

## STREAM CROSSING NARRATIVE

Proposed development of the Bald Hill Estates site will require a new crossing of Tributary 25. Tributary 25 is a tributary of the Ramapo River and flows in a generally north to south direction through the eastern third of the site. The stream enters the site at the northeasterly property line and exits the site near the southeasterly property line through a twin box culvert beneath County Route 105.

Tributary 25 has been studied by detailed methods by the Federal Emergency Management Agency and has a defined floodplain and floodway, which has been adopted by the Town of Monroe. Base flood elevations have been mapped by FEMA and are indicated on the water surface elevation profile and Flood Insurance Rate Map (FIRM) as defined by the Town of Monroe Flood Insurance Study.

Two floodplain models and two floodway models were previously prepared for the Draft Environmental Impact Study to illustrate the hydraulic effects of the construction of a new crossing on Tributary 25 and demonstrate compliance with regulations promulgated by the Federal Emergency Management Agency (FEMA). The models were prepared by utilizing the United States Army Corps of Engineers (USACE) hydraulic analysis software HEC-RAS. One floodplain and one floodway model were prepared for existing conditions and one floodplain and one floodway model were prepared for the proposed conditions, which includes the proposed stream crossing. Peak discharges found in the effective Town of Monroe Flood Insurance Study were utilized in all four hydraulic models.

The existing conditions floodplain model was created utilizing topography that was compiled by aerial photogrammetry. Utilizing the existing conditions floodplain model, an existing conditions floodway model was prepared that matched the effective floodway limits from the Town of Monroe Flood Insurance Study. The proposed stream crossing was included in the existing conditions floodplain and floodway models to create proposed conditions models. To determine the proposed stream crossing's effect on the floodway elevation, the same floodway limits that were determined in the existing conditions model were replicated in the proposed conditions model. The results indicated that the floodplain model yields zero increase in the 100-year water surface elevation on the adjacent property and zero increase in the floodway water surface elevation.

The previously proposed stream crossing design configuration consisted of a single 20 foot wide, 9 foot high concrete box culvert including approximately 18 inches of stream material placed on the bottom of the box culvert to replicate natural streambed conditions. The installation of this material results in a culvert which has an effective size of 20 feet by 7 ½ feet, resulting in an effective conveyance area of 150 square feet.

The output of these previously prepared HEC-RAS models was included as an Appendix to the drainage report, which was included in the Draft Environmental Impact Statement.

These analyses demonstrated that the installation of a 9' x 20' concrete box culvert will conform to requirements promulgated by FEMA.

As requested by the Town of Monroe Planning Board's Engineering Consultant, additional hydrologic and hydraulic analyses have been prepared and included in the Supplemental Environmental Impact Statement.

The effective date of the original Town of Monroe Flood Insurance Study was June 1, 1981. The effective date of the currently effective Town of Monroe FIS is February 23, 2001, although additions to the 2001 revision include only the addition of hydrologic and hydraulic analyses of Palm Brook. There were no revisions to streams analyzed in the original study in the 2001 revision.

Since the publication and adoption of the 1981 version of the Town of Monroe Flood Insurance Study by FEMA and the Town of Monroe, the contributing drainage area of Tributary 25 has undergone significant development within the Village of Kiryas Joel. This development has likely resulted in higher peak discharge rates on Tributary 25 than those published in the effective Flood Insurance Study.

Leonard Jackson Associates has performed hydrologic analyses for drainage basins within the Village of Kiryas Joel, including Forest Brook and Tributary 25. The point of interest utilized for these studies was the Tributary 25 crossing of Route 17, which is just upstream of the proposed stream crossing on the Bald Hill Estates site. Included in this Supplemental Environmental Impact Study is a HEC-1 hydrologic analysis model prepared for these drainage basins.

The calculated 100-year peak discharge on Tributary 25 at the Route 17 crossing is 1740 cfs with a contributing drainage area of 2.1 square miles. As a point of comparison, the published effective 100-year peak discharge on Tributary 25 at its confluence with the Ramapo Creek in the Town of Monroe FIS is 440 cfs with a contributing drainage area of 2.9 square miles.

