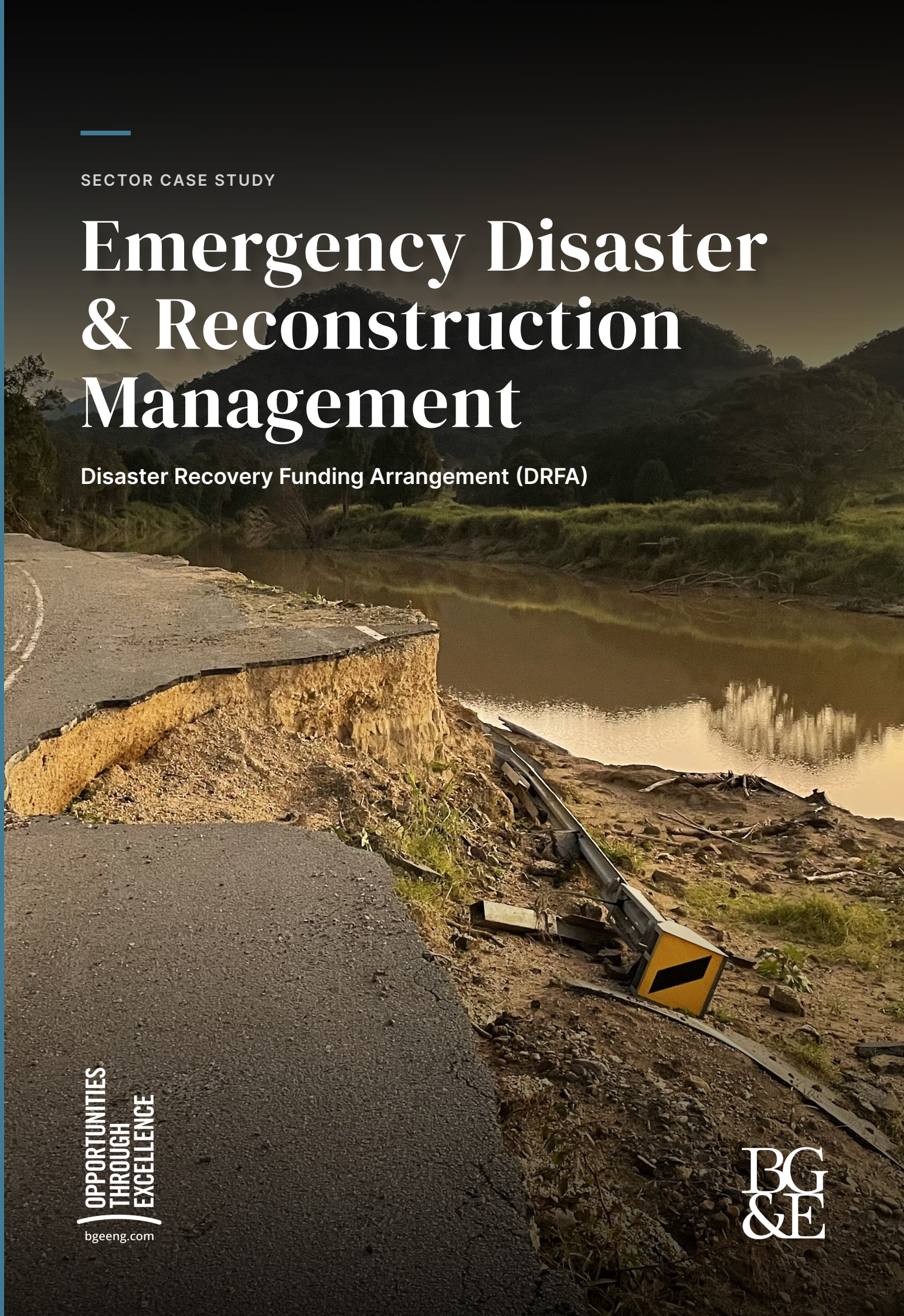
SECTOR CASE STUDY

Emergency Disaster & Reconstruction Management

Disaster Recovery Funding Arrangement (DRFA)



OPPORTUNITIES THROUGH EXCELLENCE

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ARGN 1012

NSW Severe Weather & Flooding, 2022

TWEED SHIRE COUNCIL, NSW, AUSTRALIA
CLIENT: CIVIL MINING & CONSTRUCTION PTY LTD (CMC)

In February 2022, Tweed Heads, located on the Nothern Rivers Region of the NSW Coast, witnessed the worst recorded flood in the region's history, receiving over 1000 millimetres in 48 hours. The local road network connecting Murwillumbah to Uki sustained significant damage due to flooding of the Tweed River.

