

# **APPENDIX D**

## **STORMWATER APPENDIX**

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**LJA**

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**HYDROLOGIC AND HYDRAULIC ANALYSIS AND  
STORMWATER DESIGN CALCULATIONS**

**Prepared for**

**BALD HILL ESTATES**

**TOWN OF MONROE  
ORANGE COUNTY, NEW YORK**

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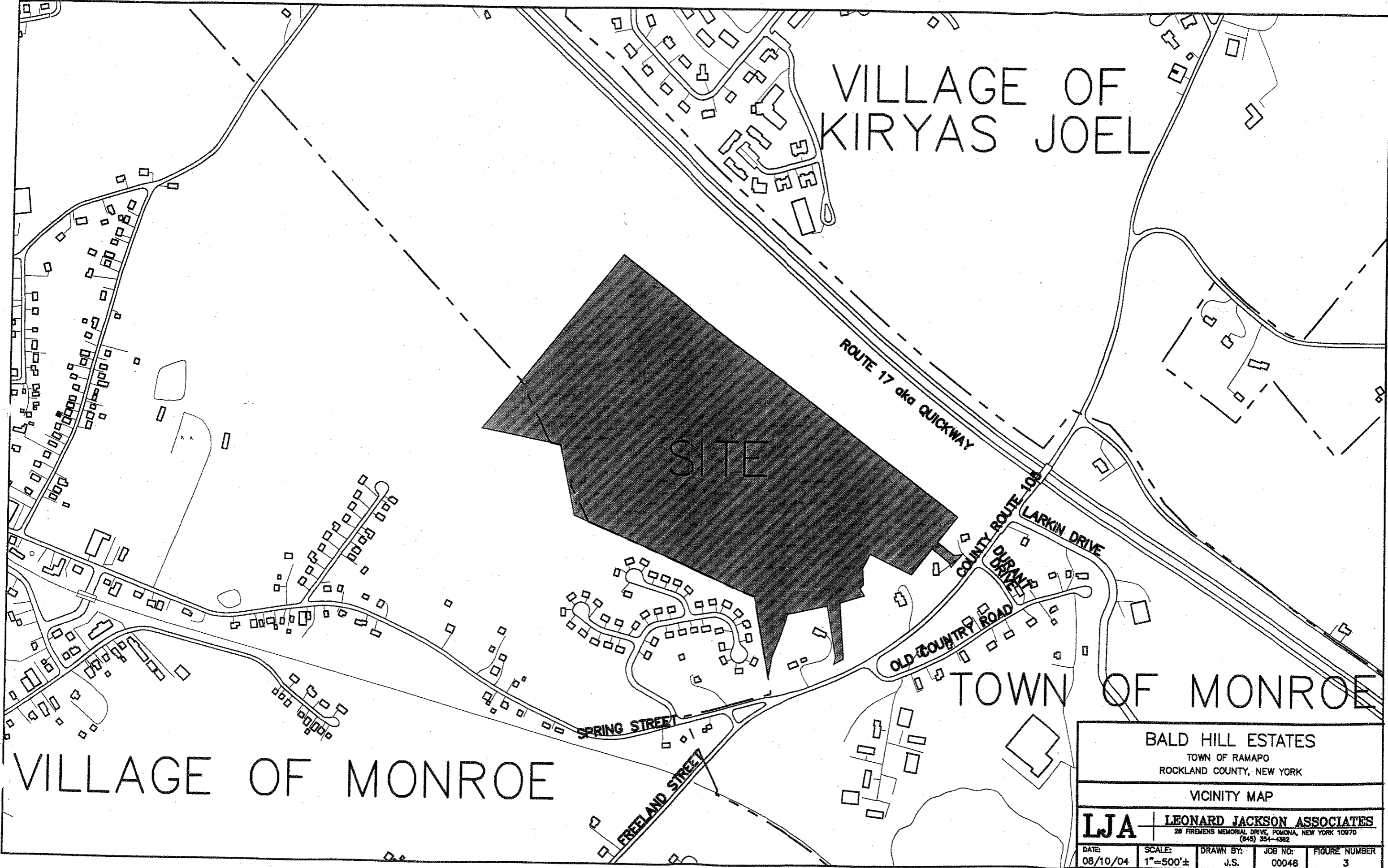
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### Appendix

