



ESS Earth Sciences & ESS Weathertech Pty Ltd

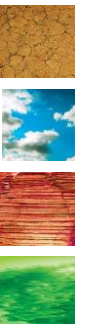
COMPANY PROFILE

engineering solutions for monitoring the environment

www.esands.com



PROUDLY AUSTRALIAN



ESS Earth Sciences and ESS Weathertech (ESS) are part of an advanced technology group, specialising in solutions in the environment and allied fields such as meteorology, hydrology, seismology, oceanography, water and air quality, and geotechnical engineering.

We understand the importance of using reliable, proven and appropriate technology when dealing with extreme environments. Our installed base covers all environmental extremes throughout Australia, Asia and the Antarctic. Indeed many of our clients have been using our systems for many years which serves to reinforce our business philosophy of quality and reliability in design, manufacture and support services.

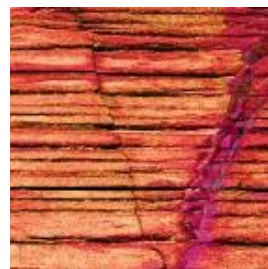
ORGANISATIONAL CAPABILITY

ESS is the largest Australian owned group specialising in meteorological, oceanographic, seismic, environmental and geotechnical products and services and has been operating for more than 30 years. ESS has offices in Melbourne, Brisbane and Beijing China and representatives in more than 20 countries including Indonesia, Malaysia, Singapore, Thailand, Brunei, India, Bangladesh, Pakistan, Hong Kong, Taiwan, South Korea, Japan, Philippines, Vietnam, USA, Canada, Finland, Germany, UK, France, South Africa and Chile. Under its new partnership with US company Enterprise Electronics Corporation (EEC), ESS Weathertech now operates one of the three global EEC weather radar and satellite sales and service centres in Melbourne with an expanded direct responsibility for Asia, Australia and the Pacific.

This builds on the ESS track record where, over the last 30 years we have supplied more than 65 weather radars and 100 satellite systems to the Australian Bureau of Meteorology and other National Meteorological Services and Defence and Remote Sensing agencies in Asia and the Pacific region.

ESS has a long history of collaboration with major government and private industry organisations, including CSIRO, the Bureau of Meteorology, Geoscience Australia, Malaysian Meteorological Service, Indonesian Bureau of Meteorology and Geophysics, New Zealand National Institute of Water & Atmospheric Research and the Hong Kong Observatory.

ESS has extensive experience in the design, manufacture, installation and support of weather satellite ground reception systems and tidal monitoring systems throughout Australia and Asia, and has been a major supplier to national weather bureaus, port authorities and military in the region.



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ESS Earth Sciences ESS Earth Sciences groups our seismology, water and geotechnical divisions to focus product and services on supporting a broad range of companies and government agencies at all levels.

The ESS Seismology Research Centre operates a network of around 100 seismographs and accelerographs in eastern Australia, and locates about 400 earthquakes within the network on average each year. Most of these earthquakes are too small or too deep to be felt, but the rate of activity and ratio of small to large events can be used in earthquake hazard analysis, and activity . The SRC provides an expert consulting service advising on seismic hazard.

The SRC has a long history of designing and manufacturing seismographs, and the latest development called the Gecko is the seventh generation of these precise instruments. Most of the instruments are operated on behalf of owners of significant infrastructure such as large dams, power stations or other structures, with the SRC providing an earthquake alarm service, routine operation and maintenance, replay and analysis of data, and preparation of seismicity reports.

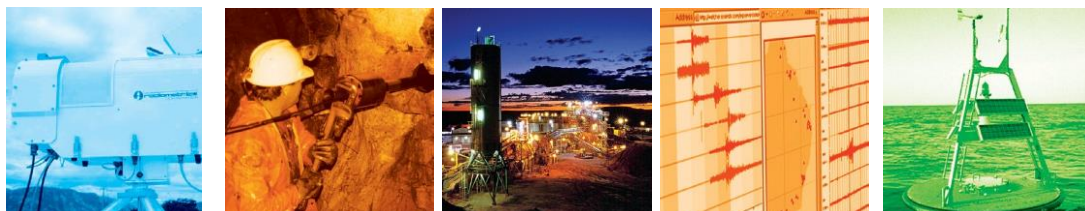
ESS instrumentation caters to all aspects of water level and water quality measurement and meets water authority standards for groundwater monitoring. ESS sensors are unique and robust and come with a standard 3-year warranty as testament to their proven record of reliability and durability. We specialise in instrumentation designed for monitoring water level, salinity, turbidity of various inland rivers, dams and lakes, servicing a large sector of the hydrological industry.

