

Utility Construction Supervisor Killed When Struck by a Pickup Truck at a Work Zone in Washington State

FATALITY INVESTIGATION REPORT

Investigation: # 02WA03401
SHARP Report: # 52-13-2005

Release Date: July 29, 2005



WA FACE Program/SHARP
PO Box 44330
Olympia, WA 98504-4330
(888) 667-4277

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SUMMARY

On June 10, 2002, a 49-year old male utility construction supervisor was killed and a fellow utility worker was seriously injured when they were struck by a motorist who drove a small pick-up truck into their work zone situated along a busy city street. The victim and the co-worker were working in a narrow, 2 ½ foot deep trench and were in the process of installing a natural gas line connection to a commercial building. The victim and his co-worker were just in the process of exiting the trench when the victim was struck and killed, and the co-worker was seriously injured, when the pick up drove straight into the trench and then crashed into the back of a parked dump truck located on the opposite side of the trench. The foreman (the fatal victim) was airlifted to an area trauma center where he died of his injuries an hour later. The co-worker was transported to a local medical facility with serious head and face injuries.

To prevent similar occurrences in the future, the Washington State Fatality Assessment & Control Evaluation (FACE) investigative team concluded that employers engaged in roadway construction, maintenance, or utility operations should follow these guidelines:

- **Contractors and subcontractors should conduct site-specific hazard assessments and develop plans to control or eliminate the hazards.**
- **Employers should use positive protective barriers to shield workers from intruding vehicles.**
- **Conduct pre-construction safety meetings to discuss potential work zone hazards and appropriate control measures.**
- **Use safety hierarchy principles to reduce exposure by rerouting traffic, closing down a lane, or instituting a complete street closure.**
- **Situate vehicles with flashing lights to act as a barricade to protect workers and to warn motorists of the work zone.**
- **Explore using new mobile work zone protective devices.**

INTRODUCTION

On June 10, 2002, the Washington State FACE Program was notified by the WISHA* (Washington Industrial Safety & Health Act) Services Division of the death of a 49 -year-old utility construction supervisor and the serious injury of a co-worker who were involved in a work zone intrusion incident

The Washington FACE Principal Investigator and the Field Investigator met with the regional WISHA representative who was investigating the case. After reviewing the case with WISHA, the WA FACE team traveled with the WISHA representative to the incident site. The WISHA representative helped pinpoint the incident location, some of the specific site details and defined the position of the people and equipment involved in this incident. Photographs, incident reports, police and other investigation reports, and news articles were also reviewed as part of the FACE evaluation of this work zone incident.

The Washington FACE Principal Investigator and the Field Investigator also met with a representative (Safety Manager) of the utility contractor whose employees were involved in this incident. Interviews with the utility contractor representative were conducted, the contractor's safety & health programs, and company work zone safety criteria were discussed, and specifics related to the incident were reviewed. The incident site was also visited with the utility contractor representative, and a discussion of safety preventive measures was done at the site.

The incident site was located at a city street construction work zone, where a utility contractor had been hired as a subcontractor by a local gas utility company to install a natural gas line connection from a gas supply main in the street, to a commercial building located directly east of the work zone.

The work zone was located on a very busy public street situated within city limits. The street, a major thoroughfare for the area, is part of the state highway system. The street, designated as street "A" in figure 1 and photo 1, runs north-south traveling past the area where the work zone was situated. The work zone was located on the east side of street (A) at the north corner of intersecting street, street (B). The posted speed limit for street (A) was 30 mph.

Street (A) was four-lane asphalt-paved, undivided-roadway (two lanes traveling north and two lanes south, plus a center turn lane) separated by double yellow no passing lines. In addition to the four travel lanes, Street (A) also had unmarked (i.e., no fog line or other marking) parking lanes, established on each side of the street. Street (A) was a very active road, from a traffic flow and volume standpoint, with a mix of both commercial and private vehicles traveling past the work zone location. The area along street (A) consists mostly of commercial buildings mixed with rental apartment housing units.