Existing Conditions HEC-1 Output
Developed Conditions HEC-1 Output
Existing Conditions Floodplain HEC-RAS Output
Existing Conditions Floodway HEC-RAS Output
Developed Conditions Floodplain HEC-RAS Output
Developed Conditions Floodway HEC-RAS Output

TABLE 1 - SUMMARY OF PEAK DISCHARGES						
RECURRENT INTERVAL	Leaving Bald Hill Site			At Confluence of Tributary 25 and the Ramapo Creek		
	EXISTING CONDITIONS (cfs)	DEVELOPED CONDITIONS (cfs)	NET CHANGE (cfs)	EXISTING CONDITIONS (cfs)	DEVELOPED CONDITIONS (cfs)	NET CHANGE (cfs)
2-YR	20.68	6.25	-14.43	55.28	45.09	-10.19
5-YR	43.09	33.42	-9.67	130.39	130.34	-0.05
10-YR	61.08	49.24	-11.84	200.95	200.07	-0.88
25-YR	73.28	59.38	-13.90	251.00	249.62	-1.38
50-YR	91.25	73.61	-17.64	328.41	325.97	-2.44
100-YR	115.07	97.48	-17.59	440.00	439.42	-0.58



VILLAGE OF  
KIRYAS JOEL

SITE

ROUTE 17 aka QUICKWAY

COUNTY ROUTE 109

LARKIN DRIVE

DURAND DRIVE

OLD COUNTRY ROAD

SPRING STREET

FREELAND STREET

TOWN OF MONROE

VILLAGE OF MONROE

<b>BALD HILL ESTATES</b> TOWN OF RAMAPO ROCKLAND COUNTY, NEW YORK			
VICINITY MAP			
<b>LJA</b>		<b>LEONARD JACKSON ASSOCIATES</b> <small>28 FIREMENS MEMORIAL DRIVE, POMONA, NEW YORK 10670 (845) 351-4382</small>	
DATE:	SCALE:	DRAWN BY:	FIGURE NUMBER
08/10/04	1"=500'±	J.S.	3
		JOB NO:	
		00046	

## Methodology

The Bald Hill Estates site is located on the west side of County Route 105 in the Town of Monroe, just south of Route 17 (also known as the Quickway). The site has an area of 70.9 acres sloping moderately from west to east from an elevation of 890 at the top of Bald Hill to an elevation of 590 at the banks of Tributary 25, which flows through the easterly portion of the site. There is minimal offsite drainage area which enters the site due to the fact that it is located at a high point. All the runoff from the site drains to Tributary 25. The proposed development consists of 112 townhomes, with associated roadways, driveways and parking areas.

There are two points of interest for this analysis. Point of Interest 'A' is the upstream end of the County Route 105 culvert on Tributary 25, the point at which all runoff from the developed portion of the site (subareas 2 through 9) are joined; and Point of Interest 'B' which is the confluence of Tributary 25 with the Ramapo Creek. The Tributary 25 drainage basin was divided into 9 subareas, which were determined according to how the runoff from each will be controlled for developed conditions. These are as follows:

<u>Subarea</u>	<u>Subarea Description</u>
Subarea 1	Subarea containing both onsite and offsite areas which are not to be disturbed and do not drain into the proposed onsite storm drainage system. This includes all area not defined in Subareas 2 through 9 draining to Tributary 25 above its confluence with the Ramapo Creek.
Subarea 2	Offsite area to the southwest of the site which drains onto the site and into the proposed leaching basins. No disturbance is to occur in this area.
Subarea 3	Offsite area to the southeast of the site, which under existing conditions drains across the site to Tributary 25. Under developed conditions, the runoff from this area is intercepted by the onsite storm drainage system and directed to proposed Detention Basin 'D'. No disturbance will be made in this subarea.
Subarea 4	Onsite area in the north-central portion of the site which drains into Tributary 25 under existing conditions and is completely wooded. Under developed conditions, runoff from this subarea enters proposed Detention Basin "A". 36 of the townhomes and some road and driveway area are contained within this subarea.
Subarea 5	Onsite area in the south-central portion of the site, which for existing conditions drains partially into Tributary 25 and partially across the southern property line of the site, and eventually into Tributary 25. Under existing conditions, this subarea is completely wooded. Runoff from this subarea enters proposed Detention Basin "B" under developed conditions. 70 of the townhomes, a majority of the roadway and the water tank are located in this subarea.
Subarea 6	Onsite area in the eastern portion of the site, which under existing conditions drains into Tributary 25. This subarea flows into Detention Basin "B" under developed conditions. This subarea contains no impervious area for developed conditions, with only minor grading taking place.
Subarea 7	This subarea is no longer utilized in these analyses. The area formerly contained in this subarea is now part of Subarea 5
Subarea 8	Onsite area in the eastern portion of the site, which under existing conditions drains into Tributary 25. This subarea flows into Detention Basin "D" under developed conditions. This subarea contains only impervious area from the proposed roadways.
Subarea 9	Onsite area in the southeast portion of the site which drains into Tributary 25 under existing conditions. This subarea enters proposed leaching basins under developed conditions. This subarea contains 6 of the townhomes and some of the roadway.

