

Appendix A

WATER TERMS

Acre-foot (a.f.) - The amount of water needed to cover an acre of land one foot deep, equal to 325,851 gallons.

Algae - Aquatic one- or multi-celled plants without true stems, roots and leaves but containing chlorophyll. Algae may produce taste and odor problems.

Alluvium - Debris from erosion, consisting of some mixture of clay particles, sand, pebbles, and larger rocks. Usually a good porous storage medium for groundwater.

Artesian well - A well in which water rises to the surface without pumping from a permeable geological formation that is overlain by an impermeable formation. No artesian wells remain in the Tucson area.

Artificial recharge - The deliberate act of adding water to a groundwater aquifer by means of a recharge project. Artificial recharge can be accomplished via injection wells, spreading basins, or in-stream projects. See also incidental recharge, natural recharge, recharge.

Aquifer - One or more geologic formations containing enough saturated porous and permeable material to transmit water at a rate sufficient to feed a spring or for economic extraction by a well. Combination of two Latin words, *aqua* or water, and *ferre*, to bring; literally, something that brings water.

Assured Water Supply - A technical term used in the Groundwater Management Act defined as a supply of water theoretically sufficient to meet the needs of a new development or customers of a municipal water

supplier for 100 years. The methods for determining this are spelled out in AACR12-15-701.

Augmentation - Supplementing the water supply by such means as importing water from another basin or storing water.

Base flow - Streamflow derived from groundwater seepage into the stream; water that flows on the surface independent of precipitation.

Basin - See Groundwater basin.

Ccf (hundred cubic feet) - a unit of water used by some municipal water providers for metering and billing purposes. 1 Ccf = 748 gallons.

Central Arizona Project (CAP) - A facility consisting of canals, pumping stations and pipelines used to transport water from the Colorado River at Lake Havasu to Central Arizona and ultimately to Tucson.

CERCLA - The Comprehensive Environmental Response, Compensation and Liability Act, commonly known as Superfund, which regulates disposal and cleanup of hazardous materials.

Chloramine - A chemical used to disinfect and inoculate water supplies. Formed by combining chlorine and ammonia, chloramine is generally more stable but less potent than chlorine.

Chlorine - A chemical commonly used to disinfect water. It is highly effective against algae, bacteria and viruses, but not protozoa.

Coliform bacteria - a common type of bacteria found in soil and water and which

grows in the intestines of warm-blooded animals. They are generally not harmful, but high levels may indicate the presence of other harmful bacteria or viruses.

Cone of depression - A drop in the water table around a well or wells which have been pumping groundwater. Depending on the rate of pumping and aquifer characteristics a cone of depression can be shallow and extend only a few feet or it can extend for several miles. Since water flows downhill underground, a cone of depression pulls water from the surrounding area into it, thus affecting the nearby water table.

Constructed wetland - A manmade wetland, usually designed to utilize wastewater and often involving a wildlife habitat component.

Consumptive use - A use that makes water unavailable for other uses, usually by permanently removing it from local surface or groundwater storage as the result of evaporation and/or transpiration. Does not include evaporative losses from bodies of water. Compare with non-consumptive use.

Corrosivity - A measure of the ability of water to corrode pipes. Corrosion occurs when metal is exposed to conditions which cause the breakdown of the metal through an exchange of ions. If corrosion is severe enough, the pipes may break entirely. EPA has no standards for corrosivity.

Desalinization - A process of removing salts and other dissolved minerals from water.

Disinfection byproducts - Compounds formed from the interaction of treatment chemicals with materials (usually organic) in the water.

Distribution system - An interconnected grid of water mains, valves, storage reservoirs and pressure boosting or reducing facilities.

Downgradient - The direction water flows by force of gravity.

Drawdown - A lowering of the groundwater level or the piezometric pressure caused by pumping, measured as the difference between the original groundwater level and the level after a period of pumping.

Effluent - Water that has been collected in a sewer for subsequent treatment (ADWR definition). The term is also commonly used to refer to water discharged from a treatment plant.

Evapotranspiration - The amount of water transpired through pores and evaporated by vegetation.

