DEVELOPMENT OF AN ICE, SWIFTWATER/WATER AND RESCUE DIVE TEAM FOR THE CITY OF ANN ARBOR

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Abstract

A study was conducted to show that inadequacies may exist within the ice, swiftwater and water rescue standard operating procedures in the City of Ann Arbor. The study included a history of past ice and water accidents in the City of Ann Arbor and six case studies. The most serious incident occurred on November 3, 1989 and took the lives of three teenage females. A properly trained and equipped rescue dive team may have made a difference on that November day. It is important for a jurisdiction to make its citizens as safe as possible and to continually strive to uphold the highest standards in ice, swiftwater and water rescue. It was concluded that a progressive city and a proactive fire department should be prepared to handle an ice or water accident, by having a properly trained and equipped ice, swiftwater and water rescue team.

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Chapter 1

Introduction

ICE, SWIFTWATER AND WATER RESCUE TEAM:

REQUIRED OR OPTIONAL

You are at the fire station conducting your daily tasks, an alarm comes in, you are dispatched to a reported child in the river. You arrive at the scene and find a swollen river fourteen feet deep and 150 feet wide. The velocity is thirty miles per hour. Then you spot a child heading your way. Are you prepared to handle this incident?

In many areas of the nation, ice, swiftwater and water rescue is a new and daunting specialty for fire service managers who are having trouble maintaining their current capabilities. Specialty fields such as ice, swiftwater and water rescue require extra equipment and training and create new administrative headaches. Why should the fire department be saddled with such programs? By whose mandate? Where is the funding and what are the liabilities? There are no easy answers, but incidents described below clearly demonstrate the importance of being prepared for ice, swiftwater and water rescues. It is in the fire services' best interest to develop a wide variety of capabilities. Those who say it's not their job could be in for a rude awakening when an incident occurs and the fire department does not respond in the appropriate manner. With the expanded media coverage and a growing legion of amateur videographers converging

on high-profile rescue incidents, it is a sure bet that the fire department's performance will be well documented.

As Collins (1993) reports, "Generally, the public understands that the fire department cannot save everyone. Predicaments arise in which the victims would require suicide missions to rescue, and that is not what firefighters are paid to do" (p. 32)

However, when there is no forethought, planning, training, or when equipment and rescue operations are clearly botched, there is likely to be a public outcry. Even if the operations went as well as could be expected, yet the victim was lost, the fire chief might be called on to explain his/her department's actions to the media, citizens and politicians. It is far better to have made the effort to do the job right than to take justifiable criticism for not having had the forethought to take care of a potential or probable hazard.

Fortunately, the ability to successfully handle an ice, swiftwater, water rescue or other technical rescue incident is not a single-dimension trait. A department that has made efforts to properly handle technical rescue incidents will find its fire fighting force more well-rounded and better able to handle fires and other traditional fire department duties. The fire chief will find that many operations will run more smoothly, more efficiently and, above all more safely. The public will recognize that tax money is being spent to save lives, and that the fire department can be relied on even when unusual rescues and disasters strike.

Some fire departments, with severe life hazards, have not dealt with the issue at all. In many cases, the fire administrators do not even realize the severity of the hazard until a disastrous incident occurs or until they are educated on the topic, which is one of the reasons for this paper.

FUNCTIONS OF ICE, SWIFTWATER AND WATER RESCUE TEAMS

There are six functions that must be considered when rescue teams are being developed, they are: (1) hazard evaluation, (2) rescue training, (3) safety and rescue equipment, (4) standard operating procedures (SOP), (5) rescue preplans, and (6) continuing education. These functions will be discussed in detail in Chapter 3, Development of Ice, Swiftwater and Water Rescue Programs.

One area that was left out of the basic functions, but that is considered to be an important part of the overall ice, swiftwater and water rescue services is the Incident Command System (ICS). The Incident Command System was designed to provide a practical framework for the management of all field operations while insuring the safety of personnel and effective integration of the efforts of the responding fire department companies. The Ann Arbor Fire Department (AAFD) uses the ICS developed by the National Fire Academy (NFA).

METHODOLOGY

The methodology for this study is based on a thorough investigation of current ice, swiftwater and water rescue standards (local, state and federal), laws and ordinances, and a review of the ice, swiftwater and water rescue functions.

Four case studies are used to show the vulnerability to these types of hazards. The City of Ann Arbor has seven miles of the Huron River flowing through the community, with some large areas created by dams that are used for water recreation. In addition to the river and

associated small lake areas, there are two lakes and a number of large water retention areas that are subject to be potential water rescue sites.

In conclusion, it was this information that was examined to identify the shortcomings of the current rescue system used by the City of AAFD. By identifying these areas, the fire department was able to correct the flaws in their system and allow them to be better prepared in the event of an ice, swiftwater or water rescue.

Chapter 2

HISTORY OF ICE, SWIFTWATER AND WATER RESCUE IN THE CITY OF ANN ARBOR

1973 - 1988

In the early years of water rescue in the City of Ann Arbor, the fire department was ill equipped at best. The only apparatus with any sort of water rescue equipment on it was Rescue-one, which responded to any rescue call in the city. The lone piece of water rescue equipment was a 3/8 inch 50 foot, polypropylene throw line with a rubber ball tied to the end of the rope. The rubber ball added weight so the line could be thrown further in an attempt to reach the victim in trouble. When I said that this was the only piece of water rescue equipment, I mean "*the only piece*". There were no personal flotation devices on any apparatus in the city. The idea was that the water areas were the jurisdiction of the Washtenaw County Sheriff Department (WCSD), so the fire department didn't need to waste money on useless equipment.

When the call came in for a person in the water, one apparatus, usually an engine company with two personnel on it, was dispatched to verify this condition. If the officer thought that the rope from Rescue-one could be used in a rescue attempt they would radio fire dispatch to send Rescue-one to their location. In most cases, the victim had gone under water or made it

back to shore before Rescue-one arrived on the scene. When Rescue-one arrived on the scene, if the victim had disappeared under the water, the WCSD was called so that body recovery operations could begin.

