FACILITIES PLAN

PRELIMINARY ENGINEERING STUDY

FOR

WASTEWATER TREATMENT FACILITIES

prepared for

CITY OF HARRISBURG, SOUTH DAKOTA

April 1997

STOCKWELL ENGINEERS, INC.

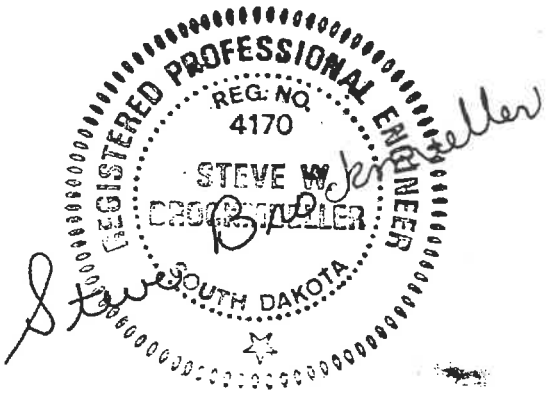
SIOUX FALLS, SOUTH DAKOTA

PROJECT: Preliminary Engineering Study
Wastewater Treatment Facilitites
City of Harrisburg, South Dakota

PROJECT NO.: 6296

DATE: April 30, 1997

Preliminary Engineering Study prepared by or under the supervision of Steve W. Brockmueller, Reg. No. 4170.



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SECTION 1

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1.1 Conclusions.

1. The purpose of this study is to evaluate the City's Wastewater treatment Facility and to determine improvements required to accommodate future growth to year 2017.

2. Population projections indicate continued growth for the City to a design population of 1,670 for the year 2017.

3. The planning area includes the City's incorporated limits and adjacent areas that are developable within the planning period. The total area within the planning area is 315 acres.

4. The existing wastewater treatment facility was designed for a population equivalent of 722 and an average daily waste flow of 54,200 gallons per day.

5. The sewage collection system is subject to excessive infiltration during periods of high groundwater. The infiltration appears to be caused by sump pumps and foundation drains connected to the sanitary sewer system.

6. The City passed a resolution to inventory all existing residences for sump pumps and foundation drains connected to the sanitary sewer system. Numerous violations were inventoried and were notified they must be in compliance with the Ordinance. Compliance has been very good.

7. An average daily flow of 75 gallons per capita per day was determined for design of future improvements. The average daily flow is 125,250 gallons per day at the design population.

8. The existing facility has reached its design capacity; however, it currently meets the treatment requirements of the City's Surface Water Discharge Permit.

9. Prior to 1993, the facility only required a discharge in 1986. Based upon the existing hydraulic load it appears the facility may have excessive leakage.

10. The City's discharge permit expires on March 31, 2000. The permit allows discharge of treated wastewater to Nine Mile Creek, however an additional provision was placed in the permit that allows the department to modify the permit if its discharge is an impact on Lake Alvin.

11. DENR design criteria recommend a minimum separation distance of one-half mile between the community and the stabilization pond. The existing facility does not meet this requirement.

12. Alternatives evaluated to meet future wastewater treatment requirements include; a) expansion of existing wastewater stabilization pond, b) abandon existing facility and construct total retention waste stabilization pond at another location, and c) abandon the existing facility and pump the waste flow for treatment at the Sioux Falls Wastewater Treatment Facility.

13. A summary of total project costs and annual equivalent costs for each alternative is as follows:

Alternatives	Total Project Cost	Equivalent Annual Cost
a. Expand Existing Facility - Controlled Discharge	$435,820	$36,300
b. Relocate and Construct Waste Stabilization Pond - Total Retention	$789,505	$63,980
c. Force Main and Pumping Station, Abandon Existing WWTF	$575,300	$104,150

14. Alternative No. 1 to expand the existing facility has the lowest total project cost and annual cost of the alternatives. It requires the purchase of approximately 13 acres of land for the expansion. This site will allow gravity flow to the system without pumping.

The negative side of this alternative is that it will not meet ammonia limitations and is not expandable to a total retention facility if required to eliminate discharges to the Lake Alvin watershed. The existing discharge permit for Harrisburg's wastewater facility currently allows this provision. Also, the existing site does not meet the minimum separation distance from the community as recommended in the DENR Design Criteria.

15. Alternative No. 2 provides for a total retention facility at a location approximately 2 miles southeast of the city limits. The alternative has the highest total project cost and a higher annual cost than expansion of the City's existing facility. A disadvantage of total retention is the large land requirements. Another disadvantage of this facility is that it requires pumping of wastewater flows.

An advantage of the location for this alternative is the separation from the community and its high growth areas. The proposed site is favorable regarding the direction of prevailing winds and is expandable for future growth.

The major advantage of total retention is that it will not require a discharge permit from DENR. The Owner may want to obtain the permit should an emergency discharge be required. A facility of this type will assure that there is no wastewater discharge to Nine Mile Creek and will eliminate potential pollution source for the City of Harrisburg to Lake Alvin.

A total retention facility is relatively easy to operate and maintain. Since the facility is non-discharging, there are no testing requirements.

16. Pumping wastewater for treatment at the Sioux Falls WWTF, Alternative No. 3, has a lower project cost than total retention; however, the annual cost is the highest of all the options. The annual cost is high since it involves substantial maintenance due to the pumps and controls, power costs, and the treatment costs at the Sioux Falls WWTF. Treatment costs charged by Sioux Falls will be $1.35/1000 gallons.

Discussions with Sioux Falls Staff indicate there is adequate capacity to treat Harrisburg wastewater; however, the collection system in southeastern Sioux Falls is at maximum capacity or reserved for planned development. Therefore, the wastewater would need to be pumped to a future collection

system. No date for construction of this system is known at this time.

17. Nettie H. Myers, Secretary DENR, has reviewed the City of Harrisburg's long term wastewater plan and has recommended the City construct a total retention facility based upon the potential for water quality impacts to Lake Alvin.

1.2 Recommendations and Implementations.

On the basis of the ability to meet the anticipated discharge requirements and other factors, the alternative recommended to meet the current and future wastewater treatment needs for the City of Harrisburg is:

The construction of a three-cell total retention wastewater stabilization pond on lands approximately 2 miles southeast of the City of Harrisburg in Section 7, T99N, R50W. The total retention facility will meet all future limitations on discharge required to protect the Lake Alvin watershed.

The City of Harrisburg is investigating the availability of low cost loans and grant funding for this project. The Southeastern Council of Governments will be assisting with an analysis of funding sources and revenue for this project.

The following implementation schedule is proposed for this project; however, the schedule is contingent upon the availability of construction funding and review by DENR:

Complete Contract Documents and Submit to DENR for Review	June 30, 1997
Advertise for Bids	July 11, 1997
Open Bids	August 4, 1997
Begin Construction	September 15, 1997
Complete Construction	July 1, 1998

SECTION 2

INTRODUCTION

2.1 Purpose and Scope.

In 1975, the City of Harrisburg constructed a sanitary sewer system and wastewater treatment facility. The existing wastewater treatment facility consists of a three-cell stabilization pond. The City's population has increased substantially since construction and planned development indicates a rapid growth rate will occur in the future. Therefore, the City of Harrisburg has initiated this study to evaluate alternatives for wastewater treatment.

There are currently no pumping records available for the City of Harrisburg. Therefore, flow measurements were recorded with portable equipment during the months of June and July of 1993. Also reviewed were existing records of water usage to estimate existing and future waste volumes.

