



~~Man~~ Woman made snow!

Tahoe Donner Cross Country Ski Area Snowmaking Case Study



The uncertainty of natural snowfall

Cross Country Season length:

- 2012-13 113 days open
- 2013-14 80 days open
- 2014-15 31 days open
- 2015-16 108 days open
- 2016-17 136 days open
- 2017-18 65 days open



*6 year average – open only 65% of potential days

2023-24 134 Days. Opened Dec 2. Natural snow came early Jan

2013-2014 Season

Season 1: Dec 8th – Jan 20

Trails opened Sunday Dec 8th 2013 with a dry 15” storm that packed to give us a thin base. 1 inch storm followed then warm weather. Much shoveling to maintain trails through Christmas.

Dry conditions continued in Jan with another 1 inch on Jan 11th Shoveling continued to maintain trails through Martin Luther King weekend. Temporarily closed on Jan 20th to wait for snow

Season 2: Feb 1 – Feb 23

XC Reopened Feb 1st with a new thin base. Heavy rain forced closure for 2 days - Feb 10th & 11th. Re opened Feb 12th with thin coverage. Closed Feb 23.

Season 3: Mar 1 - 6

Re-opened Sat Mar 1, Closed Thurs Mar 6th

Season 4: March 30 - April 7th

Re-opened (again!) Sunday, March 30. We closed for the season Monday, April 7th, for a total of **80** days open!

