

Lecture 03

Sewage **Disposal**

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Sewage disposal

A stylized illustration in the background shows a green pipe with a valve leaking a thick, brownish-green liquid (sewage) into a blue body of water. In the lower-left foreground, a small, light-brown duck is swimming. The overall style is simple and educational.

- There are different ways to dispose of sewage. Whichever method is used, it is important to make sure that it does not:
 - cause dangerous conditions which allow people to come into contact with disease-causing germs
 - cause pollution of a water supply
 - allow the breeding of insects such as mosquitoes or cockroaches which can carry disease-causing germs inside or on their bodies as a result of eating or walking in sewage
 - produce bad smells

SEWAGE SYSTEMS

On site systems

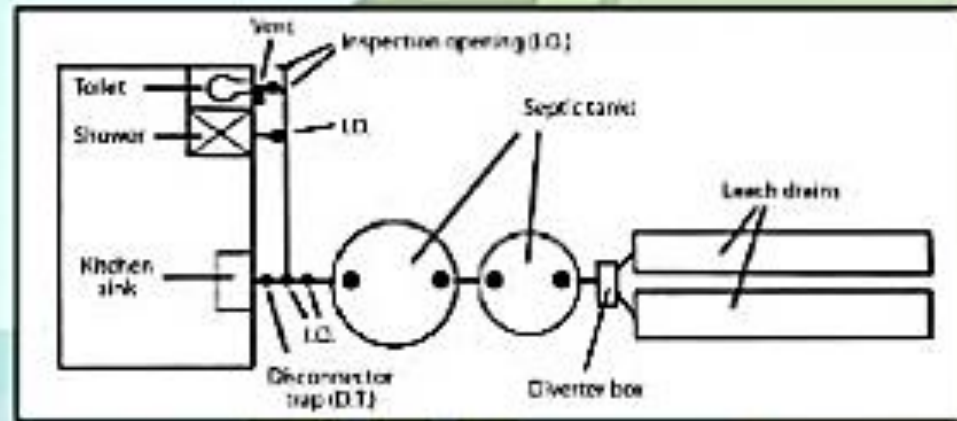
- Treats the sewage in a septic tank so that most of the sewage becomes effluent and is disposed of in an area close to the house or buildings.
- Example: A septic tank and leach drains

Sewage or effluent systems

- A sewage or wastewater system disposes of the effluent from a community at a central place usually called a sewage lagoon or effluent pond. The sewage can be treated:
 - in a septic tank at each building
 - just before the lagoon in a large septic tank or macerator system, or
 - in the lagoon itself

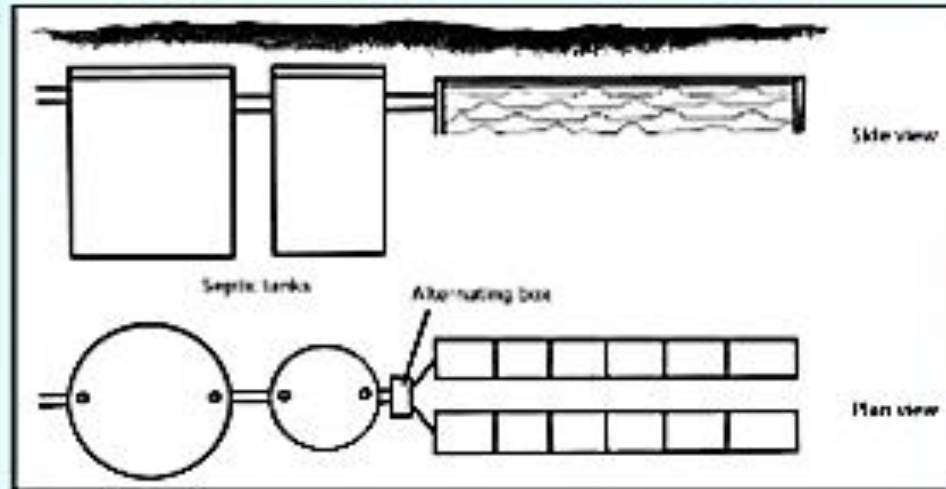
On site disposal system

- All the liquid waste from the toilet, bathroom, laundry and sink goes into pipes which carry it to a septic tank.
- The effluent from the tank is then disposed of through effluent disposal drains often referred to as leach or French drains.
- In these systems, the effluent is soaked into the surrounding soil. Some soils don't allow good soakage such as clay or similar soils



