State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
DNR209026	1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
FRANK WHITTAKER
304-558-2316

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DIVISION OF NATURAL RESOURCES
PARKS & RECREATION SECTION
BUILDING 3, ROOM 719
1900 KANAWHA BOULEVARD, EAST
CHARLESTON, WV
25305-0662 304-558-2775

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
09/22/2008				

BID OPENING DATE: 10/09/2008 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
	**********	**********		ADDENDUM NO. 1	**********	
	THIS ADDENDUM IS ISSUED TO INCLUDE THE ATTACHED STUDY BY WOOLPERT LLP CONDUCTED FOR CANAAN VALLEY STATE PARK DATED MAY 5, 2008 THE BID OPENING DATE IS CHANGED TO 10/9/2008 AT 1:30PM					
0001	1	LS		906-00-00-001		
	ARCHITECT/ENGINEERING SERVICES, PROFESSIONAL					
	****** THIS IS THE END OF RFQ DNR209026 ******				TOTAL:	

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

GENERAL TERMS & CONDITIONS
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the State of West Virginia

2. The State may accept or reject in part, or in whole, any bid.

3. All quotations are governed by the ***West Virginia Code*** and the ***Legislative Rules*** of the Purchasing Division.

4. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required $125 fee.

5. All services performed or goods delivered under State Purchase Order/Contracts are to be continued for the term of the Purchase Order/Contracts, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods, this Purchase Order/Contract becomes void and of no effect after June 30.

6. Payment may only be made after the delivery and acceptance of goods or services.

7. Interest may be paid for late payment in accordance with the ***West Virginia Code***.

8. Vendor preference will be granted upon written request in accordance with the ***West Virginia Code***

9. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

10. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.

11. The laws of the State of West Virginia and the ***Legislative Rules*** of the Purchasing Division shall govern all rights and duties under the Contract, including without limitation the validity of this Purchase Order/Contract.

12. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.

13. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, this Contract may be deemed null and void, and terminated without further order.

14. **HIPAA BUSINESS ASSOCIATE ADDENDUM:** The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, and available online at the Purchasing Division's web site (**http://www.state.wv.us/admin/purchase/vrc/hipaa.htm**) is hereby made part of the agreement. Provided that, the Agency meets the definition of a Cover Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.

15. **WEST VIRGINIA ALCOHOL & DRUG-FREE WORKPLACE ACT:** If this Contract constitutes a public improvement construction contract as set forth in Article 1D, Chapter 21 of the West Virginia Code ("The West Virginia Alcohol and Drug-Free Workplace Act"), then the following language shall hereby become part of this Contract: "The contractor and its subcontractors shall implement and maintain a written drug-free workplace policy in compliance with the West Virginia Alcohol and Drug-Free Workplace Act, as set forth in Article 1D, Chapter 21 of the West Virginia Code The contractor and its subcontractors shall provide a sworn statement in writing, under the penalties of perjury, that they maintain a valid drug-free work place policy in compliance with the West Virginia and Drug-Free Workplace Act. It is understood and agreed that this Contract shall be cancelled by the awarding authority if the Contractor: 1) Fails to implement its drug-free workplace policy; 2) Fails to provide information regarding implementation of the contractor's drug-free workplace policy at the request of the public authority; or 3) Provides to the public authority false information regarding the contractor's drug-free workplace policy."

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division.

2. **SPECIFICATIONS:** Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.

3. Complete all sections of the quotation form

4. Unit prices shall prevail in case of discrepancy.

5. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.

6. **BID SUBMISSION:** All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications: Department of Administration, Purchasing Division, 2019 Washington Street East, P.O. Box 50130, Charleston, WV 25305-0130

Table of Contents

Section 1 - Introduction

A. General Information

The Canaan Valley State Resort Park operates five separate wastewater treatment plants at the park ranging in size from 5,000 gallons per day to 100,000 gallons per day treatment capacity. Within recent years each of the treatment plants have reported violations of the WVNPES discharge limits, which has caused concerns over the ability of the existing facilities to meet permitted discharge limits It was determined that a Wastewater System Assessment Study be prepared to examine and study the existing park sanitary sewer systems This plan will define the various service areas served by the collection and treatment systems, describe the existing facilities, identify any known deficiencies, and present a plan for improvements to the facilities

B. Executive Summary

- The facilities served by the wastewater systems are located entirely within the boundaries of the Canaan Valley State Resort Park and are under the control of the West Virginia Division of Natural Resources.
- The existing land use within the planning area is controlled public recreational use classification
- The Division of Natural Resources owns and operates five separate wastewater collection and treatment systems consisting of five treatment plants, approximately 2 1 miles of collection line and three pump stations.
- The recommended plan consists of expansion of the existing treatment plant at the Lodge Area to 125,000 gallons per day and pumping wastewater from each of the remaining four areas to the expanded treatment plant
- The recommended project, which includes construction of the sewage treatment plant expansion, rehabilitation of existing equipment, four new pump stations and force mains to the Lodge Area for a total estimated project cost of $2,056,000
- The plan as proposed will provide for the combining of five separate treatment sources into a single treatment source to provide more effective control of the processes to meet discharge limits.
- The combining of the separate treatment plants into a single treatment plant will provide for greater efficiency in operations and a reduction in overall operation and maintenance costs in comparison to separate systems.
- The plan is consistent with the current TMDL program for the discharge stream by not creating any additional waste load quantities beyond the currently permitted quantities.

Section 2 – Current Situation

A. Planning Area Description

The Canaan Valley State Resort Park (CVSRP) is located in Tucker County in the scenic Allegheny Mountains. Elliott County is bordered by Preston County to the north, Grant County to the east, Randolph County to the south, and Barbour County to the west. Canaan Valley has an average elevation of around 3,200 feet making it the highest valley area of its size east of the Rocky Mountains. Surrounding mountain peaks rise to over 4,200 feet in elevation

The major water body within the Canaan Valley area is the Blackwater River. The Blackwater River flows in a northwesterly direction through the valley to its confluence with the Cheat River. Within the park boundaries, minor streams that drain into the Blackwater are Club Run, Mill Run and Black Fork.

CVSRP is the West Virginia state park system's major winter sports area, complete with modern chairlifts, snowmaking equipment, ski school and alpine\cross-country ski rental equipment. The park setting includes a 250-room lodge, with a fitness center, an indoor swimming pool, hot tub, saunas and an exercise room, vacation cottages and campsites offer park guests a wide variety of accommodations. It offers a full range of outdoor diversions including an 18-hole championship golf course, swimming, tennis, fishing, hiking and a year-round interpretive program

B. Water Usage

The CVSRP has a water treatment plant within the park area that treats and distributes potable water throughout the park. The raw water source is from a groundwater well field located near the golf course.

The table below provides a summary of the water produced at the water treatment plant taken from operation records for years 2001 through 2005.

Year	Gallons Produced
2001	23,314,000
2002	20,783,000
2003	19,262,000
2004	19,780,000
2005	22,276,000
TOTAL	**105,415,000**
Average Annual Production	**21,083,000 Gal/Yr**
Average Monthly Production	**1,757,000 Gal/Mo**
Average Daily Production	**58,000 Gal/Day**

As seen in the table above, the average water usage in the CVSRP is around 58,000 gallons per day. Looking at historic monthly records, the park has two distinct high flow periods within the year. The

peak flow periods occur within the winter month period of January and February and the summer month period of July and August The winter peak production is around 64,000 gallons per day and the summer peak production period is around 77,000 gallons per day This data will be assumed to be representative of the water usage of the sanitary sewer system located with the planning area. This data will be used in comparing wastewater generation presented later in this report

C. Land Use

No official land use plan is in place for CVSRP However, the planning area is considered to remain recreational use within the park boundaries It is anticipated that the entire park boundary area will remain under the control of the state park system and limited expansion of facilities will occur There is not anticipated to be any major change in land use will occur at the park within the planning period of this study

D. Environmental Setting

Water Quality

The State of West Virginia listed the Upper Blackwater River under the Clean Water Act Section 303(d) impaired waters list. This listing indicates that the stream quality did not meet established water quality standards The Upper Blackwater River was listed due to its inability to sustain a dissolved oxygen level of 6.00 mg/l as was required under its designated use as a trout fishery This listing required that a Total Maximum Daily Load (TMDL) be established for the stream. A TMDL was established by the U.S. Environmental Protection Agency on February 20, 1998

Wasteload Allocations

The wasteload allocation places somewhat stringent nutrient control limits on any proposed facility with a discharge to the Upper Blackwater River. The following table presents the wasteload allocation for the Canaan Valley State Resort Park wastewater discharges based on the permitted limits

