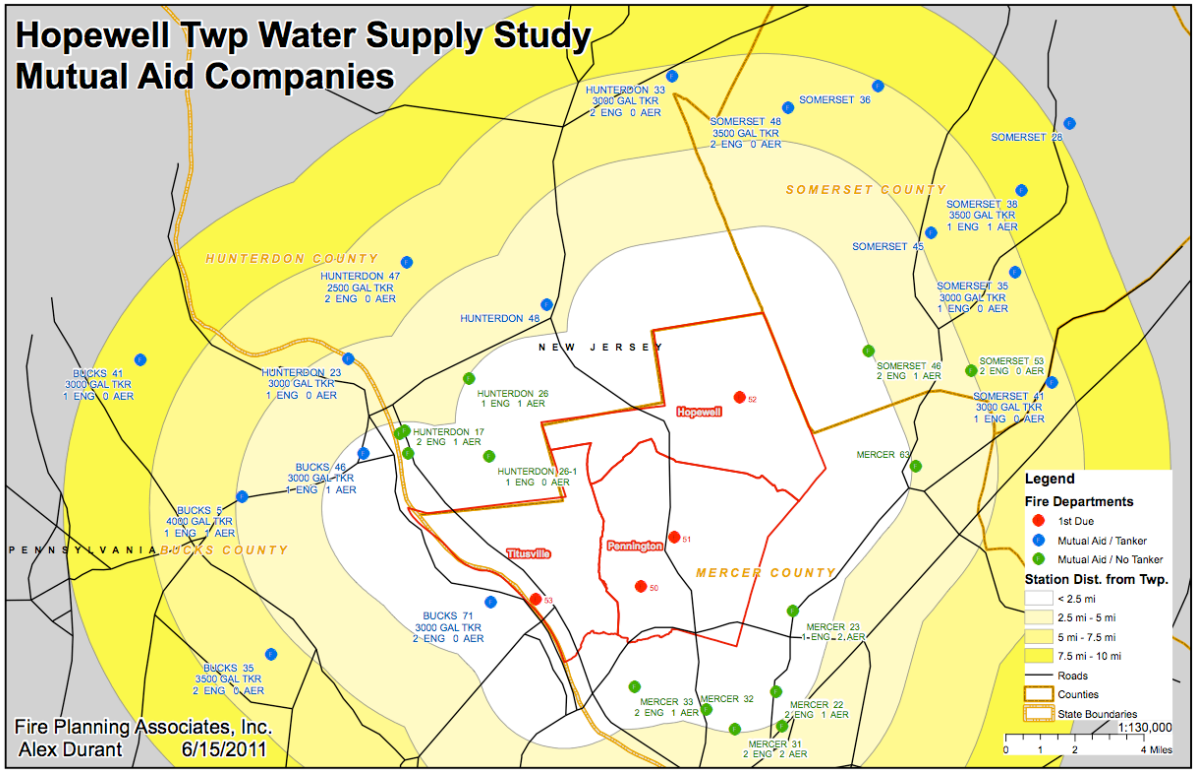
FIRE PLANNING ASSOCIATES

Water Supply Study
Hopewell Township, New Jersey
Hopewell Township Fire District No. 1



Conducted by:
Fire Planning Associates, Inc.

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Fire Planning Associates, Inc. (FPA) is pleased to present this final report based upon our proposal to Hopewell Township/Hopewell Township Fire District No. 1's Request for Quote Q10-09 to conduct a study of fire water supply issues for Hopewell Township, Mercer County, NJ. The intent of this study is to better identify alternative water sources for firefighting purposes throughout the Township (and immediately adjoining areas), and provide recommendations to better utilize those water sources during fires or related emergencies. A secondary purpose of this report is to help prepare the Township for a potential future ISO grading improvement. A number of the FPA team participated in this effort, led by Principal, Greg Jakubowski, P.E.

EXECUTIVE SUMMARY

Fire Planning Associates, Inc. (FPA) in 2011/2012 conducted a study of fire water supply issues for Hopewell Township, Mercer County, NJ. The intent of this study is to better identify alternative water sources for firefighting purposes throughout the Township (and immediately adjoining areas), and provide recommendations to better utilize those water sources during fires or related emergencies. A secondary purpose of this report is to help prepare the Township for a potential future ISO grading improvement. The study focused on not only the alternative water sources, but also means to transport that water in a timely fashion to incident sites in the Township. The study did GIS analysis of distances into the Township from fire stations with water tankers in the area, and used various resources to identify potential water sources followed by site visits to those sources to determine their usability.

The study segmented Hopewell Township into 77 geographical fire demand zones that identified required fire flows (how much water is required to extinguish a pre determined structure) in various sections of the Township, and determined water supplies in those areas to compare required fire flow versus available fire flow in those demand areas. 109 water sources were identified by the project in and around Hopewell Township, and these water sources were further categorized as readily usable, needs work to be usable, or not usable from a public fire protection perspective for various reasons. Usable water sources were photographed and cataloged in web-based preplanning software available to the fire companies serving the Township. 23 fire stations with water tankers (we need to be consistent either tanker or tender) were identified, from Mercer, Hunterdon, Somerset, and Bucks Counties, along with pump and tank capacities. An exercise was held to determine time needed to dump and fill many of these tankers, and to evaluate capabilities to flow a continuous water supply for an extended period of time simply using tanker shuttles. Five recommendations to streamline these operations have been provided to the Fire District.

A review was also conducted of 327 fire incident responses in Hopewell

Township between 2007-2011 to determine timing of water supply capabilities at actual emergencies. It took an average of 28 minutes from dispatch to arrival of all tankers on all working incidents in Hopewell Township during that time period, with that average including tankers responding from out of the Township from as far away as 8-10 miles. FPA has provided sample ordinances requiring alternative water supplies - particularly underground cisterns and dry hydrants (piping connected to ponds/streams that ease the ability of firefighters to pull water from these sources), and designs along with installation and operational cost estimates and potential funding sources for these supplies to the Fire District for future consideration.

Sixteen specific recommendations have been provided to the Fire District to improve the delivery of water supply from alternative sources in Hopewell Township. Some of these recommendations include: requiring new developments in the Township to provide a water supply in their development; requiring new bridges in the Township to have cutouts to ease drafting of water from under the bridge; implement a maintenance/inspection program for existing Township alternative water supplies; considerations for alternative water supply incorporated into the design of apparatus serving the Township; additional training on alternative water supply operations; and common identification and threading of dry hydrants. Several of these recommendations have already been implemented, showing immediate improvement to the fire services to Hopewell Township. The individual fire companies are prioritizing the alternative water supplies that require improvement to determine areas of focus for the Fire District. Completion of the recommendations included in this report will enhance the ability of the fire services in Hopewell Township to provide a more adequate, continuous supply of water to fire incidents throughout the Township.

It should be noted that this study focuses on the ability of the fire companies to fight a fire once it has occurred. A continued emphasis on fire prevention, including the annual fire inspections and fire safety education that is provided throughout the Hopewell Valley community will pay dividends by preventing fires from occurring in the first place, protecting lives and property.

WATER SUPPLY REPORT

Hopewell Township is a rural, approximately 60 square mile community with a population of approximately 18,000. The Township indicates that it is 23% developed residential, 54% vacant/wooded or agricultural, 18% public or quasi-public and approximately 5% commercial/industrial or office research. About 7% of the area is served by public water, with the balance served by on-site wells. The greatest residential population density (3.5 units per acre) can be found in the Southeast quadrant of the Township adjacent to State highway Route 31 and Interstate 95, and this area is served by public water. The rural character of the community, with lot sizes between 6 and 14 acres, has created small developments of homes ranging in size from 6,000 square feet to 20,000+ square feet. Developments are scattered throughout the Township. Fire access routes are constrained by bridges with load limits and narrow, winding roads.

Emergency Fire Services are provided to the Township through 3 fire companies, which are predominately volunteer and supplemented by a small Township career staff who also assist with code enforcement and emergency medical services. Fire companies serving Hopewell Township are:

Station 50 – Hopewell Township Emergency Services (career staff)
Station 51 – Pennington Fire Company (based in Pennington Borough)
Station 52 – Hopewell Fire Company (based in Hopewell Borough)
Station 53 – Union Fire Company of Titusville (based in Hopewell Township)

There are 2 boroughs, Hopewell Borough and Pennington Borough, which are completely surrounded by Hopewell Township. Evaluating hazards and water supply inside the Boroughs was out of the scope of this project, however, this report does recognize water supplies, where applicable, available in the Boroughs to support firefighting operations in the Township.

A consideration in fireground water supply is how much firefighting can actually be accomplished using water supply via tanker shuttles. With the pump and tank sizes on the tankers in Hopewell Valley, and dump capacities and method of operation, 1000 GPM (gallons per minute) is a reasonable expectation to be capable of flowing in a tanker operation. 1000 GPM also provides a firefighting capability that can control a significant quantity of fire, particularly in most (but not all) of the residential occupancies in Hopewell Township. The firefighting goals that are assumed in this report in areas where standard wet hydrants are not provided in Hopewell Township are to keep smaller fires from growing into larger fires, and contain larger fires to prevent spread to exposures.

Discounting the water supply on engines/aerials, the current 3 tankers in the Hopewell Valley Fire Companies carry a total of 11,000 gallons of water. Assuming that all 3 tankers respond in a timely fashion on a structural fire, and a master stream device of 1000 GPM (gallons per minute), or several smaller

hoselines adding up to 1000 GPM are desired to be operated to control the fire, these tankers will only have enough water to supply the fireground for 11 minutes. Should any one of these tankers not respond for some reason, that time is down to approximately 7 minutes. Almost all of the mutual aid tankers available to Hopewell Township will have to travel 3-5 miles at a minimum to get into Hopewell Township. These vehicles are large and heavy, and it must be assumed that their travel speed would be an average of 30 MPH to get to the incident location, or a travel time of 6-10 minutes. The mutual aid tankers will not begin to respond until the "2nd Alarm" for tankers is sounded. There is typically a "turnout time" of 5-6 minutes for volunteer firefighters from the time the alarm is sounded, until they arrive at their fire station to respond with their apparatus. The "2nd Alarm" must be sounded by a command officer, and will likely take at least 3-5 minutes from the time the command officer it alerted, a sizeup provided and the "2nd Alarm" sounded. Thus the time from the initial dispatch for the structure fire in Hopewell Township, until mutual aid tankers begin to arrive on the scene can be determined by:

Sizeup Completed and Request Made – 3-5 minutes
Turnout Time for Mutual Aid Tankers – 5-6 minutes
Travel Time for Mutual Aid Tankers – 6-10 minutes

Total Time to Arrive from Initial Dispatch for the Closest Mutual Aid Tankers – 14-21 Minutes, more likely closer to 21 rather than 14.

This is under the best conditions with no variables such as weather or traffic, and does not take into consideration the notification time necessary for Mercer County dispatchers to call the dispatchers from the adjoining counties to have their apparatus dispatched. These estimates are borne out by analysis of response times to actual incidents in the Township. Under the best conditions, the mutual aid tankers can be arriving as the Hopewell Valley Tankers are running out of water (or just have run out of water) when flowing 1000 GPM.

Another consideration is the fire control objective. If we assume the objective is to control a structure fire without causing significant damage to a home or building, this would mean in most cases containing a fire to several rooms and contents and preventing it from significantly involving the structure of the building. To do that, we estimate that somewhat less than 5000 gallons of water would be needed, or 300-500 GPM for less than 10 minutes. In this situation, enough water would be carried on almost any of the initial attack apparatus in Hopewell Valley (Engines or Quint apparatus) plus one tanker. The initial attack apparatus only carries about 2-3 minutes of water for this attack, with the need for some backup water supply from a tanker (or hydrant in a hydranted area) within that 2-3 minute window. It really wouldn't matter which stations those apparatus come from, as long as they arrive and are ready to go into service within 2-3 minutes of each other. Without that water supply being established, the initial attack apparatus will run out of water and firefighters will no longer be able to contain/control the fire allowing it to grow, perhaps beyond the 300-500 GPM

flow requirement. Firefighter safety considerations alone would dictate the need for this tanker supply to be on location and hooked up before firefighters initiate interior operations in a burning building, thus making arrival of the initial tanker a key to a safe and successful fire attack in an area where hydrants are not available. However, forcible entry, search and ventilation operations, which are normally assigned to "truck companies," also need to be occurring at around the same time. In most fire departments, "engines" and "trucks" (or ladder companies) perform these functions and work in concert to provide for safe and effective fireground operations. In areas such as Hopewell Township, "truck" work can be provided by "trucks" or properly equipped engine companies. In the case of areas where water supplies are not readily available, the tanker becomes the 3rd part of this critical equation.

