Windham Mountain Stormwater Retrofit Project

Design Report

Town of Windham, Greene County, New York

Prepared by:

Greene County Soil & Water Conservation District
907 County Office Building
Cairo, N.Y. 12413
518.622.3620 Phone
518.622.0344 Fax

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 Project Information

1.1 Project Name and Address

Windham Mountain Stormwater Retrofit Project
Clarence D Lane Road
Town of Windham
Greene County, New York, 12496

1.2 Project Owner

Ski Windham Operating Corporation
PO BOX 459
Clarence D Lane Road
Windham, New York, 12496
518.734.4300
www.windhammountain.com
Contact: ***Tim Woods***
mailto:twoods@windhammountain.com

1.3 Project Sponsor

Greene County Soil and Water Conservation District
907 County Office Building
Cairo, New York, 12413
518.622.3620 Phone
518.622.0344 Fax
www.gcswcd.com
Contact: James Buchanan
mailto:jake@gcswcd.com

1.4 Project Engineer

Kaaterskill Associates
PO BOX 1020
Cairo, New York, 12473
518.622.9667Phone
518.622.9047Fax
www.keaeng.com
Contact: Darrin Elsom PE
mailto:d.elsom@keaeng.com

1.5 Project Funding

Catskill Watershed Corporation
P.O. Box 569 Main Street
Margaretville, New York, 12455
845.586.1400
Contact: Nate Hendricks
mailto:nhendricks@cwconline.org

US Army Corps of Engineers-New York District
26 Federal Plaza
New York, New York, 10278-0090
Room # 2127
917.790.8215 Phone
212.264.2924 Fax
Contact: Rifat Salim
mailto:rifat.salim@usce.army.mil

New York City Department of Environmental Protection
71 Smith Avenue
Kingston, New York, 12401
845.340.7832 Phone
845.338.1260 Fax
Contact: Dave Burns
mailto:dburns@dep.nyc.gov

2.0 Project Background

Windham Mountain Ski Lodge and parking facilities.

The drainage encompassing the lands of Windham Mountain Ski Resort represents one of the most developed areas within the Greene County portion of the New York City West of Hudson Watershed. Historic impacts from unregulated stormwater runoff were identified in the Batavia Kill Management Plan (GCSWCD, 2004) that recommended the need for assessment and the identification of opportunities to improve stormwater quality and conveyance of stormwater runoff. Several assessments were performed to identify and quantify stormwater threats and impact as well as prioritize areas for the implementation of both structural and nonstructural Stormwater Management Practices (SMP's). This project represents the first phase for providing stormwater management for several high priority problem areas. The project represents a partnership between Greene County Soil and Water Conservation District (GCSWCD) and Ski Windham Operating Corporation, with funding provided by New York City Department of Environmental Protection Stream management Program (NYCDEP-SMP), Catskill Watershed Corporation (CWC) Stormwater Retrofit Program, and the New York State District of Army Corp of Engineers (ACOE).

2.1 Existing Site Conditions

In order to provide solutions to stormwater problems within the drainage area it is necessary to document the existing site conditions. Drainage pattern and condition, land use, soil types, stormwater threats, and hydrologic and hydraulic are some of the items discussed in this section.

2.1.1 Project Location

The project site is located along South Street (County Route 12) to the north in the Town of Windham and is bordered by a private road named Fromm Road to the East. **Map 1** is a location map containing topographic information and the location of the project site.

2.1.2 Drainage Location and Pattern

The total Windham Mountain drainage encompasses an area of approximately 1.3 square miles and is bounded by Cave Mountain, Windham Mountain Ski Resort and the Batavia Kill. Elevation ranges from 3,080 feet on its mountainous slopes to 1,500

feet at the base of the watershed. Topographic slopes vary from 0 – 35 percent, with ski slopes covering approximately 64 percent of the drainage. Runoff from the watershed is initially conveyed as sheet and shallow concentrated flow before entering drainage ditches that lead to first order tributaries of the Batavia Kill. Stormwater conveyance systems consist of modified natural channels and swales with several underground networks located near the ski facility. The drainage for the project area was delineated into five drainage areas, 10, 16A, 16B, 17 and 18, in order to analyze the existing and proposed condition hydrology that are illustrated on **Map 2** and **Map 3 (Appendix A)**.

2.1.3 Existing Land Use and Cover

Windham Mountain drainage.

Changes in land use have the potential to significantly impact a watershed's hydrology and ecological potential. As land cover changes from forest to open fields, the runoff characteristics of the land also change. While grasslands are typically considered a good land cover because they do not produce significant runoff, forests are even better. As forests are cleared for ski slopes and fields of grasslands emerge, the amount of rainfall which runs off the land as sheet flow is increased. For example, using current hydrological models, a pasture in fair hydrologic condition would produce about 36 percent more rainfall runoff than a mature forest in good hydrologic condition with an equal amount of rainfall per unit area (USDA NRCS).

Land cover data for drainage areas 10, 16A, 16B, 17 and 18 was developed from a combination of 2006 aerial photography and field surveys performed in fall of 2008. Land cover is shown on **Map 3 (Appendix A).** This cover information was then combined with soil information in order to estimate runoff rates and volumes and pollutant loading models for each of the drainage areas.

2.1.4 Project Area Soils

Soils within the drainage area are generally unconsolidated and dominated by various types of glacial till and thick deposits of lacustrine clays and fine silt formed by various glacial processes. Based on review of the Soil Survey of Greene County, New

York, soils within the area consist primarily of clay, silt, and gravelly loams. The on-site soils are shown on **Map 3 (Appendix A)** and a summarized in **Table 1** below.

Table 1. On-site soil types and hydrologic soil groups.

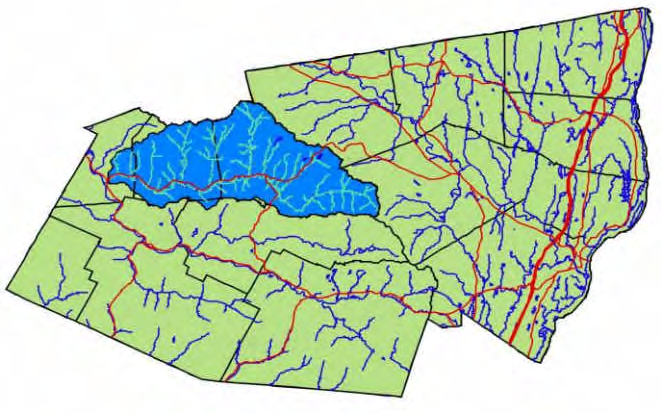
Symbol	Name	Hydologic Group	Acres
LmD	Lewbeach-Willowemoc	C	10.9
OnB	Onteora	C	4.7
OnC	Onteora	C	2.4
Su	Suny	D	4.5
TvB	Tunkhannock	A	0.6
Ur	Udorthents	A/D	0.1
VhD	Vly-Halcott	C	6.7
WmB	Willowemoc	C	0.3
WmC	Willowemoc	C	3.1
WmD	Willowemoc	C	3.7

The Natural Resource Conservation Service (NRCS) assigns each soil series to a hydrologic soil group (HSG). The HSG refers to soils grouped according to their runoff-producing characteristics and their capacity to permit infiltration. Soils are assigned to four groups (A through D). HSG A soils have high infiltration rates when thoroughly wet and have a low runoff potential. HSG B soils have a moderate infiltration rate and consist of moderately to well-drained fine textured soil. In HSG C, soils have a low infiltration rate with moderate to high runoff potential. They frequently have a layer that impedes the downward movement of water and are generally classified as fine textured soils. HSG D soils have very slow infiltration rates and thus high runoff potential. They have a layer of clay or bedrock near or on top of the surface and a high permanent water table.

The majority of the soils in drainage areas 10, 16A, 16B, 17 and 18 are classified as HSG C and D. Several areas are mapped as HSG A/D however; historically these areas have been covered by asphalt and gravel in affect reducing infiltration capacity.

2.1.5 Water Resources

Existing stormwater from the area is conveyed as sheet, shallow, and channel flow discharging to an unnamed first order tributary that conveys to the Batavia Kill.



Location of the Batavia Kill watershed (blue) within Greene County.

The Batavia Kill watershed is located in the northeastern limits of the Catskill Mountains within the Appalachian Plateau physiographic province. The Batavia Kill watershed is situated entirely within Greene County spanning the Towns of Windham, Ashland

and Prattsville. A portion of the watershed is located within the protected 700,000-acre Catskill State Park which includes a short section of the stream that carries a National Scenic River Designation from the United States Park Service.

The Batavia Kill watershed is a sub-basin of the Schoharie Creek, and comprises approximately 30 percent of the Schoharie Reservoir drainage, The Schoharie Reservoir is the northernmost reservoir in the Catskill/Delaware water supply system. Portions of flow from the Schoharie are diverted by means of a 19-mile underground tunnel discharging to the Esopus Creek near Phoenicia, and then flow naturally to the Ashokan Reservoir. The New York City water supply is unfiltered, and the NYCDEP operates its system under a Filtration Avoidance Determination (FAD) issued by the Environmental Protection Agency (EPA) and New York State Department of Health (NYSDOH).

All waters of the State of New York are given a classification by NYSDEC based on the best usage of the waters. Streams with a use classification of C or higher are protected streams and may carry a sub-classification of (t) or (ts) to indicate the waters sustaining trout populations (t), and those which support trout spawning (ts). The first order tributary (NYSDEC Tributary 12) that transects the project site has a use classification of C. Classification C indicating a best usage for fishing although without trout and trout spawning. The Batavia Kill main stem carries classifications ranging from A (ts) to C (t) indicating that the entire main stem sustain trout populations and any activities in relation to the stream must be permitted.

The Batavia Kill is listed on the 2002 NYS DEC Priority Waterbodies List (PWL) under HUC 02020005/020 Batavia Kill, Middle and tributaries (1202-0058) as Habitat/hydrology known to be stressed, Minor Impacts with a known problem species (knotweed) and Silt/sediment as suspected pollutants. Sources of pollutants are listed as; Known - streambank erosion and habitat modification, and Possible - construction, and failing onsite systems.

Furthermore, the Schoharie Reservoir is listed on the NYS-DEC 2002 303(d) List as high priority for TMDL development with the Cause/Pollutant being Silt/Sediment. The Schoharie reservoir is on the PWL, listed as impaired by silt and sediments from erosion of streambanks, roads and construction.

2.1.6 Existing Stormwater Threats and Impacts

Drainage area 10 contains Windham Mountain's maintenance facility which was identified as a hotspot area. This area contains fueling facilities, equipment storage areas and snowmaking, pumping and mechanical equipment. The majority of the stormwater runoff from the catchment is collected in a cutoff trench along an access road and conveyed around the maintenance facility to the tributary to the west of the project site. The stormwater produced within the maintenance facility area generally flows across asphalt parking areas into multiple swales draining to the same tributary. Portions of the facility's runoff are collected in drop inlets with multiple laterals

discharging into the conveyance system of drainage area 14. Drainage area 14 was delineated in the original Stormwater Assessment Report created by GCSWCD, however this catchment is not discussed extensively in this report.

