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# Amenia Fire District
# Amenia, New York

## LDH Relay Pumping Seminar
## Relay Pumping Drill – August 26, 2018
## Summary Report

# The Purpose

- The purpose of the seminar and drill was to review the basics of large diameter hose (LDH) and relay pumping operations in a non-hydranted setting.
- The drill also allowed mutual aid companies to work together in a real-life training situation.

# The Seminar

- The seminar started with a 4-hour classroom session to review the principles of LDH and relay pumping operations.
- The review session was held at the Amenia VFD station in downtown Amenia.
- Seminar topics included the types of LDH and LDH appliances, LDH operations and best practices, and the key points of relay pumping operations.
- Seminar participants were from the Amenia area.

# The 5,300 ft Relay Pumping Drill

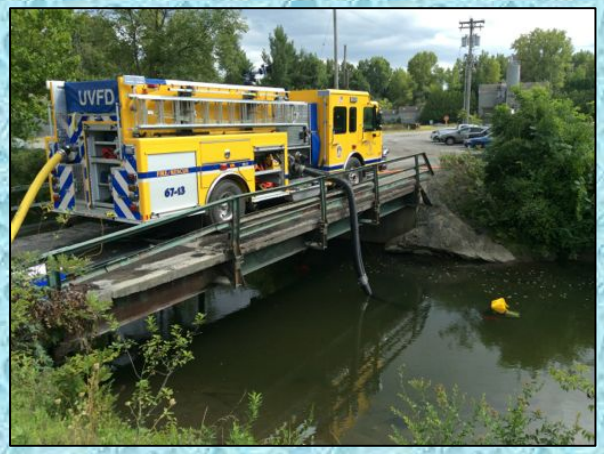
- The relay pumping drill was held in the parking lot of an asphalt/gravel facility.
- The goal of the drill was to practice a large-scale relay pumping operation and to see how much water could be delivered through 5-inch LDH using various arrangements of pumpers.
- Five separate pumping scenarios were tested – all involved pumping water through 5,300 feet of 5-inch hose.

# Water Supply Drill Participants


- *The participants for the drill were from several different fire departments in the Amenia area. The pumping apparatus was representative of the type of water supply support that would respond to a structure fire in the northern part of Dutchess County.*

# Drill Participants

- Union Vale Engine 67-13
  - 2,000 gpm pump
- Sharon Engine 5
  - 1,250 gpm pump




# Drill Participants

- Millerton Engine 51-14
  - 1,250 gpm pump
- Dover Engine 36-12
  - 1,250 gpm pump


# Drill Participants

- Amenia Squad 31-12
  - 1,500 gpm pump

# The Water Supply Source


The water supply source for the relay pumping drill was Webatuck Creek which was located in the middle of the asphalt/gravel facility. The creek had plenty of clean water and access was made using multiple suction lines. The lift at the draft site was under 15-feet.

