White Paper

COST COMPARISON OF BOTTLED WATER VS. ON-SITE PURIFICATION EQUIPMENT

June, 2018 (revised)

Author: Thomas A. Flaim, P.E. (ret.)
CEO, First Water Systems

www.FirstWaterInc.com

Abstract

There are only two viable options for having clean potable water available for emergencies. The first is the traditional method of securing a bottled water contract from a vendor who, during a disaster, would deliver truckloads of bottled water to a location. A newer alternative to this type arrangement is on-site water purification equipment that is purchased in advance and immediately available to produce water on-demand.

This White Paper will provide a detailed analysis of the cost effectiveness and comparative benefits and drawbacks of each solution.

The Traditional Model

The California General Services Procurement Division released a revised contract, number 1-14-89-200, in November of 2013 for the specific purpose of trucked in emergency water. It reflects their best negotiation and lowest price available for the delivery of emergency bottled water. More recently, FEMA released its current cost to deliver bottled water during disasters. These specific costs and delivery requirements will be used in this White Paper analysis as it represents a best-case cost scenario for this method of emergency water availability. Indeed, the pricing cited under these contracts are very aggressive and approximately 25% less than the documented costs to deliver emergency water to Hurricane Katrina victims in 2005.

Bottled Water Delivery Method Non-Cost Related Positives

Familiarity – This method of getting emergency water has been utilized for decades and is commonly written into emergency operations specifications.

Ease of Acquisition – Calling up the resource typically only requires a phone call and, because of its familiarity, is easily communicated among parties.

Safe Water – Bottled water from vendors can be relied upon to be of high quality, meeting all clean water standards for human consumption.

Bottled Water Delivery Method Non-Cost Related Negatives

Delivery and Logistics – Many times trucks cannot reach the locations in need for days, weeks or longer due to impassable roads from flooding, ice, collapsed bridges or street segments, downed trees and electrical lines, etc.

Distribution – A truck delivers its cargo of bottled water to one location and all victims and responders are required to go to the location for their water. Further, the disposal of those thousands of jugs is environmentally undesirable.

Human Resources – A significant amount of manpower is required to unload trucks of their cargo without the aid of forklifts, particularly within the realities of an emergency site and weather concerns such as high temperature.

The First Water Model

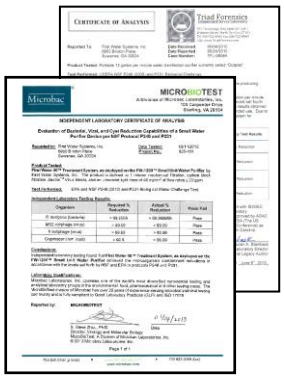
The utilization of portable emergency water purification had its start just a few years before Hurricane Katrina hit, and has expanded into many different volume and power options to meet the variety of needs in emergency response. Since its introduction, over seven hundred hospitals, hundreds of local governments and all branches of the military rely on the First Water solution for their emergency water requirements. As such, in addition to empirical data like extensive government and private sector testing, the systems have been used in virtually any type emergency one could plan for.

On-Site Water Purification Method Non-Cost Related Positives

On-Site, Not Delivered – Because the assets are pre-positioned in the areas of greatest need, clean water can be available immediately, and is not subject to impacted transportation networks.

Portability – The systems can all be transported by any common command vehicle or similar SUV, Cross-over, pickup truck, etc. This portability enables clean water to be disseminated wherever needed, and at multiple sites. All units are additionally on wheels so moving them around a site is very easy.

On-Board Pressurization – All purification systems from First Water have on-board pumps that provide pressurization, enabling applications like showering, food preparation, hand washing, ice production, dialysis, etc. that a non-pressurized source like bottled water cannot do.



Safe Water – The First Water brand of purification has been extensively tested to meet both US EPA and Department of Defense protocols to consistently produce micro-biologically safe water for human consumption.

Human Resources – The systems have been designed to run themselves. Automated mechanisms ensure the UV bulb, a critical component of the treatment technology, is working properly or the unit shuts down. There is even a built-in pressure monitoring capability that shuts the purifier off when not in use and automatically turns it on when water is being drawn.

