UTAH DIVISION OF WATER QUALITY
195 North 1950 West PO Box 144870
Salt Lake City, Utah 84114-4870

Willard Bay Project Proposal Form

Applicant Name: Sustainable Wastes-to-Bioproducts Engineering Center (SWBEC) at USU

Project Title: Nutrient Management for Water Quality Enhancement using the Rotating Algae Biofilm Reactor at Sites in the Northern Utah/ Willard Bay Area

Agency Name: Utah State University

Mailing Address: 4105 Old Main Hill; Logan; UT; 84322-4105

Phone: (435) 797 – 3549 **E-mail:** ron.sims@usu.edu

Academic

1. Estimated Project Costs ($):

Labor	$364,069
Materials	$131,716
Equipment	$120,000
Administration	$210,729
Miscellaneous	$67,974 (travel, subcontract)
SUB-TOTAL	$683,759
F&A @ 39%	See administration costs
TOTAL	$894,488

Other sources of project funding ($):

Utah Water Research Laboratory:	$70,000
RARB equipment owned by SWBEC/USTAR:	$100,000
TOTAL OTHER SOURCES:	$170,000

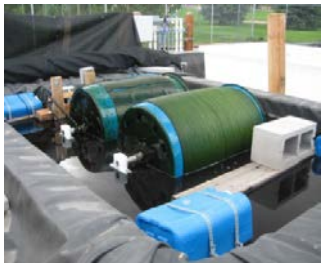
Total project costs including other sources of funding: $1,064,488
(Other sources amount is 19% of the requested amount of $894,488)

2. Describe the purpose and need of the project:

The **purpose** of the proposed project is to apply nutrient removal technology developed through USU's Sustainable Waste-to-Bioproducts Engineering Center (SWBEC) to protect the water quality of natural systems of the state of Utah that include Willard Bay State Park and ecosystems in proximity. The Rotating Algae Biofilm Reactor (RABR) removes nutrients, including phosphorus and nitrogen, by cultivating algae on the surface of a bioreactor, where the algae can be harvested and removed as biomass for use as soil fertilizer, for augmenting biogas from anaerobic digestion, and for production of high-value bioproducts including bioplastic materials. Therefore the purpose of the proposed project is to implement nutrient removal technology developed by SWBEC to protect and enhance waterways and environmental areas that may have been affected or related to the March 2013 release of diesel in the Willard Bay State Park.

SWBEC RABR manufactured by WesTech-Inc. (SLC)

RABR construction with irrigation materials and greenhouse (winter)



Pontoon RABR for lake and reservoir surfaces

The **need** for the project involves directly addressing the need for nutrient management that will protect beneficial uses and sustain natural resources of the Willard Bay and proximity areas, and the Great Salt Lake and its associated wetlands. Studies conducted by the Utah Division of Water Quality indicated that discharge from the Regional Wastewater Treatment Plant, which began discharge to Willard Spur on March 7, 2011, had the potential to reach levels similar to other Great Salt Lake wetlands where nuisance algae blooms and deleterious effects on submerged aquatic vegetation have been observed (www.willardspur.utah.gov, 2014). In addition to UDEQ working with the cities of Willard and Perry to implement phosphorus reductions within six months of operation of the plant, the DWQ also entered into a Memorandum of Understanding (MOU) with the Bear River Migratory Bird Refuge, such that DWQ agreed to conduct water studies to ensure the long-term protection of Willard Spur's designated uses. The proposed project will address the needs identified above.

2.1 Approach to organization of the proposed project

The project consists of two phases. Phase 1, through February 28, 2015, involves characterizing the constituents of concern at the sites identified in this proposal and at other sites of interest to the UDWQ, and building the RBARs. One RABR will be implemented at the Plain City waste treatment plant. Phase 2 will occur until December 31, 2017, and involves the implementation of RABRs at the remaining sites, and will include pontoon or floating RARBs in Willard Bay Sate Park and stationary anchored RABRs at other wastewater treatment plants.

3. Estimated time frame of the project with significant milestones (Note: Project must be completed with final reports filed by January 1, 2018):

Task	June, 2014	Dec, 2014	June, 2015	Dec, 2015	June, 2016	Dec, 2016	June, 2017
Nutrient characterizationat various sites	■						
RABR construction	■						
Implement technology and evaluate first year seasonal performance of nutrient uptake based on biomass produced	■	■					
Make changes to technology design and operation, and implement, to improve technology performance based on Year 1 lessons			■	■			
Scale up, implement, and evaluate technology for removal of nutrients on a larger scale as determined in consultation with Project Officer					■	■	
Evaluate performance of scale-up system							■
Prepare and submit final report draft; revise draft based on UDEQ comments. January 1, 2018: submit final report to UDEQ							■

Milestones:
Year 1 (June 1, 2014 – May 31, 2015)
Nutrient chracterization at various sites
Construction of RABRs
December 1 – 1st progress report to Project Officer
April – Presentation at annual WEAU meeting

Year 2 (June 1, 2015 – May 31, 2016):
June 1 – 2nd progress report
December 1 – 3rd progress report
April – Presentation at annual WEAU meeting

Year 3 (June 1, 2016 – May 31, 2017):
June 1 – 4th progress report
December 1 – 5th progress report
April – Presentation at annual WEAU meeting

Year 4 (June 1, 2016 – January 1, 2018):
June 1 – 6th progress report
September 1 – submit final report draft
January 1, 2018 – submit final report to UDEQ/DWQ

4. Describe the location of the project with attached location map, including details on the total area that will be directly enhanced by the project:

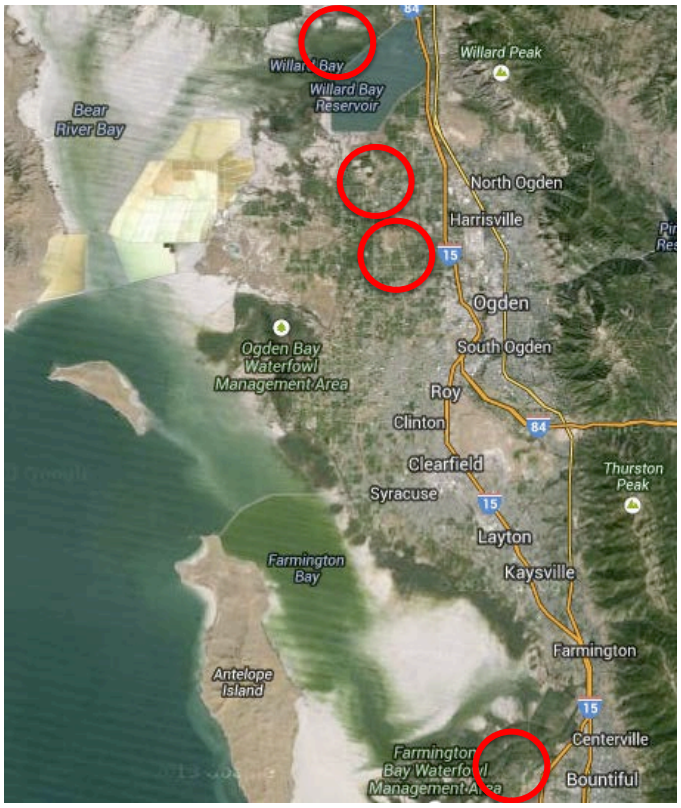
Locations of the project that will improve water quality include the general area of Willard Bay State Park, the Plain City wastewater treatment plant that discharges into the Wildlife Management Areas, the Central Weber wastewater treatment plant, and South Davis Sewer District near Farmington Bay. Therefore the area for implementation and impact spans from Willard Bay southward to Farmington Bay. Effluents from the wastewater treatment plants provide point sources where nutrient reduction, using the RABR technology, can be evaluated and demonstrated that will affect the receiving water systems in areas in proximity to Willard Bay. Nutrient removal within Willard Bay State Park area (WBSP) will be determined by directly measuring the nutrient content of the algae biomass that is harvested from the RABR.

A map showing the locations of the sites for implementing the RABR technology is shown below. In addition, the photographs of the Plain City plant and South Davis Sewer District's North plant shows the areas where the RABR technology will be implemented near the effluent and discharge. The Logan Lagoons plant (center) will be used for mechanical testing and construction. Wastewater treated by the RABR will be cycled back through the plant.

D. Wayment, R. Sims, and T. Miller at South Davis Sewer District North Plant standing where RABR will be placed

Logan City Lagoons area used for mechanical testing of RABR components and modifications

Plain City wastewater treatment plant – site for RABR implementation



Map showing sites where the RABR technology will be implemented.

5. Describe how the project will specifically enhance and protect waterways affected by the Willard Bay diesel release and improve the conditions of one or more of the following: wildlife, habitat, natural vegetation, water quality or emergency response.

The project will enhance and protect waters in Willard Bay and proximity areas by directly addressing water quality. Specifically, the project will demonstrate nutrient removal through uptake into naturally occurring algae and accumulation of biomass, followed by management of the biomass through harvesting and using the biomass as feedstock for high value bioproducts. The RABR allows algae to grow on nutrients present within the water in such a way as to contain and capture the algae as it grows, and then remove the algae from the water through simple mechanical scraping.

6. Describe project's connectivity to other natural areas or projects that further enhance wildlife, habitat, natural vegetation, water quality or emergency response.

The proposed project is connected to the natural areas extending from Willard Bay southward to the Farmington Bay area, and enhances exiting nutrient removal systems in the wastewater treatment plants identified. The RABR technology is easily integrated with wastewater treatment systems in such a way as to upgrade those systems for specific removal of phosphorus and nitrogen nutrients and pharmaceuticals that will enhance the receiver systems in those areas. The project's connectivity in the region further enhances water quality in the entire region and also enhances natural vegetation and wildlife by preventing algal eutrophication events from shading and preventing the growth of natural vegetation.