Our Geosystems division supplies structural metric instruments to the civil, construction and mining industries for a wide variety of projects including monitoring of highways, dams, tunnels, airports, bridges, batter slopes, and mines.

Our Greatest Asset...

Like all successful businesses, our staff is our most important asset, with all key functions undertaken by qualified and experienced professional and technical staff. Our company objectives for growth require the best quality service and products at all times and our enthusiastic and dedicated staff sustain that high standard.

Our team can assist in training, installations, supervision, troubleshooting and the engineering of customized solutions.



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PRODUCTS & SERVICES

Currently our divisions provide the following products and services:

METEOROLOGY

- Weather radar systems including product generation
- Aviation Weather Information Systems, LLWAS
- Computer Message Switching Systems
- Tropical Cyclone Warning Systems
- Meteorological satellite reception systems and product generation
- Automatic Weather Stations supply and installation
- Atmospheric profiling sensors, LIDAR
- Meteorological infrastructure projects
- Solar Radiation & Atmospheric Monitoring for Ozone, UV Spectra & Evapo-Transpiration

WATER RESOURCES

- Stream flow / rainfall / water quality
- Flood / pollution critical warning systems
- Ground water resource management
- Environmental impact studies
- Water resources infrastructure projects

OCEANOGRAPHIC

- Tide Gauges and high accuracy acoustic and radar level sensors
- Ocean Buoys
- Wave & Current Radar
- Oil Spill Detection

GEOTECHNICAL

- Rock stress and deformation monitoring equipment and services
- Hydraulic fracture testing equipment and services
- Underground and surface mining monitoring networks
- Geological stress consultancy services
- Geotechnical instrumentation
- Lab Equipment

SEISMOLOGY

- Seismic event data acquisition
- Earthquake preparation, alarm and response services
- Dynamic properties of structures e.g. dams and buildings
- Micro-seismic systems and services
- Blast and vibration monitoring equipment
- Ocean Bottom Seismograph instrument deployment and retrieval



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FACILITIES

ESS has offices in Melbourne, Brisbane and Beijing. Design, manufacturing and calibration of instrumentation take place at our Melbourne Manufacturing Facility and Head Office, which includes the following features:

- Over 700sqm factory manufacturing space for large project system configuration
- Over 200sqm calibration facility with state of the art calibration equipment for pressure, temperature, water quality instrumentation calibration (all devices are certified to NATA standards)
- Melbourne inner city limit location – central to all major facilities including component suppliers, transport depots, airports, major hotels
- Large conference room for holding product training courses and other functions

DESIGN

ESS has a substantial Research and Development division that includes the following:

- Principal Design Engineers for all products
- Engineers for electronic, mechanical, RF, software, embedded systems, CAD drafting
- Prototype Engineers for product and system development
- CAD drafting applications including 3D rendering types

QUALITY ASSURANCE

ESS is certified in accordance with the ISO9001:2008 standard.

MANUFACTURING

A large instrument manufacturing facility including:

- Electronic assembly line
- System configuration
- Mechanical engineering workshop
- Calibration laboratory
- Parts inspection facility

FIELD SERVICES

- Installation/Commissioning Technicians and Engineers
- Maintenance and Software Engineers
- Customer Support Officers
- Maintenance of a network of more than 100 instruments sites in Australia and more than 20 internationally.

STAFF

ESS currently has a staff of 35 persons and we supplement this on a project basis with specialists who work with us as expert consultants.



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meteorological solutions

The Meteorology division supplies the aviation, defense, meteorological agencies, energy and resource sectors with a range of products including: Doppler weather radars, satellite groundstations, data processing stations, message switching systems, atmospheric profiling systems and automatic weather stations. ESS is experienced in meteorological system integration for infrastructure upgrades.

HISTORY

ESS has supplied EEC weather radars to the Australian Bureau of Meteorology since 1991. Its current supply contract extends to 2015. These radars form almost the Bureau's entire national network and are used for the provision of aviation services in Australia. ESS operates a radar maintenance facility at its Melbourne factory for the Bureau.

