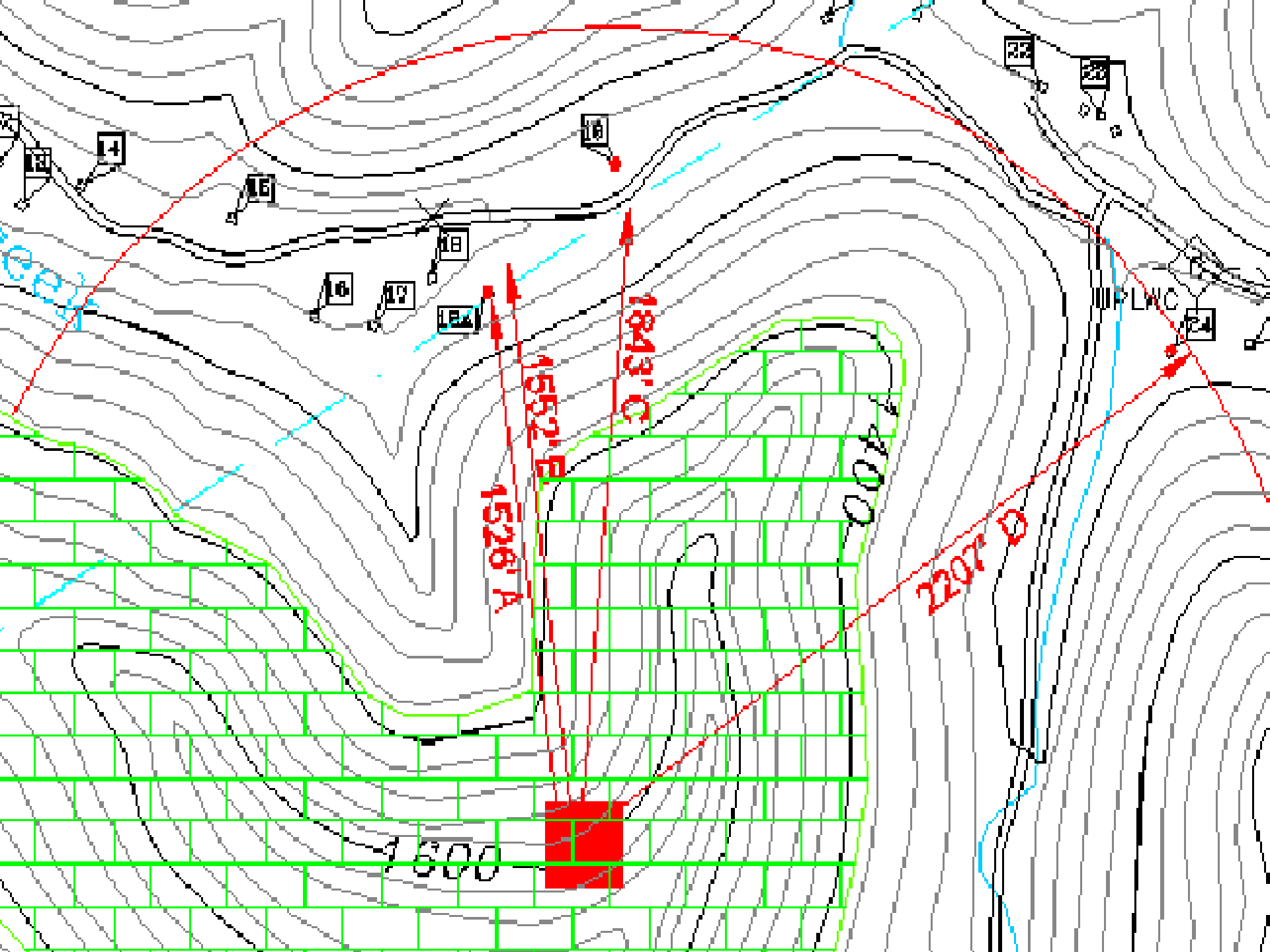
Flyrock Incidents at West Virginia Surface Coal Mines

Office of Explosives and Blasting (OEB)

Case 1- Production Blast

Flyrock was cast off the permit, more than1/2 distance to nearest structure, and outside the blast area.

- Spray pattern of Flyrock landed near three separate residences
- Blaster unaware until next day



1526' A
1552' B
1843' C
2207' D
1600
400
PLWC

Flyrock A – 430 lbs. / 24" x 18" x 12" / Cast 1,526'

Flyrock A – impact 45' from residence

Flyrock B – 290 lbs. / 24" x 12" x 12" / Cast 1,552'

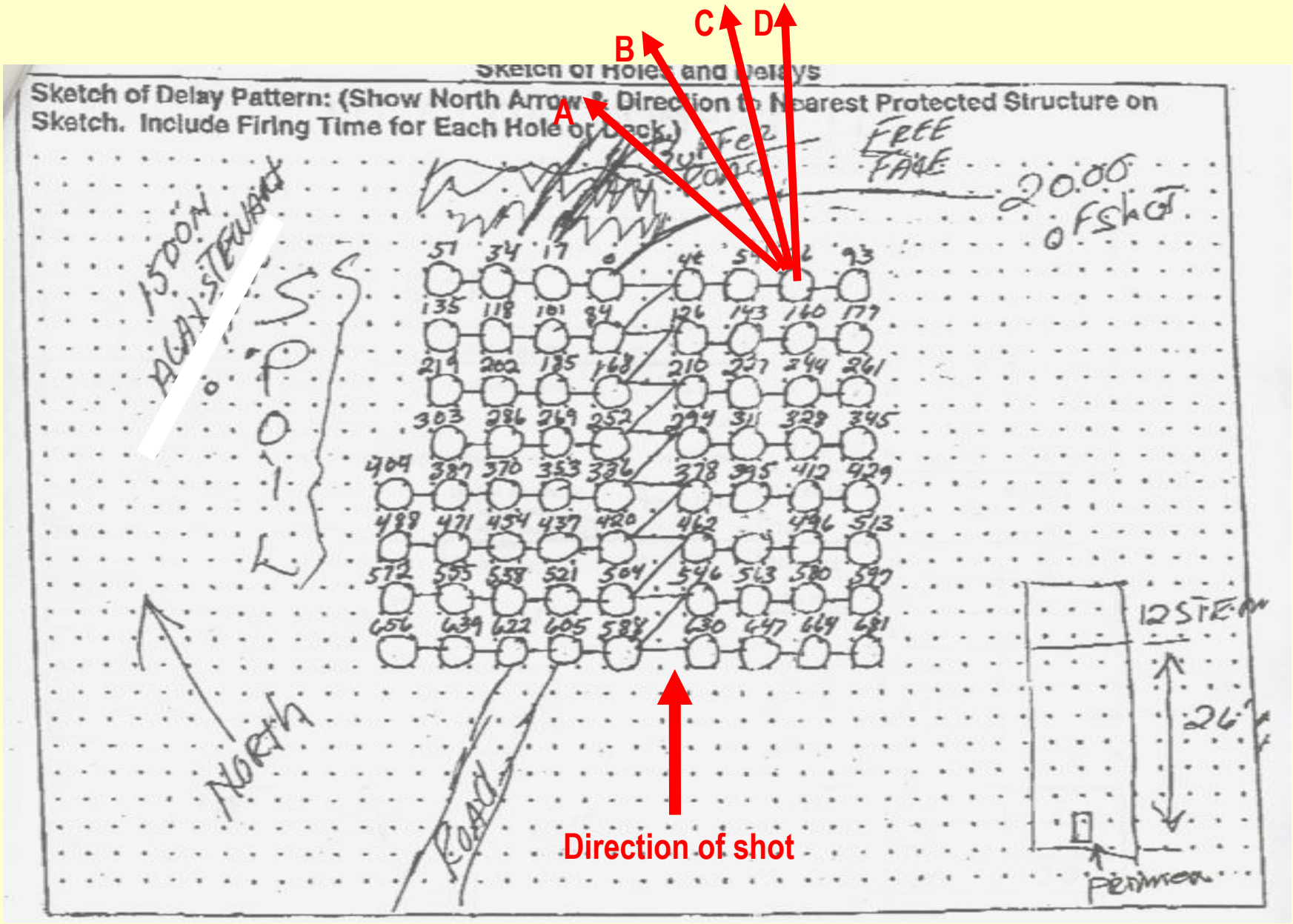
Flyrock B – damage to 12" diameter tree / 145' from residence

