UNDERGROUND REPORT

January 2004 to December 2004

PREPARED BY:

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WILLOW CREEK RECLAMATION COMMITTEE

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Background

In December of 2000 the Willow Creek Reclamation Committee (WCRC) began underground investigations of the Amethyst Vein Complex, accessed through the Commodore 5 Level Tunnel, in the hopes of determining the source and hopefully a solution for the metal laden discharge at the Nelson Tunnel portal. The Amethyst Vein Complex encompasses the Nelson/Wooster/Humphries Tunnel, Amethyst Mine, Happy Thought Mine, Park Regent Mine, Commodore Mine and the Last Chance Mine. All of these mines are located along the Amethyst vein system, which is a north-south trending fault that is heavily mineralized. The Nelson/Wooster/Humphries Tunnel, which will be referred to as the Nelson Tunnel for convenience, appears to be the single largest discharge point to the surface for all water entering the Amethyst Vein Complex. The Nelson Tunnel drains into Willow Creek approximately ½ mile above the confluence with East Willow Creek (Figure 1). As shown by ongoing water quality characterizations of Willow Creek by the WCRC the Nelson Tunnel drainage, averaging 250 gpm, remains the single largest heavy metals contributor to the watershed.

The Nelson Tunnel and Commodore 5 Tunnel were driven by competing mining interests to gain access to the rich silver deposits along the Amethyst Vein Complex. Eventually the Nelson Tunnel became the drainage tunnel for all subsurface water entering the mine workings. The Nelson Tunnel is located approximately 40 feet lower in elevation than the Commodore 5 tunnel at their respective entrances. Approximately 3 miles north of the entrances, the two mine entries converge near the Park Regent shaft. There are several intermediate connections including the Daylight Corner Winze, Javelin Shaft (winze), Berkshire Shaft (winze), Commodore Shaft (winze), No Name Winze, Last Chance Shaft, Amethyst Shaft, Del Monte Raise, Berkshire Shaft (winze), Happy Thought Shaft and Hospital Decline.

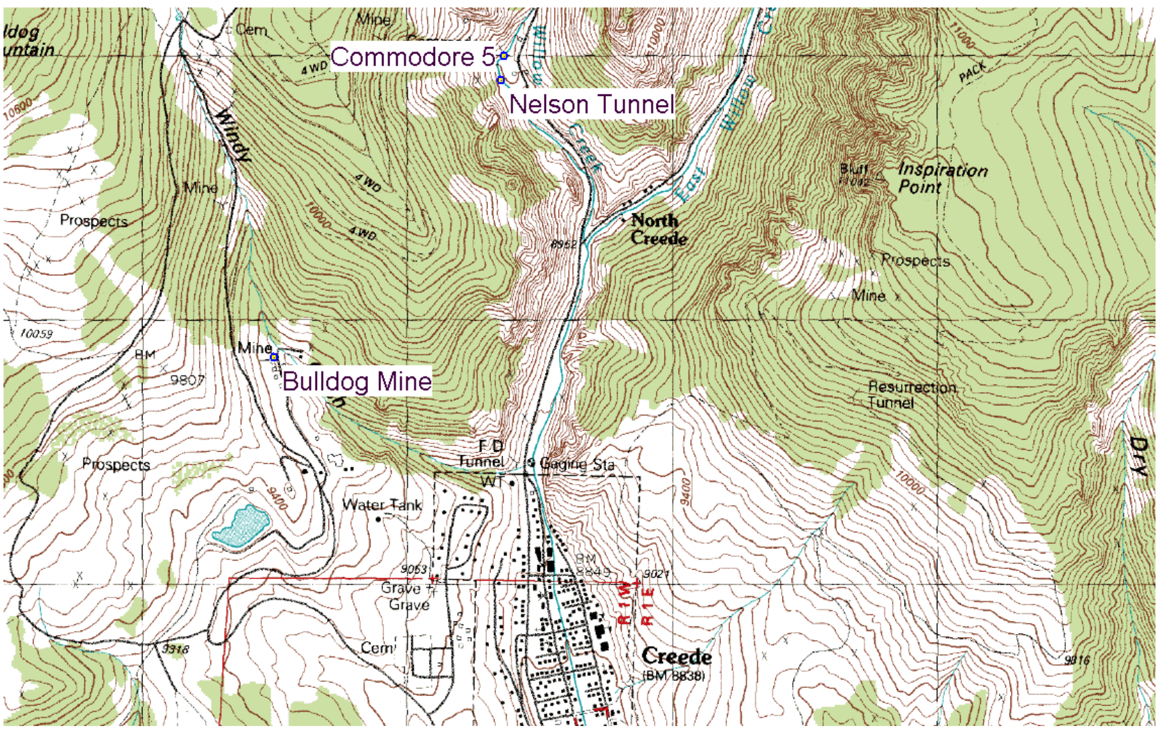


Figure 1. Commodore/Nelson Location Map

Because of the large cost to treat the mine drainage, the WCRC decided to investigate whether the source of the mine drainage can be intercepted before it enters the mine workings and/or whether the metals concentrations can be reduced through source controls.

Table 1. Dissolved metals in Nelson Tunnel drainage (6/6/03).

Site	pH	Cond. (uS/cm)	AL_D (ug/L)	CD_D (ug/L)	CU_D (ug/L)	FE_D (ug/L)	MN_D (ug/L)	ZN_D (ug/L)
Nelson Adit	4.19	1098	160.8	35.7	26.5	148	12110	63740

Rehabilitation and Safety Work

Due to the desire of the WCRC to safely investigate possible source control for the Nelson Portal drainage an extensive rehabilitation project was conducted, beginning with underground evaluations in 2001 and completion of construction in late 2003. During 2004 maintenance and monitoring of underground conditions were conducted as needed. Various locations throughout the mine workings required minor maintenance to maintain safe access. Ken Wyley and Jerry Wintz performed all maintenance work for the WCRC on an hourly basis under the direction of Jeff Graves (CDMG) and Jim Herron (CDMG).