The existing facility was evaluated to determine its adequacy to meet recommended design criteria for wastewater treatment facilities by the South Dakota Department of Environment and Natural Resources. The existing facility was evaluated to determine expansion necessary to treat estimated wastewater flows for the year 2017. Other alternatives for wastewater treatment were also evaluated.

Cost estimates will be presented for each alternative. Recommendations based upon design criteria and project costs will be summarized.

2.2 Planning Area.

The planning area includes the incorporated limits of Harrisburg, South Dakota as well as adjacent lands that are likely for development during the planning period. The total planning area is approximately 315 acres. Refer to Figure 2.2.1 for the study limits.

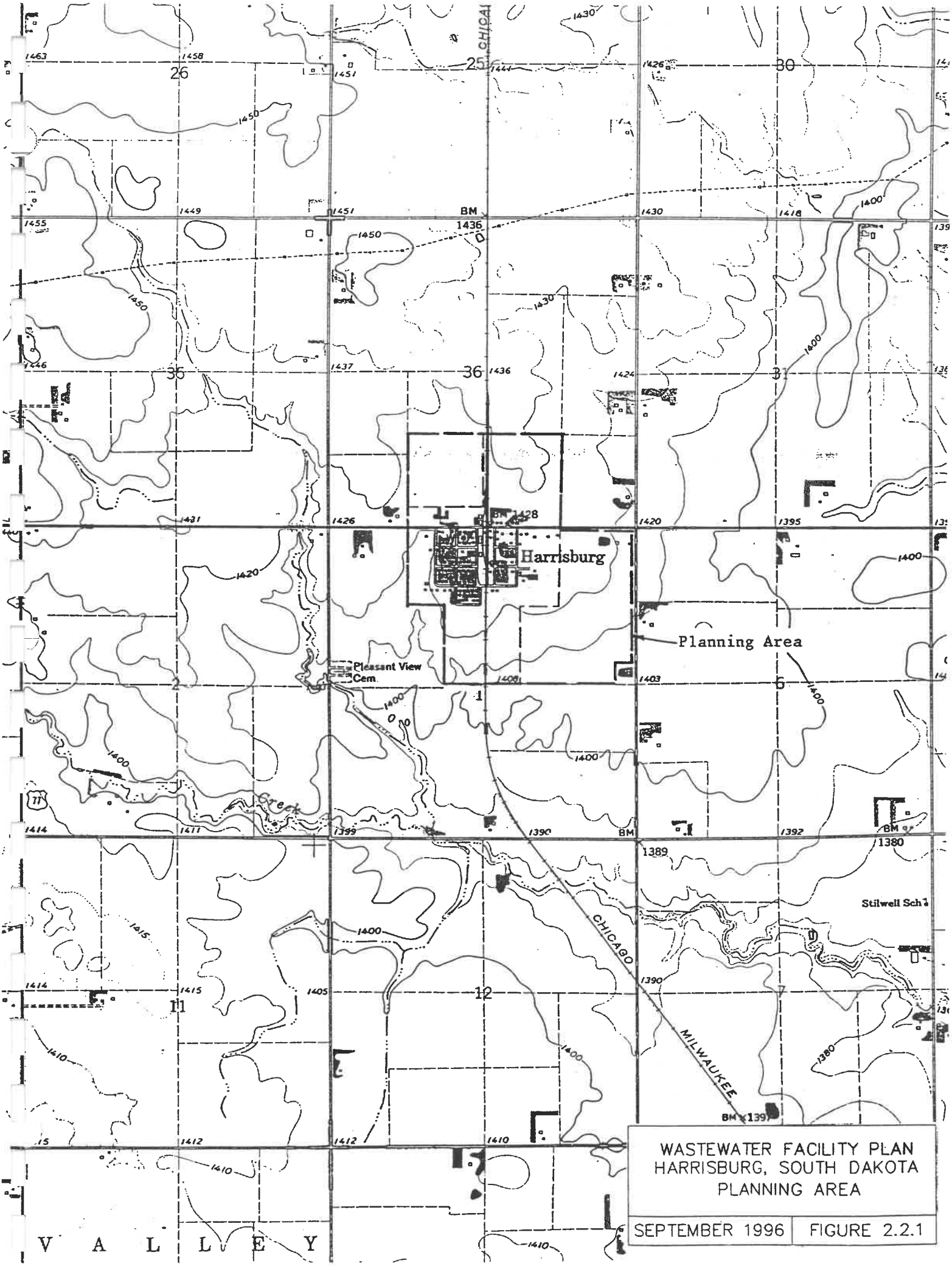
2.3 Planning Period.

The planning period used for this facility plan is 20 years. Projections for population beyond 20 years would involve too many uncertainties and could result in accelerated construction costs. The population of the City impacts both the size and type of wastewater treatment system.

Historically the City of Harrisburg has experienced a steady growth rate of approximately 2 percent since 1970. This moderate growth rate is similar to that experienced by Sioux Falls and other nearby communities. Since the 1990 census, the population of Harrisburg has increased from 729 to 897 for a 3-1/2 percent annual growth rate. Refer to Appendix E for information on growth of Harrisburg and surrounding communities.

The historical growth rate as well as low, moderate, and high growth rates for the City of Harrisburg are shown graphically on Figure 2.3.1. Low, moderate, and high growth rates for the year 2017 are as follows:

