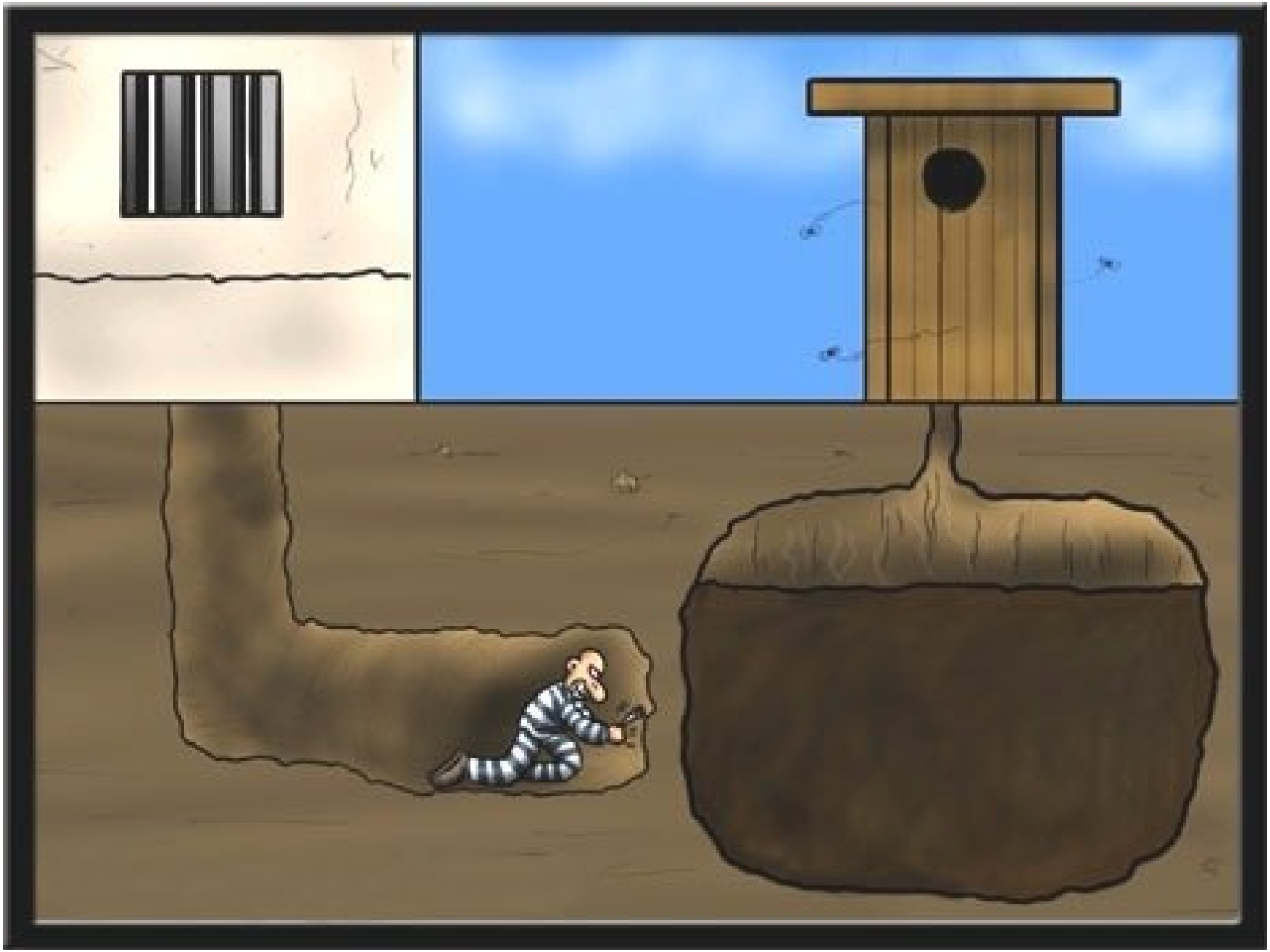
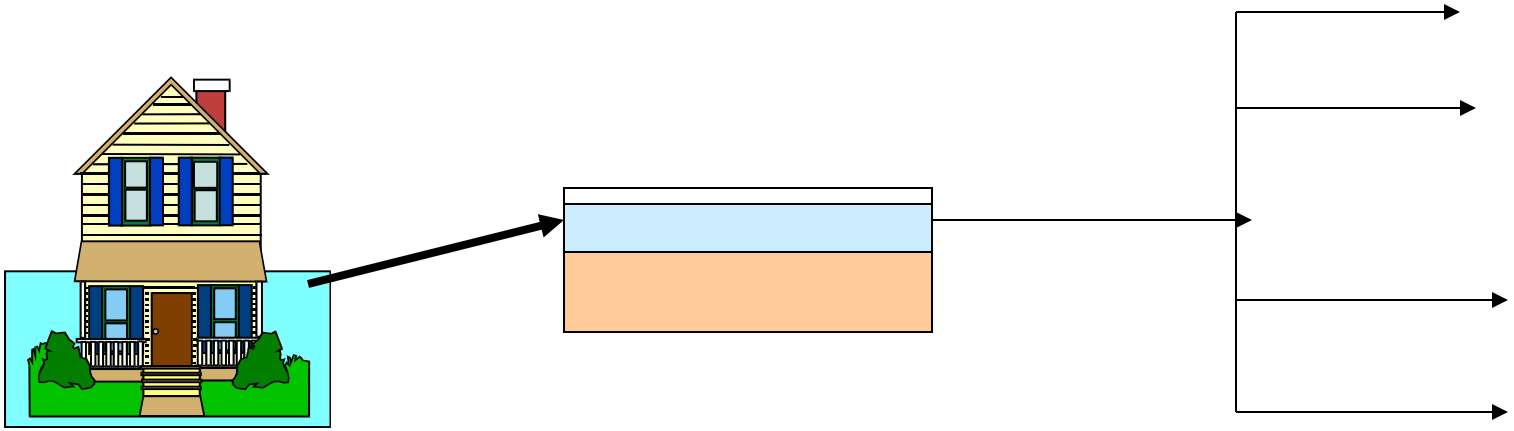