Should this initial attack not be successful in controlling/containing the fire, extended tanker shuttle (or "campaign" style) water supply operations will need to be implemented. This type of operation will involve shuttling water from a remote point, generally using drop tank operations to maximize flow from a point where tankers can easily dump with little or no need to back up, turn-around, etc. Backing and turning around delays the ability of the "water-on-wheels" operation to deliver the largest flow possible. A tanker operation involving 5 tankers over a 4 mile (or greater) shuttle loop should be capable of delivering 1000 GPM without much difficulty. The data collected while developing this report validates that capability with the mutual aid tankers evaluated. However, a fire requiring this type of delivery over a period of time will be doing a significant amount of damage, unless the water supply is used to either "cut" the fire off, or prevent it from spreading to exposures. To improve upon Township ISO ratings, the "campaign" style water delivery will need to be demonstrated.

STUDY REQUIREMENT RESPONSES

The project has been broken into a number of portions, and this report will summarize the information put together for each portion by “letter.”

A) Review and categorize the number of existing residential uses and non-residential uses located in the Hopewell Township.

FPA has divided Hopewell Township into Fire Demand Zones/"Boxes" (FDZs) in GIS based upon similar required fire flows and occupancies. The Fire Demand Zones allow for breaking down a larger community into smaller parts to facilitate a study of areas that have common hazards as well as required fireflow (RFF) and available fireflow (AFF). FDZs also allow for selection of dispatched resources based upon the particular fire protection needs of that FDZ. For example, a FDZ consisting of single family dwellings that are all almost 2500 square feet might get a lesser initial dispatch of firefighting resources than a FDZ consisting of single family dwellings that might average 6000-7000 square feet. FDZs without adequate RFF might get an initial dispatch of additional water supply resources to reported structure fires. FPA determined the FDZs for Hopewell Township as follows:

Station 51 Local – 30 Fire Demand Zones
Station 52 Local – 33 Fire Demand Zones
Station 53 Local – 14 Fire Demand Zones

Note that Station 50 does not have a “first due” per se (they cover the entire Township when working), so there are no FDZs specifically assigned to Station 50. There are 2 “special” Fire Demand Zones in the Station 51 Local:

FDZ 51-98 – Capital Health Systems new hospital complex on Scotch Road North of I-95. This property is fully hydranted, fully sprinklered, and has a detailed prefire plan.

FDZ 51-99 – Bristol-Myers Squibb Facility on Pennington-Rocky Hill Road at Titus Mill Road. This property is fully hydranted, fully sprinklered, and has a detailed preplan.

Based on this detailed information already available for these 2 FDZs, and existing protection features, no detailed analysis was conducted for them in this report.

Wherever possible, the ISO required fireflow was utilized as the required fire flow for the FDZ, although existing preplans were also utilized to determine the required fire flow for the FDZ. Maps for these FDZs have been provided to the Hopewell Township Fire District in the GIS system.

B) Review and categorize existing fire suppression for uses in "A" above.

FPA has identified 109 water sources in and around the Township, taken photographs of each, and entered each into Blazemark™ software for rapid reference at an incident scene. The water sources have been preliminarily quantified in an Excel Spreadsheet (attached) as: usable; usable with modifications; and not usable with very rough approximations of cost for the modifications. Hopewell Township Fire District #1 will need to review these recommendations and determine which are and are not feasible, and prioritize them.

FPA has identified the water supply apparatus resources for the Township and provided rough distances for each into each FDZ/box area in the Township in GIS format.

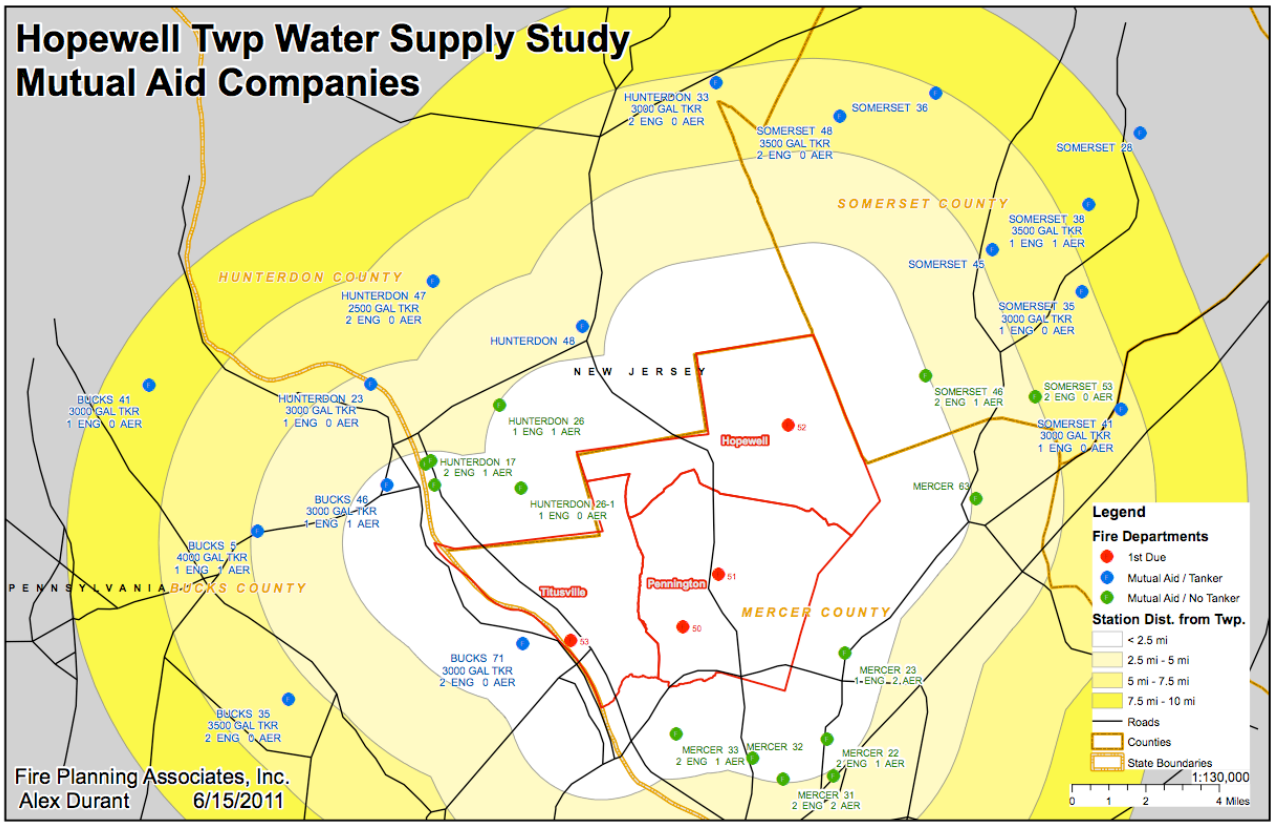
Tanker	Tank Size (gallons)	Pump Size (GPM)	Foldatank Size (gallons)
Mercer 42	3000	500	
Mercer 51	3500	1000	3500
Mercer 52	4200	1000	4000
Mercer 53	3500	1500	3000
Bucks 5	4000	1500	3000
Bucks 35	3500	750	3500
Bucks 41	3000	1250	3000
Bucks 46	3000	2000	3500
Bucks 71	3000	1500	3000
Bucks 81	4000	500	Two - 3000
Hunterdon 16	3000	1000	3000
Hunterdon 23	3000	1750	None
Hunterdon 33	3000		
Hunterdon 47	3040	1000	Two - 3000
Hunterdon 48	2000	1000	3000
Hunterdon 91-72	3000	1000	3000
Somerset E28	2500	1250	2100
Somerset 35	3000	1500	3000
Somerset 36	3200	1500	3500
Somerset 38	3000	500	3000
Somerset 41	3000	1500	3500
Somerset 45	3000	1000	3500
Somerset 48	3500	1250	3500

Mercer 42 - East Windsor Fire Co., One Mile Road, East Windsor, NJ
Mercer 51 – Pennington Fire Co., Broemel Place, Pennington, NJ
Mercer 52 – Hopewell Fire Co., Columbia Ave., Hopewell, NJ
Mercer 53 – Union Fire Co., River Road, Titusville, NJ

Bucks County 5 - Midway Fire Company, Route 202, Lahaska, PA
Bucks County 35 - Lingohocken Fire Company, Washington Avenue, Wycombe, PA
Bucks County 41 - Point Pleasant Fire Company, Point Pleasant Pike, Point Pleasant, PA
Bucks County 46 - Eagle Fire Company, Sugan Road, New Hope, PA
Bucks County 71 - Upper Makefield Fire Company, Taylorsville Road, Washington Crossing, PA
Bucks County 81 - Upper Makefield Fire Company, Eagle Road, Newtown, PA

Hunterdon County 16 – Kingwood Twp. Fire Co., County Road 519, Frenchtown, NJ
Hunterdon County 23 – Stockton Fire Co., Mill St., Stockton, NJ
Hunterdon County 33 – Three Bridges Fire Co., Main St., Three Bridges, NJ
Hunterdon County 47 – Sergeantsville Fire Co., Sergeantsville Road, Sergeantsville, NJ
Hunterdon County 48 – Amwell Valley Fire Co., County Route 579, Ringoes, NJ
Hunterdon County 91 – Quakertown Fire Co, Quakertown Rd., Pittstown, NJ

Somerset County 28 – Millstone Valley Fire Co., Amwell Road, Somerset, NJ
Somerset County 35 – Griggstown Fire Co., Canal Road, Princeton, NJ
Somerset County 36 – Flagtown Fire Co., Equator Ave., Flagtown, NJ
Somerset County 38 – Hillsborough #3, Woods Road, Hillsborough, NJ
Somerset County 41 – Little Rocky Hill Fire Co., Route 27, Princeton, NJ
Somerset County 45 – Montgomery Fire Co. #1, Griggstown Road, Belle Mead, NJ
Somerset County 48 – Neshanic Fire Co., Maple Ave., Neshanic Station, NJ



C) Review and categorize fire calls and response times in Hopewell Township

FPA has reviewed 327 Hopewell Township fire responses from 2007-2011 to determine response times and apparatus assignments. On 61% of the calls where tankers arrived, they arrived at 20 minutes or more from the initial dispatch time (Excel spreadsheet attached). The average time for dispatch to arrival of all tankers on all calls was 28 minutes. The statistics do include arrival times of mutual aid tankers that responded on some larger fires from 8-10 miles outside of Hopewell Township.

If we assume the objective is to control a structure fire without causing significant damage to a home or building, this would mean in most cases containing a fire to several rooms and contents and preventing it from significantly involving the structure of the building. To do that, we estimate that somewhat less than 5000 gallons of water would be needed, or 300-500 GPM for less than 10 minutes. In this situation, enough water would be carried on almost any of the initial attack apparatus in Hopewell Valley (Engines or Quint apparatus) plus one tanker. The initial attack apparatus only carries about 2-3 minutes of water for this attack, with the need for some backup water supply from a tanker (or hydrant in a hydranted area) within that 2-3 minute window. It really wouldn't matter which stations those apparatus come from, as long as they arrive and are ready to go into service within 2-3 minutes of each other. Without that water supply being

established, the initial attack apparatus will run out of water and firefighters will no longer be able to contain/control the fire allowing it to grow, perhaps beyond the 300-500 GPM flow requirement. Firefighter safety considerations alone would dictate the need for this tanker supply to be on location and hooked up before firefighters initiate interior operations in a burning building, thus making arrival of the initial tanker a key to a safe and successful fire attack in an area where hydrants are not available.

D) Determine all existing sources of water available for emergency fire fighting purposes in Hopewell Township, and surrounding communities with locations capable of supporting fire fighting operations in Hopewell Township (cisterns, tank storage, facility, pond or lake or free flowing streams or rivers).

FPA has identified 109 existing sources of water with a capacity of 20,000 gallons or greater available for emergency fire fighting purposes in Hopewell Township, and within an approximate 2 mile radius for pressurized hydrants and a 5 mile radius for static sources of Hopewell Township in New Jersey only (it is impractical to cross both the Delaware Canal and the Delaware River, both significant water sources, to access water sources in Pennsylvania – and crossing is limited due to bridge restrictions). An approximate 2-mile radius is selected as that would result in a minimum 4-mile tender shuttle route, which is a reasonable distance for tenders to shuttle to obtain water. These water sources have been photographed, and entered into Blazemark™ software. The water sources have been quantified as usable, usable with modifications, and not usable, and FPA has identified the water supply apparatus resources for each FDZ and obtained detailed data on capabilities of as many of them as practical, developing a data sheet on each that has been shared with the District. Water sources have been plotted on GIS maps provided to the Hopewell Township Fire District #1.

E) Map the type, location and capacity of each source identified in "D" above and rank according to accessibility for access by fire fighting apparatus. Include required drought certification necessary for ISO review

FPA has mapped the type, location and capacity of each source identified in “D” above, and entered it into FPA’s proprietary internet-based BLAZEMARK*™* preplanning software that is already in use by Hopewell Township emergency responders, as well as in GIS mapping provided to the Township. Each water source has been ranked according to accessibility for fire fighting apparatus, and appropriate notes/annotated photographs about the sources has been included in the software for effective planning and use at the emergency scene. Any drought certifications for these sources are to be completed by the Hopewell Township Hydrologist, and are outside the scope of this project as per agreement with the Hopewell Township Fire District #1.