Low snow conditions at Moondance Hut 2017-18 season



Same day in the shade







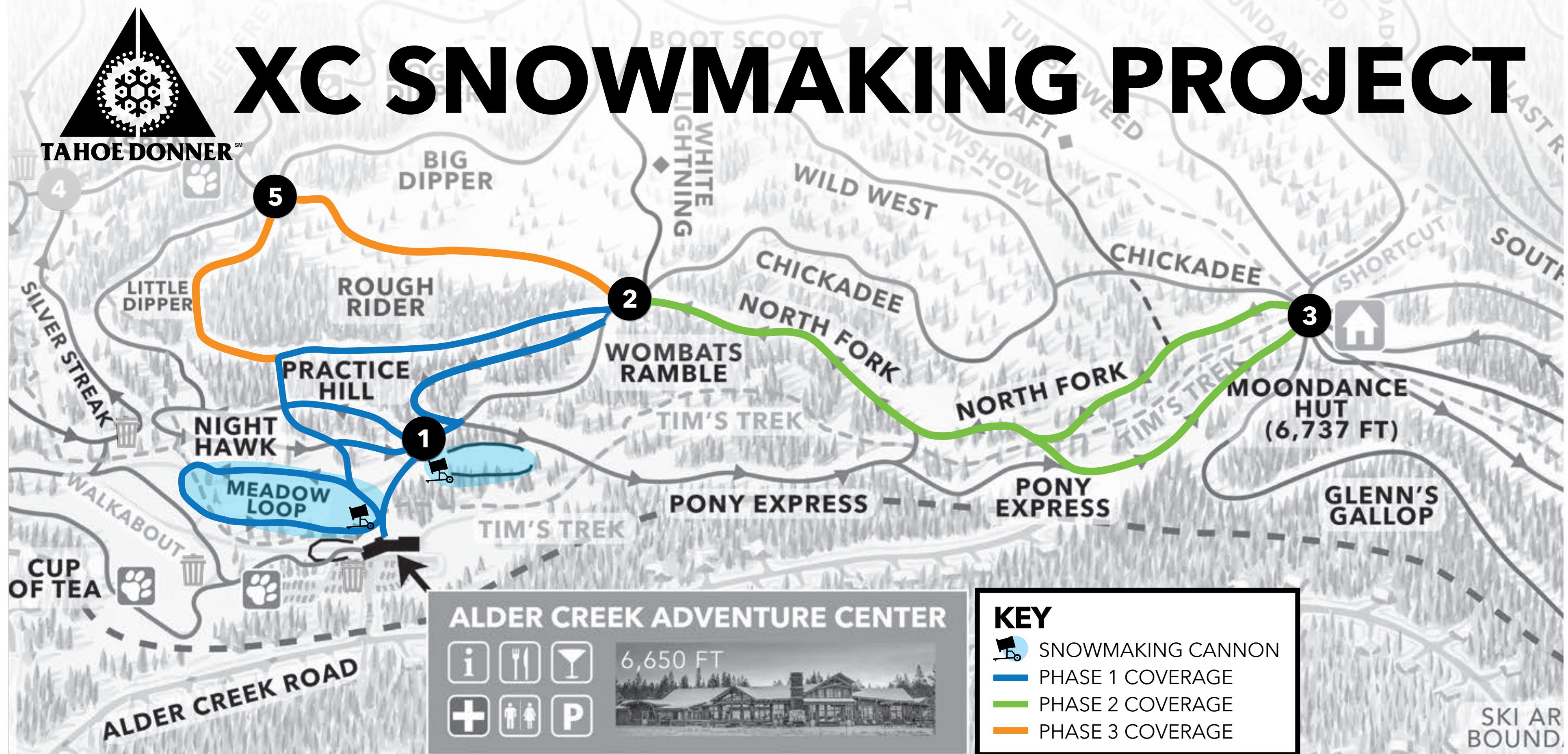




Reasons for Snowmaking

- To provide these popular activities for our Membership and community
- To reduce budget uncertainty and create more reliable positive NOR, thus reducing Operating Fund Assessment \$s
- To ensure high quality and safe user conditions
- To satisfy and retain xc season pass holders
- To provide continuity for season long xc programs and clinics
- To retain skilled employees





WHY ADD SNOWMAKING?

- Provide the membership with an insurance policy for skiing at TDXC
- Create a trail to get to snowline
- Protects key association revenue, which can stabilize overall dues and costs.

Total Days of Operation:

- Average Season at TDXC: 136 days
- 2017-2018 (low snow year): Open 65 days
- 2014-2015 (drought year): Open 31 days
- 2013-2014 (drought year): Open 80 days

PROVIDE FEEDBACK

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WHAT ARE THE IMPACTS?

- Construction conducted during the summer months
- No impact to XC operations.
- Minimal summer trail impact.
- All earthwork trenching for infrastructure will be conducted on existing soft covered roads to minimize disturbance.

WHAT IS THE TIMELINE?

- Demonstration and member outreach: Winter 2020
- Final design and planning: Winter 2020
- Enviro review and permitting: Winter-Spring 2020
- Phase 1 + 2 construction pending board approval: Summer-Fall 2020
- Enjoy open trails: Winter 2021
- Phase 3: TBD

WHAT IS THE COST?

A Development Fund Project, no increased fees are needed.

Construction Costs:

- Phase 1 (Planned for 2020): \$435,081
- Phase 2 (Planned for 2020): \$228,688
- Phase 3 (Future Project): \$153,360

Operating Costs: \$10,000 per 2 acre-feet of snow, + \$13,300 for generator and compressor.

ROI: After phase 2, conservative estimates of a low- snow year ROI is \$200,000 per year. That's 3.5 low-snow years to recoup the investment.

INGREDIENTS FOR SNOWMAKING



WATER: 3" meter and pipe. Temporary meter on fire hydrant + surface hoses, or upgrade facility infrastructure and bury pipe .

We opted for buying water from the town, @ \$5/1000 gallons



POWER: 480 volt 3 phase power. Generator or mains

We opted for renting a generator + compressor



WATER PRESSURE: Pumps on Fan Guns or Centralized Pump House better for larger scale snowmaking.