Canaan Valley State Resort Park
Wasteload Allocations
Summer Months

Discharge Location	Flow (MGD)	BOD5		TSS		NH3-N	
		mg/l	lbs./Day	mg/l	lbs./Day	mg/l	lbs./Day
Cabins	0.005	5	0.208	30	1.251	3	0.125
Ski Area	0.010	5	0.417	30	2.502	3	0.250
Campgrounds	0.006	5	0.250	30	1.501	3	0.150
Lodge	0.100	5	4.167	30	25.020	3	2.500
Golf Clubhouse	0.005	5	0.208	30	1.251	3	0.125
TOTAL LOADING	**0.126**		**5.250**		**31.525**		**3.150**

Canaan Valley State Resort Park Wasteload Allocations Winter Months							
	Flow	BOD5		TSS		NH3-N	
Discharge Location	(MGD)	mg/l	lbs./Day	mg/l	lbs./Day	mg/l	lbs./Day
Cabins	0.005	10	0.416	30	1.251	6	0.250
Ski Area	0.010	10	0.834	30	2.502	6	0.500
Campgrounds	0.006	10	0.500	30	1.501	6	0.300
Lodge	0.100	10	8.334	30	25.020	6	5.000
Golf Clubhouse	0.005	10	0.416	30	1.251	6	0.250
TOTAL LOADING	**0.126**		**10.500**		**31.525**		**6.300**

Section 3 – Existing Wastewater Systems

A. General

The wastewater collection systems located at Canaan Valley State Resort Park are generally 6-inch and 8-inch diameter PVC and clay pipes while the treatment systems are generally extended aeration process type treatment plants. There are a total of five separate treatment plants serving various facilities at the park operated under WVNPDES permit number WV0081124 dated February 26, 2001. Exhibit A-0 in Appendix A provides an overall map of the service areas of the existing wastewater treatment facilities located at the park. A schematic layout of each of the current treatment plant system for each separate treatment plant sites is provided in Appendix B. Based on records reviewed, it appears that most of the collection and treatment plant components are over 25 years in age. The treatment systems are identified by the areas which they serve and are as follows:

Facility Name	Outfall Number
Cabin Area	001
Ski Area	002
Ski Maintenance Building (at Ski Area)	201
Lodge Area	003
Campground Area	004
Golf Course Clubhouse Area	005

B. Cabin Area

The Cabin area collection system is comprised of approximately 3,600 linear feet of clay pipe with approximately 15 manholes. The collection system has been reported by the operator to exhibit increased flows during precipitation events, thus indicating some inflow and infiltration.

The Cabin Area wastewater treatment plant is comprised of a bar screen, comminutor, a 5,000 gallon aeration basin, a 1,365 gallon clarifier, a 298 gallon chlorine contact tank, dechlorinization and 2 polishing ponds with approximately 449,000 gallons of capacity each. Records indicate that the Cabin Area wastewater treatment plant was constructed around 1970 making it over thirty years old. The existing equipment is functioning in excess of its expected operating life and is in poor operating condition. The wastewater treatment plant discharges to Club Run which is a tributary of the Blackwater River.

Site vists and discussions with the contract operator indicate that the collection system is subject to a significant amount of inflow/infiltration during rain events. The inlet pipe to the treatment plant has, at times, been flowing at nearly full pipe flow.

The Cabin Area wastwater treatment plant currently serves 23 recreation cabins with a normal capacity of 92 persons. Based on the minimum design flow from the Bureau for Public Health standards of 70 gallons/person/day for recreation lodging, the estimated wastewater flows for the Cabin Area is as follows:

92 persons x 70 gallons/person/day = 6,440 GPD

It is anticipated that during peak season days the normal capacity of the cabins is exceeded as recreationists crowd into the limited lodging spaces available and that the total peak number of persons in the cabins may approach 100 persons.

Due to the type of pipe within the collection system being 30 year old clay tile, it is anticipated that the collection system inflow and infiltration may be at a level of around 400 gallons per day per inch diameter per mile of sewer. Based on the approximately 3,600 feet of 8-inch sewer within the collection system the estimated inflow/infiltration allowance for the Cabin Area is as follows:

0.7 miles of 8" line x 400 gallons/day/inch diameter/mile = 2,240 GPD

The total wastewater flow will be the summation of the wastewater flows and the amount of inflow and infiltration, therefore the total wastewater flow for the Cabin Area is as follows:

TOTAL WASTEWATER FLOW = 6,440 + 2,240 = 8,680 GPD

This total of 8,680 gallons per day for full cabin occupancy exceeds the current Cabin Area wastewater treatment plant capacity of 5,000 gallons per day.

C. Ski Area

The Ski area collection system is comprised of approximately 2,500 linear feet of 6-inch diameter clay pipe with approximately 11 manholes. The collection system has been reported by the operator to exhibit increased flows during precipitation events, thus indicating some inflow and infiltration.

The Ski Area wastewater treatment plant is comprised of a 13,000 gallon areated flow equilization tank, a bar screen, a comminutor, a 10,000 gallon aeration basin, a 2,360 gallon clarifier, two alternating surface sand filters, a 417 gallon chlorine contact tank, dechlorinization and 2 polishing ponds with approximately 800,000 gallons of capacity each. Records indicate that the Ski Area wastewater treatment plant was originally constructed around 1970 making the original construction over thirty years old. The plant was subsequently upgraded in 2002 to add the flow eqilization tank, alternating surface sand filters and the chlorine/dechlorinization contact tank. The existing equipment originally installed in the 1970 is functioning in excess of its expected operating life and is in poor operating condition. The newer equipment installed in 2002 is in good operating condition. The wastewater treatment plant discharges to Mill Run which is a tributary of the Blackwater River.

Site vists and discussions with the contract operator indicate that the collection system is subject to a significant amount of inflow/infiltration during rain events. The inlet pipe to the treatment plant has, at times, been flowing at nearly full pipe flow.

The Ski Area wastwater treatment plant currently serves the ski area that may have as many as 800 total persons using the facility during ski season. Based on the minimum design flow from these types of facilities of 12 gallons/person/day, the estimated wastewater flows for the cabin area is as follows:

800 persons x 12 gallons/person/day = 9,600 GPD

Also located at the ski area, and discharging directly into the polishing ponds and not currently connected to the wastewater treatment plant, is the ski maintenance shop and associated oil water separator from the truck maintenance bays. It is anticipated that the maintenance shop area contributes and additional 250 gallons per day loading to the polishing ponds. It is anticipated that regardless of any improvement scenarios, the flows from these facilities will be connected onto a wastewater treatment plant and

therefore are added to the total flows for the Ski Area. The total flow from the Ski Area is therefore 9,850 GPD

Due to the type of pipe within the collection system being 30 year old clay tile, it is anticipated that the collection system inflow and infiltration may be at a level of around 400 gallons per day per inch diameter per mile of sewer. Based on the approximately 560 feet of 6-inch sewer within the collection system prior to the wastewater treatment plant the estimated inflow/infiltration allowance for the Ski Area is as follows:

0.1 miles of 6" line x 400 gallons/day/inch diameter/mile = 240 GPD

The total wastewater flow will be the summation of the wastewater flows and the amount of inflow and infiltration, therefore the total wastewater flow for the Cabin Area is as follows:

TOTAL WASTEWATER FLOW = 9,850 + 240 = 10,090 GPD

This total of 10,090 gallons per day for full ski facility occupancy exceeds the current Ski Area wastewater treatment plant capacity of 10,000 gallons per day

D. Lodge Area

The Lodge area collection system is comprised of approximately 1,400 linear feet of 8-inch diameter clay pipe and approximately 700 feet of 6-inch diameter clay pipe with approximately 9 manholes. The collection system has been reported by the operator that there is no noticeable increased flows during precipitation events, thus indicating there is not a problem with inflow and infiltration

The Lodge Area wastewater treatment plant is comprised of a flow spitter box, a bar screen, a comminutor, four 25,000 gallon aeration basins, four 4,150 gallon clarifiers, two 2,084 gallon chlorine contact tanks, dechlorinization, two 3,952 gallon and one 8,000 gallons studge holding tanks and 2 polishing ponds with approximately 1,800,000 gallons of capacity each. The flow from the polishing ponds is pumped for further polishing to an additional polishing pond located at hole number eighteen at the state park golf course. Records indicate that the Lodge Area wastewater treatment plant was originally constructed around 1970 making the original construction over thirty years old. The existing equipment originally installed in the 1970 is functioning in excess of its expected operating life and is in poor operating condition. The wastewater treatment plant discharges to Blackwater Run which is a tributary of the Dry Fork River

