



# The Unique History of Charleston Water System's

**Sewer Collection and Treatment Facilities** 

May 11-13, 2022 Kin Hill, P.E., CEO Charleston Water System

### Welcome to Charleston!

• Voted by CONDÉ NAST TRAVELER Magazine as the #1 tourist destination 10 years



Will focus on the history of CWS, and especially the history of our wastewater system

- How we morphed from a water only utility to a water and wastewater utility
- Show some unique aspects
- Give you some data on our compliance track record, etc.



Figure 49: The 78" x 70" three-dimensional wall mural depicts the Charleston Tunnel Sewer System, and is hung in the lobby of the Plum Island Plant Administrative Building. The mosaic was executed in ceramic by the internationally famous artist Gabriel Loire (1904-December 25, 1996) in Chartres, France.

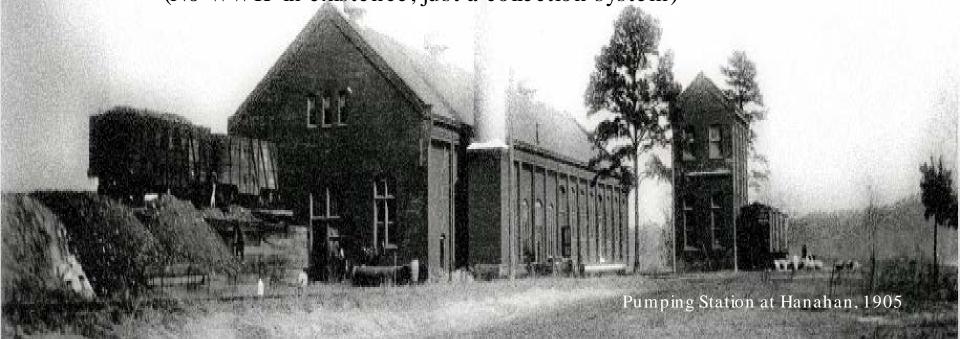


TheCharleston
Light & Water Co.
Light & Water Co.
builds the Goose
Creek Reservoir
and a pumping
station to provide
water to the naval
ship vard.
syst





- ❖ 1917 Charleston Commissioners of Public Works formed; later name changed to Charleston Water System. (CWS)
  - Assumed assets of the Charleston Water & Light Company
  - Operated a surface water treatment plant and water distribution system for over 40 years
- ❖ 1961 City of Charleston transferred ownership, operations, maintenance and control of City's wastewater collection system to Charleston CPW. (No WWTP in existence; just a collection system)



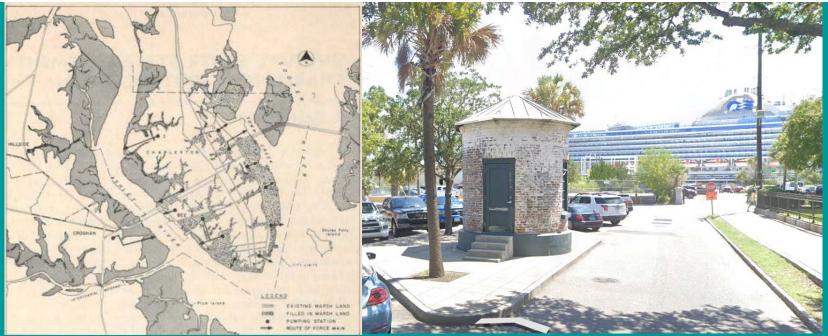
# Collection System "Evolution"

- ❖ Between 1865 1896 City Council's Health and Drainage Committee recommended the construction of separate sanitary sewers and removal of wastes from the storm drain system by means of a TIDAL Drain System.
- TIDAL Gate Keepers operated slide gates in sync with tidal cycles to flush out the storm drains.
- This system was kept operational until early 1960's.