If the call was for a person through the ice, one engine company was dispatched to the scene. Once on the scene, the officer would verify the existing condition, the officer would then radio for dispatch to send Rescue-one to their location. While the Engine Company was waiting for the throw rope from Rescue-one, a 16-foot straight ladder was removed from the engine and slid out on to the ice. One of the personnel from the Engine Company would attempt to reach the victim; the only protection that the fire fighter would have would be their fire fighting turnout gear. This would add about twenty-five extra pounds to the weight of the fire fighter and the ladder. This usually meant that on arrival, the crew from Rescue-one was now rescuing not only the victim, but also the fire fighter.

In 1979, several members of the department who had been involved in several ice and water rescues approached the Chief of the AAFD; they were able to convince the Chief that more protection was needed for the personnel of the department. An order was sent in for: one buoyant rescue ring with 50 foot of 3/8 inch polypropylene rope and fourteen personal flotation devices (PFD's). The buoyant rescue ring was placed into service on Rescue-one, along with a kit that could be used to inflate a 2 1/2 inch fifty foot fire hose with air. The kit contained two caps, one fifty foot 2 1/2 inch hose, two 3/8 inch 100 foot guide ropes, one five foot air hose with regulator and one self-contained breathing apparatus (SCBA) bottle. Two personal flotation devices were placed on every piece of apparatus in the City of AAFD. This apparatus response and equipment for ice and water rescue would remain the same until 1986.

In 1986, once again, the group of concerned fire fighters approached the fire Chief about the need for a rescue boat in the department. This came about because of a situation involving a "*vehicle in the water* " call at Gallup Park.

After three months of negotiations, the department purchased a six foot inflatable raft with oars, which was placed in the back of Rescue-one. A three and one-third horse power (hp) motor was added in the spring of 1987, this motor is still in use today.

1988 - 1994

In 1988 the City of Ann Arbor held a national search to replace its retiring fire chief. George A. Markus was hired in February of that year and started work on March 1st. One of the new Chief's first concerns was the lack of personnel responding to and lack of equipment for ice and water rescue calls. Chief Markus authorized the first AAFD ice and water rescue standard operating procedure with an effective date of May 1, 1988. This standard operating procedure assured that fifteen personnel would respond to any ice or water rescue call received in the City of Ann Arbor's borders. This would include the following apparatus: (1) Battalion Chief, (1) Rescue Truck, (2) Engines, (1) Ground Ladder Truck, and (1) Aerial or Aerial Platform.

The six-foot inflatable raft was replaced with an eight-foot inflatable raft and twenty additional personal flotation devices were ordered. Each apparatus would now carry four personal flotation devices and one, 100 foot, 1/2 inch rescue rope to be used in ice and water rescues.

The training officer was directed to put together a training program that would teach the proper ice and water rescue techniques to the Department's personnel by the first of May. This was the first official in-house ice or water rescue training received by the members of the AAFD ever. The training was from the American Red Cross (ARC), Water Safety Instructor course and the first sessions were taught by American Red Cross instructors.

In addition, during the months of June, July and August the training officer set up practical hands-on training sessions for the proper operation of the eight-foot inflatable boat and motor. One of the department's mechanics was able to make an adapter that could be attached to one of the department's SCBA bottles. This would allow the inflating of the boat in one-tenth of the previous time or about one-minute. January of 1994 would bring about changes that would move the fire department into a new era of ice and water rescue.

1994 - PRESENT

In January of 1994, ten members of the AAFD attended an ice rescue course sponsored by the WCSD. The course was taught by corporate instructors from Dive Rescue Inc./ International, one of the top ice and water rescue agencies in the world. These fire fighters completed the course and were certified in ice rescue, but more importantly they had become aware of the deficiency of the AAFD ice rescue equipment. A proposal was forwarded to Assistant Chief William Steele explaining the deficiencies in the standard operating procedures and lack of equipment for ice rescue. Also attached was a proposal for the purchase of six ice rescue sets. Each set was to include: (1) ice rescue suit, (1) 200 foot braided polypropylene water rescue rope with bag, (1) 70 foot rescue throw rope with bag, (1) set of swim fins, (1) set

of ankle weights, (3) carabiners, and storage container. These kits would be placed on apparatus located in different areas of the city for better coverage. One member of the original group applied and was accepted into the Dive Rescue Inc./ International *Ice Rescue Instructor Trainer course*. Upon completion of the ice rescue trainer course the new instructor would return to the AAFD and set up an ice rescue course to train all the members of the department. This training was completed in December of 1994.

In November 1995, the AAFD received two personal watercraft (PWC) to be used for swiftwater and water rescue situations in the department's response area. With the addition of this new equipment it was decided that the department would have to develop up-to-date standard operating procedures and one person would have to be chosen to head up a new rescue team. Assistant Chief William Steele was directed to post the position for ten days after which he would pick the team leader from the resumes received from interested personnel. Captain Robert Lechtanski was picked as the team leader and was directed to have the process completed by March 31, 1996. This was the start of the actual development of the AAFD ice, swiftwater and water rescue team, which will be covered in Chapter 3.

PAST WATER ACCIDENT - CASE STUDIES

Six case studies have been chosen to show the need for an ice, swiftwater and water rescue team. These incidents come from the response files of the AAFD and from interviews with key members of the department who were on the incident scenes. Additional information was obtained from the files of the WCSD dive team and dive team members (Egler, 1997, [Interview]).

June 25, 1986

At 23:17, the AAFD dispatch center received a call from a person who had reported seeing a car jump the curb and drive into the Huron River. The location was the back parking lot of Gallup Park, in the southeast district of Ann Arbor. The dispatcher, after receiving the information, dispatched Engine-five to verify the call.

