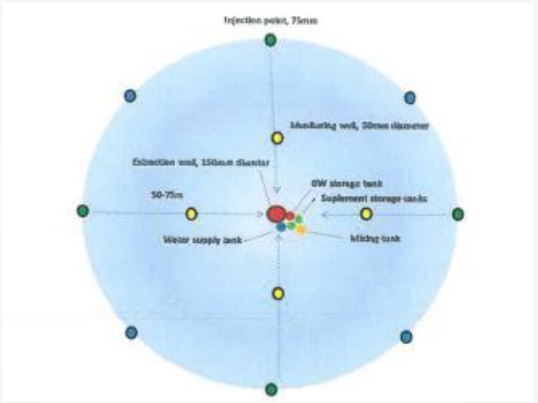
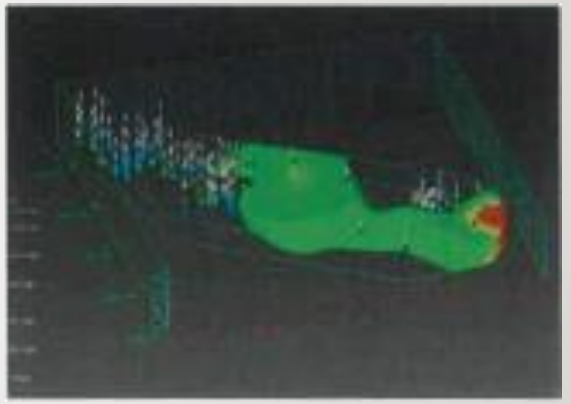
Implementation Stage of Pilot Studies for Groundwater Remediation