Plan view of an on-site sewage disposal system

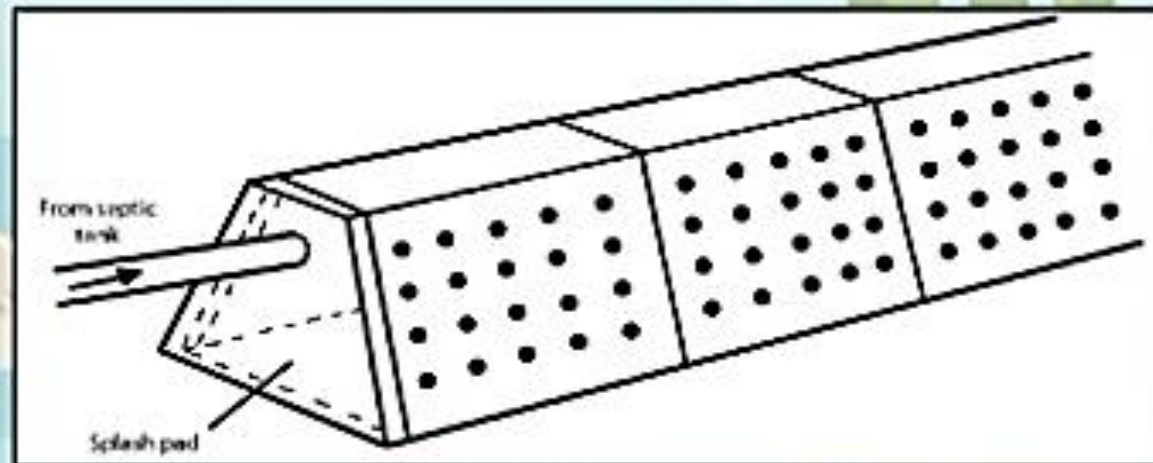
Leach drains



Septic tanks and brick leach drain

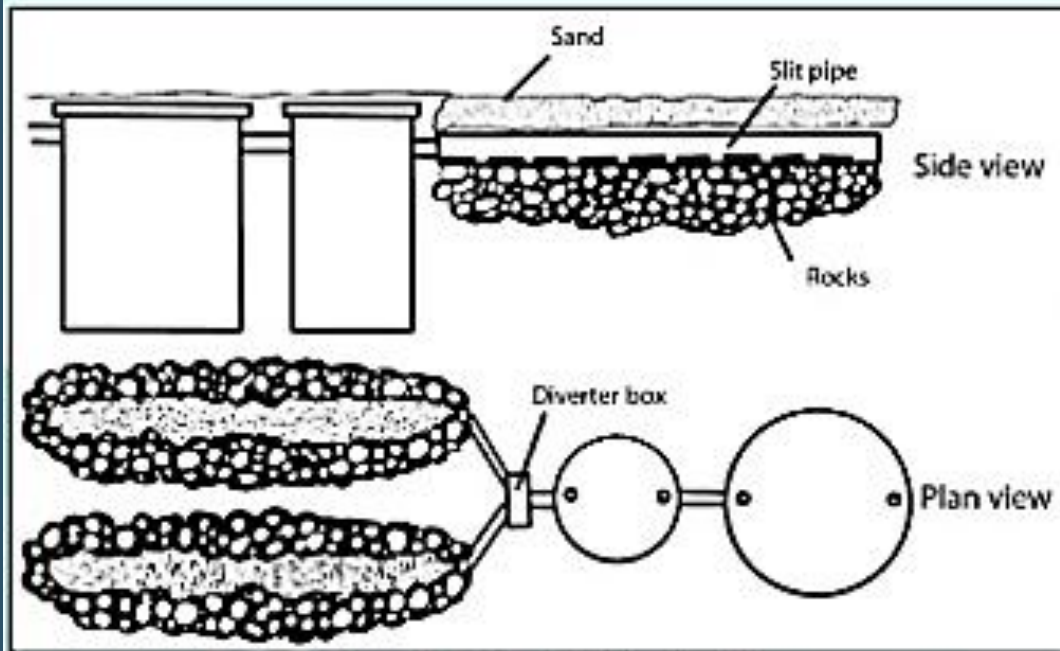
- A leach drain is a tube-like structure which is made of concrete or plastic and buried in the ground. There are holes in the sides.
- Its width can vary and its length depends upon the size of the leach drain being used, the amount of liquid waste to be disposed of, the type of soil (dirt) around it, and how it is built.

