

Long Chain Reclaim Ltd.

Long Chain



Presented by: Myles Ethier







What do we do?

CERTIFIED
Aboriginal Business

Canadian Council for
Aboriginal Business 

- Offer in-situ and ex-situ remediation services
- Provide an industry proven microbial formula **Bio-Reclaim™** which is highly effective in breaking down and degrading the full spectrum of hydrocarbons
- Access remote areas that are inaccessible or not easily accessible to other technologies
- Our solutions cost-effective and sustainable
- Keep greenhouse gases low while eliminating the liability
- Help to create a better future for future generations



History of LCR



- The founding members of **F4 Environmental Inc.** decided to utilize their expertise to reduce the damage caused by the waste from oil and gas exploration.
- They started doing field trials in 2009 and incorporated in 2012. The company's mandate was to use biologics and chemistry to create a product which would break down contaminants for more efficiently.
- Through extensive research and development successful products were created allowing **F4** to assist in the clean up of contaminants in more than 80 projects throughout Alberta and Saskatchewan, Canada.
- Due to the success of **F4's** products, in early 2020 **Long Chain Reclaim Ltd. (LCR)** was formed to act as the operations arm of **F4** to scale-up.





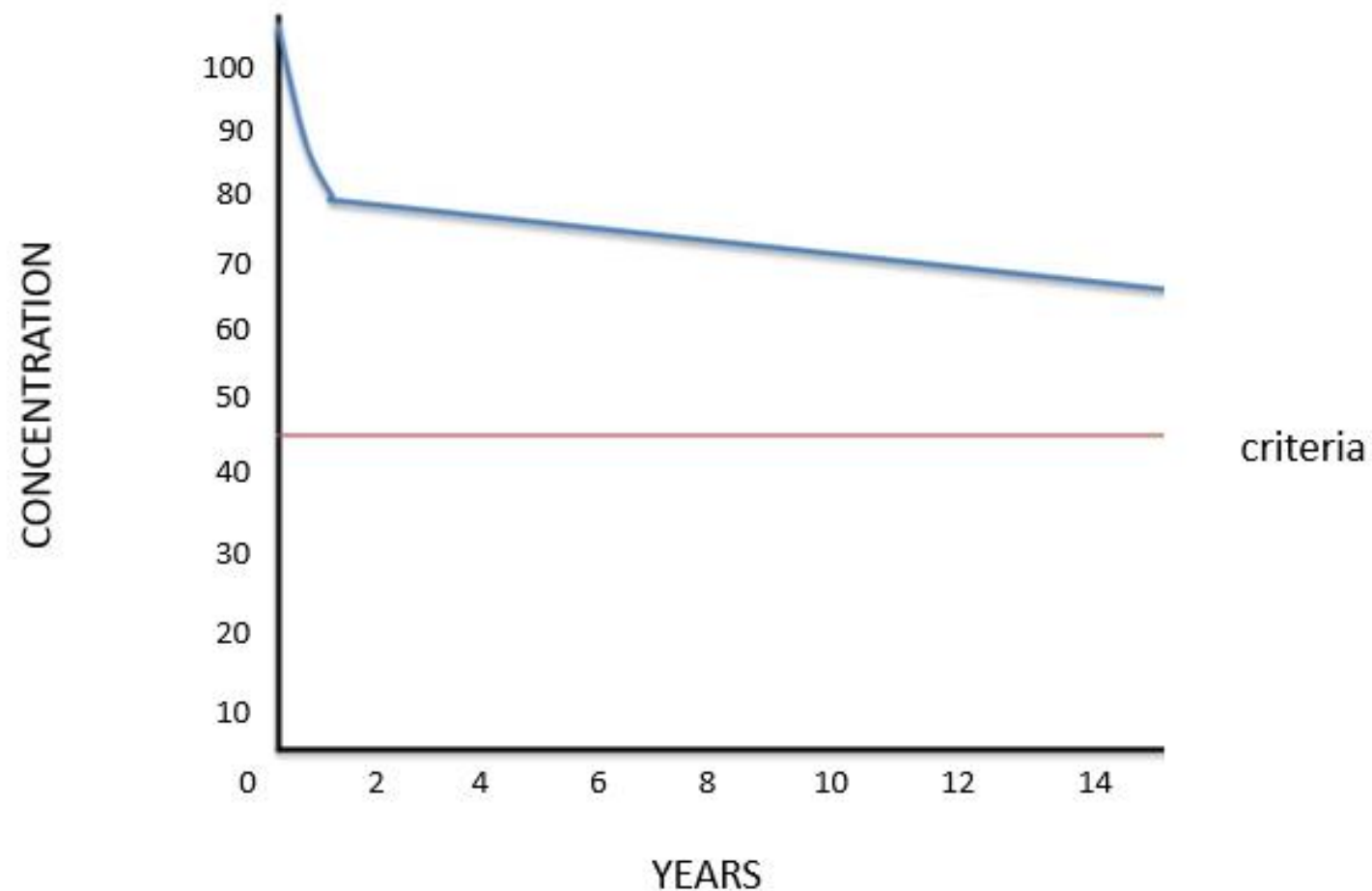
What is Bioremediation?

