BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT,	:	HP 14-001 DIRECT TESTIMONY OF COREY GOULET

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Pursuant to the Commission's Order Granting Motion to Define Issues and Setting Procedural Schedule, Petitioner TransCanada Keystone Pipeline, LP, offers the following direct testimony of Corey Goulet.

1. Please state your name and address for the record.

Answer: My name is Corey Goulet. My business address is 450 1st Street S.W., Calgary, AB Canada T2P 5H1.

2. Please state your position with Keystone and provide a description of your areas of responsibility with respect to the Keystone XL Project.

Answer: I am President, Keystone Projects, with overall accountability for the implementation and development of the Keystone Pipeline system, including the Keystone XL Project (Project). In that capacity, I am responsible for overall leadership and direction of the Project.

3. Please state your professional qualifications and experience with pipeline operations.

Answer: My professional background is stated in my resume, a copy of which is attached as Exhibit A. I have a degree in mechanical engineering.

4. Are you responsible for portions of the Tracking Table of Changes attached as Appendix C to Keystone's certification petition?

Answer: Yes. I am individually or jointly responsible for the information provided with respect to Finding Numbers 14, 15, 16, 17, 18, 19, 20, 22, 23, and 107 related to the Project. In general, I can testify to the Project purpose; overall description; construction schedule; operating parameters; overall design; cost; and tax revenues.

5. Please summarize the updated information regarding Finding Number 14.

Answer: The Bakken Marketlink project was developed after Keystone's permit application in HP 09-001. The update to this finding reflects that the Project's purpose include transporting domestic production from the Williston Basin and supporting the growth of crude oil production in the United States.

6. Please summarize the updated information regarding Finding No. 15.

Answer: The Gulf Coast Segment of the original Keystone XL Project and the Houston Lateral were constructed as a stand-alone project. The update to this finding reflects that change, meaning that the Project consists of the Steele City Segment, from Hardisty, Alberta, Canada, to Steele City Nebraska, where it will interconnect with the Keystone Cushing Extension segment of the Keystone Pipeline. The Project's current design is based on a maximum capacity to transport 830,000 barrels per day.

7. Please summarize the updated information regarding Finding No. 16.

Answer: Because the Project is limited to the Steele City Segment, the mileage decreased to approximately 1202 miles, with 876 miles through Montana, South Dakota, and Nebraska. The mileage has changed slightly in South Dakota due to minor route variations made at the request of landowners or for engineering reasons. The right of way passes through the same counties as indicated in the Permit Application.

8. Please summarize the updated information regarding Finding No. 17.

Answer: Keystone does not currently have a construction schedule for the Project, pending issuance of the Presidential Permit. The Project's inservice date is uncertain for the same reason.

9. Please summarize the updated information regarding Finding No. 18.

Answer: Due to minor route variations, the mileage in South Dakota and the mileposts have changed slightly. The pipeline will be constructed using API 5L X70M high-strength steel, which was one of the design options presented in the original Permit Application. Keystone's final design determinations were made after TransCanada withdrew its application to PHMSA for a special permit and adopted 59 special conditions developed by PHMSA as set forth in Appendix Z to the Department of State Final Supplemental Environmental Impact Statement (FSEIS).

10. Please summarize the updated information regarding Finding No. 19.

Answer: This update reflects final design determinations based on the decision to withdraw the special permit application and the requirements of 49 CFR 195.106.

11. Please summarize the updated information regarding Finding No. 20.

Answer: This update reflects a change in the number of mainline valves in South Dakota from 16 to 20 due to PHMSA requirements. All of the valves will be remotely controlled for purposes of emergency response.

12. Please summarize the updated information regarding Finding No. 22.

Answer: The 59 special conditions are set forth in Appendix Z to the FSEIS. Keystone has committed to meet these conditions.

13. Please summarize the updated information regarding Finding No. 23.

Answer: The estimated cost of the Project in South Dakota increased to $1.974 billion due to new technical requirements, inflation, and additional costs due to the delay in receipt of federal approval and commencing construction.

14. Please summarize the updated information regarding Finding No. 107.

Answer: Although I am not a tax expert, the increased cost of the Project reflected in Finding No. 23 is likely to result in increased tax revenues to the affected counties. To the extent that tax revenues are an issue at the hearing, Keystone may present rebuttal testimony addressing tax issues from Steve Klekar, Manager, Property Taxation for TransCanada – US Pipelines.

15. Are you aware of any reason that Keystone cannot continue to meet the conditions on which the Permit was granted by the Commission?

Answer: No. As stated in the Certification that I signed, Keystone is or will be able to satisfy all of the conditions imposed by the Commission as part of its Amended Final Decision and Order dated June 29, 2010.

16. Does this conclude your prepared direct testimony?

Answer: Yes.

Dated this 1 day of April, 2015.

Corey Goulet

CERTIFICATE OF SERVICE

I hereby certify that on the 2nd day of April, 2015, I sent by United States first-class mail, postage prepaid, or e-mail transmission, a true and correct copy of the foregoing Direct Testimony of Corey Goulet, to the following:

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With more than 60 years' experience, TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure including natural gas and oil pipelines, power generation and gas storage facilities. TransCanada operates a network of natural gas pipelines that extends more than 68,500 kilometres (42,500 miles), tapping into virtually all major gas supply basins in North America. TransCanada is one of the continent's largest providers of gas storage and related services with more than 400 billion cubic feet of storage capacity. A growing independent power producer, TransCanada owns or has interests in over 11,800 megawatts of power generation in Canada and the United States. TransCanada is developing one of North America's largest oil delivery systems. TransCanada's common shares trade on the Toronto and New York stock exchanges under the symbol TRP. For more information visit: www.transcanada.com or check us out on Twitter @transcanada or http://blog.transcanada.com.

Corey Goulet

President, Keystone Projects

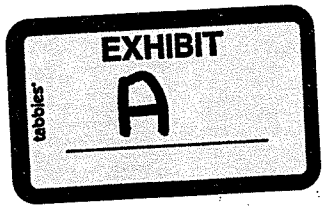
As President, Keystone Projects, Corey Goulet has overall accountability for the development and implementation of all phases of the Keystone Pipeline including securing land and permits, engineering, procurement, construction, commissioning, start-up and testing.

Prior to his current role, Mr. Goulet was Vice-President of the Facilities and Pipeline Projects department where he was responsible for leading the technical development and implementation of power plant, compression, metering and pipeline projects in Canada and the United States.

Mr. Goulet has 27 years of energy infrastructure experience. His experience is varied and has focused on the development, construction, operation and maintenance of natural gas, wind, hydro, nuclear and transmission power facilities; gas, oil and refined products pipelines; and oil and gas production facilities. He joined the company in 1998 as a manager in the international business unit where he was responsible for developing projects. Since that role, he has lead various departments including pipeline engineering, energy projects, and nuclear technical development.

Mr. Goulet is a former member of the Operations and System Integrity subcommittee for CSA Z662 Oil and Gas Pipeline Systems. In addition, he represented TransCanada for two years as a Board member, Executive Committee member, and Planning Committee member with the Pipeline Research Council International, Inc. (PRCI). Mr. Goulet has also been a Board member for two joint venture companies.

Born and raised near Edmonton, Alberta, he graduated with a Bachelor of Science in Mechanical Engineering (with Distinction) from the University of Alberta in 1985.



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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT,	:	HP 14-001 DIRECT TESTIMONY OF DAVID DIAKOW

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Pursuant to the Commission's Order Granting Motion to Define Issues and Setting Procedural Schedule, Petitioner TransCanada Keystone Pipeline, LP, offers the following direct testimony of David Diakow.

1. Please state your name and address for the record.

Answer: My name is David Diakow. My business address is 450 1st Street S.W., Calgary, AB Canada T2P 5H1.

2. Please state your position with Keystone and provide a description of your areas of responsibility with respect to the Keystone XL Project.

Answer: I am Vice President, Commercial, Liquids Pipelines, for TransCanada Pipelines. I am responsible for commercial activities for TransCanada's liquids pipeline business, including the Keystone XL Project.

3. Please state your professional qualifications and experience with pipeline operations.

Answer: My professional background is stated in my resume, a copy of which is attached as Exhibit A. I have a bachelor's and master's degree in mechanical engineering, and a Master of Business Administration degree.

4. Are you responsible for portions of the Tracking Table of Changes attached as Appendix C to Keystone's certification petition?

Answer: Yes. I am individually or jointly responsible for the information provided with respect to Finding Numbers 24, 25, 26, 27, 28, and 29 related to the Project. In general, I can testify to demand for the Project.

5. Please summarize the updated information regarding Finding Number 24.

The crude oil market is dynamic. While the crude oil market has changed since 2010, demand for the Project remains strong. Keystone has binding shipper commitments for the Project. The need for the Project is driven by factors that include the need to transport safely and efficiently growing U.S. and Canadian crude oil production, insufficient pipeline capacity, and the opportunity to reduce U.S. dependence on foreign offshore crude oil through increased access to North American supplies. The continued demand for the Project is documented in the Department of State Final Supplemental Environmental Impact Statement (FSEIS), Section 1.4, Market Analysis.

6. Please summarize the updated information regarding Finding Number 25.

Answer: Since Keystone's petition for a permit was filed with the Commission in 2009, United States production of crude oil has increased significantly, from approximately 6.5 million barrels per day (bpd) in 2012, and is expected to peak at 9.6 million bpd by 2019. Even with this growth in domestic production, the United States is expected to remain a net importer of crude

oil. Keystone reviews and relies on forecasts from the U.S. Energy Information Administration (EIA). According to the EIA, U.S. demand for crude oil has held steady at approximately 15 million bpd and is expected to remain relatively stable into the future. More information from the EIA forecasts is included in the FSEIS in Section 1.4. Keystone also relies on industry information available from the CAPP Crude Oil Forecast, Markets and Transportation June 2014, which Keystone produced in discovery in this proceeding.

7. Please summarize the updated information regarding Finding Number 26.

Answer: While domestic production of light crude oil has increased since 2009 and has replaced most foreign imports of light crude, demand persists for imported heavy crude oil by U.S. refineries that are optimally configured to process heavy crude slates. The U.S. Gulf Coast continues to import approximately 3.5 million bpd of heavy and medium sour crude oil. This demand is supported by Keystone's binding shipper commitments for the Keystone XL Project.

8. Please summarize the information regarding Finding Number 27.

Answer: Continued demand for imported heavy crude oil is also demonstrated by the fact that the vast majority of Canadian heavy crude oil production is currently exported to the United States to be processed by U.S. refineries. North American crude oil production growth and logistics constraints have contributed to significant discounts on the price of landlocked crude and led to growing volumes of crude shipped by rail in the United States. As the FSEIS makes clear, in the absence of new pipelines, crude oil will continue to be transported via rail at an increasing rate. The North Dakota Pipeline Authority estimates that rail export volumes from the U.S. Williston Basin have increased from approximately 40,000 bpd in 2010 to over 700,000 bpd in early 2014. Over 60% of crude oil transported from the Williston Basin is delivered by

rail. The industry has also been making significant investments in increasing rail transport capacity for crude oil out of the Western Canadian Sedimentary Basin. In recent years, rail transport of crude oil in Canada has grown from approximately 10,000 bpd in 2010 to approximately 270,000 bpd by the end of 2013. Chapter 5 of the FSEIS (sections 5.0, 5.1, 5.2, and 5.3) indicates that transportation of crude oil by pipeline is safer and less greenhouse gas intensive than crude oil transportation by rail. Thus, the statement in Finding No. 27 remains true--that the project will provide an opportunity for U.S. refiners in Petroleum Administration for Defense District III, the Gulf Coast region, to further diversify supply away from traditional offshore foreign crude supply and to obtain direct access to secure and growing domestic crude supplies.

9. Please summarize the updated information regarding Finding No. 28.

Answer: The numbers vary slightly, but the overall fact remains the same. Reliable and safe transportation of crude oil will help ensure that U.S. energy needs are not subject to unstable political events. Canada has 173 billion barrels of oil reserves, 97% of which are located in the oil sands. Canada's reserves are third only to Venezuela and Saudi Arabia. Canada is the largest foreign supplier of crude oil to the United States and is likely to remain as such for the foreseeable future.

10. Please summarize the updated information regarding Finding No. 29.

Answer: Keystone's shippers have committed to long-term binding contracts, which demonstrate a material endorsement of support for the Project, its economics, proposed route, and target market, as well as the need for additional pipeline capacity to access domestic and

Canadian crude supplies. The FSEIS independently confirms strong market demand for the Project.

11. Are you aware of any reason that Keystone cannot continue to meet the conditions on which the Permit was granted by the Commission?

Answer: No. I have reviewed the conditions contained in the Amended Final Decision and Order dated June 29, 2010. The changes discussed in Finding Nos. 24-29 related to demand do not affect Keystone's ability to meet the conditions on which the Permit was granted.

12. Does this conclude your prepared direct testimony?

Answer: Yes.

Dated this 24 day of March, 2015.

David Diakow

CERTIFICATE OF SERVICE

I hereby certify that on the 2nd day of April, 2015, I sent by United States first-class mail, postage prepaid, or e-mail transmission, a true and correct copy of the foregoing Direct Testimony of David Diakow, to the following:

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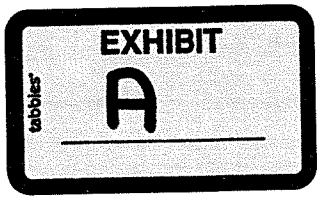
David Diakow

Vice President, Commercial, Liquids Pipelines
TransCanada Pipelines

David is currently responsible for commercial activities for TransCanada's liquids pipeline business, including strategy development, commercial regulatory management and commercial management of its operating assets, such as the Keystone Pipeline system, and including those in advanced stages of commercial development such as the Keystone XL project.

David has over 27 years of experience in the oil and gas industry, with 24 years at TransCanada. David has held management positions in engineering, major projects and business development with respect to natural gas and crude oil pipelines development in Canada and the U.S.

David graduated from the University of Saskatchewan in 1987 with a Bachelor of Science degree in Mechanical Engineering and also holds both a Master of Science degree in Mechanical Engineering (1994) and a Master of Business Administration degree (2002) from the University of Calgary.



BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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HP 14-001

IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT,

DIRECT TESTIMONY OF MEERA KOTHARI, P.ENG.

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Pursuant to the Commission's Order Granting Motion to Define Issues and Setting Procedural Schedule, Petitioner TransCanada Keystone Pipeline, LP, offers the following direct testimony of Meera Kothari.

1. Please state your name and address for the record.

Answer: My name is Meera Kothari. My business address is 700 Louisiana Street, Houston, Texas 77002.