7. Describe any additional social benefits of implementing this project.

High water quality in project areas, as demonstrated by the lack of the presence and negative environmental impact of high concentrations of algae cells, provides additional social benefits. High water quality areas are attractive to people considering social outdoor activities and family gatherings, as well as the enjoyment of water-related activities with friends and colleagues. Positive impacts on dignity, amenity value, cleanliness, and enjoyment are all associated with positive social benefits of the proposed project.

8. Project plans and details, including rights to work on specified piece of land.

The proposed project will involve the installation of the nutrient removal system referred to as the Rotating Algae Biofilm Reactor (RABR) in the wastewater treatment plants located at Plain City, Central Weber, and South Davis Sewer District, and in the Willard Bay State Park (see attached letters of permission and support). The RABR is a technology developed by SWBEC and supported by the Utah Water Research Laboratory (UWRL), which is providing an additional source of funding for this project for water quality enhancement in Utah, that utilizes the nutrients phosphorus and nitrogen in water to grow algae as a biofilm on a growth surface, where the biofilm can be easily removed. The RABR has been developed over a five-year period at the Logan City Wastewater Lagoons plant for the treatment of municipal and industrial wastewater (1, 2). Phosphorus concentrations less than 1 mg/L and total nitrogen concentrations less than 1 mg/L during summer operation have been achieved, and during winter operations the RABRs have been operated in greenhouse conditions employing transparent plastic covers to increase the temperature of the system.

The harvested algae biomass has been transformed into valuable bioproducts, including bioplastic materials, fish feed, cattle feed, liquid transportation fuels, and biomethane for heat, power, and electricity using biological and chemical processes that were developed by SWBEC (3). Development of the RABR and the processes and production of bioproducts has been supported by the Utah Science Technology and Research (USTAR) initiative and the (WRL.

9. Describe your experience in implementing projects of similar scope and magnitude.

Drs. Sims and Miller, and Mr. Issa Hamud have been developing the RABR technology and associated bioproducts for five years at the Logan Lagoons Wastewater Treatment plant through grants from the U.S. Department of Energy and the Utah Water Research Laboratory. More recently, SWBEC was created in 2010 as part of the state of Utah Science Technology and Research (USTAR) initiative, as the collaboration between Utah State University's Biological Engineering Department and the City of Logan Environmental Department, which became the first "Public-Public Partnership" that was officially approved by the state of Utah Commissioner of Higher Education. The project at the Logan Lagoons encompasses 460 acres of Lagoons and 10 adjoining acres developed as the "Algae Testing and Evaluation" (AT&E) Facility. In addition, facilities were developed at the USU Innovation Campus that include an Algae Process and Products (APP) Facility and a fermentation facility, both of which are involved in bioproducts production from algae. Scope and magnitude of the project in time (5 years), budget (over $2.5 Million), and locations and space (multiple sites) are equivalent or exceed the scope and magnitude of the proposed project.

Dr. Sims has also been the Principal Investigator of environmental projects for the Electric Power Research Institute (Palo Alto, California), American Petroleum Institute, and the U.S. Environmental Protection Agency that have involved sampling multiple surface water,

groundwater, and soil sites, implementing rehabilitation and remediation technologies, addressing nutrients, and working with multiple agencies, property owners, and citizen interests over the last 25 years, with budget magnitudes over $1 Million for each project. Dr. Sims has included a copy of his resume that includes his experience in directing and implementing projects or similar scopes and magnitude.

10. Describe how ongoing maintenance of the project will be funded and carried out.

The South Davis Sewer District specifically states that the site will provide facilities to operate and maintain the project. The plant has extensive fabrication and maintenance facilities. Also, there is a budget item for maintenance and fabrication ($20,160). In addition, Logan City Mayor Craig Petersen is allowing the development and ongoing maintenance of the RABR technology to occur at the site of the Logan City Wastewater Treatment Plant and the Algae Testing & Evaluation Facility, which has been used for this purpose for over five years, so this site also will be used. With these facilities at the north and south ends of the area of interest, SWBEC will be able to address ongoing maintenance.

For routine maintenance of RABR parts, including cloth, rope, motors, pumps, etc., Drs. Miller and Sims will train the graduate and undergraduate students, and make these routine maintenance activities part of their educational responsibilities. Remote sensors and a computer will be placed at the test sites so that they can be monitored at USU, especially in the Willard Bay area. SWBEC students and staff will have scheduled visits to the sites at two-week intervals for routine monitoring, maintenance, and sampling activities.

11. List consultants or agency partners that have participated in project development:

Name/Company	Address	Phone
Utah Water Research Laboratory	1600 East Canyon Road, Logan	435-797-3155
Logan City	290 North 100 West	435-716-9002
Plain City	4160 West 2200 North	801-731-4908
South Davis Sewer District	1800 West 1200 North West Bountiful	801-295-3469
Central Weber Sewer District	2618 West Pioneer Rd., Ogden	801-731-3011
Willard Bay State Park	900 West 650 North, Willard	435-734-9494
WesTech-Inc.	3665 South West Temple	801-265-1000

Signature of Applicant Ronald C. Sims Date: 5/5/2014

References (additional relevant references can be accessed at website: http://swbec.usu.edu)

1. Christenson, L. B. & Sims, R. C. Rotating algal biofilm reactor and spool harvester for wastewater treatment with biofuels by-products. Biotech and Bioengi 109, 1674–1684 (2012).
2. Bernstein, H. C. et al, including C. Miller and R. Sims. Direct measurement and characterization of active photosynthesis zones inside wastewater remediating and biofuel producing microalgal biofilms. Bioresour. Technol. 156, 206–215 (2014).
3. Sathish, A., Glaittli, K., Sims, R. C. & Miller, C. D. Algae Biomass Based Media for Poly(3-hydroxybutyrate) (PHB) Production by Escherichia coli. J. Polym. Environ. 1–6 doi:10.1007/s10924-014-0647-x

PLAIN CITY
Utah

April 30, 2014

Ronald C. Sims, Co-Director
Sustainable Waste-to-Bioproducts Engineering Center (SWBEC)

RE: Permission & Support Concerning Willard Bay Settlement Nutrient Removal Technology

Dear Mr. Sims:

Plain City is pleased to have the opportunity to participate with SWBEC in the proposed project to the Division of Water Quality addressing nutrient removal, including phosphorus and nitrogen, from waters of the State of Utah.

Plain City gives permission to SWBEC to locate the nutrient removal technology referred to as the Rotating Algae Biofilm Reactor (RABR) on the site of the Plain City Wastewater Treatment Plant. Plain City also gives permission to SWBEC to test for nutrient removal from the wastewater and for harvesting biomass that accumulates the nutrients for nutrient recovery. The harvested biomass, with associated nutrients, will be removed and further processed into value bioproducts by SWBEC, and will not reenter or be reintroduced into the wastewater or receiving system.

Questions regarding Plain City participation may be addressed to me.

Sincerely,

Don Weston-DH

Don Weston
Plain City
Wastewater Treatment

Bruce Higley

Bruce Higley
Plain City
Mayor

4160 W. 2200 N. • Plain City, Utah 84404 • (801) 731-4908 • Fax: (801) 731-8619

Central Weber Sewer Improvement District

May 5, 2014

Dr. Ronald C. Sims, Co-Director
Sustainable Waste-to-Bioproducts Engineering Center
4105 Old Main Hill
Logan, UT 84322-4105

Re: Support of Rotating Algae Biofilm Reactor Project

Dear Dr. Sims:

The Central Weber Sewer Improvement District (Central Weber) is pleased to have the opportunity to participate with Sustainable Waste-to-Bioproducts Engineering Center (SWBEC) in the proposed project to the Division of Water Quality addressing nutrient removal, including phosphorus and nitrogen, from waters of the State of Utah.

Central Weber is willing to allow SWBEC to locate the nutrient removal technology referred to as the Rotating Algae Biofilm Reactor (RABR) on the site of the Central Weber Treatment Plant and permission for SWBEC to test for nutrient removal from the wastewater and for harvesting the biomass that accumulates the nutrients for nutrient recovery. The harvested biomass, with associated nutrients, will be removed from the site by SWBEC personnel and further processed into bioproducts by SWBEC, and will not reenter or be reintroduced into the wastewater or receiving system. Effluent from the RABR technology will be cycled back to the plant.

SWBEC will accept full responsibility for the implementation, monitoring, maintenance, repair, and measurements of nutrient removal, and costs concerning the RABR technology. Central Weber staff will not be asked to assist or involve personnel in this project, except to understand the project, provide permission to access the site, and allow the implementation of the RABR technology at the effluent of the plant.

Following award of the project by the Utah Division of Water Quality and prior to implementation, I request a meeting to discuss the project specifics with regard to implementation and impact of the project on the Central Weber Treatment Plant.

Sincerely,

CENTRAL WEBER SEWER IMPROVEMENT DISTRICT

Lance L Wood

Lance L Wood, P.E.
General Manager

2618 West Pioneer Road, Ogden, Utah 84404 • Telephone (801) 731-3011 Fax (801) 731-0481

South Davis Sewer District

Mailing Address:
PO Box 140111 • Salt Lake City, Utah 84114-0111

Office Location:
1800 West 1200 North • West Bountiful, Utah 84087

Phone (801) 295-3469 • *Fax* (801) 295-3486

30 April 2014

Ronald Sims, PhD, Professor of Biological Engineering
Sustainable Waste-To-Bioproducts Engineering Center (SWBEC)
4100 Old Main Hill
Logan, Utah 84322-4100

RE: Rotating Algal Biofilm Reactor (RABR) Research Project

Dear Dr. Sims:

The District is pleased to have the opportunity to participate with SWBEC in its on-going research into its RABR. The District may be faced with nutrient limits to its effluent in the future. There are not a lot of good options for trickling filter plants to achieve biological removal. The District also supports the efforts to view our mission as resource recovery.

