

**Narrows pump station SRM rehabilitation
Wareham MA
Reels arrangement to line through manhole (pos
87+25)**

Overview

- The Narrow pump project in Wareham MA was designed initially to be lined pit 13 pits and seven pulls
- The liner was sent in 3 reels, the planned pulls were arranged to fit all the required liner in the reels.
- Lining through the manhole at position 87+25 (pit 12) is possible, however some re-arrangements in the reels distribution and number of pulls is needed to accommodate the available material contained on the reels to successfully rehabilitate the whole length of the pipeline.
- The original plan initially proposed is as follows

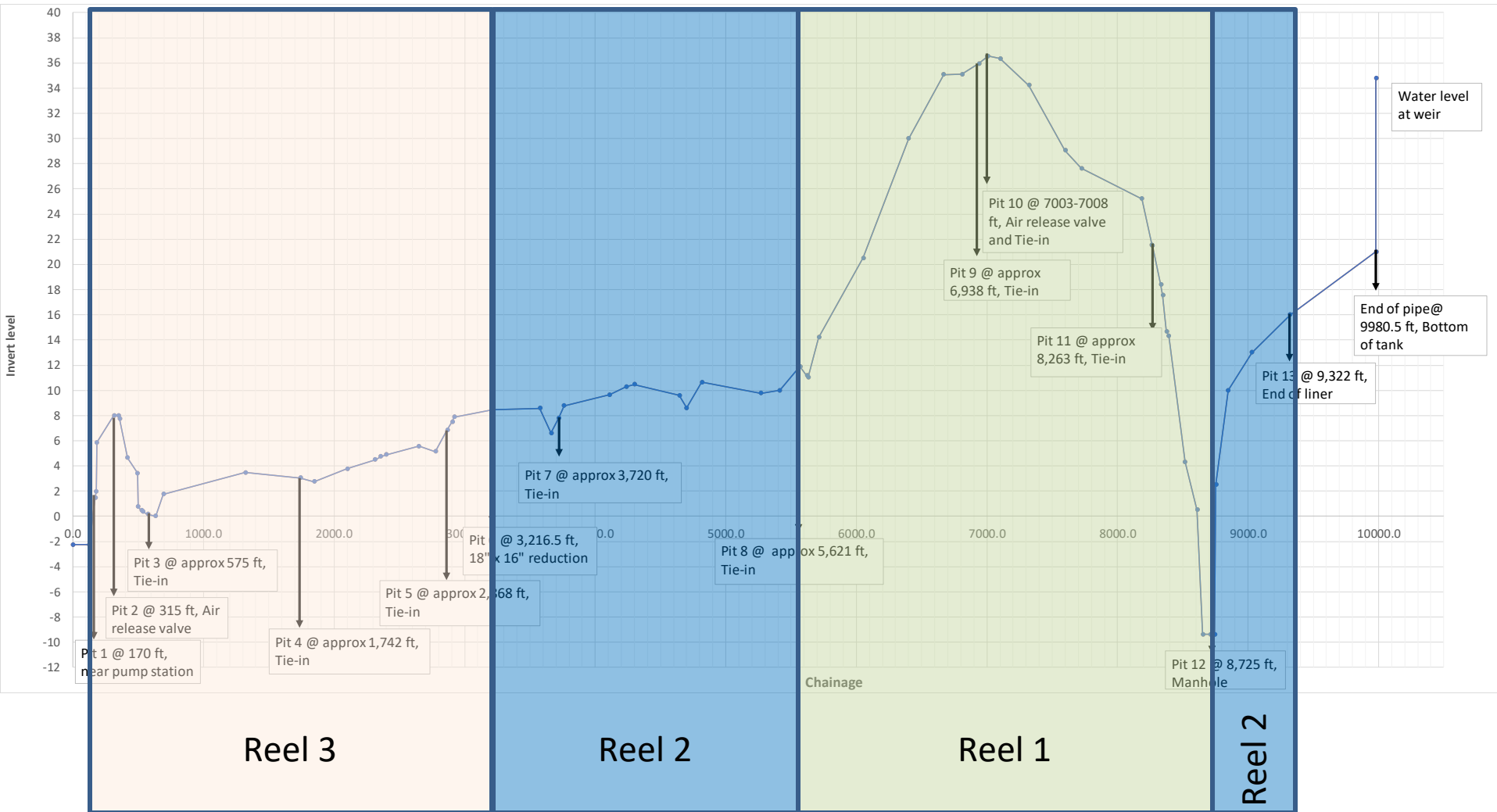
Planned Pits

- The project initial plan contemplates 13 pits in total:
- Pit 1, sta 1+70, 90 degree bend
- Pit 2 sta approx. 3+15, air release valve
- Pit 3 sta approx. 5+75, tie-in from Narrows restaurant
- Pit 4 sta approx. 17+42, tie-in
- Pit 5 sta approx. 28+68, tie-in from Indian Neck PS
- Pit 6 sta 32+16.5, 16" to 18" transition
- Pit 7 sta approx. 37+20, tie-in
- Pit 8 sta approx. 56+21, tie-in
- Pit 9 sta approx. 69+38, tie-in
- Pit 10 sta approx 70+03 to 70+08, air release valve, tie-in
- Pit 11 sta approx 83+63, tie-in
- Pit 12 sta 87+25, manhole
- Pit 13 sta 93+22, end of liner