Engine-five arrived on the scene at 23:23 and reported that tire tracks led across the lawn and entered the water, but no vehicle was visible. The officer requested that Rescue-one be dispatched to the location. He also advised dispatch to notify the WCSD for their dive team. Rescue-one arrived on the scene at 23:31, fourteen minutes after the initial call. Air bubbles were seen coming up from an area about ten feet from shore, in line with where the vehicle had last been seen. After the two fire officers on the scene conferred, they decided to put a fire fighter into the water to see if they could feel the vehicle. One fire fighter was going to enter the water tethered to shore by a rope and wearing a personal flotation device. As the fire fighter was about to enter the water, a wrecker arrived on the scene and asked if the fire fighter could take a cable to hook on to the vehicle if possible, that way the vehicle could be pulled back to shore. Once the fire fighter had entered the water, he could feel the roof of the vehicle under him, but he was not able to hook the cable onto the vehicle so it could be pulled out. The fire fighter decided to remove the personal flotation device so that he could dive under the water to hook the cable. The vehicle was pulled to shore and the vehicle was checked for occupants. There were no occupants inside the vehicle.

"As the vehicle was being towed away, the first WCSD dive team member was arriving, the time was 00:10. This was fifty-three minutes after the first report of the vehicle in

the water. The average response time for the WCSD dive team was one hour, from time of call, to on scene arrival during the 1986 water season. The average response time for the AAFD was four and one-half minutes, from time of call, to on scene arrival for the same period" (Zahn, 1997, [Interview]).

November 3,1989

At 23:15, the AAFD dispatch center received a call reporting a vehicle in a retention pond at the corner of Bluett Street and Nixon Street, in the northeast district of the City of Ann Arbor. The reporting caller told the dispatcher that they had seen two people in the vehicle and no one escaped before the vehicle disappeared under the water. The temperature was below freezing and there was a thin layer of ice on the pond. The dispatcher toned out a full water rescue response according to the AAFD water rescue standard operating procedure, this includes fifteen personnel and five pieces of apparatus.

Engine-five was the first AAFD unit on the scene at 23:19; the officer immediately radioed dispatch to call the WCSD dive team for activation. The crew from Engine-five made two attempts to enter the water, but the water was so cold that as the fire fighters entered the water they lost their breath. At 23:22, the rest of the water rescue response arrived on the scene, the on duty shift commander assumed command, he directed the crew from Rescue-one to inflate the raft and see if they could reach the vehicle. "The depth of the retention pond was measured at eighteen feet, one fire fighter attempted to free dive to the vehicle, but once again the temperature of the water took his breath away. The vehicle was located and marked by pike poles pushed into the bottom of the pond. The first member of the WCSD dive team arrived on the scene at 00:21, the member was gearing-up when the second member arrived.

The diver was able to attach a cable to the vehicle and it was pulled to the surface. As soon as the vehicle was on solid ground, crews from the AAFD and Huron Valley Ambulance (HVA) company had the vehicle doors open. The bodies of three teenage females (1-15 years, 2-16 years) were found in the vehicle"(Skrypec, 1997, [Interview]). This is the worst water accident ever to happen in the City of Ann Arbor.

July 6, 1994

At 19:34, the AAFD dispatch center received a call from the park ranger at Gallup Park, which is located in the southeast district of the City of Ann Arbor. The Huron River flows through the park and several areas of the river widen out into small lakes. The park ranger reported that a person had run into his office shouting that a man had attempted to retrieve a volleyball from the river, but was unable to make it back to shore. Before going to the scene, the park ranger called 911 to request fire rescue. The dispatcher toned out a full drowning response according to the water rescue standard operating procedure. This consisted of fifteen personnel and five pieces of apparatus.

"Engine-five was the first unit to arrive on the scene at 19:39. At this time the officer met with the park ranger who confirmed that there was a victim down in the water. The officer advised the dispatcher to contact the WCSD dive team for activation.
By 19:43, all responding fire department units were on the scene" (Nimke, 1997, [Interview]).

The on-duty shift commander took control of the situation. He directed the crew from Rescue-one to inflate the raft and start a probing search for the victim. Two fire department units were positioned at different locations down river in case the victim had surfaced downstream. The officer from Engine-five was instructed to question the witnesses in hopes of

finding a last seen position of the victim, which is used by the dive team as a starting search point. The WCSD dive team arrived on the scene at 20:00, their response time was shorter that normal due to the fact that the team was having a meeting and all the members were already at the WCSD headquarters. "The WCSD dive team leader joined the incident commander (IC) in the command post. All of the information obtained from the witnesses was processed. The IC informed the dive team leader that the fire department felt that they had a good starting point. After processing the information a diver was put into the water for a quick search, this was at 20:15. The starting point chosen by the WCSD dive team leader was about twenty-five feet up stream from the position set by the AAFD IC. The search was called off because of darkness, due to the fact that the river in this area contains many items (i.e. fence, barbed wire, etc.), that could be potentially fatal to a diver should they become tangled in it. The AAFD and WCSD dive team continued the search the next morning, July 7, 1994 at 08:00. Within ten minutes of the first diver entering the water, the body of the victim was found. The location was within five feet of the projected starting point proposed by the IC the night before" (Zahn, 1997, [Interview]).

November 28, 1996

At 07:53, the AAFD dispatch center received a call reporting that a woman saw her neighbor's dog go out onto an ice covered retention pond and she thought that it had fallen through. This retention pond is located in the south-central district of the City of Ann Arbor. The dispatcher toned out an animal through the ice rescue call, this consisted of six personnel and two pieces of apparatus. These vehicles respond normal traffic, which means no emergency lights or siren. At 07:55.45, about forty-five seconds after the dispatcher had hung

up the telephone from the original call, the woman called back to say that her neighbors were going out on the ice with a canoe to get the dog. Before the dispatcher could get all of the information, the woman screamed that the canoe had tipped over, dumping both of the neighbors into the water. At this time the dispatcher upgraded the call to a full response for a person through the ice, an additional nine personnel and three apparatus were dispatched and all units were upgraded to emergency response.

