Appendix C.4

Analysis of Impacts Associated with Water Resource Management at the Proposed Belleayre Resort

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PROJECT TECHNICAL MEMORANDUM

TO: NYCDEP – OEPA

FROM: EA Engineering, P.C. and its Affiliate EA Science and Technology

SUBJECT: Crossroads DEIS Review – Subtask C.5, Deliverable No. 6
– Analysis of Impacts Associated with Water Resource Management at the Proposed Belleayre Resort
EA Project No. 14112.01

DATE: 3 February 2004 (finalized April 2004)

INTRODUCTION

This report presents a holistic assessment of water resource management on the Project site and regional study area. A number of data sources and documents were used to complete this analysis of the overall water resource management of the proposed development and the impact to the hydrology of the project site and regional study area.

Data used in this analysis included the following sources:

1. Subtask A.2 Deliverable No. 2 – Review of the Adequacy and Age of Engineering Data Used in the Draft Environmental Impact Statement (DEIS) (Appendix A.3)

2. Subtask C.1 Deliverable No. C.1 – Analysis of Impact Associated with Stormwater at the Proposed Belleayre Resort (Appendix C.1)

3. Subtask C.2 Deliverable No. C.3 – Analysis of Impacts Associated with Erosion and Sedimentation at the Proposed Belleayre Resort (Appendix C.2)

4. Subtask C.3 Deliverable No. C.4 – Analysis of Impacts Associated with Wastewater at the Proposed Belleayre Resort (Appendix C.3)

5. Subtask C.4 Deliverable No. C.5 – Analysis of Water Quality Impacts Associated with Long-Term Regional Land Use Changes (Appendix C.5)

6. DEIS Appendix 19A with Exhibit 19A – Water Budget Analyses for Wildacres and Big Indian Resort

Please note: this document is not a carbon copy of the comments submitted to NYSDEC. Inaccurate pagination has been corrected.

7. DEIS Appendix 10A – Operational Phase Stormwater Quality and Management Plan

8. Daily precipitation from the New York State Department of Environmental Conservation (NYSDEC) monitoring station on Belleayre Mountain

9. Average annual precipitation from the National Climatic Data Center

10. Daily stream discharge data near Crossroads Venture property from New York City Department of Environmental Protection (NYCDEP)

11. Daily stream discharge for Birch Creek from the U.S. Geologic Survey.

NATURAL RESOURCE MANAGEMENT PLAN

The project applicant should take advantage of guidance that has been compiled and successfully implemented nationwide to provide environmentally sound developments of this nature. The Audubon International Signature Program may be considered a likely program to invest in. This program provides guidance for certification and continues a long-term relationship with the management staff to assure that high standards for environmental protection are maintained over the life of the project.

WATER RESOURCES MANAGEMENT

Hydrogeology

The discussion of the relationship between surface and groundwater resources provided in the DEIS is inadequate and inconsistent. It is recommended that Crossroads Venture develop a comprehensive model to clarify the relationship between surface water and shallow and deep groundwater aquifers at the site to better understand the impacts of development on runoff and recharge. In some sections, the DEIS indicates that groundwater pumped from the deep bedrock wells is confined and hydrologically isolated from the surface water and surficial aquifer. However, in another section, it is suggested that irrigation of the golf courses using water from deep bedrock wells would recharge the deep groundwater aquifer.

A thorough evaluation of the hydrogeology of the developed areas, including the Big Indian Plateau and Wildacres sites, should be presented in the DEIS. Of particular interest is the north face of Belleayre Mountain defined from Giggle Hollow to the confluence of Birch Creek and the Esopus Creek at Big Indian, and the Wildacres site including those areas located north of the proposed development that will receive surface and groundwater flow from the project. These areas are of specific interest due to the potential negative effects of the golf course development and operation on water quality and stormwater runoff quantity. The potential impacts include water quality degradation of the springs and watercourses in these areas and negative effects on the highly erodible deposits on the lower slopes of the valley walls.