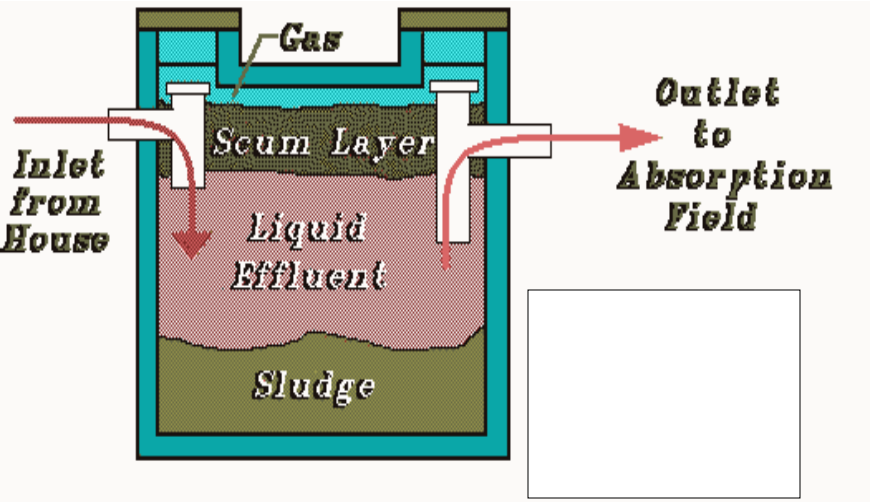
# ON-SITE TREATMENT



**SEPTIC TANK**

**LEACH FIELD**

"CONVENTIONAL SYSTEM"

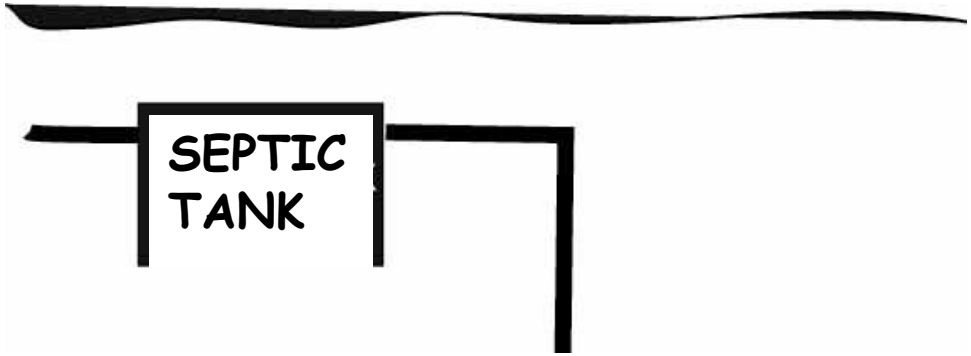



SCUM, LIQUID, SOLIDS → **SEPTAGE**

**ANAEROBIC** CONDITIONS IN THE SEPTIC TANK,

**AEROBIC** CONDITIONS IN THE LEACH FIELD

# ON-SITE OPTIONS




"ALL" OPTIONS BEGIN WITH A SEPTIC TANK (PRIMARY TREATMENT)

# ALTERNATIVE SYSTEMS NEEDED WHEN…

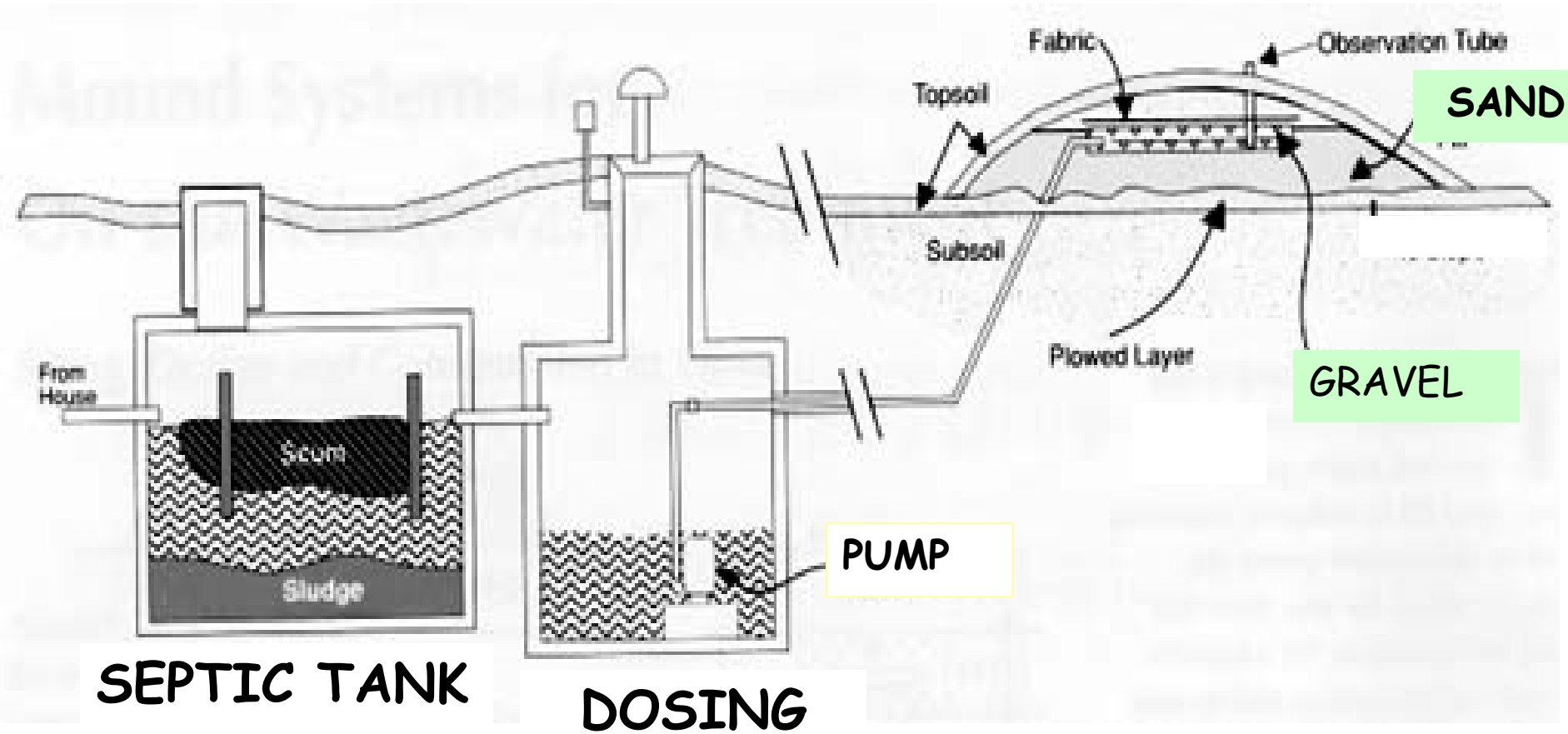
- TOO MUCH VOLUME TO TREAT
- POOR SOIL
- TOO SMALL A LOT
- HIGH WATER TABLE or ENVIRONMENTALLY SENSITIVE AREA

