G&P DIGEST

Newsletter of G&P Professionals Group

Issue 2 - February 2011

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ACEM (Association of Consulting Engineers M'sia) GOLD AWARD OF SPECIAL MERIT 2010

SG. DAMANSARA FLOOD MITIGATION PROJECT - PACKAGE 1

This project is a design and build flood mitigation project for the lower reaches of Sg Damansara, commissioned by the Government of Malaysia through Jabatan Pengairan dan Saliran Malaysia (JPS) under the Ninth Malaysia Plan. Wijaya Baru Sdn Bhd was assigned as the Design and Build contractor for this project. The project commenced on 6th August 2007 was successfully completed in August 2009.

INTRODUCTION

Jabatan Pengairan dan Saliran Malaysia (JPS) has specified that the main emphasis of the Project is to provide adequate protection from the 100 years ARI overbank flooding at six important areas within the Sg Damansara catchment, which were frequently flooded in the past .

Priority was given to Taman TTDI Jaya, NKVE Highway, Section 13 Shah Alam, Batu Tiga at the Federal Highway and KTMB Railway, Taman Mesra and Kampung Melayu Kebun Bunga.

Besides the protection from overbank flooding, four low lying areas along the river were also identified for additional flood protection works by JPS, namely Taman Saujana Indah, TTDI Jaya, Taman Mesra and Kampung Melayu Kebun Bunga. These areas were susceptible to flooding due to their existing low platform levels (lower than surrounding catchments) and internal drainage levels.

The Project consists of the following flood mitigation works (see Figure 1 for Project Layout):

(i) Construction of the RRIM, Subang Airport East (SAE) and Subang Airport South (SAS) flood detention

(ii) Removal of bridge constrictions along Sg Damansara from its confluence with Sg Klang to Taman Saujana Indah.

(iii) River protection works for six critical areas which include earth bund, culvert, pumping station, RC flood wall at TTDI Jaya, etc.

G&P's ACHIEVEMENTS

G&P has set new industry practice for flood investigation and design:

(i) LiDAR survey to assist flood mitigation design

(ii) 2-D Hydrodynamic Computer Simulation for flood design

In order to overcome space contraint and construction difficulties at site, G&P also introduced new technologies for design and construction:

(i) Confined Head-Room Sheet Piling (under bridges)

(ii) Disconnected Piles for Inlet Structures

(iii) Developed real-time flood warning system for construction team

LiDAR

Light detection and ranging (LiDAR) survey is an airborne laser terrain mapping technology. It measures the altitude accurately using a precise laser rangefinder.

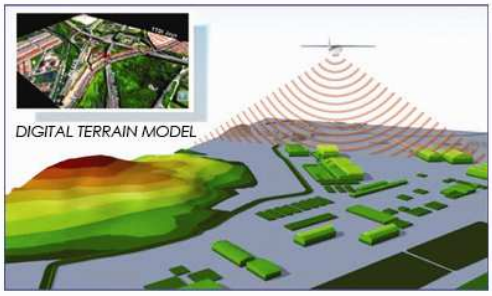


Figure 2 : LiDAR and DTM in Hdryodynamic Modelling

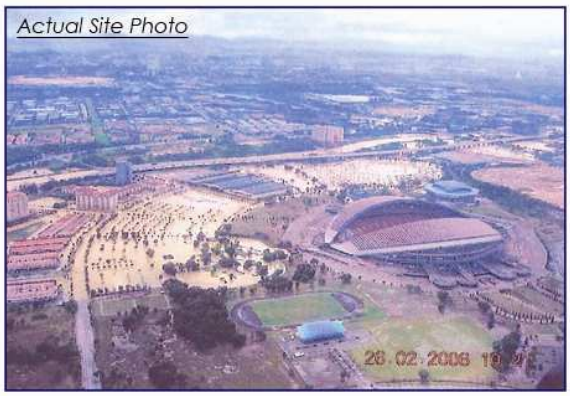
Digitial Terrain Model (DTM) with a grid of 1m x 1m or less and a vertical accuracy of ±0.15m can be established rapidly for 2D modelling. In short, the use of LiDAR generated DTM allows engineers to carry out catchment studies and river modelling in a more holistic approach with greater depths and accuracy (see Figure 2).

2-D HYDRODYNAMIC MODELLING

This project utilized the latest engineering technologies to pioneer the application of 2-D flood plain modeling in Malaysia. By accurately reproducing the flooding phenomenon in the Damansara catchment, flood mitigation options could be tested, compared and finally adopted.

