Solid Waste Management Facility Siting

DESCHUTES COUNTY SOLID WASTE ADVISORY COMMITTEE (SWAC) MEETING

Tuesday, February 20, 2024, 9:00 a.m.-11:00 a.m.

Deschutes County Road Department Conference Room (61150 SE 27th St., Bend, OR 97702) **or** Zoom

Zoom Meeting Information: This meeting may be accessed via Zoom using a phone or computer.

- To join the meeting from a computer, copy and paste this link: bit.ly/40aKaGc
- To join by phone, call 253-215-8782 and enter webinar ID #893 0788 6009 followed by the passcode 773333.
- If joining by a browser, use the raise hand icon to indicate you would like to provide public comment, if and when allowed. If using a phone, press *6 to indicate you would like to speak and *9 to unmute yourself when you are called on.

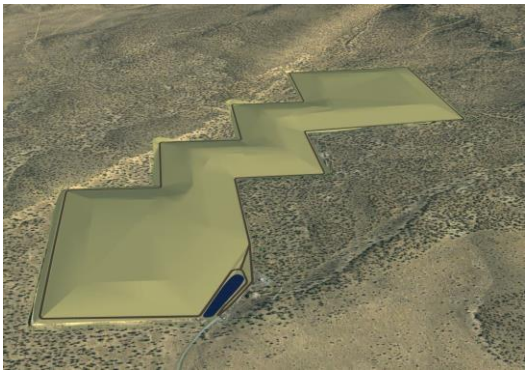
February Meeting Agenda

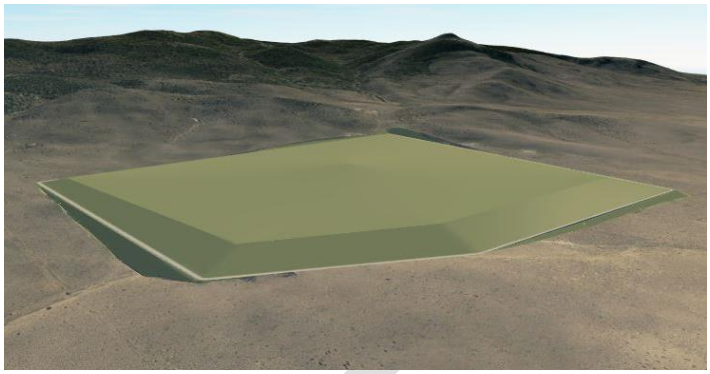
1. Welcome
2. Review/ Approve October Meeting Minutes
3. Public Comment
4. Final Site Evaluation Preliminary Findings
5. SWAC Discussion
6. Adjourn

Managing the Future of Solid Waste: Solid Waste Management Facility resource information
Story Map: Deschutes County Managing the Future of Solid Waste informational story map including Frequently Asked Questions
Solid Waste Advisory Committee Meetings: April 2022 to June 2023 meeting materials, including agendas and summaries
Deschutes County Meeting Portal - Solid Waste Advisory Committee Meetings: August 2023 and later meeting agendas and summaries

Deschutes County encourages persons with disabilities to participate in all programs and activities. This location is accessible to people with disabilities. If you need accommodation to make participation possible, please call the Solid Waste office at (541) 317-3163, or send an email to solidwaste@deschutes.org.

Condado de Deschutes alienta a las personas con discapacidad a participar en sus programas y actividades. Este lugar es accesible para personas con discapacidad. Si necesita hacer arreglos para hacer posible la participación, llame a Solid Waste la oficina a (541) 317-3163, o envíe un correo electrónico a solidwaste@deschutes.org.





Deschutes County Solid Waste Management Facility (SWMF) Final Site Evaluation

Prepared for

Deschutes County Department of Solid Waste

February 2024

Parametrix

Executive summary

Deschutes County is faced with the imminent challenge of Knott Landfill reaching capacity by 2029, necessitating the selection of a new Solid Waste Management Facility (SWMF), including a 100-year-life landfill. As recommended in the 2019 Deschutes County Solid Waste Management Plan and directed by the Board of County Commissioners, the Solid Waste Department has been working with the County's Solid Waste Advisory Committee (SWAC) to identify potential locations for a new SWMF in Deschutes County. Following a rigorous site selection process, the Moon Pit and Roth East sites, both situated east of Bend near Highway 20, emerged as the final candidate sites. The County and its consultant team, led by Parametrix, commenced an exhaustive multi-disciplinary investigation to evaluate the efficacy of each site for development. This report offers a comprehensive analysis of the findings for each site, aiming to guide the County in the selection of a preferred location for the new SWMF.

The Moon Pit site property shape results in a more complex layout that is less efficient than at the Roth East site. Despite a lower capacity-to-acreage ratio, Moon Pit benefits from existing infrastructure, including an access road, gate, scales, and well, potentially reducing some upfront development costs. However, its active surface mine status and zoning complexities require careful consideration. The site has an established paved access road with direct access to US 20, but it crosses through BLM lands which could lead to a lengthy federal environmental review process for a change in use. Moon Pit also offers existing water supplies, though securing future water right permits may pose challenges.

Conversely, the Roth East site features a more efficient layout, resulting in a better capacity-to-acreage ratio. As an undeveloped grazing property, it lacks existing infrastructure, demanding upfront capital for access road construction. Zoned as Exclusive Farm Use, Roth East faces a conditional use permit process, including a Farm Impact Test. New water infrastructure and water rights permits would be needed at the Roth East site to meet anticipated water demands.

Significant geological differences also exist between the two sites. Moon Pit is situated in a ridge-bounded valley with shallow bedrock that will requiring blasting to excavate. As a result, cell development costs are expected to be substantially higher at Moon Pit. However, the aggregate resource value, established mining operation, Surface Mining (SM) Zoning, and DOGAMI permit for the site present the opportunity for excavation to occur as part of aggregate resource extraction. Roth East, on the other hand, lies in Millican Valley with unconsolidated alluvial deposits that can be excavated with conventional equipment and used onsite for development and landfill cover needs.

Moon Pit's development is perceived to have fewer visual and residential impacts, given its remote location and topographic screening by ridges on three sides. It also faces fewer archaeological risks due to its prior disturbance for gravel mining. In terms of wildlife impact, the Moon Pit site poses potential impacts to a golden eagle nest and essential habitat for mule deer, elk, pronghorn, and sage grouse. Mitigation costs for these potential wildlife impacts are estimated at $700,000, with additional operations and maintenance costs of up to $800,000 for mitigation sites.

Roth East, because it is largely undeveloped, possesses potential archaeological resources, incurring longer review, permitting, and investigation timelines. In terms of wildlife impact, Roth East faces greater potential impacts to mule deer, elk, pronghorn, and sage-grouse habitat, with estimated wildlife mitigation costs of $1,500,000 and additional operations and maintenance costs of up to $2,500,000 for mitigation sites.

The Parametrix team prepared planning level opinions of probable cost (costs) for both sites. These opinions have ranges of +50% and -30%, which is an appropriate level of accuracy for comparison of sites. Moon Pit initial development costs range between $50-$64 Million, which includes $15.4-$15.9 Million for land acquisition. Roth East development costs are approximately $36 Million, with $5.5 Million allocated for land acquisition. Moon Pit's landfill cell development costs range from $705,000-$1,075,000 per acre, while Roth East's cell development cost is approximately $393,000 per acre. Moon Pit annual operating costs are $7.6 Million, with Roth East higher at $8.4 Million. Moon Pit's average cost per ton for disposal (capital plus operations) ranges between $43-$48, while Roth East's average cost is just under $45/ton. The cost ranges presented here for Moon Pit depend on the extent and cost of cell excavation that could occur as a part of aggregate mining operations onsite. Initial capital costs are significantly higher at Moon Pit, which will necessitate higher tip fees for the first 20 years. However, total cumulative costs are estimated to be similar over the projected lifespans.

The decision between Moon Pit and Roth East hinges on a nuanced evaluation of advantages, challenges, and costs. Moon Pit provides existing infrastructure and potential cost offsets but faces zoning and access road complexities as well as substantially higher upfront development costs. Roth East boasts efficiency and favorable soil conditions, but is challenged by greater infrastructure needs, water availability risks, wildlife impacts, land-owner concerns, and haul costs. Deschutes County's ultimate selection should prioritize long-term sustainability, environmental protection, and economic viability, ensuring the chosen site best aligns with the County's waste management goals and community values.