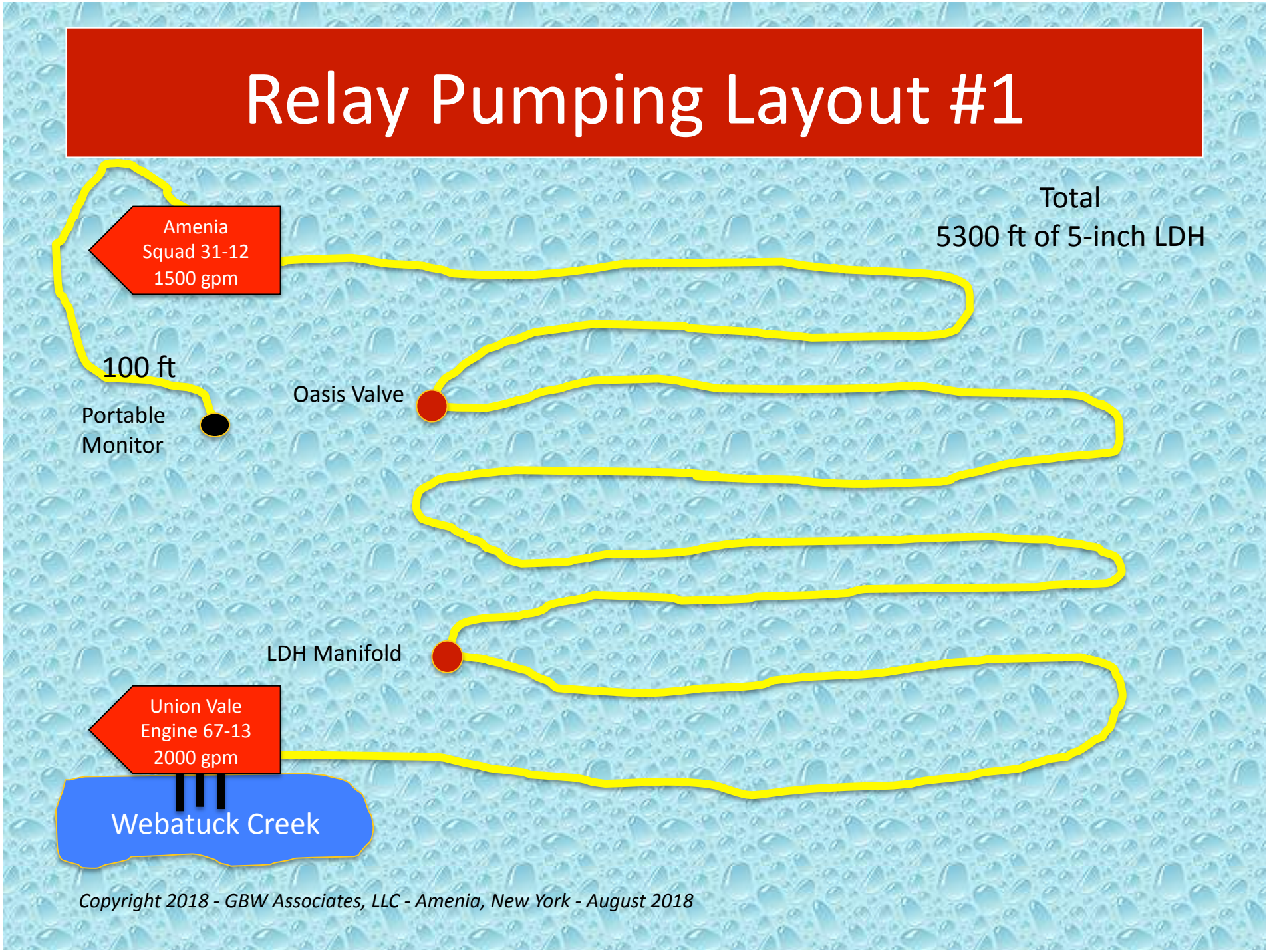
# Hose Lay Out

The hose layout was accomplished using Amenia Pumper 31-17 and Dover Engine 36-12. A total of 5,300 feet of 5-inch hose was laid out in an accordion fashion in the facility parking lot.

# Flow Measurement

Water flow was measured using a pitot gauge on a portable monitor equipped with a 2-inch tip. A HoseMonster flow diffuser was used to measure flow in addition to the portable monitor when flows approached 1,000 gpm.

# Relay Pumping Layout #1



# Layout #1 Results

- The first test used just two pumpers, the 2,000 gpm source pumper (Union Vale Engine 67-13) and the 1,500 gpm attack pumper (Amenia Squad 31-12).
- In between the two pumpers was 5,300 feet of 5-inch hose with basically no change in elevation.