  (Both systems discharged to the Ashley and/or Cooper Rivers)

#### What wastewater assets did CWS assume in 1961?

- Original wastewater collection lines installed in early 1800's
- All pipes flowed to Ashley or Cooper Rivers (untreated)
- By 1840 such system was deemed 'defective and offensive."
- By 1854 City public health reports stated: "The evil was radical, and the remedy must be radically administered, or the large number of causes of disease and death will continue to increase with the augmenting population".



# October 1961 – City Transfers Ownership to CWS (What happened next?)

- 1963 Legislative Action by SC, 'Charleston Harbor Pollution Law" (1970 Treatment Target)
- 1965 Charleston Harbor declared 'dead" by SC Pollution Control Authority, the predecessor of SC DHEC
- Fish Kills and zero dissolved oxygen events prevalent in Charleston Harbor
- June 1965 Plans announced for a \$9.2 million wastewater treatment plant project on 14 acres at Plum Island, the former site of historic quarantine 'pest houses' in Charleston

1961 CPW assumes operation of the City's sewer system.

1963 The SC legislature passes the "Charleston harbor pollution law," requiring municipalities to begin treating wastewater by 1970.



1968

CPW begins construction of the Plum Island Pollution Control Plant and a deep sewer tunnel system. The plant went on-line in 1970.

#### 1960's Media Records of Charleston Harbor



By BARBARA J. STAMBAUGH A "bad" pollution trend affecting swimmers off Sullivan's Island and the Isle of Palms of well as other water near Charleston, was indicated in a repor released here yesterday. The South Carolina Water Pollu

tion Control Authority study states that swimming standards are exceeded at two sampling stations off the Isle of Palms beach and at one point off Sullivan's Island

at one point of solitivan's Island.
It also states that the bacteriological quality has declined at other of the dopular beaches since 1985.
The possibility of a faulty septic tank-speciation on the Isle of Palms was offered as explanation for the instruction. ion off 41st and 6th Avenues. Water-sking off the Sullivan's sland back beach is termed "defover-flow lines discharging into Conch Creek without treatment. Although Folly Beach also has had an increase in coliform bacbelow the maximum for

nels for this popular sport.

Water Charle

become unfit for public use. Water-skiing already as hazard-

ous in some of the favorite chan-

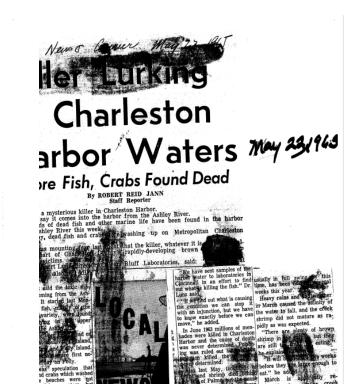
This news, though depressing, is hardly surprising. As population grows, the problem will become worse. Provision must be made sooner or later for sewage dis-