Site vists and discussions with the contract operator indicate that the collection system is not subject to any significant amount of inflow/infiltration during rain events

The Lodge Area wastwater treatment plant currently serves a variety of facilities related to the ammenities offered at the lodge. The following table presents the wastewater flows from the various sources broken down by summer and winter seasons:

LODGE AREA WASTEWATER FLOWS		
Flow Source	**Summer Season (GPD)**	**Winter Season (GPD)**
Lodge Office Personnel	100	100
Lodge Dining Rooms	12,250	17,500
Lodge Waiter Personnel	200	400
Lodge Snack Bar	1,050	1,500
Lodge Kitchen Personnel	460	600
Lodge Conference Rooms	350	350
Lodge Laundry Machines	800	800
Lodge Laundry Personnel	40	40
Swimming Pool	1,050	------
Pool Lifeguards	40	------
Ice Rink	------	500
Ice Rink Personnel	------	80
Tennis Courts	210	------
Tennis Courts Personnel	40	------
Recreation Personnel	40	40
Recreation Maintenance	500	500
Lodge Rooms	22,020	31,060
WASTEWATER FLOWS	39,150	53,470

Due to the type of pipe within the collection system being 30 year old clay tile, it is anticipated that the collection system inflow and infiltration may be at a level of around 300 gallons per day per inch diameter per mile of sewer. Based on the approximately 1,380 feet of 8-inch sewer and approximately 650 feet of 6-inch sewer within the collection system the estimated inflow/infiltration allowance for the Lodge Area is as follows:

0.26 miles of 8" line x 300 gallons/day/inch diameter/mile = 620 GPD

0.12 miles of 6" line x 300 gallons/day/inch diameter/mile = 210 GPD

TOTAL INFLOW/INFILTRATION = 830 GPD

The total wastewater flow will be the summation of the wastewater flows and the amount of inflow and infiltration, therefore the total wastewater flow for the Lodge Area is as follows:

TOTAL SUMMER WASTEWATER FLOW = 39,150 + 830 = 39,360 GPD

TOTAL WINTER WASTEWATER FLOW = 53,470 + 830 = 54,300 GPD

From the above analysis, it can be seen that the summer flow rate is seventy three percent of the winter flow rate. The summer flow rate is approximately fifty four percent of the total 100,000 gallon per day treatment capacity of the Lodge Area wastewater treatment plant, and the winter flow rate is approximately thirty nine percent of the total treatment capacity of the treatment plant.

E. Campground Area

The Campground area collection system is comprised of approximately 2,700 linear feet of 6-inch clay pipe with approximately 13 manholes and pump station that pumps all the collected flow to the wastewater treatmement plant. The collection system has been reported by the operator to exhibit increased flows during precipitation events, thus indicating some inflow and infiltration. This is also evident as the pump station continues to pump even though the campground is vacant.

The Campground Area wastewater treatment plant is comprised of a bar screen, comminutor, a 6,000 gallon aeration basin, a 1,365 gallon clarifier, a 250 gallon chlorine contact tank, dechlorinization and 2 polishing ponds with approximately 135,000 gallons of capacity each. Records indicate that the Campground Area wastewater treatment plant was constructed around 1970 making it over thirty years old. The existing equipment is functioning in excess of its expected operating life and is in poor operating condition. The wastewater treatment plant discharges to Mill Run which is a tributary of the Blackwater River.

Site vists and discussions with the contract operator indicate that the collection system is subject to a significant amount of inflow/infiltration during rain events. The inlet pipe to the pump station has, at times, been flowing at nearly full pipe flow

The Campground Area wastwater treatment plant currently serves 36 campsites, 1 bathhouse with laundry facilities, the park office and the park nature center. Based on the minimum design flow from the Bureau for Public Health standards of 25 gallons/person/day for campground facilities, the estimated wastewater flows for the Campground Area is as follows:

102 persons x 25 gallons/person/day = 2,550 GPD

Due to the type of pipe within the collection system being 30 year old clay tile, it is anticipated that the collection system inflow and infiltration may be at a level of around 400 gallons per day per inch diameter per mile of sewer. Based on the approximately 2,700 feet of 6-inch sewer within the collection system the estimated inflow/infiltration allowance for the Cabin Area is as follows:

0.5 miles of 6" line x 400 gallons/day/inch diameter/mile = 1,200 GPD

The total wastewater flow will be the summation of the wastewater flows and the amount of inflow and infiltration, therefore the total wastewater flow for the Cabin Area is as follows:

TOTAL WASTEWATER FLOW = 2,550 + 1,200 = 3,750 GPD

This total of 3,750 gallons per day for full campground occupancy is only around fifty eight percent of the current Campground Area wastewater treatment plant capacity of 6,000 gallons per day.

F. Golf Clubhouse Area

The Golf Clubhouse Area collection system is comprised of approximately 1,100 linear feet of 8-inch clay pipe with approximately 4 manholes. The collection system has been reported by the operator that there is no noticeable increased flows during precipitation events, thus indicating there is not a problem with inflow and infiltration.

The Golf Clubhouse Area wastewater treatment plant is comprised of a bar screen, comminutor, a 5,000 gallon aeration basin, a 1,365 gallon clarifier, a 208 gallon chlorine contact tank, dechlorinization and 2 polishing ponds with approximately 374,000 gallons of capacity each Records indicate that the Golf Clubhouse Area wastewater treatment plant was constructed around 1970 making it over thirty years old The existing equipment is functioning in excess of its expected operating life, but is in reasonably fair operating condition, presumably due to the very low flow loadings The wastewater treatment plant discharges to Mill Run which is a tributary of the Blackwater River

Site vists and discussions with the contract operator indicate that the collection system is not subject to any significant amount of inflow/infiltration during rain events

The Golf Clubhouse Area wastwater treatment plant currently serves only the golf course clubhouse Based on the minimum design flow standards of 25 gallons/person/day for this type of facility, the estimated wastewater flows for the Golf Clubhouse Area is as follows:

300 persons x 12 gallons/person/day = 3,600 GPD

Due to the type of pipe within the collection system being 30 year old clay tile, it is anticipated that the collection system inflow and infiltration may be at a level of around 300 gallons per day per inch diameter per mile of sewer Based on the approximately 1,100 feet of 8-inch sewer within the collection system the estimated inflow/infiltration allowance for the Golf Clubhouse Area is as follows:

0 2 miles of 8" line x 300 gallons/day/inch diameter/mile = 480 GPD

The total wastewater flow will be the summation of the wastewater flows and the amount of inflow and infiltration, therefore the total wastewater flow for the Golf Clubhouse Area is as follows:

TOTAL WASTEWATER FLOW = 3,600 + 480 = 4,080 GPD

This total of 4,080 gallons per day for full campground occupancy is only around eighty two percent of the current Golf Clubhouse Area wastewater treatment plant capacity of 5,000 gallons per day

G. Wastewater Systems Operations

The wastewater treatment facilities at Canaan Valley State Resort Park are operated by a part-time contract operator The contract operator is licensed to operate wastewater treatment plants within the state of West Virginia The current contract is set up for the operator to inspect and maintain each treatment plant three times per week

During the inspections the operator is contracted to maintain the treatment equipment for proper operation, check pH and chlorine levels, remove materials from the bar screens and coordinate the hauling of waste sludge at each of the treatment plants

H. Sludge Management

The wastewater treatment facilities at Canaan Valley State Resort Park do not have an onsite facility to process waste sludge from the treatment process The waste sludge is pumped from each treatment plant by a liquid waste contract hauler for ultimate disposal in an off-site landfill The waste sludge is not

hauled on a set schedule, but rather, the contract hauler hauls the waste sludge when he is contacted by the contract operator

I. Total Wastewater Flows

The total seasonal wastewater flows for the treatment facilities at Canaan Valley State Resort Park are summarized in the following table. The Cabin Area and Lodge Area remain open year round, though the winter Lodge Area flows are approximately thirty one percent higher than the winter flows. The Campground Area and Golf Clubhouse Area will only operate at full capacity during the summer season, while the Ski Area will only operate at full capacity during the winter season.

