

The following form may be used by the Review Agency/Commission for comments in response to the request for clearance from the proposed Public Water Supply Loan Fund Project.

☐ Army Corps of Engineers
☐ Kansas Biological Survey
☐ State Conservation Commission
☐ Kansas Corporation Commission
☐ Division of Water Resources/Kansas Department of Agriculture
☒ Kansas Geological Survey
☐ Kansas State Historical Society, State Historic Preservation Office
☐ Kansas Water Office
☐ Kansas Department of Wildlife & Parks
☐ US Dept of Agriculture - Natural Resources Conservation Service
☐ Kansas Department of Health and Environment
☐ US Dept of the Interior - Fish and Wildlife Service

Agency Review Comments: (to be completed by reviewing agency and returned to applicant contact person at name and address shown below)

Comments: The top of the lagoon embankment will only be 3.3 ft above the 100-year flood level. The City should develop a plan to handle its wastewater during a 100-year or greater flood because the wastewater level in the lagoons could be lower than the floodplain water level and prevent wastewater discharge. The

Recommended Action: (to be completed by the reviewing agency and returned to applicant contact person at name and address shown below.)

embankments of the lagoons should be built to resist erosion during a 100-yr or greater flood so that they are not washed away by flowing river water across the floodplain.

☒ Clearance of project should be granted
☐ Clearance of project should not be granted
☐ Clearance of project should be delayed until the issues or questions have been clarified.
☐ Clearance of project should not be delayed, by the applicant (in the application) address or clarify the questions or concerns indicated above.)

Donald Whittemore
Reviewer's Name

KS Geological Survey 9/17/03
Division/Agency/Commission Date

Project Title: Public Water Supply Loan Fund Application

Applicant: CITY OF DOUGLASS

Contact Person: JON SHELLHORN, P.E. Consultants, P.A.

Address: 303 S. TOPEKA

City, State: WICHITA, KS **Zip:** 67202 **Phone:** (316) - 262-2691



Professional Engineering Consultants, P.A.

August 29, 2003

Kansas Geological Survey
University of Kansas
1930 Constant Ave. - Campus West
Lawrence, KS 66047

Attention: Mr. Donald O. Whittemore

Reference: Douglas STP Design
PEC Project No. 34-02231-673

Dear Mr. Whittemore:

Please consider the enclosed attachment as a formal request to conduct a "clearance/comment" review of the described project on behalf of the City of Douglass, Kansas.

The City is requesting State Revolving Loan Funds for purposes of constructing new Wastewater Treatment Lagoons, the addition of a new discharge line and lift station. Please refer to the enclosed aerial. These improvements have been determined necessary in order to maintain NPDES Permit compliance by the City.

Please address your review and clearance comments no later than September 30, 2003, to the following:

Jon C. Shellhorn, I.E.
Design Engineer
Professional Engineering Consultants, P.A.
303 S. Topeka
Wichita, Kansas 67202

Thank you for your consideration of this project.

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

Jon C. Shellhorn, I.E.
Design Engineer

JCS/tac

Encl: As noted

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J.P. MOORE, P.E.

■

303 S. TOPEKA

WICHITA, KANSAS

67202

316-262-2691

FAX

316-262-3003

www.pec1.com

designers@pec1.com

■

WICHITA

TOPEKA

LAWRENCE

PITTSBURG

**CITY OF
DOUGLASS**

**DOUGLASS
WASTEWATER SYSTEM
IMPROVEMENTS**

November 2002



**Professional
Engineering
Consultants, P.A.**

DESIGN MEMORANDUM UPDATE

1.0 INTRODUCTION

After a review of the site limitations due to property line separation distances, land acquisition concerns and underground utilities (gas lines), it was necessary to re-evaluate the wastewater treatment facility recommendations. It was discovered that a 50 foot wide gas pipeline easement runs through the selected site and would result in the need to pump wastewater from the new lagoon cells to the existing location. It was determined this situation would lead to increases in construction and operation and maintenance costs. This led to a review of a fifth alternative which included an abandonment of the existing lagoon system and the construction of a new three celled lagoon system. This report is intended to examine this alternative and reinforce the criteria stated in the design memorandum.

2.0 CONCERNS

There are several concerns that must be addressed prior to the construction of a new lagoon system. These were discussed in the design memorandum and are summarized below.

- Flood Plain – The top of the lagoon embankment must exceed the 100-yr. flood elevation. This elevation is 1180 in the location being considered.
- Archeological Areas – There is an area to the west of the treatment plant and an area to the south of the treatment facility that must be avoided. The area to the west will not have an impact with this design, but the archeological area to the south must be carefully monitored.

- Types of Soils – The soils located around the plant site have a low permeability which could make them a suitable soil for the pond lining.
- Residents – A minimum of 500 feet between the lagoons and the nearest residence must be maintained. If there is written permission from the land owner then this distance may be reduced to 350 feet. There also must be a distance of 100 feet from the property lines to the treatment facility.
- Railroads/Highways – There is a railroad and a highway to the east of the wastewater treatment facility. The new lagoons will be constructed to the west of the lagoons and the railroad or highway will not be an issue in design.
- Utilities – There is a pipeline that travels to the south of the treatment facility that must have a 25 foot easement to either side.