* The OSHA State Plan program in Washington State.

Street (B) was a very short two-lane asphalt connector that intersected street (A), and also had a parking lane on each side of the street. Access to street (A) from street (B) was controlled via a stop sign. Vehicles, after stopping at the stop sign, would then have to merge into the appropriate lane traveling either north or south on street (A).

The work zone occupied the parking lane of both street (A) and (B) at the northeast corner of the intersection between the two streets. The work zone impacted the motorists traveling west on street (B) and those traveling on the inside lane heading north on street (A). Please refer to figure 1 and photo 1 for views of the incident area.

Because the street was such an extremely busy thoroughfare and because the job was scheduled to be a short-term stationary work zone, the contractor, in agreement with the city, decided to minimize any traffic flow impact and have only a short section of the parking lanes of both street (A) and street (B) closed from public use. This parking area primarily affected the nearby commercial business that was involved in the natural gas connection project. The work zone impacted only a very short section of parking lane that would not be available for parking along the corner of street (A) and street (B).

On the date of the incident, the three-person utility construction crew arrived at the work zone site (intersection of street A and street B) at about 7:30 AM. They parked their vehicles and equipment along the sides of streets A and B in areas designated for vehicle parking. The weather that morning was clear, warm and dry and was not considered a factor in the incident.

This utility project was planned and scheduled as a short-term work zone project. From the judgment of the utility company and the contractor, the natural gas line connection was a fairly basic job that the utility contractor had performed numerous times over their work history. They estimated that this job would take in the neighborhood of 3 to 6 hours to complete.

Traffic control devices were set up using cones and warning signs. The cones were used to define the work area consisting of the parking lanes of streets (A) and (B). Advance warning signs were set up along the sidewalk area of northbound street (A). They were set up in an attempt to be consistent with short-term work zone guidelines, determined for the location, traffic conditions, and the work that was being performed along street (A). The signs were set-up to warn the driving public of the work zone and the cones were used to restrict and prevent people from parking in the parking lanes of street (A) and (B). No restrictions were designated for the traffic lanes on streets (A) and (B).

The crew started work on the west side of street (A), along the sidewalk area to determine if they could find an existing utility pipe-run that could be used so that they would not have to dig up any section of street, and thus minimize the effect on traffic to the least possible level while making the natural gas line connection. If they found an existing line, then they could just run a new pipe through the existing line without having to dig up a section of the street to accomplish the new connection.

No existing line was found that could be used, so the crew had to run a new line and dig out a section of pavement. They cut out a section of asphalt that extended from the curb at the corner of streets (A) and (B). The work crew then excavated the cut-out area to expose the natural gas line main, running along street (B), and were in the process of making the natural gas connection at the time of the incident (see figure 1).

The utility contractor involved in this incident employed about 180 persons. They were a diverse contractor, and had been in business for over 14 years. The company was involved in a variety of utility construction related activities such as telecommunications, gas and oil utility systems, and were very experienced in working in both rural areas and the more heavily trafficked metropolitan roadways. The utility contractor employed a full-time safety and health manager and had an updated safety program. The fatal victim, and the injured worker had attended a number of documented safety and health training sessions including training that was specific to highway, road and street construction work zone hazards (i.e., certified flagger training).

On that clear, sunny, Monday morning in June, the lead worker/foreman was struck and fatally injured and a co-worker was seriously injured, when a pick-up truck ran through their work zone. Local city police, fire department and emergency personnel responded to the incident. The Washington State Patrol (WSP) Traffic Investigation Division and the Washington State Patrol Commercial Enforcement unit were also called into the investigation because a commercial vehicle was involved the incident (i.e., the utility contractor's dump truck). The regional WISHA office investigated the work-related fatality.

The pick-up truck that intruded into the work zone was a 1992 Chevrolet S-10. The police investigation of the incident concluded that the motorist was under the influence of intoxicants/drugs. The pick-up truck driver pleaded guilty to hit-and-run driving resulting in death, and hit-and-run causing injury in a work zone crash. The motorist was sentenced to five years in prison. He had two DUI citations prior to the incident.

