Permit as well as a modification to the existing NPDES permit for the proposed treatment plant. This modification would include increasing the permitted capacity of the existing treatment plant as well as any possible modifications to the wasteload allocation. Also, a NPDES General Permit for construction stormwater will need to be applied for through the West Virginia Division of Environmental Protection- Office of Water Resources. In addition, a certificate of convenience and necessity will be required from the Public Service Commission of West Virginia. These permits will be obtained upon completion of design and prior to the initiation of construction.

IV. ALTERNATIVES

A. Wastewater Treatment Plant Alternatives

For the treatment plant, four different alternatives were explored. Expanding the existing treatment facility, or adding another pond, was not examined as an alternative. This is largely due to the fact that the land requirements and capital expenditure for such an option is not considered fiscally viable in comparing the other systems.

Option 1. *"Do Nothing" Alternative*

The City could chose to not perform any improvements at the existing treatment plant. This is not a practical solution for the City in light of the recent NOV's, and more are expected to be received. Eventually, if the City remains not in compliance with their permit, some sort of environmental enforcement action will be issued, most likely including fines. Therefore, the City must proceed with an improvements or replacement project. Appendix E shows a schematic of the existing treatment plant.

Option 2. *Other Methods of Disposal*

Putnam Public Service District (PSD) has approached the City with at least two different possibilities. The PSD operates the wastewater treatment plant (lagoon system) for the Town of Eleanor and owns and operates the extended air treatment plant at Hometown. The plant at Eleanor is permitted for 250,000 GPD and the Hometown plant is permitted for 350,000 GPD, according to the PSD. Since both of these plants are similar in size to the City's existing plant, either an expansion of the existing treatment plant, or the construction of a new plant at either site would be required to attain the capacity needed to accept the City's waste flow.

Both of these sites are on the opposite side of the Kanawha River from Winfield, so a lift station and a river crossing would be required to transport the flow either way. The Hometown plant would be the closer of the two, and therefore, the least expensive of the two options. The probable cost of this option includes the following: the installation of a new lift station at the City's plant capable of pumping all the waste to Hometown, new force main and river crossing, and a new wastewater treatment plant at Hometown. The SBR system, being the less expensive of the two options discussed below was utilized in this option. One thing to be considered in this option is the installation of a screen and grit removal system with the proposed lift station. This would be recommended in order to remove as many solids as possible before pumping the waste across the river. That would, however, remove that portion of the new treatment plant from the Hometown plant. If additional flow would be added to the new plant in the future from the

north side of the river, new screening and grit removal would need to be constructed to accommodate such if the existing Hometown plant does not have adequate facilities to perform such.

This option would also include a crossing of the railroad tracks on the Hometown side of the river, which will add to the cost of this option. A preliminary opinion of probable construction cost for this option is $6,553,000. See Appendix F for the breakdown of costs and overall map for this option.

Only if the City desires to enter into a long-term operation and maintenance agreement with the PSD, with the City still financing this project, would this be a viable option.

Option 3. *New Wastewater Treatment Plant in Winfield - Carrousel® System*

The Carrousel System is a modern, closed loop, "racetrack style" oxidation ditch reactor. At a minimum, each Carrousel system is designed with a specific solids retention time (SRT) required for full nitrification (conversion of ammonia, NH_3, to nitrate, NO_3). SRT typically varies from 8 to 18 days in modern Carrousel Systems. Actual values will be determined for the City based on wastewater temperature and effluent requirements. Carrousel basins are equipped with the aerators to maintain solids in suspension at 10-20% of the input power. This allows operators to vary the aerator horsepower to match demand 24 hours a day with virtually no mixing limitations. Carrousel Systems offer the lowest number of aerators per basin compared to other oxidation ditch

systems, such as those that use horizontal shaft aerators. This greatly simplifies installation and maintenance requirements.

Vertically mounted, low-speed surface aerators installed in the turns provide all aeration and mixing required. The aerators function as large-scale pumps, propelling aerated mixed liquor from zones of intense aeration to downstream, quiescent channels. In the channels, mixed liquor re-circulates at a rate 50-100 times the influent flow rate, providing protection against shock loading and eliminating short circuiting.

Mixed liquor is conveyed between the Carrousel basin and the anoxic basin via internal recycle (IR) channels. The flow of mixed liquor in the IR channels occurs as a result of the propulsion already present in the Carrousel basin. No IR pumps are required and IR rates are typically 6 to 15Q. The IR flow is regulated by means of a gate.

