ADVANCES IN IMPACTS RECOVERY FROM ELECTOKINETIC SOIL REMEDIATION

Oil and Gas Research Program

North Dakota

Industrial Commission

Application

Project Title: ADVANCES IN IMPACTS RECOVERY FROM ELECTROKINETIC SOIL REMEDIATION

Applicant: Stealth Energy Group, LLC. with NDSU, EOG, Oasis

Principal Investigators: Dustin Anderson, Dr. Thomas DeSutter, Dr. Bernhardt Saini-Eidukat, and Dr. Xinhua Jia.

Date of Application: 06/01/2021

Amount of Request: $265,000.00

Total Amount of Proposed Project: $547,660.00

Duration of Project: Two Years

Point of Contact (POC): Tod Ammerman – 701.580.4314

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ABSTRACT

Objective: The objective of this project is to enhance the recovery of mobilized ions, such as sodium and chloride, during electrokinetic (EK) remediation through improved groundwater recovery well design. A secondary objective is the use of sub-irrigation to decrease remediation duration and to potentially expand locations where this remediation technology may be applied. The unintended release of produced fluid, especially, brine, can have a deleterious effect on vegetation. Previous field-scale studies conducted in northwestern North Dakota have shown EK remediation is an effective and sustainable remediation option compared to "dig and haul." Primary headwinds identified during a previous project (2019-2020) were accumulation of target ions just outside the electrode wells (wells), and the need for soil moisture to aid the mobilization and recovery of said ions. Analytical results indicated near background conditions existed for the target ions in the treatment area, > 6 inches from the wells, and as much as 140 times background concentrations < 6 inches from the wells. Additionally, ions moved much faster than expected in near-saturated soil. This project seeks to enhance ion recovery through an improved water recovery system and to decrease remediation time using sub-irrigation. Additionally, irrigation may allow for a broader application of this remediation technology to dryland conditions. Project scope includes the design, installation, and operation of a solar powered electrokinetic remediation system along with soil monitoring, reporting and the development of a publicly available model. The reports will present data documenting the efficacy of the process and the model will provide prescriptions for broader application of this technology for the benefit of the Oil and Gas industry, local landowners, and environmental consultants while sustainably remediating impacted lands.

Expected Results: Based on laboratory experiments, computer modeling scenarios, and prior field scale implementation of the EK system, we expect to remove > 80% of the chloride and sodium mass from the soil in the contaminant source zone. That remediation of brine impacted soil may be reduced to two field seasons.

Duration: The project is expected to operate over two field seasons. The system will be idled and secured during the winter month due to freezing conditions, which is near certain in the study area. These winter conditions limit the ability to recover fluids from the systems.

Total Project Cost: The estimated cost for this pilot demonstration is $547,660.00. We are proposing to cost share on a 52% basis.

Participants: EOG Resources, Inc. of Denver, CO, Oasis Petroleum of Williston, ND, North Dakota State University – Fargo, and local environmental consultants including; OneCor, American Engineering and Testing.

PROJECT DESCRIPTION

Objectives: The objective of this project is to enhance the recovery of mobilized ions such as sodium and chloride during electrokinetic (EK) remediation, through groundwater recovery well design. A secondary objective is the use of sub-irrigation to decrease remediation duration and to potentially expand locations where this remediation technology may be applied. A third objective is to make the learnings about this technology available to interested operators, landowners, and consultants using NDSU Extension, and operator roundtables. This objective is expected to encourage the use of this technology to responsibly remediate brine impacted soil.

Methodology:

In EK, ions, such as chloride (Cl^-) and sodium (Na^+), are mobilized and eventually recovered by passing a low-level direct current (DC) between rows of positively charged electrodes (anodes) and negatively charged electrodes (cathodes) inserted into saturated soil. The imposed electrical field encourages the migration of ions to anodes and/or cathodes through three primary processes: electroosmosis, electromigration, and electrophoresis:

- Electroosmosis is the movement of charged particles due to electrical potential differences.
- Electromigration is the transport of ions and ion complexes in the soil pore fluid towards the oppositely charged electrodes.
- Electrophoresis is the transport of charged particles or colloids under the influence of an electric field, while contaminants bound to mobile particulate matter are transported in this manner.

