City of Peoria
Utilities
9875 North 85th Avenue
Peoria, Arizona 85345

FINAL SANITARY SEWER REPORT-2009

A Final Sanitary Sewer Report is required for all proposed sewage collection systems. The design report shall include: the basis of design, calculations for project design flow, system capacity, capacity phasing, and all other information needed to clearly understand the project. This document provides an overview of the minimum components to be included in the Final Sanitary Sewer Report. This report must be sealed by a professional engineer registered in the State of Arizona.

Final Sanitary Report Format

As a minimum, the following information needs to be included with the Final Sanitary Sewer Report. Additional, pertinent information may be included.

1. Development Data

a. Name: Provide the name of the proposed development. Include the name of the developer and the point of contact for the reports.

b. Location: Provide the township, range and section(s) in which the proposed development is located. Provide the general location of the proposed development using major crossroads. Include a vicinity map and an overall plan showing the proposed development.

c. Zoning and Land Use: Provide the current zoning of the proposed development and summarize any recent prior zoning changes that have been made to the parcel. Indicate whether a zoning change will be required for the new development. Provide the number of single family units, multi-family units, commercial acres, applicable building square footages, and the total acreage of the new development.

2. Project Description

a. Discuss any design deviations from any prior reports or project submittals.

b. Describe the proposed collection system including gravity lines, lift stations, and forcemains. Include pipe sizes and pipe materials. Discuss any drop manholes, manholes over 5' in diameter, or manholes over 12' in depth in detail.

c. Discuss the locations where the proposed collection system will tie into the existing system.

d. State whether there are any physical features such as canals, floodplains, railroads, washes, extreme grading, etc. that will impact the proposed development. Discuss any possible impacts.

e. Show the service area that will be served by the proposed sewage system, including offsite areas.

f. Provide a clear exhibit that depicts the entire service area. Select a drawing scale so that the entire site can fit on 1 sheet. If the site is odd shaped or very large, then select a scale that minimizes sheets and clearly depicts all the required items. The exhibit should show the following:

1. pipe sizes and material
2. the direction of flow
3. manholes and manhole labels
4. physical features (per item b above)
5. property lines and site boundary
6. the limit of construction
7. the ADF and MDF flow (in cfs) at the critical tie in points to the existing sewer system

3. Design Flows and Basis of Design

a. Provide calculations for the **average daily flow (ADF)** for wastewater per the *City of Peoria Wastewater Master Plan 2007.*

Average Daily Flow- Wastewater	
Residential	100 GPCD
Non-Residential	*Refer to AZ Admin. Code, Title 18, Chapter 9

*Attached for Reference.

Residential Population: See table below. (Not required for commercial sites)

Projected Population Density	
Single Family (persons/dwelling)	2.9
Multi-Family (persons/dwelling)	1.7

ADF (residential) = number of units x projected population density x 100 GPCD

ADF (non-residential) = Refer to AZ Admin. Code, Title 18, Chapter 9

b. Provide calculations for the **maximum daily flow (MDF)** for wastewater using the wet weather peaking factor per the *City of Peoria Wastewater Master Plan 2007.* Refer to the equations below:

Dry Weather Peaking Factor (Residential)
PF_{DW} = Per Table 6.2 of the 2007 Wastewater Master Plan

Dry Weather Peaking Factor (Non-Residential)
$PF_{DW} = 4$

Wet Weather Peaking Factor (*for projects in the Northern Planning Area)
$PF_{WW} = 1.16 \times PF_{DW}$

Wet Weather Peaking Factor (*for projects in the Southern Planning Area)
$PF_{WW} = 1.30 \times PF_{DW}$

Maximum Daily Flow
$MDF = ADF \times PF_{WW}$

*Beardsley Road is the boundary between the Northern and Southern Planning Areas.

c. Utilize pipe design criteria in Table 5.3 of the November 2007 Wastewater Master Plan. www.peoriaaz.gov/utilities/Docs/Wastewater-Ch05.pdf

d. Based on the calculated MDF, provide calculations for each run of Sanitary Sewer. Calculations can be done by spreadsheet, modeling software, or other method that adequately conveys the full sewer design. *See attached Sanitary Sewer Calculations example* below. Refer to Chapter 6 of the Development Engineering Design Guidelines- *Sewer Facilities Design and Construction* and to Table 5.3- Wastewater System Criteria Summary from the 2007 Wastewater Master Plan. Sanitary Sewer Calculations for each segment of pipe should include the following:

1. Manhole labels- Labeling scheme should match the exhibit
2. Q design- The cumulative MDF in each pipe segment.
3. Pipe Diameter- Should match the exhibit
4. Slope- Should match the slopes in the final engineering plans
5. Velocity design- Should be calculated based on design slope and Q design (not Q full) Target design velocity is between 2.5 ft/s and 10.0 ft/s.
6. The cover- Rim elevation to invert elevation at manholes. If applicable, cover at critical locations should be included (i.e. crossings under a wash, etc.)

