

**Attachment A**  
**List of Authorized Injection Material Amendments**

**(original September 2014)**  
**(updated August 2020, with new additions in boldface)**

*The list below does not represent any endorsement of products or materials by the Regional Water Quality Control Board, Los Angeles Region (Regional Board). Many of the products/materials listed are patented. Users of these products/materials shall comply with any regulations and laws applicable to the use of the products/ materials. Some products/materials may contain by-products or impurities that are not authorized to be used by the Regional Board. Compounds listed under one category can also be used under another category.*

**1. Chemical Oxidants:**

- Fenton's reagent (hydrogen peroxide, ferrous iron catalyst, and pH buffer)
- Hydrogen Peroxide
- Ozone
- Potassium or Sodium Permanganate
- Sodium Percarbonate
- Sodium Persulfate
- **Potassium Persulfate**

**2. Chemical Oxidant Activators:**

- Calcium Hydroxide
- Chelating Agents (ferric ethyldiaminetetraacetic acid (EDTA), sodium citrate, sodium malonate, sodium phytate)
- Silica and Silicates (Silicic Acid, Sodium Silicate, Silica Gel)
- Sodium Hydroxide

**3. Aerobic Bioremediation Enhancement Compounds:**

- Calcium Oxide/Peroxide
- Calcium hydroxide
- Magnesium (Oxide/Hydroxide/Peroxide)
- Methane (Dissolved Phase)
- Propane (Dissolved Phase)
- **Ammonium Bicarbonate**
- **Ammonium Phosphate**
- **Ammonium Sulfate**

**4. Anaerobic Degradation Enhancement Compounds:**

- **Ammonium Nitrate**

- Calcium Sulfate (gypsum)
- Cheese Whey
- Complex organic materials (starch, wood chips, yeast extract, grain milling products)
- Complex Sugars
- Corn Syrup
- Emulsified Vegetable Oil
- Ethanol
- Glucose
- Glycerol esters of fatty acids and poly lactates
- Glycerol Polylactate/Tripolylactate
- Glycerol, Xylitol, Sorbitol
- Guar
- Hematite
- Lactose
- Lecithin
- Magnesium sulfate
- Milk Whey
- Methanol
- Molasses
- Organic Acids (Acetate, Lactate, Propionate, Benzoate, and Oleate)
- Potassium Sulfate
- **Potassium Chloride**
- Propanol
- **Red yeast rice extract and garlic oils (Antimethanogenic Reagents (AMRs))**
- Sorbitol Cysteinate/Cysteine

***5. Reduction Degradation Enhancement Compounds:***

- Ferrous Chloride
- Ferrous Gluconate
- Ferrous Sulfate
- Sodium Dithionite
- Zero-Valent Iron
- **Sodium Ascorbate**
- **Sodium Sulfit**
- **Sodium Sulfate**
- **Calcium Ascorbate**

***6. Metals Precipitation / Stabilization:***

- Calcium Phosphate
- Calcium Polysulfide
- **Ferric Chloride**
- **Ferrous Sulfide**
- Ferrous Sulfate

- Sodium Tripolyphosphate (STPP)
- **Iron (III) Oxide & Iron Pyrite**
- **Zeolite**

**7. Surfactants/Co-solvents:**

- Benzenesulfonic acid
- Dioctyl Sodium Sulfocuccinate
- D-limonene
- Ethoxylated Castor Oils Surfactants
- Ethoxylated Cocamides Surfactants
- Ethoxylated Coco Fatty Acid Surfactants
- Ethoxylated Octylphenolic Surfactants
- Sorbitan Monooleate
- Xanthan Gum
- **Alcohol Ethoxylate**

**8. Bioaugmentation Organisms:** *The users shall prove that any bacterial genomes in the original injection form, its degradation form, other impurity or by-product shall not be human/animal pathogens\*. Genetically-modified organisms (GMO) should not be used.*

- Dehalococcoides Sp.
- Dehalobacter Sp.
- Geobacter
- Methanomethylovorans
- Desulfovibrio
- Desulfobacterium

\* = for any bacteria consortium along with above species, a human/animal pathogen test must be performed for the following species at minimum (table below). If a positive test result is returned for any listed microorganism or group, then additional testing may be required before permission for use is granted.

| <b>Genus or Group</b>            | <b>Species</b>       |
|----------------------------------|----------------------|
| <i>Vibrio</i>                    | sp.                  |
| <i>Campylobacter</i>             | sp.                  |
| <i>Pseudomonas</i>               | <i>aeruginosa</i>    |
| <i>Bacillus</i>                  | <i>anthracis</i>     |
| <i>Salmonella</i>                | sp.                  |
| <i>Listeria</i>                  | <i>monocytogenes</i> |
| <i>Yersinia</i>                  | sp.                  |
| <i>Clostridium</i>               | <i>perfringens</i>   |
| Fecal streptococci (Enterococci) | -                    |
| Fecal coliforms                  | -                    |
| <i>Escherichia</i>               | <i>coli</i>          |
| <i>Citrobacter</i>               | <i>freundii</i>      |

|                   |                   |
|-------------------|-------------------|
| <i>Klebsiella</i> | <i>pneumoniae</i> |
| <i>Serratia</i>   | <i>marcescens</i> |

**9. Tracer Study Compounds:** *The tracer compounds shall be highly contrasting and not reactive with current contaminants to be treated. The tracers may be chloride-based, bromide-based, or fluoride-based salts, or similar materials as approved by the Executive Officer.*

- Calcium Bromide
- Calcium Chloride
- Eosin Dyes
- Fluoride Salts
- Iodide
- Potassium Bromide
- Potassium Iodide
- Rhodamine Dyes
- Sodium Bromide
- Sodium Chloride
- Sodium Fluorescein

**10. Buffer Solutions and pH Adjusters:**

- Calcium Carbonate
- Calcium Magnesium Carbonate
- Potassium Bicarbonate
- Sodium (carbonate/bicarbonate)

**11. Inorganics/Nutrients:**

- Nitrate
- Ammonia
- Phosphate
- Vitamins

**12. Sorption Materials**

- Granular Activated Carbon
- **Activated Carbon with Reactive Iron**
- **Activated Carbon with Hydrocarbon Degrading Bacterial Consortium\* (Terminal Electron Acceptors (TEA), Nutrients, and Bacteria)**
- **Colloidal Activated Carbon**
- **Micron-Scale Activated Carbon**

\*= see note in section 8 above.