Liner reels (initial plan)

- The liner was shipped in three T-600 reels (6m)
- Reel 1 with 3,207.00 LF of 18" liner
- Reel 2 with 3,083.00 Lf of 18" liner
- Reel 3 with 3,182.00 LF 16" liner
- Reel 1 must be used to line the section between pit 8 and pit 12
- Reel 2 must be used to line the section between pit 6 to pit 8 and the section between pit 12 and pit 13
- Reel 3 must be used to line the section between pit 1 and pit 6

Liner reels (initial plan)



Planned pulls and phases (initial plan, 7 pulls)

- The calculated pulling forces are the following:

Phase	Pull	Reel to be used	Launching pit	Receiving pit	Length [ft]	Comments	Pulling force [ton]	Pulling Force [lbs]
1	1	1	Pit 10, Air release valve @ (70+03)	Pit 8, Tie-in (56+21)	1,382.00	2 x 5° vert bends	2.24	4,941.91
	2	1	Pit 10, Air release valve @ (70+08)	Pit 12, Blowdown manhole (87+25)	1,717.00	2 x 11° vert bend 1 x 15° hor bend 2 x 45° hor bend	3.73	8,223.14
	3	2	Pit 13, End of Liner @ (93+22)	Pit 12, Blowdown manhole (87+25)	597.00	1 x 22.5° hor bend 1 x 45° hor bend 2 x 45° vert bends	2.50	5,515.29
2	4	2	Pit 6, 18"x16" reduction @ (32+16.5)	Pit 8, Tie-in (56+21)	2,404.50	1 x 5° hor bend 1 x 7° hor bend	3.68	8,103.99
	5	3	Pit 6, 18"x16" reduction @ (32+16.5)	Pit 4, Tie-in (17+42)	1,474.50	2 x 45° hor bend	2.86	6,300.30
3	6	3	Pit 3, Tie-in @ (5+75)	Pit 4, Tie-in (17+42)	1,167.00	2 x 45° hor bend	2.49	5,494.44
	7	3	Pit 3, Tie-in @ (5+75)	Pit 1, Start of liner (1+70)	405.00	2 x 25° vert bend 2 x 34° vert bends 1 x 38° vert bend 2 x 45° vert bend	2.85	6,291.84
				Total	9,147			

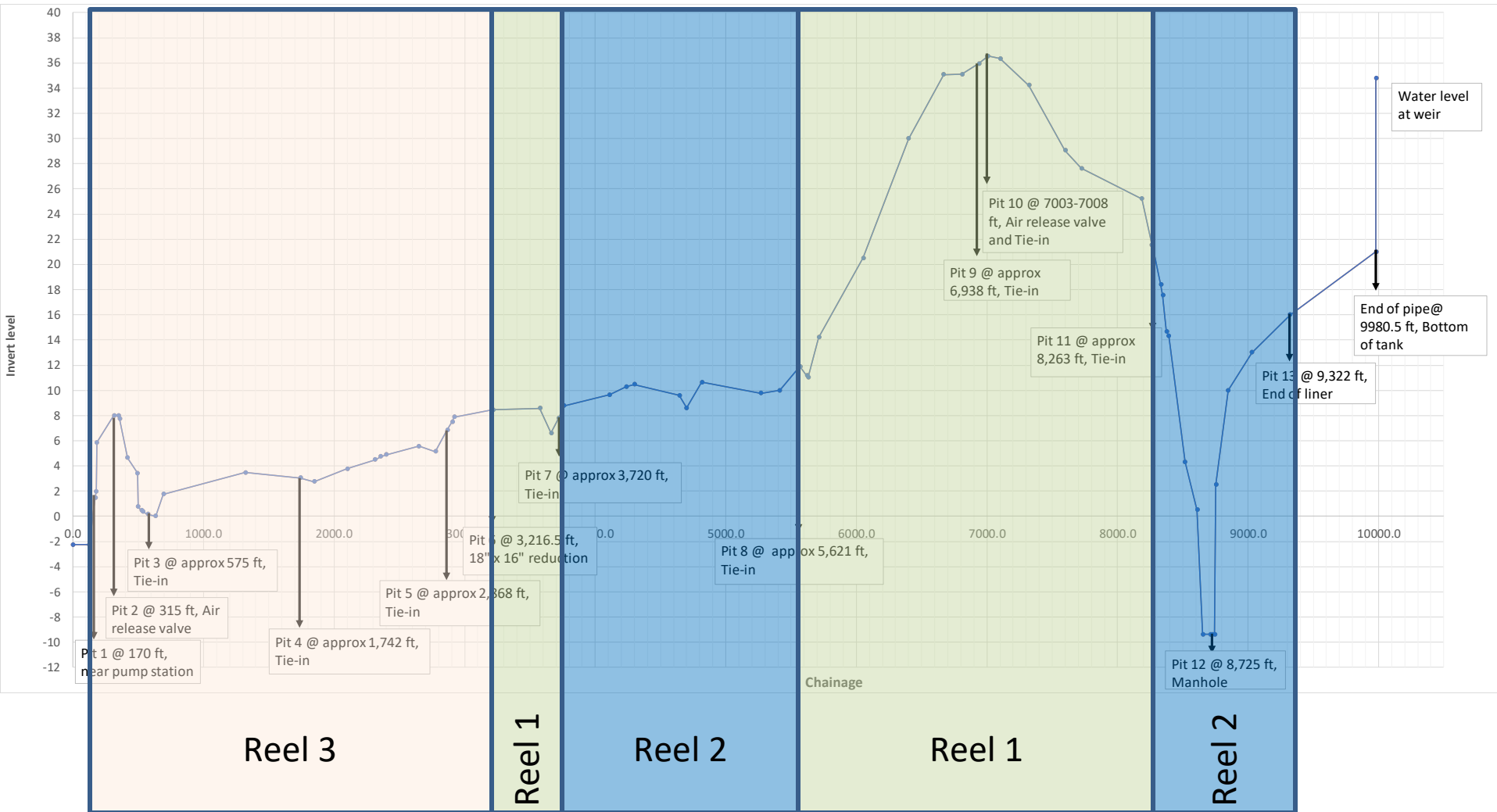
Modified plan to line pass through manhole (pit 12) pos 87+25