Figure 3 shows a 3-D visual of a typical output from a MIKE FLOOD 2-D model simulation compared with the actual site condition during a flood.

Figure 1 : Overview of Sg. Damansara Flood Mitigation - Package 1



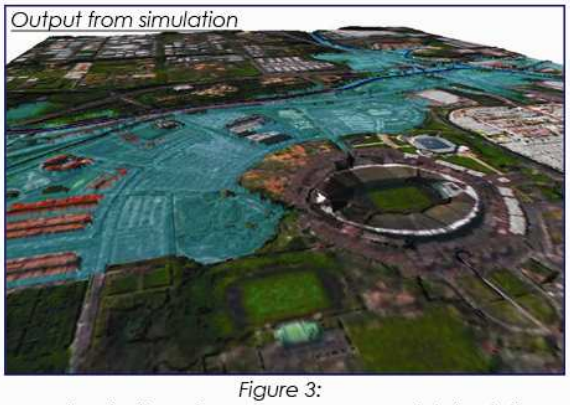


Figure 3:
3-D visualization of MIKE FLOOD 2-D Model Simulation

PROJECT IMPLEMENTATION

In evaluating the proposed flood mitigation works, the following strategies were adopted:

(a) Maximize upstream flood storage (to resolve problem of downstream bridge constrictions) by detention ponds.
(b) Maximize river corridor with minimum land acquisition and resettlement of people.
(c) Earth sections preferred over lined sections wherever possible to be environmental friendly.
(d) Packaging of works to suit Government's allocations, urgency, effectiveness and to avoid repetitive works.
(e) Ease of Operation and Maintenance (O&M) works and low Operating Expenditures (OPEX)

Figure 4: Use of "press-in" sheet piling method

REMOVAL OF BRIDGE CONSTRICTION

Being a heavily urbanized catchment, a total of 33 crossings exist over Sg Damansara connecting trunk roads, expressways and railway lines.

19 out of the 33 existing bridges had very little vertical clearance beneath the bridges, causing overbank flooding even during minor flood events.

Demolition and reconstruction of these bridges were not an option due to traffic disruptions. The potential removal of the constriction within each bridge was determined via hydrodynamic model simulation. The proposed increase in flow area beneath bridges were assessed to improve the flow conditions as a result of the widening works.

Due to the restricted headroom beneath the bridge, new technology from Japan using "press-in" method is utilised to install the sheet pile retaining wall as shown in Figure 4.

FLOOD DETENTION PONDS - DISCONNECTED PILE FOUNDATION

Three flood mitigation ponds were proposed and constructed to detain flood water until the river flood level subsides. The sizing of the pond inlets and outlets were analysed using hydrodynamic model setup.

The foundation design of the inlet structures utilizes an innovative "disconnected" piled raft system as shown in Figure 5 in order to resolve the technical challenge of large lateral force imposed by water pressure onto the inlet structure while at the same time, ensuring cost-effectiveness of the solution.

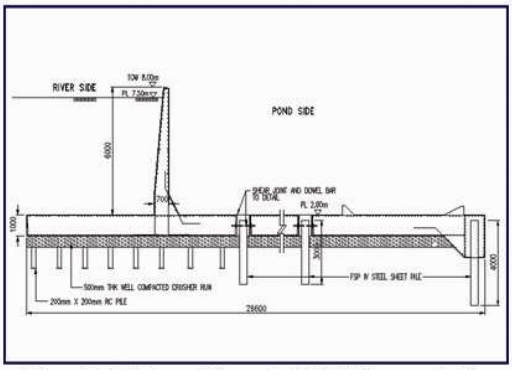


Figure 5: Reinforced Concrete (RC) Wall supported by disconnected pile foundation. Piles are disconnected from inlet base with a layer of 500mm thick crusher run

Conventional Approach	Alternative Approach (Adopted)
- Structurally connected piled foundation	- "Disconnected" piled raft system
- 4619 nos. of piles	- 586 nos. of piles (87% reduction)

Table 1: Comparision between Conventional and Alternative Approach for Pond Foundation

PUBLICATION

The following publications have been made based on the project:

1.) Disconnected pile foundation utilised for the inlet structures presented at the 17th Southeast Asian Geotechnical Conference 2010.
2.) 2-D flood modelling of Sg Damansara, published in the Water Management (162) Proceedings of the Institution of Civil Engineers (ICE), February 2009; as well as at the 2nd International Conference on Managing Rivers in 21st Century, Kuching, Sarawak 2007.