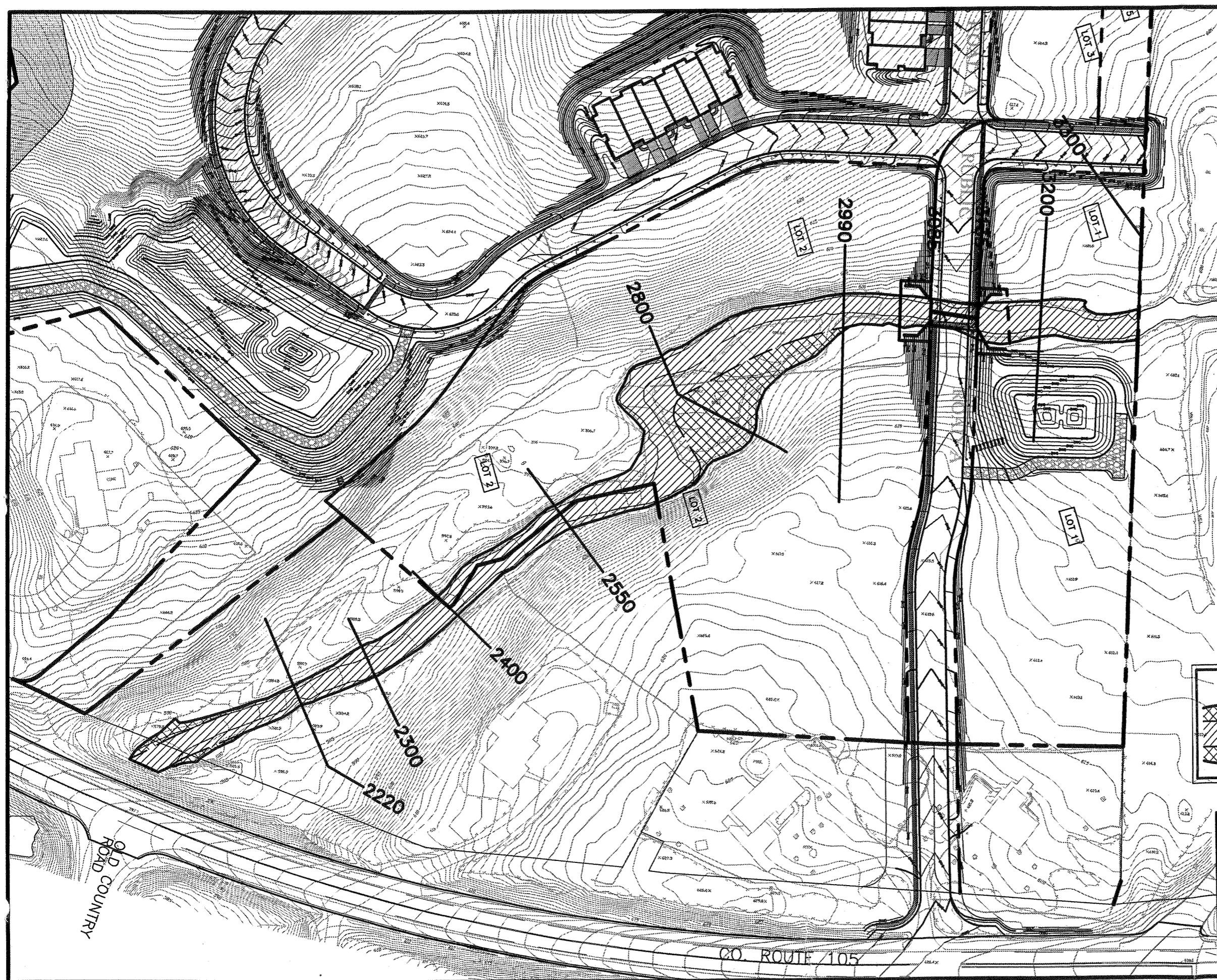
The proposed conditions hydraulic analysis was run utilizing this revised 100-year peak discharge of 1740 cfs to determine the effect of the previously proposed stream crossing on the hydraulic profile of Tributary 25. When the 9' by 20' concrete box culvert is modeled, the culvert is flowing full. Low flow through the culvert with available freeboard is the desirable condition in this situation. Providing freeboard would allow for the possibility of future increases in peak rates of runoff.

An iterative process was undertaken to determine the revised culvert configuration that would pass the increased peak discharge under low flow conditions, while also providing at least 2 feet of freeboard.


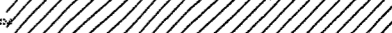


Through this iterative process it was determined that twin box culverts, 11 ½ feet high by 12 feet wide, would satisfy these conditions. As previously proposed, 1 ½ feet of native material would be placed on the bottom of the culvert to replicate the natural stream

channel. The installation of this material results in an effective open area of 10 feet by 12 feet in each culvert, providing a total conveyance area of 240 square feet. Approximately 2 ½ feet of freeboard is provided by this culvert configuration.

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**LEGEND**

-  100 YEAR FLOOD BOUNDARY
-  FLOODWAY BOUNDARY
-  FLOODWAY BOUNDARY
-  100 YEAR FLOOD BOUNDARY

**BALD HILL ESTATES**  
TOWN OF MONROE  
ORANGE COUNTY, NEW YORK

**FLOODPLAIN AND FLOODWAY DELINEATION**

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DATE: 2/1/07	SCALE: 1"=100'	DRAWN BY: J.S.	JOB NO: 00046
			FIGURE NUMBER

OLD ROAD COUNTRY

CO. ROUTE 105