Field assessment identified several diesel pumps and fueling areas in drainage area 10 which lack formal roofing, allowing rainfall to directly entrain any spilled or leaked petroleum-based pollutants. Air and water pumping machinery lacked roofing, allowing entrainment of debris from mechanical wear and other apparent pollutants. The main building of the facility has missing and damaged sections of rain gutters allowing surface runoff to be conveyed to mechanical systems, parking and fueling areas. Currently heavy equipment is located in multiple storage areas within the drainage area without treatment systems and spill containment systems. In general, the area occupied by the facility lacks adequate stormwater treatment practices allowing untreated runoff to be conveyed directly to the tributary to the west of the drainage area.

Gravel accumulations in diversion swale in drainage area 17.

Drainage area 16 (A and B combined) is located on the eastern edge of the Windham Mountain watershed and consists of mixed forests and grassed open space. The catchment is generally undeveloped, but is considered to be a prime area for future development due to the proximity to the ski resort and due to the availability of sewer and water infrastructure. Runoff from the area flows in a northerly direction to a 2.4-acre pond used for snowmaking during the ski season. Flows from the pond enter the tributary to the west of the project area near South Street through an open channel spillway. Field assessment identified multiple stormwater conveyance inefficiencies within the lower drainage. Conveyance inefficiencies were inventoried in the open channel sections that collect the runoff from the entire catchment. Sections of channel along the private gravel road are inadequate and frequently overtop the road causing erosion shoulder and are responsible for portions of the rill formations in the parking areas of drainage area 17. Immediately downstream, channel erosion was documented below the culvert section that crosses the private road. These impacted areas are suspected to deliver extensive loading of suspended solids to the impoundment facility and system.

Drainage area 17 is predominately gravel parking lots containing a portion of runoff from mixed forest/brush areas. Runoff from the area flows north, primarily as sheet and shallow concentrated flow, with some channel flow forming within parking areas. Currently all the stormwater runoff flows to an interception swale along the north edge of the parking lot along the snow making impoundment. Storm flow in the interception swale travels to the west and enters the tributary on that side of the drainage area through a culvert. It is suspected the diversion was created to reduce loading of gavel and fine sediment from the parking area to the impoundment. The erosion of gravel surfaces of the parking area is considered to be an extreme contributor of sediment to the system. Field assessment revealed several inch deep rills and gullies throughout the entire parking area, with large accumulations of gravels and fine sediments inventoried in the perimeter trench. The high degree of energy produced from runoff across parking areas was confirmed by rill erosion of asphalt surfaces, and acknowledged by substantial annual maintenance by Windham Mountain Operations.

Drainage area 18 is located between 10 and 16 and is bounded by drainage area 14 to the south. Runoff from the drainage is collected in multiple channels containing multiple sections of culverts which drain to the tributary to the west of the project area. Due to the proximity to the Ski Area and the availability of sewer and water infrastructure, this area is considered to be a likely area for future development. Field inspections inventoried a reduction of size, slope and apparent capacity moving down gradient through the existing conveyance system as well as a crushed pipe outlet. It is suspected that the pipe's reduced capacity allows runoff to travel across the parking surfaces generating erosion within the gravel parking areas of drainage area 17. It is assumed that as development has progressed in the upper drainage, individual property owners have developed and sized pipes to address local stormwater without regard for downstream conveyance.

2.1.7 Existing Condition Hydrology

An assessment to determine hydrologic and hydraulic characteristics for existing land uses, including estimates of peak runoff rates and runoff volumes, was performed to identify system inefficiencies and evaluate and design retrofitting options based on their influence to reduce peak runoff rates and reduce runoff

Turbid flow condition and sedimentation within Tributary 12.

volumes. In order to determine the impact of development on the mountainside, a pre-developed condition model was also created in addition to the existing condition model. The pre-developed condition represents how the watershed was expected to have acted in its natural state of forest/rural open land cover before development. This condition was modeled for assessment of current conditions and the development of target values for design of SMP's.

The project area has a total drainage area measuring approximately 39.0 acres. For existing condition hydrologic analysis, five catchments were generated (DA10, 16A, 16B, 17, and 18), each with a single contributing drainage area. These areas were defined in order to properly represent the natural drainage characteristics of the area. Each of these drainage areas has a single design point associated with it. Design points are numbered in relation to the drainage area they are associated with, for example the design point for drainage area 10 is DP-10. Design points and drainage areas are shown on **Map 3 (Appendix A)**.

HydoCAD software incorporating NRCS TR-20 methodology was used to evaluate the project site hydrology. Using digital imagery, land cover was digitized and topology data collected to develop times of concentration for each treatment area. Rainfall depths for the 1-, 2-, 10-, 25- and 100-year design storms in Greene County are 3.0", 3.25", 5.0", 6.0" and 8.0". Findings from the pre-development and existing condition models are displayed in **Table 2**.

Table 2. Pre-Development and Existing Condition Discharge Estimates (cfs).

Pre-Developed Condition						
Catchment	Area (ac.)	1-Year	2-Year	10-Year	25-Year	100-Year
DA10	1.86	1.15	1.39	3.35	4.59	7.18
DA16A	14.77	8.47	10.36	25.64	35.36	55.88
DA16B	5.76	3.02	3.74	9.54	13.26	21.16
DA17	5.67	3.61	4.35	10.23	13.91	21.60
DA18	8.96	5.62	6.87	16.95	23.36	36.86
Existing Condition						
Catchment	Area (ac.)	1-Year	2-Year	10-Year	25-Year	100-Year
DA10	1.86	5.00	5.67	10.52	13.33	18.93
DA16A	14.77	16.88	20.19	46.15	62.27	95.75
DA16B	5.76	20.73	23.08	39.56	48.92	67.47
DA17	5.67	23.02	25.29	41.02	49.91	67.57
DA18	8.96	15.41	17.97	37.32	48.96	72.68

2.1.8 Existing Condition Pollutant Load

Annual pollutant load estimates were calculated using the "The Simple Method", as described in "Reducing the Impacts of Stormwater Runoff from New Development" (NYSDEC 2003). Input data consisted of the effective annual rainfall of 42.4 inches for Greene County and existing land use and cover characteristics. **Table 3** displays annual estimates in pounds of Total Suspended Solids (TSS), Total Phosphorous (TP), and Total Nitrogen (TN) discharge from the five catchments.

Table 3. Pre-Development and Existing Condition Pollutant Loading (lbs/yr).

Pre-Developed Condition				
Catchment	Area (ac.)	TSS	TP	TN
DA10	1.86	41.03	0.09	1.40
DA16A	14.77	325.77	0.70	11.11
DA16B	5.76	127.05	0.27	4.33
DA17	5.67	125.06	0.27	4.27
DA18	8.96	197.63	0.43	6.74
Existing Condition				
Catchment	Area (ac.)	TSS	TP	TN
DA10	1.86	1220.15	2.62	32.51
DA16A	14.77	1146.73	2.47	39.12
DA16B	5.76	1471.04	3.96	36.70
DA17	5.67	5324.62	16.24	100.07
DA18	8.96	1292.24	3.32	34.89

3.0 Proposed Design

The steps for designing the project consisted of establishing a set of project goals, determining project constraints, and then developing a plan that best met these goals while working within the constraints. It was determined that the most effective way to treat substantial amounts of storm water would be to utilize a wet pond with an appropriately sized forebay for pretreatment. In addition to the pond, improvements to the stormwater conveyance system were recommended. The improved conveyance system would allow for capture and treatment of additional stormwater, and would reduce erosion across the gravel parking surface located in drainage area 17.

Ski Windham snowmaking pond and parking facilities.

3.1 Watershed Stormwater Management Goals and Objectives

The fundamental project goal is to have an overall increase in water quality by providing point and non-point source mitigation from the impacts of pollutants associated with stormwater runoff from the site. This project aims to manage runoff from drainage areas 10, 16A, 16B, 17 and 18 as outlined in the Windham Mountain Stormwater Assessment and as shown on **Map 3 (Appendix A)**. Other project goals and objectives include:

- Provide a measurable reduction in most pollutant loading including Total Suspended Solids, Phosphorus, Nitrogen, Heavy Metals, and Petroleum Products.
- Increased storm flow attenuation and reduction provided through implementation of SMP's.
- Illustrate effective stormwater management practices for future land use planning and development.
- Develop cooperative partnerships on many levels including private enterprises, local municipalities, County, State and Federal governments, NYCDEP, and residents of the watershed.
- Demonstrate good housekeeping/pollution prevention.

3.2 Design Constraints

A number of potential constraints for the project were identified during the design process including physical site constraints, landowner approval and access, project permitting, cost and data needs and limitations. The project design addressed stormwater

quantity and quality while working within project constraints. The design needed to capture substantial quantities of stormwater runoff and treat it within a very limited area. Physical site constraints were identified that could impact various design alternatives, making an analysis of the costs and risks involved with each design alternative critical to the development of an appropriate retrofit strategy.

3.2.1 Water Resources

As stated the project site drains to a first order NYSDEC Class C tributary to the Batavia Kill. The site is approximately 1,150 feet up gradient from the tributary's confluence with the Batavia Kill. The Batavia Kill is listed on the NYSDEC PWL, listed as impaired by silt and sediments from erosion of streambanks, roads and construction. Caution must be taken during construction activities to ensure that the project will have a positive impact upon water quality in the area. Any turbid runoff from the area that causes a visible contrast in receiving waterbodies is a water quality violation, thus proper erosion and sediment control measures must be utilized during all construction activities.

3.2.2 Wetlands

A wetland inventory identified 0.9 acres of federal wetland located in and around the project site. The majority of the wetland area, 0.7 acres, is located adjacent to the stream running along the west side of the project area. The remaining 0.2 acres is located in two small wetland areas, one on the north side of the pond, and the other on the south end of the parking area. **Appendix E** contains a delineation report and application and correspondences with the ACOE for preliminary jurisdictional determination. Substantial effort was made to limit disturbance to these areas during the design and planning for construction and project implementation. The design proposes minimal wetland disturbances. Mitigation is planned to compensate for any wetland areas that are disturbed during the course of the project. The proposed wetland mitigation is described in the design section of this report.

3.2.3 Historic and Archaeology Resources

Archaeology investigations were performed to inventory resources within the area and document any potential constraints on the design. In December and January of 2008 and 2009 TRACKER Archaeology Services conducted a Phase 1A documentary study and Phase 1B survey for the proposed project. Based upon topographic characteristics and proximity to prehistoric sites the property was assessed as having an above average potential for encountering prehistoric sites on any intact soils. Based upon topographic characteristics and proximity to historic sites and MDS's, the property was assessed as having a higher than average potential for encountering historic sites on any intact soils. During the course of the archaeological field survey no prehistoric or historic artifacts were encountered. The site had been impacted by

development as a parking area associated with the ski resort. No further work was recommended. The full report has been provided in **Appendix D**.

3.2.4 Plants and Animals

As proposed, the project requires the clearing and grubbing of approximately 0.3 acres of land near the stormwater pond. This cover type has been identified as potential habitat of the Indiana bat (Myotis sodalis) in New York State, on both the federal and state endangered species list. Investigation was performed to determine any potential affect the project may have on the bats habitat. Recent communications with Alan Hicks, a Mammal Specialist with the Endangered Species Unit of NYSDEC confirmed that there has been no record of Indiana bats inventoried near the project area, nor have any known maternity colonies been discovered at elevations above 1,000 ft anywhere in the state (project area elevation is over 1,600 feet).

