

crossroads ventures llc

DRAFT
Environmental Impact Statement

Appendix 24

Bridge Hydraulics

The Belleayre Resort at Catskill Park

Appendix 24
Bridge Hydraulics

EXISTING AND PROPOSED BRIDGE EVALUATION REPORT

The Belleayre Resort at Catskill Park Towns of Shandaken and Middletown Ulster and Delaware Counties

Prepared for:

**Crossroads Ventures
P. O. Box 267
72 Andrew Lane
Mt. Tremper, NY 12457
(845) 688-7740**

Prepared by:



Project #99-057

September 2001
Rev. October 2002

INTRODUCTION

The primary objectives of this Report are to evaluate the feasibility for four (4) proposed bridge structures on the preferred alignment and to identify the approximate limit of work so that the environmental impacts can be identified. In conjunction with the primary objective, this Report considers hydraulic perimeters and the rehabilitation needs as short-term solutions to an existing bridge crossing on Winding Mountain Road. The locations studied are identified on Figures P1 and P2 and include the following:

1. Proposed bridge structure carrying the proposed main access road to the Plateau (off Friendship Mountain Road).
2. Existing bridge and proposed bridge structure carrying Winding Mountain Road (construction access and emergency/maintenance access road to the Plateau).
3. Proposed bridge structure carrying the main access road over Giggle Hollow.
4. Proposed bridge structure carrying a Wildacres site access road over an unnamed tributary of Emory Brook.

BRIDGE HYDRAULICS

Both the Friendship Road and Winding Mt. Road bridge structures were sized to pass the anticipated stream runoff for Birch Creek, which both bridges cross at the base of the mountain. The accepted criteria is to design the waterway opening below the main bridge supporting members to pass the fifty year storm (Q_{50}) with a minimum of two (2) feet of freeboard, and the one hundred year storm (Q_{100}) with reduced freeboard. The estimated peak discharges were calculated from the formulas found in the USGS Water Resources Investigations Report 90-4197 entitled REGIONALIZATION OF FLOOD DISCHARGES FOR RURAL UNREGULATED STREAMS IN NEW YORK, EXCLUDING LONG ISLAND. These formulas are as follows:

$$Q_{50} = 24.0(A)^{0.804} (ST+1)^{-0.410} (P-20)^{1.014}$$

$$Q_{100} = 25.3(A)^{0.794} (ST+1)^{-0.435} (P-20)^{1.075}$$

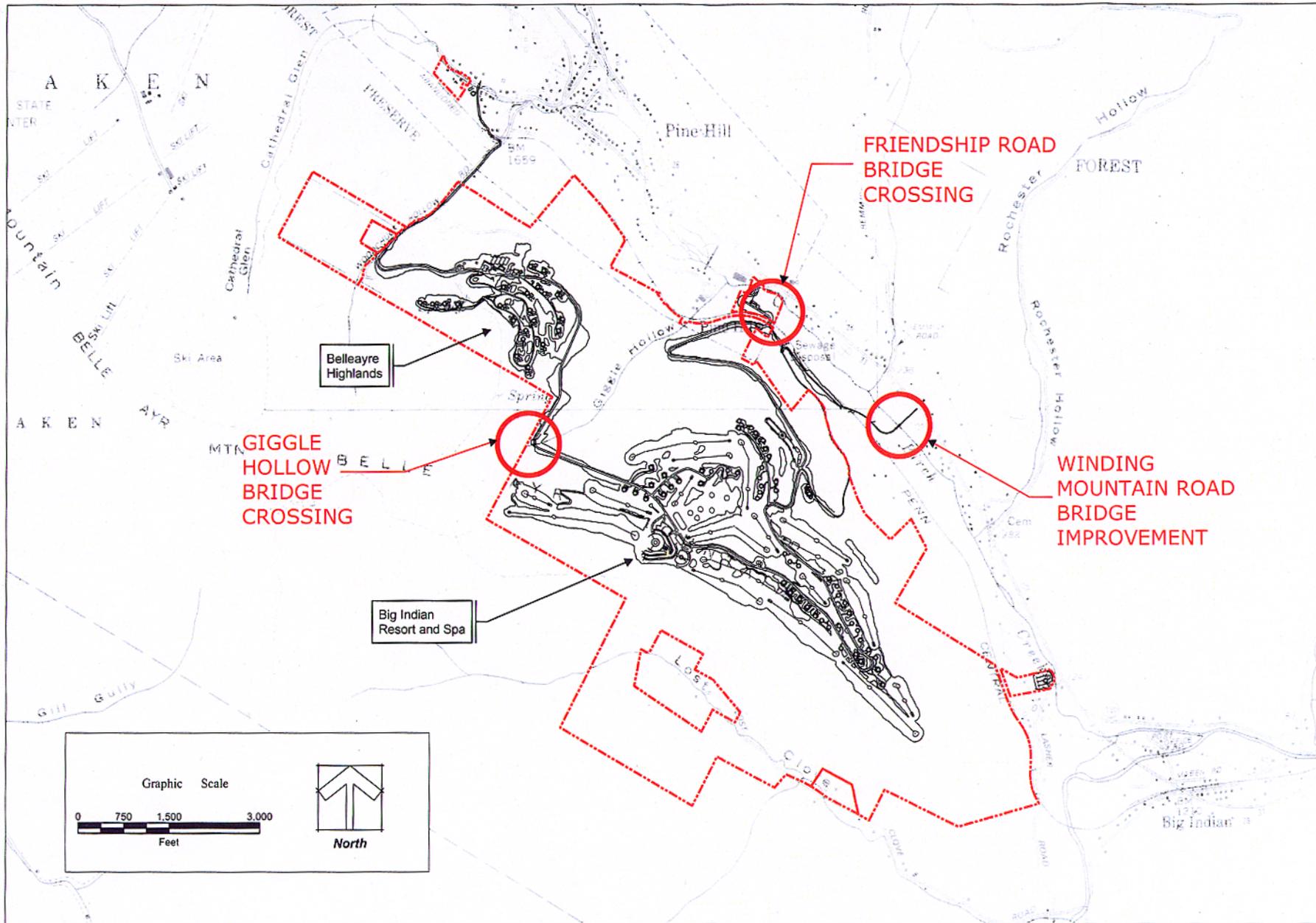
Where: Q = peak discharge in cubic feet per second (cfs)

A = drainage area in square miles

ST = storage in percent of basin drainage area

P = mean annual precipitation, in inches

For the analysis, A= 9.53 sq. mi., ST= 0, P= 48 in., which yielded $Q_{50} = 4,313$ cfs, and $Q_{100} = 5,448$ cfs.