In late 2023, the contract was awarded by Tweed Shire Council to begin restoration of Kyogle Road and Mount Warning Road.

BG&E was engaged by CMC as the Lead Consultant to restore four significant landslips - three along Kyogle Road and one along Mount Warning Road. The total restoration of the project is valued at approximately $40 million.

The project involved the preparation of 30% concept designs to progress the Early Contractor Involvement (ECI) for eight significant damage sites in Tweed Shire Council's (TCSs) Local Government Area (LGA). CMC were successfully awarded four sites based on BG&E's concepts, to progress to detailed design.

As of 2024, these road restoration works are in progress, with riverbank rehabilitation works being undertaken by the Tweed Shire Council's Coast and Waterways team.

BG&E collaborated with Tweed Shire Council in adopting the same rehabilitation (soft) treatments to achieve a homogenous and integrated solution.

The successful inclusion of the 'soft treatment' addressed the environmental and ecological criteria, resulting in obtaining timely statutory approvals to enable construction.

The reconstruction scope included:

- Up to six metre high gabion retaining walls over hundreds of metres at each site.
- Guardrails to protect motor vehicle users.
- Rock backfill with earth anchors to stabilise the slopes.
- Concrete cut-off wall to protect the road pavement from scour.
- Boulders with timber pin rows (soft treatments) to naturally resolve the downstream impact of a gabion structure.

BG&E was requested to complete concept designs for a further six major sites as a variation to the ECI. The early design work included the scope to repair the Mount Warning Bridge. The proposed construction will permanently replace the missing concrete span, currently substituted with a temporary timber deck, and address various other repairs needed for the bridge.

The eligible detailed design solutions developed by BG&E delivered a saving of over $1 million from the total outturn costs and significantly shortened the construction program. This is behind BG&E's design philosophy to reduce impacts and long-term disruption to local communities and road users.

Severe Weather & Flooding, 2022 - Tweed Heads, NSW, Australia.

ARGN 1012

NSW Severe Weather & Flooding, 2022

RICHMOND VALLEY COUNCIL, NSW, AUSTRALIA
CLIENT: CIVIL MINING & CONSTRUCTION PTY LTD (CMC)

Naughton's Gap Road suffered significant damage as a consequence of recurrent extreme rainfall events which triggered a 280 metre landslide. The extents of damage prompted Richmond Valley Council (RVC) to close the road due to safety concerns and loss of road asset functionality.

Naughtons Gap Road provides a critical community function as the main connecting road between the townships of Casino, North Casino, and other key roads such as Bentley and Kyogle Roads in the north, leading to large townships such as Lismore.

Severe Weather & Flooding, 2022 -
Richmond Valley, NSW, Australia.

Richmond Valley Council, in conjunction with Transport for NSW (TfNSW), took decisive action by formulating the initial eligibility concept. The project aimed to create a design adhering to current NSW disaster relief guidelines and deliver construction-ready specifications for required treatments. These treatments were designed to restore Naughtons Gap Road to its pre-disaster state and improve its design life capacity to deal with heavy rainfall events and suboptimal ground conditions.

The scope of works for the Naughtons Gap Road landslip included:

- Construction of a bored pile wall with 900 millimetre and 1050 millimetre diameter piles and 1550 millimetre wide by 650 millimetre deep capping beam, and reinstatement of downslope batter earthworks.
- Reinstatement of road safety barriers.
- Reinstatement of table drains and road and pavement drainage, including a slight realignment of the road to avoid partial property resumptions and minimise impacts from temporary construction works.
- Reinstatement of drainage culverts with additional pits and kerbed outlets to capture surface drainage via dish gutters for erosion prevention behind piled walls.
- Pavement reconstruction.
- Reinstatement of existing PUP services.

BG&E's solution encompasses a comprehensive approach, integrating safety in design principles throughout the project's lifecycle - including construction, operation, and maintenance phases.

Our methodology involves a study of design elements to proactively identify and address complete eligibility workplace health and safety considerations. Additionally, environmental sustainability, constructability, and operational maintenance aspects have been incorporated into our design framework.

ARGN 1012

NSW Hampton Downslope Remediation Temporary Works & Geological Mapping, 2023

BLUE MOUNTAINS, NSW, AUSTRALIA
CLIENT: MCILWAIN CIVIL ENGINEERING PTY LTD.