ESS has also supplied all of the meteorological satellite tracking stations operated by the Bureau in Australia and the Antarctic.

ESS has undertaken installations and servicing of its radar and satellite systems in Australia and in more than 20 countries in Asia and the Pacific.

PROJECTS

ESS has designed, installed, commissioned and integrated meteorological systems in Australia, and other countries including: Samoa, Hong Kong, China, Taiwan, Indonesia, Malaysia, India, Bangladesh and Pakistan.



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environmental water solutions

The Environmental Division caters to all areas of Water Quality Measurement. Unique and robust, ESS manufactured sensors come with a standard 3 year warranty - a testament to their proven record of reliability and durability. We specialise in instrumentation designed for monitoring water level, salinity, turbidity of various inland rivers, dams and lakes, servicing a large sector of the hydrological industry.

GROUNDWATER MONITORING

ESS instrumentation meets water authority standards for groundwater monitoring. Instrumentation for depth measurement and condition monitoring of borehole wells include dipmeters (up to 300 metres) and borehole cameras (up to depths of 650 metres).

SENSORS

ESS Sensors have been designed to meet the industry requirements. Electrical Conductivity sensors (models 1500 and the new 1600) provide Conductivity and Temperature readings in one sensor for monitoring salinity. The 1500 is also upgradable from standard analogue 4-20mA output to SDI -12 digital outputs (model 1500S). The new 1600 is unique in the industry in providing auto-ranging sensing from 0-100,000µS/cm with high resolution and accuracy across the entire range.

Turbidity sensors (model 2600) maintain a high standard of engineering excellence. Our unique use of a flapper and IR measurement has proven to be extremely reliable, with less maintenance required in comparison to alternative products. ESS 2600 turbidity sensors are also upgradable from analogue (4-20mA) to digital (SDI-12) at a fraction of the cost of a new sensor.

WATER LEVEL INSTRUMENTATION

Water Level instrumentation such as bubbler systems are conducive to both remote and built up areas, rivers, creeks, dams, channels and manufactured drains.

The LevelPro 6100 is self-supportive and easy to install using a gas bottle (nitrogen or compressed air). The bubbler tube provides an equilibrium of pressure which then converts that pressure reading into a level reading.

The PumpPro 6150 incorporates its own compressor, is easily installed in the field, and requires minimum maintenance.

TIDE & LEVEL MONITORING

Tide and water level monitoring systems are available for ports and coastal regions, as well as rivers and creeks that are subject to fast rising waters. Systems are mounted to structures such as bridges and piers to monitor levels with reasonable accuracy.

CUSTOM WATER MONITORING STATIONS

Customised water monitoring stations incorporating ESS instrumentation are also available. Options include:

- Data collection via the monitoring systems to provide real time data collection with memory storage capability.
- GPS systems for real time stamping and location. The GPS serves a dual purpose providing real time data and monitoring of location which can alert the central control to theft or vandalism.
- Modern communications available include radio, 3G and satellite subject to individual suitability and price.

AGENCY PRODUCTS

Agency products sourced by ESS provide a range of additional products to complement ESS products and deliver solutions to a range of clients' needs. Complete turn-key systems are available for flow, dissolved oxygen, pH, temperature and contaminant measurements, borehole cameras, ultrasonic leak detection sensors, solar radiation sensors, and other weather station instrumentation.

MAJOR PROJECTS

Major projects have been successfully installed around the world, working with industry alliance partners and in Government aid projects in Vietnam, Fiji, New Zealand and PNG to name a few.



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geotechnical solutions

The Geotechnical division supplies structural, hydrological and seismic instruments to the civil, construction and mining industries for a wide variety of projects including monitoring of highways, dams, tunnels, airports, bridges, batter slopes, mines, etc.

Our team of experienced professionals can assist in training, installations, supervision, troubleshooting and the engineering of customized solutions.

HISTORY

In 2002 ESS acquired the businesses of Mindata Australia and the Seismology Research Centre (SRC) and integrated these into our expanded operations. This has opened up new opportunities and enables us to satisfy a broader range of needs from our customers.

Mindata is a manufacturer of high quality sensors for the water monitoring industry and has customers in Australia and South East Asia. Mindata has another division specializing in the supply of equipment for rock stress measurement in mining and civil engineering. The Seismology Research Centre is primarily involved with developing equipment and systems to measure and analyse earthquakes. The SRC has developed a system to notify clients after moderate and large earthquakes. The SRC also provides seismicity reviews for major engineering projects.