2. Please state your position with Keystone and provide a description of your areas of responsibility with respect to the Keystone XL Project.

Answer: I am currently Manager, U.S. Business Development, Liquids Pipelines, for TransCanada, as well as Manager, Technical Services Pipeline Engineering for Keystone Oil Projects. I have oversight responsibility for design and engineering for the Keystone XL Pipeline Project.

3. Please state your professional qualifications and experience with pipeline operations.

Answer: My professional background is stated in my resume, a copy of which is attached as Exhibit A. In general, I am a Professional Engineer, with a degree in mechanical and manufacturing engineering. Beginning in October, 2005, I served as the Lead Project Engineer for the Keystone Pipeline Project. I was the Project Manager for the Cushing Extension Pipeline Project from April 2010 to January 2011. I was the Reclamation Project Manager for the Cushing Extension Pipeline from January 2011 to November 2011. I have testified before the Commission in the permit proceedings concerning the Keystone Pipeline in Docket HP07-001 and concerning the Keystone XL Pipeline in Docket HP 09-001.

4. Are you responsible for portions of the Tracking Table of Changes attached as Appendix C to Keystone's certification petition?

Answer: Yes. I am individually or jointly responsible for the information provided with respect to Finding Numbers 60, 61, 62, 63, 68, 83, 90, and 107. In general, I can testify to design and construction of the Keystone XL Pipeline and PHMSA compliance.

5. Please summarize the updated information regarding Finding No. 60.

Answer: Since the Amended Final Order dated June 29, 2010, Keystone withdrew its request to PHMSA for a special permit ("Special Permit") on August 5, 2010. The decision was explained in a media advisory issued on August 5, 2010, a copy of which is attached as Exhibit B. As a result of the withdrawal, Keystone will implement 59 additional safety measures as set forth in Appendix Z to the Department of State Final Supplemental Environmental Impact

Statement. These measures provide an enhanced level of safety equivalent to or greater than those that would have applied under the previously requested Special Permit.

6. Please summarize the updated information regarding Finding No. 61.

Answer: This finding is no longer relevant as Keystone has withdrawn its request for a Special Permit.

7. Please summarize the updated information regarding Finding No. 62.

Answer: This finding is no longer relevant as Keystone has withdrawn its request for a Special Permit.

8. Please summarize the updated information regarding Finding No. 63.

Answer: As a result of withdrawing the Special Permit application, Keystone will build the Keystone XL Pipeline using the as-proposed high strength steel, API 5L grade X70M steel with a nominal wall thickness of 0.465 inches, but will operate the pipeline at a lower pressure of 1,307 psig to comply with internal pressure design requirements in accordance with federal code of regulation title 49 CFR 195.106. For location specific low elevation segments close to the discharge of pump stations, the maximum operating pressure will be 1,600 psig. Pipe associated with these segments of 1,600 psig MOP will have a design factor of 0.72 and a nominal pipe wall thickness of 0.572 inches (X-70M).

9. Please summarize the updated information regarding Finding No. 68.

Answer: This Finding was updated because TransCanada has four more years of experience in the use of FBE coated pipe. On one occasion when TransCanada excavated pipe to validate FBE coating performance, there was one instance in which an adjacent foreign utility interfered with the cathodic protection system in a shared utility corridor. The situation was

remedied, and no similar situation could exist in South Dakota because there are no shared utility corridors.

10. Please summarize the updated information regarding Finding No. 83.

Answer: Keystone will use Horizontal Directional Drilling ("HDD") for the Bridger Creek and Bad River crossings, in addition to the Little Missouri, Cheyenne, and White River crossings. Attachment B to Keystone's Tracking Table of Changes contains the preliminary site-specific crossing plans for the HDD crossings of the Bad River and Bridger Creek.

11. Please summarize the updated information regarding Finding No. 90.

Answer: The updated information for this finding is based on the withdrawal of the Special Permit application. Keystone will comply with the 59 additional conditions as set forth in the FSEIS, Appendix Z, which provide an enhanced level of safety equivalent to or greater than those that would have applied under the Special Permit.

12. Please summarize the updated information regarding Finding No. 107.

Answer: To the extent that Finding No. 107 included reference to the Special Permit, Keystone has withdrawn its application, but will comply with the 59 additional conditions as set forth in the FSEIS, Appendix Z.

13. Are you aware of any reason that Keystone cannot continue to meet the conditions on which the Permit was granted by the Commission?

Answer: No. I have reviewed the conditions contained in the Amended Final Decision and Order dated June 29, 2010. The changes discussed in Finding Nos. 60, 61, 62, 63, 68, 83, 90, and 107 do not affect Keystone's ability to meet the conditions on which the Permit was granted.

14. Does this conclude your prepared direct testimony.

Answer: Yes.

Dated this 1 day of April, 2015.

Meera Kothari

Meera Kothari P.Eng.

CERTIFICATE OF SERVICE

I hereby certify that on the 2nd day of April, 2015, I sent by United States first-class mail, postage prepaid, or e-mail transmission, a true and correct copy of the foregoing Direct Testimony of Meera Kothari, P.Eng., to the following:

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Meera Kothari P.Eng.

Professional Experience

TransCanada Corp. Houston, TX — October, 2014 – Present

Manager, U.S. Business Development, Liquids Pipelines

- Manage TransCanada's existing customer relationships, and develop new customers for future business opportunities.
- Market of capacity on TransCanada's existing oil pipeline system, and extending the reach of TransCanada's oil pipeline network through the development of transportation and terminalling opportunities.
- Perform market research and provide analysis supporting strategy development.
- Prepare business strategies and plans.
- Provide analytical and due diligence support.
- Prepare marketing material and proposals.
- Assist with development of key valuation assumptions and related analysis.
- Interact with key internal clients: Engineering, Supply Chain, Construction, Operations, Legal, Finance, Accounting, Tax, and Risk.
- Transition successful development projects to execution.

TransCanada Corp. Houston, TX — October, 2012 – Present

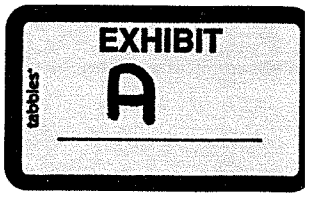
Manager, Technical Services Pipeline Engineering for Keystone Oil Projects

- Guide, review and sign off on pipeline designs and facility interface designs for oil project portfolios worth up to $12B.
- Oversight of 8 engineering firms dealing with all facets of pipeline engineering (inclusive of specialty items such as routing, civil design, E&I, welding, ECA, coating, welding, NDE technology, stress analysis, cathodic protection design, AC mitigation design, risk and spill analysis, thermal modeling, etc.)
- Oversight of construction technical execution for a 860 km 36" pipeline project inclusive of mechanize and flux core welding, automated girth weld coating application, high risk HDDs applications (7500 ft+ in length), AUT/RTR nondestructive examination, automated inspection record capturing
- Performance management for team of 15 direct reports/10 contract staff (engineers, technologists, resident inspectors).
- Technical representative interfacing with construction contractors and major pipe/material suppliers.
- Preparation of permit applications, data responses and meetings with Canadian/US Federal and State agencies (NEB, PHMSA, Department of State, Bureau of Reclamation/Land Management ,etc.),

TransCanada Corp. Houston, TX — November 2011 - October 2012

Technical Advisor, Keystone XL Pipeline Project

- Technical advisor during pipeline detail design phase, construction contractor bid process, material procurement, and preconstruction planning activities for 36" 2,798 km cross border pipeline project.



TransCanada Corp. Houston, TX January 2011 - November 2011

Reclamation Project Manager, Cushing Extension Pipeline

- Management of ROW reclamation activities for 482 km pipeline.

TransCanada Corp. Houston, TX April 2010 - January 2011

Project Manager, Cushing Extension Pipeline Project

- Construction execution of $110M, 36" 171 km pipeline project in Kansas.
- Delivery of safety performance results and ensured management visibility on the construction site.
- Ensured the project was constructed with the approved design, plans, and standards; and in accordance with environmental regulations and all project permit conditions.
- Delivered within budget and on-time performance meeting project safety, environmental, and quality requirements.
- Ensured positive and professional relationships are enhanced and maintained with contractors, unions, landowners, communities, aboriginal , governmental and regulatory bodies.
- Facilitation of Board of Directors and External Stakeholder visits to the ROW.

TransCanada Corp. Calgary, AB October 2005 - April 2010

Lead Project Engineer, Keystone Pipeline Project

- Development and review of DBM, FEED, detail design, specifications, standards, procedures for new construction, pipeline change of service conversion and above ground facilities in accordance with applicable industry codes and standards (Canada & USA).
- Pipeline route planning, HCA development, integrity management plans, spill analysis.
- Construction technical support for design, coating, NDE (AUT/RTR), ECA, mechanized/manual welding, hydrostatic testing, In-Line Inspection (ILI), and materials.
- Commissioning support.
- Engineering and Integrity assessment for conversion of 864 km circa 1950, 34" gas pipeline to crude oil service in Canada. Converted without hydrotesting through the use of ultrasonic in-line inspection
- Engineering assessment for the design, construction and operation of 30"/36" 2,215 km crude pipeline at 80% SMYS in the USA. First liquid line to be granted a waiver in the US.
- Plan, review and ensure timely completion of regulatory baseline data collection, permit application preparation and submittal in Canada (NEB Section 74, Section 52, Section 58) and the US (NEPA and State).
- Preparation and analysis of project budgets & expansion cases.
- Generation of terms, conditions, scope, analysis and award and completion of project RFP for major materials and services.
- Expert witness testifying at multiple Department of State (DOS) hearings, State hearings, technical spokesperson at public consultation project open houses.
- Preparation of permit applications, data responses and meetings with Canadian/US Federal and State agencies (NEB, PHMSA, Department of State etc),

TransCanada Energy. Trois Rivières, Québec May 2005 - October 2005

Project Engineer, Becancour 500 MW Cogeneration Power Plant

- Development & implementation of inside battery limit/outside battery limit construction quality plan for $550M project.
- Witness point inspections and audit of equipment fabrication & equipment installation.
- Conducted plant hazard assessment recommendation close out.
- Validation of work package estimates for outside battery limit pipeline project bid award.
- Development hazardous material philosophy.

- RFP preparation for gas and chemical supply.
- Development of community investment risk matrix.
- French guided plant tours for various stakeholders.
- Preparation of monthly project status report, management presentations and HS&E statistics
- Analysis and validation of cost and schedule for various work packages
- Development of management operating system compliance tracking report

TransCanada Corp. Calgary, AB July 2001 - April 2005

Pipeline Integrity Engineer for Asset Reliability, Technical Support and Technology Management

- Technical specification support for new capital pipeline projects (coating, welding, materials, NDE).
- Engineering critical assessment for pipeline defect assessment, maintenance repair, pipeline pressure de-rating, unsupported pipe lengths, blasting/explosives, coating systems for 40,000 miles of operating pipeline.
- Urban development encroachments, foreign utility, road and vehicle crossing application review focused in the areas of integrity verification, stress analysis, population growth tracking for the purpose of code compliance and conflicts with facilities that may impact the ability to maintain integrity, access for maintenance purposes, emergency response accessibility and compatible land uses for 40,000 miles of operating pipeline.
- Failure analysis of in service pipe body leaks, pipeline ruptures and hydrostatic test failures
- Research & Development of SCC & MFL In-Line Inspection, NDT techniques, pipeline repair techniques, mainline and joint coating systems, welding of new materials.
- Risk analysis for new pipeline construction projects.
- Development of engineering & integrity budget and programs for due diligence and acquisitions.
- Development of commercial agreements & contracts with Provincial Governments, private developers and construction contracts for pipeline upgrade/rehabilitation project.
- Coordination of Facilities Integrity R&D Program reviews and budgeting cycles.
- Liaison with Regulators (National Energy Board, Transportation Safety Board and Alberta Energy and Utilities Board) with respect to integrity management issues and incidents.
- Providing direction during emergency maintenance activities to various groups within the organization.
- Developed annual integrity maintenance program using quantitative risk modeling software.
- Coordination of research & development projects for risk management, corrosion and SCC.
- Coordination of peer review team for evaluation of projects feasibility and cost management.
- Performed value/benefit analysis for integrity projects.
- Directing contractors & field technicians to perform technical tasks.

Education

Bachelor of Science (BSc) – Mechanical & Manufacturing Engineering, University of Calgary, AB May 2001

- Four (4) Summer Student Program Terms with Petro-Canada Oil & Gas Ltd performing data and technology architecture development for various projects: McKay River Bitumen Recovery Scheme, De-sulferization upgrade facility, transportation developments and Natural Gas Liquids (NGL) facilities June 1998 - May 2001

Special Skills

- **Team and Individual Leadership** – Can fully utilize the capabilities of direct reports to ensure effectiveness of own department. Empowers and motivates the team to set and achieve goals despite significant obstacles.
- **Project Management** – Utilize time management skills to meet deadlines for numerous major projects and demonstrated ability to engage and collaborate with team members effectively.
- **Communication & Collaboration** – Possess strong oral and written communication skills; able to research and present ideas effectively as shown through publications, speeches, and presentations.
- **Languages** – Write and speak fluent English and French

Publications & Industry

M. Kothari, S. Tappert, U. Strohmeier, J. Larios and D. Ronsky, "**Validation of EMAT In-Line Inspection Technology for SCC Management**," Proceedings of the International Pipeline Conference, Calgary, 2004.

R. Worthingham, M. Cetiner, M. Kothari, "**Field Trial of Coating Systems for Arctic Pipelines**," Proceedings of the International Pipeline Conference, Calgary, 2004.

Chair Person: **In-Line Inspection Session**, Banff Pipeline Integrity Workshop, Banff, 2005

Professional Member of APEGGA

TransCanada
In business to deliver

Media Advisory

Special Permit Application Withdrawn for Keystone Gulf Coast Expansion Pipeline

Calgary, Alberta – August 5, 2010 – TransCanada has withdrawn its request to the Pipeline and Hazardous Materials Safety Administration (PHMSA) for a special permit. The permit would have allowed TransCanada to operate the proposed Keystone XL pipeline at a slightly higher pressure than current federal regulations for oil pipelines in the United States, subject to building the pipeline using stronger steel and operating under additional safety conditions.

After listening to concerns from the public and various political leaders, TransCanada made the decision to withdraw the permit application. The company will build Keystone XL using the as-proposed stronger steel but will operate it at a lower level of pressure, consistent with current U.S. regulations.