The SCS method was used for this analysis to determine the existing and developed conditions curve numbers for each subareas. This was done by determining the existing soil type from the Orange County, NY Soil Survey and along with the ground cover using the TR-55 Table 2-2 to determine the applicable curve number. A weighted curve number for each subarea was calculated, and then utilized in the United States Army Corps of Engineers HEC-1 Hydrologic Computer Program. HEC-1 was utilized to generate, combine and route runoff hydrographs for rainfall events including the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals.

Water quality mitigation has been provided for runoff from all developed areas as required by the New York State Department of Environmental Conservation. This has been accomplished in the form of the three proposed detention basins which accept runoff from subareas 4, 5, 6, and 8 (Detention Basin "C" is no longer utilized in these analyses). Subarea 9 had been treated for water quality by use of 8 8-foot diameter, 8-foot deep leaching basins connected in series, with pretreatment being provided by a 6000-gallon oil-water separator tank (no routing benefit is obtained from these leaching basins, and therefore have not been incorporated in the hydrologic models). These measures have all been designed in accordance with the NYSDEC Stormwater Management Design Manual.

There shall be a zero net increase in peak rates of runoff under developed conditions for all recurrence intervals analyzed.

To compile the existing conditions HEC-1 model:

- The hydrographs for all subareas were combined to produce the peak rate of runoff leaving the site under existing conditions.

To compile the developed conditions HEC-1 model:

- The hydrographs for subareas 4, 5, 6 and 8 were routed through the proposed detention basins as follows:
  - Subarea 4 was routed through Basin "A". Basin "A" has a volume of 0.1044 acre-feet in the permanent pool, and a total volume of 1.4079 acre-feet at the top of the basin. The outflow from the basin is controlled by two orifices and an overflow weir: 1) a 3" diameter orifice at elevation 628.0, at the top of the permanent pool, which is utilized for water quality purposes, 2) a 18" diameter orifice at elevation 630.3 and 3) an overflow weir is provided at elevation 635.0 (refer to elevation vs. discharge calculations, page 68).
  - Subarea 5 and Subarea 6 are routed through Detention Basin "B". For this basin there is a volume of 0.1279 acre-feet in the permanent pool, and a total volume of 1.7392 acre-feet in the basin. The outflow from the basin is controlled by three orifices and an overflow weir: 1) a 3" diameter orifice at elevation 616.0, at the top of the permanent pool, which is utilized for water quality purposes, 2) a 18" diameter orifice at elevation 620.7, 3) a 24" diameter orifice at elevation 620.7 and 4) an overflow weir is provided at elevation 623.5 (refer to elevation vs. discharge calculations, page 69).
  - Subarea 8 was routed through Basin "D", which has a storage volume of 0.0794 acre-feet provided for a permanent pool. A total storage volume of 0.5273 acre-feet is provided in the basin. The outflow from the basin is controlled by two orifices and an overflow weir: 1) a 3" diameter orifice at elevation 600.0, at the top of the permanent pool, which is utilized for water quality purposes, 2) a 14" diameter orifice at elevation 601.7, and 3) an overflow weir at elevation 604.0 (refer to elevation vs. discharge calculations, page 71).

- The hydrographs for subareas 1, 2, 3, and 9, and the routed hydrographs from each of the three detention basins were lagged and combined to produce the combined hydrograph for the Tributary 25 drainage basin. This hydrograph demonstrates that the peak discharge for developed conditions is not greater than that of existing conditions, thus achieving the desired zero net increase in peak rate of runoff for the proposed site development.