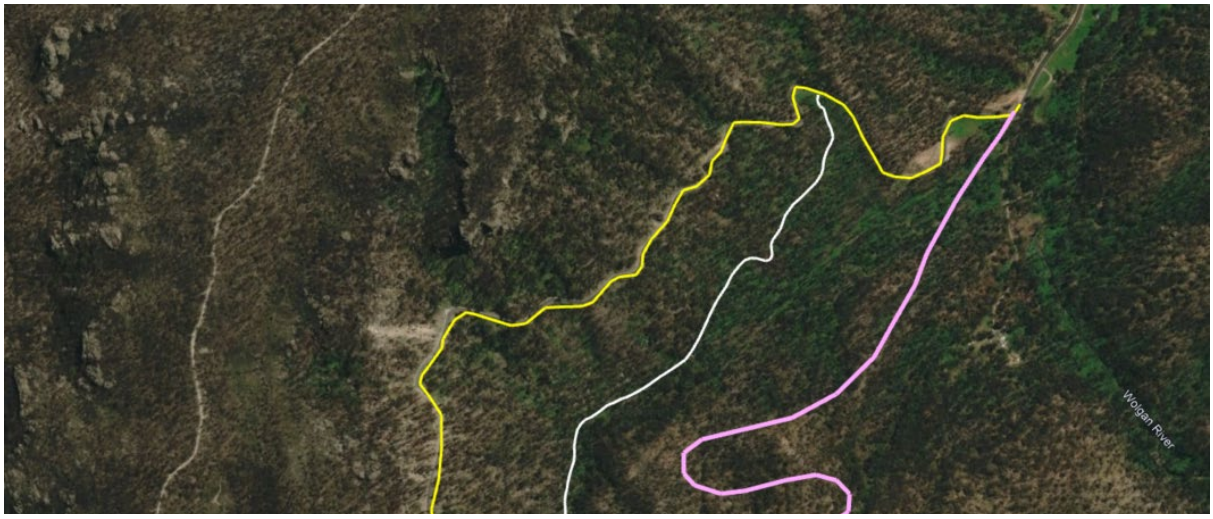
Lithgow City Council

Wolgan Valley Access Road

Proposal for Preferred Route Selection

February 2023



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Wolgan Valley Access Road
Proposal for Preferred Route Selection

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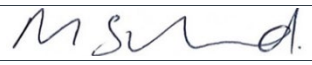
Prepared by:	Mark Schofield	07/03/2023	
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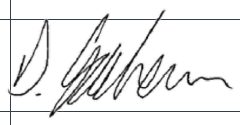
Manager approval (as per DoA):	D. Graham	21/03/2023	
Client manager approval (if required):			

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

PP142484-WSP-SYD-RAC-PRP-00001 Rev01 issue

February 2023

Our ref: PP142484-WSP-SYD-RAC-PRP-00001 Rev01 issue

By email
Jonathon.Edgecombe@lithgow.nsw.gov.au

21 March 2023

Jonathon Edgecombe
Director Infrastructure Services
Infrastructure Services
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Dear Sir

Wolgan Valley Access Road
Proposal for Preferred Route Selection

We appreciate your invitation to provide Professional Services to determine an alternative route for Wolgan Road through Wolgan Gap. Our proposal is attached for your consideration.

We are excited to be in a position to continue our collaboration with Lithgow City Council for the next stage of the Wolgan Road upgrade, building on the work undertaken so far on this important access road.

If you have any questions regarding our proposal, please contact me and I will be pleased to help.

Yours faithfully

Nathan Steggles
Principal Geotechnical Engineer

Karen Allan
Principal Geotechical Engineer

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1 Project understanding and Scope

1.1 Introduction

Lithgow City Council (Council) has engaged WSP to provide assistance with finding an alternative long-term resilient access route into the Wolgan Valley. The existing access from Castlereagh Highway via Wolgan Road has been subject to many rockfalls and landslips. The road remains closed due to slope instability within the approximately 2 km section of Wolgan Road descending from the Wolgan Gap lookout. Refer to Figure 1 which is a map showing the extent of Wolgan Road from the junction with Castlereagh Highway west of Lithgow, up to Newnes.

The Wolgan Valley includes private residences, farms, tourist destinations including Emirates One & Only, a luxury resort located near the Wolgan River. The Newnes area grew out of the Commonwealth Oil Shale Company operations at Newnes Junction. The ruins of the shale oil mine processing are a popular attraction to this day.

Wolgan Valley is formed by the Wolgan River in mountainous country. The river flows generally east, joining the Capertee River, and then becomes the Colo River. The Wolgan Valley includes sections of Wollemi National Park, Gardens of Stone National Park and the UNESCO declared Greater Blue Mountains World Heritage Area.

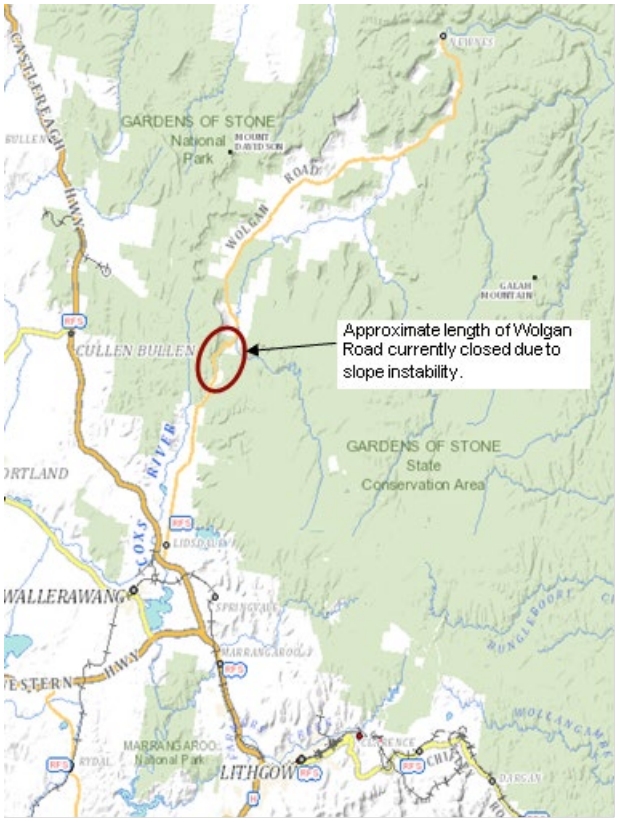


Figure 1: Location of Wolgan Road

1.2 Developments since road closure

Wolgan Road was closed to traffic in November 2022 by Council due to the high risk of harm resulting from continued slope instability. Council engaged Public Works to construct an interim alternate access road along the eastern side of the Wolgan Gap based closely on the route of an existing historic track known as the Donkey Steps. This access has been used by four-wheel drive vehicles since January 2023 in accordance with Council's Donkey Steps Emergency Bypass Route Access Strategy Plan (Council Ref. P-FY20231791, Version 5).

This access has provided some relief by allowing restricted access for residents but is not suitable as a permanent all vehicle access solution in replacement of the original (now closed) road on the western side of the valley.

Council previously commissioned WSP to look at a long-term strategy to provide new access that would cater for expected traffic types and numbers, would be safe and resilient to use and would be cost effective to construct and maintain. In response to this, WSP has produced two reports to establish the location of a future new access road into the Wolgan Valley. The first report considered the constraints that would inform a future corridor study. These constraints included geotechnical slope risk, ecology, waterways, utilities, and heritage. The second report identified three corridors that could contain a future access road. The corridors were spatially diverse, covering a route across the Newnes plateau from Lithgow, a route south from Glen Davis and a route within the existing Wolgan Gap valley. An assessment of these corridors against a range of engineering, cost and environmental criteria found that the eastern side of the Wolgan Gap valley offered a preferred location for a new access road.

1.3 Project understanding

The next stage of the development of a new permanent access into the Wolgan Valley is to determine the best route through the preferred corridor. The scope herein covers undertaking sufficient investigations to determine key constraints that will inform alignment design followed by engineering design and costing to determine a preferred alignment. The scope is split into three design delivery phases:

- Investigations and Data Acquisition Phase (Phase 1) – Assembly of the required design data, agreement of design criteria and identification of key inputs required for the Alignment Assessment Phase (i.e., Phase 2).
- Alignment Assessment Phase (Phase 2) – Development of design concepts for three potential road alignments within the preferred corridor to a level of detail sufficient to enable comparison of each alignment against high-level engineering, environment, and cost factors. That comparison will be available for Council's consideration in determining a preferred alignment.
- Preliminary Concept Design Phase (Phase 3)– Development of the preferred alignment design concept into a Preliminary Concept Design.

1.3.1 Considerations

There are several matters that need to be considered and resolved (or managed) to achieve the desired outcomes for this study. As a starting point, the items listed below need to be discussed and resolved as part of the project scope.

- Construction delivery method (Alliance, ECI, D&C or GC21)
- Council's whole of life cost objectives for the life of the road
- Allowable impact on operation of Donkey Steps during the investigation and construction of a new road.
- Design Standards (Cross section, Design Speed, maximum grade, design vehicle)
- Drainage and water quality (risk-based approach to water quality)
- Methods to protect against scour risk in table drains and culvert outlets resulting from steep grades and drainage system requirements to flush any debris without blocking to minimise maintenance intervention
- Relative merits of earthworks vs structures (balancing cost of high earthworks batters against using retaining walls and bridges or half bridges)
- Safety in Design and construction stage safety risks
- Temporary (i.e., construction phase) and permanent (i.e., operational phase) slope remediation and support requirements (considering target construction phase and operational phase loss of life and property risk criteria).
- Cross section should include a debris berm on higher cut batters to aid capture and removal of rockfalls
- Need for breakdown bays and safety ramps
- Maintenance and operational requirements and objectives (e.g., accessibility of remedial measures for maintenance, repair and/or replacement).
- Opportunities to capture valley views by combining stopping bays with short term parking bays
- Pavement surfacing that can resist traction and braking forces on steep grades and tight curve radii
- Bushfire risk and access requirements during bushfires
- Urban design requirements (e.g., reduction of visual impact; using coloured concrete, cobbles set in concrete in lieu of concrete channel, minimising slope scarring from cut batters).

2 Methodology

2.1 Phase 1 - Investigations and data acquisition

The investigations phase is dedicated to assembling required design data and mapping constraints that will influence the preferred alignment of a new road within the preferred corridor. This phase requires the following components:

Undertaken By WSP

- A geotechnical walkover to extend the existing geotechnical model and identify geotechnical risks and opportunities within the preferred corridor.
- Develop a scope for geophysical survey along key sections of the 3 potential alignments to provide input into risk evaluation and further investigations.
- An ecological site assessment and constraints mapping to inform design requirements relating to sensitive habitat and species within the preferred corridor.
- Extension of the previous heritage surveys undertaken by Council to cover the footprint of the preferred corridor and map areas of significance to avoid impacts where possible
- Identification of the recorded locations of known utility assets from BYDA data with respect to the preferred corridor
- Location of key watercourses and drainage lines which will need to be conveyed across the road within the preferred corridor
- Determination of property boundaries, land ownership and occupation
- Determination of FutureReady factors which should be considered such as climate change (rainfall, bushfire potential), society (Indigenous influence, tree change), design for future upgrading and net zero/decarbonisation.

Undertaken by Council in consultation with WSP

- Applicable design criteria and development of a Basis of Design including:
  - Design speed and maximum superelevation. The design speed may vary according to topography between the gentler lower slopes and the steeper upper section of the valley
  - Design vehicle to be accommodated on the road
  - Typical road cross sections including features such as benches, road furniture, drainage elements and indication of where width for potential for future pavement widening exists.
  - Maximum grade
  - Maximum channel flow width into traffic lane and associated ARI event
  - Relevant Council standard details that need to be included, (e.g., spacing of breakdown bays)
  - Determination of criteria to be adopted in the multi-criteria analysis of three alignments within the preferred corridor which will be considered by Council in identifying a preferred alignment to be advanced to concept design.

2.2 Phase 2 – Identification of Preferred Alignment

The purpose of this phase would be to develop three potential new routes within the preferred corridor at Wolgan Gap that meet the agreed design criteria (Basis of Design) and to a level adequate to differentiate between the alignments. These alignments would be costed and assessed against agreed criteria to determine a preferred alignment.

We will prepare an Alignment Assessment Report which documents the process undertaken for the three alignments and provides a multi-criteria assessment for Council's consideration in determining a preferred alignment. The Alignment Assessment Report will include the items nominated in Table 1 below for each assessment component.

Table 1: Phase 2 scope – Alignment Assessment Report Components

Alignment Assessment Component	Description of Scope	Alignment Assessment Deliverable Item
Project Risks and Opportunities and HSiD	Undertake a maximum one-day project risks, opportunities, HSiD workshop to identify, agree and document project and Safety in Design risks and opportunities in a draft risk and opportunity register which will be updated during the design development and referenced in the comparison of alignment options. Attendee list to be discussed with Council but we suggest the following be invited; key stakeholders, relevant Council staff, Public Works staff, and WSP designers. Some risks to be discussed include slope risks (i.e., rockfall and landslide), bush fire, safety risks for users of the Donkey Steps access road during construction. We have allowed for an external facilitator.	Memorandum, summarising workshop process, outcomes and including the draft HSiD Risk Register spreadsheet. Provided as Appendices to the Assessment Report.
Geotechnical	Assessment of the geotechnical risks and opportunities for each of up to 3 alignments within the preferred corridor comprising: — Targeted field mapping and geophysical (seismic) survey at key sections of the alignments. — Review of the horizontal and vertical alignment (including indicative cross sections) for each alignment against existing Slope Hazard Susceptibility Mapping and — Categorisation of alignments from that with the lowest slope hazard susceptibility to that with the highest slope hazard susceptibility. — Identification of anticipated foundation conditions based on reference to the existing geotechnical model for Donkey Steps developed from site geological mapping of surface features and rock cuttings undertaken to date. — Identification of areas where slope remedial measures (e.g., rockfall catch fences, slope and cutting support such as dowels and mesh) are likely to be required to meet design criteria. Supplement hazard identification with seismic profiling along key sections of each of the three alignment options Qualitative discussion of likely relative magnitude and type of geotechnical investigation, testing and design required to advance any of the alignments to Concept Design stage. Appendix B contains an example of geophysical survey outputs which are able to be produced in landslide settings.	Annotated plan and cross sections and discussion of the geotechnical components of the assessment within the Assessment Report.

Road alignment	Develop up to 3 new road alignments based on the above agreed design criteria, to a level of detail to enable high level comparison on agreed environmental, engineering and cost factors. The alignments, subject to terrain and constraints would be independent routes although possibly sharing some sections at the tie in points. Curves would include lane widening where needed to accommodate the design and check vehicle.	Road alignments drawn at Roll plan 1:1,000 scale on an aerial photo base showing: — three road alignments — structures locations, — safety barrier principal types, — transverse drainage culvert locations and size — fauna crossings if required — typical sections for road, bridges and retaining walls. Road longitudinal sections presented on a separate roll plan.
Drainage	High level drainage design - Indicatively scope would include sizing of transverse waterway crossings, determination of preliminary extent of roadside channels and typical pit spacing layout where it may differentiate between options.	
Pavements	Pavement profiles will be developed based on traffic data and assumed subgrade CBR, gradient, curvature, and design vehicles. We have allowed for one main pavement profile across all 3 alignments for this phase.	
Road furniture	Preliminary road furniture layout focussing on type and extent of safety barriers. Allowance for signage and line marking will be made on a preliminary lineal metre basis for the purpose of relative cost comparison.	
Bridges and structures	Preliminary indicative bridge and retaining wall location, extents, and structural form. It is unlikely that bridges would be needed for waterway crossings but the use of retaining walls and bridges in lieu of earthworks may be cost effective in steep terrain to avoid the need for high earthworks batters and the corresponding larger footprint. Bridge scoping would include determining location, structure length and width, preferred structural form and a typical cross section for costing purposes. Retaining wall details would include location (start - finish), height, type (Reinforced soil, L shaped and bored pile) and typical section for pricing purposes.	Typical preliminary indicative sections of retaining walls and bridges for relative cost comparison purposes only.
Cost estimate	Cost estimates for each of the three alignments including a risk-based contingency agreed with Council to reflect the preliminary nature of the design concept information and geotechnical model.	Cost estimates with high level breakdowns for each alignment.

2.3 Phase 3 – Preferred Alignment Preliminary Concept Design

The purpose of this phase would be to develop a Preliminary Concept Design for the preferred alignment identified by Council in consideration of Alignment Assessment Report. The Preliminary Concept Design for Council's preferred alignment will be developed to a level suitable for use as the basis for a planning submission, preliminary funding application and for contemplation of a preferred delivery method only. Design of reinforcement of structures will be excluded from this alignment Preliminary Concept Design.

We will prepare a Preliminary Concept Design Report which includes discussion of the following.

- Design development process.
- Adopted Design Criteria with reference to the Basis of Design.
- Methods of calculation and analysis.
- Constructability.
- Land ownership.
- Environmental and heritage status of the corridor through which the alignment passes.
- Planning approval process.
- Procurement strategies and risks.

In addition to results and discussion of the above items, the Preliminary Concept Design Report will include the deliverables nominated in Table 2 below for each element of the Preliminary Concept Design.

Table 2: Phase 3 Preliminary Concept Design Concept Report Scope and Summary of Deliverables

Design Element	Description of Scope	Preliminary Concept Design Deliverable
Geotechnical	The scope of geotechnical investigation, testing, analysis and design will need to be confirmed based on the results of Phase 2 (Alignment Assessment). The preferred alignment adopted by Council and the nature of the structures proposed for that alignment will influence the nature and extent of geotechnical investigation, analysis and reporting required to complete Preliminary Concept Design. At this stage a provisional allowance only has been made, which envisages relatively limited investigation comprising additional field mapping, targeted boreholes, test pits and in-situ testing (e.g., Dynamic Cone Penetration or DCP testing). That provisional allowance provided in Section 5 of this proposal will require review and agreement on completion of Phase 2 of the work described above. The results of geophysical testing carried out during Phase 2 would be used to target locations for field investigation.	Technical memorandum as an Appendix to the Preliminary Concept Design Report containing the results of geotechnical investigations, in-situ and laboratory testing, geotechnical analysis, geotechnical design, and a summary of the geotechnical model for the Preliminary Concept Design. Where remediation design elements are required typical sections and concept design details will be incorporated into the drawing sets described further below in this table and a discussion of indicative residual risk levels will be provided.
Road alignment	Refine preferred alignment design, incorporate structure locations (retaining walls and bridges), modelling of safety barriers and drainage channels	A3 drawing set — Road alignment general arrangement plans, long sections and cross sections at 50m spacings —Typical sections
Bridges and structures	Structures members will be sized, and reinforcement weights calculated for costing and preparation of general arrangement drawings. For bridges, this applies to	A3 drawing set

	abutments, piers, deck units, safety barrier types, all documented on plan, elevation, and sections at mid span/ pier/ abutment. For retaining walls, design would include preliminary global stability check and documentation of elevation and cross section of each wall, including safety barriers, drainage with wall location shown on road plan drawings.	— Bridge general arrangement plans, elevations and cross sections — Retaining wall sections and elevations — *No reinforcement layouts or detailing provided*
Drainage	Drainage design pit and pipe layout undertaken using DRAINS or 12d to meet flow width restrictions, table drains detailed, transverse culverts sizing confirmed, waterways in agreed ARI and location and type of water quality facilities. Documentation includes plans showing pipe runs and size, pits and manholes type and location and location and size of transverse drainage, extents of scour protection. Pipe long sections are not included.	A3 drawing set — Drainage layout plans showing pit, manhole, pipe layouts, excluding pipe long sections. — Transverse culvert sections — Initial sizing and location of water quality features, typical details and scour treatments
Pavements	Pavement types and extent will be shown on a separate drawing set which covers pavement profiles, extent of each type of pavement and subsoil drainage. Typical interface and edge details will be provided.	A3 drawing set — Pavement profiles — Pavement layout plans — Key edge/interface details
Road furniture	Line marking, signage and safety barriers drawing set incorporating signage layout, safety barrier types, extents and terminals, line marking layout.	A3 drawing set — safety barriers, signage and line marking plans
Cost estimate	A preliminary cost estimated prepared based upon details provided in the Preliminary Concept Design models and drawing sets.	As an appendix to main design report.

2.4 Program

Our indicative program is shown as Table 3 below. If we are engaged by Council for this project, we suggest we meet with Council to agree on a progress reporting methodology and develop a revised base-line program which meets Councils requirements at the time of award. We can provide a Gantt Chart program to manage the project using MS Project.