"Engine-six arrived on the scene at 07:58, the officer reported that both of the people were making their way out of the water and the dog was running around on shore. The officer from Engine-six canceled all other responding AAFD units and remained on the scene to obtain information for her report. She also advised the owners of the dog how dangerous it was for them to venture out onto the thin ice. In the name of public relations, the officer decided to have a fire fighter wearing an ice rescue suit enter the water and retrieve the canoe that had tipped over. This made the owner happy and guaranteed that no one would enter the water after Engine-six cleared the scene"

(Brow, 1997, [Interview]).

December 31, 1996

At 08:45, the AAFD dispatch center was advised by the Ann Arbor Police Department (AAPD) dispatch center that the Barton Dam located on the Huron River was leaking. The Barton Dam is the oldest dam is the area, built in 1929, it controls the largest man-made lake in southeast Michigan. A flood warning was sent out by the National Weather Service (NWS) to all communities below the Barton Dam on the Huron River. If the dam were to fail there are nine dams down river that could possibly be washed out. All on duty AAFD personnel were

advised of the situation and the City of Ann Arbor's Emergency Operations Plan (EOP) for possible flooding was put into effect.

At 10:00 the decision was made to call in the ice, swiftwater and water rescue team leader and twelve addition personnel. These personnel would staff the ice, swiftwater and water rescue equipment at locations on both sides of the river below the dam.

At 11:45 the ice, swiftwater and water rescue team leader was called to AAFD headquarters for a briefing from the City's Emergency Manager (EM), Cathy Rich:

> "At 08:25, a water alarm had sounded in the control house of the Barton Dam. When the on-duty person went to investigate the alarm she found water pouring into a manway that leads under the dam. This manway is used for inspection purposes and travels from one side of the dam to the other. The leak was coming from a golf ball size hole in the dam about sixteen feet below the surface of the water. The concrete is six foot thick at this point of the wall. A commercial diving firm had been notified and was enroute to the dam so an inspection dive could be made on the Barton Lake side of the dam. The company had requested the AAFD ice, swiftwater and water rescue team stand-by during their dive."

At this time the AAFD does not have a certified rescue dive team in operation, however, the team leader is fully certified and was prepared to assist the company if this was approved by the City's EM.

At 13:20, the commercial diver was ready to enter the water to see how bad the problem was and if any temporary repair measures would work. Ice, swiftwater and water

rescue team members were in position both above and below the dam. The team leader was in a ready position at the entry point where the commercial diver had begun his dive. The ready position means that the back-up diver is completely dressed and ready to go in case of trouble. The commercial diver found a six-foot hole on the Barton Lake side, but felt that a temporary patch could be made using sandbags and cinders. Twenty-three sandbags were pushed into the hole, and then ten more bags of cinders were poured in around the sandbags hoping to slow the leak down so the patch could be placed inside the manway. This operation took one hour and twenty-five minutes. The reason why the diver had to work this slowly was that the water flowing into the hole was creating a total water force of 751 pounds per square inch (PSI). One wrong move and the diver would have been pulled into the hole and held there by the water force. No one has survived being pulled into this type of pressure. The force of the water crushes the body and the lungs cannot inflate to get oxygen to the brain.

Once the repair was made on the Barton Lake side the diver had to work down in the manway in full dive gear to attempt to complete the temporary patch. This was equally as dangerous. If the sandbags gave way the water would be coming into the manway at a rate of over three thousand gallons per minute (GPM). Because the diver had to work from below the hole in the wall, the pressure would be more than the diver could work against and he would be lost in the area under the dam. This procedure took about one hour. A wood and cloth plug was constructed and then lowered into the manway. A hydraulic jack was used to put reverse pressure against the remaining leaking water. A shoring system was then constructed from six inch by six-inch wood shoring material built to hold the patch in place until permanent repairs could be completed. All temporary repairs were completed and the diver was out of the water

by 16:00. It was also decided that the situation was under control and all extra AAFD personnel were released from duty. While no AAFD ice, swiftwater and water rescue team members entered the water they were on stand-by for the completion of the temporary repair operation.

As a side note, on ***February 27,1997*** a similar situation occurred on the Newburg Lake dam, part of the Rouge River, in Livonia, Michigan. A commercial diving company was racing to complete a dam repair job before the time deadline was reached and some one committed a fatal mistake. The situation was investigated by Michigan Occupational Health and Safety Administration (MIOHSA), preliminary reports state that "a diver was caught in a floodway that runs under the dam while still tethered to shore by an air hose, warming water hose and communications line. The water pressure was estimated to be approximately 750 PSI, which crushed the diver to death. This also hampered the rescue attempts by fire and police department personnel, as well as special rescue dive teams called in on a mutual aid agreement" (Roost, 1997, [Interview]).

August 7, 1999

At 15:32, Ann Arbor Fire dispatch received a call from Ann Arbor Police dispatch advising that a call had been received reporting a person missing after the canoe that the victim was riding in overturned. Units from both agencies responded to the reported location and set up for a rescue operation. After confirming that one person was missing, fire and police officers interviewed all witnesses and started water rescue efforts. Using the witness information makers were placed to verify the victims last known location. The Washtenaw County Sheriff Department dive rescue team was notified at 15:47, the first WCSD team member arrived on

the scene at 16:07 and reported to the command post for an informational up-date. The WCSD dive team entered the water setting up the first search within the area located by the AAFD surface water rescue team. Items from the canoe were found in the search area on the first dive, but no victim was found. Several more dives were completed with no success. During this time, deputies from the WCSD dive team re-interviewed the witnesses and attempted to relocate the accident site. After several hours, the rescue effort switched to a body recovery. As the WCSD dive team was meeting to decide where to begin search activities Sunday morning, a new witness came forward advising that the victim had tried to swim to shore. The witness said "that the victim was wearing full Muslim dress and appeared to be pulled down by the weight of the wet clothing." The information obtained from the new witness placed the victim at least fifty feet, 180 degrees in direction outside of the present search area. After this information had been confirmed by questioning the other family members who had been in the canoe, a new search area was set up for the following morning. The first WCSD dive team to enter the water Sunday August 8, 1999 at first light, located the victim's body within ten minutes of entering the new location (Egeler, 1999 {interview}).

