The Measured Performance of Aluminized Type 2 Steel Pipe in Storm Sewer Applications in the North Georgia Region

May 2017

NCSPA

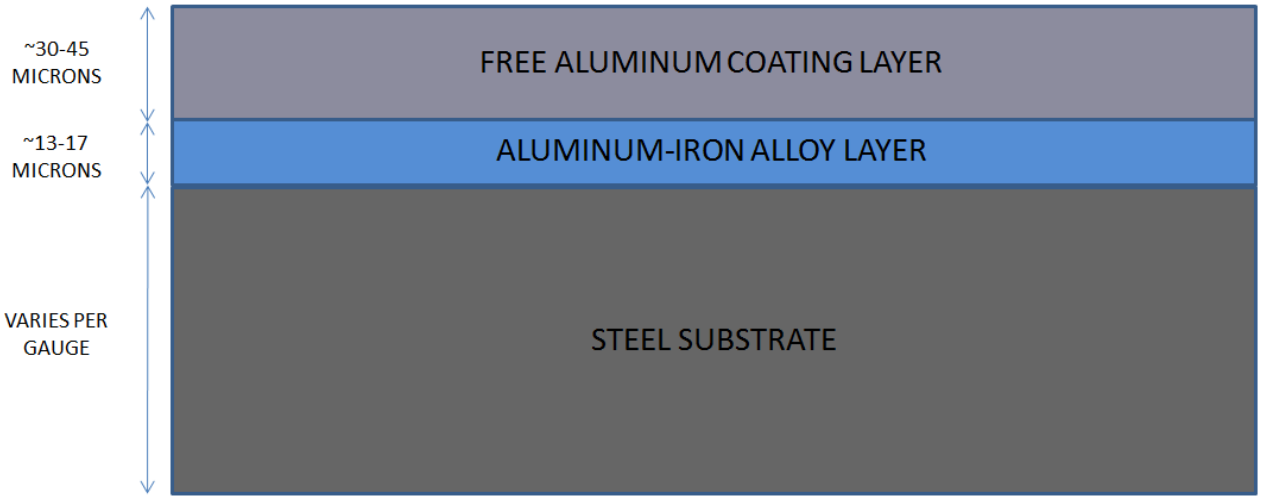
STEEL: PROVEN 100-YEARS STRONG

The Measured Performance of Aluminized Type 2 Steel Pipe in Storm Sewer Applications in the North Georgia Region

A research project on the durability of Aluminized Steel Type 2 pipe installed in the metro Atlanta area has resulted in an outstanding report of the product's performance. The study focused on the performance of pipes in storm sewer applications, so the majority of the pipes are connecting two catch basin structures. All of investigated pipes that were installed per industry guidelines are **far exceeding** the stated goal of a 75 year minimum service life for the product. The investigation is ongoing and this document will be updated as more data is added.

The study includes 105 pipes located in Gwinnett, Cobb, Forsyth, Hall, Barrow, Athens-Clarke, and Walton counties. The oldest pipe in the study group is 38 years old and the average age of the pipes is 20 years. All of the pipes were tested and documented per the NCSPA's "Non-Destructive Testing Protocol for Corrugated Metal Pipe."

The protective coating of aluminized type 2 corrugated steel pipes is composed of a free aluminum surface layer and an aluminum-iron alloy layer that protects the steel substrate from exposure to the surrounding environment and the abrasion forces of flowing water.



The gauges used in this study measured the overall thickness of the steel pipe as well as the free aluminum coating layer. The aluminum-iron alloy layer was not directly measured, but was estimated using the known thicknesses of these layers from decades of metallographic analysis.

The average measured loss rate of the free aluminum layer found in the study was 0.84% per year. **At that rate, a piece of pipe installed today would still have significant aluminum coating after 100 years**. This wear rate only accounts for the surface free aluminum layer of and does not include the aluminum-iron alloy layer or the base steel itself. These second and third layers of material will provide substantial additional service life after the free aluminum is depleted.

This wear rate does not vary significantly across the sample based on the age of the pipes. For pipes that have been installed for 30 years or more, the measured wear rate is 0.78% per year, which is practically identical to the overall average for all the pipes in the study.

The aluminum-alloy layer is typically 1/3 of the thickness of the free aluminum layer, but is much more chemically stable and over twice as hard as the free aluminum layer. Because the durability characteristics of the alloy layer are more than twice as resistant to wear compared to the free aluminum layer, a 2x factor could be assumed to extrapolate from the free aluminum wear rate. A reasonable add-on factor for the alloy layer would be 66% of the free aluminum layer service life (1/3 x 2 = 66%), but a 50% add-on factor was used to remain very conservative. The chart on the following pages is based on the measured free aluminum wear rate and the 50% add-on for the aluminum alloy layer, but it does not include the substantial service life provided by the steel substrate itself after the aluminized coating is depleted.

