

GORDON MCPHAIL

Principal

Curriculum Vitae

QUALIFICATIONS

BSc (ENG) CIVIL (1974)

MSc (ENG) CIVIL (1982)

PhD (1995)

Arbitrator

Mediator

MEMBERSHIPS

Member, Institute of Engineers, Australia

Member, South African Institution of Civil Engineers

Fellow, Southern African Institute of Mining and Metallurgy

Member, Resolution Institute of Australia

PROFESSIONAL REGISTRATIONS

Chartered Engineer, Australia

Registered Professional Engineer, Queensland

Registered Professional Engineer, South Africa

BACKGROUND

Gordon has acquired many specialisations over 38 years of consulting in dam, tailings dam, waste and environmental engineering. These specialisations include: Tailings geotechnics and depositional behaviour, Tailings dam siting, design, management and monitoring, Tailings dam remediation, Slope stability analysis, Seepage analysis, Hazardous and non-hazardous waste management, Hydrological Assessments, Hydraulic engineering, Quantified risk assessment, Risk-based environmental remediation and control, Long term erosion modelling and landform engineering, and Sustainability-based decision-making.

Gordon has qualified as an Arbitrator, a Mediator, an Expert Determiner, and an Adjudicator

SPECIAL EXPERTISE

- Project Management and coordination of mine waste management studies
- Geotechnical site investigation
- Tailings storage and closure planning
- Seepage, consolidation and slope stability analyses for waste rock dumps, water storage dams and tailings storage facilities
- Dam break and liquefaction flow slide analysis
- Long term erosion modelling and landform engineering

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- Depositional practices to control beaching profiles, regulate pond positions and sizes, and refine operating paradigms
- High density tailings design and management
- Water and effluent management
- Flood assessment and hydraulic design
- Design, investigation, and construction monitoring services on mining sites
- Monitoring of operations and dam performance including environmental and closure issues
- Engineering design of long term closure measures to address hydrological, erosion and seismic stability issues
- Alternative dispute resolution.

SELECTED PROJECT EXPERIENCE

Tailings Storage Facilities

- Rössing Uranium Mine, Namibia
- Langer Heinrich Uranium Mine, Namibia
- Olympic Dam Expansion, South Australia
- Argyle Diamond Mine AK1 Tailings Dam, Western Australia
- Argyle Diamond Mine Alluvial Tailings Dams
- Osborne Mines Tailings Dams, Queensland
- Merriespruit Tailings Dam, South Africa
- Bafokeng Tailings Dam, South Africa
- Kalgoorlie Consolidated Gold Mines, Western Australia
- Robe Iron Ore Mine, TSF2 and TSF3 Western Australia
- Obuasi Mine North TSF, Ghana
- Pering Lead/Zinc Mine, South Africa
- Paardekraal Tailings Dam, South Africa

Assessment of High Density Tailings Beaching Profiles

- Osborne Mine, Queensland
- South Kalgoorlie Operations, Western Australia
- Rössing Uranium Mine, Namibia
- Langer Heinrich Uranium Mine, Namibia
- Caseronnes Project, Chile
- Collahuasi Mine, Chile
- Chuquicamata Mine, Chile
- Radomiro Tomic Mine, Chile
- Mantos Blancos Expansion, Chile
- El Abra Project, Chile
- Escondida Mine, Chile

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- Esperanza Mine, Chile
- Sierra Gorda Mine, Chile
- Toromocho Mine, Peru
- Antamina Mine, Peru

Dam break and liquefaction flow slide analyses

- Impala Platinum Mine, South Africa
- Durban Roodepoort Deep Mine, South Africa
- Merriespruit Gold Mine, South Africa
- Kalgoorlie Consolidated Gold Mine, Western Australia
- Argyle Diamond Mine, Western Australia
- Cracow Mine, Queensland, Australia
- Rössing Uranium Mine, Namibia
- Mumi Mine, DRC