TOTAL SEASONAL PARK WASTEWATER FLOWS			
Flow Source	**Summer Calculated Flows (GPD)**	**Winter Calculated Flows (GPD)**	**Total Permitted Flows (GPD)**
Cabin Area	8,680	8,680	5,000
Ski Area	------	10,090	10,000
Lodge Area	39,360	54,300	100,000
Campground Area	3,750	------	6,000
Golf Clubhouse Area	4,080	------	5,000
WASTEWATER FLOWS	55,870	73,070	126,000

There may be some seasonal variation of flows during transitions depending on weather conditions for the season. It is anticipated that these variations would amount to around ten percent increase in average daily flow during these transitions. This would equate to a summer flow rate of as much as 61,460 gallons per day and to a winter flow rate of as much as 80,380 gallons per day. From this and as can be seen from the above table, the total permitted flows of 126,000 gallons per day for all facilities is adequate to cover the peak seasonal flows anticipated.

Section 4 – Need for Project

A. Background Information

It was identified that in order to address wastewater treatment issues at Canaan Valley State Resort Park a concise report needed to be prepared to evaluate the existing conditions and make recommendations on any improvements that were identified during the evaluation. For years the Park had been attempting to address issues individually with each treatment plant on a sporadic basis. It was determined that rather than a random individualized approach to taking corrective actions, a single report was necessary to provide in one single document consideration of all of the treatment facilities in total

B. Compliance Status

The Canaan Valley State Resort Park has received notices of violation of discharge limits at each of their various wastewater treatment plants within the last several years The following paragraphs discuss the violation issues at each park wastewater treatment facility

B.1. Cabin Area

A review of the Discharge Monitoring Reports for the years 2003, 2004 and 2005 indicates that the Cabin Area wastewater treatment plant has been in compliance with its effluent quality discharge parameters, except for a few instances, for that period Tables of the Discharge Monitoring Report summaries for the years 2003 through 2005 are included in Appendix C The reports indicate that the following maximum daily discharge parameter limits were exceeded during the period. In that a sample is collected only once per month, Average Monthly values are reported that same as the Maximum Daily values on the Discharge Monitoring Reports Though the Average Monthly values may also appear on the Discharge Monitoring Report as being exceeded, these values are not considered in that they are a single value and not an average over an entire month.

CABIN AREA MAXIMUM DAILY DMR VIOLATION SUMMARY				
Date	**Parameter**	**Units**	**Permit**	**Reported**
February 2003	Flow	MGD	0.005	0.007
February 2003	BOD5	mg/l	20	21.5
May 2003	BOD5	mg/l	10	15.1
June 2003	BOD5	mg/l	10	11.4
July 2003	BOD5	mg/l	10	11.4
July 2003	TSS	mg/l	60	70
September 2003	BOD5	mg/l	10	14.3
February 2004	BOD5	mg/l	20	22.5
March 2004	Fecal	C/100ml	400	2000
December 2004	Fecal	C/100ml	400	7000
May 2004	BOD5	mg/l	10	10.5
May 2004	Fecal	C/100ml	400	2000
June 2004	BOD5	mg/l	10	16.3
July 2004	BOD5	mg/l	10	10.4
September 2004	BOD5	mg/l	10	33.3
September 2004	NH3-N	mg/l	6	6.64
August 2005	BOD5	mg/l	10	15.2

The above table demonstrates that six violations of the maximum daily limits occurred in 2003, nine violations occurred in 2004 and only one violation occurred in 2005. The vast majority of the violations have occurred in the exceeding of the BOD levels. This may be attributed to the issue of the wastewater treatment plant flows being in excess of the design standards flows. This may be placing additional loading on the treatment plant that can not be supported with existing equipment.

The next most frequent violation occurring was the level of fecals. The violations were very extreme levels and could possibly been related to contamination of the sample or to the improper application of the disinfecting chlorine solution.

The remaining violations occurring were a single instance of Flow, TSS and NH3-N. These were one time events and did not indicate any specific pattern nor did either exceed the permitted levels by an extreme amount.

B.2. Ski Area

A review of the Discharge Monitoring Reports for the years 2003, 2004 and 2005 indicates that the Ski Area wastewater treatment plant has been in compliance with its effluent quality discharge parameters, except for a few instances, for that period. Tables of the Discharge Monitoring Report summaries for the years 2003 through 2005 are included in Appendix D. The reports indicate that the following maximum daily discharge parameter limits were exceeded during the period. In that a sample is collected only once per month, Average Monthly values are reported that same as the Maximum Daily values on the Discharge Monitoring Reports. Though the Average Monthly values may also appear on the Discharge Monitoring Report as being exceeded, these values are not considered in that they are a single value and not an average over an entire month.

SKI AREA MAXIMUM DAILY DMR VIOLATION SUMMARY				
Date	**Parameter**	**Units**	**Permit**	**Reported**
January 2003	NH3-N	mg/l	12	49
February 2003	NH3-N	mg/l	12	14.7
1st Quarter 2003	BOD5	mg/l	20	28
1st Quarter 2003	NH3-N	mg/l	12	14.8
March 2003	BOD5	mg/l	20	36
January 2004	TRC	ug/l	0	10
February 2004	pH	SU	6-9	9.1
February 2004	TRC	ug/l	0	10
March 2004	BOD5	mg/l	20	34.6
1st Quarter 2005	BOD5	mg/l	20	27
1st Quarter 2005	NH3-N	mg/l	12	23.6

The above table demonstrates that five violations of the maximum daily limits occurred in 2003, four violations occurred in 2004 and only two violations occurred in 2005. The vast majority of the violations have occurred in the exceeding of the NH3-N and BOD levels during the winter months. This may be attributed to the issue of the wastewater treatment plant flows being in excess of the design standards flows during the peak usage during winter ski season. This may be placing additional loading on the treatment plant that can not be supported with existing equipment.

The next most frequent violation occurring was the level of TRC. These two violations were not exceptionally extreme levels and could possibly been related to the improper application of the disinfecting chlorine solution or a malfunction of the dechlorination equipment.

The trend has been for the number of violations occurring to decrease over the three year period. The limited number of violations did not indicate any specific pattern nor did either exceed the permitted levels by an alarmingly extreme amount.

B.3. Lodge Area

A review of the Discharge Monitoring Reports for the years 2003, 2004 and 2005 indicates that the Lodge Area wastewater treatment plant has been in compliance with its effluent quality discharge parameters, except for a few instances, for that period. Tables of the Discharge Monitoring Report summaries for the years 2003 through 2005 are included in Appendix E. The reports indicate that the following maximum daily discharge parameter limits were exceeded during the period. In that a sample is collected only once per month, Average Monthly values are reported that same as the Maximum Daily values on the Discharge Monitoring Reports. Though the Average Monthly values may also appear on the Discharge Monitoring Report as being exceeded, these values are not considered in that they are a single value and not an average over an entire month.

LODGE AREA MAXIMUM DAILY DMR VIOLATION SUMMARY				
Date	**Parameter**	**Units**	**Permit**	**Reported**
February 2003	Fecal	C/100ml	400	45000
May 2003	BOD5	mg/l	10	11.4
June 2003	BOD5	mg/l	10	12.8
September 2003	BOD5	mg/l	10	10.2
February 2004	pH	SU	6-9	9.1
August 2005	BOD5	mg/l	10	10.4

The above table demonstrates that four violations of the maximum daily limits occurred in 2003, only one violation occurred in 2004 and only one violation occurred in 2005. The majority of the violations have occurred in the exceeding of the BOD levels during the summer months, but none were at an extremely high level above the permitted limit. The lone violation for Fecal occurring in 2003 may well have been attributable to a contaminated sample due to its lone occurrence and the extreme value and that preceding and subsequent months are at low levels. The lone pH violation occurring in 2004 has not reoccurred within the subsequent twenty two month period.

The trend has been for the number of violations occurring to decrease over the three year period. The limited number of violations did not indicate any specific pattern nor did either exceed the permitted levels by an alarmingly extreme amount.

B.4. Campground Area

A review of the Discharge Monitoring Reports for the years 2003, 2004 and 2005 indicates that the Campground Area wastewater treatment plant has been in compliance with its effluent quality discharge parameters, except for a few instances, for that period. Tables of the Discharge Monitoring Report summaries for the years 2003 through 2005 are included in Appendix F. The reports indicate that the following maximum daily discharge parameter limits were exceeded during the period. In that a sample is collected only once per month, Average Monthly values are reported that same as the Maximum Daily values on the Discharge Monitoring Reports. Though the Average Monthly values may also appear on

the Discharge Monitoring Report as being exceeded, these values are not considered in that they are a single value and not an average over an entire month

CAMPGROUND AREA MAXIMUM DAILY DMR VIOLATION SUMMARY				
Date	**Parameter**	**Units**	**Permit**	**Reported**
2nd Quarter 2004	BOD5	mg/l	10	11.2
3rd Quarter 2004	BOD5	mg/l	10	21.7
3rd Quarter 2005	Fecal	C/100ml	400	8000

The above table demonstrates that no violations of the maximum daily limits occurred in 2003, two violations occurred in 2004 and only one violation occurred in 2005. The vast majority of the violations have occurred in the exceeding of the BOD levels. This may be attributed to the issue of the wastewater treatment plant receiving slug flows from the dumping stations as campers are emptying the motor home waste tanks within a relatively short period time. This may be placing additional loading on the treatment plant that can not be supported with existing equipment.