The company recognizes it needs to take more steps to assure the public and stakeholders that the parameters of the special permit would result in a safer pipeline. The company will continue to establish an operating record which will demonstrate the strength and integrity of the Keystone Pipeline System, which has been granted a special permit.

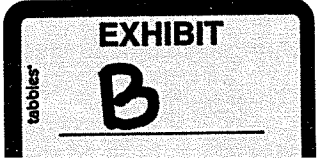
Keystone XL will implement the additional safety measures that would have been required under the special permit. These measures offer an enhanced level of safety and would allow TransCanada to request a special permit in the future. These safety measures also will be consistent with those that have been implemented on the existing Keystone Pipeline. In issuing the special permit for Keystone, PHMSA concluded the permit would provide a level of safety equal to or greater than that provided if the pipeline were operated under the current standard.

Without the special permit, Keystone XL will meet all of its initial commercial commitments to serve Gulf Coast refineries. Keystone also will continue to work with U.S. producers in the Bakken and broader Williston Basin area to provide needed transport for growing production in Montana and the Dakotas.

The Keystone XL project received approval in March 2010 from both the South Dakota Public Utility Commission and the National Energy Board in Canada. Pending receipt of additional permits, construction is planned to begin in 2011.

When completed, the Keystone XL project will increase the commercial capacity of the overall Keystone Pipeline System from 590,000 barrels per day to approximately 1.1 million barrels per day. The $12 billion system is 83 percent subscribed with long-term, binding contracts that include commitments of 910,000 barrels per day for an average term of approximately 18 years.

Commercial operations of the first phase of the Keystone system began June 30. Construction of the extension from Steele City Nebraska to Cushing Oklahoma is one-third complete and the pipeline is expected to be operational in 2011.



Keystone XL is a planned 1,959-mile (3,134-kilometre), 36-inch crude oil pipeline stretching from Hardisty, Alberta and moving southeast through Saskatchewan, Montana, South Dakota and Nebraska. It will connect with a portion of the Keystone Pipeline that will be built through Kansas to Cushing, Oklahoma and facilitate take away capacity from U.S. hubs located on the pipeline. The pipeline will then continue on through Oklahoma to a delivery point near existing terminals in Nederland, Texas to serve the Port Arthur, Texas marketplace.

To view a map of the proposed pipeline route, please visit the project web page at www.transcanada.com/keystone

With more than 50 years' experience, TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure including natural gas and oil pipelines, power generation and gas storage facilities. TransCanada's network of wholly owned natural gas pipelines extends more than 60,000 kilometres (37,000 miles), tapping into virtually all major gas supply basins in North America. TransCanada is one of the continent's largest providers of gas storage and related services with approximately 380 billion cubic feet of storage capacity. A growing independent power producer, TransCanada owns, or has interests in, over 11,700 megawatts of power generation in Canada and the United States. TransCanada is developing one of North America's largest oil delivery systems. TransCanada's common shares trade on the Toronto and New York stock exchanges under the symbol TRP. For more information visit: www.transcanada.com

TransCanada Forward-Looking Information

This news release may contain certain information that is forward looking and is subject to important risks and uncertainties. The words "anticipate", "expect", "believe", "may", "should", "estimate", "project", "outlook", "forecast" or other similar words are used to identify such forward-looking information. Forward-looking statements in this document are intended to provide TransCanada securityholders and potential investors with information regarding TransCanada and its subsidiaries, including management's assessment of TransCanada's and its subsidiaries' future financial and operations plans and outlook. Forward-looking statements in this document may include, among others, statements regarding the anticipated business prospects, projects and financial performance of TransCanada and its subsidiaries, expectations or projections about the future, and strategies and goals for growth and expansion. All forward-looking statements reflect TransCanada's beliefs and assumptions based on information available at the time the statements were made. Actual results or events may differ from those predicted in these forward-looking statements. Factors that could cause actual results or events to differ materially from current expectations include, among others, the ability of TransCanada to successfully implement its strategic initiatives and whether such strategic initiatives will yield the expected benefits, the operating performance of TransCanada's pipeline and energy assets, the availability and price of energy commodities, capacity payments, regulatory processes and decisions, changes in environmental and other laws and regulations, competitive factors in the pipeline and energy sectors, construction and completion of capital projects, labour, equipment and material costs, access to capital markets, interest and currency exchange rates, technological developments and economic conditions in North America. By its nature, forward looking information is subject to various risks and uncertainties, which could cause TransCanada's actual results and experience to differ materially from the anticipated results or expectations expressed. Additional information on these and other factors is available in the reports filed by TransCanada with Canadian securities regulators and with the U.S. Securities and Exchange Commission (SEC). Readers are cautioned to not place undue reliance on this forward looking information, which is given as of the date it is expressed in this news release or otherwise, and to not use future-oriented information or financial outlooks for anything other than their intended purpose. TransCanada undertakes no obligation to update publicly or revise any forward looking information, whether as a result of new information, future events or otherwise, except as required by law.

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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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HP 14-001

IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT,

DIRECT TESTIMONY OF JON SCHMIDT, PH.D.

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Pursuant to the Commission's Order Granting Motion to Define Issues and Setting Procedural Schedule, Petitioner TransCanada Keystone Pipeline, LP, offers the following direct testimony of Jon Schmidt.

1. Please state your name and address for the record.

Answer: My name is Jon Schmidt. My business address is exp Energy Services, 1300 Metropolitan Boulevard, Suite 200, Tallahassee, FL 32308.

2. Please state your position and provide a description of your areas of responsibility with respect to the Keystone XL Project.

Answer: I am Vice President, Environmental & Regulatory Services in the Tallahassee office of exp Energy Services, Inc. I am the regulatory and permitting manager for the Keystone XL Pipeline Project, including the coordination of the Department of State EIS, DEIS, SEIS, FEIS, and FSEIS, the Section 9 Biological Opinion, NHPA Section 106 Programmatic

Agreement, United States Army Corps of Engineers permitting, the Montana Facility Siting Act licensing, South Dakota PUC environmental filing, and other state and federal permitting.

3. Please state your professional qualifications and experience with pipeline operations.

Answer: My professional background is stated in my resume, a copy of which is attached as Exhibit A. My education consists of a bachelor's degree in marine biology, a master's degree in biological sciences, and a Ph.D. in biological sciences. In general, I have extensive experience in environmental management with respect to the pipeline industry, and have permitted over 30,000 miles of pipeline projects in most states in the United States over the last 28 years. I managed the regulatory and permitting tasks associated with the Keystone Pipeline, including associated compliance inspection during construction. I have testified before the Commission in the permit proceedings concerning the Keystone XL Pipeline in Docket HP 09-001.

4. Are you responsible for portions of the Tracking Table of Changes attached as Appendix C to Keystone's certification petition?

Answer: Yes. I am individually or jointly responsible for the information provided with respect to Finding Numbers 32, 33, 41, 50, 54, 73, and 80. In general, I can testify to environmental issues other than risk and spill response information; the CMR Plan; the Con/Rec Units and the use of horizontal directional drilling.

5. Please summarize the updated information regarding Finding No. 32.

Answer: The environmental impacts discussed in Table 6 of Keystone's permit application still apply. The CMR Plan has been updated. The last version is Rev4, which is attached in redlined form as Attachment A to Appendix C to Keystone's certification petition.

Overall changes to the CMR Plan were made to clarify language, provide additional detail related to construction procedures, and incorporate lessons learned from previous construction, current right-of-way conditions, and project requirements.

6. Please summarize the updated information regarding Finding No. 33.

Answer: Keystone previously submitted Exhibit TC-14 in connection with the hearing on its permit application. Exhibit TC-14 includes soil type maps and aerial photograph maps of the route in South Dakota, showing topography, land uses, project mileposts and location descriptors. Exhibit TC-14 is still generally consistent in the description of the current Project route through South Dakota. Keystone has disclosed in discovery maps of minor route variations made at the request of landowners or for engineering reasons. These maps will be marked as an exhibit at the hearing on Keystone's certification petition. In addition, Keystone will submit updated maps prior to the initiation of construction as required by Condition No. 6 of the Amended Final Decision and Order.

7. Please summarize the updated information regarding Finding No. 41.

Answer: Since the permit application, Keystone has decided to use horizontal directional drilling ("HDD") to cross the Bad River and Bridger Creek, in addition to the Little Missouri, Cheyenne, and White Rivers. Exhibit C to Keystone's permit application contains a listing of all water body crossings and preliminary site-specific crossing plans for the HDD sites. To supplement Exhibit C in Docket HP09-001, Attachment B to Keystone's Tracking Table of Changes in Docket HP14-001 contains the preliminary site-specific crossing plans for the HDD crossings of the Bad River and Bridger Creek.

8. Please summarize the updated information regarding Finding No. 50.

Answer: The total length of the Project pipe with the potential to affect a High Consequence Are ("HCA") is 14.9 miles. The reference to 19.9 miles in the Tracking Table was a typographical error. Since the Tracking Table was prepared, the Cheyenne River crossing was adjusted because of HDD access issues and for construction and engineering reasons, resulting in a slight increase in total HCA mileage. The current HCA mileage figure is 15.8 miles. The 15.8 miles are ecologically sensitive areas and do not encompass populated areas or drinking water areas.

9. Please summarize the updated information regarding Finding No. 54.

Answer: Because of minor route variations, the mileages in South Dakota have changed slightly. The route is approximately 315 miles in South Dakota. All but 27.9 miles of the route are privately owned. 1.7 miles are owned by local governments, and 26.3 miles are state owned and managed. No tribal or federal lands are crossed by the route in South Dakota.

10. Please summarize the updated information regarding Finding No. 73.

Answer: Keystone has updated its CMR Plan since the Amended Final Decision and Order. The changes are shown in a redlined version of the CMR Plan, which is Rev4, filed with the Commission as Attachment A to Appendix C to Keystone's certification petition.

11. Please summarize the updated information regarding Finding No. 80.

Answer: Since the Amended Final Decision and Order, Keystone has completed the construction/reclamation unit ("Con/Rec Unit") mapping in consultation with the National Resource Conservation Service. The Con/Rec Unit mapping is included as Appendix R to the FSEIS.

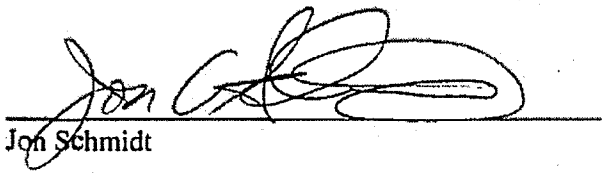
12. Are you aware of any reason that Keystone cannot continue to meet the conditions on which the Permit was granted by the Commission?

Answer: No. I have reviewed the conditions contained in the Amended Final Decision and Order dated June 29, 2010. The changes discussed in Finding Nos. 32, 33, 41, 50, 54, 73, and 80 do not affect Keystone's ability to meet the conditions on which the Permit was granted.

13. Does this conclude your prepared direct testimony?

Answer: Yes.

Dated this 30th day of March, 2015.



Jon Schmidt

CERTIFICATE OF SERVICE

I hereby certify that on the 2nd day of April, 2015, I sent by United States first-class mail, postage prepaid, or e-mail transmission, a true and correct copy of the foregoing Direct Testimony of Jon Schmidt, to the following:

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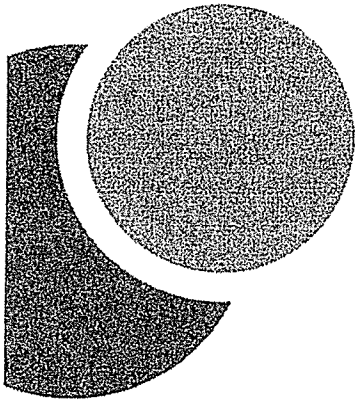

Jon Schmidt, PhD

Vice President, Environmental & Regulatory

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Education & Training

- PhD, Biological Sciences, Florida State University
- M.S., Biological Sciences, University of Bridgeport
- B.S., Marine Biology, University of Massachusetts - Dartmouth

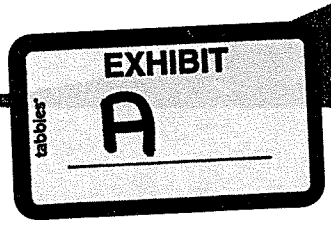
Overview

Jon A. Schmidt is currently the Vice President, Environmental & Regulatory Services in the Tallahassee office of **exp** Energy Services Inc. He joined **exp** in May of 2009.

Mr. Schmidt has extensive experience in environmental management, particularly with respect to the pipeline industry including: environmental regulatory strategy development and project planning, project management, environmental surveys, permitting, and environmental inspection. In over 25 years, he has permitted over 30,000 miles of pipeline projects in most states in the US for mid-stream pipeline companies, gas distributors, and producers. He has also permitted LNG facilities, refined products, natural gas, and crude oil pipelines and terminals throughout the US. This included the management of the regulatory and permitting tasks associated with the 7-state, 1,385 mile Keystone pipeline and associated compliance inspection during construction.

Currently, Jon is the regulatory and permitting manager for work for the 6-state, 1,300 mile Keystone XL Pipeline Project, including the coordination of the Department of State EIS, DEIS, SEIS, FEIS and now SFEIS, the Section 9 Biological Opinion, NHPA Section 106 Programmatic Agreement with over 60 parties, USACE permitting across 7 USACE Districts, Montana Facility Siting Act licensing, South Dakota Public Utilities Commission certification and other state and federal permitting. Jon is also working with the Alaska Pipeline Project in developing the FERC filing strategy and overall environmental program for the re-designed pipeline and LNG project.

Prior to joining **exp,** Mr. Schmidt had a wide variety of experience in the midstream energy industry, including work on international pipeline projects.



Jon Schmidt, PhD– *Continued*

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Project Experience

- **TransCanada/ExxonMobil Development Company as Alaska Pipeline Project (APP), 754 mile, Alaska Pipeline Project, Alaska.**
  Employment: 2010-2012

  Jon served as a member of the company Environment, Regulatory, and Land (ERL) management team for TransCanada and ExxonMobil to direct consulting firms conducting the environmental field surveys, agency consultations, and development of the FERC application for the proposed APP. His role focused on developing and implementing a regulatory strategy lined up with the commercial realities of the project. Jon directed consultants on the scope and efforts required for field surveys, the Resource Reports, and agency meetings and pre-filing activities. He wrote an overarching permitting roadmap and strategy, individual agency permitting plans, and helped implement through agency meetings and workshops to address and resolve timing and level of detail issues with the Alaskan agencies.