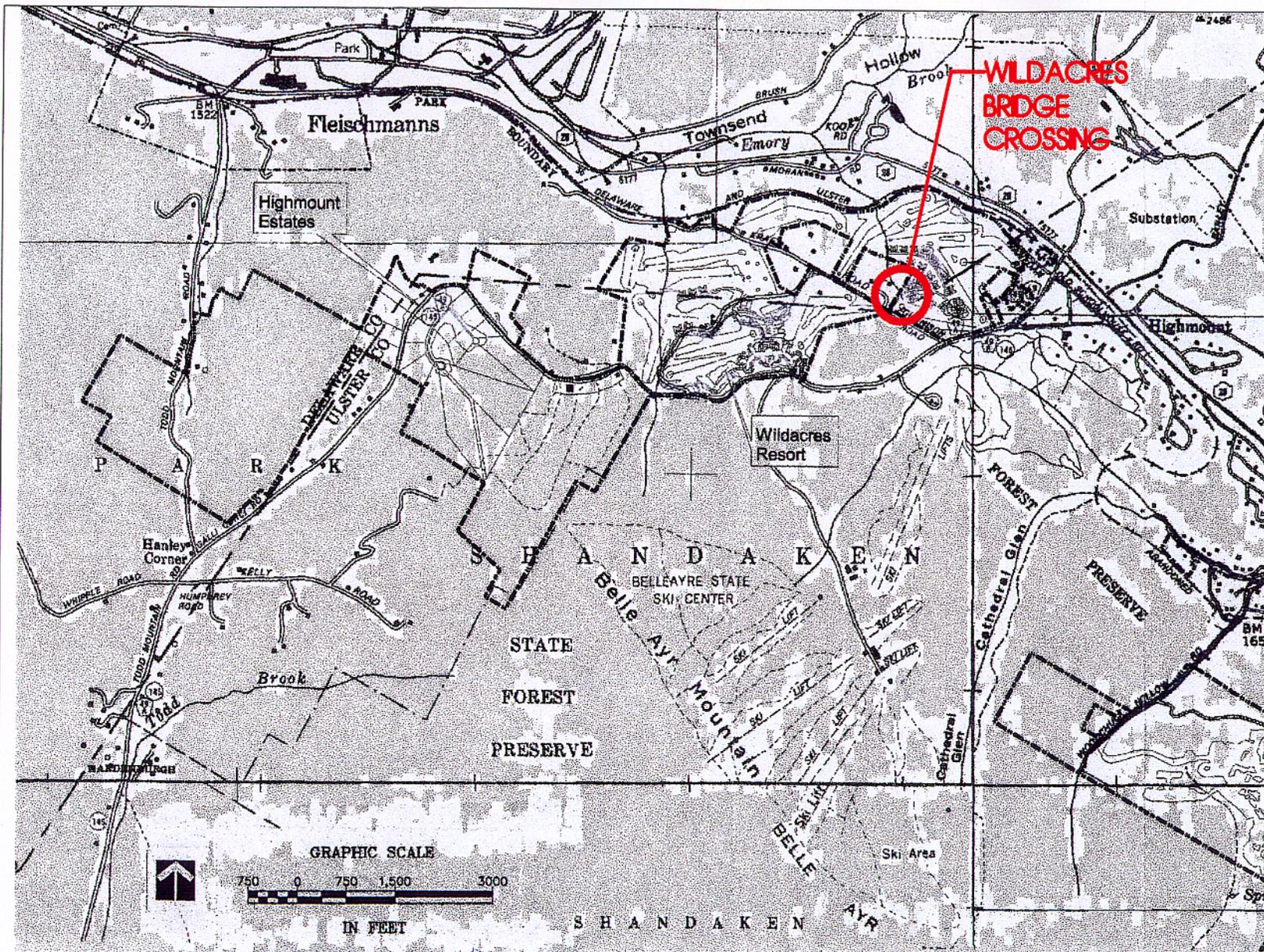
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**BELLEAYRE
RESORT AT
CATSKILL
PARK**

**DRAFT
ENVIRONMENTAL
IMPACT
STATEMENT**

**BIG INDIAN
PLATEAU
BRIDGES**

Project: 00052
Date: 12/10/02



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 addition to this document is
 a violation of Section
 1700 of the New York State
 Education Law.

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BELLEAYRE
 RESORT AT
 CATSKILL
 PARK

DRAFT
 ENVIRONMENTAL
 IMPACT
 STATEMENT

WILDACRES
 RESORT
 BRIDGE

Project: 00052

Date:

Figure P-2

Friendship Road Bridge

Span lengths of sixty (60') and seventy (70') were analyzed to determine the best flow characteristics for the site. At the site, Birch Creek flows at normal stage within well-defined vertical stream banks, which show signs of scour occurring during higher flows. The sixty-foot span was found to be too restrictive, and was discarded. The seventy-foot span is being proposed with a trapezoidal channel armored with heavy stone fill to prevent erosion. The abutments are located back in the over bank area. The water surface elevation for the design flood of $Q_{50} = 4,313$ cfs was estimated to be slightly below elevation 1384, with the stream bottom at elevation 1377+/- . The bottom of bridge superstructure would need to be above elevation 1386.

Winding Mt. Road Bridge

The existing bridge span of approximately thirty-five (35') feet is inadequate for the anticipated Q_{50} and Q_{100} peak discharges and cannot be considered a permanent structure for this location. Currently there is no well-defined stream channel, and during high flows, the north approach to the bridge reportedly serves a relief channel. In addition, this bridge is not supported on piles and is subject to being washed out given the right storm conditions. The south abutment embankment was recently reinforced with heavy stone where the embankment had settled during a minor storm event. This bridge is downstream from Friendship Road, and a seventy-foot (70') span is being proposed here as well, with the south abutment at the existing bank, and the north abutment at the location of a theoretical channel extent. The water surface elevation for the design flood of $Q_{50} = 4,313$ cfs was estimated to be slightly above elevation 1316, with the stream bottom at elevation 1311+/- . The bottom of bridge superstructure would need to be slightly above elevation 1318.

Giggle Hollow Bridge

Hydraulic calculations were not performed for the existing channel of Giggle Hollow as it is well defined within the banks and the profile places the roadway well above the stream channel. Abutment locations were field chosen on the banks away from the channel and heavy stone fill will be placed to prevent erosion of the banks.

Wildacres Bridge

Hydraulic calculations were not performed for the unnamed tributary of Emory Brook as it is well defined within the banks and the profile places the roadway well above the stream channel. Abutment locations were field chosen on the banks away from the channel and sheet piling has been specified to keep the fill out of the stream channel.

ESTIMATED BRIDGE COSTS

Prior to detailed design phases of a project, it is customary to estimate for programming purposes bridge construction costs on a per square foot of shoulder break area. The shoulder break area is the width of the proposed bridge, times the length between tops of abutment slope embankment. The cost per square foot is derived from recent projects of similar size and complexity. For this

project our analysis will use a figure of \$250 per square foot without projections of future increases due to inflation.

Friendship Road Bridge

The proposed bridge would allow for a two-lane structure with twenty-eight feet of combined lane and shoulder width plus an additional three feet for bridge railings for a total width of thirty-one feet. Our estimated shoulder break length for this location is approximately 110', yielding a shoulder break area and cost as follows:

$$31' \text{ width} \times 110' \text{ length} = 3,410 \text{ sq. ft.} \times \$250/\text{sf} = \$ 852,500.$$

Winding Mt. Road Bridge

The proposed bridge would allow for a one-lane structure with fourteen feet of combined lane and shoulder width plus an additional three feet for bridge railings for a total width of seventeen feet. Our estimated shoulder break length for this location is approximately 115', yielding a shoulder break area and cost as follows:

$$17' \text{ width} \times 115' \text{ length} = 1,955 \text{ sq. ft.} \times \$250/\text{sf} = \$ 488,750.$$

Winding Mt. Road Bridge Rehabilitation

The existing bridge was load rated for weight capacity for short-time use as a means of allowing construction traffic to access this side of the project area while the Friendship Road Bridge was being constructed. As stated previously, the existing bridge is inadequate for hydraulic capacity and is vulnerable to being washed out given the right storm event. The existing bridge consists of two used 27" deep steel beams with a timber plank deck approximately 10' wide with no railings. The beams are supported on a combination of fill, gabion baskets, and a concrete bridge seat. The span length was estimated to be thirty-five feet although the beams were longer. Our analysis assumed the beams had a yield strength of 33 KSI, and were not deteriorated (based on a visual inspection) to the point of affecting the load capacity. The analysis indicated the beams as-is are capable of carrying an AASHTO H24 truck (no posting required).