Three stratigraphic units generally compose the cross-section of this area from the top plateau to the valley bottom. The stair-step geomorphology of the Catskill Mountain slopes is comprised of sandstone and siltstone bedrock with a thin, bouldery soil layer on the benches, and glacial deposits on the lower slope valley walls. This structure is typical of the area in the vicinity of the Big Indian Plateau.

The steep upper slopes above the valley floor escarpments consist of sheer bedrock ledge. These escarpments are the source of numerous springs along the lower benches. These springs form discrete channels across the benches or flow as shallow concentrated flow through the bouldery soil that make up the bench itself. The springs are sustained for long periods during the spring, fall, and winter by the secondary porosity within the bedrock fractures that are recharged by rainfall on the plateau and higher benches. Percolation and runoff through these flow paths can be rapid with little opportunity to pass through soil profiles, which could act as filters for particulate pollutants.

These watercourses and springs then discharged onto the lower slope valley wall composed of glacially derived clay and silt. These areas could be subject to mass movement if affected by rapid subsurface changes in soil moisture. Significant erosion associated with channel incision could result from increased stormwater runoff from development.

The glacial geology of the Wildacres site is somewhat different from the Big Indian Plateau in that the bedrock benches (typified by the Marlow Mansion site) are broader and the slopes have a much deeper soil profile consisting of thick drift. It is important to note that the deep gravel aquifers located on the relatively gentle slopes can act as prime recharge areas for wells and springs such as Fleischmanns' water supply.

Streamflow and Watershed Routing

Surface water springs, intermittent stream, and ephemeral conveyances both onsite and offsite have not been adequately mapped. This includes delineations of all existing individual watersheds within the project site and regional study area. The delineations of these headwaters should extend offsite across adjacent property to their confluence with Birch Creek, Lost Creek, and Emory Brook. Furthermore, the extent of development within each of these watersheds must be delineated to allow for an adequate assessment of the potential impacts to these local streams. This mapping evaluation is critical as it is the configuration of these watersheds that must be the basis for establishing the design points (stormwater points of interest) used in this hydrologic analysis. Specifically, questions that are not addressed include: (1) what are the changes in land cover for each watershed (e.g., impervious area), (2) pre- and post-development water balances for each watershed, (3) how has the change in storm flow routing impacted how and where runoff ultimately reaches the streams (i.e., in the headwaters or further downstream), and (4) what is the impact on surface water conveyances from the point where proposed stormwater discharge leaves the project property on the mountain slopes to where stormwater enters the receiving streams located in the valley.

In addition, numerous intermittent stream channels have not been delineated nor their effect on the stormwater control system design discussed in the DEIS, especially along the steep terrain uphill from the railroad bed. These intermittent streams have the potential to short-circuit the entire stormwater management plan. Many of the detention micro-ponds are designed to discharge stormwater as overland sheet flow via level spreaders. A number of these overland flow discharges are designed on steep slopes in areas above the new road across Giggle Hollow and above the railroad bed. Considering the steep terrain, numerous intermittent stream channels and springs, and the number of existing washouts that were observed along the railroad bed, it is likely that micro-pond discharges will quickly re-concentrate in channels contrary to the intent of the stormwater management plan. This concentrated flow on steep slopes will be greater than in the existing, predevelopment condition and could likely result in erosion and destabilization of slopes, swales, and drainage channels that have been designed without consideration of this potential impact. These springs and channels must be mapped in order to assess their proximity and potential connection to designed stormwater management control structures and their potential to disrupt the stormwater management plan.

Page 2-26 of the DEIS states that groundwater will be recharged via infiltration. This conclusion contradicts the conclusion of the pump test where it was determined that the bedrock aquifer is not hydraulically connected to the overburden. Additionally, the fairway under-drain design would further limit any recharge to the overburden. Therefore, this DEIS requires more in-depth discussion regarding groundwater recharge potentials.

Precipitation Rates

Precipitation is a key component in the WinSLAMM modeling for stormwater quality analysis and water budget analysis. Long-term (± 50 year) annual average precipitation for National Oceanic and Atmospheric Administration weather stations within 20 mi of the project site have been compiled in our review and are presented in Table 1.