The other single violation occurring was the level of fecals. This violation was at a very extreme level and could possibly been related to contamination of the sample in that no other parameters were in violation or at extreme elevated levels at the same time

The violations were infrequent events and did not indicate any specific pattern nor did either exceed the permitted levels by an extreme amount

B.5. Golf Course Clubhouse Area

A review of the Discharge Monitoring Reports for the years 2003, 2004 and 2005 indicates that the Golf Clubhouse Area wastewater treatment plant has been in compliance with its effluent quality discharge parameters, except for a few instances, for that period. Tables of the Discharge Monitoring Report summaries for the years 2003 through 2005 are included in Appendix G. The reports indicate that the following maximum daily discharge parameter limits were exceeded during the period. In that a sample is collected only once per month, Average Monthly values are reported that same as the Maximum Daily values on the Discharge Monitoring Reports. Though the Average Monthly values may also appear on the Discharge Monitoring Report as being exceeded, these values are not considered in that they are a single value and not an average over an entire month.

GOLF CLUBHOUSE AREA MAXIMUM DAILY DMR VIOLATION SUMMARY				
Date	**Parameter**	**Units**	**Permit**	**Reported**
2nd Quarter 2004	BOD5	mg/l	10	11.2
3rd Quarter 2005	BOD5	mg/l	10	15.9

The above table demonstrates that no violations of the maximum daily limits occurred in 2003, only one violation occurred in 2004 and only one violation occurred in 2005. The only violations have occurred in the exceeding of the BOD levels.

The violations were infrequent events and did not indicate any specific pattern nor did either exceed the permitted levels by an extreme amount

C. Summary of Issues

Each of the wastewater treatment plants have exhibited to some extent issues with regards to the treatment plants ability to treat the wastewater to the level necessary to meet discharge limits at all times of the year The treatment plants all experience highly variable influent flow rates due to the nature of the park facilities that they serve Flow rates vary not only by season, but over short periods of time including weekend periods and holidays These highly varying rates of flow make operation of smaller treatment facilities more difficult

It is also noted that all of the treatment plants are around twenty five years of age and were designed using the standards and equipment current for that time period. The age of the equipment makes it less efficient in its operation and with the exception of the Ski Area facility, the treatment plants do not include critical design features, such as flow equalization basins to handle the widely variable flow rates nor adequate tertiary treatment equipment to provide the level of treatment required by the stringent effluent limits The current use of polishing ponds has not provided the level of final effluent polishing needed to maintain fully compliant treatment effluent quality.

Within several areas issues with inflow and infiltration of extraneous water into the collection systems also appear to be creating issues with treatment process stability. For small treatment plants with limited excess treatment capacity, extraneous flows can negatively impact the treatment process stability

Section 5 – Future Situation

A. Future Flow Projections

There are no identified plans for near-future new development at Canaan Valley State Resort Park. Based on this, it is anticipated that the flow rates at each treatment facility area will remain the same as current levels of flow as presented in the following table. The table provides a breakdown of the estimated average daily flow (ADF) for the park wastewater facilities.

TOTAL SEASONAL PARK AVERAGE DAILY WASTEWATER FLOWS			
Flow Source	**Summer Calculated Flows (GPD)**	**Winter Calculated Flows (GPD)**	**Total Permitted Flows (GPD)**
Cabin Area	8,680	8,680	5,000
Ski Area	------	10,090	10,000
Lodge Area	39,360	54,300	100,000
Campground Area	3,750	------	6,000
Golf Clubhouse Area	4,080	------	5,000
WASTEWATER FLOWS	55,870	73,070	126,000

Also below are definitions of each wastewater flow category with a description of the design flow basis used for this report.

Average Daily Flow. The ADF is defined by Ten States Standards as the average of the daily volumes to be received for a continuous 12-month period. Two basic components make up the ADF, actual wastewater generation and typical system inflow and infiltration. The wastewater flow generation is based upon estimated generated wastewater data. An allowance for typical I&I in the gravity collection systems of 300 to 400 gpd per inch-mile is assumed based on the aged condition of the pipes.

Maximum Daily Flow. The MDF is defined by Ten States Standards as the largest volume of flow to be received during a continuous 24-hour period. A ratio of MDF to ADF is typically in the range of 2.25:1 to 2.50:1. Based upon the type of intermittent flow conditions at the park, an average MDF to ADF ratio of approximately 2.5 to 1 will be used.

Peak Hourly Flow. The PHF is defined by Ten States Standards as the largest volume of flow to be received during a one-hour period. For this project, the PHF is also assumed to be the peak instantaneous flow or the maximum instantaneous flow rate to be received. The PHF is the worst case scenario and is the peak hydraulic flow rate for which the sanitary sewers, pump stations, and STP are designed to process. The PHF should assume peak domestic use coupled with wet weather conditions and peak I&I rates. Based upon the type of intermittent flow conditions at the park, for design a peaking factor of 4.0 shall be applied to the ADF computed to determine peak hourly flow rates.

TOTAL DAILY WASTEWATER FLOW RATES			
Flow Source	**Average Daily Flows (GPD)**	**Maximum Daily Flows (GPD)**	**Peak Hourly Flows (GPD)**
Summer	55,870	139,675	223,480
Winter	73,070	182,675	292,280

Section 6 – Collection System Alternatives

A. Introduction

As stated previously, the several of the collection systems at Canaan Valley State Resort Park exhibit influences from inflow and infiltration. Based on the treatment plants being small in size with limited reserve capacity, it is imperative that any improvement project at the park include additional investigative work to identify and eliminate all sources of extraneous water. Improvements will be based on including system investigations at each collection system.

B. Cabin Area

The Cabin Area collection system is comprised of approximately 3,600 linear feet of clay pipe with approximately 15 manholes. The collection system has been reported by the operator to exhibit increased flows during precipitation events, thus indicating some inflow and infiltration. Site vists and discussions with the contract operator indicate that the collection system is subject to a significant amount of inflow/infiltration during rain events. The inlet pipe to the treatment plant has, at times, been flowing at nearly full pipe flow.

It is recommended that in order to confirm preliminary conclusions presented within this section for the Cabin Area collection system improvements, that pre-design tasks include an internal closed circuit television (CCTV) internal inspection of the pipe system, smoke testing of the system between manholes and dye testing to evaluate source location and path of inflow and infiltration into the system. The costs for these tasks are included as a part of the collection system improvement recommendations.

The following is a summary of the recommended improvements to the Cabin Area collection system:

1. Smoke test entire length of collection system.
2. Dye test areas of smoke testing indicating inflow and infiltration locations.
3. CCTV entire length of collection system.
4. Slip line approximately 1,800 feet of sewer collection system.
5. Excavate and repair sewer collection system at 25 locations.
6. Repair 10 manholes.

A detailed cost estimate of the proposed improvements to the Cabin Area collection system is contained in Appendix H.

C. Ski Area

The Ski area collection system is comprised of approximately 2,500 linear feet of 6-inch diameter clay pipe with approximately 11 manholes. The collection system has been reported by the operator to exhibit increased flows during precipitation events, thus indicating some inflow and infiltration. Site vists and discussions with the contract operator indicate that the collection system is subject to a significant amount of inflow/infiltration during rain events. The inlet pipe to the polishng lagoons has, at times, been flowing at nearly full pipe flow.

It is recommended that in order to confirm preliminary conclusions presented within this section for the Ski Area collection system improvements, that pre-design tasks include an internal closed circuit television (CCTV) internal inspection of the pipe system, smoke testing of the system between manholes

and dye testing to evaluate source location and path of inflow and infiltration into the system. The costs for these tasks are included as a part of the collection system improvement recommendations

The following is a summary of the recommended improvements to the Ski Area collection system:

1 Smoke test entire length of collection system
2 Dye test areas of smoke testing indicating inflow and infiltration locations
3 CCTV entire length of collection system
4 Slip line approximately 1,300 feet of sewer collection system
5 Excavate and repair sewer collection system at 10 locations
6 Repair 7 manholes

A detailed cost estimate of the proposed improvements to the Ski Area collection system is contained in Appendix H

D. Campground Area

The Campground area collection system is comprised of approximately 2,700 linear feet of 6-inch clay pipe with approximately 13 manholes and pump station that pumps all the collected flow to the wastewater treatmement plant The collection system has been reported by the operator to exhibit increased flows during precipitation events, thus indicating some inflow and infiltration. This is also evident as the pump station continues to pump even though the campground is vacant.