F) Evaluate typical water shuttle operations during responses in Hopewell Township; within each department and for multi-alarm. Provide written description of the operation and rank efficiency of the operation. Make recommendations to improve efficiency/effectiveness of existing operations. Provide a review of water shuttle operations to include and ISO timing review.

FPA evaluated/documented (file attached) a water shuttle exercise on November 12, 2011 in Hopewell Township involving the 3 fire companies serving the Township and mutual aid tankers. A detailed description of the water shuttle drill is in a Word file attached. Here is a summary of the observations/ recommendations:

1. It appeared to some that the wet hydrant fill site arrangement may have been a bit too complicated to operate on a normal basis, with both dual 3" and dual 5" lines being used. This can be a bit of work for a single engine with a light crew. The dry hydrant fill site arrangement was set up with dual 5" lines. Often a single 5" line will be adequate to fill tankers at 1500 gpm, but it is important to determine what fill adapters are on the incoming tankers. It was the opinion of 1 observer that 5" lines can take a lot of time and effort to maneuver, and a mechanism needs to be put into place to relieve the pressure on the 5" line once filling is completed to facilitate removal of the supply line. We realize that this arrangement does allow 2 tankers to be filled at once.
2. Engines assigned to fill points should practice and understand this evolution. One fill engine had apparently not performed this before, and while this was good to practice during this exercise, would caution trying to do this during an actual incident. Might require command staff member being assigned to the fill point to mentor them.
3. To keep the shuttle moving, it is important that driver/operators of tankers/ tenders stay in their apparatus during filling and dumping. Some may have SOPs that require only the driver/operator make or break any connections on their apparatus, but this is probably not critical for tanker fill lines only and we need to get beyond that. Tanker/tender driver/operators were not all fully aware of the operation of their vehicles and fittings, etc. Holding exercises such as this are a good opportunity to become more familiar with this, but it should also be an important part of driver/operator training programs.
4. Useful to clearly communicate to out-of-county tankers the "standard" hose fitting/coupling to use to fill tankers in Mercer County. There were a number of different variations on scene at this exercise. This might be a useful function for mutual aid coordinators to assist with on equipment lists. In addition, review Township tankers fill arrangements. It was noted that Tanker 52 has a 5" piston valve on the rear that was perceived to take longer than other apparatus to open and close the valve for filling, and a different style of valve might speed things up. Notes from the fill site show that fill times for Tanker 52 were 5, 4, and 3 minutes, which were not much different from fill

times of other tankers. There may be concerns about the type of valve on fill lines of 3" or greater, here are the applicable NFPA requirements:

NFPA 1901-2009 "Standard for Automotive Fire Apparatus" applicable excerpts:

18.5 Mobile Water Supply Apparatus.

If the apparatus is designed to be a mobile water supply apparatus, the requirements of this section shall apply.

18.5.1 External Fill.

An external fill connection leading directly to the tank shall be provided.

18.5.1.1*

The external fill connection shall permit a minimum filling rate of 1000 gpm (4000 L/min) from sources external to the unit.

18.5.1.2

The external fill connection shall be provided with a removable or accessible strainer, a shutoff valve capable of being throttled, a minimum 30-degree sweep elbow positioned downward, and a closure cap or plug.

18.5.1.3

Any 3 in. (75 mm) or larger valve shall be a slow-operating valve.

18.5.1.4

A check-type device shall be permitted to be substituted for the modulating and slow-operating valve in those operations where the flow rate is to be controlled at the source.

While a piston-operated ("slow-operating") valve is an acceptable feature for any 3 inch or larger valve, if the flow rate is to be controlled at the source (fill site engine, valve on a hydrant), a check-type device or other valve is acceptable.

5. At the dump site, up to 12-13 hard sleeves were in operation, as well as other water movement hardware. This appeared to be a time-consuming and complicated operation that while it allowed for large flows and backup pump capability, required a lot of time and resources to setup and operate. Even if every engine on the fireground carried 3 hard sleeves (which is not all that common), it would require 5 engines worth of hard sleeves for this operation. It also requires a lot of savvy, focus, and training on the part of both pump operators. To be able to achieve this arrangement quickly at an emergency scene, this setup will likely need to be drilled upon twice a year for familiarity. We might suggest simplifying it a bit to make it reasonable and achievable for all Hopewell Valley personnel and mutual aid companies to establish a continuous water supply promptly to get an effective initial knockdown. Tactically, setting up a draft site operation with 3 portable tanks and 2 transfer legs, requiring 4 hard sleeves total, would work well for the overwhelming majority of your incidents and allow for rapid setup and operation. As additional resources become available, they can be fed into the operation to build-in backup and additional flow capability. Set up the 3 tanks, and as another engine becomes available, go to 4 or 5, but lay an additional supply line from the draft site to the flow site to not only allow for increased flow, but also build in some safety/redundancy for "campaign-style"

incidents.

Following this same train of thought, a single tanker shuttle should plan on flowing 1000 GPM. That means that the initial attack engine needs to flow 1000 GPM, the supply line(s) to it need to flow 1000 GPM, the initial nurse tanker needs to flow 1000 GPM, the shuttle needs to flow 1000 GPM, and the water supply (dry or wet hydrants)/fill site needs to flow 1000 GPM. For incidents that turn into a "campaign-style" incident, there is no reason that you can't continue adding to what you started with to increase your flow as additional resources arrive and you find the 1000 gpm isn't cutting it (happens to all of us). To build into that, as an "expanding" incident, using 1 or 2 tankers to feed a supply line via a jumbo Siamese off of the driveway entrance to the fire building still permits some space for aerial apparatus to gain access to the fire building. Apparatus drivers/operators need to be cognizant of that and set up water supply a little bit out of the way which will also facilitate a tanker loop should that develop.

Other considerations are related to how you set up the dump tanks. They need to be in a position to allow ease of dumping while minimizing backing (remember suction hose if apparatus must draft off of the side), but close enough to the scene to be useful. Some have suggested off a side road, or back at the closest major intersection. Some companies set them up in-line, some in diamond shape (point-to-point). This can allow infill of more tanks later and ease dumping into multiple tanks at the same time. Diamond shape is also useful for tankers with only rear dumps, as they can back into the tank like a diagonal parking spot. From this drill, it would appear that all tankers readily accessible to Hopewell Twp. are equipped with sufficient side dumps.

G) Review fire safety ordinances for the region that require alternatives to public water systems with fire hydrants in rural areas with no other on-site water resources such as cisterns, standpipes, water towers, pools, etc.

FPA has provided links to these following fire safety ordinances that require alternatives to fire hydrants with no other on-site water resources:

http://www.stanoes.com/fire-marshal/water-supply-req.shtm
http://www.brightonareafire.com/SITE%20WATER%20REQUIREMENTS.pdf
http://www.xmrfire.org/mrn/Prevention%20Documents/Microsoft%20Residential%20Development%20Minimum%20Requirements.pdf

Here is a link to specification/code for underground tanks from Baltimore County, Maryland.
http://www.baltimorecountymd.gov/Agencies/fire/firemarshal/firelanes.html

Further information on their program including photographs/PowerPoint presentation has been provided to the Fire District. Point of contact for further info is:

John Bryan

Chief Fire Protection Engineer
Special Assistant State Fire Marshal
Fire & Building Plans Review
410-887-3985

Carroll County, Maryland's program -
http://ccgovernment.carr.org/ccg/pubsafe/tanks.asp

http://www.bouldercounty.org/find/library/environment/w05emerwatersupply.pdf

Example ordinance language from a Bucks County municipality has also been provided to the Fire District. In this municipality, the underground tanks are attached to a well with a pump tied to a float on the tank to self-fill

Dry hydrant design and cost information (Note – costs are likely not what it would be in Hopewell Township as it depends on local contractors, length of pipe needed, and other variables) -
http://pond.dnr.cornell.edu/Pond/farmpond/contents/Wisconsin-dry-hydrants.pdf
http://www.co.larimer.co.us/wildfire/dry_hydrant_concept.htm

H) Review the potential effectiveness of the alternatives in "G" above within Hopewell Township. Rank alternatives for effectiveness and make recommendations for Hopewell Township based upon effectiveness.

The simplest of the alternative water supply methods to install, maintain and use is the dry hydrant. A pumper can hook up to the dry hydrant with 1 or 2 sections of hard sleeve with minimum manpower and equipment. Each dry hydrant should be flushed and flow tested twice each year to receive full ISO credit, and ensure it can be utilized reliably when needed. The dry hydrants do rely upon an adequately sized body of water to feed them, however. One key issue with dry hydrants is to standardize threading on the connection point. A 6" Female National Standard thread fitting on the end of the dry hydrant will allow most any modern pumping apparatus to hook up to the dry hydrant with no adapter, which not only eases/speeds connection, but minimizes the potential for air leaks which could be created by the adapter/fitting.

Individual or community cisterns can be installed. Links have been provided explaining each in "G" above. Cisterns are much more capital-intensive to install than dry hydrants or other arrangements.

Where alternative water supplies such as dry hydrants or cisterns are installed, ensure that these locations have all-weather access. Consider stone or Terra-Grid at access points to water supplies.

Another potential tool that could be considered by the fire department, to obtain

up to 670 GPM from water sources up to 250 feet from the apparatus is the Turbodraft device - http://www.turbodraft.net/ This may be an interim tool that could be used until dry hydrant installations can be provided, but this tool does require training to operate properly at a fire incident. Union Fire Co. Station 53 currently has 2 of these units.

I) Provide estimates of capital costs for alternates recommended in "H" above

Baltimore County, Maryland is reporting recent install cost of $110,000 for a 30,000 gallon tank. Further information on pricing for Baltimore County's program can be found in these articles - http://archives.explorebaltimorecounty.com/news/101121/underground-tanks-help-fight-rash-fires/

http://archives.explorebaltimorecounty.com/news/6080005/water-tanks-help-cut-fire-insurance-rates/

Albemarle County, Virginia is reporting install costs for dry hydrants to be $1500-2000, but can vary greatly due to site costs, length of pipe, etc.
http://albemarle.org/upload/images/Forms_Center/Departments/Fire_and_Rescue/Forms/Pamphlets_and_Educational/Dry_Hydrant_Pamphlet.pdf

J) Estimate annual operating and maintenance costs for each in "H" above

Most of these alternative water supply sources have minimal annual operating and maintenance costs.

Underground Cisterns – need to be maintained full. It is recommended that they be tied to a float and well pump to keep them full. This requires some minor electrical costs. They should be flowed annually, which can be done by the fire department as part of normal training. They should be inspected at least annually, if not twice a year, to ensure that access is not impeded, and the equipment is not overgrown with brush, weeds, etc.

Dry Hydrants – the water source needs to be maintained at a reasonable capacity, and how that is done is dependent upon what feeds the water source. Ponds should be maintained as any other ponds, somewhat cleared of growth of weeds, etc. Dry hydrants should be flushed and flow tested twice annually, which is recommended to be done by the fire department as part of normal training to keep them familiar with the locations and operation of these. Once, if not twice each year, they should be inspected to ensure that access is not impeded and the dry hydrant is not overgrown with brush, weeds, etc.

K) Describe and provide examples of usage agreements for alternate described in "H" above

FPA has provided hard copies to the Fire District of several different sample usage agreements for alternative water supplies.

L) Provide references for potential funding sources for rural fire fighting (i.e. USDA Rural Development Grants/Loans)

The following apply to New Jersey as far as potential funding sources for rural fire fighting. USDA resources as passed through/administered by the State:
New Jersey Natural Resources Conservation Service
http://www.nj.nrcs.usda.gov/about/2010Summary/2010_RCD.html

New Jersey Forest Fire Service
http://www.nj.gov/dep/parksandforests/fire/docs/vfa_grant_app.pdf
http://www.nj.gov/dep/parksandforests/fire/grants.htm

OVERALL RECOMMENDATIONS

The following specific recommendations are presented to improve the delivery of water supply from alternative sources in Hopewell Township:

1. Hopewell Township Fire District #1 should consider incorporating the fire department recommendations outlined in this report in their agreements/contracts with the fire companies servicing the Township.
2. Incorporate a requirement in Township planning/zoning that all new development in the Township should have access to a minimum water supply of 20,000 gallons via wet or dry hydrant, cisterns or other similar alternative water supply.
3. Incorporate a requirement in Township planning/zoning that any bridges constructed/rebuilt in the Township over potential water supplies should be required to be reviewed by the Fire District for incorporation of "draft cutouts" on the bridge structure to allow for ease of drafting by pumpers from the water supply. http://www.firefighternation.com/slideshow/drafting-tools-techniques
4. The Township should continue to advocate/lobby to have new homes protected by residential sprinklers. Although not the answer to water supply issues, residential sprinklers have been proven in Bucks County, PA to significantly reduce property loss and water needed to extinguish residential fires, and to save lives. http://www.homefiresprinkler.org/fire-department-bucks-county-report They may also help to sustain a primarily

volunteer fire service and may reduce the need for capital fire protection equipment improvements. Even if a residential sprinkler ordinance is unable to be adopted, consider working with developers to allow tradeoffs such as greater housing density or similar benefits in exchange for provision of residential sprinklers. One Bucks County community was able to tradeoff block firewalls in townhouses for fire-rated drywall and residential sprinklers. However, residential sprinklers do not cover all areas of the home (including attics) and water supply requirements should not be traded off for residential sprinklers as the potential for a significant fire can still exist.