Recent use of the EK technology has demonstrated successful ion migration to the electrodes, but also that there is a mounding of ions, proximal to the wells. This mounding or concentrating of ions has been mitigated by over excavation when decommissioning the treatment system. Over excavation is an invasive and destructive approach, especially in sensitive areas, that we propose can be addressed with redesigned recovery wells. There are many potential reasons for the cause of this mounding near the well. Regardless of the forces at play, gravitational forces during surge water recovery can overwhelm other forces. With this understanding, the installation of larger wells with proper sand pack and development can be strategically surge-pumped to enhance ion recovery.

Each electrode well will consist of 2-inch polyvinyl chloride (PVC) well-screen riser. The borehole annulus will be backfilled with electrically conductive material and silica sand pack. The silica sand pack will provide a coarser matrix than the clay rich native soil. This more water transmissive soil will facilitate for surge pumping during effluent recovery. The extraction effluent will be collected in plastic totes until it is subsampled and transported for disposal at a licensed saltwater disposal well. The effluent recovery system will be constructed to account for harsh pH conditions.

Each system will be designed to accommodate site specific conditions but will generally consist of approximately 150 bore-hole based electrodes connected to direct current (DC) solar power supplied by an array of solar panels. The power will be delivered directly to the soil with no battery storage and operate

for 14-16 hours per day with a charge regulator. The system will not be operated during the winter months. It is estimated the process will take 8 months of operation or two summer field seasons.

Laboratory studies will be conducted to better understand 1) the barrier of why chloride and sodium do not easily enter into the wells, which has been observed in the field, 2) efficiencies in using sub-irrigation vs flood irrigation for removal of chloride and sodium, and 3) how soil textures and their water contents influence the migration of ions. These studies will be conducted during the winter months in controlled settings.

Anticipated Results:

Based on laboratory and field studies, removal of chloride and free sodium to near background concentrations is possible. We expect increasing the well size with a sand pack development will enhance ion recovery. These recovery improvements coupled with irrigation should decrease remediation time from decades long to years or even months making this a cost effective remediation tool. If successful, use of irrigation could greatly broaden the opportunities for application of the EK technology to soils in non-wetland environments such as croplands, rangelands, and native areas.

Facilities:

The proposed demonstration will be operated to remediate one wetland and one dryland in Western ND. One of the treatments will be applied to a perennial stream located approximately 14 miles southeast of Williston off of County Road 29 where a produced water release occurred in February 2017. The second treatment will be applied to a dryland area 15 miles east of Powers Lake, ND where the release of brine water from a buried gathering line occurred in 2015.

Resources:

The resources required to install and operate the electrokinetic system are minimal. The electrodes are installed using direct-push technology with no waste soils to manage. The recovered brine components will be pumped to on-site collection tanks prior to being transported to a saltwater disposal for deep well injection points. All electrical power will be sustainable, provided through the use of solar panels. NDSU has soil sampling equipment to be used during and after EK treatment.

Techniques to Be Used, Their Availability and Capability:

The installation and operation will be similar to the Schmitz EK project and will include sub-irrigation and an improved well design. A sub-irrigation system will be trenched/bored approximately six inches below the ground surface to maintain soil saturation near field capacity. The added water will aid the electrical sphere and encourage ion migration towards the electrode. Installed larger sand-packed wells will improve water recovery. The electrode wells will be installed using conventional direct-push technology. Photovoltaic panels will be used for the DC electrical component. A 50 KW grid will be installed at the well pad site.

Environmental and Economic Impacts while Project is Underway:

Anticipated environmental impacts will be positive. The removal of acute brine from soils and groundwater, at the point source, will eliminate the potential for further migrations. The recovered brine components including Na^+ and Cl^- will be removed for off-site deep well reinjection at a licensed saltwater disposal well.

