

**NAGOG POND DAM
ACTON, MASSACHUSETTS**



**UNDERWATER INSPECTION
OF THE
RAW WATER INTAKE SUPPLY LINE**

APRIL 11, 2012

**Inspection conducted for
PARE CORPORATION
10 LINCOLN STREET, SUITE 103
FOXBORO, MA 02035**

**Inspection conducted by
INNER TECH MARINE SERVICES LLC
PO BOX 91234
WARWICK, RI 02889**

LOCATION OF INSPECTION: Nagog Pond Dam, Acton, Massachusetts, via the cul-de-sac at the end of Breezy Point road, Acton MA.

DATE OF INSPECTION: April 11, 2012

SCOPE OF WORK: Visual underwater inspection of the alignment of the raw water intake pipeline extending approximately 1400 ft from the gatehouse

PERSONEL PRESENT

Inner Tech

Stephen Antoniou- Inspector

Richard Callen- STB. Diver, boat tender

Anthony Carroll, Tender

Pare Corporation

Ryan McCoy

Town of Concord

Various personnel

DIVE STATION: Access to the dam site was via a dirt road through a private residence access at the Breezy Point Road cul-de-sac. Diving equipment for the inspection was trailered on site and set up aboard a skiff provided by the Town of Concord. SCUBA tanks were used to breathing air ,in the relatively shallow water, via an umbilical down to the divers helmet. Two way communications to the diver was maintained at all times. Dry suits provided cold water protection as the skiff was not large enough for a hot water system. The tender rowed the skiff following the diver's air bubbles; the resident engineer was aboard with a GPS device to track the position of the pipeline and deficiencies.

STRUCTURE HISTORY AND GENERAL OBSERVATIONS: The dam was constructed and the pipeline placed during the early 1900's. The pipeline consists what is assumed to be a lead and oakum sealed, bell and spigot, cast iron pipe sections, 16 inches in diameter. The flexible joints allowed the pipeline to follow some contour in the pond bottom and provided a means to change direction within the range of the joint.

GATEHOUSE TO APPROXIMATELY 1000 LF OUT.



The general alignment of the pipeline was followed by swimming a trench cut in stone for the first approximately 200-300lf. The pipeline was covered with silt and not visible in the trench. Some effort was made to hand dig through the silt and uncover the pipeline. The silt proved to be too deep to be uncovered practically for the work scope of this project. At approximately 200lf out (engineer to confirm), a short section of pipeline was visible along with an adjacent open ended section (see photograph No. 1). This is believed to be a secondary outlet controlled by a gate in the gatehouse or an as-built means to drain the pond during construction. Within the trench, the top sections of 4-5 inch diameter wooden posts could be seen on either side of the pipeline path. These posts may have been used to align the pipeline within the trench. At approximately 400lf to approximately 1000lf, the trench and much of the pipeline was not visible. The alignment was followed by swimming post to post (See figure 1 for cross section and detail).

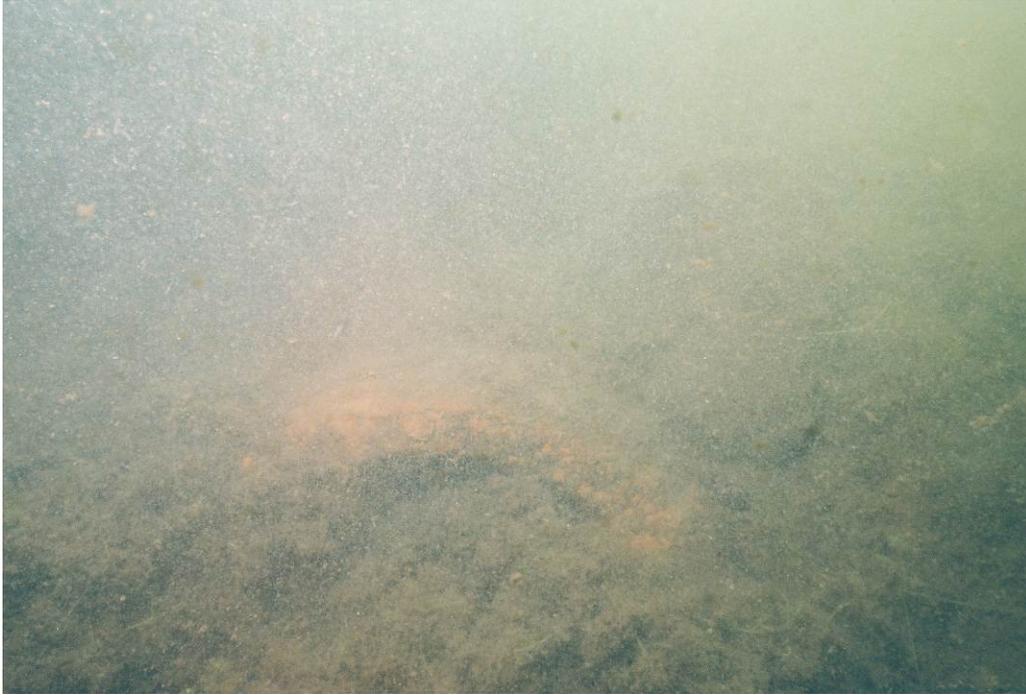
**APPROXIMATELY 100LF OUT TO PIPELINE END
(1400LF OUT)**