3.2.5 Landowner Agreement

Landowner approval of the project is prerequisite to project design and construction. Implementation of the project requires formal approval to be obtained in the form of Landowner Project Agreements. Initial planning for this project incorporated landowner knowledge of the site and addressed owner concerns where appropriate. The provisions of landowner approval were set forth via the Landowner Project Agreement, which is a temporary license between the landowner Windham Mountain Operating Corporation, and the GCSWCD, NYCDEP and CWC.

3.2.6 Regulatory Permits and Approval

Site and construction plans will require ACOE, NYSDEC, and NYCDEP, Town of Windham Planning Board and Greene County Planning Board permits and approvals. The Town of Windham Planning Board is acting as lead agency in the coordinating State Environmental Quality Review (SEQR) process. NYSDEC has authorized similar projects under Article 15 of ECL, while the ACOE utilizes Nationwide 27 and 43 permits. Construction of the project will require coverage under NYSDEC SPDES Stormwater Construction Activity General Permit (GP-0-08-001) and NYCDEP WHO Stormwater Program plan approval. Regulatory applications and correspondences can be seen in **Appendix F**.

3.3 Design Goals and Objectives

The fundamental goal of the Windham Mountain Stormwater Retrofit Project is to improve water quality by better managing stormwater runoff from the site. To attain this goal a variety of issues were addressed, including stormwater quality, stormwater conveyance and stormwater runoff rates. Numerous secondary benefits exist with implementation of the proposed design although they are not discussed in the section of the report.

3.3.1 Stormwater Quality

Site-specific pollutant concentrations were determined for each catchment using the Simple Method obtained from the Terrene Institute, 1996 adapted from NURP 1983 "Constant Concentrations Used for Spreadsheet Method." The concentrations were used to determine the most efficient SMP available for the concentration of pollutants pertaining to the drainage area.

NYSDEC performance criteria and runoff volume requirements should be considered in the evaluation of the proposed scenarios. NYSDEC accepted treatment practices are predicted to be capable of removing 80 percent TSS, 40 percent TP, and 40 percent TN and have an accepted longevity in the field. The proposed condition pollutant loads from individual SMP's should be verified to meet or exceed these criteria.

Preliminary sizing of the practices was accomplished based on the required portion of stormwater runoff known as the water quality volume (WQv). This technique, the accepted method by the NYSDEC, describes the WQv as the portion of the SMP reserved to treat runoff either through detention, filtration, infiltration or biological activity. Typically the WQv is designed to improve water quality by capturing and treating 90 percent of the average annual stormwater runoff volume. The WQv is directly related to the amount of impervious cover on a site. Impervious cover includes paved and gravel surfaces, roof tops, paved sidewalks, and building structures.

3.3.2 Stormwater Conveyance

In accordance with the guidelines from the New York State Stormwater Management Design Manual, targeted storm frequencies for conveyance design are 2 and 10-year storm events. The 2-year event is used to ensure non-erosive flows through roadside swales, overflow channels, pond pilot channels and over berms within SMP's. The 10-year 24-hour discharge rate was used as a minimum for sizing closed storm drain systems. Flood conveyance was provided for larger storms up to the 100-year 24-hour storm event.

3.3.3 Stormwater Runoff Rates

In accordance with the guidelines from the New York State Stormwater Management Design Manual, targeted storm frequencies for stormflow attenuation included the 1, 10 and 100-year 24-hour rainfall events. The existing condition hydrologic modeling performed on individual catchments may be treated as the developed condition and pre-developed discharge estimates (**Table 4**) provide target discharge rates. Stormflow attenuation should be accomplished through a combination of retention and extended detention incorporated within the SMP's implemented to meet discharge criteria.

Table 4. Pre-Developed Condition Discharge Estimates (cfs).

Catchment	Area (ac.)	1-Year	10-Year	100-Year
DA10	1.86	1.2	3.4	7.2
DA16A	14.77	8.5	25.6	55.9
DA16B	5.76	3.0	9.5	21.2
DA17	5.67	3.6	10.2	21.6
DA18	8.96	5.6	17.0	36.9

3.4 Design Components

Individual components were selected based on existing and proposed land uses, physical feasibility, cost, and treatment capability and performance. Ease of maintenance, and aesthetic value were also considered. Specific issues and questions that were addressed include the following:

- What is the most effective mix of structural and non-structural SMP's that can meet project partner's sub watershed goals?
- Which hydrologic variables do we want to manage in the sub watershed (recharge, channel protection, flood reduction, etc)?
- What are the primary stormwater pollutants of concern (phosphorus, bacteria, sediment, metals, hydrocarbons, or trash and debris)?
- Which SMP's should be used or avoided in the sub watershed because of their environmental impacts?
- What is the most economical way to provide stormwater management?
- Which SMP's are the least burdensome to maintain within local budgets?

The proposed plan can be seen on sheet **SP-04** of the Project Drawings contained in **Appendix G** and is described below.

3.4.1 Stormwater Pond

Stormwater ponds are designed to provide extended settling of pollutants, prevent re-suspension and allow for biological removal of pollutants. Stormwater ponds are typically designed with extensive landscaping and associated recreational amenities and can be designed to enhance the aesthetic values of the area

The utilization of existing facilities and physical resources to treat and/or attenuate stormwater runoff is an efficient technique in reducing the cost associated with stormwater treatment. Windham Mountain is currently in the second phase of a pond expansion project. The project's objective is to increase the capacity of the existing snowmaking pond. The existing pond has a surface area of 2.4 acres and is approximately 18 feet deep with a single outlet consisting of a vegetated open channel. The pond receives drainage from the 14.8 acre drainage area 16A and controlled intakes from the tributary to the west of the project area which drains drainage areas 10 and 14. Direct up gradient drainage areas 17 and 18 have been diverted due to problems with sediment loading from excessive erosion of the gravel

surfaces associated with the parking areas. Presently, stormwater runoff from drainage areas 17 and 18 is conveyed to the tributary by means of piped and overland flow without any stormwater treatment.

The pond expansion project provides the opportunity for multiple benefits including stormwater treatment, reduction of hydraulic loading, and increased capacity for the snowmaking operations. The planned expansion will allow untreated runoff from drainage areas 10 and 17 to be routed to the pond for treatment. Runoff from these areas will be pretreated to remove excess sediment in order to limit loading to the facility. In addition, the snowmaking pond will provide secondary stormwater treatment for hot spot runoff associated with drainage area 10.

The proposed pond will include a riser structure which will have a 4 inch orifice at elevation 1597.00, with the top of the riser being at outlet elevation 1598.25. During the ski season, the 4 inch outlet will be closed. The normal water elevation will correspond to the top of the riser (elevation 1598.25) except where the water elevation is lowered as a result of the snow-making operations. During the rest of the year, the 4 inch orifice will be open and the normal water elevation will be 1597.00. In addition to the orifice and the riser, the pond will have a 50 feet wide spillway at elevation 1597.00.

During normal (non-ski season) conditions (when the water surface elevation is 1597.00) the volume in the pond will be approximately 33.85 acre-feet (approximately 11 million gallons). During the ski season the volume in the pond (corresponding to water elevation will 1598.25) will be approximately 37.47 acre-feet (approximately 12.2 million gallons. The pond in its existing condition holds approximately 8.5 million gallons.

The pond expansion will increase the surface area of the pond from 2.4 acres to approximately 2.9 acres. Additionally, the creation of a forebay will provide pretreatment including access for maintenance. The design includes an increase in storage capacity, the installation of a staged primary outlet structure and retrofit of the existing spillway as an emergency spillway. The staged primary outlet will assist in reducing storm flows and provide the attenuation goals of the design. The outlet consists of a low flow orifice and grated inlet for higher flows up to the 100-year 24-hour storm event. The existing open channel outlet will be retrofitted to act as a tertiary or emergency spillway for extreme storm events.

For proposed condition calculations additional drainage areas needed to be added in order to properly represent the proposed drainage characteristics of the site. Drainage area 18 remained unchanged, while the size of drainage area 16B was reduced slightly. Drainage area 10 was divided into 2 areas, 10-A and 10-B. Drainage areas 16A and 17 were subdivided into 3 drainage areas, and 6 drainage areas respectively. Drainage areas for the proposed condition hydrology are shown on **Map 4 (Appendix A).**

In order to evaluate the project site hydrology a proposed condition model was developed using HydroCAD software incorporating NRCS TR-20 methodology. Using digital imagery and proposed site plans, land cover was digitized and topographic data collected to develop times of concentration for each treatment area. **Map 4 (Appendix A)** delineates proposed drainage areas and their associated land cover. Findings from the model are displayed in **Table 5**.

Table 5. Proposed Condition Discharge Estimates.

Catchment	Area (acres)	T_c (min.)	1-Year (cfs)	10-Year (cfs)	100-Year (cfs)
DA10-A	1.60	5.4	5.8	9.5	16.6
DA10-B	0.26	3.8	0.5	1.2	2.4
DA16A-A	13.50	14.5	14.2	40.1	84.5
DA16A-B	1.01	6.0	3.6	6.5	10.9
DA16A-C	0.80	2.5	3.0	5.5	9.1
DA16B	5.24	5.5	18.4	34.1	57.1
DA17-A	1.16	1.5	4.3	8.1	13.7
DA17-B	1.32	7.0	4.9	8.6	14.1
DA17-C	1.24	2.5	5.4	9.1	14.7
DA17-D	1.11	1.7	5.0	8.5	13.6
DA17-E	0.58	1.7	2.6	4.4	7.1
DA17-F	0.40	2.0	1.5	2.6	4.5
DA18	8.97	6.5	17.4	41.5	79.3

Water quality treatment was designed to capture and treat the full WQ_v. The wet pond will be the water quality practice utilized for this project. A forebay will provide primary sediment removal and storage, and vegetated swales will enhance water quality treatment.

For this area of Greene County, the water quality event is generated by storms with 1.1 inches of rainfall or less. Based on the proposed condition hydrology, approximately 1.24 acre-feet of storage is required to provide treatment of the water quality volume. Proposed condition hydrologic regimes, and hydraulic grades including area of impervious surfaces for all drainage areas remain consistent with existing site conditions. **Table 6** outlines the required water quality volumes.

Table 6. Water Quality Volumes (acre-feet).

Catchment	Area (acres)	Percent Impervious	WQ_v (acre-feet)	Proposed SMP
DA10-A	1.60	59.2	0.08	Sand Filter & Wet Pond
DA10-B	0.26	29.2	0.01	Wet Pond
DA16A-A	13.50	9.8	0.25	Wet Pond
DA16A-B	1.01	75.3	0.07	Wet Pond
DA16A-C	0.80	68.8	0.05	Wet Pond
DA16B	5.24	71.9	0.34	Wet Pond
DA17-A	1.16	68.1	0.07	Grassed Swale & Wet Pond
DA17-B	1.32	81.1	0.09	Grassed Swale & Wet Pond
DA17-C	1.24	93.6	0.10	Grassed Swale & Wet Pond
DA17-D	1.11	100.0	0.10	Grassed Swale & Wet Pond

DA17-E	0.58	96.6	0.05	Grassed Swale & Wet Pond
DA17-F	0.40	82.5	0.03	Grassed Swale & Wet Pond
DA18	8.97	22.3	0.21	None

The proposed forebay has a permanent pool volume of 0.13 acre-feet, which exceeds 10% of the WQv. The proposed snowmaking pond has a permanent pool of 33.85 acre-feet (corresponding to the normal summer operation water surface elevation of 1597.00).