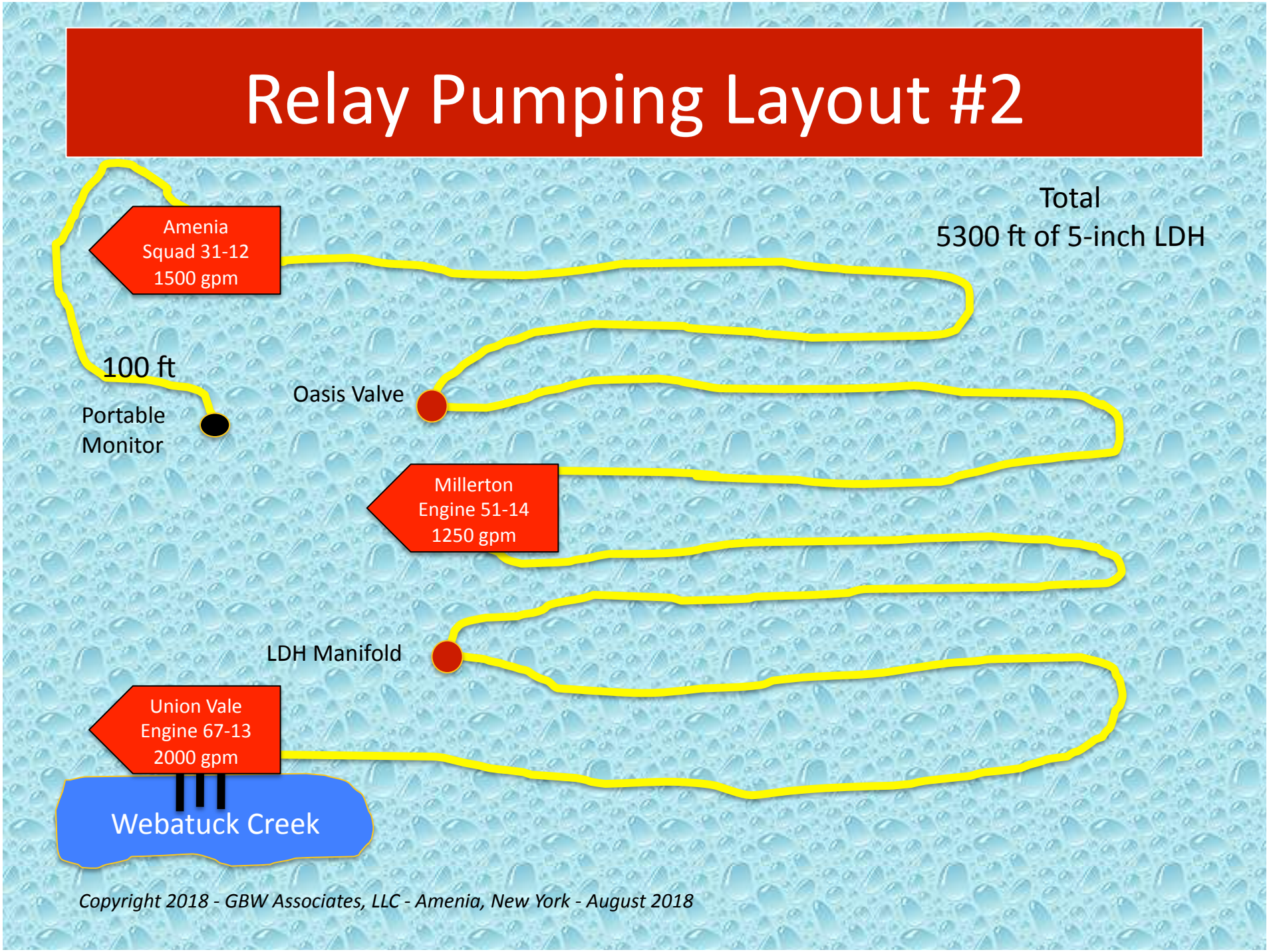
# Layout #1 Results

- With the source pumper discharging at 150 psi and the attack pumper maximizing output, a flow of 857 gpm was achieved at the portable monitor.
- With just the two pumpers, more than 750 gpm of water was flowed over one-mile using a single line of 5-inch LDH!

# Adding the 1st Relay Pumper

The first relay pumper added to the hose layout was Millerton Engine 51-14, a 1,250 gpm pumper. The crew added their rig near the midway point of the 5300-ft hose lay. Their task was to add the pumper into the hose lay at a point where no control valve existed.