It is recommended that in order to confirm preliminary conclusions presented within this section for the Campground Area collection system improvements, that pre-design tasks include an internal closed circuit television (CCTV) internal inspection of the pipe system, smoke testing of the system between manholes and dye testing to evaluate source location and path of inflow and infiltration into the system. The costs for these tasks are included as a part of the collection system improvement recommendations.

The following is a summary of the recommended improvements to the Campground Area collection system:

1 Smoke test entire length of collection system
2 Dye test areas of smoke testing indicating inflow and infiltration locations
3 CCTV entire length of collection system
4 Slip line approximately 1,400 feet of sewer collection system
5 Excavate and repair sewer collection system at 10 locations
6 Repair 9 manholes

A detailed cost estimate of the proposed improvements to the Campground Area collection system is contained in Appendix H

E. Cost of Improvements

In order to correct the identified issues with the inflow and infiltration issues within the Cabin Area, Ski Area and Campground Area, it will be necessary to perform an inflow and infiltration elimination program to specifically identify and remove the sources of inflow and infiltration. The table below provides a summary of the estimated costs for improvements for each collection system area examined above

PROJECT COSTS – COLLECTION SYSTEM IMPROVEMENTS			
COLLECTION SYSTEM AREA	CONSTRUCTION COST	NON-CONSTRUCTION COST	TOTAL COST
Cabin Area	$ 107,000	$ 29,000	$136,000
Ski Area	$ 74,000	$ 21,000	$95,000
Campground Area	$ 81,000	$ 23,000	$104,000
Total Costs	$262,000	$73,000	$335,000

Section 7 – Wastewater Treatment Alternatives

A. Introduction

This section of the wastewater system assessment will discuss four different wastewater treatment alternatives considered for implementation to meet the needs of the Canaan Valley State Resort Park planning area. These alternates include various combinations for replacement of existing treatment units with new treatment units, modifications to existing treatment systems and abandonment of existing treatment plants in favor of transporting wastewater flows to a different treatment plant location. For each alternative, a discussion is presented on the general process description, estimated project costs, operation and maintenance costs, and process reliability/performance. All options consider that permitted discharge limits will remain the same as current permitted limits for each discharge location.

B.1 Treatment Alternative 1

Alternative 1 considers that improvements will be made to each existing wastewater treatment plant and that each treatment plant will continue to discharge at it current discharge point location. Exhibit A-1 in Appendix I provides a schematic of the proposed facilities under this alternative. A summary of the planned improvements for each site is as follows for Alternative 1:

1. Cabin Area
   a. New 2,500 gallon flow equalization tank.
   b. New 10,000 gallon per day extended aeration wastewater treatment plant.
   c. New covered tertiary surface sand filters.
   d. New ultraviolet disinfection system.
   e. Abandon existing polishing ponds.

2. Ski Area
   a. New 12,000 gallon per day extended aeration wastewater treatment plant.
   b. Additional covered tertiary surface sand filter.
   c. Covers for existing surface sand filters.
   d. New ultraviolet disinfection system.
   e. Abandon existing polishing ponds.
   f. Pump station and force main for maintenance garage and warming hut.

3. Lodge Area
   a. New bar screen unit and headworks.
   b. New 25,000 gallon flow equalization tank.
   c. New continuous backwash tertiary sand filter units.
   d. New ultraviolet disinfection system.
   e. Abandon existing polishing ponds.
   f. Replace existing blowers.
   g. Replace existing control system.
   h. Replace existing pumps.
   i. Repair existing piping and valves.

4. Campground Area
   a. New 1,500 gallon flow equalization tank.
   b. New 6,000 gallon per day extended aeration wastewater treatment plant.

c New covered tertiary surface sand filters.
d New ultraviolet disinfection system.
e Abandon existing polishing ponds

5. Golf Clubhouse Area
a. New 1,250 gallon flow equalization tank
b New 5,000 gallon per day extended aeration wastewater treatment plant.
c. New covered tertiary surface sand filters.
d New ultraviolet disinfection system
e Abandon existing polishing ponds.

A detailed cost estimate for each treatment plant site is included in Appendix J The following table presents a summary of the costs for Alternative 1

PROJECT COSTS - WASTEWATER TREATMENT ALTERNATIVE 1			
TREATMENT SYSTEM AREA	CONSTRUCTION COST	NON-CONSTRUCTION COST	TOTAL COST
Cabin Area	$ 245,000	$ 53,000	$298,000
Ski Area	$ 361,000	$ 78,000	$439,000
Lodge Area	$ 537,000	$ 113,000	$650,000
Campground Area	$ 173,000	$ 38,000	$211,000
Golf Clubhouse Area	$ 161,000	$ 36,000	$197,000
Total Costs	$1,477,000	$318,000	$1,795,000

B.2 Treatment Alternative 2

Alternative 2 considers that improvements will be made to the existing wastewater treatment plants at the Ski Area and the Lodge Area and that each of these two treatment plant will continue to discharge at their current discharge point location. The treatment plants at the cabin area, campground area and golf clubhouse area will be abandoned in favor of pumping the wastewater from these areas to the Lodge Treatment Plant. Exhibit A-2 in Appendix I provides a schematic of the proposed facilities under this alternative. A summary of the planned improvements for each site is as follows for Alternative 2:

1 Cabin Area
a. Pump station and force main from Cabin Area to Lodge Area.

2 Ski Area
a New 12,000 gallon per day extended aeration wastewater treatment plant
b Additional covered tertiary surface sand filter.
c Covers for existing surface sand filters.
d. New ultraviolet disinfection system.
e Abandon existing polishing ponds
f Pump station and force main for maintenance garage and warming hut.

3 Lodge Area
a. New bar screen unit and headworks.
b. New 31,000 gallon flow equalization tank.

c. New 25,000 gallon per day aeration basin
d. New 4,500 gallon clarifier
e. New continuous backwash tertiary sand filter units
f. New ultraviolet disinfection system
g. Abandon existing polishing ponds
h. Replace existing blowers
i. Replace existing control system
j. Replace existing pumps
k. Repair existing piping and valves

4. Campground Area
   a. Pump station and force main from Campground Area to Lodge Area

5. Golf Clubhouse Area
   a. Pump station and force main from Golf Clubhouse Area to Lodge Area

A detailed cost estimate for each treatment plant site is included in Appendix K. The following table presents a summary of the costs for Alternative 2.

PROJECT COSTS - WASTEWATER TREATMENT ALTERNATIVE 2			
TREATMENT SYSTEM AREA	CONSTRUCTION COST	NON-CONSTRUCTION COST	TOTAL COST
Cabin Area	$ 163,000	$ 36,000	$199,000
Ski Area	$ 337,000	$ 72,000	$409,000
Lodge Area	$ 624,000	$ 132,000	$756,000
Campground Area	$ 137,000	$ 30,000	$167,000
Golf Clubhouse Area	$ 180,000	$ 38,000	$218,000
Total Costs	$1,441,000	$308,000	$1,749,000

B.3 Treatment Alternative 3

Alternative 3 considers that improvements will be made to the existing wastewater treatment plant at the Lodge Area and that this treatment plant will continue to discharge at the current discharge point location. The treatment plants at the Cabin Area, Ski Area, Campground Area and Golf Clubhouse area will be abandoned in favor of pumping the wastewater from these areas to the Lodge Area treatment plant. Exhibit A-3 in Appendix I provides a schematic of the proposed facilities under this alternative. A summary of the planned improvements for each site is as follows for Alternative 3:

1. Cabin Area
   a. Pump station and force main from Cabin Area to Lodge Area

2. Ski Area
   a. Pump station and force main from Ski Area to Campground Area

3. Lodge Area
   a. New bar screen unit and headworks
   b. New 31,000 gallon flow equalization tank

c New 25,000 gallon per day aeration basin
d New 4,500 gallon clarifier
e New continuous backwash tertiary sand filter units
f New ultraviolet disinfection system
g Abandon existing polishing ponds
h Replace existing blowers
i Replace existing control system
j Replace existing pumps
k Repair existing piping and valves

4 Campground Area
a Pump station and force main from Campground Area to Lodge Area

5 Golf Clubhouse Area
a Pump station and force main from Golf Clubhouse Area to Lodge Area

A detailed cost estimate for each treatment plant site is included in Appendix L. The following table presents a summary of the costs for Alternative 3.