We opted for 200gal/min pump



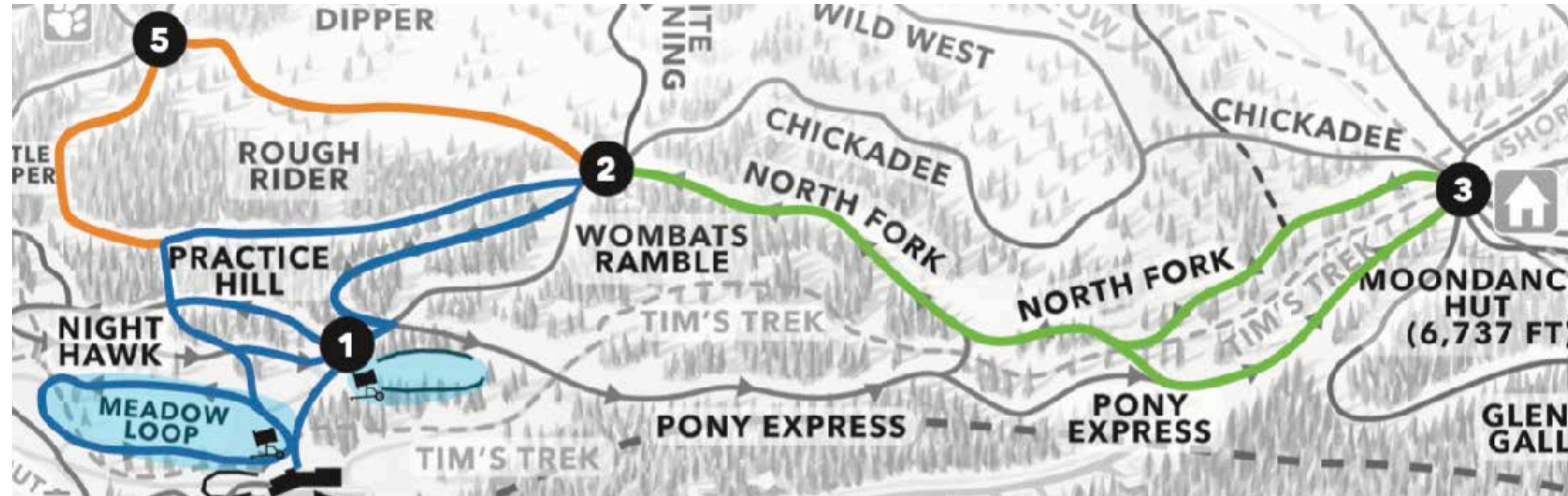
HYDRANTS (close to guns best) and HOSE (buried pipe removes issues with frozen hoses)



GUNS: Fan Guns great for large areas, Stick Guns better on trails. Stick guns require a compressor but less power

We opted for 2 fan guns * 12 stick guns





Utility install: \$190k

(90k meter + Vault; \$42k asphalt)