The District can support this research project with space within our existing facilities to operate and maintain the project. The District will supply electrical power, utility water, lab space and security within the District's fenced site. We can supply raw wastewater, primary effluent, secondary effluent or final effluent as needed. Discharge from the research project can be cycled back through the plant. Arrangements can be made for support from the District's extensive fabrication and maintenance facilities.

Again, the District appreciates the opportunity to assist development of this promising technology and to make a contribution to our industry. Any questions regarding District participation may be addressed to me.

Very sincerely,

Dal D. Wayment, P.E.
General Manager

DDW/sm

Mayor: H. Craig Petersen

LOGAN
CITY UNITED IN SERVICE
ESTABLISHED 1866

April 28, 2014

To Whom It May Concern:

Logan City is pleased to support the proposal by Utah State University's Sustainable Waste-to-Bioproducts Engineering Center (SWBEC) for nutrient removal and management by giving permission to conduct project activity on property owned by Logan City at the Logan Wastewater Treatment Plant. In addition, in-kind support by Logan City Environmental Department staff, including Mr. Tim Lindsay, will be made available to the project.

Specific activities to be conducted at the Logan Lagoons in support of the proposed project include construction, assembly, and mechanical testing of the technology-based process referred to as the Rotating Algae Biofilm Reactor (RABR) prior to transport to the sites of implementation. Also, the Logan City site can be used for building and testing modifications of the RABR design and/or operation to improve nutrient removal at the test sites.

Logan City is the proud co-founder of SWBEC, and has been working with Utah State University for more than four years in supporting the development and testing of the RABR. Logan City has provided financial support, facilities, and in-kind support using staff of the Environmental Department in the development and testing of the RABR technology at the Logan Lagoons Wastewater Treatment Plant.

Sincerely,

H. Craig Petersen
Mayor

290 North 100 West Logan, Utah 84321 • ph: 435.716.9002 • fx: 435.716.9003 www.loganutah.org

WesTech
Process Equipment. Process Driven.

Dr. Ronald Sims
Co-Director, Sustainable Wastes-to-Bioproducts Engineering Center
Utah State University

May 2, 2014

Dear Dr. Sims:

WesTech Engineering, Inc., headquartered in Salt Lake City, Utah, is pleased to collaborate with the Sustainable Wastes-to-Bioproducts Engineering Center (SWBEC) concerning the manufacture of the Rotating Algae Biofilm Reactor (RABR) as part of the response of SWBEC to the "Willard Bay Settlement Request for Proposals" issued by the UDEQ. WesTech has a history of collaboration with SWBEC specifically with regard to the previous manufacture of the RABR in 2011 that was implemented at the Logan City Wastewater Treatment Plant.

If the proposed project is awarded to SWBEC, then WesTech will work with SWBEC to define a more precise scope of work, budget, and timeline for the manufacturer of two RABR units. A current estimate for the manufacture of two units is $120,000. This estimate is subject to modification depending on the specific sites of implementation and operation, requirements for electronic controls, and water quality parameters that will be monitored.

WesTech appreciates the opportunity to work with SWBEC in service to the state of Utah concerning enhancing water quality in waters of the state.

Sincerely,

Rex R. Plaizier, CEO

John Whitehead,

If SWBEC is awarded the project, I will contact Mr. James Morgan, General Manager of the Willard Bay State Park for access to the site. He has declined to provide a letter of support due to multiple competing requests for letters of support for the UDEQ/WQD solicitation, as he explains in the message below. There will not be competing letters of request if SWBEC is awarded the project.

Sincerely,
Ron Sims

Ronald C. Sims
SWBEC Co-Director
Utah State University
Logan, UT 84322-4105

From: Ronald Sims [mailto:ronaldsims1@gmail.com]
Sent: Monday, May 05, 2014 11:15 AM
To: James Morgan
Subject: Re: Letter of support

Hello James Morgan,

Thank you for considering our request from Utah State University for a letter of support. If USU is awarded the project, then we will approach you for access to Willard Bay so that we can assist the state of Utah with water quality enhancement.

Sincerely,
Ron Sims

Ronald C. Sims
SWBEC Co-Director
USU
Logan, UT 84322-4105

Sent from my iPhone

On May 5, 2014, at 10:29 AM, James Morgan <jamesmorgan@utah.gov> wrote:

After some consideration, I am sorry to inform you that we will not be able to give a letter of support for your proposal to DEQ. We have had a number of people contact us for support and in an effort to be fair to all we have decided not to issue any letters of support for projects. I apologize for any inconvenience this may have caused. If you have any questions please feel free to contact me.

James Morgan
Park Manager
Willard Bay State Park
Office (435) 734-9494

Utah State University

SWBEC
Sustainable Waste-to-Bioproducts Engineering Center

LOGAN CITY UNITED IN SERVICE ENVIRONMENTAL DEPARTMENT

BIOLOGICAL ENGINEERING

Mission: To generate technologies, patents, and publications that promote sustainability, environmental protection, and the generation of valuable bioproducts from wastes

Sustainable Waste-to-Bioproducts Engineering Center:

Bioenergy Analytical Laboratory

Bldg 620

Algae Products Processing Facility

APP

Algae Test & Evaluation Facility

AT&E

City of Logan Wastewater Treatment Facility

Logan WWTP

Dr. Ronald Sims: Co-Director

Mr. Issa Humud: Co-Director

- 4 Physical facilities and sites shown above
- 4 Center partners
  - USU BioEnergy Center
  - Synthetic BioProducts Center
  - Utah Water Research Laboratory
  - WesTech (industry)
- 8 current projects
  - Algal biofilm wastewater treatment
  - Developing organic coagulants for algae harvesting
  - Wet lipid extraction procedure for biodiesel production
  - Acetone, butanol, and ethanol production from algal biomass
  - Bioplastic (PHB) production from algae based media
  - High value bioproducts from cyanobacteria grown in industrial wastewater
  - Fish feed based on algae protein
  - Ruminant feed based on algae protein and omega fatty acids
- 6 patent applications
- 18 publications

APP outdoor test raceways

For More Information:

- swbec.usu.edu →

RONALD C. SIMS
Professor and Head, Department of Biological Engineering
College of Engineering
Utah State University, Logan, Utah
President
Institute of Biological Engineering, USA

Dated: 09/30/2013

Summary: 191 Publications in 30 years with funding at $11 Million total (not including state of Utah USTAR initiative) in Biological Engineering and Environmental Engineering

Education:

PhD	Biological and Agricultural Engineering, North Carolina State University, Raleigh, NC, 1982
MS	Environmental Engineering, Washington State University, Pullman, WA, 1977
MS	Environmental Biology & Chemistry, School of Public Health, Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill, NC 1972
BS	Biology (Chemistry minor), University of Dayton, Dayton, OH, 1970

Experience:

4/10-present	Head, Department of Biological Engineering (BE), USU
9/03-3/10	Head, Department of Biological & Irrigation Engineering (BIE), USU
6/02-9/09	University Programs Coordinator for DOE/ Inland Northwest Research Alliance (INRA)
1996-2003	Director, Utah Water Research Laboratory, and Professor, Department of Civil and Environmental Engineering (CEE Department)
1988-1996	Head, Division of Environmental Engineering, and Professor, CEE Department and Professor, Interdisciplinary Program in Toxicology
1988-1989	Visiting Engineer with the U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory, Ada, OK
1988-1990	Head, Division of Environmental Engineering and Associate Professor, CEE Department, and Associate Professor, Interdisciplinary Program in Toxicology
1984-1985	Head, Division of Environmental Engineering and Research Associate Professor, CEE Department and Interdisciplinary Program in Toxicology
1983-1984	Head, Division of Environmental Engineering and Research Assistant Professor, CEE Department and Utah Water Research Laboratory
1982-1983	Research Assistant Professor, CEE Department and joint appointment with the Utah Water Research Laboratory, Utah State University, Logan, UT
1977-1979	Environmental Engineer, Process Engineering Department, Research Triangle Institute, Research Triangle Park, NC
1973-1975	Supervisor, Environmental Control Laboratory, Bayer AG, Verona Dyestuffs Division of Bayer Inc., Mobay Chemical Corporation, Charleston, SC
1972-1973	Director, International Program in Environmental Aspects of Industrial Development, University of North Carolina at Chapel Hill, Chapel Hill, NC

Administrative Experience:

4/10-present	Head, Department of Biological Engineering (BE), USU
9/03-3/10	Head, Department of Biological & Irrigation (BIE) Engineering, USU
11/96-8/03	Director, Utah Water Research Laboratory, Utah State University, Logan, UT
1984-1996	Head, Division of Environmental Engineering, Civil and Environmental Engineering Department, Utah State University, Logan, UT
1973-1975	Supervisor, Environmental Control Laboratory, Verona Dyestuffs Division, Mobay Chemical Corporation, Charleston, SC
1972-1973	Director, International Program in Environmental Aspects of Industrial Development, University of North Carolina at Chapel Hill, Chapel Hill, NC

USU Academic Programs Teaching (CEE, BIE, and BE Departments)
1982-present: Utah State University Faculty - Undergraduate courses in Biochemical Engineering, Downstream Processes, Water and Wastewater Treatment Unit Operations and Unit Processes, Agricultural Waste Management, and Land Treatment of Wastes; Graduate courses in Biochemical Engineering, Biophotonics, Downstream Processes, Biological Process Engineering, Biological Waste Treatment Processing, Industrial Waste Treatment, and Soil-based Hazardous Waste Management.

Major Research Projects Awarded: (PI or Co-PI) $10.2M - **not** including USTAR $. US Government competitive funding shown **in bold**; industry & private competitive funding shown underlined.