CONCLUSION

A major flood mitigation project has been designed and successfully implemented which has contributed to the advancement of engineering practices and also contributed to the social well-being of the residents along the affected flood plains.

The Gold Award of Special Merit from the Association of Consulting Engineers Malaysia (ACEM)

G&P Professionals Group was awarded the Gold Award of Special Merit for the project at the biennial ACEM Engineering Awards Competition 2010. The award presentation ceremony was held at the ACEM's 47th Anniversary Dinner at the Taming Sari Grand Ballroom, The Royale Chulan, Kuala Lumpur.

MALACCA ARCH BRIDGE DESIGN

The construction of the new arch bridges arcoss Sungai Melaka is part of the Phase 4 - Malacca River Rehabilitation Works joint venture by Jabatan Pengairan and Saliran Malaysia and Majlis Perbandaran Melaka Bersejarah. Up-to-date, four bridges have been completed and open to public.

INTRODUCTION

G&P Geotechnics Sdn Bhd has been engaged by Kejuruteraan Asas Jaya Sdn Bhd to provide alternative design for three (3) vehicular and two (2) pedestrian arch bridges across Sg. Melaka.

In general, arches are excellent structures as demonstrated by existing old buildings and bridges in many countries and they can be classified as
(i) fixed-end arches
(ii) hinged arches or
(iii) mixture of both arches.

An alternative design which is easier for construction and more economical is required due to the following constraints that have limited the use of original design by other consultant:

1. The foundation system cannot be constructed within the original riverbed regime due to UNESCO requirement.
2. The water path cannot be blocked during construction period to allow for water traffic flow (i.e. river cruise)
3. Shallow arch is required to provide a gentle gradient in connecting the existing road and for easy pedestrian crossing.
4. Minimum disturbance and vibration by construction works due to existence of critical and sensitive historical building and exposed TNB cable.

The following three completed arch bridges with some special features are discussed:

1. Kampung Mortern Pedestiran Arch Bridge
2. Hang Tuah Vehicular Bridge
3. Old Bus Pedestrian Bridge

1. KG. MORTERN PEDESTRIAN ARCH BRIDGE

The site has been approved to construct with a low and long span (25m) R.C arch over Sg Melaka for easy pedestrian crossing. Specially made Hume Low Profile Bebo Arch has been used as shown in Figure 2.
The shallow and long span arch would induce huge lateral load and has restricted the adoption of original bridge design which required massive and costly foundation system that has encroached into neighbouring historical buildings.

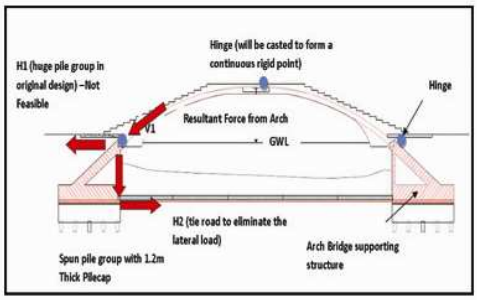


Figure 1 : Bridge Design Concept

Alternative design with horizontal pre-stressing tie cables (beneath the original riverbed) and the bridge structures to be seated on bearing plates have been proposed to eliminate and minimize the transfer of horizontal loads onto the proposed foundation system. (see Figure 1). Significant saving in foundation cost has been achieved as tabulated.

Figure 2 : Launching of Bebo Arch Frame

Conventional Approach	Alternative Approach (Adopted)
- Φ 300mm Spun Pile on both sides	- Φ300mm Spun Pile on both sides with horizontal pre-stressing tie cables

Micro tunnelling has been adopted for installation of horizontal pre-stressing tie cables. The site team had managed to overcome the following site challenges:

a. Serious leakage of river water into abutment cofferdam, by constructing a layer of mass concrete in front of the cofferdam.

b. Existing obstruction beneath the river bed, by re-adjusting the tie cable alignment. Additional tie cable had been added to stabilise the twisting forces due to re-adjusted cable alignments.

c. Very precise control of pre-stressing works in every different construction stages to avoid over-stressing the installed foundation system, etc.

Figure 3: Kampung Mortern Pedestrian Bridge Completed in December 2009

Figure 4: Night View of Kampung Mortern Pedestrian Bridge

2. Hang Tuah Vehicular Bridge

Hang Tuah Vehicular Bridge spans across Sg Melaka in busy town city area. The rise and span of Hang Tuah Bridge is 5.0m and 25.5m respectively. The width of the bridge is 20.2m which comprises 3 traffic lanes and 2 pedestrian walkways.