Category	Moon Pit	Roth East
Conceptual Facility Layouts	The Moon Pit site layout is more complex and less efficient, compared to Roth East. As a result, the ratio of capacity-to-acreage ratio is lower and more leachate pump stations are needed. Approximately 64,000,000 cy airspace is available within a 346-acre footprint and the estimated lifespan is 100 years. The existing access road, gate, scales, and well could help reduce site development costs to some extent. Mined areas provide some "free" airspace and help reduce initial excavation needs. Although the prevalence of shallow bedrock at this site increases excavation costs, the potential for synergistic aggregate mining operations presents an opportunity to further subsidize cell excavation costs.	The Roth East site has a more efficient square shape, which results in a better capacity-to-acreage ratio and requires fewer leachate sumps/pumps. As an undeveloped grazing property, there is no existing infrastructure available onsite for landfill operations. The mix of sand, gravel, and cobbles within the excavation depth onsite is very favorable for efficient landfill development and operation. Approximately 80,000,000 cy of airspace is available within a 387-acre footprint. The estimated lifespan of the preliminary design is approximately 113 years, but the lifespan could potentially be extended with horizontal and/or vertical expansion if needed.
Site Development and Permitting Assessment	Moon Pit is an active surface mine zoned for Surface Mining (SM) with Wildlife Area (WA) and Surface Mining Impact Area (SMIA) overlays. The site is in proximity to the Oregon Badlands Wilderness and public lands. To permit landfill use, three options are considered: (1) Changing base zoning from SM to Multiple Use Agriculture (MUA); (2) Amending the Comprehensive Plan to allow landfill use after mining; (3) Introducing a new landfill overlay zone for designated areas. Conversations with BLM suggest potential NEPA review due to the site's access road crossing BLM land, requiring a new ROW easement. Risks may emerge from the land use approval process and a potentially extended NEPA process if mandated.	The Roth East Site is currently rural undeveloped land used for grazing purposes and is surrounded by rural residential properties, OHV trails, and the Deschutes National Forest. The Pine Mountain Observatory is located approximately 4.4 miles southwest of the site. The site is zoned Exclusive Farm Use Horse Ridge (EFUHR) with overlays for Forest Use (F1), Landscape Management (LM), Sage Grouse Habitat Area – Low Density (SGIA-LOW), Surface Mining Impact Area (SMIA), and Wildlife Area Combining Zone (WA). A new landfill use is a conditional use under EFU zoning and would require a Farm Impact Test. Potential risks may arise from the Farm Impacts Test which could lead to a Land Use Board of Appeals (LUBA) appeal which can be a lengthy process.
Transportation System Assessment	The Moon Pit site has an existing and useful transportation network that provides direct access from US 20. The existing road between the site and US 20 is currently used by heavy vehicles, which is a benefit to a future landfill use and would likely reduce any upfront capital expenditures necessary for transportation access to the site. However, the access road is bound by BLM lands which means that any change of use or expansion of the road, if necessary, would be subject to BLM review which would likely be timely and costly. In addition, the road serves as a shared access to the Badlands Wilderness area which may create the perception of a conflict between a landfill and the recreation area.	The Roth East site has no existing improved access road between the site and US 20. As a result, the primary transportation need for this location would be to construct an access road, which would result in more upfront capital expenditures for access compared to the Moon Pit site. Multiple routes could be considered with trade-offs in regard to overall route length, connection point with US 20, avoidance of BLM land, and limiting the overall grade along the route. However, several route options would result in direct and unshared access to the site, which would limit any conflict between the landfill and adjacent uses.
Water Infrastructure Assessment	As both sites are within the Deschutes Groundwater Study Area, the timeframe for securing and mitigating for new water rights permits may extend beyond 2029. The Moon Pit site has existing industrial wells onsite with water rights. Although transfer the water rights is not offered with the property acquisition, the seller is willing to lease a partial water right to the County for landfill operational needs at a reasonable cost until the County can secure its own water rights. The current wells produce enough water to meet estimated operational water demands. The estimated costs for water rights permitting and water system upgrades at the Moon Pit site are approximately $665,000.	As both sites are within the Deschutes Groundwater Study Area, the timeframe for securing and mitigating for new water rights permits may extend beyond 2029. The existing well on the Roth East site does not have water rights and is thus limited to the exempt well production rate of 5,000 gallons per day. Until water rights can be secured, it is assumed that water trucks from Knott Landfill would be needed to meet elevated water demands in March-October. It may be possible to purchase and transfer water rights from an existing water rights holder in the vicinity. The estimated costs for water rights permitting and water system upgrades at the Roth East site are approximately $1,090,000.
Electrical Power Supply Review	The Moon Pit site will require approximately 9.5 miles of overhead utility line upgrades from the closest three-phase power connection point, near the intersection of Highway 20 and Dodds Rd. Roughly 2.6 miles will consist of upgrading an existing single-phase pole line. New three-phase power lines will need to be extended (overhead or underground) an additional 7 miles to the landfill location, mostly along Highway 20. Easements may be required through BLM property. Discussions with Central Electric Cooperative (CEC) approximated the cost of this upgrade at roughly $2,000,000 with a 50-60 week lead time for material acquisition.	The Roth East site will require approximately 2.3 miles of overhead utility line upgrades from the closest three-phase power connection point, near the intersection of Highway 20 and George Millican Rd. Roughly 1.2 miles will consist of upgrading an existing single-phase overhead line. New three-phase power lines will need to be extended (overhead or underground) an additional 1.1 miles to the landfill location. Easements may be required through private property. Discussions with CEC approximated the cost of this upgrade at roughly $700,000 with a 50-60 week lead time for material acquisition.
Flood Risk Desktop Review	Moon Pit site is not directly within mapped flood hazard areas, but the northern part of the site is near the 100-year floodplain for the Dry River (ephemeral stream). There is a relatively large upstream drainage basin (approx. 3 square miles) that presents an elevated risk of flash flooding from intense thunderstorms and periods of rapid snowmelt. Several existing drainage channels convey this runoff northwest through the site toward Dry River. Climate change may increase flood frequencies and extents, emphasizing the importance of further study and mitigation strategies, including conservatively sized perimeter ditches.	The Roth East site is not directly within mapped flood hazard areas. There is an upstream drainage basin (approx. 1 square mile) that presents a moderate risk of flash flooding from intense thunderstorms and periods of rapid snowmelt. Several channels collect runoff from the northeast slope of Pine Mountain and drain north through the site and discharge to Dry River (ephemeral stream) near Highway 20. The mapped floodplain for the Dry River crosses Highway 20 in several locations, which poses a secondary flood risk to site access. Coordination with state transportation and hazard mitigation agencies is recommended to identify detours and alternate routes in case of disruptions to Highway 20 due to flooding.
Geology/ Hydrogeology Assessment	The Moon Pit site is located within a pre-Holocene fault bounded valley with shallow depth to bedrock, resulting in higher excavation costs. Although generally impermeable, fissures and higher-permeable zones in subsurface volcanic materials could allow vertical migration of fluids to groundwater. Depth to groundwater is well-documented by onsite wells at 850 ft below ground surface (bgs). Onsite well yield is very good and water quality is also very good. Due to the significant aquifer depth and arid conditions generating minimal leachate, the risks of groundwater contamination are low.	The Roth East site is located in the Millican Valley with over 300 ft of unconsolidated alluvial deposits, resulting in lower excavation costs. These deposits are unlikely to provide any significant low permeability zones to retard vertical migration of fluids to groundwater. Estimated groundwater depth at the site is at least 500 ft bgs, based on 9 well logs within 3 miles. The onsite well (Powell Deep 1+ mi SW of development area) has very good quality and yield is better than nearby residential/stock wells. Due to the significant aquifer depth and arid conditions generating minimal leachate, the risks of groundwater contamination are low.