**SOMETIMES CHAMBERS ARE INSTALLED INSTEAD OF LEACH FIELDS**

# ON-SITE OPTIONS


- **MOUND SYSTEM**

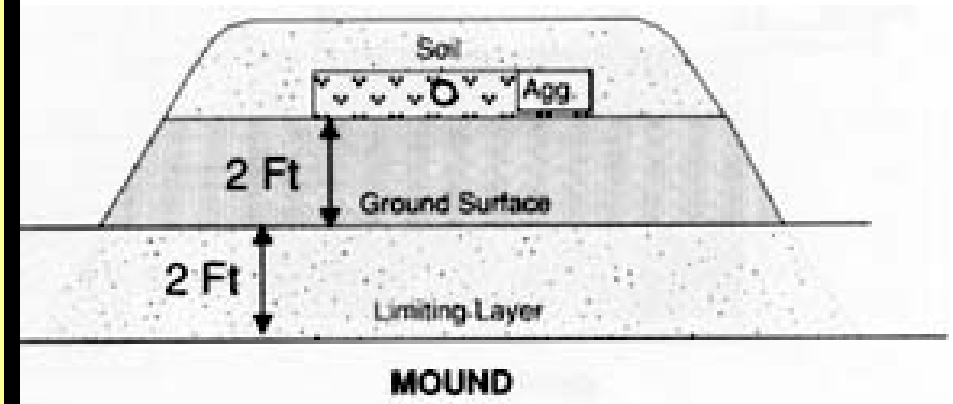
# MOUND SYSTEM



# MOUND SYSTEM

BUILD WHERE:

- <10 ft to rock
- <1 inch/hr percolation



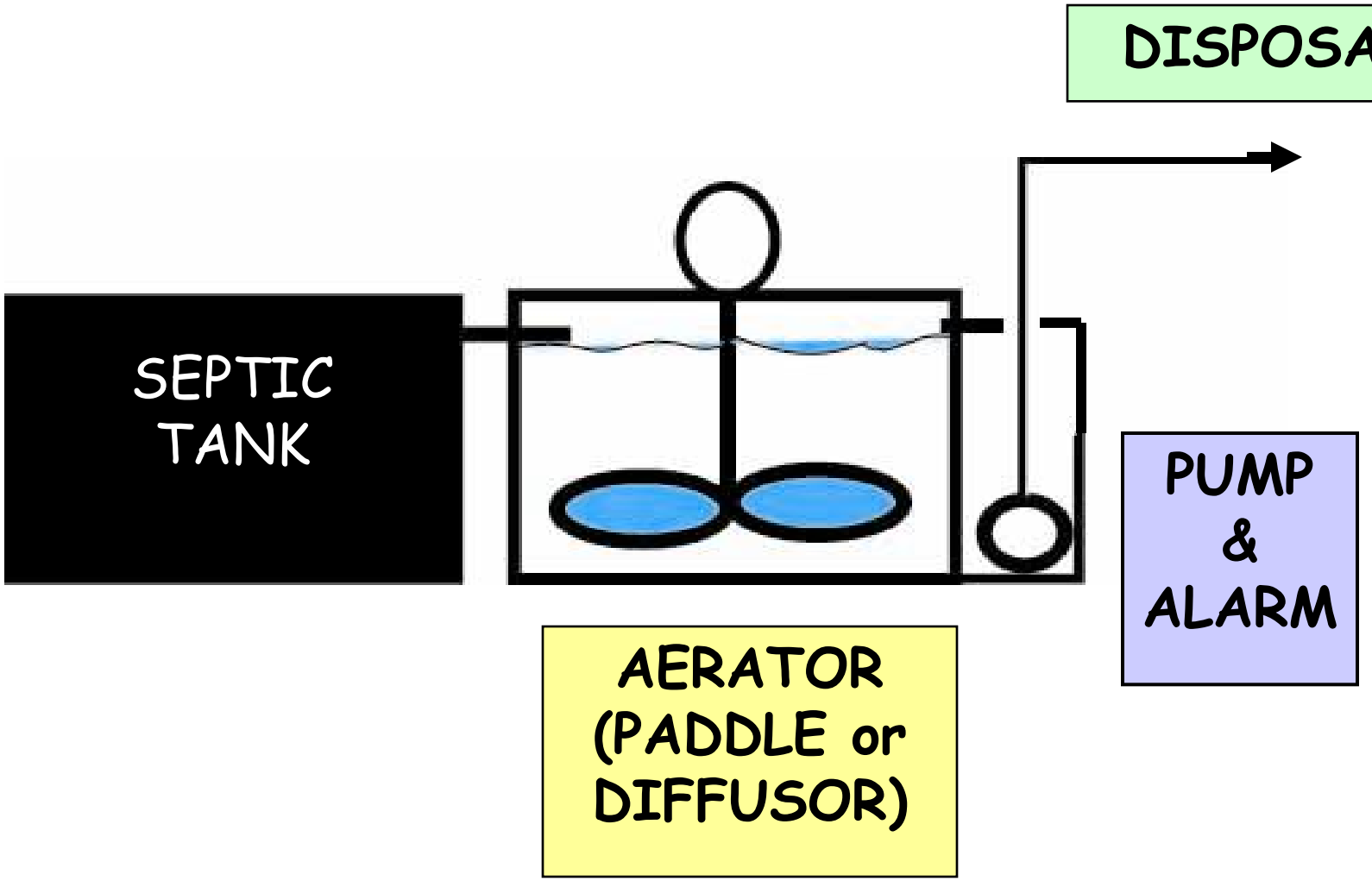
# ON-SITE OPTIONS

SEPTIC TANK

- MOUND SYSTEM

- AEROBIC SYSTEM

# AEROBIC SYSTEM



# POTENTIAL PROBLEMS WITH AEROBIC SYSTEMS

NEGLECTION FROM HOMEOWNERS

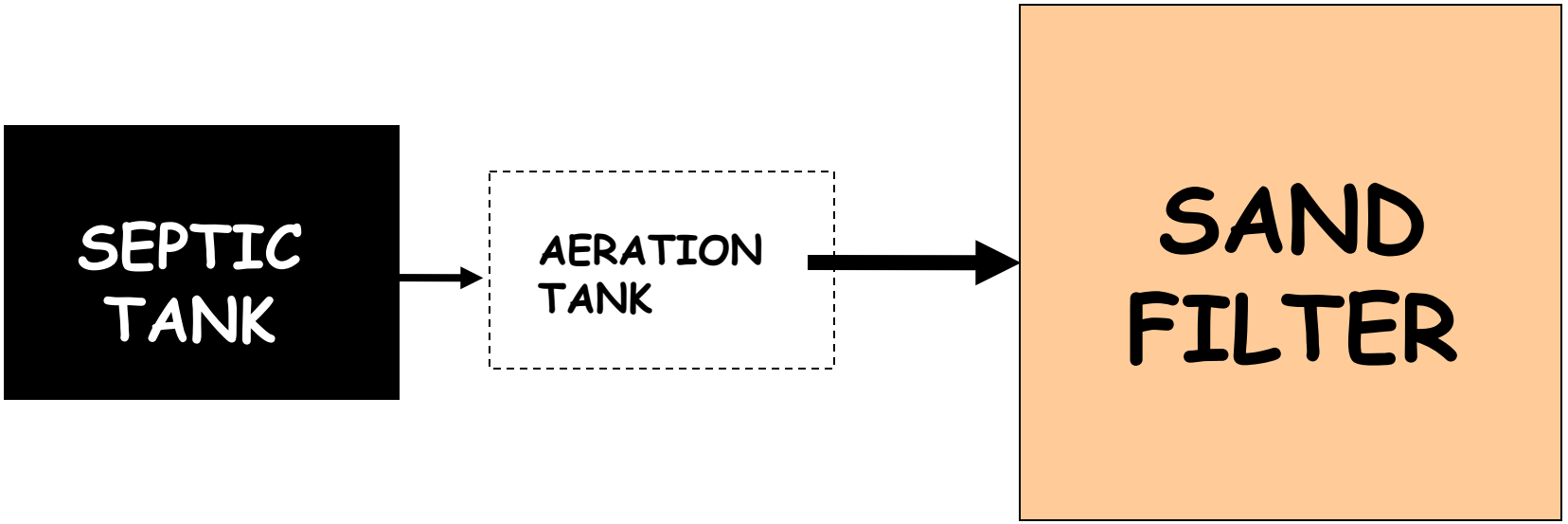
SOME STATES REQUIRE CERTIFIED OPERATORS TO MAINTAIN THESE UNITS

# ON-SITE OPTIONS

SEPTIC TANK

- MOUND SYSTEM
- AEROBIC SYSTEM
- SAND FILTER

# SAND FILTERS




- FILTERS CAN BE ABOVE GROUND (OPEN FILTER) OR BELOW GROUND (BURIED FILTER)
- ACT LIKE MINATURE TRICKLING FILTER; SO, OPEN FILTERS MUST BE RAKED AND SAND REPLACED REGULARLY

# ON-SITE OPTIONS


- MOUND SYSTEM
- AEROBIC SYSTEM
- SAND FILTER
- CONSTRUCTED WETLANDS

# CONSTRUCTED WETLANDS

- AKA-ROCK & REED FILTERS; MICROBIAL ROCK PLANT FILTERS; VEGETATED ROCK FILTERS; VEGETATED SUBMERGED BED WETLANDS; SHALLOW HORIZONTAL FLOW WETLANDS; MICRO-WETLANDS; ARTIFICIAL MARSH; PHYTOREMEDIATION