Table 3 3: Draft Base-Line Programme – Wolgan Road Alternate Access Preliminary Concept Design

ID	Activity/*Milestone*	Week 1	Week 2	Week 3	Week 4	Week 5 to Week 10	Week 11	Week 12	Week 13	Week 14 to Week 23	Week 24	Week 25	Week 26
1	*Estimated Project Award (14.04.2023, TBC)*	■											
2	Project Start Up Meeting**; Meeting 1** (Week 1, Date TBC)	■											
3	**Phase 1 – Investigations and Data Acquisition**	■	■	■	■								
4	Project Risk & Opportunity and HSiD Workshop**; Meeting 2** (Date TBC)			■									
5	**Phase 2 – Identification of Preferred Alignment**				■	■	■	■	■				
6	Site Investigation (Targeted field mapping and Seismic profiling)					■							
7	Preferred Alignment Assessment Draft Report Briefing**; Meeting 3** (Date TBC)						■						
8	*Submission of **Final** Preferred Alignment Assessment Report (Date TBC)*							■					
9	Council Review of Preferred Alignment Assessment Report and Confirmation of Preferred Alignment for Preliminary Concept Design (Date TBC)								■				
10	**Phase 3 –Preferred Alignment Preliminary Concept Design**									■	■	■	■
11	Site Investigation (Targeted Boreholes, Test Pits and Laboratory Testing)									■			
12	Preferred Alignment Preliminary Concept Design Draft Report Briefing; **Meeting 4** (Date TBC)										■		
13	*Submission of Final Preferred Alignment Preliminary Concept Design Report (Date TBC)*												■
14	Preferred Alignment Preliminary Concept Design Close-Out Meeting**; Meeting 5**												■

We have assumed that the contract would be awarded mid-April 2023. For any other dates we would simply move the durations above to suit the revised start date.

The logic follows a typical design project comprising *Investigations > Design > Deliverables* with some tasks progressing concurrently where possible.

The design phase starts with road alignment design followed by the other disciplines once the three alignment options are established. Quantity surveying can start once draft drawings are produced and will progress while reporting is underway, and drawings are being finalised.

We have allowed for a total of 5 meetings (including the Project Risk and Opportunity and HSiD workshop) with face-to-face presence of key team members at project milestones and prior to delivery of Phase 2 and Phase 3 deliverables as shown in Table 3 above. On award we can review whether an online format may be preferred by Council for some of those meetings.

2.5 Potential Risks and Opportunities

We provide an initial draft summary list of potential risks and opportunities which will need to be considered and developed at a Risk and Opportunity and HSiD workshop and then regularly updated throughout the alignment selection and preliminary concept design phases of the project. Some risks and opportunities may change during the design process, and some may remain to be addressed at later (detail design) phases.

Risks:

- Accuracy of aerial survey and impact on alignment design and outcomes (quantities)
- Extent of geotechnical data along alignment corridors and impact on assessment of geotechnical stability, stabilisation requirements. slope and foundation uncertainty
- Unforeseen utility assets
- Assessment of residual geotechnical slope risk in relation to new alignment including property and loss of life risk and cost of on-going maintenance, repair, and replacement.
- Stakeholder opposition to alignment(s) through the preferred corridor (e.g., Indigenous Land Council and/or Community Groups)
- Presence of additional or larger extent of protected or endangered flora and fauna with potential to impact alignment selection than presently mapped.
- Planning approval process.

Opportunities

- Dual use of breakdown bays as viewing points
- Alignment design can consider wider road footprint to offer improved resilience, or include design of water quality ponds to be accessible as a source of water for firefighting
- Improved access during bushfire events

3 Relevant experience of the company

3.1 Company profile

WSP is one of the world's leading professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisers including engineers, technicians, scientists, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. We design lasting solutions in the Transport & Infrastructure, Property & Buildings, Earth & Environment, Mining & Energy, and Water sectors and are at the forefront of integrated digital innovations. With approximately 4,500 talented people in 14 offices across Australia, we engineer Future Ready™ projects that will help societies grow for lifetimes to come. wsp.com/au.

Relevant project experience

WSP has undertaken several route options and concept design road projects over the last 10 years. The two projects profiled below follow a similar process to our approach for the new Wolgan Road route study. They required investigation of constraints, assessment of route options, cost estimating and engineering design.

WOOLGOOLGA TO BALLINA PACIFIC HIGHWAY UPGRADE

LOCATION

Pacific Highway Woolgoolga to Ballina

CLIENT

TfNSW

PROJECT VALUE

AUD 4.3B

PROJECT DURATION

2015 - 2020

As part of the Pacific Complete consortium, WSP developed the strategic design to create a robust preliminary design upon which cost estimates could be based. This work included responding to non-conformances and developing the earthworks strategy including some adjusting of the vertical grading. The Delivery Partner approach provided a collaborative environment to achieve outcomes that were best for project.

Relevance to Wolgan Road:

- Strategic options development
- Cost estimating
- Options assessment

MOUNT VICTORIA TO LITHGOW HIGHWAY UPGRADE

LOCATION

Blue Mountains, NSW, Australia

CLIENT

TfNSW

PROJECT VALUE

AUD 2M

PROJECT DURATION

2011 - 2013

WSP and its JV partner formed a design alliance with Roads and Maritime Services to develop the concept design for a 20 km section of the Great Western Highway between Mount Victoria and Lithgow. The first phase involved development of a comprehensive concept design for the full 20 km length of the project. This also included environmental corridor studies to identify environmental constraints and detailed geotechnical investigations. Key technical issues addressed by the Alliance included complex geology, steep terrain, extensive non-Aboriginal and Aboriginal heritage, and biodiversity.

Relevance to Wolgan Road:

- Location and similar constraints (geology, heritage, biodiversity
- Constraints mapping
- Concept design stage

4 Skills and experience of the team

4.1 Organisational chart

WSP has adopted a flat project structure to deliver this project as reflected in Figure 2 which covers down to team leader level. The engineering design will be led by the Design Manager (DM) and all key disciplines report to the DM. Each discipline team typically comprises:

- A discipline lead who plans the work and guides the designers
- A designer who undertakes the bulk of the design task
- A verifier to independently check high risk designs such as pavements and structures

Using this approach, we can ensure design requirements are met whilst keeping the process as cost effective as possible.

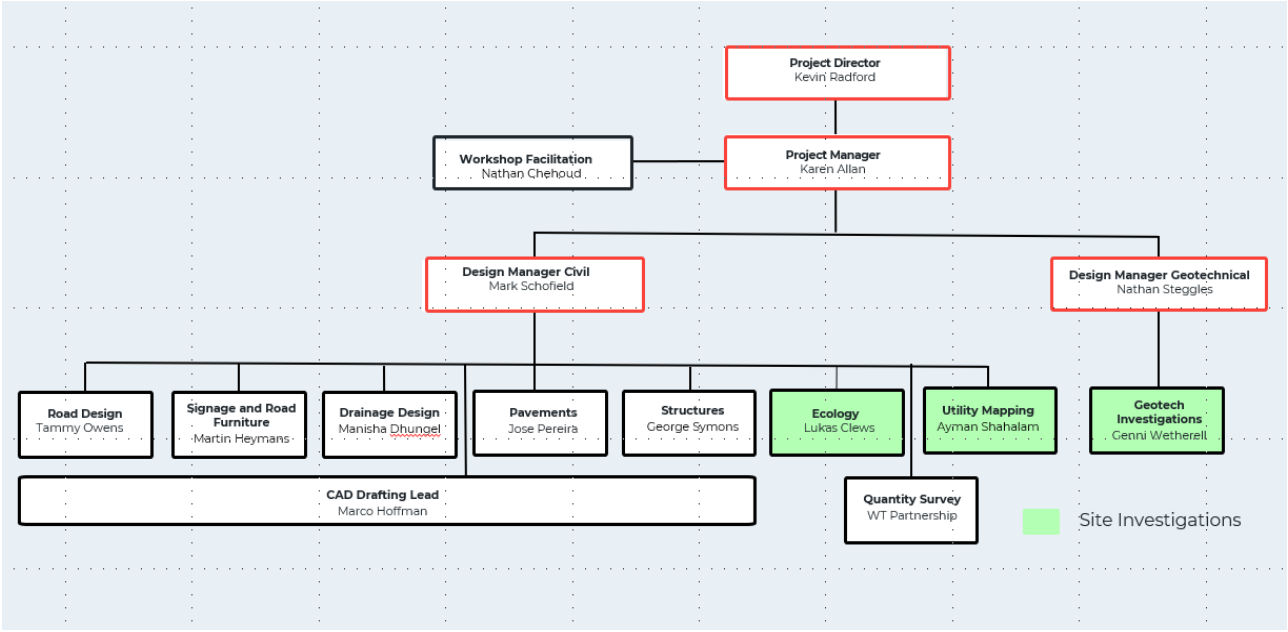


Figure 2: Organisation chart

4.2 Key personnel

WSP will commit experienced leadership to the team for this project. We have created discipline-based teams comprising a team leader to direct the design, an experienced engineer to undertake the main design tasks and a design reviewer to provide an independent check of the work.

The overall team will be led by **Karen Allan** as Project Manager. Karen has 30 years of consulting experience in the geotechnical space. She has been involved in many projects in the Blue Mountains area, including along the Great Western Highway from Lawson to Lithgow. **Nathan Steggles** will work with **Mark Schofield** to lead the multi-disciplinary team to complete the options assessment and preferred route alignment design. Nathan has over 20 years of consulting experience and is well known to Council from his long-standing work on slope risk in the area and at Wolgan Gap since 2015.

Mark has led the two previous studies for Wolgan Road, the first to determine constraints and the second to select the Southern Corridor as the preferred location for a new access road. He has 40 years of experience in road planning, design, construction, and maintenance.

Our road alignment team will be led by **Steven Ellis**. Steve's intimate knowledge of road design gained over 22 years enable him to quickly determine the most cost-effective route options within the physical and environmental constraints on the site.

Once a preferred route is determined, **Martin Heymans**, one of our seasoned road designers with over 9 years' experience as a road designer will update the design.

The designers will be supported by an engineering team led by **Tammy Owens**, who has over 22 years' experience in road design.

George Symons will provide structures options where needed. George is an experienced structural engineer with over 8 years' experience in bridge and related structures design.

The drainage design will be undertaken under the leadership of **Manisha Dhungel** who is one of WSPs Principal Engineers specialising in hydrology and drainage with over 14 years of practical experience.

Jose Pereira will oversee the pavement design. Jose brings over 20 years of practical knowledge and has been designing pavements to TfNSW standards since 2008.

CVs of key personnel are available in Appendix A.

4.3 Management and communication

We have structured the delivery team so that Karen is the principal contact with Council's Project Manager. Nathan and Mark will lead the design and will also communicate with Council on specific technical matters as an expediency and would ensure Karen is appraised of any discussions.

Within WSP, Mark would be the primary contact for the design team and will conduct weekly meetings with the design team leaders to discuss progress, resolve design issues and co-ordinate delivery of design packages. These meetings would also include subconsultants where relevant.

Given the distance between WSPs office and the site / Council offices, communication between WSP and LCC would normally be by MS Teams, email, and telephone as this avoids the need to travel. If Council request a physical presence at meetings, we have made provision to attend up to two separate meetings on site/or at Council's offices in Lithgow. Our Project Manager who resides locally in the Blue Mountains can attend your offices in Lithgow to facilitate other select meetings.

Karen and Mark will manage the project under its design management system which will allow scrutiny of program, risk, value for money and the check and review process. We request that our fee is billed according to progress and against an itemised schedule at monthly intervals.

5 Fee and commercial terms

5.1 Our Fees

We have made some assumptions in the preparation of this proposal, and these are listed below. We would be happy to discuss these points if Council require clarification. Assumptions

- The study will be completed by end of 2023
- We will submit drawings and a report at each of the two (2) design delivery phases. These are the Alignment Assessment phase and the Preferred Alignment phase
- We encourage Council to provide one set of review comments at each of the two submission phases (i.e., Phase 2, Alignment Assessment and Phase 3 Preferred Alignment).
- CAD files and design models along with the hard copy deliverables are sufficient for Council's current purpose (i.e., Digital Engineering, BIM or confederated models have not been allowed for).
- Council will provide recent traffic counts, categories, and growth trends to inform pavement design and confirm the typical road cross section
- Our pavement design will utilise TfNSW standard materials to provide confidence in durability and design life outcomes
- No requirement for flood modelling beyond the determination of catchment discharges
- Only high-level water quality assessment design is required. Water quality devices will be estimated based on road catchment areas versus required basin area
- An allowance for up to 3 simple (plank, Super-T) bridges and one longer span (steel) bridge for each alignment (it is not possible to determine the number and size of bridges and retaining walls prior to establishment of vertical and horizontal alignments). In a similar manner, up to 7 fill walls and 1 cut wall with total length of 400m have been allowed for each alignment.
- Structural options at the Alignment Assessment Phase will be based on span to depth ratios and knowledge gained from previous projects only.
- We have not allowed for any temporary works design.
- Foundation types only (e.g. pile or pad footings) are sufficient for Council's current purpose and no further foundation details (e.g., foundation dimensions or depths) will be provided.
- Bridge scour assessments are not required at this stage

Based on the above, we offer a fee of **$493,886** excluding GST to undertake Phase 1 and Phase 2 scope as discussed in this proposal. We have also provided an indicative fee of $552,000 to undertake Phase 3 as detailed in the methodology in Table 2 below.

The fee is broken down as shown in Table 4 as follows:

Table 4: Fee Estimate Breakdown – Wolgan Road Alternate Access Preliminary Concept Design

Phase	Component	Fee (Excl GST)
Phase 1 and 2 – Alignment Assessment	Investigations	$75,628
	Geotechnical Assessment of 3 x Alignment Hazards and Initial Seismic Traverses (3 days)	$91,775
	Design and cost estimating	$156,586
	Drawings	$31,938
	Reporting	$39,808
	Reviews and checks	$6,172
	Project and design management	$87,535
	Expenses	$4,444
	Total Phase 1 and 2	**$493,886.00**
Phase 3 –Preferred Alignment Preliminary Concept Design	Indicative fee (Excluding investigations)	$420,000
	Geotechnical investigation and reporting for Preferred Alignment (provision sum only for geotechnical investigation, analysis & design including test pits, DCPs, boreholes, laboratory and reporting for preferred alignment)	$132,0000

For any additional work outside the scope outlined above, our variation rates for additional services for professional staff is provided in Table 5 below.:

Table 5: Variation Rates for Consulting services

Graduate Engineer to Engineer	Hourly	$165 per hr
Senior to Associate Engineer	Hourly	$200 to $240 per hr
Senior Associate Engineer to Principal Engineer	Hourly	$280 to $345 per hr
Technical Executive to Technical Director	Hourly	$420 to $460 per hr
Mileage	Per km	$1 per km
Vehicle	Per day	$150
Disbursements (e.g., tolls, parking)	Handling fee	Cost plus 12.5%

5.2 Notice of potential impact of COVID-19

WSP anticipates that there may be circumstances relating to the COVID-19 pandemic which could materially affect the scope, availability, cost and timing of the professional services we are offering in this submission. These circumstances could affect our ability to perform the services in accordance with the time frames set out in your request documentation. We will update you with details of any likely changes to the timing, cost and availability of our resources, as they unfold so that our respective organisations can work together to optimise a revised program of activities. In addition, WSP will take practical steps to minimise any potential or actual delay to the provision of our professional services and will consult, cooperate, and coordinate our activities with you to manage the impact of the COVID-19 pandemic.

Appendix A

Curriculum Vitae for key staff

KAREN ALLAN

Principal Geotechnical Engineer
FIEAust CPEng

1 years with WSP

28 years of experience

LOCATION

Sydney (George St), Australia

TECHNICAL SKILLS

Geotechnical Engineering in Design

Retaining wall and excavation support

Forensic investigations

Pavement engineering

Coal Combustion Residual (CCR) waste management

ACCREDITATIONS

Engineers Australia - Chartered Professional Engineer (CPEng)

Fellow Member of Engineering Australia

PROFILE

Karen Allan has over 25 years engineering experience across the geotechnical industry in Brisbane, Sydney, South East Asia and the South Pacific.

Karen's experience includes project and team management and co-ordination of small to large scale geotechnical studies using conventional and state of the art methods; design of foundations for bridges and high-rise buildings, including pile foundation design and analysis. She has also provided advice on the interaction of soil or rock and complex structures using finite difference/element analysis packages; stability analyses for embankments, natural slopes, and cuttings for soil and weak rock; temporary and permanent retaining wall design for excavations in weathered rock and loose sands, and excavations below the water table. She has significant experience in providing tender, detail design and construction stage advice to D&C teams for a wide range of state government infrastructure projects.

Karen has also designed flexible and rigid heavy-duty pavements and has attended industry courses relating to current design practices. She has completed a Graduate Certificate in Pavement Technology through the Centre for Pavement Engineering Education (CPEE).

EDUCATION

Graduate Certificate in Pavement Technology, Centre of Pavement Education, CPEE	2012
Bachelor of Civil Engineering (Honours), Queensland University of Technology	1994

PROFESSIONAL ASSOCIATIONS

Engineers Australia - Chartered Professional Engineer (CPEng) and Fellow

National Engineering Register (NER)

APEC Engineer

Australian Geomechanics Society Member

PROFESSIONAL HISTORY

Golder Associates Pty Ltd, Principal Geotechnical Engineer	2021 - Present
Edge Geotechnical Pty Ltd, Director, Principal Geotechnical Engineer	2017 - Present
Golder Associates Pty Ltd, Senior & Associate Geotechnical Engineer	1999 - 2017
Coffey Geosciences, Graduate Geotechnical Engineer	1995 - 1999

PUBLICATIONS AND PRESENTATION

Understanding soil-module system behaviour to provide sustainable solutions in pavement engineering *NZGS*	2020
Probability and Sensitivity Analyses in Geotechnical Engineering *5th YGPC, Rotorua, NZ*	2002
Experience in Geotechnical Design of Overseas Port Facilities *ISRM International Symposium*	2000

MARK SCHOFIELD

Technical Executive

1 years with WSP

39 years of experience

LOCATION

Sydney (George St), Australia

TECHNICAL SKILLS

Design Management

Constructability and staging

Highway design

Value Engineering

MANAGEMENT SKILLS

Project Management

Team leadership

PROFILE

Design delivery of complex infrastructure projects, particularly urban and rural roads. Mark has led multi-discipline design teams on a variety of highway projects including route option studies, preliminary design and detailed design. Projects have been delivered by various methods including traditional design and various design and construct delivery methods including D&C, DBM, Alliance and BOOT. Country experience includes NZ, Australia, SEA and the UK

EDUCATION

NZCE(Civil), Otago Polytechnic 1985

PROFESSIONAL ASSOCIATIONS

Engineers Australia - Chartered Professional Engineer (CPEng)

National Engineering Register (NER)

Engineers Australia - Full Member

PROFESSIONAL EXPERIENCE

Road design

M1 Black Hill to Tomago Tender Design, Newcastle area, NSW, Australia (2022): John Holland for TfNSW, Roads TL

Roads lead for 10km highway deviation with two interchanges and local road upgrades

Warringah Freeway Upgrade Tender Design, Sydney, NSW, Australia (2019 - 2020): John Holland for TfNSW, Roads TL

Leading the road design team for the 3km upgrade of the Warringah Freeway around North Sydney

Ipswich Motorway Upgrade (Rocklea to Darra), Brisbane, Qld, Australia (2011 - 2012): TMR Queensland, PM/DM

Led a small design team for the concept design and business case

Stansted Generation 2 second runway, Stansted, Essex, United Kingdom (2005 - 2007): BAA Ltd, Roads lead for airport access and local access

Led the design of new airport accesses from the M11 and A120 roads to support the second runway planning application

Design management, road engineer

Medlow Bath Upgrade, Medlow Bath, NSW, Australia (2019 - 2022): TfNSW, Design Manager

DM for the four lane upgrade of the GWH through Medlow Bath, coordinating all discipline inputs, providing technical advice to client PM

Rail civil design

More Trains More Services, Sydney, NSW, Australia (2019): Sydney Trains, Civil TL

Leading the rail civil team developing concept upgrade options for the Sydney commuter rail network

Elevated expressway design

NLEX and Segment 10 Expressways, Manila, NCR, Philippines (2012 - 2014): Manila North Tollway Corporation, PM/DM

Led the design team in the design of 8km of viaduct along a rail corridor in Metro Manila

Design management, value engineering

Banora Point Pacific Highway Upgrade Alliance, Banora Point, NSW, Australia (2009 - 2011): RMS, Design Manager

Led the design team to deliver a 2,5km highway upgrade including 330m viaduct, a rock cutting 19m deep and over 1km supported on RSW. Resolved several complex design issues saving over $10 million in cost

Design management, road engineering

WestLink M7 Motorway tender and detailed design, Sydney, NSW, Australia (2001 - 2004): RTA, Roads lead and Design Manager

Led the road design for 40 km of motorway and 16 interchanges for the tender design stage then DM for detailed design for 13km of motorway, 5 interchanges and around 4 km of arterial road upgrade.