The use of either naturally occurring or deliberately introduced micro-organisms or other forms of life to consume, breakdown, or otherwise remove environmental pollutants in order to clean up a contaminated site.





Typical Hockey Stick Curve



- Create not emulate
- In the past, the bacteria used were ***Bacillus*** strains
- **Bio-Reclaim™** uses ***Pseudomonas* spp.** bacteria
 - These bacteria have an affinity for mineral oil and mineral grease. **Their nutrient source is hydrocarbons**
 - ***Pseudomonas* spp.** cannot sporulate, and we utilize non-pathogenic species
- Side products from process is limited to minute quantities of CO₂, water, and microbial biomass

Pre Treatment



Soil and ground water polluted with hydrocarbons heavily impacting health of flora and fauna

Post Treatment



Soil and ground water revitalized allowing flora and fauna to prosper

Our Technology





Bio-Surf™ - our proprietary surfactant

What are surfactants?

Compounds that reduce the surface tension between two fluids, allowing them to mix or emulsify.

Why do we use a surfactant?

PHCs are hydrophobic; adding surfactant allows PHCs to mix with water and improve bioaccessibility for Bio-Reclaim™ microbes.

Bio-Surf™

Our surfactant is biodegradable, environmentally safe, and microbially compatible, in addition to providing ideal water/hydrocarbon miscibility





Microbe Facts

- Each cell is expected to reproduce 7-12 times every 20 minutes over the lifespan of the culture
- Hydrocarbons are their carbon source & the culture will continue to degrade until all nutrients are depleted
- Nature provides 1-5 million per gram while **Bio-Reclaim™** provides trillions of microbes per gram

Our Technology





Features & Benefits Overview

- Proven chemical/biological system
- **Bio-Surf™** is a completely biodegradable, water-based formula
- Total hydrocarbon degradation
- Minimal amount of ground disturbance
- No adverse effects to the environment
- Can be applied in restricted areas
- **Bio-Reclaim™** is pathogen free and non-GMO
- Products are NCP and TSCA approved allowing them to be shipped and used worldwide
- **Highly cost effective** in comparison to other historical methods such as excavating, transporting, and 'storing' contaminated materials in landfills
- Eliminates potential future liabilities from landfill containment failure