TABLE 1 LONG-TERM AVERAGE ANNUAL PRECIPITATION FOR GAUGES WITHIN 25 MI OF THE PROJECT SITE

Station	Location	Distance from Belleayre Mountain (mi)	Elevation (ft AMSL)	Average Precipitation (in.) 1971-2000[(a)]	Period of Record
Arkville 2W	42°08'N / 74°39'W	5.25	1,310	40.97	1967 - Present
Slide Mountain	42°01'N / 74°25'W	9.56	2,650	63.61	1948 - Present
Phoencia	42°05'N / 74°19'W	10.82	870	53.14	1985-2001
Prattsville	42°20'N / 74°27'W	14.24	1,207	39.00	1948 - Present
Claryville	41°55'N / 74°34'W	15.19	1,653	52.66	1951 - Present
Stamford	42°24'N / 74°38'W	19.37	1,779	41.40	1948 - Present
Grahamsville	41°51'N / 74°32'W	19.60	960	48.02	1948 - Present
Windham 3E	42°18'N / 74°12'W	19.88	1,680	43.90	1948 - Present
Shokan Brown Station	41°57'N / 74°12'W	20.60	510	51.91	1940 - Present
Delhi 2SE	42°15'N / 74°54'W	21.21	1,440	43.20	1948 - Present

(a) Southern Regional Climate Center (www.srcc.lsu.edu/7100/prcp/NY.html).

SOURCE: National Climatic Data Center.

A project of this magnitude and in this location cannot ignore the spatial heterogeneity in rainfall data. Rainfall data summarized in Table 1 indicate that precipitation is extremely variable within the region, ranging from as low as 39 in. at Prattsville to 63.7 in. on top of Slide Mountain. The average precipitation used in the DEIS pollutant loading analysis was obtained from Tannersville, New York located nearly 20 mi from the proposed resort. In addition, data consistency is suspect in the DEIS, as multiple gauging locations were used for various DEIS analyses. For example, Slide Mountain with the highest annual precipitation rates is used for the water budget analysis, Tannersville is used for pollutant loading, Arkville is used in the GLEAMS modeling, and data from the NYSDEC gauge adjacent to the site on Belleayre Mountain were ignored altogether. Based on the long-term precipitation averages presented in Table 1, it appears that Tannersville annual precipitation used in the pollutant loading analysis (32 in.) is well below the long-term averages for sites in closer proximity to the proposed resort. This potential underestimate of precipitation would result in an underestimate in the pollutant loading analysis where the DEIS already projects a net increase in phosphorus loading offsite.

Because precipitation is a key variable in the models used in the DEIS, the developer must provide an analysis of the spatial heterogeneity in rainfall data within the region, and how representative each of the datasets is of the project site. This is particularly important in the WinSLAMM model, which used relatively low precipitation rates from the Tannersville data. At a minimum, the developer should provide a correlation between Tannersville data, Belleayre Mountain, and Slide Mountain (NOTE: The DEIS claims Slide Mountain is most representative of the site [Appendix 19A Page 3]) and, if applicable, apply a correction factor that would make the rainfall depths representative of the site. For consistency, the various analyses should all use the same source for precipitation data.

Water Budget Analysis: Changes in Pre- and Post-Development Water Quantity

EA's analysis of the site water budget and comparison to the WinSLAMM analysis results presented in the DEIS indicate that WinSLAMM has underestimated pre- and post-development runoff. This calls into question the validity of the stormwater flow and pollutant loading estimates and the adequacy of the stormwater management plan that depend on these calculations.

A water budget analysis was performed by Alpha Geosciences and is presented in Appendix 19A of the DEIS. The focus of the water budget analysis was to determine the amount of infiltration that would occur on the project site; the overall process included balancing the precipitation with runoff, infiltration, and evapotranspiration across the development. An average annual runoff coefficient of 0.4 was used across the site, which is typical of woodlands with shallow soils over bedrock (Dunne and Leopold 1978, Table 10-9), but may not be appropriate on a sub-basin scale given the complexity of the terrain within and adjacent to the areas proposed for development. The water budget analysis was prepared on a site-wide basis and was applied in an appropriate manner to evaluate overall effects on water supply, however, it was not used as recommended by NYCDEP as a collaborative tool for analysis of pre- versus post-development stormwater runoff routing and infiltration.

