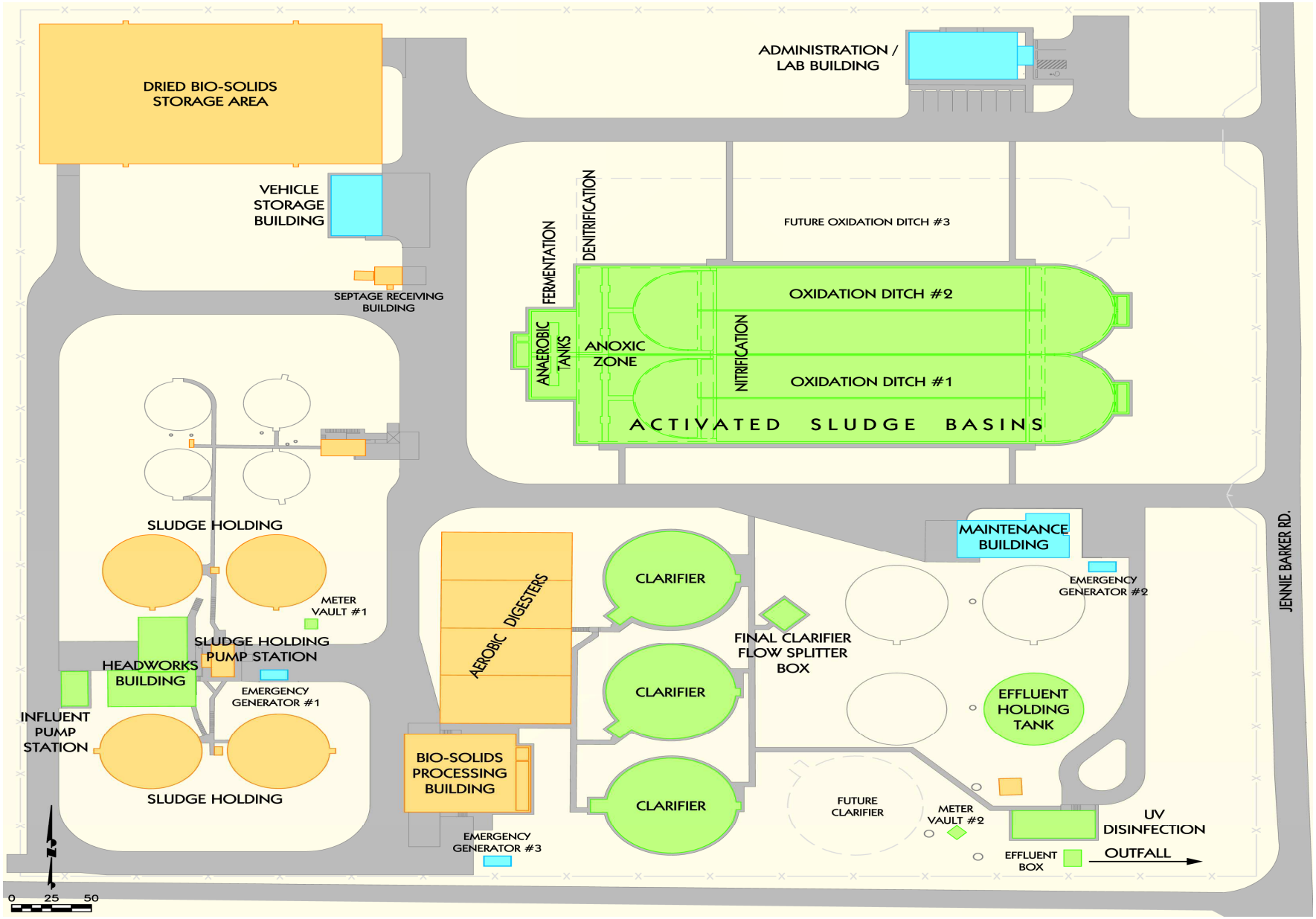

FUTURE TREATMENT IMPROVEMENTS

Seven basins from the original facility have been cleaned and kept for future use in the effluent disposal and solids processes. Space is available to add another oxidation ditch and a fourth clarifier. The facility's piping has space to add two more influent pumps and a third sludge recirculation pump. These future improvements can increase the capacity of the wastewater treatment plant by fifty percent to nine million gallons per day average flow.

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WASTEWATER TREATMENT SYSTEM
FOR THE
CITY OF GARDEN CITY, KANSAS

In 1997, the City of Garden City initiated design and construction work to improve its 3.5 million gallon per day Wastewater Treatment Facility. Key design criteria were that the new facility would remain at the site of the existing plant and that many existing structures would be either re-used or kept for future use.