It is important to realize that this is just a small sampling of the past ice and water accidents that have occurred within the boundaries of the City of Ann Arbor, although there would seem to be continuous improvements in the water rescue system. These cases were used to study the need for a better-trained and better-equipped ice, swiftwater and water rescue team.

Chapter 3

DEVELOPMENT OF ICE, SWIFTWATER AND WATER RESCUE PROGRAMS

RESCUE TEAM DEVELOPMENT

The development of the ice, swiftwater and water rescue programs follow the same basic functions, so they will be discussed all at the same time. On November 15, 1995 after the team leader was picked, a March 31, 1996 deadline was set for the completion of the development process. It was expected that as of April 1, 1996, the AAFD would have a functional ice, swiftwater and water rescue team off the drawing board and on the road.

As explained earlier there are six functions that must be considered when developing ice, swiftwater and water rescue teams, they are: (1) hazard evaluation, (2) rescue training, (3) safety and rescue equipment, (4) standard operating procedures (SOP), (5) rescue preplans, and (6) continuing education. Each function will be described individually, except rescue training and continuing education; these two are closely related and were handled at the same time.

HAZARD EVALUATION

All potential water hazards within the AAFD's jurisdiction had to be located and some form of survey completed on them. First, all potential water sources had to be located. Most of this was accomplished using topographical maps from the City of Ann Arbor's Parks and Recreation Department and the Building Department. Second, additional maps were obtained from the Washtenaw County Drain Commissioner's Office. Using this information, surveys were completed on the primary hazard locations. This is a continuous process, teams are sent out monthly to update current maps and to map out new trouble areas as they appear.

Hazard evaluation requires that the rescue team is able to complete the following:

- Survey all moving water within the department's jurisdiction during low flows, recording width, depth, velocity and the river's structure.
- Examine the courses of rivers and streams to locate natural and man-made hazards, especially those with accident histories. The examinations should include the location of access sites, direct routes and areas that are particularly inaccessible or dangerous, such as viaducts.
- Survey all moving water during periods of high water, again recording the characteristics and measurements of the river.
- Hold a training exercise at a potential accident site when the river or stream is approaching high water conditions, yet not beyond the safe limitations of the rescue team. (King, 1980)

All of the experts agree with the information listed above, but one carries it out even more. In a recent study, Ray (1989) found that a more in-depth evaluation was needed. Ray felt that a series of visits to potential accident sites should be scheduled only after they have been reviewed on paper. The team visits enabled them to:

1. Locate islands, which may flood in high water
2. Locate the lowhead dams in the area
3. Locate places where trees and brush pile up at high water levels such as (A) outside sharp bends; (B) gravel bars; (C) abutments and (D) washed over roads

4. Study the hazard points at different water levels
   - At low levels observe permanent bottom obstacles such as: rocks, jutting or undercut abutments, rooting undercut banks, pipeline crossings
   - At medium level (1/2 of the bank full) observe the effects of the bottom obstacles on the surface current and whether or not powered craft could be safely operated. Observe lowhead dams for development of "keeper" hydraulics. (Calculate maximum velocity.)
   - At high level (bank full) observe dams for "hidden keepers" hydraulics and submerged islands with trees and brush acting as strainers. (Calculate maximum velocity.)
   - At flood level (1 foot + out of banks) observe flooding of access roads, current cutting across bends, hydraulics forming where water flows across bends, hydraulics forming where water flows across perpendicular roads and particularly low bridges which would not allow a rescue boat to safely pass underneath if it were inadvertently swept downstream from the rescue site.

What was quickly learned was that the hazard evaluation process can be very complex and it can be difficult to conduct a realistic evaluation when the people doing them didn't know what to look for. Classes were held for members of the AAFD who had volunteered to be on the ice, swiftwater and water rescue team, the class material was taken from the Ohio Department of Natural Resources, Division of WaterCraft, *Advanced River Rescue Course*. Once the members completed this course, the team was off and running.

RESCUE PREPLANS

Waterway rescue preplans are a concept, which was advanced by the Ohio Department of Natural Resources and the Ohio State Fire Marshal in their widely renowned river rescue-training program. The strategic priorities during an ice, swiftwater and water incident are, first, the safety of all the rescuers, second, the safety of the victim. Some other priorities include assisting survivors, acting as department liaison, providing for public information and controlling the scene.

Effective preplans take the information that was obtained during the hazard evaluation surveys and plans what type of approach would be needed if an incident should happen in a certain location. The team members use maps of the area and mark down all hazards, including debris, fences, bridge abutments, lowhead dams, hydraulics, hydroelectric power plants, trees, brush, high velocities and so on. Also, they will show any possible access points and areas where special equipment is needed. All rescue tactics can be included in a rescue preplan; this way the IC can use the preplan to quickly develop his or her incident action plan. Preplans can save the day by assigning units to strategic locations downstream of the victims, but you need to know when and where this can be used. In the AAFD these plans are developed by trained team members. They are reviewed by the team leader, once they are approved; they are printed and distributed to all AAFD ice, swiftwater and water rescue units. The units carry the rescue preplans in a binder or folder on the apparatus for quick reference while enroute to the incident. In the near future the AAFD will be putting computer aided dispatch (CAD) units in the apparatus. This will allow the dispatcher to transfer all appropriate information to the units by computer. These preplans are constantly being revised as changes are made or when new developments are built. Most of the new water problems come from water retention ponds being required when developers construct new subdivisions. These are just as dangerous as moving water, as seen in the case study of *November 3, 1989,* where three teenagers lost their lives.

This same preplan program is being used in many parts of the United States with great success. Combined with proper training, equipment and interagency cooperation, this type of

rescue response program can be adapted for use anywhere there is an ice, swiftwater and water problem

RESCUE TRAINING AND CONTINUING EDUCATION (CE)

A national survey shows that without basic training and personal safety equipment, rescuers are extremely vulnerable to death and injury. Ice, swiftwater and water rescue, like many technical rescue fields, is undergoing a tremendous upswing in the national learning curve. New techniques and equipment are being developed and advanced at a record pace. It is for these reasons that it was decided that once a team member was trained to the basic level, there would have to be CE to maintain their skills. Also, before a new piece of equipment could be added to the rescue units, all members of the team would have to be trained on the equipment's proper usage and safety handling procedures.

