

NORWESTER

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National Mining Association
September 26-28, 2016
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(between Caterpillar and Komatsu)



Our Expertise

environmental • hydrology/hydrogeology
geology/geotechnical • mining (surface/underground)
process and design • field operations
construction services

Our Strengths

responsive • experience based solutions – value added
creative and flexible to meet your needs • energy and
minerals sectors are our sole focus
complete internal project development disciplines
broad international experience



EXPLORE the depths of our experience

Working Together...A Norwest Multi-discipline Specialty

by Greg Gillian



Brine from the Sevier Playa is being modeled by Norwest to determine reserves.

The feasibility study will include evaluating opportunities for project optimization, and the potential to improve project economics. These options include evaluating associated minerals such as lithium compounds, optimizing the mine plan, and improving process design, as well as other elements to reduce or defer capital costs and to accelerate time-to-production.

the Sevier Playa and infrastructure areas. Norwest's specific areas of responsibility for this project include:

- in-ground resource estimation;
- hydrogeology and modeling of the brine-hosted resource;
- recovery of the ion-laden brine via mine plans developing extraction trenches and wells;
- geotechnical analysis of clay strata;
- evaporation pond layout and civil design;
- delineation of proven and probable reserves;
- process plant tailings;
- electrical distribution; and
- authoring pertinent sections in the 43-101 Report.

Project partners CH2M and Novopro play an important role in the delivery. CH2M will

As the world faces a plethora of challenges in the mining industry, it is crucial that companies work together to ensure industry success. As such, Norwest was selected by Crystal Peak Minerals, Inc. (Crystal Peak) to work alongside CH2M Hill (CH2M) and Novopro Projects (Novopro) to complete a feasibility study and NI 43-101 technical report for Crystal Peak's premium specialty fertilizer project on the Sevier Playa in southwestern Utah. Crystal Peak is currently engaged in engineering and analysis designed to support the feasibility study, environmental and other permitting, and ultimately mineral production of a specialty fertilizer made from potassium sulphate through the use of a cost-effective solar evaporation process. Potassium sulphate and other specialty fertilizers are used in the production of high value, chloride-sensitive crops such as fruits, vegetables, and tree nuts.

"We are very pleased with the team we have put together to deliver our feasibility study," said Lance D'Ambrosio, Chief Executive Officer of Crystal Peak. "The fieldwork portion was very encouraging so we look forward to optimizing our project, delivering a great study, and creating real value for our shareholders."

Norwest is utilizing its professional multi-disciplined staff (Process and Design, Mining Engineering, Hydrology, Geology, and Geotechnical) to provide the project design, engineering, and cost estimation of



Snowcats used in the field program on the Sevier Playa.

Norwest and Heavy Norwest are on the Move



Effective August 1, 2016, our Calgary, Alberta offices moved to the Selkirk House Building. We look forward to serving you from our new location.

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serve as the lead feasibility study consultant and will be responsible for coordinating the overall delivery of the study. In addition, CH2M will be providing hydrogeology expertise for development of groundwater flow and solute transport models, hydrology and water balance studies, along with key infrastructure and cost estimation for the non-process areas. Novopro is a project development and implementation company specializing in potash processing and related industries. Novopro will be responsible for evaporation pond and process plant design, engineering, and cost estimation.

Norwest and the team are working hard to successfully deliver this project for Peak in 2017.

Coal Generation A Dying or Thriving Resource?

by Pat Akers



Site visit – box cut East.

Coal is a prime source of energy in India, and it plays an important role in the economic development of the country. It is vital for the country's energy security, as it provides for more than 66% of the country's energy generation. At the end of the 11th Five Year Plan (2012), coal based power generation contributed over 134 gigawatts (GW) of power. The Planning Commission projections indicate that, over the next decade, electricity generated from coal-fired plants will reach 2,141 terawatt-hours (TWh) by 2047. Thus, it can be seen that coal will continue to be a prime source of energy looking into the future.

NTPC, Ltd. (NTPC) is India's biggest power generator, with a commissioned capacity of 43,128 megawatts (MW). It feeds a fourth of India's electricity needs, or as they say "NTPC lights up every fourth bulb in the country". It is one of the most efficient power companies in India, having

operations that match global standards.

Commensurate with the growth challenges in India, NTPC has embarked upon an ambitious plan to attain a total installed capacity of 128,000 MW by 2032. Towards this goal, NTPC has adopted a multi-prong strategy which includes greenfield projects, brownfield projects, joint ventures, and acquisition of existing plants. In addition, the corporation has also adopted the diversification strategy in related business areas such as coal mining, power trading, and manufacturing to ensure robust growth of the company.

As part of their aggressive growth plans, NTPC is developing the Pakri Barwadih coal deposit located in the Hazaribagh district, located in the state of Jharkhand in eastern India. NTPC has engaged Thriveni – Sainik Mining Pvt Ltd (TSM) as a Mine Developer and Operator (MDO) for mining the Pakri Barwadih coal deposit.