- **Keystone XL Pipeline, Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.**
  Employment: 2010

  For the expansion of the Keystone pipeline, Jon served as the overall environmental manager reporting directly to TransCanada. Keystone XL is a 36-inch 1,375 mile crude oil pipeline to the Gulf Coast of the US. Jon's role was similar to that on the Keystone project, but with overall responsibility for environmental compliance. He managed several firms that carried out the field surveys, report writing, and permit application preparation.

- **Keystone Pipeline, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Missouri, and Illinois.**
  Employment: 2006-2012

  Was overall account manager and project director for AECOM as they served as environmental management contractor for Trow Engineering Consultants, owner's engineer for the TransCanada Keystone Project. Keystone is an approximate 1,300 mile crude oil pipeline. Jon was responsible for the overall environmental regulatory strategy for the Department of State Presidential Permit application and EIS process. This effort entailed the coordination with the USACE across multiple districts, multiple USFWS field offices, the NRCS, the South Dakota PUC, North Dakota PSC, and multiple state agencies in each state. Jon's role also included senior review on the multiple filings that were made to the agencies, consultation coordination and meetings, and negotiation of permit conditions, and a Conservation Agreement with the USFWS for Migratory Bird Treaty Act mitigation. Jon was also pivotal in negotiating the USACE permitting to be a NWP for all states crossed and mitigation projects to cover compensation in all states crossed.

- **ConocoPhillips Company, Environmental Services for Licensing of Proposed Beacon Port Liquid Natural Gas Facility, Gulf of Mexico.**
  Employment: 2004

  - Project Director, ConocoPhillips Company contracted ENSR to assist with the licensing of its proposed Beacon Port liquid natural gas facility in the northern Gulf of Mexico. ENSR's services included: 1) developing the environmental report for the deepwater port (DWP) license application to the Maritime Administration (MARAD) and the U.S. Coast Guard (USCG), and 2) managing the development of the entire DWP license application per the DWP Act of 1974, as amended.

Jon Schmidt, PhD– *Continued*

Vice President, Environmental & Regulatory

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- Related services included: 1) regulatory outreach, 2) biological impact assessment, 3) water discharge modeling, 4) air emissions modeling, 5) Environmental Protection Agency permitting (air and water discharges), U.S. Army Corps of Engineers permitting, 5) wetland surveys, 6) threatened and endangered species surveys, and 7) development and coordination of a biological sampling plan, among other services. ENSR continues to support ConocoPhillips Company in its efforts to develop Beacon Port.

- **AES Ocean Express Pipeline Third Party Environmental Impact Statement.**
  Employment: 2004

  Served as Project Director for the Environmental Impact Statement (EIS) prepared for the AES Ocean Express pipeline project from the Economic Exclusion Zone (EEZ) to Broward County, Florida. This project ties into a pipeline and LNG facility to be built in the Bahamas. ENSR's role is to serve as the Federal Energy Regulatory Commission's (FERC's) extended staff in preparing the EIS. To date, a PDEIS has been drafted for regulatory review by the MMS, NMFS, FERC, and the USACE.

- **Ingleside Energy Center and San Patricio Pipeline, Oxy Energy Ventures, Corpus Christi, Texas.**
  Employment: 2003-2005

  Jon served as the Project Manager overseeing the preparation of the FERC filing for a new LNG regas facility collocated with Occidental's chemical plant and power plant near Corpus Christi, Texas. Jon coordinated the field surveys required for the facility location, the marine studies to accommodate the dredging of a new berth and pier, as well as studies along the 80+ mile pipeline from the facility to the interstate pipeline grid. Jon worked with Oxy's energy services staff to utilize waste heat from the power plant for regasification, air modeling and coordination with the plant's existing air permits, and coordination of the NHPA 106 and Section 7 ESA consultation required for the FERC application.

- **Bayou Casotte Energy LLC, Casotte Landing Natural Gas Import Terminal, Pascagoula, Mississippi.**
  Employment: 2003-2005

  Jon acted as Project Director for the FERC licensing and permitting of a liquefied natural gas import terminal adjacent to Chevron's Pascagoula refinery at Moss Point, Mississippi. The FERC filing covered the regasification facilities, air modeling and permitting, USACE permitting and dredge disposal studies, and the water use permitting for hydrotesting the LNG storage tanks. Because the site location and required dredging impacted the Gulf Sturgeon, a Section 7 ESA consultation was required to complete the EIS.

- **Cypress Pipeline Project, 166 mile Natural Gas Pipeline, Coastal Georgia and Florida**
  Employment: 2002-2004

  Project Director for permitting the Cypress Project, which included route analysis, agency consultation, FERC Environmental Report preparation, wetland delineation report to USACE and FERC, Environmental Resource Permit application to the state of Florida, and specialized field surveys for Gopher Tortoises.

Jon Schmidt, PhD– *Continued*

Vice President, Environmental & Regulatory

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- **ConocoPhillips Company, Environmental Services for Licensing of Proposed Compass Port Natural Gas Facility, Gulf of Mexico.**
  Employment: 2002-2004

  Project Manager, ConocoPhillips Company contracted ENSR to assist with the licensing of its proposed Compass Port liquid natural gas facility in the northern Gulf of Mexico. ENSR's services included: 1) developing the environmental report for the deepwater port (DWP) license application to the Maritime Administration (MARAD) and the U.S. Coast Guard (USCG), 2) developing the environmental report for the Certificate of Public Convenience and Necessity with the Federal Energy Regulatory Commission (FERC), and 3) managing the development of the entire DWP license application in accordance with the DWP Act of 1974, as amended. Related services included: 1) management of the regulatory Team Permitting process, 2) biological impact assessment, 3) water discharge modeling, 4) air emissions modeling, 5) Environmental Protection Agency permitting (air and water discharges), U.S. Army Corps of Engineers permitting, 6) wetland surveys, 7) threatened and endangered species surveys, and 8) development and coordination of a biological sampling plan, among other services. ENSR continues to support ConocoPhillips Company in its efforts to develop Compass Port.

- **Elba Island LNG Import Terminal Reactivation, Southern LNG Inc.—An El Paso Company, Georgia.**
  Employment: 1999-2001

  Project Director for the successful 1999–2000 certification for reactivation of the Elba Island Import Terminal.

- **Gulfstream Natural Gas System, Environmental Management of Pipeline Construction Project, Gulf of Mexico, Mississippi, Alabama, Florida.**
  Employment: 1998-2001

  Project Director for siting, routing, field surveys, and permitting for 775-mile pipeline construction project. To-date, the project has involved the coordination of over 100 regulatory agencies, and over 15 public meetings with landowners, the general public and over 30 environmental groups. Led the Team Permitting (Florida) and FERC coordination aspects on behalf of the client. Included assessing project impacts to live bottom (reefs) in the Gulf of Mexico and impacts to threaten and endangered marine turtles and mammals.

- **Destin Pipeline Company, LLC (Southern Natural Gas Affiliate), Destin Pipeline Project - Construction of Natural Gas Pipeline, Gulf of Mexico to Clarke County, Mississippi.**
  Employment: 1996-1998

  Project Manager for environmental aspects of construction project which included the installation of 206 miles of 36-in outside- diameter (OD) and 30-in OD pipeline, installation of 2.4 miles of 16-in OD pipeline in Mississippi, installation of four meter stations,construction of a platform in the Gulf of Mexico, and construction of two new compressor stations in Mississippi. Tasks included Alternatives Analysis for selection of a preferred route, environmental surveys, permitting, and on-site environmental inspection.

Jon Schmidt, PhD– *Continued*

Vice President, Environmental & Regulatory

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- **Blue Atlantic Transmission System, Environmental Management of Pipeline Project, Nova Scotia Canada to New York.**
  Employment: 1996
  Project Director for the siting, routing, field surveys, regulatory permitting and meetings, and FERC filing for a 850+ mile large diameter pipeline from Nova Scotia into the New York marketplace. The project has involved meeting with all the New England state regulatory bodies, the FERC, NMFS, USACE, MMS, and NOAA to discuss routing and field survey requirements. Most of the offshore field surveys have been completed to date.

- **Etowah LNG Company, LLC, Etowah LNG Peakshaving Facility and Pipeline Construction Project, Polk County, Georgia.**
  Employment: 1995
  Project Director for all environmental aspects of project related to construction of a new 2.5-billion cubic ft. liquefied natural gas peakshaving facility and 12.49 miles of 12.75-in OD natural gas pipeline. Directed team responsible for: preparation ofFERC 7(c) filing and Biological Survey Report; conducting biological field surveys of the jurisdiction and non- jurisdictional facilities (including wetlands, species of concern, and surveys for construction constraints); assisting in the siting of the Etowah Pipeline; preparing Land Disturbing Activity; permitting for the construction of the jurisdictional facilities; preparing the application to the USACE for Section 404 permit; coordinating with surveyors to quickly complete field surveys; and performing agency consultations and negotiations.

- **TransCanada/ANR partnership, 800+ mile SunShine Pipeline Project, Florida, and Alabama.**
  Employment: 1994
  Technical Project Manager. Managed the technical team to put together the state of Florida Siting Application as well as directed the effort for the FERC ER. Managed the technical efforts and data analysis for the cultural resource and biological surveys using GPS/GIS. Participated in the 36 public meetings and coordinated with 80 regulatory agencies from local, regional, state and federal agencies to coordinate comments and simplify licensing/permitting conditions. Put together a regulatory and technical Mitigation Task Force to constructively deal with the impact to over 1,000 wetland crossings.

- **TransContinental Pipe Line Company, Southeast Mainline Looping Project, Alabama, Georgia, and North Carolina.**
  Employment: 1994
  Directed the biological field survey efforts, FERC ER preparation, and provided support to TransContinental for FERC interrogatories.

- **Viking Voyageur Pipeline Company, Viking Voyageur Pipeline Project, Minnesota, Wisconsin, and Illinois.**
  Employment: 1993
  Project Director for 800+-mile project which included providing siting, biological and cultural resource field surveys, FERC ER preparation, and permitting support and coordination for the joint TransCanada and NSP Power project.

Jon Schmidt, PhD– *Continued*

Vice President, Environmental & Regulatory

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- **ANR, LSP Power Project, Mississippi.**
  Employment: 1992
  Project includes the field surveys, permitting and FERC ER preparation for the 12-mile lateral.

- **Southern Natural Gas Company, Southern Natural Zone III Expansion Project, Alabama, and Georgia**
  Employment: 1991-1994
  Project director for the Southern Natural Zone III Expansion Project (27 miles looping in 3 states with compression), FERC Section 7(c) Environmental Report (ER), field Surveys, permitting, and environmental inspector's manual preparation.

- **Florida Power Corporation, Environmental Master Services Agreement, Florida.**
  Employment: 1991-1993
  Projects included jurisdictional wetland delineations at the Higgins Power Plant, waste water monitoring at the Montincello facility.

- **ANR Pipeline Company, Patterson Looping Project, Gulf of Mexico, and Louisiana.**
  Employment: 1991
  Project director for 37-mile project which included FERC ER preparation, federal and state permitting, and agency negotiation.

- **Southern Natural Gas Company, Approximately Fifteen 7(c) Projects Totaling 600 Linear Miles, LA, MI, AL, GA, TN, SC, NC, FL, and Gulf of Mexico.**
  Employment: 1990-1992
  Project Manager and Director providing air permitting, contamination assessment, audit and environmental inspection services for regulated facilities.

- **US Navy, Environmental Assessments, Puerto Rico, Florida, and Atlantic Seaboard.**
  Employment: 1990
  Project manager for several US Navy EAs which were completed for proposed facilities or Navy actions. Projects included the Camp Pendleton Warfare Training facilities, the Naval Warfare Training Facilities on Isla Pincros, Puerto Rico, and the ecological risk assessment at the Naval Air Training Center in Pensacola, Florida. Managed the efforts to conduct a siting alternatives analysis study along the Atlantic seaboard for the shock testing for the new class of submarine, the Sea Wolf. Project utilized satellite imagery to create databases and a GIS to manage the information. Required to assess impacts of underwater detonation of explosives to marine mammals and endangered species.

Jon Schmidt, PhD– *Continued*

Vice President, Environmental & Regulatory

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- **Chandeleur Pipeline Company, Chandeleur Destin Extension Project and Chandeleur Expansion Project, Mississippi, and Gulf of Mexico, and Louisiana.**
  Employment: 1990
  Project director for Chandeleur Destin Extension project (4 miles) and Chandeleur Expansion project (30 miles). ENSR provided field survey, FERC ER preparation and permitting support until the project was removed from consideration by Chandeleur.

- **Discovery Pipeline Company LLC, Discovery Pipeline Project, Gulf of Mexico, and Louisiana.**
  Employment: 1990
  Project manager for 80-mile project where ENSR was asked to provide a fast track ER for filing with the FERC and support to Discovery through the FERC review and certification process.

- **Southern Natural Gas Company, Southern Natural East Tennessee Expansion Project, Alabama, Georgia, and Tennessee.**
  Employment: 1989-1991
  Project Director for the project. On a fast track basis, ENSR conducted biological field surveys, completed the FERC ER and survey reports, agency consultation for filing with the FERC and sate and federal agencies in 45 days. Completed all permitting and construction implementation plans. Provided EIS and managed environmental inspection.

- **Southern Natural Gas Company, North Alabama Pipeline Project, Alabama.**
  Employment: 1989
  Project Manager for Southern Natural's 122-mile North Alabama pipeline project in Tuscaloosa, Fayette, Walker, Cullman, Morgan, and Madison counties, Alabama. Project involves route alternatives analysis, FERC 7(c) ER, field surveys using GPS/GIS, and public meeting/FERC support through the EIS process, permitting, and agency negotiation. Currently providing EIS and inspection services.

- **Tenneco, Tenneco West-East Pipeline Project, Louisiana, and Mississippi.**
  Employment: 1989
  Project management involved preparation of the ER for a 225-mile project, management of the biological and cultural resource surveys in Tennessee's Vicksburg field office, and coordination with state and federal agencies and FERC.

Jon Schmidt, PhD– *Continued*

Vice President, Environmental & Regulatory

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International

- **TransCanada Pipelines, Colombia.**
  Employment: 1997
  For TransCanada's first pipeline project in Colombia, Jon served as the technical reviewer and in-country consultant coordinator between the local environmental consulting firms and TCPL's project staff. He helped the locals develop the scope of work for the EIA with the regulators, oversaw implementation, and assisted in impact assessment development to ensure permitting conditions could be implemented in the field by TCPL.

- **ENSR (now AECOM) – Senior Vice President**
  Employment: 1996 – 2009
  Responsibilities included: Part of senior management team at ENSR/AECOM that oversaw all of the company's consulting services related to pipelines and LNG facilities. This included ensuring that staff resources were available across the country and around the world to support key clients on all pipeline and LNG projects. Jon was also account manager for TransCanada, El Paso, and ConocoPhillips while overseeing the company's mid-stream services line.