Low (1 percent)	1,105
Moderate (2 percent)	1,360



WASTEWATER FACILITY PLAN
HARRISBURG, SOUTH DAKOTA
PLANNING AREA

SEPTEMBER 1996 | FIGURE 2.2.1

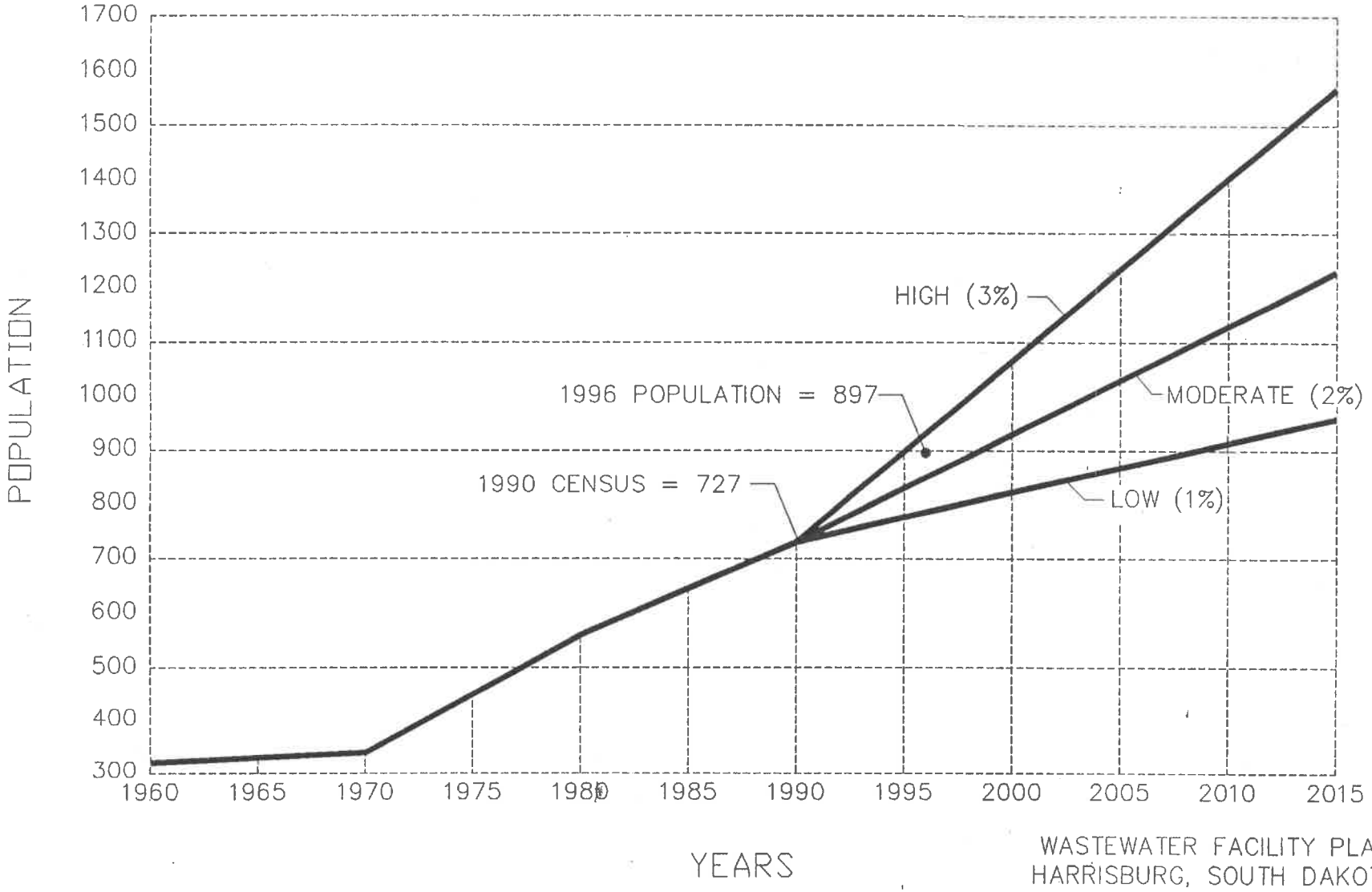
High (3 percent)	1,670
Current (1990)	897

A development corporation has recently began construction of a residential development that will ultimately include 195 homes. The community has adopted an aggressive growth plan that includes both residential and industrial growth. It is therefore anticipated that future growth in Harrisburg will be high (3 percent) with a population projection of 1,670 for year 2017.

2.4 Land Use.

Currently the City of Harrisburg encompasses approximately 178 acres of nearly level to gently rolling land. Harrisburg has a small area of commercial development along the east-west county road in the north part of the City. This road links to I-29 approximately 4-1/2 miles west of the City.

A new residential development of approximately 50 acres is just beginning in the southeast part of Harrisburg. It is expected the growth in residential development will also promote commercial and industrial growth. An active railway extend in a north-south direction through the City of Harrisburg. An industrial park is planned along this railroad in the north area of the City.



WASTEWATER FACILITY PLAN
HARRISBURG, SOUTH DAKOTA
POPULATION PROJECTIONS
FIGURE 2.3.1

SECTION 3

EXISTING WASTEWATER SYSTEM

3.1 Sanitary Sewer Collection System.

The sanitary sewer system consists of approximately 18,200 linear feet of 8 inch sewer. Construction of the sanitary sewer system began in 1974. The earliest systems were constructed of vitrified clay pipe.

The collection system drains toward the south edge of town at Walnut Street and the railroad tracks. From this location it drains south in a 8 inch VCP sewer to the existing stabilization ponds.

The existing manholes are of precast concrete construction. There are currently 39 manholes in the system. Approximately one-third of the manholes were visually inspected for this study. Construction of the manholes appears very good. At the time of the inspection, groundwater conditions were very high; however, no major infiltration was noted. Some minor seepage was noted at the lower joints of a few manholes.

The City currently has no lift stations in their system; however, it has been nearly extended to the limits for gravity flow. Future development planned in the southeast part of the City will require construction of a sewage pumping station and force main.

3.2 Wastewater Treatment Facility.

The City's wastewater treatment facility consists of a three-cell stabilization pond. The facility was constructed in 1974. Various design parameters for the existing facility are listed in Table 3.2.1.

Table 3.2.1
Design Parameters Existing WWTF

Primary Stabilization Pond:	
Depth at HWL, ft.	5.0
Water Surface Area at HWL, ac.	4.20
Water Surface Area at LWL, ac.	3.40
Drawdown Capacity, mg.	3.72
Side Slopes	6:1
Secondary Stabilization Ponds (Ea.):	
Depth at HWL, ft.	5.0
Water Surface Area at HWL, ac.	2.20
Water Surface Area at LWL, ac.	1.60
Drawdown Capacity, mg.	1.86
Side Slopes	6:1

Combined Storage Capacity, mg	9.77
Population Equivalent for 180 Day Storage at 75 GPCD	722

A schematic diagram of the wastewater treatment facility is shown on Figure 3.3.1.

The stabilization pond is designed to discharge on an intermittent basis and to store wastewater for a period of 6 months during the winter. The facilities outfall is to a drainageway extending along the west side of the railroad tracks approximately 1/2 mile to Nine Mile Creek. The wastewater flows by gravity into the primary cell and continues to flow in series through the secondary cells. There was no discharge from the facility until 1986 which was an extremely wet year. The wet conditions occurring since 1993 and increased hydraulic loading have resulted in annual discharge from the facility.

As Table 3.2.1 indicates the total storage capacity of the stabilization ponds is 7,440,000 gallons. The equivalent population for 180 days storage assuming 75 gallons per capita per day is 550.

The City has had operational problems associated with the existing control structures. Future improvements should address reconstruction of these structures to provide better control of liquid levels in the ponds. Also, the ditch that transports effluent discharged to Nine-Mile Creek has very poor drainage. Local property owners have filed complaints to the City. This problem could be solved by construction of a 12" outfall line to Nine-Mile Creek.