Flyrock C – 20 lbs. / 6" x 6" x 6" / Cast 1,843'

Flyrock C – impact area – children playing across road

Flyrock D – 250 lbs. / 24" x 12" x 12" / Cast 2,207'

Flyrock D – impact area near cars and 40' from residence

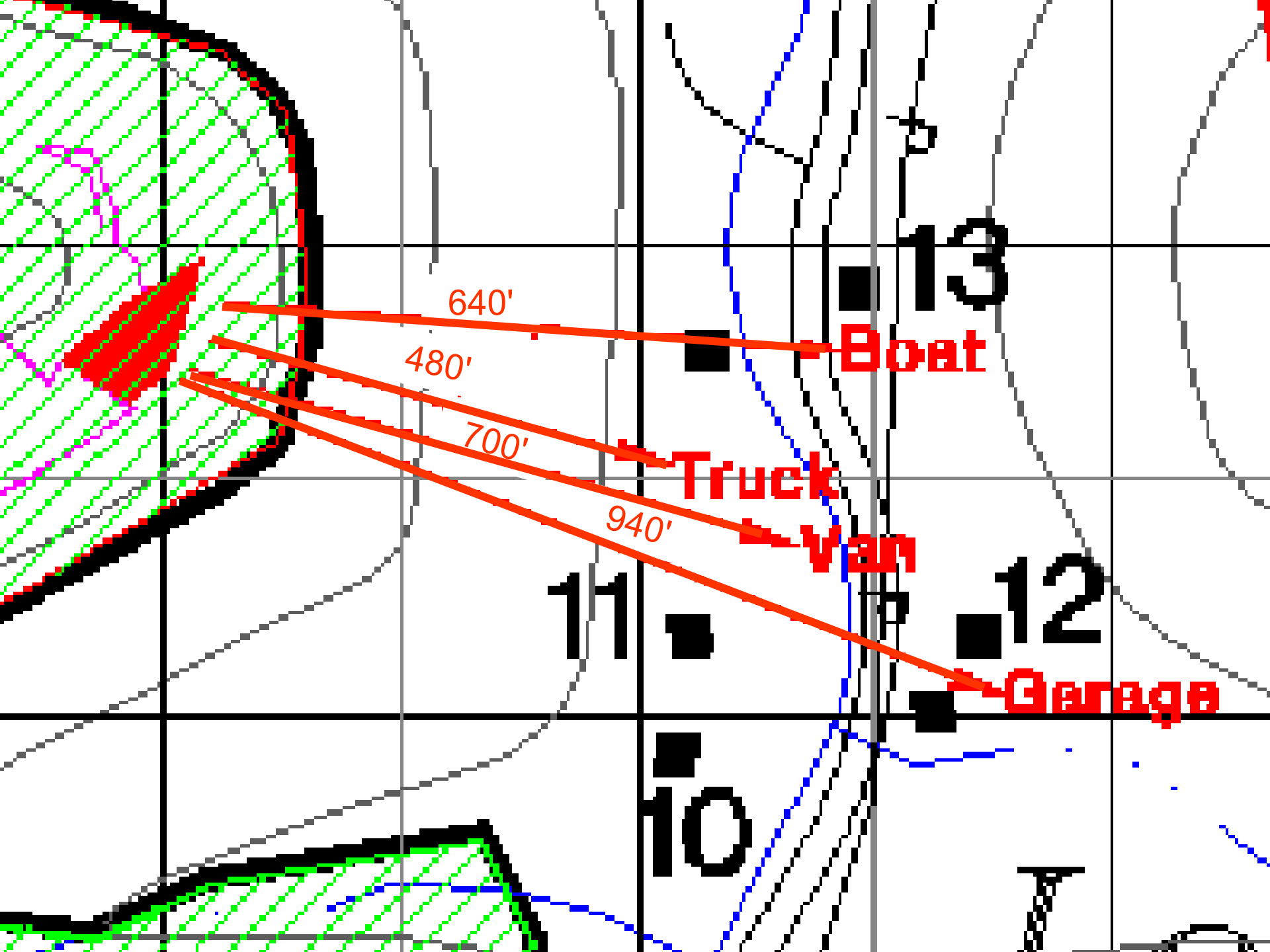


Scanned portion of blast log sketch showing relationship to flyrock

Case 2 - Production Blast

Flyrock was cast off the permit, more than1/2 distance to nearest structure, and outside the blast area.

- Vehicles, structures, and boat impacted
- Landed in four different yards
- Vehicle entering driveway hit