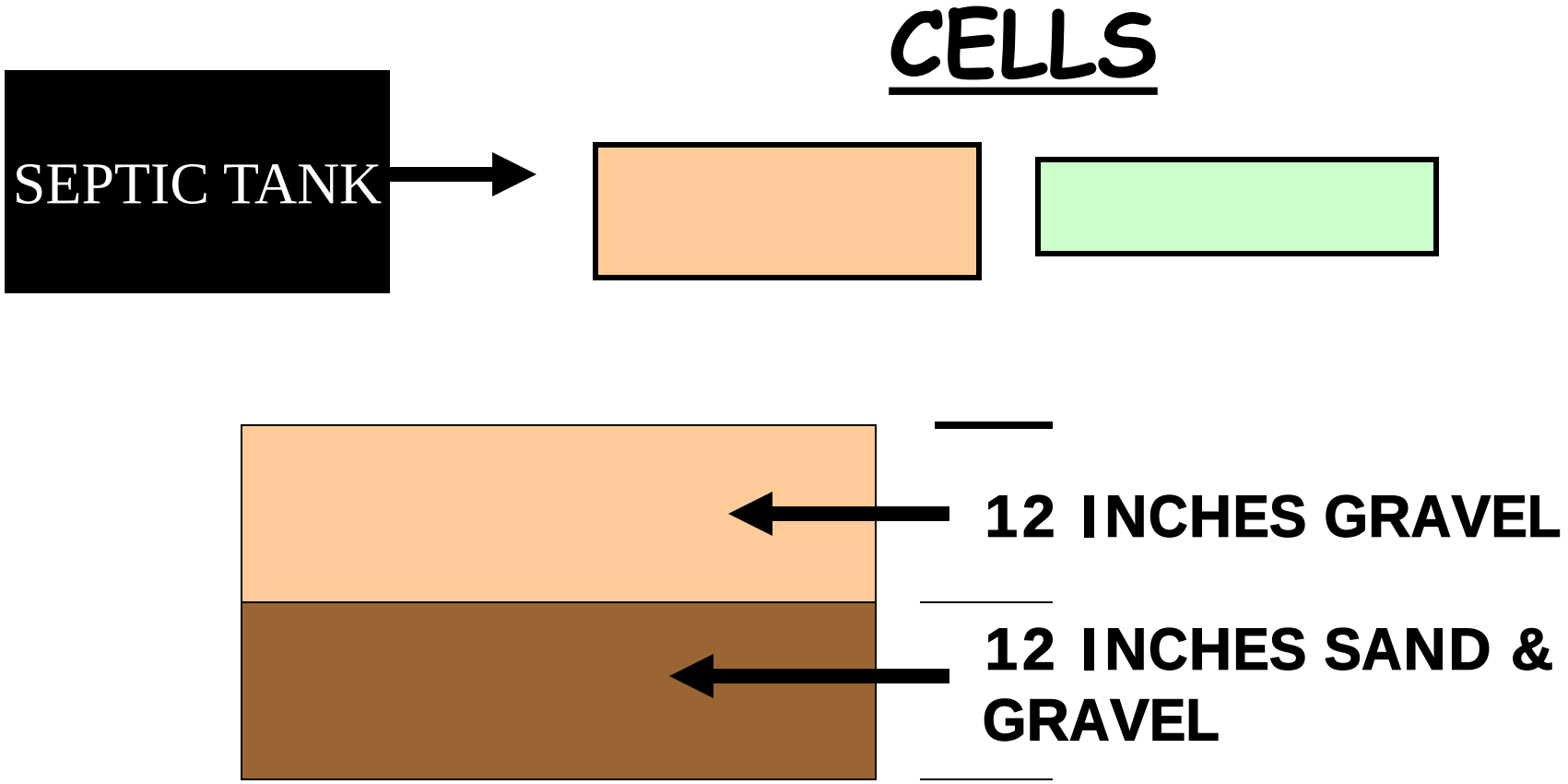
# CONSTRUCTED WETLAND

TWO TYPES:

- WATER FLOWS **ON SURFACE;**
- WATER FLOWS **BENEATH THE SURFACE**

**PURPOSE IS TO ARTIFICIALLY REPRODUCE WHAT ACTUALLY HAPPENS IN A NATURAL WETLAND**

# CONSTRUCTED WETLAND



# DISTRIBUTION PIPES INTO A CONSTRUCTED WETLAND

# CONSTRUCTED WETLAND

VEGETATION: BULRUSHES, CATTAILS, REEDS, RUSHES, SEDGES…SHOULD BE NATURAL VEGETATION TO ADAPT WELL AND CONTROL PESTS

# HOW CONSTRUCTED WETLANDS WORK

- PLANT ROOTS GIVE OFF OXYGEN TO AERATE THE WATER.
- AEROBIC ORGANISMS ATTACH TO ROOTS AND GRAVEL
- BACTERIA, FUNGI, PROTOZOAN, AND ENZYMES BREAK DOWN THE POLLUTANTS

# WATER LOSSES IN THE WETLANDS

DEATH VALLEY, CA HAS AN EVAPORATION RATE OF 150"/YR.

WHAT IS THE AVERAGE ANNUAL EVAPORATION IN SOUTHERN NEW MEXICO?

ANS: 60-80 INCHES/YEAR

# TRANSPIRATION

- ONLY 1% OF THE WATER TAKEN UP BY PLANTS IS NEEDED, THE REST IS "TRANSPIRED" TO THE AIR

- EXAMPLE: ONE CORN PLANT TRANSPIRES ABOUT 1/2 GALLON OF WATER PER DAY.

- A FIELD OF CORN TRANSPIRES ABOUT 400,000 GAL PER SEASON

# EVAPOTRANSPIRATION

DIFFICULT TO TELL HOW MUCH WATER IS LOST TO EVAPORATION AND HOW MUCH TO TRANSPIRATION, SO… THE LOSSES ARE LUMPED TOGETHER AND CALLED

"*EVAPOTRANSPIRATION*"

# OTHER WATER LOVING PLANTS

- DEEP-ROOTED TREES CALLED *"PHREATOPHYTES"* (MEANING THEY TAKE WATER FROM THE WATER TABLE)

- TAMERISK (aka SALT CEDARS), COTTONWOOD ARE PHREATOPHYTES

# CONSTRUCTED WETLANDS ARE GROWING IN POPULARITY.

*BENEFITS*: INEXPENSIVE TO CONSTRUCT; EASY TO MAINTAIN; EFFICIENT AND RELIABLE; CAN TOLERATE LOW OR HIGH FLOWS AND VARYING CONTAMINANT LEVELS; AESTHETICALLY PLEASING AND PROVIDE A HABITAT FOR WILDLIFE AND HUMAN ENJOYMENT

# DISADVANTAGES OF CONSTRUCTED WETLANDS

- MAY REQUIRE LARGE LAND AREA
- NEW TECHNOLOGY AND ALL THE "BUGS" ARE NOT YET WORKED OUT
- BIOLOGICAL AND HYDROLOGICAL PROCESSES NOT WELL UNDERSTOOD
- MAY BE POSSIBLE PEST PROBLEMS

# REMOVAL EFFICIENCIES of CONSTRUCTED WETLANDS

| | 1st CELL | 2nd CELL |
|---|---|---|
| BOD/TSS | 75% | 90+% |
| FECAL COLIFORM | 95% | 99.9% |
| AMMONIA ($NH_3$) | 40% | 99.9% |

