GLOSSARY OF TERMS

Acid rain - Rain with a pH of less than 5.6 that has mixed with sulfur and nitrogen oxides in the atmosphere as a result of burning fossil fuel. Acid rain can damage buildings, wildlife and aquatic life.

Alkalinity - Refers to the capability of water to neutralize acid. This is really an expression of buffering capacity. A buffer is a solution to which an acid can be added without changing the concentration of available H+ ions (without changing the pH) appreciably.

Annual Exceedance Percentage (AEP)- The probability that a storm of that size will occur in any given year. For example, a 10% AEP storm means that there is a 10% probability a storm of that size will occur in any given year.

Average Day Demands/Base Capacity – The average daily water and sewer volumes of the system. There will be different values for what the City treats versus what is billed to each customer class.

Beneficial Rainfall – the amount of precipitation throughout the year that offsets the water needs of plants/soil.

Best Management Practice (BMP) - A practice or combination of relatively low-cost practices that prevents or controls the discharge of pollutants to receiving waters.

Biochemical Oxygen Demand (BOD) - A laboratory measurement of wastewater that is one of the main indicators of the quantity of organic pollutants present. BOD measures the amount of oxygen that will be consumed by microorganisms when oxygen biologically reacts with organic material in wastewater. A decrease in BOD indicates that water quality is improving.

Bioengineering - The science that uses living plant materials as a main structural component to control erosion, sedimentation and flooding. Also referred to as soil bioengineering, it is used for land stabilization and habitat restoration.

Bioretention garden - A shallow, planted depression in the ground designed to retain or detain stormwater before it is infiltrated or discharged downstream. Could also be called a rain garden.

Bioswale - A broad, shallow conveyance channel with a dense stand of vegetation cover on the side slopes and bottom that traps pollutants, promotes infiltration and reduces the volume of stormwater runoff. Bioswales can be used to replace curbs, gutters and storm sewer systems.

Carbonaceous Biochemical Oxygen Demand (CBOD) - CBOD is a subset of BOD that looks at both carbonaceous and nitrogenous biochemical oxygen demand. The laboratory test is conducted over a 5-day period. CBOD will never be higher than biological oxygen demand but the same value if there is no nitrogenous uptake of oxygen. A decrease in CBOD indicates that water quality is improving.

Catch basin - A structure designed to remove debris from stormwater runoff that is collected from streets. A catch basin includes a small, underground storage area to capture sediment and a cover with

openings to prevent sticks and large debris from entering the storm sewer. Sometimes called a storm inlet.

CCF/HCF – hundred cubic feet and represents a unit of measure for water volume. The City currently bills in hundred cubic feet and there are 7.48 gallons per cubic foot, or 748 gallons per one hundred cubic feet of water.

Chain-of-custody - Procedures for collecting, handling, shipping and analyzing samples to ensure integrity of laboratory results that are being used for regulatory compliance.

Chlorine residual - A low level of chlorine remaining in water after its initial application. It constitutes an important safeguard against the risk of subsequent microbial contamination after treatment—a unique and significant benefit for public health.

Cistern - a catchment for rainwater.

Clean Water Act (CWA) - A federal law that dates back to 1948, the 1972 CWA amendments set the basic structure for regulating discharges of pollutants to waters in the United States. The law gave the EPA authority to set effluent standards on an industry basis and continued the requirements to set water quality standards for all contaminants in surface waters. The CWA makes it unlawful to discharge any pollutant from a point source into navigable water unless a National Pollutant Discharge Elimination System permit is obtained under the Act.

Collection system - A network of pipes used to collect wastewater and/or stormwater and transport it to a wastewater treatment plant or sewer outfall.

Combined sewer - A sewer that carries both wastewater and stormwater. During dry weather, all flows are sent to a wastewater treatment plant. During wet weather, the sewers fill and flows that do not reach a wastewater treatment plant overflow to nearby lakes, streams or rivers. Combined sewers are found primarily in older, urban systems in the northeast and upper Midwest of the United States. Combined sewer systems were the primary type of sewer system constructed prior to the 1950s. Ann Arbor does not have any combined sewers.

Combined sewer overflow (CSO) - The overflow of a mixture of wastewater and stormwater into a river when heavy rainfalls overload a combined sewer. Untreated CSOs pose a health and safety hazard.

Commingling - The mixing of flows from two different sources. An example would be discharging sanitary sewer flows into a combined sewer system.

CPI – consumer price index, made up of almost 200 different goods and services.

Crop Coefficient – a value assigned to different types of plants/crops. The higher the coefficient, the greater the water needs of the plant/crop type.