2012 (12 Mo.) Scale-Up of Algae Bioproducts Production. $270,000. USTAR/SBC/USU (PI)
2012 (12 Mo.) Scale-Up of Bioplastics and Spider Silt Production. $519,360. USTAR/SBC/USU (PI)
2011-2012 Algae Testing and Evaluation for Logan Lagoons Upgrade. $25,000. Carollo Engineers, Salt Lake City, UT (Ron Sims PI).
2008-2012 Synthetic Biomanufacturing Center. State of Utah (USTAR) Initiative. $7.3 Million total. (PI H. Scott Hinton, Co-PIs: Ron Sims, Daryll DeWald, and Jon Takemoto).
2008-2013 Biological Phosphorus Removal Combined with Bioenergy Production Research at the City of Logan Lagoons. $491,420. David Stevens(PI) and Ronald Sims (Co:PI). Environmental Department, City of Logan, Utah (10/1/08-9/30/2010)
2007-2011 Biofuels and Bioproducts Production from Microalgae. State of Utah (USTAR) Initiative. $6.5 Million total ($1.6 Million-Sims). (1/1/2007-21/31/2011)
2006-2008 Biotechnology & Bioremediation Initiative. Inland Northwest Research Alliance (INRA). $250,000 (7/1/06-6/30/08)
2006-2008 FTIR Spectrometer Microscope System for Bioremediation**. U.S. Department of Defense**, U.S. Army Research Office. $160,000 (6/1/06-5/31/08)
2005-2008 Genomic Sequencing of Polycyclic Aromatic Hydrocarbon Degrading Non-Pathogenic Mycobacteria. Miller, C.D., A.J. Anderson, and R.C. Sims **(U.S. DOE/ Joint Genome Institute**, $1.5 Million value with project conducted through DOE/JGI)
2004-2007 Are Plant Root-mycobacterium Interactions Beneficial in Remediation of Polyaromatic Hydrocarbons (PAH)? Anderson, A.J., C.D. Miller and R.C.Sims **(National Science Foundation**, $473,000)
2003-2009 Evaluating Hyporheic Zone Biodegradation/Attenuation of MTBE & Other Oxygenates. R.C. Sims (American Petroleum Institute, $95,866)
2001-2005 Removal of Pharmaceutical Chemicals in Drinking Water Treatment Systems (Pfizer Global Research and Development, $150,000)
2000-2005 Fate of Surfactants in Land Treatment Plant-Soil Systems (Alkyl Phenol Ethoxylates Research Council (APERC), $180,000)
1999-2009 MTBE and Petroleum Toxicity and Biodegradation in Contaminated Soils [American Petroleum Institute, $64,134)
1998-2003 Utah Training Center for On-Site Wastewater Treatment & Reuse. [**U.S. EPA**, Kennecott Copper Corporation, State of Utah Department of Environmental Quality, $250,000]
1995-2002 Field Scale Relationship of PAH Parent Compound Disappearance to Humification, Mineralization, Leaching, and Volatilization of Transformation Intermediates **(U.S. Environmental Protection Agency** Hazardous Substance Research Center, $317,800)
1995-1999 Revegetation of Exploration and Production Sites (Exxon Production and Exploration Corporation, $60,000)
1994-1998 Guidance for the Use of Prepared Bed Land Treatment as a Bioremedial Technology for PAH and other chemicals (**U.S. EPA**, $180, 391)
1994-1996 Vegetation Assisted Remediation of Metal Contaminated Soils for Protection of Public Health (**U.S. Geological Survey**, Washington, DC, $41,000)
1994-1996 Libby, Montana Superfund Site: Prepared-Bed Bioremediation of PAH and PCP in Buried Lifts & Oxygen Concentration in Soil Gas (**U.S. EPA**, $150,000)
1992 Bioengineering for Water Cleanup: State-of-the-Art Assessment (National Geographic Society, Washington, DC, $41,771)
1991-1996 Treatability Studies for Subsurface Remedial Actions (Robert S. Kerr Environmental Research Laboratory, **U.S. Environmental Protection Agency**, Ada, OK, $320,000)

1990-1996	Environmental Behavior of Organic Substances (PAH and PCP) in Soil and Groundwater (Electric Power Research Institute, Palo Alto, CA, $1.9 million)
1991	Phytoremediation for Treatment of PAH Contaminated Soil (Union Carbide Corporation, Charleston, WV and Dynamac Corp., Rockville, MD, ($80,000)
1989-1991	Evaluation of Mechanisms of Microbial Alteration and Humification of PAHs for Water Quality Management **(U.S. Geological Survey**, Washington, DC, $272,000)
1989-1990	Remedial Action Assessment System for In Situ Remediation of Contaminated Soil: Aspects of Oxygen-Limited Biodegradation (Battelle Northwest, Richland, WA, $25,000)
1989-1991	Environmental Contaminant Property Estimation Using Quantitative Structure Activity Relationships (QSARs) (**Department of Defense**, Washington, DC, $ 285,000)
1988-1992	Biological Hazardous Waste Management of PAH Contaminated Soil Using *Phanerochaete Chrysosporium*: Bioreactor Engineering Design and Operation **(National Institute of Environmental Health Sciences**, Research Triangle Park, NC, $100,000)
1988-1991	Soil Transport/Fate Data Base Design/ Development (Robert S. Kerr Environmental Research Laboratory, **U.S. Environmental Protection Agency**, Ada, OK, $46,000)
1988	Capital Facilities Needs for Water Treatment Plants in the State of Utah: 1989-2008 (State of Utah Department of Health, Salt Lake City, UT, $10,000)
1988-1989	Evaluation of the Effect of Deep-Rooted Grasses on Biological Degradation of Polynuclear Aromatic Hydrocarbons (PAHs) in Unsaturated Soil (Union Carbide Corporation, Charleston, WV, $15,000)
1987-1990	Evaluation of Cooxidation Mechanisms in the Removal of Polynuclear Aromatic Hydrocarbons from Vadose Zone Soil: In Situ Treatment of Hazardous Waste (Office of Research and Development, Exploratory Research Program**, U. S. Environmental Protection Agency,** Washington, DC, $222,000)
1987-1989	$280,00Soil Treatment Decision-Model Development and Field Evaluation (Robert S. Kerr Environmental Research Laboratory**, U.S.EPA** , Ada, OK, $90,000)
1987-1988	Soil Treatability Studies for PAHs for Land Treatment of Koch Refinery Waste, Minnesota (**Koch Refining Co.,** MN, $115,000)
1987-1989	Laboratory and Field Evaluation of Mechanisms of Particle Removal in Slow Rate Sand Filtration (**Rocky Mountain Energy Corporation**, Denver, CO, $9,000)
1986-1989	Support Studies for Land Treatment Decision-Model Development/Verification and Input Data Generation (R. S. Kerr Environmental Research Laboratory**, U.S. Environmental Protection Agency**, Ada, OK, $249,000)
1986-1989	Use of Structure-Activity Relationships as an Aid in Modeling the Subsurface Transport of Organic Contaminants (**U.S. Geological Survey**, Washington, DC, $80,000)
1985-1986	Permit Guidance Manual for Land Treatment Demonstrations for Hazardous Wastes (Office of Solid Waste, **U.S.EPA**, Washington, DC, $140,000)
1985-1986	Treatment Evaluation of the Immobilization of Metals Associated with Industrial Wastes in Soil Systems (Region 8, **U.S. Environmental Protection Agency**, Denver, CO, $30,000)
1985-1986	Research Studies for Behavior of Petroleum Organic Chemicals in Unsaturated Soil – Land Treatment Systems (**American Petroleum Institute**, Washington, DC, $200,000)
1984-1986	Protection of Groundwater by Immobilization of Hazardous Metals Associated with Industrial Wastes in Soil **(U.S. Geological Survey**, Washington, DC, $20,500)
1984-1988	Laboratory Treatability Studies and Field Scale Biological Remediation of Coal-Gasification Residues (PAHs) in Soil (**Thunder Basin Coal Company**, WY, $80,000)
1983-1987	Waste-Soil Treatability Studies for Four Complex Industrial Wastes: Two Petroleum and Two Wood Preservative Wastes (Robert S. Kerr Environmental Research Laboratory, **U.S. Environmental Protection Agency**, Ada, OK, $380,000)
1977-1979	Potable Water Treatment by Clinoptilolite Filtration (**International Minerals and Chemical Corporation**, Terre Haute, IN, $ 40,000)
1983-1984	Comparison of Direct Filtration and Conventional Water Treatment Systems for Removal of Pollutants from Source Waters (**U.S. Geological Survey**, Washington, DC, $40,000)

Major Research Projects Awarded (Continued): [Principal or Co-Principal Investigator]

1982-1984 Evaluation of the Mound System of On-Site Waste Disposal for Use in Utah (**State of Utah Mineral Lease Funds**, Utah Water Research Laboratory, Logan, UT, $42,000)

1982-1984 In Situ Treatment Techniques Applicable to Large Quantities of Hazardous Waste Contaminated Soil (Risk Reduction Research Laboratory**, U.S. Environmental Protection Agency**, Cincinnati, OH, $ 92,000)

1981-1984 Use of Slow Rate Sand Filtration for Providing Drinking Water for Small Communities (**State of Utah Mineral Lease Funds**, Utah Water Research Laboratory, $60,000)

Patent: Process for Remediating Soils Contaminated with Polycyclic Aromatic Hydrocarbons and Chlorinated Phenols. U.S. Patent Number: 6,069,292. Date of Patent: May 30, 2000. Inventors: Ishwar P. Murarka, Benjamin J. Mason, and Ronald C. Sims.