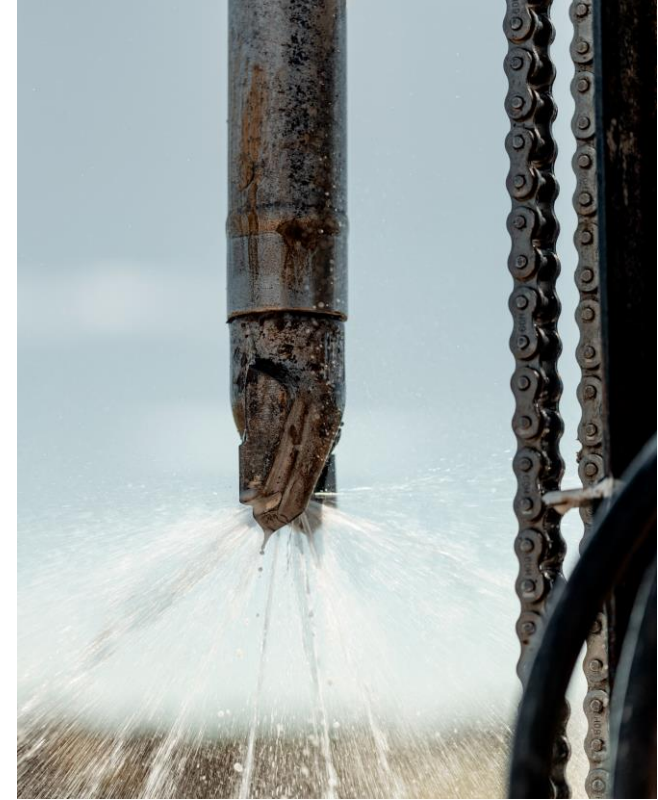
Applications

- Hydrocarbon spills & historical contamination (land & water)
- Oil & Gas Industry
 - Inert cuttings / drilling waste
 - Soil
 - Sumps
- Brownfields
 - Bulk Fuel Stations
 - Underground Storage Tanks
 - Retail
- Abandoned Property
 - Commercial
 - Industrial
 - Private / residential





LCR *In situ* Services



Remediation of an area with minimal ground disturbance with LCR's *in situ* drill





LCR *Ex situ* Services



Remediation of an area using a combination of excavators and LCR's Earth Cleaning Machine (ECM)



Contaminants Degraded by Bio-Reclaim™



Aliphatic Hydrocarbons

BTEX

Chloride

Chlorinated Solvents

Citronellol

Creosote

Crude oils/sludge

Dichlorobenzene

Dichlorotoluene

Fluorene

Isoprenoids

Limonene

Methylene

Methyl Ethyl

Naphthalene





Case Examples



In situ Example Case – Red Deer Automotive Dealership

- An automobile dealership on the site of a former fueling station was found to have petroleum hydrocarbon contamination resulting from the original underground storage tanks
- Primary fractions of concern included F1 – F2 hydrocarbons, including benzene
- The remediation program was designed as a one-time injection event of 36,000 liters(26 injection points) Bio-Reclaim into the most affected zones of petroleum hydrocarbons.





In situ Example Case –
Red Deer Automotive Dealership 2019



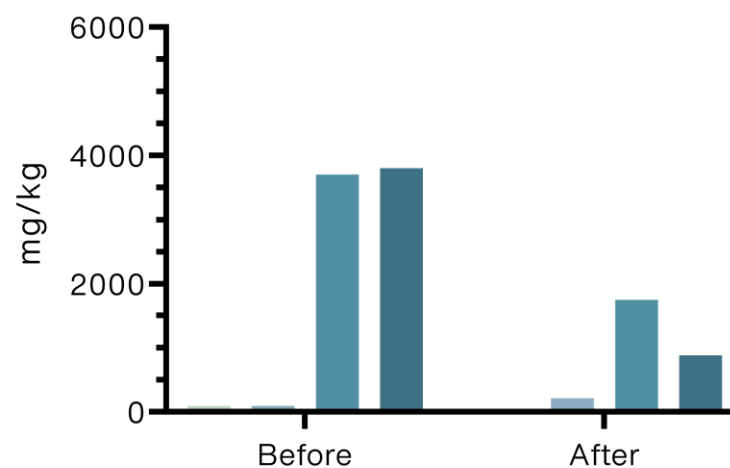
In situ Example Case - Wood Buffalo Site 2021

- Former refueling/maintenance depot, soil contaminated with BTEX, F1-F4, and associated compounds
 - e.g., trichlorobenzene isomers, naphthalene, anthracene
- Treated via *in situ* vertical drill injection, depths ranging from 1 to 6 meters below ground surface