640'
480'
700'
940'
Boat
Truck
Van
Garage
13
12
11
10

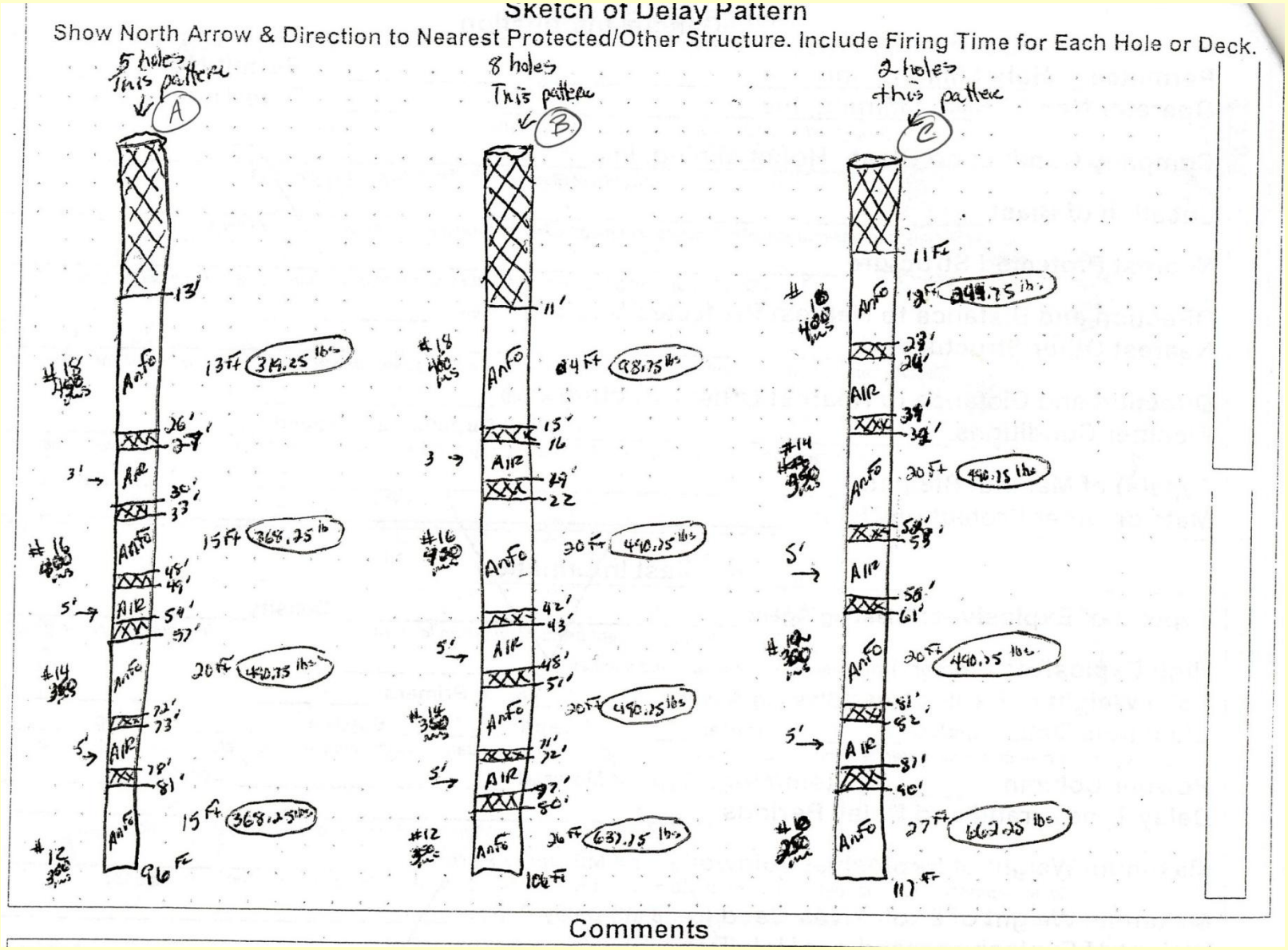
Blast site location relative to residence