Category	Moon Pit	Roth East
Preliminary Geotechnical Feasibility	The Moon Pit site is situated in an area with an inactive fault-bound depression. Shallow bedrock of differing quality is present, covered by a thin layer (less than 10 feet) of mixed sediments. Blasting will likely be required to excavate bedrock to the desired landfill cell depths. The preliminary geotechnical assessment identified no significant issues related to soil stability or geological risks.	The site is on a fan-shaped deposit of sediment, with around 400 feet of mainly gravel layers. These gravels are usable for operations (daily/intermediate cover) and might be usable for site development, pending further lab testing. Excavation and grading for the landfill are expected to be done using standard equipment. An assumed fault line runs from a nearby mapped fault to the site's northeast corner, but it is considered inactive in recent geological times. The preliminary geotechnical assessment identified no significant issues related to soil stability or geological hazards.
Environmental Assessment Phase I	Moon Pit is an operating quarry and aggregate pit southeast of Bend. This site does not appear on any environmental regulatory databases that indicate a release of hazardous substances or petroleum. A site reconnaissance in November 2023 noted two diesel above-ground storage tanks (ASTs) in use as well as a boneyard containing considerable old heavy equipment, and some noted de minimis staining. A former asphalt plant which operated on the site during the 1990s represents a Recognized Environmental Condition. A limited Phase II Environmental Site Assessment (ESA) involving soil sampling is recommended to delineate shallow soil sampling in the vicinity of the former asphalt plant and other areas of petroleum staining.	The Roth East site consists of approximately 1,700 acres of vacant land east of Millican. A review of historical documents including aerial photographs and topographic maps revealed no environmental concerns. Site reconnaissance identified two likely empty fuel ASTs with no noted soil staining. These portions of the assessment along with an interview with the current property caretaker did not identify any Recognized Environmental Conditions at the site and no further environmental investigation is recommended.
Weather and Air Quality Desktop Review	Due to resolution of weather and air quality information in Central Oregon, the two proposed sites are represented by the same data. Average annual precipitation in the vicinity of the subject properties is less than 12 inches, so leachate generation is expected to be very minimal. Air quality data (from Prineville) indicate PM2.5 and ozone peaks of 518 micrograms per cubic meter (9/12/20) and 39 parts per billion (also 9/12/20) respectively. Both sites have a relatively low risk score for lightning susceptibility. No local (within 3 miles) permitted air quality facilities or sensitive receptors identified. Prevailing winds for the area are from the SE and NW.	Due to resolution of weather and air quality information in Central Oregon, the two proposed sites are represented by the same data. Average annual precipitation in the vicinity of the subject properties is less than 12 inches, so leachate generation is expected to be very minimal. Air quality data (from Prineville) indicate PM2.5 and ozone peaks of 518 micrograms per cubic meter (9/12/20) and 39 parts per billion (also 9/12/20) respectively. Both sites have a relatively low risk score for lightning susceptibility. No local (within 3 miles) permitted air quality facilities or sensitive receptors identified. Prevailing winds for the area are from the SE and NW. Because of the local topography, the Roth East site is more exposed and likely more susceptible to high winds causing operations issues.
Natural Resources Assessment	No water or wetlands were present at the Moon Pit site and endangered species act (ESA) species are unlikely to be impacted by site development. A golden eagle nest is located within 2 miles of the site and site development would result in permanent alteration of habitat which would require compensatory mitigation. The site is located entirely within winter range habitat for mule deer and elk and essential and limited habitat for pronghorn and impacts as a result of the project must be mitigated to achieve “no net loss” and a “net benefit”. In addition, the site development is estimated to impact 7.8 functional acres of greater sage grouse habitat which must be mitigated for and provide a net conservation benefit to sage grouse. The initial cost of mitigation for potential impacts to protected habitat as a result of site development is estimated at $700,000 with up to $800,000 in operations and maintenance costs for mitigation sites over 50 years.	No water or wetlands were present at the Roth East site and ESA species in addition to bald and golden eagles are unlikely to be impacted by site development. However, the site is located entirely within winter range habitat for mule deer and elk and essential and limited habitat for pronghorn and impacts as a result of the project must be mitigated to achieve “no net loss” and a “net benefit”. In addition, the site development is estimated to impact 173.3 functional acres of greater sage grouse habitat which must be mitigated and provide a net conservation benefit to sage grouse. The initial cost of mitigation for potential impacts to protected habitat as a result of site development is estimated at $1,500,000 with up to $2,500,000 in operations and maintenance costs for mitigation sites over 50 years.
Archaeology and Cultural Heritage Assessment	Much of the Moon Pit site is developed and/or disturbed by gravel mining. As a result, the potential for archaeological resources is lower than for the Roth East site. A formal survey of the undisturbed areas is recommended to identify archaeological resources. Resources will need State Historic Preservation Office (SHPO) permits and evaluative site testing. Overall, less resources will require less time and cost for review, permitting, and field investigations.	Roth East is largely undeveloped, which means there is potential for more archaeological resources. A formal archaeological survey is recommended to identify those resources. Resources will need SHPO permits and evaluative site testing. Overall, more resources will require more time and cost for review, permitting, and field investigations, and potentially mitigation.
Community Assessment	Of the two sites, development of Moon Pit is generally viewed as having fewer visual and residential impacts. Because the site is currently used as a gravel mine, there is a perception that use as a landfill would pose minimal new impacts. Public comments about Moon Pit note concerns about potential historical or cultural loss due to proximity to a Native American petroglyph site. Comments also note potential disruption to recreation in the adjacent Badlands Wilderness Area. Similar to the Roth East site, there are concerns about potential impacts to habitat and area wildlife.	Of the two sites, development of Roth East is generally viewed as having more visual and residential impacts. Public comments about the Roth East site note concerns about potential impacts to Millican Valley landowners, area recreation, and the Pine Mountain Observatory. Specifically, the potential for high winds to spread debris and dust and concerns about contamination of local groundwater have been noted. Similar to the Moon Pit site, there are concerns about potential impacts to habitat and area wildlife.
Cost Analysis	Initial development costs are estimated at $50-$64 million, which includes $15.4-$15.9 million for land acquisition. Landfill cell development costs are estimated at $705,000-$1,075,000 per acre. Annual operating costs are estimated at $7.6 million per year, which includes $2.5 million/year for waste hauling. The estimated average cost per ton is $43-$48, to dispose of roughly 38 million tons over a 100-year lifespan. The cost estimate ranges presented here depend on the extent and cost of cell excavation that could occur as a part of aggregate mining operations onsite. There is greater upside potential for the Moon Pit site due to opportunities for more aggregate mining during landfill operations. Initial capital costs are significantly higher at Moon Pit, which will necessitate higher tip fees for the first 20 years.	Initial development costs are estimated at $36 million, which includes $5.5 Million for land acquisition. Landfill cell development costs are estimated at $393,000 per acre. Annual operating costs are estimated at $8.4 million/year, which includes $3.3 million/year for waste hauling. The estimated average cost per ton is $44.50, to dispose of roughly 46 million tons over a 113-year lifespan. While the Roth East site is offered at a lower acquisition price and will have lower cell excavation costs, the additional operational costs for further waste hauling are projected to drive total cumulative costs beyond that of Moon Pit around year 83 of operations (circa 2112).

Solid Waste Management Facility Siting Study

Solid Waste Advisory Committee (SWAC) Meeting

February 20, 2024




Agenda

1. Welcome
2. Review/ Approve October Meeting Minutes
3. Public Comment
4. Final Site Evaluation Preliminary Findings
5. SWAC Discussion
6. Adjourn

Steps to SWAC recommendation

February 2024:
Site Evaluation Findings Overview and Discussion

Introduction and overview for the SWAC to the Site Evaluation Report findings.

March 2024:
Site Evaluation Report Review and Discussion

Opportunity for the SWAC to discuss and provide input on the full Site Evaluation Report.

April 2024:
Finalist SWMF Site Recommendation

The SWAC will vote on recommendation to the BOCC for a preferred SWMF location.