5. Dredge/clean/repair the lake supplying the dry hydrants at the "Marshall Corner/Pennytown" facility now owned by the Township. This is a primary water supply source utilized by the fire companies servicing the township and familiar to mutual aid water supply apparatus. This site could be more useful if a surface supporting fire apparatus is built to allow drafting apparatus to be pulled off of Pennington-Hopewell Road.
6. Hopewell Township has a mix of publicly- and privately-owned "standard" fire hydrants. Maximum credit by ISO for these fire hydrants will be achieved only if all standard hydrants are inspected/tested twice annually. Commonly, most communities inspect/test these hydrants at least annually, although this is not consistently occurring for all of these hydrants in Hopewell, in some cases only flushed/tested approximately every 5 years. Standard hydrants in Hopewell Township should be inspected/tested annually.
7. Implement a maintenance program for all alternative water supply locations. This should include:
   - Inspection, flushing and flow-testing twice/year
   - Ensuring clear marking, no parking or otherwise blocking these locations
   - Clearing of any brush, weeds or overgrowth to ensure good access
   - Clearing of snow or ice to ensure good access
8. All Hopewell Valley apparatus with supply hose should upgrade to the capability of 5" hose to both standardize and maximize flow capabilities. Most have this currently. Apparatus supply discharges should be arranged to provide maximum supply to 5" hose. At the same time, if 3" or other size hose will be utilized to fill tankers, ensure that all apparatus that could fill tankers has this capability.
9. We recommend that any Hopewell Valley apparatus that would be expected to draft from a static water supply at an incident in the Township be equipped with 3 sections of hard sleeve and a floating strainer, as a number of the water supplies in the Township need this to access them. Equipment for drafting/water supply carried on each engine/tanker needs to be similar for familiarity and ease of use.

10. Hopewell Valley Fire Companies should evaluate their ability to draft using their brush/field all-wheel-drive trucks. Can they currently draft, and if not, what is needed to allow them to draft? If they can currently draft, what capacity can they provide? Future purchases of all-wheel-drive trucks (including larger "Class A" pumpers) may consider larger pumps for conducting water supply evolutions. All apparatus with pumping capability (including tankers), other than brush trucks, in Hopewell Township should have a minimum pumping capacity of 1000 GPM or greater to ensure in all operations the ability to maintain that 1000 GPM flow. Evaluate the capability of existing pumpers in the Township to go off-road to access static water supplies, and adjust SOPs/SOGs accordingly.
11. Hopewell Valley Fire Companies should evaluate fill arrangements on each tanker for consistency and simplicity. Tanker 51 currently has a 5" intake that is low to the ground, and requires taking the cap off and replacing each time without a way to easily stow the cap. Tanker 52 has a piston intake valve on the rear that takes extra time to open and close and presents the potential for a hand injury.
12. Hopewell Valley Fire Companies should incorporate into their drill schedules a variety of water supply practice evolutions that are directly germane to operations in Hopewell Township, including:
    - Drafting from dry hydrants, and time it takes to hook up and get a draft
    - Use of Turbodraft equipment
    - Tanker shuttle drills including use of a single engine for low level draft and water transfer between ponds with target of 1000 GPM or greater
    - Filling tankers
    - Use of double Siamese to supply initial attack apparatus
    - Practice lay of supply hose up a driveway to a water source, and pumping out to a tanker fill site on the main road.
    - Setting up simple tanker fill site that allows ease of operations by minimally manned crew
    - LDH relay of 1000 GPM through at least 2600' of hose
13. Currently, fire companies covering Hopewell Township may respond all 3 companies on dispatches for house or building fires, but none of the companies run their Tanker first out – they all will run their Tanker 2nd or 3rd out which can result in a delay in arrival of critical water supply. If a working fire is determined, a 2nd alarm will be sounded bringing a tanker task force but this may take approximately 20 minutes to arrive (coming from mutual aid companies in Somerset, Hunterdon, and Bucks Counties) from the initial dispatch for the house/building fire assignment. Ensure that one of the Hopewell Valley Companies responding on a structure fire in non-hydranted portions of the Township runs their tanker first.
14. Hopewell Valley Fire Companies should consider breaking their districts into Fire Demand Zones/Boxes, and adjust response equipment as necessary to ensure adequate resources are dispatched to reported

structure fires in each box area based upon the hazards/Needed Fire Flow present in each box area. For example, tankers would not need to be dispatched ("due") into box areas provided with hydrants, although additional tankers may need to be dispatched into box areas with higher Needed Fire Flows and no hydrants present. FPA has provided a drawing showing the box areas and closest tankers based on mileage for consideration in drafting run card assignments.

15. Adopt a standard reflective sign on a sign post to identify alternative water supply locations or where the potential for brush overgrowth exists. Easy identification is needed.
16. All Dry Hydrants should be provided with a standard connection of 6" female National Standard threads so any draft hose on most modern apparatus can connect directly without searching for a double-female adapter.
17. The following water supply improvements have been identified by Hopewell Valley Fire Companies as priorities for them:
    a. The large pond across from the old "Easy Street" labeled in Google maps as Hunt Lake. This body of water would greatly benefit firefighting in the northwest section of the Township, but may take considerable planning and expense to be practically utilized. Agreements with 2 landowners may be needed to access the site and stone or other stabilization material needed to access the water source by fire apparatus. Site improvements may also be needed along the shoulder of Route 31 as well for this source.
    b. The pond on 330 Carter Road. Install a dry hydrant could be in the grassy area just off the parking lot of the mansion, and provide an access point for drafting apparatus. The parking lot is large enough to accommodate a tanker shuttle even if there were cars in it.
    c. Install a dry hydrant at Niederer's pond on Brick Yard Road (Titusville) to provide all-weather access.
    d. Install a dry hydrant at the Stephan residence at 1415 Route 579 (Bear Tavern Road) near Pleasant Valley Road. An alternative would be to install a draft point on the ground in a box similar to what was installed on Woosamonsa Rd.
18. Consider painting wet hydrant bodies in Hopewell Township a more visible color. Current hydrant color in most cases is "rust red", or the original manufacturer's red although now somewhat rusty. This color tends to blend into surroundings making them a bit more difficult to locate, and the rust indicates to ISO that inspections/maintenance may be lacking. Draft hydrants (such as from cisterns) should be clearly marked/colored differently to clearly indicate they are draft hydrants. The body of the hydrant can be painted any visible color (NFPA recommends Chrome Yellow), however we recommend that the hydrant bonnet (top) be color-coded in accordance with NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants* as follows (at minimum of 20 psi):

1500 GPM or greater – Light Blue
1000-1499 GPM – Green
500-999 GPM – Orange
Less than 500 GPM – Red
It is recommended that the paint be reflective. NFPA 291 also recommends that private hydrants be painted red or some other color to make them distinctive from public hydrants.

In addition, the Township may consider working with the quarry to see about the availability of using their tanker to assist in water supply operations. The quarry reportedly had a 500 GPM overhead water fill arrangement. Evaluate the possibility of using this as a tanker fill site, although apparatus will need to be designed/arranged to fill via this method.

CONCLUSION

FPA's position on firefighting and water supply is that to be most effective in fighting a structure fire in areas not provided with hydrants (or frankly, in any area) in Hopewell Township, the arrival of an apparatus that can conduct engine company operations, an apparatus that can conduct ladder company operations, and an apparatus that can provide water supply operations within a 2-3 minute time frame would provide optimal initial attack conditions. That initial arriving tanker needs to quickly set up to supply the initial arriving attack apparatus. One mechanism to accomplish this is the use of a double jumbo clappered Siamese that the attack apparatus can leave at the end of a driveway, cul-de-sac, etc. attached to supply hose to the attack apparatus. The initial tanker can pump into that Siamese, and as the 2nd tanker arrives, they can hook up to the other inlet on the Siamese to provide an uninterrupted flow of 7000 gallons or more to the attack apparatus before a tanker shuttle can get set up. FPA personnel have had a good deal of success with this tactic while operating at structure fires similar to those faced by Hopewell Valley.

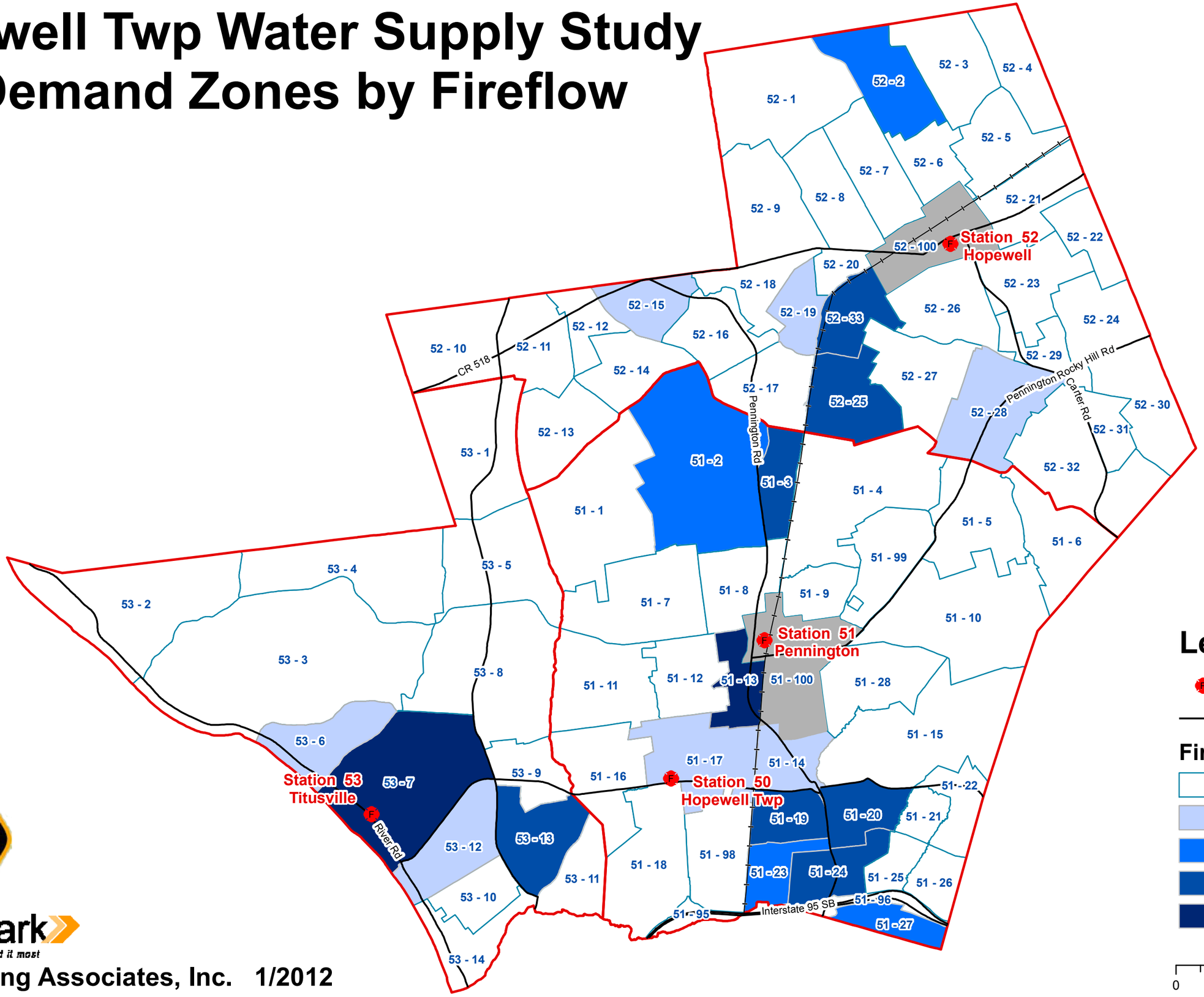
As has been mentioned, our general recommendation for your operations is to ensure a tanker is responding as quickly as possible from the one of the initial due companies on any house or building fire in the Township, and to have that tanker arrive and nurse the initial attack engine. During hours when career staff is working, the attack engine could well be Engine 50 and a tanker needs to arrive close behind them to ensure continuity of a continuous water supply. Having 4000-5000 gallons on the scene very quickly can facilitate an attack that will control a very high percentage of your incidents. A 1000 GPM flow would be a reasonable objective to achieve at structural fires in Hopewell Township based upon flow from dry hydrants and other water supplies in the Township for tanker shuttle operations. 1000 GPM is also a reasonable initial attack flow for an initial crew of 4-5, using either a fixed or portable monitor, and 1 handline. Therefore,

the entire system needs to achieve that – including the pump on the attack engine, the supply hose for the attack engine (1000 GPM can be achieved through 5" LDH at distances up to 2600 feet without a relay engine), and a pump on the tanker supplying the attack engine. Cooperation is the key to making this all happen.