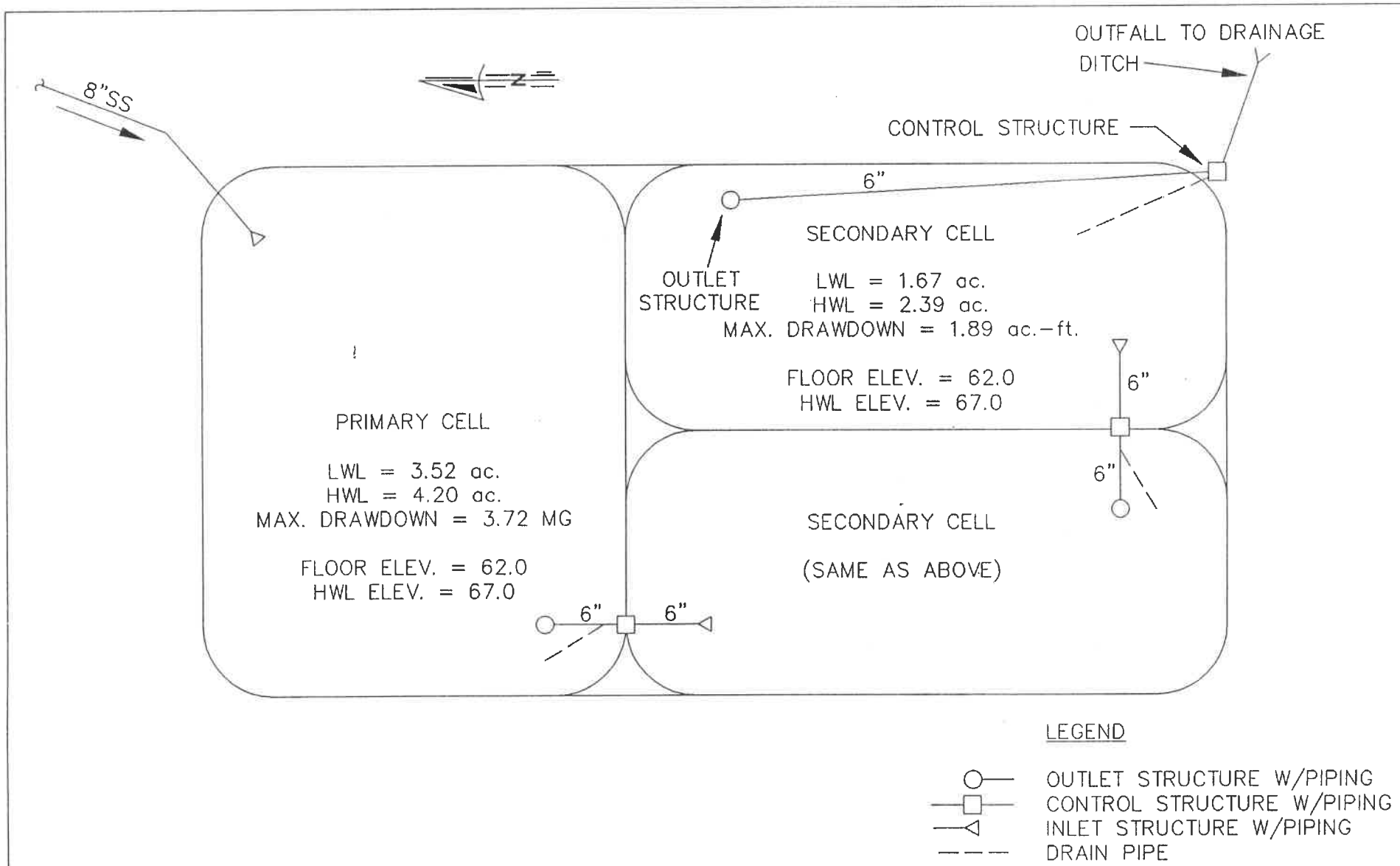
3.3 Permit Limitations.

The effluent standards for the wastewater treatment facility are outlined in the City's permit for Authorization to Discharge Under the Surface Water Discharge System issued by DENR. The current discharge permit expires on March 31, 2000. The permit allows intermittent discharge from the facility to Nine Mile Creek. Permission to discharge must be obtained from the South Dakota Department of Environment and Natural Resources (DENR). The permit includes an additional provision that allows the DENR to modify the permit to eliminate the discharge and thereby eliminate any adverse impact the facilities discharge has on Lake Alvin. Table 3.3.1 summarizes the NPDES permit requirements. A copy of the permit is included in Appendix A.

Table 3.3.1
Discharge Permit Requirements

Effluent Characteristic	30-Day Average	7-Day Average	Daily Maximum
BOD_5, mg/l	30	45	N/A
Total Suspended Solids, mg/l	30	45	N/A
pH	6-9	6-9	6-9
Fecal Coliform, no/100 ml*	N/A	N/A	N/A
Ammonia-Nitrogen, mg/l*	N/A	N/A	N/A

* Monitor only during the permission to discharge sampling.



WASTEWATER FACILITY PLAN
HARRISBURG, SOUTH DAKOTA
SCHEMATIC – EXISTING STABILIZATION PONDS

SEPTEMBER 1996 | FIGURE 3.1

3.4 Wastewater Flows.

The City of Harrisburg has no wastewater recording data. Therefore, a portable flow meter was installed in the sanitary sewer outfall line to collect data on wastewater flows. The data was recorded continuously from June 22 to July 16, 1993. Prior to and during the monitoring period, unusually wet conditions existed. Groundwater conditions were very high and several rainfall events occurred during the flow monitoring.

To analyze recorded wastewater flows, it is necessary to establish a baseflow. Baseflow is defined as that component of measured flow that is domestic wastewater. It is generally considered as wastewater discharge from residential and commercial users. For this study, the base flow was estimated from historical water consumption records for the winter months of December, January, and February. Normally approximately 80 percent of the water consumption will become sewage. The calculated average daily base flow based on water consumption is 63 gallons per person per day or 45,800 gallons per day.

The recorded flows were substantially higher than the calculated base flow. Average daily wastewater flow is approximately 170,000 GPD. This flow is almost 4 times the calculated baseflow. A review of the flow records indicates a steady flow rate with only slight increases apparent at those times of day when peak wastewater flows are anticipated. The flow variation throughout the day is approximately 0.1 cfs or 64,600 GPD.

It is apparent the wastewater flows recorded are excessive. Groundwater levels at the time of flow records were extremely high. During the period of flow measurements there were several rainfall occurrences. Immediately following a rainfall occurrence, there were no significant peaks apparent. The flow records remain relatively steady with slight increases apparent after a rainfall that tapers off after several hours. This pattern indicates the excessive flows are due to infiltration of groundwater into the system. Infiltration is defined as groundwater that enters into a sanitary sewer system through various defects in the sewage collective system. Typical infiltration sources are listed in Table 3.4.1.

Table 3.4.1
Typical Infiltration Sources

Private Sector	Public Sector
Building foundation drains	Defective manhole walls
Broken service laterals	Defective manhole inverts
Stub-in service connections	Leaking pipe seals
Broken service wye or tap	Broken sewer pipe
Sump pumps	Offset pipe joints
	Separated pipe joints

As mentioned in Section 3.1, a representative number of manholes were inspected during the high groundwater conditions. The inspections indicate very good construction techniques and only minor infiltration was apparent. No televised inspections of the sewer system were available to verify condition of the sanitary sewers. It is assumed the construction of the sewers were comparable to the manholes and since the sewer systems are relatively new, excessive infiltration through pipe joints are not expected. Therefore, all of the public sector infiltration sources are eliminated as infiltration sources.

The City's sewer ordinance prohibits connecting foundation drains and sump pumps to the sewer system; however, illegal connections are suspected to contribute inflow to the system. The excessive I/I was discussed at a Council meeting in March 1995. The Council passed a resolution to inventory sump pump violations and enforce the ordinance. As a result, the City inventoried at least 30 violations.

The average daily wet weather flow is 170,000 GPD or 124,200 gallons per day more than base flow. Assuming each time a sump pump operates it pumps 25 gallons into the sewer, and that the frequency of pump operation is 10 minutes, the theoretical number of sump pump violations to equal the excess flow is 35. Therefore, it appears the excessive flow in the system was a result of sump pumps pumping to the system.

124,200 GPD/25 gal./(24 hr. x 60 min. x 10 min./cycle) = 35

The City also completed construction of paved streets with curb and gutter in all areas of town. This has resulted in improved drainage conditions for its residences. The City is now observing that sump pumps are ~~now~~ being discharged outside of residences.

SECTION 4

FACILITY EVALUATION

The previous sections have provided data on the existing wastewater treatment facility and collection system, population projects, NPDES permit requirements, and historical records of wastewater flows. This section will use the date to provide criteria for the evaluation of the existing wastewater treatment facility and the design of improvements.

4.1 Basis of Design.

The design criteria listed in Table 4.1.1 has been developed for the facility evaluation.