It was decided that all members of the AAFD ice, swiftwater and water rescue team would be required to have the following courses as the minimum standards:

- Ohio DNR Water Safety course 32 hours
- Ohio DNR Basic River Rescue course 32 hours
- Dive Rescue International Ice Rescue course 8 hours
- Michigan DNR Boating Safety course 8 hours
- Michigan DNR PWC course 16 hours
- Emergency Medical Technician Water Rescue Training 24 hours

This was a total of 120 hours of minimum training that had to be completed by March 31, 1996. With the help of the AAFD training battalion chief, all of the training was completed by the first of March. The courses were taught using both in-house and outside agency instructors. This was the first time that outside instructors were used for any material other then first responder medical classes.

At this time a system was set up to deliver forty hours of CE per year. The courses are scheduled in four-hour blocks, so that all CE training is completed while the personnel are on active duty. The material is divided into five eight-hour blocks, which are:

- Ice Rescue 8 hours
- PWC Annual Refresher 8 hours
- Swiftwater 8 hours
- Water 8 hours
- Aquatic Environment Medical 8 hours

This training is mandatory if the member wishes to remain on the team. If a team member misses any part of this training on their own duty shift, they can come in and take the training on another shift, on their own time, at no pay. Another way that a team member can complete their CE requirements is to attend an outside training session that is of equal or higher level of training in the same subjects as listed above.

It is important not to overlook the command staff when setting the training schedule. Chief officers should have an understanding of the hazards and dynamics of moving water, what equipment and tactics can be used, and how to use an ice, swiftwater and water rescue preplan. Most of this training for the command staff is completed during operational staff meetings, which are held monthly. However, there are times when the command staff must go through the same training as the team (i.e. reading currents, hydraulics, keepers, etc.). This is accomplished at special ice, swiftwater and water rescue team training sessions.

Even though practicing on the ice or in the water is preferred, it is not always necessary. There are “dry land” exercises that can effectively teach basic skills such as tossing throw ropes or setting up tension lines. Combining all of the courses and programs listed above the AAFD

ice, swiftwater and water rescue team has taken the step up to the next level of professional service.

SAFETY AND RESCUE EQUIPMENT

Below is a list of the ice, swiftwater and water rescue equipment carried by AAFD apparatus. The equipment is listed by unit number:

Engine-one	4 PFD type II
Engine-three	4 PFD type II
Engine-four	4 PFD type II
Engine-seven	4 PFD type II
Tower-one	4 PFD type II
Tower-seven	4 PFD type II
Ladder: two	4 PFD type II

Engine- five

- Two ice rescue kits
- Primary kits with an ice rescue board
    - 1 - Streans ice rescue suit (ex-large)
    - 1 - 300 ft. 1/2 inch floating kernmantle water rescue rope with bag
    - 2 - 70 ft. rescue throw ropes with bags
    - 1 - set of Turtle swim fins
    - 1 - set of ankle weights (large)
- Secondary kit
    - 1 - Streans ice rescue suit (ex-large)
    - 1 - 250 ft. 1/2 inch floating kernmantle water rescue rope with bag
    - 2 - 70 ft. rescue throw ropes with bags
    - 1 - set of Turtle swim fins
    - 1 - set of ankle weights (regular)
- 4 - PFD type II

Engine-six

- Two ice rescue kits
- Primary kits with an ice rescue board
    - 1 - Streans ice rescue suit (ex-large)
    - 1 - 300 ft. 1/2 inch floating kernmantle water rescue rope with bag
    - 2 - 70 ft. rescue throw ropes with bags
    - 1 - set of Turtle swim fins
    - 1 - set of ankle weights (large)
- Secondary kit
    - 1 - Streans ice rescue suit (ex-large)
    - 1 - 250 ft. 1/2 inch floating kernmantle water rescue rope with bag
    - 2 - 70 ft. rescue throw ropes with bags
    - 1 - set of Turtle swim fins
    - 1 - set of ankle weights (regular)
- 4 - PFD type II

Rescue-one

- Two ice rescue kits
- Primary kits with an ice rescue board
    - 1 - Streans ice rescue suit (ex-large)
    - 1 - 200 ft. 1/2 inch floating kernmantle water rescue rope with bag
    - 2 - 70 ft. rescue throw ropes with bags
    - 1 - set of Turtle swim fins
    - 1 - set of ankle weights (large)
- Secondary kit
    - 1 - Streans ice rescue suit (ex-large)
    - 1 - 200 ft. 1/2 inch floating kernmantle water rescue rope with bag
    - 2 - 70 ft. rescue throw ropes with bags
    - 1 - set of Turtle swim fins
    - 1 - set of ankle weights (regular)

Rescue-one Additional equipment

- 2 - Bayley's ice rescue suits (medium)
- 2 - Bayley's ice rescue suits (Small)
- 4 - Water rescue ropes
    - 1 - 200 ft. 1/2 inch floating kernmantle
    - 3 - 200 ft. 1/2 inch floating Braided polypropylene
- 1 - Rescue hose kit, 2 caps, 2 -100 ft. 3/8 inch guide ropes, 2 1/2 inch fire hose (50 ft.), air hose (5 ft.) , regulator and SCBA air bottle
- 1- 8 ft. inflatable boat
- 1 - 3 1/3 hps Honda outboard motor