3.0 DESIGN CRITERIA

To properly design a three-celled lagoon system guidelines set by KDHE must be followed. The requirements for a continuously discharging lagoon system are:

- 34 pounds of BOD/Acre
- 120 days of detention time above the bottom level
- Up to five (5) feet of water depth for cells one and two
- Eight (8) to Ten (10) feet of water depth for the final holding cell
- Maintain a 60%/40% split of surface area in cells one and two

The Design of the lagoon system will be based on 2025 projected information stated in the Design Memorandum. A summary of this information is listed in Table 3.0-1

Table 3.0-1
Design Criteria

	Currently	Projected (2025)
Population	1,813	2,561
Influent Flow (MGD)	0.173	0.256
Influent BOD (lbs.)	390	564
Inflow and Infiltration w/ Rainfall (MGD)	0.403	0.506

3.1 Lagoon Sizing

The surface area of the lagoons will be determined based on the projected BOD loading in 2025. A loading of 564 pounds of BOD per day will result approximate 16.6 acres of lagoon surface area. From KDHE requirements, there must be a 60%/40% split in the surface area in lagoons cells one and two. This results in a surface area of approximately 10 acres for Lagoon Cell One and 6.6 acres for Lagoon Cell Two.

The two primary lagoon cells along with the holding cell must provide 120 days of detention time for the design flow stated in Table 3.0-1. A design flow of 0.256 mgd will result in a required storage volume of 30,720,000 gallons, or 4,106,667 ft³. Lagoon Cells One and Two are each five (5) feet deep with three feet of freeboard. This results in an operational volume of 2,035,000 ft³ for Lagoon Cell One and 1,338,000 ft³ for Lagoon Cell Two. The holding cell must be sized to adequately hold the remaining volume not achieved in the primary and secondary cell to achieve 120 days of detention. This necessary volume is equal to 733,660 ft³.

From USGS maps it indicates that the elevation at the proposed lagoon site is approximately 1176. As previously stated, the flood plain elevation is 1180 in this area and requires the lagoon embankment to be higher than this elevation. This design will use 1183.35 as the top of the lagoon embankment and will result in a lagoon bottom elevation of 1175.35 for Cells One and Two and 1172.35 for the holding cell. At a 4:1

slope this will result in an additional 20 feet on each side of the levee that will need to be purchased for the embankment to reach the ground.

3.2 Pump Station

The pump station will be designed to handle the projected inflow and infiltration rate of 0.506 MGD. KDHE guidelines state that the sewage pumping stations must be designed to pump the maximum hourly flow. The wetwell should be designed so that with any combination of inflow and pumping, the cycle of operation of the pumps will not be less than five (5) minutes and the maximum retention time in the wetwell will not exceed one hour. The pumps used for this design will be 625 gpm pumps that are capable of delivering 30 feet of head.

The pump station wetwell should be designed to hold approximately 2,500 gallons which is equal to fifteen minutes of storage with the rate of 0.506 MGD. With a wetwell operating depth of 10 feet this results in a bottom area of 33 ft². This design will use equal dimensions for the length and depth of the wetwell. This results in a length of six (6) feet and a width of six (6) feet. The value given represents the volume that the water will occupy and does not reflect the actual size of the wetwell.

3.3 Piping

Pipelines are required from the existing pump station to the new pump station, from the pump station to the lagoons and from the lagoons to the outfall structure at the Walnut River.

The pipeline from the existing pump station to the new pump station will only be approximately ten (10) feet and should not present any major concerns for the City. This additional pipeline should remain an 18".

The pipeline from the pump station to the lagoons should be capable of transporting approximately 500 gallons per minute at a velocity of two (2) ft/s to five (5) ft/s. An 8"

pipeline would meet the necessary flowrate. In this situation approximately 2500 feet of pipeline is required.

The gravity outfall pipeline from the lagoons to the discharge structure should be capable of transporting a flowrate of 0.256 MGD and should be in continuous operation. The velocity in the pipeline should be between 2 ft/s and 5 ft/s and should not generate more than three feet of head. A 12" pipeline will be used for this situation, but the flow must be controlled at the lagoon effluent through the use of a weir plate.

4.0 COST ESTIMATIONS

The items mentioned above along with the cost for purchasing the land is listed in Table 4.0-1. These costs include installation, project costs and contingencies.

Table 4.0-1
Project Costs

Item	Cost
Waste Stabilization Ponds	\$ 489,800
Treatment Plant Discharge	\$ 98,800
Miscellaneous	\$ 205,000
Land	\$ 120,000
Contingency	\$ 119,100
Project Costs	\$ 198,400
Total	\$ 1,231,100

These costs are slightly higher than the costs stated in the design memorandum. This is partly due to an increase in the cost for land acquisition, excavation and embankment. The cost stated in the design memorandum did not account for the pumping that would be required to transfer the flow from the lagoon cells to the existing lagoon cells for holding. These costs also reflect a reduction in piping that is required with this alternative and a reduction in the cost for a new pump station. The operation and maintenance cost for this alternative will be reduced to \$12,800, but is higher than the operation and maintenance cost mentioned in the design memorandum.

Scale: 300' 0 300' 600'

**FUTURE
PUMP STATION**

Residence

Property Line

ABANDON

**FUTURE
DISCHARGE LINE**

100' Rod

350' Rod

500' Rod

40%

60%

50 ft Pipeline Easement

Farmland On Pipeline

100 ft Clearance from Road

CITY OF DOUGLASS, KS
WWTP FACILITY
THREE-CELLED LAGOON SYSTEM
JANUARY 2003