Absorption beds were initially proposed as part of the wastewater treatment system for the development and were included in the water budget analysis. Although the absorption beds are no longer a component of the proposed design, the water budget analysis was not revised to account for this reduction in infiltration.

EA has calculated water budgets for several watersheds in close proximity to the project site (Table 2) to compare runoff yields modeled in WinSLAMM to observed data. Water budgets were calculated for the water year ending 1 October 2002, since precipitation and streamflow data were readily available. It should be noted that EA's water budget analysis is focused at the watershed scale in contrast to the DEIS water budget analysis which is focused at the scale of the project site and various soil groups. The overall approach to developing a water budget involves calculating watershed inputs (i.e., precipitation) and outputs (i.e., runoff and evapotranspiration). Precipitation on Belleayre Mountain has been measured since the early 1990s at a meteorological station operated by NYSDEC. Runoff via stream discharge has been measured by NYCDEP for several streams within and around the project site for the past several years. Two assumptions are typically required when calculating water budgets: (1) changes in storage are assumed to be negligible by calculating the balance on a water year basis (1 October – 30 September); and (2) evapotranspiration is assumed to be the difference between precipitation and runoff (NOTE: These assumptions are accepted and routinely used by the USGS when calculating water budgets where evapotranspiration data are not readily available).

TABLE 2 WATER BUDGET ANALYSIS FOR NEARBY STREAMS

Site	Water Year	Drainage Area (ha)	Precipitation (in.)	Annual Runoff (mm)	Annual Runoff (in.)	Runoff Coefficient
BELLE5	2002	62.16	38	274.4	10.8	0.28
BELLEGIG	2002	147.63	38	524.9	20.7	0.54
BELLETOD	2002	334.11	38	137.6	5.4	0.14
BELLOST	2002	437.71	38	310.4	12.2	0.32
SENECA	2002	181.30	38	255.8	10.1	0.27
BIRCH	2002	3,237.49	38	485.0	19.1	0.24

NOTE: Water year is from 1 October to 30 September as used by the U.S. Geologic Survey.

Based on results of EA's water budget analysis and comparison to the DEIS WinSLAMM output results, WinSLAMM has underestimated pre- and post-development runoff. For year 1993, WinSLAMM estimated pre-development runoff for the Big Indian parcel as 111 mm (or a runoff coefficient of 0.14). This is only a quarter of the runoff coefficient yielded in the water budget analysis for Giggle Hollow in water year 2002. Giggle Hollow water year 2002 provides a valid comparison since water year 2002 had similar precipitation to that used in the 1993 WinSLAMM modeling. Giggle Hollow is located within the project site, has similar topography, and has similar land use as the pre-development condition at Big Indian. This review has a number of implications including that the DEIS underestimates pollutant loading and underestimates stormwater runoff. Giggle Hollow's high runoff coefficient indicates that rainfall on Belleayre Mountain is not readily abstracted. Rather, soil water is quickly routed to the stream channel via a subsurface stormflow mechanism, a mechanism that is well documented in the literature

(Whipkey 1965; Hewlett and Hibbert 1967; Freeze 1974; Beven and Germann 1982). It is strongly suggested that the model be verified and validated using observed data collected by NYCDEP. An analysis of the residuals of the predicted versus the observed results can be performed to evaluate trends and biases in the deferential.

Runoff is expected to decrease based on WinSLAMM model results (Tables 3 and 4). This has the potential to reduce water yields to the Ashokan and Pepacton reservoirs, although this change may be negligible.