The "short cut" sizing method was utilized to determine the storage required and the average release rate to meet the channel protection volume requirements. Calculations show that 2.17 acre-feet of storage and an average release rate of 1.09 cubic feet per second are required.

The stormwater facility was designed to allow for the 24-hour extended detention of the 1-year storm event. The proposed pond has a 4" orifice at elevation 1597.00 and a concrete riser at elevation 1598.25. The available volume between these two outlets is 3.62 acre-feet. The maximum discharge rate during the one-year storm (during summer conditions) is 0.41 cubic feet per second.

Based on a comparison between existing condition and pre-development condition, there has been a drastic increase in peak flow rates as the site was developed. This project seeks to provide mitigation to ensure that peak flow rates will be no greater than the pre-development condition rates for the 10-year and 100-year storm events.

Hydraulic routing was performed using HydroCAD software to determine the proposed flow rates and make certain they met with the above-mentioned criteria. These calculated flow rates were established by routing all drainage areas except drainage area 18 through the stormwater pond. It was determined that drainage area 18 would continue to outlet to the tributary in its present location. **Table 7** presents a summary of the pre-developed condition, and mitigated proposed condition peak flow rates. The flow rates in **Table 7** are calculated based on drainage areas 10, 16A, 16B and 17 being routed through the stormwater pond to a single design point.

Table 7. Pre-Developed, Existing & Proposed Condition Peak Flow Rates at Pond Outlet.

	Peak Flow Rate (cfs)		
	1-Year Storm	10-Year Storm	100-Year Storm
Pre-Developed	16.2	48.7	105.7
Existing	56.2	115.9	194.3
Proposed (Summer Condition)	0.4	9.5	75.7
Proposed (Winter Condition)	15.7	45.1	100.8

The pond was designed using a staged primary outlet for discharge consisting of a low flow 4 inch orifice in the side of a 5 foot by 3 foot catch basin which will act as a weir to outlet larger flows. A tertiary outlet designed as an emergency spillway will be used for extreme events. The orifice is set at an elevation of 1597.00 feet, and the opening at the top of the riser structure at 1598.25 feet. This results in a storage capacity of 3.62 acre-feet of water before water begins flowing into the catch basin.

The spillway elevation is set at 1599.00 feet, allowing 2.25 acre-feet of storage before it begins to discharge. The forebay for the pond was designed to a 2.5-foot depth and will hold approximately 5,670 cubic feet (0.13 acre-feet) of water in its permanent pool. This is roughly 10.6 percent of the water quality volume. A detailed report on the HydroCAD model can be found in **Appendix B**.

3.4.2 Drainage Area 10 Conveyance System Improvements

Rill erosion of asphalt and gravel surfaces in parking area.

Conveyance improvements in drainage area 10 include rerouting a diversion ditch and construction of a closed pipe system to convey water to a new sand filter, and then carry it to the pond. An existing diversion ditch routes a small quantity of stormwater runoff from the up-gradient vegetated area of drainage area 10. Presently this ditch carries water into drainage area 10-B by crossing through a culvert under the roadway running east out of the maintenance area. It is proposed that a 12 inch pipe be installed up-gradient of the roadway in order to divert this water to the sand filter for treatment.

Runoff from the maintenance facility itself will enter a closed piped network. This network will provide multiple laterals with pretreatment devices including deep sump catch basins, oil and water filters and separators and an underground sand filter. The perimeter system will act to collect multiple laterals and all the runoff from the facility up to the 10-year storm event. This plan will isolate the high priority area and will provide a method to convey flows to the stormwater pond for secondary treatment.

The closed pipe network for drainage area 10A will utilize catch basins with 3 foot deep sumps. These deep sumps are effective at reducing the amount of suspended solids in the stormwater prior to it leaving the catch basin. The stormsewer piping for drainage area 10A will be sized at 18 inches in order to carry flows of at least 9.7 cubic feet per second which is equivalent to the expected flow rates for the 10-year storm. The network will 2,000 gallon tank which will function primarily as a flow splitter to allow runoff from large storm events to bypass the treatment system. After the flow splitter, a 7,000 gallon tank will be used for settling/pre-treatment. The sand filter system will be constructed in two halves, with each half being installed in a 6,000 gallon tank concrete tank. The sand filters will discharge to the pipe network that carries stormwater from drainage area 17 to the pond. A bypass for larger flows

exists in front of the pretreatment tank. This bypass will allow flows greater than the 90% storm to bypass the sand filters and flow directly into the pipe network of drainage area 17 and to the stormwater pond.

3.4.3 Drainage Area 18 Conveyance System Improvements

Conveyance improvements in drainage area 18 include the replacement of the closed pipe system and outfall as well as the stabilization of the ditch up-gradient of the roadway along the border between drainage areas 10 and 18. The current pipe is inefficient and has a crushed outlet allowing water to erode the surfaces of the parking areas of drainage area 17. The proposed piped system will follow a similar alignment and will act as a collection system for drainage area 18.

The existing ditch located in drainage area 18 along the roadway on the border with drainage area 10 will also be resized. This swale is responsible for diverting approximately 20 percent of the runoff from drainage area 18 around drainage area 10. Hydrologic models predict that this channel experiences flows of approximately 9.2 cubic feet per second for the 10-year storm. Based on these calculations it is suggested that the channel be regraded to establish a bottom width of 12 inch and side slopes of 1:1, lined with rip-rap to mitigate erosion.

The new pipe for drainage area 18 will be sized to convey at least the 10-year storm. Hydrologic models of this catchment predict that the flow rate out of drainage area 18 is approximately 42.5 cubic feet per second for the 10-year storm. As a result of this, it is proposed that the existing pipe be replaced with a 36 inch pipe to convey storm flows unimpeded.

3.4.4 Drainage Area 16A Conveyance System Improvements

Conveyance improvements within drainage area 16A include improvement of the channel along the private road and improvement of the piped section of the system which outlets to the snowmaking pond. The section of channel along the private gravel road is inadequate and overtops the road causing erosion of the road surface and shoulder and rill erosion in the parking areas of drainage area 17. Immediately downstream, extensive channel erosion was documented below the culvert section that crosses the private road. These impacted areas are suspected to deliver extensive loading to the snow making facility. It is proposed to replace the open channel section with a single closed pipe system. The conveyance improvements will relieve erosion and loading to the system.

Runoff rates and volumes from the top of drainage area 16 have been modeled in the proposed hydrologic condition calculates. This area has been labeled drainage area 16A and the 10-year runoff rate has been determined to be approximately 40.1 cubic feet per second. The existing pipe will be replaced with a 30 inch diameter pipe in order to pass the 10-year storm. This pipe will combine at a manhole junction with the runoff from drainage area 16A-B. Another 30 inch diameter pipe will then

transport the flow to a swale along the southern edge of the pond. This swale flows west to east and will transport the runoff to the new forebay of the stormwater pond.

3.4.5 Drainage Area 17 Conveyance System Improvements

Drainage area 17 will receive a new stormwater conveyance system which will drastically reduce the amount of overland flow. This system will consist of four swales which will transport water from east to west across the parking area. These swales will be 12 inch wide and 12 inch deep with 1:1 side slopes. At the end of each of these swales will be a deep sump catch basin. Upon entering the catch basin stormwater will be transported down gradient via an underground pipe network connecting the catch basins. Stormwater runoff from each portion of the catchment was calculated in the proposed hydrology model. These areas were labeled as drainage areas 17-A through 17-F. All stormwater pipes in this catchment were sized to pass the runoff from the 10-year 24-hour storm event.

3.4.6 Parking Area Improvements

Field assessment determined the existing parking area is likely a significant source of pollutants. Field evidence characterized the extent of erosion both in channels and flow paths in the form of rills and gullies through down gradient parking surfaces. It is proposed that surface erosion be addressed by the improvement of the grading of the parking lots. Grading will shorten flow paths and assist in rerouting and diverting clean water. In-channel pollutant loading will be minimized through properly sized channels and the installation of a closed conveyance system.

The proposed parking area design calls for the creation of a terraced parking area. The terracing will allow for a decrease in the slope of the parking area which will decrease runoff velocity. Additionally, swales will be installed on the top of each of the terraces. These swales will run from east to west and will direct stormwater to catch basins located at the end of the parking aisles. Swales are adequately sized to convey the 10-year storm. The catch basins will be linked by an underground pipe network which will outlet to the new forebay of the snowmaking pond. The combination of the reduced slope and the shortened flow path will reduce the erosive forces on the parking area.

Field inventory of the existing gravel parking lots on a weekend during the ski season revealed no designated parking. It is suspected the improvement of parking designation will provide for greater parking capacity and assist with incorporating water quality treatment within the lower parking areas.

A parking layout has been developed with the goals of maintaining the existing parking capacity, while providing space for terracing and swales to effectively convey runoff. The proposed parking area is calculated to be 5.78± acres. The existing parking area is calculated to be 5.74± acres. This variation is less than 1%. The

proposed project, therefore, does not represent a significant change in the parking capacity of Windham Mountain.

Construction of the parking area will require a substantial amount of fill in order to bring the area to grade. The fill will come from the excavation required for the pond expansion. This fill will need to be properly compacted in order to be used as a suitable sub grade for the parking area. Soil samples have been performed and a geotechnical report prepared by Daniel G. Louckes, P.E. is attached as **Appendix C**.

Based on the geotechnical report it will be possible to use the excavated material from the pond as the sub grade for the parking area. The material will need to be compacted to 95 percent of the maximum ASTM Specification D 1557-91 density, modified proctor. It is suggested that a field specification be developed in order to ensure proper compaction, and alleviate the need for constant nuclear density testing. Once the sub grade is constructed a layer woven geotextile will placed atop it. A 16 inch thick gravel layer will then be installed over the geotextile. This gravel layer will be compacted to a minimum of 95 percent of the maximum density ASTM D 1557.

3.4.7 Maintenance Facility Improvements

As discussed, the removal of stormwater runoff from the vegetated up-gradient areas would reduce the entrainment of pollutants at the facility and allow enhanced treatment of smaller flows at the maintenance building. The majority of the direct runoff from the maintenance facility will be collected and treated with practices adequate to collect, separate, and treat commercial runoff. These include deep sump catch basins, oil and grit separators and an underground sand filter. These devices will be connected to the proposed closed piped system. The plan will provide primary treatment to this high priority area and provide conveyance for secondary treatment in the stormwater pond.