Patents applied for:

Biomass Production Using a Rotating Bioreactor and Spool Harvester. Inventors: Logan Christenson and R.C. Sims. Provisional Patent No. 61310360 (3/4/2010). ***ABSTRACT*** *: The invention involves an apparatus that alternately exposes a biofilm growth surface to liquid media and air as it rotates. The substratum may be wound around the reactor as a rope or belt, and a spool harvesting method may be applied to harvest and reload the reactor.*

A Novel Use of the Phasin Protein for the Purification of Polyhydroxyalkanoates (PHAs). Inventors: Charles Miller, Elisabeth Linton, and R.C. Sims. (Provisional Patent filed 10/19/2009). **Abstract** Polyhydroxyalkanoates (PHAs) are non-petrochemically-derived biodegradable plastics. Polyhydroxybutyrate (PHB), the most common PHA, is accumulated by a variety of microorganisms and has comparable properties to polypropylene. Use of PHBs is limited by purification costs, which are mostly associated with bioplastic purification from the bacteria. It is estimated that extraction and purification costs of bioplastics represent as much as 50% of the total production cost. Polymer secretion would simplify recovery by eliminating the need for chemical or mechanical disruption. We have developed a system whereby a PHA specific binding protein is fused to a secretion signal, allowing for the bioplastic to be secreted out of the bacterial cell or translocated to the periplasm. This technology will reduce purification costs for bioplastic production, as well as allowing for continuous production of bioplastics since the bacteria will not need to be destroyed in any downstream processing.

Recovery of Intracellular Algae and Other Microbial Lipids Using a Single Step Reactive-Extraction and Separation. 2/2010. Inventors: S. Viamajala, D. Nelson, and R.C. Sims. (Provisional Patent Invention Id: D09033). This *in-situ* transesterification method combines extraction and transesterification steps into a single step and thus lowers solvent use and processing time.

Publications in Refereed Journals: 82

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Effect of Moisture on In Situ Transeserification of Microalgae for Biodiesel Production. 2013. Journal of Chemical Technology & Biotechnology. http://onlinelibrary.wiley.com/doi/10.1002/jctb.4125/abstract [Sathish, A., B. Smith, & R.C. Sims]

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Transesterification of Intracellular Lipids Using a Single Step Extractive Reaction. . Institute of Biological Engineering 15th Annual Conference. Cambridge, MA. (March 4-6) 2010. (D. Nelson, S. Viamajala, and R.C. Sims)

Optimization of Controlled Anaerobic Digestion of Algae. **Poster**. Institute of Biological Engineering 15th Annual Conference. Cambridge, MA. (March 4-6) 2010. (K. Sims, S. Dustin, C. Hansen, R.C. Sims, C. Miller, B. Wood, and I. Hamud)

Reactor Design for Anaerobic Digestion of Algae. **Poster** Institute of Biological Engineering 15th Annual Conference. Cambridge, MA. (March 4-6) 2010. B. Boissevain, S. Dustin, C. Hansen, I. Hamud, K. Sims, B. Wood, and R.C. Sims).

Mycobacteria and Soil Remediation at Hazardous Waste Sties. Inland Northwest Research Allliance (INRA) Annual Symposium. Utah State University, Logan, UT (July 26) 2007.. (A. Anderson, C. Miller, Y. Liang, and R.C. Sims)

Applications of Nuclear Magnetic Resonance (NMR) to Environmental Samples: Incorporation of Toxic PAH Into Microbe Cell Biomass. Inland Northwest Research Alliance (INRA) Annual Symposium, Utah State University, Logan, UT (July 26), 2007. (K. Nieman, R.C. Sims, R. Holz)

Monitored Natural Attenuation of MTBE at Abby's Corner Utah. Inland Northwest Research Alliance Annual Symposium, USU, UT. July 26, 2007. (Hartle, R., M. greenwood, and **R.C. Sims**)

Biodegradation of Pentachlorophenol in Continuous Flow Bioreactors. Intermountain Systems Biology Symposium, Inland Northwest Research Alliance, Utah State University, June, 2007 . K. Albretsen, J. Neff, and R.C. Sims. (**First Place Research Poster)**

Enhanced Natural Attenuation of Contaminated Soil for Sustainable Restoration. Battelle On-Site and In Situ Bioremediation Symposium, Baltimore, MD. May 7-10, 2007. (**Sims, R. C..,** Miller, C., Anderson, A.)

Modelling of Landfarming for Remediation of Contaminated Soils and Sediments. Battelle On-Site and In Situ Bioremediation Symposium, Baltimore, MD. May 7-10, 2007 (Harmsen, J., Rulkens, W., **Sims, R.C.)**

Reduction of the Impact of Contamination by Land Use. . Battelle On-Site and In Situ Bioremediation Symposium, Baltimore, MD. May 7-10, 2007 (Harmsen, J., Rulkens, W., **Sims, R.C.)**

Photobioreactor for Algal Production of Biodiesel. Institute of Biological Engineering Annual Symposium. St. Louis, MO., March23 (2006). (S. Merrigan, R.C. Sims, B. Wood, P. Zemke, D. Dye).

Presentations at Nat'l/Internat'l Professional Conferences (Continued): (* indicates authorship)

Bioplastics: Sustainable Production through Wastewater Treatment. Institute of Biological Engineering, Arizona State Univ. 2005. (G. Sullivan, E. Linton, D. Nelson, and R.C. Sims)

Environmental Mycobacteria" Biomedical Research and Applications. Inland Northwest Research Alliance (INRA), Montana State Univ. 2006. (K. Sims, C. Miller, A. Anderson, R.C. Sims, Y. Liang, J. Neff).

Identification of PAH-Degrading Mycobacteria in Utah Soils. Inland Northwest Research Alliance (INRA), Montana State Univ. 2006. (K. Albretsen, C. Miller, R.C. Sims)

Soil Microbes that Degrade Persistent PAHs: Identification and Detection. 2006. Institute for Soil Science and Plant Cultivation, Pulawy, Poland. 2005. (K. Hall, F. Olson, J. Sims, K. Sims, R.C. Sims).

Biodegradation Rate of PAHs and Mineral Oil in Sediments on a Landfarm. **Invited/Platform** Battelle On-Site and In Situ Bioremediation Conference, Baltimore, MD. 2006. (J. Marmsen, W.. Rulkens, H. Zweers, and R.C. Sims)

One Model of Biological Engineering Education at a Land Grant University Based on Directed Evolution. Institute of Biological Engineering, **Invited (R.C. Sims * T. Taylor presenting))** Arizonaz State U., Tucson, AZ. 2006. (T. Taylor, D. Britt, M. McConkie, P. Schreuders, and R.S. Sims)

Genetic Probe for Sensing Microorganisms for Bioremediation System Design: International Application. Poster. F. Olson, K. Hall, J. Harmsen, R. Naumova, O. Yakusheva, C. Miller, A. Anderson and R. Sims. Institute of Biological Engineering (IBE) 10th AnnualSymposium, March 4-6, 2005, University of Georgia.

Management of Agroecosystems for Persistent Pollutants. **Invited Platform** by Ronald C. Sims at the International Workshop, Institute of Soil and Agriculture, Pulawy, Poland, March 10-12, 2005.

Petroleum and Biofuel Oxygenates-Monitored Natural Attenuation. **Invited Platform** R. C. Sims, A. Swank, and M. Greenwood. Presented at the DOE/INRA Subsurface Science Symposium, Big Sky, Montana, Sept. 19-21, 2005

Biodegradation and Sorption of TBA and MTBE in Near-Surface Sediments at a Full Scale Site in Wyoming. **Invited Platform** M. Greenwood, A. Swank, J.E. McLean, and R. C. Sims. Society of Environmental Toxicology and Chemistry (SETAC), San Diego, CA, November 13-18, 2005.

Fugacity Framework 2.0: Calculator and Training Applications for Site Assessment and Rehabilitation. **Invited.** Second International Conference on Prevention, Assessment, Rehabilitation and Development of Brownfield Sites. Siena, Italy. June 14-16, 2004. (R.C. Sims, J.L. Sims, M. McConkie, W.J. Grenney, and J.K Nieman).

Field Performance" Bioremediation of PAH Contaminated Sediments. **Invited.** Society of Environmental Toxicology and Chemistry Annual Conference, Salt Lake City, UT, November 17-19, 2002, (R.C. Sims, J.L. Sims, and D.L. Sorensen)

Sediment MTBE Interactions at a Full Scale Site in Montana: Natural Attenuation and Toxicity. **Invited.** 18th International Conference on Contaminated Soils, Sediments, and Water. University of Massachusetts, Amherst, October 21-24, 2002, (R. C. Sims and A. Swank)

Management Options and Environmental Sustainability for Subsurface Remediation. **Invited.** DOE/Inland Northwest Research Alliance (INRA) 2nd Annual Symposium. Boise, ID, October 13-16, 2002 [Ronald C. Sims].

Fugacity Framework: web access and implementation for site assessment and rehabilitation. **Invited** First International Conference on Brownfield Sites Assessment, Rehabilitation,& Development. Cadiz, Spain, September 1-4, 2002, (*, J.L. Sims, S.A. Gibbons, M.R. Baugh, M. McConkie, J.K. Nieman, and W.J. Grenney).

Soil Treatment of Chemical Industry Residues. **Invited Paper**. Kazan State University, Tatarstan, Russia, July 1-5, 2002, (R.C. Sims).

Synchrotron Radiation Research for Engineering Soil Bioremediation. Wageningen University, Environmental Technology Department, The Netherlands, July 24, 2002 (R. C. Sims).