TABLE 3 ANNUAL RUNOFF ESTIMATED BY WinSLAMM FOR WILDACRES PRE- AND POST-DEVELOPMENT

	Parcel	Area (ha)	Annual Runoff Volume	
			(ft^3)	(gal)
Wildacres Resort	*Pre-development*	224	14,015,540	104,836,239
	Post-development	201	9,816,851	73,430,045
Highmount Estates	*Pre-development*	69	2,765,894	20,688,887
	Post-development	69	2,172,657	16,251,474
Wildacres (combined)	*Pre-development*	494	26,598,285	198,955,172
	Post-development	339	14,755,402	110,370,407
	Net change	**-155**	**(11,842,883)**	**(88,584,765)**
	Net change (%)	**-31%**	**-45%**	

TABLE 4 ANNUAL RUNOFF ESTIMATED BY WinSLAMMFOR BIG INDIAN PRE- AND POST-DEVELOPMENT

	Parcel	Area (ha)	Annual Runoff Volume	
			(ft^3)	(gal)
Big Indian Resort	*Pre-development*	392	NA	NA
	Post-development	392	13,267,095	99,237,871
Belleayre Highlands	*Pre-development*	178	NA	NA
	Post-development	178	7,059,589	52,805,726
Big Indian (combined)	*Pre-development*	570	22,910,000	171,366,800
	Post-development	570	20,326,684	152,043,596
	Net change	**0**	**(2,583,316)**	**(19,323,204)**
	Net change (%)	**0%**	**-11%**	
NOTE: NA = Not available.				

Impervious Surfaces: Changes and Location

For a detailed analysis of changes in impervious areas due to direct and indirect development, see Appendix C.5 (Analysis of Water Quality Impacts Associated with Long-Term Regional Land Use Changes). In general, under worst-case scenarios, the amount of impervious area that might result from induced growth could be as much as 12 acres. Since most of this development is projected to occur along Route 28 in proximity to the entrance to the Belleayre Ski Resort, impacts to these headwater streams could be significant. This additional development has the potential to increase stream temperatures from stormwater runoff and water quality degradation from contaminant wash-off from parking lots and streets.

As discussed in earlier sections, watersheds within the project site and regional study area have not been adequately delineated. This does not allow for an adequate review of the changes in impervious area within each of these small watersheds. Crossroads should use their Geographic Information System coverages to delineate watersheds and overlay developed areas to calculate impacts.

The employee parking (285 spaces) seems to be undersized for the total number of full-time and seasonal employees (832). It appears that the number of employees was divided by 3 (i.e., 3 shifts) to determine the number of spaces required. However, it is unlikely that the proportion of employees working during the day and night would be equivalent. The parking section also indicates that additional onsite parking for "special events" would be located on grassed areas; DEIS (Page 2-45) states *"Additional onsite temporary grass surface parking areas that exist next to both hotels will accommodate any overflow parking for special events."* Depending on the frequency and the magnitude of this usage, it may eventually be decided to pave this area; the DEIS should address this as an alternative and present information relative to the additional increase in impervious surface that would be generated.

Stormwater/Snowmelt Control, Treatment, and Disposal

The WinSLAMM model does not account for runoff during the winter, including spring snowmelt and rain on snow events, again resulting in an underestimation of runoff and associated pollutant loads for rain on snow events. To account for spring snowmelt, the DEIS states that basins have been resized to attenuate spring snowmelt based on the New York State Stormwater Design Manual. Calculations and assumptions used to estimate the storage required for spring snowmelt should be provided in the DEIS and validated. Additionally, snow removal activities should be detailed, including stockpile locations. These locations should be taken into consideration for the stormwater management design (i.e., impact of melting during a rain on snow event).

Analysis of Pesticide Risk

Two models were used in the DEIS for risk assessment of impacts to groundwater from use of pesticides under the turf management plan: GLEAMS was used to evaluate pesticide transport in stormwater runoff, and LEACHM was used to assess vertical leaching of pesticides through the soil profile. The results of this risk assessment are potentially invalid due to inappropriate characterization of the post-development soils. The analysis used the type soil profiles for the five mapped soil units onsite; these soil profiles were 2.5 m in depth. However, the grading plans for the area of the golf courses indicate that there will be extensive cut/fill and that crushed rock and underdrains will be placed below a 6- to 8-in soil/turf layer. The soil profiles used in the model do not reflect the post-development soil conditions. It is likely that the thin soil/turf layer and underdrains will short-circuit the leaching process, transporting pesticides to the detention micro-ponds rather than leaching through 2-3 m of soil above the water table. If this short-circuiting occurs, higher concentrations of pesticides are likely to reach Waters of the State than predicted by the applicants modeling.