Electrodialysis - a membrane filtration process that uses an electric charge rather than water pressure to force dissolved solids through the membrane pores. Used by Buckeye, AZ.

Filtration - The process of passing water through materials with very small holes (pores) to strain out particles. Filtration can remove microorganisms including algae, bacteria and protozoa, but not viruses.

Flexibility Account - A paper account in which farmers can accumulate credits for unused portions of their groundwater allotments for use in meeting conservation requirements in the future.

Floodplain - The area near a watercourse inundated during floods. The 100-year floodplain is the area that is expected to be inundated by a flood of a magnitude that has a one-in-a-hundred probability of occurring in any year.

GPCD (Gallons per capita per day) - The amount of water used on average by an

individual each day. Total gpcd is calculated by dividing total water use in the area, including industrial and commercial uses, by the number of users. Residential gpcd is the number resulting from only considering domestic water use.

Gradient, hydraulic - The change of pressure per unit distance from one point to another in an aquifer. When an area is said to be “downgradient” it is at a lower level and water will flow in that direction.

Groundwater - Subsurface water body in the zone of saturation, or more commonly, available groundwater is defined as: That portion of the water beneath the surface of the earth that can be collected with wells, tunnels, or drainage galleries, or that flows naturally to the earth’s surface via seeps or springs.

Groundwater basin - An area enclosing a relatively distinct hydrologic body or related bodies of groundwater.

Groundwater savings facility (GSF) - A facility, usually a farm, which agrees to use a renewable water supply such as CAP water instead of groundwater under the UWS program. Entities with extra renewable supplies, such as municipal water providers, sell CAP water to the farms and in return get a credit for groundwater saved, which can be used to offset future groundwater pumping.

Hardness - A water quality parameter that indicates the level of alkaline salts, principally calcium, magnesium, and iron, and expressed as equivalent calcium carbonate (CaCO_3). Hard water is commonly recognized by the increased quantities of soap, detergent or shampoo necessary to raise a lather.

Hydraulic gradient - see gradient, hydraulic.

In-lieu recharge - A term used by ADWR to describe the process of using a renewable supply instead of pumping groundwater at a Groundwater Savings Facility. No water is actually recharged.

Impact fee - A fee charged to developers to cover part or all of the costs of providing services, such as sewers, water connections, and roads. Such a fee is allowed but not required under state law.

Incidental recharge - Water incidentally added to a groundwater aquifer due to human activities, such as excess irrigation water applied to fields or water discharged as waste after a use. See also recharge, artificial recharge, natural recharge.

Infiltration - The process of water entering the soil or streambed surface.

Injection well - An artificial structure (usually an existing well) used to recharge the water table by forcing water down the well.

Irrigation district - A political entity created to secure and distribute water supplies. Most irrigation districts provide water for irrigation on farms, but some which originated for agricultural purposes now primarily serve municipal customers.

mg/l - Milligrams per liter - Roughly equivalent to parts per million (see below).

Microfiltration (uf) - a form of filtration using a membrane with larger pores than nanofiltration. It is highly effective in removing pathogens, including parasites such as giardia, but does not remove salts. Because it has large pores, UF does not leave a saline concentrate, although filters must be backwashed to keep the pores open.

Mineral content - See Total dissolved solids.

Mountain front recharge - Natural recharge that occurs at the base of the mountains because of rainfall or snow melt at higher elevations.

Municipal water use - All non-irrigation uses of water supplied by a city, town, private water company or irrigation district. Generally includes domestic, commercial, public and some industrial uses.

Nanofiltration (NF) - A form of filtration using membranes with larger pores than reverse osmosis. NF removes most salts, pathogens and organics. Like RO the process requires pretreatment of water with chemicals or a sand-based system. NF has not been used commercially on a large scale for drinking water.

Natural recharge - Natural replenishment of an aquifer generally from snowmelt and storm runoff. See also recharge, artificial recharge, incidental recharge.

Ozone - A highly reactive form of oxygen (O₃) used to disinfect water.