Landform Design

- Newmont Boddington Gold Mine, Western Australia
- Osborne Mine Waste Rock Dump and Tailings Storage Facilities, Queensland
- Argyle Diamond Mine Waste Rock Dumps, Western Australia
- Rössing Uranium Mine Tailings storage facility, Namibia
- Kalgoorlie Consolidated Gold Mines Waste Rock Dumps and Tailings Storage Facility, Western Australia
- St Barbara Leonora waste rock dump design, Eastern Goldfields, Western Australia
- St Barbara Kailis dump design, Eastern Goldfields, Western Australia
- Golden Grove Mine, Tailings Storage Facility, Western Australia
- Suncor Millenium Dump 5, waste rock dump, Alberta Canada
- St Ives Gold Mine heap leaching dumps landform design, Western Australia
- Western Platinum tailings facility landform design, South Africa

Flood Assessments

- Osborne Mine, Queensland
- Langer Heinrich Uranium Mine, Namibia
- Argyle Diamond Mine, Western Australia
- Newmont Boddington Gold Mine, Western Australia

Water Management Plans

- Osborne Mine, Queensland
- Argyle Diamond Mine, Western Australia
- Kalgoorlie Consolidated Gold Mine, Western Australia

Water Dams

- TSF23 Reclaim Dam, Osborne Mine, Queensland

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- Amandelbult Return Water Dam, South Africa
- Davis Creek Dam, California
- Klipgat Water Dam, South Africa
- Klipfontein Water Dam, South Africa
- Paardekraal Water Dam, South Africa
- Morgenstond Dam, South Africa
- RCP2, Argyle Diamond Mine, Western Australia

Heap Leach Facilities

- Rössing Uranium Mine, Namibia
- St Ives Gold Mine, Western Australia
- Etango project, Namibia

Water Balances

- Rössing Uranium Mine, Namibia
- St Ives Gold Mine, Heap Leach, Western Australia
- Osborne Mine, Queensland
- Argyle Diamond Mine, Western Australia
- AECI Fertilizers, South Africa

Sustainability-based Design

- Tailings Storage, Husab Project, Namibia
- Site Access, Husab Project, Namibia
- Tailings Storage Facility closure, Newmont Boddington Gold Mine, Western Australia
- Tailings Storage Selection, Obuasi Mine, Ghana

Quantified Risk Assessment

- Fimiston II Tailings Storage Facility, Kalgoorlie Consolidated Gold Mine, Western Australia
- AK1 Tailings Storage Facility, Argyle Diamond Mines, Western Australia
- Tailings Dam, Rössing Uranium Mine, Namibia
- Bafokeng No.4 Tailings Dam, South Africa
- Paardekraal No.3 Tailings Dam, South Africa
- Sasol Fibres Limited, South Africa
- Mossgas Power Supply Analysis, South Africa

PUBLICATIONS

High Density Tailings Beaching

McPhail, G. (1995) Prediction of the beaching characteristics of hydraulically placed tailings, PhD Dissertation submitted to the University of the Witwatersrand, Johannesburg, South Africa.

McPhail, G., Noble, A., Papageorgiou, G. and Wilkinson, D. (2004) Development and Implementation of Thickened Tailings Discharge at Osborne Mine, Queensland, Australia, Proceedings 7th International Seminar on Paste and Thickened Tailings (Paste 2004), 31 March – 2 April 2004, Cape Town, South Africa.