Impact area

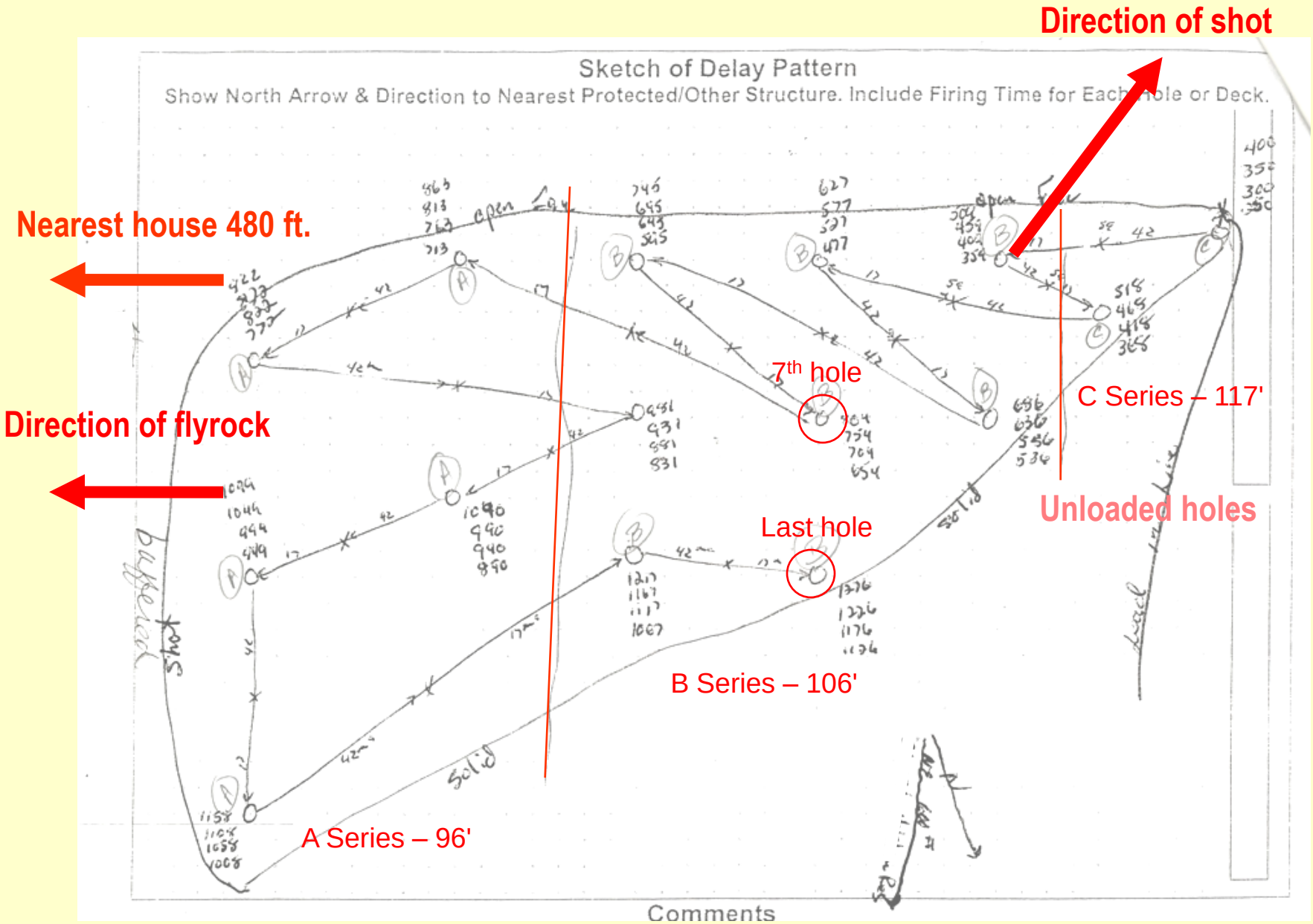
View from driver's side door

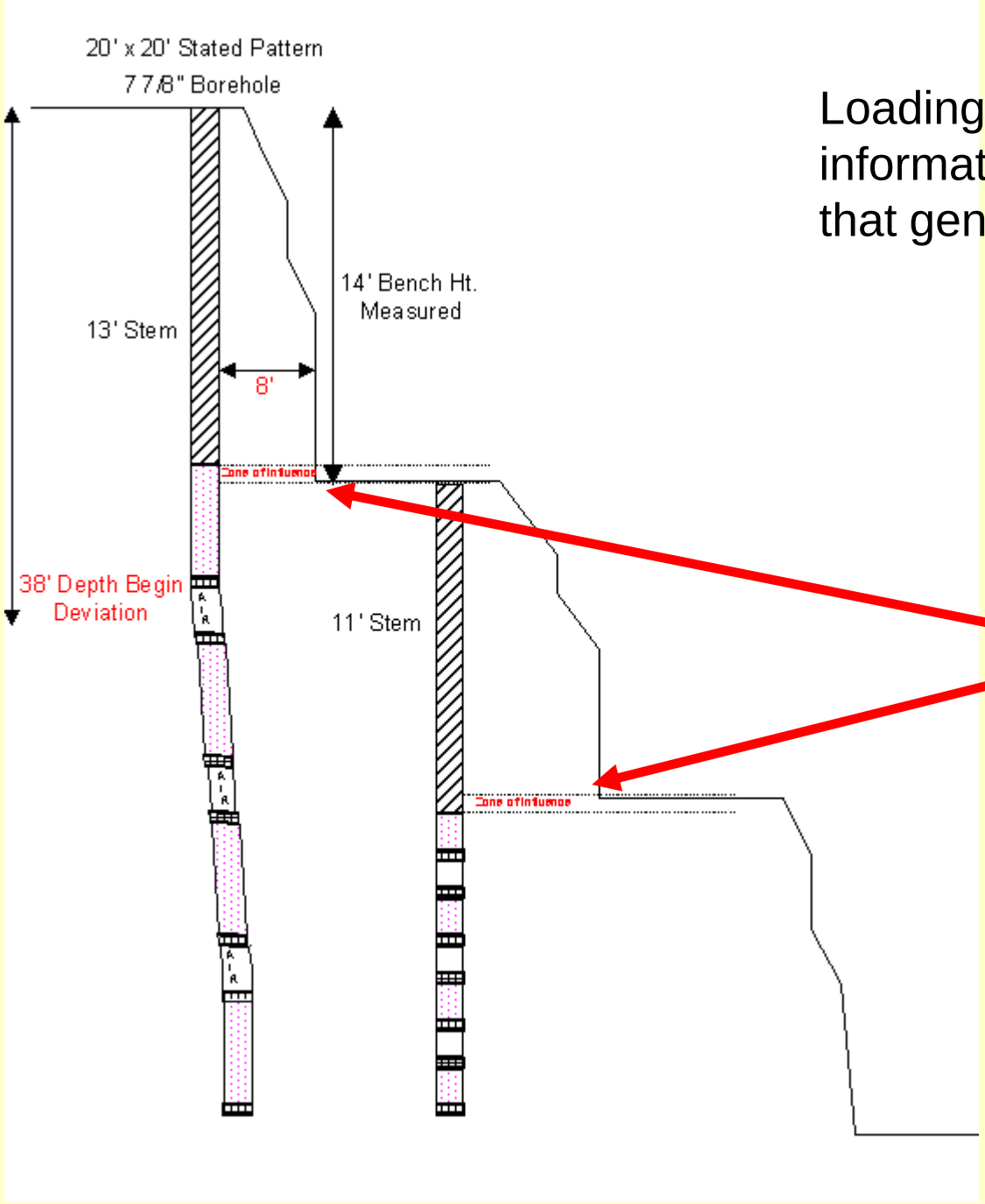
Damage to back of vehicle cab

Highwall



Scanned portion of blast log showing loading sketch


Direction of shot
Sketch of Delay Pattern
Show North Arrow & Direction to Nearest Protected/Other Structure. Include Firing Time for Each Hole or Deck.
Nearest house 480 ft.
Direction of flyrock
7th hole
Last hole
C Series – 117'
Unloaded holes
B Series – 106'
A Series – 96'
Comments



Loading configuration based on information from blast log of shot that generated flyrock.

Area of insufficient burden

Suspected Causes

- Company believed timing a contributing factor
- Bad geology
- OEB believed insufficient burden based on bench configuration was a contributing factor.

Typical Remedial Measures

- Citizen w/in 1000ft notification prior to each blast
- Details of notifications noted on blast logs
- Driller provide drill logs to blaster
- Drill logs attached to blast logs
- Drill logs signed by driller and blaster

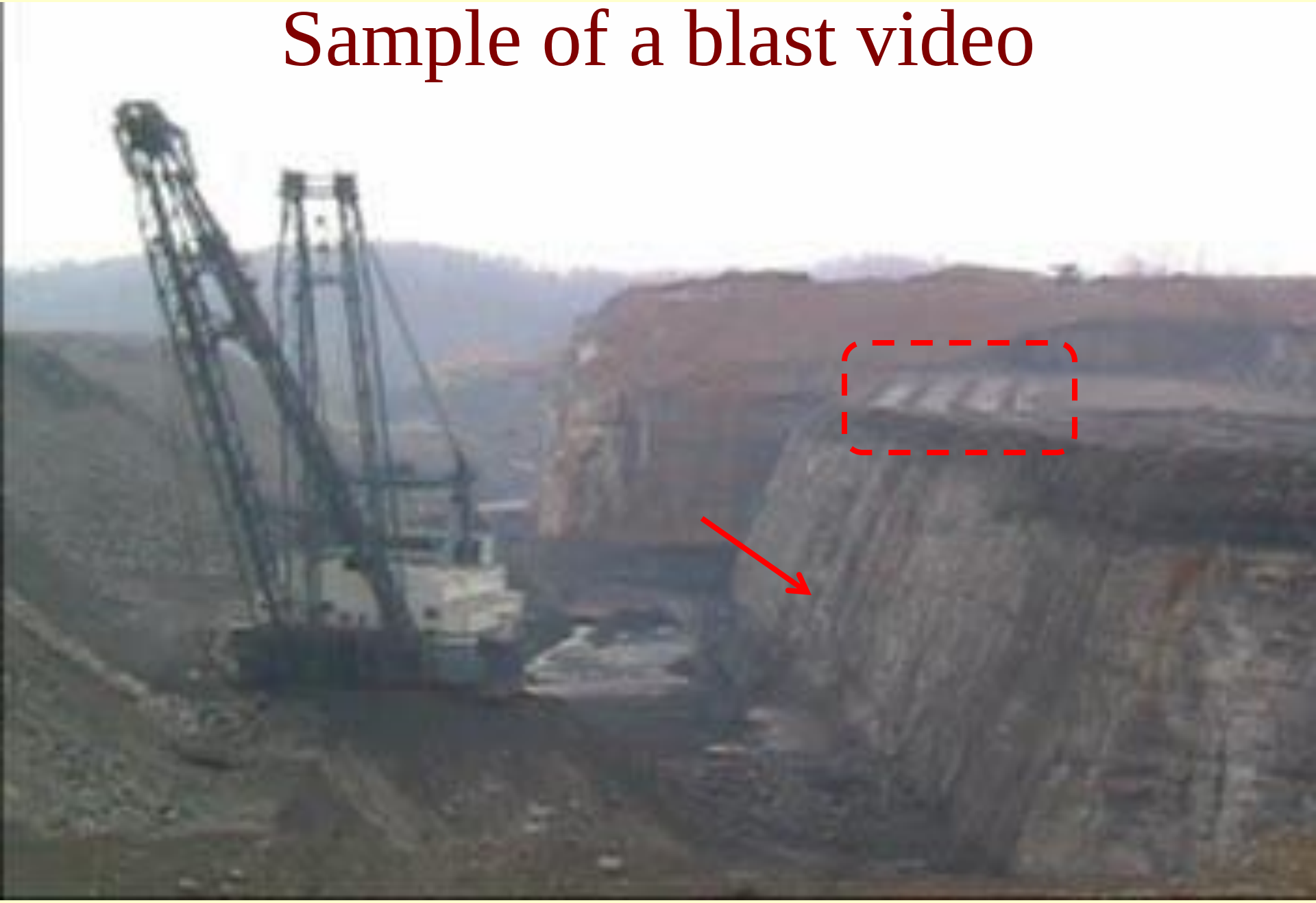
Typical Remedial Measures (cont.)