# IRRIGATION SYSTEMS

- DRIP TECHNOLOGY CAME FROM ISRAEL. SEPTIC TANK EFFLUENT MUST GO THRU A SERIES OF DISK FILTERS TO PREVENT NOZZLE CLOGGING

# DRIP IRRIGATION TRENCHES

# SPRAY IRRIGATION

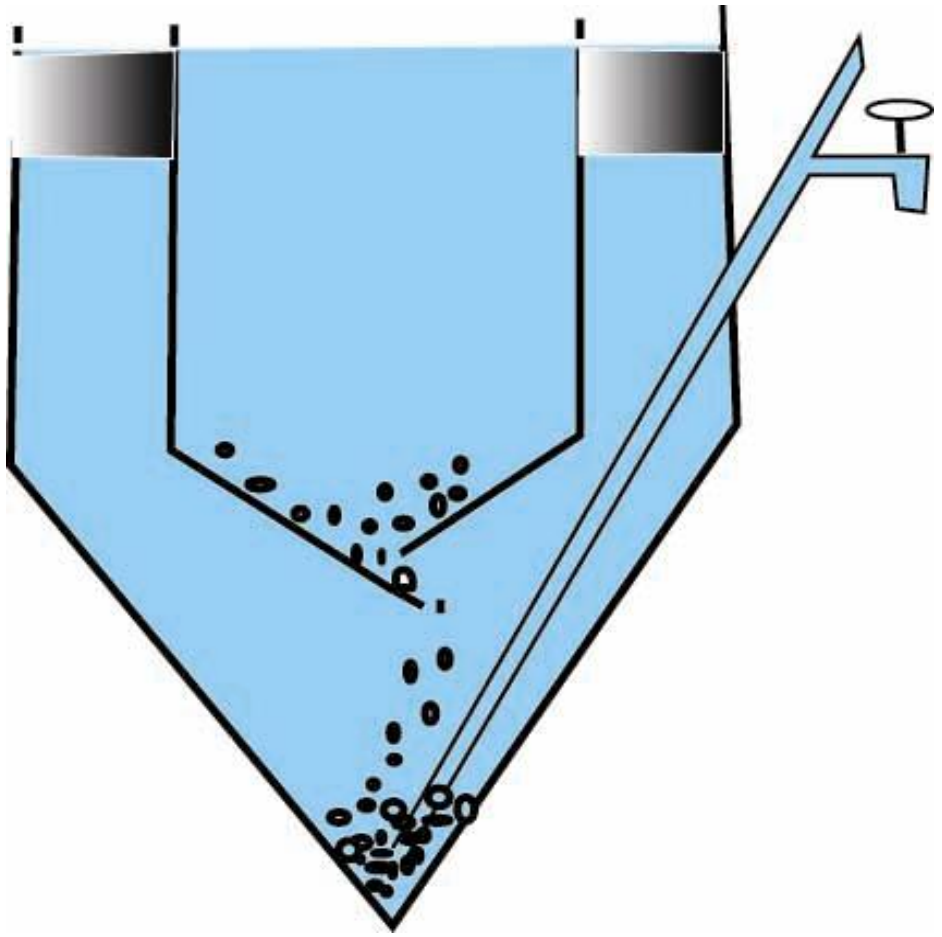
# CLUSTER SYSTEMS

SOME SMALL COMMUNITIES (OR SEVERAL HOUSEHOLDS) "CLUSTER" TOGETHER