Cubic feet per second (cfs) - A measurement of flow rate. It represents the number of cubic feet of liquid volume passing by a stationary point in one second.

Demonstrative approach - A pilot or staged treatment and control approach proposed by a community designed to verify that the constructed improvements will meet regulatory requirements for combined sewer overflow or sanitary sewer overflow control. Under this approach, the community tests the completed facility to demonstrate that it is achieving required treatment levels. If it cannot meet requirements, improvements need to be made to achieve the required level of treatment. Demonstrative approaches are undertaken to construct a minimum of infrastructure facilities to achieve a defined level of treatment.

Design storm capture - The size of storm a collection and treatment system has been designed to capture and hold for treatment. Design storm sizes are expressed in terms of the percent chance of Annual Exceedance Probability (AEP).

Detention - The temporary storage of stormwater runoff to control peak discharge rates and provide treatment of pollutants. Detention basins can be concrete structures or naturalized areas like wetlands or bioretention gardens.

Dewatering - The process of draining or removing flows from a storage structure like a retention treatment basin or tunnel after a storm. Dewatered flows are transported to the wastewater treatment plant.

Diffuser - A porous tube or other device that air or a liquid is forced through so that it is uniformly discharged along the entire length of the tube or other device.

Discharge - Treated and untreated water released from an outfall into surface water. Discharges classified as intermittent include combined sewer overflows, sanitary sewer overflows and stormwater. Continuous discharges include treated effluent from wastewater treatment plants.

Dissolved oxygen (DO) - The oxygen freely available in water, which is vital to fish and other aquatic life and for the prevention of odors. DO levels are considered the most important indicator of a water body's ability to support desirable aquatic life. An increasing DO means water quality is improving. Secondary and advanced wastewater treatment are generally designed to ensure adequate DO in waste-receiving waters.

Downspout disconnection - Roof draining downspouts are connected into many stormwater and sanitary sewer systems increasing the amount of rain water that gets into a system. Downspouts are disconnected at ground level to divert rain water onto lawns where it will filter into the ground. This requires capping the existing outlet pipe and diverting the flow away from the home or building.

Dry weather flow - Flow in a combined or sanitary sewer that is not influenced by a rain storm or snowmelt.

E. coli - Escherichia coli (abbreviated as E. coli) are bacteria found in the environment, foods, and intestines of people and animals. E. coli are a large and diverse group of bacteria. When E. coli is present, other viral, bacterial and protozoa pathogens can be present. For years, it was difficult to detect

these other pathogens so scientists settled for using E. coli as an indicator of risk. The higher the level of E. coli, the more likely it is that other pathogens are present. E. coli is a subset of fecal coliform.

ET – Stands for evapotranspiration which is a measure of water loss from different plant and soil types.

Effluent - The treated discharge from wastewater treatment and manufacturing plants discharged into a surface or ground water. NPDES permits outline the water quality requirements of effluent.

Enclosed stormwater drainage system - A system of buried pipes to collect and transport stormwater to an outlet on a river, stream or lake. Most urban areas have enclosed storm drainage systems.

EPA - The United States Environmental Protection Agency is the federal regulator responsible for administering the Clean Water Act.

Fecal coliform - Rod-shaped bacteria associated with the fecal matter of warm-blooded animals. Like E. coli, the presence of fecal coliform in water samples indicates other pathogens could be present. Fecal coliform counts are typically larger than E. coli counts in a sample.

First flush - During the initial part of a storm, rainfall washes accumulated materials (grit, trash, oil, salt, lawn chemicals) off impervious surfaces. This first flush of stormwater runoff contains the highest level of pollutants. In Ann Arbor, this is defined by the first inch of rainfall. If the runoff discharges directly to lakes and streams it can cause a shock load.

Floatables - Materials found in sewers and storage tanks that are lighter than water.

Flushing gates - Devices (gates) in a sewer or tank that can store flow. The gates opening releases the stored flow to flush sediments deposited in sanitary sewer and tank sections to areas for eventual treatment.

Footing drain - Drain tiles around a home's or other building's foundation that collect stormwater from around the structure and prevent it from leaking into the basement.

Footing drain disconnection - The removal of stormwater footing drain flow from a combined or sanitary sewer system. This typically requires the installation of a sump pump to direct flows onto a lawn or into a nearby stormwater system.
GPM – gallons per minute

Gray infrastructure - Traditional practices for stormwater management and wastewater treatment such as sewers, pumping stations, retention treatment basins and wastewater treatment plants. Gray infrastructure is constructed from concrete, steel and other materials.