This section of pipeline was generally visible and covers an area from and adjacent to the island (situated at the center of the pond) to the end. The pipeline protrudes out of a bank of sand and rock which extends from the Island to the Easterly shore. The pipeline appears heavily rusted but intact and without observable cracks or broken sections. The pipeline is supported off the bottom of the pond by previously described wooden posts topped with cross timbers and bottom wedges holding the pipe on center. The posts and timbers appear heavily weathered and grainy with reduced X section from deterioration. The height of the wooden pipe supports varies with the elevation off the bottom. Discussion with the Town engineer detailed a previous inspection in which some settling of the pipe supports was noted. This could not be determined during this inspection effort because the as-built elevation of the pipeline was not known. The pipeline joints do not appear to have rotated or moved recently and the pipeline is currently bearing on all wooden pipe supports. Generally, the pipeline passes over a deeper area from the bank, into a shallower area for 50 to 100 lf, changes direction or elevation and back into a deeper area to the end. During this direction or elevation change, the greatest pipe joint angle was noted, the joint appeared intact and without leakage. (note photograph following)

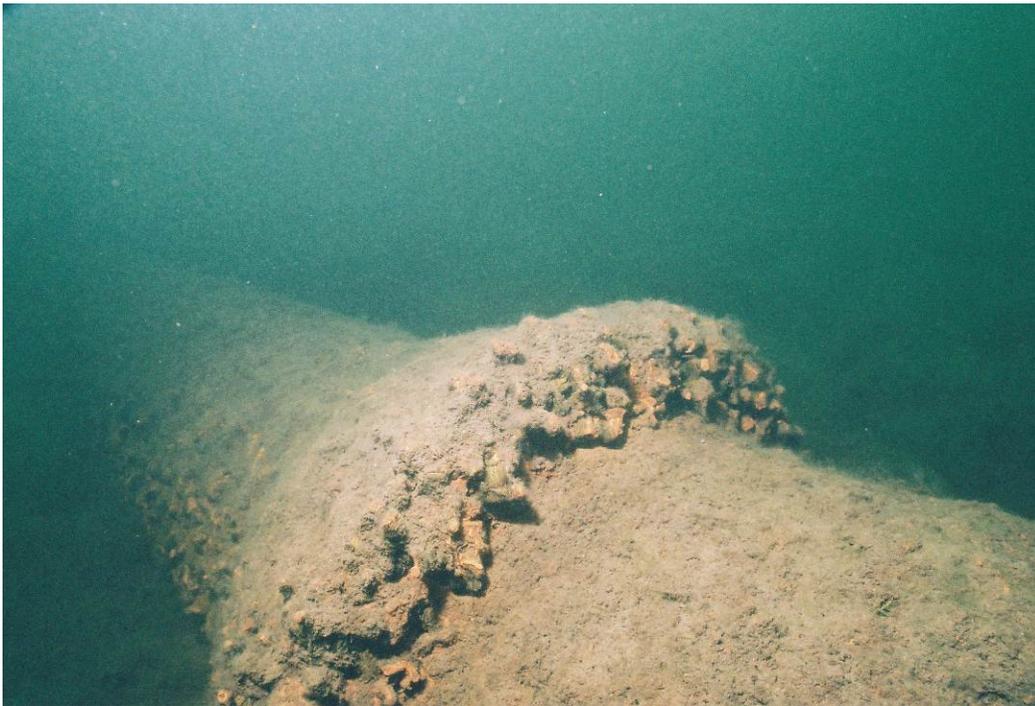
The pipeline terminates at a bell end which has a greatly reduced inner diameter (approximately 12 inches) from rust and deterioration (Note photographs following). Directly in front of the end of the pipe is a concrete or stone block pad laid on a wooden platform. The blocks were covered with a layer of soft silt approximately ½ to 1 inch deep. The blocks appear flat and intact but irregular in shape and very weathered (Note following photographs and figure 3).

SUMMARY OF OBSERVATION

The pipeline is typically covered with silt until the final 400 lf which is exposed. The pipeline is generally intact but heavily rusted with reduced inside diameter. The wooden pipe supports are intact but are very deteriorated. A deteriorated scour pad exists at the end of the pipe. The pad is covered with a light layer of silt.