With increasing interest in potential dewatering locations, the area around the Del Monte Raise was thoroughly investigated. This investigation resulted in the discovery of undetonated blasting caps and possible nitroglycerine (nitro) type explosives in the dead end drift adjacent to the Del Monte Raise. The discovery of these explosives prompted discussion and subsequent approval by the WCRC for a final comprehensive survey to find all remaining explosive hazards within the commonly frequented portions of the mine. This survey was conducted by Jeff Graves, Jim Herron, and Al Amundson (CDMG) and resulted in the discovery of undetonated nitro explosives in the blacksmith shop and at 19 raise, in addition to that which was previously discovered at Del Monte raise (Figure 4). Once again it was decided that detonating all blasting caps and nitro type explosives in place provided the safest outcome.

Based on previous experience and success, Jay Parker with Pitkin County was hired by the WCRC to conduct the detonation of all explosive hazards within the mine. During the first week of June, Jay Parker, under the direction of Al Amundson and Jeff Graves, successfully completed the detonation of known explosive hazards within the mine (Figures 2 & 3). All of Jay Parker's time was graciously donated by Pitkin County.

Periodic monitoring and maintenance of rehabilitated portions of the mine will be required throughout the life of the project to ensure safe working conditions. Additionally, the potential for future discovery of explosive hazards within unexplored areas of the mine remains very high based on current experience.

Figure 2. Explosives Discovered @ Del Monte Raise

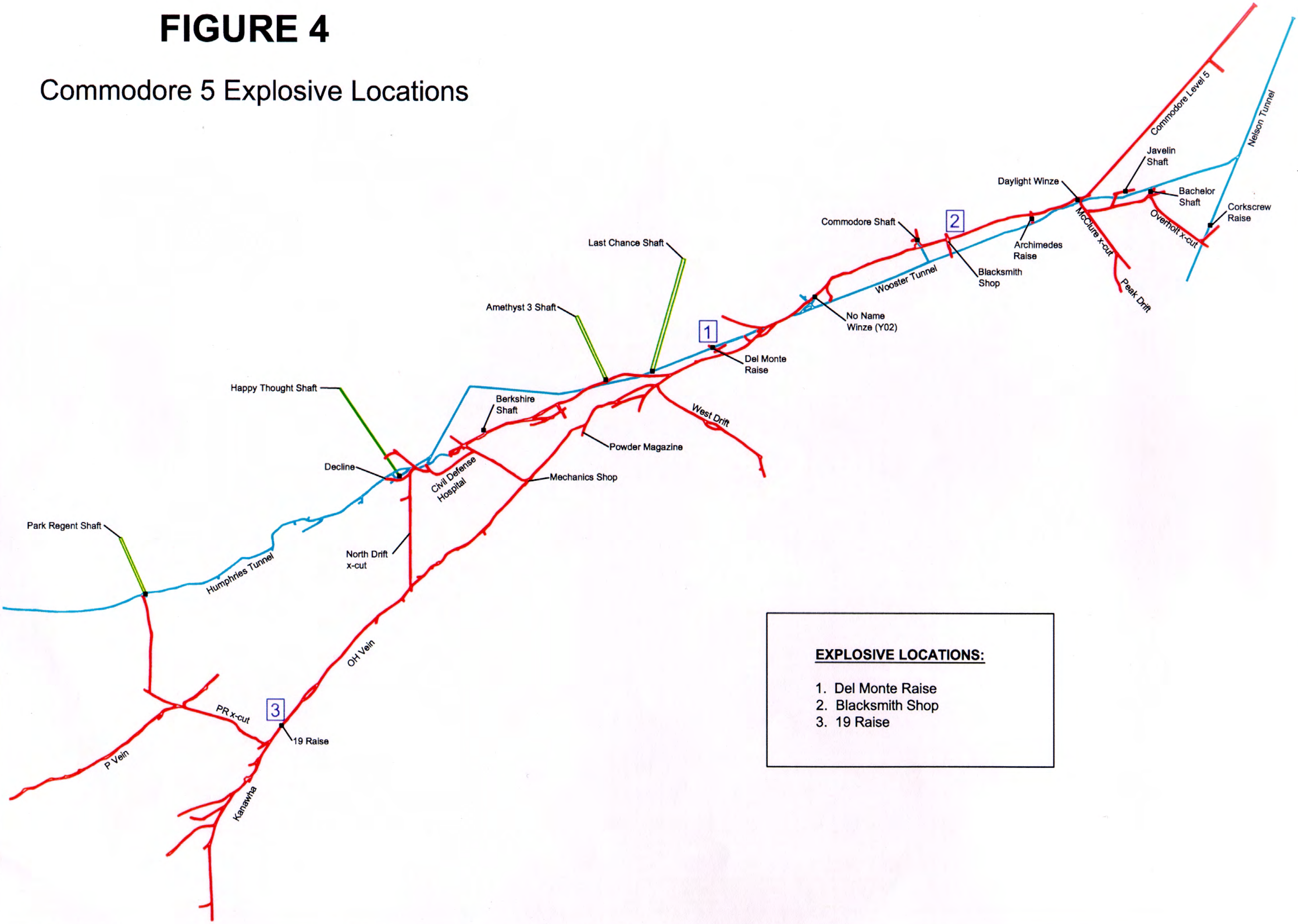
Figure 3. Preparing to Detonate Explosives In-Place

Water Sampling and Water Levels

The WCRC analyzed no underground water samples in 2004 due to limited funding, however CDMG personnel took water level measurements on a number of occasions at various locations within the mine. All water elevation data is compiled in Table 1, which is located in Appendix A. The water level data continues to support the theory that at least two major mine pools exist within the mine, a lower pool and an upper pool (shown in Figure 5.) The lower mine pool is formed by a major blockage near the Bachelor Shaft. The upper pool is formed by a substantial blockage near Noname Winze and Del Monte Raise. The variations in water elevation on the same day at different locations for each pool may result from measuring error or small collapses forming a number of smaller pools. When the water level data is plotted versus time for each of the major mine pools a general water level trend is evident over the past two years (Figures 6 & 7).