Green infrastructure - Practices for stormwater management that use natural hydrologic features to manage water and provide environmental and community benefits. Green infrastructure includes bioretention gardens, bioswales and porous pavement that promote infiltration and filter out pollutants. It is typically used to free up capacity in stormwater systems, or gray infrastructure, during rain events to enhance overall performance of the stormwater system.

Green roof - A green infrastructure practice frequently used in urban areas where plants on the roof of a building absorb precipitation and release it at a reduced and measured pace to reduce stormwater peak flow and runoff volumes.

Hardness – The amount of dissolved calcium and magnesium in the water. Hard water is high in dissolved minerals, both calcium and magnesium.

Heavy metals - Metals that can be precipitated by hydrogen sulfide in acid solution, including lead, silver, gold, mercury, bismuth, and copper. Heavy metals are considered harmful to humans when ingested.

Hydraulics - The branch of engineering that deals with water or other fluid in motion.

Hydraulic modeling - Development of a computer model to represent fluid in motion. For example, in a wastewater collection system, hydraulic modeling is used to represent wastewater and to determine how the system will react under different flow conditions.

Illicit connection - An illegal connection of a sanitary sewer into a stormwater system that allows human waste to go directly into streams and rivers. Illegal connections also include stormwater connections to sanitary systems, such as sump pumps that homeowners have connected into the sanitary sewer system instead of discharging into their yard or a stormwater system.

Impervious areas - Surfaces that cannot absorb rain water including streets, sidewalks, roofs, parking lots and driveways. The larger the impervious area, the greater the runoff volume.

Infiltration - The absorption of water into the ground, expressed in terms of inches per hour. It is also the penetration of water from the soil into underground pipes through defective joints, connections, or manhole walls.

Inflow - The discharge of stormwater into a sanitary sewer system through footing drains, sump pumps, inappropriate catch basin connections, leaking manhole covers or other sources.

Influent - Flows into a treatment facility, storage facility, or sewer system. Influent characteristics, flow rates and volume are used to determine the size and treatment requirements of a facility.

In-system storage - The use of existing pipes and structures to store excess flows during a wet weather event.

Inter-Class Allocations – The allocation of system costs between customer classes (residential, non-residential, irrigation, etc.)

Interceptor - A large sewer that collects sanitary sewage flow from a number of trunk sewers and transports the flow to the wastewater treatment plant. These sewers do not directly connect to homes, buildings or streets.

Intra-Class Allocations – The further allocation of cost to customers within a customer class.

Irrigation Efficiency – irrigation systems that are less than 100% efficient would need additional water recognizing system loss.

Lateral sanitary sewer - A sanitary sewer that collects flows from homes and businesses for discharge into sanitary trunk sewers.

Level sensors - Monitors in pipes and manholes that detect the level of flow in the stormwater and sanitary sewer systems and alert operators to significant changes.

Long Term Control Plan (LTCP) - A plan that outlines a program to control combined sewer overflows through a variety of ways, such as sewer separation, construction of facilities that treat overflows, storage facilities to store them until they can be sent to a wastewater treatment plant, etc.

Manhole - A structure designed to provide access to an underground utility system for inspection, cleaning and other maintenance activities.

Max Day Demand – The highest water volume on a given day during a year.

MHI – Median Household Income. A common metric used to evaluate affordability of water/sewer service.

Michigan Department of Environmental Quality (MDEQ) - Formerly known as the Michigan Department of Natural Resources, the MDEQ has regulatory oversight of Michigan's air, land and water resources and issues all National Pollutant Discharge Elimination System permits in the state.

Million gallons per day (MGD) – A rate of flow. It represents the number of million gallon increments of liquid volume passing by a stationary point in a 24-hour period.

Mitigation - An activity or project to reduce the impact of a pollutant or replace lost land features such as wetlands, woodlands and surface water.

National Pollutant Discharge Elimination System (NPDES) - A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation. In Michigan, NPDES permits are issued by the Michigan Department of Environmental Quality for wastewater treatment plant, retention treatment basin, screening and disinfection facility, and combined sewer overflow discharges to ensure protection of Michigan Water Quality Standards at the times of discharge. Each permit is reviewed, modified and reissued every five years.

Natural Resources Environmental Protection Act (NREPA) - Also called Public Act 451, this Michigan State Act establishes the requirements for National Pollutant Discharge Elimination System permits for wastewater treatment plants and retention treatment basins overseen by the Michigan Department of Environmental Quality.

Negative treatment - The remixing of settled solids in a basin that creates an effluent that is more polluted than the influent.

Nexus –the existence of a reasonable relationship

Non-point source - Sources of pollution that cannot be traced to an exact point of entry. Non-point sources of pollution include land runoff that goes directly in the river, lake or stream, and streambank erosion.