PROFESSIONAL DEVELOPMENT

BEng (Civil), University of Canterbury	1990

PROFESSIONAL HISTORY

WSP Ltd	2022 - present
BG&E Pty Ltd, Associate	2019 - 2022
SMEC, Civil Team Leader	2017 - 2019
Arcadis, Design Manager	2015 - 2017
SMEC, Design Manager	2008 - 2015
Faber Maunsell, Associate Director	2004 - 2008
SMEC, Engineer	1999 - 2004
MWD > Works Consultancy Services > Opus, Civil Drafter, Graduate Engineer, Engineer, Office Manager	1983 - 1998

NATHAN STEGGLES MScEng (Geotechnical) BEng (Civil)
Geotechnical Design Manager

8 years with WSP

20 years of experience

Areas of expertise

Geotechnical investigation, analysis, design and project management for large scale linear infrastructure including tunnels

Geotechnical risk assessment

Design and documentation for slope remediation measures

Slope remediation

Languages

English

Profile

Nathan is a geotechnical engineer with 20 years professional engineering experience in project management, site investigation management, slope risk analysis and remediation, geotechnical design and construction phase support for large scale linear infrastructure including road, tunnels and rail for private, defence and government clients with a focus on RMS highway upgrades in regional NSW (Pacific Highway, Princes Highway, Great Western Highway) and TfNSW projects. Nathan is also experienced in geotechnical risk assessment and has undertaken design and documentation for slope remediation measures to suite a variety of challenges including where remediation design of failed embankments must maintain continuous traffic flow adjacent.

Geotechnical design considerations, including those associated with earthworks and constructability issues, are also well understood by Nathan having undertaken and delivered geotechnical design and construction stage support for large road and rail projects. His experience is useful in obtaining maximum return on client's investment in geotechnical investigation, whilst meeting the safety, environmental, heritage (Aboriginal and European) and community expectations whether in constrained urban or regional and remote settings where numerous stakeholders are involved.

Nathan has significant experience in leveraging remote sensing data (i.e. photogrammetry, state based and project specific LiDAR, aerial imagery and laser scanning) to develop slope risk assessment campaigns with improved safety (e.g. reduced site exposure of assessors) and technical outcomes (e.g. more accurate assessment of slope risk analysis inputs). Nathan is committed to providing value for money geotechnical solutions which are best for project by leveraging off existing information, corporate knowledge, an understanding of the geology and an openness to innovation.

Education

Master of Engineering Science (Geotechnical), University of New South Wales (UNSW)	2009
Bachelor of Civil Engineering, University of New South Wales (UNSW)	2002

Professional Associations

Engineers Australia, Member	EA
Chartered Professional Engineer	CPEng
Australian Geomechanics Society, Member	AGS

Professional Experience

Selected Linear Infrastructure Investigation and Construction Stage Support

Sydney Gateway – Canal North Site Investigation

St Peters NSW 2019 - 2020

Project Manager for geotechnical and contamination investigation of a major road development with numerous stakeholders. Investigation was required in road and rail corridor, prior landfill, active container terminals and proximate to significant underground infrastructure (including Sydney De-Salination pipeline, high pressure gas pipeline, major

electrical and communications cable banks). An innovative block load test methodology was developed to investigate ground response in areas of former landfill.

WestConnex – New M5

Sydney, NSW, 2015 to 2018, CPBDJV

Construction stage services including geotechnical RFI for ground improvement, temporary works and working platform construction.

Mount Victoria to Lithgow (40 Bends) – Great Western Highway

Hartley NSW 2015 - 2017

Contractor's Geotechnical Management Representative (GMR) providing construction stage services including supervision and temporary works design.

NorthConnex Geotechnical Site Investigation – M1 and M2

Sydney, NSW, 2014 to 2016 (Geotechnical Investigation Manager)

Investigation Manager for a deep road tunnel. Investigation was delivered safely to a tight timeframe in response to dynamic project drivers and access conditions, requiring continuous monitoring and update of drilling program.

Pacific Highway Upgrades – Sapphire to Woolgoolga, Coffs Harbour Bypass, Oxley Highway to Kempsey, RMS, 2005 - 2014

Project Manager or Site Investigation Manager for multiple sections at concept and detail design stage (including construct only, design and construct and Alliance delivery formats). As well as managing and leading site investigations, Nathan has provided analysis and reporting associated with cut batter design and earthworks material usage for geotechnical interpretive and geotechnical design reports. Nathan was Alliance Management Team member responsible for the 3 Key Result Areas (KRAs) of Innovation and Value for Money, Time and Cost for which a result of "Outstanding" was formally assessed by the client RMS (i.e. meeting the criteria of significant innovations with beneficial costed impact achieved, project delivered within budget and on time). The project was the largest geotechnical investigation commissioned by RMS at the time.

Princes Highway Upgrades – Albion Park Rail Bypass, Bega Bypass, RMS, 2010 - 2015

Project Manager for geotechnical investigation, design and documentation of new highway, highway upgrade, local road and highway bridges. Areas included soft soil flood prone locations, active agricultural land, environmental and heritage constraints and active highway (requiring nightworks). A responsive, collaborative approach accommodated on-going design development targeted to very tight project timelines.

Hunter 8 Alliance, ARTC

Maitland, NSW, 2009 to 2010

Project Manager for investigation, analysis, design and documentation of an innovative ground improvement solution to overcome challenges of track widening in steep terrain and a constrained ARTC rail corridor.

South West Rail Link – Glenfield Junction Alliance

Glenfield, NSW, 2009

Geotechnical Project Manager for major upgrade of rail infrastructure including re-alignment, station up-grade, at grade and multi-storey carparks.

Rail Clearways Project, TIDC (now TfNSW)

Sydney NSW 2006 - 2009

Project Manager for geotechnical and contamination investigation for Macarthur 4th Platform, Liverpool Turnback and Schofields to Vineyard Duplication.

Selected Geotechnical Risk Assessment and Remediation

- **Browns Gap Road, Hassans Walls Road and Sir Thomas Mitchell Drive, NSW (2022 – Present): Lithgow, Geotechnical Risk Assessment and Remediation**

  Nathan performed slope risk assessment for a number of sites including large areas of slope comprising numerous slope instability mechanisms including rockfall and large scale landsliding, as well as hazards relating to the coal measures and their extraction.

- **Diamond Bay Walkway, NSW (2021): Vaucluse, Geotechnical Risk Assessment**

  Nathan performed slope risk assessment for a section of coastal cliffline including large rock overhangs upon which pathways and viewing platforms were situated.

- **Wombeyan Karst Conservation Reserve, NSW (2021): Wombeyan, Geotechnical Risk Assessment and Remediation Concept Design**

  Nathan performed slope risk assessment and remediation concept design development for areas of access track and viewing platform.

- **Macaulay Street Slopes, NSW (2020): Lithgow, Geotechnical Risk Assessment and Remediation**

  Nathan performed slope risk assessment for a large area of slope comprising numerous slope instability mechanisms including rockfall and large scale landsliding. Following the 2019/2020 bushfire seasons, data acquisition via the use of Remote Piloted Aircraft (RPA, also known as drone) was applied to develop 3D digital reality models based on photogrammetry and LiDAR data. Slope risk assessment and development of remediation measures required consideration of 3D effects on rockfall trajectories.

- **Wolgan, NSW (2015 - Present): Wolgan, Lithgow, Slope Risk Assessment, Investigation and Remediation**

  Nathan provided slope risk assessment, emergency response, geotechnical investigation and remediation design including scaling, rock-bolting, soil nail and shotcrete, installation of monitoring points and development of a Risk Management Plan. Risk assessment utilising RPA acquired photogrammetry and LIDAR.

- **Royal National Park, Sydney, NSW (2018 - Present): Geotechnical Risk Assessment and Remediation**

  Baseline QRA of over 23 km of coastal cliffline within a range of geomorphological conditions and detailed assessment of individual sites. Remote sensing in the form of targeted video fly through, photogrammetry and LIDAR along with traditional field mapping and terrestrial laser scanning was applied to improve quality, safety and efficiency. Individual areas were progressed to detailed assessment and remediation design (including development of IFT and IFC drawings) on a prioritised basis.

- **Minimbah Road, NSW (2018 - 2021): Willoughby, Slope Risk Assessment and Remediation Design**

  Nathan performed geotechnical assessment of rock slope containing numerous geo-hazards and existing remediation measures. RPA acquired photogrammetry and LIDAR was utilised to produce a 3D Digital terrain model and assist in hazard inventory, risk assessment and development of remediation designs (and associated documentation).

- **Metropolitan Colliery, NSW (2018 - Present): Helensburgh, Site-Wide Slope Risk Assessment**

Nathan provided geotechnical risk assessment of the metropolitan colliery site including natural slopes, rock cuttings, spoil heaps and large pond embankment.

- **Scenic World, NSW (2016): Katoomba, Investigation and design of stabilisation and laterally loaded piles**

  Nathan provided design of soil nailed slope remediation and pile design for laterally loaded pile groups within a colluvial slope required consideration of difficult access, equipment and machinery constraints.

- **Harbord Road Crib Wall, Harbord, NSW (2010): Emergency response, stability assessment, investigation design and supervision of remediation**

  Following heavy rain events, loss of material from an existing concrete crib wall supporting the road embankment for Harbord Road was observed. Emergency response, stability assessment, investigation, design and supervision of remediation works was provided.

OTHER SELECTED EXPERIENCE

- **Goulburn and Newcastle Gasworks– Jemena, NSW 2018**

  Client's geotechnical reviewer for contractor D&C designs including retention systems and pavement crossings.

- **Garden Island Wharf – Royal HaskoningDHV, Garden Island, NSW, 2018**

  Project Manager for site investigation of Garden Island Wharf upgrade. Site investigation required careful planning to ensure avoidance of numerous existing marked and unmarked services including extensive underslung services below the old wharf structure, the wharf structure itself and tensioned re-enforcement within portions of the existing wharf slab. Investigation was undertaken utilising tight access tracked drill rigs, GPR and marine push tube samplers from boat and with specialist divers.

- **Lynwood Quarry (New Quarry) – HOLCIM, Lynwood, NSW, 2010 to 2012 and 2016 to 2017**

  Project Manager for site investigation of a new hard rock quarry, including site access roads, water storage and supply dams and a heavy haul bridge over the Main Southern Railway and crossing of high pressure gaslines. Geotechnical design and construction phase support for heavy haul road protection slabs over high pressure gas line.

- **Moorebank Intermodal Terminal – QUBE, Moorebank, NSW, 2016**

  Project Manager for geotechnical site investigation of a previous military installation with numerous legacy ground investigation and design challenges including Unexploded Ordnance (UXO), extensive buried service and training infrastructure. In addition to geotechnical investigation an Earthworks Specification was developed to provide flexibility in methodology for meeting the container terminal development benching criteria whilst maximising efficient use of existing on site material and minimise wastage and off site disposal. Rigorous assessment of topsoil character and extent was undertaken to enable an effective earthworks strategy to be developed.

- **Replacement of CTGM – Beresfield, NSW, Beresfield, NSW, 2009 to 2010**

  Project Manager for geotechnical and geo-environmental investigation of upgrade and replacement of Hunter Water Corporation pipeline.

- **Prospect Raw Water Pump Station, John Holland, Prospect, NSW, 2008**

  Geotechnical engineer responsible for construction stage support including mapping and temporary support advice during deep excavation of the on-shore pump station and offshore intake structure constructed within a cofferdam.

- **Kingston Historic Wharf Refurbishment, Norfolk Island Trust, Norfolk Island, 2005**

  Geotechnical Site Manager and only ‘in country’ geotechnical advisor for investigation works to inform the design of refurbishment for the historic Kingston Wharf. Site investigation required use of specialist low weight portable equipment which was set up as a temporary cantilevered structure off the wharf for overwater drilling within challenging drilling conditions comprising coral reef and basalt flows with extremely high strength core stones.

MANISHA DHUNGEL

Associate Civil Engineer

5 years with WSP

14 years of experience

LOCATION

Sydney (George St), Australia

TECHNICAL SKILLS

Drainage design and modelling

PROFILE

Manisha is a civil engineer with a strong background in drainage design for roads infrastructure projects. She has over thirteen years' professional experience in that technical capacity, most of which was gained on major road upgrades including major Roads and Maritime Services' projects. She has a strong understanding of the integrated requirements of a complex and complete drainage design including longitudinal, transverse and overland flow design and modelling.

EDUCATION

Bachelor of Civil Engineering (Honours), University of Sydney 2008

PROFESSIONAL ASSOCIATIONS

WSP Rail Safety Worker (RSW) Competency for TfNSW

Rail Industry Worker (RIW) Card

Engineers Australia - Full Member

PROFESSIONAL EXPERIENCE

Drainage design and modelling

M6 Stage 1 Detail Design, Sydney, NSW, Australia (2021 – Present): CPB Ghella UGL Joint Venture, Drainage Discipline Lead

Drainage discipline lead for the design of twin four kilometre tunnels linking M8 Motorway at Arncliffe to President Avenue at Kogarah and associated motorway control centre, new intersection at President Avenue, shared cyclist and pedestrian pathways.

Westconnex 3B – M4-M5 Link Rozelle Interchange, Sydney, NSW, Australia (2018 - 2021): CPB John Holland Joint Venture, Surface works senior drainage engineer

Package lead City West Link section of the project which widening of City West Link and Victoria Road at Rozelle. Carrying out pavement drainage and open channels design for the project using 12D and Drains, water quality control measures using MUSIC and interdisciplinary coordination for multiple options within tight timeframes.

Pacific Highway Upgrade from Woolgoolga to Ballina – Portion A – Glenugie Link, NSW, Australia (2017 - 2018): Pacific Complete, Senior drainage engineer

Senior drainage engineer for the project which involved design of 3 km of dual carriageway road design, earthworks, bridgeworks, and drainage system and water quality measures. Responsibilities included carrying out pavement drainage design for the project using 12D and DRAINS, open channel design and basin modelling using 12D and erosion and sediment control design.

Pacific Highway Upgrade from Woolgoolga to Ballina – Portion D, NSW, Australia (2016 - 2017): Pacific Complete, Longitudinal drainage team lead

Longitudinal drainage team lead of the project, which involved the design of 19 km of dual carriageway road design, earthworks, bridgeworks, and drainage system and water quality measures. Responsibilities include leading the longitudinal drainage team that carried out pavement drainage design for the project using 12D and

DRAINS, open channel design and basin modelling using 12D and erosion and sediment control design.

Westconnex 1A – M4 Widening,, Sydney, NSW, Australia (2014 - 2017): Sydney Motorway Corporation, Senior drainage engineer

Drainage engineer for tender, detailed design and construction phase of the project, which involved widening of approximately 7.5 km of the existing M4 Motorway between Church Street, Parramatta and Homebush Bay Drive, Homebush. Carried out pavement drainage and open channels design for the project using 12D, water quality control measures using MUSIC and interdisciplinary coordination during the tender and detailed design phase and construction phase support.

Pacific Highway Upgrade - Nambucca Heads to Urunga, NSW, Australia (2013 - 2014): Roads and Maritime Services, Drainage engineer

Drainage engineer for Zone 2 (11 km) of the project, which involved the design and construction of 22 km of dual carriageway road design, earthworks, bridgeworks, drainage system and water quality measures. Carried out pavement drainage, design for the project using 12D and DRAINS, open channel design and basin modelling using 12D, transverse drainage design checks using DRAINS.

M5 West Widening, Sydney, NSW, Australia (2012 - 2014): Roads and Maritime Services, Drainage engineer

Drainage engineer for project which involved widening approximately 22 km of the M5 South West Motorway. The project comprised of pavement widening into existing median from existing two lanes to three lanes in both directions between King Georges Road, Beverly Hills and Camden Valley Way Road, Casula. Carried out pavement drainage design for project using 12D and DRAINS, assessed on site detention requirements, carried out open channel design and aquaplaning assessments. Also provided construction phase support which involved responding to site queries often within a very short time frame.

Hunter Expressway Design and Construct, Sydney, NSW, Australia (2010 - 2011): Roads and Maritime Services, Drainage engineer

Drainage engineer for Zone 1 (9 km) of the project, which involved the design and construction of 26 km of dual carriageway road design, earthworks, pavements, bridgeworks, drainage system and water quality measures. Carried out pavement drainage design, open channel design and basin modelling.

PROFESSIONAL HISTORY

WSP, Associate Civil Engineer	2017 - Present
SMEC Australia Pty Ltd, Senior Drainage Engineer	2014-2017
Sinclair Knight Merz, Drainage Engineer	2009-2014

MARTIN HEYMANS

WSP Role: Engineer
Proposal Role: Road Design

9 years of experience

LOCATION

Sydney (George St), Australia

TECHNICAL SKILLS

Road Design

Site Grading

Drainage

Water

Structural Design

PROFILE

Offering over 9 years of experience in the civil engineering industry. Specializing in civil & infrastructure design with experience in structural design. Working primarily in the consulting environment with project management and onsite experience. Qualified BSc Civil Engineer registered as a member of Engineers Australia. A driven and enthusiastic team player with a passion for engineering. Exceptional analysis, reporting and communication skills. Proficient in AutoCAD Civil 3D, AutoCAD Storm & Sanitary Analysis, AutoCAD, AllyCad, HEC-RAS, Modelmaker modules and Microsoft suite.

EDUCATION

BSc Engineering (Civil), University of Kwa-zulu Natal 2012

PROFESSIONAL EXPERIENCE

Road Design

– **M12 Motorway, Sydney, NSW, Australia (2021): Transport for NSW, Road Alignment Designer**

Metadata input and C3D Model DE integration for 100% FCD design.

– **Milton to Ulladulla Bypass, Milton, NSW, Australia (2021): Transport for NSW, Road Alignment Designer**

DCD stage interchange design and sight line checks.

– **M6 Stage 1, Kogarah (Sydney), NSW, Australia (2021 - Present): CGU, Road Alignment Designer**

– DCD-IFC stage Surface works design and verification. Surface works includes Princes Highway upgrades and President Ave, including side streets as well as southern M6 Entry/ Exit ramp design/ tie-in. Ancillary items include drainage swales and ponds.

– SDD-IFC stage Active Transport Corridor design which includes alignment design, corridor modelling and drainage coordination.

– Stood in for Principal Road Designer several times within the project lifespan. Managing internal team resourcing and coordination with other teams.

Water and Drainage

– **Sydney Metro West - Clyde MSF, Clyde (Sydney), NSW, Australia (2020 - 2021): Sydney Metro, Civil Engineer Water Services Coordinator**

Adjust and re-route twin DN1200 watermains and combined utilities corridor for proposed Metro Stabling Facility.

– **Sydney Metro West - North Strathfield, Strathfield (Sydney), NSW, Australia (2020 - 2021): Sydney Metro, Civil Engineer Water Services Coordinator**

Adjust and re-route DN900 sewer main (micro-tunnelling design) for proposed Metro Station.

– **Sydney Metro West - Burwood North, Burwood (Sydney), NSW, Australia (2020 - 2021): Sydney Metro, Civil Engineer Water Services Coordinator**

Adjust and re-route DN300 sewer main (micro-tunnelling design) & catchment flow analysis for proposed Metro Station.

– **Sydney Metro West -Five Dock, Burwood (Sydney), NSW, Australia (2020 - 2021): Sydney Metro, Civil Engineer Water Services Coordinator**

Adjust and re-route DN180 rising sewer main for proposed Metro Station.

– **Sydney Metro Western Sydney Airport, Sydney, NSW, Australia (2020 - 2021): Sydney Metro, Civil Engineer Water Services Coordinator**

Feasibility reports for various proposed stations.

– **uMhlanga Oceans Development, Durban, KwaZulu Natal, South Africa (2017 - 2019): Edison Property Group, Civil Engineer**

Enabling Works Contract - Bulk earthworks, SW drainage & management, Sewer and water design. Telecomm relocation. Site inspections and QA.

– **Danville Girl's Highschool Synthetic Surface Hockey Field, Durban, KwaZulu Natal, South Africa (2015 - 2016): Danville Girls High School, Civil Engineer**

Site grading, retaining structures, SW drainage and project management site inspections and QA.

Road Design, Site Grading and Drainage

– **Kwadukuza Mall, Kwadukuza, KwaZulu Natal, South Africa (2018 - 2019): Edison Property Group, Civil Engineer**

Bulk earthworks, SW drainage & management, Sewer and water design. Site inspections and QA.

– **ND Engineering, Hammarsdale, KwaZulu Natal, South Africa (2018 - 2019): Rokwil Property Development, Civil Engineer**

Site grading, SW drainage & management, Sewer and water design. Site inspections and QA.

– **Rokwil Property Development, Hammarsdale, KwaZulu Natal, South Africa (2018 - 2019): Dromex, Civil Engineer**

Site grading, SW drainage & management, Sewer and water design. Site inspections and QA.

– **Print Park, Durban, KwaZulu Natal, South Africa (2017 - 2019): Redfine, Civil Engineer**

Bulk earthworks, parking lot and truck hardstand design, SW drainage & management. Site inspection and QA.

– **Provincial Route R22 re-route, Hluhluwe, KwaZulu Natal, South Africa (2014 - 2015): SANRAL, Civil Engineer**

Road & interchange design, road markings and surface water drainage.

Flood Modelling (drainage) and Structural Engineering

– **National Route N3 Hammarsdale Interchange Upgrade (JV with Hatch), Hammarsdale, KwaZulu Natal, South Africa (2015 - 2016): SANRAL, Civil Engineer**

Flood modelling & reporting. Culvert sizing and structural design.

Road Design, Drainage and Structural Engineering

– **Bufflesdraai Landfill, Bufflesdraai, KwaZulu Natal, South Africa (2014 - 2016): DSW-Durban Solid Waste, Civil Engineer**

Landfill earthworks, lining design, leachate drainage, road design, SW drainage, structural design and project management. Site inspections and QA.