PROJECT COSTS - WASTEWATER TREATMENT ALTERNATIVE 3			
TREATMENT SYSTEM AREA	CONSTRUCTION COST	NON-CONSTRUCTION COST	TOTAL COST
Cabin Area	$ 163,000	$ 36,000	$199,000
Ski Area	$ 306,000	$ 65,000	$371,000
Lodge Area	$ 627,000	$ 132,000	$759,000
Campground Area	$ 142,000	$ 32,000	$174,000
Golf Clubhouse Area	$ 180,000	$ 38,000	$218,000
Total Costs	$1,418,000	$303,000	$1,721,000

B.4 Treatment Alternative 4

Alternative 4 considers that improvements will be made to the existing wastewater treatment plant at the Lodge Area and that this treatment plant will continue to discharge at the current discharge point location The treatment plants at the Cabin Area, Ski Area, Campground Area and Golf Clubhouse area will be abandoned in favor of pumping the wastewater from these areas to a new Sequential Batch Reactor treatment plant at the Lodge Area treatment plant site Exhibit A-4 in Appendix I provides a schematic of the proposed facilities under this alternative A summary of the planned improvements for each site is as follows for Alternative 4:

1. Cabin Area
a. Pump station and force main from Cabin Area to Lodge Area

2. Ski Area
a. Pump station and force main from Ski Area to Campground Area

3. Lodge Area
a. New bar screen unit and headworks

b New 125,000 gallon per day SBR unit
c. Convert existing aeration basin to flow equalization tank
d New continuous backwash tertiary sand filter units
e New ultraviolet disinfection system
f Abandon existing polishing ponds

4 Campground Area
a. Pump station and force main from Campground Area to Lodge Area.

5. Golf Clubhouse Area
a. Pump station and force main from Golf Clubhouse Area to Lodge Area

A detailed cost estimate for each treatment plant site is included in Appendix M. The following table presents a summary of the costs for Alternative 4.

PROJECT COSTS - WASTEWATER TREATMENT ALTERNATIVE 4			
TREATMENT SYSTEM AREA	**CONSTRUCTION COST**	**NON-CONSTRUCTION COST**	**TOTAL COST**
Cabin Area	$ 163,000	$ 36,000	$199,000
Ski Area	$ 306,000	$ 65,000	$371,000
Lodge Area	$ 793,000	$ 168,000	$961,000
Campground Area	$ 142,000	$ 32,000	$174,000
Golf Clubhouse Area	$ 180,000	$ 38,000	$218,000
Total Costs	$1,584,000	$339,000	$1,923,000

C. Operation and Maintenance Costs

The cost of operation and maintenance for each alternative will include electric power costs, plant operator costs, waste sludge disposal costs, equipment maintenance parts and supplies cost, and laboratory testing costs The following sections provide a breakdown for each of these costs by alternative

C.1 Power Costs

The cost of electrical power was evaluated for each treatment system alternative Based on the estimated electrical power service costs, Alternate 1 has the least cost for annual electrical costs, while Alternate 2 has the greatest annual cost for electric. Electric power service costs vary from the low of $12,100 per year to a high of $15,800 per year, a range of 30 percent

The electrical power cost for each alternative is included in the following table.

ANNUAL ELECTRICAL POWER COSTS BY ALTERNATIVE				
SYSTEM AREA	ATERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4
Cabin Area	$ 1,100	$ 500	$ 500	$ 500
Ski Area	$ 800	$ 800	$ 300	$ 300
Lodge Area	$ 9,000	$ 13,900	$ 13,900	$ 14,300
Campground Area	$ 600	$ 300	$ 300	$ 300
Golf Clubhouse Area	$ 600	$ 300	$ 300	$ 300
Total Costs	$12,100	$15,800	$15,300	$15,700

C.2 Plant Operator Costs

The park currently utilizes a service contract operator to operate all of the wastewater treatment and collection system. It is anticipated that the service contract operation will continue to be utilized for operations of all the systems in the future. The cost of the contract operator employed to operate the treatment plant service areas along with laboratory and miscellaneous costs was evaluated for each treatment system alternative. Based on the estimated plant operator costs, Alternate 3 has the least cost for annual operator costs, while Alternate 1 has the greatest annual cost for a plant operator. Plant operator costs vary from the low of $22,200 per year to a high of $38,000 per year, a range of around 70 percent.

The treatment plant operator cost for each alternative is included in the following table.

ANNUAL OPERATOR COSTS BY ALTERNATIVE				
ALL SYSTEM AREAS	ATERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4
Labor Contract Amount	$ 38,000	$ 25,900	$ 22,200	$ 24,000
Total Costs	$38,000	$25,900	$22,200	$24,000

C.3 Waste Sludge Disposal Costs

The park currently utilizes a service contract hauler to remove and dispose of digested sludge from all of the wastewater treatment plants. It is anticipated that the service contract hauler will continue to be utilized for sludge removal operations of all the systems in the future. The cost of the contract hauler employed to remove sludge from the treatment plant service areas will essentially be the same for each treatment system alternative in that nearly the same volume of sludge will be removed for the volume of wastewater treated.

The sludge hauling cost for each alternative is included in the following table.

WASTE SLUDGE DISPOSAL COSTS BY ALTERNATIVE				
ALL SYSTEM AREAS	ATERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4
Sludge Hauling Expenses	$ 11,500	$ 11,500	$ 11,500	$ 11,500
Total Costs	$11,500	$11,500	$11,500	$11,500

C.4 Equipment Maintenance Parts and Supplies Costs

The park currently utilizes a service contract to maintain and repair all of the wastewater treatment and collection system equipment as a part of the contract It is anticipated that the service contract maintenance and repair services will continue to be utilized for the maintenance and repair services of all the systems in the future The cost of the contract operator employed to maintain and repair the treatment and collection system are included in the Plant Operator Cost section above and covers the labor portion of maintenance and repair costs. The added costs for the parts and supplies for equipment maintenance and repair was evaluated for each treatment system alternative. Based on the estimated parts and supplies costs, Alternate 3 has the least cost for annual parts and supplies costs, while Alternate 4 has the greatest annual cost for parts and supplies. Parts and supplies costs vary from the low of $6,800 per year to a high of $7,800 per year, a range of around 15 percent

The parts and supplies cost for each alternative is included in the following table

ANNUAL EQUIPMENT MAINTENANCE PARTS COSTS BY ALTERNATIVE				
ALL SYSTEM AREAS	ATERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4
Equipment Parts & Supplies	$ 7,400	$ 7,300	$ 7,100	$ 8,000
Total Costs	$7,400	$7,300	$7,100	$8,000

C.5 Laboratory Testing Costs

The park currently utilizes a service contract operator to collect required samples for all discharge locations and has the non-field laboratory tests performed by a contract lab. It is anticipated that the same service contract operation will continue to be utilized for operations of all the systems in the future The cost of the laboratory testing services was evaluated for each treatment system alternative Based on the estimated laboratory testing costs, Alternates 3 and 4 have the least cost for annual laboratory testing costs, while Alternate 1 has the greatest annual cost for the testing. Laboratory testing costs vary from the low of $1,300 per year to a high of $5,200 per year, a range of 300 percent

The annual laboratory testing cost for each alternative is included in the following table

ANNUAL LABORATORY TESTING COSTS BY ALTERNATIVE				
ALL SYSTEM AREAS	ATERNATE 1	ALTERNATE 2	ALTERNATE 3	ALTERNATE 4
Laboratory Testing	$ 5,200	$ 2,500	$ 1,300	$ 1,300
Total Costs	$5,200	$2,500	$1,300	$1,300

C.6 Total Operation and Maintenance Costs

The total cost of operation and maintenance will be the summation of the electric power costs, plant operator costs, waste sludge disposal costs, equipment maintenance parts and supplies cost, and

laboratory testing costs for each treatment system alternative. Based on the estimated total operation and maintenance costs, Alternate 3 has the least total cost for annual operation and maintenance, while Alternate 1 has the greatest annual total cost for operation and maintenance. Total annual operation and maintenance costs vary from the low of $57,100 per year to a high of $74,000 per year, a range of approximately 30 percent.