The proposed bridge rehabilitation would provide for a new nail-laminated 14' wide 2"x10" timber deck with a road width of 10' (one lane) between new two-rail bridge railings. In addition, steel diaphragms; concrete bridge seats and some embankment and heavy stone fill were included. The increase in dead load weight due to the new deck and railings would still allow for an H20 vehicle (no posting required).

The programming cost for the rehabilitation of the existing structure for a short duration use during construction was estimated to be approximately \$ 55,000. A preliminary cost estimate showing a minor amount of work is included.

Giggle Hollow Bridge

The proposed bridge would allow for a two-lane structure with thirty-five (35) feet of combined lane and shoulder width including additional width for bridge railings. The span length is fifty-five (55) feet. Our estimated shoulder break length for this location is approximately 95', yielding a shoulder break area and cost as follows:

$$35' \text{ width X } 95' \text{ length} = 3,325 \text{ sq. ft. X } \$250/\text{sf} = \$ 831,250.$$

Wildacres Bridge

The proposed bridge would allow for a two-lane structure with twenty-four (24) feet of combined lane and shoulder width. The span length is sixty (60) feet. Our estimated shoulder break length for this location is approximately ninety-six (96) feet, yielding a shoulder break area and cost as follows:

$$24' \text{ width X } 96' \text{ length} = 2,304 \text{ sq. ft. X } \$250/\text{sf} = \$ 576,000.$$

BE BELL ENGINEERING

5895 Johnston Road
Slingerlands, N.Y. 12159
Phone/Fax (518) 357-0313

June 5, 2003

Dean L. Gitter
Crossroads Ventures, LLC
P.O. Box 267
Mt. Tremper, NY 12457

RE: Responses, Hydraulic Study, Friendship Road, Winding Mt. Road Bridges.
BE# 201-018

Dear Mr. Gitter:

The following information we believe addresses the questions regarding the bridge hydraulics for the Friendship and Winding Mt. Road bridges:

BRIDGE SIZING

As indicated in our original description of Bridge Hydraulics, both bridges were sized to pass a $Q_{50} = 4,313$ cfs with two (2) feet of freeboard and $Q_{100} = 5,448$ cfs with reduced freeboard. The method of analysis used was application of Manning's formula for open channel hydraulics, $Q = 1.486/nAR^{2/3}S^{1/2}$. A value of $n = 0.045$ was used for both the channel and the side slopes. The stream slope (S) was measured from the project topographic map and was determined to be 1.5% (0.015 ft./ft.) for the Friendship Road crossing and 2% at the Winding Mt. crossing. A span length of sixty feet (60') with a bottom angle of twenty-five feet (25') and 2h:1v side slopes to the abutment faces was first progressed at Friendship Road, assuming a depth, calculating the area (A), wetted perimeter, the $R = (A/WP)$, and consequently the Q for that depth, and comparing that to the Q_{50} . The depth was then increased or decreased and the calculations iterated until the Q_{50} depth was determined. Once the depth was determined (8.25'), the water surface elevation (stage) was determined by adding the stream elevation (1377±), and the approximate velocity through the structure was determined $V = Q/A$ (12.6 ft/s).

As indicated in our original description of Bridge Hydraulics, we judged this waterway opening to be too restrictive, and decided to analyze a structure with a seventy foot (70') span length. By increasing the span, and hence the waterway opening we calculated a reduction in velocity of over 1.2 ft/s, but more importantly a reduction in stage of 1.5 ft.. We judged this to be a more favorable span length for further progression and use at both locations.

ABUTMENT SCOUR

The abutments of both bridges will be built on bearing piles and the bottom of footings will be four (4') feet below stream bed. In addition the stream banks will be armored with heavy stone fill. These measures are in accordance with NYSDOT standards.

ROADWAY FLOODING

Neither approach to the Friendship Road bridge will be subject to roadway flooding due to existing topography and approach roadway embankments. The north approach to the existing Winding Mt. bridge is currently subject to flooding due to the short span length, restrictive opening, and abutment configurations. The proposed structure will significantly increase the waterway opening, and reduce or eliminate roadway flooding.

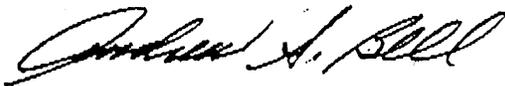
SEDIMENT TRANSPORT AND CHANNEL REACH STABILITY

Sediment transport is apparent in Birch Creek under existing conditions as evidenced by the large gravel bar deposit immediately upstream of the existing Winding Mt. Bridge, and gravel and debris noted on the north over bank area upstream of the site of the proposed Friendship Road bridge. The proposed embankments around the new bridge abutments will be protected by geotextile fabric and heavy stone fill and will stabilize the existing conditions at the bridge site(s).

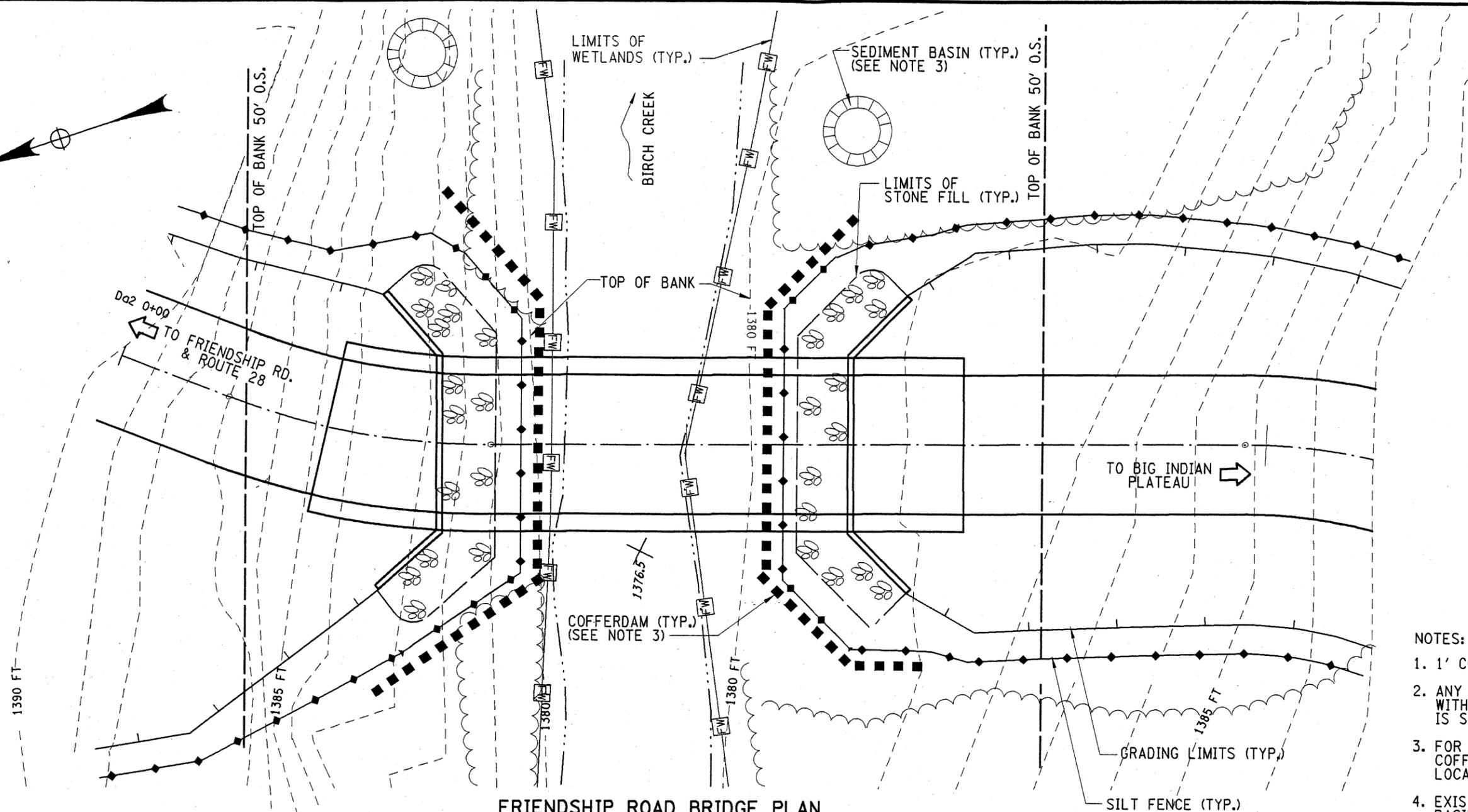
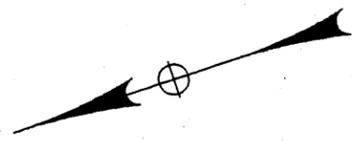
Channel reach stability will not be affected by the construction at the Friendship Road bridge crossing as abutment construction will occur in the over bank areas. Channel reach stability at the Winding Mt. Bridge will be greatly improved due to the increased waterway opening and the significant reduction in velocity through the structure.