– **Summerveld Training Centre, Shongweni, KwaZulu Natal, South Africa (2013 - 2015): Gold Circle, Junior Civil Engineer**

Site gradings, road design, drainage & infrastructure, structural design and project management. Site inspections and QA.

George Symons, MEng MIEAust CPEng NER

Senior Structural Engineer, Bridges Maritime & Structures NSW

<1 years with WSP

8 years of experience

Areas of expertise

Prestressed concrete bridge design and assessment, steel truss and plate girder bridge design and assessment, earth retaining structures design (cut-and cover etc)

Languages

English

Profile

George is a Senior Structural Engineer with 8 years of bridge engineering experience in the UK and Australia.

His key experience covers: prestressed beam/girder bridge concept and detailed design (with a focus on integral structures); steel truss bridge detailed design; steel plate girder (U-frame) bridge assessment; rehabilitation and strengthening design; and on-site contactor supervision.

George has seen projects through the design and construction life cycle being involved in the concept, tender, detailed design and construction phases on a number of large, multidisciplinary, infrastructure projects.

Education

MEng Civil Engineering 1st Class (Hons) 2014

Professional Associations

Chartered Member of Engineers Australia (2019) MIEAust CPEng

National Engineers Register (2019) NER

Professional experience

Structural/Bridge Engineering

– **Parramatta Light Rail Stage 1- Supply Operation and Maintenance, Sydney, NSW Australia (2022), Greater River City Light Rail, TfNSW, Senior Structural Engineer- Construction Phase Services**

Responding to RFI's from site regarding civil structural works and the Stabling and Maintenance Facility (SaMF).

– **Dubbo Regional Rail Maintenance Facility, Sydney, NSW, Australia (2022), CPB Contractors, TfNSW/ARTC, Senior Structural Engineer- Construction Phase Services**

Responding to RFI's from site regarding civil structural works.

Previous experience

Structural/Bridge Engineering

BG&E (Australia)

– **Sydney Gateway Detailed Design, Sydney, NSW, Australia (2021-2022), John Holland Seymour White JV, TfNSW, Bridge Package Lead**

Package lead and design lead for Taxi Tunnel Bridges, twin integral plank bridges over an existing taxi tunnel structure on Sir Reginald Ansett Drive.

Package lead and design lead for bridge SB71, a 10-lane integral plank bridge over a drainage pond, pipe culvert and Jemena gas main on Qantas Drive including a temporary sheet pile cofferdam.

Design lead for temporary sheet pile retention system at Underpass below Nigel Love Bridge.

Substructural designer for the Stage 3 Viaduct structure, encompassing pile group design and monopile design for the 1.5km long structure.

Construction phase services- responding to RFI's from site.

– Warringhah Freeway Upgrade Tender Design, Sydney, NSW, Australia (2020-2021), John Holland Seymour White JV, TfNSW, Cut-and-Cover Design Lead

Lead for over 800m of cut & cover structures comprising the Western Harbour Tunnel cut & cover structure and 2 no. Beaches Link Tunnel cut & cover structures.

– Leura Culvert Replacement, Sydney, NSW, Australia (2020-2021), Blue Mountains City Council, Design Lead

Concept and detailed design of a precast concrete culvert structure in Leura.

– Port Botany Rail Duplication Tender Design, Sydney, NSW, Australia (2020), CPB Contractors

Tender design for lengthening of Port Botany Rail Underbridge to accommodate new approach slabs.

Temporary works design for demolition and rectification of existing bridges.

– Mitchell Freeway Extension Tender Design, Perth, WA, Australia (2020), Georgiou Contractors, Main Roads WA

TeeRoff bridge abutment design under earthquake loading

Reinforced concrete underpass design.

– Brisbane Cross River Rail, Brisbane, Queensland, Australia (2020), Robert Bird, PULSE Consortium, Verifier

FEA modelling of Albert St. underground station for the purposes of verifying the proposed Robert Bird design.

Verification of segmental post-tensioned Vierendeel concrete trusses for the Gabba Underground Station in a fire event.

– Mulwala Bridge Barrier Upgrade, NSW, Australia (2020), TfNSW

Detailed design of a replacement basic performance level bridge barrier across the 500m+ long bridge structure.

– Sydney Gateway Tender Design, Sydney, NSW, Australia (2019-2020), John Holland Seymour White JV, TfNSW

Monopile design for large viaduct structure and tied arch bridge substructure design.

Temporary works design across a number of bridges, including the tied arch bridge to facilitate incremental launching.

Mott Macdonald (Australia)

– Port Botany Bulk Liquid Berth, Sydney, NSW, Australia (2019), Freysinnet, NSW Ports, Bridge Engineer- Technical Support

Provision of technical support to NSW Ports in relation to remedial works being undertaken by Freyssinet on a 4 span, 75m long road/pipe bridge. Design of temporary bracket anchored into headstock face to permit bearing shelf concrete repair.

– Future Rail, More Trains More Services, Sydney, NSW, Australia (2019), TfNSW, Bridge Engineer

Bridge refurbishment and replacement concept design to facilitate ‘quadruplication’ of the Northern Line from Hornsby to Concord West.

– Sydney Metro Design Services, Trains to Metro, Sydenham to Bankstown, Sydney, NSW, Australia (2019), TfNSW

Coordination and programming of construction activities to suit possession timetables.

— Parramatta Light Rail Stage 2 Definition Design, Sydney, NSW, Australia (2019), TfNSW

Designer for a light rail bridge spanning over the Parramatta River. Involved working closely with the client, its representatives from RMS, and colleagues across a range of disciplines to deliver a definition design that offered value for money, functionality and aesthetic appeal.

— Singapore North-South Corridor (NSC) Novena Underground Network (2019), Penta-Ocean Construction and Bachy Soletanche JV

Finite element analysis shell modelling and extraction of load effects for underground tunnel structures at the North South Line MRT tunnel crossing and the Novena Underground Network.

— Flinders University Footbridge Assessment, Adelaide, SA, Australia (2018), BUILT Pty

Proof engineering assessment for installation of lightweight tensile fascade for an existing multi-span, 116m long, steel footbridge structure.

— Darlington Upgrade Project, Adelaide's North-South Corridor, Adelaide, SA, Australia (2018), DPTI

Proof engineering of highly skewed RC protection slab and integral RC piles.

— Confidential Project, TfNSW

Concept design of segmental post-tensioned concrete box girder deck.

— Transport Access Program 3 Standardised Station Footbridge Design, Sydney, Australia (2018), TfNSW

Concept and detailed design of three standardised pedestrian bridges to accommodate varying spans. Standard designs are to be utilised at 12+ no. stations being upgraded as part of the TAP3 programme. Bridges designed comprise: a weathering steel truss bridge; a precast concrete u-trough bridge, and a precast pre-tensioned plank bridge. The project involved significant liaison with TfNSW and coordination with the wider project team which consisted of durability specialists (Vinsi), architects (DesignInc & GML), constructability advisors (Arenco) and lift shaft designers (Jacobs).

— Project 3 International Terminal Bridge Crescent Overpass, Sydney, Australia (2017), Seymour White/Sydney Airport Corporation Ltd

Response to contractor queries from site regarding construction of steel I-girder bridge to airport terminal.

Atkins (UK)

— Thames Water Asset Management Programme, London, UK (2016-2017)

Inspector for 20 no. Principal Bridge Inspections. Assessor for 4 No. pre-1900 steel plate girder bridges with composite trough decks in accordance with BD21/01, BS 5400-3, BD 56/10 and BD 44/15. Strengthening and rehabilitation feasibility reporting for 3 no. steel truss and plate girder bridges including work breakdown scheduling and option pricing. Strengthening design in accordance with Eurocode for 2 no. through truss bridges and 1 no. U-frame steel plate girder bridge. Rehabilitation specification for 4 no. bridges.

— Balfron Pipe Bridge Replacement, Glasgow, UK (2017), Scottish Water

Steel truss pipe bridge replacement detailed design in accordance with Eurocode. Collision protection beam detailed design.

— Heathrow Terminal 4 MSCP, Heathrow Asset Management Programme, London, UK (2016), Heathrow Airport Limited

Lead designer for bridge and car park refurbishment comprising bearing replacement; concrete repair; expansion joint replacement and impressed current cathodic protection in accordance with Eurocode, DMRB and associated Published Documents (i.e. PD 6703:2009).

– **A14 Cambridge to Huntington Improvement Scheme, Birmingham, UK (2015), Highways England**

Highway alignment design and Development Consent Order coordination role based in Atkins' Global Design Centre in Bangalore and Delhi.

– **East West Rail Phase 1 Bridge Packages, Birmingham, UK (2014-2015), Network Rail & Chiltern Railways**

Preliminary and detailed design of two reinforced concrete integral precast pre-stressed (pre-tensioned) beam bridges with site inspection/supervision during the construction phase.

Professional development

Rail Industry Worker Accreditation	2017

Professional history

WSP (Australia), Senior Structural Engineer	2022 – Present
BG&E (Australia), Chartered Bridge Engineer	2019 – 2022
Mott Macdonald (Australia), Bridge Engineer - Chartered Bridge Engineer	2017– 2019
Atkins (UK), Graduate Bridge Engineer -> Bridge Engineer	2014-2017

STEVEN ELLIS

Technical Executive
Civil Designer

2 years with WSP

22 years of experience

LOCATION

Sydney (George St), Australia

TECHNICAL SKILLS

Roads and Highways

Rural Roads

Mining roads

Autodesk Software

MANAGEMENT SKILLS

Geometric Road Design Review

PROFILE

Steven has 22 years of experience in the civil engineering industry, having worked in both the private and government sectors on a broad range of projects. Utilising digital engineering tools to deliver large multi-disciplined engineering projects.

This diverse background has given him a thorough understanding of how all areas of the infrastructure industry operate.

EDUCATION

Civil Engineering Diploma, TAFE 2006

PROFESSIONAL EXPERIENCE

Civil Infrastructure

M1 Pacific Motorway Widening, Kariong Interchange to Somersby, Kariong, NSW, Australia (2015): Roads and Maritime Services, Principal Designer

Concept design of the M1 Pacific Motorway between the Kariong Interchange to Somersby. The works include widening of the main carriageways into the median providing an extra lane in each direction. Upgrading of the southbound entry ramp from Piles Creek Bridge to two lanes, northbound exit ramp to dual lane exit, northbound entry ramp extended acceleration lanes.

Woolgoolga to Ballina Delivery Partner, Ballina, NSW, Australia (2014 - 2015): Roads and Maritime Services, Principal Designer

Delivery of the 150 km concept design and tender documentation. Working with Laing O'Rourke and Roads and Maritime Services to develop the digital engineering workflow, protocols and software integrations that are being rolled out through the detail design process. Deep involvement in the writing of the business case that saw the NSW government adopt a BIM approach for this project.

Albion Park Rail Bypass Concept, Albion Park, NSW, Australia (2013 - 2014): Roads and Maritime Services, Principal Designer

Concept design works for the extension of the M1 Princes Motorway between Yallah and Oak Flats to provide a bypass of the Albion Park Rail Township. The works comprise of concept design optionerring for approximately 10 km dual carriageway including three major grade separated interchanges. The options phase focused on delving a wide range of engineered options to take to a Value Management Workshop. There was a major focus on traffic analysis, flooding and community connectivity.

Manari Road Upgrade, Kimberly Coast, WA, Australia (2012): Woodside, Principal Designer

Strategic concept & concept design works for the upgrade of Manari Road. This is a very sensitive project in the Broome area with complex environmental, heritage and social concerns. The project is part of the James Price Point LNG facility. The works comprise of 36 km road upgrade, preparation of a draft scope of works document and flood modelling for eight major floodways along the route.

Roy Hill Rail Overpass-Great Northern Highway Diversions, Pilbara, WA, Australia (2012): WA Main Roads, Principal Designer

Concept and detail design works for the upgrade and temporary diversions of Great Northern Highway near South Hedland at the crossing of the Roy Hill Infrastructure rail line. The works comprise of concept optionerring, preferred alignment selection,

concept construction staging and final detailed design of the ultimate Great Northern Highway rail overpass bridge alignment.

Hunter Expressway Alliance, Newcastle, NSW, Australia (2010 - 2011): Roads and Maritime Services, Principal Designer

Detail design of approximately 13 km dual carriageway. Leading a team of seven designers working over three zones, construction access and early works designs. Involved in the project through tender to issued for construction. The project is built utilising machine guidance technology and required working closely with construction team surveyors to maintain design and modelling standards. Ensuring the final models were accepted for machine control construction.

Inner West Busway along Victoria Road, Rozelle, NSW, Australia (2008 - 2009): Roads and Maritime Services, Principal Designer

Detail design for the Bridge to Bay Alliance, responsible for installation of a bus lane along 3 km of a major urban arterial road in the centre of Sydney, including the construction of a 470m incrementally launched bridge, a 1 km Australia-first Tidal Flow Scheme, numerous intersection amendments, significant traffic studies, a $5 million cycleway and rehabilitation and improvement of King George Park and Playground.

Ballina Bypass Concept Design & Early Works Packages, Ballina, NSW, Australia (2006 - 2008): Roads and Maritime Services, Principal Designer

Concept design of 13 km of dual carriageway, four grade separated interchanges and design of earthwork embankments for early works package.

Mining

Yandi Sustaining, Pilbara, WA, Australia (2011 - 2012): Rio Tinto, Principal Designer

Detail design works including the ROM and primary crushing areas, transfer station and heavy vehicle haul and access roads. All modelling works have been carried out using 12d model software. Design standards were to be in accordance with new autonomous haul vehicles.

Brockman 2 to Brockman 4 road, Pilbara, WA, Australia (2011 - 2012): Rio Tinto, Principal Designer

Detail design works for a new 32 km road connection between two mine camps in the Pilbara. This project had interfaces with a new airport, rail and major flood ways. All modelling works have been carried out using 12d model software.

Solomon Project, Pilbara, WA, Australia (2010 - 2011): Laing O'Rourke, Principal Designer

Detail design works including stockyard areas, stacker and reclaimer rails and pad area, earthworks for a load out conveyor, a network of access roads and all volume calculations. All modelling works have been carried out using 12d model software.

PROFESSIONAL HISTORY

EIC Activities, Associate Principal - Civil Infrastructure	2017 - 2021
Autodesk, Senior Technical Sales Specialist	2015 - 2017
WSP, Principal Designer	2014 - 2015
Arcadis, Senior Civil Designer	2013 - 2014

STEVEN ELLIS

Technical Executive
Civil Designer

Rio Tinto, Senior Civil Designer	2011 - 2014
Hyder Consulting, Civil Design Team Leader	2006 - 2011
RTA, Project Officer	2001 - 2006
SMEC, CAD Drafter	1999 - 2001

TAMMY OWENS

Highway Engineering Lead

4 years with WSP

30 years of experience

LOCATION

Sydney, Australia

TECHNICAL SKILLS

Motorway and Road Alignment Design

MANAGEMENT SKILLS

Leadership

PROFILE

Tammy has more than 30 years' experience in engineering consultancies with a proven track record in delivering Motorway and Road Design projects. She leads, at the most senior level, the technical practice of geometric road design.

Tammy manages teams undertaking the planning and design of roads and highway infrastructure. She has extensive expertise in all aspects of road design and is very experienced in geometric design.

Tammy excels in delivering to tight timeframes – a feature of major design projects on which she has worked. She is a problem solver and has the ability to recognise an issue before it becomes a big issue and get it on the table with potential solutions. She has been instrumental in offering solutions which provide significant safety, performance, and cost benefits.

In the past few years, she has led the road design teams for the M6 Stage 1 Detail Design, M12 West Detail Design, Rozelle Interchange temporary works, the Outer Sydney Orbital and the Southern Sydney Access Investigation. Her team has been commended for performing exceptionally well within the time frames and for meeting the changing demands from JV partners and clients as they arose. She works hard with her teams to be innovative while developing robust design solutions that will stand the test of time.

EDUCATION

Associate Diploma in Civil Engineering, QUT 1985

PROFESSIONAL ASSOCIATIONS

AMIEAust CEngA NER

Engineers Australia - Full Member

National Engineering Register

PROFESSIONAL EXPERIENCE

– **M6 Stage 1, Sydney, NSW, Australia (2021 - Present): CPB Ghella-UGL Joint Venture, Discipline Lead for Alignment Design**

The M6 Stage 1 project is the design and construction of the M6 tunnel, surface works upgrades and active transport corridor (ATC). Role on the project was alignment and earthworks Discipline Lead across multiple packages. These include Princes Highway and President Avenue surface works upgrade, 6.5km of ATC with 4 bridges and 6 boardwalks, and the new Bicentennial Parklands. Continuous liaison has been required with the construction team CPB, and the Urban Designers (Hassell) to produce a coordinated design at the many interfaces between the ATC the Parklands, the Local Area Works, several sporting clubs, Bayside Council and the Sydney Water Muddy Creek Renewal Project. Lead a team of up to eight designers to deliver optimal design solutions within the tight time frames of this D&C project.

– **M12 West Detail Design, Sydney, NSW, Australia (2020 - 2021): Transport for NSW, Lead Road Alignment Designer**

Road Design Manager for the M12 West, a project which delivers the western part of the proposed M12 between the M7 and The Northern Road and a Systems Interchange linking the motorway to the new Western Sydney Airport. Guided a team of designers to deliver this project as a trial Digital Engineering project for TfNSW. Played a key role in the Challenge and Innovation period and lead much of the early Value Engineering

process to achieve important design improvements for the project. Maintained continuous liaison with multiple disciplines and the DE team. Encouraged the team to develop and share innovative solutions whilst never losing sight of the project objective to deliver a conforming design. Skilled in listening to what the client wants and delivering a design that is fit for purpose.

– **WestConnex – Rozelle Interchange, Sydney, NSW, Australia (2019): Roads and Maritime Services, Principle Highway Designer**

Design lead in the temporary works team for City West Link (CWL) and Victoria Road. This complex area of design had dive structures and cut and cover tunnel introduced into the existing City West Link configuration. It also had the existing Victoria Road bridge being reconstructed under traffic. Worked closely with the construction teams to optioneer solutions to keep traffic moving in this highly constrained area, a challenge that called upon geometric design skills, appreciation of local standards and strong communication skills. Liaised with the multiple disciplines involved in this area, i.e. the permanent road design team, permanent and temporary structures teams, temporary drainage designers, and the utilities teams.

– **WestConnex Stage 3B Rozelle Interchange, Sydney, NSW, Australia (2018): WestConnex, Tender Evaluator**

AECOM were the Technical Advisors for WestConnex Stage 3B. Involved in evaluating the geometric design and road safety aspects of the tender submissions, calling on experience of local standards and a common-sense approach to road design. Highlighted potential issues across multiple disciplines.

– **Easing Sydney's Congestion (ESC), Sydney, NSW, Australia (2017): Roads and Maritime Services, Lead Alignment Designer**

Principal Road Designer on the ESC team embedded in the project office with RMS in Parramatta This programme of works covered a wide range of road and intersection upgrades to remove known pinch-points in the road network and provide more clearway. Many of these projects started as strategic design, and with an accelerated program, were carried through to construction. Significant contribution to robust concept development for planning and approvals and thoroughly detailed design outputs for subsequent construction. Worked closely with the drainage and utilities teams, TCS designers and RMS Engineering Services to deliver "no surprises" solutions.

– **Outer Sydney Orbital (OSO), Sydney, NSW, Australia (2016 - 2017): Roads and Maritime Services, Lead Alignment Designer**

Road Alignment Manager for the OSO corridor preservation study. The team investigated and reported on alignment options for combined motorway and freight rail along a 75 km corridor in Western Sydney. Role included coordination of a team of five road designers and liaison with rail designers, flood modellers, bridge designers, utilities specialists, and the planning and environmental teams to develop realistic options for assessment. The process included the investigation of options for four systems interchanges, seven access interchanges and two rail junctions along the route.

– **Southern Sydney Access Investigation (SSAI), Sydney, NSW, Australia (2014 - 2015): Roads and Maritime Services, Lead Designer**

Road Alignment Manager on the SSAI corridor study. The team investigated and reported on motorway and interchange options along the F6, A1, A3 and A6 corridors. Involved in developing the 30 km F6 preferred option to the next stage of Technical Assessment. The investigation included surface, viaduct and tunnel options.

– **Pacific Highway Upgrade, Woolgoolga to Ballina early works, Sydney, NSW, Australia (2014 - 2015): Roads and Maritime Services, Road Designer**

Main responsibility was to investigate alternatives to the proposed interchanges between Yamba and Iluka. Also involved in the detailed design of ground treatments at soft soil sites using MX software and producing tender documentation for these construction packages.

– **NorthConnex Technical Advisory, Sydney, NSW, Australia (2014): Transurban, Road Designer**

The Technical Advisory team completed an "illustrative scheme" and performance specifications for the 8km link between the M2 at North Rocks and the F3 at Wahroonga prior to calling for design and construct tenders. Involvement was to review previously prepared options and documentation. Assisted in piecing together preferred options to form a complete reference design. Played a key role in the effective and timely identification of design constraints and risks while developing the reference design.