# Relay Pumping Layout #2



# Layout #2 Results

- The difficulty of adding the pumper in without a control valve in place was that water flow to the attack pumper had to be interrupted and the crew had to fight back-pressure in the hose.
- The pumper crew did a great job of getting everything ready for the switchover and then made that switchover in under 3-minutes.

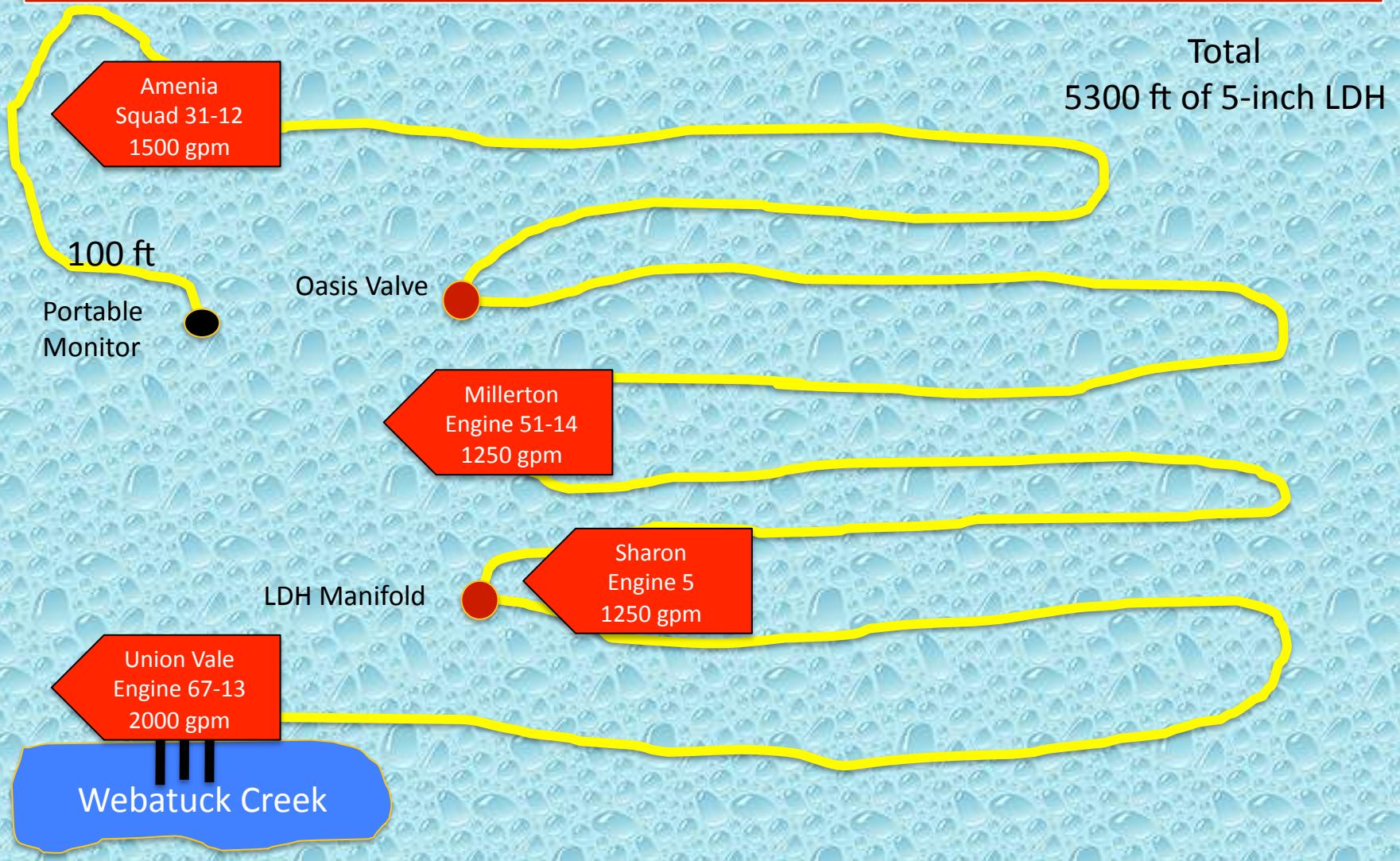
# Layout #2 Results

- With the source and relay pumpers discharging at 150 psi and the attack pumper using every drop of available intake water, a flow of 994 gpm was achieved.
- Adding the relay pumper only increased the total flow by about 140 gpm. The relay pumper had a 3-inch LDH discharge, so that piping most likely was flow limiting.

