

Trials and Tribulations of Shooting a Water Well

by Wes Bender

In the spring of 1987 I got a call from a well driller who had some serious problems. He had set off explosives in a well in an attempt to increase water flow. After the blast several homeowners in the area contacted him with claims of damage. A rather convoluted chain of events ensued. A review of the claims, the driller's attempts at defending against those claims and the resulting court decisions can make for interesting reading. There are also a few lessons to be learned from this case regarding blast damage claims in general. These will be discussed at the end of the article.

The well was blasted late in 1985, approximately 15 months prior to my receiving his call. A total of 130 pounds of dynamite, made up into a charge 60 feet in length had been lowered into the well so that the top of the charge was at a depth of 191 feet. The well was located approximately 275 feet from the owner's residence and it is important to note that the blast caused no damage to the residence, which had a full basement.

Within a month after the shot, a claim was made by Complainant A that the blast caused cracks in the drywall in the ceiling and walls of his living room. The repair estimate was ~\$1000. The home was located 2400 feet from the well that was blasted. Six months later a claim was made by Complainant B that their well had been experiencing reduced flow and blamed it on underground changes caused by the blasting. It was located 2000 feet from the blast. The claim was for over \$6000 to deepen their well. A few months later the insurer of another homeowner (Complainant C) requested compensation of \$3000+ for cracks in their client's concrete garage floor, located 1750 feet from the blast.

After failing to obtain satisfaction from the well driller, near the end of 1986 Complainant A filed in Small Claims Court in an attempt get his claim of \$1000 paid. Additional damage claims would be forthcoming, but at this point it would be best to examine some of the evidence offered in this first small claims case that involved Complainant A.

In court, the plaintiff testified that when the blast was detonated, his residence shook for one to two minutes and a crack in his ceiling appeared before his very eyes. He described the blast as being similar to an earthquake. He submitted a report from an engineering firm that indicated, *"The vertical displacement and subsequent settling caused by a seismic shock, as would occur from dynamiting a well in close proximity, is a typical impact type loading that could cause the damage."*

The plaintiff also introduced into evidence an article from Water Well Journal that, pertaining to shooting a well says, "*..the process is dangerous and carries serious liability questions.*" It goes on to say, "*Be sure to use this technique only in areas that are sparsely populated. The effect on the well may also be felt in adjacent wells or basements. Your insurance company may be called on to repair a lot of cracked basement walls.*"

The plaintiff brought in as an expert witness a competing well driller. This driller testified that, "*Small shots consisting of two or three pounds of explosive are used. Larger shots are never used because they are not necessary or advised. Fly rock, damage to neighbor's property, safety of the blaster and liability to structures are only a few of the reasons.*"

Complainant C appeared on behalf of the plaintiff (Complainant A) and testified that he also heard the blast and it seemed to go on for over a minute.

The judge asked both the plaintiff and the defendant to comment on the rock and geologic formation below ground in an effort to determine if this might have a bearing on whether the blast in question could cause damage to a structure. The plaintiff called upon his well driller witness to address the geology. He stated that he had dynamited two wells and, "*In both cases clay and sand made up the first ninety feet of drilling. It was at this level that the formation changed. Loose boulders existed in greater quantities in the (1st name deleted) well. The (2nd name deleted) well appeared to be larger fractured rock, perhaps even considered solid rock. It is this rock or boulder strata that transmits the shock wave. Since there is a layer of soft material on the surface, the building closest to the actual blast were spared damage.*"

In response to the judge's request for geologic information, the defendant presented a surface geologic map and stated that it proved that the ground conditions are all alike throughout the area.

In an attempt to show how vibration decays with distance, the defendant introduced a document depicting how sound waves decay in air and also how they react to changes in atmospheric conditions such as temperature gradients. (The judge, in his decision, determined this to be irrelevant to the case.) The defendant also introduced literature pertaining to detonation times that should have refuted the plaintiff's claim that the blast effects lasted for one to two minutes.

When asked by the court why he used the quantity of explosive he did, the defendant indicated that he wanted to obtain water as quickly as possible.