The excavation and drilling works at Jenolan Caves Road, Hampton involved a multi-stage program occurring at two sites, with excavators sequentially excavating benches and installing rows of soil nails. McIlwain engaged BG&E to conduct lift studies, geological mapping and certification - essential components of the temporary works required to restore the road asset.

Due to the slope's sensitivity, the surcharge loads from excavators needed approval from the geotechnical consultant to ensure safe operations. The allowable loads varied depending on the project stage, as the slope was progressively stabilised with each row of soil nails installed.

BG&E's construction engineering team classified the construction staging into a series of lift cases, characterised by the model and configuration of the excavator used and the reach and arm loading required for the activity for that stage.

BG&E developed in-house tools to rapidly undertake the lift studies, allowing for the assessment of ground loading for every combination of construction activity and excavator required by the contractor, who utilised varying sizes of excavators as the works progressed - easing loading constraints and increasing reach requirements. It also enabled us to quickly respond to changes in the availability of plant and assess loads from alternative machines as required by the contractor.

In addition to the temporary works for the Hampton Downslope Remediation project, BG&E's commission encompassed geotechnical soil nail inspections and geological mapping, ensuring comprehensive stabilisation and recovery efforts in the affected area.

Works & Geological Mapping , 2023 - Blue Mountains, NSW, Australia.

ARGN 1044

WA Ex-Tropical Cyclone Ellie & Associated Flooding, 2022

KIMBERLEY, WA, AUSTRALIA
CLIENT: MAIN ROADS WA

Flooding generated by Ex-Tropical Cyclone Ellie between December 2022 and January 2023 caused significant damage to the sections of Great Northern Highway at Willare Crossing and Fitzroy Crossing in the Kimberley region of WA.

At Fitzroy Crossing, the Fitzroy River Bridge was significantly damaged along with 500 metres of road - cutting access to Indigenous communities and other key stakeholders east of the Fitzroy River as well as the East Kimberley and Northern Territory.

As a part of the Fitzroy Bridge Alliance with Georgiou and BMD Group, BG&E adopted a streamlined and focused approach to restoring this critical link. BG&E provided bridge design services for the Fitzroy River Bridge replacement project, which included:

- Constructing a new two-lane bridge over the Fitzroy River.
- Integrating a pedestrian pathway.
- Reconstructing bridge approaches.
- Implementing flood and scour protection.
- Managing the protection and relocation of utility services.
- Flood modelling and hydrology.

In December 2023 the New Fitzroy River Bridge officially opened to traffic, more than six months ahead of schedule, marking the official reconnection of East and West Kimberley.

This project is set to have a lasting and sustainable legacy for the community surrounding Fitzroy Crossing - reconnecting East and West Kimberley and creating skills development and economic opportunities.

DRFA 21J

Southern QLD Extreme Weather Event Reconstruction Works, 2021

MULTIPLE SITES ACROSS SOUTHERN QLD, AUSTRALIA
CLIENT: DEPARTMENT OF TRANSPORT & MAIN ROADS, SOUTH COAST REGION, QLD

In response to the declared disaster event Southeast QLD Coastal Trough, 21-24 March 2021 (Event 21J), assistance was activated for City of Gold Coast, Scenic Rim Regional and Logan City Local Government Authorities LGAs.

Based on inspections of state-controlled roads, it was found that the intense rainfall during Event 21J caused damage to pavements, batter slopes, drainage culverts, and other road infrastructure at over 500 locations across more than 30 state-controlled roads within the three LGAs.

The scope of works included:

- Carrying out emergency phase investigations and providing advice for repairs.
- Recommendations for eligible reconstruction works.
- Geotechnical advice for major sites, including slope risk assessments.
- Prepare options analysis reports, including multi criteria assessments for all major sites.
- Completing both preliminary and detailed designs for three packages (one for each LGA), encompassing all eligible solutions.
- Compiling a set of construction contract documents to establish the Construction Contract (TIC-CO).

Extreme Weather Event Reconstruction Works, 2021 - Southern QLD, Australia.

DRFA 22A, 22F & 22I

Southern QLD Flood Reconstruction Works, 2022

MULTIPLE SITES ACROSS SOUTHERN QLD, AUSTRALIA
CLIENT: DEPARTMENT OF TRANSPORT & MAIN ROADS, SOUTH COAST REGION, QLD

In 2022, Southern QLD experienced multiple instances of heavy rainfall and flooding, resulting in extensive damage on 41 road assets across three Local Government Areas (LGAs), namely **City of Gold Coast, Scenic Rim Regional and Logan City.** This damage included major landslips, widespread pavement damage, and scour erosion around bridges and culverts.