Pump/electric/air set up \$240k

Pipes / Hydrants \$230k

1.2km 4" air+water pipe/trenching
/29 hydrants/3 fan pedestals

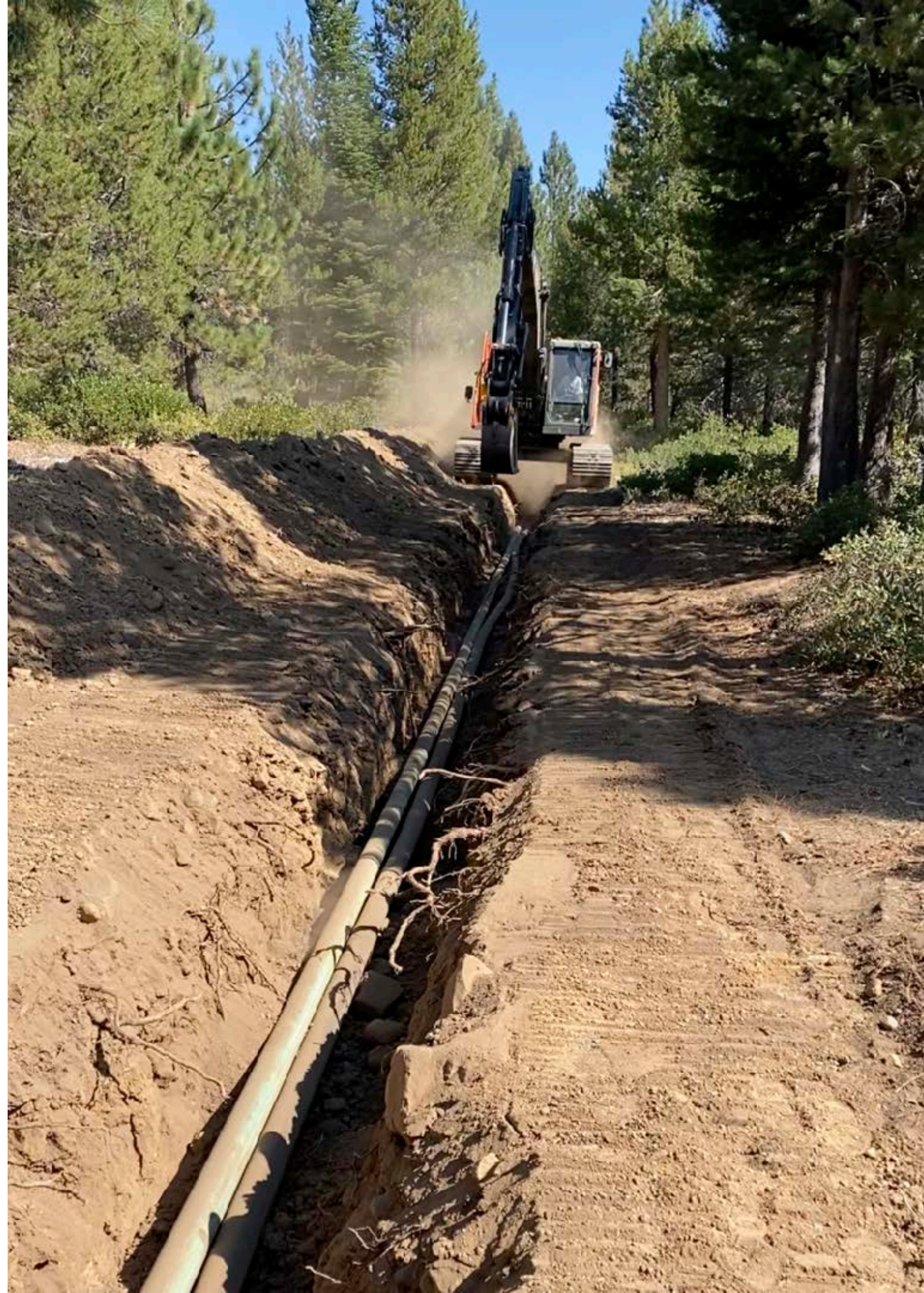
Snow Guns \$110,000

2 Fans & 12 stick guns

Construction Costs:

- Phase 1 (Planned for 2020): \$435,081
- Phase 2 (Planned for 2020): \$228,688
- Phase 3 (Future Project): \$153,360

Phase 1&2 \$770,000 + Pump House



1.2 km trench 3' Deep
to bury 4" air & 4" water pipes



200 gallons / minute capacity pump
(maxed out at 2 fans &
4 sticks in coldest temps)