JOSE PEREIRA

Principal Pavement Engineer

1 year with WSP

20 years of experience

LOCATION

Sydney (George St), Australia

TECHNICAL SKILLS

Pavement Design: Rigid, Flexible

Pavement Construction Phase Services

Pavement Rehabilitation

PROFILE

Jose is a Chartered Professional civil engineer with over 20 years' professional experience inside infrastructure design for pavements and geotechnical investigation for civil engineering projects both in Brazil and Australia.

His expertise has been developed through a wide range of projects around Western Australia, Victoria, Tasmania and New South Wales covering flexible and rigid pavement design, heavy-duty pavement design for roads and highways, pavement stabilisation, pavement structural analysis, road maintenance assessment. His pavement design experience includes flexible and rigid pavements using contemporary software applications and conforming to Austroads Guide to Pavement Structural Design, Austroads Pavement Evaluation and Treatment Design and other relevant Standards.

As part of his professional career development, Jose obtained a Master's degree in Transportation Engineering in 2007 with research published on back calculation procedures for flexible pavements involving Benkelman Beam and Mathematical models. He has also participated in several conferences, seminars and technical courses from organizations including AAPA, CPEE, ASCP and ARRB.

His project management and design experience ranges from preliminary design studies through to concept and detailed design.

EDUCATION

Master's degree (MSc) Transportation Engineering, University of Sao Paulo – Brazil	2007
Bachelor of Engineering (Civil), Campinas State University – Brazil	2001

PROFESSIONAL ASSOCIATIONS

Chartered Professional Engineer (CPEng)

Engineers Australia – Civil College Member

Australian Society for Concrete Pavement (ASCP) member

PROFESSIONAL EXPERIENCE

Pavement

M12 Elizabeth Drive Connections, NSW (2022): Transport for New South Wales, Pavement Lead

The M12 Motorway forms a key part of the Western Sydney Infrastructure Plan (WSIP), a joint initiative of the Federal and State governments to fund a $4.4 billion road and transport program for Western Sydney. The M12 Motorway will provide a direct access to Western Sydney International Airport (WSIA) at Badgerys Creek and connect with Sydney's existing motorway network, providing increased road capacity, reduced congestion and travel times, and improved movement of freight.
WSP has been engaged to deliver the M12 Motorway Project – Package 3 – M12 East Elizabeth Drive Connection (EDC) Concept and Detailed Design for Transport for NSW (TfNSW).

As pavement lead for the Detailed Design stage, Jose has been responsible for full pavement package deliverables (including drawings and pavement design report with deflection analysis data).

Southern Link Road, NSW (2022): Transport for New South Wales, Pavement Lead

Southern Link Road (SLR) project is funded by Department of Planning, Industry and Environment (DPIE). It is located 35km to the west of the Sydney CBD. This new east-west corridor would provide an additional link between Mamre Road, Kemps Creek and Wallgrove Road, Horsley Park to support the expected future traffic demand generated by future land developments in the surrounding area. It would also complete the road network. It would also complete the road network for access to the Western Sydney Employment Area (WSEA), west of the M7 Motorway and south of the M4 Motorway.

TfNSW has engaged WSP to deliver the concept design and environmental assessment under the EP&A Act (Review of Environmental Factors (REF) for the SLR from Mamre Road, Kemps Creek to Wallgrove Road, Horsley Park.

As pavement lead for the Concept Design stage, Jose has been responsible for full pavement package deliverables (including drawings and pavement design report).

Central Coast Highway Upgrade – Tumbi Road to Bateau Bay Road, NSW (2022): Transport for New South Wales, Pavement Lead

The Central Coast Highway Upgrade, Tumbi Road to Bateau Bay Road Project is an important step towards completing the 'missing link' in a four-lane Central Coast Highway between the Kariong interchange and Wyong Road. The Project will make a significant improvement to the travel times and congestion for 26,500 regional and local road users each day.

As pavement lead for the Concept Design stage, Jose has been responsible for full pavement package deliverables (including drawings and pavement design report).

– **Mamre Road Upgrade, Sydney, NSW, Australia (2021): Aurecon/Transport for New South Wales, Pavement Lead**

TfNSW proposes to upgrade about 3.8 kilometres of Mamre Road between Erskine Park Road and the M4 Motorway. The Project includes widening of Mamre Road to four lanes with two lanes in each direction and a central median along the length of the road. The works include associated upgrades to existing side roads; signalised intersections are proposed at intersections along Mamre Road. Pavement lead for the Concept Design stage, responsible from Pavement Options Report (including whole of life cost analysis) to full pavement package deliverables (including drawings and pavement design report with deflection analysis data).

– **M5SW Pavement rehabilitation, Sydney, NSW, Australia (2021): Ventia, Site Supervision and Technical Advice**

NA Group has been awarded the contract to rehabilitate the rigid pavement on M5 Motorway (westbound) in Sydney from Heathcote Road to Moorebank Avenue. Involved directly as the client's representative verifying rigid pavement rehabilitation procedures on site during night shifts in relation to TfNSW rehabilitation practice requirements and providing answers to Request for Information (RFI) from the Contractor.

– **Pound Road West Upgrade, Victoria, Australia (2021): Seymour Whyte Constructions/Major Road Projects Victoria, Pavement Lead**

The scope of the project (D&C Contract) was to build a new bridge over the Cranbourne rail line to remove the dead ends at Remington Drive and Pound Road West. The bridge will provide a second connection between Abbotts Road and South Gippsland Highway, improving access to the freeway network and reducing travel times for businesses. Pavement lead in this project being responsible for all matters related to pavements.

– **Mulgoa Road Upgrade, Sydney, NSW, Australia (2021): Transport for NSW, Pavement Lead**

Mulgoa Road Upgrade aims to reduce travel times and improve traffic flow between Glenmore Parkway to Jeanette Street (Stage 2), Blaikie Road to Union Road (5A) and from Jamison Road to Union Street (5B). The site is located at Penrith and is an important arterial road that connects Penrith to the M4 Motorway. This upgrade will take Mulgoa Road from two lanes to three in each direction, easing congestion and facilitating future development of the community and services in the region. Pavement lead for the Concept Design stage responsible from Pavement Options Report (including whole of life cost analysis) to full pavement package deliverables (including drawings and pavement design report with deflection analysis data).

– **Denny Avenue Level Crossing Removal Project, Perth, Western Australia, Australia (2020): Downer EDI Works Pty Ltd, Pavement Lead**

The project objective is to close and remove the Denny Avenue level crossing and replace this critical east-west connection with a rail over road grade separation at Davis Road in order to reduce congestion and to improve safety for pedestrians, cyclists and motorists in the area. Road works are also required to deliver the grade separation and enhancement of the surrounding road network. Pavement lead for this project liaising with PTA (Public Transport Authority) and MRWA (Main Roads Western Australia) in relation to design preferences and technical discussions in relation to pavement design.

– **Albion Park Rail Bypass, Albian Park, NSW, Australia (2018): Transport for NSW, Pavement Lead**

Albion Park Rail Bypass project provided a four-lane divided highway (two lanes in each direction) extension of the M1 Princes Motorway between Yallah and Oak Flats. The bypass completed the 'missing link' for a high standard road between Sydney and Bomaderry. The Project consists of a new motorway bypassing Albion Park Rail township from Oak Flats Interchange to Yallah, connecting with the existing Princes Highway at the Duck Creek Bridge. The northern extent of work is located just south of where the existing A1 Princes Highway passes under the M1 Princes Motorway. The southern extent of work is located immediate south of Oak Flats interchange. Directly involved in the detailed design stage as pavement lead developing the pavement design for main carriageway, state roads and local roads in the project area. Also responsible for Construction Phase Services (CPS) for this project.

– **Jane Street and Mulgoa Road Upgrade, Sydney, NSW, Australia (2017): Transport for NSW, Pavement Lead**

The Project was developed to alleviate congestion and improve traffic flow along Mulgoa Road and Castlereagh Road adjacent to Penrith's CBD by widening the corridor from south of Union Road to south of Museum Drive. To accommodate the widening, the existing rail underbridge over Castlereagh Road will be replaced and three intersections will be upgraded. Developed in an urban environment, the project

involved rehabilitation of existing pavement through back calculation of layer moduli and proposal of alternative and expedite pavement types to suit constructability. Pavement lead for this project involved in discussions with the client providing technical support to assess pavement remaining life, pavement design and constructability issues.

– **Northern Beaches B-Line Program, Sydney, NSW, Australia (2017): Transport for NSW, Independent Verifier**

The B-Line Program was an integrated package of service and infrastructure improvements designed to provide more reliable journeys between Mona Vale and the Sydney CBD. Improvements to the road corridor and implementation of bus priority measures will improve reliability of bus services affected by congestion at several bottlenecks. Involved in the project as an Independent Verifier (IV). Inside this role, the main responsibility was to supervise roadworks involving pavement construction to ensure that the Contractor carried out the works in accordance with project requirements and relevant Roads and Maritime Specifications.

– **Narara to Lisarow – Pacific Highway upgrade, Sydney, NSW, Australia (2016): Transport for NSW, Pavement Lead**

The project involved the development of a concept design to upgrade 5.0 km section of road alignment along Manns Road and the Pacific Highway. The project extends from 0.375 km south of Narara Creek Road, Narara to Parsons Road, Lisarow. The previous single lane in each direction was proposed to be upgraded to a dual carriageway with intersection improvements at various locations. This was expected to improve traffic flow and increase safety for road users, including cyclists and pedestrians. Pavement lead in the project providing whole of life costing analysis, pavement options report and guidance for the preferable pavement structures to be adopted in the main alignment and local roads.

– **Kankool – Heavy Vehicle Inspection Station, Sydney, NSW, Australia (2016): Transport for NSW, Pavement Designer**

Located in the Upper Hunter Region, the project consisted of replacing the existing flexible pavement with rigid pavement. Role on the project was the engineer responsible for the design which included: geotechnical investigation, complete pavement design (including joints, subsoil drainage, edge and interface details), cost estimate for the construction of the works and construction documentation based on TfNSW specifications.

– **WestConnex (M4 Motorway Widening), Sydney, NSW, Australia (2015): Transport for NSW, Pavement Designer**

The M4 Widening upgraded the M4 to four lanes in each direction between Church Street, Parramatta and Homebush Bay Drive, Homebush, providing an extra lane for motorists using this section of the motorway and helping to alleviate congestion around the James Ruse Drive ramps. Role as pavement team, Jose responsible for rigid and flexible pavement design.

– **North West Rail Link (Sydney Metro – OTS), Sydney, NSW, Australia (2014): Transport for NSW, Pavement Lead**

The $8.3 billion North West Rail Link was Australia's largest public transport infrastructure project under construction at that stage. It is the first fully automated rapid transit rail system in Australia. The project delivered eight new railway stations and 4,000 commuter car parking spaces to Sydney's growing North West. Role as pavement lead involved in geotechnical investigation and pavement design

considering the different pavements needed at the train stations, road upgrades around and train maintenance facilities.

PROFESSIONAL HISTORY

WSP, Principal Pavement Engineer	2022 - Present
SMEC, Senior Pavement Engineer	2014 - 2022
Pitt & Sherry Consulting Engineers, Pavement Engineer	2013 - 2014
AECOM, Senior Civil Engineer	2008 - 2012
CCB-P Consulting Engineers, Graduate Civil Engineer	2002 - 2008

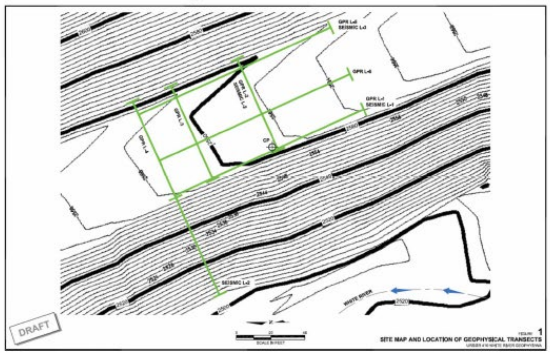
Appendix B

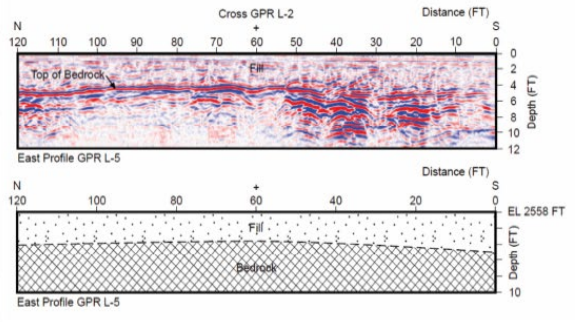
Seismic Profiling Information for Landslides

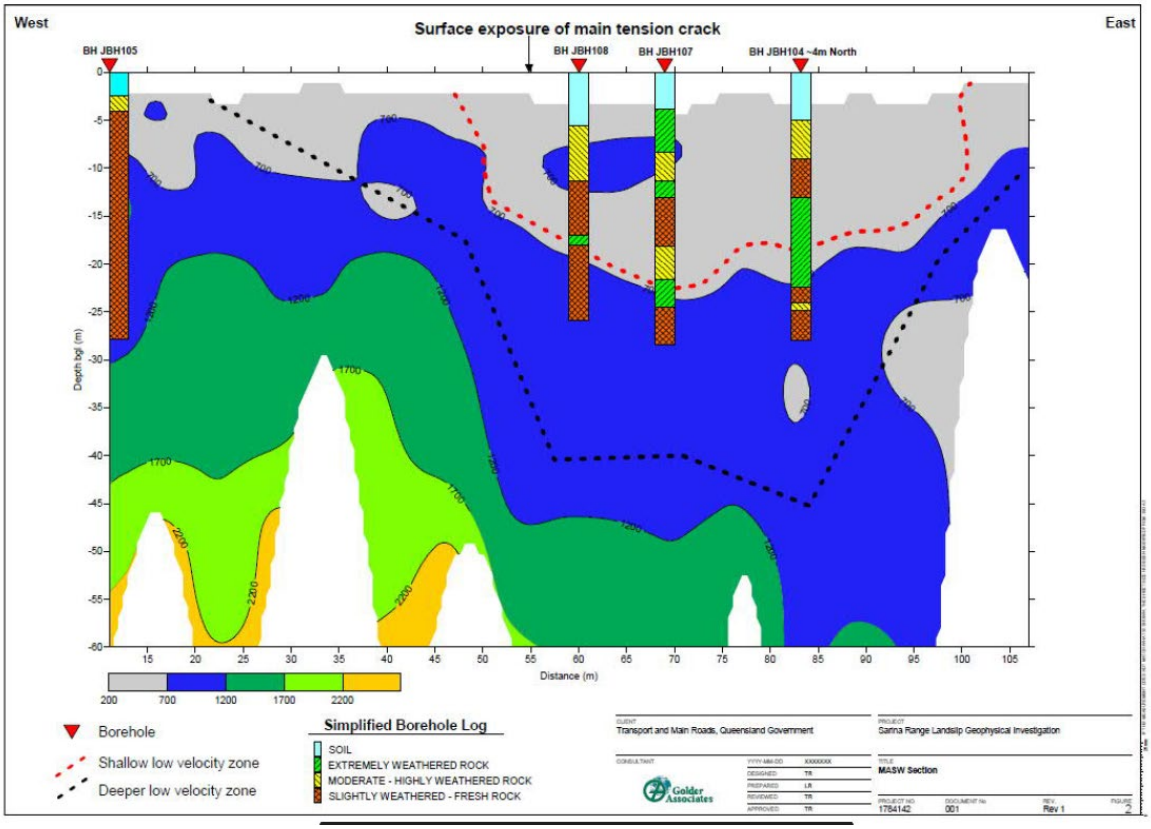
Seismic Refraction and GPR

Photo 1a. GPR L-1 & Seismic L-1 Looking North.

Photo 2a. Seismic Line L-2.







Geophysical Surveys

Capability Statement

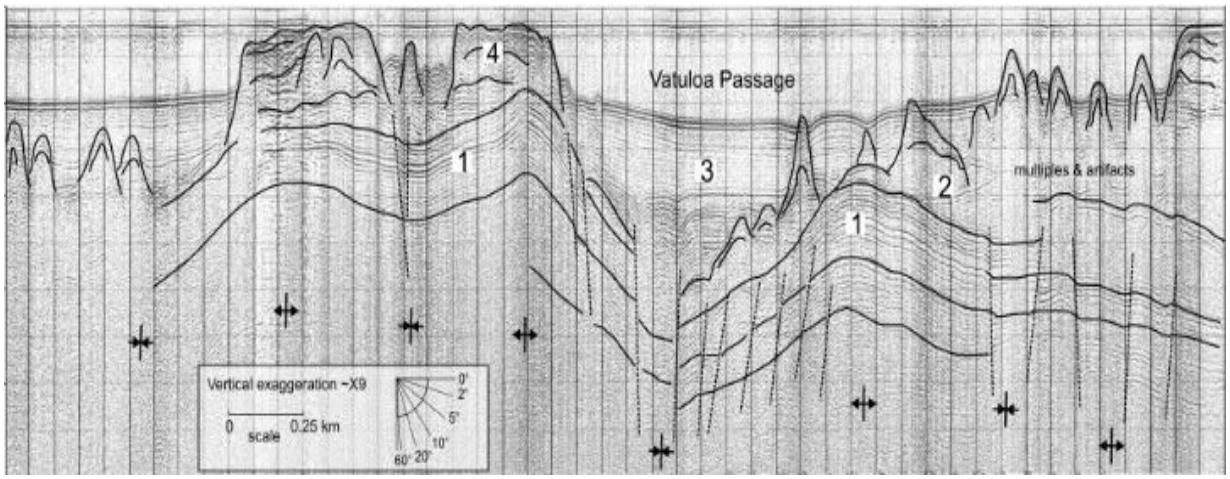
Submitted to:

Submitted by:

WSP | Golder Australia
900 Ann Street, Queensland 4006 Australia

+61 7 3721 5400

6 September 2022



WSP | Golder is a world leader in the application of geophysics for obtaining subsurface information. Geophysical investigations complement other investigations to enhance site information at a lower cost and to facilitate decision making. Geophysics is applied for site characterisation, data collection for site remediation, construction design and planning assistance, and site condition monitoring.

WSP | Golder geophysicists work seamlessly with specialists in Hydrogeology, Environmental, Geotechnical Engineering and other teams, to provide a truly integrated service.

Overcoming challenges

The crucial element to any project involving a geophysical survey is having qualified and experienced geophysicists to plan and conduct the work. Identifying the correct geophysical method for the requirements of the client, and ensuring data quality and knowledgeable interpretation of the resulting data is key. These are the benefits the WSP | Golder team can provide.

Benefits of geophysical surveys in site investigations

WSP | Golder is capable of implementing innovative methods of investigation tailored to solve project-specific challenges using a range of geophysical techniques. By integrating data from different geophysical surveys with relevant mapping and intrusive techniques, a greater understanding of site conditions can be achieved, reducing project costs and risks. WSP | Golder has a range of applied geophysical methodologies and extensive experience in utilising these to enhance investigations associated with:

- Geotechnical engineering
- Environmental investigations
- Hydrogeological investigations
- Marine investigation

Geophysical techniques have the potential to overcome the limitations inherent to traditional intrusive site investigation methods. Some of the benefits geophysical methods offer over a traditional method such as drilling include:

- Non-intrusive and more environmentally friendly
- Explore large subsurface volumes for relatively low cost
- Characterise bulk properties of soil and rock
- Offers greater operator safety
- Rapid acquisition and quick turnaround time for results
- Continuous data, as opposed to “point” data
- More portable in areas with difficult access
- Significantly lower risk of spills, site contamination, or fire

Environmental sensitivity

Geophysical surveys are non-intrusive, have minimal impact on the survey area and are particularly relevant in areas of high environmental and cultural sensitivity. Geophysical equipment is versatile and can be adapted to fit different marine vessels depending on the survey extents and/or access restrictions. The equipment is set-up manually and generally consists of low powered electronic equipment, without the need for heavy machinery. This largely reduces the risk for site contamination through spills and wastewater runoffs, and site impacts such as vibration, waste material and damage to vulnerable marine flora and fauna. Geophysical testing design offers flexibility and can often be performed on difficult to access areas where intrusive methods are not viable. WSP | Golder provides safe work method statements on all its geophysical test methods on how environmental impacts will be controlled and minimized.

Multi-scale geophysical methodologies

The geophysical techniques offered by WSP | Golder enable us to assess subsurface conditions and interpret relevant material properties at three differing scales of investigation.

Macro-scale (hundreds to thousands of meters)

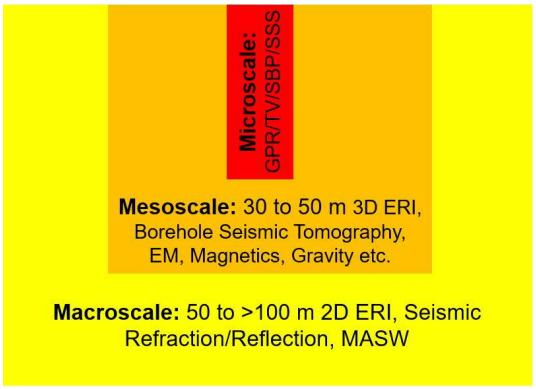
This scale uses broad-scale site characterisation surveys to identify and delineate targets such as stratigraphic boundaries; imaging of paleo-channels; stratigraphic and structural discontinuities (i.e. faults); lateral variations in formation thickness and inferred material strengths; and thickness and composition of overburden. This approach provides for an effective means of developing an overall understanding of the geological ground model.