Based on this study, as well as several multistate studies of aluminized steel pipes more than 60 years old, we expect that Aluminized Steel Type 2 pipe installed in metro Atlanta will provide an exceptional service life far beyond the design goal of 75 years.

Thank you,

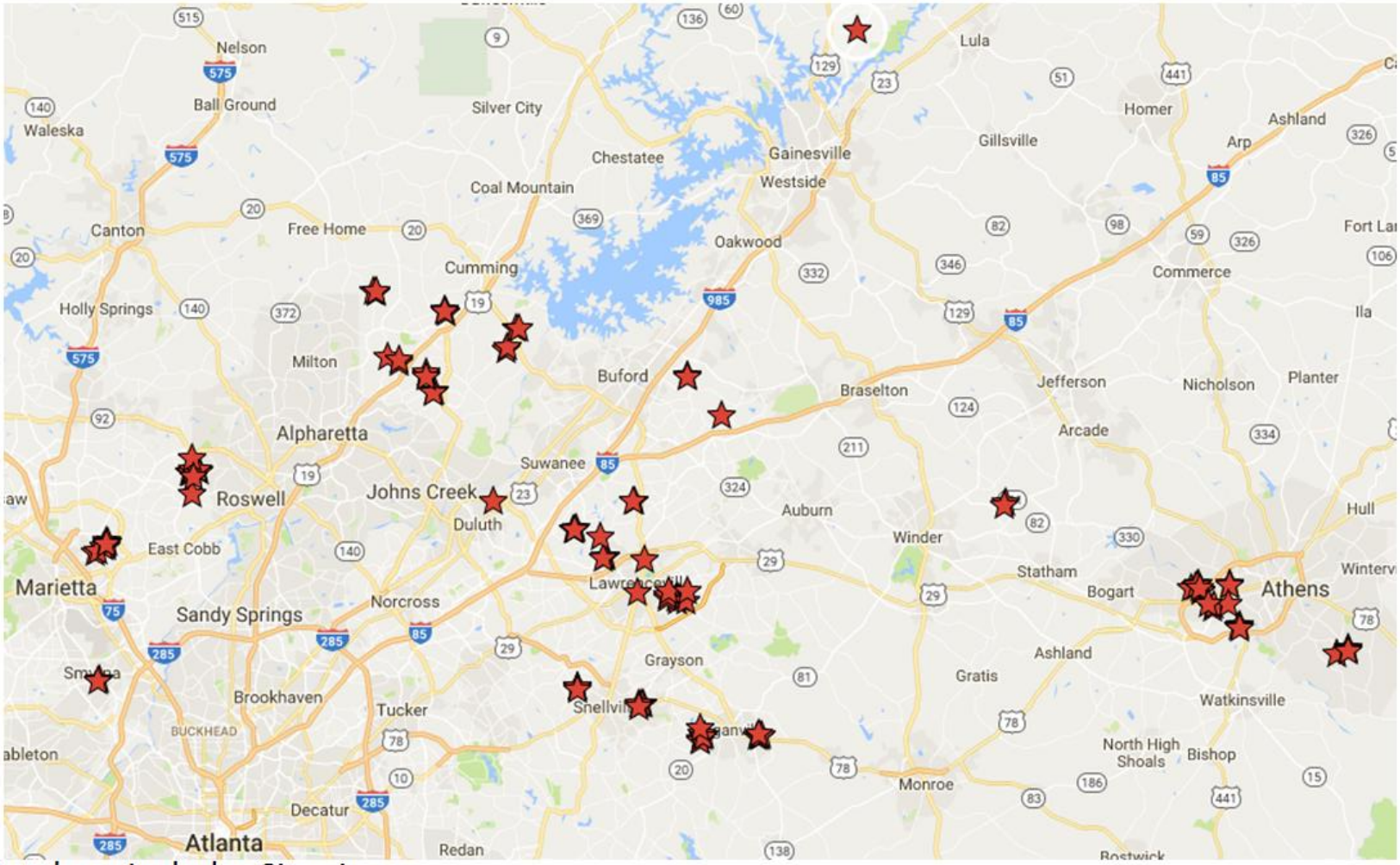
Travis Owen, Civil Engineer, and Tim Kitts, Civil Engineer

Southeast Culvert Inc.