- 8 - PFD
    - 4 - Type I
    - 4 - Type II

Utility-four

- 6 - 3 mm Wet suits
    - 1 - XX-Large
    - 2 - X-Large
    - 2 - Large
    - 1 - Medium
- 12 - Pro-tec “Perception” water rescue helmets
    - 5 - X-Large
    - 5 - Large
    - 2 - Medium
- 9 - Water rescue foot protection
    - 2 pr - Large
    - 3 pr - Medium
    - 4 pr - Small
- 4 - 25 ft. 3/8 inch Floating kernmantle water rescue ropes
    - 2 - Water rescue ropes with rescue floatation devices and bags
    - 2 - Back-up water rescue ropes with bags
- 6 - 70 ft. Rescue throw ropes with bags
- 14 - Extrasport Swiftwater/ High Float PFD
    - 2 - XX-Large
    - 5 - X-Large
    - 5 - Large
    - 2 - Medium
- 1 - Two place marine vehicle trailer
- 2 - WRB 700 YAMAHA marine water vehicles

Personal Water Craft (PWC)

All of the equipment listed above on the unit called Water Rescue 1, is support equipment for the operation of the AAFD rescue team’s PWC units. These units were appropriated through the *Law Enforcement Water Vehicle Loan Program*, this program is established to assist police and fire departments that are required to carryout the water rescues

and water safety programs in their jurisdictions. This private grant was approved by the YAMAHA Motor Corporation and a letter was sent to the local dealer, Nicholson's Enterprises, Inc. of Ann Arbor, Michigan. The PWC's were delivered to the AAFD two weeks later, on May 25, 1999.

The training for this vehicle was different from the standard fire department training. This required special training from the WCSD. First, all members had to attend and pass the Michigan DNR Boaters Safety course and second, the WCSD took the Michigan DNR PWC course and taught it in Ann Arbor. This meant that the class could be taught to all three on duty shifts of the AAFD. It was taught on the seven miles of the Huron River that runs through Ann Arbor. So, as the members were learning how to handle the PWC's, they were also learning how to do hazard evaluations as well. This training was something that both WCSD and AAFD members had been trying to do for many years, but was not accepted by the administrations in the past. Due to this training, a new joint training agreement has been established. Instructors from both departments are working together on new interagency training. The program started in June 1997 and continues to be an ongoing joint training session, with PWC training, high line and technical rescue procedures being the core group of courses for the program..

The operation of the PWC vehicle is relatively safe, if the operator is properly dressed. This includes, but is not limited to: 3-mm wet suit, protective footwear, gloves, water rescue helmet and most importantly a swiftwater PFD. The SOP pertaining to the operation of PWC vehicles is very specific as to what protective safety equipment is worn during swiftwater and water rescue incidents.

STANDARD OPERATING PROCEDURES (SOP)

The last function to be discussed is one of the most important. SOP's are designed to support the operations that training has made possible. They are guidelines for minimum standards, which should be followed at an incident. They should also be flexible to allow informed decision-making at the scene. SOP's follow a specific structure, depending on the department using them. The structure used by AAFD is shown below:

- SOP title: WATER RESCUE RESPONSE
  - PURPOSE
  - SCOPE
  - RESPONSIBILITY
  - RESPONSE
  - EQUIPMENT - OPEN WATER
  - SIZE - UP
  - OPERATIONAL PLANS
  - PERSONNEL ACCOUNTABILITY
  - TERMINATION OF INCIDENT COMMAND

Chapter 4

PROPOSED RESCUE DIVE TEAM

In October, 1999, a proposal will be presented to the Fire Chief of the AAFD. This proposal will contain the information requested to cover the start of a rescue dive team in the fire department. The proposal will contain information on: (1) staffing, (2) equipment, (3) training and (4) a rough draft SOP. The rescue dive team would be part of the current ice, swiftwater and water rescue team, but would be a specialized division. This is a brief highlight of that proposal.

STAFFING

The proposal calls for six rescue divers to be trained and fully equipped to respond to calls involving ice, swiftwater and water rescue incidents. This would not replace the WCSD dive team, it would supplement their team with much needed personnel and equipment. The system would be set up so that two divers would be on-duty at all times. The remaining off-duty divers would carry alphanumeric pagers and would be called in when the situation demanded. In order to maintain two divers on-duty, the department would have to pick and train ten personnel. As of the date that the proposal went in, there are four, fully certified rescue

divers and another six with different levels of training currently working on the ice, swiftwater and water rescue team. These fire fighters have all volunteered for this rescue dive team.

TRAINING

The system for training would bring the WCSD and AAFD trainers together again. Almost all of the training would be joint training, once the members of the AAFD dive team were brought up to minimum WCSD dive team standards. Due to the different levels of certification, in-house training would not work. Arrangements with a local public safety dive trainer have been formalized, all of the AAFD personnel will attend a group of core classes being taught in the area. This will be new information for some and refreshers for the other divers. The core courses are:

- Certified PADI SCUBA - Open Water I
- Certified PADI SCUBA - Open Water - II
- Certified PADI SCUBA - Rescue Diver
- Certified PADI SCUBA - Ice Diver
- Certified PUBLIC SAFETY Diver
- Certified NITROX Diver
- Dive Rescue Inc./ International - DR 1
- Dive Rescue Inc./ International - DR 2

There will have to be a system for CE with the dive team as well, since the AAFD will be diving with the WCSD dive team it would be to the benefit of both departments if all requirements were the same. So, the following CE schedule was put together for approval by both departments.

CE TRAINING SCHEDULE

- One eight hour training session per month 96 hours
- One full team training quarterly 32 hours
- Two full team night dive 8 hours
- One Haz -Mat dive 8 hours

The team leaders from both organizations have been working side-by-side during the planing of this venture. There are still many training obstacles that will have to be handled before this program goes forward. However, it appears that all parties involved see this as a positive move.

EQUIPMENT

The proposed rescue dive team vehicle is a GMC step-van, which will be purchased by the AAFD. It will be a 24-foot Value-Van 35 and it will need to be painted and the interior restructured to meet the needs of the dive rescue team.