Introde No Place To Swim, Water Samples Indicate

City's Problems: Harbor Cleanup Methods, Money

JAN. 7, 1965 In Some Areas, Report Says

19,1963



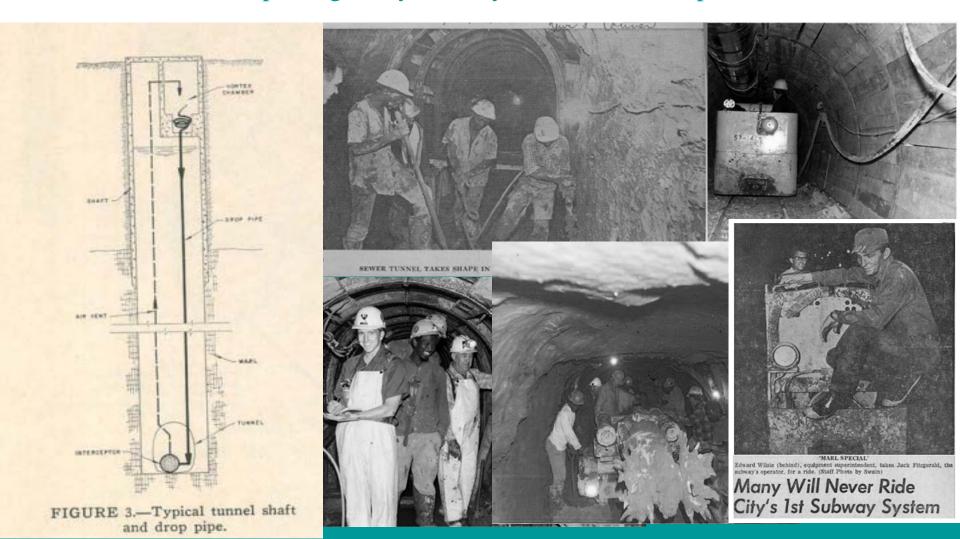
- MAY 22, 1965

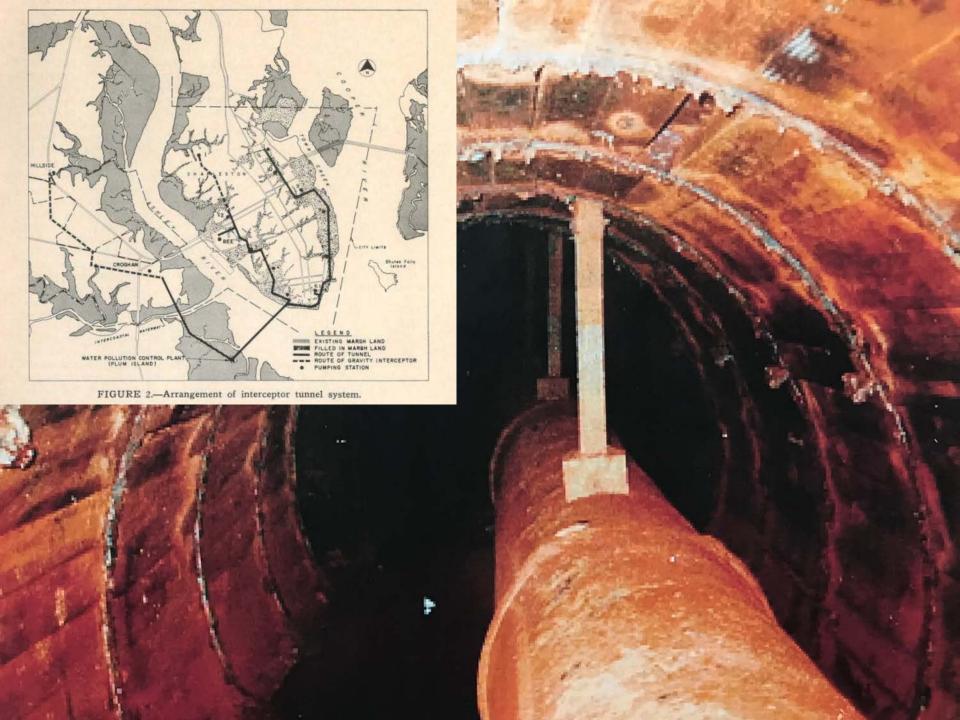


1968 – CWS begins construction of Plum Island WWTP

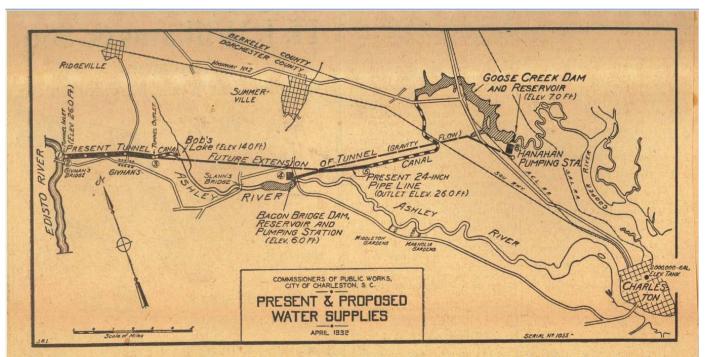
# Associated with Plum Island WWTP was 7 miles of deep collection system tunnels (11 miles ultimately)