FIGURE 4

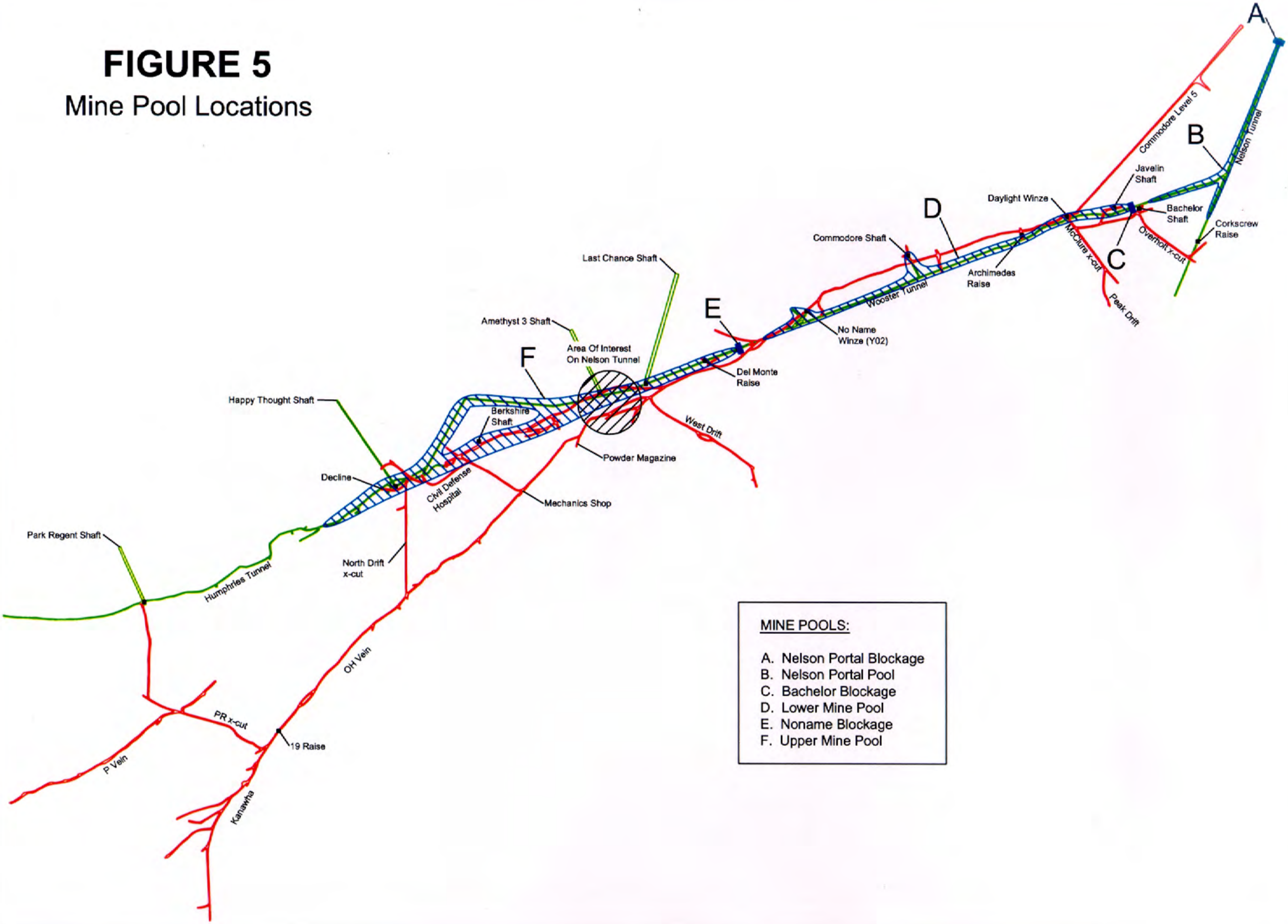
Commodore 5 Explosive Locations



EXPLOSIVE LOCATIONS:

1. Del Monte Raise
2. Blacksmith Shop
3. 19 Raise

FIGURE 5
Mine Pool Locations



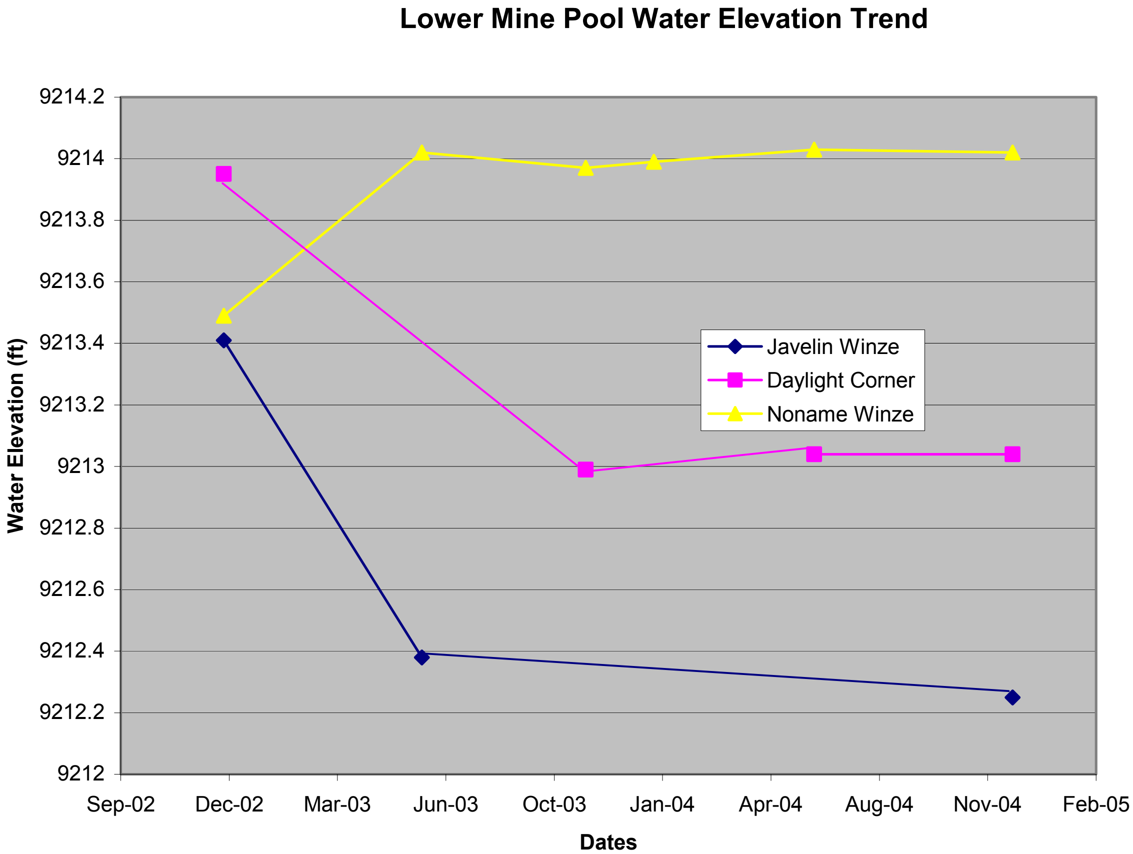


Figure 6. Lower Mine Pool

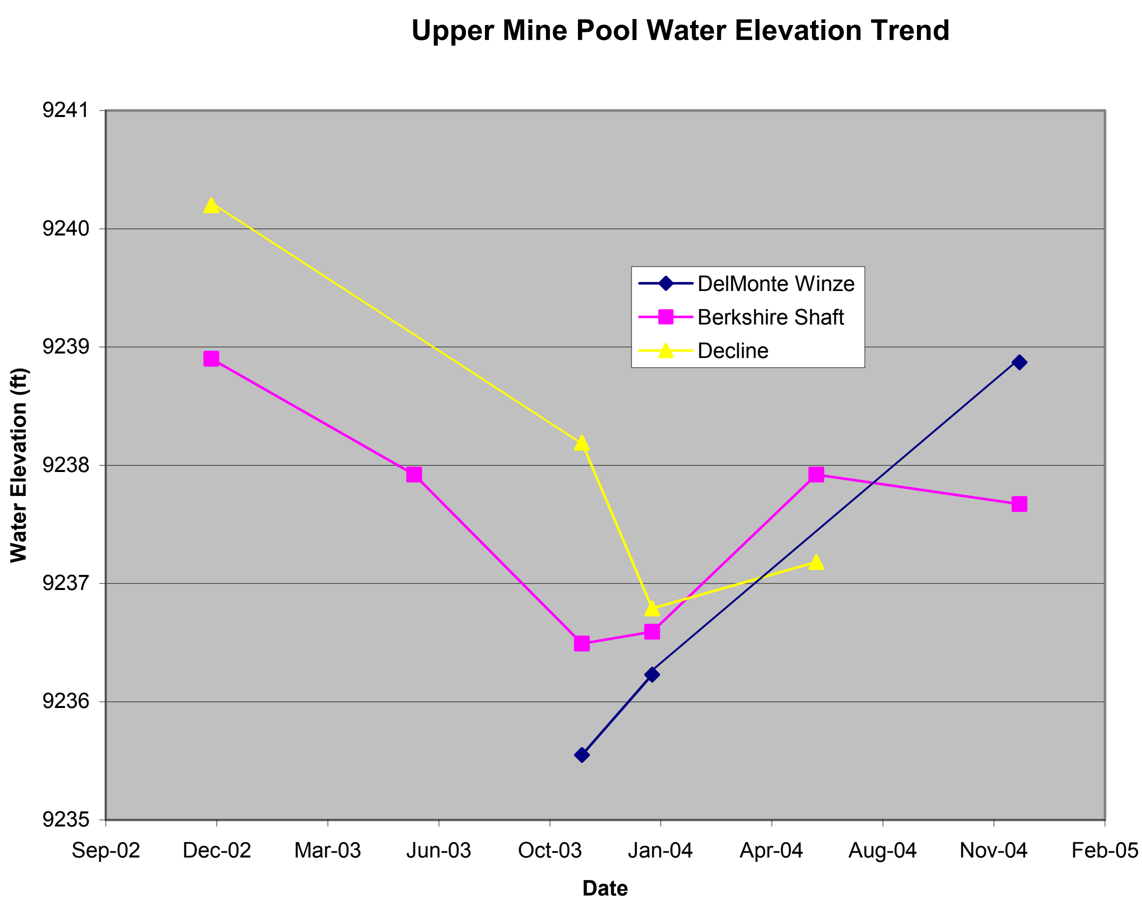


Figure 7. Upper Mine Pool

Dewatering Proposal

With completion of the Commodore 5 Level rehabilitation in 2003, increased emphasis was placed on gaining access to flooded portions of the Nelson Tunnel. In early 2004 CDMG (Jeff Graves and Jim Herron) was tasked by the WCRC to develop and present to the committee a comprehensive dewatering plan for the Nelson Tunnel and cost estimate for implementation. The flooded portion of the Nelson Tunnel desired for access is the section of mine where the Amethyst, P, and OH veins appear to converge, and historic records indicate "big" water was encountered during mining (Figures 5 & 10).

At the April 2004 WCRC meeting CDMG presented "Nelson Tunnel Dewatering Options" (Attached in Appendix B). CDMG discussed various pumping locations, options for treatment of pumped water, infrastructure required for pumping, and conclusions. The recommendation of CDMG to the WCRC was that dewatering from the Del Monte Raise using hydraulic powered pumps and subsequent treatment by lime and settlement in the West Drift met all the criteria for dewatering the Nelson Tunnel. It was also suggested that a pilot-pump test could be performed at a moderate cost to further evaluate the dewatering proposal. The pilot would involve completion of the necessary infrastructure to pump, treat, and transport water to the West Drift. After completion of the infrastructure, the West Drift would be filled to capacity (approximately 400,000 gallons). During this test, a number of variables associated with complete dewatering of the Nelson Tunnel could be better evaluated. Based on CDMG's recommendations the WCRC decided to proceed with the Nelson Tunnel dewatering pilot test.