- Blaster layout all holes
- Powder factor will not exceed 1.1 lbs./cy.
- No holes loaded without drill log
- Blaster to verify burden, spacing, and hole depth
- Minimum burden distance on face holes

Typical Remedial Measures (cont)

- Site Specific Blast Design revised
- Blaster determine pattern for all shots (1,000 ft.)
- Driller flag all holes and report abnormalities
- Video shots within 1,000 ft. of structures
- Locate blasts with Global Positioning System

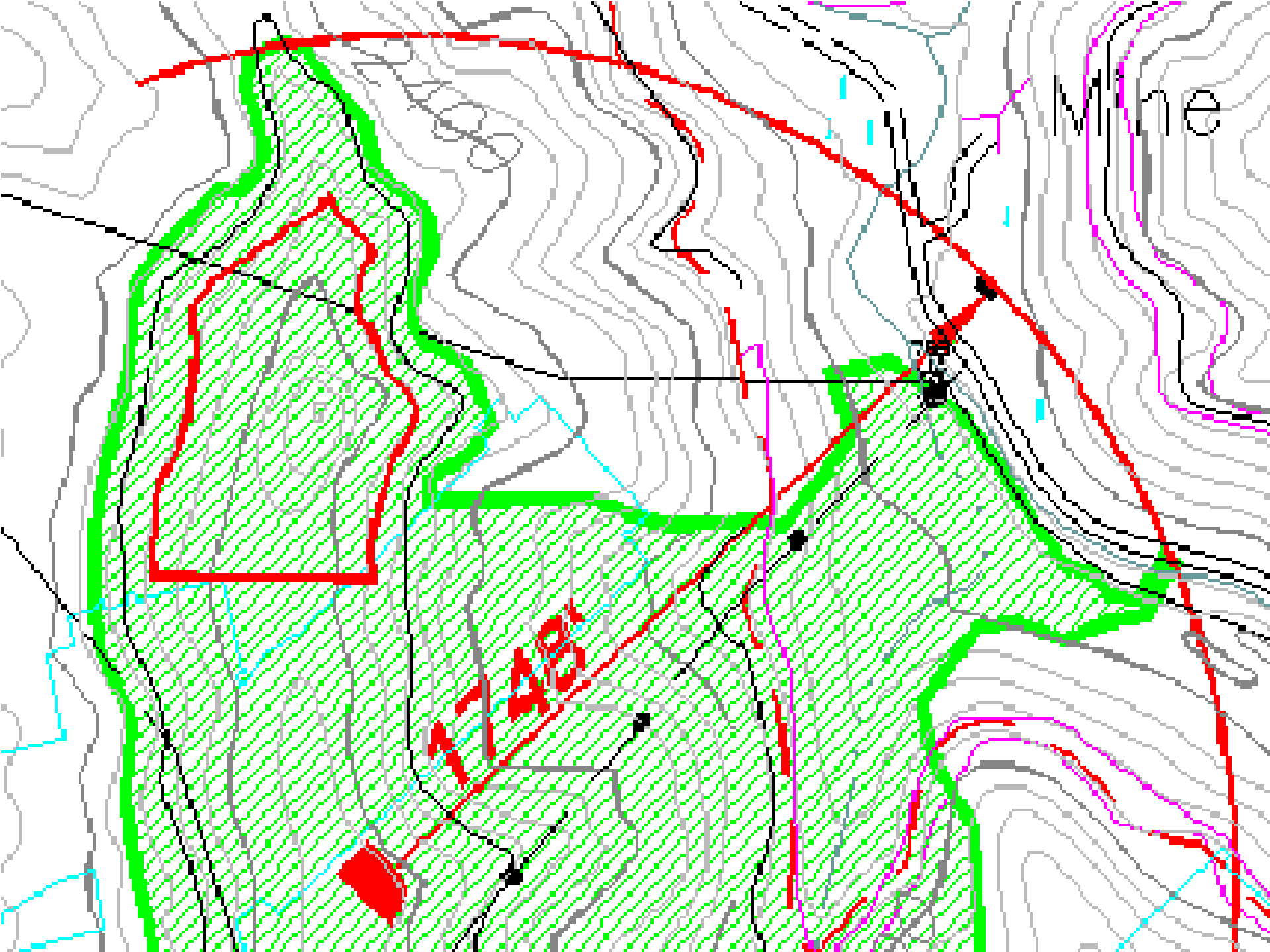
Sample of a blast video



Case 3 - Production Blast

Flyrock was cast off the permit, more than1/2 distance to nearest structure, and outside the blast area

- Mobile home was impacted by rock
- 550 ft. debris field in adjacent campground
- Farthest impact area 1,980 ft.
- Landed in various campsites
- Area was occupied day of incident