The following is equipment that has been placed in the upcoming budget:

- 1- 10 ft. Inflatable boat (hard bottom and transom)
- 1 - 10 hps Outboard motor
- 6 - sets of Rescue Diver gear
    - Viking Pro Classic Surveyor Dry Suit
    - USIA Thermowear with boots
    - 1 - pr Viking Dry Gloves
    - 1 - set Viking Cuff Rings
    - Viking Hood
    - Full Faced Diving Mask
    - Regulator
    - Octopus
    - Diving Computer and Gauge System
    - 80 cu. ft Self Contained Underwater Breathing Apparatus Tank
    - Weight belt
    - Lead weight
    - Buoyancy compensator

    - Back-up Diving Mask
    - Snorkel
    - 1 - set of Turtle Swim Fins
    - Diving Knife
    - Equipment Bags X-Large
- 12 - extra 80 cu. ft. SCUBA tanks
- Underwater Voice Communication - through the rope system
- 600 ft. 1/2 inch Com-line
- 4 - 250 ft. 1/2 inch Water Rescue Rope
- 1 - 5000 watt Generator
- 4 - light bars (for night diving)
- 1 - Quick Set-up Command Post
- 1 - 30 ft. inflatable walk way
- 4 - Motorola model 1000 Hand held Radios

This vehicle would replace Water Rescue-1 as the water rescue vehicle for the AAFD. All of the equipment from Water Rescue-1 would be transferred to the rescue dive team vehicle. The radio designation for the new vehicle would be Rescue Dive Team - one, shortened to RDT-one.

STANDARD OPERATING PROCEDURES

The SOP's for this proposal are in draft form and are currently waiting for final approval. The process will take a little longer, due to the fact that most of the items must be approved in the new budget before any movement can be made toward the finalization of this proposal.

Chapter 5

CONCLUSION

The conclusion will be divided into two parts: first the development of the ice, swiftwater and water rescue team and second, the proposed rescue dive team, which is still under consideration.

During the initial process of considering whether an ice, swiftwater and water rescue team was needed, the group appointed by the Chief of the AAFD, obtained ice and water rescue data for the last 25 years. This information was processed and charted by the group to see how many incidents were responded to during this time period. On an average, the AAFD was responding to eight incidents a year involving some type of ice or water rescue. It was clear that even with the improvements that were started in 1988, then again in 1994, some type of specialized water rescue team was needed.

A look at the case studies clearly shows a need for better training and equipment. This was very evident in 1989, when a vehicle went through the fence into the water retention pond and three teenage females lost their lives. Had a fully trained and fully equipped water rescue team been available, maybe this tragedy could have been avoided. On arrival members of the team would have had the equipment to enter the water and possibly remove the occupants from

the vehicle. Some members of the rescue team would have been on duty and would have arrived on the scene within three minutes, not 66 minutes which was the time it took for the WCSD dive team to arrive on the scene. The time factor alone is a major point in favor of the ice, swiftwater and water rescue team.

The need for better equipment, water rescue suits, PFD's, floating water rescue ropes and rescue boat was evident again in 1994 when a swimmer was lost at Gallup Park. The Dive Rescue Inc./International training for the recovery of victims from cold water states "Rescuers have what is known as the "*golden hour*" to recover the victim and start the needed medical procedures, if there is going to be any chance of survival" (Linton, 1982). The first AAFD unit was on the scene within five minutes, but had only four PFD's and one 100-ft. rescue rope. Had the ice, swiftwater and water rescue team been in operation, the proper equipment would have been on the scene with Engine-five. This means that everything needed to start the search process would have been available from the time of arrival and not thirty-six minutes later when the WCSD dive team arrived on the scene.

There is no guarantee that everyone would have been saved, but they would have been given a better chance of surviving. This would be accomplished due to the fact that with AAFD personnel arriving on the scene and starting the rescue procedures sooner, the victim would be found quicker. Then medical treatment could be started within the "*golden hour*", giving that victim a fighting chance.

It is important to say that this is not a paper against the WCSD dive team, they are a very capable rescue team. The WCSD dive team coverage area is the entire county, so when the call comes in for a water incident they may be at one of the far ends of the county. This

would delay their response time to assist the AAFD on any water rescue call, as has been the case in the past.

The City of Ann Arbor has the largest fire department in the county and is capable of handling most emergency situations in its area. So, it just makes sense that if you are the AAFD responding to ice or water incidents in your own area, you need your own ice, swiftwater and water rescue team. The process of developing the full service ice, swiftwater and water rescue team was completed on March 1, 1996 and the team was operational on April 1, 1996.

The proposal for the rescue dive team will be submitted in October, 1999 for the proposed budget of 2000 - 2001. It is believed that the rescue dive team is needed for the same reasons as the ice, swiftwater and water rescue team. The AAFD is a full service fire department and it is currently expanding its service delivery to better serve the citizens of the city. At the present time there is a difference of almost one-hour from the time of call to when the first AAFD unit arrives on the scene and when the WCSD dive team arrives on the scene. As it currently stands, this means that no one can initiate an underwater search until the WCSD dive teams arrives on the scene. Add to this the time it takes for the divers to don their equipment and it would be about one hour and fifteen minutes. The AAFD rescue dive team members could be entering the water within ten minutes of their units arriving on the scene. This can be accomplished because the divers could start getting into their gear while enroute to the scene, something that is not possible with the WCSD dive team. Their members arrive in their own WCSD road patrol cars and wait for the department's dive van to arrive before they can start getting dressed.

The City of Ann Arbor Fire Department has made major improvements in the fields of ice and water rescue. The next natural progression will be the formation of a rescue dive team. The process of developing the full-service rescue dive team was completed on July, 1999 and submitted for budget consideration. It was decided to wait until October, 1999 putting off consideration for the 2000 – 2001 budget. The results of this report find that the addition of the ice, swiftwater and water rescue team and the proposed rescue dive team can only help the AAFD to better serve the citizens. The general public should not have to wait for a dive team to respond from out-county to an ice or water incident within the boundaries of the city of Ann Arbor when there are already certified dive rescue personnel on duty in the AAFD stations. There is a saying which states "you can't put a price on a human life," hopefully the city council will keep this in mind during the 2000 - 2001 budget hearings. A community this progressive should not have to live through another water incident like the ones described in this report, when it has the trained personnel and equipment to do the job.

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