If this demonstration is successful, this technology can be used as an alternative to excavation and soil replacement significantly reducing disruption of the surface soils and biota. Also, the solar component makes the system attractive at remote locations with no available line power.

Ultimate Technological and Economic Impacts:

The Oil and Gas Industry works hard every day to avoid spills, whether it be oil, brine water, or any other product. However environmental stewardship not only means minimizing the overall number of spills, but also mitigating their impacts when they occur. This technology is a passive-noninvasive and sustainable approach to returning disturbed soil back to potentially, pre-disturbed productive capacity. Further, the environmentally-friendly manner of this treatment lends to treatment in sensitive areas where cost effective alternatives are, at best, limited. Using electrokinetic technology, we are harnessing renewable solar energy to rehabilitate the non-renewable soil.

Why the Project is Needed:

Traditional remediation strategies for the treatment of brine impacted lands are either not sustainable, too expensive or simply not effective. These headwinds have too often resulted in the removal and disposal of productive soil to landfills or even worse, inaction. With the latter, acute brine remains in the environment where it further migrates, contaminating additional soil and local groundwater. If a sustainable, timely, and economic remediation alternative, like EK, were available, then potentially less destructive remediation approaches would be employed and fewer spills would go unmitigated.

STANDARDS OF SUCCESS

This project is expected to develop a sustainable alternative to current invasive and non-sustainable remediation methods such as “Dig and Haul.” The EK remediation method targets ions from the soil pores and groundwater. To be successful, the system must remove >80% of non-naturally occurring Na and Cl ions from the disturbed system.

To measure the effectiveness, NDSU will collect soil samples before, during, and after treatment. A statistically based sampling protocol will be developed following existing regulatory criteria. To truly benefit all stakeholders this remediation technology must be economic and timely. Input costs will be tracked and potential cost savings will be documented.

If successful, the modified EK remediation process will be fully commercialized and presented to the industry as an alternative to current technologies. This in turn, will aid the oil and gas industry to address current and historic disturbed sites in North Dakota.

BACKGROUND/QUALIFICATIONS

(From Instructions: A summary of prior work related to the project conducted by the applicant and other participants as well as by other organizations. This should also include summary of the experience and qualifications pertinent to the project of the applicant, principal investigator, and other participants in the project).

Electrokinetics has been demonstrated to be a promising and useful remediation technology when treating impacted soils from Oil and Gas related brine spills. This technology was successfully used to remediate the Connie brine spill. This spill impacted a sensitive and protected Prairie Pot-hole wetland in North Dakota. It was also used to remediate the Schmitz, another sensitive wetland stream in North Dakota. While both applications have been successful, and many lessons were learned, there are still a few more improvements necessary, as outlined in this applications, holding this technology back from broader use. It is this team's expectation that this project will provided the design and application improvements that will broaden the utilization of EK remediation systems in the Oil and Gas industry.

The project team represents two Oil and Gas companies, North Dakota State University professors, and local consultants. Find below a short background and qualification summaries of the team members with the contribution each will make to this project.

Tod Ammerman and Shane Ewert are principle environmental professionals with Stealth Energy Group, LLC. Ammerman and Ewert have decades of experience consulting in the Upstream and Midstream segments of the Oil and Gas Industry. Specific to this project, both have vast experience in the design, construction and management of aforementioned EK treatments. Mr. Ewert, has extensive experience working with groundwater recovery systems and will bring over 20 years of knowledge to this project. Stealth will be responsible for infield construction and management of the EK system.

Dustin Andersen and Jason Rauen bring decades of environmental experience working in both the Upstream and Midstream segments of the Oil and Gas industry in North Dakota. Anderson and Rauen, with Stealth, will be responsible for the operations and management of the EK treatment system.