Meso-scale (tens to hundreds of metres)

This scale is more refined and target specific than the macro-scale. Geophysical methods at this scale are tailored to target more specific subsurface features such as the structure and fabric of the stratigraphic layers, including clay lenses, interbedding, intra-strata discontinuities, and voids; lithological and strength variations within formations; and lateral changes in material layer thickness and strengths. These methods can also help resolve larger features such as faults or ridges that may have been identified at a macroscale.

Micro-scale (centimetres to metres)

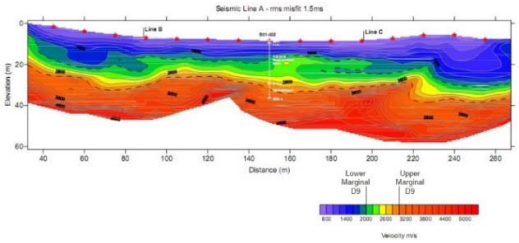
High-resolution methods, such as ground-penetrating radar (GPR); televiewer imaging and other borehole geophysics; high-frequency sub-bottom profiling (SBP); side scan sonar (SSS); and other techniques have sub-metre accuracy in identifying subsurface features and stratigraphy. These can be correlated with available intrusive data to build detailed, continuous, and reliable site characterisations.



SUMMARY OF GEOPHYSICAL METHODS

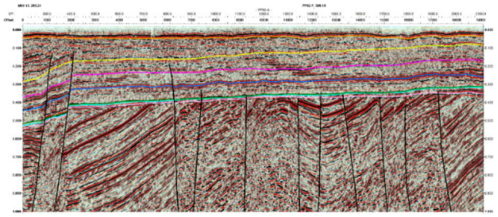
Seismic Refraction

The seismic refraction method is the most widely applied geophysical methodology used to assist in geotechnical investigations. This method utilises the P-wave (first arrival) signal of the seismic record, captured by an array of geophones, and typically provided by a hammer swing. The P-wave velocity (V_p) is directly controlled by the stiffness (elastic moduli) and density of the subsurface strata, with saturated material giving a predictable response that aids in the identification of the groundwater table. The seismic refraction method can yield the subsurface V_P structure, which can be used to help model subsurface stratigraphic and structural characteristics, and also evaluate bedrock rippability potentials. Where a significant change in V_P occurs (e.g. the soil-rock interface), estimates of the depth to layer interfaces can be made for assessing depth to bedrock and thickness of overburden.



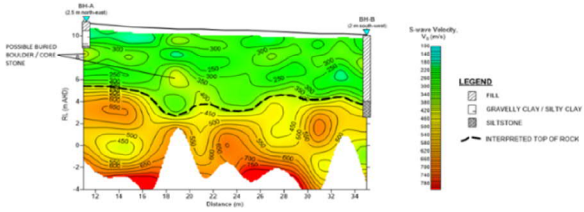
Seismic Reflection (2D and 3D)

Seismic Reflection is a commonly accepted method for mapping subsurface stratigraphic boundaries. This method uses a controlled energy source at given locations (shot points) to introduce a seismic signal into the subsurface. The seismic signal is reflected from interfaces between materials that have differing acoustic characteristics, such as the interface between sand and gravel. The reflected seismic signals are received by a series of geophones that are connected to a seismic cable laid on the ground in a linear configuration. The seismic energy source is discharged at a shot point between each of the geophones. The timing of the reflected acoustic energy (raw seismic data) is processed to determine the seismic velocity of the earth material and to map the subsurface stratigraphy and structures.



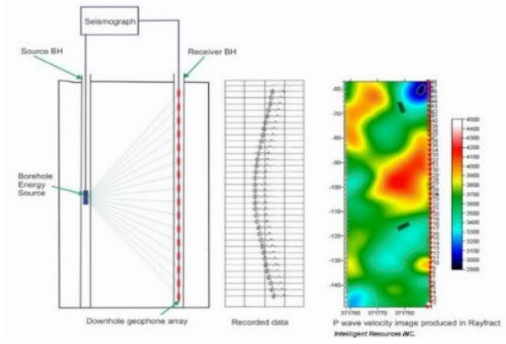
Multi-channel Analysis of Surface Waves (MASW)

This method uses geophones to capture the shear-wave (S-wave) profile in a similar manner to seismic refraction. S-waves are sensitive to soil stiffness and can be used to image variations in the rigidity of the soil. The S-wave velocity (Vs) can be used in conjunction with seismic refraction results to provide 2D estimates on various engineering values such as Poisson's Ratio, Young's Modulus, and Shear Modulus.

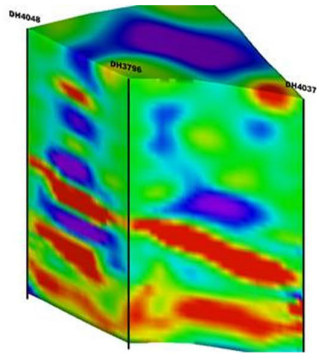


Cross-hole Geophysics

WSP | Golder also applies both the seismic and ERI methods as cross-hole methods. Source and receiver locations are placed both along borehole lengths and the ground surface to record data in a 2D or 3D pattern. These surveys are used for detailed investigations at target locations, such as investigating seepage issues in coal mining,



identifying weak / voided ground conditions, detailed stratigraphic characterisation, progressive fracture formation above mine workings, and imaging fracturing and seepage in aquitard layers.



WSP | Golder' Suite of downhole and In-hole Seismic Tests

WSP | Golder' List of Geophysical in situ in hole Seismic Tests includes:

- Vertical Seismic Profiling (VSP – 2D and 3D);
- Cross hole Seismic tests (cross hole seismic and cross hole seismic tomography) – for the derivation of both P-wave and S-wave information, (Vs30, in situ engineering parameters, soil liquefaction susceptibility Poisson's Ratio, damping factor etc.); and
- Seismic Transmission Tomography (custom geometry setup, inverse VSP etc.) – for the derivation of P-wave velocity imaging information.

Site Response Analyses

As a part of an overall site-specific seismic hazard analysis, a site response analysis is a crucial segment in the definition of site geohazard. The information derived from the site response analysis can be used as input information in seismic hazard and liquefaction susceptibility assessments. The main type of information derived from the investigations are related to the Vs velocity information (using the MASW, ReMi and HVSR methods) that can be used to define the site class, the amplification characteristics of the soil at the foundation and the dominant site natural period.

The site response information can be utilised in the development of ***Synthetic Time Histories*** for non-linear structural response analysis. WSP | Golder has a wide range of experience, in house know-how and a suite of software tools to efficiently perform these tasks.

Frequency Domain Electromagnetics (FDEM)

Frequency Domain Electromagnetic (FDEM) surveys use Faraday's law of induced electrical currents in an electromagnetic field to map out variations in subsurface electrical conductivity in the frequency domain. An electromagnetic field is transmitted by a source coil in the FDEM tool, inducing eddy currents in subsurface materials. These induced eddy currents produce their own electromagnetic fields of varying amplitude (depending on the material conductivity) which is then picked up by one or more receivers. The in-phase response (orientated on the same plane as the source) is strongly affected by metallic objects. The out-of-phase receiver (orientated 90 degrees to the source) is directly related to soil and rock bulk electrical conductivity. The presence of groundwater in the shallow surface can vary depending on factors such as salt saturation but is often recorded as an area of high electrical conductivity. FDEM can be land-based or airborne depending on survey area, target depth, resolution, and site accessibility. FDEM surveys are limited by the surrounding environment, therefore do not work as well in urban environments. Depth penetration is dependent on the transmitter frequency and spacing between the transmitter and receiver coils.

Time Domain Electromagnetics (TDEM)

Time Domain Electromagnetic (TDEM) surveys use Faraday's law of induced electrical currents to assess variations in subsurface electrical conductivity in the time domain. A transmitter loop of wire with a current running through it induces an electromagnetic field in the soil and rock below the loop, before being turned off.

A receiver coil then records the length of time that it takes for the induced electromagnetic field to diffuse into the earth.

The total time taken to diffuse directly relates to rock conductivity of the subsurface material. Because rock conductivity strongly correlates to rock properties, TDEM is an effective way to map changes within rock such as water bearing units and seepage from reservoirs and dams. The penetration depth of TDEM surveys is dependent on the diameter of the coils but is approximately five times the transmitting loop's size. Regional airborne TDEM surveys can be flown with larger coils to investigate broader and deeper zones before using smaller coils in a land-based survey to refine survey resolution.

Microgravity

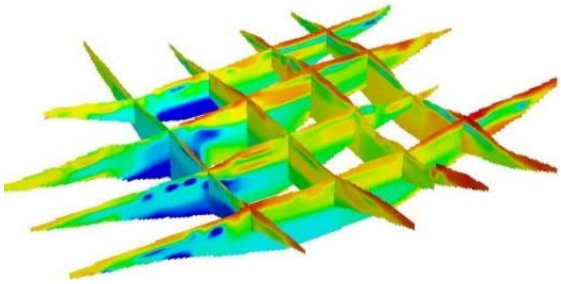
Microgravity surveys measure subtle variations in the Earth's gravitational field related to the densities of subsurface materials. The principle is that a local perturbation in the gravitational acceleration, *g*, is caused by a buried region of anomalous density compared to the surroundings. Microgravity data acquisition requires that the measurements be taken under stable conditions and also requires extraordinary precision in the determination of the data acquisition instrument's location, (especially elevation). Microgravity surveys are useful to assist in assessing undulations in the rock head (paleo channel) and also the detection of voids and weak ground conditions.

Ground Penetrating Radar (GPR)

Ground Penetrating Radar (GPR) uses radar pulses to image the subsurface. It can detect buried objects, changes in material properties, and defects. It works in a similar method to seismic reflection in that energy is reflected back to the surface at locations of discontinuities. Data acquisition by shielded GPR antennae is completed by a single person pushing a GPR unit at walking pace. The data can be observed in real-time to assist with quality control. Data resolution depends on the frequency chosen. The depth of investigation also depends on the frequency chosen, as well as the conductivity of the ground.

Electrical Resistivity Imaging (ERI)

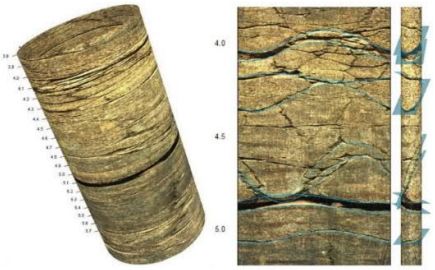
The ERI method measures the 2D apparent resistivity of the subsurface, detecting lateral and vertical changes in subsurface electrical properties. These changes can result from variations in sediment or rock type, water content, pore-water chemistry, and the presence of buried debris. Coarse gravelly/sandy layers are likely to have a lower conductivity response than surrounding finer-grained silts and clays, therefore providing electrical contrast for detection. The ERI technique is useful for imaging stratigraphy and lateral changes in material properties of the subsurface, such as mineral alteration. Useful information can also be obtained regarding groundwater level variations, seepage paths, and confined aquifers. WSP | Golder can also conduct 3D ERI surveys to more comprehensively map subsurface features.



Electrical Resistivity Sounding (ERS)

The ERS method measures the apparent resistivity of the subsurface. The method works by increasing the spacing between four electrodes positioned in the ground to achieve readings at desired depths. Tests are often completed in orthogonal directions to evaluate the presence of electrical anisotropy in the ground. The apparent resistivity values are used to evaluate corrosive soils and protection design requirements for any buried steel structures. The apparent resistivity values are also used to evaluate design requirements for electrical earthing.

Geophysical Borehole Logging



Downhole borehole services provide a direct view, with incredible resolution, of the properties of a borehole wall. The following probes can be used to characterise different parameters of a borehole:

- Caliper (measuring the diameter of the bore and open defects)
- Acoustic Televiewer (imaging defects and rock strength)
- Optical Televiewer (imaging defects and rock type)
- FWS (Full waveform sonic)
- Conductivity
- Resistivity
- Flowmeter Logging
- Gamma Logging
- Thermal Logging

Downhole televiewer surveys are conducted in uncased geotechnical boreholes to provide the general subsurface characteristics including the thicknesses and dip of the strata, and particularly the nature of rock mass defects and their geographic orientation, which is not possible to record with standard geotechnical rock logging procedures. Two types of televiewers are commonly used: the acoustic televiewer (ATV) and the optical televiewer (OTV). Both provide an orientated image of the borehole walls. The ATV can only be used in fluid-filled boreholes, however it provides more information such as the nature of rock defects and apparent rock hardness.

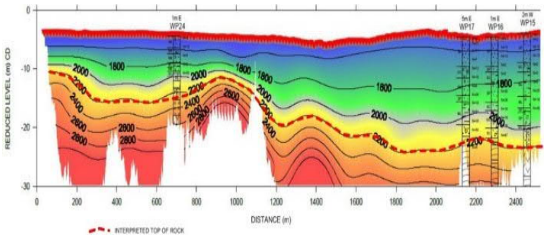
Self-Potential (SP)

Self-Potential (SP) uses natural electrical potentials between two points on the ground surface. This electrical potential may be generated by several sources, but notably, groundwater is a very strong source of SP. This can be generated by groundwater flow or by natural electrochemical reactions taking place within a body of groundwater. SP is measured using non-polarising, porous electrodes called pots (metal electrodes cannot be used as they generate their own SP, which can interfere with true signal). These pots are extremely sensitive to fluctuations in polarity and voltage and are often arrayed as a linear survey or a grid to produce a 2D profile or contour map as required by the client. SP is often used to locate seepage from dams and reservoirs and to delineate groundwater aquifers and flow.

Marine Geophysics

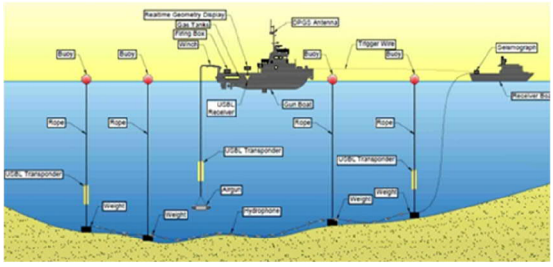
Continuous Marine Seismic Refraction

Continuous marine seismic refraction is a technique which can use either a bottom-towed or surface-towed hydrophone array with an airgun source and integrated DGPS system for accurate positioning. This method is designed to measure the compressional P-wave velocity of shallow sub-bottom material and their distribution. Correlation of compressional P-wave velocities and materials' in-situ strength can provide useful information for engineering projects such as dredging and assisting in targeted drilling operations.



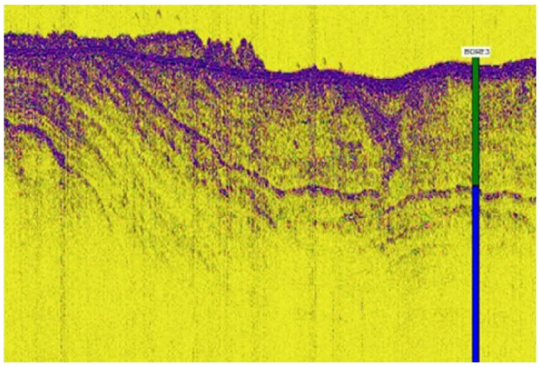
Static Marine Seismic Refraction

Static marine seismic refraction makes use of the same technique employed in continuous marine seismic refraction, however the hydrophone array is placed on the seafloor and remains static during the testing. Two vessels are used to ensure accurate placement of the hydrophone array on the seabed, and to enable movement of the airgun along the line. This method allows for improved signal-to-noise ratio, and increased depth of penetration.



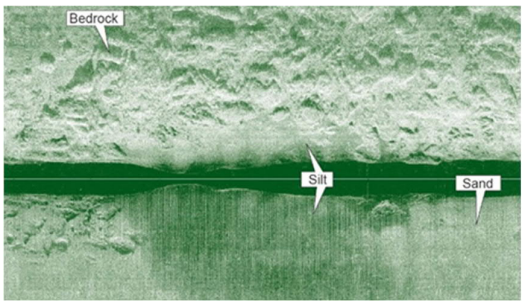
Sub-Bottom Profiling (SBP)

SBP, or single-channel seismic reflection, is a geophysical method used to create high resolution images of shallow subsurface marine settings. Using a transducer emitting a range of frequencies to ensure good resolution and sediment penetration, signal is reflected of layers, referred to as reflectors, such as the seafloor or the rock at the base of overburden before being picked up by an onboard receiver. Mapped as acoustic boundaries in a 2D profile, this method is excellent at delineating stratigraphic boundaries, structural discontinuities and lateral variations within units such as channel incisions and unit lensing.



Side Scan Sonar (SSS)

Side Scan Sonar (SSS) provides a high resolution image of the seafloor using a high frequency signal to image a swath of area. This signal reflects off outcropping features and returns as a real-time image containing amplitude highs and lows converted into colours with shadowing. These shadows are extremely helpful in identify features in a variety of survey objectives such as mapping geological features, search and recovery of bottom laid objects, or pre/post dredging operations.



Single and Multi-beam Bathymetry

Bathymetry surveys map seafloor topography by measuring the delay in travel time of sonar signals sent out from the system which bounce of the seafloor and return to the ship. The changes in travel-time correspond to depth variations of the seafloor. This data can be used to create a contoured map of the seafloor, helping to identify outcropping features and debris. Single-beam or multi-beam surveys can be conducted each with their own benefits such as covering larger areas or for small surveys with smaller data files.

Marine Electrical Resistivity Imaging (MERI)

MERI uses the similar equipment required for land ERI surveys but adapted to marine use. This method measures the 2D apparent resistivity below the seabed, detecting lateral and vertical changes in subsurface electrical properties. In a marine setting these differences are often associated with changes in stratigraphic units or debris scattered on the seabed. The resulting data is a 2D resistivity profile which is coloured for ease of interpretation. This method has been successfully used previously by WSP | Golder to map out the location and extent of sub-seafloor features, characterise seabed conditions, and map stratigraphic layers.

Marine Magnetics

Marine magnetics is completed using a hull mounted or towed magnetometer that measures variations in magnetic flux density. The processed magnetic data is contoured and can be draped over bathymetric maps to identify and delineate magnetic anomalies, and in conjunction with other geophysical data, can be used to interpret the structural and lithologic character of the ocean bottom. The technique is the primary tool for locating buried metallic object below the seafloor.

Underwater Multi-Channel Analysis of Surface Waves (UMASW)

UMASW is a newly developed that is utilised for imaging strength variations in marine sediments. As with marine seismic refraction, this method uses a hydrophone array placed on the seafloor with the seismic signal being transmitted from an airgun offset from the array. This received signal is processed as a dispersion curve and then inverted to generate a 1D S-wave velocity profile. Multiple 1D profiles can then be contoured to provide a 2D cross section providing assessment of shallow subsurface soil stiffness, rock strength, and stratigraphic unit delineation.