Please contact us if you have any questions with any of this material.

Sincerely yours:

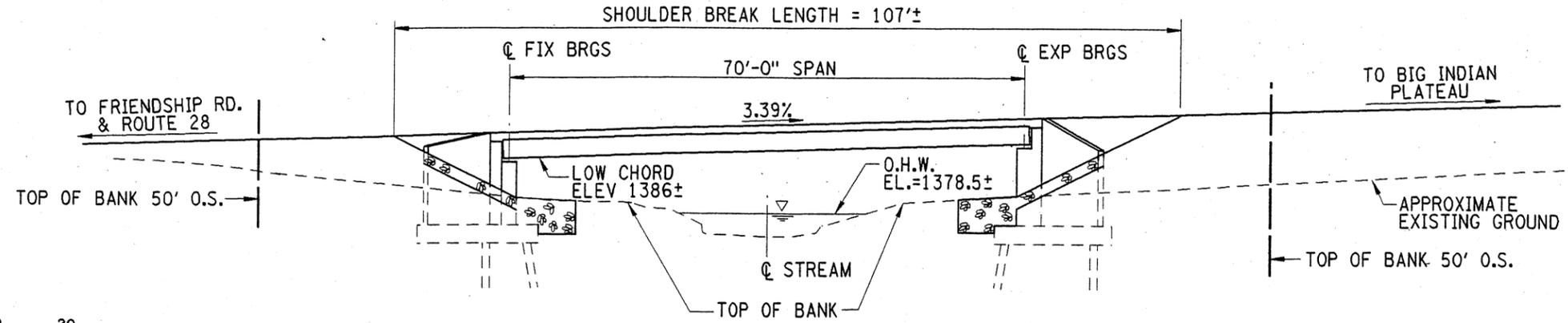


BELL ENGINEERING
Andrew S. Bell, P.E.,
Owner



FRIENDSHIP ROAD BRIDGE PLAN

- NOTES:
1. 1' CONTOUR INTERVAL
 2. ANY OPERATION OF MACHINERY WITHIN THE STREAM CHANNEL IS STRICTLY PROHIBITED.
 3. FOR SEDIMENT BASIN AND COFFERDAMS SEE DETAILS, LOCATE ON FLAT LAND A.O.B.E.
 4. EXISTING VEGETATION BETWEEN BASIN AND STREAM SHALL REMAIN UNDISTURBED.



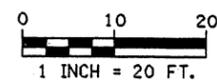
FRIENDSHIP ROAD BRIDGE ELEVATION

FEDERAL WETLAND IMPACTS= 0
 STREAM DISTURBANCE= 0

STREAM CROSSING DETAILS
 FRIENDSHIP ROAD BRIDGE
 PLAN & ELEVATION
 BELLEAYRE RESORT AT CATSKILL PARK
 TOWNS OF SHANDAKEN AND
 MIDDLETOWN, NEW YORK

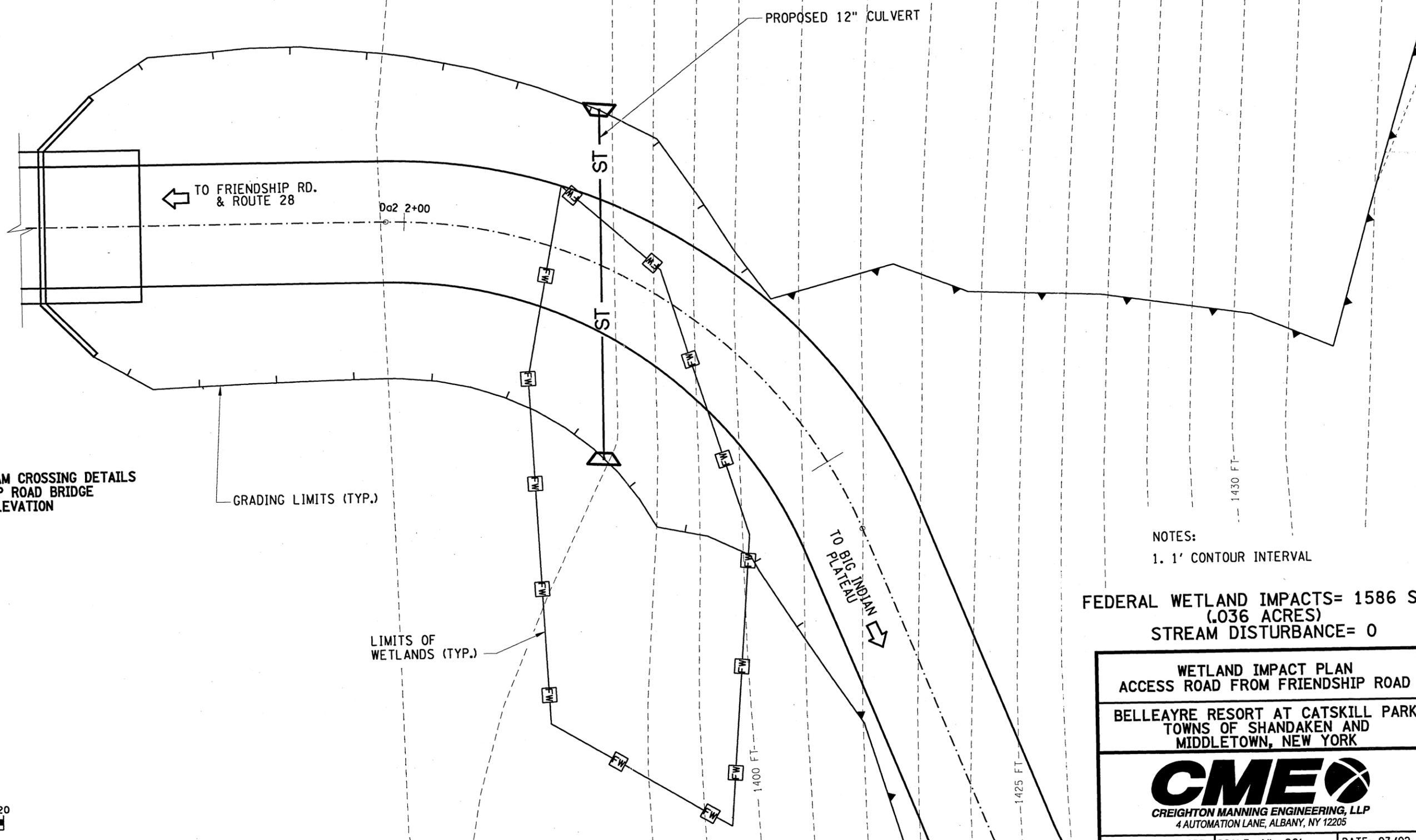
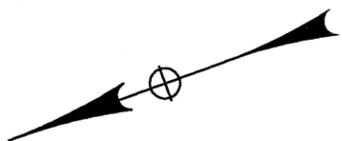