Dr. DeSutter is a professor of soil science at NDSU. He did his PhD research in environmental soil science and has been working on reclamation-related projects for about 8 years. He was the principle investigator on the black slough oil spill research project and currently has a USDA research project on reclamation of brine spills, which does not cover the scope of this current proposal. DeSutter will be responsible for overseeing the collection and sampling of soils and installation of the sub-irrigation system.

Dr. Jia is a professor and registered professional engineer at NDSU. She did her Ph.D. research on EK and has a background in engineering design. In this project, she will be responsible in design and construction of a bench EK system, evaluation of different technologies on ion mobility and removal rate, and also to design the subirrigation system for the field studies.

Dr. Saini-Eidukat is a professor of geology at NDSU. He has experience in geophysical exploration which is relevant to this project, and in geochemistry and geochemical modeling. In this project, he will assist with the field and laboratory experiments, and will be responsible for the interpretation of soil chemical data and the modeling of ion speciation.

MANAGEMENT

This demonstration will be managed jointly by Stealth Energy Group, LLC. (Stealth – Tod Ammerman 701.580.4314) of Williston, ND, EOG Resources of Denver, CO, North Dakota State University, and Oasis Petroleum of Williston, ND. NDSU will manage the technical aspects of the design. Stealth will manage the installation and operation as well as the data management. Oasis and EOG will provide local field support, oversee local contractors, manage any waste, and maintain the equipment during operations. Data evaluation and reporting will be completed through a joint effort of all participants.

Over the course of operations, strategic soil and groundwater samples will be collected to determine the effectiveness of the system. At a minimum, every October, prior to winter shutdown, the samples will be collected and evaluated. Decisions concerning operations will be made based on the data. Adjustments to the future operation of the system may also be made at that time. During the active operating periods, operating parameters such as voltage, current and soil temperature will be monitored by onsite-field-staff. This data will allow us to calculate power usage and estimate the Na^+ and Cl^- migration and removal rates based on computer models. The soil and groundwater samples mentioned above will help us calibrate these models.

TIMETABLE

Installation is anticipated for Spreing of 2022 with the system going fully operational during the summer of 2022. The system will operate spring to fall, during the non-freezing season. The system will be shut down for the winter months due to complications of operating during freezing conditions. Due to the project scope, the system will operate for 2 full field seasons. At the end of each field season soil and water samples will be collected and analyzed to demonstrate treatment effectiveness. Any adjustment will be determined at this time and will be implemented for the following field season. The laboratory investigations will start occurring fall 2022 and continue until the end of the project.

BUDGET

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Other Project Sponsor's Share
Site Investigation and Prep - Direct	$0		$22,000	Stealth
Investigation and Prep - Labor	$0		$14,500	Stealth
System Design - Labor	$124,040		$25,000	EOG
Equipment/Materials	$125,960		45,000	Oasis
Installation - Direct	$0		$48,000	EOG/Oasis
Installation - Labor	$		$38,160	Oasis/EOG
Operations - Direct	$0		$30,000	EOG
Operations -Labor	$0		$30,000	Oasis/EOG
Monitoring - Direct	$0		$40,000	EOG/Oasis
Monitoring - Labor	$15,000		$0	
Demobilization - Direct	$0		$20,000	Oasis/EOG
Demobilization - Labor	$0		$0	
TOTALS	$265,000		$282,660	

Advances in Impacts Recovery from Electrokinetic Soil Remediation

Scope of Work

NDSU SNRS, ABEN, and Geoscience faculty will be responsible for the following tasks: design of the sub-irrigation system, testing the relationships between soil water content and ion mobility in variable textured soils, collection and sampling of soils, and interpretation of data. Specifically, DeSutter will be responsible for overseeing the

collection and sampling of soils and installation of the sub-irrigation system, Jia will be responsible for the design and implementation of the laboratory studies looking at ion mobility in variably-textured soils and also to design the sub-irrigation system, and Saini-Eidukat will be responsible for the interpretation of soil chemical data and the modeling of ion speciation.