Member of NCSPA

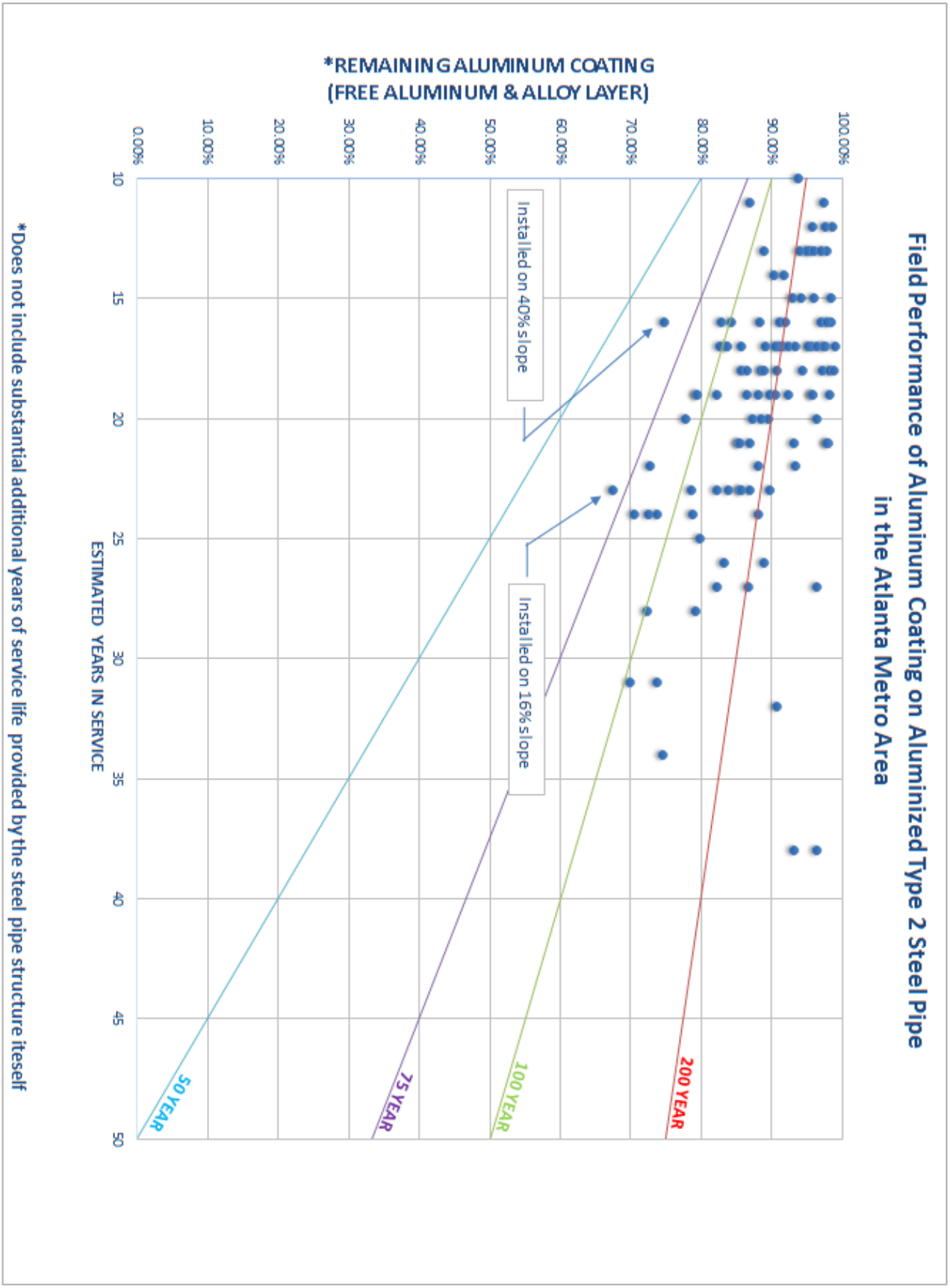
Updated 5-2-17

105 Aluminized Pipes Included in the Database
Oldest pipe installation – 38 years, Average Age – 20 years



Database Includes Sites in :

Gwinnett (38), Athens-Clarke (20), Forsyth (19), Cobb (18), Walton (4) Hall (3), and Barrow (3)


Field Performance of Aluminum Coating on Aluminized Type 2 Steel Pipe
in the Atlanta Metro Area
*REMAINING ALUMINUM COATING
(FREE ALUMINUM & ALLOY LAYER)
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
10
15
20
25
30
35
40
45
50
ESTIMATED YEARS IN SERVICE
Installed on 40% slope
Installed on 16% slope
50 YEAR
75 YEAR
100 YEAR
200 YEAR
*Does not include substantial additional years of service life provided by the steel pipe structure iteself