- In order to accommodate the liner in the reels to the project for the contractor to be able to line through the manhole at position 87+25 some re-arrangements in the reels usage and in the number of pulls is needed
- Since pit 12 will not be have connectors installed in this modified plan, more liner length will be needed for that specific pull, this changes the usage of the liner in the reels.
- The liner lengths sent in the reels was design with the original plan in mind.
- This modified plan will require 8 pulls instead of 7
- If it is decided to line pass through the manhole at position 87+25 the following reels arrangement and usage have to be followed to rehabilitate the pipeline.

Liner reels (modified plan)

- The liner was shipped in three T-600 reels (6m)
- Reel 1 with 3,207.00 LF of 18" liner
- Reel 2 with 3,083.00 Lf of 18" liner
- Reel 3 with 3,182.00 LF 16" liner
- Reel 1 to be used to line the section between pit 8 and pit 11, and section between pit 6 and pt 7
- Reel 2 to be used to line the section between pit 11 and pit 13 and the section between pit 7 and pit 8
- Reel 3 to be used to line the section between pit 1 and pit 6

Liner reels usage (modified plan)



Planned pulls and phases (modified plan, 8 pulls)

- The calculated pulling forces are the following:

Stage	Pull	Reel to be used	Launching pit	Receiving pit	Length [ft]	Comments	Pulling force [ton]	Pulling Force [lbs]
1	1	1	Pit 10, Air release valve @ (70+03)	Pit 8, Tie-in (56+21)	1,382.00	2 x 5 vert bends	2.24	4,941.91
	2	1	Pit 10, Air release valve @ (70+08)	Pit 11, Tie-in (82+63)	1,255.00	2 x 11° vert bend 1 x 15° hor bend	2.24	4,947.69
	3	2	Pit 11, Tie-in (82+63)	Pit 13, End of Liner @ (93+22)	1,059.00	1 x 22.5° hor bend 3 x 45° hor bend 2 x 45° vert bends	4.13	9,113.17
2	4	1	Pit 6, 18"x16" reduction @ (32+16.5)	Pit 7, Tie-in (37+20)	503.50	-	0.96	2,112.63
	5	2	Pit 7, Tie-in (37+20)	Pit 8, Tie-in (56+21)	1,901.00	1 x 5° hor bend 1 x 7° hor bend	2.98	6,564.56
	6	3	Pit 6, 18"x16" reduction @ (32+16.5)	Pit 4, Tie-in (17+42)	1,474.50	2 x 45° hor bend	2.86	6,300.30
3	7	3	Pit 3, Tie-in @ (5+75)	Pit 4, Tie-in (17+42)	1,167.00	2 x 45° hor bend	2.49	5,494.44
	8	3	Pit 3, Tie-in @ (5+75)	Pit 1, Start of liner (1+70)	405.00	2 x 25° vert bend 2 x 34° vert bends 1 x 38° vert bend 2 x 45° vert bend	2.85	6,291.84
				Total	9,147			