- The liquid waste enters the leach drain at one end then slowly seeps down through the open base and out the sides through holes into the surrounding soil.



Concrete segment leach drain

French (rubble) drains



French drain (Rubble drain)

- The French drain is also used to dispose of the liquid waste coming from the septic tank.
- It is a pipe with holes or slits cut in it, laid on a bed of round rocks. The holes or slits in the pipe face downwards.
- It is usually about 20 m long but the length depends upon the amount of effluent to be disposed of and the soil type around the drain.
- The drain is covered with plastic or some similar material and is then covered with a protective layer of sand or gravel.
- This helps prevent the pipe holes or the gaps between the rocks from blocking up with the protective sand or gravel.

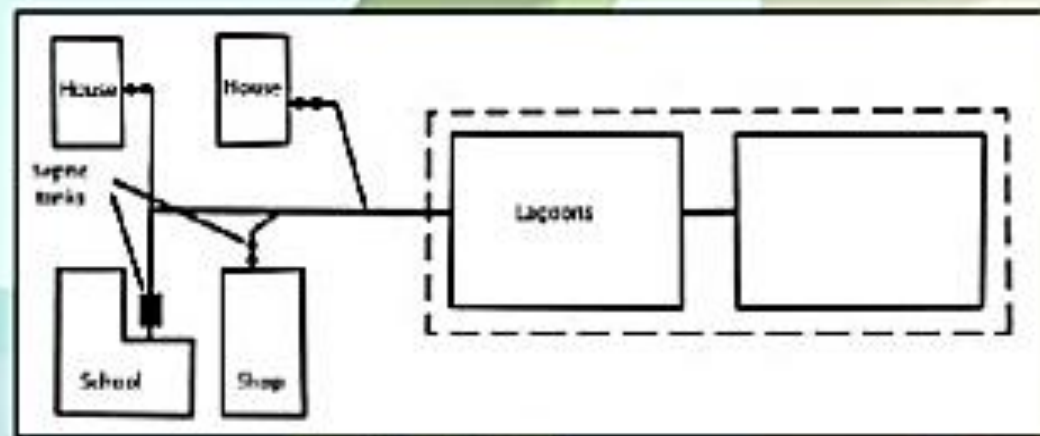
Effluent (wastewater) disposal system

In this method the effluent from the community is carried by large pipes to the lagoon.

These pipes serve all the houses and other buildings in the community.

The sewage may be either be treated in septic tanks at the houses or buildings or at the lagoon

There are no leach or French drains



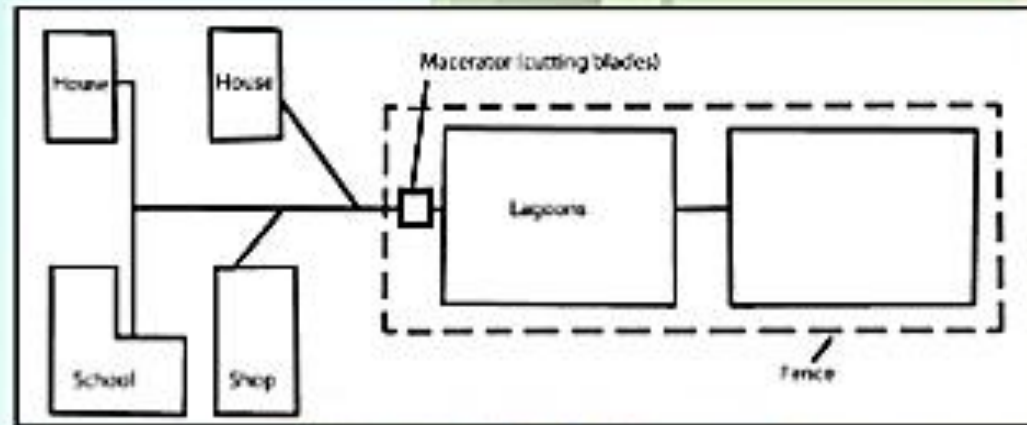
Plan view of a wastewater disposal system