SELECTED EQUIPMENT LIST

Seismic Receivers

- Geospace 4.5 Hz vertical geophones (GS 11D)
- Geospace 14 Hz vertical geophones (GS 20DX)
- Marsh phones (for use in mangrove / swamp / shallow water areas)
- 0.5 m, 1 m, 2 m, 4 m, and 6 m spaced seismic take-out cables
- 0.5 m, 1 m, 2 m spaced seismic landstreamers
- Geostuff BHG2, downhole triaxial geophone
- Geotomographie 24 channel hydrophone array

Seismic Sources

- 5 kg sledgehammer – mobile, quick acquisition
- 15 kg drop weight seismic source – larger seismic energy output than sledgehammer
- Ute mounted propelled energy system, using a 60 kg accelerated drop weight – increased seismic energy source to achieve greater depth penetration and for use in seismically challenging sites
- Geometrics Seismic Timer (Model HVB-1) – for use with seismic detonators.
- Geotomographie SBS42 borehole sparker

Seismic Recorders

- Geometric Geodes
- 4 KHz sampling rate
- Pre-trigger of 0.1s minimum
- Variable sample rate and recording length
- Triggering option on +/- or adjustable contact closure
- 24-bit A/D converter
- Cross-talk (-125 dB for 20-30 Hz)
- SEG-2 or SEG-Y file format

Conductivity Meter

- CMD Explorer
- Five modes of measurement
- Samples at six depth ranges, up to 6.7 m
- Integrated with DGPS system for sub-metre positioning
- Resolution of 0.1 mS/m
- Max sample rate of 10 Hz
- Measurement accuracy: ± 4% at 50 mS/m

Electrical Resistivity Tests

Miller 400D

- Rugged, hard plastic case
- 4-terminal system
- Resistance measurement range from 0.01Ω to 10MΩ

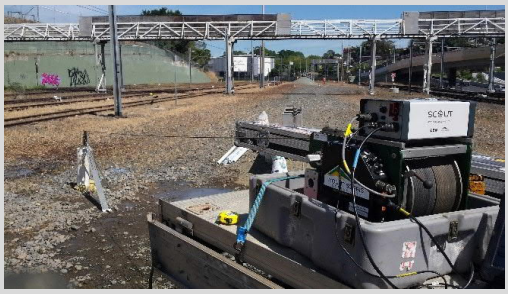
Syscal Pro

- Multi-node resistivity and IP system
- 10 true differential input channels
- Resolution of 1 µV and accuracy of 0.2%

Megger

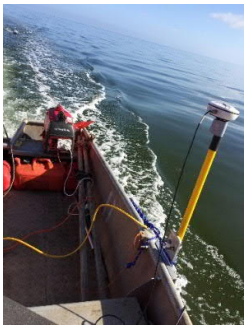
- 4-terminal system
- Robust and versatile
- Resistance measurement range from 0.01Ω to 20 kΩ

  Accuracy ±0.5% of reading ±2 digits



Borehole Logging

- Mt Sopris 4MXB 480m 4conductor wireline winch
- Mt Sopris Mini winch 200 m single conductor wireline
- ALT Scout data acquisition system
- ALT Matrix data acquisition system
- QL40 Abi40 2G ALT Acoustic Televiewers
- QL40 Obi40 2G ALT Optical Televiewers
- QL40 FWSS-4 Full waveform sonic tool
- QL40 CAL ALT Mechanical caliper tool



Marine Geophysics

- Seismic refraction source: 5, 10, and 20 cu.in. airgun
- Multi-channel hydrophone receiver
- Sub-bottom profiling / seismic reflection: various SBP and sparker & boomer systems, tailored to project requirements
- Marine ERI cable with Echosounder, Sysmar software, and Syscal Pro acquisition unit
- Starfish Side Scan Sonar system
- SeaSpy Marine Magnetometer
- Hemisphere R330u DGPS

KEY PERSONNEL

Dr Tariq Rahiman

Technical Executive – Geophysics Lead Australia

tariq.rahiman@wsp.com

Tariq has over 18 years' experience in the practice of geophysical, geological, geotechnical, environmental and hydrogeological investigations in Australia, SE Asia and SW Pacific. Close to 10 years of these have been for WSP | Golder's ground engineering, mining, oil and gas, water and energy client sectors. In his current role as the technical lead of geophysics, Tariq is responsible for developing the geophysical services within WSP | Golder Australia through maintaining quality of geophysics deliverables to clients, introducing and integrating innovative geophysical technologies into engineering consultancy practice and training and mentoring junior staff. Tariq is a Registered Professional Geoscientist (RPGeo) with the Australian Institute of Geoscientists.

Zivko Terzic

Principal Geophysicist

zivko.terzic@wsp.com

Zivko has extensive experience accumulated in over 23 years professional career and diverse geophysics projects both in Australia and overseas (i.e. South East Asia, Mid East, New Zealand, USA, Canada, South East Europe). Zivko's experience involved: marketing, planning, project management, project delivery, acquisition, processing, interpretation and presenting and reporting on variety of geophysical techniques (passive active and solid earth geophysics) and applications for onshore and offshore projects for diverse industries. The range of industries / projects involved: Infrastructure (Geotech investigations for large buildings, roads, bridges, tunnels, water reservoirs and dams); Mining (Coal, Zink, Iron Ore exploration etc.); Environment (Land Fill, Contaminated Groundwater, WWTP Investigations etc.). Zivko has used a variety of geophysical techniques with focus on innovations and development of alternative approaches in solving tough engineering geophysics problems.

Brodie Klue

Senior Associate Geophysicist

brodie.klue@wsp.com

Brodie has been a geophysicist with WSP | Golder since 2006, during which time he has conducted geophysical investigations in support of geotechnical, O&G, mining and environmental projects across Australia, New Zealand, Canada and SE Asia. Brodie is experienced with both terrestrial and marine geophysics applications using a wide range of geophysical methods, often conducting surveys as part of multidisciplinary projects.

Romney Rayner

Senior Associate Geophysicist

romney.rayner@wsp.com

Romney has over ten years' industry experience, including working in Australia, SE Asia, Africa, and the UK. In these roles he has specialized in targeted geophysics investigations for near surface applications across the engineering, environmental, and construction industries, and is passionate about the innovative application of geophysical technologies to provide meaningful and effective engineering solutions. His areas of expertise include seismic refraction, cross-hole seismic, borehole seismic tomography, seismic reflection, electrical resistivity, GPR, and electromagnetics.

Matt Harris

Senior Geophysicist

matt.harris@wsp.com

Matt is the technical lead for Geophysics in New Zealand. He joined WSP | Golder in 2006, and has gained experience around the globe, leading seismic refraction, MASW and electrical resistivity surveys, along with downhole geophysical logging investigations. Matt is focused on the application of geophysics to geotechnical investigations, including seismic site characterisation, borehole televiewer and microgravity investigations.

Lachlan Renfrey

Senior Geophysicist/Geologist

lachlan.renfrey@wsp.com

Lachlan has over three year's involvement within the geophysical community and has been a keen advocate on the application of geophysical methods within smaller niche industries such as environmental and civil engineering. He has worked on a number of large projects within infrastructure, energy and transport industries. Lachlan has experience with a range of geophysical methods with particular emphasis on borehole televiewer imaging, seismic refraction and Multi-channel Analysis of Surface Waves (MASW).

Byron Gear

Senior Geophysicist/Geologist

byron.gear@wsp.com

Byron has a Master of Research from Macquarie University and undergraduate in geology and geophysics. He has worked with WSP | Golder since 2018 and has experience with both fieldwork and processing aspects of a wide variety of methods. He has worked in various industries across Australia, including roads, rail, airports, and defence.

Gareth Hay

Senior Geophysicist

gareth.hay@wsp.com

Gareth has over 15 years of experience as a geophysicist and technical manager. He has experience with GPR, radio imaging, shallow seismic and wireline geophysical techniques. He has worked across the scientific, mining, geotechnical and water industries and specialises in televiewer surveys and remote field operations. As a technical manager Gareth has extensive experience in training people to collect and interpret quality wireline geophysical logs in Australasia, SE Asia and South America. He enjoys solving problems and finding new ways to apply geophysical techniques.

Harrison Jones

Senior Geophysicist/Geologist

harrison.jones@wsp.com

Harrison has over 4 years' industry experience, including working as a geotechnical engineer, geologist and geophysicist. He has worked with WSP | Golder since 2018 and has experience in field application and processing / analysis of a wide variety of geophysical methods. He has been involved in a number of large-scale projects within infrastructure and transport industries. Majority of Harrison's experience is with downhole geophysical logging and various seismic methods.

Dr Pouya Ahmadi

Senior Geophysicist

pouya.ahmadi@wsp.com

Pouya holds a PhD in Exploration Geophysics from Curtin University, where he continued his career as a Research Fellow and experienced working side by side with the industry. More than 15 years of study and industry driven research in academia has given him the opportunity to join WSP | Golder Associates as a Geophysicist. His areas of expertise include seismic methods and downhole geophysical logging. Pouya focuses on near surface imaging using advanced innovative geophysical methods in the Geotechnical and mining industries by building practical, effective solutions to their current and future problems.

Stephen Stark

Geophysicist

stephen.stark@wsp.com

Stephen has over five years' experience within the Geophysics industry which includes working in Australia, Mexico and East Africa. Before joining WSP | Golder in 2021, he worked within the exploration Geophysics industry gaining experience in a wide variety of geophysical methods. These include Gravity, electromagnetics, Induced Polarisation and Sub-Audio Magnetics (SAM).

Suman Bhattarai

Geophysicist

suman.bhattarai@wsp.com

Suman has a master's degree in Geophysics from Macquarie University and undergraduate degree in Geology. Suman has recently joined WSP | Golder and has already gained experience in the field, conducting Electrical Resistivity Imaging (ERI) and Televiewer imaging surveys. He has also developed strong skills in data processing and report writing.

Peter Leith

Geophysicist

peter.leith.2@wsp.com

Peter is a geophysicist with 5 years of experience working in the geotechnical and mining industries. He has a strong background in many near surface geophysical methods with an emphasis on ground penetrating radar, electrical resistivity tomography, and borehole geophysics. He joined the Golder Canada team in 2019 at their Toronto office and has since worked on a diverse array of projects within the Earth and Environment group, relocating to Western Australia in 2022.

Bodee Bignell

Geophysicist

bodee.bignell@wsp.com

Bodee has a bachelor's degree with honours in Exploration Geophysics from the University of Queensland. He is the newest member of the year, with one and a half years industry experience with Electromagnetic and Sub-Audio Magnetics (SAM) methods. Bodee is primarily skilled in data acquisition of land based Geophysics in varyingly challenging terrains.

Contact

WSP | Golder has a long-proven record of providing geophysical services in Australia. If you would like further information on our project experience not listed, the benefits that a geophysical survey can bring to further TMR projects, or require further information on the available geophysical technologies, please contact Tariq Rahiman at tariq.rahiman@wsp.com.

Appendix C

Professional Services Agreement

PROFESSIONAL SERVICES AGREEMENT (Aust. Only)

TABLE OF CONTENTS

Professional Services Agreement (Aust. only)

SCHEDULE

1.	**WSP contracting entity:**	**WSP Australia Pty Ltd**			
	WSP contact:	Kevin Radford	Project no:	PS142484	
	Registered address: Ernst & Young Centre, Level 27, 680 George Street, Sydney NSW 2000				
2.	**Client:**				
	Client:	Lithgow City Council	Address:	80 Mort Street LITHGOW NSW 2790	
	Contact:	Jonathon Edgecombe			
	Phone:	(02) 6354 9999	ABN:	59 986 092 492	
	Fax:	(02) 6351 4259	Email:	Jonathon.Edgecombe@lithgow.nsw.gov.au	
	Other (name):		Address:		
	Contact:				
	Phone:		ABN:		
	Fax:		Email:		
3.	**Project:**	Wolgan Valley Preferred Route Selection			
4.	**Deliverables:**	☒ Report	☐ Specification	☐ Tender docs	☒ Drawings	☐ Other (specify)
5.	**Duration:**	Commencement Date: April 2023		Date for Completion: December 2023	
6.	**Basis of Fee:**	☐ Lump Sum		☒ Time charged	
7.	**Description of Services**			**Amount**	**Timing (weeks)**
	As set out in Proposal dated 20th March 2023 ref PP142484-WSP-SYD-RAC-PRP-00001 Rev 00 (Annexure B).				
	Phase 1 and 2 - Preferred Alignment Assessment			$493,886	14
	Phase 3 – Preliminary Concept Design of Preferred Alignment			$552,000	15
	Estimated Fee (excluding GST)			**$1,045,886.00**	**29**
8.	**Purpose of the Services (clause 3.3):** Studies to identify 3 route options to one preferred route into Wolgan Valley and progress one preferred route to preliminary concept design.				
9.	**Percentage applicable to Reimbursable Expenses (clause 5.1):** 10%				
10.	**Project location:** Lithgow, Wolgan Valley, NSW, 2790				
11.	**Governing Law (clause 1.10):** NSW				

12.	**Insurances to be provided by the Consultant (clause 6):**		
	1. Professional indemnity insurance:	$1,000,000 per claim and in the aggregate (if nothing stated, $1,000,000 per claim and in the aggregate)	
	2. Public Liability insurance:	$10,000,000 per occurrence (if nothing stated, $10,000,000 per occurrence)	
	3. Workers Compensation insurance:	According to the law of New South Wales According to the law of the State or Territory where the Consultant's employees are employed.	
	4. Motor Vehicle insurance:	$30,000,000 for third party property damage	
13.	**The Consultant's liability is limited to (clause 8.1):**	**The value of the fee** (if nothing stated, Fee)	
14.	**[can reference a more detailed document here and attach as annexure]**		
	Annexures [select]:		
	(a) Special Conditions (Annexure A)	☐ Yes	☒ No
	(b) Proposal (Annexure B)	☒ Yes	☐ No
	~~(c) Program (Annexure)~~	~~☐ Yes~~	~~☒ No~~
	~~(d) [insert]~~	~~☐ Yes~~	~~☐ No~~
	Intellectual Property Rights (clause 7.1) (Option 1 being the default position)	☒ Option 1	☐ Option 2
15.	**Documents forming the Agreement in order of priority (clause 1.9)** [select including Annexures identified in Item 14 above eg Annexure C could be omitted if incorporated in Annexure B]		
	1. Annexure A - Special Conditions 2. General Terms of Business 3. Annexure B – Proposal dated 20th March 2023		
16.	**Date of this Agreement (clause 1.6)**		

SIGNING PAGE

Signed as an agreement

Signed for and on behalf of **WSP Australia Pty Ltd**
by its authorised representative

_____
Signature

Kevin Radford

_____
Name [in capital letters]

Regional Executive; Roads, Aviation & Civil NSW

_____
Position

Signed for and on behalf of **Lithgow City Council 59 986 092 492**
by its authorised representative

_____
Signature

Jonathon Edgecombe

_____
Name [in capital letters]

Director Infrastructure Services

_____
Position

TERMS OF BUSINESS

1. Definitions and Interpretation

1.1 In this Agreement:

"Benchmark Rate" means the base lending rate at HSBC Bank Australia Limited ("HSBC"), as established and quoted from time to time by HSBC in national daily newspapers or financial papers applicable at the time interest is to be charged.

"Client" means the person or entity specified in Item 2 of the Schedule.

"Commencement Date" means the date stated in Item 5 of the Schedule.

"Confidential Information" means all information or data in whatever form, nature or media disclosed by either Party to the other but does not include:

(a) information which, at the time it is disclosed or communicated to the receiving Party:
   i. is publicly known; or
   ii. is already known to or is in the possession of the receiving Party and was not acquired from the disclosing Party; or

(b) information which, after the time it is disclosed or communicated to the receiving Party, comes into the public domain other than as a result of any breach by the receiving Party of its obligations under this agreement.

"Consultant" means the contracting entity specified in Item 1 of the Schedule.

"Contract Documents" means any drawings, designs, reports, electronic records and other documents and concepts provided by the Consultant to the Client as part of or in connection with the Services and includes the Deliverables.

"Date for Completion" means the date stated in in Item 5 of the Schedule.

"Deliverable" means any design, report, specification, tender document, drawing or any other deliverable prepared by the Consultant in the course of or incidental to the performance of the Services and including the Deliverables identified in Item 4 of the Schedule.

"Fee" means the Lump Sum Fee and/or Time Charge Fees, being the amount specified in Item 6 of the Schedule as adjusted in accordance with clause 4 and any Additional Amount calculated in accordance with clause 14.3.

"Governing Law" means the law governing the Agreement and identified in Item 11 of the Schedule

"Gross Negligence" means any act or omission done or omitted to be done with reckless and serious disregard to the consequences of a risk of which the relevant Party was aware or ought reasonably to have been aware would result in loss being incurred by incurred by the other Party to this agreement, but does not include an act or omission which occurs in a reasonable and honest attempt to fulfil its obligations referred to or in relation to this Agreement.

"GST" means GST as defined in the *A New Tax System (Goods and Services Tax) Act 1999 (*Cth).

"Intellectual Property Rights" means all intellectual property rights whether or not registered including all applications and the right to apply for registration which is owned by or licensed to the Consultant including, without limitation:

(a) any trade marks, service marks, trade names, domain names, brands and company names, trade secrets and copyright works, drawings, discoveries, inventions, technical data, formulae, computer programs, software, know-how, logos, symbols and similar industrial or intellectual property rights;

(b) all patents, patent applications, registered designs and unregistered design rights; and

(c) all confidential information of the Consultant.

"Legislative Requirements" includes:

(a) Acts, Ordinances, regulations, by-laws, orders, awards and proclamations of the Commonwealth and the Governing Law; and

(b) certificates, licenses, consent, permits, approvals and requirements of organizations having jurisdiction applicable to the Services.

"Lump Sum Fee" means that part of the Fee payable by the Client as a lump sum.

"Party" means each of the Client and the Consultant and *"Parties"* means both of them.

"Project" means the project described in Item 3 of the Schedule.

"Proposal" means the document described in Item 7 of the Schedule (if any).

"Reimbursable Expenses" means the cost plus the percentage specified in Item 9 of the Schedule, of all travel and accommodation, equipment use/hire, communications, printing, photocopying, third party fees and other out of pocket expenses incurred by the Consultant in the course of performing the Services.

"Related Body Corporate" has the meaning given to that term in the *Corporations Act* 2001 (Cth).

"Services" means the services specified in Item 7 of the Schedule as varied in accordance with this Agreement.

"Schedule" means the schedule at the front of this Agreement.

"Site" means the lands and other places to be made available by the Client for the purpose of performing the Services and includes the place referred to in Item 10 of the Schedule.

"Time Charge Fees" means that part of the Fee calculated on a time spent basis.

"Wilful Misconduct" means an intentional act or omission with the knowledge that the act or omission was likely to have harmful consequences but does not, include any innocent or negligent act, omission, mistake or error of judgment.

1.2 The word "includes" in any form is not a term of limitation.

1.3 Headings are for convenience only and shall not be taken into consideration in interpreting the terms of this Agreement.

1.4 A reference to the singular includes the plural.

1.5 Monetary references are references to the currency identified in Item 7 of the Schedule. If not specified, the currency will be Australian currency (AUD).

1.6 The date of this Agreement is the date specified in Item 16 of the Schedule. If nothing stated, then the date of execution.

1.7 This Agreement may only be varied by a document signed by or on behalf of each Party or agreed to in writing.

1.8 To the extent permitted by law, in relation to its subject matter, this Agreement (consisting of the documents listed in Item 15 of this Schedule):

(a) embodies the entire understanding of the parties, and constitutes the entire terms agreed by the parties; and

(b) supersedes any prior written or other agreement of the parties.

1.9 In the event of any inconsistency between any documents forming part of this Agreement (including the Schedule) the order of priority set out in Item 15 of the Schedule shall apply.

1.10 The Agreement is subject to and is to be construed in accordance with the laws of the State or Territory referred to in Item 11 of the Schedule or if the State or Territory is not stated, the law of the State or Territory where the Services are to be substantially performed, and each party irrevocably submits to the exclusive jurisdiction of courts exercising jurisdiction in that State or Territory.

2. Engagement

2.1 The Client engages the Consultant to provide the Services in accordance with this Agreement.

2.2 If the Services require access to the Site, the Client will provide sufficient access to the Site from the Commencement Date during normal working hours.

2.3 The Consultant will perform the Services in a timely manner from the Commencement Date and in accordance with any program for the provision of the Services attached to the Agreement or otherwise agreed in writing between the parties to achieve the Date for Completion.

2.4 The Consultant will be entitled to an extension of time to the Date for Completion for the performance of the Services where it is delayed by an event, circumstance or matter beyond its reasonable control (including without limitation, failure by the Client to provide sufficient access to the Site). This extension of time shall be for a reasonable period not less than the duration of the period of actual delay.

2.5 In addition to an extension of time to the Date for Completion under clause 2.4, the Consultant will be entitled to an adjustment of the Fee by a reasonable amount to compensation the Consultant for any additional costs incurred by the Consultant calculated in accordance with clause 4.7.

2.6 In providing the Services, the Consultant will exercise the degree of skill, care and diligence normally exercised by professional consultants performing services of a similar nature

2.7 The Consultant will:

(a) take all reasonable measures to inform itself of the Client's requirements in respect of the Services;

(b) promptly inform the Client if it:

(i) considers that it has insufficient information to enable it to satisfactorily perform the Services; or

(ii) becomes aware of any matter (including any inaccuracies in information provided to it) which may materially affect the scope of the Services.

2.8 Where the Consultant informs the Client that it requires further information to enable it to satisfactorily perform the Services by the Date for Completion, the Client must promptly provide such further information to the Consultant.

2.9 The Consultant may subcontract the Services or part thereof to another consultant.

3. Obligations of confidentiality

3.1 The receiving Party shall not disclose or provide any Confidential Information to any person other than the officers and employees of the receiving Party on a "need to know" basis and who have been informed that the Confidential Information is confidential and remains the property of the disclosing Party.

3.2 The receiving Party shall protect and preserve the confidential nature and continued secrecy of the Confidential Information. The receiving Party will ensure that the Confidential Information is dealt with in such a manner as is appropriate to private, confidential and restricted information.

3.3 The receiving Party shall not use the Confidential Information other than in relation to the purpose of the Services described in Item 8 of the Schedule.

3.4 The receiving Party may disclose Confidential Information if required by Legislative Requirement, but only:

(a) to the extent required by the Legislative Requirement; and

(b) where the receiving Party has given the disclosing Party not less than seven (7) days' notice in writing that it intends to disclose the Confidential Information and provides at the time of giving that notice particulars of the Legislative Requirement and particulars of the Confidential Information intended to be disclosed.

4. Fee and Scope of Services

4.1 The Fee is based on the Services specified in the Schedule.

4.2 The Client may, by notice in writing, request that the Consultant change the scope of the Services described in Item 7 of the Schedule. Any such change must be within the general scope of the Services. Unless it is not reasonably practicable for the Consultant to do so, the Consultant must give effect to any change to the Services requested by the Client which is within the general scope of the Services.