Budget Justification
July 1 2021- June 30 2024

NDSU's indirect cost rate policy can be found at https://www.ndsu.edu/fileadmin/research/documents/SPA/forms/NDSU_FA_RA_Signed_2019-04-23.pdf

Salaries and Wages (total = $36,660)
-One, quarter-time graduate student: $16,000 for two years; with fringe benefits of $480 (calculated at 3%)
-undergraduate students: $6,000 ($12.50 per hour for 480 hrs); with fringe benefits of $600 (calculated at 10%)
-Partial funding for a full-time, research technician for two years (includes annual adjustment of 3%): $8,818; with fringe benefits of $4,762 (calculated at 54%)

Travel (total = $15,000)
-Hotels for field activities (three rooms per night@$86.40/room/5 nights): $1,296/yr x 2 years
-Mileage to travel to research sites (estimated 6,525 miles x $0.56/mile): $3,654/yr x 2 years
-Per diem (estimated at 30 days at $35/day): $1,050/yr x 2 years
-Partial co-PI support for attendance at a national scientific meeting year 2 only to present research findings (two people at $1,500 each; airfare $1000 each, registration $500 each): $3,000.

Services ($38,000)
-Soil and water sample analysis (380 samples at $100 per sample): $38,000

Supplies ($5,500)
-soil and water sampling equipment to sample and transport soil samples ($1,500)
-power supply and charging regulator for electrokinetic systems ($2,000)
-plastic tanks for electrokinetic studies ($2,000)

Total Direct Cost: $95,160
Total F/A Cost: $42,822
Total Project Cost: $137,982

DeSutter Jia and Saini-Eidukat
NDIC 2021

	Year 1	Year 2	Total
Personnel			
Technical Staff	$4,344	$4,474	**$8,818**
Fringe Benefits (54%)	$2,346	$2,416	**$4,762**
Graduate Students	$8,000	$8,000	**$16,000**
Fringe Benefits (3%)	$240	$240	**$480**
Undergraduate Students	$2,880	$3,120	**$6,000**
Fringe Benefits (10%)	$288	$312	**$600**
Total salaries	**$15,224**	**$15,594**	**$30,818**
Total benefits	**$2,874**	**$2,968**	**$5,842**
Total salaries+benefits	**$18,098**	**$18,562**	**$36,660**
Travel			
Travel to sites	$6,000	$6,000	**$12,000**
travel to out-of-state meetings	$0	$3,000	**$3,000**
Total Travel	**$6,000**	**$9,000**	**$15,000**
Services			
Soil sample analysis	**$15,000**	**$23,000**	**$38,000**
Total contract	**$15,000**	**$23,000**	**$38,000**
Supplies			
Supplies (soil sampling, storage, sample bottles,	$5,000	$500	**$5,500**
Total Supplies	**$5,000**	**$500**	**$5,500**
Direct Costs	$44,098	$51,062	**$95,160**
Indirects 45%	$19,844	$22,978	**$42,822**
Total Project Cost	**$63,942**	**$74,040**	**$137,982**

The above costs are estimates based on the two previous EK systems. Note, costs may vary slightly due to unknown field conditions that will affect the size of the EK remediation system. The industry partners, EOG and Oasis, have provided some soil and groundwater analytical data, but more sampling is necessary to characterize current conditions for treatment design purposes. A majority of the site investigation and prep costs will be borne by the Industry partners. NDSU will evaluate all soil and groundwater analyses to develop the initial design, which in turn is used to generate the cost estimates for the project.

The cost match funds will be used to purchase equipment and materials required to make and install the electrode wells (well pipe, DSA wire, backfill material), and to acquire conductors, plumbing, pumps, totes, data acquisition system, communication system, and power system (solar power).

The installation costs include several weeks of subcontracting direct-push equipment and operators and support as well as general laborers. It also includes surveying, the system hookup, and shakeout. The installation should take approximately 4 weeks to complete.

Operations include the on-going data management, maintenance, waste management, and general oversight. The system is expected to operate for at least two field seasons.