PROJECT: 99-057 | SCALE: 1"= 20' | DATE: 07/02



DATUM=1360.00

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← TO FRIENDSHIP RD.
& ROUTE 28

PROPOSED 12" CULVERT

Sta 2+00

SEE STREAM CROSSING DETAILS
FRIENDSHIP ROAD BRIDGE
PLAN & ELEVATION

GRADING LIMITS (TYP.)

LIMITS OF
WETLANDS (TYP.)

TO BIG INDIAN
PLATEAU →

1430 FT.

1400 FT.

1425 FT.

NOTES:
1. 1' CONTOUR INTERVAL

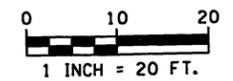
FEDERAL WETLAND IMPACTS= 1586 SF
(.036 ACRES)
STREAM DISTURBANCE= 0

WETLAND IMPACT PLAN
ACCESS ROAD FROM FRIENDSHIP ROAD

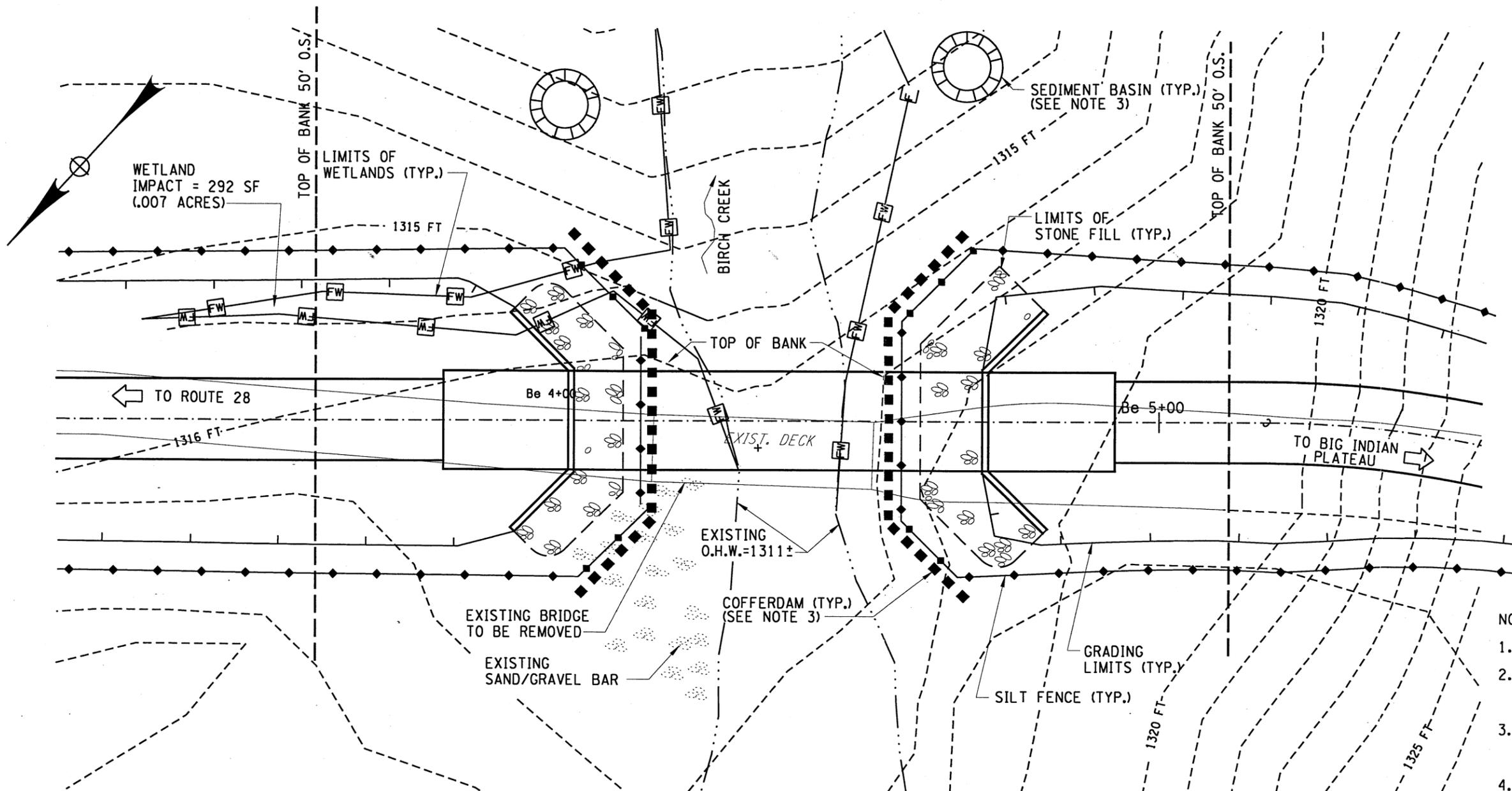
BELLEAYRE RESORT AT CATSKILL PARK
TOWNS OF SHANDAKEN AND
MIDDLETOWN, NEW YORK



PROJECT: 99-057 SCALE: 1" = 20' DATE: 07/02

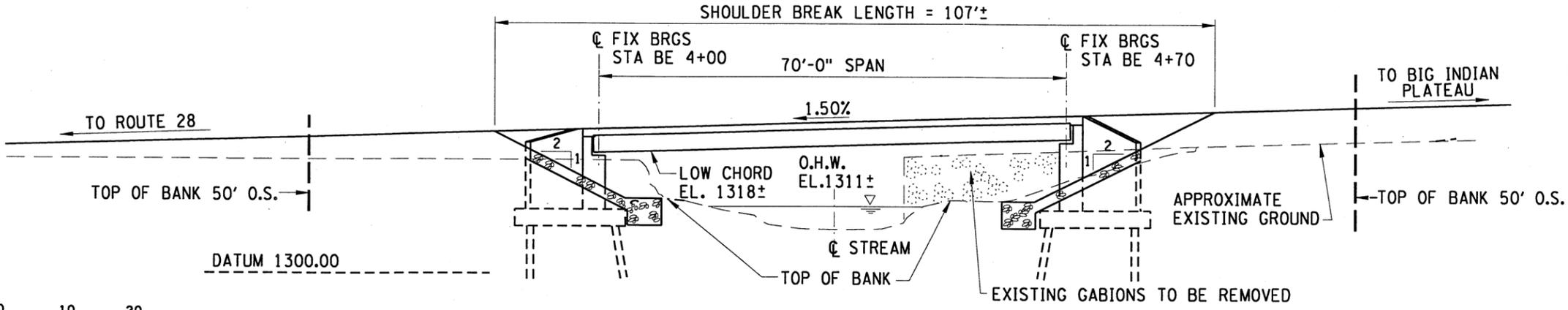


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WINDING MT. ROAD BRIDGE PLAN

- NOTES:
- 1' CONTOUR INTERVAL
 - ANY OPERATION OF MACHINERY WITHIN THE STREAM CHANNEL IS STRICTLY PROHIBITED.
 - FOR SEDIMENT BASIN AND COFFERDAMS SEE DETAILS, LOCATE ON FLAT LAND A.O.B.E.
 - EXISTING VEGETATION BETWEEN BASIN AND STREAM SHALL REMAIN UNDISTURBED.