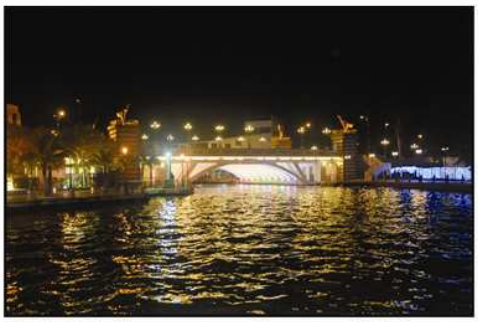


Figure 8: Night view of Hang Tuah Vehicular Bridge

A comparison between the original and alternative approach is tabulated.

Conventional Approach	Alternative Approach (Adopted)
- Φ300mm Spun Pile on both sides - Reinforced Concrete Arch Bridge	- Φ300mm Spun Pile and 200x 200 mm RC pile on both sides - Steel Arch Frame Bridge

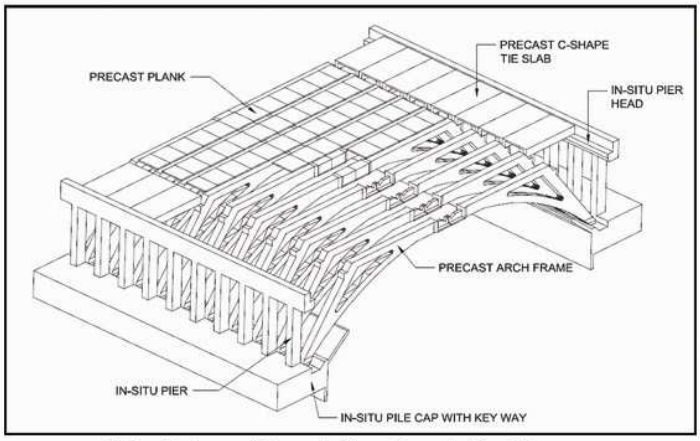


Figure 5: Precast Concrete Open Spandrel Arch Frame

3. Old Bus Station Pedestrian Bridge

The Old Bus Station Bridge requires a large span of 33m long across Sg Melaka and with a higher imposed Dead Load due to Architectural requirement.

Again, due to existence of huge lateral load, an innovative design using passive sheet pile wall acting together with pre-stressed spun piles group has been adopted as shown in Figure 6.

Finite element analysis has been carried out to assess the performance of proposed geotechnical system for various construction stages. A cost optimised and construction friendly system has therefore been achieved.

Conventional Approach	Alternative Approach (Adopted)
- Φ 500mm Spun Pile on both sides	- Φ500mm Spun Pile on both sides with passive sheet pile wall

A good alternative would be a steel frame that can be concealed inside the Architectural treatment. The use of Finite Element Analysis simplified the design of a combined hybrid of Rigid Frame & Truss system which finally satisfied the job requirement. Steel truss system minimise the lateral force, thus reducing the number of piles and avoid piling in river (as shown in Figure 9).

Launching of the long steel bridge frame (see Figure 10) required detailed study on traffic control. A rare large crane (500ton) has been arranged for the installation after midnight due to site constraint.

Figure 10: Steel Arch Frame Upon Launching

Figure 11: Old Bus Station Pedestrian Bridge Completed in January 2010

Figure 12: Night view of Old Bus Pedestrian Bridge

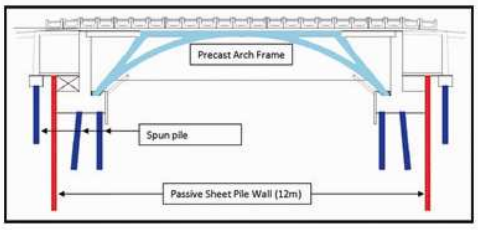


Figure 6: Bridge Design Concept

Figure 7: Hang Tuah Vehicular Bridge completed in December 2010

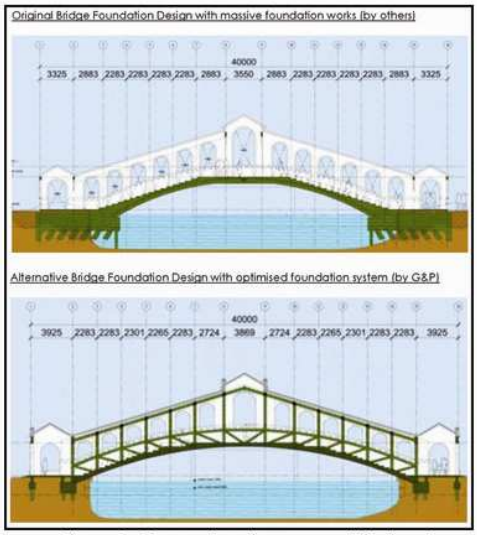


Figure 9: Comparison between original and alternative bridge foundation design

CONCLUSION

Alternative design with significant cost saving on foundation system have been carried out by G&P for the three (3) vehicular and two (2) pedestrian arch bridges across Sg. Melaka.