On-Site Water Purification Method Non-Cost Related Negatives

Purchasing – This method is a proactive approach that requires purchase of the systems in advance. While all conceivable types of grants have been previously used for purchasing, it still requires the cost to be paid up front.

Storage – Because the systems are generally purchased in advance and stored on-site, physical room must be available. Because all systems have been designed to minimize space requirements (all the equipment required to run and support a typical hospital can fit in a residential closet), and because there is no longer a need to store pallets of bottled water, space concerns are typically mitigated.

Familiarity – Innovation in emergency response simply does not happen often. The methods and tools used today are many times the same as was used by previous generations. This is particularly true in the provision of emergency water. However, with so many thousands relying on this technology and many more moving to it every year, this negative is quickly becoming mitigated.

Cost Considerations

The above considerations could lead one to conclude that the difference in utilizing trucked in bottles of water or on-site water purification equipment can be slight. While both provide very high-quality water, on-site water production can produce significantly higher volumes of water and is available to make clean water immediately after an event. From both a logistics and deployment perspective, on-site water purification is clearly more robust and yields far more flexibility to react to event conditions.

The remaining primary concern is cost. There are many soft costs that are variable and associated with each solution. It would not be pragmatic to try and determine all such costs. This is particularly true in determining actual deployment and opportunity costs. For example, what is a reasonable soft cost to assign to bottled water if it cannot be supplied for four days while the on-site solution is producing water immediately? Rather this analysis will concern itself with the easily measured hard costs that can be associated with procuring and utilizing either solution.

The following normalizes the costs between both solutions. The goal is to determine the comparative cost of providing a gallon of water to a victim at an event site.

Truck Delivery Cost

One Semi-Truck of Water (per California state contract):

Cost = $390.61 / pallet X 20 pallets / truck (max. capacity) = $7,812.20

Water Volume = 37,440 (16.9 oz.) bottles / truck (max. capacity), or the equivalent of 4,943 gallons / truck (max. capacity)

Therefore, one semi-truck of 16.9 oz. bottles costs $7,812.20, and contains 4,943 gallons of water, or $1.58 per gallon delivered. While 16 oz. bottles are used in this analysis because they are more typical, one-gallon jugs yield a similar cost per gallon. FEMA has recently provided an updated study of its cost of $1.85 per gallon delivered, which includes their significant volume discounting.

First Water FW-1,200-M Cost

One FW-1,200-M purification system:

Cost = $19,000 / unit delivered anywhere in the continental U.S.

Water Quantity = 1,200 gallons / hour
X 24 hrs. / day
X 50% factor for evenings and idle time
= 14,400 gallons / day (typical day's use)

Therefore, one First Water FW-1,200-M purification system costs $19,000, and produces an average of 14,400 gallons of water, or $1.32 per gallon. However, the FW-1,200-M will continue purifying its 14,400 gallons of water per day, every day, for as long as needed at no additional cost.

For example, after 5 days of use the cost per gallon goes down to $1.32 / 5 = $0.26 per gallon, compared to $1.85 per gallon with a truck delivery. If one uses the equipment just one time per year for events lasting five days each, the cost comes further down to $0.26 / 5 = **$0.05 per gallon**. **Clearly the cost per gallon delivered to victims is substantially less through on-site purification.**

Deployment Scenarios

Raw cost analysis is helpful in determining the magnitude of savings of different solutions, but actual deployment scenarios help in applying those savings to specific applications. The reader is urged to remember that while the following deployment scenarios demonstrate this cost savings, the water purification equipment will be stored on-site and ready to use as many times as desired for only the cost of a filter change. Filters sets cost only hundreds of dollars and one change is included in the costs shown.

Deployment Scenario 1 – EMA Response to a 10 day Hurricane Event (utilizing California EMA cost figures):

Assume:

1. 4,000 victims to serve
2. Each victim requires 1 gallon per day for hydration
3. Each victim requires 1 gallon per day for hygiene, pets, misc. loss, etc.