Sediment Environmental Factors Affecting Natural Attenuation/Bioremediation of MTBE at a Full-Scale Site. **Invited Paper.** 12th Annual AEHS Conference, San Diego, CA, March 2002, (A. Swank and R.C. Sims)

Conceptual Descrition of Landfarming for Sustainable Restoration of Soils Worldwide. Sixth International In Situ and On-Site Bioremediation Symposium, San Diego, CA, June 4-7, 2001. (R. Sims and J. Harmsen)

Application of Microbial Toxicity Testing to MTBE Contaminated Site in Ronan, MT. **Invited Paper**. 11th Annual Meeting of the Association for the Environmental Health of Soils (AEHS), San Diego, CA, March, 2001, (A. Swank and R.C. Sims)

Regulatory and Management Issues in Prepared Bed Land Treatment: Libby Groundwater Site. International Symposium for In-Situ and On-Site Bioremediation, San Diego, CA, April 19-22, 1999. [J.K.C. Nieman, R.C. Sims, and D.M. Cosgriff].

Isolation and Characterization of Pyrene Degrading Microorganisms. American Society of Microbiology, Rocky Mountain Section, 1998. [B.A. Issa, R.C. Sims, D.L. Sorensen, J.E. McLean, J.K.C. Nieman, and H.N. Holeman].

Effect of Redox Environment on Oxidation of Pentachlorophenol with Manganese Oxide. *HSRC/WERC Joint Conference on the Environment*, Great Plains/Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Albuquerque, NM, May 21-23, 1996. (R.A. Petrie, *, J.E. McLean, and P.R. Grossl)

Phytoremediation of Lead-Contaminated Soils by Native Plants at an Abandoned Mine Site in Utah. Poster Presentation, *HSRC/WERC Joint Conference on the Environment*, Great Plains/Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Albuquerque, NM, May 21-23, 1996. (S.P. Klassen, J.E. McLean, P.R. Grossl, and *)

Treatment of Wood Preservative-Contaminated Soils as Affected by Electron Acceptor Addition. Poster Presentation, *HSRC/WERC Joint Conference on the Environment*, Great Plains/Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Albuquerque, NM, May 21-23, 1996. (K.C. Nieman, *, R.A. Petrie, and J.L. Sims)

A Batch Reactor for Control of Eh, pH, and Temperature of Subsurface Aqueous Systems. Poster Presentation, *HSRC/WERC Joint Conference on the Environment*, Great Plains/Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Albuquerque, NM, May 21-23, 1996. (R.A. Petrie, *, and P.R. Grossl)

Cadmium, Copper, and Zinc Accumulation in Transgenic and Non-Transgenic Tobacco Plants. Poster Presentation, *HSRC/WERC Joint Conference on the Environment*, Great Plains/Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Albuquerque, NM, May 21-23, 1996. (N.A. Yancey, J.E. McLean, *, P.Kotrba, M. Mackova, T. Macek)

Hazardous Waste Management Policy in the United States of America (USA): Prevention and Remediation. *Seoul International Waste Treatment Technology Conference and Exhibition* , Seoul, Korea, August 23-27, 1995. (* and J.L. Sims) (Invited Speakers)

Guidance Manual for the Use of Prepared Bed Land Treatment as a Bioremedial Technology. Poster Session, *10th Annual Hazardous Waste Research Conference*, Great Plains-Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Manhattan, KS, May 23-24, 1995. (J.L. Sims, *, and A.L. Moss)

Evaluation of In Situ Bioremediation Associated with Natural Attenuation at A Gas Plant Waste Site. *In Situ and On-Site Bioreclamation*, Third International Symposium, Battelle, San Diego, CA, Apr 24-27, 1995. (J.S. Ginn, *, and I.P. Murarka)

Wood Preserving Waste-Contaminated Soil: Treatment and Toxicity. Poster Session, *In Situ and On-Site Bioreclamation*, Third International Symposium, Battelle, San Diego, CA, April 24-27, 1995. (S.G. Huling, D.F. Pope, J.E. Matthews, J.L. Sims, *, and D.L. Sorensen)

Technology Transfer at Universities. *Rewarding Technology Transfer and Outreach at Universities: Overcoming Institutional Barriers*, Technology Transfer Meeting, U.S. EPA Hazardous Substance Research Centers, Sea Island, GA, November 20-22, 1994. (*) (Invited Speaker)

Bioremediation of Soils and Aquifer Materials Contaminated with Petroleum Products Containing Carcinogenic and Non-Carcinogenic Polycyclic Aromatic Hydrocarbons. *Hawai'i First National Technologies Conference: Remediation and Environmental Monitoring*, Waikiki, Hawaii, September 12-16, 1995. (*) (Invited Speaker)

Interactions of Pentachlorophenol with Manganese Oxide. *9th Annual Conference on Hazardous Waste Remediation* Great Plains-Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Bozeman, MT, June 8-10, 1994. (A.C. Cramer, J.E. McLean, and *)

Pentachlorophenol Interactions with Aquifer Solids. *9th Annual Conference on Hazardous Wast e Remediation*, Great Plains-Rocky Mountain Hazardous Substance Research Center, U.S. Environmental Protection Agency, Bozeman, MT, June 8-10, 1994. (R. Petrie and *)

Evaluation of Bioremediation of Creosote-Contaminated Ground Water. *Annual Groundwater Research Symposium*, Robert S. Kerr Environmental Research Laboratory, U.SEPA, Oklahoma City, OK, June 1-3, 1994. (*, J.L. Sims, D.L Sorensen, and M.W. Kemblowski)

Land Treatment Unit Performance Evaluation at the Champion International Superfund Site, Libby, Montana. Poster session presented at the *Annual Groundwater Research Symposium*, Robert S. Kerr Environmental Research Laboratory, U.S.EPA , Oklahoma City, OK, June 1-13, 1994 . (D.L Sorensen, *, and J.L. Sims)

Field Scale Evaluation of Grass-Enhanced Bioremediation of PAH Contaminated Soils. *20th Annual Risk Reduction Engineering Laboratory Research Symposium*, U.S. Environmental Protection Agency, Cincinnati, OH, April, 1994. (D.L. Sorensen, *, and X. Qiu)

Evaluation of Biotransformation Products Associated with Manufactured Gas Plant Waste. *Special Symposium on Emerging Technologies in Hazardous Waste Management VI*, Division of Industrial and Engineering Chemistry, American Chemical Society, Atlanta, GA, September 19-21, 1994. (J.S. Ginn and *)

Bioremediation of Contaminated Soil. Video (41 minutes). Office of Solid Waste, U.S. Environmental Protection Agency, Washington, DC, November, 1993. (*)

Chemical Mass Balance Approach for Estimating Fate and Transport of Polycyclic Aromatic Metabolites in the Subsurface Environment. *14th International Symposium on Polycyclic Aromatic Compound*s, International Society for Polycyclic Aromatic Compounds (ISPAC), Lake of the Ozarks, MO, September 8-11, 1993. (J.S. Ginn, W.J. Doucette, and *)

Evaluation of Biotransformation Products of PAH Metabolism in a Creosote-Contaminated Aquifer. *Special Symposium on Emerging Technologies in Hazardous Waste Management V*, Division of Industrial and Engineering Chemistry, American Chemical Society, Atlanta, GA, September 27-29, 1993. (J.S. Ginn and *)

Biotreatment: Prepared Bed and Compost Systems. *Proven and Emerging Techniques in Bioremediation*, American Society of Microbiology Workshop Program, 92nd ASM General Meeting, New Orleans, LA, May 30, 1992. (*) (Invited Speaker)

Contaminated Site Remediation: Insights for Professionals and Managers. *Seminar on the Environment*, Environmental Research and Studies Centre, University of Alberta, Edmonton, Alberta, Canada, May 29, 1992. (*) (Invited Speaker)

Contaminated Site Remediation and Industrial Site Decommissioning. *Conference on Industrial and Hazardous Waste Management*, The Banff Centre for Management, Banff, Alberta, Canada, April 15-19, 1993, May 10-15, 1992, May 5-11, 1991, and May 27-June 2, 1990. (*) (Invited Speaker)

Conceptual Approach for Characterizing Problems at Hazardous Waste Sites. Video (48 minutes). Office of Solid Waste, U.S. Environmental Protection Agency, Washington, DC, March, 1992. (*)

Effect of Oxygen Tension on the Degradation of High Molecular-Weight Polycyclic Aromatic Hydrocarbons in Soil. *Second Annual National R & D Conference on the Control of Hazardous Materials*. Hazardous Materials Control Research Institute, San Francisco, CA, February 4-6, 1992. (H.S. Park and *)

Mass Balance Approach for Remedy Selection at Corrective Action Sites. U.S. Environmental Protection Agency *First Annual Corrective Action Symposium*, San Francisco, CA, June 3-5, 1991. (*) (Invited Speaker)

Habitat Conditions Affecting Bioventing Processes. *Symposium on Soil Venting*, U.S. Environmental Protection Agency, Houston, TX, April 29-May 1, 1991. (D.L. Sorensen and *) (Invited Speakers)

In Situ Bioremediation of Dense Non Aqueous Phase Liquids (DNAPLs). U.S. Environmental Protection Agency *Workshop on DNAPLs*, Dallas, Texas, April 16-18, 1991. (*) (Invited Speaker)

Characterization of Vadose Zone Processes as Part of Remediation Technology Evaluation and Selection at Hazardous Waste Sites. *National Meeting of the Association of Engineering Geologists*, Pittsburgh, PA, Oct. 1-5, 1990. (*) (Invited Speaker)

Remediation Considerations for Carcinogenic Aromatic Hydrocarbon Contaminated Soil Based on Interphase Transfer and Chemical Alternation Analysis Using Integrated Chemical and Biological Assays. Poster Session. *Society of Environmental Toxicology and Chemistry (SETAC) 10th Annual Meeting*, Toronto, Canada, Nov., 1989. (C. Abbott and *)

Bioremediation: Contaminated Soil. Robert S. Kerr Environmental Research Laboratory Technical Assistance Program to U.S. EPA Region VIII: *Oily Waste- Fate, Transport, Site Characterization, and Remediation*, Denver, CO, May 17-18,1989. (*) (Invited Speaker)