• 90 – 130 feet deep for gravity conveyance in the cooper marl formation





#### Why a gravity tunnel for conveyance? 3 Reasons



Water from the Edisto river travels 43 miles to reach the faucet in your kitchen, bathroom or garden. J. E. Gibson, general manager and engineer of the Commissioners of Public Works, had this map prepared to show you the twists and turns the fluid takes to be at your

The tunnel starts at the Edisto river, near Givhan's Ferry, the inlet shaft being designated No. 2 on the map. For 41/2 miles it penetrates through solid marl, and the water continues to flow by gravity, discharging into Dodd Branch (3), a tributory of the Ashley river. It flows in a canal for 1.8 miles, and at Bob's Lake empties into the Ashley river, which carries it 8 miles to the Bacon's bridge dam, reser-

At Bacon's bridge (4) the gravity flow ceases and the water is pumped through a wood stave pipe line for miles, discharging into a canal (5) that takes it on to Goose Creek. At Hanahan pumping station (6) it is processed and made thoroughly fit for human consumption, and then is forced through the maze of pipes to serve the consumers.

From the point designated No. 3 to No. 6 is shown the proposed extension of the tunnel, which would give a gravity flow all the way from the Edisto river to the pumping station at Hanahan. That is a project for the future, however, when money becomes much more plentiful than it is at present.

- 1. Least disruption to historical 2. Great Geology for 3. Past Experience areas of Charleston
- Tunnelling (Cooper Marl)

(Water Tunnel)

#### Charleston's "underground", delight to tunnel digger and water works alike

There is an "underground" in Charleston, South Carolina. Not a group of latter day radicals, but one that's been there for millions of years...just waiting to benefit this colorful, historic Southern City.

That "underground" is a geological rarity called Cooper marl. Soft enough that tunnels can be cut through it easily. Dense enough that those tunnels can be used to transport water..."

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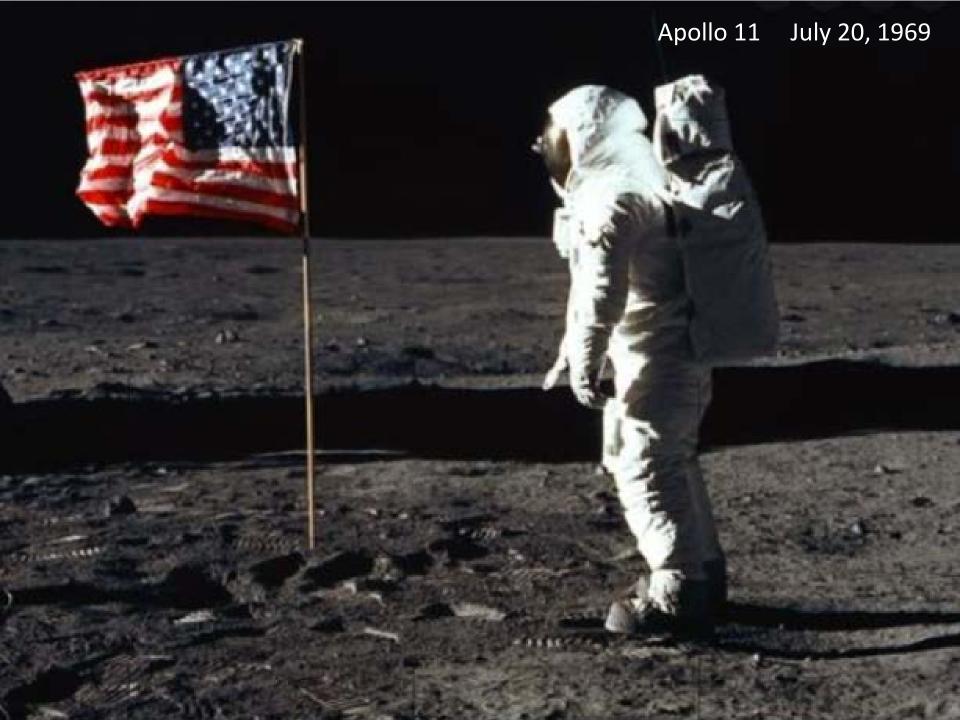
That 'underground' is a goological rarity called Cooper mark. Soft ecough that tunnels can be cut through it easily. Dense enough that these tunnels can be used to transpare under. And that's what the City of Charleston has been doing since 1928. Using such tunnels ... Now it is enupleting another.