In January 1987 the Small Claims Court issued its decision, finding in favor of Complainant A and awarded him approximately \$1000 for repairs and court costs. In its decision, the court found that the blast could indeed be termed a large one. The court did not agree with the defendant's primary argument that, "*...the blasting was carried out according to industry standards and that Plaintiff's home was at such a great distance from the blasting site that it could not have possibly damaged it.*" The court also placed substantial weight on the plaintiff expert's definition of the underlying geology and accepted it, while downplaying the value of the defendant's simple geologic map. The judge determined that the plaintiff could recover damages under either or both of two legal theories. These were (1) Strict or Absolute Liability, and (2) Negligence. The first because he blasted in a thickly populated place and that carried with it such a high risk of danger that it is justifiable to place liability for the loss on the person engaging in it. The second because of the defendant's response as to why he used so much explosive and also that (1) the defendant did not conduct any analysis of the rock or geology, (2) did not consult with any qualified blasting expert prior to the blasting and (3) did not notify any of the surrounding property owners of the fact that the blasting would take place. The court felt that these would have been prudent steps to take, especially considering the "large quantities of explosives".

Shortly after the above Small Claims Court decision, complainant C contacted the driller seeking compensation for the \$1000 deductible on their insurance (garage floor cracking) and added \$500 for cracks found in their sidewalk that they claim also resulted from his blast. Another claim came from Complainant D who submitted a claim for over \$1500 to have their well drilled deeper because of reduced flow. Their well was located 2700 feet from the blast. When the driller refused to pay their claims of damage, Complainants C and D filed in Small Claims Court to recover the amounts requested.

As you can see, this problem was beginning to snowball out of control. The well driller's attempts to handle his own defense had not gone well. As would be apparent to anyone who has reasonable experience in investigating claims of blasting damage, at the distances involved and the size of the blast, the damages simply could not have been the result of the blast. One cannot expect a Small Claims Court Judge, however, to be an expert in the technical issues involved. He has to decide the case on the evidence submitted in court. The definition of a large blast is in the eye of the beholder. In the judge's opinion, this was a large blast, probably reinforced by the testimony of the plaintiff's "expert". The judge took the time to go out and verify the locations of the well and where the damage had occurred and probably came to the only conclusion he could, considering the testimony presented.

At this point the well driller obtained legal counsel and filed to appeal the Small Claims Court's decision.

In California, appeals to small claims decisions are handled in Superior Court. Upon the driller's filing to appeal, the Small Claims Court suggested that Complainants C and D continue their pending cases until the appeal was decided.

It was also at this juncture that the well driller contacted a noted seismologist for possible assistance and also contacted this writer to assist in his appeal. The well driller was not a wealthy individual, nor was his well drilling business very large. He apparently did not have insurance to cover the costs that were being incurred. When he received the seismologist's estimated cost to visit the site and properly address the issues, he instead asked if that expert could possibly just review an information package that he would send and make a determination as to whether or not the damage claimed was legitimate. This is not something that an expert witness is usually willing to do. If his testimony is to stand up in court, it is important that he visit the site and investigate all of the evidence available before rendering an opinion. To his credit, the seismologist, after explaining the drawbacks of doing so without his visiting the site, agreed to offer an opinion in the form of a Report of Investigations (RI) based upon, and limited to, the information in the package that he had been sent.

As previously stated, the well driller and his attorney had also decided to use my services. First, I had to go through all of the well driller's file of documents and his testimony and try to clarify and/or correct any errors he had made. He had minor discrepancies in the actual weight of explosives, the detonation velocities, distances, geology, etc. The details have to be accurate or one's findings can be suspect. I visited the site of the occurrence, investigated all of the issues involved and wrote up a report of my findings. Refuting the competing well driller's testimony regarding the limited amount of explosive used in shooting a well was relatively easy. There have been numerous instances where several hundreds of pounds of explosive have been used for the purpose. It was equally easy to refute his theory that the vibration had bypassed the nearest structures, traveled along the rock at depth and then had caused damage at distant residences. This may have come from a diagram of seismic refraction theory that he found, but he was confusing the ray of the first wave to arrive (the ray on the diagram) with a ray with maximum ground motion (his interpretation).

Previously, I had consulted and done vibration monitoring on a hydroelectric project 1-1/2 miles from the area where these damages were claimed. The geology was similar and I had documentation from the previous work to show what the vibration decay rates would have been. I calculated that the vibration intensity at the Complainant's residence was between 0.03 and 0.05 inches per second (IPS) of peak particle velocity.