The pesticide Groundwater Monitoring Program and the draft State Pollutant Discharge Elimination System (SPDES) permit designate four existing wells for monitoring pesticide contamination of groundwater. The designated wells are installed into deep bedrock 400-700 ft below the golf course. Considering that the DEIS indicates that there is no hydraulic connection between surface water and the deep bedrock aquifer, these wells are inappropriate monitoring locations for assessment of impacts to ecological receptors, Fleischmanns' water supply, or the New York City reservoir system. It is more appropriate to monitor infiltration and potential contamination of groundwater using shallow overburden wells. The DEIS should propose a rigorous monitoring program with installation of a system of new shallow monitoring wells for use in SPDES compliance monitoring.

Golf Course Irrigation Sources and Methods

The DEIS does not present a detailed quantitative assessment of the irrigation requirements for the golf courses during both turf establishment and subsequent operation. Rather, typical volumes used by other courses in the area are presented based on personal communication with golf course managers. Estimates of irrigation demand, based on area to be irrigated, infiltration, and retention rates, should be provided for a range of operating conditions (e.g., average water year, drought year). These numbers should then be assessed for their implications to the overall water budget for the entire development as well as the small watersheds within the project site and regional study area. Note that ponds that are part of the stormwater management facility cannot be used for irrigation purposes, however, these ponds appear to receive discharge from the fairway underdrains which is not included in the hydraulic analysis in HydroCad.

Development of Groundwater Production Wells

The hydrogeologic investigation to demonstrate the capacity of the production wells for the Big Indian and Belleayre Highlands development is inadequate. The Big Indian Plateau will use wells RW-1, RW-2 (82,080 gpd + 102,240 = 184,320), and Silo A (99,792 gpd) spring (backup only) for its water source. RW-1 will be used to fill the retention ponds for irrigation and RW-2 will be used for potable needs. These sources are upgradient of the Pine Hill Water Company water supply and warrant a thorough investigation of their potential impacts (i.e., drawdown and reduction of yield) on local residential wells as well as the Pine Hill water sources.

The total potable water requirement for the Big Indian Plateau (DEIS Table 1) is 114,817 gpd. This water will be supplied by well RW-2 that is capable of a sustained yield of 71 gpm (while simultaneous pumping at RW-1) or 102,000 gpd, a shortage of 12,817 gal. RW-1, capable of yielding 57 gpm (82,080 gpd), is more than capable of making up this shortfall. Although water supply appears adequate, the impacts to surrounding area wells as a result of these withdrawals have not been adequately addressed, and the long-term sustainability of these sources has not been demonstrated. The water supply study has made the assumption that these sustainable yields are fixed and have not adequately addressed growth in the local community. The connection (or lack thereof) between the planned water usage and the Pine Hill Water Company water supply has not been adequately addressed. Whether or not the proposed development will hinder Pine Hill Water Company's ability to expand their water usage to meet *future* demand

within the water district is not addressed. Although the DEIS concluded that there was no impact to the Pine Hill Water Supply based on a 72-hour pump test, a thorough understanding of the bedrock fracturing system is needed to establish that there will be no impact to this resource.

The water supply analysis should be supplemented by inclusion of hydrogeologic cross-sections showing the relationship of the onsite wells to the Pine Hill Water Company springs and wells and the physical relationships and hydraulic communications and barriers between the overburden and bedrock aquifers.

The pump tests were qualitative in nature. Long-term pumping projections were based solely on straight-line projections on semi-log plots. Residential wells measured during the pump test were hydraulically downgradient and in the opposite direction of the Pine Hill Water Supply. Only Residential Wells 3 and 4 were completed in bedrock. Residential Well 3 was artesian and, thus, not capable of being monitored in a quantifiable way; well elevations may also be useful in understanding why Residential Well 3 is artesian. Indeed, there is no apparent reason why they should have been affected.