The main building of the facility currently has failing roof gutters and lacks any gutter system on some portions of the building. Rainfall currently is concentrated on the roof then conveyed to the concrete parking surface surrounding the entire building. Evidence of concentrations of oil, grease and other hydrocarbons were inventoried around the facility from the numerous machinery and vehicles occupying the area. Improvement of the existing gutters can reduce entrainment of the pollutants from the parking surfaces as well as supplying a flow path into formal treatment practices. The construction of a sheet metal roofing system over the existing fuel pumps and several large generators would reduce the pollutant entrainment from leaks and spills as well as from regular maintenance and wear of the machinery. These new roofs will also have gutters which will be connected to the proposed closed pipe conveyance system.

3.4.8 Underground Sand Filter

It is suspected that stormwater runoff from the maintenance facility contains a wide array of contaminants. It was determined that providing a stormwater treatment

practice specifically for this area would be an excellent way to improve water quality. Sand filters provide excellent pollutant removal and can be placed underground, resulting in a negligible footprint. The combination of these two attributes makes a sand filter an excellent option to treat stormwater runoff from this area.

The proposed condition hydrology model indicates that the drainage area which will be contributing to the sand filter is approximately 1.6 acres in size and is roughly 60 percent impervious. This resulted in a calculated WQv of approximately 3,733 cubic feet. To treat this quantity of stormwater a sand filter with a 2 feet deep sand bed, and 2 feet of head would need to have a bed size of approximately 320 square feet.

The underground structure which houses the sand filter will be placed under an existing parking area. Thus it is extremely important that the structure can bear the weight of numerous vehicles passing over it. It was determined that using multiple pre-fabricated concrete structures connected in parallel would be the most economically feasibly method of installing the underground sand filter and provide H-20 traffic load capacity.

The sand filter system will consist of four main chambers. The first chamber will be a 2,000 gallon concrete tank. The main purpose of this tank will be to provide a bypass which will allow high flows to bypass the treatment system. The second unit will be a 7,000 gallon tank which will provide pre-treatment. This volume is equal to 935± cubic feet which is approximately 25 percent of the WQv. Water from the pre-treatment tank will flow into one of two sand filter chambers. Each chamber will contain a sand filter consisting of 24 inch depth of filter media with a surface area of 171 square feet (for a total surface area of 342 square feet). This system will provide treatment for the WQv in the sand filters, and larger storms will bypass the sand filters and be treated in the stormwater pond. Filtered runoff exiting the sand filters will also be conveyed to the pond for secondary treatment.

3.4.6 Stream Enhancement

The removal of a large double culvert is planned to enhance stream stability and habitat in the tributary on the west side of the project site. The culvert removal will require the realignment of two 12 inch steel snow making supply lines and a 4 inch domestic supply that cross the tributary at the culvert location. It was determined that it will be most economically feasible to replace the 12 inch lines with new HDPE pipes. The HDPE pipes represent a substantial cost savings, have a longer life expectancy, and are easier to install than steel pipes.

Four rock cross vanes will be installed through the project length to provide stream bank protection along with grade control for the channel bottom. The cross vane structures will re-direct channel currents and provide energy dissipation, while maintaining transitions between physical bed features. The structures will provide significant benefits by enhancing fisheries habitat through the reach, while generating a bed and bank form suitable for the proposed Rosgen B stream type. The cross vanes

will be constructed of large diameter rock from culvert removal oriented in an upstream fashion with two vane arms protruding from both the right and left streambank, connected in the center of the stream channel by a rock sill. Each cross vane arm will be constructed with an interior acute angle of 20 – 30 degrees. The length of the rock cross vanes will average 20 feet and key into the streambank at an elevation approximately .5 feet below the bankfull stage. The cross vanes will be keyed into the streambank a minimum of 5 feet to prevent scour and flanking of the structure. The location of the cross vanes are shown on sheet **SP-09** of the Project Drawings located in **Appendix G**. The following table (**Table 8**) details the locations of the structures and the amount of required rock.

Table 8. Rock Structure Locations and Size

Structure	Type	Station (approx. ft.)	Rock Volume (cu. yd.)	Weight (tons)
1	Cross Vane	0+50	24.7	49.3
2	Cross Vane	1+11	21.3	42.7
3	Cross Vane	2+04	25.3	50.7
4	Cross Vane	2+75	26.7	53.3
		Total	98.0	196.0

The culvert removal and the construction of vanes will be completed in a dry condition in order to meet the requirements of various regulatory agencies. During all construction in the existing or proposed stream channel, diversion of the entire stream flow around the work area will be required.

Dewatering will be performed in two phases and will be maintained 24 hours per day, 7 days per week during the construction period. Before construction of the cross vanes, the excavation of a sump and construction of a gravel coffer dam across the existing channel at top and bottom of the reach. Upon completion of the construction of this phase all areas will restored as soon as possible to prevent any erosion. During the culvert removal and pipe realignment portion of this phase, the diversion gates at the upstream culvert will be used to divert Tributary 12 into the snowmaking pond exiting through the existing spillway downstream of the work area. The diversion will be used to bypass flow around the culvert removal work area.

Sediment control during construction will be accomplished through collection of all turbid water within the work area, and pumping the sediment-laden water to designated filter area. Turbidity control equipment with adequate capacity to capture and treat all turbid water within the dewatered work area. The sediment control measures should ensure that no turbid water discharged from the work area. Construction Plan and Dewatering Plan has been included in the projects Stormwater Pollution Prevention Plan **(Section 4.0)** and drawings in **Appendix H**.

3.4.7 Revegetation

Establishment of an effective riparian buffer zone is critical to the success of a stream stabilization design. A combination of dormant plant materials, native seed mixtures,

and plantings of live trees and shrubs will be employed to initiate the development of a functioning riparian community. Native willow and dogwood species will be planted on the streambanks. Single or double rows of live fascines will be applied to flood plain benches, along side each vane, on outside bends and to other areas of special concern. All other areas of disturbance will be treated with rye seed mixtures and mulched to minimize soil losses followed by the application of permanent seed mixture and rates to be applied as specified in the drawings. Various species of woody trees and shrubs, appropriate for the riparian zone, shall be planted in the disturbed upland areas.

3.4.8 Wetland Mitigation

Wetlands and improved riparian buffer will be constructed to mitigate the disturbance of approximately 0.11 acres of wetland within the grading extent. Wetland will be developed totaling 0.12± acres in addition to the improvement of approximately 0.2 acres of riparian buffer. The attached project drawing **(SP-05)** further clarifies proposed location of the constructed wetland. Wetland vegetation will be established by use of a wet meadow seed mixture, with species selected for known wetland and wildlife values **(Table 9)**. The emergent species selected for this area would be tolerant of irregular surface inundation and are expected to survive in moist to saturated soil conditions. The wetland seed mixture would encourage the establishment of a uniform herbaceous cover. The seed mix to be used will be the "FACW Wetland Meadow Mix" marketed by Ernst Conservation Seed.

Table 9. Proposed wetland seed mixture.

Latin Name	Common Name
Elymus virginicus	Virginia Wild Rye
Carex vulpinoidea	Fox Sedge
Glyceria striata	Fowl Mannagrass
Scirpus atrovirens	Green Bulrush
Verbena hastata	Blue Vervain
Carex scoparia	Blunt Broom Sedge
Heliopsis helianthoides	Ox-Eye Sunflower
Carex lurida	Lurid/Shallow Sedge
Eupatorium perfoliatum	Boneset
Gylceria grandis	American Mannagrass
Juncus effusus	Soft Rush
Onoclea sensibilis	Sensitive Fern
Bidens Cernua	Nodding Bur Marigold
Carex comosa	Cosmos (Bristly) Sedge
Carex Lupulina	Hop Sedge
Eupatorium fistulosum	Joe Pye Weed
Eupatorium maculatum	Spotted Joe Pye Weed
Juncus tenuis, PA Ecotype	Path Rush, PA Ecotype
Mimulus ringens	Square Stemmed Monkey Flower
Scirpus polyphyllus	Many Leaved Bulrush
Vernonia gigantia	Giant Ironweed
Carex stipata	Awl Sedge
Carex tribuloides	Bristlebract Sedge
Geum laciniatum	Rough Avens

Glyceria canadensis	Rattlesnake Grass
Ludwigia alternifolia	Seedbox

Assessment of the existing 0.11 acre wetland indicated that this wetland is not suitable for performing wetland functions or values. In fact site investigations indicated that wetland is only present in this area due to water discharge from the existing snowmaking pond. The wetland to be developed will not outlet directly to the stream, and will perform the wetland function of providing groundwater recharge.

After construction the developed wetland will be monitored annually to ensure it is meeting the federal wetland criteria. Additionally, monitoring will ensure that an 85% survival and/or coverage rate of hydrophytic vegetation is being met or exceeded, and invasive vegetation cover is less than 5%. If monitoring determines these conditions are not being met then re-grading and re-planting may be necessary.

3.5 Design Performance

SMP's were considered with respect to their ability to treat or manage specific design goals and objectives. While specific objectives are often unique to a particular area, generally common goals include the following:

- Maintenance of groundwater recharge and quality;
- Reduction of stormwater pollutant loads;
- Protection of stream channels;
- Prevention of increased overbank flooding; and
- Safe conveyance of extreme floods.

The following sections reexamine proposed goals and objectives and quantify expected design performance of the proposed design.

3.5.1 Pollutant Removal

Annual pollutant load estimates for the proposed condition were calculated using the "The Simple Method" as described in The NYS Stormwater Management Design Manual (NYSDEC April 2008). Input data consisted of the effective annual rainfall of 42.4" for Greene County and existing land use and cover characteristics. **Table 10** displays annual estimates in pounds of Total Suspended Solids (TSS), Total Phosphorous (TP), and Total Nitrogen (TN) discharge from the proposed drainage areas.

Table 10. Pre-developed, existing and proposed condition pollutant loading.

TSS Removal						
Design Point	Pre-Development (lbs/Yr)	Existing (lbs/Yr)	Treatment Practice	Removal (lbs/Yr)	Proposed (lbs/Yr)	% Reduction Achieved
DP10	41.03	1131.48	Sand Filter & Wet Pond	1097.5	33.9	97%
DP16A	325.77	1783.18	Wet Pond	1426.5	356.6	80%
DP16B	127.05	526.16	Wet Pond	420.9	105.2	80%
DP17	125.06	5412.80	Swale & Wet Pond	5245.0	167.8	97%
Total	618.90	8854		8190.0	663.6	93%
TP Removal						
Design Point	Pre-Development (lbs/Yr)	Existing (lbs/Yr)	Treatment Practice	Removal (lbs/Yr)	Proposed (lbs/Yr)	% Reduction Achieved
DP10	0.09	2.43	Sand Filter & Wet Pond	1.9	0.49	80%
DP16A	0.70	4.64	Pond	2.32	2.32	50%
DP16B	0.27	1.20	Pond	0.60	0.60	50%
DP17	0.27	16.28	Swale & Wet Pond	11.4	4.88	70%
Total	1.33	24.5		16.26	8.29	66%
TN Removal						
Design Point	Pre-Development (lbs/Yr)	Existing (lbs/Yr)	Treatment Practice	Removal (lbs/Yr)	Proposed (lbs/Yr)	% Reduction Achieved
DP10	1.40	30.59	Sand Filter & Wet Pond	18.7	11.93	61%
DP16A	11.11	47.29	Pond	16.55	30.74	35%
DP16B	4.33	16.78	Pond	5.87	10.91	35%
DP17	4.27	105.70	Swale & Wet Pond	71.3	34.35	68%
Total	21.12	200.4		112.43	87.93	56%

These calculations show that the use of treatment practices will result in a substantial decrease in the amounts of suspended solids, phosphorus, and nitrogen which are discharged as a result of stormwater runoff. Although it is impossible to restore pollutant levels to pre-development conditions, these treatment practices will alleviate a substantial amount of the pollutant load. The following figures illustrate the decreased amount of pollutants being discharged from the site for the proposed site conditions.