FPA has gathered and collated a large amount of information/data related to fire protection resources for Hopewell Township. FPA is able to provide recommendations to Hopewell Township related to improving fire protection operations, and some of these recommendations are relatively easy to implement, while others are more challenging. Some of the recommendations may have limited impact, while others have broad impact in the Community. Ultimately, it is up to the officers and members of the fire companies serving the Hopewell Fire District #1 to decide how best to take action on these recommendations to provide the best possible service to the Hopewell Township community.

September, 2012
Greg Jakubowski, P.E.
Principal and Chief Engineer
Fire Planning Associates, Inc.

Hopewell Twp Water Supply Study
Fire Demand Zones by Fireflow



Legend

- Fire Departments
- Arterial Roads

Fire Demand Zones

- 1000 gpm
- 1250 - 1750 gpm
- 2000 - 2750 gpm
- 3000 - 3750 gpm
- 4000+ gpm

1:60,000

0 0.5 1 2 Miles

HOPEWELL TWP. FIRE DISTRICT

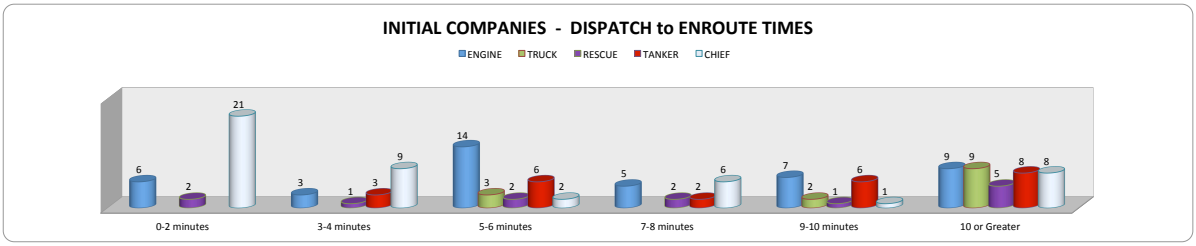
Blazemark
critical data when you need it most

Fire Planning Associates, Inc. 1/2012

INITIAL COMPANIES

DISPATCH to ENROUTE TIMES

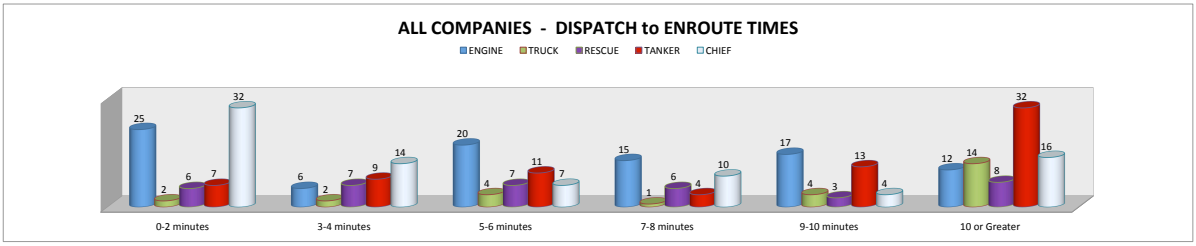
APPARATUS TYPE	0-2 minutes	3-4 minutes	5-6 minutes	7-8 minutes	9-10 minutes	10 or Greater
ENGINE	6	3	14	5	7	9
TRUCK			3		2	9
RESCUE	2	1	2	2	1	5
TANKER		3	6	2	6	8
CHIEF	21	9	2	6	1	8



ALL COMPANIES

DISPATCH to ENROUTE TIMES

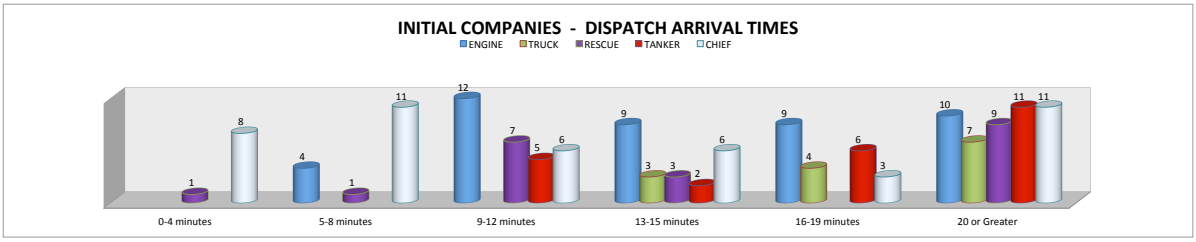
APPARATUS TYPE	0-2 minutes	3-4 minutes	5-6 minutes	7-8 minutes	9-10 minutes	10 or Greater
ENGINE	25	6	20	15	17	12
TRUCK	2	2	4	1	4	14
RESCUE	6	7	7	6	3	8
TANKER	7	9	11	4	13	32
CHIEF	32	14	7	10	4	16



INITIAL COMPANIES

DISPATCH to ARRIVAL TIMES

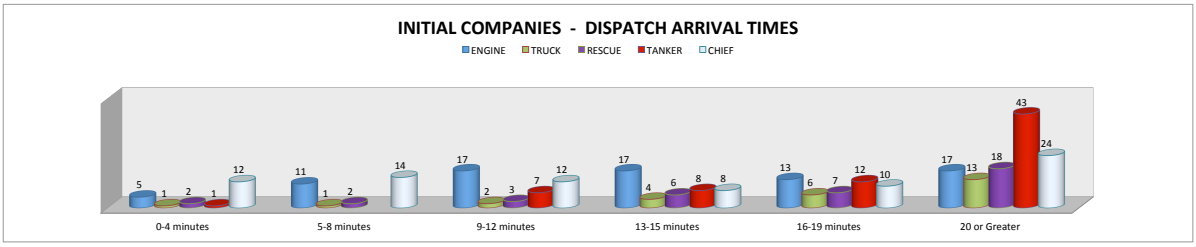
APPARATUS TYPE	0-4 minutes	5-8 minutes	9-12 minutes	13-15 minutes	16-19 minutes	20 or Greater
ENGINE		4	12	9	9	10
TRUCK				3	4	7
RESCUE	1	1	7	3		9
TANKER			5	2	6	11
CHIEF	8	11	6	6	3	11



ALL COMPANIES

DISPATCH to ARRIVAL TIMES

APPARATUS TYPE	0-4 minutes	5-8 minutes	9-12 minutes	13-15 minutes	16-19 minutes	20 or Greater
ENGINE	5	11	17	17	13	17
TRUCK	1	1	2	4	6	13
RESCUE	2	2	3	6	7	18
TANKER	1		7	8	12	43
CHIEF	12	14	12	8	10	24



FIRE PLANNING ASSOCIATES

HOPEWELL TOWNSHIP TANKER SHUTTLE DRILL
NOVEMBER 12, 2011

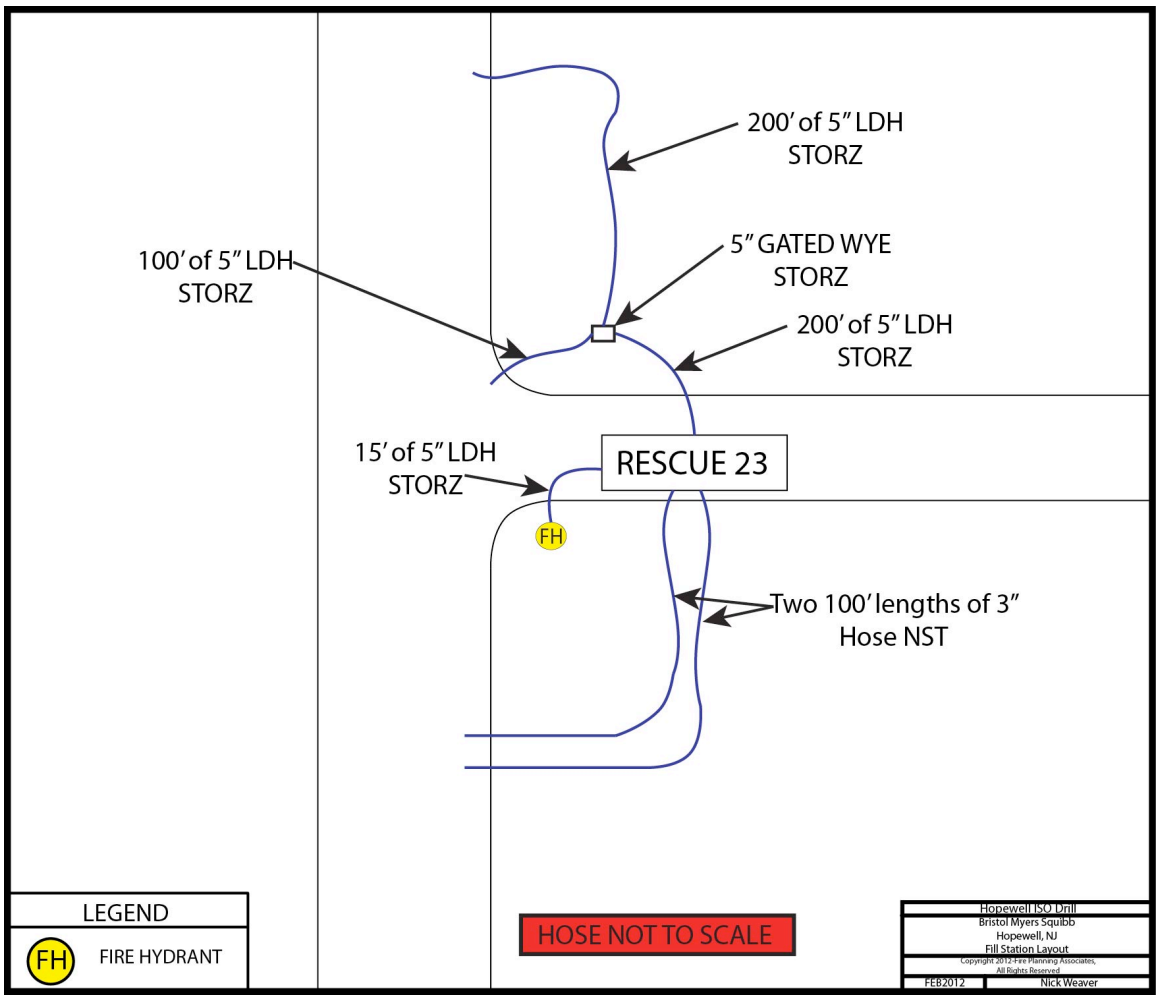
On November 12, 2011, firefighters set up a Tanker Shuttle Drill at the West side of the Bristol-Myers Squibb facility at 311 Pennington Rocky Hill Road, off of Titus Mill Road, in Hopewell Township. Tankers shuttled water on a 2.2 mile loop around the site loop road.

Before the shuttle drill began, tankers that participated in the shuttle were timed in driving 200', dumping, and driving an additional 200' to establish basic criteria for ISO. Data on these tankers is included in the Appendix to this document.

A dump site was established in a driveway to the parking lot located to the South of Building 21 on the West side of the site, with apparatus flowing water back into the site pond. Tankers in the shuttle dumped at times individually, and at times with multiple tankers dumping simultaneously into the folda-tanks. Three 3000 gallon dump tanks were arranged along the driveway feeding a single 4000 gallon "supply" tank that provided suction for the dump site engine.

2 fill sites were established at:

1. Fill Site 23 - The hydrant on the ring road adjoining the parking garage at the Northwest corner of the site. This hydrant is a standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. This hydrant is fed from a 6" main that is supplied from the plant fire water system which is fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond. The fire pumps discharge via common piping into the underground fire main system, which is not tied into any public water supply. The Fill Site Engine at this location was Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) that was supplied directly off of the hydrant. The fill site engine supplied 200' 5" line to a 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers



2. Fill Site 46 - The dry hydrant arrangement at the dam for the site pond. Dry hydrant is set up with 6" piping fed from the pond. The Fill Site Engine at this location was Somerset County Engine 46-107 (Montgomery Twp. Fire Co. #2) 1500 GPM, 1000 GWT using 40' of 6" hard suction to the dry hydrant. Prior to filling tankers, the flow capability of this dry hydrant arrangement was checked using the apparatus flowing through a deck gun with flowmeter showing 1045 GPM validated by checking with pitot gauge. . The fill site engine supplied 200' 5" line to a 5" gated wye to dual 50' sections of 5" line to fill tankers

Draft Engine at Dump Site – Engine 53 (Union Fire Co. of Titusville)

Pump Size – 1750 GPM. 750 gallon tank

Suction from 4000 gallon draft tank – Two 6" suction lines, 1 connected to the front suction and 1 connected to the side suction of the engine, and both connected to low level strainers. Engine 53 flowed through 225' of 5" supply hose to Rescue 51, a 2000 GPM, 1000 gallon tank apparatus.

Water Transfer Engine at Dump Site – Engine 52 (Hopewell Fire Co.)