Truck Delivery of Bottled Water

8,000 gallons / day for victim hydration, hygiene, etc.
/ 4,943 gallons / truck
= 1.6 trucks per day

Cost = approx. 2 trucks every day for 10 days, or

$ 7,812.20 cost per truck
X 20 trucks over ten days
= **$156,244.00 after 10 days**

On-Site Water Purification

Assume:

1. Same number of victims and water requirements (10,000 gallons per day)
2. Cost of equipment reflects 2014 pricing

One (1) FW-1,200-M Deployment Group		$45,389.00
Including:		
(1)	FW-1200-M™	
(1)	Spare Filter Set	
(1)	Supply Station 3,000™	
(1)	Filling Station 1200™	
(800)	AquaBags™	
(1)	On-Site Training	
(3,200)	Additional AquaBags	$19184.00
Total Cost =		**$64,573.00**

In this scenario, the cost to supply enough water and all supporting products and consumables is $64,573.00 for on-site water purification vs. $156,244.00 for truck delivered bottled water, or **59% less**.

Deployment Scenario 2 – 250 Bed Hospital Response to a 6 day Water Disruption (utilizing FEMA cost figures):

Assume:

1. 2,500 victims to serve, including patients, staff and surge
2. A daily drinking water requirement of 5,000 gallons per day (same 2 gallons per day per person as in Scenario 1)
3. Full hospital operations to continue, including the ER and OR

Truck Delivery of Bottled Water

5,000	gallons for victim hydration, hygiene, etc.
X $1.85/gallon	gallons / truck
= $9,250	per day

Cost = approx. $9,250 every day for 6 days, or

$ 9,250 cost per day
X 6 days
= **$55,500 after 6 days**

Important Note:

Bottled water cannot sustain hospital operations because it is not pressurized. The water supplied above can only keep people alive by supplying drinking water. As unfortunately seen many times every year, the operations of the hospital must cease. Community care is suspended, and there is a significant cost to the hospital for lost revenues while closed. Additionally, it is assumed the bottled water trucks can even make it to the facility starting with the first day.

On-Site Water Purification

Assume:

3. Same 2,500 victims and water requirements of 5,000 gallons per day

One (1) HCF-1		$74,432.00
Including:		
(1)	FW-1200-M™	
(1)	Spare Filter Set	
(1)	Supply Station 3,000™	
(1)	Filling Station 1200™	
(2)	FW-120-M™	
(1)	FW-120-MS™	
(1)	Supply Station 300™	
(1,600)	AquaBags™	
(1)	Nex-Gen Bladder 500 ™	
(1)	On-Site Training	
Total Cost =		**$74,432.00**

In this scenario, the cost to supply enough water and all supporting products and consumables is $74,432.00 for on-site water purification vs. $55,000.00 for truck delivered bottled water, or about one third more. However, there are many cost benefits that cannot be quantified in this Paper as they are site specific. As example, what is the lost revenue to the hospital for shutting its doors and diverting patients for six days? Or the cost to re-establish operations, the value being able to provide a continuity of care for the community, etc.? Additionally, because the solution can be used repeatedly for decades by simply replacing used filters, the solution would pay for itself in direct savings after only the second time used.

Conclusions

In analyzing the hard costs associated with providing emergency water to either victims or critical infrastructure, it is readily apparent that mobile systems producing water on-site is substantially more cost effective. The analysis demonstrates that the cost difference between it over bottled water vendors is cost justified after only one or two typical events like water main breaks and natural disasters. However, the hard cost savings are magnitudes higher when one considers that the systems can be used over and over. With repeated deployments and use, the hard cost savings are incalculable.

The soft cost savings are equally significant. In typical EMA victim response or hospital operational conditions, the units can be moved anywhere water is needed, enabling immediate relief wherever the need arises. Additionally, because of the large volumes of water produced, one system can be moved to multiple locations and satisfy multiple populations. Greatly increased flexibility in logistics and operations will greatly enhance the response to any type event.

The soft savings in any type health care facility situation is truly staggering. Continuity of care throughout a coalition or region can finally be achieved, a condition simply not currently possible through a reliance on bottled water delivery.