Thriveni Earthmovers Private Limited (TEMPL) (www.thriveni.com) is one of the largest MDOs in India; covering a variety of commodities including: iron ore, coal, aggregates, and limestone, etc., with approximately 100 million tonnes per annum (Mtpa) coal mining capacity.

The Pakri Barwadih coal deposit, which TEMPL will operate, will be one of the largest open pit mines in India. Once in operation, it will produce 15Mtpa, at an average strip ratio of 4:1. There are at least 10 mineable seams, with an average dip of 12 to 14 degrees and a mining depth up to 300 meters. Development of this project will require diversion of several major drainages, and the relocation of 13 villages affecting approximately 4,300 families.

Even though production has already begun in small areas, TSM recently engaged Norwest to prepare a conceptual study which will analyze several mining methods and make a recommendation for the most suitable method for the ultimate development of the mine. These methods include the traditional truck/shovel and dragline mining as well as bucket wheel excavators and in-pit crushing and conveying which is not widely used in India.

In July of this year, Norwest professionals, Pat Akers and Larry Henchel, traveled to India to tour the site, met with the TSM project team, and attended a kick-off meeting for the project. While there, Pat and Larry toured the future mining area, the existing mining area, and the development of project infrastructure which is currently under construction.

Once the conceptual study is complete, Norwest will prepare a Detailed Project Report, similar to a Feasibility Study, in support of project financing. These efforts

(cont'd on pg 6)



Open pit mine site.



Norwest professionals, Larry Henchel and Pat Akers, conduct a sunset site visit.



India marketplace.

High Adventures in West Virginia

by Greg Gillian

As a West Virginia native, I wanted my family to be able to experience a true outdoor adventure that we could always remember. On a recent trip through the area, my family and I were privileged to be able to visit the recently opened 14,000-acre Summit Bechtel Reserve (SBR) located near our Charleston office.

The SBR property was once the site of an extensive surface coal mine near Thurmond, West Virginia. The reclaimed SBR is now a scouting and leadership training facility for youth and adults, which showcases how a reclaimed mine site can be returned to beneficial use for the surrounding community. The property terrain is tiered into a series of benches and reclaimed highwalls from the mining process, which helped to facilitate construction of many of the roads and infrastructure on the property.

It offers marvelous facilities and outdoor programs for scouts, leaders, and families wishing to take part in the adventure of a life time. There is something for everyone over the age of 11 to experience; whether you are a leader, scout, or visitor. It is home of the National Scout Jamboree held every four years, with the next Jamboree scheduled for 2017. The SBR is also within a one-day drive of 66% of the U.S. population and 33% of the Canadian population. Visitors can purchase one-day passes which include everything from tours of the facility, walks on the CONSOL Energy Bridge, hiking, mountain bike trails, skate parks, paddle boarding, boating and kayaking, fishing, tomahawk throwing, rappelling and bouldering, to zip lining through the green mountains.

We discovered one day isn't nearly enough to experience all it has to offer!

While in the area, we also took our 9 and 11 year olds to the Beckley Exhibition Coal Mine to experience first-hand the mining industry their grandpap and great-grandpaps supported for so many years.



Fourth and fifth generation friends of coal.

Both kids had a lot of great questions, and were able to gain an appreciation for all the hard work it takes to mine, process, and transport coal from the face to the rail loadout. By the end of the tour, they were excited to be able to pose by the 'Friends of Coal' sign to show their coal mining heritage is important to them as well.



Beckley Exhibition - underground coal mine.



Adventures for the whole Gillian family!

Support for Imperial Kearl Construction & Instrumentation Monitoring

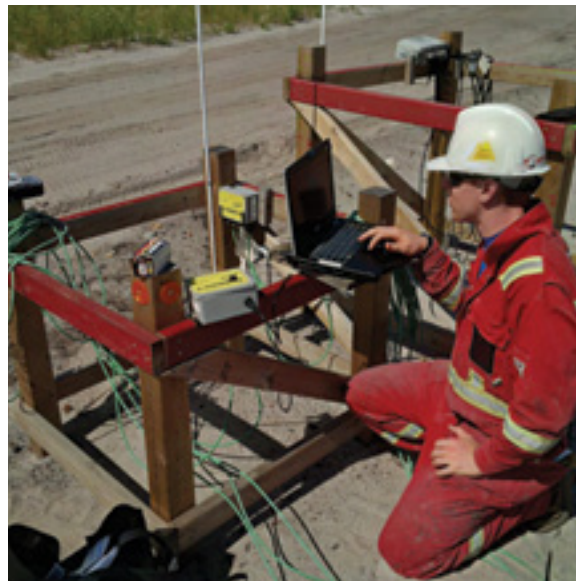
by Brad Steele and Carson Todd

Norwest Corporation began providing geotechnical engineering support to Imperial Kearl Oilsands Mine, near Fort McMurray, Alberta, Canada, in 2005. Pre-operation consulting support included geotechnical investigation, analysis, and design of pit walls and overburden disposal areas (ODAs), long range mine planning, and regulatory approval reporting. Since Imperial Kearl began producing oil in 2013, Norwest has also provided continuous field operations support for construction monitoring of civil earthworks, instrumentation, and other geotechnical performance monitoring of site infrastructure. Numerous Norwest professionals in multiple disciplines including geology, field services, geotechnical, hydrogeological, and mining engineering have been utilized to monitor and support Imperial operations and engineering goals, and to report the performance of mining structures.