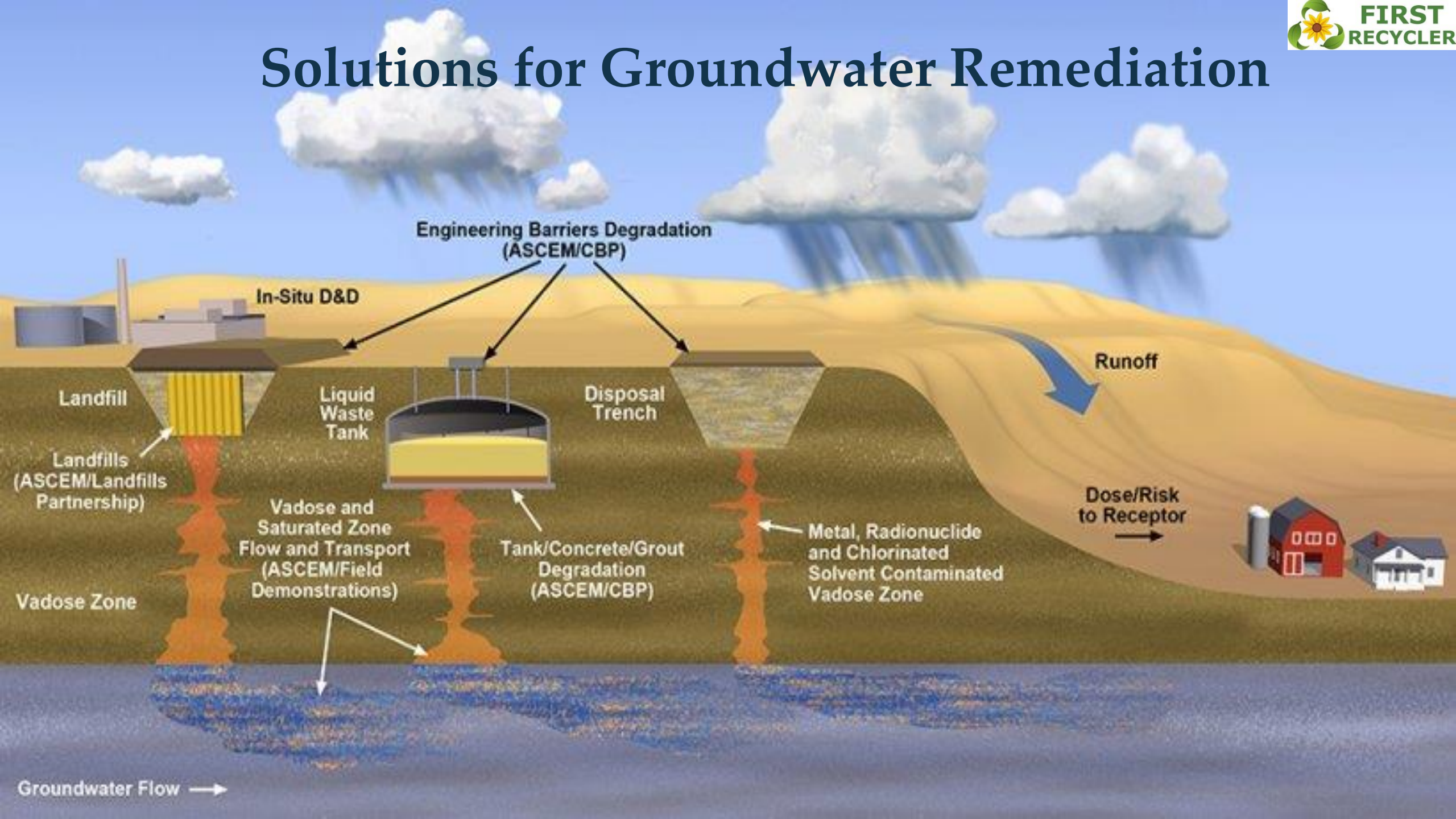








Solutions for Groundwater Remediation



PUMP TREAT RE-INJECT FACIY PROCESS BLOCK FLOW DIAGRAM

AQUIFER-1/2 PRODUCTION WELLS | WATER STORAGE TANKS (A/B) | SAND FILTER UNIT NOTE 9 | ACTIVATED CARBON FILTER UNIT NOTE 9 | WATER HOLDING TANKS (A/B) | RO FEED PUMPS (A/B) | REVERSE OSMOSIS UNIT NOTE 3 | TREATED WATER TANKS (A/B)

INJECTION PUMPS (A/B) AQUIFER-1 | INJECTION PUMPS (A/B) AQUIFER-2 | INJECTION WELLS | BACKWASH SOLID/WATER SEPARATION UNIT | DISPOSAL DEEP WELL NOTE 5 | CIP SKID NOTE 20

NOTE 12 SODIUM HYDROXIDE/PH DOSING SYSTEM
NOTE 8 SODIUM HYPOCHLORITE SYSTEM
NOTE 6 FLOCCULANT DOSING SYSTEM

WELL PUMP A — AQUIFER-1 PRODUCTION WELL
WELL PUMP B — AQUIFER-2 PRODUCTION WELL

NOTE 7 → WATER STORAGE TANKS (A/B)

SAND FILTER UNIT NOTE 19: PUMPS (A/B) → SAND FILTERS (A/B) ↔ BACKWASH PUMP

ACTIVATED CARBON FILTER UNIT NOTE 19: PUMPS (A/B) → ACTIVATED CARBON FILTERS (A/B/C) ↔ BACKWASH PUMP

WATER HOLDING TANKS (A/B)

BACK WASH WATER + RINSING WATER + DRAIN WATER

NOTE 3 → RO FEED PUMPS (A/B)

ORP NOTE 1

NOTE 2: ANTI-SCALANT DOSING SYSTEM; SULPHURIC ACID DOSING SYSTEM; SODIUM BI-SULFITE DOSING SYSTEM

CARTRIDGE FILTERS (A/B) NOTE 9

HIGH PRESSURE PUMPS (A/B)

BACKWASH SOLID/WATER SEPARATION UNIT NOTE 19

BACKWASH SOLID/WATER SEPARATOR → DISPOSAL PUMPS (A/B) → CARTRIDGE FILTER (A/B) NOTE 14 → DISPOSAL DEEP WELL NOTE 5

SLUDGE DISPOSAL BY ROAD TANKER

MAKEUP WATER BY ROAD TANKER 130m3/Day

NOTE 18

NOTE 13 ~100 m NOTE 7 → WATER INJECTION PUMPS (A/B) AQUIFER-1 → TREATED WATER TANK NOTE 4

NOTE 21

REVERSE OSMOSIS UNIT NOTE 19

TREATED WATER TANK → WATER INJECTION PUMPS (A/B) AQUIFER-2

AQUIFER-2: INJECTION WELL-1 NOTE 11 | INJECTION WELL-2 NOTE 11 | INJECTION WELL-3 NOTE 11 | INJECTION WELL-4 NOTE 11 | INJECTION WELL-5 NOTE 11