In 2007 ESS acquired the business of Geosystems Australia who commenced manufacturing in 1984 and has grown to be one of the largest suppliers of geotechnical instrumentation in Australia.

Through acquisition ESS is the largest geotechnical instrumentation supplier in Australia with numerous representative offices throughout the world.

PROJECTS

ESS capabilities include supply, installation and commissioning of instrumentation and monitoring equipment for a variety of projects such as:

DAMS

Earthfill/ Concrete / Rockfill

Instrumentation and datalogging equipment to monitor pore water pressure, uplift water pressures, seepage flows, water level, vertical settlement, lateral displacement, joint/crack movements, earth pressures, temperature and seismic vibrations.

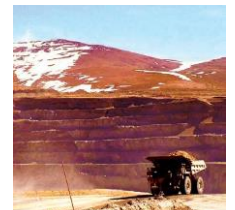
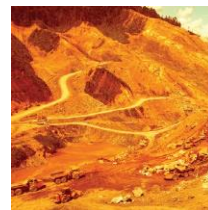
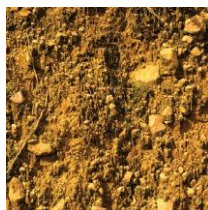
MAJOR PROJECTS

GEOTECHNICAL

Merrimu Reservoir Dam
Wartook Reservoir 1999
Lake Eppalock 2000
Eildon Reservoir 1999
Kinta Dam Malaysia 2004
Bakun Dam Malaysia 2005
Cobarra Dam NSW 2001
Milbrook Dam 2007

SEISMIC

Warragamba & Cataract Dams, NSW
Pindari, Keepit, Glenbawn, Chaffey, Hume & Burrinjuck Dams, NSW
Canning Dam , WA
Thomson, Dartmouth and Upper Yarra Dams, VIC
Hinze, Beenleigh and Awoonga Dams, Qld
Bajna Basta, Serbia
Bakun Dam, Malaysia
Manila and Mindanao dams, Philippines
National hydro power dams, India



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TUNNELS & UNDERGROUND STRUCTURES

MAJOR PROJECTS

Instrumentation and datalogging equipment to monitor convergence movements, loads on rock anchors, stresses on shotcrete walls, earth pressure, concrete strains, joint/crack movements, tilt/inclination, vibrations and seepage.

GEOTECHNICAL

North South Tunnel Brisbane
Eraring Power Station
Burnley Tunnel
Peabody Coal
Port Botany Elgas underground LPG tank monitoring vibration monitoring
Milbrook Dam

OPENCUT & UNDERGROUND MINING

MAJOR PROJECTS

Instrumentation to monitor slope stability (pore water pressure, tilt/inclination, lateral displacement, crack/joint movement), underground movements, in-situ rock stresses, convergence movements, loads on rock anchors, failure warning alarm systems.

GEOTECHNICAL

Olympic Dam SA
Sunrise Dam WA
Challenger WA
X Strata MIM QLD
North Parkes Mine NSW
Leinster Nickel Operation
Argyle stress measurement
Argyle tailings dam vibration monitoring

ROADS, AIRPORTS & Other Earth Structures Involving Preloading

MAJOR PROJECTS

Instrumentation and datalogging equipment to monitor pore water pressure, settlement (surface and underground), lateral displacement, earth pressure and temperature.

GEOTECHNICAL

NCIG Newcastle Coal
Thiess
ABIGroup contractors Tugan Bypass

SEISMIC

Kuranda Railway, Cairns

OTHER PROJECTS

Structural Monitoring (eg bridges, concrete structures) – stress, strain, angular tilt, crack/joint movement, temperature, settlement and datalogging.

St Johns Cathedral Brisbane
Malthouse Theatre
Parliament House
Pluto Project Gas Storage
Grand Prix track compaction, Melbourne
Tasma Terrace demolition monitoring
Mt Eliza slope stability investigation
Environmental Monitoring – Temperature, dissolved oxygen, conductivity, pH, salinity, total dissolved solids.
Hydrological/Meteorological - River water levels, temperature, flow rates, rainfall, atmospheric pressure.
Deep Excavations and Retaining Walls - Lateral displacement, earth pressure, tilt/inclination, loads on struts & rock anchors, heave, settlement, pore-water pressure, automatic datalogging, early warning alarm systems.