Mine
N148

View of campground from blast site

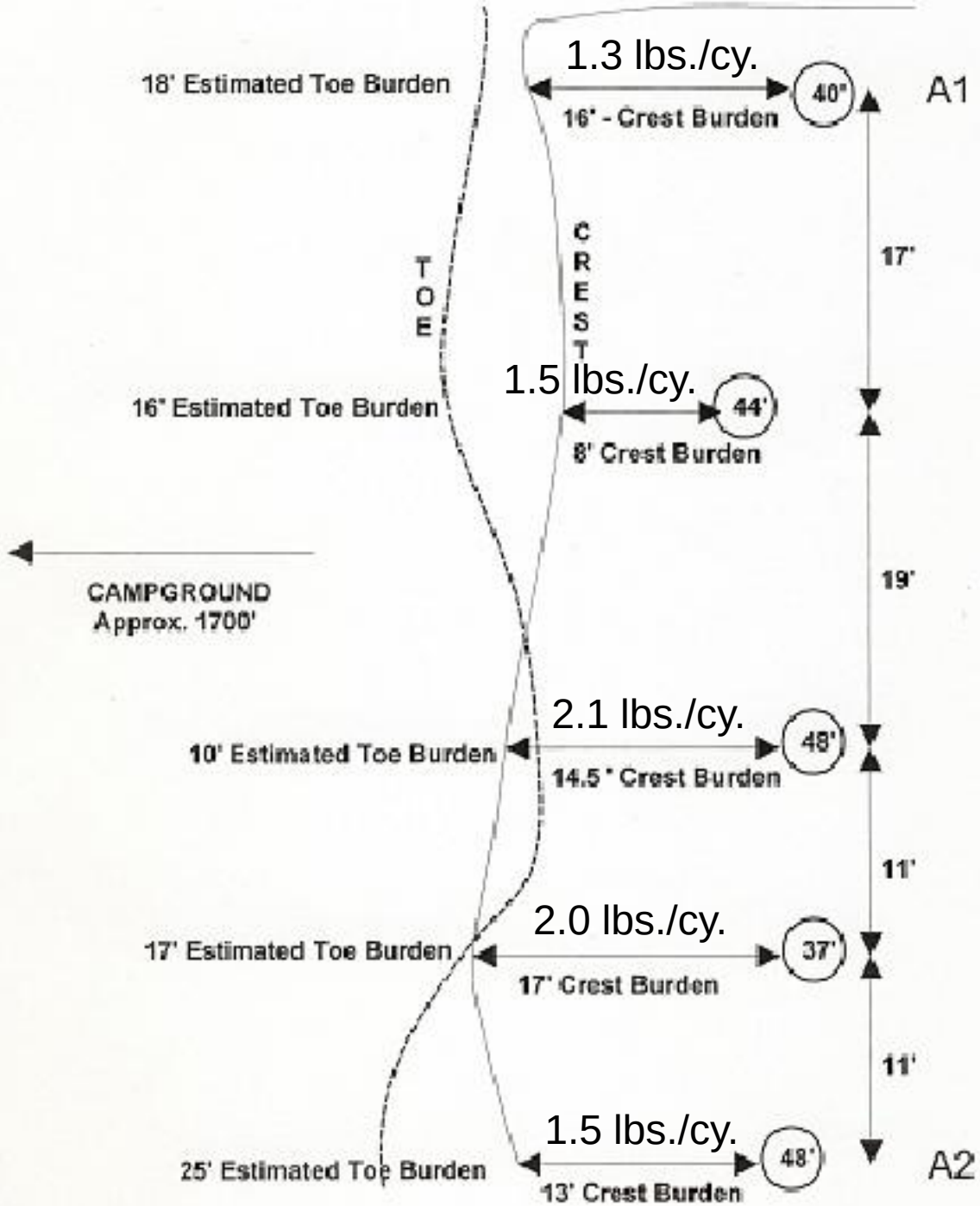
31" x 12 ½" hole

Interior damage to mobile home

530 lbs. / Rock split on impact / Cast 1,750'

Suspected Causes

- Angle holes drilled without blaster knowledge
- Drill out not considered
- Insufficient burden



Plan view of outside row of holes, on adjacent bench.

Planned 18 ft. x 18 ft. pattern / Depth 50 ft.

Actual burden 10 – 25 ft.
Spacing 11 – 19 ft.
Depth 37 – 48 ft.

Design powder factor 1.2 lbs./cy.

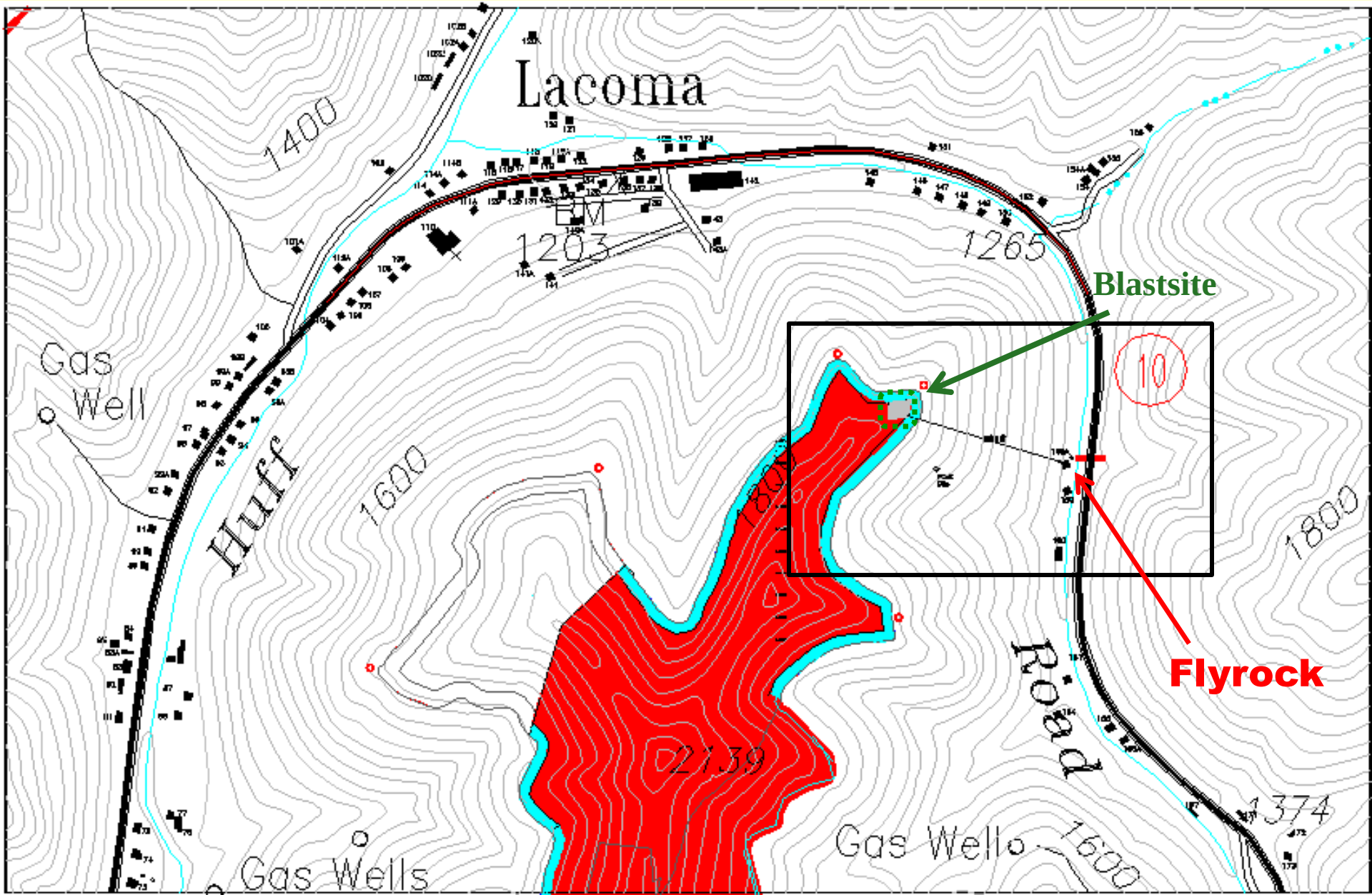
Blast Video – Do you think this was a good blast?