Pump Size – 1500 GPM. 750 gallon tank

Suction from 4000 gallon draft tank – Two 6" suction lines. This engine was used solely to pump small diameter handlines to siphon/transfer water between the various dump tanks, with dual 6" hard suctions each connecting the "supply" tank with Tanks 1, 2, and 3.

Apparatus at Flow Site – Rescue Engine 51 (Pennington Fire Co.)

Pump Size – 2000 GPM. 1000 gallon tank

Flowing through 150' of 2 ½" to a portable ground monitor

Flowing through 100' of 5" hose to Tower 51's aerial monitor

TOWER 51 (Pennington Fire Co.) – 2000 GPM, no water tank, 100' Tower Ladder

Flows were based upon flowmeter on pump panel, with spot confirmation via pitot gauge

Tankers utilized for this drill (note, all dumps were gravity dumps, pumps on tankers were not utilized and all tankers were utilized in the shuttle, none were used to initially nurse) –

Mercer County Tanker 51 (Pennington) – 3500 gallons
Mercer County Tanker 52 (Hopewell) – 4200 gallons
Mercer County Tanker 53 (Union – Titusville) – 3500 gallons
Bucks County Tanker 71 (Upper Makefield) – 3000 gallons
Hunterdon County Pumper/Tanker 23 (Stockton) – 3000 gallons
Hunterdon County Tanker 33 (Three Bridges) – 3000 gallons
Hunterdon County Tanker 91-72 (Quakertown) – 3000 gallons
Someret County Tanker 35 (Griggstown) – 3000 gallons
Somerset County Tanker 41 (Little Rocky Hill) – 3000 gallons
Somerset County Tanker 45 (Montgomery Fire Co. #1) – 3000 gallons

Manpower used – Each tanker had a driver and a spotter. This is what each would respond with (actually some of the tankersare pumper/tankers, and may respond with 2 or more additional firefighters beyond the driver and spotter). The spotters would be used to assist in setting up the folda-tanks, and opening any manual dump valves as necessary, otherwise they simply assisted in directing the tanker driver for safety purposes.

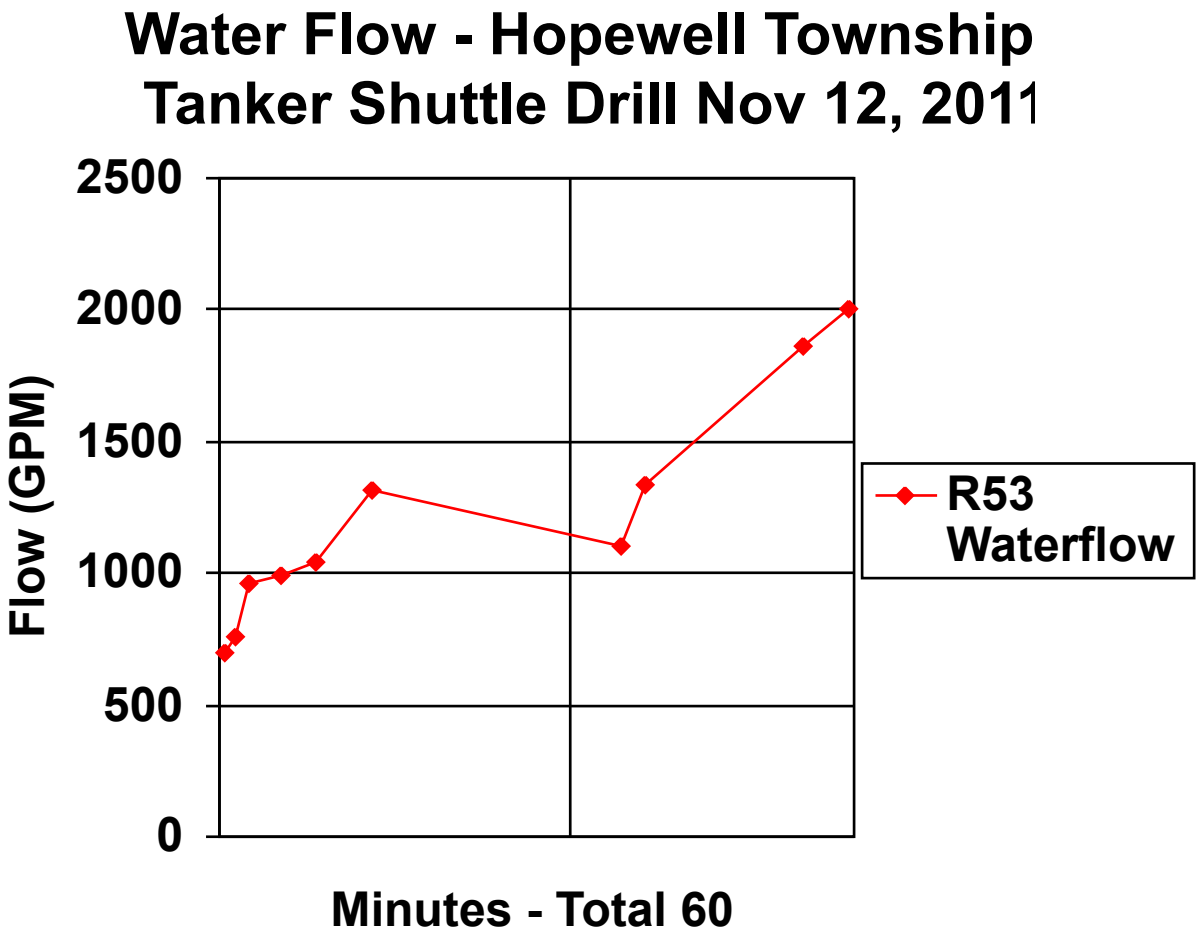
At 1020 hours, the fill sites were set up and the dump site was set up, with 3 of the 4 tanks full as the scenario was initiated.

Time Engine at Dump Site Begins to flow to Apparatus at Flow Site – 1020 hours

Note – flow measured via flow meters on Rescue 51, with validation at several points via pitot gauge

1025 – 700 GPM discharge
1026 – 760 GPM
1027 – 960 GPM
1030 – 990 GPM

1033 – 1040 GPM
1038 – 1320 GPM
1100 – 1100 GPM – Changes made at dump site to allow for increased flow
1102 – 1340 GPM
1116 – 1800 GPM
1120 – 2000 GPM



TANKER DUMP TIMES

Tanker Times Begin to Dump at Dump Site –

Somerset Tanker 35 – 1019 hours
Dump Time – 1:25
Mercer Tanker 51 – 1022 hours
Dump Time – 2:20
Mercer Tanker 52 – 1027 hours
Dump Time – 1:25
Hunterdon Tanker 91 – 1028 hours
Dump Time – 1:45
Somerset Tanker 35 – 1033 hours
Dump Time – 2:25

Somerset Tanker 41 – 1033 hours
Dump Time – 2:15
Hunterdon Tanker 33 – 1037 hours
Dump Time – 3:35
Mercer Tanker 53 – 10:37 hours
Dump Time – 3:15
Hunterdon Tanker 23 – 1041 hours
Dump Time – 6:00
Somerset Tanker 45 – 10:44 hours
Dump Time – 1:12
Bucks Tanker 71 – 10:44 hours
Dump Time – 1:15
This list is not completely comprehensive

FILL TIMES – FILL SITE 23 (PARKING GARAGE)

Tanker Times Arriving At Fill Site by Parking Garage (time in parentheses is fill time in minutes) – ** NOTE that some of these tankers were refilled prior to beginning the shuttle, but after being timed for the initial dump timing

Bucks Tanker 71 – 0923 hours (6)
Mercer Tanker 52 – 0923 hours (5)
Hunterdon Tanker 23 – 0930 hours (4)
Somerset Tanker 45 – 0934 hours (5)
Somerset Tanker 35 – 0935 hours (6)
Somerset Tanker 41– 0939 hours (5)
Mercer Tanker 51 – 0944 hours (6)
Hunterdon Tanker 23 – 0946 hours (4)
Mercer Tanker 51 – 1003 hours (4)
Bucks Tanker 71 – 1015 hours (3)
Somerset Tanker 45 – 1022 hours (3)
Mercer Tanker 51 – 1025 hours (3)
Mercer Tanker 52 – 1032 hours (4)
Hunterdon Tanker 91 – 1036 hours (3)
Somerset Tanker 35 – 1041 hours (3)
Somerset Tanker 41 – 1043 hours (3)
Mercer Tanker 53 – 1045 hours (5)
Hunterdon Tanker 33 – 1052 hours (4)
Bucks Tanker 71 – 1050 hours (3)
Mercer Tanker 51 – 1056 hours (3)
Somerset Tanker 35 – 1059 hours (3)
Somerset Tanker 41 – 1102 hours (3)
Bucks Tanker 71 – 1105 hours (3)
Somerset Tanker 45 – 1106 hours (4)
Hunterdon Tanker 23 – 1111 hours (3)
Somerset Tanker 35 – 1114 hours (3)
Mercer Tanker 52 – 1117 hours (3)
Mercer Tanker 53 – 1120 hours (3)

Somerset Tanker 41 – 1123 hours (3)
Hunterdon Tanker 33 – 1126 hours (3)

It would appear that this fill site became more accomplished with their task as the drill progressed, speeding filling of tankers.

FILL TIMES – FILL SITE 46 (DRY HYDRANT)
Tanker Times Arriving At Fill Site at plant pond dry hydrant – ** NOTE that some of these tankers were refilled prior to beginning the shuttle, but after being timed for the initial dump timing and did not obtain fill times at this site

Somerset Tanker 41 – 1034 hours
Mercer Tanker 51 – 1045 hours
Mercer Tanker 52 – 1048 hours
Hunterdon Tanker 91 – 1050 hours
Somerset Tanker 35 – 1054 hours
Mercer Tanker 53 – 1055 hours
Bucks Tanker 71 – 1057 hours
Hunterdon Tanker 23 – 1100 hours
Somerset Tanker 45 – 1101 hours
Hunterdon Tanker 33 – 1104 hours
Mercer Tanker 51 – 1105 hours
Mercer Tanker 52 – 1107 hours
Somerset Tanker 35 – 1109 hours
Mercer Tanker 53 – 1112 hours
Hunterdon Tanker 91 – 1112 hours
Somerset Tanker 41 – 1113 hours
Bucks Tanker 71 – 1116 hours
Somerset Tanker 45 – 1117 hours
Mercer Tanker 51 – 1120 hours
Hunterdon Tanker 33 – 1120 hours
Somerset Tanker 35 – 1124 hours
Hunterdon Tanker 23 – 1124 hours
Mercer Tanker 52 – 1127 hours
Mercer Tanker 53 – 1127 hours

The following objectives were established in advance for the drill:

1. Ensure safety of personnel at all times
2. Overall objective to verify water delivery capacities on Box 50-TK (1st through 3rd alarm)
3. Establish 250 gpm within 5 minutes of arrival of Rescue 51
4. Establish 1200 gpm within 15 minutes of arrival of Rescue 51
5. Maintain minimum 1200 gpm (1500 gpm preferred) for a duration not less than 60 minutes
6. Establish fill point at Southwest draft point
7. Establish fill point at P1 parking garage
8. Establish traffic control at drafting point, dump site and hydrant fill point

Essentially all of the objectives were successfully achieved during this exercise, which is a great positive. From this, can we strategies and tactics be modified or changed to achieve the same results in a quicker fashion using less resources – essentially streamlining operations?

I like to look at water supply from several different ways. In the best case scenario, we get the "right" amount of water needed to the scene quickly to achieve a fast knockdown and quickly contain the fire – sort of a "commando" style operation. This avoids the need for a poorer scenario which is the application of a lot of water over a long period of time – more of a "campaign-style" operation, in which the fire is likely going to cause a lot more damage than that experienced on arrival. While goals to improve ISO follow the "campaign-style" thinking, that doesn't necessarily make a fire department better in containing fires early and quickly. There are times, such as a gas leak or gas-fed fire, when campaign-style water supply is needed. The thinking below reflects those concepts.

Several observers, including myself and Nick Weaver from Fire Planning Associates, and John Welling from BMS, as well as comments from some of the participating chief officers, offer the following suggestions:

1. It appeared to some that the wet hydrant fill site arrangement may have been a bit too complicated to operate on a normal basis, with both dual 3" and dual 5" lines being used. This can be a bit of work for a single engine with a light crew. The dry hydrant fill site arrangement was set up with dual 5" lines. Often a single 5" line will be adequate to fill tankers at 1500 gpm, but it is important to determine what fill adapters are on the incoming tankers. It was the opinion of 1 observer that 5" lines can take a lot of time and effort to maneuver, and a mechanism needs to be put into place to relieve the pressure on the 5" line once filling is completed to facilitate removal of the supply line. We realize that this arrangement does allow 2 tankers to be filled at once.
2. Engines assigned to fill points should practice and understand this evolution. One fill engine had apparently not performed this before, and while this was good to practice during this exercise, would caution trying to do this during an actual incident. Might require command staff member being assigned to the fill point to mentor them.
3. To keep the shuttle moving, it is important that driver/operators of tankers/ tenders stay in their apparatus during filling and dumping. Some may have SOPs that require only the driver/operator make or break any connections on their apparatus, but this is probably not critical for tanker fill lines only and we need to get beyond that. Tanker/tender driver/operators were not all fully aware of the operation of their vehicles and fittings, etc. Holding exercises such as this are a good opportunity to become more familiar with this, but it should also be an important part of driver/operator training programs.
4. Useful to clearly communicate to out-of-county tankers the "standard" hose fitting/coupling to use to fill tankers in Mercer County. There were a number of different variations on scene at this exercise. This might be a useful function for mutual aid coordinators to assist with on equipment lists. In

addition, review Township tankers fill arrangements. It was noted that Tanker 52 has a 5" piston valve on the rear which was perceived to take longer than other apparatus to open and close the valve for filling, and a different style of valve might speed things up. Notes from the fill site show that fill times for Tanker 52 were 5, 4, and 3 minutes, which were not much different from fill times of other tankers. There may be concerns about the type of valve on fill lines of 3" or greater, here are the applicable NFPA requirements:

NFPA 1901-2009 "Standard for Automotive Fire Apparatus" applicable excerpts:

18.5 Mobile Water Supply Apparatus.

If the apparatus is designed to be a mobile water supply apparatus, the requirements of this section shall apply.