The facility upgrade was completed in 2001 and with the improvements made, the Wastewater Treatment Facility is now capable of treating an average wastewater flow of 6 million gallons per day. During short periods of peak flow, the facility can treat up to 12 million gallons per day.

In addition to the increase in capacity, the facility can now remove ammonia, total nitrogen and phosphorus to permitted limits set by the Kansas Department of Health and Environment. Further, disinfection equipment destroys pathogens in the wastewater. Waste bio-solids removed from the wastewater are processed to reduce the total solid waste volume and to destroy harmful micro-organisms before reuse of the solids as fertilizer.

Complete wastewater treatment consists of several individual processes that remove harmful waste materials from the water. The following descriptions explain the treatment pathway of wastewater through the Garden City facility, and the processes that take place along the way.

INFLUENT PUMP STATION

Wastewater collected throughout the city arrives at the influent pump station through a large sewer interceptor pipe. The pump station houses four pumps, each capable of pumping 3.6 million gallons per day through the treatment system.

HEADWORKS BUILDING

The first treatment process for wastewater occurs in the headworks building. Solids larger than 1/4 inch are screened out and more dense grit solids such as, sand, eggshells and coffee grounds, are removed from the waste stream. These solids are disposed of at the landfill.

ACTIVATED SLUDGE BASINS

Leaving the headworks building through a 30 inch pipe, the wastewater flow is electronically measured as it passes into the activated sludge basins which are built in oval configurations called oxidation ditches. The primary process in the oxidation ditches is to completely mix the wastewater with air. The mixing keeps beneficial microbes in contact with waste matter which the microbes use as food. Each oxidation ditch contains two smaller basins in which additional microbiological processes occur to help convert dissolved phosphorus and nitrogen into forms that can be removed from the waste stream.

In the oxidation ditches, large aerator mixers keep the wastes in suspension and add air for the oxygen supply that the microbes need for metabolism. The oxidation ditches are large enough so that matter stays in theses basins for twelve to twenty-four hours as needed for the microbial metabolic processes to be completed.

CLARIFIERS

From the oxidation ditches, the wastewater is split and flows into the three clarifiers. In the clarifiers, conditions are kept as still as possible so that solids, microbes and wastes will settle to the bottom. Clear water at the top of these clarifier basins flows over a weir to the disinfection building for the final wastewater treatment process.

UV DISINFECTION

After biological wastes have settled, the wastewater is disinfected. The UV disinfection system uses intense ultra-violet light that radiates live cells in the wastewater and renders them harmless to plant and animal life.

WATER RE-USE

The wastewater treatment facility re-uses the treated wastewater as utility water for washing facilities and for site irrigation. Some effluent leaves the site through the out-fall line and is used by neighboring farms for crop irriga-tion. The treated effluent leaves the facility through a pipe into an irrigation canal and finally to the Arkansas River.

BIO-SOLIDS PROCESSING

Most of the material removed in cleaning the wastewater is solid organic matter. These solids are removed as sludge from the bottom of the clarifiers. Part of the sludge is re-circulated into the oxidation ditches to maintain microbe/ food levels. The remainder is pumped into the solids processing system.

BIO-SOLIDS PROCESSING CONTINUED

Although the sludge from the clarifiers may look thick, it is usually only one to two percent solids. The volume of the sludge is reduced by two gravity-belt-thickener machines in the solids building. The reduced wet sludge volume means that less volume is required for sludge digestion.

The processes in this system are aerobic digestion, dewatering, drying and land application. When removed from the clarifiers, the sludge still contains live microbes and undigested organic matter. The digestion process is completed in the aerobic digesters, where the sludge is mixed with air and the process is continued for 30 to 60 days as required to render the solids into inert, organic chemical compounds.

The digested sludge is next pressed into cake solids by a belt filter press machine that removes water. The dewatered sludge is transported to sludge storage beds where it dries further and is then taken to nearby farm fields for land application.

In the Garden City plant, the original primary clarifiers were cleaned and modified to re-use as sludge holding basins. Sludge is stored in these basins prior to processing. The old plant's activated sludge basins were cleaned and modified for re-use as aerobic digesters.

SUPPORT FACILITIES

Other structural features of the wastewater treatment improvements include the John Carr Administration Building which houses the plant's laboratory facilities; a maintenance shop; a vehicle storage building for specialty vehicles used by the Wastewater Collections department; and three emergency generators which can provide power to operate all of the essential wastewater processes if normal electrical power is interrupted.

The facilities are linked by an automated control system that allows the operators to remotely monitor and control the treatment processes from two main control centers– one in the administration building and one in the solids building. With computer and radio communications, operators can view the status of pumps, basins, and other processes, make changes, learn of alarm conditions and review historical data for the plant.