Figure 1. Pre-developed, existing and proposed condition total suspended sediment annual load.

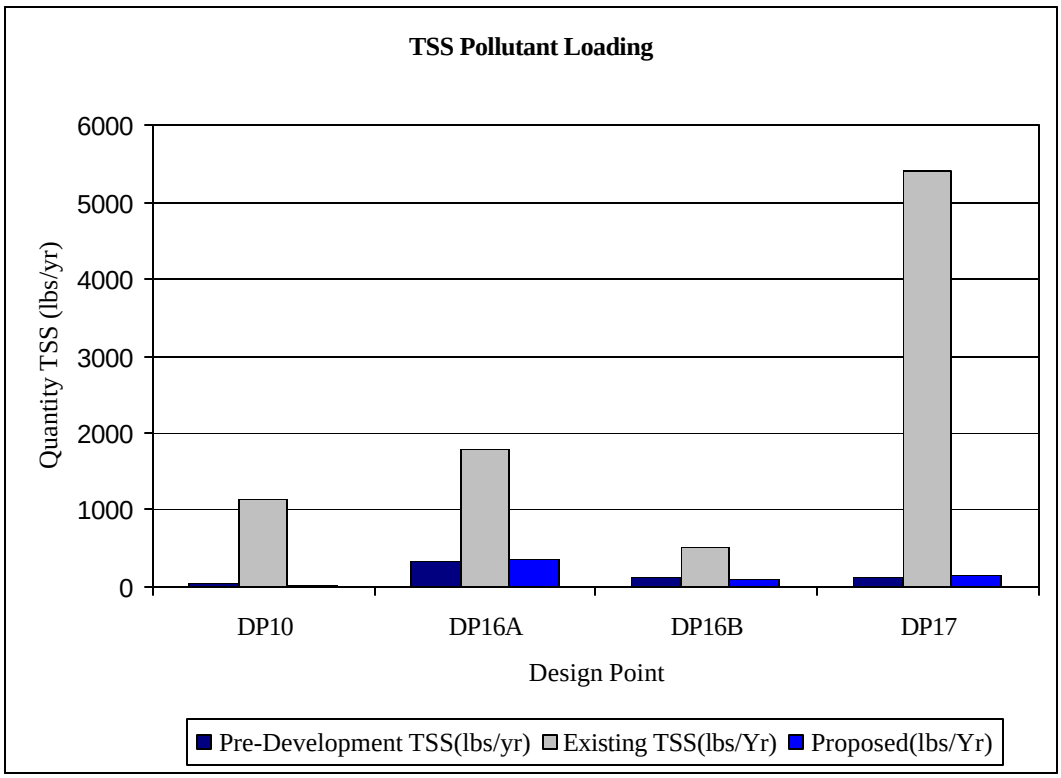


Figure 2. Pre-developed, existing and proposed condition total phosphorous annual load.

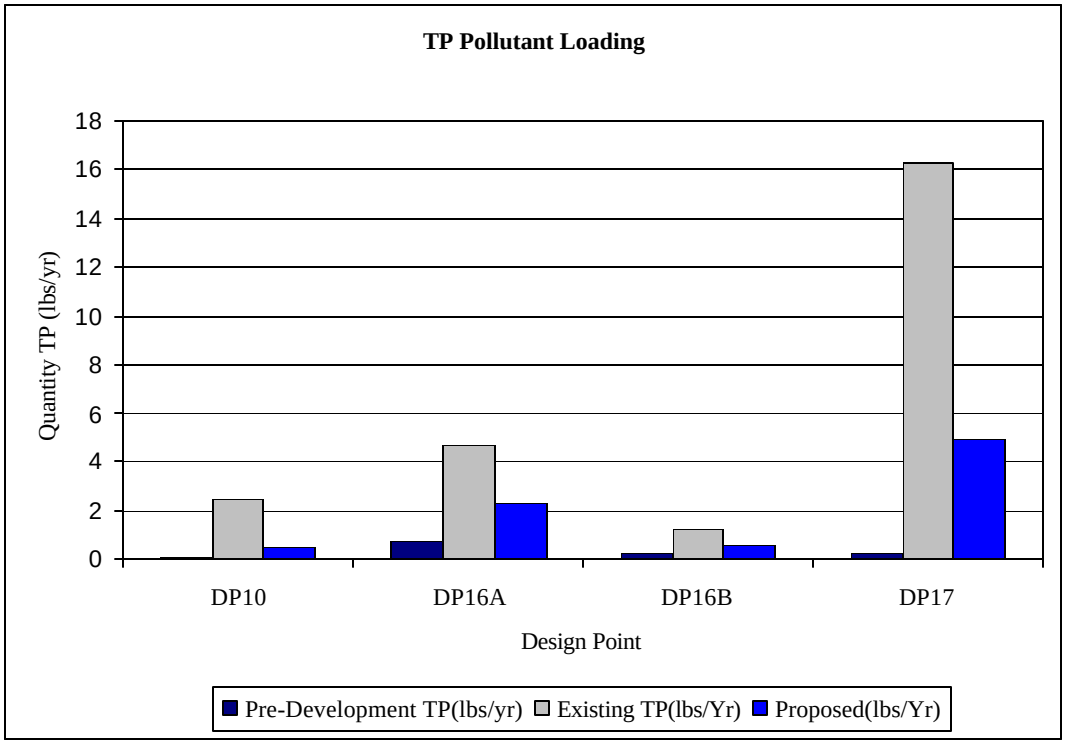
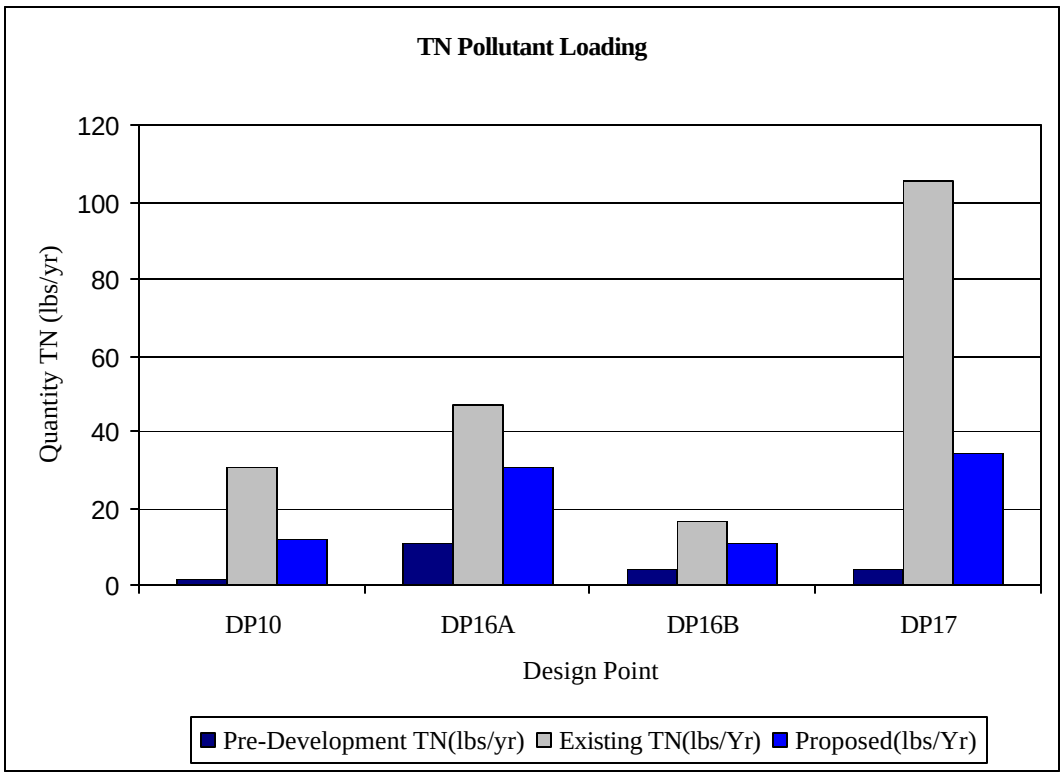


Figure 3. Pre-developed, existing and proposed condition total nitrogen annual load.



3.5.2 Stormwater Conveyance Improvements

All new components of the conveyance system have been designed for the 2- and 10-year storm events. The 10-year 24-hour discharge rate was used as a minimum for sizing closed storm drain systems. The following table (**Table 11**) describes the pipes required for the new conveyance system. All pipes listed in this table are also shown on sheet **SP-10** of the Project Drawings located in **Appendix G**.

Table 11. Summary of required pipes for stormwater conveyance system.

Pipe	Size (in.)	Length (ft.)	Upstream Invert	Downstream Invert	Slope (%)
1	36	137	1,614.75	1,614.50	0.18
2	30	123	1,624.50	1,614.75	7.93
3	24	129	1,633.50	1,624.50	6.98
4	24	145	1,642.50	1,633.50	6.21
5	36	220	1,645.00	1,639.00	2.73
6	18	153	1,648.25	1,642.50	3.76
7	30	90	1,627.00	1,614.50	13.89
8	30	88	1,630.00	1,627.00	3.41
9	12	50	1,627.50	1,626.00	3.00
10	18	36	1,672.00	1,671.50	1.39
11	18	86	1,673.00	1,672.00	1.16
12	18	148	1,674.50	1,673.00	1.01
13	18	35	1,675.00	1,674.50	1.43
14	24	50	1,677.00	1,675.00	4.00
15	12	20	1,674.00	1673.50	2.50

The 2-year event is used to ensure non-erosive flows through roadside swales, overflow channels, pond pilot channels and over berms within SMP's. **Table 12** details the ditches and swales which will be created or utilized for stormwater management. All channels listed in this table are also shown on sheet **SP-10** of the Project Drawings located in **Appendix G**.

Table 12. Summary of required channels for stormwater conveyance system.