AQUIFER-1: INJECTION WELL-1 NOTE 10 | INJECTION WELL-2 NOTE 10 | INJECTION WELL-3 NOTE 10 | INJECTION WELL-4 NOTE 10 | INJECTION WELL-5 NOTE 10

HP BOOSTER PUMPS (A/B)

STAGE-III RO MEMBRANE

STAGE-II RO MEMBRANES

STAGE-I RO MEMBRANES

CIP SKID NOTE 20: CIP TANK → CIP PUMP

UTILITIES / AUXILIARY SYSTEMS: DIESEL FUEL SYSTEM | POWER GENERATION SYSTEM | FIRE FIGHTING SYSTEM | F&G SYSTEM | CHEMICAL INJECTION SYSTEMS

NOTES

1. SINGLE UNIT ORP ANALYZER SHALL ALSO MONITOR THE FREE CHLORINE, PH, CONDUCTIVITY, TURBIDITY, TEMPERATURE AND FLOW RATE ETC.
2. INLET WATER QUALITY PARAMETERS ARE GIVEN BELOW:
   - TURBIDITY < 30 NTU (TO BE CONFIRMED)
   - PH = 7-7.5
   - SDI ≤ 5 (TO BE CONFIRMED)
   - TDS = 3000 mg/l
   - TPH = 0.68 mg/l (TO BE CONFIRMED)
   - FE = 0.35 mg/l
   - Mn = 9.5 mg/l
3. THE REQUIRED RO PROCESS INLET CONDITIONS AND QUALITY REQUIREMENTS ARE GIVEN BELOW.
   - FLOW = 54 m3/hr
   - PRESSURE = 395 Psig
   - SDI < 3
   - TPH (OIL & GREASE) < 0.1 ppm
   - METALS (Fe, Al etc) < 0.05 ppm
   - TDS = 3000 ppm
4. TREATED WATER REQUIREMENTS ARE GIVEN BELOW.
   - COLOUR < 15 TCU
   - ODOUR < 3 TON
   - TDS < 600 mg/l
5. DISPOSAL DEEP WELL DEPTH SHALL BE 150-200m.
6. FLOCCULENT SHALL BE COMPATIBLE TO REVERSE OSMOSIS MEMBRANE. THE PACKAGE PROCESS DETAILS SHALL BE CONFIRMED BY VENDOR.
7. THE WATER INJECTION PUMPS DISCHARGE LINE LENGTH IS 100m. IT SHALL BE FINALIZED LATER.
8. SODIUM HYPOCHLORITE SHALL BE INJECTED TO MAINTAIN CHLORINE OF 0.5ppm. THE PACKAGE PROCESS DETAILS SHALL BE CONFIRMED BY VENDOR.
9. SAND FILTER SHALL BE HORIZONTAL AND ACTIVATED CARBON FILTER SHALL BE DOWN FLOW. THE PARTICLE SIZE AT OUTLET OF CARTRIDGE FILTER IS 5 MICRONS.
10. AQUIFER-1 THE ACTUAL DEPTH IS 17-45m.
11. AQUIFER-2 THE ACTUAL DEPTH IS 50-100m.
12. SODIUM HYDROXIDE SHALL BE INJECTED TO ADJUST PH OF 7-8. THE PACKAGE PROCESS DETAILS SHALL BE CONFIRMED BY VENDOR.
13. FLOW METER SHALL BE INCLUDED TO MEASURE THE INJECTION FLOW RATES.
14. CARTRIDGE FILTER POROSITY IS 5 MICRONS.
15. THE EQUIPMENT, LINE SIZES AND PUMPS DIFFERENTIAL PRESSURE INCLUDING SHAFT RATING ARE INDICATIVE BASED ON PRELIMINARY DESIGN REPORT AND SHALL BE FINALIZED BY PROCUREMENT CONSTRUCTION CONTRACTOR IN CONSULTATION WITH WATER TREATMENT PACKAGER/SUPPLIER. THE LOCATION AND DEPTH OF PRODUCTION/INJECTION/DISPOSAL DEEP WELLS SHALL BE FINALIZED BY PROCUREMENT CONSTRUCTION CONTRACTOR.
16. THE STANDARD EQUIPMENT AND PACKAGE ITEMS SHALL BE CONTAINERIZED.
17. ELECTRICALLY OPERATED MOTORIZED VALVES WILL BE PREFERRED AGAINST PNEUMATIC OPERATING CONTROL VALVES. IN CASE OF UNAVAILABILITY OF ELECTRICALLY OPERATED MOTORIZED VALES THEN REQUIRED NECESSARY UTILITES AS INSTRUMENT AIR AND OTHER UTILITIES SHALL BE PART OF ALL ASSOCIATED PACKAGE UNITS.
18. TREATMENT LOSS AT 10% OF 1300m3/Day WILL BE MAKEUP THROUGH ROAD TANKER.
19. ALL NECESSARY ITEMS AND SUB ITEMS WITHIN THE SKID INCLUDING EQUIPMENTS, INSTRUMENTS, PIPING, VALVES, UNIT CONTROL PANEL ETC SHALL BE PART OF PACKAGE UNIT.
20. REVERSE OSMOSIS UNIT CLEAN IN PLACE (CIP) SKID.
21. DURING REVERSE OSMOSIS UNIT MEMBRANES CLEANING, TREATED AND REJECTED WATER SHALL BE TRANSFERRED TO DISPOSAL DEEP WELL.
22. FILTERED WATER SHALL BE CONDITIONED WITH ANTI-SCALANT, SULPHURIC ACID AND SODIUM BI-SULFITE WITHIN THE RO PACKAGE TO SAFEGUARD THE MEMBRANES.