The conclusions on well yield and the effects of pumping on nearby bedrock water supplies are based solely on data collected from one downgradient bedrock well (Residential Well 4). The other wells monitored were overburden wells and, thus, were not affected. The finding that the overburden wells were not affected is significant as it relates to statements made in the DEIS water budget analyses regarding recharge to groundwater water supplies due to irrigation. If the bedrock groundwater supply is not hydraulically connected to the overburden, then it is unlikely that any significant recharge to the bedrock aquifer would occur via infiltration of irrigation water to the overburden.

There were no upgradient bedrock wells monitored between the pump test location and the Pine Hill Water Company supply wells. The Station well and the PH-1 Pine Hill Water Company wells were monitored during the pump test. The Station and PH-1 wells were located 6,000 and 7,400 ft away, respectively. Therefore, a 6,000-ft data gap exists between the test location and the area of most concern regarding potential impacts. Since no observation wells were located upgradient, it is not be possible to rule out a hydraulic connection to the Pine Hill Water Supply.

During simultaneous pumping of RW-1 and RW-2, Residential Well 4 had significant drawdown (18 ft) during the pump test although Residential Well 1 showed no effect though located less than half the distance away. These results are inconsistent with those determined during the RW-2 only pump test, and this must be evaluated. This finding is significant, as Residential Well 4 is located approximately 1,600 ft away from the pumping wells that, in turn, are located 6,000 ft from the Pine Hill Water Supply. Additionally, the observation wells were aligned in a generally straight line so anisotropic effects due to fracture orientation could not be readily quantified. The orientation and connection of subsurface fractures were not discussed in the DEIS. Fracture orientation is important since well drawdown effects will be greater with wells located along a fracture line than wells located perpendicular to them. Since all the wells were orientated in a straight line, any differential drawdown related to fracture alignment could not be ascertained. The orientation of these fractures must be established especially in relationship to the upgradient Pine Hill Water Supply sources. This information can also be used to properly plan the monitoring well array.

An inflection (change in slope) of the graphed drawdown data was noted on pumping well RW-2 data that needs to be further explained. A change of this type indicates that a change in well yield was noted during the pumping test. This particular inflection indicates a change of recharge conditions for this well at a drawdown of approximately 40 ft; a similar inflection was also noted on the recovery data for this well.

DEIS Appendix 7 Exhibit E, Well RW-2 Report, Section 4.5 briefly mentions boundary effects. If no boundary conditions were encountered or suspected during the pump tests, then this must be clearly stated. A boundary effect can have serious impacts on long-term well yield and, thus, must be further discussed and evaluated.

KEY ISSUES – WATER RESOURCES ANALYSIS

1. Crossroads should use their Geographic Information System coverages to delineate watersheds and overlay developed areas to calculate impacts.

2. Watersheds within the regional study area and project site should be delineated. The small watersheds will be most susceptible to the land use change and potential impacts should be addressed.

3. It appears that WinSLAMM under-predicted pre-development runoff based on an analysis of water balances and runoff yields for nearby streams.

4. Average precipitation rates for stations near the site vary widely. Precipitation rates used in the pollutant loading analysis, therefore, may be underestimated.

CONCLUSION

This review indicates that the water budget analysis is flawed due to the selection of inappropriate data sources to represent conditions at the site of the proposed Belleayre Resort. Various analyses presented in the DEIS used different locations to estimate precipitation, however, ignored data collected by NYSDEC adjacent to the site at Belleayre Mountain. The data used for the water budget (Slide Mountain) overestimate the available precipitation, while the data used for the pollutant loading (Tannersville) underestimate precipitation. Generic runoff coefficients used in the DEIS are significantly lower than site-specific data collected by NYCDEP and provided to the applicant. The inconsistencies and underestimates indicate that the estimated stormwater loading to the watersheds during the operational phase of the proposed project may be underestimated in the DEIS. Underestimates of stormwater flow impact subsequent analyses of pollutant loading and design parameters for the stormwater management and control structures. Higher flows than estimated in the DEIS indicate the mass loadings of pollutants are also underestimated. Higher flows also indicate that temporary construction stormwater ponds, operational phase extended detention micro ponds, and other stormwater control structures and drainage channels may be undersized and, therefore, ineffective for mitigating stormwater flows and pollutant loads.

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