Sanitary Sewer Calculations

Location	Q design (cfs)	Pipe Dia. (in.)	Slope (%)	Vel. Design (ft/s)	% full Design (%)	Vel. Full (ft/s)	Length (ft)	Rim Elev. (ft)	Invert Elev.(ft)		Cover (ft)
									Upper	Lower	
RUN 2											
SMH-U TO SMH-R											
SMH-T TO SMH-S											
SMH-S TO SMH-R											
SMH-R TO SMH-Q											
SMH-Q TO SMH-P											
SMH-P TO SMH-B											
RUN 1											
SMH-N TO SMH-C											
SMH-O TO SMH-F											
SMH-M TO SMH-K											
SMH-L TO SMH-K											
SMH-K TO SMH-J											
SMH-J TO SMH-F											
SMH-I TO SMH-H											
SMH-H TO SMH-G											
SMH-G TO SMH-F											
SMH-F TO SMH-E											
SMH-E TO SMH-D											
SMH-D TO SMH-C											
SMH-C TO SMH-B											
SMH-B TO SMH-A											
SMH-A TO EX. MH											

4. Conclusions

a. Engineer should discuss that the proposed collection system conforms to the City's master plan and (if applicable) the development's specific master plan.
b. Engineer should summarize their calculations and state whether the design is in accordance with the City of Peoria Development Engineering Design Guidelines. {For low flow conditions and "end of the line" runs, the engineer shall attempt to steepen the sewer to increase the design velocity. Engineer shall justify all runs in which the target design velocities of 2.5 ft/s to 10.0 ft/s are not achieved.}

5. References

City of Peoria Wastewater Master Plan, 2007

List other pertinent report references. If possible, attach reference report as an appendix.

12, 2005 (05-3).

Table 1. Unit Design Flows

Wastewater Source	**Applicable Unit**	**Sewage Design Flow per Applicable Unit, Gallons Per Day**
Airport	Passenger (average daily number) Employee	4 15
Auto Wash	Facility	Per manufacturer, if consistent with this Chapter
Bar/Lounge	Seat	30
Barber Shop	Chair	35
Beauty Parlor	Chair	100
Bowling Alley (snack bar only)	Lane	75
Camp Day camp, no cooking facilities Campground, overnight, flush toilets Campground, overnight, flush toilets and shower Campground, luxury Camp, youth, summer, or seasonal	 Camping unit Camping unit Camping unit Person Person	 30 75 150 100-150 50
Church Without kitchen With kitchen	 Person (maximum attendance) Person (maximum attendance)	 5 7
Country Club	Resident Member Nonresident Member	100 10
Dance Hall	Patron	5
Dental Office	Chair	500
Dog Kennel	Animal, maximum occupancy	15
Dwelling For determining design flow for sewage treatment facilities under R18-9-B202(A)(9)(a) and sewage collection systems under R18-9-E301(D) and R18-9-B301(K), excluding peaking factor.	Person	80
Dwelling For on-site wastewater treatment facilities per R18-9-E302 through R18-9-E323: Apartment Building 1 bedroom 2 bedroom 3 bedroom 4 bedroom Seasonal or Summer Dwelling (with recorded seasonal occupancy restriction) Single Family Dwellings Other than Single Family Dwelling, the greater flow value based on: Bedroom count 1-2 bedrooms Each bedroom over 2 Fixture count	 Apartment Apartment Apartment Apartment Resident see R18-9-A314(D)(1) Bedroom Bedroom Fixture unit	 200 300 400 500 100 see R18-9-A314(D)(1) 300 150 25
Fire Station	Employee	45
Hospital All flows Kitchen waste only Laundry waste only	 Bed Bed Bed	 250 25 40

Hotel/motel		
Without kitchen	Bed (2 person)	50
With kitchen	Bed (2 person)	60
Industrial facility		
Without showers	Employee	25
With showers	Employee	35
Cafeteria, add	Employee	5
Institutions		
Resident	Person	75
Nursing home	Person	125
Rest home	Person	125
Laundry		
Self service	Wash cycle	50
Commercial	Washing machine	Per manufacturer, if consistent with this Chapter
Office Building	Employee	20
Park (temporary use)		
Picnic, with showers, flush toilets	Parking space	40
Picnic, with flush toilets only	Parking space	20
Recreational vehicle, no water or sewer connections	Vehicle space	75
Recreational vehicle, with water and sewer connections	Vehicle space	100
Mobile home/Trailer	Space	250
Restaurant/Cafeteria	Employee	20
With toilet, add	Customer	7
Kitchen waste, add	Meal	6
Garbage disposal, add	Meal	1
Cocktail lounge, add	Customer	2
Kitchen waste disposal service, add	Meal	2
Restroom, public	Toilet	200
School		
Staff and office	Person	20
Elementary, add	Student	15
Middle and High, add	Student	20
with gym & showers, add	Student	5
with cafeteria, add	Student	3
Boarding, total flow	Person	100
Service Station with toilets	First bay	1000
	Each additional bay	500
Shopping Center, no food or laundry	Square foot of retail space	0.1
Store	Employee	20
Public restroom, add	Square foot of retail space	0.1
Swimming Pool, Public	Person	10
Theater		
Indoor	Seat	5
Drive-in	Car space	10

Note: Unit flow rates published in standard texts, literature sources, or relevant area or regional studies are considered by the Department, if appropriate to the project.