Table 4.1.1
Design Criteria

1.	Existing Population (1996)	897
2.	Design Population (2017)	1,670
3.	Existing Wastewater Flow, GPD (1996)	67,275
4.	Wastewater Flow (2017)	
	A. Average Daily, GPD	125,250
	B. Average Daily, GPCD	75
	C. Average Daily, GPM	87
	D. Peak Design, GPM	225
5.	BOD, PPD	
	Existing (1996)	
	(200 ppm)(0.067 MGD)(8.34)	112
	Future (2017)	
	(200 ppm)(0.125 MGD)(8.34)	209
4.	TSS, PPD	
	Existing (1996)	
	(240 ppm)(0.067 MGD)(8.34)	134
	Future (2017)	
	(240 ppm)(0.125 MGD)(8.34)	250

1,670 people x 75 gpcd = 125,250 GPD

125,250 / 1440 = 86.98

The average daily per capita flow is based on the theoretical base flow determined in Section 3.4. As previously noted, the City will enforce the ordinance prohibiting such connections. DENR standards require a minimum infiltration allowance of 200 gallons per inch of pipe diameter per mile of pipe per day. The minimum infiltration allowance for Harrisburg is 7.6 GPCD. The calculated base flow is 63 GPCD for a total flow of 70.6 GPCD. DENR standards require a minimum design average daily flow of 75 GPCD which was used for this analysis.

4.1.1 Stabilization Ponds.

The design of the wastewater stabilization ponds shall conform to the criteria listed in Table 4.1.1.1.

Table 4.1.1.1
Design Criteria for Stabilization Ponds

1.	BOD Design Load, Primary Cell, PPAD	30
2.	Total BOD Load, all Cells (PPAD)	20
3.	Storage Capacity at Design Flow, days	180
4.	Seepage Rate, inch/day	1/16

The BOD loadings and effective storage capacity for the existing stabilization pond at the current population is as follows:

A. Cell No. 1 (Primary):

1.	BOD Loading, PPAD 112 PPD/4.20 ac.	26.7
2.	Drawdown Capacity, MG	3.72
3.	Seepage, MGD (1/16 in./Ac/day)(1/12)(4.20 Ac)(43,560)(7.481)	0.0071
4.	Storage Time, days 3.72/(0.067-0.0071)	62

B. Cell No. 2 & 3 (Secondary):

1.	Drawdown Capacity, MG	3.72
3.	Seepage, MGD (1/16)(1/12)(2.39 + 2.39)(43,560)(7.481)	0.0081
4.	Storage Time, days 3.72/(0.067-0.0081)	63

C. Total BOD Loading, PPAD 12.5
112/4.20 Ac + 2(2.39 Ac)

D. Total Storage Capacity (pop. 897), days 125

The storage capacity required to meet future organic and hydraulic loadings is as follows:

Controlled Discharge Pond:

A. Min. Area for Primary Cells based on Organic Loading:
Area = 209 PPD/30 PPAD = 7.0 acres

B. Min. Total Area for all cells based on Organic Loading:
Area = 209 PPD/20 PPAD = 10.5 acres

C. Total Volume for 180 Day Storage:
Volume = 0.125 MGD(180 days) = 22.5 MG = 3.01 MCF
Volume Primary Cell = (0.5)(22.5 MG) = 11.25 MG = 1.50 MCF
Volume Secondary Cells = (0.5)(22.5 MG) = 11.25 MG = 1.50 MCF

D. Area Primary Cell:
Area = 1,500,000/(43,560)(3) = 11.5 acres

E. Area Secondary Cells:
Area = 1,500,000/(43,560)(4) = 8.6 acres

F. Total Area for 180 Day Storage:
Area = 11.5 + 8.6 = 20.1 acres

2017 ADF

Non-Discharging Pond (Total Retention):

A. Total Volume for 365 Day Storage:
Wastewater Volume = 0.125 MGD(365 days) = 45.6 MG = 6.1 MCF

B. Annual Rainfall = 24.62"
Annual Evaporation = 39"
Seepage = 1/16" per day(365 days) = 22.82"
Net Loss = 37.2" = 3.1'

CELL #1 - 5' DEEP
CELL #2 - 6' DEEP
(TERTIARY) CELL #3 - 8' DEEP

C. Total Pond Area @ 3' Depth = 6,100,000 CF/(3.1 ft)(43,560) = 45 acres

D. Additional Area Berms, Roads, etc. = 5 acres

E. Total Land Area = 50 acres

4.1.2 Design Summary

A summary of existing conditions and future requirements for the wastewater treatment facility are listed in Table 4.1.2.1.

Table 4.1.2.1
Summary of WWTF Review

		Existing	Future Discharging	Future Total Retention
A.	Primary Pond:			
1.	Water Surface Area, ac.	4.20	11.5	22.5
2.	Liquid Depth, ft.	5	5	5
3.	Volume, mg	3.72	11.3	20
4.	Detention, days	36	90	160
5.	BOD Loading, PPAD	44	18	9.3
B.	Secondary Pond (Total):			
1.	Water Surface Area, ac.	4.78	8.6	22.5
2.	Liquid Depth, ft.	5	6	6
3.	Volume, mg	3.72	5	25
4.	Detention, days	36	90	200
C.	Total BOD Loadings, PPAD	21.5	10.3	4.6

SECTION 5

EVALUATION OF ALTERNATIVES

5.1 Alternatives.

The various alternatives for handling the future wastewater needs for the City of Harrisburg are; 1) expanding existing stabilization ponds, 2) abandon existing facilities and construction new stabilization pond at alternate location, and 3) abandon existing facility and pump to the Sioux Falls Wastewater Treatment Facility.