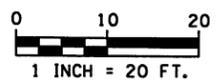
WINDING MT. ROAD BRIDGE ELEVATION

FEDERAL WETLAND IMPACTS= 292 SF
(.007 ACRES)
STREAM DISTURBANCE= 0

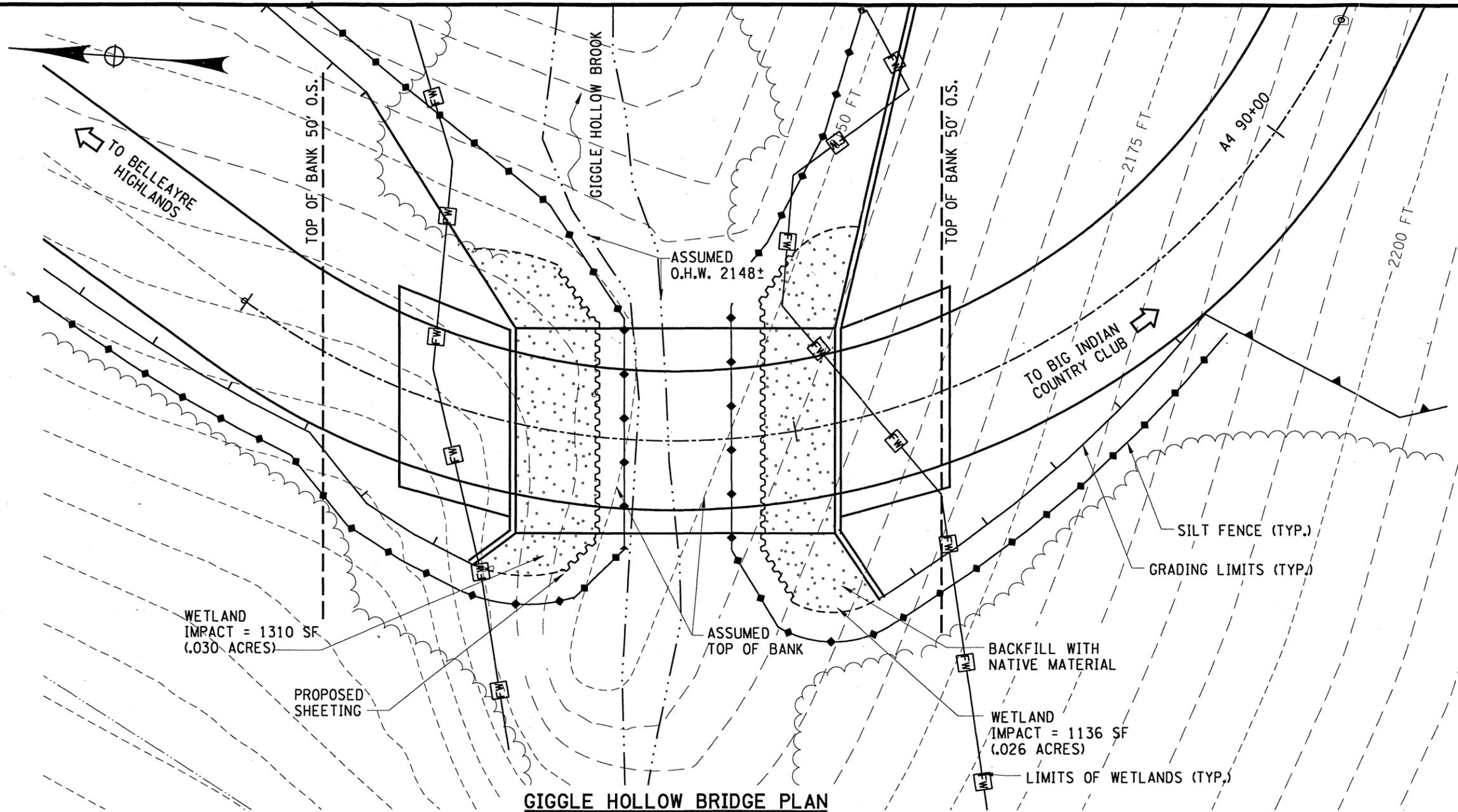
STREAM CROSSING DETAILS
WINDING MT. ROAD BRIDGE
PLAN & ELEVATION
BELLEAYRE RESORT AT CATSKILL PARK
TOWNS OF SHANDAKEN AND
MIDDLETOWN, NEW YORK



PROJECT: 99-057 SCALE: 1" = 20' DATE: 07/02



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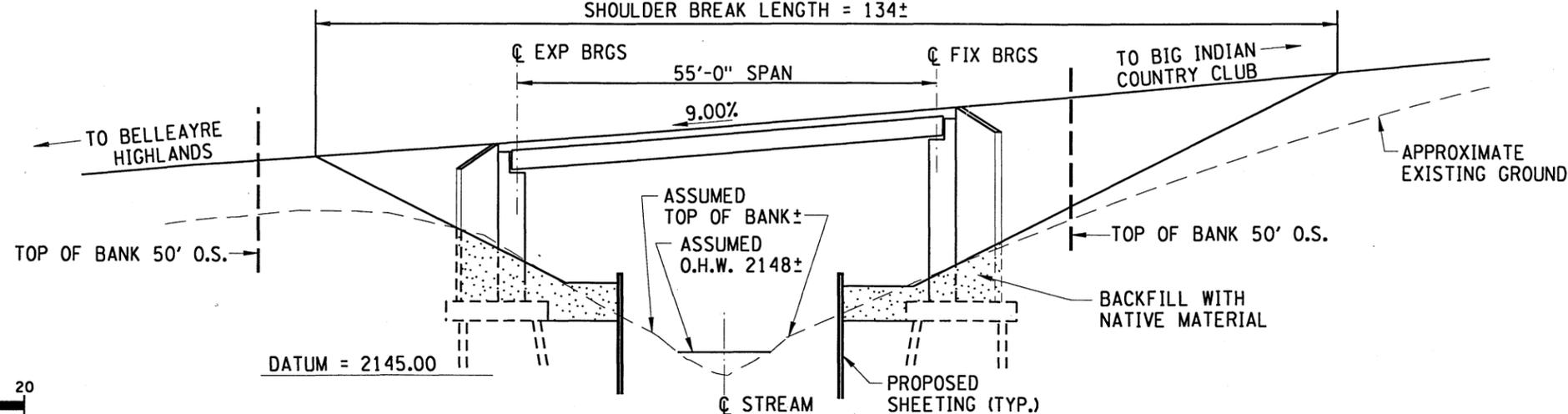


GIGGLE HOLLOW BRIDGE PLAN

SHOULDER BREAK LENGTH = 134±

NOTES:

1. 5' CONTOUR INTERVAL
2. ANY OPERATION OF MACHINERY WITHIN THE STREAM CHANNEL IS STRICTLY PROHIBITED.