The construction of the arch bridges post various challenges to both engineers and contractors due to site constraints. Nevertheless, we have managed to overcome the site issues and completed four (4) bridges up to date.

G&P 11th ANNIVERSARY DINNER 2010

A WORD FROM OUR CEO -

Ir. Dr. Gue See Sew:

On 2nd October 2010, we celebrated our 11th year of establishment. This year, we have accomplished various achievements and this could be a good stepping stone for us to move forward into our second decade in engineering consultancy.

I would like to take this opportunity to thank all the G&P partners, directors and staff for your contribution and hard work that have brought us this far. I hope that together, we can keep up the good work, keep abreast with the latest development in the engineering industry, keep improving, and finally accomplish more success and achievements in the future.

THANK YOU.

NEWS FLASH @ G&P

17th SEAGC '10
The Seventeenth South East Asian Geotechnical Conference

Ir. Tan Yean Chin, Ir. Liew Shaw Shong, Ir. Chow Chee Meng and Ir. Lee Peir Tien attended the 17th SEAGC at Taipei, Taiwan from 10th to 13th May 2010 and presented a total of nine (9) papers.

All the publications are available for download from G&P official website at: http://www.gnpgeo.com.my/publication.asp

The conference was a good venue for G&P's delegates to exchange engineering ideas & views and at the same time provide networking opportunities.




1. SEAGC Group Photo
2. Ir. Liew Shaw Shong
3. Ir. Tan Yean Chin
4. Ir. Chow Chee Meng

G&P'S AWARDS & RECOGNITIONS

Federation of Engineering Institutions of Asia and the Pacific (FEIAP)
- Engineer of the Year 2010 Award.

Founder & CEO of G&P Professionals Group, Ir. Prof. Dr. Gue See Sew was awarded (FEIAP) Engineer of the Year 2010 Award. The award presentation was held at the FEIAP Dinner & Awards Night at Hotel Melia, Hanoi, Vietnam.

FEIAP Dinner & Awards Night at Hotel Melia, Hanoi, Vietnam

BOARD OF ENGINEERS (BEM), MALAYSIA

Director of G&P Geotechnics Sdn Bhd, Ir. Tan Yean Chin has been re-appointed by the Minister of Works, Malaysia as Board Member of the Board of Engineers, Malaysia (BEM) for the year 2010 – 2012.

BOARD MEMBER OF UNIVERSITI MALAYSIA PERLIS

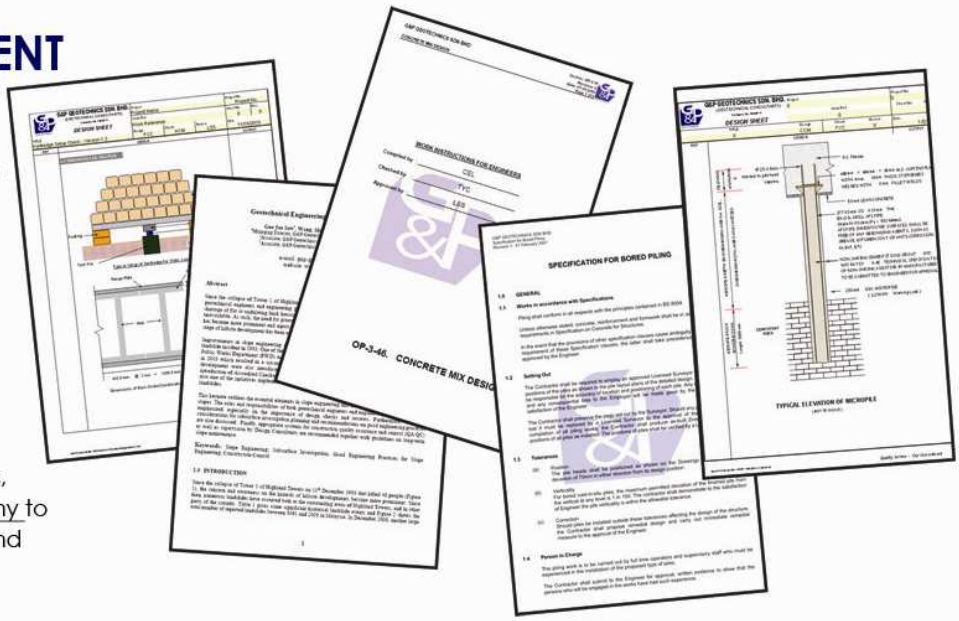
The Minister of Higher Education Malaysia has appointed Founder and CEO of G&P Professionals Group, Ir. Prof. Dr. Gue See Sew as the Board Member of Universiti Malaysia Perlis.