INVESTIGATION

On June 10, 2002, a Monday morning, the work crew collected gear and equipment at their contractor facility in preparation for use on that day's project and then drove from their facility to the work area, which was located along a busy commercial street. They arrived at the work zone shortly around 7:30 AM. It was a dry, warm, sunny day.

The utility contractor crew working at the site consisted of three persons, a lead worker/foreman (the fatal victim), a utility worker/laborer (injured victim) and an equipment operator (who was not injured in the incident). The crew set up warning signs defining the work zone parameters for motorists traveling north on street (A) (figure 1 and photo 1). In interviews conducted with the two surviving employees, they stated that no-one at the site was acting as, or performing the duties of, a "traffic control supervisor." However, two of the workers had participated in flagger training and had viable flagger cards, certifying that they were able to perform the duties of a flagger in Washington State under Washington State Department of Transportation guidelines.

The equipment operator (under the direction of one of the certified flaggers) set up the signs and traffic control devices to reflect: the work that was being done (i.e., short duration); the anticipated length of time that would impact traffic in that area; and the specific placement of signs in relation to driveways, bus stops and other obstacles located in the area.

The first warning sign, which read "Road Construction Ahead," was approximately 317 – 320 feet from the work zone and was 116 feet south of the second warning sign. The second warning sign, which stated "Lane Closed Ahead," was 96 feet south of the third warning sign. The third warning sign read "Flagger Ahead," and was positioned about 105 feet from the traffic cones defining the work area. There was nobody performing flagging duty at the time of the incident. During the WISHA investigation there was some controversy as to the appropriate signage and the appropriate placement of the signage, warning of the work zone ahead.

Between 7:30 AM and 11:00 AM the utility construction work team had narrowed their scope of the work, which was to dig a section of street (A) in order to access the natural gas main and then run a line to a nearby commercial building for tie-in (see photo 1 and figure 1). They had explored other options that included trying to find an old abandoned pipeline so that they could feed a new line through the old line and minimize any impact to vehicle traffic on the street.

They placed traffic cones defining the work area, which consisted of the parking lanes located on the northeast corner of street (A) and street (B). The work zone did not restrict traffic for the either the northbound lanes of street (A) or the west bound along street (B). Traffic traveling northbound past the work zone on street (A) was moderate to heavy. There was very little traffic east or west bound past the work zone on street (B).

The excavator dug a narrow trench extending from the side walk curb into the parking area along street "A". The trench was about 2 ½ to 3 feet deep, about 8 to 10 feet long and about 4 feet wide. Their crew's dump truck was parked just north of the trench, straddling part of the parking lane and the sidewalk along street "A" (see photos and figure 1).

The lead worker/foreman (the fatal victim) and the utility worker/laborer (injured victim) on this project, were working in the trench finishing specific aspects of the natural gas tie-in. They were both climbing out of the trench at approximately 11:30 AM. The utility worker had just stepped out of the trench and the lead worker/foreman was just about to follow him out, when a small pick-up truck slammed through the work zone.

At about the same time that the utility workers were in the trench, the driver of a small red pick-up truck was traveling northbound on street (A). He was driving in the left lane, or "fast lane" of street (A) (the lane closest to the double center lines). According to the pick-up driver, he stated that he had noticed the construction workers situated along the right side of the road. He remembers seeing the work zone, seeing the dump truck, the backhoe and also seeing the fire station that was located just past the work zone on the right side of the road.

The driver said he briefly looked down to the interior of his pick-up for a second or two (in one statement he indicated that he was reaching for a music CD) and then realized that he was about to collide with the utility contractor's dump truck that was parked on the far right hand side of the road, partly on the sidewalk. He was not certain, but he thought he might have blacked out for a moment before the impact.