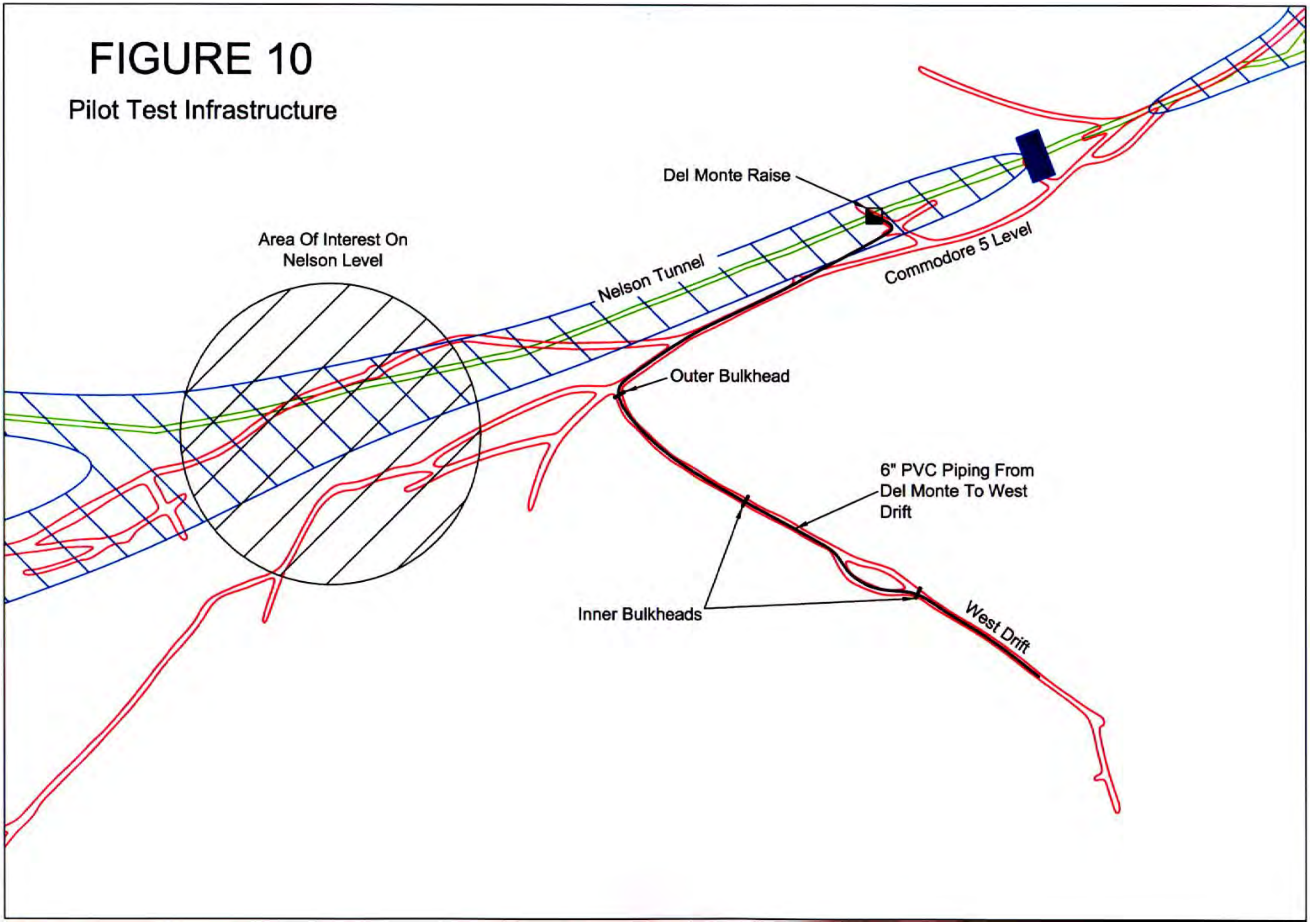
Construction of the bulkheads in the West Drift began in the spring of 2004 (Figures 8, 9 & 10). Ken Wyley and Jerry Wintz were contracted by the WCRC to construct the bulkheads, obtain the infrastructure and install it under the guidance of CDMG.

Figure 8. Partially Completed Bulkhead

Figure 9. Bulkhead and Piping

FIGURE 10

Pilot Test Infrastructure



As construction of the bulkheads proceeded, the pipe necessary to transport water from the Del Monte Raise to the West Drift was purchased. Installation of the pipe was begun from the inner bulkhead towards the Del Monte. By the end of the summer the inner bulkheads were nearing completion, and most of the pipe had been laid out. Construction on the pilot dewatering project was halted at the end of the summer due to a lack of funds.

During the fall of 2004 Jeff Graves presented to the WCRC the progress of the pilot dewatering project and estimated the time and funding necessary to complete the project. The time estimated for completion was 1 to 2 months at a cost of $28,300. Based on the estimated cost, the WCRC decided to pursue 319 funding to complete the pilot dewatering project.

Summary and Conclusions

During 2004 the WCRC initiated the process of pursuing the possibility of source controls on the Nelson Tunnel drainage with the Nelson Dewatering Pilot Project. If the pilot is successful, and the necessary funding for full dewatering is found then the WCRC will be able to implement full dewatering in hopes of solving the Nelson water source. The source of water creating the Nelson drainage and its entry point into the mine remain the missing link in understanding and hopefully implementing a successful source control.

In 2005 work on the dewatering project will hopefully be funded and implemented. Additionally, the mine workings should be monitored for any maintenance and safety needs. Water levels should continue to be taken periodically to further establish long-term water trends within the mine. Water quality sampling within the mine should not be a priority unless new discreet inflows are discovered. Finally, additional work at the Commodore Mine should address the Nelson Portal flume and portal collapse, to ensure accurate flow measurements and alleviate portal blowout concerns. This coming year could prove to be an exciting time of discovery and progress within the Commodore Mine Complex.

APPENDIX A

Water Level Data - Commodore Mine

Location	Spad Elevation (current May'04)	Approximate Distance From Nelson Portal	Water Elevation (11/6/02 & 12/5/02)	Water Elevations (6/6/03)	Water Elevations (11/4/03)	Water Elevations (1/6/04)	Water Elevations (6/2/04)	Water Elevations (12/2/04)
Nelson Portal	9175	0	9175		9175	9175	9175	
Bachelor	9207.17	2000	9201.4	9199.86	9200.17	9200.21		n/a
Javelin Winze	9241.55	2200	9213.41	9212.38				9212.25
Daylight Corner	9241.54	2560	9213.95		9212.99		9213.04	9213.04
Commodore Shaft	9242.88	3960	9211.49					
Noname Winze	9218.32	4680	9213.49	9214.02	9213.97	9213.99	9214.03	9214.02
DelMonte Winze	9243.63	5177			9235.55	9236.23		9238.87
Berkshire Shaft	9250.34	7300	9238.9	9237.92	9236.49	9236.59	9237.92	9237.67
Decline	9242.01	8100	9240.2		9238.19	9236.79	9237.18	
19 Winze	9260.64	9340	9240.79		dry	dry	dry	
Upwelling? Past Noname	9245.57	5240	9245.37					

APPENDIX B

NELSON TUNNEL DEWATERING OPTIONS

The purpose of this report is to present the various options for dewatering and characterizing the inflows to the Nelson Tunnel. The Nelson tunnel is actually broken into the Nelson, Humphries, and Wooster tunnels, but for the purposes of this report, it will be referred to as the Nelson.