Non-consumptive use - A water use that leaves the water available for other potential uses, usually after it has been collected in a sewage system. Most indoor uses are largely non-consumptive. Compare with consumptive use.

Parts per million (ppm) and parts per billion (ppb) - A measure of the concentration of materials in a liquid, often used to describe the degree of contamination of water. One ppm indicates that for each one million units of water there is one unit of the contaminant. One ppb indicates that for each one billion units of water there is one unit of the contaminant. 1 ppm is approximately equal to 1 mg/L.

Permeability - A measure of the relative ease with which a porous medium can transmit a liquid under a potential gradient.

pH - A measure of the relative acidity of water. Below 7 is increasingly acid, 7 is neutral and above 7 is increasingly alkaline.

Potable water - Water that is suitable for drinking, from a Latin word meaning "drink."

Primary treatment - Initial treatment given to sewage, usually removal of solids and possibly some disinfection.

Private water utility - A water provider that is owned by individuals or a corporation and sells water to customers.

Protozoa - Microscopic animals that occur as single cells. Some can cause disease in humans. They are not destroyed by disinfection, but can be destroyed by filtration.

Public utility - A water or power provider owned by a government such as a city or town.

Recharge - Augmentation of the groundwater by the addition of water. See natural recharge, artificial recharge, incidental recharge.

Reclaimed water - Tertiary-treated water available for use on turf or other facilities.

Reservoir - A facility for storing water until it is to be used. A reservoir may be open or covered.

Reverse osmosis - A process whereby water is forced through membranes that contain holes so small that even salts cannot pass through them. It removes microorganisms, organic chemicals and inorganic chemicals, producing very pure water.

Runoff - Drainage or flood discharge which leaves an area as surface flow or as pipeline flow, having reached a channel or pipeline by either surface or sub-surface routes.

Safe yield - A groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an Active Management Area and the annual amount of natural and artificial recharge within a designated area.

Secondary treatment - The most common level of treatment of sewage, involving removal of solids, use of bacterial action for purification, and the addition of disinfectants.

Service area - The area served by a municipal water provider, within which it may hold a monopoly.

Sewage - Water that has been used by individuals or businesses and needs treatment.

Sewer - A pipeline used to transport sewage to a treatment facility.

Sludge - Solids left over from the wastewater treatment process.

Sodium - A mineral which occurs naturally in most water.

Soft water - Water with relatively low concentrations of certain dissolved minerals, principally calcium, magnesium, and iron. Water from which these minerals have been mostly removed, usually through an ion exchange process.

Soil-aquifer treatment - A method of treating water by letting it seep through soil and other materials to mitigate pollution.

Subsidence - Downward movement of the land surface associated with groundwater pumping, especially where such pumping exceeds safe yield and the water table has dropped. Uneven rates of subsidence over an area can lead to differential subsidence, which can cause lateral movement of the land surface, and cracks and fissures to appear. This is more likely to occur in areas where the aquifer varies in thickness, such as near the edges of groundwater basins. Subsidence is an essentially irreversible process, not greatly ameliorated by later raising the water table.

Subsurface water - All water below the land surface, including soil moisture, capillary fringe water in the vadose zone, and groundwater.

Superfund - A commonly used name for the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Surface water - Water that flows on the surface in streams.

Terminal storage - A facility for storage of water near the end of a pipeline or canal. A facility to be used in times of water shortage in the CAP system (due, for example, to damage to the canal), that would supply water during a period of system repair or while wells are being reactivated.

Trichloroethylene (TCE) - A compound used most often for degreasing metal parts during manufacturing. Found as a pollutant in some Tucson-area groundwater, suspected of causing certain serious diseases.

Trihalomethanes (THMs) - Disinfection byproducts arising from the combination of chlorine with organic matter in the water.

Tertiary treatment - Post-secondary treatment of water designed to improve the quality of the water to the point where it can be put to a particular beneficial use.

Total dissolved solids (TDS) - A measure of the minerals dissolved in water. Up to 500 ppm is considered satisfactory and above that level increasingly unsuitable for domestic use. Tucson-area groundwater generally has TDS levels between 200 and 600 ppm; CAP water has TDS of about 700 ppm.