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seismology solutions

The ESS Seismology Research Centre operates a network of around 100 seismographs and accelerographs in eastern Australia, and locates about 400 earthquakes within the network on average each year. Most of these earthquakes are too small or too deep to be felt, but they do provide information on relative levels of earthquake activity, and permit the delineation of active faults. Most of the instruments are operated for owners of large dams, power stations or other structures, with the SRC providing routine operation and maintenance, replay and analysis of data, and preparation of routine reports.

The recorders are triggered and continuously recording digital instruments, and emphasis has been placed on using a wide dynamic range so that both small and large local earthquakes can be recorded without the instruments going to full scale. They are optimised to measure higher frequency seismic waves than are normally recorded by regional seismographs. This gives more detailed records of local earthquakes by reducing out the low frequency motion from large distant earthquakes and micro seismic noise.

Data from most of the recorders are telemetered continuously to the Centre, and where a preliminary automatic analysis is performed, SMS messages are then used to alert staff within minutes, after larger earthquakes are recorded.

A number of portable recorders are used for special projects such as recording blasts, the vibration response of structures, or for installation in the epicentral area of larger earthquakes to allow precise location of aftershocks. Portable instruments have been installed following the Tennant Creek earthquakes of January 1988, the earthquakes near Newcastle in December 1989 and August 1994, and the earthquakes near Korumburra in 2009.

Digital recordings require extensive analysis to derive accurate earthquake information. Computer programs have been developed for the replay and analysis of seismograms, determination of earthquake location, magnitude and mechanism, support of a computer based earthquake catalogue, determination of the structure of the earth, calculation of earthquake ground motion recurrence and the response of structures to this motion, and production of synthetic accelerograms for design purposes at particular locations.

HISTORY

The Seismology Research Centre (SRC) was established at Preston Institute of Technology in 1976. The Institute was renamed Phillip Institute of Technology a few years later, and during 1992 was amalgamated into the RMIT University. In mid 1998 the Seismology Research Centre was acquired by a private company which has since been taken over by Environmental Systems & Services (ESS). Equipment and software manufacture and design and seismic network operation continue and the research work in the application of earthquake seismology to geological and engineering problems now come under our earthquake hazard consulting division.

The Centre has developed several generations of digital seismograph equipment since 1977. The Kelunji digital seismograph has been designed and manufactured within the Centre, and hundreds of recorders are now operating throughout Australia, India, Germany, the Philippines, China, Fiji, Malaysia, Pakistan, Papua New Guinea, Myanmar and other countries around the world.

CONSULTING

The Centre has been involved in earthquake hazard estimation for many major engineering projects, especially large dams in Australia, the Pacific Islands, Asia, the Middle East and Africa.

The following consulting services are provided:

- Earthquake hazard evaluation using ground motion recurrence statistics, the most useful form being a series of spectra corresponding to ground motion for a range of return periods.
- Measurement of dynamic properties of a structure, including natural frequencies and damping at low strain, by measurement of its response to earthquakes, artificially generated motion, or ambient motion.
- Calculation of spectrally scaled or matched accelerograms for use in time series analysis methods for design of structures.



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SEISMOLOGICAL PROJECTS

Major seismic network projects have been conducted by SRC for the following organisations:

WATER AUTHORITIES

- Melbourne Water, including operation of seismograph network and alarm service about the Sugarloaf, Thomson and Upper Yarra Dams, VIC.
- Goulburn-Murray Water, including operation of seismograph network and alarm service around Lake Eildon, Goulburn Weir, and approximately 16 other water storages throughout Victoria.
- Southern Rural Water, including operation of seismograph network and alarm service around Yallourn Weir, Glenmaggie Dam, Blue Rock Dam and approximately 7 other water storages.
- SMEC Victoria and previously the Rural Water Commission of Victoria, including operation of seismograph networks about the Dartmouth Dam and about dams in Western Victoria.
- Snowy Mountains Engineering Corporation, including earthquake hazard analysis for dams in Papua New Guinea, Indonesia, Thailand, Laos, Nepal and the Philippines.
- Sydney Water, including the operation of an extensive seismograph network south and west of Sydney, NSW.
- NSW Dept. of Land & Water Conservation, including operation of seismograph networks about Hume, Burrinjuck and northern NSW dams.
- Gladstone Area Water Board, including operation of seismograph network about East End Reservoir, Gladstone Water Treatment Plant and Awoonga Reservoir in Gladstone, QLD.
- Cradle Mountain Water Authority, including operation of seismograph network about Lake Mikany and Lake Isandula in northwest Tasmania.
- Southern Water, including operation of seismograph network about all the domestic water supply storages for Hobart, Tasmania.
- Hydro Tasmania, including operation of seismograph network about approximately 40 water storages throughout Tasmania.
- QLD State Government, including a comprehensive seismograph network to monitor earthquake activity throughout eastern Queensland for water supply storages, roads, bridges and other infrastructure.
- Actew AGL, including operation of seismograph network about Corin Dam, Cotter Dam and Googong Reservoir – domestic water supply storage for Canberra, ACT.