GIGGLE HOLLOW BRIDGE ELEVATION

FEDERAL WETLAND IMPACTS= 2446 SF
(.056 ACRES)
STREAM DISTURBANCE= 0

**STREAM CROSSING DETAILS
GIGGLE HOLLOW ROAD BRIDGE
PLAN & ELEVATION**

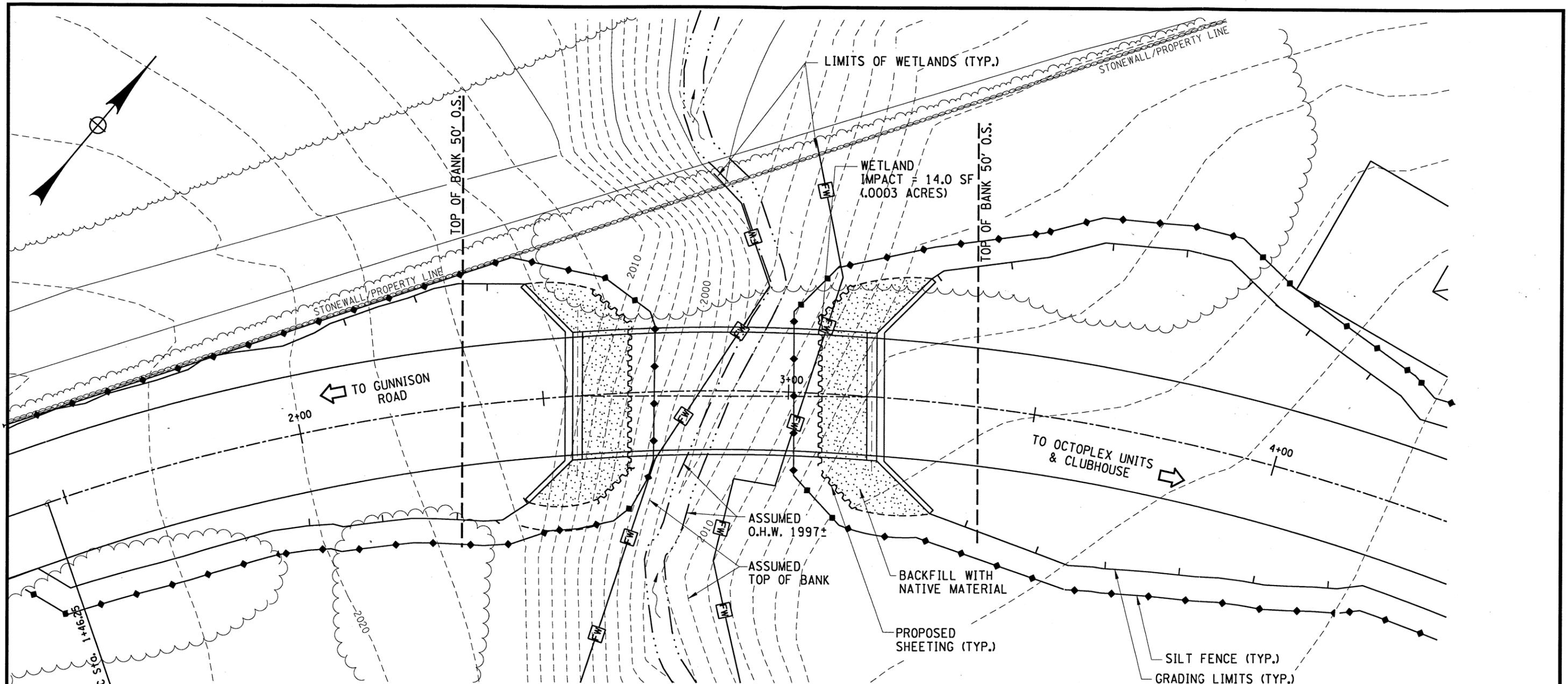
**BELLEAYRE RESORT AT CATSKILL PARK
TOWNS OF SHANDAKEN AND
MIDDLETOWN, NEW YORK**



PROJECT: 99-057 | SCALE: 1" = 20' | DATE: 07/02

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WILDACRES BRIDGE PLAN

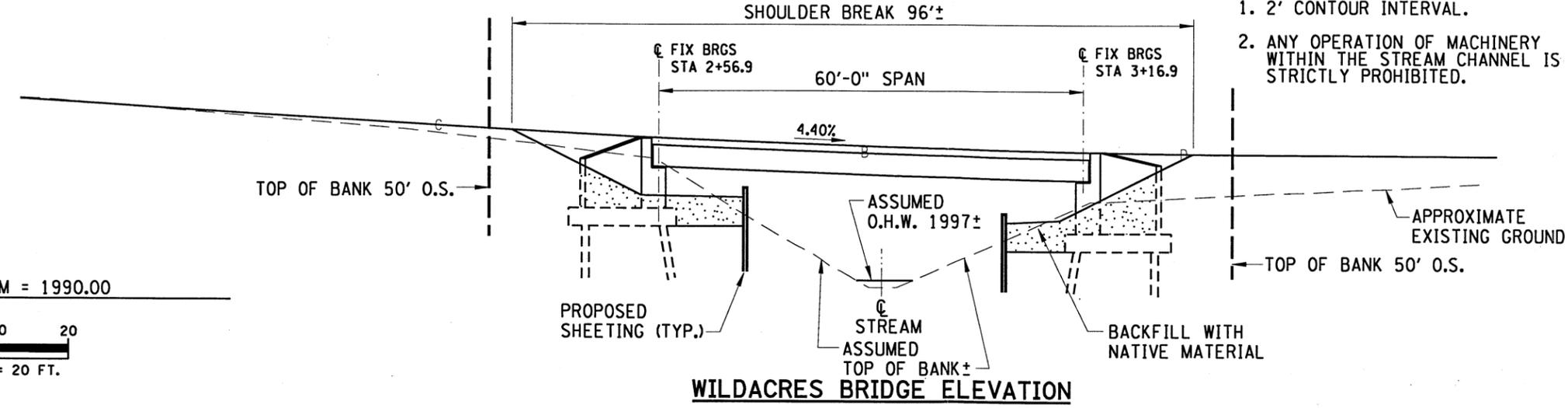
- NOTES:
1. 2' CONTOUR INTERVAL.
 2. ANY OPERATION OF MACHINERY WITHIN THE STREAM CHANNEL IS STRICTLY PROHIBITED.

FEDERAL WETLAND IMPACTS= 14 SF
 (.0003 ACRES)
 STREAM DISTURBANCE= 0

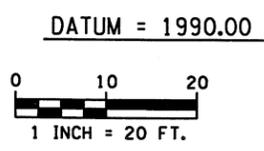
STREAM CROSSING DETAILS
 WILDACRES BRIDGE
 PLAN & ELEVATION
 BELLEAYRE RESORT AT CATSKILL PARK
 TOWNS OF SHANDAKEN AND
 MIDDLETOWN, NEW YORK



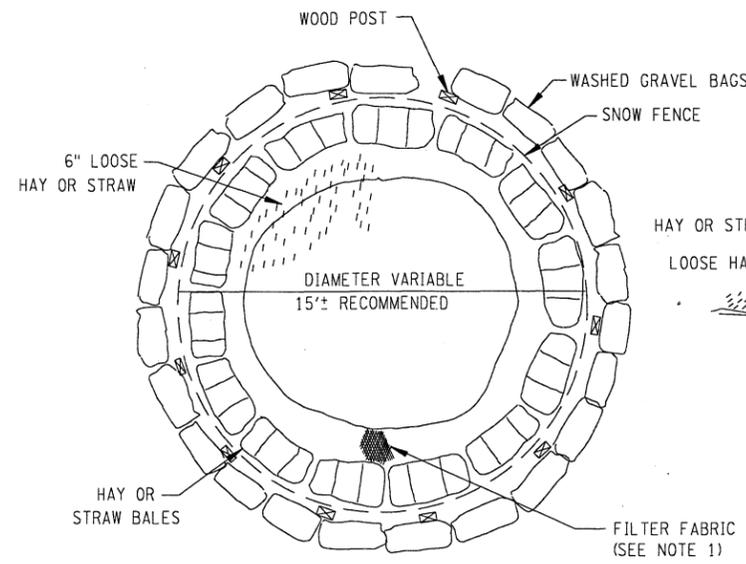
PROJECT: 99-057 | SCALE: 1" = 20' | DATE: 07/02



