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Purpose

Water supply for rural firefighting operations presents numerous challenges and can be resource intensive. Understanding the capabilities and limitations of rural water supply tactics, characteristics of the available water supply points, pre-planning, and training are all essential to effective and efficient water supply operations.

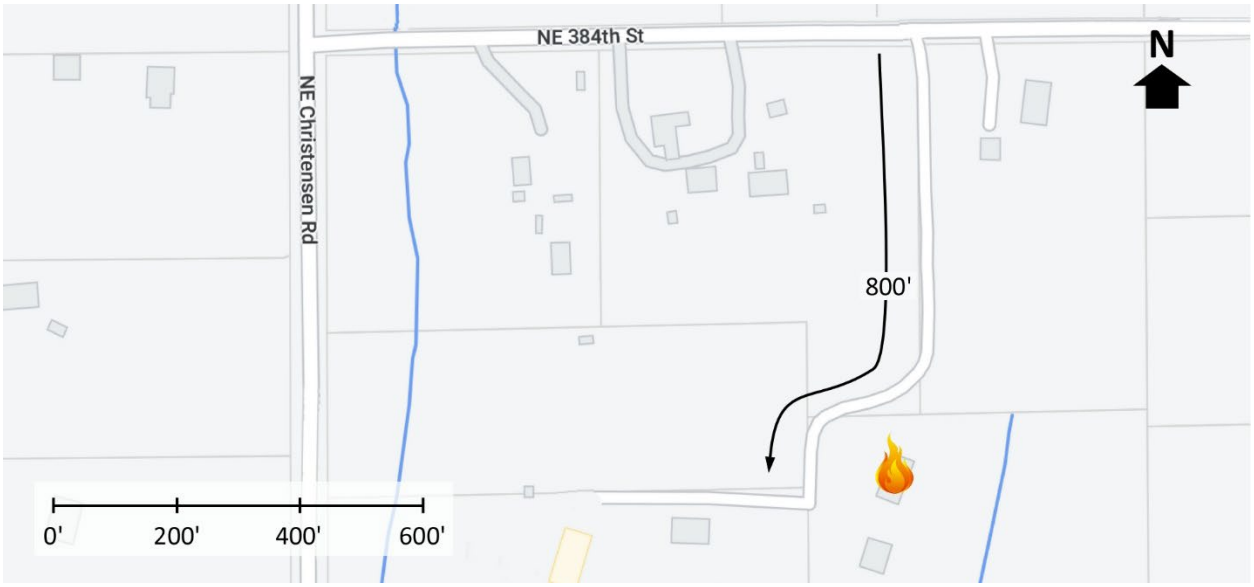
Learning Outcomes

Firefighters and officers perform an effective size-up; select an appropriate strategy, and implement tactics based on the strategic decision-making model.

Conducting the Drill

This incident involved a residential fire at 5605 NE 384th Street in La Center, Washington on December 12, 2022, at 20:09 (ClarkCountyToday.com, 2022 & The Reflector, 2022). Review the map and photos (Figures 1-6) to gain an understanding of area and building involved.