The Nelson Tunnel roughly parallels the Commodore 5 level. At their portals, the Nelson Tunnel is approximately 40 feet below the Commodore 5. The two join approximately three miles into the mountain near the Park Regent Shaft. There are several connections between the Commodore 5 and the Nelson Tunnel between the portals and their junction near the Park Regent. From front to back, these include: 1) Bachelor Shaft; 2) Javelin Shaft; 3) Daylight Winze; 4) Commodore Shaft; 5) Y02 or No Name Winze; 6) Del Monte Winze; 7) Berkshire Shaft; and 8) Hospital Decline.

There are three known major collapses that flood portions of the Nelson Tunnel. The outermost collapse is at the portal and probably continues for about 200 feet, based upon anecdotal information. This collapse backs up water to near the Bachelor Shaft. The second collapse is located at the Bachelor Shaft, where sloughage falling down a stope has piled up above the back of the tunnel. This collapse backs up water beyond the No Name Winze. The third collapse is located approximately 1,100 feet above the connection with No Name Winze. This collapse totally inundates the Nelson Tunnel workings beyond the Hospital Decline.

The Nelson Tunnel flows approximately 300 gallons per minute (gpm) of metals laden water. There is no known passive treatment system that will remove sufficient metals to support healthy aquatic life. An active treatment system would be the only known option to remove the metals from the mine drainage. An active treatment system for a flow this large would likely cost several million dollars to construct and have an operating cost of hundreds of thousands of dollars per year. Because of the large cost to treat the mine drainage, the WCRC decided to investigate whether the source of the mine drainage can be intercepted before it enters the mine workings and/or whether the metals concentrations can be reduced through source controls.

Flow measurements have shown that the majority of the water inflows occur upstream of the uppermost collapse. Because these workings are totally flooded, the workings must be dewatered before any characterization can be completed.

There are two major considerations that must be resolved before this project can continue. The first is whether the Willow Creek Reclamation Committee (WCRC) obtains a dewatering permit from the Colorado Department of Public Health & Environment (CDPH&E) or gets a release from permit requirements through a Removal Action Memorandum (RAM). If a permit is obtained, the cost for review and approval by CDPH&E would be over $2,300. Also, based upon a meeting with the Water Quality Control Division, it is not certain what the discharge limits for a dewatering permit may be. At the best, the discharge limits would be set to not increase the metal loading from the Nelson Tunnel, but may be table value standards. Meeting table value standards may be problematic. CDPH&E indicated that the standards would likely be set for no net increase in metal loading. If discharge standards are exceeded, WCRD could receive a Notice of Violation and a fine could be levied. A RAM would provide more protection to the WCRD and no fee would be required. However, based upon experience with the RAM for waste pile reclamation, it may take several months to get a RAM approved.

The second major consideration is the potential for the Nelson Tunnel to have a blowout. The possibility of a blowout has always existed, and to-date, the WCRC has not done any work in the Nelson that could increase the chance of a blowout. Dewatering of the upper portions of the Nelson could cause consolidation of the blockages. Once the pumps are shut off, water will likely back up to a greater depth than the current level. The increased head could lead to a collapse.

There are indications that the blockage located above No Name Winze has blown out or at least partially blown out in the past. In fact, there was some freshly washed out material as recently as January of this year. A blowout of one of the upper collapse features could cause a chain reaction collapse downstream. The sudden release of water from the Nelson Portal would probably overwhelm the capacity of the flume and may result in overtopping of the Commodore 5 waste rock pile. If the Commodore 5 waste rock pile is overtopped, considerable debris and water could cause major damage in Creede.

The condition of the portal of the Nelson Tunnel is unknown. Mine mapping indicates that there may be a large collapse area near the portal that could be large enough to withstand a collapse of the upper blockages. DMG recommends that the condition of the portal area be investigated before any dewatering is done. A minimum of three drill holes should be drilled into the Nelson Tunnel to determine the condition of the workings and determine the amount of hydraulic head at several points.

If an investigation is not done, a temporary solution may be to construct a blowout control near the Bachelor Shaft. Constructing a concrete wall at the base of the collapse can stabilize the collapse above the Bachelor. The lower portion of the wall would have to allow for the current flow to pass through unimpeded. The wall would simply reinforce the existing collapse against failure in the event of a collapse further upstream.

Pumping Locations

There are three connections between the upper collapse and the junction of the Commodore 5 and Nelson Tunnel. The Del Monte Winze is the preferred location because it is nearest to the collapse. It is the only location where it is possible to pump the Nelson Tunnel near the Amethyst Shaft dry. Based upon documented observations during mining of the Nelson Tunnel, it appears that the most likely inflow point would be the vicinity of the Amethyst Shaft.

The Berkshire shaft is another possibility, but the mine workings downstream of the shaft would remain covered by water, making identification of the inflows difficult. In addition, the water would have to be pumped further to the portal or an intermediate discharge point. At this time, pumping from the Berkshire Shaft doesn’t appear to meet the desired outcome.

Mine Drainage Treatment

In Order to have no adverse effect on water quality the mine drainage will have to be treated. It is estimated that ten million gallons of mine Drainage will have to be pumped to dry up the mine workings above the Del Monte winze. The proposed pumping rate is 500 gpm. Based upon the measured flow at Noname Winze, the metal load will have to be reduced by a minimum of one-half. Bench scale tests will have to be run in order to determine the optimal pH to remove half the metals, but it is estimated to be between 9.0 and 9.5. At the beginning of pumping, more than 50% of the metals may have to removed, because there will continue to be some discharge through the blockage until the water level falls below the top of the blockage. At the beginning of pumping, the pH may have to be raised to near 10, or some type of treatment will have to be done to the mine drainage that continues to flow below the blockage.