# Adding a 2nd Relay Pumper


Sharon Engine 5 (1,250 gpm) was added as a second relay pumper. Their rig was inserted around the halfway mark between the first relay pumper and the source pumper. An LDH manifold had been left by the hose wagon so water control was much better. However, flow to the attack pumper had to be stopped in order to complete the hookup.

# Relay Pumping Layout #3



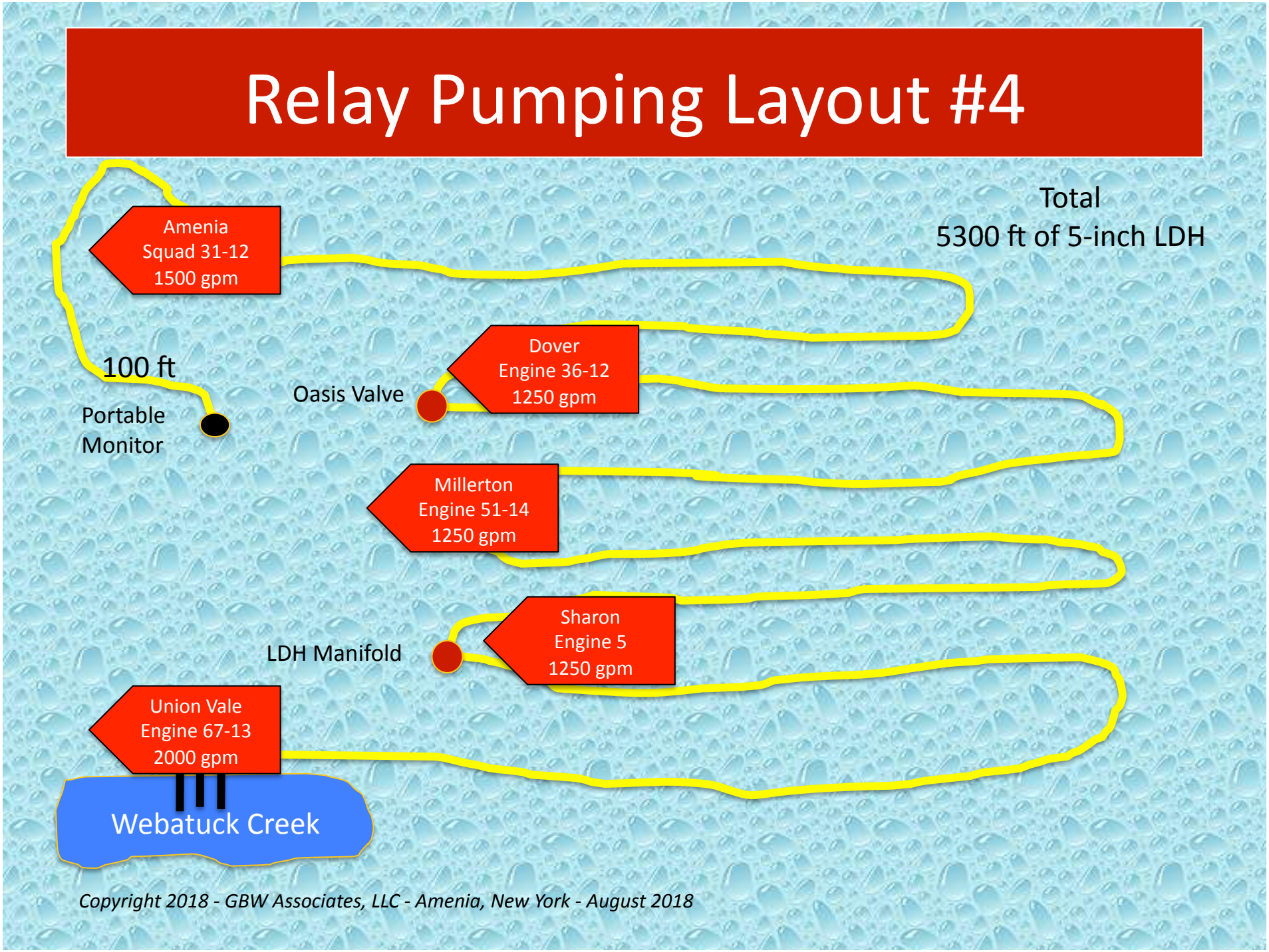
# Layout #3 Results

- Using a four pumper relay configuration with the source and relay pumpers discharging at 150 psi and the attack pumper using all incoming water, a flow of 1,189 gpm was attained.
- Again, the first relay pumper's discharge pumping was suspect in terms of flow limiting.

# Adding a 3rd Relay Pumper

Dover Engine 36-12 (1,250 gpm) was added as a third relay pumper. Their rig was inserted around the halfway mark between the first relay pumper and the attack pumper. A TFT Oasis valve had been left by the hose wagon so no interruption in water flow was needed in order to insert this pumper.