Full sewage system

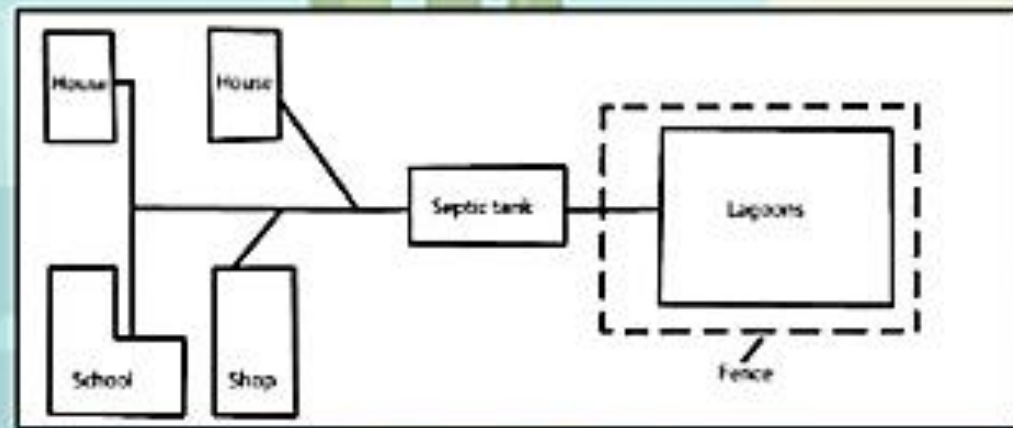
All the sewage from the toilet, shower, laundry and other areas enters waste and sewer pipes directly and is pumped to a lagoon.

There are three types of full sewage system:

- The sewage enters the lagoon without treatment
- The sewage goes through a series of cutting blades which help break up the solid matter before it enters the lagoon. These blades are called macerators.
- The sewage may be treated in a large septic tank just before it enters the lagoon.



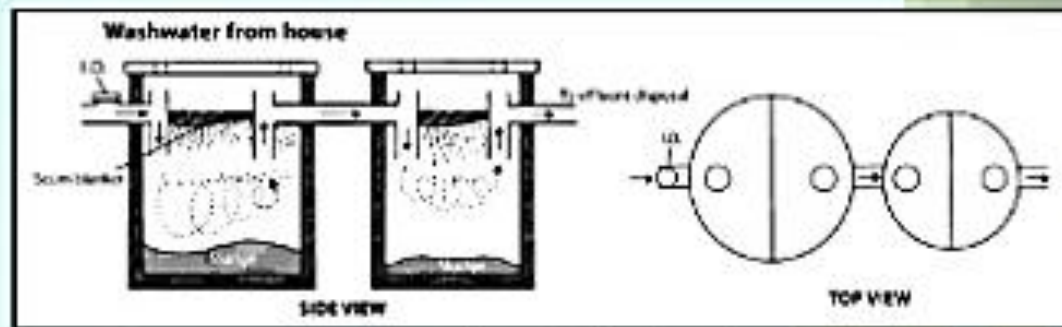
Plan view of full sewage system and macerators