- **PDVSA, eastern Venezuela.**
  Employment: 1996
  Working with Willbros Engineers, Jon served as the project manager for a routing and feasibility study for the Caripito-Guiria oil pipeline project in the Orinocho River basin. This project involved siting a new oil pipeline from interior E & P locations, across virgin tropical wetland forests, to the coast for PDVSA to build a new oil refinery and shipping facilities to export this new source of crude. Working with local environmental and engineering firms, Jon oversaw the route development, aerial reconnaissance, and report preparation. He participated with Willbros in presenting the study's results to the PDVSA management.

- **Endesa, Chile.**
  Employment: 1993
  For two separate projects on the Bio-Bio River, Jon served first as a task leader for an Environmental Impact Assessment (EIA) to the International Finance Corporation (IFC) for a hydro-electric dam, the first in a series of 5 to be built on this Clase VI river. This project was the first Category A EIA to be reviewed and approved by the IFC. On a subsequent project, Jon was the project manager for a downstream impact and flow study related to the EIA. Issues and concerns related to the operations of the dam resulted in this additional study where Jon had to coordinate and manage local University professors specializing in endemic fish species, hydrologists, modelers, and riverine ecologists coupled with E & E's ecological and modeling staff. He managed his work efforts from Santiago Chile and served as the principal negotiator between Endesa and the IFC on flow conditions for dam operations.

- **Ecology and Environment Inc. – Senior Environmental Scientist.**
  Employment: 1987 – 1996
  Responsibilities included: Served as project manager and project director on energy related projects throughout the US and overseas. Specialties included marine impact assessments and NEPA document preparation for energy projects.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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HP 14-001

IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT,

DIRECT TESTIMONY OF HEIDI TILLQUIST

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Pursuant to the Commission's Order Granting Motion to Define Issues and Setting Procedural Schedule, Petitioner TransCanada Keystone Pipeline, LP, offers the following direct testimony of Heidi Tillquist.

1. Please state your name and address for the record.

Answer: My name is Heidi Tillquist. My business address is Stantec Consulting Services Inc., 2950 E. Harmony Road, Suite 290, Fort Collins, CO 80528.

2. Please state your position and provide a description of your areas of responsibility with respect to the Keystone XL Project.

Answer: I am a contractor of Keystone. I am employed as an environmental toxicologist and Director of Oil & Gas Risk Management with Stantec Consulting Services Inc. I have provided environmental consulting services to Keystone with respect to the Keystone XL Project. I am responsible for evaluating risk posed by the Project to human and environmental resources.

3. Please state your professional qualifications and experience with pipeline operations.

Answer: My professional background is stated in my resume, a copy of which is attached as Exhibit A. My education consists of a bachelor's degree in fishery and wildlife biology, and a master's degree in environmental toxicology. In general, I have over 25 years of experience in environmental consulting, including environmental toxicology and conducting environmental risk assessments and water quality assessment and analysis. I have previously testified before the Commission in the permit proceedings concerning the Keystone Pipeline in Docket HP 07-001 and concerning the Keystone XL Pipeline in Docket HP 09-001.

4. Are you responsible for portions of the Tracking Table of Changes attached as Appendix C to Keystone's certification petition?

Answer: Not directly. In general, I can testify to the risk assessments related to the Keystone XL Pipeline, including spill frequency. I am familiar with the design changes addressed in the Tracking Table as a result of Keystone's decision to withdraw its Special Permit application with PHMSA, as well as the minor route variations in South Dakota. The design and route changes have not affected the overall conclusion of the spill frequency analysis to which I testified in connection with the permit application. With respect to Finding No. 50, the minor route changes have caused slight changes resulting in a reduced probability of a spill occurring within High Consequence Areas. As a result, the statement that a spill that could affect an HCA would occur no more than once in 250 years would now be altered to no more than once in 460 years, based on 15.8 miles of HCAs crossed in South Dakota. The 2009 Keystone XL Risk

Assessment, which is Appendix P to the Final Supplemental Environmental Impact Statement, and its conclusions remain valid. .

5. Are you able to address issues related to worst case spill scenarios, environmental cleanup in the event of a spill, and the potential impacts to groundwater resources?

Answer. Yes. I participated in answering discovery in this proceeding with respect to all of these issues. While nothing with respect to these issues has changed since the Amended Final Decision and Order, I can answer questions at the hearing related to these issues.

6. Are you aware of any reason that Keystone cannot continue to meet the conditions on which the Permit was granted by the Commission?

Answer: No. I have reviewed the conditions contained in the Amended Final Decision and Order. With respect to risk assessment and environmental toxicology, the changes discussed in the Tracking Table do not affect Keystone's ability to meet the conditions on which the Permit was granted.

7. Does this conclude your prepared direct testimony?

Answer: Yes.

Dated this 31 day of March, 2015.

Heidi Tillquist

CERTIFICATE OF SERVICE

I hereby certify that on the 2nd day of April, 2015, I sent by United States first-class mail, postage prepaid, or e-mail transmission, a true and correct copy of the foregoing Direct Testimony of Heidi Tillquist, to the following:

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Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Stantec

Ms. Tillquist has over 24 years of experience in environmental consulting, including environmental permitting, environmental toxicology, environmental risk assessment, water quality assessment and analysis, fisheries and wildlife biology. She has evaluated risk and environmental consequences of contaminant releases in 28 states of the U.S. and 6 Canadian provinces. Ms. Tillquist routinely provides technical assistance in support of complicated environmental issues. She has successfully negotiated changes in surface water quality criteria for mining companies and has helped develop water quality criteria for several metals. She has managed numerous projects, such as environmental permitting and compliance for TransCanada's Keystone Pipeline Project and multiple third-party Environmental Impact Statements (EISs). Ms. Tillquist's work requires an in-depth understanding both the engineering and environmental aspects of pipeline projects. Ms. Tillquist breadth of knowledge and ability to effectively communicate between diverse stakeholders (project engineers, environmental staff, regulatory agencies) has resulted in collaborative efforts that focus on potential benefits, constraints and feasibility issues, and short- and long-term costs. Ms. Tillquist believes that development and environmental protection are not mutually exclusive, but are hallmarks of a well-designed and executed project. She has conducted multiple risk assessments for regulatory agencies and mining and the oil and gas industry and provides technical expertise regarding potential environmental impacts. Ms. Tillquist routinely provides expert witness support for issues related to environmental toxicology and risk assessment.

EDUCATION

MS, Environmental Toxicology, Colorado State University, Fort Collins, Colorado, 1992

BS, Fishery and Wildlife Biology, Colorado State University, Fort Collins, Colorado, 1987

REGISTRATIONS

Certified Wildlife Biologist #114667, The Wildlife Society

Certified Fisheries Professional #044814, American Fisheries Society

MEMBERSHIPS

Member, The Wildlife Society

Member, American Fisheries Society

Member, Society for Environmental Toxicology and Chemistry

PROJECT EXPERIENCE

Pipeline Projects

TransCanada, Energy East and Related Pipeline Projects, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and New Brunswick, Canada

Senior technical advisor, pipeline risk assessment lead. TransCanada proposes to repurpose an existing natural gas pipeline, construct new build pipeline and terminal facilities to transport various crude oils from Alberta to terminals in Quebec and New Brunswick. Ms. Tillquist and her staff evaluate risk for project components as part of the National Energy Board (NEB) filing. For each project, Stantec will i) identify high consequence areas, ii) assist engineers with valve siting, and iii) conduct a pipeline risk assessment that assesses failure frequency, probable spill volumes, and spill impacts to terrestrial, freshwater, and marine environments. After the final route is approved, Ms. Tillquist and her staff will conduct detailed flow path modeling to identify pipeline segments with the potential to impact High Consequence Areas per 49 CFR 195. Ms. Tillquist role on this project is to advise TransCanada, addressing and resolving substantive issues, helping to maintain consistency of analysis, and providing TransCanada with legacy information to facilitate and improve the overall project.

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Grand Rapids, Heartland, and Northern Courier Pipeline Projects, Alberta, Canada

Senior technical advisor, pipeline risk assessment lead. TransCanada and its affiliates propose to develop multiple pipeline projects in Alberta. For each project, Stantec will i) identify high consequence areas, ii) assist engineers with valve siting, iii) conduct a pipeline risk assessment that assesses failure frequency, probable spill volumes, range of environmental impacts, and mitigation, and iv) map groundwater vulnerability along the ROW. Ms. Tillquist role on this project is to advise TransCanada, addressing and resolving substantive issues, helping to maintain consistency of analysis, and providing TransCanada with legacy information to facilitate and improve the overall project.

TransCanada, Keystone XL Pipeline Project*, Montana, South Dakota, Nebraska, Oklahoma, Texas

Senior Technical Advisor and Lead Pipeline Risk Assessor for the project, attending numerous public meetings and providing expert witness testimony for public utility commissions in South Dakota as well as a variety of condemnation hearings. TransCanada proposed the construction and operation of a 36- inch crude oil pipeline from the Alberta oil sands into the U.S., terminating in the Gulf Coast region in Texas. The pipeline would have a nominal maximum throughput of 830,000 barrels per day. Within the U.S., the pipeline would cross portions of Montana, South Dakota, Nebraska, Oklahoma, and Texas. Because the project crosses the U.S.-Canada border, the Department of State is the lead federal agency. Ms. Tillquist was involved with TransCanada's Keystone XL crude oil pipeline since its initial design phase. Ms. Tillquist conducted an environmental risk assessment estimated spill frequency and spill volumes and the subsequent environmental consequences, particularly to sensitive areas. The risk analysis was used to support Keystone's Presidential Permit Application, various state permitting processes, and for refinement of the project design. As a result of this early interaction, Ms. Tillquist's risk assessment work helped control construction costs while reducing potential impacts of a spill, thereby reducing potential future environmental damages. Ms. Tillquist prepared the South Dakota Public Utilities Commission Application and participated in public meetings and hearings. She provided expert witness testimony in support of environmental and spill risk issues.

Hess Corporation, Hawkeye Pipelines, North Dakota

Senior technical advisor, PHMSA compliance lead, pipeline risk assessment lead. Hess proposes to construct several co-located pipelines to transport crude oil, natural gas liquids, and natural gas from the Bakken Formation. Stantec is leading the environmental permitting process. Ms. Tillquist role on this project is to advise, address, and resolve substantive issues, such as perceived risk associated with crossing of the Missouri River, tribal concerns, and PHMSA compliance.

Bureau of Land Management (BLM), BakkenLink Pipeline, North Dakota

PHMSA Compliance Lead/ Lead Risk Assessor. BakkenLink proposed to construct and operate a 12-inch crude oil pipeline from Frybery to Beaverlodge, North Dakota, with a 8-inch lateral to Belfield. Ms. Tillquist prepared a risk assessment that evaluated failure frequency and environmental consequences of a release, particularly to High Consequence Areas. The risk assessment was successfully used in the Environmental Assessment for the federal NEPA process. Ms. Tillquist also prepared BakkenLink's Emergency Response Plan which was reviewed and approved by PHMSA. Ms. Tillquist will provide technical support for BakkenLink with their Emergency Response Training exercises.

TransCanada, Keystone Pipeline System, US and Canada

Lead Pipeline Risk Assessor, PHMSA Compliance. Ms. Tillquist prepared hazard assessments for both new build and existing pipeline segments associated with the Keystone Pipeline System in the US and Canada. In Canada, Ms. Tillquist created a procedure to identify highly sensitive receptors, based on economic, public health, and ecological concerns. Using fate and transport analyses, segments of pipeline that were capable of potentially affecting the highly sensitive areas (Canada) or PHMSA-defined High Consequence Areas (US) were identified, risk quantified, and pipeline segments prioritized to facilitate operations and maintenance activities. The analysis incorporated both new build and existing infrastructure. Ms. Tillquist assisted TransCanada with PHMSA audits and provided technical responses to information requests. Ms. Tillquist documented legacy information regarding environmental compliance requirements. Ms. Tillquist coordinated with emergency response team. Provided updated to hazard assessments as required by federal regulations. Ms. Tillquist's work on this project continues with Stantec as the project continues to evolve.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

TransCanada, Keystone Crude Oil Pipeline Project*, North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, Canada

Environmental Permitting Project Manager and Pipeline Risk Assessor. As the Environmental Project Manager for the project, Ms. Tillquist was responsible for all environmental permitting and surveying within the U.S., including pre-construction siting and post-construction monitoring and compliance. Ms. Tillquist worked with TransCanada's Keystone crude oil pipeline since its initial design phase. As a result of this early interaction, route selection and intelligent valve placement helped control construction costs while reducing potential impacts of a spill, thereby reducing potential future environmental damages. Further, TransCanada successfully used Ms. Tillquist's environmental risk assessment to justify modification of the pipeline's design factor from 0.72 to 0.8 for the majority of the route. This modification reduced capital costs associated with the pipe by $50 million.

Texas Offshore Port System (TOPS)*, Texas

Lead Pipeline Risk Assessor, Senior Technical Advisor. The Texas Offshore Port System (TOPS) Project consisted of the construction and operation of a proposed deepwater port, receiving up to 1,700,000 barrels of crude oil per day and transporting the oil to a receiving terminal and transmission facility via 50 miles of on- and off-shore pipelines. Ms. Tillquist prepared a risk assessment document to support TOPS in permitting the project through the Maritime Administration and US Coast Guard. The document evaluated risk of a pipeline disruption and its potential environmental consequences. The report presented the results of a pipeline incident frequency and spill volume analysis based on TOPS' design and operations criteria and applies the resulting risk probabilities to an environmental consequence analysis, incorporating project-specific environmental data. Specifically, the report evaluated the risk of crude oil spills during pipeline operations, including contribution of natural hazards to spill risk, and the subsequent potential effects on humans and other sensitive resources, particularly High Consequence Areas, that include highly and other populated areas, municipal drinking water intakes (surface and groundwater), and/or ecologically sensitive areas.

Enterprise Products Company, Seaway Pipeline – Segment 7, Texas

Lead Pipeline Risk Assessor. The Seaway Pipeline - Segment 7 is a crude oil pipeline that will loop an existing- 30-inch pipeline for approximately 60 miles in length from Mont Belvieu to Nederland, Texas. Ms. Tillquist was hired as a subcontractor by Project Consulting Services, Inc. (PCS) to identify valve sites to ensure regulatory compliance and to minimize potential impacts to the environment, particularly to High Consequence Areas.