5.1.1 Expand Existing Stabilization Ponds.

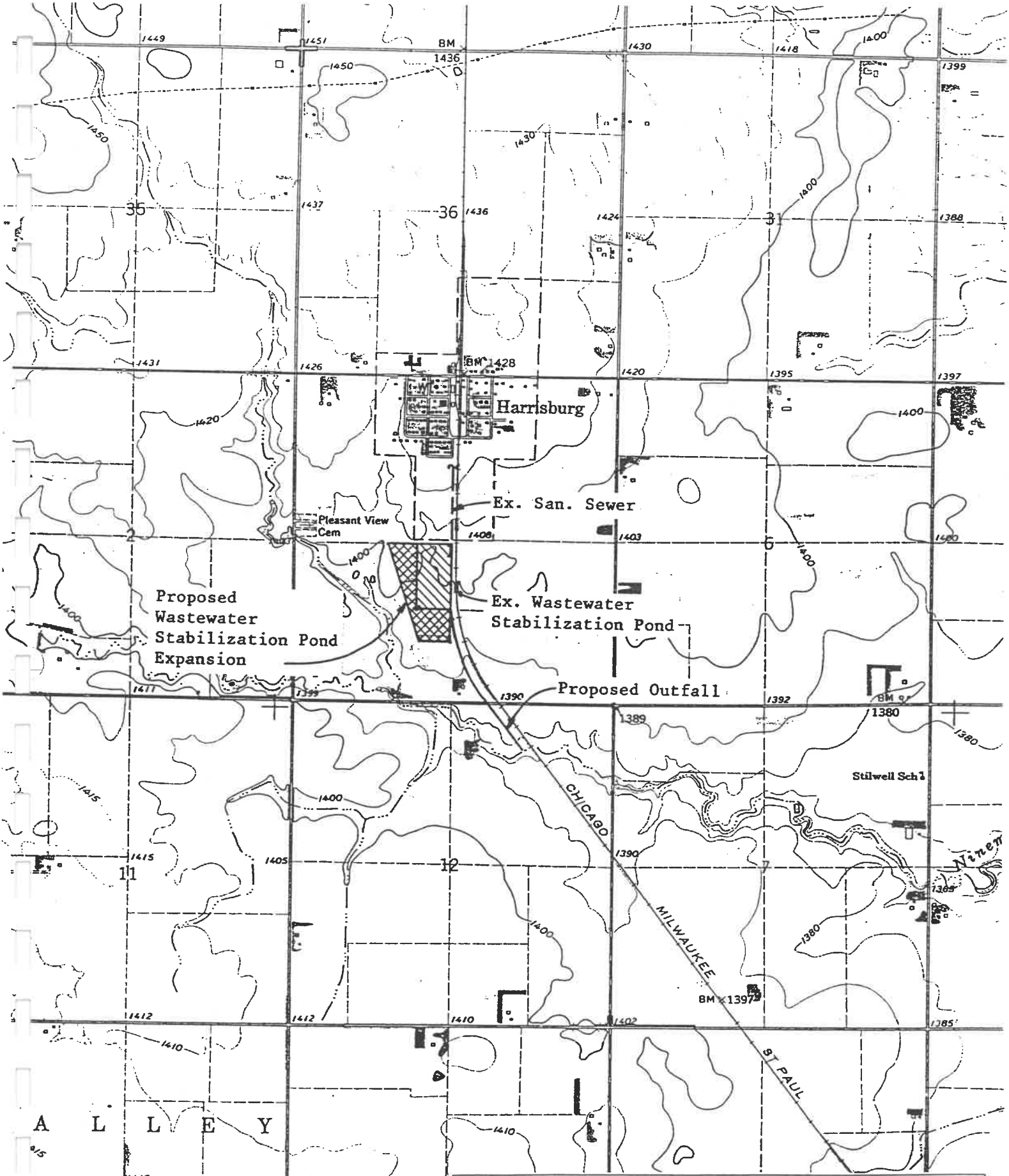
The DENR has conducted a limited study of the Nine Mile Creek and Lake Alvin Watershed. The study results indicate the discharge from Harrisburg's stabilization pond contributes a small part of the total pollution to the Lake Alvin Watershed. This was noted in a April 10, 1996 letter from Nettie Myers, Secretary of DENR. The letter goes on to indicate the City's existing wastewater discharge permit allows discharge to Nine Mile Creek; however the permit contains a provision to modify the permit to eliminate the discharge if it impacts Lake Alvin. Therefore, the letter recommends a total retention facility or a facility that can be easily expanded to total retention. A copy of the April 10, 1996 letter is included in Appendix C.

There is limited land available for expansion of the existing stabilization ponds. The ponds are located adjacent to the city limits and residential development is occurring in close proximity to the site. DENR standards recommend a pond site shall be at least one-half mile from the community and one-quarter mile from a residence. The existing pond site will not meet these minimum distances. Discussions with staff at DENR indicate since this is an existing site it will be acceptable to expand at this location. The land available for expansion would permit construction of a controlled discharge facility; however, there is not adequate land available for future expansion to a total retention facility.

Expansion of the existing facility for controlled discharge requires increased size for the primary and secondary cells to meet organic loadings and the 180 days winter storage requirements. Expansion of the existing facility would also require reconstruction of the existing secondary cell to correct apparent leakage. It is assumed the ponds leak since there has only been a controlled discharge in 1986 and until recent years beginning in 1993. The control boxes would need to be reconstructed to provide better operation of the facility. A 12 inch outfall is recommended to Nine Mile Creek.

Williams Pipeline operates a buried pipeline west of the existing site. It is proposed to locate the facility expansion along the east side of this pipeline.

The total area required for the expansion is approximately 28 acres. Of this total approximately 15 acres is available on the existing site and the additional area would need to be obtained by purchasing land adjacent to and west of the site. The proposed improvements will impact existing wetlands on the south side of the existing facility. If the effected wetland exceeds 1/3 acre in total area, wetland mitigation may be required. A permit application in accordance with Section 404 of the Clean Water Act would need to be submitted to the U.S. Army Corps of Engineers. Refer to Figure 5.1.1.1 for site location.



WASTEWATER FACILITY PLAN
HARRISBURG, SOUTH DAKOTA
ALTERNATE FOR EXPANSION OF STABILIZATION POND

SEPTEMBER 1996	FIGURE 5.1.1.1

5.1.2 Construct New Total Retention Wastewater Stabilization Pond.

As previously noted, the site of the existing pond doesn't meet the minimum separation distance recommended in the DENR Design Criteria and is not large enough for construction of a total retention facility. These distances are one-half mile from the community and one-forth mile from a farm home or residence. Also a pond shall not be located within 1000 feet of a well used to supply potable water. A review of potential sites indicates a location in the southwest quarter of Section 7 would provide the recommended separation distances. Discussions with DENR staff indicate the wells in this region are generally drilled to a depth of 200 feet or more and would not be impacted by seepage from a waste stabilization pond.

This site would be located adjacent to and south of the railroad right-of-way. Access would be from the township road on the west edge of the site. Refer to Figure 5.1.2.1 for the proposed pond location.

Wastewater presently flows by gravity to the existing pond. This location will require pumping wastewater from the vicinity of the existing site to the new location. The force main would be installed in easements obtained adjacent to the railroad right-of-way.

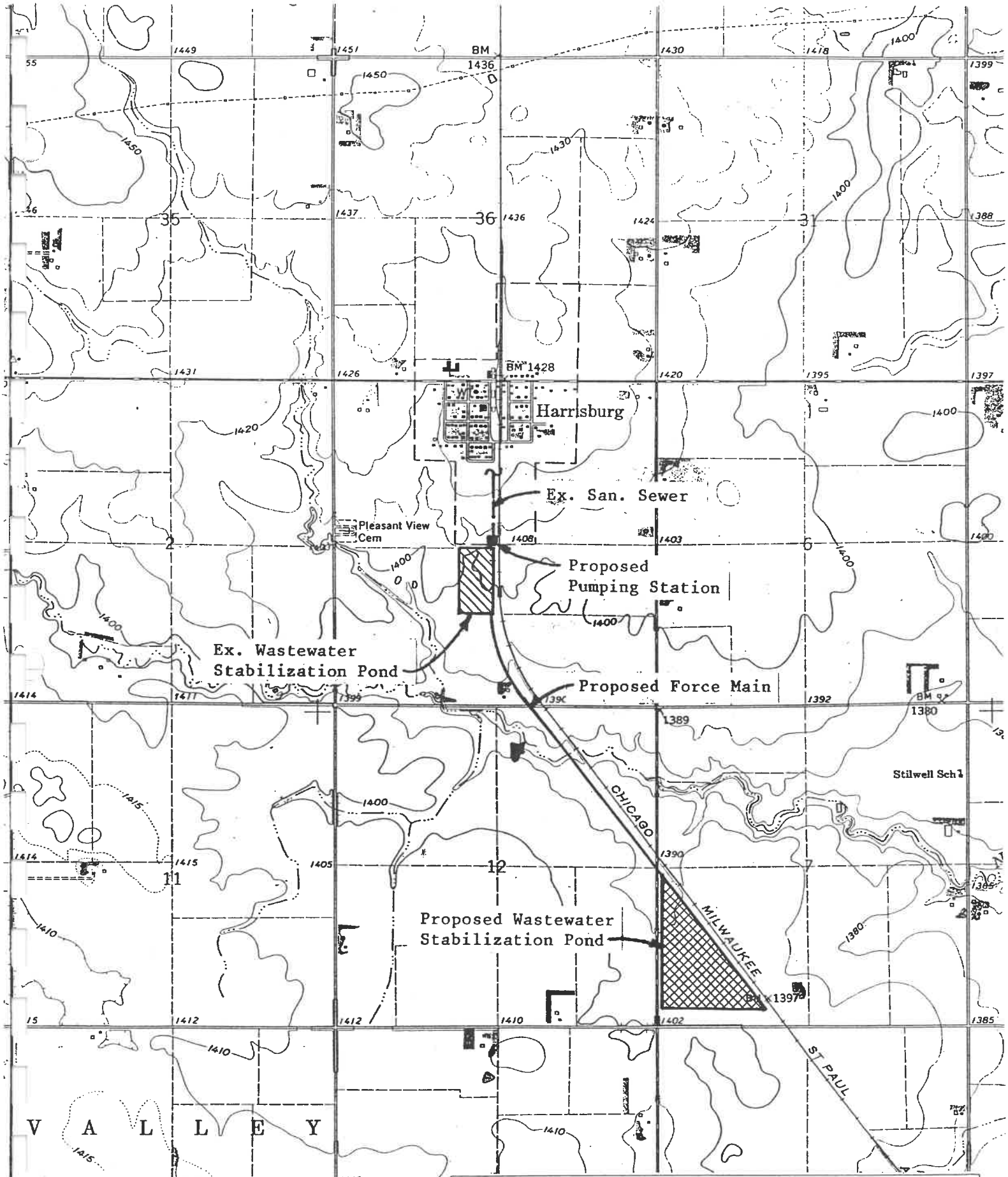
The design criteria from Section 4 indicates 50 acres is required for cosntruction of a total retention stabilization pond. The site selected is within the triangular tract on the south side of the railroad tracks. The total area of this tract is approximately 60 acres which allows additional area for future expansion.