18.5.1 External Fill.

An external fill connection leading directly to the tank shall be provided.

18.5.1.1*

The external fill connection shall permit a minimum filling rate of 1000 gpm (4000 L/min) from sources external to the unit.

18.5.1.2

The external fill connection shall be provided with a removable or accessible strainer, a shutoff valve capable of being throttled, a minimum 30-degree sweep elbow positioned downward, and a closure cap or plug.

18.5.1.3

Any 3 in. (75 mm) or larger valve shall be a slow-operating valve.

18.5.1.4

A check-type device shall be permitted to be substituted for the modulating and slow-operating valve in those operations where the flow rate is to be controlled at the source.

While a piston-operated ("slow-operating") valve is an acceptable feature for any 3 inch or larger valve, if the flow rate is to be controlled at the source (fill site engine, valve on a hydrant), a check-type device or other valve is acceptable.

5. At the dump site, up to 12-13 hard sleeves were in operation, as well as other water movement hardware. This appeared to be a time-consuming and complicated operation that while it allowed for large flows and backup pump capability, required a lot of time and resources to setup and operate. Even if every engine on the fireground carried 3 hard sleeves (which is not all that common), it would require 5 engines worth of hard sleeves for this operation. It also requires a lot of savvy, focus, and training on the part of both pump operators. To be able to achieve this arrangement quickly at an emergency scene, this setup will likely need to be drilled upon twice a year for familiarity. We might suggest simplifying it a bit to make it reasonable and achievable for all Hopewell Valley personnel and mutual aid companies to establish a continuous water supply promptly to get an effective initial knockdown. Tactically, setting up a draft site operation with 3 portable tanks and 2 transfer legs, requiring 4 hard sleeves total, would work well for the overwhelming majority of your incidents and allow for rapid setup and

operation. As additional resources become available, they can be fed into the operation to build-in backup and additional flow capability. Set up the 3 tanks, and as another engine becomes available, go to 4 or 5, but lay an additional supply line from the draft site to the flow site to not only allow for increased flow, but build in some safety/redundancy for "campaign-style" incidents.

Our general recommendation for your operations is to ensure a tanker is responding as quickly as possible from the 1st or 2nd due company on any house or building fire, and to have that tanker arrive and nurse the initial attack engine. During hours when career staff is working, the attack engine could well be Engine 50 and a tanker needs to arrive close behind them to ensure continuity of a continuous water supply. Having 4000-5000 gallons on the scene very quickly can facilitate an attack that will control a very high percentage of your incidents. A 1000 GPM flow would be a reasonable objective to achieve based upon flow from dry hydrants and other water supplies in the Township for tanker shuttle operations. 1000 GPM is also a reasonable initial attack flow for an initial crew of 4-5, using either a fixed or portable monitor, and 1 handline. Therefore, the entire system needs to achieve that – including the pump on the attack engine, the supply hose for the attack engine (1000 GPM can be achieved through 5" LDH at distances up to 2600 feet without a relay engine), and a pump on the tanker supplying the attack engine. We will discuss these points and this arrangement further in the Water Supply Study final report.

Following this same train of thought, a single tanker shuttle should plan on flowing 1000 GPM. That means that the initial attack engine needs to flow 1000 GPM, the supply line(s) to it need to flow 1000 GPM, the initial nurse tanker needs to flow 1000 GPM, the shuttle needs to flow 1000 GPM, and the water supply (dry or wet hydrants)/fill site needs to flow 1000 GPM. For incidents that turn into a "campaign-style" incident, there is no reason that you can't continue adding to what you started with to increase your flow as additional resources arrive and you find the 1000 gpm isn't cutting it (happens to all of us). To build into that, as an "expanding" incident, using 1 or 2 tankers to feed a supply line via a jumbo Siamese off of the driveway entrance to the fire building still permits some space for aerial apparatus to gain access to the fire building. Apparatus drivers/operators need to be cognizant of that and set up water supply a little bit out of the way which will also facilitate a tanker loop should that develop.

Other considerations are related to how you set up the dump tanks. They need to be in a position to allow ease of dumping while minimizing backing (remember suction hose if apparatus must draft off of the side), but close enough to the scene to be useful. Some have suggested off a side road, or back at the closest major intersection. Some companies set them up in-line, some in diamond shape (point-to-point). This can allow infill of more tanks later and ease dumping into multiple tanks at the same time. Diamond shape is also useful for tankers with only rear dumps, as they can back into the tank like a diagonal parking spot. From the recent drill we did, it would appear all tankers readily accessible to Hopewell Twp. are equipped with sufficient side dumps.

I was very pleased to see all of the work that went into preparing for this exercise, as well as the effort made in executing it. The participating companies achieved more than 2000 gpm of flow and maintained it simply using tankers, and that is something to be proud of. We gathered a great deal of data as well. In addition, I believe there was much learning/ education that occurred during the incident, and as I told several of you there, if you had to do that evolution later that evening, you likely would have performed it much better than you would have before the exercise - that is a good thing! As one of the Hopewell Valley Chiefs has mentioned, there is a lot of information coming at you from different directions, new thoughts, theories, etc. There isn't necessarily one "right" way of doing things – often similar results can be obtained by different means. Some of these means are simpler, and quicker, and that is the direction I suggest you consider heading. You won't all always agree on the best method, and you may have different ideas - which we respect - but it is indeed up to you to figure out what works best for you and drill and practice on it so that when you really need it, it works. When we design an exercise for ISO, you will only be allowed to use your 1st and 2nd alarm companies, which is normally in a non-hydranted area the 1st alarm, with the 2nd alarm being your tanker task force.

In the meantime, keep thinking about ways to make your operations smoother, more efficient, and ensure you have the right equipment in the right places with the right training to make it happen.

Greg Jakubowski, PE, CSP, FSFPE
Principal and Chief Engineer

APPENDIX A – TANKER DATA HOPEWELL TOWNSHIP

TANKER DATA

Hopewell Township, Mercer County, NJ

P.O. Box 446 Washington Crossing, PA., 18977
Phone: 215-321-6260 www.getblazemark.com

Tanker	Tank Size (gallons)	Pump Size (GPM)	Foldatank Size (gallons)
Mercer 42	3000	500	
Mercer 51	3500	1000	3500
Mercer 52	4200	1000	4000
Mercer 53	3500	1500	3000
Bucks 5	4000	1500	3000
Bucks 35	3500	750	3500
Bucks 41	3000	1250	3000
Bucks 46	3000	2000	3500
Bucks 71	3000	1500	3000
Bucks 81	4000	500	Two - 3000
Hunterdon 16	3000	1000	3000
Hunterdon 23	3000	1750	None
Hunterdon 33	3000		
Hunterdon 47	3040	1000	Two - 3000
Hunterdon 48	2000	1000	3000
Hunterdon 91-72	3000	1000	3000
Somerset E28	2500	1250	2100
Somerset 35	3000	1500	3000
Somerset 36	3200	1500	3500
Somerset 38	3000	500	3000
Somerset 41	3000	1500	3500
Somerset 45	3000	1000	3500
Somerset 48	3500	1250	3500

Mercer 42 - East Windsor Fire Co., One Mile Road, East Windsor, NJ
Mercer 51 – Pennington Fire Co., Broemel Place, Pennington, NJ
Mercer 52 – Hopewell Fire Co., Columbia Ave., Hopewell, NJ
Mercer 53 – Union Fire Co., River Road, Titusville, NJ

Bucks County 5 - Midway Fire Company, Route 202, Lahaska, PA
Bucks County 35 - Lingohocken Fire Company, Washington Avenue, Wycombe, PA
Bucks County 41 - Point Pleasant Fire Company, Point Pleasant Pike, Point Pleasant, PA
Bucks County 46 - Eagle Fire Company, Sugan Road, New Hope, PA
Bucks County 71 - Upper Makefield Fire Company, Taylorsville Road, Washington Crossing, PA
Bucks County 81 - Upper Makefield Fire Company, Eagle Road, Newtown, PA

Hunterdon County 16 – Kingwood Twp. Fire Co., County Road 519, Frenchtown, NJ
Hunterdon County 23 – Stockton Fire Co., Mill St., Stockton, NJ
Hunterdon County 33 – Three Bridges Fire Co., Main St., Three Bridges, NJ

Hunterdon County 47 – Sergeantsville Fire Co., Sergeantsville Road, Sergeantsville, NJ
Hunterdon County 48 – Amwell Valley Fire Co., County Route 579, Ringoes, NJ
Hunterdon County 91 – Quakertown Fire Co, Quakertown Rd., Pittstown, NJ

Somerset County 28 – Millstone Valley Fire Co., Amwell Road, Somerset, NJ
Somerset County 35 – Griggstown Fire Co., Canal Road, Princeton, NJ
Somerset County 36 – Flagtown Fire Co., Equator Ave., Flagtown, NJ
Somerset County 38 – Hillsborough #3, Woods Road, Hillsborough, NJ
Somerset County 41 – Little Rocky Hill Fire Co., Route 27, Princeton, NJ
Somerset County 45 – Montgomery Fire Co. #1, Griggstown Road, Belle Mead, NJ
Somerset County 48 – Neshanic Fire Co., Maple Ave., Neshanic Station, NJ

INDIVIDUAL TANKER DATA SHEET

Tanker – Mercer 51

Tank Size – 3500

Pump Size – 1000

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 3 Minutes, 7 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 3 Minutes

NOTES:

8" round side dump, 12" round rear dump.
4" and 5" Storz rear fill connections
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Mercer 52

Tank Size – 4200

Pump Size – 1000

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 44 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 17 seconds

NOTES:

10" square side and rear dumps
5" Storz rear fill connection with 4" Storz x 5" Storz adapter
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Mercer 53

Tank Size – 4200

Pump Size – 1000

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 44 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 17 seconds

NOTES:

10" square side and rear dumps
5" Storz rear fill connection with 4" Storz x 5" Storz adapter
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 16

Tank Size – 3000

Pump Size – 1000

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

Automatic side and rear dumps
Kingwood has 2 tankers

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INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 23

Tank Size – 3000

Pump Size – 1500

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 1 Minute, 42 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 31 seconds

NOTES:

10" square side and rear dumps
3" Storz rear fill connection
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 33

Tank Size – 3000

Pump Size – 500

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 32 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 5 seconds

NOTES:

8" round side and 10" square rear dump
two 3" Storz and one 5" Storz rear fill connection
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 47

Tank Size – 3040

Pump Size – 1000

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

Automatic side and rear dumps
Vehicle is new – no data available

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INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 48

Tank Size – 2000

Pump Size – 1000

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

No data available

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INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 91-72

Tank Size – 3000

Pump Size – 1000

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 33 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 48 seconds

NOTES:

10" round side air operated and 10" square manual rear dump
2 ½" female direct rear fill connection with 3" valve
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Somerset E28

Tank Size – 2500

Pump Size – 1250

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

No data available

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INDIVIDUAL TANKER DATA SHEET

Tanker – Somerset 35

Tank Size – 3000

Pump Size – 1500

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 15 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 15 seconds

NOTES:

10" square side and rear dumps
5" Storz rear and side fill connections
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Somerset 36

Tank Size – 3200

Pump Size – 1500

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

No data

INDIVIDUAL TANKER DATA SHEET

Tanker – Somerset 38

Tank Size – 3500

Pump Size – 500

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

No data

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INDIVIDUAL TANKER DATA SHEET

Tanker – Somerset 41

Tank Size – 3000

Pump Size – 1500

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 59 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 15 seconds

NOTES:

8" round air operated side and 12" manual round rear dumps
4" Storz rear fill connections
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Somerset 45

Tank Size – 3000

Pump Size – 1500

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

11/12/11 - 2 Minutes, 9 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

11/12/11 - 4 Minutes, 8 seconds

NOTES:

10" round side and 12" round rear dumps
3" adapter to 5" Storz rear fill connections
11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line or dual 100' 3" to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Hunterdon 48

Tank Size – 3500

Pump Size – 1250

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

No data available

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INDIVIDUAL TANKER DATA SHEET

Tanker – Bucks 5

Tank Size – 4000

Pump Size – 1500

Date –

Location –

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Time to Drive 200', Fill Tank, and Drive 200' Further –

NOTES:

Vehicle is New in 2011 – No data

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Phone: 215-321-6260 www.getblazemark.com

INDIVIDUAL TANKER DATA SHEET

Tanker – Bucks 35

Tank Size – 3500

Pump Size – 750

Date – 5/11/04

Location – Devonshire Estates Phase 4, off Swamp Road, Buckingham Twp., Bucks County, PA. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 8" main that is supplied from a 12" feed main from nearby storage tanks (public system).