In order to remove the heavy metals, settling time will have to be provided. The standard is to settle for 12 to 24 hours. Two options were considered: settling outside and settling inside the mine. If the mine drainage is pumped outside, a settling pond 120 feet square, and six feet deep will have to be constructed to allow for a minimum of 12 hours settling time. The pond will have to be lined with PVC or HDPE. The total cost for pond construction is estimated to be $12,000. Additional cost will be incurred for sludge removal following treatment. There is no adequately sized space on the mine dump for a pond to be constructed.

The preferred alternative is to construct a settling pond inside the West Drift. Treating in the West Drift has the advantages of: 1) Cheaper construction costs; and 2) no sludge removal costs. The sludge from the treatment can be left following the dewatering activities. By constructing three bulkheads, a settling time of over 12 hours can be attained. Three bulkheads are necessary because of the slope of the mine workings. The two interior bulkheads do not have to be completely watertight, but the exterior bulkhead must be as water tight as possible. The mine drainage must be pumped to the innermost bulkhead. A neutralizing agent must be added to the mine drainage to remove metals. It would be preferable to add the neutralizing agent into the pipe conveying the mine drainage through the innermost bulkhead. This would result in better mixing than separately injecting the neutralizing agent into the mine drainage.

There are several neutralizing agents that could be used. These include liquid sodium hydroxide, bulk caustic soda beads and hydrated lime. Sodium hydroxide is the simplest neutralizing agent to use. Sodium hydroxide could be pumped into the settling pond or fed by gravity. Approximately 13 tons of sodium hydroxide would be required to treat ten million gallons of mine drainage. The drawback of using sodium hydroxide is that it has to be hauled into the mine in barrels that could leak during handling. Sodium hydroxide is extremely caustic and the fumes can cause severe lung damage if inhaled.

Caustic soda and hydrated lime would have to be injected using a slaking plant. A slaking plant will be more costly than a simple pump system. A slaking system will require water, a mixing tank, a mixer and a pumping system. The existing steel tank at the Amethyst/OH vein junction probably can be modified for use with the slaking plant. The tank has a capacity of approximately 500 gallons. Less caustic soda would be required than hydrated lime, but is more costly than hydrated lime. Approximately 15 tons of caustic soda or 23 tons of hydrated lime would be required to treat 10 million gallons of mine drainage. Past experience has shown that the sludge characteristics of caustic soda and sodium hydroxide are less desirable than the sludge produced when hydrated lime is used. In general, the sodium base neutralizing agents produce a less-dense sludge than the calcium based neutralizing agents.

Because of the potential danger of utilizing sodium hydroxide underground, caustic soda or hydrated lime should be used. The total chemical cost for caustic soda would be $9,600 and the cost for hydrated lime would be $5,980. On just the basis of cost, it would seem that hydrated lime should be used. However, there are some higher costs involved in mixing and injecting lime. Lime is much less soluble than caustic soda. Significantly more caustic soda can be dissolved in a mix tank than lime. If lime is used, the injection rate will have to be greater than when using caustic soda. In other words, the mix tank will have to be filled more frequently when using lime than when using caustic soda. This could be an important consideration, particularly if the pumping system is run 24 hours a day. If one of the existing tanks can be used as a mix tank, caustic soda would at the most have to be replenished once each day. It is conceivable that lime would have to be replenished 3 or more times per day. Bench scale testing needs to be completed to determine the overall costs of using caustic soda or hydrated lime.

<u>Pumping and Plumbing</u>

Dewatering the Nelson Tunnel will involve difficult cost and logistical decisions regarding the pumping and plumbing. The first and probably easiest variable to establish is the required pumping rate. Currently, it is known that approximately 250 gpm of water are leaving the Nelson Tunnel pool above Y02 Raise (Noname Winze). It can be safely assumed that 250 gpm is therefore entering and sustaining that mine pool. It will be necessary to pump water from the mine pool at a rate greater than the inflow, assuming that outflow through the collapse will eventually become negligible. Due to the high cost and logistics associated with long term pumping, a pumping rate of at least double the inflow should be used to expedite dewatering. The following table, Table 1, illustrates the volumetric estimate and the time necessary to pump that volume at 500 gpm for the Nelson mine pool.

Drift Width (ft)	Mine Pool Length (ft)	Mine Pool Depth (ft)	Volume in Storage (mil. gals.)	Dewatering Time (days)
10	4122	22	6.9	19.2

The estimated dewatering time is based on some assumptions and is subject to a number of unknown variables. One assumption made is that outflow through the collapse is zero. Initially, outflow will be 250 gpm, but will eventually become minimal as the mine pool is drawn down. If a pumping rate of 500 gpm is used, then half of that pumping rate (250 gpm) will be required to account for that lack of outflow. The other big assumption is that inflow rate will remain constant. Inflow rate will most likely increase as the mine pool is drawn down. The increase in inflow will be dependant upon the amount of water stored in the surrounding vein/fracture system and the ability of water to move within that system. Historic accounts of driving the Nelson Tunnel suggest that the vein/fracture system has stored water in the past and released that water when the discharge point became low enough. One to Two months will probably be required for total dewatering of the Nelson mine pool above Y02.

Many pump and pipe combinations are capable of achieving the desired discharge rate for dewatering the mine pool, but only a few options appear cost effective. If the Del Monte raise is used as the pumping location and the West Drift is used as a settlement pond then some of the piping system variables become known. The total static head for the system is approximately 50 ft. and the distance from the Del Monte raise to the back of the West Drift is 1720 ft. The total dynamic head is dependent upon the discharge rate, pipe size and type, and joints. The following table illustrates the total system head (dynamic + static) at various pipe sizes and discharge rates.