56KW Diesel generator

\$2600 / mo

4.4 gals/ hr at full load. 103
gal tank. Averaged ~ 25-30
gals/night

Fan Guns 20-30 Galls / min





915 CFM 150psr Diesel
Compressor

\$5600 / mo

14.5 gals/hr at full load



Stick Guns 10-20 Galls / min



1st Night - November 24 2023. Not great temps



2 Nights = November 25 2023



Night 3 = November 26 2023



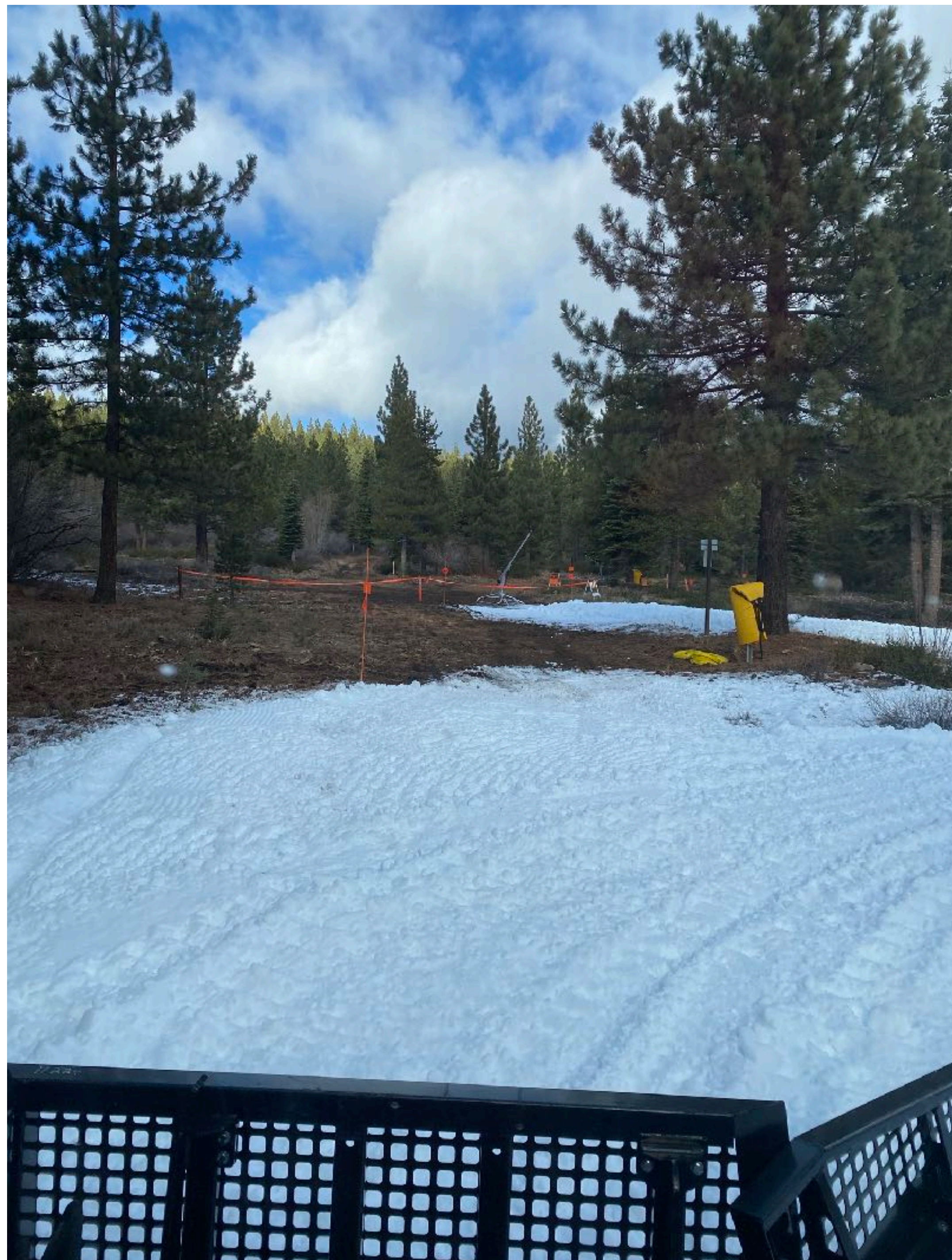
After Night 3 November 26 2023



Night 3 = November 26 2023



Night 6 (November 30 2023)

