course play resumes. To eliminate the possibility of accidental contamination of a domestic water system, a entirely separate delivery system should be constructed.

For irrigation purposes, the organic portion of the effluent water is generally of minimal consequence. The most influential characteristic of effluent water irrigation is the higher salt load which results from its use.

Dissolved Solids

Soluble materials accumulate in water as the result of it having been used once. Generally, water going through one cycle of average home use accumulates approximately 300 ppm of *Total Dissolved Solids* (TDS). Any water having TDS greater than 1,000 ppm will have limitations as a successful long-term irrigation source.

Permeability

Water management and adequate drainage is the key to successful effluent use in turf management. Ability to leach out these salts is necessary to prevent accumulation of toxic concentrates. High TDS-containing effluent water also has a tendency to clog soil pores and coat the land surface. Coarse-textured soils, such as sandy loams, with a moderately permeable soil capable of infiltrating approximately two inches per day or more on an intermittent basis, are best for the use of wastewater. Soils with a hard pan, clay pan or underlaying rock may create a perched water table which promotes surface accumulation of salts and heavy metals.

Initial tests should be taken to show the *Sodium Absorption Ration* (SAR) or *Exchangeable Sodium Percentages* (ESP), which is an index of the effect of sodium in reducing soil permeability (the rate which water passes into and through soil) based on the ratio of sodium to calcium and magnesium. A SAR of 10 or less is considered desirable. If greater than 10, gypsum or gypsite could be incorporated into the management program or alternate applications of fresh water with effluent water should be followed to help leach out sodium. A SAR above 10 indicates increasing potential permeability problems. Sodium-rich irrigation waters can replace soil exchangeable calcium and magnesium with sodium resulting with reduced permeability. Usually this is more of a concern in arid states in which most irrigation water sources have high a sodium content. This may, however, be a concern in Florida during dry months (e.g., April, May, October) and if salt intrusion has occurred into the normal irrigation water source or into the sewage system. Waterlogging, slow infiltration, crusting or compaction, poor aeration, weed invasion, and disease occurrence are typical symptoms of reduced permeability. A severe infiltration problem may develop if electrical conductivity (EC_W) of irrigation water is less than 0.2 mmhos/cm.

Effects of sodium in irrigation water can be partially offset by dissolving gypsum in the wastewater stream. However, high salinity concentrations cannot be easily overcome. Dilution of high salinity wastewater with freshwater is probably the most practical solution.

Other potential problems with effluent irrigation use include exposure of golf course maintenance equipment and golf carts to salt when these are driven through depressions holding standing effluent water. Internal switches and underside bodies of carts are susceptible to rusting from salinity as are seals and bearings associated with maintenance equipment.

Table 27. Typical nutrient ranges in effluent water used for irrigation.

Element	Rating (ppm) Low	Normal	High	Very High
Calcium	<20	20-60	60-80	>80
Magnesium	<10	10-25	25-35	>35
Potassium	<5	5-20	20-30	>30
Phosphorus	<0.1	0.1-0.4	0.5-0.8	>0.8
Nitrogen	<1	1-10	10-20	>20
Nitrates	<5	5-50	50-100	>100
Sulfur	<10	10-30	30-60	>60
Sulfates	<30	30-90	90-180	>180