Plan view of a full sewage system with a large septic tank

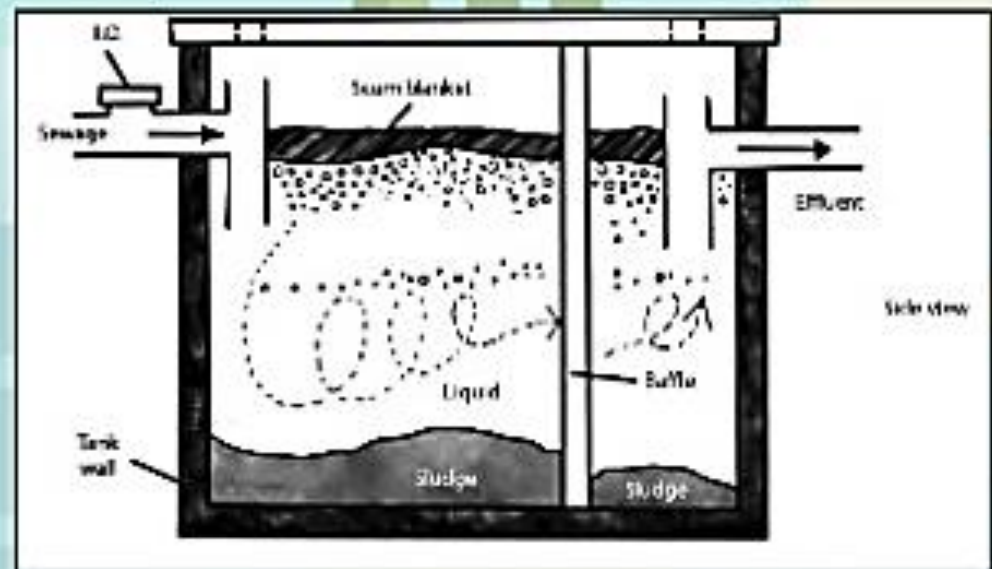
The septic tank

- A household septic tank usually consists of two round concrete tanks with lids placed close to each other. They are connected by a pipe.



A round septic tank system

- A septic tank can also be a single rectangular concrete tank with a dividing wall in it. A rectangular septic tank is designed to be used by more than 10 people and is often used for sewage treatment at a lagoon.
- The tank is constructed on the site where it is to be used.



A rectangular septic tank system

Necessity and objectives of wastewater disposal

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Definition :

Sewage: liquid waste from community

Removing act of sewage :: *sewage disposal*

Necessity :

- Accumulation causes nuisance
- Selection of Pretreatment method
- Protection of groundwater