Provisions would be made for future addition of anaerobic basins for phosphorus removal and more stringent nitrogen limits, if necessary.

The Carrousel® System will consist of: one (1) precast post-tensioned oxidation ditch, two (2)30 Hp dual impeller aerators (one duty and one installed spare), and one (1) dissolved oxygen (DO) monitoring control system and control logic including DO probe.

The treatment plant will include influent mechanical bar screen, Carrousel® System; two (2) precast post-tensioned concrete secondary

clarifiers; aerated sludge holding tank; ultraviolet (UV) disinfection; emergency generator; control building to house blowers, Motor Control Center, belt filter press system under roof, solids handling including dump truck to haul sludge/solids, bathroom, and office/storage, 6 foot privacy fence, effluent sampling manhole, and effluent discharge outfall.

The treatment capacity of this option would be 500,000 GPD maximum and the opinion of probable construction cost for this type of system would be $5,860,000.00. See Appendix F for a process schematic and breakdown of costs.

Option 4. *New Wastewater Treatment Plant in Winfield - Sequencing Batch Reactor (SBR) System*

Sequencing Batch Reactors (SBR) treatment process does in one tank what conventional continuous-flow treatment systems do in a series of tanks. The SBR tank is equipped with a specifically designed floating mixer and aeration diffusers that carries wastewater through all processes - biological oxidation, nitrification, denitrification, and sedimentation. The processes occur in sequence during five basic operating modes: 1) fill, 2) react, 3) settle (clarify), 4) decant, and 5) idle (waste sludge).

The SBR treatment process utilizes floating mixers and aeration diffusers to provide biological treatment. Positive displacement blowers transfer air to the diffusers while the mixers are designed to completely mix the process tank. The diffusers are located at the bottom of the tank and are mounted to a retrievable device in order to pull out of the water for

maintenance. Effluent is removed from the tank utilizing a floating solids excluding decanter and a submersible solids handling pump waste sludge. The treatment process is a level based system and cycles/operating modes are controlled by submersible pressure level transducers and control panel with a programmable logic controller (PLC). This type of treatment was evaluated due to its ability to handle varying flow ranges and influent characteristics while providing consistent tertiary effluent limits.

The SBR treatment process will consist of: two (2) tank SBR two (2) dry pit motive pumps (one as standby), two (2) dry pit waste sludge pumps (one as standby), two (2) influent transfer pumps (one as standby), associated SBR valves, diffused aeration system, PLC control panel, floating solids excluding decanter, and in-basin air/liquid piping. The SBR system will be installed in precast post-tensioned concrete tanks.

The treatment plant will include influent mechanical bar screen, SBR treatment process; effluent equalization basin; aerated sludge holding tank; ultraviolet (UV) disinfection; emergency generator; control building to house blowers, Motor Control Center, belt filter press system under roof, solids handling including dump truck to haul sludge/solids, bathroom, and office/storage, 6 foot privacy fence, effluent sampling manhole, and effluent discharge outfall.

The treatment capacity of this option would be able to accommodate flows ranging from 500,000 to 1,000,000 GPD, and the preliminary opinion of probable construction cost for this type of system would be

$5,243,000.00. See Appendix F for a process schematic and breakdown of costs.

B. Collection System

At least two of the lift stations that were recommended to be upgraded according to the 2007 Burgess and Niple report have not been part of any project. These two stations, Winfield Way and the High School stations, are the same two stations that City personnel believe need to be upgraded. Also, each of the main lift stations (not including the grinder stations) need to have running time meters installed. This will help City personnel be able to identify pumping times of each station and to some extent, the amount of water pumped from each, providing further information to assist with determining the extent of current and future I/I within the system. Once the two stations above are upgraded, they will contain running time meters, leaving only the Rocky Step lift station as the only station without such, and it can be added to the station easily. Appendix G includes an opinion of probable construction cost for that described above.

In January of 2012, the City hired Underwater Services to perform video inspection of certain sections of the collection system. From the recorded videos, there are still portions of the originally constructed collection system that remain in service, and the majority of such appear to be in inadequate condition. These areas are almost certainly contributing to the I/I problem. Also, one line entering into the Bridge Street lift station from the west side of the bridge has very heavy grease deposits. This line presumably collects waste from the McDonalds and Speedway convenience store in the area of City National Bank and Winfield Elementary School. Flow was barely able to travel in parts of this section due to heavy accumulated grease. There were also several spots