Figure 1. Map of the Incident Area

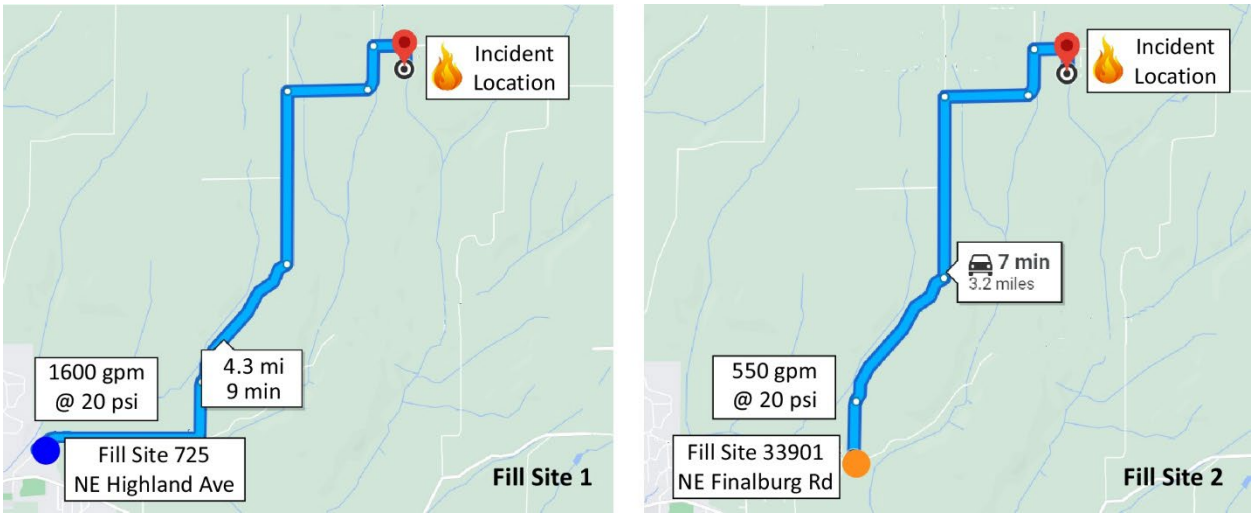


Note: Adapted from Google. (2023a). [map 5605 NE 384th Street, La Center, WA]. http://bit.ly/3X0w9Ik.

Two options for water tender fill points are provided as illustrated in Figure 2. The closest fill site has a flow capability of 550 gpm, and the more distant fill site has a flow capability of 1600 gpm. Fill Site 2 was

used by the companies operating at this incident this incident and the available flow from this hydrant is unknown. The flow rates identified in this 10-Minute Training are specified to provide context for water supply decision-making and do not necessarily reflect the actual flow rates from these hydrants.

Figure 2. Water Tender Fill Points



Note: Adapted from Google. (2023b). [Google map directions from 5803 NE 384th St to 725 NE Highland Ave] http://bit.ly/3YKq9V9 and Google. (2023c). [Google map directions from 5803 NE 384th St to 33901 Finalburg Rd]. http://bit.ly/3k2h37O.

Figure 3. Aerial View

Note: Adapted from Google. (2023d). [aerial view 5605 NE 384th Street, La Center, WA]. http://bit.ly/3jDgwbZ.

Figure 4. Approach on NE 384th Street

Note: Adapted from Google. (2023e). [street view 5605 NE 384th Street, La Center, WA]. http://bit.ly/3Ids2vn.

Figure 5. Driveway

Note: Adapted from Google. (2023f). [street view 5605 NE 384th Street, La Center, WA]. http://bit.ly/3jyQIOk.

Figure 6. Sides Alpha and Charlie

Note: Adapted from Realtor.com. (2023c). *5605 NE 384th St, La Center, WA 98629*. http://bit.ly/3XY9yNP.

You have been dispatched to 5605 NE 384th Street for a residential fire. You are the company officer or AIC of the first arriving engine and have your company's typical staffing. Temperature is 45° F with wind from the northwest at 7 mph (Weather Underground, 2023).

1. What critical factors would you consider when dispatched and during response and what conversations would you have with your crew while responding?

While responding you hear a command officer and an engine and water tender with typical staffing for your agency go enroute. The second engine will arrive approximately eight minutes after you followed by the command officer. The water tender will arrive approximately 12 minutes after you. All other units dispatched on the first alarm will arrive after the command officer. You are arriving from the west, on 384th Street. Examine Figure 7 illustrating conditions on arrival.

Figure 7. Conditions on Arrival

Note: Adapted from Clark-Cowlitz Fire Rescue. (2022). [Residential fire 5605 NE 384th Street, La Center, WA]. http://bit.ly/3Iijlci.

2. State your initial radio report (IRR) exactly as you would transmit it to dispatch.

3. What specific actions would you take (as the company officer) immediately upon arrival and exiting the apparatus and what task orders you would give your crew?

Conditions on all sides of the building are consistent with those observed from Side Alpha (Figure 7).