Total retention facilities rely upon water loss be evaporation to maintain the pond depth with design levels. These facilities may experience difficulty maintaining minimum depths during the initial years of the facility's design life especially during years of low precipitation and high evaporation. If the pond depths are not maintained, excessive weed growth may occur and the clay liners may crack and become ineffective. It is therefore recommended the facility be constructed in phases. The initial phase shall include construction of a primary cell of approximately 22 acres plus a 12 acre secondary cell. The third cell will be constructed at a later date as dictated by the City's growth.

5.1.3 Pump Wastewater.

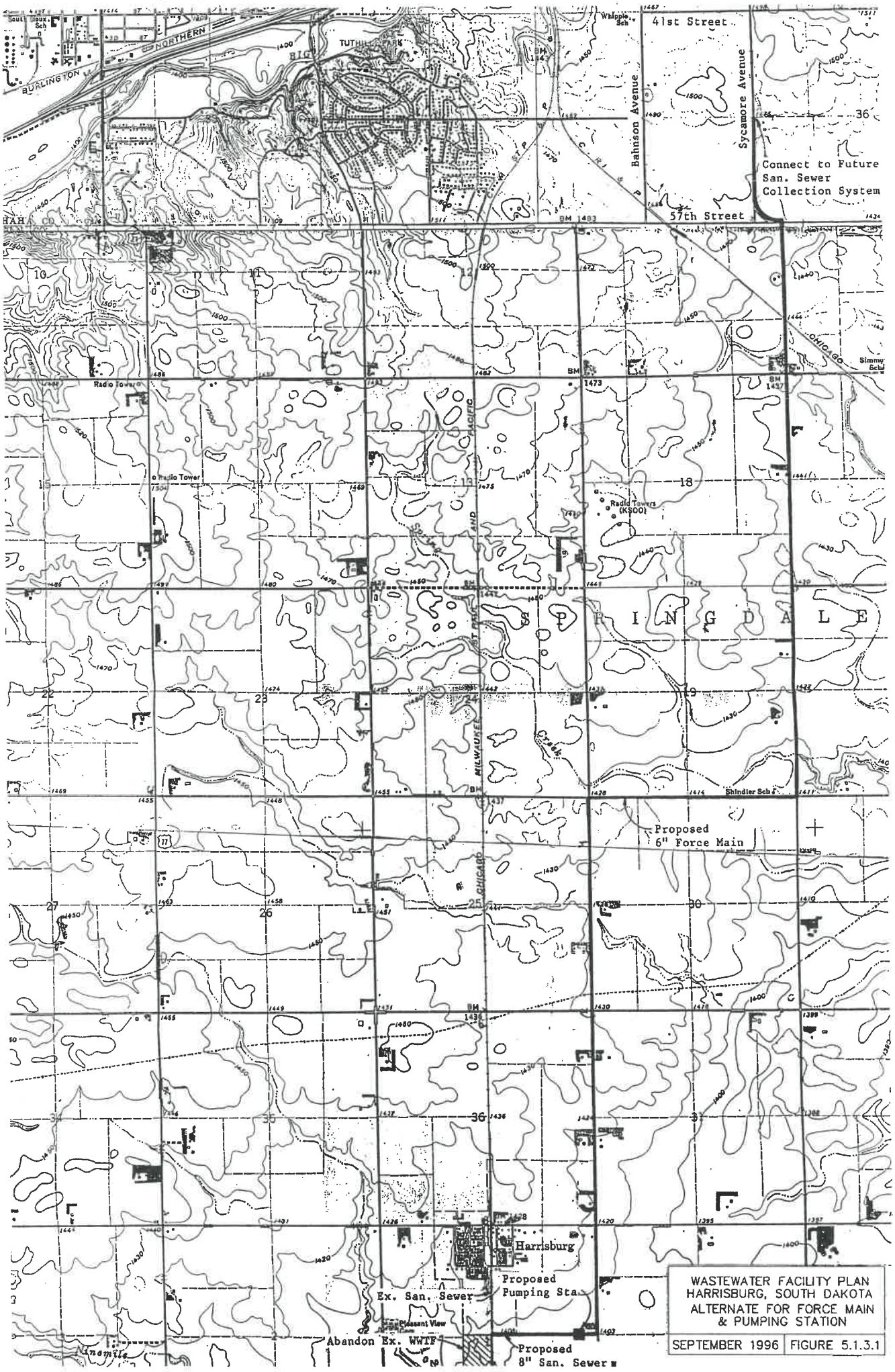
Pumping of wastewater flows include abandoning the existing plant and pumping all flow for treatment at the Sioux Falls Wastewater Treatment Facility. This alternative requires approximately 35,000 linear feet of 6" PVC force main extending from near the existing wastewater treatment facility to near 41st Street and Sycamore Avenue in Sioux Falls. Figure 5.1.3.1 shows the proposed alignment for the force main. The size of the force main has been oversized to provide for future growth beyond 20 years.

Discussions with staff at the City of Sioux Falls indicates their existing wastewater treatment facility has adequate capacity to treat the flow from the City of Harrisburg; however, the existing collection system on the south perimeter of Sioux Falls are near capacity or reserved for future development. Construction of additional capacity is not expected in the near future.