Bioremediation: Contaminated Aquifer Material - Ground Water. Robert S. Kerr Environmental Research Laboratory Technical Assistance Program to U.S. Environmental Protection Agency Region VIII: *Oily Waste- Fate, Transport, Site Characterization, and Remediation*, Denver, CO, May 17-18, 1989. (*) (Invited Speaker)

Evaluation of the Collector Efficiency and Impediment Modulus for Slow Rate Sand Filtration. *Intermountain American Water Works Association Annual Meeting*, Sun Valley, ID, September 21-23, 1988. (S. Hirschi and *)

Status of Land Treatability Studies and Closures in the United States. *Environment Canada Annual Meeting on Land Treatability of Oily Wastes*, Calgary Convention Centre, Calgary, Alberta, Canada, March 22, 1988. (* and J.L. Sims) (Invited Speakers)

Evaluation and Recommendations for Increasing Efficiency of the Water Treatment System for the Town of Salmon, Idaho. *Intermountain American Water Works Association Annual Meeting*, Park City, UT, 1987. (S. Hirschi and *)

Background Concentrations and Fate of Organic Chemicals in Soil-Plant Systems for Risk Assessment. *Annual Conf., American Institute of Chemical Engineers*, Boston, MA, 1986. (*) (Invited Speaker)

Clinoptilolite-Amended Slow Rate Sand Filtration: Performance and Economics. *Intermountain American Water Works Association Annual Meeting*, Pocatello, ID, Sept., 1985. (D.R. McNair and *)

Mathematical Modeling of PAH Compounds for Use in Groundwater Protection Strategies. *Western Annual Meeting of the American Geophysical Union*, Boulder, CO, July, 1986. (B.D. Symons & *)

Slow Rate Sand Filtration With and Without Zeolite: A Comparison of Water Treatment Efficiency and Filtration Economics. *Intermountain American Water Works Association Annual Meeting*, Jackson, WY, Aug. 29-31, 1984. (G.P. Foreman and *)

Biodegradation of Polynuclear Aromatic Compounds in Soil Systems. *Agronomy Abstracts* 76:36. 1984 Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Las Vegas, NV, Nov. 25-30, 1984 (* and J.L. Sims)

Evaluation of Fill Materials for Use in the Mound System of On-site Waste Disposal. *Agronomy Abstracts* 76:36. Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Las Vegas, NV, Nov. 25-30, 1984 (J.L. Sims, R.A. Watts, and *)

Immobilization of Polynuclear Aromatic Compounds in Soil Systems. *Agronomy Abstracts* 76:31. 1984 Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Las Vegas, NV, Nov. 25-30, 1984. (R.J. Mahmood, *, and J.L. Sims)

Protection of Groundwater by Immobilization of Hazardous Metals Associated with Industrial Wastes in Soil Systems. *Agronomy Abstracts* 76:30. 1984 Annual Meeting of the American Crop Society, Crop Science Society of America, and Soil Science Society of America, Las Vegas, NV, Nov. 25-30, 1984. (J.E. McLean, *, I-fu Shen, and J.L. Sims)

Land Treatment of Oil Shale Wastewaters. *Utah Water Pollution Control Association Annual Meeting*, St. George, UT, 1984. (D. E. Umfleet and *)

Reclamation of PAH Contaminated Soils. *1984 Annual Specialty Conference in Environmental Engineering*, American Society of Civil Engineers, Los Angeles, CA , 1984. (D.E. Umfleet, *, and A. Pano)

In Situ Soil Treatment of Polynuclear Aromatic Compounds. *185th American Chemical Society National Meeting*, *Division of Environmental Chemistry*, Seattle, WA, Mar. 20-25, 1983. (*, M.R. Overcash, and C.M. Sparacino)

Applications of Clinoptilolite in Biological Nitrification Systems. *46th Annual Water Pollution Control Federation Conference*, Cleveland, OH, 1973. (*, L.W. Little, and J.C. Brown)

Dissertation and Theses of Ronald C. Sims:

PhD *Land Application Design Criteria for Recalcitrant and Toxic Organic Compounds in Fossil Fuel Wastes*. Department of Biological and Agricultural Engineering, North Carolina State University, Raleigh, NC, 1982. (M.R. Overcash, Major Professor)

MS *Engineering Design for Removal of Toxic Levels of Ammonium from Dworshak National Fish Hatchery Reuse Water*. Department of Civil and Environmental Engineering, Washington State University, Pullman, WA, 1977. (E. Hindin, Major Professor)

MS *Enhanced Nitrification by Addition of the Ion Exchange Resin, Clinoptilolite, to Tertiary Activated Sludge Units*. School of Public Health, Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill, Chapel Hill, NC, 1972. (L.W. Little, Major Professor)

Committee Service (International, National, State, University Service]:
1995 - Present

International

- International In-situ and On Sight Bioremediation Conference (Baltimore, MD). Co-Chair for PAH Bioavailability Session. (Biannual 1995-2009)
- Organizing Committee Member, International Remediation for Sustainable Agro-ecosystems, with The Netherlands and Poland (2003-2005).
- Editorial Board, Bioremediation Journal (2000-2006)
- International In Situ and On-Site Bioremediation Bi-Annual Symposium, Co-Chair of Landfarming Session with Dr. Joop Harmsen, Wageningen University, The Netherlands. (1990-1995)

National

- Past-President, Institute of Biological Engineering (2013)
- President, Institute of Biological Engineering (2012)
- President-Elect, Institute of Biological Engineering (2011)
- Institute of Biological Engineering Awards Committee Chair (2009-2012)
- Journal of Bioremediation and Biodegradation Editorial Board (2009-present)
- Journal of Biological Engineering Editorial Board (2008-present)
- Institute of Biological Engineering Regional Conference Chairman (Western U.S., 2008, 2009)
- Institute of Biological Engineers (Steering Council 2004-2006, 2009-present)
- Institute of Biological Engineering (Bioethics Essay Judge 2008- present)
- National On-Site Wastewater Treatment Technical Advisory Committee, member [1998-2002]
- National Water Resources Research Institute Directors, member [1996-2003]
- Editor and Contributor , Soil Science Society of America and American Society of Agronomy, *Monograph 37 on Bioremediation of Contaminated Soil.* (1995-2000)

State of Utah and Utah State University

- Logan City, Utah, Water & Wastewater Board, member (2005-present)

State of Utah Water Quality Board, Department of Environmental Quality, member (1997-2007)
State of Utah On-Site Wastewater Treatment Center, Board of Director s Member (2000-2003)
State of Utah Committee on Infrastructure Aspects of Quality Growth, member (1999-2003)
State of Utah Division of Drinking Water Citizen and Technical Advisory Committee for Source Water Assessment [1998-2000]
Chair, State of Utah Advisory Board for On-Site Wastewater Training Center [1998-2000]
Water & Wastewater Advisory Board, City of Logan, Utah (2003-present)
Utah State University Program Coordinator for DOE/ Inland Northwest Research Alliance (INRA) (2002-present)
Utah State University Environmental Task Force, Chair, Water use Subcommittee (2002-2003)
Utah State University Faculty Early Retirement Committee [2002]
Utah State University Health & Benefits Committee (2001-2003)
Representative for Utah State University, Idaho National Engineering Laboratory (INEL) University Research Consortium (1995-present)
Committee on Technology Transfer for the Governor of Utah Science Advisor (1995)

College of Engineering

College of Engineering Administrative Council
College of Engineering Dean Search Committee (2001-2002)
Representative for the College of Engineering, Utah State University Graduate Council (1990-2000)

1982-1995

National

American Society for Testing and Materials, Committee D-34, Solid & Haz. Waste [1986-89]
American Society of Civil Engineers Committee on Slow Rate Sand Filtration (1986 - 1992)
Water Pollution Control Federation Bioassay Research Committee - Chairman, Human Health Effects Subcommittee (1982 - 1988)
Environmental Quality Committee, Rocky Mountain Chapter, American Association of Agricultural Engineers (1984 - 1988)
American Water Works Assoc. Research Foundation Project Advisory Committee (1987- 1988]
Alabama EPA/EPSCoR (U.S. Environmental Protection Agency Experimental Program to Stimulate Competitive Research) Proposal Review Panel (1992)
Department of Energy (DOE) Review Panel for Proposals for Innovative Technologies (1990)
U.S. EPA Review Panel for Superfund Remedial Actions (1989-1996)
U.S. EPA Resource Conservation & Recovery Act Solid Waste Management Unit (SWMU) Stabilization Workgroup (1990)

State of Utah

Utah Water Pollution Control Association - Chairman, Student Paper Contest (1984 - 1988)

Utah State University

Scholarly Publications Committee Member (2007-present)
USTAR/Biofuels Executive Committee (2007-present)
USTAR/Synthetic Biomanufacturing Center (2008-present)
Strategic Planning Committee for Research Directions, Utah State University (1988)
Tenure/Assistant to Associate Professor Committee (1986 - 1989)
Biotechnology Faculty Advisory Committee, Utah State University (1987 - 1997)
Search Committee, Biotechnology Director, Utah State University (1987, 1992)

International Activities:

2013 **Invited Speaker**, Wastewater Remediation: Nutrient Management for Value Bioproducts using the Rotating Algae Biofilm Reactor (RABR). National Research Council, Canada, Vancouver, February 2.

2012 **Invited Speaker**, Biofuels and Renewable Chemicals from Wastewater Streams. CRIBIQ, Quebec, Canada, October 2.

2007-2008 **Invited Speaker**, Wageningen University, The Netherlands, topic: Biofuels Research at USU-Biodiesel from algae (10/1/07). Representing Biofuels USTAR at USU

2003-2005 **Organizing Committee** Member, International Committee on Remediation for Sustainable Agro-ecosystems Workshop. with The Netherlands and Poland, **sponsored by European Union.**

2003 **PAH/Land Treatment Expert to Niznikamsk, Russia**, collaboration with Wageningen University & Alterra (The Netherlands) for Petrochemical Waste Treatment using Land Application.