Photograph showing adjacent open pipe approximately 200LF. From the gatehouse



Photograph showing typical exposed pipe joint



Photograph showing pipeline resting on wooden support



**Photograph showing pipeline resting on wooden support, pipeline changing
Elevation into deeper area showing more extreme joint angle**



Photograph showing top of posts visible in area where pipe is covered with silt



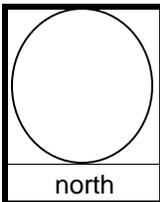
Photograph showing pipeline support arrangement near end of pipeline



Photograph showing inside end of pipeline with reduced diameter

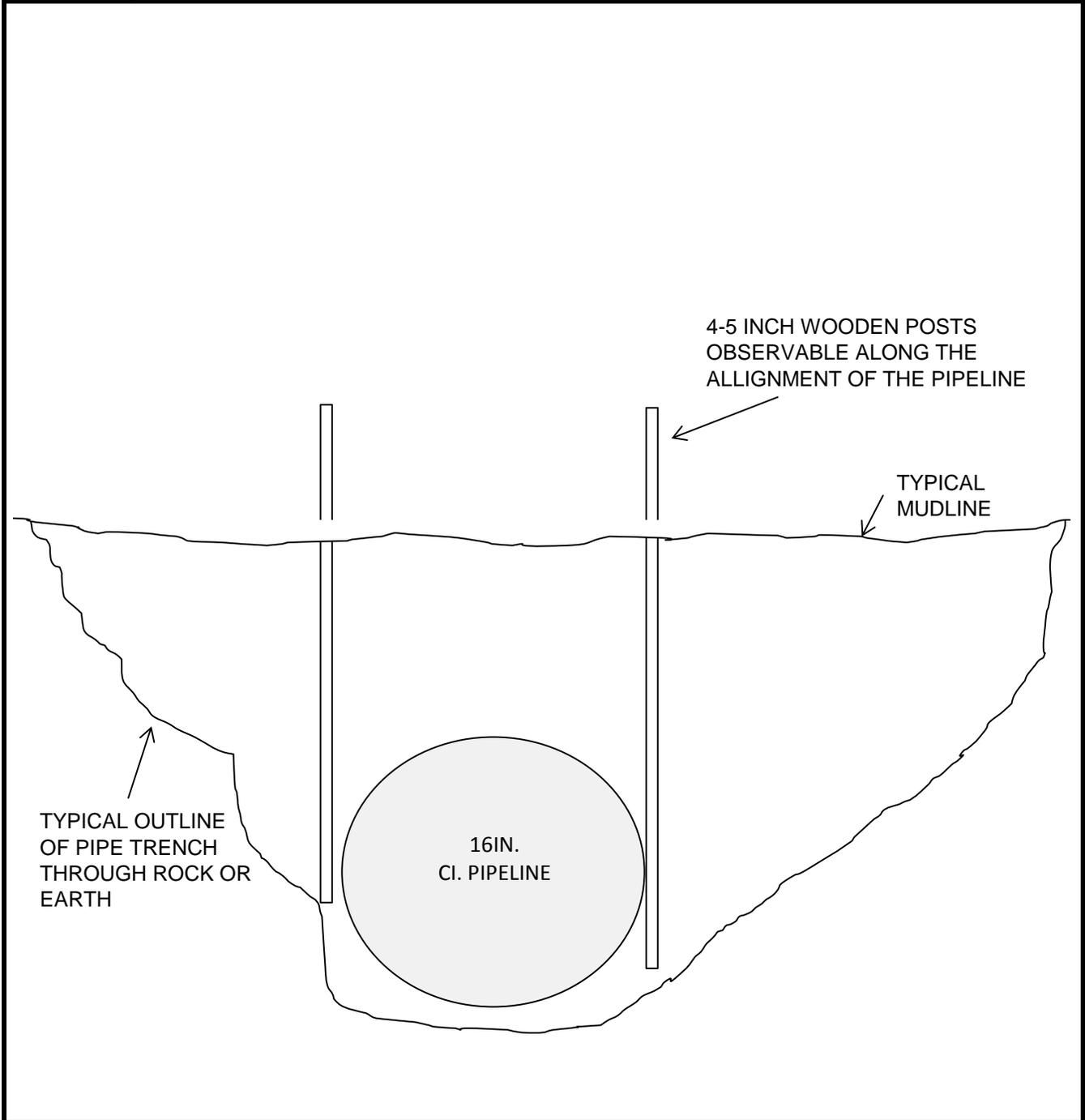