Public Comments

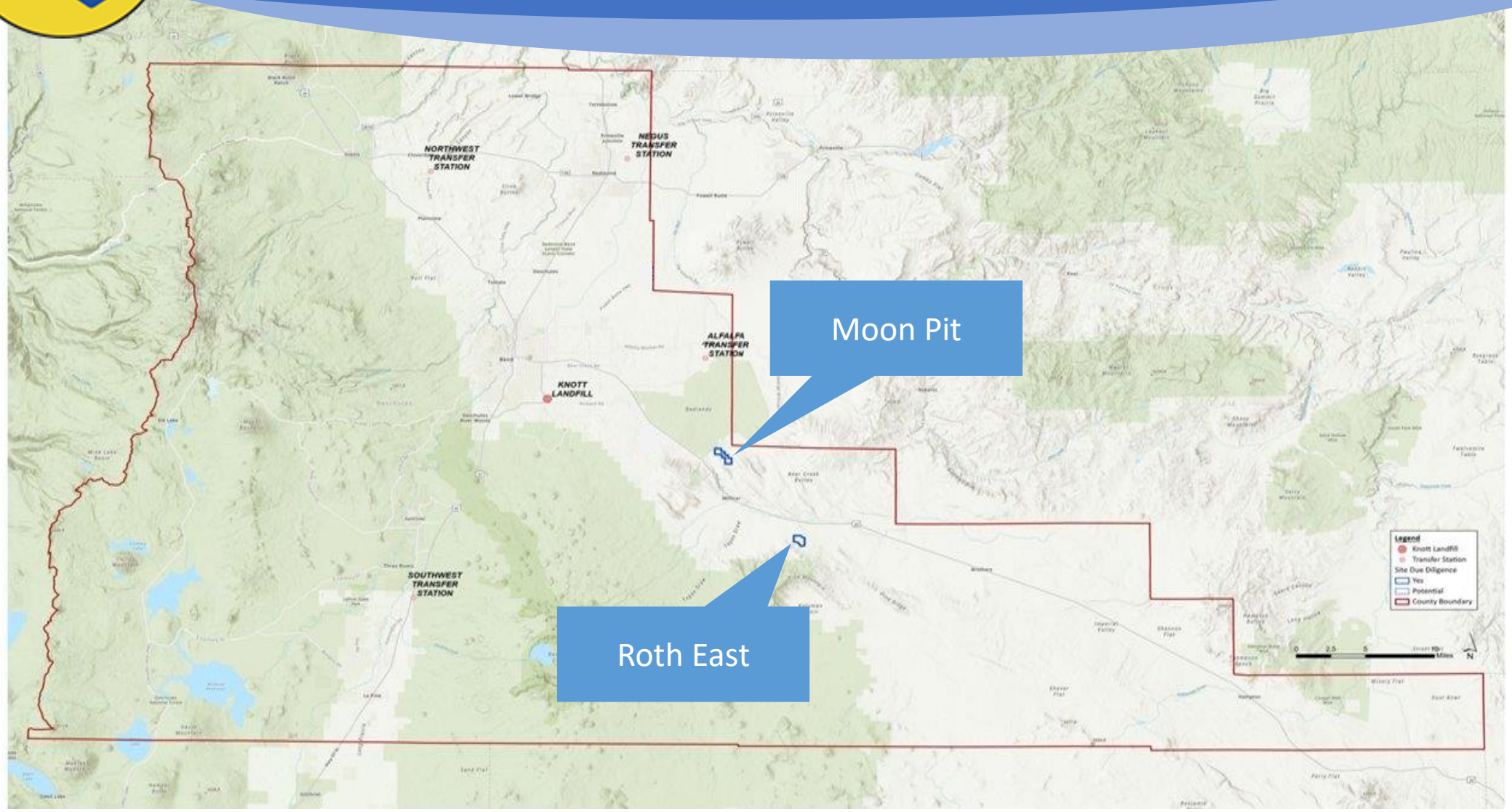
Public Comments

3 minutes per person
Based on number of people wishing to comment

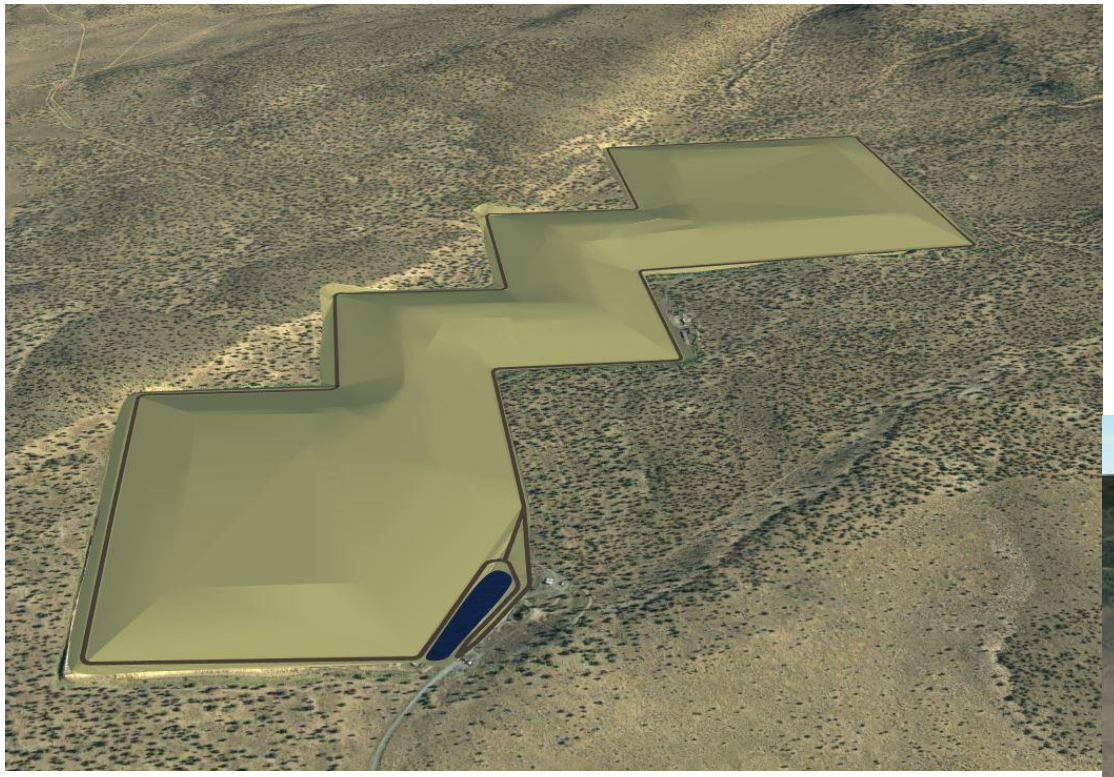
Written comments can also be sent to:
managethefuture@deschutescounty.gov