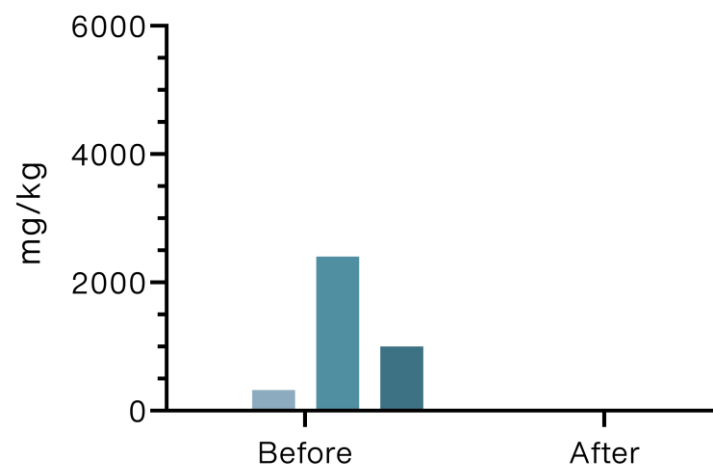




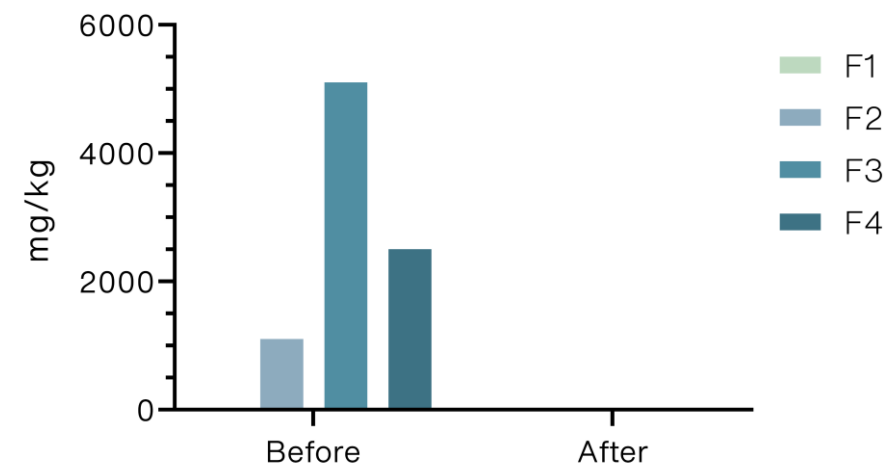
Wood Buffalo Site A;
June - September, 2021



Wood Buffalo Site B;
June - September, 2021



2021 Wood Buffalo Site C;
June - September, 2021



In situ Example Case - Wood Buffalo Site 2021



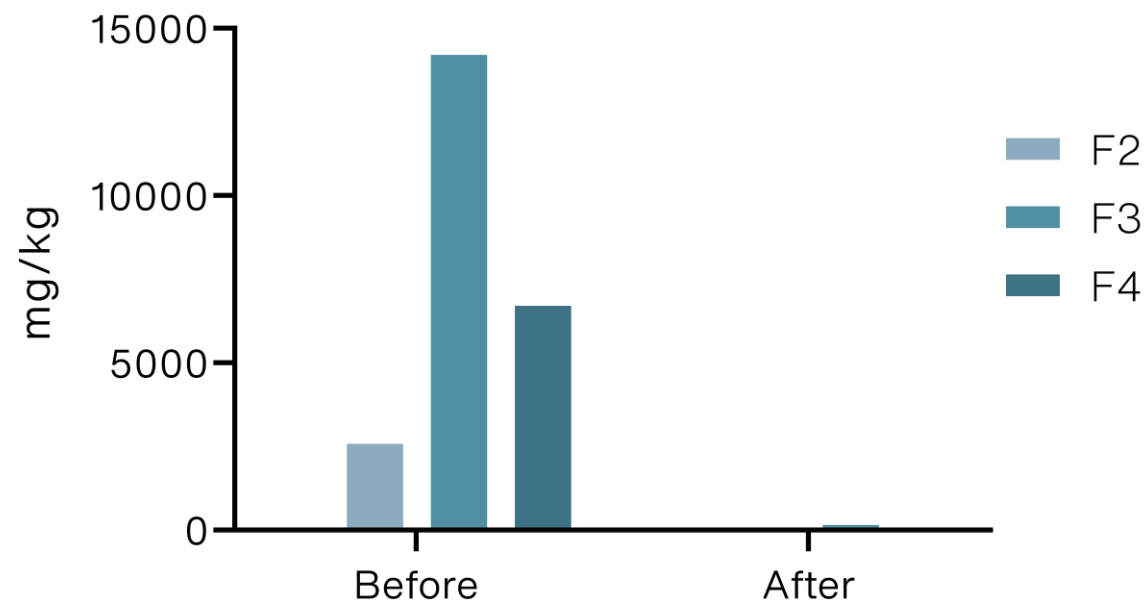
Broadcasting Example Case - Flare Stack Release 2018

- Critical failure of flare stack in Sturgeon County released PHCs over neighboring agricultural lot
- Abundant F2 – F4 contamination
- Sensitive case; agricultural land use has stricter remediation requirements compared to industrial in provincial guidelines