CITY OF WINFIELD
NEW PLANT AT HOMETOWN

Description	Amount
8" PVC Force Main	
(11,000 L.F. at $60.00/L.F.)	$ 660,000.00
8" River Crossing	
(1,000 L.F. at $200.00/L.F.)	$ 200,000.00
Railroad Track Crossing	
(Includes permitting, flagging, bore and jack, insurance, etc.)	$ 100,000.00
New Lift Station at Existing Treatment Plant	$ 350,000.00
New SBR Treatment Plant	
(See Option No. 4 for cost breakdown)	$ 5,243,000.00
Total Probable Construction Cost	**$ 6,553,000.00**

CITY OF WINFIELD
CARROUSEL SYSTEM TREATMENT PLANT

Description	Amount
Bonding/Bid Cost	$ 75,000.00
Mobilization	$ 75,000.00
Clearing and Grubbing	$ 40,000.00
Excavation/Site Work	$ 250,000.00
Screening Unit & Grit Removal System	$ 245,000.00
Screening and Grit Channel w/Bypass	$ 38,000.00
Headworks/UV Building	$ 228,000.00
Carrousel Treatment System	
Aerators	$ 120,000.00
Control Unit	$ 55,000.00
Splitter Box	$ 50,000.00
Secondary Clarifiers	
Equipment	$ 170,000.00
Weirs and Baffles	$ 11,000.00
Pre-Cast Post Tension Concrete Structures	$ 1,316,000.00
UV Disinfection Equipment	$ 96,000.00
UV Channel	$ 35,000.00
RAS Lift Station	$ 130,000.00
Sludge Holding Tank w/Mixers	$ 250,000.00
Belt Filter Press and Pumps	$ 315,000.00
Sludge Dewatering Building	$ 245,000.00
Doors & Windows	$ 35,000.00
Painting	$ 115,000.00
Sampling Manhole w/Flume	$ 9,000.00
Existing Lab/Office Building Improvements	$ 75,000.00
Miscellaneous Metals (Grating/Handrail)	$ 130,000.00
Office/Plant Equipment	$ 10,000.00
Non-Potable Water System	$ 15,000.00
SCADA Equipment (Incl. Lift Stations)	$ 220,000.00
Electrical	$ 300,000.00
Emergency Generator	$ 100,000.00
HVAC	$ 35,000.00
Plumbing	$ 27,000.00
Flow Metering Equipment	$ 7,500.00
Plant Piping	$ 350,000.00
Pre-Cast MH/Structures	$ 15,000.00
Site Paving	$ 75,000.00
Fencing	$ 50,000.00
Seeding and Mulching	$ 7,500.00
Sludge Dump Truck	$ 70,000.00
Maintenance Equipment	$ 10,000.00
Abandon Existing Treatment Plant	$ 460,000.00
Total Probable Construction Cost	**$ 5,860,000.00**

CITY OF WINFIELD
SBR TREATMENT PLANT

Description	Amount
Bonding/Bid Cost	$ 75,000.00
Mobilization	$ 75,000.00
Clearing and Grubbing	$ 40,000.00
Excavation/Site Work	$ 200,000.00
Screening Unit & Grit Removal Equipment	$ 245,000.00
Screening and Grit Channel w/Bypass	$ 38,000.00
Headworks/UV Building	$ 228,000.00
SBR Treatment System	
Equipment	$ 694,000.00
Post Tensioned Concrete	$ 985,000.00
UV Disinfection System	$ 112,000.00
Belt Filter Press With Pumps	$ 315,000.00
Sludge Dewatering Building	$ 245,000.00
Doors & Windows	$ 35,000.00
Painting	$ 95,000.00
Sampling Manhole w/Flume	$ 9,000.00
Existing Lab/Office Building Improvements	$ 75,000.00
Miscellaneous Metals (Grating/Handrail)	$ 100,000.00
Office/Plant Equipment	$ 10,000.00
Non-Potable Water System	$ 15,000.00
SCADA Equipment (Incl. Lift Stations)	$ 220,000.00
Electrical	$ 300,000.00
Emergency Generator	$ 100,000.00
HVAC	$ 35,000.00
Plumbing	$ 27,000.00
Flow Metering Equipment	$ 7,500.00
Plant Piping	$ 275,000.00
Pre-Cast MH/Structures	$ 15,000.00
Site Paving	$ 75,000.00
Fencing	$ 50,000.00
Seeding and Mulching	$ 7,500.00
Sludge Dump Truck	$ 70,000.00
Maintenance Equipment	$ 10,000.00
Abandon Existing Treatment Plant	$ 460,000.00
Total Probable Construction Cost	**$ 5,243,000.00**