Monitoring includes periodic soil and groundwater sampling as well as preparing seasonal reports on operating conditions and remediation progress.

Demobilization consists of removing the power source from the site and pulling the electrode wells from the ground.

CONFIDENTIAL INFORMATION

At this time, there is no confidential information in this grant application.

STATUS OF ONGOING PROJECTS (IF ANY)

If the applicant is a recipient of previous funding from the Commission, a statement must be provided regarding the current status of the project.

Stealth Energy Group, LLC. has not participated nor receive funding from the Commission prior to this application. It is important to notet hat Oasis Petroleum and Terran Corporation was awarded funding in 2017 to evaluate the use of solar panels as an alternative power source for electrokinetic remediation. That research concluded early spring 2021.

LETTER OF SUPPORT

May 19, 2021

Karlene Fine, Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

Re: ADVANCES IN IMPACTS RECOVERY FROM ELECTROKINETIC SOIL REMEDIATION

Ms. Fine.

I am writing in support of the referenced application submitted by Stealth Energy Group, LLC. with NDSU, EOG and Oasis. I believe that the proposed site is an ideal candidate for the proposed electrokinetic project.

Electrokinetics has the potential ability to remediate a site faster while being less invasive than other methods. In addition, it can preserve the existing topsoil and minimize the amount of waste generated.

This is the type of technology that we need to advance to help make brine remediation more successful and cost effective. If you have any questions of concerns, please feel free to contact me.

Bill Suess
Manager – Spill Investigation Program
North Dakota Department of Environmental Quality
701-328-5216

EOG Resources, Inc.
600 Seventeenth Street
Suite 1000N
Denver, CO 80202
Main: 303-572-9000
Fax: 303-824-5400

July 20, 2021

Attn: Karlene Fine
Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept. 405
Bismarck, ND 58505-0840

RE: Oil and Gas Research Council – Electrokinetic Matching Fund Grant
Letter of Support

Dear OGRP:

EOG Resources, Inc. (EOG) is submitting this letter in support of the collaborative research program submitted by Stealth Energy Group, LLC on May 31, 2021 which is entitled "*Advances in Impacts Recovery from Electrokinetic Soil Remediation.*" The subject research program is revered as a great opportunity to advance our collective understanding and mutual capabilities of alternative technologies to promote effective and responsible remediation of salt impacted soils. While the situation which has created this opportunity is undesirable, the unintentional release of saltwater associated with the EOG pipeline referenced in the application offers a positive opportunity to expand our remediation options. This technology serves to improve the efficacy (via efficiency and expedience) of available remediation options to address conducive environments impacted by salts within the State of North Dakota regardless of cause or source.

EOG recognizes in this OGRC grant application (GA) there must be commitment to and dedication of funding to support execution of the research program. This letter is to affirm EOG's commitment to the research program as well as the financial commitment stated in the grant application. A total of $282,660.00 in funding will be provided over the course of the project (refer to GA, page 9 and 12) by the participating partners (i.e. EOG / Oasis / Stealth); as allocated and justified on page 10 of the GA.

EOG appreciates your time and consideration of the application, project proposal and this letter of support. Should there be any questions or additional information necessary please do not hesitate to make contact by email at, jason_rauen@eogresources.com, or by phone, 303/262-9914.

Sincerely,

Jason Rauen
Environmental Manager – EOG Resources, Denver Division

July 30, 2021

Attn: Karlene Fine
Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept. 405
Bismarck, ND 58505-0840

Sent also via email to Brent Brannan: brentbrannan@auroraenergyllc.com

RE: Oil and Gas Research Council – Electrokinetic Matching Fund Grant Support Letter

Dear OGRP:

Oasis Petroleum, Inc. (OAS) prepared this letter in support of a collaborative research program submitted by Stealth Energy Group, LLC entitled "*Advances in Impacts Recovery from Electrokinetic Soil Remediation*." to the North Dakota Oil and Gas Research Program on May 31, 2021. There is need in the Oil and Gas Industry ("Industry") for an environmentally sustainable alternative to removing otherwise productive soil that has been impacted by industry activities to local landfills. This technology looks to provide such an alternative.

