsurface Works). As authors of regulatory documents ALARP brings great depth of understanding about the use of standards and technical information in a practical way for the clients. ALARP™ Qatar engages with all local agencies and regulators to ensure that its innovative and technically based solutions for delivering safe complex subsurface built infrastructure are acceptable and gain long term regulatory and stake holder acceptance and approval.

FROM VISIONS TO REALITY

ALARP provides the link between a clients tunnel vision and the reality of ultimate tunnel operations. By accessing the world's leading practical experts to manage the special risks underground we make underground systems work.

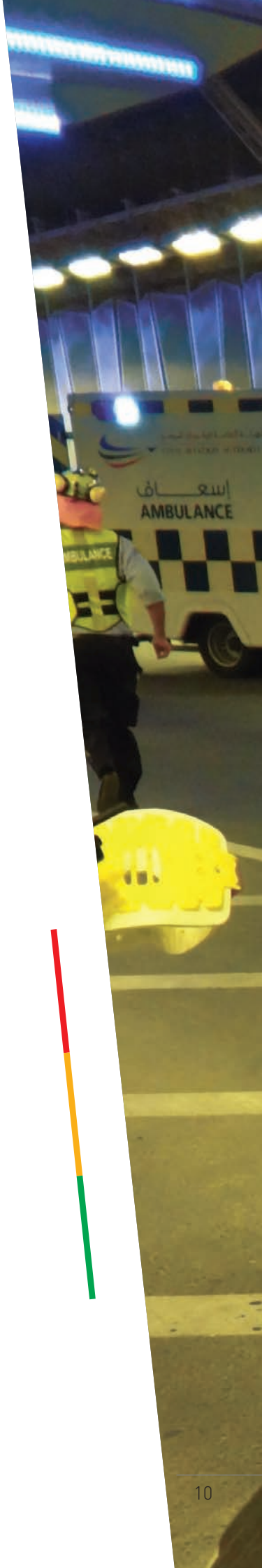
Our clients:

- Ministers, Ministries, Government agencies and senior advisors
- CEOs and Board of Directors
- Institutional and private investors
- Insurers
- Regulators
- Operators

A selection of what we can do:

- Governance, standards and regulatory arrangements
- From concept, to design, construction and operation ALARP provides certainty that the clients' vision becomes a reality
- Audits, independent verification, regulatory approvals, risk evaluations including insurance and legal liability, reviews, opinions, transportation studies and safety assessments
- Challenge teams; supervision and audit of subsurface works
- Specialised training, testing and accreditation of workforces
- Operational readiness, degraded mode safe operational strategies, testing and audit of systems, equipment and personnel
- Subsurface risk documentation and advice (e.g. mapping, quantification, and qualitative assessments)
- Remediation and option assessments
- Full scale trials, testing, proving and exercises

We offer the most trusted independant counsel, investigations, peer review, operations and operational assessment services for our clients worldwide.









PROFESSOR ARNOLD DIX

ALARP founder and CEO, Professor Dix is one of the world's leading underground risk experts protecting sovereign and corporate entities from operational risk in life, complex property and environmental risks. Professor Dix is both an accomplished lawyer and scientist, a former Professor of Engineering and currently a Professor in the disaster team of the School of Medicine, University of Western Sydney (UWS), Australia. He is the CEO and founded ALARP, with ALARP companies in Europe (London), Asia (Hong Kong, China), Oceania (Melbourne) and Qatar. His legal career includes being a partner at DLA Philips Fox, a specialist consultant to DLA Piper (London) and is a trial attorney (Barrister). He was appointed by the USA to both the road and rail tunnel fire and life safety committees of the United States National Fire Protection Association "NFPA", chairs the legal group of the International Tunneling Association (United Nations Affiliated), represents a country's safety interests on the Permanent International Association of Road Congresses "PIARC", and served as a Special Expert to the Europeans Parliamentary inquiry on tunnel fire safety. He is a member of Japans Society for Social Management Systems "SSMS". He sits on the International Tunnel Insurance Group "ITIG" (re-insurance) for major sub surface infrastructure for the world as well as investigating disasters as a special expert worldwide. Professor Dix is also a prolific author on underground risks and safety and is the recipient of numerous international awards for his work.

www.arnolddix.com
www.alarp.com