Enterprise Products Company, ATEX Express Pipeline*, Ohio, Indiana, Texas

Lead Pipeline Risk Assessor, Project Manager. The ATEX Express Pipeline (ATEX) is designed to transport ethane from the Marcellus and Utica shale regions in Pennsylvania, West Virginia and Ohio to the U.S. Gulf Coast. The approximately 1,230-mile, 16-inch diameter pipeline will have an initial capacity of 125,000 barrels per day of ethane and will deliver ethane to Enterprise's natural gas liquids storage complex at Mont Belvieu, Texas. Ms. Tillquist was hired as a subcontractor by Project Consulting Services, Inc. (PCS) to identify valve sites and perform a precursory HCA analysis for the purposes of selecting valve locations along Segment 3, approximately 117 miles in length through southwestern Ohio and southeastern Indiana, and Segment 6, approximately 55 miles in length through southeastern Texas.

Enterprise Products Company, Lone Star West Texas Pipeline and Laterals, Texas

Lead Pipeline Risk Assessor, Senior Technical Review. The Lone Star West Texas Pipeline and Laterals project will deliver natural gas liquids across Texas. As a subconsultant to Project Consulting Services, Inc., Ms. Tillquist was responsible for evaluating the placement of valve sites in relation to 1) federal pipeline regulations and 2) protection of environmental resources. Ms. Tillquist also provided senior technical review of a preliminary risk report.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

FERC and BLM, Entrega Natural Gas Pipeline Environmental Impact Statement*, Colorado and Wyoming

Project Manager and Lead Pipeline Risk Assessor. Entrega Gas Pipeline Inc. (an affiliate of Encana Natural Gas) proposed to construct and operate a 328-mile 36- to 42-inch-diameter natural gas transmission pipeline. The pipeline transports up to 1.5 billion cubic feet per day of natural gas from the Piceance Basin in Colorado to interconnections in Wamsutter and near Cheyenne, Wyoming. As the Project Manager, Ms. Tillquist supervised the preparation of the EIS as a third-party contractor to the FERC (lead agency) and the BLM (cooperating agency). Major issues include potential impacts to threatened and endangered species (water depletion issues), noxious weed management, and socioeconomic impacts. Because Western Interstate Company (a subsidiary of El Paso Corporation) also proposed to build a large diameter pipeline from the Piceance Basin to Wamsutter, cumulative impacts were also an issue. The project was approved and construction completed in 2007.

BLM and USFS, ONEOK, Overland Pass Natural Gas Liquids Pipeline*, Wyoming, Colorado, and Kansas

Project Manager, Lead Pipeline Risk Assessor. ONEOK and Williams proposed to construct and operate a 760-mile transmission pipeline for transportation of up to 150,000 barrels per day of natural gas liquids from western Wyoming, through Colorado, to Conway, Kansas. As the Project Manager, Ms. Tillquist supervised the preparation of the EIS as a third-party contractor to the BLM (lead agency) and the U.S. Forest Service (cooperating agency). Major issues included potential impacts to cultural resources, threatened and endangered species, and fisheries impacts. The Final EIS was published in 2007, with the pipeline constructed and is currently in-service.

FERC, Piceance Basin Expansion Natural Gas Pipeline Environmental Impact Statement*, Wyoming and Colorado

Senior Technical Advisor. Wyoming Interstate Company (WIC, a subsidiary of El Paso Corporation) proposed to construct and operate a 141.7-mile 36-inch-diameter natural gas pipeline to transport up to 350 million cubic feet per day of natural gas from the Piceance Basin in Colorado to interconnections near Wamsutter, Wyoming. As The Senior Technical Advisor, Ms. Tillquist supervised staff in the preparation of the EIS (concurrent with the Entrega Pipeline EIS) as a third-party contractor to the Federal Energy Regulatory Commission, with the Bureau of Land Management as a cooperating agency. Major issues include potential impacts to threatened and endangered species (water depletion issues), noxious weed management, and socioeconomic impacts. Because Entrega Pipeline Company Inc. also proposed to build a large diameter pipeline from the Piceance Basin to Wamsutter, cumulative impacts also were an issue.

BLM, Inland Resources, Castle Peak and Eightmile Flat Oil Expansion Project*, Utah

Lead Pipeline Risk Assessor. Ms. Tillquist conducted a pipeline risk assessment, evaluating pipeline failure threats, mitigation, failure frequencies, and probable environmental impacts in the event of a failure. The BLM's Vernal Field Office commissioned the preparation of the EIS that examined potential impacts associated with a proposed expansion of oil field development operations in the Uintah Basin area of northeastern Utah. The study area covered approximately 110 sections or 65,500 acres. Inland proposed to expand its existing waterflood oil recovery operations by drilling up to 900 additional wells in the Castle Peak and Eightmile Flat areas of the greater Monument Butte-Myton Bench oil and gas production region. Important issues associated with this project included cumulative effects to raptor species in the Uintah Basin, air quality, and effects on sensitive species, such as the mountain plover and hookless cactus. A Biological Assessment for the U.S. Fish and Wildlife Service was prepared as part of the project permitting.

* *denotes projects completed with other firms*

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

BLM, Equilon/Shell Pipeline Company, New Mexico Products Pipeline Environmental Impact Statement*, New Mexico and Texas

Project manager, pipeline risk assessor. Shell proposed to convert and reverse the flow of an existing 406-mile crude oil pipeline to transport refined petroleum products (i.e., gasoline, diesel, jet fuel). System conversion also entailed the construction of two new pipeline extensions (about 100 miles total), pump stations, pressure reducing stations, miscellaneous facilities, and associated electrical transmission lines. The project would affect portions of New Mexico and Texas, involving many local, state, federal, and tribal jurisdictions. Due to public concern, a probabilistic risk assessment evaluated risk to humans and the environment that could result from an accidental release from the pipeline and its facilities. As a third-party contractor for the BLM, the Draft EIS in May 2003 and the Final EIS was completed in September 2003. Prior to the release of the Final EIS, Shell decided to put the project on hold.

FERC, Raton Basin 2005 Expansion*, Colorado, Kansas, New Mexico, Oklahoma

Technical support on pipeline risk issues and field surveys. For this 100-mile, six-loop project built in 2005, Ms. Tillquist supported Colorado Interstate Gas with the Federal Energy Regulatory Commission (FERC) NEPA Pre-filing Process (including agency and public scoping), preparation of the FERC certification application, state and federal environmental permitting, Environmental Assessment (EA) preparation, Biological Assessment/ Biological Evaluation preparation, and construction management. Ms. Tillquist also assisted with U.S. Fish and Wildlife Service Section 7 consultation, a Forest Service EA for crossing the Comanche National Grasslands, environmental compliance training, avian and mammal pre-construction clearing and biological monitoring during construction, and construction environmental inspection support.

FERC, Application for Line 2000 Converting a Crude Oil Pipeline to Natural Gas Pipeline, Texas, New Mexico, Arizona

Technical evaluation of pipeline reliability and public safety. Ms. Tillquist assisted with the preparation of El Paso Energy's Line 2000 application to the Federal Energy Regulatory Commission (FERC) for the conversion of an existing 800-mile crude oil pipeline to natural gas service. This conversion project affected lands within Texas, New Mexico, and Arizona. Ms. Tillquist's duties included the preparation of FERC resource reports, an applicant-prepared biological assessment, applicant-prepared environmental assessment, and Clean Water Act 404 permit. Ms. Tillquist's project management activities included project budgeting, coordinating office staff and field survey crews, and creation and maintenance of a database detailing over 300 construction sites and activities.

FERC and CSLC, Southern Trails Natural Gas Pipeline*, California, Arizona, Utah, and New Mexico

Project Manager. Responsible for personnel management and project budgeting in addition to technical writing responsibilities. Questar Natural Gas proposed to convert a 600-mile crude oil pipeline to a natural gas pipeline, referred to as the Southern Trails Pipeline. Construction resulting from the proposed extensions, reroutes, realignments, and replacements affected portions of California, Arizona, Utah, and New Mexico and involved many local, state, federal, and tribal jurisdictions. As Project Manager, Ms. Tillquist supervised staff in the preparation of this third-party Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Federal Energy Regulatory Commission. As project coordinator, wrote several technical sections, and provided technical review of the EIS document. For the California Environmental Quality Act, a separate Environmental Impact and Mitigation Measures Summary was developed for the California State Lands Commission.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

El Paso - Western Interstate Company, Kanda Natural Gas Lateral Pipeline Project*, Utah

Environmental Toxicologist and Lead Pipeline Risk Assessor. One of the most significant services that Ms. Tillquist provides is effective communication between oil and gas companies and federal regulating agencies. Ms. Tillquist has repeatedly demonstrated the ability to successfully work through difficult problems. On the Kanda Project, the U.S. Fish and Wildlife Service (USFWS) insisted that El Paso install emergency shutoff valves at the Green River to protect threatened and endangered fish species. The USFWS concerns revolved around the perceived toxicological threats from natural gas and the potential future conversion to hazardous liquids transportation. Ms. Tillquist prepared a white paper that detailed why the USFWS concerns were unjustified. The argument was successful: the USFWS withdrew its request for a valve at the site, thereby saving El Paso an estimated $250,000.

BLM, Natural Gas Liquid Pipeline Environmental Assessment*, Wyoming

Lead Pipeline Risk Assessor. Inland Resources plans to develop an area for natural gas liquids extraction. As part of the development, a new pipeline would be constructed which would cross a tributary to the Green River in Utah, which contains several endangered fish species. At the request of the BLM and potential hazard posed by the pipeline by evaluating the likelihood of a spill, attenuation rates, and dilution potential.

Additionally, cumulative risk from other natural gas liquid pipelines within the same drainage was also estimated. Based on the pipelines' location, volume of natural gas liquids, probability of failure, and likelihood of downstream transport, the assessment showed that no impacts to endangered fish species would be anticipated.

Spill & Resource Damage Evaluations

Emergency Spill Response, Confidential O&G Client, North Dakota

Deputy Incident Command/Lead Environmental Risk Assessor. Ms. Tillquist was on-site to within 6 hours of notification, responding to a well blowout near Watford City, North Dakota. Ms. Tillquist coordinated the environmental sampling and documentation. Crude oil and produced water was dispersed over a 5-square mile area during a winter blizzard. Stantec's emergency response team established and Incident Command Center and coordinated containment and cleanup with the US Environmental Protection Agency and North Dakota Department of Health. The site is stabilized, with closure anticipated after spring runoff. Due to the subzero temperatures, quantitative sampling of snow samples was conducted to determine the area where total petroleum hydrocarbons might exceed North Dakota soils standards after spring runoff. Salinity was also examined as a contaminant of concern since the blowout may have contained produced water. Stantec continues to work with North Dakota Department of Health and US Environmental Protection Agency to monitor the site during spring runoff and obtain site closure.

American Petroleum Institute (API), Fate and Effects of Oil Spills in Freshwater Environments*

Environmental Toxicologist, Technical Writing and Review. Ms. Tillquist assisted in the preparation of an API report describing the fate and effects of oil spills in freshwater environments. This report summarizes and documents potential environmental effects from inland oil spills into fresh surface waters. It identifies, describes, and compares the behavior, fate, and ecological implications of crude oil and petroleum products in inland waters. The document provides basic information necessary for the formulation of spill response strategies that are tailored to the specific chemical, physical, and ecological constraints of a given spill situation. The report describes the relevant features of various inland spill habitat types, discusses the chemical characteristics of oils and the fate processes that are dependent thereon, summarizes reported ecological and toxicological effects results both generally and with specific reference to distinct organism groupings, and, finally, in the context of case histories from past spills, highlights some of the considerations, difficulties, and elements of success of presently available spill response techniques.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Toxicity Profile for Crude Oil*, Nationwide
Ms. Tillquist authored a report that reviewed the toxicity of crude oil to terrestrial and aquatic ecosystems. The intended audience of this report was BP field personnel that might be involved with accidental releases of crude oil into the environment. The document provided a general characterization of crude oil, its environmental fate, and potential effects to various environments.

Exxon Valdez Oil Spill*, Prince William Sound, Alaska
Ms. Tillquist provided technical support for Natural Resource Damage Claims filed against Exxon following the Exxon Valdez spill. Data were compiled from thousands of environmental samples, ranging from water and sediment to oiled wildlife. Ms. Tillquist provided technical support for expert witness testimony in support of Exxon. Specifically, Ms. Tillquist was responsible for assembling, synthesizing, and summarizing relevant literature on oils spills and their impacts to aquatic ecosystems.

Burlington Northern Santa Fe Railroad, Train Derailment Emergency Response Team, Crow Creek*, Cheyenne, Wyoming
Ms. Tillquist was a team member in an emergency response program to evaluate potential human health and environmental contamination. She participated in an emergency response call to evaluate potential aquatic effects on a train derailment at Crow Creek, Wyoming. Ms. Tillquist was responsible for coordinating activities with state and federal wildlife agencies regarding potential impacts on federally endangered Preble's meadow jumping mouse as well as to the local plain stream fishery. In the field, she was responsible for the sampling design and field sampling. After the event, she summarized the incident events and presented findings in a report to Burlington Northern Santa Fe Railway.

Evaluation of the Transredes Petroleum Product Spill*, Bolivia (Technical Advisor)
Ms. Tillquist provided technical support following a pipeline rupture on the Rio Desaguardero. The spatial extent and environmental effects of hydrocarbon contamination were evaluated by chemical analysis of environmental media and laboratory toxicity tests. These data were then used in a risk assessment to evaluate the potential risk to aquatic biota, terrestrial herbivores (cattle, sheep, and endangered vicunas), and human receptors.

Exxon Valdez Oil Spill*, Prince William Sound, Alaska
Technical Support. Ms. Tillquist provided technical support for Natural Resource Damage Claims filed against Exxon following the Exxon Valdez spill. Thousands of environmental samples were collected, analyzed, and catalogued, ranging from water and sediment to oiled wildlife. Ms. Tillquist was responsible for assembling synthesizing, and summarizing relevant literature on oils spills and their impacts to aquatic ecosystems in support of expert witness testimony in support of Exxon.

Oil and Gas Projects

Washington Ranch Natural Gas Field Storage Project*, New Mexico
Technical support evaluating public safety issues, including preparation of Resource Reports for the Federal Energy Regulatory Commission (FREC) application. El Paso proposed to construct a small natural gas storage field in southeastern New Mexico. The project consisted of several horizontal wells, tie-in pipelines, and access roads. Ms. Tillquist prepared several environmental Resource Reports in support of El Paso's successful Federal Energy Regulatory Commission (FERC) application.