RESEARCH & DEVELOPMENT @ G&P

G&P'S CULTURE
RESEARCH & DEVELOPMENT

Reseach & development is the key to continual improvement and sustainability of the company. A well-structured R&D system is formed to continually seek for improvement and innovation.

G&P organizes the R&D Achievement Award bi-annually to show appreciation and encouragement to engineers for their innovation and contribution to the company. We publish our R&D products (such as specifications, construction checklists, operating procedures, technical publications, etc.) in our website at www.gnpgroup.com.my to share our knowledge and exchange ideas and opinions with others.



Some of our R&D products in 2010 includes:
1. Specification for Earthworks
2. Specification for Pond Reclamation
3. Checklist for Demolition Works

G&P is also frequently being invited by local universities, Institute of Engineers Malaysia and overseas engineering institutions / associations to conduct short courses, seminars and to publish our research findings and technical papers.

PROJECTS UPDATE

Nadayu 92 Kajang Development

G&P Infra Sdn. Bhd. has been appointed by Regal Form Sdn. Bhd to carry out engineering design on the infrastructure works for this proposed development.

The proposed development area is approximately 31.94 hectares and such development, when fully developed, shall consist of residential, commercial and amenities. Phase 1 involves 349 units of terrace houses meanwhile phase 2 involves 19 units of bungalows and 24 units of semi-detached houses.

The infrastructure system is designed to achieve minimum alteration to existing terrain and maintain natural drainage catchment characteristics.

Ritze Perdana 2, PJ

The development located at Damansara Perdana,Petaling Jaya, consists of two blocks of 8 to 13-storey tower and one block of 10-storey service apartments linking with a 7 to 9-storey podium consisting of shops and car parks.

The basement walls were designed in such a way that they were isolated from the ground floor slabs.

Optimum structural systems are achieved by adopting Post-tensioned system for long span podium carpark floor.

List of 5 major projects

Platinum Park (Phase 3)
Client:
NAZA TTDI Sdn Bhd
Description:
2 blocks of office tower (38 and 50 storeys) with 3 levels of basement
Scope:
Full geotechnical consultancy service for foundation system

Phase 1 & 2 of Le Trong Tan Township Project in Hadong, Hanoi (Park City)
Client:
Vietnam International Township Development JSC (VIDC)
Description:
Phase 1 (6.34 hectares) with 3-storey villas and 2 blocks of 33-storey codominium with 2 levels of basement
Phase 2 (5.67 hectares) with 3-storey villas and 2 blocks of 31-storey condominium
Scope:
Alternative spun pile foundation system design to replace original bored pile foundation design

Engineering Consultancy Services for Hulu Terengganu Hydroelectric Dam
Client:
SNC-Lavalin Power (M) Sdn Bhd
Description:
1 main dam (Puah Dam) and 1 secondary dam (Tembat Dam) located at upstream of Kenyir Dam with approximately 70m height, 617m crest length, and catchment area of 410km²
Scope:
Civil, geotechnical and highway consultancy services

Kelantan Flood Mitigation (Kota Bahru,Kelantan)
Client:
Jabatan Pengairan dan Saliran (JPS)
Description:
Construction of flood wall along Sungai Kelantan with a total length of 3.8km and wall height up to 5m.
Scope:
Full consultancy services including hydrological and hydraulics analysis for developing flood mitigation plan

Redevelopment of Lot 149, Kuala Lumpur (Aurora Tower)
Client:
Aurora Tower at KLCC Sdn Bhd (A company in Sunrise Berhad)
Description:
63-storey building with 5 levels of basement
Scope:
Full geotechnical consultancy service for foundation system design and basement retaining wall system design

For complete list of G&P Professionals Group projects, kindly visit http://www.gnpgroup.com.my

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