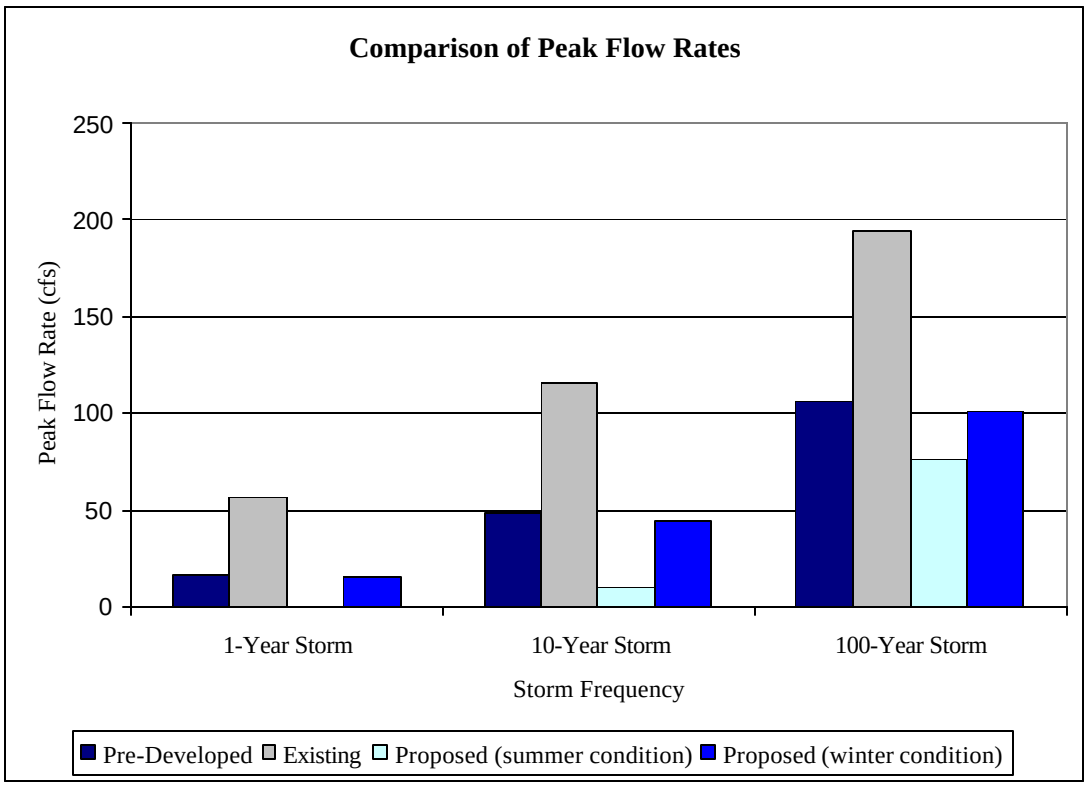
Ditch	Minimum Slope (%)	Channel Type	Bottom Width (in.)	Side Slopes	Channel Depth (in.)	Capacity (cfs)
1	1	Stone	24	8:1	3	1.28
2	2	Grass	12	2:1	6	3.20
3	13	Rip-rap	12	1:1	12	17.38
4	8	Rip-rap	12	1:1	12	13.63
5	Existing Channel					
6	2	Grass	12	1:1	12	9.09
7	3	Grass	24	1:1	24	53.00
8	3	Grass	12	1:1	12	11.13
9	3	Grass	12	1:1	12	11.13
10	3	Grass	12	1:1	12	11.13
11	Existing Channel					
12	1	Grass	12	1:1	12	6.43
13	6	Grass	12	1:1	12	15.74
14	1	Grass	12	1:1	12	6.43

3.5.3 Stormwater Runoff Rate Reduction

The retrofit project aimed to provide storm flow attenuation for the 1, 10 and 100-year 24-hour rainfall events. The existing condition hydrologic modeling performed on individual drainage areas (**Table 4**) was treated as the developed condition and pre-developed discharge estimates provided target discharge rates. Stormflow attenuation was accomplished through a combination of retention and extended detention that was achieved through the use of the stormwater pond and its associated outlet structure.

The pre-development, existing and proposed peak flow rates out of the stormwater pond can be seen in **Table 7**. The following figure illustrates the reduction in peak flow rates which was obtained using the stormwater pond.

Figure 4. Pre-developed, existing and proposed peak discharge rates for the 1-, 10- and 100-year storm



3.6 Construction Estimate

The following table details the approximate cost of the components of the Windham Mountain Stormwater Retrofit Project. **Table 13** is a preliminary estimate, the actual project costs may vary substantially as the design is finalized.

Table 13. Preliminary construction estimate for materials, construction labor and equipment costs.

Project Component	Estimated Cost
Construction Management	$127,880
Pond Expansion	$173,685
Conveyance System Improvements	$111,232
Parking Area Improvements	$360,965
Maintenance Facility Improvements	$378,000
Sand Filter	$59,208
Stream Enhancements	$115,982
Total	$1,334,954

4.0 Stormwater Pollution Prevention Plan (SWPPP)

This SWPPP presents the minimum required inspection and maintenance practices that shall be used to maintain erosion and sediment controls: To the degree practicable, all temporary erosion and sediment control mitigation measures shall be installed immediately before associated project areas are disturbed in anticipation of all soil disturbing activities to follow.

4.1 Project Construction Timing

Project construction should be undertaken during the summer/early fall season with the new pond outlet structures to be completed no later than early October. Construction should occur during dry weather in order to allow for proper compaction of fill material for the parking lot, and to reduce dewatering needs for the pond excavation. Equipment should be staged from the existing parking lot area to avoid damage to existing vegetation around the pond and stream channel.

4.2 Project Construction Sequence

The project will involve approximately 14.5 acres of total disturbance and will be completed in three phases to minimize the amount of disturbed area at any one time. An overall plan illustrating sediment controls is shown on sheet **SP-11** of the accompanying drawings. All measures shall be installed in accordance with New York State Standards and Specifications for Erosion and Sediment Control (August 2005). **Any change in construction design, construction operation or maintenance or construction sequencing, will require an amendment to the storm water pollution prevention plan and approval by GCSWCD, the Project Engineer, NYCDEP, NYCDEC and the owner. Any modification of the plan will be documented within the Site Construction Log Book.**

4.2.1 Phase I

Phase I will include the removal of two culverts in the stream channel, the installation of an outlet structure for the pond, the realignment of pipes crossing the channel, the installation of 3000 ft of 12 inch pipe and 1500 feet of 4 inch pipe, and the installation of several rock cross vanes in the stream channel. The phase will include approximately 2.9 acres of disturbance and is shown on sheet **SP-11** of the project drawings. Site access and staging will utilize the existing entrance to the site from Windham Mountain's parking lots to the west of the site. These parking lots are accessed via Clarence D. Lane Road. This entrance will be stabilized for use as the construction entrance. Phase I construction sequencing is as follows:

1. Install silt fence in all locations within the Phase I boundaries as shown on the approved plans.
2. Create stabilized construction entrance.
3. Close gates in stream channel and divert stream through pond and its overflow spillway.

4. Install turbidity pump in dewatered stream channel.
5. Realign pipe and remove culverts.
6. Install pipes along western edge of parking area.
7. Grade swale along western edge of parking area.
8. Install diversion pump at top of reach.
9. Install turbidity pump at downstream end of reach to be reconstructed.
10. Install rock cross vanes in stream channel.
11. Install vegetative measures of seed & mulch as specified on disturbed soil.
12. Open gates in stream channel to enable stream to bypass pond.

4.2.2 Phase II

Phase II will include the construction of the curtain drain along the southern edge of the parking area, as well as ditch improvements and the installation of underground conveyance to transport stormwater to the sand filter and installation of manholes and pipes on the western side of the parking area. The phase will include approximately 4.2 acres of disturbance and is shown on sheet **SP-11** of the project drawings. Site access will utilize the stabilized construction access established in Phase I. Phase II construction sequencing is as follows:

1. Install silt fence in all locations within the Phase II boundaries as shown on the approved plans.
2. Regrade existing ditch along access road that runs between drainage area 18 and drainage area 10.
3. Stabilize regraded ditch.
4. Excavate and install tanks for sand filters as well as underground pipe system to transport stormwater runoff from around the maintenance facility to the sand filter.
5. Install curtain drain along southern edge of parking area.
6. Install vegetative measures of seed & mulch as specified.
7. Install manholes and pipes for stormwater along the western side of the parking area.
8. Remove silt fence only after 80% stabilization has been achieved through permanent vegetation.

4.2.3 Phase III

Phase III will be subdivided into five sub-phases, Phase IIIa through IIIe. Construction for each sub-phase should be completed prior to commencing the next sub-phase of construction. Phase III will include constructing the pond expansion and forebay, as well as construction of the parking area and its associated drainage swales. Pond construction will be a component of each of the sub-phases. Each sub-phase will focus on constructing a different area of the parking lot. This is to ensure that the amount of exposed soil stays under the 5.0 acre threshold.

4.2.3a Phase IIIa

Phase IIIa will include construction of the pond and the southernmost terrace of the parking area, as well as creation of the drainage swale associated with that parking area. Phase IIIa will include approximately 3.8 acres of disturbance and is shown on sheet **SP-11** of the project drawings. Site access and staging area will utilize stabilized construction entrance from Phase I. Phase IIIa construction sequencing is as follows:

1. Install silt fence in all locations within the Phase IIIa boundaries as shown on the approved plans.
2. Begin excavation of the pond expansion.
3. Use excavated material to construct lifts to bring the southernmost parking terrace to 16" below grade, compacting as specified.
4. Cover fill material with stone and gravel as specified.
5. Construct swale with underdrain system and connect to manhole.
6. Install vegetative measures of seed & mulch as specified.

4.2.3b Phase IIIb

Phase IIIb will include construction of the pond and the second terrace of the parking area, as well as creation of the drainage swale associated with that terrace. Phase IIIb will include approximately 3.5 acres of disturbance and is shown on sheet **SP-11** of the project drawings. Site access and staging area will utilize stabilized construction entrance from Phase I. Phase IIIb construction sequencing is as follows:

1. Install silt fence in all locations within the Phase IIIb boundaries as shown on the approved plans.
2. Continue excavation for the pond expansion.
3. Use excavated material to construct lifts to bring the second parking terrace to 16" below grade, compacting as specified.
4. Cover fill material with stone and gravel as specified.
5. Construct swale with underdrain system and connect to manhole.
6. Install vegetative measures of seed & mulch as specified.

4.2.3b Phase IIIc

Phase IIIc will include construction of the pond and the third terrace of the parking area, as well as creation of the drainage swale associated with that terrace. Phase IIIc will include approximately 3.6 acres of disturbance and is shown on sheet **SP-11** of the project drawings. Site access and staging area will utilize stabilized construction entrance from Phase I. Phase IIIc construction sequencing is as follows:

1. Install silt fence in all locations within the Phase IIIc boundaries as shown on the approved plans.
2. Continue excavation for the pond expansion.
3. Use excavated material to construct lifts to bring the third parking terrace to 16" below grade, compacting as specified.
4. Cover fill material with stone and gravel as specified.
5. Construct swale with underdrain system and connect to manhole.
6. Install vegetative measures of seed & mulch as specified.

4.2.3b Phase IIId

Phase IIId will include construction of the pond and the fourth terrace of the parking area, as well as creation of the drainage swale associated with that terrace. Phase IIId will include approximately 4.2 acres of disturbance and is shown on sheet **SP-11** of the project drawings. Site access and staging area will utilize stabilized construction entrance from Phase I. Phase IIId construction sequencing is as follows:

1. Install silt fence in all locations within the Phase IIId boundaries as shown on the approved plans.
2. Continue excavation for the pond expansion.
3. Use excavated material to construct lifts to bring the fourth parking terrace to 16" below grade, compacting as specified.
4. Cover fill material with stone and gravel as specified.
5. Construct swale with underdrain system and connect to manhole.
6. Install vegetative measures of seed & mulch as specified.