Boehm Natural Gas Storage Field Project*, Colorado
Ms. Tillquist provided technical support evaluating public safety issues, including preparation of Resource Reports for the Federal Energy Regulatory Commission (FERC) application. El Paso proposed to construct a small natural gas storage field in southeastern Colorado. The project consisted of horizontal wells, tie-in pipelines, and access roads. The project was successfully permitted.

Raton Basin Expansion Project and Washington Ranch Natural Gas Field Storage Project*, Colorado, Kansas, Oklahoma, and New Mexico
Technical Review of Public Safety. Ms. Tillquist evaluated public safety issues associated with several El Paso projects, including Raton Basin and Washington Ranch. El Paso proposed to loop its existing Raton Basin natural gas pipeline system in Colorado, Kansas, and Oklahoma. The project would consist of several pipeline loops, laterals, metering stations, and access roads. In New Mexico, El Paso proposed to construct a small natural gas storage field in southeastern New Mexico. The project consisted of several horizontal wells, tie-in pipelines, and access roads. Ms. Tillquist prepared environmental Resource Reports in support of El Paso's successful FERC application.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Pipeline and Facility Decommissioning Evaluation*, New Jersey, Pennsylvania

Project Manager. Ms. Tillquist was responsible for evaluating the condition of the pipeline and facilities and providing cost estimates for decommissioning the facilities, including regulatory compliance. Reliant owns a 10-mile pipeline that has been used to transport fuel oil #6 (historically) and fuel oil #2 (currently). The company also owns a related facility with breakout tanks and aboveground piping. Reliant was considering temporarily (1 to 3 years) suspending the transport of oil through the pipeline and facility and, perhaps, totally abandoning these assets. Alternatively, Reliant wanted the evaluation to include the potential for reactivating the pipeline after a temporary suspension. Ms. Tillquist and other staff evaluated the federal, state, and local regulatory that govern the temporary suspension, reactivation, and abandonment processes. Additionally, Ms. Tillquist and staff identified technical issues that would be associated with each process. Finally, Ms. Tillquist and staff provided Reliant with a range of anticipated costs associated with each of these activities.

Ecological Risk Assessment

Ecological Risk Assessment of Depleted Uranium*, Sonoran Desert and Chesapeake Bay, Arizona, Maryland

Co-investigator, assessing the environmental fate and distribution of depleted uranium in the Sonoran Desert, Yuma, Arizona, and the Chesapeake Bay, Aberdeen, Maryland. Ms. Tillquist collected biota, vegetation, water, soils, and sediments in the field from contaminated and uncontaminated sites. She also conducted toxicity tests to evaluate the toxicity of depleted uranium on kangaroo rats and freshwater and marine aquatic organisms. Ms. Tillquist compared concentrations of depleted uranium collected in the field to concentrations that caused toxicity in laboratory organisms.

Effects of Two-Stroke Outboard Motor Exhaust on Aquatic Biota*, California, Nevada

Ms. Tillquist conducted a systematic survey of the published literature and prepared a monograph summarizing and documenting the ecological effects from two-stroke outboard engine exhaust into the aquatic environment was produced. The document identified the major constituents of outboard exhaust, described the environmental fate of these constituents, and the detailed the toxicological implications. The ecological significance of two-stroke outboard engines was found to be primarily dependent on the water quality characteristics of the waterbody, the intensity of boat use, and the amount of pollution from other anthropogenic sources.

U.S. Army Corps of Engineers, Alaska District, Fort Richardson Post-wide Human Health and Ecological Risk Assessment*, Alaska

Ms. Tillquist provided technical support for the ecological risk assessment and toxicological evaluations for the project. Four ecological risk assessments have been conducted for various areas within the Fort Richardson post. This particular post-wide ecological risk assessment reviewed all previous assessments, identified data and assessment gaps, and re-assessed risk on a post-wide scale. During this process, Ms. Tillquist developed chemical profiles for more than 80 compounds that had been detected at Fort Richardson. Ms. Tillquist calculated exposure of various ecological receptors and compared with toxicity reference values established in the chemical profiles to evaluate the likelihood of risk. The evaluation suggested that potential risk exists to wildlife receptors from bioaccumulating contaminants in aquatic ecosystems. Subsequent field surveys were conducted to confirm or refute this possibility. Data from these surveys indicated that the level of contamination was not significantly impacting aquatic ecosystems. To further reduce potential ecological risk at the site, cooling water was rerouted around sensitive areas, providing a simple and inexpensive mitigation to eliminate further exposure.

Ecological Risk Assessment of US Navy Facilities, South Weymouth, Department of Defense*, Boston, Massachusetts

Ms. Tillquist conducted ecological risk assessments for the Navy's South Weymouth facility. Ms. Tillquist and other staff evaluated the potential risk to aquatic, wetland, and terrestrial receptors using a weight-of-evidence approach that included screening against benchmarks values, critical body residues, toxicity tests, quantitative field surveys, and food web exposure models.

Ecological Risk Evaluation of Dioxin's Effects on Wildlife*, Guam

Ms. Tillquist evaluated the toxicity of dioxin to terrestrial and aquatic receptors. In support of an ecological risk assessment, provided technical assessment of dioxin hazards and potentially toxic threshold values.

* *denotes projects completed with other firms*

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Upper Clark Fork River Ecological Assessment*, Upper Clark Fork River, Montana

Ms. Tillquist provided technical support for the ecological risk assessment and toxicological evaluations. Terrestrial and aquatic screening-level ecological risk assessments were conducted by Ms. Tillquist to evaluate the potential effects of heavy metals on the Clark Fork River ecosystem. In cooperation with the U.S. Environmental Protection Agency (USEPA) Region VIII, developed food web exposure models and provided extensive chemical profile documentation to justify the selection of aquatic and terrestrial toxicity reference values for arsenic, cadmium, copper, lead, and zinc. Estimated exposure and risk using computer models. Ms. Tillquist submitted multiple documents to the USEPA in support of the advancement of science in the risk assessment process as rebuttals to the State of Montana's legal position.

Evaluation of 210 Chemicals: Physical Chemistry, Acute Toxicity, and Human Health Protection*, Nationwide

Ms. Tillquist co-authored a book and accompanying CD-ROM that describes the toxicity, physical chemistry, emergency response procedures, material handling procedures, and regulatory compliance information of 210 chemicals. Information was compiled from various computerized databases.

Evaluation of Chronic Effects to Aquatic Biota from Organochlorine Exposure, Rocky Mountain Arsenal*, Colorado

Ms. Tillquist was awarded grant as co-principal investigator to evaluate the sublethal effects of organochlorine pesticide exposure on fish via food web exposure at the Rocky Mountain Arsenal. Specifically, the project evaluated toxic effects using bioenergetic models and used field data to validate the model.

Environmental Assessments

Bureau of Land Management, Over the River™ Art Project Environmental Impact Statement and Event Management Plan*, Colorado

Lead Public Safety Risk Assessor. Ms. Tillquist evaluated public safety risks associated with the project, including boating accidents, emergency access, and sufficiency of emergency personnel and equipment. The artists, Christo and the late Jeanne-Claude, propose to drape curtains across the Arkansas River as a temporary form of art. Since the project would occur on federal lands, Ms. Tillquist helped prepare a draft EIS as a third-party consultant to the BLM's Royal Gorge Field Office. The project will take three years to construct, display, and disassemble, affecting more than 3,500 acres of land. Public concerns ranged from impacts to bighorn sheep, aesthetics, socio-economic impacts, and public safety and emergency access along the narrow road that parallels the river through the Arkansas River canyon. Ms. Tillquist prepared a semi-quantitative risk assessment on how the project could potentially impact public safety. The four-volume draft EIS evaluated several alternatives that reduced the size or duration of the exhibit. The Draft EIS was published in July 2010, with the Final EIS and Record of Decision issued in February 2011.

Environmental Assessment of Chatfield Reservoir Drawdown*, Denver, Colorado

Ms. Tillquist provided technical direction and analyzed impacts associated with potential drawdown. Denver Water proposed to construct and operate a pump station to convey raw water from Chatfield Reservoir to the municipal water supply system during drought conditions. Construction of the pump station and drawdown of the reservoir required the approval of the U.S. Army Corps of Engineers. The Environmental Assessment evaluated the potential impacts from several drawdown and refill scenarios. While the drawdown would affect recreational opportunities, water quality, and fish and wildlife habitat at the reservoir, the No Action alternative (no pump station, but high evaporative losses) also would substantially impact these same resources.

* *denotes projects completed with other firms*

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Pima County Wastewater District, Applicability of U.S. EPA Water Quality Criteria in the Arid West*, Arizona and Other Western States

Project Manager. Ms. Tillquist evaluated the applicability of national water quality criteria (AWQC) for the arid West, particularly for effluent-dominated systems. The evaluation process included the evaluation of four AWQC, looking at duration and frequency of exceedances, sensitivity of local biota, and speed of aquatic system recovery. Various AWQC-modifying procedures, such as the Recalculation Procedure and the Biotic Ligand Model, were reviewed to determine their appropriateness and usefulness for site-specific modification of the AWQC. Results of this project were published in a special publication, "Relevance of Ambient Water Quality Criteria for Ephemeral and Effluent-Dependent Watercourses of the Arid Western U.S.," by the Society of Environmental Toxicology and Analytical Chemistry.

State of Wyoming, Evaluation of the Effects of Water Depletion on Endangered Species, Litigation Support, North Platte River*, Wyoming and Nebraska

Ms. Tillquist was responsible for evaluating correlations between water levels, fish populations, and whooping crane and plover populations. The effects of North Platte water depletions on endangered whooping crane and plovers were contested in Federal Court. Both these species use the North Platte drainage during their seasonal migrations as a foraging and resting area. Ms. Tillquist provided a technical evaluation of whooping crane population trends and its relationship to discharge at Grand Island, Nebraska. Results indicated that while discharge rates can directly affect habitat suitability for cranes and forage fish for plovers, these factors have not had any measurable effect of whooping crane populations.

Programmatic Environmental Impact Statement for Herbicide Application throughout the Western U.S.*

Lead Technical Advisor for toxicological evaluations of herbicides and their environmental fate and persistence in the environment. Ms. Tillquist assisted in the preparation of a Programmatic EIS for the BLM that evaluated the application of nine herbicides on BLM-administered lands throughout the West. Ms. Tillquist developed an ecological risk assessment to evaluate exposure pathways and potential effects to multiple receptors, ranging from non-target plant species to aquatic biota and terrestrial wildlife species. The nine herbicides included bromacil, chlorsulfuron, diflufenzopyr, diquat, diuron, fluridone, imazapic, sulfmeturon methyl, and tebuthiuron. To evaluate the toxicity of these nine herbicides, Ms. Tillquist review, synthesized, and summarized information from the Environmental Protection Agency registration data and the peer-reviewed literature to develop toxicity benchmarks (toxicity reference values). These benchmark values were subsequently used in the ecological risk assessment and programmatic EIS.

Mining

Bureau of Land Management, Cameco Resources In-Situ Uranium Mine Environmental Impact Statement*, Gas Hills, Wyoming (Lead Public Safety Risk Assessor)

Cameco proposes to develop the Gas Hills In-situ Recovery Uranium Mine Project. The project area covers approximately 8,500 surface acres (approximately 13 square miles) of federal, state and private lands. The Bureau of Land Management's Lander Field Office is the lead agency for the environmental analysis. The Project is permitted by the Wyoming Department of Environmental Quality and is licensed by the U.S. Nuclear Regulatory Commission. Unlike conventional mining practices, in-situ removal mining methods utilize a solution consisting of oxygen and carbon dioxide or bicarbonate injected via conventional water wells into uranium ore-bearing rock formations in the subsurface. The solution dissolves the uranium ore from the rock formations into the circulating groundwater. The resultant uranium-bearing groundwater is recovered by pumping wells located adjacent to the injection wells. The groundwater containing uranium is then processed through an ion-exchange facility where the uranium is precipitated onto a resin bead media. The resin beads containing uranium would then be transported to the Cameco Smith Ranch-Highland facility for processing into uranium yellowcake. After the uranium has been removed, the resin bead media would be returned to the Project site for re-use. The distance one-way from the Gas Hills to Smith Ranch-Highland is approximately 140 road miles.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Beartrack Mine, NPDES Issues and Biological Opinion*, Napias Creek, Idaho

Ms. Tillquist was the project manager for a study that evaluated the toxicity of heavy metals to trout. Because of extremely low water hardness (less than 10 mg/L of $CaCO_3$), the permitted discharge of metals, particularly copper, were extremely low for this mine. Ms. Tillquist developed a site-specific sampling plan to collect the necessary data for the development of a site-specific translator value for the mine's National Pollutant Discharge Elimination System permit. Samples were collected using ultra-clean sampling techniques and were analyzed to detect metal concentrations at very low concentrations. Results from these analyses were used to develop a translator value, allowing the mine to continue to discharge effluent.

Water Quality Evaluation*, Nevada

Ms. Tillquist was the environmental toxicologist and risk assessor evaluating the impacts of selenium and mercury from a mine. The U.S. Fish and Wildlife Service (USFWS) expressed concerns that elevated concentrations of contaminants derived from the Big Springs Mine, particularly mercury and selenium, have affected or have the potential to affect aquatic biota in the North Fork of the Humboldt River. The USFWS concern was enhanced by the presence of endangered Lahontan cutthroat trout and other species of concern. Critically evaluated the USFWS-proposed field sampling plan and questioned whether the data that would be collected could credibly discern any adverse effects attributable to the Big Springs Mine from normal environmental variability. As a result of the critique, the USFWS revised its field sampling plan and entered into consultation with Independence Mining Co. regarding alternative approaches.

Atlanta Gold, National Pollutant Discharge Elimination System Permit*, Atlanta, Idaho

Project Manager. Mining operations in Atlanta, Idaho, have occurred since the 1870s. As a result of these activities, mine drainage is currently being released at 25 different locations. The primary contaminant of concern is arsenic. Atlanta Gold needs to obtain a National Pollutant Discharge Elimination System (NPDES) permit for these existing discharges. To expedite the NPDES process, the Environmental Protection Agency (EPA) Region 10 agreed to third-party preparation of the NPDES application, EPA Fact Sheet, and the EPA permit.

Mining Company, Evaluation of Dietary Metals Toxicity to Rainbow Trout*, Western U.S.

Ms. Tillquist conducted literature research to compile and synthesize data related to dietary metal exposure to trout. In some mining areas, metals concentrations in benthic macroinvertebrates are elevated compared to reference sites. Some scientists have expressed concern that trout may be exposed to potentially toxic levels of metals via dietary exposure. Ms. Tillquist analyzed the published literature and established concentrations of metals in the diets that are considered to have no observable adverse effects as well as the lowest concentration demonstrated to have an adverse effect on survival or growth. This information was presented at the 1999 Society of Environmental Toxicology and Analytical Chemistry.