Nutrient - An element or compound such as nitrogen, phosphorus or potassium that is necessary for plant growth. Fertilizers contain nutrients.

Open drainage system - A system of ditches and open channels that collect and transport stormwater to an outlet on a river or stream.

Organic material - Material derived from living things.

Outfall - The pipe where a combined sewer or storm sewer discharges into a lake or river.

Overland flow - The flow of stormwater across the land surface that ultimately reaches a stream, river or lake.

Peak Hour Demand – The highest water volume on the system in a given hour during a year.

Pervious surfaces - Surfaces that are permeable and absorb stormwater like lawns, gardens and other vegetated areas.

Pilot project - A project conducted on a small scale to demonstrate the effectiveness of an approach, such as to treat wet weather pollution or limit stormwater from getting into a collection system.

Point source - Discharges from stationary locations such as wastewater treatment plants, sewer outfalls and factories. Point source discharges include combined sewer outfalls and storm sewer outfalls that are regulated by the Michigan Department of Environmental Quality.

Primary treatment - The first stage of wastewater treatment that removes settleable or floating solids only. Generally, 40% of suspended solids are removed and 30% to 40% of the biological oxygen demand is removed in the wastewater.

Pumping station - A structure containing pumps and the associated piping, valves and other mechanical and electrical equipment for pumping wastewater, stormwater or combined sewage. Also called a lift station when it is used to lift flows from a low point to a higher pipe so that it can be transported by gravity.

Rain garden - Also called a bioretention basin, rain garden is frequently the term used for a small bioretention garden on an individual residential lot.

Rain gauge - A device for collecting and measuring the amount of rainfall.

Receiving water - A river, lake or other watercourse into which treated wastewater treatment plant effluent, treated retention treatment basin effluent, untreated combined sewer overflow or untreated stormwater is discharged.

Regulator - A device installed in combined systems to control the amount of flow into the sewer system and directed to treatment facilities during periods of wet weather. Excess flows are routed to an outfall.

Regulatory sampling - Collection of effluent discharge samples at retention treatment basins and wastewater treatment plants during operation that are taken to a laboratory for analysis and reported to the Michigan Department of Environmental Quality to demonstrate compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements.

Relief sewer - Sewers constructed to relieve capacity deficiencies on existing sewer systems.

Sanitary sewer - A sewer that carries wastewater only.

Sanitary sewer overflow (SSO) - The discharge of untreated sanitary sewage as a result of operational problems, undersized pipes, heavy inflow and infiltration or sewer pipe breaks, blockages or failures.

Screening and disinfection facilities - Combined sewer overflow treatment facilities that treat flows using fine screening and disinfection contact time provided in downstream pipes rather than a basin structure. Discharges from these facilities are classified as retention treatment basin discharges and must meet the same discharge requirements as RTBs.

Screening devices - Devices, such as bar screens, used in basins and other screening facilities to remove large solids and floatables. In the case of basins, the screening devices remove material about one-half inch in diameter and larger.

Screenings - Materials that are removed from combined sewage flows at retention treatment basins and wastewater treatment plants through the use of screens and disposed of like other solid waste. These materials typically include branches, leaves and trash that accumulate on streets and are flushed into the sewer during a rain storm.

Scum baffle - A plate that extends below the surface of wastewater in a tank to prevent floating matter from passing through the tank.

Secondary treatment standards - Minimum requirements of the Clean Water Act to remove 85% of the biological oxygen demand and total suspended solids in wastewater. Secondary treatment normally uses biological treatment processes followed by settling tanks.

Sedimentation - See Settling.

Septic system - A domestic wastewater treatment system that treats household waste through a tank and a soil absorption system. Bacteria in the tank decompose the waste that settles to the bottom of the tank, and treated effluent flows out into the ground through drainage pipes. Failing septic systems can contaminate ditches, creeks and shallow drinking water supplies.

Settling - The process of subsidence and deposition of suspended matter carried by water, wastewater, or other liquids. It is usually accomplished by reducing the velocity of the liquid below the point that it can transport the suspended material. Also called sedimentation.

Sewer separation - Replacing a combined sewer pipe with a separate sanitary sewer pipe and a stormwater conveyance pipe. The sanitary sewer pipe flow is transported to a wastewater treatment plant and stormwater flow is discharged either directly to a drain or river, without treatment; or to a water quality treatment BMP.

Sewer siphon - An inverted siphon that transports sewer flows under an obstruction (i.e. valleys, creeks, river, or other utility) , eliminating the need for pumping.

Shunt channel - A channel used to route flows around a storage basin when flow rates through the basin would result in negative treatment.