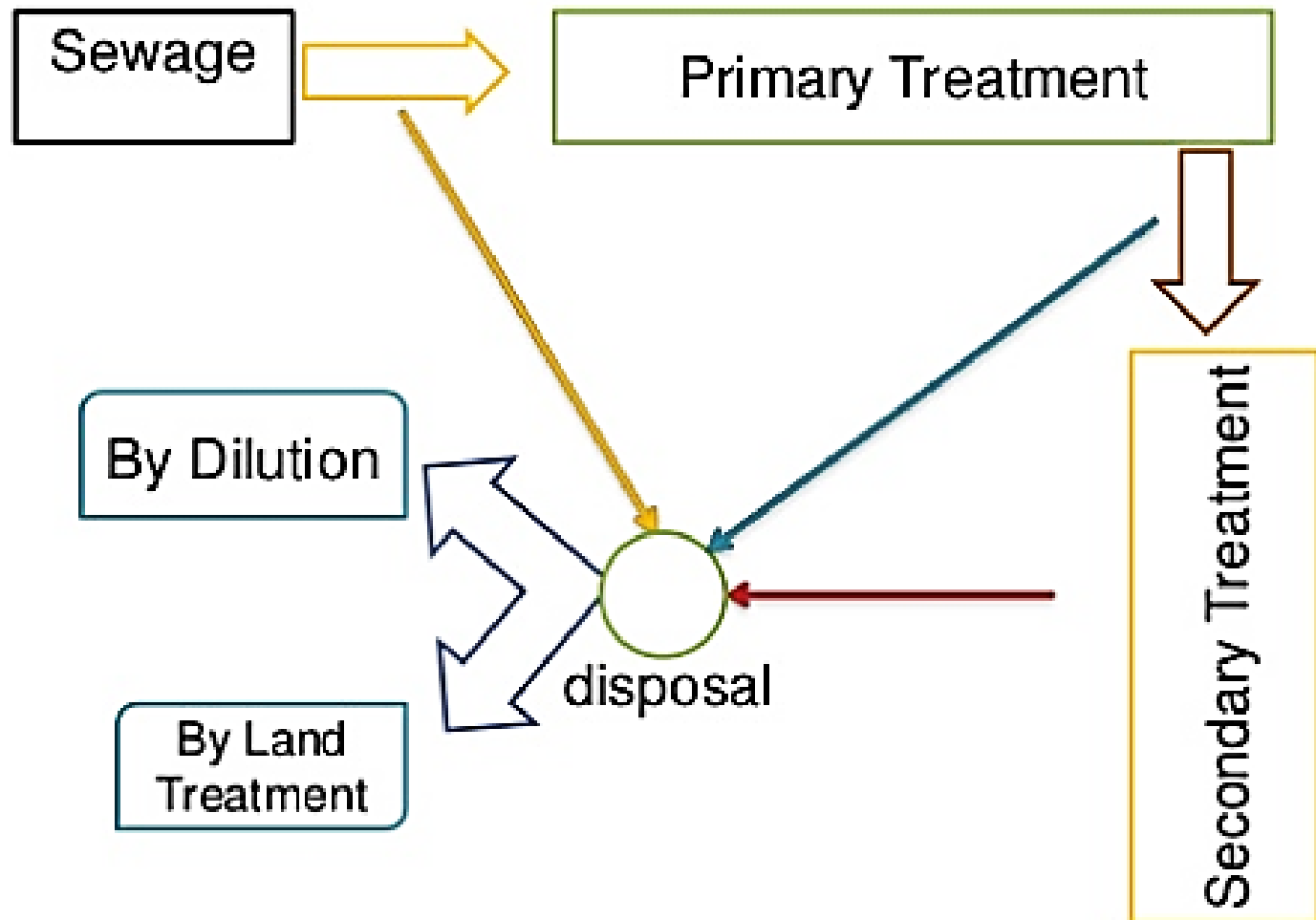
Objectives :

- To improve public health
- To use sewage in farm
- To protect aquatic life

6.2 Wastewater Disposal Method

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Composition, Quality, Characteristic of Sewage



3 Wastewater disposal by Dilution process and essential conditions for dilution

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Disposal into water bodies

- Purification of wastewater by self-purification of natural water

Essential Conditions :