"The geological formation of this region is a rarity... an engineer's delight and a boom to waiter departments," wrote seporter Gautiner Miller in the Cavalian Manu Iast your. Cooper man's foundation Manu Iast your. Cooper mad is foundated literatures, ideal for transition, Trunels through Cooper must rarely need supports since, once expessed to air, the stone sets almost like concrete and is importation to water. That is why a hole through it makes a good water pipe.

Mueller Record, Spring, 1978.



Figure 48: Mueller Record, 1978.



# Plum Island WWTP goes online for the first time, November 1971

- Primary Treatment Only
- Later upgraded to secondary treatment in 1984 at a cost of \$13 million

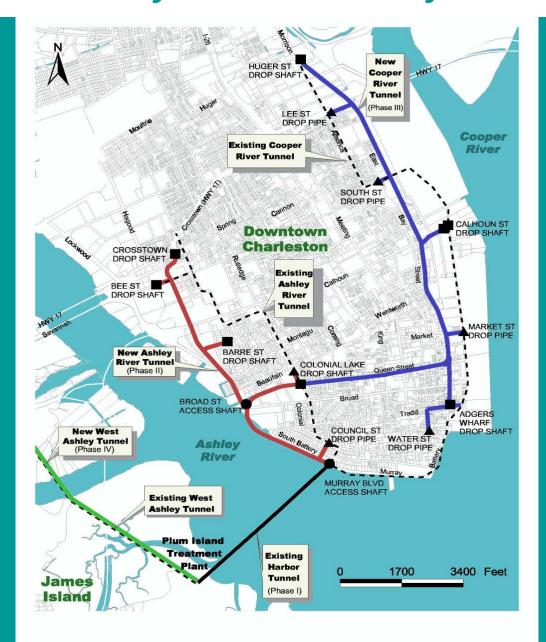


## Plum Island Today, 2022



36 MGD Conventional Activated Sludge Treatment Plant

## New Tunnel System Today, 2022



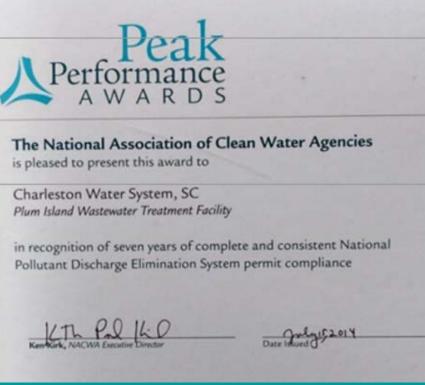
So How Has Plum Island Performed Since 1971 (50 Years)?

**Answer: PHENOMINALLY!** 



25 times!

including numerous individual WEF Awards for CWS Staff!



Peak Performance Platinum - 2015, 2014, 2013, 2012, 2003 Peak Performance Gold Award - 2020, 2019, 2018, 2017, 2016, 2011, 2010, 2007, 2001, 2000, 1999, 1998, 1996

Peak Performance Silver Award – 2015, 2006, 2005, 2004, 1997, 1995, 1994

# Charleston Harbor Today



• Fishable

• Swimmable

• Love able!

\*Kathleen Wilson, CWS Commissioner (Long Distance Swimmer)

# Enjoy our wonderful City!



Thanks to Plum Island and the FANTASTIC CWS "Team" it is even more enjoyable!