Beginning in August 2016, Norwest was awarded a contract to carry out construction and instrumentation monitoring and performance reporting tasks for all structures within the operating mine area. These structures include two very large tailings facilities (one dry tailings area and one fluid tailings area), two ODAs, the open pit mining area, multiple reclamation material storage stockpiles, two ore stockpiles, and numerous operating aggregate stockpiles. All engineered structures within the mine

area are monitored by Norwest via manual and automated real-time geotechnical instrumentation. Norwest also conducts construction monitoring to assure compliance with engineering design specifications which includes moisture density testing, sampling and laboratory testing, visual observations, and reporting.

Construction and instrumentation monitoring is supported by a team of 16 persons which is led by two senior technologists with several years of experience at the site who carry out health, safety and environment management, team supervision, quality assurance/quality control, communication, and reporting tasks. The remainder of the team includes construction monitoring leads who task and supervise monitoring technicians; dedicated tailings area monitors who provide daily testing, monitoring, and reporting and ensure compliance with the area Operation Maintenance and Surveillance manual; and construction and instrumentation technicians who monitor mine pit walls, overburden disposal and stockpile areas, the open pit, and haul road and other civil construction. In order to safely operate nuclear moisture density gauges for material compaction testing, all of these technicians have extensive nuclear safety training. Norwest also maintains corporate and site radiation safety officers, and transportation and storage facilities licensed for use by the Canadian Nuclear Safety Commission. Norwest instrumentation technicians are cross-trained and tasked to serve as laboratory technicians. This group provides instrumentation installation, maintenance and repair, data collection, and reporting support for geotechnical instrumentation which includes slope inclinometers, shape accel arrays, vibrating wire piezometers, standpipes, pressure plates, and flow gauges. Norwest monitors and maintains various levels of automation, telemetry, and real-time instrumentation systems which have been incorporated into the site



A Norwest instrumentation technician downloads and verifies data collected from a multiple instrumentation array in the field.

instrumentation network based on client needs, accessibility, and the area risk profile. Norwest laboratory technicians sample and transport construction materials to a Norwest managed and maintained laboratory for testing which includes standard proctor, grain size, atterberg limits, and moisture content tests. Lab technicians are trained and licensed by the American Concrete Institute (ACI), Canadian Council of Independent Laboratories (CCIL), and others. As the mine site and area geotechnical structures expand over time, Norwest expects to continue to work with Imperial Kearl to optimize area instrumentation and construction and performance monitoring tasks and to provide reliable and efficient monitoring support.



A Norwest construction monitoring technologist collects and records compaction and other construction data in the field.



A Norwest construction monitoring technologist collects and records compaction and other construction data in the field.

U.S. Office Under New Leadership



Carl Pollastro was appointed President of Norwest Corporation's U.S. Operations, effective April 1, 2016, following the retirement of Bob Evans.

Carl joined Norwest in our Salt Lake City office in 2009 and worked as Sr. Vice

President, Engineering/International prior to his appointment as President of Norwest's U.S. Operations. Since joining Norwest, he has worked on numerous domestic and international projects.

Carl serves as a Board Member of the Norwest Corporation Board of Directors, and was a former Board Member of Intermountain Electronics. He holds a degree from the University of Utah in Mining Engineering, and a Qualified Person (QP) designation from the Mining and Metallurgical Society of America in mining and ore reserves.

Prior to joining Norwest, Carl worked in the industry for over 35 years holding numerous engineering and management positions. During that time, he worked for Interwest Mining Company, Energy West Mining Company, Emery Mining Company, Soldier Creek Coal Company, and Kaiser Steel Company.

Norwest Opens an Office In Brazil

Norwest is pleased to announce the establishment of our new subsidiary company in Belo Horizonte, Brazil - As of August 2016, Norwest Brasil Engenharia has been officially incorporated. The office will be managed by Paulo Gouvea, Senior Geotechnical Engineer, who has 20 years' experience in mine geotechnical engineering working in Brazilian iron ore mines as well as Canadian oil sands operations.

Norwest is pleased to have Paulo join our team and we are excited about this expansion as it opens up new opportunities for Norwest to serve our clients with Brazilian and South American based projects.



Coal Generation... A Dying or Thriving Resource?

(cont'd from pg 3)



India mine site.

will involve a multi-disciplined effort from Norwest's U.S. based geology and facilities groups, and surface mining groups from both the U.S. and Canada offices.

Norwest looks forward to working on this important project, alongside TSMPL and Geovale Services.

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