A. Sewage

- ✓ Fresh Sewage
- ✓ No floating & suspended solids
- ✓ No toxic substances

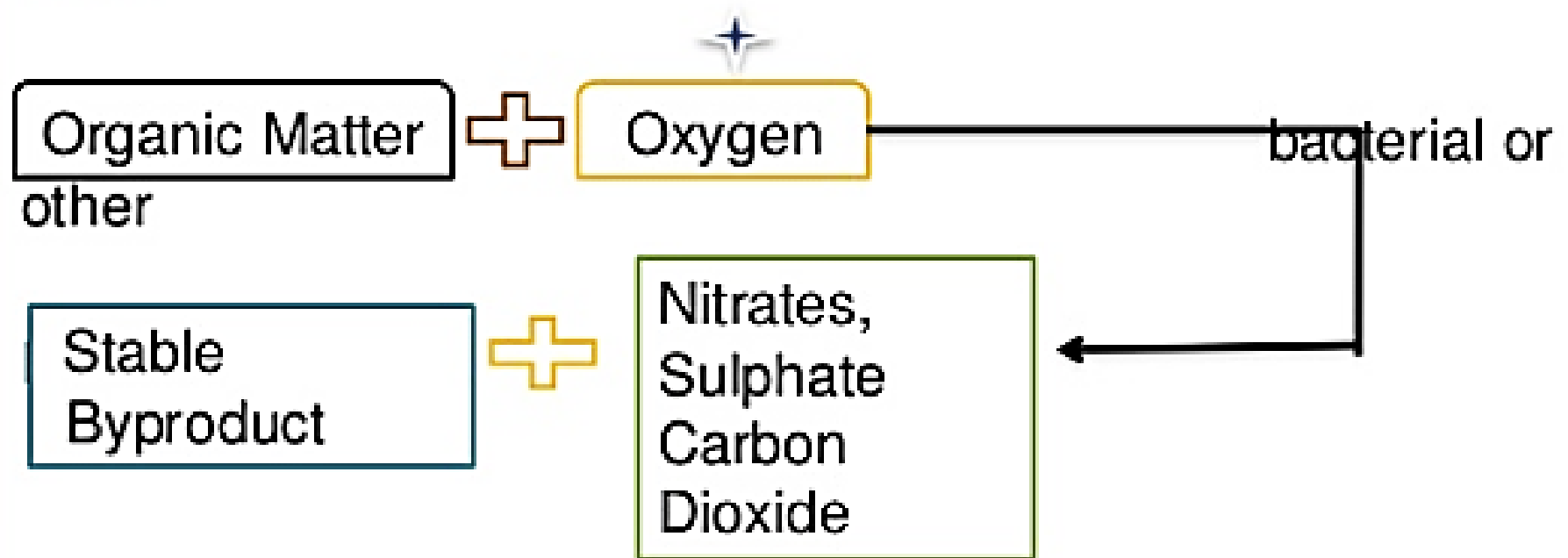
B. Water Bodies

- ✓ High DO content
- ✓ Not being used for water supply & navigation
- ✓ Volume of water \gg Volume of sewage
- ✓ Thorough mixing capacity

6.4. Self Purification of rivers/streams

Despite discharge of sewage,

Balancing its (river) DO content after few days.



- ❑ Due to decomposition, reduction in DO content.
- ❑ Deficit DO is replenished by aeration.

6.5. Factors affecting self purification

1. Dilution

- ❖ Ratio of volume of water bodies to sewage
- ❖ Higher the Dilution ratio, not appreciably reduction in DO

$$C = (C_s \cdot Q_s + C_r \cdot Q_r) / (Q_s + Q_r)$$

where,

C = resulting concentration of mixture

C_s, C_r = concentration of organic content

BOD, suspended solids in sewage & river resp.

Q_s, Q_r = Discharges of sewage & river

2. Current

- # Disperse the wastewater
- # High velocity of current – reduction in time of recovery
- But affected to long length of stream.

3. Sunlight

- # Enhance aquatic plants to produce oxygen

4. Sedimentation

- # Removal of suspended solids by settling
- # Anaerobic decomposition due to settled solids

5. Temperature

- # High temp. increases solubility of oxygen in water.
- # High temp. causes less self-purification time.

6. Oxidation

- # Capability of stream to absorb more oxygen

7. Reduction

- # Hydrolysis of organic matter

After conveying the sewage through sewers, the next step is its disposal. The sewage can be disposed of without treatment or after suitable treatment finally, the sewage is disposed of either in natural water courses or on land.