4. Would you change the action you are taking or modify the assignments given to your crew? If so, what task orders would you provide?

5. State your update report exactly as you would transmit it to dispatch.

6. State the tactical assignment you would give the next arriving engine exactly as you would transmit it.

7. State your conditions, actions, and needs (CAN) report that you would provide to the first arriving command officer as part of command transfer to IC #2?

Decisions made by IC #1 set the stage for rural water supply. The following questions focus on this component of tactical operations.

8. Did you (first arriving engine) perform a dry forward lay from NE 384th Street? Why or why not? If you did not, did you have the second engine use this tactic? What are the advantages and disadvantages of this tactic?

9. How did anticipated water supply capability (continuous flow in gallons per minute (gpm)) impact on your strategic and tactical decisions?

10. How would you anticipate IC #2 will use the first arriving and subsequent water tenders to develop and maintain a continuous water supply (nurse tender operations or tender shuttle) and which tender fill point would be most advantageous? Why?

11. How do nurse tender operations differ from a tender shuttle (where tenders dump into a portable tank and an engine (relay or attack) drafts from the portable tank)? What are the advantages and disadvantages of these two water supply tactics?

Additional Learning: Review the factors that influence water delivery capability when using water tenders. Equation 1 illustrates how to determine flow capability in a tender shuttle. This equation can also be adapted to determine nurse tender capability, but the "dump time" is the time required to pump the water from the tender based on the tank capacity and flow rate of the receiving apparatus (which may make this a bit more complicated). To simplify this, assume that the receiving apparatus (attack engine) will maintain a full tank as reserve and tenders will be directly supporting the flow rate being used for fire control and exposure protection (e.g., 150 gpm for a single 1 ¾" attack line, 300 gpm for two 1 ¾" attack lines, etc.).

Equation 1. Tender Shuttle Flow Capability Formula

$$Q = \left(\frac{0.9V}{D + T_1 + F + T_2}\right)k$$

Where:

Q	=	Flow capability in gallons per minute (gpm)
V	=	Volume of the water tender apparatus tank
D	=	Dump time including handling time (if any) and discharge of water
T_1	=	Travel time from the incident to the water source
F	=	Fill time including handling time and filling of the water tank
T_2	=	Travel time from the water source to the incident location

Note: Adapted from *National Fire Protection Association (NFPA) 1142 Standard on Water Supplies for Suburban and Rural Firefighting* (NFPA 2022).

Dump and fill times must be determined through experimentation. If using nurse tender operations, divide 90% of the tender's capacity in gallons by the anticipated flow rate to determine the equivalent to "dump" time. Travel time (T_1 and T_2) is calculated by using the following formula:

Equation 2. Water Tender Travel Time Formula

$$T = 0.65 + 1.7L_r$$

Where:

T	=	Time in minutes to the nearest tenth of a minute
0.65	=	Water tender acceleration constant for the first 0.5 miles
1.7	=	Vehicle speed constant for a 35-mph average speed
L_r	=	Length of the route between the incident location and water source in miles

Note: Adapted *from National Fire Protection Association (NFPA) 1142 Standard on Water Supplies for Suburban and Rural Firefighting* (NFPA, 2022) and *Water Tender Credit (Dwelling Properties Only)* (WSRB, 2009, 2013)

Depending on the characteristics of the travel route (driving surface, slope, one- or two-way traffic, controlled intersections, etc.) average speed may vary from this basic calculation.

Field estimation of water tender flow capability is much simpler, divide 90% of a tender's tank capacity in gallons by the round-trip time from empty to return and discharge of water to supply the attack engine in minutes. This value is the flow rate contribution of the tender in gallons per minute.

Water tender travel time is a given, based on the characteristics of the travel route and conditions (going faster will not have a significant impact and dramatically increases risk to the operator and the public). The major factors that can improve flow rate are to reduce fill, dump, and handling time. Review rural water supply tactics and the capability of your available resources. Identify ways to improve the effectiveness and efficiency of your rural water supply operations! If you don't know the capabilities and limitations of the available rural water supply resources, experiment and find out!

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