4.2.3b Phase IIIe

Phase IIIe will include construction of the pond, forebay and swale, as well as construction of the northernmost terrace of the parking. Phase IIIe will include approximately 3.6 acres of disturbance and is shown on construction plan sheet **SP-11** of the project drawings. Site access and staging area will utilize stabilized construction entrance from Phase I. Phase IIIe construction sequencing is as follows:

1. Install silt fence in all locations within the Phase IIIe boundaries as shown on the approved plans.
2. Complete pond excavation.
3. Use excavated material to construct lifts to bring the northernmost parking terrace to 16" below grade, compacting as specified.
4. Cover fill material with stone and gravel as specified.
5. Construct pond forebay.
6. Install the forebay's outlet structure.
7. Construct swale along northern edge of parking area that transports water to the pond forebay.
8. Install vegetative measures of seed & mulch as specified.

4.3 Erosion and Sediment Controls / Stabilization Practice

The construction of the project shall proceed in three phases sized between 2.9 and 4.2 acres. All measures shall be installed in accordance with New York State Standards and Specifications for Erosion and Sediment Control (August 2005).

4.3.1 Temporary Stabilization

Topsoil stockpiles, staging areas and disturbed pervious portions of the project area where construction activity temporarily ceases for at least 14 days shall be stabilized with temporary seed and mulch.

Temporary seed shall be Rye (grain) applied at the rate of 30 pounds per acre. Straw Mulch shall be applied in conjunction with seeding and applied at the rate of 90 lbs per 1000 square feet. Seed and mulch shall be reapplied as necessary.

Sediment control fencing shall be installed around the site where depicted on the attached plan sheets. Sediment control fencing shall be "dug-in" using a narrow ditch witch device. Prior to commencing any earthwork, a stabilized construction entrance shall be installed as indicated on the attached plans. This entrance shall be utilized as the exclusive construction entrance and exit to the construction areas. Construction traffic shall be limited to the designated construction entrances.

Proposed grades that will have slopes steeper than 3:1 shall be stabilized with erosion control fabric.

4.3.2 Permanent Stabilization

Disturbed portions of the project area where construction activities permanently cease shall be stabilized with permanent seed no later than 7 days after the last construction activity. The permanent seed mix shall be in accordance with the project specifications and plans. Construction and maintenance of erosion and siltation control measures are in accordance with the New York Standards and Specifications for Erosion and Sediment Control (August 2005).

Where construction activity is complete, over areas to be permanently vegetated, stabilize with permanent seeding. Evenly apply seed in accordance with the species and rate indicated in the previous section by broadcasting or hydroseeding. Verify seeding dates with engineer. If engineer determines that seed cannot be applied due to climate, topsoil shall not be spread and mulching shall be applied to the exposed surface to stabilize soils until the next recommended seeding period.

4.4 Other Controls

In addition to temporary and permanent stabilization measures there will be numerous other controls required for managing erosion and sediment on the project. Additional

controls include waste disposal, sediment tracking by vehicles and non-stormwater discharges.

4.4.1 Waste Disposal

Waste materials – Foreign waste materials shall be collected and stored in a secured area until removal and disposal by a licensed solid waste management company. All trash and construction debris from the project area shall be disposed of in a portable container unit. No foreign waste materials shall be buried within the project area. All personnel shall be instructed regarding the correct procedure for waste disposal. Notices stating these practices shall be posted in the project trailer and the individual who manages day-to-day project operations will be responsible for seeing that these procedures are followed.

Hazardous Waste - All hazardous waste materials shall be disposed of in a manner specified by local or state regulations or by the manufacturer. Project personnel shall be instructed in these practices and the individual who manages day-to-day project operations shall be responsible for seeing that these practices are followed.

Sanitary Waste - Any sanitary waste from portable units shall be collected from the portable units by a licensed sanitary waste management contractor, as required by NYS DEC regulations.

4.4.2 Sediment Tracking by Vehicles

A stabilized construction entrance shall be installed and maintained as necessary to help reduce vehicular tracking of sediment. The entrance shall be cleaned of sediment and redressed when voids in the crushed stone become filled and vehicular tracking of sediment is occurring. Dump trucks hauling materials to and from the construction project area shall be covered with a tarpaulin to reduce dust. Any sediment and debris tracked from work area along project adjacent roadways shall be immediately removed with a street sweeper or equivalent sweeping method.

4.4.3 Non-Stormwater Discharges

Non-stormwater discharges are not expected to exit the project area during construction.

4.5 Timing of Controls/Measures

The erosion and sediment control measures shall be constructed prior to clearing or grading of any portion of the project. Where construction activity temporarily ceases for more than 21 days, areas to be vegetated shall be stabilized with a temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area, that area shall be stabilized with permanent measures. After the

entire project area is stabilized, the accumulated sediment shall be removed from the project area. Erosion control devices shall remain in place until disturbed areas are permanently stabilized.

4.6 Construction Inspection Procedures

Certified inspections must be carried out by a qualified inspector as outlined in the GP-0-08-001 permit. In order to be considered a qualified site inspector one must be: a licensed professional engineer P.E., a registered landscape architect (R.L.A.), a certified professional in erosion and sediment control (C.P.E.S.C.), or a trained technician who has attended a 4-hour training course and is working under the direct supervision of a licensed P.E. or R.L.A.

The SWPPP shall be updated/revised as conditions merit or as directed by the regulating authority. The attached inspection forms included with this document allows for the certification of any updates/revisions

4.6.1 Erosion and Sediment Control Inspection and Maintenance Practices

These are the minimum required inspection and maintenance practices that shall be used to maintain erosion and sediment controls:

- All control measures shall be inspected at least once every seven (7) calendar days using the "Weekly Inspection Form" attached in Appendix F.
- A copy of the SWPPP must be present onsite, in a publicly accessible location.
- A summary of the project area inspection activities shall be posted monthly in a publicly accessible location. A copy of the "Monthly Inspection Summary Form" is included in the "Construction Log" section of this plan.
- The operator shall prepare a written summary of the SWPPP's status with respect to compliance with the SPEDES general permit (GP-0-08-001) at a minimum frequency of every three months during which coverage under the permit exists. The summary should address the status of achieving each component of the SWPPP. A copy of the "Monitoring, Reporting and Three-Month Status Inspection Form", referenced from Appendix H of the New York State Standards and Specifications for Erosion and Sediment Control, is included in the "inspection forms" section of this plan.
- Prior to filing of the Notice of Termination or the end of permit term, the Operator shall have a qualified inspector perform a final project area inspection. This inspection shall certify that the project area has undergone final stabilization using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as

designed. A copy of the "Final Stabilization and Retention of Records Inspection Form", referenced from Appendix H of the New York Standards and Specifications for Erosion and Sediment Control, is included in the "inspection forms" section of this plan.

- All measures shall be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report or as ordered by the owner's representatives.
- Built up sediment shall be removed from any silt fence when it has reached one-third the height of the fence / dike.
- Sediment control fencing and wetland protection barrier shall be inspected for depth of sediment, and tears, to see if fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
- The construction entrance shall be cleaned of sediment and redressed when voids in the crushed stone become filled and vehicular tracking of sediment is occurring.
- Dust shall be controlled on access points and other disturbed areas subject to surface dust movement and blowing.
- Stabilization fabric and rock dams shall be inspected to ensure that slopes and swales are not being eroded. Fabric shall be replaced / reinstalled and rock dams added as necessary to prevent any such erosion
- Inspection of diversion swales shall be conducted to check condition of swale.
- The temporary sediment basin shall be inspected to check condition of basin.
- Inspection must verify that all practices are adequately operational, maintained properly and that sediment is removed from all control structures.
- Inspection must look for evidence of soil erosion on the site, potential for pollutants entering drainage systems, problems at the discharge points, and signs of soil and mud transport from the site to the public road.
- The site operator or superintendent shall select the individuals who will be responsible for the inspections, maintenance, repair activities, and filling out the inspection and maintenance report.
- Personnel selected for inspection and maintenance responsibilities shall have received proper training in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used on-site in good working order.
- The operator shall retain copies of SWPPP's, any reports submitted in conjunction with this permit and records of all data used to complete the NOI to be covered by this permit for a period of at least three years from the date that the site is finally stabilized.

4.6.2 Post-Construction Inspection and Maintenance Practices

The Ski Windham Operating Corporation will continue operating the site through permanent stabilization. Long-term inspection forms performed by the Operator for the stormwater management practices are referenced from Appendix H of the New York State Standards and Specifications for Erosion and Sediment Control (August

2005). An Operation and Maintenance Plan for all permanent controls can be seen in **Appendix J**.

4.7 Spill Prevention

The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

4.7.1 Good Housekeeping

The following good housekeeping practices shall be followed within project areas during construction:

- An effort shall be made to store only enough products required to do the job.
- All materials stored within project areas shall be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products shall be kept in their original containers with the original manufacturer's label.
- Substances shall not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product shall be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal shall be followed.
- The project superintendent shall inspect daily to ensure proper use and disposal of materials.

4.7.2 Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be within the project area during construction:

- Fertilizers / seeding materials.
- Stone.
- Concrete Pipe.
- Petroleum based products.
- Silt fence fabric.
- Lumber.
- Corrugated plastic pipe.
- Iron pipe and CMP.
- Steel pipe.
- Cellulose fiber mulch.
- Straw/hay mulch.
- Anchoring chemicals.

4.7.3 Hazardous Products

These practices are used to reduce the risks associated with hazardous materials:

- Products shall be kept in original containers unless they are not resealable.
- Original labels and material safety data shall be retained.
- If surplus product must be disposed of, manufacturers' or local and state recommended methods of proper disposal shall be followed.
- Material Safety Data Sheets for all hazardous products shall be within the project area for the duration of construction.

4.7.4 Product Specific Practices

The following product-specific practices shall be followed within the project areas:

4.7.4.1Petroleum Products

All project related vehicles shall be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers that are clearly labeled.

4.7.4.2 Fertilizers

Fertilizers used shall be applied only in the minimum amounts recommended by the manufacturer and specified by the engineer. Once applied, fertilizer shall be worked into the soil to limit exposure to stormwater. Fertilizers shall be stored in a covered or other contained area.

4.8 Spill Control Practices

The contractor will be responsible for preparing a project area specific spill control plan in accordance with local and NYS DEC regulations. At a minimum this plan should:

- Maintain Spill Kit on site at all times.
- Call NYCDEC Spill Response unit.
- Reduce stormwater contact if there is a spill.
- Contain the spill.
- Stop the source of the spill.
- Dispose of contaminated material in accordance with manufactures procedures, and NYS DEC regulations.
- Identify responsible and trained personnel.
- Ensure spill area is well ventilate

4.9 Contractor's Certification

I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Signature: _____ Date: _____

Name (Print): _____

Title: _____

Contracting Firm Name: _____

Address: _____

_____

Telephone: _____

Trained Individual(s):

Name: _____

Title: _____

Name: _____

Title: _____

SWPP Responsibilities: _____

_____

_____

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