Case 4 - Production Blast

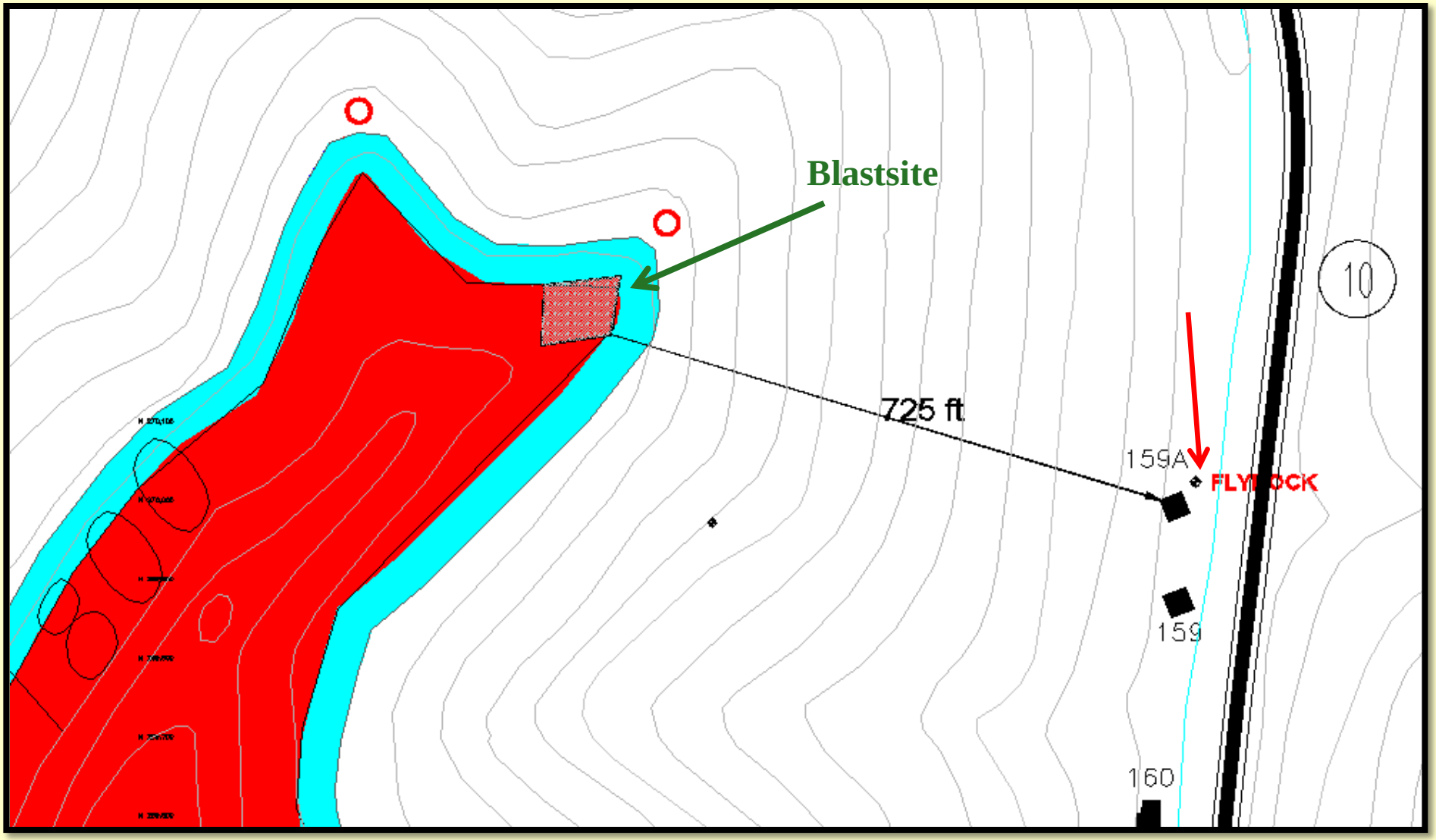
Flyrock was cast off the permit, more than1/2 distance to nearest structure, and outside the blast area.

- Parked vehicle was impacted
- Rock landed less than 4 feet from house
- Rocks were shoved from shot downslope