At about 11:30 AM on that Monday morning, the driver of this small red pick-up truck, had traveled in just a matter of seconds, from the left lane of the four lane road, crossed into the right lane of street (A), missing other vehicle traffic. The pick-up then traveled into the parking lane and into the coned off work zone, finally driving into and through the trench that the two utility workers were working in. The pick-up violently struck the lead worker/foreman (fatal victim) and the utility worker (injured victim) and then ran into the back of the parked dump truck before coming to a stop.

Reports indicated that the driver was traveling at approx. 40 mph and that there was no sign that the driver attempted to apply his breaks before impact. The injured utility worker, who had just gotten out of the trench, was knocked back several feet after the impact with the pick-up truck. The third worker witnessed the incident, but fortunately was not standing near the trench and was not injured in the incident.

Almost immediately after impact, it was reported that the driver of the pick-up truck got out of his truck, grabbed a back pack, and just briefly might have checked on the injured workers, then quickly started walking or running (depending on the witness) away from the scene.

A witness, who saw the pick-up truck driver leaving the scene, got the attention of the third utility worker who then chased after the driver. The driver was restrained and held

until local police officers arrived at the scene. Almost simultaneous with this tragic event, a local city fire department unit was just returning from a run, and witnessed the incident.

The fire station was located only a couple of hundred feet from the work zone. The fire engine was stopped on street (A) facing south (see figure 1) waiting on oncoming traffic in order to make a left turn in order to cross the north bound lanes and head into the fire station. They saw the red pick-up strike the supervisor who was in the trench and also saw the co-worker who was standing near the trench go flying in the air.

The fire department emergency team attended to the two injured workers. The injured co-worker was transported to a local hospital in serious condition with upper torso, head injuries and facial fractures. The supervisor, who was more seriously injured, was trapped under the pick-up truck. He was airlifted to an area medical trauma center where he underwent surgery for severe head and leg injuries. He died from his injuries at the trauma center about two hours later.

CAUSE OF DEATH

The medical examiner listed the cause of death as multiple rib fractures and visceral lacerations and contusions due to, or as a consequence of blunt force injury from being struck by a motor vehicle.

RECOMMENDATIONS AND DISCUSSION

Recommendation #1: Contractors and subcontractors should conduct site-specific hazard assessments and develop plans to control or eliminate the hazards.

Discussion:

Setting up work zones and performing jobs within work zones may seem like fairly routine and repetitive tasks, especially when the work is done by experienced persons who have performed this job many times in their work history. But every work situation that involves motor vehicle traffic, presents some degree of uniqueness and perhaps some different challenges to maintain a safe work zone for both the motorists and workers, at each work zone site. This is particularly true in a situation where motor vehicles travel within close proximity of workers in a roadway, street, or highway work zone.

Because work zones involve the recognized hazard of vehicles traveling at varying speeds past the work zone, it is imperative that not only from the perspective of the work zone in this incident report, but each and every work zone be looked at very closely to ensure the safety of the workers within the zone. The job and exposure may seem very familiar and appear cut and dried but it is not always the case. as demonstrated by this very serious incident that impacted so many lives.

While occupational fatality numbers have been decreasing nationally, per Bureau of Labor Statistics (BLS) data, work zone fatalities have been increasing over the years. Because of the serious nature of work zone hazards, the job-site coordinator, supervisor, lead person and/or foreman should conduct a hazard assessment of all potential work zone safety hazards. It is important that the individual be properly trained in conducting hazard evaluations and especially hazard evaluations specific to work zones.

All of the hazards of the work zone should be reviewed and evaluated prior to the start of each job. The work zone hazards should also continue to be reviewed while the job is in progress, and be further evaluated to ensure that the job can be accomplished as safely as possible. In this incident, because there were vehicles traveling at 30 – 40 mph, within a yard or two of the work zone, it would be easy for a vehicle to deviate out of their lane, or for someone to be distracted for just a fraction of a second, and to have a vehicle enter into the work zone and cause an injury or a fatality. A lot can happen in just a few seconds. The vehicle in this incident traveled across two lanes of traffic, and into the work zone during a slight moment of inattention by the driver.