BG&E played a crucial role in aiding TMR to deliver deliver this DRFA program, following three consecutive disaster events (22A, 22F and 22I) from January to May 2022. The events had a significant adverse impact on the three LGAs within the South Coast Region.

The scope of works was delivered in two concurrent packages. BG&E's assistance included:

- Immediate Reconstruction Works (IRW): complete reference designs, final designs, TMR annexures, SiD and undertaking construction phase support activities for 29 critical sites in Scenic Rim Regional Council LGA. The final design scope is to be constructed under two separate and bespoke emergency construction contracts.
- Construction Contract (TIC-CO): complete preliminary design, detail design, contract documentation, and reporting separated into three LGA Packages containing over 800 sites comprising detailed design of eligible solutions delivered in the form of contract documents.
- Conducting thorough site inspections to assess the extent of damage.
- Determining eligibility for recovery assistance.
- Meticulously analysing treatment options via multi-criteria assessments.
- Developing preferred concept designs, reference design and final designs.
- Preparing and submitting the necessary documentation for endorsement and cost estimation.
- Preparing for the Principal's endorsement and submitting "Phase 1 – REPA forms" with initial BoQ cost estimates (P50) for each site.

BG&E maintained a high level of resilience in delivering the program through to construction phase support under tight timeframes. The technical quality, high degree of damage assessment and treatment optioneering was able to achieve value for money and full eligibility for the entire program. BG&E's proactive approach has been pivotal in aiding recovery efforts in these affected LGAs.

Flood Reconstruction Works, 2022 - Southern QLD, Australia.

DRFA 23C

Southern QLD Flood Reconstruction Works, 2023

MULTIPLE SITES ACROSS SOUTHERN QLD, AUSTRALIA
CLIENT: DEPARTMENT OF TRANSPORT & MAIN ROADS, SOUTH COAST REGION, QLD

South East QLD experienced extreme rainfall from the 22nd to 23rd of September 2022 (Event 23C). Event 23C caused extensive flooding and landslips adjacent to Department of Transport and Main Roads (TMR) assets, resulting in damage across two Local Government Areas, namely Gold Coast City Council and Scenic Rim Regional Council. This damage included major landslips, widespread pavement issues, and erosion around bridges and culverts.

The aim of the project project was to secure eligible funding under the DRFA program led by the Queensland Reconstruction Authority.

BG&E played a crucial role in aiding TMR with funding submissions and preliminary and detailed design following Event 23C across 43 separate site locations.

BG&E's engagement included:

- Conducting thorough site inspections to assess the extent of damage because of Event 23C.
- Determining eligibility for recovery assistance using DRFA guidelines.
- Analysing treatment options with civil, hydraulic, and geotechnical engineers.

- Assessing any environmental impacts to ensure minimal disturbance to known flora and fauna species.
- Preparing and submitting the necessary documentation for endorsement and cost estimation.
- Developing the Issue for Construction (IFC) documentation.

Each of the 43 damage sites went through multiple gates of assessment starting from designation of a geotechnical or civil site. For geotechnical sites they're based on the Slope Risk Assessment (SRA) and Assessed Risk Level (ARL) undertaken by the geotechnical team. The civil sites are assessed in accordance with the DRFA Eligibility Guidelines as well as the functionality of the site.

The project involved 43 sites in total including 17 major sites, 12 minor sites and 14 road maintenance sites. Major sites are complex and typically involve an engineered solution that is non-standard and site specific. Minor sites and road maintenance sites are relatively standard in nature and vary from pothole repairs to silt and debris cleaning around culverts, scaling and revegetation of scoured batters

The technical quality, high degree of damage assessment and treatment optioneering was able to achieve value for money and full eligibility. BG&E's proactive approach has been pivotal in aiding recovery efforts in these affected regions.

Flood Reconstruction Works, 2023 - Southern QLD, Australia.

At BG&E, we are united by a common purpose – we believe that truly great engineering takes curiosity, bravery and trust, and is the key to creating extraordinary built environments.

Our team of more than 1100 highly skilled people, in offices across Australia, New Zealand, Singapore, the United Kingdom and Middle East, design and deliver engineering solutions for Clients in the Property, Transport, Ports and Marine, Water, Defence, Energy and Resources sectors.

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