AND INSTALL A SMALL CENTRALIZED SYSTEM

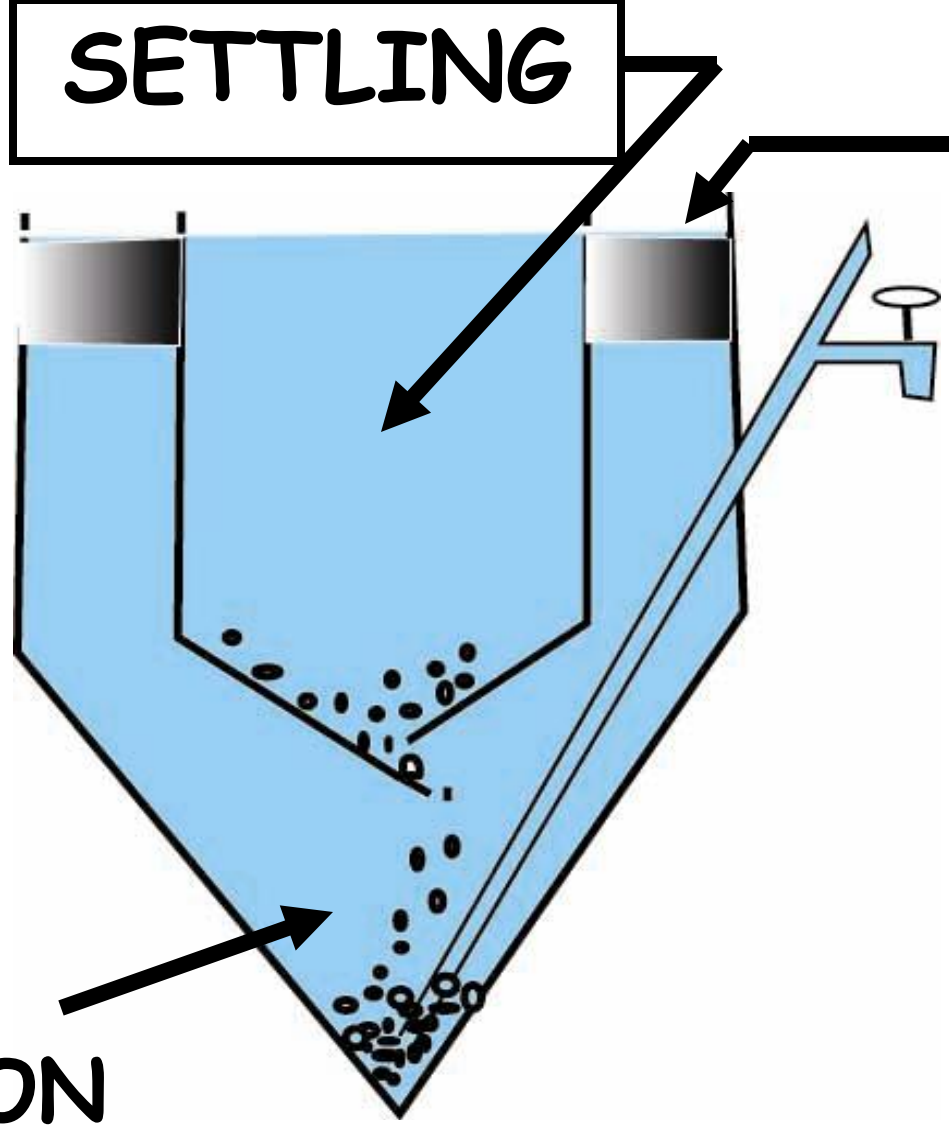
# COMBINED SETTLING AND DIGESTION UNITS

- USUALLY CONSIDERED "PACKAGED TREATMENT PLANTS" BECAUSE THEY ARE FACTORY-BUILT AND SHIPPED TO THE SITE AS A PACKAGE

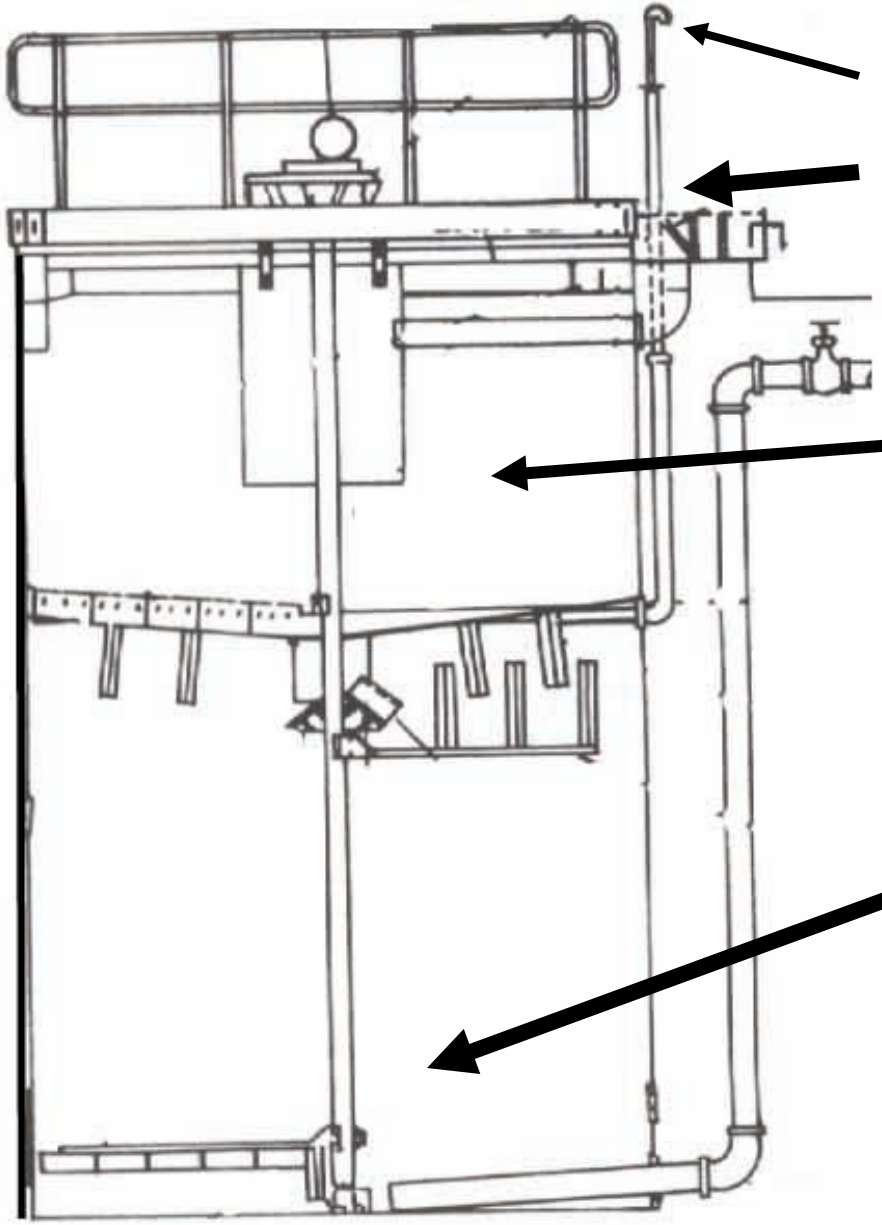