This would have been on the order of one fifteenth to one twenty-fifth of the Bureau of Mines suggested limit of 0.75 IPS for plaster and approximately one twenty-fifth to one fortieth of the lowest level that could possibly cause damage to gypsum wallboard construction. My conclusion was that it was just not physically possible to cause the damage claimed by detonating 130 pounds of well confined explosive at a distance of 2400 feet.

With regard to the duration of shaking the plaintiff says he witnessed, I pointed out that the entire column of explosive would have detonated in 3 milliseconds. The ground waves and surface waves would have spread somewhat over the 2400 foot distance, but the duration of shaking would not have exceeded two seconds at that point. Further, there was no continuing source of energy that could cause the ground to continue to oscillate as if it were a bowl of Jello.

The plaintiff's attorney did object to the submission of the seismologist's RI without the presence of the author because he could not be cross-examined. Anticipating that objection, I had previously reviewed the RI and then included references to portions of it in my report. The court allowed the RI to be entered into evidence as part of my report.

The appeal trial was conducted in a single day in Superior Court. I testified as to my findings and to my concurrence with the seismologist's findings and was cross-examined by the plaintiff's attorney. A structural engineer also testified on behalf of the well driller. Afterward, we all thought that the lower court's decision would probably be overturned on this appeal.

However, this was not to be. When the Superior Court Judge rendered his decision, he found in favor of the plaintiff. Although he placed weight on the testimony of the expert witnesses (and actually complimented same), he indicated that he placed more weight on the plaintiff's testimony that the cracks were not there before the blast, but were there afterward.

A very unfortunate circumstance in this case was that there was an individual who knew that the damage in question existed prior to the blast. As a contractor, he had been asked for an estimate to repair the damage. This was before the well was blasted. When the well driller managed to track down this important potential witness, he admitted that he had indeed seen the damage before the blast, but refused to testify in the case because, "*they are my friends.*"

As far as I know, Complainant B never filed a claim in court. It turned out that the summer before the blast they had mentioned to the owner of the blasted well that their well was also experiencing a reduction in flow. That would have come out in any court proceeding and probably had an impact on their decision not to file.

The defendant also had a very poor relationship with Complainant C, who had testified on behalf of Complainant A in Small Claims Court and who also had a case pending. Several years earlier, the defendant had inadvertently drilled a well on a corner of Complainant C's property. It was supposed to have been drilled on a neighboring property. The ensuing hassles in sorting it all out left the two with a very strained relationship.

After thinking back on that day in Superior Court, although I cannot be sure, I suspect that it's possible that the judge may have been somewhat annoyed that this piddling small claims matter had been appealed to his court. If handled properly it should have been resolved at the lower level, or possibly without even going to court at all. When you analyze the monetary awards in his decision, it becomes apparent that he basically penalized both parties in the matter. He awarded the plaintiff \$992, the lower of two estimates for repairs to his ceiling and walls, but then only awarded him \$15 in attorney's fees.

Following this, the remaining two small claim cases were defended successfully.

There are a number of lessons that can be derived from this experience. Some of the more important ones are:

1. Protect your business and yourself by recording the blast effects of all of your blasts, no matter how large or how small. Record at the closest structure or item of concern. Also record at other structures nearby. It would also be of benefit if you can record at a structure at some greater distance. Although they can be derived from prediction charts, this would assist in determining the actual vibration and airblast decay rates.
2. When you are faced with claims of damage, obtain expert assistance as soon as possible. Damage claims need to be investigated promptly, before the evidence is covered up by repairs. In this case, it could have been very enlightening to carefully examine the cracks in question as soon as the claim was made. How old were they? Did they possibly contain paint?
3. If you undertake to design or detonate a large or complex blast, it would be advisable to obtain expert assistance. This is especially true for those with marginal experience, but might also apply to those experienced blasters who are attempting a blast that approaches the limits of their experience or ability.
4. Adequately document all of your blasts and everything you do in their preparation. Make sure that the information is accurate. In a court situation, if any information in your records is found to be in error, the rest of it will probably be called into question.