Methods of sewage disposal can be classified under

The natural methods

1. By dilution
2. Land treatment

The artificial methods

- 1.Primary treatment
- 2.Secondary treatment

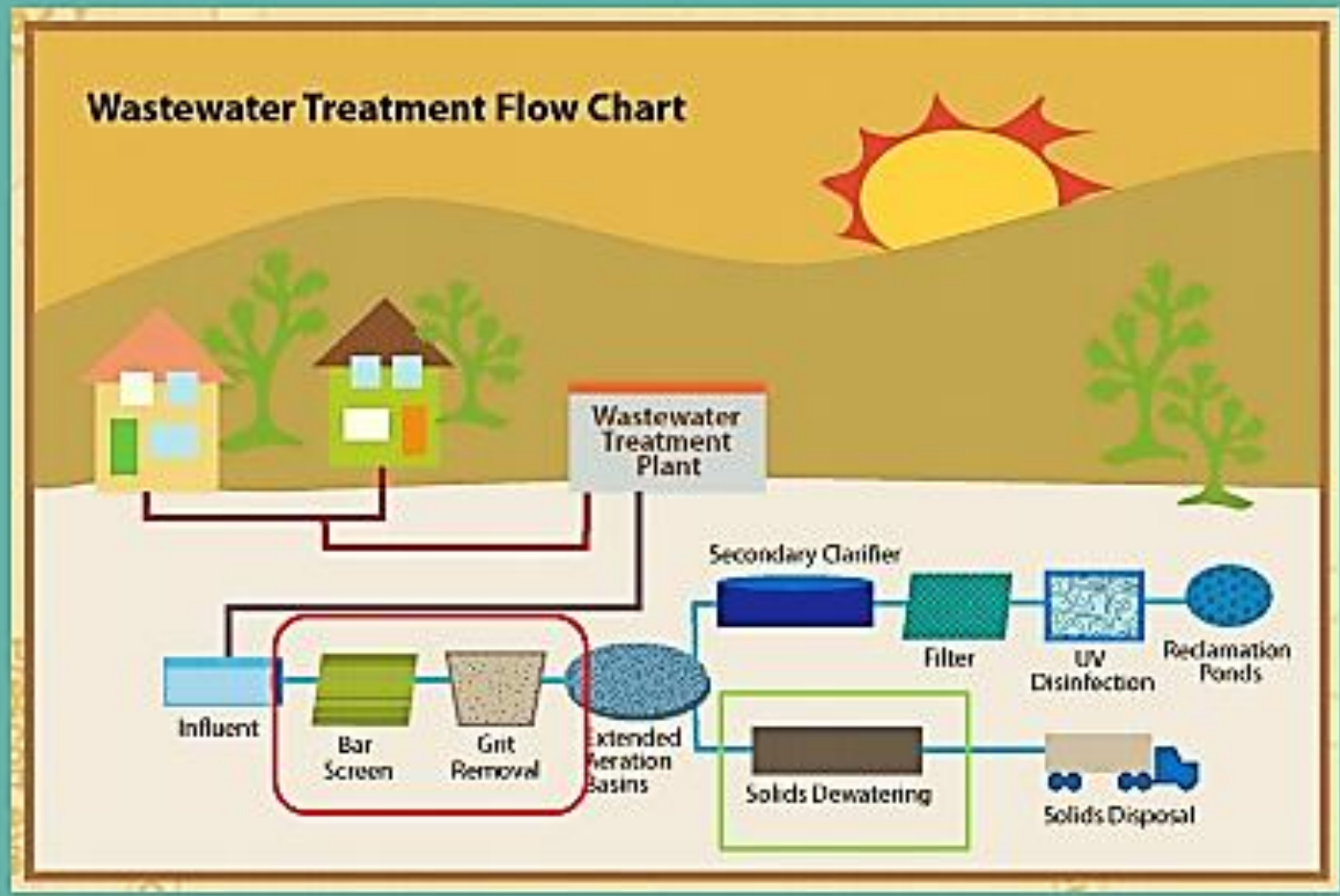
Dilution

The disposal of sewage by discharging it into watercourses such as streams, rivers or large body of water such as a lake, sea is called dilution. This methods of disposal are only possible when the natural water in required quantity is available near the town. While discharging the sewage in this way care should be taken that the sewage may not pollute the natural water and render it unfit for any other purpose such as bathing, drinking, fish culture, rough industrial use and irrigation.

Land treatment

When the sewage is evenly spread on the surface of land methods is called land treatment the water of sewage percolates in the ground and the organic suspended solids remain at the surface of the ground the organic suspended solids are partly acted upon by the bacteria are partly oxidized by exposure to atmospheric action of heat light and air.

What are STP Screenings and Grit?



Course Screens aka Bar Racks



Management/Disposal

- Screenings and Grit are defined as 'Special Waste' by the Department
- Special Waste require special handling and disposal procedures based on its physical and chemical characteristics
- Permitted Solid Waste Landfills



Management/Disposal

- **Stockpiled at Sewage Treatment Plant**
- **Resources Recovery Facilities (RRF) –**
 - **directly transported to a permitted RRF and disposed as special waste; or**
 - **if it has been properly “washed, ground and dewatered”, may be accepted as municipal solid waste**



Thank you