The hazard assessment should define the work areas, the hazards of the work being performed, and potential emergency situations and hazard prevention methods related to the utility construction work zone. Conditions and the location of personnel can change very quickly within the work zone and not anticipating some changes can result in serious consequences.

Recommendation #2: Employers should use positive protective barriers to shield workers from intruding vehicles.

Discussion:

The work zone, in this incident, was set up to try to meet MUTCD guidelines for an undivided four-lane road with an intersecting secondary road, located in an urban setting. The work crew used generally standard traffic control devices and safety practices and precautions to manage the work zone. The work team had placed advanced warning signs and they had set up cones to delineate the work zone.

Cones and other delineating devices can be useful to define the proper traffic lanes from the work zone, but they provide little to no physical protection for workers from an intruding vehicle that might enter the work zone. With today's driving public, it is not unusual to find drivers who are impaired, who are inattentive, who are speeding, who drive aggressively and who pose a danger to not only themselves but to other drivers. They also present a serious hazard to workers situated in highway and road work zones. As demonstrated in this incident report, the current work zone control methods were ineffective in preventing the fatality and serious injury that occurred to the two utility workers in the work zone.

To prevent death and serious injury at highway, road and street work zones utility, maintenance and other highway work areas, employers/contractors should use positive protective barriers to shield workers from intruding vehicles. Approved barricades, such as the concrete "jersey-type" barricades provide positive protection by helping prevent vehicles from leaving designated traffic lanes, and striking workers within the work zones. Using "jersey-type" barriers requires a little more planning and set up time, and employers also need to have the right equipment available to place and remove the barriers, but they can be well worth the time, effort and cost, because of their life saving potential. There are other types of positive protective barriers available, such as water fill-able plastic/composite barriers and barrels that could be used as an alternative to the concrete barriers.

Recommendation #3: Conduct pre-construction safety meetings to discuss potential work zone hazards and appropriate control measures.

Discussion:

Employers should initiate and conduct safety meetings (i.e., tailgate/toolbox meetings) with each crew at each project site. The safety meeting should be specific and should be focused on the project and the activities for that day. This would be a good time to review a work zone safety checklist to help ensure that specific safety elements are not missed during the meeting. It is a good time to clarify safety requirements, identify new and existing hazards, and determine if the pre-plan safety precautions meet actual needs. It is also a time to plan, review and establish escape routes for work zones in the event a vehicle intrudes into their work space.

It should be emphasized, during the process of the safety meetings, that situations within work zones can change very quickly and the work team should be in tune to those changes and have the authority and the capability to make immediate changes and improvements to the safety controls that are in place to protect both the public and the worker within the work zone.

Recommendation # 4: Use safety hierarchy principles to reduce exposure by rerouting traffic, closing down a lane, or instituting a complete street closure.

Discussion:

The energy from an acute event can be controlled, 1) at the source, 2) during its path, or 3) at the receiver (worker).

The method most likely to completely control the energy is by reducing or eliminating the hazard at the source. Removing traffic from the street during a work zone activity by rerouting or closing a street effectively controls the energy (vehicle traffic) at the source for work zone intrusions.

Street (B), in this incident, might have been a candidate for closure. It was a fairly short street and had considerably less traffic than street (A) that it intersected. Closure of street (B) would have marginal impact on the businesses/residents of the area as there were other ways to access their property. There was also an alleyway that would allow vehicles to move in and out of the affected properties. The road closure would have been for only a short duration and it could possibly have been closed during “off –peak” hours only. There were several other road options as alternative roadways for persons to use instead of using street (B).

Closure of the road would have allowed for the use of most effective positive barrier protection of the work zone. These types of barriers include the use of construction vehicles positioned to protect the work zone. Opportunities for road closure should be

one of the top options considered when planning a work zone project. The road closure option has become a more accepted practice and is being used more and more in highway and road work to help increase the safety of workers and in many case help expedite work being done on or along the roadway.

Please note that even with road closure, workers on site are still exposed to hazards within the work zone from construction vehicles. Physical barriers and road markers along the vehicle path are also recommended if traffic closure or detour is not feasible. Controls at the worker (receiver) such as retro-reflective vests are recommended in all cases.