FIRST RECYCLER

General

The Pump-Treat-Reinjection facility comprises pumping wells from two aquifers, inlet manifold, modular water treatment packages like inline pH dosing,sodium hypochlorite and flocculent dosing skids, water storage tanks, sand filter and activated carbon filters, intermediate water holding tanks , R.O. Units, treated water tanks, two injection water pumps & solid water separation units etc. The PTR pilot facility is designed to treat the ground water to remove its contaminants to a desired water quality.

Ground Water Analysis

Description	Units	Values
Flow Rate	m^3/hr (m^3/day)	54 (1296)
Temperature	°C	15-35
pH	-	7- 7.5
Turbidity	NTU	<30

Description	Units	Values
SDI	SDI	<5
Suspended Solids	mg/l	<30
TPH	mg/l	0.68
TDS	mg/l	3000
Fe++	mg/l	0.35
Mn++	mg/l	9.5

Ground Water Properties

Parameters	Values
Density (kg/m^3)	995-1015
Molecular Weight	18
Viscosity (cP)	0.5-1

Treated Water Quality

Description	Units	RO. Inlet	RO. Outlet
Flow Rate	m^3/day	1231.5(Note-1)	1170 (Note-2)
Temperature	°C	15-40	15-40
Pressure	barg	Water static head in water holding tank (0.4 barg)	-
pH	-	7-7.5	7-7.5
Turbidity	NTU	0.5	-
SDI	SDI	<3	-
Suspended Solids	mg/l	-	-
Particle Size	micron	5	-
TPH	mg/l	0.1	0.1
TOC	mg/l	2	-
TDS	mg/l	3000	600
Fe++	mg/l	<0.1	-
Mn++	mg/l	<0.05	-
Colour	TCU	-	<15
Odour	TON	-	<3

The treatment packages are included below:

- Borehole Pumps
- Chemical Injection Skids
- Water Storage Tanks
- Water Quality Analyzers
- Sand Filters (Horizontal)
- Downflow Granulated Activated Carbon Pressure Filters
- Reverse Osmosis Unit
- Solid Water Separation Unit
- Cartridge Filter
- Treated Water Injection Pumps
- Waste water disposal pump.
- Diesel Power Generation Unit
- Centralized Control Room






FIRST
RECYCLER




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