4.3 If a new Legislative Requirement or a change in a Legislative Requirement after the date of the Agreement, or any other event beyond the control of the Consultant, necessitates a change to the Services, the Consultant must provide details of the extent to which the Services need to change due to the Legislative Requirement or other event and seek the Client's approval to the change in the Services. For the avoidance of doubt, the approval of the Client is not required to entitle the Consultant to an extension of time to which it is entitled pursuant to clause 2.4.

The Client must approve or reject the change within 10 days of receipt of the Consultant's notice. If the Client rejects the change the Consultant is not required to change the Services to accommodate the Legislative Requirement or event and may (in its absolute discretion) terminate this Agreement immediately.

4.4 Where a change to the Services:

(a) requested by the Client under clause 4.2 is one which the Consultant must give effect to; or

(b) is approved by the Client (including pursuant to clause 4.3),

the Consultant will be entitled to:

(c) an adjustment of the Fee in accordance with clause 4.7; and

(d) a reasonable extension of time for providing the Services.

4.5 If the Consultant considers that additional services are required to be performed, it may provide a written proposal to the Client specifying the time and cost of the proposed change.

4.6 Following receipt of the Consultant's written proposal, the Client may in writing instruct the Consultant to change the Services.

4.7 The value of a change to the Services or an extension of time which entitles the Consultant to an adjustment of the Fee or compensation (together with a reasonable amount for overheads and profit) will be determined using a Time Charge Fee on the hourly rates set out in Item 7 of the Schedule. If Item 7 of the Schedule does not include relevant hourly rates, reasonable rates will apply.

4.8 The Consultant is under no obligation to provide additional services in the absence of a written instruction from the Client.

5. Payment

5.1 The Client must pay to the Consultant the Fee, Reimbursable Expenses and Additional Amounts in accordance with this Agreement.

5.2 The Consultant may render invoices:

(a) Monthly; or

(b) when the Services have been partly completed or otherwise terminated earlier in accordance with this Agreement.

5.3 The Client must pay all amounts invoiced within 21 days after the date of the invoice. Any amount not paid within that period will attract interest at a rate of 2% above the Benchmark Rate per annum from the date payment was due until the amount is paid in full. Payments received will be applied firstly against any interest owing under this clause and secondly against the outstanding invoice amount.

6. Insurance

6.1 The Consultant will:

(a) maintain professional indemnity, public liability, motor vehicle and workers compensation insurance with the level of cover specified in Item 12 of the Schedule; and

(b) if requested by the Client, provide certificates of currency evidencing such insurance.

7. Ownership, use and nature of materials

7.1 Option 1: The Consultant retains title to and copyright and other Intellectual Property Rights in the Contract Documents.

OR

Option 2: Other than title to and rights in respect of drawings, designs, reports, electronic records and other documents and concepts created prior to the date of this Agreement, the Consultant assigns to the Client any title to and copyright and other Intellectual Property Rights it holds in any Contract Documents.

7.2 The Consultant is not required to provide the Client with an editable version of any of the Contract Documents. The Client must not, without the prior written approval of the Consultant, alter or authorise or permit the alteration of any editable version of the Contract Documents.

7.3 The Client has a licence to use the Contract Documents for the purposes for which those documents are prepared and provided to the Client. The Client must not use (including make copies) of the Contract Documents for any purpose other than that for which they were originally prepared.

7.4 The licence in clause 7.3 terminates on the termination of this Agreement by the Consultant pursuant to clause 12.3, 12.4 or 12.5.

7.5 The Consultant, unless specifically instructed otherwise by the Client, is entitled to:

(a) refer to the Services and any related project in respect of which the Services are provided; and

(b) identify the Client,

for the purposes of promoting the services of the Consultant to third parties.

8. Liability and Indemnity

8.1 To the extent permitted at law, the liability of the Consultant arising out of or in connection with this Agreement and the performance or non-performance of the Services (whether under the law of contract, tort (including, but not limited to negligence), under any warranty or indemnity, under statute, in equity or otherwise) is limited to an amount set out in Item 13 of the Schedule in the total aggregate, except in the case of Gross Negligence, Wilful Misconduct or fraud, in which case the liability of the Consultant is not limited.

8.2 In no event will the Consultant be liable for any economic loss, loss of profit or revenue, loss of any contract, loss of business opportunity, loss of data, loss of production or production stoppage, financing costs or expenses however characterised, loss of use (including without limitation, loss of use or the cost of use of property, equipment, materials and services including without limitation, those provided by contractors or subcontractors of every tier or by third parties) increased costs and expenses of construction or operation or any other economic or consequential loss (whether direct or indirect) of the Client arising out of or in connection with the performance or non-performance of the Services (whether under the law of contract, tort (including but not limited to negligence), under any warranty or indemnity, under statute, in equity or otherwise).

8.3 If any warranty is implied whether by law, custom or otherwise, that warranty is to the full extent permitted by law, hereby excluded. Nothing in this Agreement shall be read or applied so as to purport to exclude, restrict or modify or have the effect of excluding, restricting or modifying the application in relation to the supply of any goods or services pursuant to this Agreement of all or any of the provisions of the *Competition and Consumer Act* 2010 (Cth) (as amended) or any relevant State or Territory legislation which by law cannot be excluded, restricted or modified.

8.4 The Services are performed solely for the benefit of the Client and the Client shall not permit any third party to use or rely upon the Deliverables.

8.5 The Services and the Deliverables are also subject to inherent limitations having regard to the nature and the scope of the

Services, and the circumstances in which they have been commissioned and are to be delivered.

8.6 The Consultant shall be entitled to include limitation and disclaimer wording in all of its Deliverables to the foregoing effect, and no third party may use or rely upon any aspect of those Deliverables without the prior written consent of the Consultant (which consent may be given or withheld in its absolute discretion, and subject to such conditions as it may wish to impose).

9. Special Conditions

9.1 Any special conditions specified in Annexure A apply.

10. No Assignment

A Party cannot assign, novate or otherwise transfer any of its rights or obligations under this Agreement without the prior written consent of the other Party. Such consent shall not be unreasonably withheld. Unless otherwise agreed in writing, no assignment, novation or transfer shall release the assignor, novator or transferor from any obligation under this Agreement.

11. Ethical Conduct

11.1 Each Party shall at all times:

(a) conduct business in accordance with high ethical standards, and in connection with the performance and subject matter of this Agreement, in compliance with all applicable laws and regulations (local or international) prohibiting bribery and any and all other forms of corruption and/or bad faith (including without limitation the *Corruption of Foreign Public Officials Act SC 1998 (Canada), Criminal Code Act* 1995 (Cth), the *Bribery Act* 2010 (UK) and the *Foreign Corrupt Practices Act* U.S. 1977) and shall not do anything that might prejudice the other Party from complying with the same; and

(b) undertake that it (including its officers, directors, employees and agents) not directly or indirectly, through any third party, pay, give, offer, promise or authorise payment of any money or anything of value to any person, including without limitation any agency or entity issuing a solicitation for bids, for the purpose of improperly incentivising or rewarding favourable treatment or advantage in connection with the Services, proposal or project underlying this Agreement.

12. Termination

12.1 Either Party may terminate this Agreement for convenience by giving 30 days prior written notice to the other Party.

12.2 The Client may terminate this Agreement if the Consultant is in material breach of this Agreement and that breach has not been remedied within 30 days after receipt by the Consultant of a written notice from the Client identifying the breach and requiring it to be remedied.

12.3 The Consultant may suspend the provision of the Services or terminate this Agreement:

(a) if any money payable to the Consultant has been outstanding for more than 14 days;

(b) if the Client is in material breach of this Agreement and that breach has not been remedied within 14 days after receipt by the Client of a written notice from the Consultant identifying the breach and requiring it to be remedied; or

(c) immediately:

(i) if the Client becomes an "externally administered body corporate" or a person or entity is appointed as a "controller" of any of the Client's property (as those terms are defined in section 9 of the *Corporations Act* 2001 (Cth));

(ii) if the Consultant has reason to believe that that the Client is or is likely to become not able to pay its debts as and when they fall due; or

(iii) in the circumstances specified in clause 4.3.

12.4 If the Consultant suspends the provision of the Services pursuant to clause 12.3 it may at any time thereafter:

(a) if the event which entitled the Consultant to suspend the performance of the Services is remedied, recommence performance of the Services; or

(b) otherwise terminate the Agreement at any time after commencing the suspension.

If the Consultant recommences the performance of the Services pursuant to paragraph (a) the Client must indemnify the Consultant against any costs, losses or expenses suffered or incurred by the Consultant arising out of or in connection with the suspension and/or the recommencement of the performance of the Services.

12.5 This Agreement shall terminate immediately upon delivery of a written notice by either Party (the “Delivering Party”) to the other or a Related Body Corporate of that Party (the “Receiving Party”) in the event that:

(a) the Receiving Party has been charged by a competent authority with any criminal offence including without limitation offences relating to bribery, corruption, theft or fraud (excluding any offence relating to the operation of a motor vehicle), which in the reasonable opinion of the Delivering Party, renders the engagement or relationship between the parties unfit to continue; or

(b) on the reasonable suspicion of the Delivering Party, the Receiving Party offering or having offered any person any bribe or other improper inducement or reward for doing or forbearing to do anything in connection with this Agreement.

12.6 Upon termination of this Agreement the Consultant is:

(a) immediately entitled to payment of that portion of the Fee and Reimbursable Expenses in respect of Services performed up to and including the date of termination, and any interest payable on that amount; and

(b) where the Consultant has terminated the Agreement pursuant to clause 12.3 or 12.4, entitled to recover any costs, losses and damages suffered or incurred by it arising out of or in connection with any breach of contract by the Client or the termination of the Agreement.

12.7 Without limiting any other provision which as a matter of interpretation may survive the termination of this Agreement, the provisions of clauses 3, 6, 7, 11 and 13 survive termination of this Agreement.

13. Disputes

13.1 If a difference or dispute (together called a "dispute") between the parties arises in connection with the subject matter of the Agreement, then either Party may, by hand or by registered post, give the other Party a written notice of dispute adequately identifying and providing details of the dispute.

Notwithstanding the existence of a dispute, the parties must, subject to clause 13.5 continue to perform the Agreement.

13.2 Within 14 days after receiving a notice of dispute, the parties must confer at least once to resolve the dispute or to agree on methods of doing so. At every such conference each Party will be represented by a person having authority to agree to such resolution or methods of resolution. All aspects of every such conference except the fact of occurrence will be privileged.

13.3 If the dispute has not been resolved within 28 days of service of the notice of dispute, the parties agree to endeavour to settle the dispute by mediation administered by the Australian Commercial Disputes Centre ("ACDC") before having recourse to litigation. The mediation shall be conducted in accordance with the ACDC Guidelines for Commercial Mediation ("Guidelines") which are operating at the time the matter is referred to ACDC.

13.4 The Guidelines set out the procedures to be adopted, the process of selection of the mediator and the costs involved.

13.5 Nothing in this clause 13 will prejudice the right of a party to institute proceedings to enforce any payment due under the Agreement or to seek injunctive or urgent declaratory relief.

14. GST

14.1 The parties acknowledge and agree that:

(a) except where the context suggests otherwise, terms used in this clause 14 have the meanings given to those terms by the *A New Tax System (Goods and Services Tax) Act* 1999 (Cth) (as amended from time to time).

(b) any part of a supply that is treated as a separate supply for GST purposes (including attributing GST payable to tax periods) will be treated as a separate supply for the purposes of this clause 14; and

(c) any amount payable by the Client to the Consultant under or by reason of this Agreement is exclusive of GST. Any consideration that is specified to be inclusive of GST must not be taken into account in calculating the GST payable in relation to a supply for the purpose of this clause 14 or additional amount payable under clause 14.3.Any payment or reimbursement required to be made under this Agreement that is calculated by reference to a cost, expense, or other amount paid or incurred by the Consultant will be limited to the total cost, expense or amount less the amount of any input tax credit to which the Consultant is entitled for the acquisition to which the cost, expense or amount relates.

14.2 If GST is payable in relation to any supply made under or by reason of this Agreement:

(a) the Client must pay to the Consultant an additional amount ("Additional Amount") equal to the amount of that GST at the same times as any other consideration is to be first provided for that supply. Any Additional Amounts will not be refundable in any circumstance; and

(b) the Consultant will provide a tax invoice to the Client no later than 14 days after the day on which any consideration is to be first provided for that supply.

14.3 If the GST payable in relation to a supply made under or in connection with this Agreement varies from the Additional Amount paid by the Client under clause 14.2 such that a further amount of GST is payable in relation to the supply, then the Consultant will be entitled to receive from the Client, and the Client will promptly pay, the amount of that variation. Any payment under this clause 14.3 is deemed to be a payment of the additional amount payable under clause 14.2.

14.4 Clause 14 survives expiry or termination of this Agreement.

ANNEXURES

ANNEXURE A - SPECIAL CONDITIONS (CLAUSE 9.1)

[Guidance Note; Select the relevant specific conditions and delete those specific conditions not relevant to the Services]

A1. Special Conditions relevant to the provision of geotechnical services

(a) Proposals are generally based on access to test sites for truck mounted drilling rig or rubber tyred backhoe. Repair or reinstatement of any surface disturbance or damage caused by gaining access to the sites by normal methods is the Client's responsibility unless a specific cost has been included in the Fee to cover repair or reinstatement.

(b) At the completion of site works, boreholes will be loosely backfilled (unless a piezometer is installed) with spoil distributed around the site in open areas and concrete surfaces washed down. Test pits will be backfilled with spoil and wheel rolled with material mounded above surface. If the Site is required to be reinstated to original conditions, for example, with sealed surface, excess spoil removed, an extra charge will be incurred.

(c) The Client will provide copies of all service plans relevant to the area of work. Whilst all care will be taken to avoid damage to underground services, any damage to underground services will be the Client's responsibility.

(d) Samples recovered during investigations will be stored for 28 days from the date of submission of the final report. Unless a written request from the Client is received, samples will be disposed of after 28 days. Longer storage can be arranged for an additional monthly charge.

(e) The Client will retain ownership of all waste materials and samples (including purge water from well development and drill cuttings) generated during site investigation works. The Consultant is entitled to leave or deposit all waste materials and samples on the Site. The disposal of waste materials and samples is the responsibility of the Client unless such disposal is expressly included in the Services.

(f) The Deliverables will be based on a subsurface investigation and on factors specific to the site such as the nature of any development, its size, configuration, location, orientation and the location of access roads and parking areas.

(g) The Client acknowledges that subsurface conditions may be affected by changing natural forces or man-made influences. Construction activities at or adjacent to the site and natural events such as floods or groundwater fluctuations are examples of forces which may affect subsurface conditions. The Deliverables are based on sub-surface conditions which existed at the time of subsurface investigations and exploration by the Consultant.

(h) The Client:

(i) releases the Consultant from and against all claims, costs, expenses, losses or damages suffered or incurred by the Client arising out of or in connection with any damage, loss, deterioration or destruction of:

A. any of the Client's samples or property to be tested or analysed by the Consultant except to the extent that the damage, loss, deterioration or destruction arises due to the negligence of the Consultant; or

B. the site in respect of which the Services are to be provided and the surrounding land, to the extent that the damage, loss, deterioration or destruction arises out of or in connection with any geotechnical services described in Annexure A carried out by the Consultant as part of the Services; and

(ii) indemnifies the Consultant from and against all claims, costs, demands, expenses, losses or damages suffered or incurred by the Consultant arising out of or in connection with:

A. any claims by any person that has contracted with the Client and for which the Services are being procured by the Client;

B. any claims arising out of or in connection with the Client using or permitting the use of the Contract Documents in a manner not authorized by this Agreement; and

C. any claims arising out of or in connection with any damage to equipment used in the provision of the Services, which resulted from adverse Site conditions.

D. any claims by:

A. an owner of any property adjacent to or in the vicinity of the site in respect of which the Services are being performed; or

B. an owner of any services (including water, gas, fuel, telephone, electricity, drainage, sewerage, railway, airport, industrial waste and electronic communications services),

arising out of or in connection with any loss or damage caused to the property or services where such loss or damage arises out of or in connection with the performance of the Services.

A2. Special Conditions for the Property Business Group

(a) The Client must brief the Consultant accurately and completely by:
   i. providing the Consultant with details of any existing services (including so far as practicable any "as installed" documentation) associated with the Project which may be relevant to the Services;
   ii. requiring (or authorize the Consultant to require) trade contractors to investigate the actual site conditions of the Project to identify any departures from the "as installed" documentation. Any investigation undertaken by the Consultant pursuant to this clause will be a Reimbursable Expense payable by the Client and does not form part of the Fee; and
   iii. providing sufficient documentation to enable any associated services to be incorporated in the work packages of others engaged on the Project, if such associated services are required for the performance of the Services.

(b) To the extent relevant to the performance of the Services, the Consultant will:
   i. co-ordinate the design services being performed as part of the Services, with any services of other consultants engaged by the Client, but under no circumstances will the Consultant be responsible for:
      1. design co-ordination of services for a building structure, architectural finishes or for any other function which the Consultant reasonably considers to be normally within the ambit of the scope of the services being provided by another consultant engaged by the Client;
      2. on-site co-ordination management and programming;
      3. shop drawings and "as installed" drawings at the completion of the Project; or
      4. commenting on or approving any design documentation prepared by a third party;
   ii. carry out inspections of the Project for the purpose of assessing compliance by others engaged on the Project with the design intent of the Services, but under no circumstances will the Consultant be responsible for:
      1. performing the quality assurance requirements for the Project;
      2. providing defects reports;
      3. a trade contractor's scope of services, whether under the quality assurance requirements of the Project or otherwise; or
      4. certifying the work or services of a third party, including (without limitation) that of a trade contractor.
   iii. participate in the final inspections of the Project prior to the end of the defects liability period (if any) and prepare a schedule of items requiring attention including issues identified by the Client or its representative. In engaging in this activity, the Consultant shall not be responsible for overseeing the rectification of any defects, errors, omissions or malfunctions that arise during the defects liability period. If no fee is agreed for the Consultant's involvement in this stage of the Project, then a fee calculated on a time spent basis at the Time Charge Fees rate in accordance with clause 4.7 of the Terms of Business, shall apply; and
   iv. correct errors or omissions in any Deliverables at the Consultant's own expense, to the extent that the error or omission is due to an error or omission by the Consultant in the performance of the Services.

(c) To the extent that the Client requires the Consultant to upload, publish, communicate or otherwise provide access to the Client to Contract Documents, or communicate with the Client or other third parties engaged on the Project in relation to matters relevant to the Services via a document management system which is hosted by the Client or a third party (the "Document Management System"), the Client must ensure that:
   i. the Consultant is given adequate access to the Document Management System to enable the Consultant to perform the Services;
   ii. the Consultant is permitted to access and copy any materials hosted on the Document Management System which relate to the performance of the Services at any time:
      1. prior to completion of the Services; and
      2. during the period which is seven (7) years after completion of the Services.

The Client accepts responsibility and liability for all work and services outside the scope of the Services including defining the responsibilities of all consultants, contractors and trade contractors working on the Project.

A3. Special Conditions in relation to a project involving construction activities by the Client

(a) Where the Services are provided in connection with a project involving the construction (including refurbishment) of works ("construction work") the Client must:
   i. require any construction contractor it engages to include the Consultant as an additional insured on its contractors all risk and public liability insurance policies in respect of the construction work; and;
   ii. if any Legislative Requirements relating to occupational health and safety require the appointment of a person to be responsible for the overall management of safety at the site ("principal contractor") for the construction work, appoint or procure the appointment of the person responsible for the construction work as the "principal contractor" and notify the Consultant of that appointment.

(b) If the Client fails to make or procure an appointment of a "principal contractor" the Client will be deemed to have appointed itself as the "principal contractor" for that construction work.

(c) Any opinion of construction costs prepared by the Consultant (whether as part of the Services or otherwise) and provided to the Client is supplied for the general guidance of the Client only and the Consultant provides no guarantee as to the accuracy or suitability of any such opinion for any purpose.

A4. Special Conditions for the Environment Business Group

(a) The Client acknowledges and agrees that:

i. the Services will not include an assessment of any ownership of, or the title to, any properties, buildings and structures referred to in the Deliverables, nor the application or interpretation of relevant laws to those properties, buildings and structures;

ii. the Deliverables will rely on data, surveys, analyses, designs, plans and other information provided by the Client or made available to the Consultant by the Client and which have not been verified for accuracy or completeness;

iii. the Consultant will not be liable to update or revise any Deliverable to take into account any events, circumstances or facts occurring or apparent after the date of the Deliverable

(b) [**insert other**]

ANNEXURE B – PROPOSAL

ANNEXURE C – PROGRAM

ABOUT US

WSP is one of the world's leading professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. We design lasting solutions in the Transport & Water, Property & Buildings, Earth & Environment, and Mining & Power sector as well as offering strategic Advisory, Engagement & Digital services. With approximately 6,100 talented people in more than 50 offices in Australia and New Zealand, we engineer future ready projects that will help societies grow for lifetimes to come. www.wsp.com/en-au/.