Recommendation #5: Situate vehicles with flashing lights to act as a barricade to protect workers and to warn motorists of the work zone.

Discussion:

When workers or the work zone is exposed to passing traffic, physical barriers provide the best protection if proper placement is possible, as described in recommendation #2.

In lieu of engineered positive protective barriers, on-site vehicles (construction vehicles, pick-up trucks, dump trucks, etc.) may be used and placed in the line between traffic and the work site to take the impact of any vehicle straying from the lane of travel. Care must be taken in mobile sites to assure that the vehicle(s) providing cover is in the line of travel between traffic and the work area.

This method is most effective when the work area is contained to a limited area and is not mobile. Work vehicles with impact attenuators are preferred for use as barriers and should be used for sites where vehicles are moving at highway speed. The impact momentum of the moving vehicle must be considered. A passenger vehicle moving at arterial speeds can move a large construction vehicle on direct impact.

Placement of vehicles as barriers should also consider the ricochet of the impacting vehicle and movement of the barrier vehicle to assure the work area location is protected. Flashing lights should be used on all barrier vehicles to warn motorists of both the stopped vehicle and the work zone. California has used police vehicles before the work zone to warn motorists. Flashing directional arrows are preferred to simple lights, as they provide more information for drivers.

Recommendation #6: Explore using new mobile work zone protective devices.

Discussion:

Workers in road and highway work zones continue to work in close proximity to motor vehicle traffic and are not only exposed to the risk of these traffic hazards, but the workers continue to be fatally or seriously injured by vehicles that intrude into their work zones.

To prevent the continued occurrence of these serious and traumatic events, employers engaged in roadway construction, maintenance, or utility operations should explore new methods, processes and technologies that are evolving in the highway construction, maintenance and utility industries. Additionally, consider technology that can be borrowed from other industries and applied to work zones to make them safer places to work.

An example of new technology is a device that has been developed by Caltrans (California Department of Transportation) called the “Balsi Beam.” It is a transportable mobile work zone device that provides positive barrier protection to workers. The “Balsi Beam” is a modified semi-trailer that consists of high-strength steel-box section and beams that are capable of being extended to provide additional protection. The system is transported by a semi-tractor to the work location.

The beam was developed by Caltrans after one of their workers was struck and lost a leg to an impaired driver whose car entered a Caltrans work zone. Caltrans stated that the incident underscored the need for additional protection for their workers. They subsequently went out and developed a device that would fill the void of current available technology.

The “Balsi Beam” might not be functional for all situations but it should be considered as a device to explore along with other new evolving technology to have in your arsenal of injury and fatality prevention and protective safety equipment for use in a variety of work zones. Caltrans has had the “Balsi Beam” on tour in several states, including Washington and Oregon, so that others could see a demonstration and evaluate the application as another tool for use as a safety protective system for work zones. WA FACE recommends that smaller versions of the “Balsi Beam” be explored, as they could be applied in a variety of work zone situations.

ACKNOWLEDGEMENTS

In conducting this work zone fatality investigation, the Washington State FACE investigation team requested that the contents of this report be reviewed by key representatives from the labor and business communities involved and Washington State and Federal worker safety agencies, prior to its publication.

Though we are not able to acknowledge specific individuals for their invaluable input into this document, we would like to recognize the following for their help and support to the FACE process:

- The Employer involved in the incident
- WISHA enforcement
- WISHA Policy & Technical Services staff
- Federal FACE Program Management (NIOSH)
- Safety & Health Assessment & Research for Prevention (SHARP)
- Washington State Attorney Generals Office
- Seattle City Light
- Northwest Laborer Employee Training Center