WASTEWATER FACILITY PLAN
HARRISBURG, SOUTH DAKOTA
ALTERNATE FOR RELOCATION OF STABILIZATION POND

SEPTEMBER 1996	FIGURE 5.1.2.1


41st Street
57th Street
Bahnson Avenue
Sycamore Avenue
Connect to Future San. Sewer Collection System
TUTHILL PARK
NORTHERN
BURLINGTON
Radio Tower
Radio Towers (KSOO)
SPRINGDALE
MILWAUKEE
CHICAGO
Proposed 6" Force Main
Harrisburg
Proposed Pumping Sta.
Ex. San. Sewer
Pleasant View
Abandon Ex. WWTF
Proposed 8" San. Sewer
WASTEWATER FACILITY PLAN
HARRISBURG, SOUTH DAKOTA
ALTERNATE FOR FORCE MAIN & PUMPING STATION
SEPTEMBER 1996
FIGURE 5.1.3.1

SECTION 6

COST ESTIMATES AND ECONOMIC EVALUATION

6.1 Cost Estimates.

Preliminary cost estimates for expansion of the existing wastewater treatment facility as well as the other alternates are listed in Tables 6.1.1 through 6.1.3. The Costs are current and no allowance has been made for inflation.

Table 6.1.1

Preliminary Cost Estimate
Expansion of Wastewater Treatment Facility - Controlled Discharge

	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Earthwork	60000	CY	$1.75	$105,000.00
2	Compacted Clay Liner	20000	CY	$2.00	$40,000.00
3	Riprap	3000	Ton	$20.00	$60,000.00
4	Seeding	6	Acre	$750.00	$4,500.00
5	Soil Sterilant	1	LS	$2,000.00	$2,000.00
6	Control Structures and Piping	1	LS	$35,000.00	$35,000.00
7	Piping and Valves	1	LS	$17,000.00	$17,000.00
8	Outfall Line	2600	LF	$15.00	$39,000.00
9	Fence	1000	LF	$3.00	$3,000.00
10	Gravel	400	Ton	$8.00	$3,200.00
11	Pumping & Prefilling Pond	1	LS	$5,000.00	$5,000.00
				Subtotal	$313,700.00
				Contingencies @ 10%	$31,370.00
				Total Estimated Construction Cost	$345,070.00
				Administrative, Engineering & Legal Fees	$51,750.00
				Site & Easements (13 ac. @ $3,000)	$39,000.00
				TOTAL ESTIMATED PROJECT COST	$435,820.00

Table 6.1.2

Preliminary Cost Estimate
Wastewater Stabilization Pond - Total Retention

	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Earthwork	125000	CY	$1.25	$156,250.00
2	Compacted Clay Liner	30000	CY	$1.50	$45,000.00
3	Riprap	8000	Ton	$15.00	$120,000.00
4	Seeding	8	Acre	$600.00	$4,800.00
5	Control Structures and Piping	1	LS	$30,000.00	$30,000.00
6	Piping and Valves	1	LS	$25,000.00	$25,000.00
7	Fence	6500	LF	$3.00	$19,500.00
8	Gravel	3000	Ton	$7.50	$22,500.00
9	Prefilling Ponds	1	LS	$7,500.00	$7,500.00
10	Pump Station	1	LS	$45,000.00	$45,000.00
11	Wetwell	1	LS	$6,000.00	$6,000.00
12	6" Force Main	6200	LF	$10.00	$62,000.00
13	Abandon Existing Ponds	1	LS	$25,000.00	$25,000.00
14	Flow Measurement	1	LS	$6,000.00	$6,000.00

Subtotal	$574,550.00
Contingencies @ 10%	$57,455.00
Total Estimated Construction Cost	$632,005.00
Administrative, Engineering & Legal Fees	$95,000.00
Site & Easements (50 ac. @ $1,250)	$62,500.00
TOTAL ESTIMATED PROJECT COST	$789,505.00

Table 6.1.3

Preliminary Cost Estimate
Force Main and Pumping Station
Abandon Existing WWTF

	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	6" Force Main	35000	LF	$8.00	$280,000.00
2	Pumping Station	1	LS	$40,000.00	$40,000.00
3	Wetwell	1	LS	$6,000.00	$6,000.00
4	Flow Meter	1	LS	$4,000.00	$4,000.00
5	Air Release Valve	6	Each	$2,500.00	$15,000.00
6	Highway Crossing	80	LF	$75.00	$6,000.00
7	Valve	6	Each	$750.00	$4,500.00
8	8" Sanitary Sewer	2600	LF	$12.00	$31,200.00
9	Manhole	7	Each	$1,500.00	$10,500.00
10	Railroad Crossing	35	LF	$75.00	$2,625.00
11	Seeding	28	Acre	$750.00	$21,000.00
12	Abandon Existing Ponds	1	LS	$30,000.00	$30,000.00
			Subtotal		$450,825.00
			Contingencies @ 10%		$45,082.50
			Total Estimated Construction Cost		$495,907.50
			Administrative, Engineering & Legal Fees		$74,400.00
			Site & Easements		$5,000.00
			TOTAL ESTIMATED PROJECT COST		$575,307.50

6.2 Economic Evaluation.

An economic evaluation of the various alternatives are shown in Tables 6.2.1 through 6.2.3. For comparison, costs have been calculated to show the total present worth and the average annual equivalent cost. The estimates operation and maintenance costs have been assumed as constant during the 20 year design period.

Table 6.2.1

Economic Evaluation
Expansion of Wastewater Treatment Facility - Discharging

		COST	LIFE	SALVAGE
Proposed Improvements:				
Ponds		$273,870.00	40	$136,935.00
Control Structures & Piping		$65,780.00	40	$32,890.00
Fence & Gravel		$7,840.00	10	($3,920.00)
Site		$39,000.00	-	$39,000.00
Outfall Line		$49,330.00	50	$29,600.00
Total Capitol Cost		$435,820.00		
Salvage at Year 20				$234,505.00
Annual Cost Capitol Improvements	$28,800.00			
Annual Operation & Maintenance	$7,500.00			
Annual Equiv. Cost (i=5.25%)	$36,300.00			

Table 6.2.2

Economic Evaluation
Wastewater Stabilization Pond - Total Retention

		COST	LIFE	SALVAGE
Proposed Improvements:				
Ponds		$422,000.00	40	$211,000.00
Control Structures & Piping		$69,600.00	40	$34,800.00
Fence & Gravel		$53,200.00	10	($26,600.00)
Pump Station		$56,950.00	20	-
Force Main		$78,450.00	50	$47,070.00
Wetwell		$7,615.00	40	$3,810.00
Site		$62,500.00	-	$62,500.00
Abandon WWTF		$31,600.00	-	$31,600.00
Flow Measurement		$7,590.00	20	-
Total Capitol Cost		$789,505.00		
Salvage at Year 20				$364,180.00
Annual Cost Capitol Improvements	$53,980.00			
Annual Operation & Maintenance	$10,000.00			
Annual Equiv. Cost (i=5.25%)	$63,980.00			

Table 6.2.3

Economic Evaluation
Force Main and Pumping Station
Abandon Existing WWTF

		COST	LIFE	SALVAGE
Proposed Improvements:				
Force Main		$380,780.00	50	$228,500.00
Pump Station		$50,600.00	20	-
Structures		$20,870.00	40	$10,400.00
Sanitary Sewer		$50,380.00	50	$30,200.00
Valves		$24,670.00	20	-
Equipment		$5,060.00	20	-
Sites		$5,000.00	-	$5,000.00
Abandon WWTF		$37,950.00		$37,950.00
Total Capitol Cost		$575,310.00		
Salvage at Year 20				$312,050.00
Annual Cost Capitol Improvements	$47,150.00			
Annual Operation & Maintenance	$57,000.00			
Annual Equiv. Cost (i=5.25%)	$107,150.00			