# Relay Pumping Layout #4



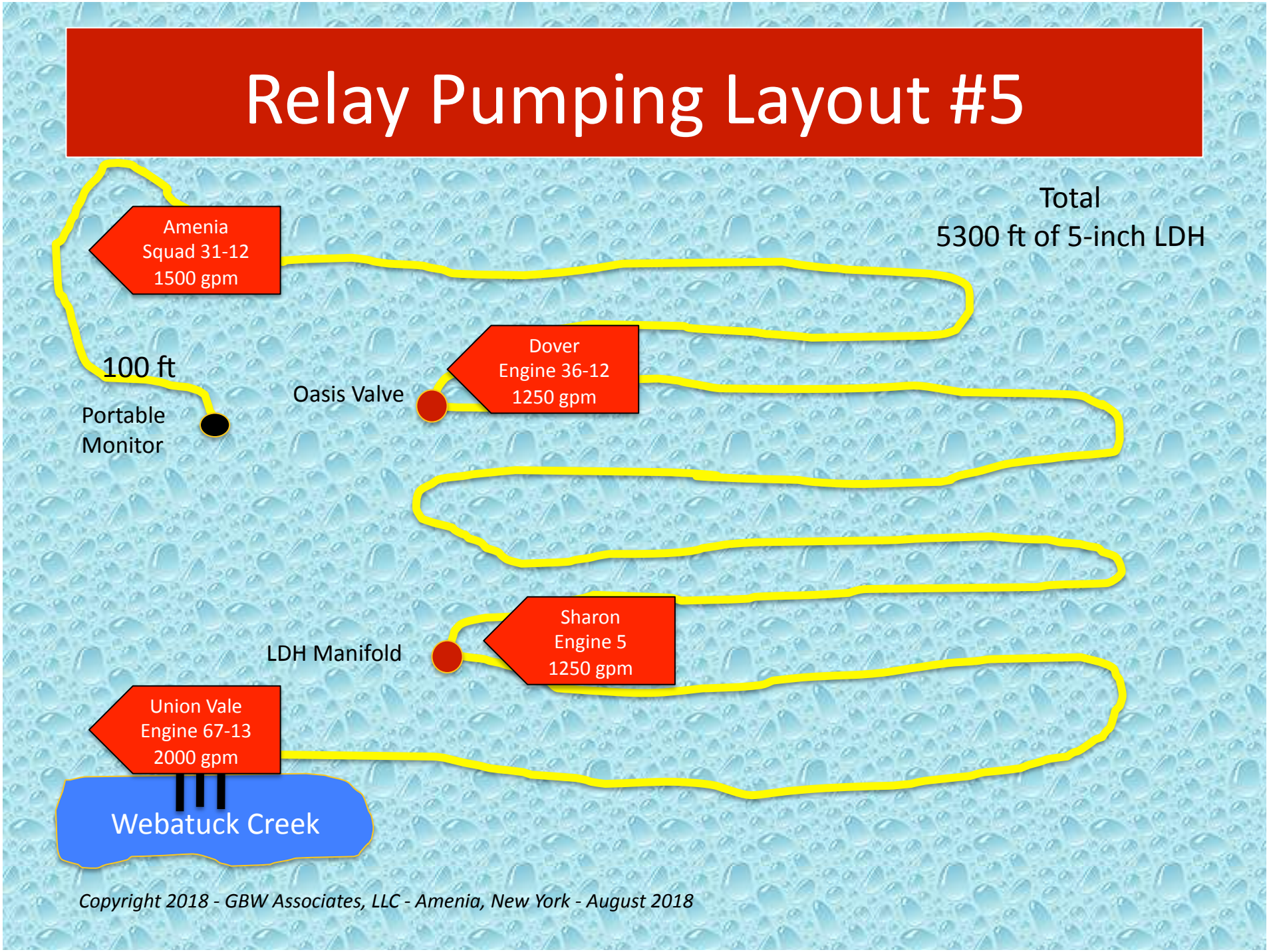
# Layout #3 Results

- Using a five pumper relay configuration with the source and relay pumpers discharging at 150 psi and the attack pumper using all incoming water, a flow of 1,285 gpm was attained.
- Again, the first relay pumper's discharge pumping was suspect in terms of flow limiting.

# Removing a Relay Pumper

- Because the first relay pumper's (Millerton) LDH discharge was suspect in terms of its size and flow, the pumper was removed from the layout.
- This left a four-pumper configuration and each pumper had a 4-inch piped LDH discharge.

# Relay Pumping Layout #5



# Layout #5 Results

- Moving back to a four pumper relay configuration with the source and relay pumpers discharging at 150 psi and the attack pumper using all incoming water, a flow of 1,356 gpm was attained.
- This final test proved that the Millerton pumper had been a flow restriction and that the relay performance improved by actually reducing the number of pumpers involved.

# Summary of Results

| | Hose Layout | 150 psi Test |
|---|---|---|
| 2 Pumpers | 5,300 feet | 857 gpm |
| 3 Pumpers | 5,300 feet | 994 gpm |
| 4 Pumpers | 5,300 feet | 1,189 gpm |
| 5 Pumpers | 5,300 feet | 1,285 gpm |
| 4 Pumpers | 5,300 feet | 1,356 gpm |

The results of the flow tests illustrate the capability of 5-inch LDH and the importance of adding relay pumpers when increased flow is needed.

It is interesting to note that in the end, four pumpers moved more than 1,300 gpm over 1-mile from a water source. That result has huge implications when thinking about protecting downtown areas of small communities where static water sources are present nearby.

# The Lessons Learned/Reinforced

- When possible try to place the largest pumper at the water source.
- Using some type of control valve in the middle of long hose lays allows for a relay pumper to be inserted later into the event.
- A critical item in the success of a LDH relay pumping operation is having a sufficient number and type of LDH appliances and adaptors.
- A review of the results show that the upper end of the flow did not significantly increase as more pumpers were added; this most likely means that the source pumper was maximized in terms of output – possibly the rear high-flow discharge.
- The results also showed that dropping out the lesser performing relay pumper actually improved flow. Remember that not all LDH discharges are “created the same” –meaning pipe and valve size.

# Summary

- The relay pumping drill was a success. For the new folks, they got to see how a relay pumping operation can support a sustained fire flow over a long distance.
- For the older, experienced folks, it was a chance to "brush up" on their skills and knowledge.
- The success of the drill showed the importance of mutual aid response practices and procedures – and the importance of mutual aid interoperability.
- Many thanks to Amenia Fire District and the Amenia VFD for sponsoring and hosting this seminar.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