APPENDIX

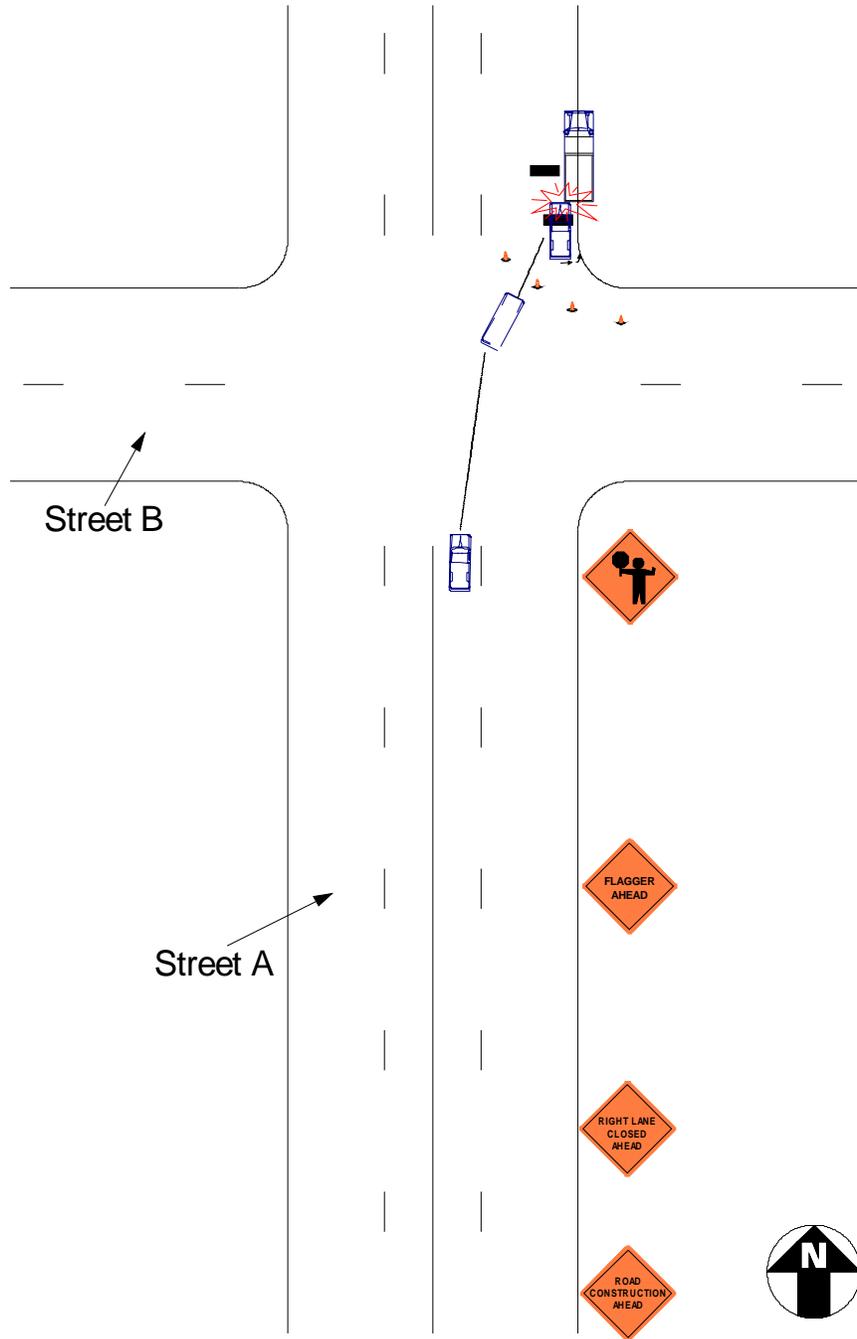


Figure 1. Diagram of the incident area, streets and layout of the work zone.



Photo 1: Shows the work zone incident site after completion of the job, and streets (A) and (B) in relation to the incident site (looking east).