Photograph showing scour pad blocks at end of pipeline



north

NAGOG POND
FIGURE 1
DETAIL OF POSTS VISIBLE
VISIBLE ALONG ALIGNMENT OF PIPELINE
CROSS SECTION

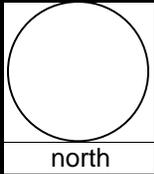


4-5 INCH WOODEN POSTS
OBSERVABLE ALONG THE
ALIGNMENT OF THE PIPELINE

TYPICAL
MUDLINE

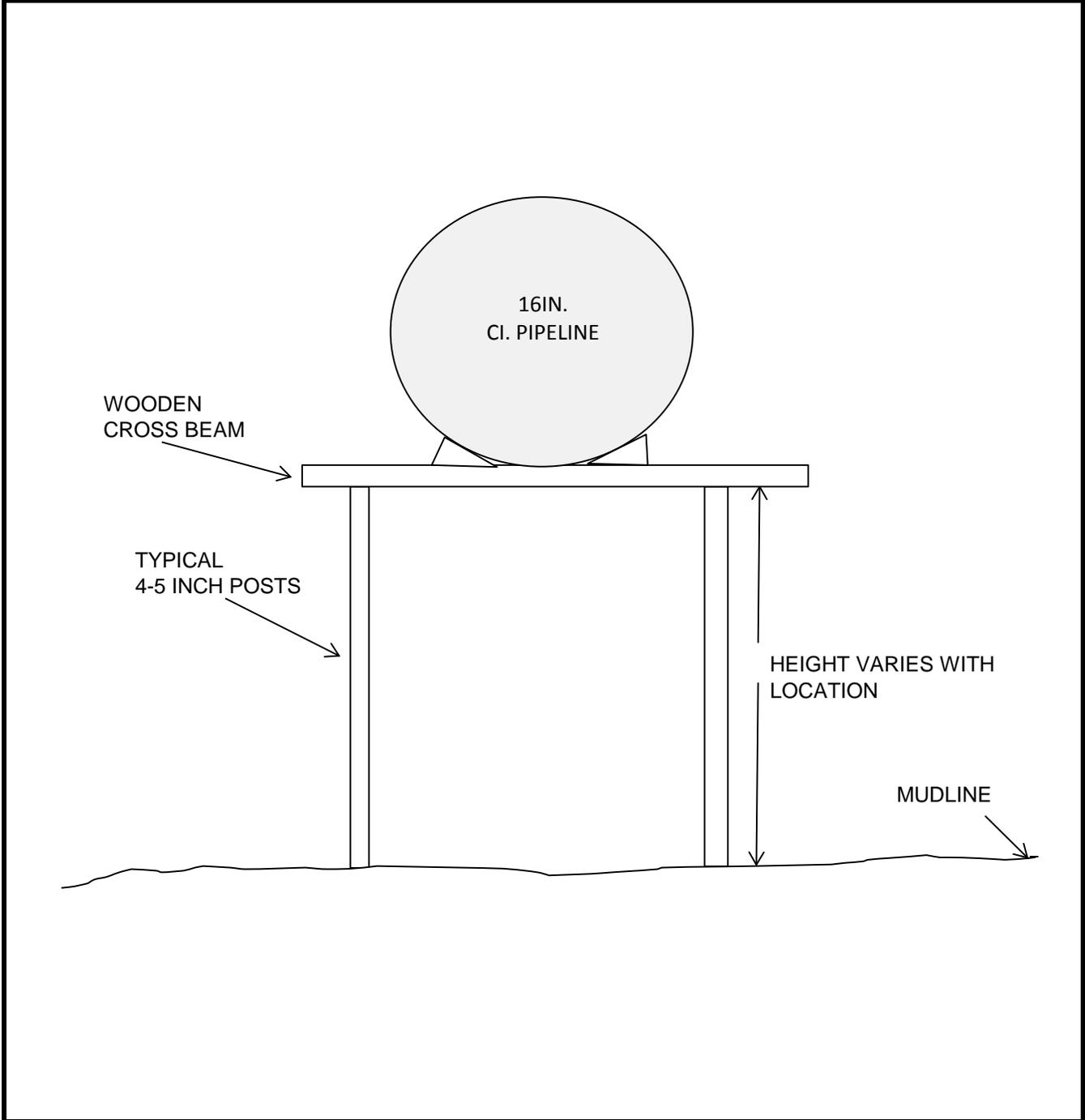
TYPICAL OUTLINE
OF PIPE TRENCH
THROUGH ROCK OR
EARTH

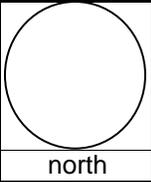
16IN.
CI. PIPELINE



north

**NAGOG POND DAM
INTAKE PIPELINE CROSS-SECTION
FIGURE 2
PIPELINE SUPPORT DETAIL**





north

**NAGOG POND DAM
X SECTION OF END OF
INTAKE PIPELINE
FIGURE 3**