# COMBINED SETTLING/DIGESTION



THESE UNITS ARE ALL COPIED FROM THE IMHOFF TANK

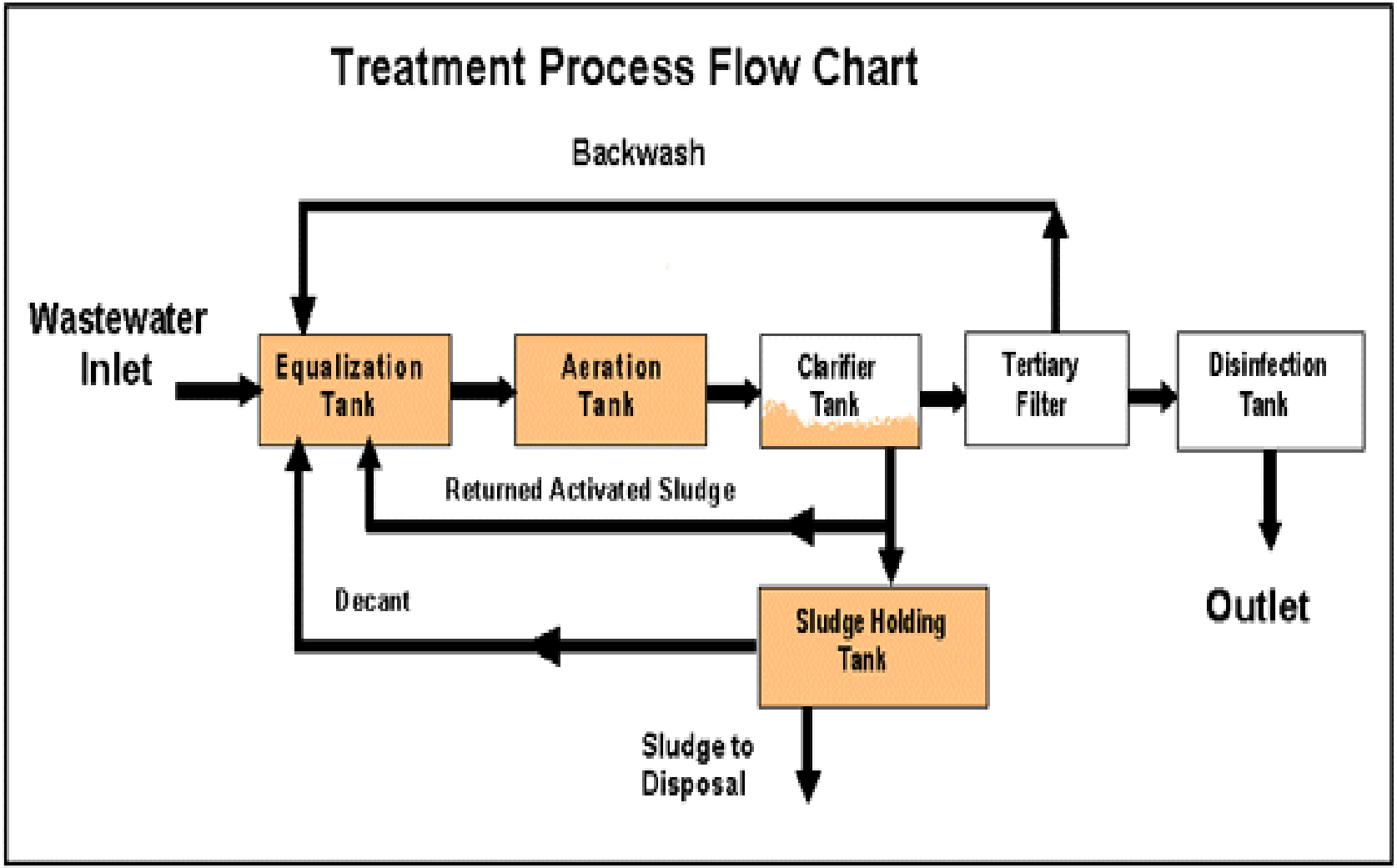



# IMHOFF TANK

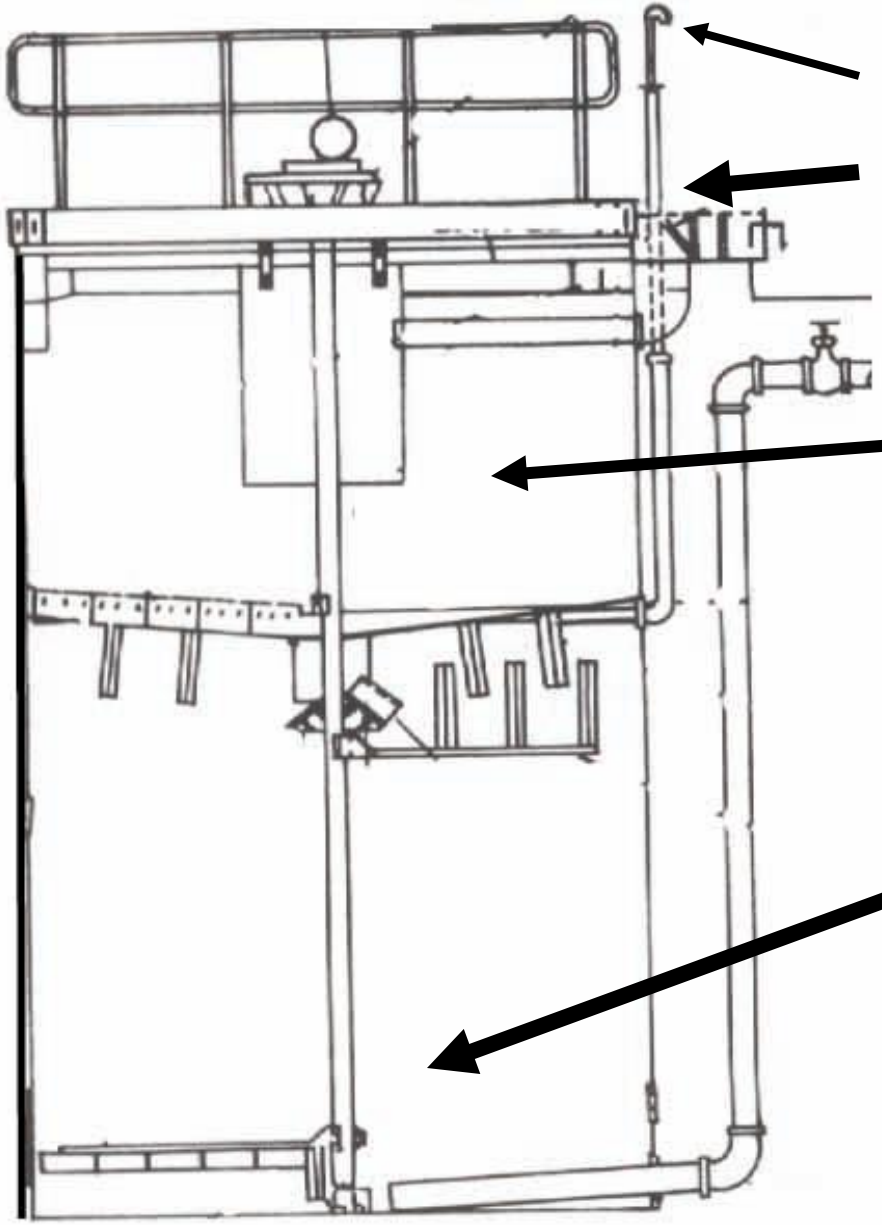



# CLARIGESTER™

# PACKAGE TREATMENT PLANT




# PACKAGE PLANT FLOW CHART

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