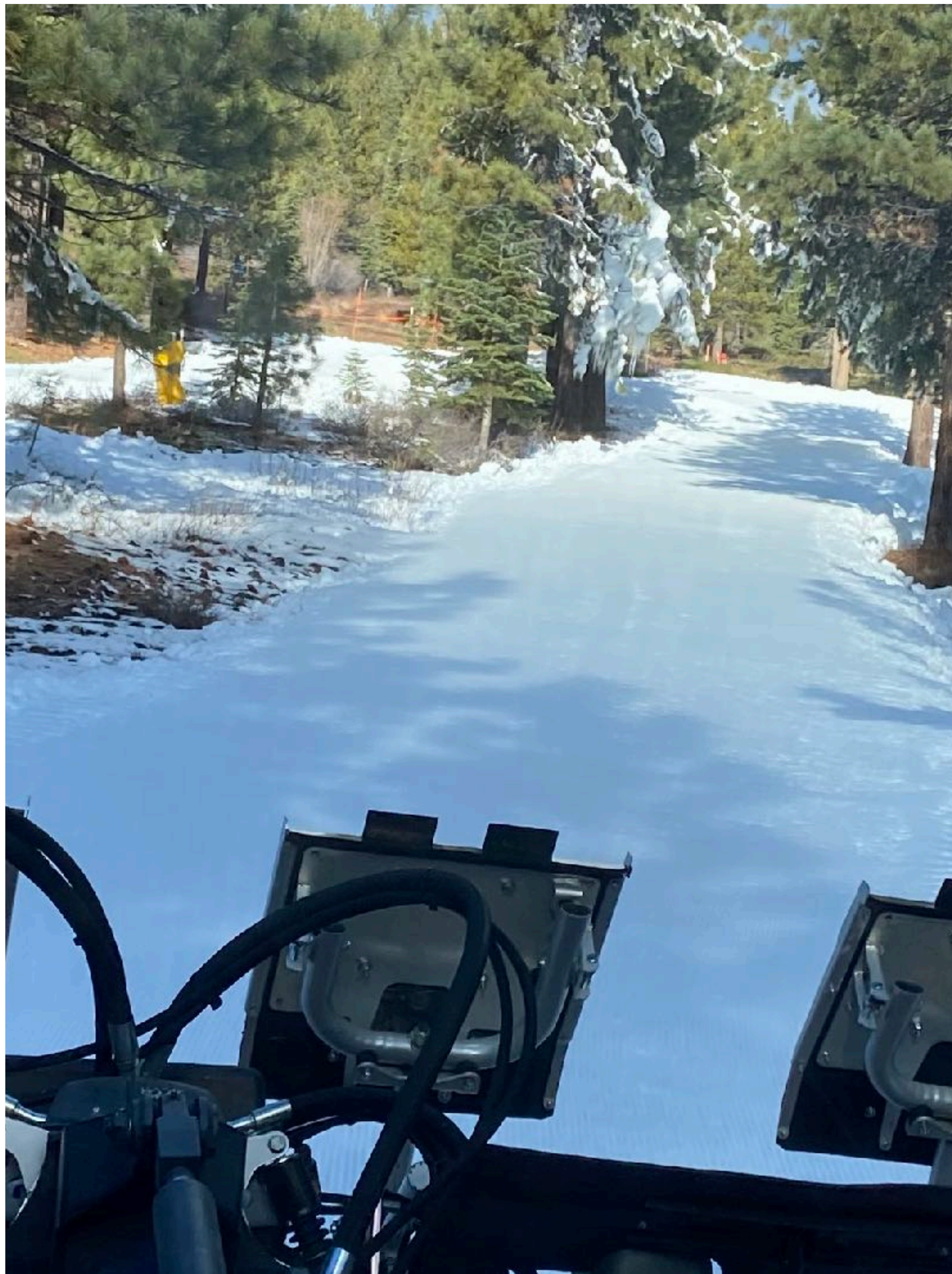




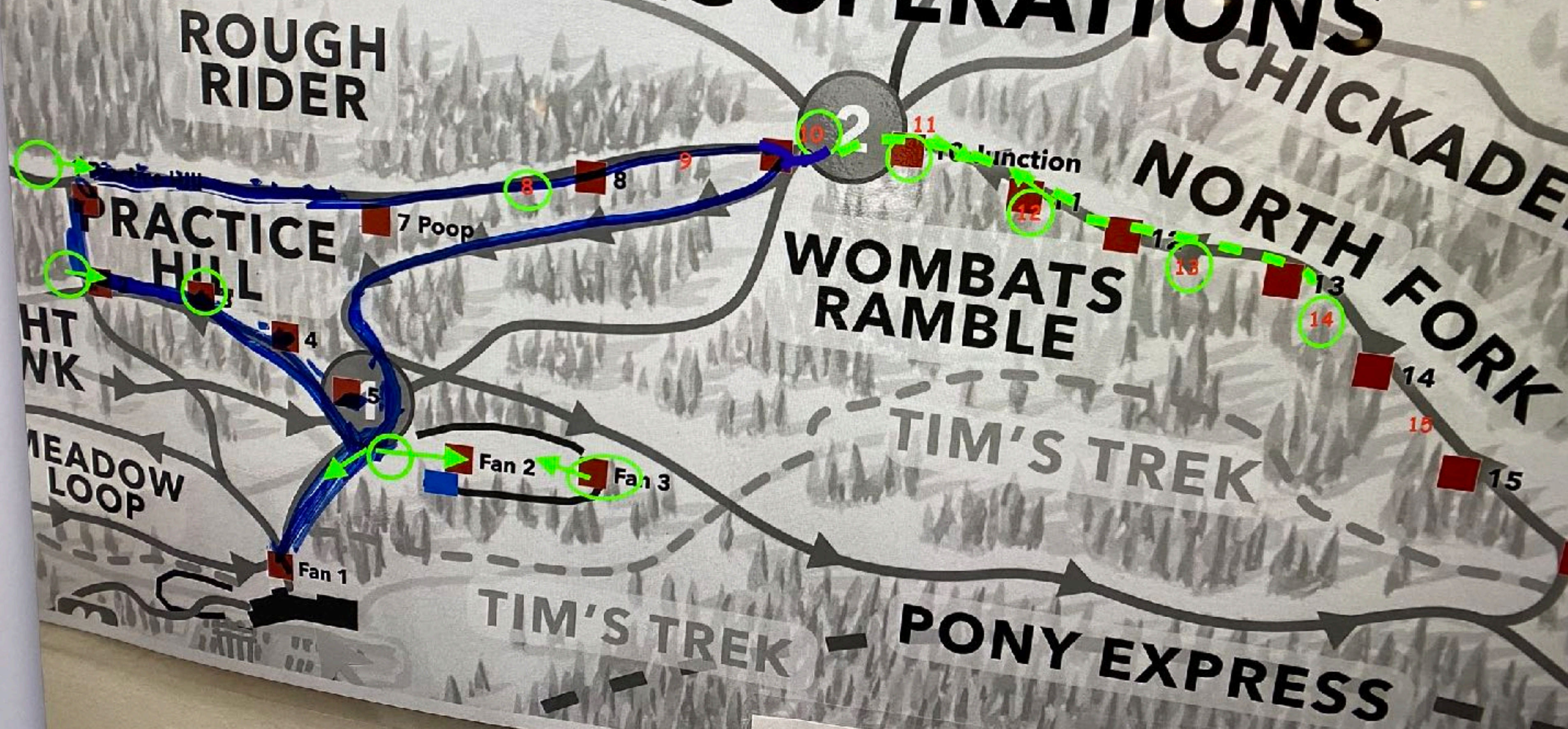
Night 6 (November 30 2023)

