CHERRINGTON

September 22, 2002

Mr. Bud Till
O'brien & Gere Engineers Inc.
5000 Brittonfield Parkway
P.O. Box 4873
Syracuse, NY 13221

Re: Hudson River Feasibility Analysis, Horizontal Directional Drill (HDD) 11,000' x 24" Pipeline Installation

Dear Mr. Till:

Per your request, Cherrington Corporation has reviewed the information as transmitted to us for the referenced project above. In our analysis, Cherrington used the following criteria:

Current / Specialized HDD Technology Available
Geotechnical Investigations of the Tappen Zee Bridge
Environmental Considerations

It is our understanding that the longest HDD pipeline installation to date is approximately 6,800 feet with a pipe diameter of 12.75-inches. Having stated this, Cherrington Corporation is of the opinion that without significant changes in the standard industry practice for HDD river-crossing installations the limits may push 7,500 feet at the best. Therefore, any project over this distance should and needs to be considered in the realm of research and development in our assessment. This is not to say that crossings over this distance are not feasible to construct or technically possible to drill successfully, only that current practices and tooling need to be advanced before longer crossings of this magnitude can be achieved. We have observed several such evolutionary advancement through out the 30 some years we have been associated with the HDD industry. As larger diameter and longer distances opportunities presented themselves, relative evolutionary changes occurred.

With this in mind, we are of the opinion that a crossing of 11,000 feet in distance and 24-inch in diameter is feasible. Cherrington's preliminary analysis for the Hudson Bay Pipeline Crossing considered two methodologies after reviewing the geotechnical information from the Tappen Zee Bridge.

An Enhanced Conventional HDD System
EBB System (Environmental Beneficial Boring)

The enhanced conventional HDD approach's planned execution involves the conventional pilot hole, pre-ream and pull back technique. Modifications to today's conventional HDD included:

- Higher torque capacities of HDD drill rigs than what is available today
- Larger diameter/higher torque in-hole tools that what is currently available

These are all relative evolutionary changes, identical to what has taken place in the past.

Our analysis contemplated drilling through a limited amount of rock on both sides of the Hudson River and penetrating the clay and silt formations existing in the middle. These soft alluvial formations, which are found throughout the middle of the project, create a large environmental concern for a project of this distance. We believe that there will be a loss of drilling fluid circulation while drilling through these soft zones. This loss of circulation has good potential of fracturing to the bottom of the river, which may create a problem with the local governmental agencies as well as concerned citizens.

The basis for our concern is a general "Rule of Thumb" which states that there is approximately one (1) psi of annular fluid pressure created for every 30 feet of hole drilled. At 6,000 feet, the annulus pressure near the bit would be approximately 200 PSI and would likely have pressure spikes that could be 50% greater. Pressure values such as this would likely cause the drilling fluids to fracture out of the soft formation borehole and continue to fracture out of the borehole to completion of the project. The escaping drilling fluid would most likely migrate to the bottom of the Hudson River. The total amount of lost drilling fluid by way of fracturing throughout the duration of the project could reach as much as 3-4,000,000 gallons using a modified conventional HDD method

The EBB System, which is not widely known, was first introduced to crossing under rivers in 1977. This river crossing system has several unique characteristics. Basically, it is a one-step process similar in nature to that of drilling a pilot hole in the conventional HDD drilling operation. Several smaller internal pipes are placed within the larger pipe, which are used to perform various functions. Simply speaking, the larger diameter pipe is used as the drilling string, eliminating the need for either the reaming phase or the pipe pull back phase as in the conventional HDD operation.

The combined weight of the empty 36" pipe plus the added weight of the internal pipes and their respective content inside result in a neutral or near neutral buoyancy of the structure. This allows greater distances to be achieved as the frictional forces along the pipe are reduced significantly. The EBB's use of the larger 36" diameter pipe allows a much higher column loading on the pipe which enables much greater distances to be achieve

The most important feature is that the drilling fluid that is expelled through the bit is drawn back into the 36" pipe near the bit and internally pumped back to the surface where it can be cleaned and reused. The pumps used in this process are infinitely controlled allowing

the annulus pressure to be maintained at an ideal range well below the formation pressure. This unique feature eliminates any fracture potential into the bay's benthic community.

However, in the EBB System's one-step process, a relatively large (36") diameter pipe is used either as a casing for the product pipe or the 36" casing could be replaced with the product pipe.

Budgetary Costs

Enhanced Conventional HDD	$ 20,000,000 to $ 22,000,000
EBB System	$ 15,000,000 to $ 18,000,000

In concluding our analysis, Cherrington Corporation recognizes that a project of this magnitude is completely outside the realm of conventional HDD technology as used today. However, with specific enhancements to the conventional HDD technology, 11,000 feet is achievable although the environmental ramifications with fracture potentials are still problematic.

Shifting our focus to the EBB System, its capabilities, based on empirical data gathered in the past, validate our conclusions that HDD installations beyond 11,000 feet are achievable while negating the potential for mud fractures. It should also be noted that this technology has had limited opportunities for use therefore placing it in the realm of research and development also.

We thank you for this opportunity to present our thoughts regarding this project. If you should have any questions or comments, please feel free to contact either Martin or myself.

Sincerely,

CHERRINGTON CORPORATION

Larry Bertolucci
Vice President
Engineering/Estimating

LB/lab

cc: Martin Cherrington
Mark Parsons