Case 4 - Production Blast

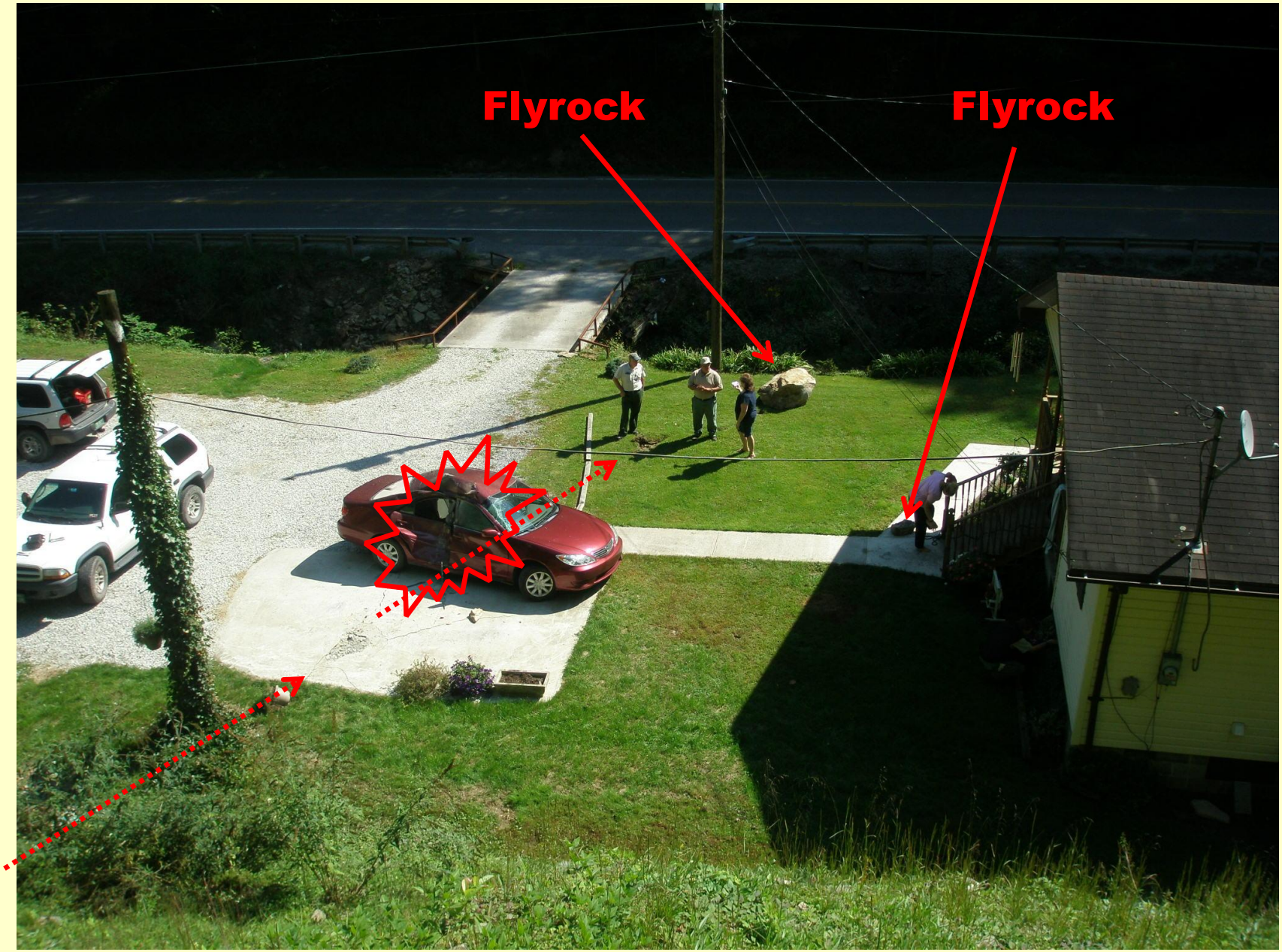


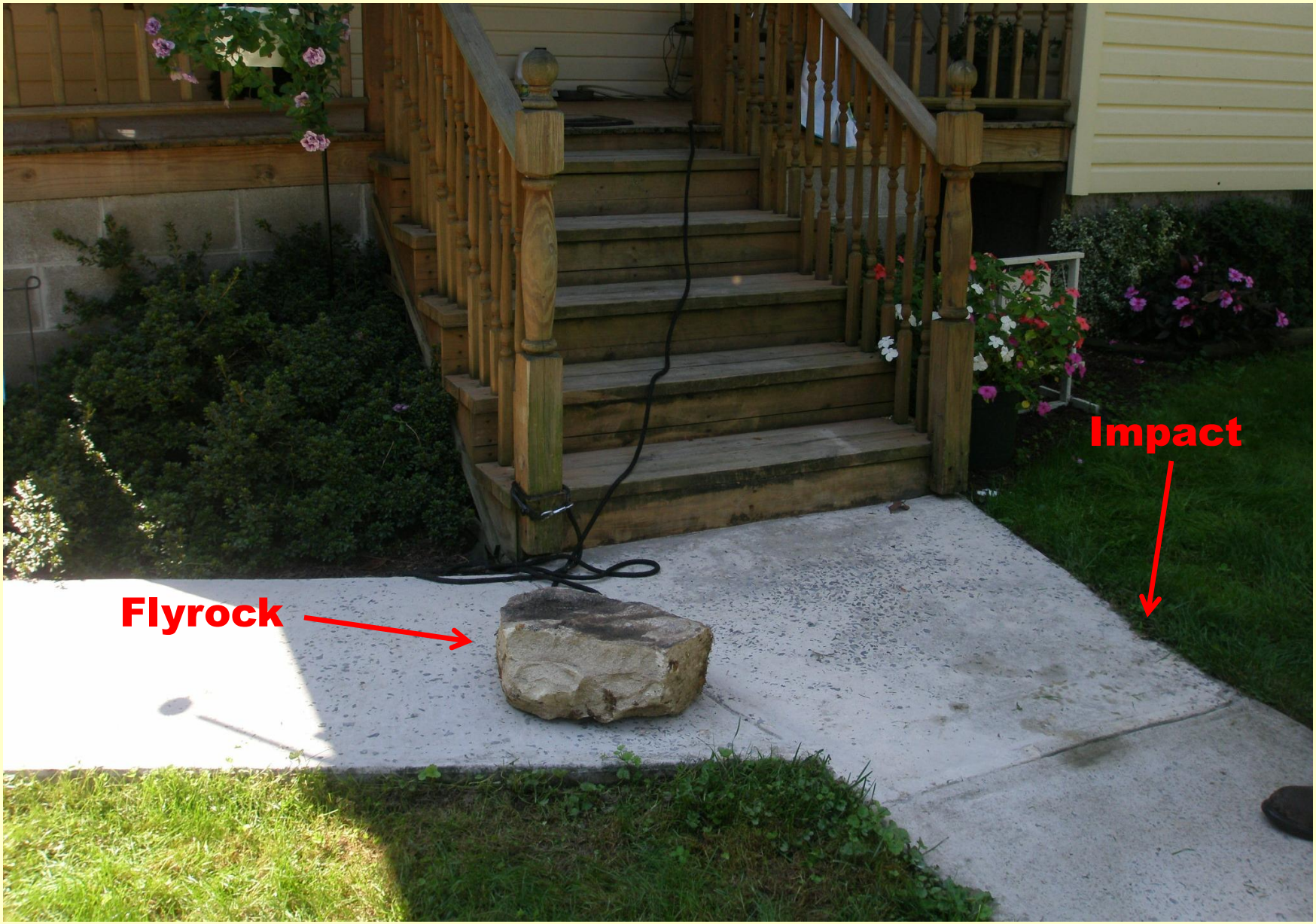
Case 4 - Production Blast



GPS locations of blastsite and flyrock on AutoCAD blast map

Case 4 - Production Blast


Flyrock
Flyrock



100 lb rock splintered off larger flyrock at impact

Flyrock
CAMRY LE
2EN 913

Rock was estimated at over 1.1 tons

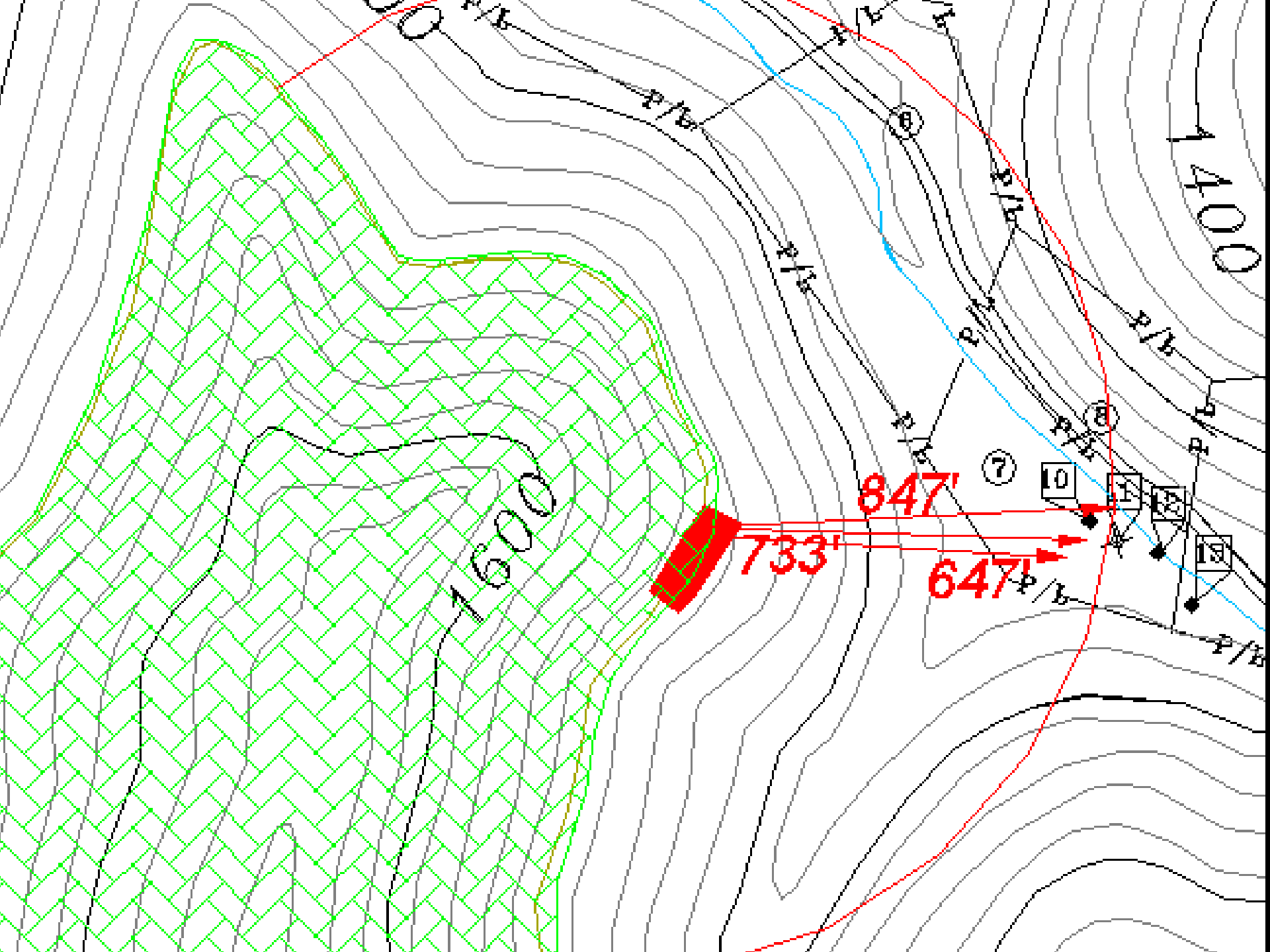
Case 4 - Production Blast

- Now let us look at that last video again.

Case 5 - Binder Shot

Fly rock was cast off the permit, more than1/2 distance to nearest structure, and outside the blast area

- Resident on porch heard trees breaking and rocks hitting driveway
- No structures damaged
- Resident promptly called company



1400
1600
847'
733'
647'
P/L
6
7
8
10
1
12
13

DODGE
DURANGO
72-369

Back yard / 110' from residence

Front yard / 95' from residence

Questions?

WVDEP
Office of Explosives and Blasting