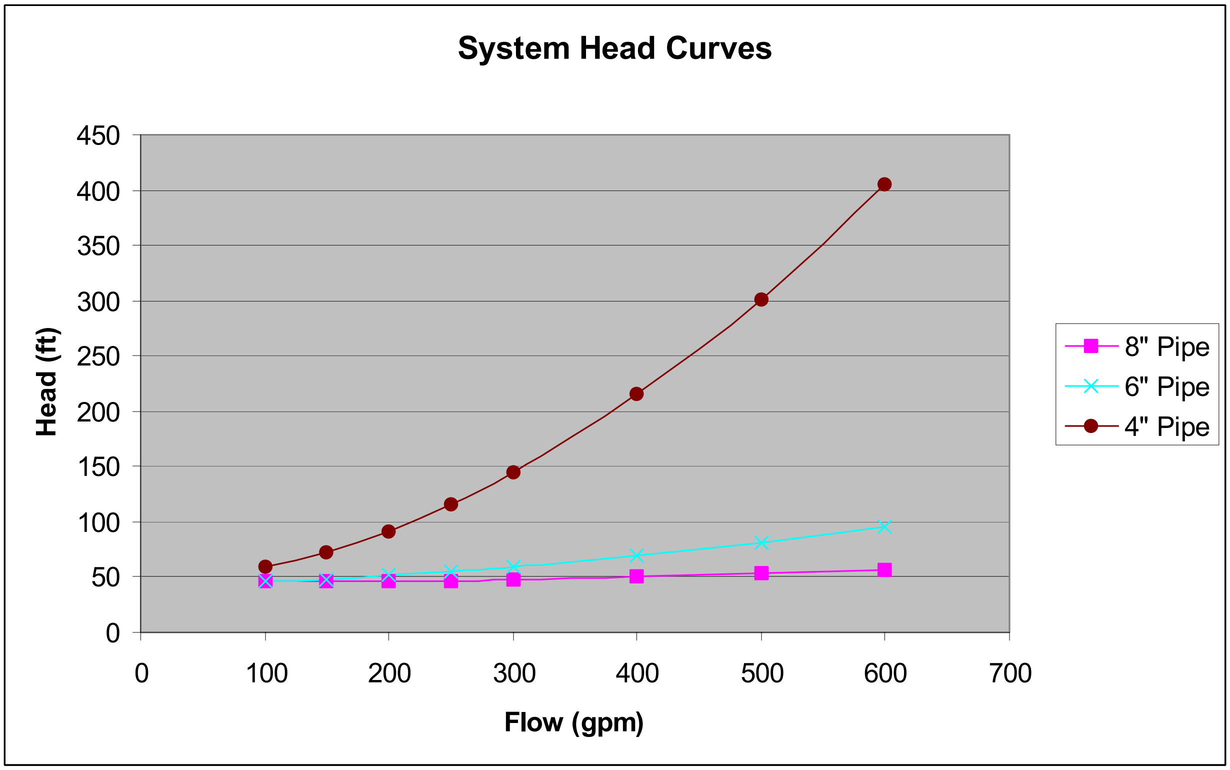


Table 2. System Head Curves (*Frictional losses based on used PVC)

As shown in Table 2, pipe with a diameter of 6" gives a good balance between size and frictional losses. The type of piping used will be heavily dependant upon availability and cost. At a minimum, the piping selected should be able to withstand water pressure of 40 psi and have low frictional loss characteristics. It will also be necessary to install piping from the settlement bulkheads to the outside of the mine. Approximately 6000 feet of piping will be required. The piping should be sized to move at least 500 gpm. Some siphon effect can be factored in if the discharge point is at the creek level.

Sizing the pump is relatively easy once the variables of discharge rate and total system head are decided. Based on a discharge rate of 500 gpm, and 6" schedule 40 PVC pipe, one 12 hp pump or two 7.5 hp pumps would be required. It is recommended that two pumps be utilized or at least be available in order to increase the systems redundancy. With a minimum pumping rate of 250 gallons per minute for each pump, no progress would be lost if one of the pumps malfunctions, or requires maintenance. Additionally, two pumps sized at over half the desired flow rate would be capable of increasing the originally desired total discharge rate. The actual capability of a specific pump will be dependant on the efficiency of that pump. Pump performance curves should be compared to the system head curve in order to ensure that the desired pump will be capable of the desired output and head at or near the best efficiency point.

Deciding on a pump type provides for numerous options in terms of the pump's driving force. Three pump driving forces are available: electric, hydraulic, and air. Electrically powered centrifugal pumps are highly energy efficient when running and easy to operate. Additionally, they are more readily available and often cheaper (new). The drawbacks for electric pumps are the possibility of burning up a motor, large startup amperage, electrical shock and pump weight. Hydraulically powered centrifugal pumps have good energy efficiency, are mechanically simple, are lighter and can run dry. The big detractors are potential cost and availability. Air powered diaphragm pumps have similar advantages and disadvantages to hydraulic centrifugal pumps. If air powered pumps are used it would be more efficient to use a belt drive compressor than an electric powered compressor.

The type of pumping method selected will also dictate the type of peripherals that can be used. If air powered pumps are selected, air powered tools can be used. Air powered tools are geared towards mine usage and are readily available. Both hydraulic and electric tools could be used with their respective pumping methods, but not as easily. If air powered tools are desired and hydraulic or electric pumping is selected, then it would be easiest to run a small generator and compressor combination specifically for those tools. Regardless of the driving force selected for the pump, exhausting the combustion products associated with power generation will be crucial.

Generator

The generator requirement will depend upon the pumping method chosen. Electric motors require as much as 6.3 times electric capacity to start the motor as is required to maintain the motor. Two 7.5 horsepower electric pumps would require up to a 60 kV generator to start them. Using electric power to run a compressor could require an even larger generator. If hydraulic pumps are used, the slaking plant could be run hydraulically, but it would be simpler to use an electrically powered pump and mixer. A small generator could be used for that operation.

The underground location of the generator would also affect the size required. The preferred location for exhausting the engine fumes would be at 4 Station. However, there would be some electrical loss through the 2000 feet of electric wire leading to the Del Monte. The most efficient area for set-up would be at the Del Monte. The bulkhead in the Del Monte Raise needs to be investigated to determine whether sufficient airflow can be attained through the raise. It has been reported that the raise was bulkheaded because there was considerable air loss through the raise. Air curtains or an air door above the West Drift may greatly increase the airflow. If this is a suitable location, it is recommended that the exhaust be piped up the raise as far as possible.

Conclusion

Dewatering the Nelson Tunnel will provide an incredible opportunity to possibly employ some type of source control capable of reducing contaminant levels in the Nelson Tunnel discharge. To successfully dewater the mine pool it will require making numerous choices, some difficult, based on cost, engineering feasibility, safety, time and personal preference.