Early field studies have successfully demonstrated the removal of sodium and chloride ions from the soil. If this technology can be refined to a more economical treatment. The historic practice of Dig and Haul maybe greatly reduced. This grant application is specifically unique due to the collaborative efforts of North Dakota State University, environmental consultants, local government, landowners, and Industry.

Oasis recognizes that to qualify for this OGRC grant matched funds are required. This letter is to affirm that Oasis, and others named in the grant application, commit $282,660.00 of the $547,660.00 requested funds (refer to GA, page 9-12). We are excited to participate with this research. The sustainable and environmentally responsible extraction and recovery of petroleum hydrocarbons are part of the Oasis culture and this research is exactly that.

Oasis appreciated you consideration of this applications, Please contact me at (701) 580-3208 or dcanderson@oasispetroleum.com if you have any questions regarding Oasis' participation.

Sincerely,

Dustin Anderson
Environmental Scientist
Oasis Petroleum North America LLC

NW Land Owners
NORTHWEST LANDOWNERS ASSOCIATION
THE VOICE PROTECTING LANDOWNER RIGHTS
across North Dakota and beyond

Executive Board
Troy Coons, Chairman - 701-721-4258
Dave King, Vice Chairman - 701-848-6032
Galen Peterson, Secretary - 701-833-7258
Bob Grant, Treasurer - 701-340-8082
Amy Shelton, ED - 701-721-4446

Dr. Tom DeSutter
North Dakota State University
May 24, 2021

Re**: ADVANCES IN IMPACTS RECOVERY FROM ELECTROKINETIC SOIL REMEDIATION**

Thank you for reaching out to the Northwest Landowners Association in regards to your grant proposal titled "ADVANCES IN IMPACTS RECOVERY FROM ELECTROKINETIC SOIL REMEDIATION," which is being submitted to the North Dakota Industrial Commission. The remediation of brine spills is of great concern to our members and the use of in-situ electrokinetics shows great promise in removing contaminants without the further disruption of topsoil.

Based on our conversations with you the use of electrokinetics has been limited to soils that are saturated with water, such as around wetlands. Your proposal will expand the technology to dryland conditions where many spills have occurred. Specifically, your idea to use sub irrigation with electrokinetics is unique and we are eager to learn the effectiveness of this strategy to help bring our brine-impacted soils back to productivity.

Thank you for sharing your ideas with us and respecting our Association's thoughts and opinions. We encourage the exploration of electrokinetics for cleaning up impacted soils and therefore strongly support the funding of this proposal. If the Northwest Landowners Association can be of further assistance please do not hesitate to contact us.

Sincerely,

Northwest Landowners Board of Directors:

Troy Coons, Chairman
Dave King, Vice Chairman
Bob Grant, Treasurer
Galen Peterson, Secretary
Hal Ross
Larry Peterson
Myron Hanson
Pete Artz
Patty Jenson
Shirley Myer
Kenton Onstad
Howard Rice
Candyce Kleeman
Marvin Heller

APPLICATION CHECKLIST

Use this checklist as a tool to ensure that you have all of the components of the application package. Please note, this checklist is for your use only and does not need to be included in the package.

☒	Application
☒	Transmittal Letter
☒	$100 Application Contribution
☒	Tax Liability Statement
☒	Letters of Support (If Applicable)
☐	Other Appendices (If Applicable)

When the package is completed, send an electronic version to Ms. Karlene Fine at kfine@nd.gov, and 2 hard copies by mail to:

Karlene Fine, Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

For more information on the application process please visit:
http://www.nd.gov/ndic/ogrp/info/ogrcsubgrant-app.pdf

Questions can be addressed to Ms. Fine at 701-328-3722 or Brent Brannan at 701-425-1237.