1990-2005 **Co-Chair** (with drs. Joop Harmsen, The Netherlands) of the Landfarm Sessionof the biannual International In Situ and On-Site Bioremediation Symposium.

1990-1996 **Invited Speaker, Technical Expert, and Project Reviewer.** Ontario and Alberta, Canada. Present U.S. remediation program (RCRA and CERCLA) for soil and ground water. Review, plan, and evaluate urban remediation technologies and strategies.

1995-2000 **Invited Speaker and Technical Expert**. Perth and Sydney Australia. Member of a U.S. EPA team to develop issues and options for remediation of petroleum impacted sites with research organizations (CISRO) and national engineering firms.

2000 **Invited Speaker**. Czech Republic. Presentation: "Landfarming Framework for Sustainable Restoration of Soil." NATO Conference. Invited by U.S. EPA.

2002 **Invited Speaker and Technical Expert**. Tatarstan, Russia. Invitation and collaboration - Drs. Joop Harmsen, Wageningen University, The Netherlands. Presentations, assessment, and development of treatment alternatives for chemical industry residue assimilation in a landfarm environment. Collaborative research development with Kazan State University, Russia, and Wageningen University, The Netherlands.

2002 **Invited Speaker**. First International Conference on Brownfield Sites. Spain. Collaboration with International Brownfields Committee for international cooperation and exchange of technical information.

2002 **Invited Researcher**. Wageningen University, The Netherlands. Develop research and academic training collaboration with Wageningen University in the areas of environmental engineering technologies and remediation of soils and sediments.

Professional Organizations:

Institute of Biological Engineering (IBE)
American Institute of Chemical Engineers (AiCHE)
Air & Waste Management Association (A&WMA)
American Association of Agricultural Engineers (AAAE)
American Water Works Association (AWWA)
American Society for Engineering Education (ASEE)
Association of Environmental Engineering and Science Professors (AEESP)
Association for Environmental Health and Sciences (AEHS)
Society of Environmental Toxicology and Chemistry (SETAC)
Water Environment Federation (WEF)

Awards/Honors/Recognition:

2012 President, Institute of Biological Engineering (IBE)
2011 President-Elect, Institute of Biological Engineering (IBE)
2010 College of Engineering nominee for USU Wynn Thorne Research Award
2009 Co-Advisor for Gold Medal Award for student team at the **International Genetically Engineered Machine (iGEM) Competition** at MIT, MA. Topic: Secretion-Based System for Microbially Produced Polyhydroxyalkanoates (Bioplastics)
2008 Co-Advisor for Bronze Medal Award for student team at the **International Genetically Engineered Machine (iGEM) Competition** at MIT, MA. Topic: Biobrick Assembly for Microbially Produced Polyhydroxyalkanoates (Bioplastics)
2007 **Utah Department of Environmental Quality**, Utah Water Quality Board Recognition for service to the state of Utah Water Quality Board
2005 **American Water Resources Association**, Utah Chapter
2003 Major advisor for National Winner (Kevin Hall) for Posters on the Hill (Washington, DC)
2002 Phi Kappa Phi, Faculty Induction, Utah State University

1998 **Plenary Speaker**, U.S. EPA Regions 7&8 Hazardous Substance Research Center 13th Annual Meeting, May 18-21.

1995 **Karen Morehouse Best Research Paper Award**, U.S. Environmental Protection Agency Great Plains/Rocky Mountain Hazardous Substance Research Center.

1993 Utah Governor's Medal for Science and Technology, Salt Lake City, UT

1993 Invited Speaker, Ritchey Science Lecture Series, Weber State University, Ogden, UT

1990 **Air & Waste Management Association (AWMA) Award** from the A&WMA Critical Review Committee: Presentation of the 1990 Critical Review, "Soil Remediation Techniques at Uncontrolled Hazardous Waste Sites," published in the Society Journal and presented at the 1990 National Meeting of the AWMA, Pittsburgh, PA

1989 **U.S. Environmental Protection Agency** recognition for contributions as a visiting engineer (1989) Robert S. Kerr Environmental Research Laboratory, Ada, OK

1987 **Outstanding Researcher Award, College of Engineering, Utah State University**

1990–1995 **Awards from Union Carbide Corporation**, Research and Development Department, for recognition and continued support of **excellence in research** in the area of polyaromatic hydrocarbon degradation and transport in soil

1986 **American Water Works Association** Certificate of Recognition for serving as Major Advisor to 1985 National Academic Achievement Award Recipient for Outstanding Research in the Water Treatment Field

1981 Alpha Epsilon (Agricultural Engineering Honorary Society)

1981 Gamma Sigma Delta (Agriculture Honorary Society)

1973 **Certificate of Recognition** from UNC-Chapel Hill for Leadership (as Director) of International Programs in Environmental Aspects of Industrial Development, sponsored by the United Nations Industrial Development Organization (UNIDO) and the U.S. State Department

1972 Sigma Xi (Research Honorary Society)

1972 Delta Omega (Public Health Honorary Society)

1972 **Outstanding Graduate Student Award** - Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina at Chapel Hill

1972 **Environmental Protection Agency Traineeship Award**, 5T2-WP-173-03, School of Public Health, University of North Carolina at Chapel Hill, NC1971-1972

Other Professional Activities and Services:

Instructor for U.S. Environmental Protection Agency Professional Staff:

1988-2002 Instructor, U.S. Environmental Protection Agency Courses, Dates, and Sponsor:

RCRA-Corrective Action-Performance-Based Management [1999-2001]. [U.S.EPA, RCRA-Corrective Action, Washington, D.C. Office]

Innovative Treatment Technologies for Hazardous Waste [1998-2000]. [U.S. EPA, National Risk Management Research Laboratory, Cincinnati, OH]

Natural Attenuation of Contaminated Soils and Ground Water [1996-2000]. [U.S. EPA, National Risk Management Research Laboratory, Ada, OK]

Bioremediation of Hazardous Waste Sites: Practical Approaches to Implementation (1993, 1996) (Center for Environmental Research Information, Cincinnati, OH)

Stabilization Technologies for RCRA Corrective Actions (1991-1992) (Center for Environmental Research Information, Cincinnati, OH)

Bioremediation-Basic Principles, Limitations, and Practical Applications (1991) (Robert S. Kerr Environmental Research Laboratory, Ada, OK)

RCRA Facility Investigation/Corrective Measures Study Training Program for Contaminated Soils and Ground Water (1990-1991) (Office of Solid Waste, Washington, DC)

Site Characterization for Subsurface Remediation (1989-1990) (U.S. EPA Robert S. Kerr Environmental Research Laboratory, Ada, OK)

Remediation of Contaminated Soil - Fundamentals and Applications (1989-1998) (Robert S. Kerr Environmental Research Laboratory, Ada, OK, through Superfund University Training Courses (SUTI), Rice University, Houston, TX)

Bioremediation of Contaminated Soils (1988 - 1989) (EPA Biosystems Committee, Cincinnati, OH)

Basic Ground Water Investigations - Vadose Zone Monitoring and Remedial Technologies (1988-2000) (Robert S. Kerr Environmental Research Laboratory, Ada, OK, through Superfund University Training Courses (SUTI), Rice University, Houston, TX)

Transport and Fate of Contaminants in the Subsurface - Soil Remediation and Treatment Train Approach (1990-1993) (Robert S. Kerr Environmental Research Laboratory, Ada, OK, through Superfund University Training Courses (SUTI), Rice University, Houston, TX)

Consulting:

2005-2006	Petro-Chemical industry (Niezhnikamskneftekhim), Tartarstan, Russia
2001-2003	U.S. Army Corps of Engineers, Hazardous/Toxic Waste Management
1999-2001	HAZMED Corporation, Lanham, MD
1991-1992	City of Toronto Housing Department, Toronto, Canada
1990-1991	NUS Corporation, Washington, D.C.
1989-1998	Eastern Research Group, Inc., Arlington, MA
1989-1990	PEI Associates, Inc., Cincinnati, OH
1987-1990	Peer Consultants, Dayton, OH
1987	International Technology Corp., Groundwater Decontamination Division, Princeton, NJ
1986-1988	Morton Thiokol, Inc., Wasatch Division, UT
1986-1988	Remediation Technologies, Seattle, WA
1986- 2002	Dynamac Corporation, Rockville, MD and Ada, OK Office
1985	CH2M Hill, Corvallis, OR
1983-1986	Environmental Research and Technology (ERT), Inc., Fort Collins, CO
1983-1986	International Minerals and Chemical Corporation, Terre Haute, IN
1983-1986	Engineering Science, Inc., Denver, CO
1983-1990	Thunder Basin Coal Company, Wright, WY

NORTH DAVIS SEWER DISTRICT

May 5, 2014

Utah State University
4105 Old Main Hill
Logan, Utah 84322-4105

ATTN: Ronald C. Sims
Co-Director Sustainable Wastes-to-Bioproducts Engineering Center

SUBJECT: Letter of Support/Permission for Rotating Algae Biofilm Reactor (RABR) Study

Mr. Sims:

The North Davis Sewer District (District) confirms that it supports the Utah State University (USU) efforts in the submittal of its Nutrient Management Proposal to the Utah Department of Environmental Quality. The District hereby gives permission to USU Sustainable Wastes-to-Bioproducts Engineering Center (SWBEC) to access the District's plant site to implement its technology referred to as the RABR.

The District recognizes the importance of this proposed study and will cooperate with the SWBEC as they conduct this study to develop practical alternatives for nutrient management.

Sincerely,

NORTH DAVIS SEWER DISTRICT

Kevin R. Cowan, P.E.
District Manager

4252 West 2200 South
Syracuse, Utah 84075
Tel: 801 825-0712
Fax: 801 773-6320