Identification of Potential Habitat for the Endangered Lahontan Cutthroat Trout*, Walker River and Carson River, Nevada, California

Ms. Tillquist identified drainages within the Walker and Carson River basins that contain potential habitat for future restoration work for off-site mitigation for Lahontan cutthroat trout habitat. As a result of the project, suitable habitat was identified for the mining client, who subsequently purchased the property with its associated water rights and successfully conducted off-site habitat mitigation.

Electrical Power Generation and Transmission

Bureau of Indian Affairs and Williams Company, Wanapa Energy Center Environmental Impact Statement*, Hermiston and Umatilla, Oregon

Ms. Tillquist evaluated water rights and researched water laws applicable to the project, particularly those related to threatened anadromous salmon species. As a third-party contractor for the Bureau of Indian Affairs, Ms. Tillquist evaluated the potential impacts associated with the construction and operation of the Wanapa Energy Center, a power generating plant. Ms. Tillquist evaluated issues associated with water rights and laws pertaining to water withdrawal, given the presumption by Diamond Generating (developer) that the water rights to be used were "reserved" municipal water rights and that these city water rights predated the in-stream flow requirements for the Columbia River. Also, the amount of water withdrawn and the method used to withdraw water were evaluated to determine if they could have potential impacts on federally listed Pacific salmon. Finally, water quality issues were evaluated to assess potential impacts of the effluent water used to cool the power generating equipment and to predict effects to the environment from the discharged water into the environment.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Tri-State Generation and Transmission Association, Environmental Assessment and Alternative Evaluation*, New Mexico

Provided technical support, evaluated data, and prepared the majority of the environmental assessment and alternatives evaluation. Tri-State applied for financial assistance from the Rural Utilities Services (RUS) in order to construct a simple-cycle combustion turbine generating facility near Lordsburg, New Mexico. As part of the RUS application process, Ms. Tillquist developed an Alternatives Evaluation which evaluated alternative sites for the power plant. A Site Selection Study also was produced; RUS used this Site Selection Study as its Environmental Assessment (with public scoping).

Power Plant Application for Certificate*, San Bernardino County, California

Wildlife Toxicologist evaluating risk to endangered biota from nitrogen deposition. The U.S. Fish and Wildlife Service expressed concerns about the potential negative effects of supplemental atmospheric nitrogen deposition on native plant communities originating from the new Mountainview Power Plant. Ms. Tillquist evaluated the likelihood of changes in the vegetative communities based on their location, growth periods, and estimated amount of nitrogen deposition. Sensitivity to nitrogen enrichment was assessed. The analysis indicated that the amount of additional atmospheric nitrogen deposition was not appreciable, particularly when compared to the sizeable background concentrations in the Los Angeles Air Basin.

Solar Energy

Stirling Energy Systems (SES), LLC, SES Solar Two Project*, Imperial County, California (Lead Biologist)

SES submitted an application to the Bureau of Land Management (BLM) for development of the proposed SES Solar Two Project, a concentrated solar electrical generating facility capable of generating 750 megawatts (MW) of renewable power. The proposed SES Solar Two Project site is located on approximately 6,140 acres of federal land managed by the BLM and approximately 300 acres of privately owned land, in Imperial County, California. The project would consist of approximately 30,000 SunCatchers, with a total generating capacity of 750 MW. The proposed SES Solar Two Project also includes an electrical transmission line, water supply pipeline, and a site access road. A new 230-kV substation would be constructed on-site, connected to the existing San Diego Gas & Electric Imperial Valley Substation via a 10.3-mile, double-circuit, 230-kV transmission line. Just over 7.5 miles of the new line would be constructed off-site. An off-site 6-inch diameter water supply pipeline would be constructed 3.4 miles from the Westside Main Canal to the project boundary. The BLM and CEC have executed a Memorandum of Understanding concerning their intent to conduct a joint environmental review of the project in a single NEPA/CEQA process. Ms. Tillquist provided review and technical input to the BLM's and CEC's environmental analysis. Ms. Tillquist revised CEC's document under an extremely tight timeline to make the document compliant with BLM minimum standards. Major concerns included biological impacts to desert bighorn sheep and desert tortoise.

* *denotes projects completed with other firms*

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Bureau of Land Management and California Energy Commission, Ivanpah Solar Energy Projects*, San Bernardino County, California

Biological Lead, handling wildlife and special status species issues. BrightSource Energy, Inc. proposed the development three separate solar thermal power plants within a 3,600-acre project site located in the desert in San Bernardino County, California. When constructed, the 392-megawatt project will be the world's largest solar energy project, nearly doubling the amount of solar thermal electricity currently produced in the U.S. It also will be the largest fully solar-powered steam turbine. Ms. Tillquist also helped prepare a Supplemental and Final EIS as a third-party contractor to the BLM. Ms. Tillquist also worked cooperatively with the California Energy Commission (CEC) to ensure the CEC siting committee issued a proposed decision consistent with the BLM's Record of Decision. BrightSource's proprietary Luz Power Tower (LPT) technology enables the company to employ a low-impact environmental design. Instead of the extensive land grading and concrete pads, BrightSource mounts mirrors (heliostats) on individual poles that are placed directly into the ground, allowing the solar field to be built around the natural contours of the land and avoid areas of sensitive vegetation. This design also allows for vegetation to co-exist within the solar field. The Final EIS was published in July 2010 with construction in fall 2010.

Inhalation Toxicology

National Institute of Health, Retention and Clearance of Radioactive Particles from Intermediate Airways in Beagle Dogs, Lovelace Inhalation Toxicology Research Institute*, New Mexico

Ms. Tillquist was a summer intern who received a grant to examine the movement and retention of small inhaled particles within the intermediate airways of lungs. In the lung, particulate matter tends to be trapped either in the upper airways or deep within the lung. Little was known about the ability of the intermediate airways to clear or retain particulate matter. Based on a grant from the National Institutes of Health, Ms. Tillquist developed a new technique for exposing intermediate airways (bronchioles). Clearance and retention rates of various-sized particulate within the lung were evaluated by using particles labeled with radioactive cesium and strontium. In addition to this basic research, was involved in the post-operative performance evaluation of lung transplants, a relatively new surgical procedure. Finally, Ms. Tillquist acted as a technician for measurement of radioactive materials in various tissues and other matrices for a variety of other projects.

National Toxicology Program, Acute $Ni^{63}SO_4$ Inhalation Exposures in Mice and Rats, Lovelace Inhalation Toxicology Research Institute*, New Mexico

Ms. Tillquist was the lead technician responsible to several National Toxicology Program studies. As part of the National Toxicology Program's evaluation of nickel compounds, conducted acute aerosol exposures of laboratory animals (over 100 animals) in order to evaluate the metabolism of nickel. Radioactive nickel was used to trace metabolic pathways. This work required Level B laboratory conditions (respirators, protective clothing, shower-in/shower-out procedures) as well as constant monitoring for radiological contamination.

National Toxicology Program, Chronic NiO, $NiSO_4$, and Ni_3S_2 Inhalation Exposures in Rats and Mice, Lovelace Inhalation Toxicology Research Institute*, New Mexico

Ms. Tillquist was the lead technician responsible to several National Toxicology Program studies. The National Toxicological Program (NTP) routinely evaluates the toxicity of compounds in the environment. Nickel compounds are used in a number of manufacturing processes. Ms. Tillquist was responsible for the supervision, monitoring, and laboratory measurements associated with three large inhalation toxicology studies (>3,500 animals) for the NTP. Ms. Tillquist ensured that staff followed Good Laboratory Practices (GLP procedures), maintained Quality Assurance of the associated data and other project-related paperwork. This work involved Level B laboratory conditions (respirators, protective clothing, shower-in/shower-out procedures).

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Water Quality Assessments

Climax Mine, Evaluation of the Effects of Aqueous Aluminum on Aquatic Biota of Tenmile Creek*, Climax, Colorado

Ms. Tillquist evaluated eight years of fish and macroinvertebrate community data to determine if any temporal or spatial trends related to water quality, specifically aluminum, were apparent. Whole-effluent toxicity (WET) test results for this same period were summarized and, again, were correlated to aluminum concentrations. Finally, a review on the toxicity of aluminum to aquatic biota was written to summarize the state-of-the-science knowledge of aluminum toxicity in aquatic systems, which has changed dramatically since the ambient water quality criteria were developed for aluminum. Results showed that although aluminum concentrations were above national ambient water quality criteria and local background levels, concentrations of aluminum were not having any demonstrable effect on aquatic biota. Rather, patterns of improvement were observed in the biological data since 1995, coinciding with the implementation of significant changes in the water treatment procedures at the Climax water treatment facility. Moreover, laboratory WET testing showed no acute or chronic toxicity when aluminum was above ambient water quality criteria.

Beartrack Mine, Review of Biological Opinion on Chinook and Steelhead: Critique and Re-evaluation, Tributary of the Snake River*, Idaho

Ms. Tillquist conducted a systematic evaluation of water quality in a Snake River tributary to determine if salmonids would be adversely affected by metal concentrations. The National Marine Fisheries Service (NMFS) originally concluded in a Biological Opinion that the continued operation of the mine jeopardized the successful reintroduction of Chinook salmon into this watershed. This conclusion was based on water quality data, which occasionally exceeded the national ambient water quality criteria. Ms. Tillquist re-evaluated the water quality data using a more extensive dataset and conducted a broad, weight-of-evidence evaluation that evaluated aquatic community health. Temporal and spatial trends in water quality and fish and benthic macroinvertebrate community structure were examined to determine if any adverse effects exist which are attributable to the operation of the mine. Specifically, this assessment evaluated the likelihood of adverse effects to federally listed salmonids. This assessment found there was no evidence of adverse impacts from the operation of the mine. Furthermore, there were statistically significant indications that the aquatic community health (measured as density and diversity) has recently improved, perhaps due to the mining company's restoration of historic placer mining areas in the watershed. As a result, the NMFS was forced to recant its original position and revised their Biological Opinion to indicate a no jeopardy finding.

Aquatic Toxicity Assessment of Leachate from the Cortez Landfill Superfund Site, Delaware Water Gap*, Pennsylvania/ Delaware

Ms. Tillquist investigated leachate from a Superfund site into a National Park area. In the 1970s, barrels containing unknown contamination were illegally dumped in a landfill in New Jersey. By the late 1980s, material from these barrels was leaching into surrounding properties and into the Delaware River and the landfill was designated as a Superfund site. Notably, there was an increased prevalence of illness in the surrounding areas. This portion of the Delaware River was part of the Delaware River Gap National Park, administrated by the National Park Service. Through a grant from the National Park Service, assessed the aquatic toxicity of leachate entering the Delaware River using Microtox® and several routine aquatic toxicity tests.

Water Quality Criteria Evaluation*, Nationwide (Technical Lead)

Ms. Tillquist is providing support on toxicological data and associated environmental impacts. National water quality criteria promulgated by the U.S. Environmental Protection Agency (USEPA) are applicable over a normal range of water hardness. However, the validity of extrapolating criteria to unusually hard or soft waters is unknown. Ms. Tillquist conducted a literature evaluation to determine whether application of the USEPA's criteria for metals is appropriate. Additionally, Ms. Tillquist conducted a series of aquatic toxicity tests with copper in both hard and soft waters. Neither the literature evaluation nor the toxicity tests supported the extrapolation of criteria beyond these hardness limits.

* *denotes projects completed with other firms*

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

Wildlife Biology

Biomonitoring of the Cache la Poudre River*, Colorado

Ms. Tillquist provided technical support for a long-term (i.e., over 10 years) biomonitoring project, fish community structure program. The study area encompassed the Poudre River in northern Colorado with the intent to evaluate if changes in water quality attributable to Eastman Kodak have negatively impacted the Cache la Poudre River ecosystem. Habitat was evaluated using U.S. Environmental Protection Agency's Rapid Bioassessment Protocol, while the fish community was assessed using the Index of Biotic Integrity. Large scale, long-term trends in the fish community appeared to be primarily affected by human disturbance activities such as channelization. Ms. Tillquist conducted fieldwork and analyzed data as part of an Index of Biotic Integrity assessment. Fish collected by electrofishing and seining were identified, weighed, measured, and examined for disease. Flow rates, habitat type, and habitat quality were quantitatively evaluated.

Survey of Fish Assemblage in the Headwaters of East Plum Creek*, Colorado

Ms. Tillquist conducted field surveys for fish in small streams on U.S. Air Force Academy lands. The Air Force Academy was evaluating the potential environmental impacts of increased training activities in undeveloped areas of the Academy's property. In conjunction with this assessment, conducted fish surveys in the intermittent portions of upper East Plum Creek. Electrofishing gear and seines were used to sample the creek and beaver ponds. No fish were found in these reaches.

Museum of Southwestern Biology, University of New Mexico, Field Surveys of Fish in Plain Streams of the Southwestern U.S.*, New Mexico, Texas, Colorado

Ms. Tillquist conducted field surveys for the collection and systematic identification of fish throughout New Mexico, Colorado, and Texas. Special emphasis was placed on the identification of new or existing endangered fish species. Through this work, the Rio Grande silvery minnow was identified and this species subsequently has been listed as an endangered species, largely due to the publication of this fieldwork. She helped curate specimens into the Museum of Southwestern Biology.

Carbon Dioxide Pipeline Project Environmental Assessment*, Wyoming (Project Wildlife Biologist)

Anadarko proposed to construct the 125-mile-long Salt Creek Carbon Dioxide Pipeline. Ms. Tillquist conducted sage-grouse, mountain plover, and raptor surveys. Data from these field reconnaissance surveys were used to assist with pipeline route selection and to identify areas with seasonal construction constraints. The pipeline has been successfully permitted and constructed.

Nesting Habitat Evaluation and Improvement for Threatened Dusky Canada Geese, Prince William Sound & Copper River Delta*, Cordova, Alaska

Ms. Tillquist evaluated areas on the Copper River Delta for their potential as nesting habitat for the endangered Dusky Canada goose. Once suitable sites were identified, artificial nesting structures and islands were constructed. Nesting success was documented through the breeding season to determine if artificial nesting structures were effective. Ms. Tillquist also participated in breeding waterfowl surveys and banded geese. She also evaluated and constructed in-stream habitat improvement structures for anadromous fish and collected water quality data.

* denotes projects completed with other firms

Heidi Tillquist

Environmental Toxicologist/Senior Program Manager

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