Final Site Evaluations: Preliminary Findings

Finalist Site Evaluation Overview

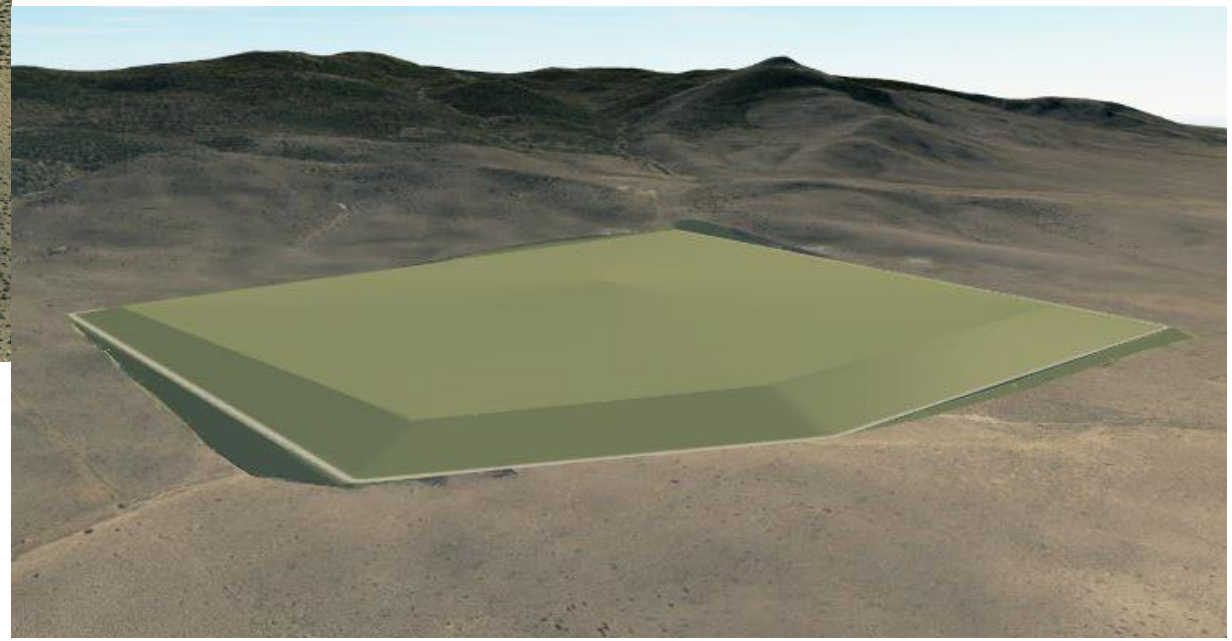


CONCEPTUAL MASTER PLAN

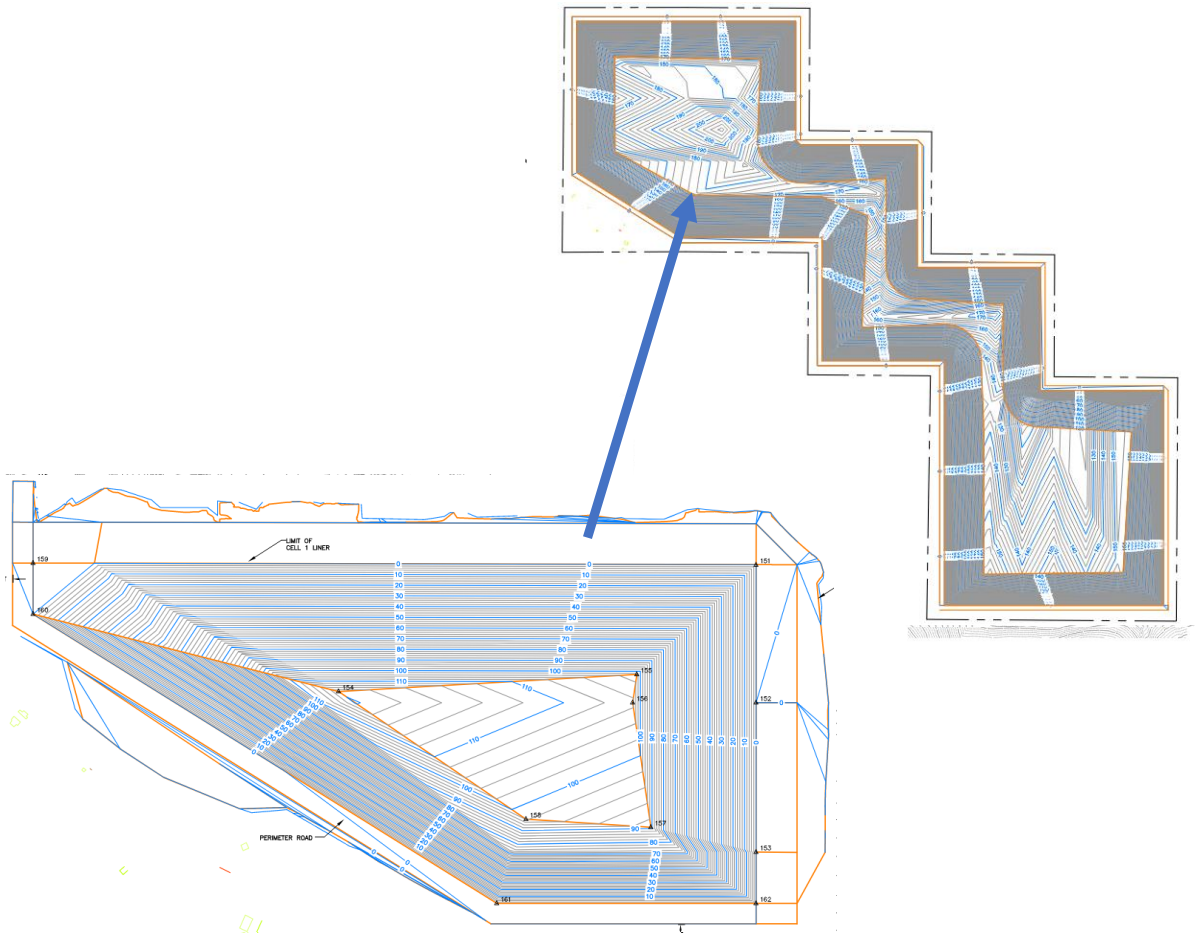


MOON PIT
SITE RENDERING

ROTH EAST
SITE RENDERING



CONCEPTUAL MASTER PLAN



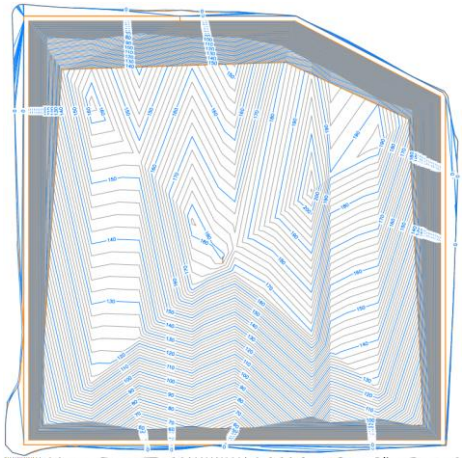
Moon Pit

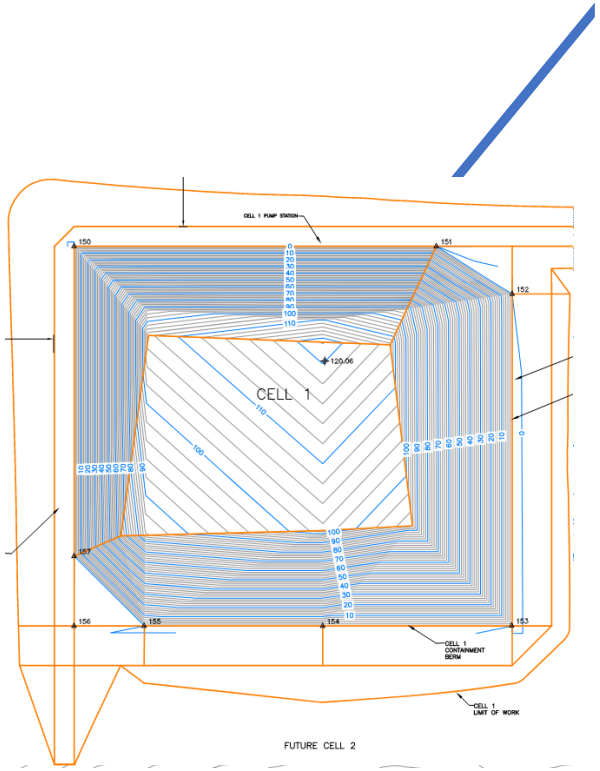
- Challenges: Unfavorable geometry and rocky conditions
- Disposal Area: 346 acres
- Available airspace: 64,000,000 cubic yards

LANDFILL PHASING SUMMARY – MOON PIT			
PHASE	AIR SPACE AVAILABLE	PROJECTED LIFE	FILL PERIOD
PHASE 1	26,000,000 CY	41 YEARS	2029-2070
PHASE 2	17,000,000 CY	26 YEARS	2070-2096
PHASE 3	21,000,000 CY	33 YEARS	2096-2129
TOTAL	64,000,000 CY	100 YEARS	

Parametrix

CONCEPTUAL MASTER PLAN





Roth East

- Advantages: Favorable square geometry and suitable soil
- Disposal Area: 387 acres
- Available airspace: 80,000,000 cubic yards

LANDFILL PHASING SUMMARY – ROTH EAST			
PHASE	AIR SPACE AVAILABLE	PROJECTED LIFE	FILL PERIOD
PHASE 1	21,000,000 CY	33 YEARS	2029-2062
PHASE 2	17,000,000 CY	27 YEARS	2062-2089
PHASE 3	22,000,000 CY	30 YEARS	2089-2119
PHASE 4	20,000,000 CY	23 YEARS	2119-2142
TOTAL	80,000,000 CY	113 YEARS	