Historical Note

New Section adopted by final rulemaking at 7 A.A.R. 235, effective January 1, 2001 (Supp. 00-4). Amended by final rulemaking at 11 A.A.R. 4544, effective November 12, 2005 (05-3).

ARTICLE 4. NITROGEN MANAGEMENT GENERAL PERMITS

R18-9-401. Definitions

In addition to the definitions established in A.R.S. §§ 49-101 and 49-201 and A.A.C. R18-9-101, the following terms apply to this Article:

1. "Application of nitrogen fertilizer" means any use of a substance containing nitrogen for the commercial production of a crop or plant. The commercial production of a crop or plant includes commercial sod farms and nurseries.
2. "Contact stormwater" means stormwater that comes in contact with animals or animal wastes within a concentrated animal feeding operation.
3. "Crop or plant needs" means the amount of water and nitrogen required to meet the physiological demands of a crop or plant to achieve a defined yield.
4. "Crop or plant uptake" means the amount of water and nitrogen that can be physiologically absorbed by the roots

Table 5.3 Wastewater System Criteria Summary
City of Peoria 2007 Wastewater Master Plan

Description		Criteria	
Pipe Size (inches)	**Minimum Slope[(1)(2)] (ft/ft)**	**Pipe Capacity[(3)]**	
		(mgd)	**(cfs)**
8	0.0050	0.45	0.70
10	0.0025	0.70	1.09
12	0.0020	1.02	1.57
14	0.0016	1.38	2.14
15	0.0015	1.59	2.45
16	0.0014	1.80	2.79
18	0.0012	2.28	3.53
20	0.0010	2.82	4.36
21	0.0010	3.11	4.81
24	0.0008	4.06	6.28

Note:
(1) Slopes are calculated using Manning's Equation for pipes flowing full with a minimum velocity of 2 fps for all diameters except for 8 inches for which the minimum slope corresponds to 2.5 fps.
(2) Sewers larger than 24 inches should have a slope ≥ 0.0008.
(3) Pipe Capacity based on full pipe flow.

Flow Velocity in feet per second (fps)	
Gravity Mains	2 fps ≤ V ≤ 6 fps* * *For controlling odors* Maximum of 8 fps
Force Mains	3 fps ≤ V ≤ 7 fps
Flow Depth, d/D, (for dry weather peak hour flows)	
d/D for New Sewer Pipes with Diameters less than 12 inches	= 0.50
d/D for Designing New Sewer Pipes 12 inches and higher	= 0.80
d/D for Evaluating Existing Mains in Developed Areas	= 0.90
Wet Weather Factors (applied to peak hour flows)	
In the Southern Planning Area	1.30
In Northern Planning Areas	1.17
Flow Depth, d/D, (for wet weather peak hour flows)	
d/D for Designing New Sewer Pipes 12 inches and higher	= 0.90
d/D for Evaluating Existing Mains in Developed Areas	< 1.00
Headloss in Existing Pipes	
Gravity Pipes	Manning's N = 0.013
Pressure Pipes	Hazen William's C = 120
Changes in Pipe Size	
When a smaller sewer joins a larger one	Sewer crowns will be matched
Headloss at Manholes	
Manholes with pipelines intersecting at 90 degrees or greater	Provide 0.2' Invert Drop
Manholes with pipelines intersecting at less than 90 degrees	Provide 0.1' Invert Drop

Table 6.2 Arizona Administrative Code Residential Dry Weather Peaking Factors for Wastewater Collection System Design City of Peoria, 2007 Wastewater Master Plan	
Upstream Population	**Dry Weather Peaking Factor**
100	3.62
200	3.14
300	2.90
400	2.74
500	2.64
600	2.56
700	2.50
800	2.46
900	2.42
1,000	2.38
1,001 to 10,000	$PF = \left(6.330 \text{ x } p^{-0.231}\right) + 1.094$
10,001 to 100,000	$PF = \left(6.177 \text{ x } p^{-0.233}\right) + 1.128$
More than 100,000	$PF = \left(4.500 \text{ x } p^{-0.174}\right) + 0.945$
PF = Dry Weather Peaking Factor p = Upstream Population Source: A.A.C. R18-9-E301-D	

Future sub-drainage basins were delineated in the northern planning areas for the purposes of routing flows to the appropriate WRF as described in Chapter 8. The dry weather peaking factor equations from the Arizona Administrative Code were applied to the populations of the sub-basin drainage area basis such that all loads generated in a particular basin would have the same peaking factor applied to them. Wet Weather Flows were calculated based on the analysis of the historical records described in Chapter 4. The Wet Weather Flow component for the sub-drainage basins in the Southern Planning Area was calculated as 30 percent of the average daily flow and for the sub-drainage basins in the northern planning areas the Wet Weather Flow component was calculated as 17 percent of the average daily flow. Table 6.3 shows the dry and wet weather peaking factors applied to each sub-drainage basin for the future planning year model scenarios.