WILDACRES BRIDGE ELEVATION



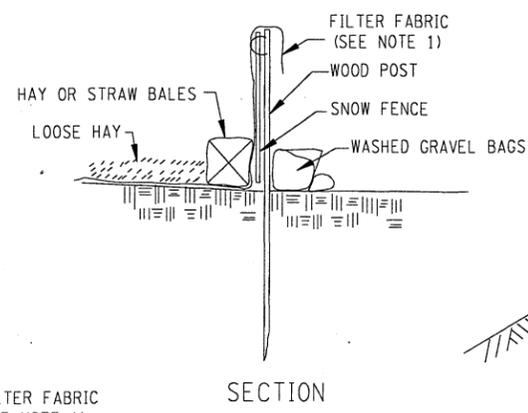
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PLAN

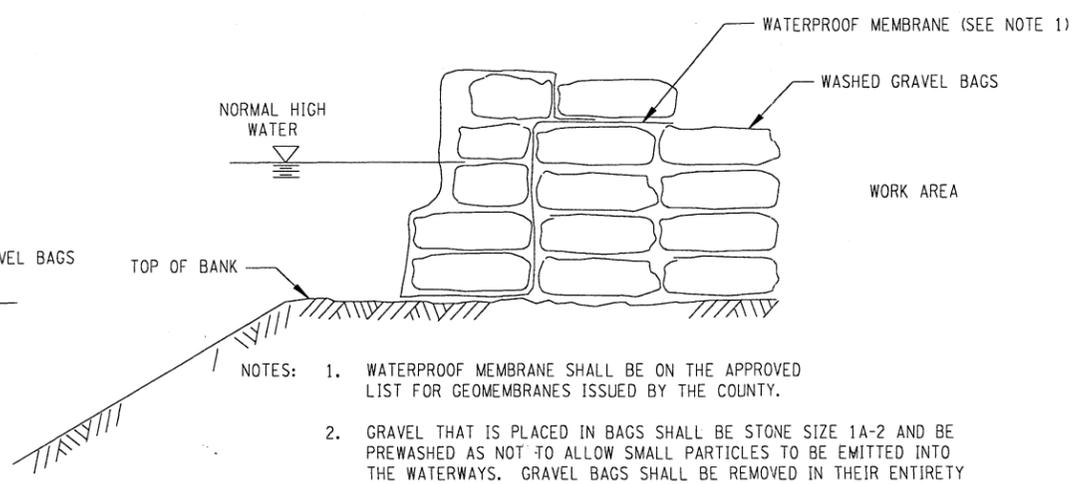
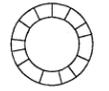
- NOTES :
1. FILTER FABRIC SHALL BE ON THE APPROVED LIST FOR GEOTEXTILES SILT FENCE ISSUED BY THE DEPARTMENT'S MATERIAL BUREAU.
 2. WHEN SEDIMENT BASIN IS REQUIRED IN CONJUNCTION WITH ITEM 552.07 COFFERDAM (WATER DISCHARGE CONTROL) COST SHALL BE INCLUDED IN COFFERDAM ITEM.

SEDIMENT BASIN



SECTION

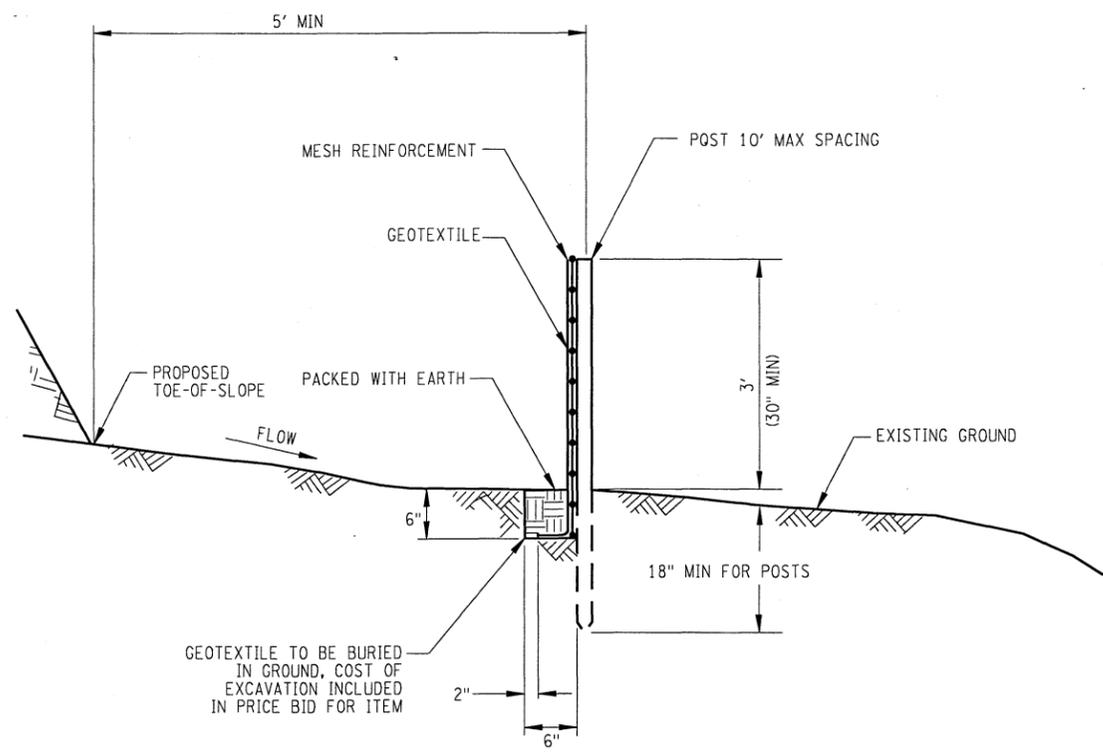
STANDARD SYMBOL



- NOTES:
1. WATERPROOF MEMBRANE SHALL BE ON THE APPROVED LIST FOR GEOMEMBRANES ISSUED BY THE COUNTY.
 2. GRAVEL THAT IS PLACED IN BAGS SHALL BE STONE SIZE 1A-2 AND BE PREWASHED AS NOT TO ALLOW SMALL PARTICLES TO BE EMITTED INTO THE WATERWAYS. GRAVEL BAGS SHALL BE REMOVED IN THEIR ENTIRETY AT THE COMPLETION OF THE PROJECT.
 3. INTERLOCK AND OVERLAP GRAVEL BAGS.
 4. MAXIMUM HEIGHT 3.0' AND AS APPROVED BY THE ENGINEER-IN-CHARGE.

COFFERDAMS
ITEM 552.07

STANDARD SYMBOL



SECTION
SILT FENCE

STREAM CROSSING DETAILS EROSION CONTROL DETAILS		
BELLEAYRE RESORT AT CATSKILL PARK TOWNS OF SHANDAKEN AND MIDDLETOWN, NEW YORK		
CME CREIGHTON MANNING ENGINEERING, LLP 4 AUTOMATION LANE, ALBANY, NY 12205		
PROJECT: 99-057	SCALE: 1" = 20'	DATE: 05/02

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