POWER STATIONS & RAIL COMPANIES

- International Power, including operation of a network of seismographs about Hazelwood Power Station, in the Latrobe Valley, VIC.
- Loy Yang Power, including operation of a network of seismographs about Loy Yang Power Station and Yallourn Power Station, in the Latrobe Valley, VIC.
- ANSTO, including monitoring of seismic activity about the Nuclear Reactor at Lucas Heights, NSW.
- NSW Rail, monitoring of seismic activity about the Stanwell Park Viaduct, NSW.

MINING & MICROSEISMIC

- Bougainville Copper Limited, including installation of a seismograph network on Bougainville
- Island and analysis of data.
- Mineral Resources Department of Fiji, including installation of a seismograph and accelerograph network, and an earthquake alarm system.
- Global Seismic Solutions, supplied blast monitoring equipment and software, also onsite training in Auckland, New Zealand
- Defence, Science and Technology Organisation, QLD, worked with them on a seismic monitoring solution for their seismic monitoring application. Worked out solution and they hired equipment to test theory, and then afterwards purchased the equipment for future use.
- CSIRO provided a solution for multi-channel monitoring of boreholes – achieved synchronous, telemetered recordings of multiple depth points in multiple boreholes, using 12 channel, tri-axial borehole sensors, in Brisbane, QLD.
- Orica, developed a blast monitoring system to suite their requirements - for temporary blast monitoring and quarry modelling, velocity and attenuation models of quarry throughout Orica mining operations.
- Newcrest, Installation of a strong motion monitoring network of recorders and data server.



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SEISMOLOGICAL PROJECTS

AFTERSHOCK NETWORKS

- SRC Research and Development, Tennant Creek, NT, January 1988
- SRC Research and Development, Newcastle, NSW, December 1989 and August 1994
- SRC Research and Development, Eugowra, NSW, August 1994
- SRC Research and Development, Bradford Hills Earthquake Swarm, VIC, April 1991
- SRC Research and Development, Thomson Reservoir event, VIC October 1996
- SRC Research and Development joint with Geoscience Australia, Collier Bay, WA, August 1997
- SRC Research and Development, Ellalong, NSW, June 1994
- Victorian Water Authorities, Korumburra, VIC March 2009

HAZARD CONSULTING

Major hazard consulting projects that have been conducted over the last few years:

INTERNATIONAL

- Tailings Dam
- Ulu Jelai Project, Malaysia
- Tsagaan Suvarga Facility, Mongolia
- Hela Hydroelectricity Project, Papua New Guinea
- Dareh Alou Project, Iran
- Nowchun and Darehzar, Iran
- Tina River, Solomon Islands
- Lihir, Papua New Guinea

NATIONAL

- Cotter Dam, Australian Capital Territory
- Rasp Mine Broken Hill, Bega Valley, Muswellbrook and Tillegra Dams, New South Wales
- Gove Peninsula, Northern Territory
- Connors River, Dugald River, Ibis and Nathan Dams and Callide Power Station, Queensland
- Middle River Dam and New Royal Adelaide Hospital, South Australia
- Eildon, Frankston, Hazelwood, Malmsbury and Musical Gully Dams, Stawell Gold Mine, and Desalination Plant Wonthaggi, Victoria
- Abadi Field, North West Shelf, Western Australia
- Wheatstone Field, North West Shelf, Western Australia

RESOURCES

The Seismology Research Centre has a dedicated staff of eight seismologists, and other ESS resources are used for electronics hardware design, assembly and maintenance, and software development. It has an extensive network of computers using a variety of operating systems. The Centre owns and operates vehicles for field surveys and network maintenance.



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