Skimming - The removal of floatables from combined or sanitary sewage.

Snowmelt - Runoff created when snow melts and the resulting water enters stormwater conveyance systems.

Sodium hypochlorite - A water solution of sodium hydroxide and chlorine where sodium hypochlorite is the essential ingredient. It is similar to laundry bleach and used as a disinfectant in retention treatment basins.

State Revolving Fund (SRF) - A federal and state program offering low interest loans to municipalities for the construction of publicly-owned water pollution control facilities.

Stormwater Conveyance System- A system of underground pipes that carry only stormwater runoff from buildings and land surfaces.

Stormwater runoff - Water that runs off streets, roofs and land during rain storms, washing pollutants off these surfaces into the stormwater system. Typical pollutants include soil, chlorides, coliform bacteria, heavy metals, nutrients, oil and grease, and solids.

Stream bank erosion - The movement of sediment and soil material from the banks and bottom within a stream or river. The higher the flow rate (velocity), the greater the erosion.

Subwatershed - A drainage area within a watershed.

Supervisory Control and Data Acquisition (SCADA) - System that collects information from points throughout a water or wastewater system to provide real time information that operators use to control the treatment and water distribution or treatment and wastewater collection process and work more efficiently.

Suspended solids - Solid organic or inorganic particles physically held in suspension in wastewater by agitation or flow.

Swirl concentrator - A treatment device that uses centrifugal force to remove pollutants from wastewater or stormwater.

TGAL – one thousand gallons. Many utilities across the country bill in TGAL or CCF.

Total coliform - Include bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste. Fecal coliforms are the group of the total coliforms that are considered to be present specifically in the gut and feces of warm-blooded animals.

Total Maximum Daily Load (TMDL) - A calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

Total Residual Chlorine (TRC) - Amount of chlorine left over from disinfection process in treated effluent discharge from a retention treatment basin or wastewater treatment plant. Too high of a TRC can be harmful to fish and aquatic life in the receiving water.

Total Suspended Solids (TSS) - All particles suspended in water which will not pass through a filter. As levels of TSS increase, a water body begins to lose its ability to support a diversity of aquatic life.

Toxicity - The quality of being toxic or poisonous.

Treatment shafts - A type of RTB that stores and treats flows in a vertical shaft rather than a horizontal basin. Discharges from these facilities are classified as retention treatment basin discharges and must meet the same discharge requirements.

Tributary area - A geographic area that contributes flows to a wastewater treatment plant or retention treatment basin. A geographic area whose stormwater drains to a waterway. A stream or body of water that contributes its water to a larger body of water. Can also be called a watershed or a creekshed.

Trihalomethanes (THM) - A group of four chemicals that are formed along with other disinfection by products when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water.

Trunkline sanitary sewer - A sanitary sewer that receives flow from many lateral and other sanitary sewers, serving a large territory. Trunk sanitary sewers feed into interceptors.

Tunnel - A large, deep, underground pipe used to store and transport wastewater or combined sewage during rain storms. Tunnels typically have higher storage capacities than basins and are capable of transporting flows directly to a wastewater treatment plant or interceptor.

Turbidity - The cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality.

Volatile organic compounds - Sometimes referred to as VOCs, are organic compounds that easily become vapors or gases. Along with carbon, they contain elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur or nitrogen.

Water Treatment Plant (WTP) - A facility that treats source water (river and well water for the City of Ann Arbor) for potable consumption. WTP is a softening plant that uses ozone as the primary disinfection. The three main processes are softening (removing hardness), disinfection and filtration.

Wastewater Treatment Plant (WWTP) - A facility that treats sanitary sewage and industrial wastewater. WWTP uses three main processes: primary treatment, secondary treatment and disinfection. More than 90% of all incoming pollutants are removed through treatment. This exceeds the compliance standards set by federal and state regulators.

Watershed - The entire area or region draining into a river, river system, or body of water.

Weir - A device that has a crest and some side containment, and is used to measure, regulate, or restrict flow. The amount of flow that may pass over the weir is a function of the weir geometry and upstream height of water above the crest.

Wet sanitary system - A sanitary sewer system that experiences a higher volume of flow during wet weather due to stormwater inflow and infiltration.

Wet weather - Weather that creates precipitation including rain, snow, sleet and hail.

Wet weather pollution - Pollution that occurs as the result of stormwater entering a system or running off impervious surfaces. Types of wet weather pollution include combined sewer overflows, sanitary sewer overflows and stormwater runoff.

Wetland - An area that periodically has water logged soils or is covered with a shallow layer of water resulting in reduced soil conditions. A wetland area typically supports plant life adapted to wet environments.