Parametrix

SITE ZONING

Moon Pit

- Surface Mining (SM) base zone, with the following overlays:
  - Wildlife Area (WA) combining zone
  - Surface Mining Impact Area (SMIA) combining zone
- Current use: active surface mine
- Surrounding Area
  - Oregon Badlands Wilderness and associated trails/trailheads
  - Public lands

Roth East

- Exclusive Farm Use Horse Ridge (EFUHR) base zone, with the following overlays:
  - Landscape Management (LM) combining zone
  - Sage Grouse Habitat Area – Low Density (SGHA-LOW)
  - Surface Mining Impact Area (SMIA)
  - Wildlife Area Combining Zone (WA)
- Current use: rural undeveloped/grazing
- Surrounding Area:
  - Rural residential properties
  - Millican Valley OHV trails
  - Deschutes National Forest and Pine Mountain Observatory (astronomical observatory)

Parametrix

SITE DEVELOPMENT/PERMITTING

Moon Pit

- Three potential options for landfill use:
  - (1) Rezone from SM to MUA10 (Multiple Use Agriculture 10-Acre Minimum
    - Requires showing the protected mineral resource has been exhausted
  - (2) Text amendment in the Deschutes Comprehensive Plan to allow the landfill use as a reclamation plan
    - Requires Coordination with DOGAMI and DLCD
    - Maintains SM zone and SMIA combining zone
    - Requires two separate hearings – hearings officer first followed by Board of Commissioners
  - (3) Create Landfill Overlay for Site
    - Requires text amendment to county code and adoption of overlay to site.
    - County Planning: Overlay should have happened before the siting process and overlays are used to limit uses on properties
- Permits:
  - County Conditional Use Permit
  - County Site Plan Review
  - BLM Environmental Assessment (EA) or Environmental Impact Statement (EIS)
    - may be required for new or assigned BLM ROW for use of access road
  - Natural Resource Permits
  - Oregon DEQ Solid Waste Disposal Permit
  - DOGAMI Permit

Roth East

- Landfill use is a conditional use under EFU zoning
  - For any non-farm use, a Farm Impact Test is required on EFU properties
    - Could lead to LUBA appeals
- Permits:
  - County Conditional Use Permit
  - County Site Plan Review
  - County Landscape Management Review
  - Natural Resource Permits
  - Oregon DEQ Solid Waste Disposal Permit

Parametrix

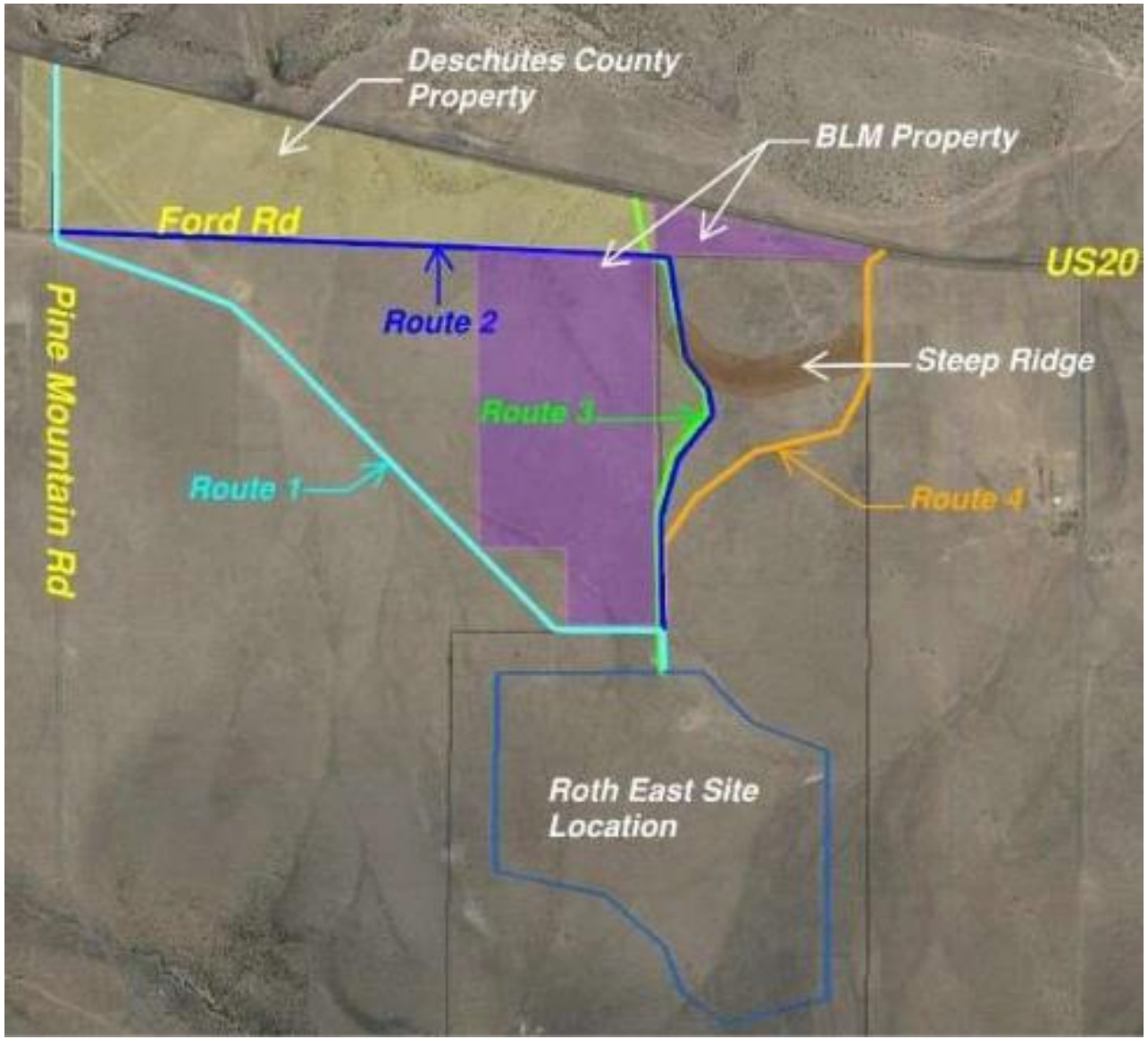
TRANSPORTATION – MOON PIT SITE

- 7 employee trips + 35 truck trips per day
- Established site access currently used by heavy vehicles for quarry operations (~1.2 miles long). Currently ~20 mining truck round trips per day, on average.
- Shared access with Badlands
- Current ROW along access road is 30’ wide (28’ wide road) through BLM lands. A NEPA process would be required if additional ROW is needed.
- Enhanced acceleration lane onto US 20 may be beneficial

Parametrix

TRANSPORTATION – ROTH SITE

- 7 employee trips + 35 truck trips per day
- Several options for preferred access route to site
- Routes range from:
  - 1.2 – 2.9 miles
  - ~$1.2M - $2.90M to construct
  - Relatively flat, with areas to up to 8-10% grade
- Alternate access points to the east would need to consider available sight distance at US 20.



WATER INFRASTRUCTURE ASSESSMENT – MOON PIT

- Two water supply wells (Wells A and B) located ~186 feet apart near the site's west entrance road.
- Well depths: 931 ft bgs (Well A) and 1135 ft bgs (Well B) with static water level around 851 feet.
- Well A is not in use; Well B is in use, capable of producing 1,000 gpm.
- Well B has water right permit (G-12860) with priority date of 5/16/1994, for dust control and gravel washing with max use rates of 174,505 gpd and 529,978 gpd.
- Beneficial use area encompasses site tax lot boundary.

WATER INFRASTRUCTURE ASSESSMENT – ROTH EAST

- A water supply well (the Powell or Deep Well) located near the southwest corner of the site tax lot ~1.1 miles SW of the proposed development area.
- The Deep Well is 995 ft deep with static water level of 970 feet based on a well completion measurement.
- The Deep Well is currently used to supply a residence and stock watering (reportedly ~ 1 water truck per day). The 1990 well report indicates well was able to produce 50 gpm with no drawdown.
- The are no water rights appurtenant to the Deep Well or the site tax lot. The closest water right is ~2 miles east of the site.
- Several wells identified in the northern area of the site with one possibly located on tax lot. Depth to groundwater and productivity appears to vary.