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Side Dump – 3 Minutes, 25 Seconds
Rear Dump – 1 Minute, 59 Seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

2 Minutes, 27 Seconds – Fill Time Limited by Hydrant Capacity

NOTES:

12" rear round and 10" round side dumps. 5" fill line, filled from approx. 75' 5" from approx. 1000 GPM hydrant through Bucks County E95 (2000 GPM pumper)

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INDIVIDUAL TANKER DATA SHEET

Tanker – Bucks 41

Tank Size – 3000

Pump Size – 1250

Date – 5/11/04 / 5/31/05

Location – 5/11/04 - Devonshire Estates Phase 4, off Swamp Road, Buckingham Twp. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 8" main that is supplied from a 12" feed main from nearby storage tanks (public system). 5/31/05 - Station 41, Point Pleasant Fire Co., Wismer Road and Point Pleasant Pike, Plumstead Twp. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet located on Wismer Road just East of Station 41. Hydrant is a draft-type hydrant fed from nearby reservoir with approx. capacity of 1125 GPM.

Using Side or Rear Dump – Rear only

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

5/11/04 - 2 Minutes
5/31/05 – 1st Run – 2 minutes 53 seconds
2nd Run – 2 minutes 20 seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

5/11/04 - 3 Minutes, 9 Seconds
5/31/04 – 3 Minutes

NOTES:

10"x10" square rear dump only.
5/11/04 - 5" fill line, filled from approx. 75' 5" from approx. 1000 GPM hydrant through E95 (2000 GPM pumper).
5/31/05 - E41-2 (1500 GPM pumper) drafted from hydrant through 2 sections of 6" suction hose. Supplied 500' 5" line to manifold to 25' section of 5" line to fill tankers, pressurized line at 100-130 psi at pump.

INDIVIDUAL TANKER DATA SHEET

Tanker – Bucks 46

Tank Size – 3000

Pump Size – 2000

Date – 5/11/04

Location – Devonshire Estates Phase 4, off Swamp Road, Buckingham Twp. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 8" main that is supplied from a 12" feed main from nearby storage tanks (public system).

Using Side or Rear Dump – Side

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

2 Minutes, 35 Seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

2 Minutes, 49 Seconds

NOTES:

10"x10" square rear and side dumps. 5" fill line, filled from approx. 75' 5" from approx. 1000 GPM hydrant through E95 (2000 GPM pumper)

INDIVIDUAL TANKER DATA SHEET

Tanker – Bucks 71

Tank Size – 3000

Pump Size – 1500

Date – 11/12/11

Location – Bristol-Myers Squibb Facility, Pennington-Rocky Hill Road, Pennington, Hopewell Township, NJ. Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 6" main that is supplied from the plant system fed by one electric 1500 gpm and one diesel 1000 gpm fire pump both taking suction from the site 20 million gallon pond.

Using Side or Rear Dump – Side

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Side Dump – 2 Minutes, 11 Seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

2 mins, 46 seconds

NOTES:

10"x10" square rear and side dumps. 5" Storz connection fill line with 5" piping, 11/12/11 – Mercer County Rescue 23 (Lawrenceville FC - 2000 gpm) supplied directly off of hydrant. Supplied 200' 5" line to 5" gated wye to 100' and 200' sections of 5" line to fill tankers

INDIVIDUAL TANKER DATA SHEET

Tanker – Bucks 81

Tank Size – 4000

Pump Size – 500

Date – 5/11/04

Location – Devonshire Estates Phase 4, off Swamp Road, Buckingham Twp., Bucks County, PA Fill site is at standard hydrant, with dual 2 ½" outlets and a 4 ½" outlet. Hydrant is fed from a 8" main that is supplied from a 12" feed main from nearby storage tanks (public system).

Using Side or Rear Dump –

Time to Drive 200', Dump Contents of Tank, and Drive 200' Further –

Side Dump – 4 Minutes, 30 Seconds
Rear Dump – 2 Minutes, 45 Seconds

Time to Drive 200', Fill Tank, and Drive 200' Further –

3 mins, 26 seconds

NOTES:

10"x10" square rear and side dumps. 5" fill line, filled from approx. 75' 5" from approx. 1000 GPM hydrant through Bucks County E95 (2000 GPM pumper)

NUMERICAL STREET NAME	SECONDARY INFO	Fire Dept	FPA Fire Demand Zone	WATER SUPPLY RATING
0 Pleasant Valley - Harbourton Rd	Residence Static Source	51	1	Red
39 Poor Farm Rd	Roadside Static Source	51	1	Yellow
44 Poor Farm Rd	Roadside Static Source	51	1	Yellow
Federal City Rd	Rosedale County Park	51	10	Green
0 Old Mill Rd	Bridge	51	10	Red
335 Pennington-Titusville Rd	Kappor Farm	51	11	Red
326 Pennington-Titusville Rd	Roadside Static Source	51	11	Yellow
463 Federal City Rd	Residence Static Source	51	14	Red
451 Federal City Rd	Residence Static Source	51	14	Yellow
3 Lawrenceville-Pennington Rd	Residence Static Source	51	141	Yellow
167 Blackwell Rd	Roadside Static Source	51	15	Green
312 Pennington-Lawrenceville Rd	Residence Static Source	51	15	Red
0 Washington Crossing-Pennington Rd	Roadside Static Source	51	16	Green
201 Washington Crossing-Pennington Rd	Roadside Static Source	51	17	Yellow
97 Nursery Rd		51	18	Red
1640 Reed Rd	Residence Static Source	51	19	Red
0 Pennington-Hopewell Rd	Near Quik-Chek	51	2	Yellow
19 Brandon Rd	Residence Static Source	51	26	Red
10 Flower Hill La	Roadside Static Source	51	27	Green
116 Bull Run Rd	Roadside Stream Source	51	27	Red
30 Pennington-Hopewell Rd	Kooltronics	51	3	Yellow
0 Titus Mill Rd	Roadside Stream Source	51	4	Yellow
Wargo Rd	Pond House	51	4	Yellow
263 Pennington-Rocky Hill Rd	Residence Static Source	51	5	Red
3 Aqua Ter	Residence Static Source	51	5	Yellow
53 West Shore Dr	Roadside Static Source	51	5	Yellow
1 East Shore Dr	Dry Hydrant	51	6	Red
29 Burd Rd	Southwind Farms Pond A	51	7	Red
257 Pennington-Harbourton Rd	Residence Static Source	51	7	Red
29 Burd Rd	Southwind Farms Pond B	51	7	Yellow
28 Yard Rd	Residence Static Source	51	8	Red
0 Scotch Rd	Merrill Lynch Bldg	51	98	
0 Pennington-Rocky Hill Rd	King George Rd	51	99	Yellow
0 Van Dyke Rd	At Bridge	52	1	Yellow
446 Lambertville-Hopewell Rd (RT 518)	Residence Static Source	52	10	Red
341 Lambertville-Hopewell Rd (RT 518)	Residence Static Source	52	11	Red
0 New Rd	Roadside Stream Source	52	12	Red
113 Marshalls Corner-Woodsville Rd (RT 612)	Roadside Static Source	52	14	Red
54 New Rd	Roadside Static Source	52	14	Yellow
0 Lambertville-Hopewell Rd (RT 518)	Roadside Stream Source	52	15	Yellow
0 Lambertville-Hopewell Rd (RT 518)	Roadside Stream Source	52	15	Yellow
0 RT 31 (Pennington Rd)	Harmony Farms R&G	52	16	Yellow
0 Stonybrook Rd	IAO Lambertville-Hopewell Rd (RT 518)	52	18	Yellow
109 Stonybrook Rd	Residence Static Source	52	18	Yellow
0 Stonybrook Rd	Stonybrook Country Club	52	19	Red
5176 Province Line Rd	Residence Static Source	52	22	Green
0 Province Line Rd		52	22	Red
0 Province Line Rd	At Bridge	52	22	Red
198 Province Line Rd	Harmony Creek Farm	52	22	Red
Benson La	Roadside Static Source	52	22	Yellow
106 Aunt Molly Rd	Residence Static Source	52	23	Red
92 Aunt Molly Rd	Roadside Stream Source	52	23	Yellow
180 Crusher Rd	Quarry Swim Club	52	24	Green
66 Aunt Molly Rd	Residence Static Source	52	24	Red
0 Aunt Molly Rd	Roadside Static Source	52	24	Yellow
82 Aunt Molly Rd	Residence Static Source	52	24	Yellow
126 Moores-Mill Mt Rose	Juniper Meadow Farm	52	25	Green
114 Pennington-Hopewell Rd	Golf Club	52	25	Green
114 Pennington-Hopewell Rd	Bridge	52	25	Green
8 Timberbrook Dr	Residence Static Source	52	25	Yellow
0 Hopewell-Princeton Rd	At Bridge	52	26	Red
275 Hopewell-Amwell Rd	Residence Static Source	52	3	Yellow
920 Cherry Valley Rd	Roadside Static Source	52	30	Green
0 Carter Rd	Industrial Park Static Source	52	31	Yellow
Cleveland Rd W	Roadside Static Source	52	32	Yellow
0 Hopewell-Amwell Rd	Residence Static Source	52	4	Green
231 Hopewell-Amwell Rd	Residence Static Source	52	4	Yellow
233 Hopewell-Amwell Rd	Residence Static Source	52	4	Yellow
559 Province Line Rd	Pond A	52	4	Yellow
559 Province Line Rd	Pond B	52	4	Yellow
578 Province Line Rd	Residence Static Source	52	5	Red
276 Hopewell-Amwell Rd	Residence Static Source	52	5	Yellow
109 Grandview Ave	Wet Hydrant	52	6	Green
156 Reservior Rd	Residence Static Source	52	6	Red
62 Lambertville-Hopewell Rd (RT 518)	Hillside Farm	52	8	Yellow
119 Van Dyke Rd	Roadside Static Source	52	8	Yellow
138 Van Dyke Rd	Residence Static Source	52	8	Yellow
212 Van Dyke Rd	Residence Static Source	52	9	Red
100 Lambertville-Hopewell Rd (RT 518)	Residence Static Source	52	9	Yellow
46 Harbourton-Mt Airy Rd	Broad Oak Farm	53	1	Red
446 Harbourton-Mt Airy Rd		53	1	Red
1125 Bear Tavern Rd (RT 579)	Jannsen Pharmaceuticals	53	10	Green
28 Maddock Rd	Roadside Static Source	53	10	Red
17 Todd Ridge Rd	Residence Static Source	53	11	Red
264 Jacobs Creek Rd		53	11	Yellow
15 Forrest Blend Dr	Dry Hydrant	53	14	Green
0 Valley Rd	At Old Ski Park	53	2	Green
Intersection Pleasant Valley Rd	Valley Rd	53	2	Red
48 Pleasant Valley Rd	At Old Abandoned Bridge	53	2	Yellow
0 RT 29	Trap Rock Quarry	53	3	Green
0 Fiddlers Creek Rd	Baldpate Mtn Park	53	3	Red
48 Fiddlers Creek Rd	Residence Static Source	53	3	Red
57 Pleasant Valley Rd	Residence Static Source	53	3	Red
26 Pleasant Valley - Harbourton Rd	Roadside Static Source	53	4	Red
25 Pleasant Valley - Harbourton Rd	Residence Static Source	53	4	Yellow
26 Harbourton-Mt Airy Rd	Residence Static Source	53	5	Red
0 Pleasant Valley - Harbourton Rd	Residence Static Source	53	5	Red
1415 Bear Tavern Rd (RT 579)	Roadside Static Source	53	5	Yellow
1443 Bear Tavern Rd (RT 579)	Roadside Static Source	53	5	Yellow
343 Pennington-Harbourton Rd	Roadside Static Source	53	5	Yellow
197 Woosamonsa Rd	Roadside Static Source	53	5	Yellow
0 Fiddlers Creek Rd	Roadside Static Source	53	6	Yellow
0 Rivera Ave	At Canal	53	7	Green
Trimmer Avenue	At Canal	53	7	Green
153 Church Rd	Rear of Residence	53	7	Red
Intersection Fiddlers Creek Rd	Church Rd	53	7	Yellow
1273 Bear Tavern Rd (RT 579)	Rear of Residence	53	8	Red
324 Pennington-Harbourton Rd	Residence Static Source	53	8	Red
0 Washington Crossing-Pennington Rd	At Bridge	53	9	Red