Sturgeon County Flare Stack Release Summer 2018 - 2019



Broadcasting Example Case - Flare Stack Release
2018





June 27,
2018



October 17,
2019

Broadcasting Example Case - Flare Stack Release
2018



Rainbow Lake, BC (Contaminated Sump)

Remote Sump Hydrocarbons Analysis: Units listed in mg/L dry wt. for Hydrocarbon Parameters
Treatment applied May 20, 2009

Parameters	BEFORE Bio-Reclaim™ Application March 16, 2009	AFTER Bio-Reclaim™ Application July 23, 2009
Light Extractable Petroleum Hydrocarbons (C10-C19)	69000	1.6
Heavy Extractable Petroleum Hydrocarbons (C20-C34)	50100	5.4
Acenaphthene	0.51	<0.00001
Anthracene	<0.003	<0.00001
Chrysene	2.62	<0.00001
Fluorene	3.86	0.00047
Naphthalene	9.34	0.00021
Phenanthrene	9.4	0.00264
Benzo	0.36	<0.00001
Benzo[a]pyrene	0.12	<0.00001
Benzene	15.4	0.0015
Toluene	60.5	0.0015
Ethylbenzene	11.0	<0.0005
Xylene	72.7	0.0011
Styrene	<0.05	<0.0005

Levels of Toxins before & after Bio-Reclaim™ Treatment

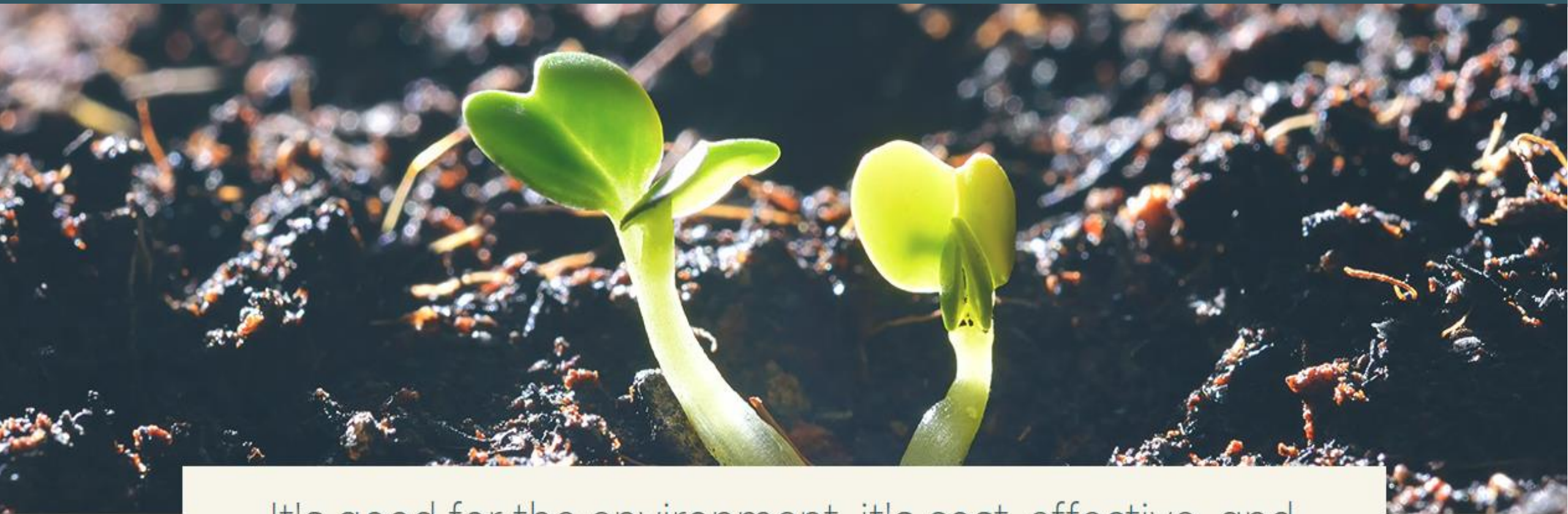


Broadcasting Example Case - Flare Stack Release 2018

*“Final F4 Environmental confirmatory results from the off-site release area returned analytical results within applicable guidelines for all parameters analyzed. The application of the **F4 Environmental bioremediation strategy removed BTEX and PHC F1 to F4 concentrations from the off-site release area to concentrations below criteria.**”*

- Consultant Summary





It's good for the environment, it's cost-effective, and it's a revolutionary technology.



LCR Contact Information



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