Transmissibility - The flow capacity of an aquifer measured in volume per unit time per unit width. Equal to the product of permeability times the saturated thickness of the aquifer.

Transmission line - A pipeline for transporting water.

Treated wastewater - The treated water that comes from a sewage treatment plant.

Treatment plant - A facility using various physical and chemical processes for treating water or wastewater. Treatment can include disinfection, filtration, adjusting the pH, adding corrosion inhibitors, and improving taste and odor.

Turbidity - The reduction of transparency in water due to the presence of suspended particles, or a cloudy appearance in the water. Increased turbidity raises the risk of water-borne pathogens growing and reproducing. Turbid water is therefore more difficult to disinfect.

Underground storage facility (USF) - A facility for artificial recharge of water supplies into an aquifer.

Underground Water Storage, Savings, and Replenishment Program (UWS) - A program administered by the ADWR to encourage the storage and/or use of renewable supplies. Rules governing permitting and operation of

Underground Storage Facilities and Groundwater Savings Facilities are described under this program.

Vadose zone - The unsaturated zone lying between the earth's surface and groundwater table.

Volatile organic compounds (VOCs) - Solvents used as degreasers or cleaning agents. They evaporate easily producing odors typical of gasoline, kerosene, lighter fluid or dry cleaning fluid. Some may be cancer-causing.

Water main - A large pipeline which transports water to smaller distribution lines which take water to homes and businesses.

Water table - The upper boundary of a free groundwater body, at atmospheric pressure.

Wellfield - A group of wells in a particular geographic area, usually operated by one entity.

Wetlands - An area that always has water at or near the surface. A natural wetland receives its water from a groundwater source and is also called a "ciénega". A constructed, or artificial, wetland usually receives its water from some wastewater source, either agricultural, industrial or municipal.

ACRONYMS

ACC - Arizona Corporation Commission
ADEQ - Arizona Department of Environmental Quality
ADWR - Arizona Department of Water Resources
AMA - Active Management Area
APP - Aquifer Protection Permit
AVID - Avra Valley Irrigation District
AWBA - Arizona Water Banking Authority
AWS - Assured Water Supply
BADCT - Best Available Demonstrated Control Technology
BMP - Best Management Practice
CAP - Central Arizona Project
CAGR - Central Arizona Groundwater Replenishment District
CAVSARP - Central Avra Valley Storage and Recovery Project
CAWCD - Central Arizona Water Conservation District
CMID - Cortaro Marana Irrigation District
DES - Arizona Department of Economic Security

DDT - Dichloro-Diphenyl-Trichloroethane
EA - Environmental Assessment
EIS - Environmental Impact Statement
EPA - U.S. Environmental Protection Agency
ED - Electrodialysis
ESA - Endangered Species Act
FCD - Flood Control District
FEMA - Federal Emergency Management Agency
FICO - Farmers Investment Company
GMA - Arizona Groundwater Management Act of 1980
GPCD - Gallons Per Capita per Day
GPM - Gallons Per Minute
GSF - Groundwater Savings Facility
INA - Irrigation Non-Expansion Area
MF - Microfiltration
NF - Nanofiltration
NPDES - Non Point Discharge Elimination System
PAG - Pima Association of Governments
PCE - Perchloroethylene

PCHD - Pima County Health Department
PDEQ - Pima County Department of Environmental Quality
RO - Reverse Osmosis
SAT - Soil-Aquifer Treatment
SAWRSA - Southern Arizona Water Rights Settlement Act
TARP - Tucson Airport Remediation Project
TAMA - Tucson Active Management Area
TCE - Trichloroethylene
TDS - Total Dissolved Solids
THM - Trihalomethane
TSMP - Tucson Stormwater Management Plan
USF - Underground Storage Facility
USGS - United States Geological Survey
UWS - Underground Water Storage, Savings, and Replenishment Program
VOCs - Volatile Organic Compounds
Water CASA - Water Conservation Alliance of Southern Arizona
WCPA - Water Consumer Protection Act
WRRC - Water Resources Research Center