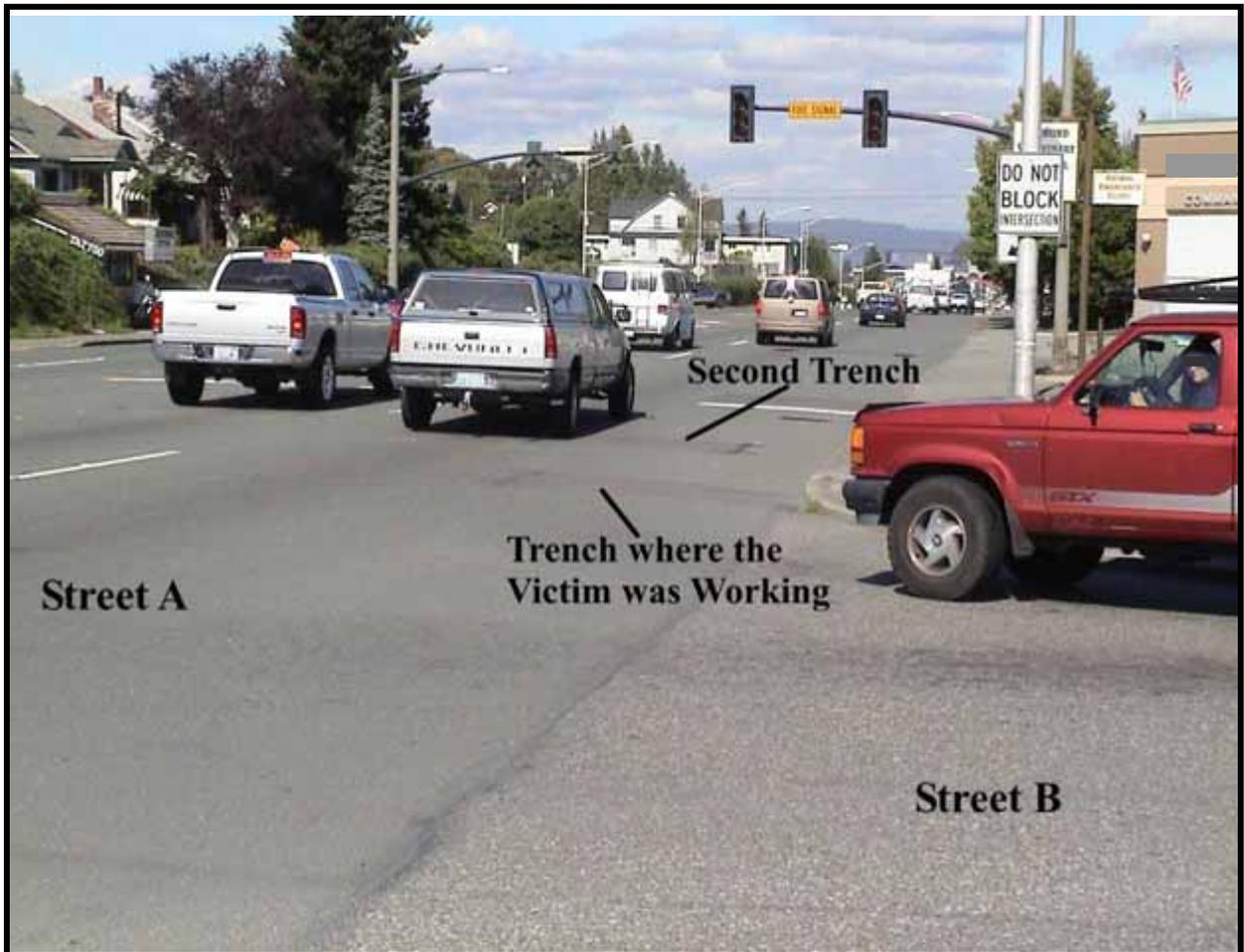


Photo 2: Shows the work zone incident site after project completion, and the intersection of streets (A) and (B) Near the work zone. The photo also shows the close proximity to traffic. The area in front of the trench and the area where the red pick-up truck is located were coned off to traffic (looking north).



Photo 3: Shows the work zone incident site and the second trench. The trench that the workers were in is under the red pick-up truck (looking south along street A).



Photo 4: Shows the incident site, with the pick-up truck and the utility trench located along street (A) (looking west).

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