- McPhail, G. and Brent, C. (2007) Osborne High Density Discharge: An Update from 2004, Proceedings 10th International Seminar on Paste and Thickened Tailings (Paste 2010), R.J. Jewell and A.B. Fourie (eds), 13-15 March 2007, Perth, Australia, Australian Centre for Geomechanics, Perth, pp. 339-350
- McPhail, G. (2008) Prediction of the Beach Profile of High Density Thickened Tailings from Rheological and Small Scale Trial Deposition Data, Proceedings 11th International Seminar on Paste and Thickened Tailings (Paste08), A.B. Fourie, R.J. Jewell, P. Slatter and A. Paterson (eds), 5-9 May 2008, Kasane, Botswana, Australian Centre for Geomechanics, Perth, pp. 179-188.
- Simms, P., Williams, M.P.A., Fitton, T. and McPhail, G. (2011) Beaching angles and evolution of stack geometry for thickened tailings – A review, in Proceedings 14th International Seminar on Paste and Thickened Tailings (Paste2011), R.J. Jewell and A.B. Fourie (eds), 5-7 April 2011, Perth, Australia, Australian Centre for Geomechanics, Perth, pp. 323-338.
- McPhail, G., Becerra, M. and Barerra, S. (2012) Important Considerations in the Testing of High Density Tailings for Beach Profile Prediction, Proceedings 15th International Seminar on Paste and Thickened Tailings (Paste 2012) R.J. Jewell and A.B. Fourie (eds), 16-19 April 2012, Sun City, South Africa, Australian Centre for Geomechanics, Perth, pp. 93-102
- Engels, J., McPhail, G., Jammett, R., and Pavissich, C. (2012) Evaluation of the Behaviour of High Density Tailings Deposition – CODELCO Pilot Plant, Proceedings 15th International Seminar on Paste and Thickened Tailings (Paste 2012) R.J. Jewell and A.B. Fourie (eds), 16-19 April 2012, Sun City, South Africa, Australian Centre for Geomechanics, Perth, pp. 197-212
- McPhail, G. (2013) Discussion on the influence of mineralogy on the rheology of tailings slurries, Proceedings First International Seminar on Tailings Management, 28 – 30 August 2013, Santiago, Chile.
- Charlebois, L.E., McPhail, G.I., Revington, A., and van Zyl, D. (2013) Observations of tailings flow and application of the McPhail beach profile model to oil sands and metal mine tailings, Proceedings Tailings and Mine Waste 2013, 3 – 5 November, 2013, Banff, Calgary, Canada
- Gaete, S., Bello, F., Engels, J. and McPhail, G. (2014) Thickening and deposition trials: laboratory through to industrial scale – Minera Esperanza, Proceedings 17th International Seminar on Paste and Thickened Tailings, 8-12 June 2014, Vancouver, Canada, 381-391
- McPhail, G. (2014) Using small scale flumes to determine rheology at low shear rates, Proceedings Second International Seminar on Tailings Management, 20 – 22 August 2014, Antofagasta, Chile.
- McPhail, G (2015) The high density thickened discharge tailings storage facility at Osborne Mine – a case history from inception to closure. 18th International Seminar on Paste and Thickened Tailings, 5-8 May 2015, Cairns, Australia.
- McPhail, G (2015) Simulation of the meandering flow path of a beaching slurry using a random walk technique. 18th International Seminar on Paste and Thickened Tailings, 5-8 May 2015, Cairns, Australia.
- McPhail, G. Engels, J. and Ugaz R (2016) Application of fluidised bed column testing to the assessment of beaching and segregation characteristics of mine tailings, 19th International Seminar on Paste and Thickened Tailings, 5 -8 July 2016, Santiago, Chile

Dam Break and Flow Slide Analysis

- McPhail, G (2015) Probabilistic dam break assessment and flow slide analysis for tailings storage facilities, Tailings 2015, 22-24 August 2015, Santiago, Chile (paper accepted)

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Landform Design

McPhail, G. and van Koersveld, A. (2006), Optimising the erosional performance of store and release covers through appropriate landform design, Proceedings of the First International Seminar on Mine Closure, 13-15 September 2006, Perth, Australia, pp 549-558

McPhail, G. and Rye, C (2008), Comparison of the erosional performance of alternative slope geometries, Proceedings of the First International Seminar on the management of rock dumps, stockpiles and heap leach pads, 5-6 March 2008, Perth, Australia pp 277-288