The total operation and maintenance cost for each alternative is included in the following table

TOTAL ANNUAL OPERATION AND MAINTENANCE COSTS BY ALTERNATIVE				
OPERATION AND MAINTENANCE ITEM	**ATERNATE 1**	**ALTERNATE 2**	**ALTERNATE 3**	**ALTERNATE 4**
Electrical Power	$ 12,100	$ 15,800	$ 15,300	$ 15,700
Treatment Plant Operator	$ 38,000	$ 25,900	$ 22,200	$ 24,000
Waste Sludge Disposal	$ 11,500	$ 11,500	$ 11,500	$ 11,500
Parts and Supplies	$ 7,400	$ 7,300	$ 7,100	$ 8,000
Laboratory Testing	$ 5,200	$ 2,500	$ 1,300	$ 1,300
Total Costs	$74,200	$63,000	$57,400	$60,500

D. Present Worth

In evaluating the effective cost of each alternative, the present worth of the total costs of the alternative is used at the basis for comparison. This evaluation takes into account the time value of the costs over a twenty year life cycle

The table below provides a present worth summary for the wastewater treatment alternatives considered by alternative

Alternative	**Est. Const. Cost**	**Non-Cost. Capital Cost**	**O&M Costs (PW Value)**	**Salvage Value**	**Present Worth**
	(1)	(2)	(3)	(4)	(5)=(1)+(2)+(3)-(4)
Alternative 1	$1,477,000	$318,000	$916,000	-$215,000	$ 2,496,000
Alternative 2	$1,441,000	$308,000	$778,000	-$216,000	$ 2,311,000
Alternative 3	$1,418,000	$303,000	$709,000	-$213,000	$ 2,217,000
Alternative 4	$1,584,000	$339,000	$747,000	-$238,000	$ 2,432,000

Present worth assumptions include an assumed interest rate of 5 125% for 20 years and an estimated salvage value of 15% of the estimated STP construction costs

Upon review of the present worth summary provided in the table above, Alternate 3 has the least present worth, while Alternate 1 has the greatest present worth. The present worth for each alternative vary from

the low of $2,217,000 to a high of $2,496,000, a range of around 13 percent. The second least present worth alternative is Alternate 2 with a present worth of $2,311,000 which is around 4 percent higher. The third least present worth alternative is Alternate 4 with a present worth of $2,432,000 which is around 10 percent higher.

E. Non-Monetary Evaluation

The following table rates the comparative ranking for non-monetary characteristics of each of the alternatives considered for the study area. These non-monetary factors are considered a part of the overall selection process used in conjunction with the monetary cost factors for selection of the process type. The ranking is based on a scale ranging from 1 for best to 5 for worst within the characteristic. The least total score indicates the best ranking under the non-monetary characteristics for the alternative.

Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
AIR QUALITY	5	3	1	1
NOISE	5	3	2	1
AESTHETICS	3	2	1	1
LAND USE	5	3	2	1
WATER QUALITY	1	1	1	1
ENERGY	1	2	2	2
RELIABLITY	1	1	1	1
FLEXIBILITY	4	3	1	1
MAINTENANCE	5	3	2	2
FAMILIARITY	2	2	1	3
TOTALS	**32**	**23**	**14**	**14**
OVERALL RANK	**3**	**2**	**1**	**1**

Based on the non-monetary factors considered within the above table, both Alternate 3 and Alternate 4 have equal ranking based on these factors considered.

Section 8 – Recommended Alternative

The systems within each of Alternates 3 and 4 which have equal non-monetary ranking are proven to provide quality wastewater treatment methods Combining all treatment at a single location, as Alternates 3 and 4 do, provides the benefit of simplification of operations, permitting, reporting, and is greatly preferred over the Alternates 1 and 2 which retain multiple treatment plant locations Upon review of the estimated project costs, operation & maintenance costs, and present worth analysis; all four alternatives are nearly equal in overall costs However, considering the process reliability, proven performance, estimated project costs, projected O&M expenses, and ready availability of knowledgeable operation support, the Alternative 3 is the recommended alternative for implementation Based upon the information contained in this report, the following paragraphs provide the recommendations for implementation of the wastewater treatment and collection facilities for the park

A. Wastewater Treatment

Alternative 3 considers that improvements will be made to the existing wastewater treatment plant at the Lodge Area and that this treatment plant will continue to discharge at the current discharge point location The treatment plants at the Cabin Area, Ski Area, Campground Area and Golf Clubhouse area will be abandoned in favor of pumping the wastewater from these areas to the Lodge Area treatment plant Exhibit A-3 in Appendix I provides a schematic of the proposed facilities under this alternative A summary of the planned improvements for each site is as follows for Alternative 3:

1 Cabin Area
   b Pump station and force main from Cabin Area to Lodge Area

2 Ski Area
   b Pump station and force main from Ski Area to Campground Area

3 Lodge Area
   l New bar screen unit and headworks
   m New 31,000 gallon flow equalization tank
   n New 25,000 gallon per day aeration basin
   o New 4,500 gallon clarifier
   p New continuous backwash tertiary sand filter units
   q New ultraviolet disinfection system
   r Abandon existing polishing ponds
   s Replace existing blowers
   t Replace existing control system
   u Replace existing pumps
   v Repair existing piping and valves

4 Campground Area
   b Pump station and force main from Campground Area to Lodge Area

5 Golf Clubhouse Area
   b Pump station and force main from Golf Clubhouse Area to Lodge Area

Implementation of this wastewater treatment alternative will require that the permitted discharge flowrate for the current permitted outfall number WVNPDES 003 be increased to allow an additional 25,000 gallons per day of discharge, but will provide for elimination of outfalls for WVNPDES 001, 002, 201, 004 and 005 by combining them with 003. By combining the overall capacities from each outfall into a single discharge, the increases in flowrates required by the Cabin Area (5,000 GPD to 10,000 GPD) and by the Ski Area (10,000 GPD to 12,000 GPD) will be eliminated, the net overall flowrate change will be a reduction of 1,000 GPD from 126,000 GPD to 125,000 GPD This is in comparison to a net increase of 7,000 GPD should each individual discharge be modified to accommodate the increase in the Cabin Area and Ski Area wastewater treatment plants individually

B. Collection System Repairs

It is recommended that in order to confirm preliminary conclusions presented within this report for the collection system improvements, that pre-design tasks include an internal closed circuit television (CCTV) internal inspection of the pipe system, smoke testing of the system between manholes and dye testing to evaluate source location and path of inflow and infiltration into the system for each area.

The following is a summary of the recommended improvements to the Cabin Area collection system:

1. Smoke test entire length of collection system
2. Dye test areas of smoke testing indicating inflow and infiltration locations
3. CCTV entire length of collection system
4. Slip line approximately 1,800 feet of sewer collection system.
5. Excavate and repair sewer collection system at 25 locations.
6. Repair 10 manholes.

The following is a summary of the recommended improvements to the Ski Area collection system:

1. Smoke test entire length of collection system
2. Dye test areas of smoke testing indicating inflow and infiltration locations
3. CCTV entire length of collection system
4. Slip line approximately 1,300 feet of sewer collection system.
5. Excavate and repair sewer collection system at 10 locations
6. Repair 7 manholes.

The following is a summary of the recommended improvements to the Campground Area collection system:

1. Smoke test entire length of collection system
2. Dye test areas of smoke testing indicating inflow and infiltration locations
3. CCTV entire length of collection system
4. Slip line approximately 1,400 feet of sewer collection system.
5. Excavate and repair sewer collection system at 10 locations.
6. Repair 9 manholes.

Implementation of the inflow and infiltration reduction program will reduce peak flows appearing at the receiving pump stations and treatment plant. It will also reduce the total volume of wastewater treated during periods of precipitation.

Section 9 – Cost of Improvements

A. Anticipated Costs

The purpose of this section of the report is to present the total costs associated with improvements to the wastewater collection and treatment systems as Canaan Valley State Resort Park The following table presents the preliminary costs for the total scope of a project to reduce inflow and infiltration rates and to provide improvements to the wastewater treatment systems

TOTAL PROJECT COSTS – COLLECTION AND TREATMENT SYSTEMS			
SYSTEM AREA	CONSTRUCTION COST	NON-CONSTRUCTION COST	TOTAL COST
Collection Systems			
Cabin Area	$ 107,000	$ 29,000	$136,000
Ski Area	$ 74,000	$ 21,000	$95,000
Campground Area	$ 81,000	$ 23,000	$104,000
Treatment Systems			
Cabin Area	$ 163,000	$ 36,000	$199,000
Ski Area	$ 306,000	$ 65,000	$371,000
Lodge Area	$ 627,000	$ 132,000	$759,000
Campground Area	$ 142,000	$ 32,000	$174,000
Golf Clubhouse Area	$ 180,000	$ 38,000	$218,000
Total Costs	**$1,680,000**	**$376,000**	**$2,056,000**