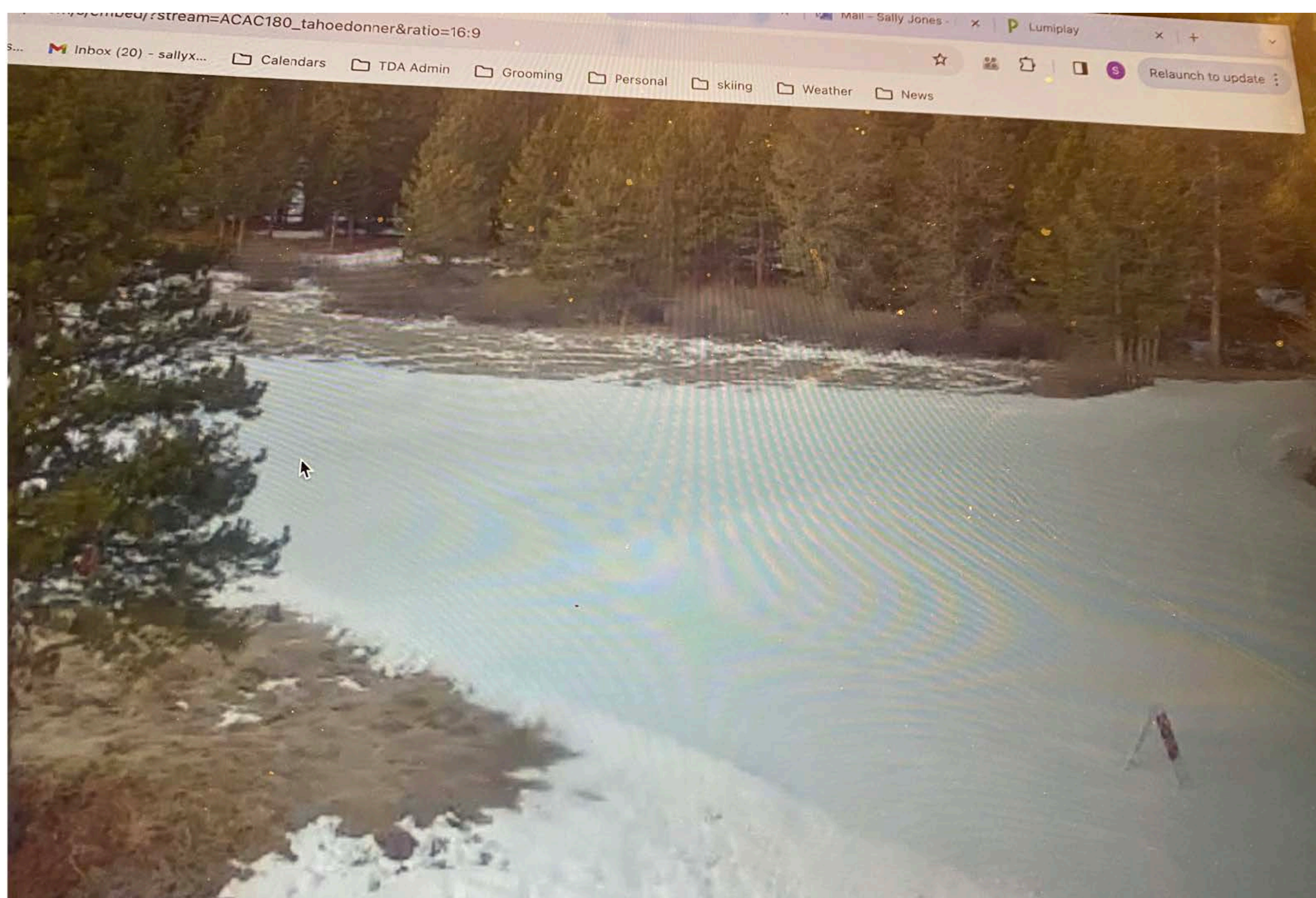


**Dec 1 2023 After
7 days of marginal temps**



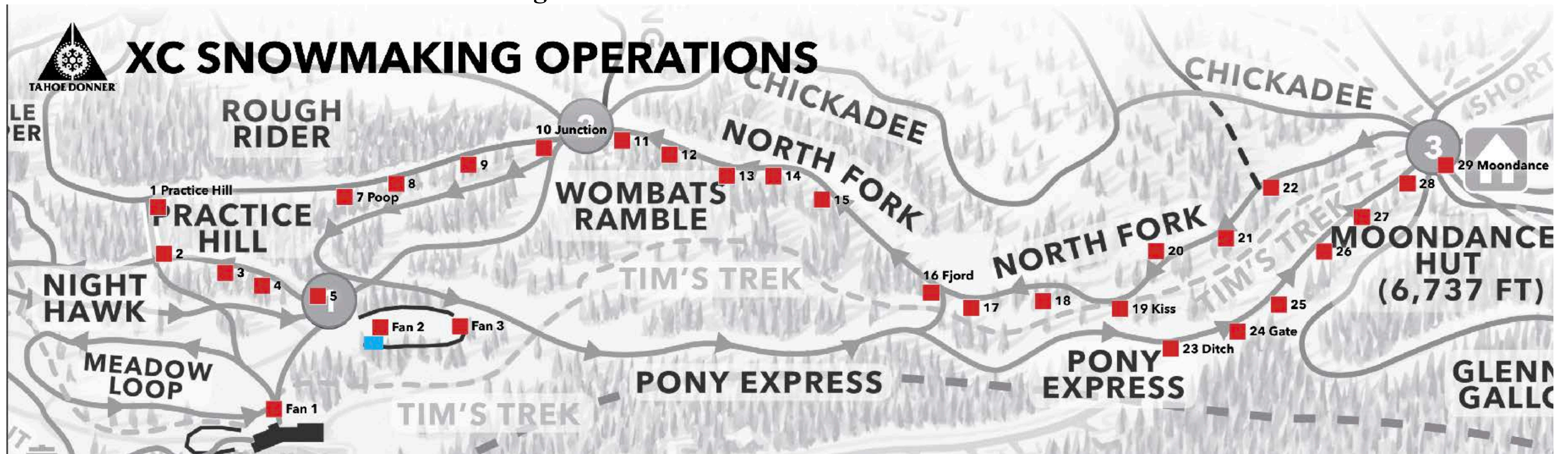
XC SNOWMAKING OPERATIONS





Dec 29 2024

Design & Scale



3" Water meter \$74,000
200 Gals / Min Pump @ \$105,000

4000 Linear feet air + water pipe + trench
29 Stick Hydrants
3 Fan Gun Hydrants

2 SMI Kid Cat Fan Guns @ \$30,000
12 SMI Air /Water Stick Guns @ \$4000

Capital Investment \$770,000

\$1 million (inc 1100 soft storage/pump house)

Operating costs ~ \$65,000 for a 3km loop in year 1

Nov / Dec comparison

2017 5 days open

2023 30 days open

+Jan- April secured

ROI: After phase 2, conservative estimates of a low- snow year ROI is \$200,000 per year. That's 3.5 low-snow years to recoup the investment.

Approx spend 2023/4 season

2 mil galls water \$11,000

2100 gals Diesel ~ \$14,000

Labor \$18,000

Equipment rental \$22,000

\$65,000





Jan 4th 2024



<https://www.kcra.com/article/tahoe-donner-cross-country-ski-area-snow-machines-climate-change/46212917>





Tahoe Donner Cross Country Ski Area Snowmaking Case Study

1 acre of snow = 613m (2000') of 22' wide trail @ 12" deep
Takes 200,000 gals water

915cFM 150psr diesel Compressor start@ 233.4 end @ 440 hrs (our photo) = 206 hrs.
56KW Diesel generator start @ 586.8 (Sunbelt) end @819.3 hrs (our photo) = 233.5 hrs.

Thurs 11/23/23
Fri 11/24/23
Sat 11/25/23
Sun 11/26/23
Mon 11/27/23
11/30/23
11/31/23
Dec 2 OPENED w 1km

Thurs Dec 7
Fri Dec 8
Dec 11
Dec 12
Dec 13 (too warm!)
Dec 14 - fans to Moondance
Dec 23

Mon 1/1/24
Tues 1/2/24
Weds 1/3/24
Thurs 1/4
Fri 1/5
Sat 1/6
Sun 1/7