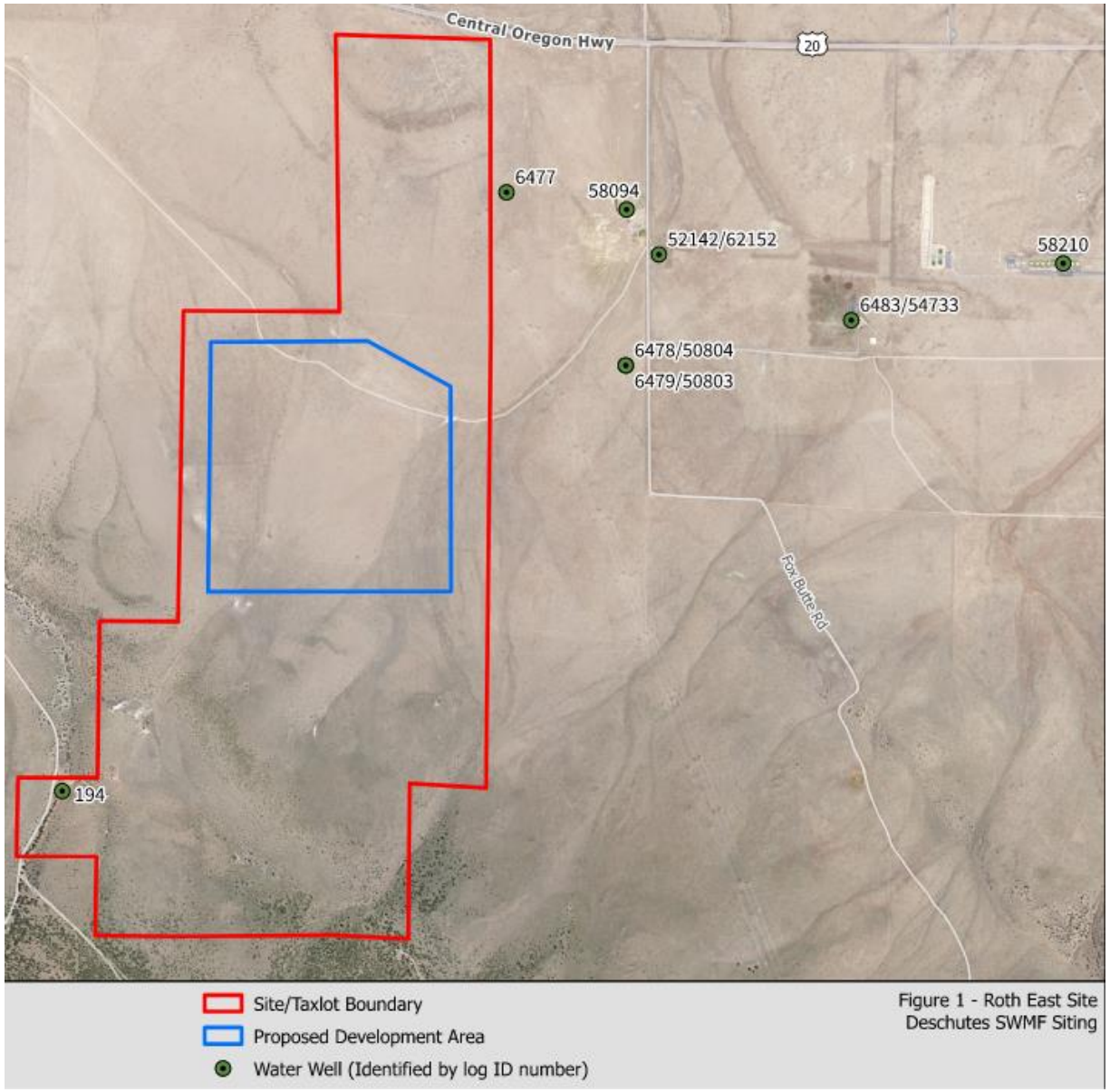
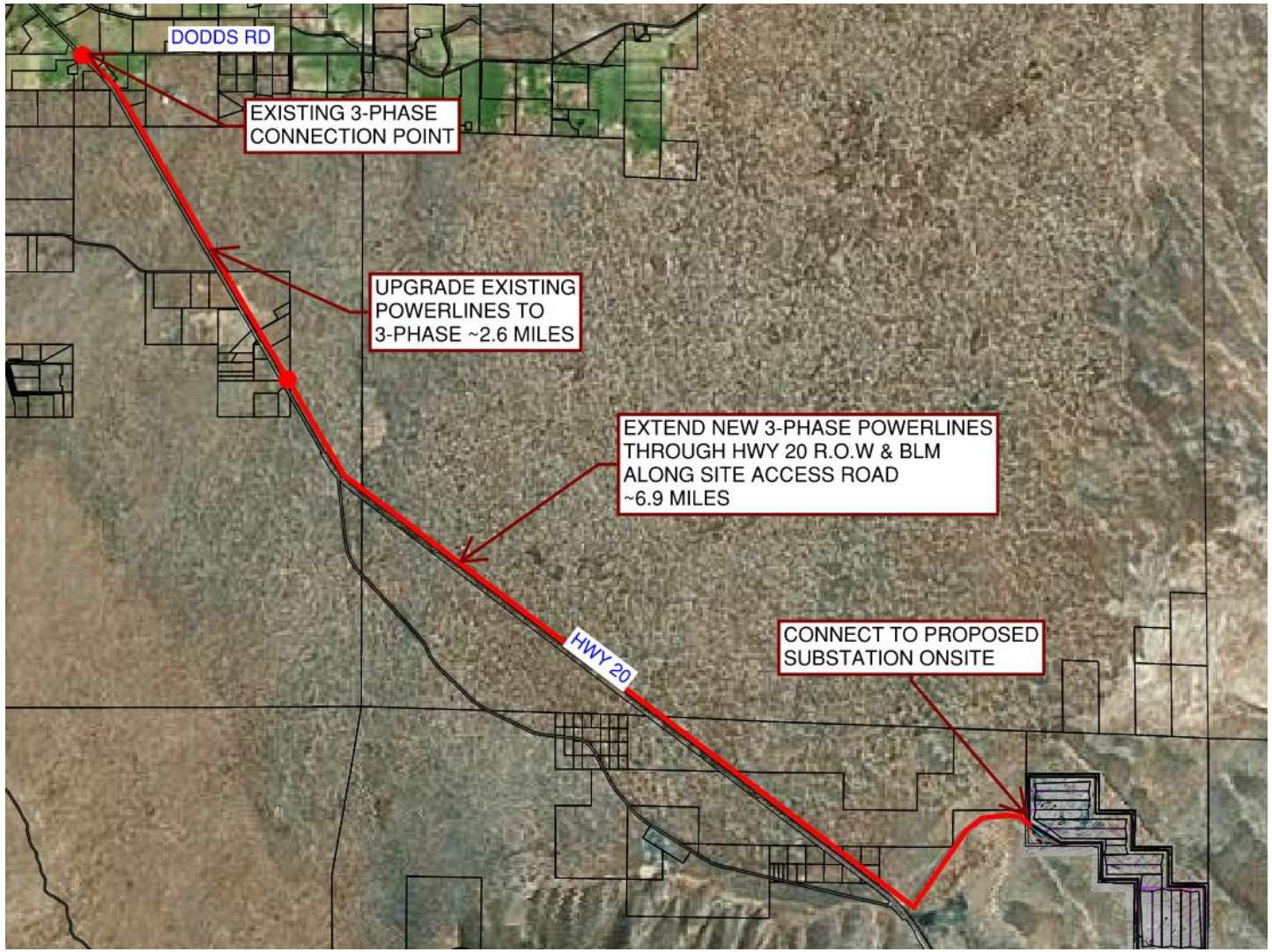


Figure 1 - Roth East Site
Deschutes SWMF Siting

ELECTRICAL– MOON PIT



Electrical Requirements

- 3-phase electrical connection
- Capacity for up to 5 MW power generation
- Onsite substation

Power Infrastructure Needs:

Extension of 3-phase power ~9.5 miles from existing overhead power lines

*easements required through BLM property

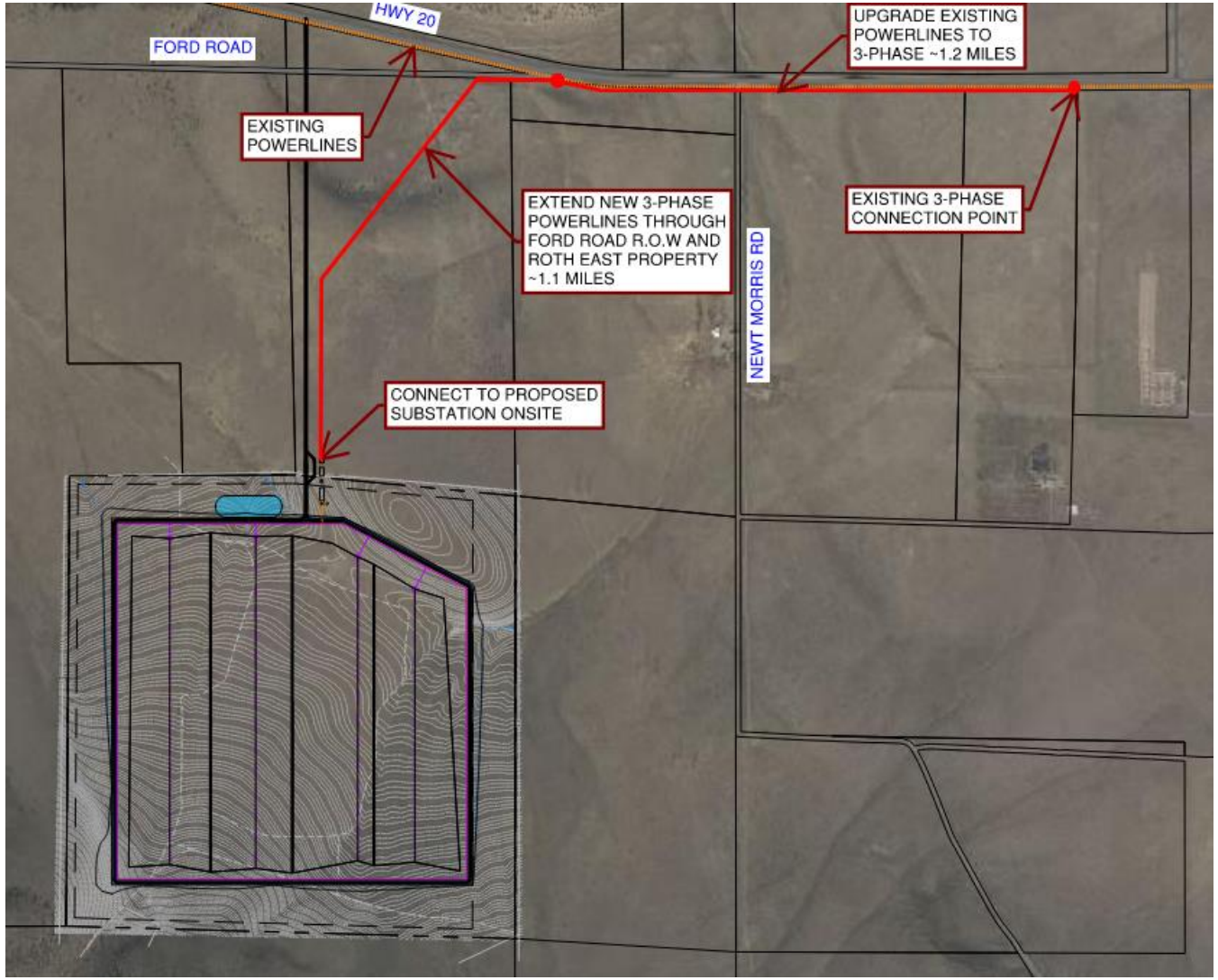
*50-60 week lead time for materials

Estimate of Probable Cost : (verified with CEC)

~$2,000,000

Parametrix

ELECTRICAL– ROTH EAST



Electrical Requirements

- 3-phase electrical connection
- Capacity for up to 5 MW power generation
- Onsite substation

Power Infrastructure Needs:

Extension of 3-phase power ~2.3 miles from existing overhead power lines

*easements required through private property for extensions

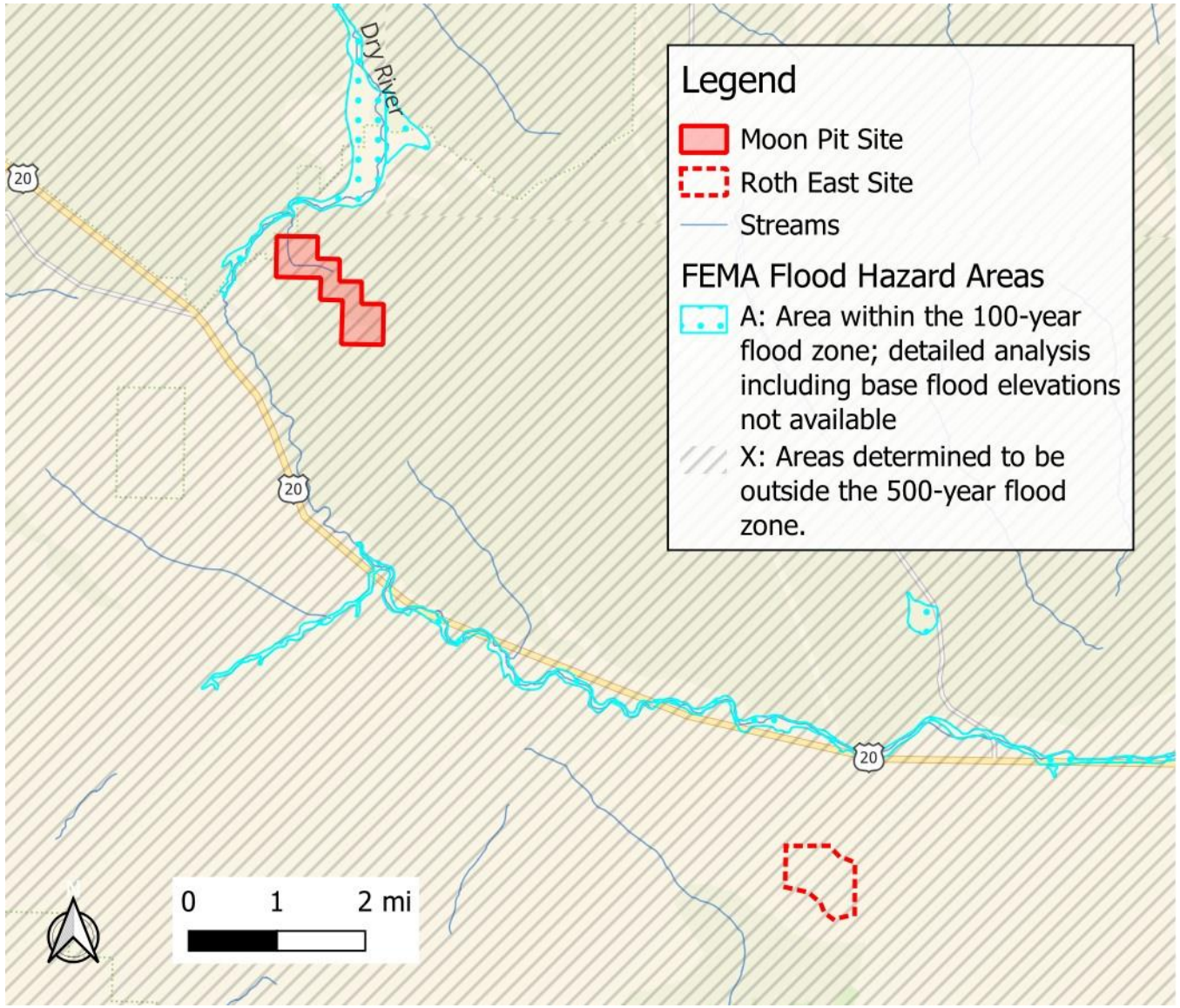
*50-60 week lead time for materials

Estimate of Probable Cost: (verified with CEC)

~$700,000

Parametrix

FLOOD RISK DESKTOP ASSESSMENT

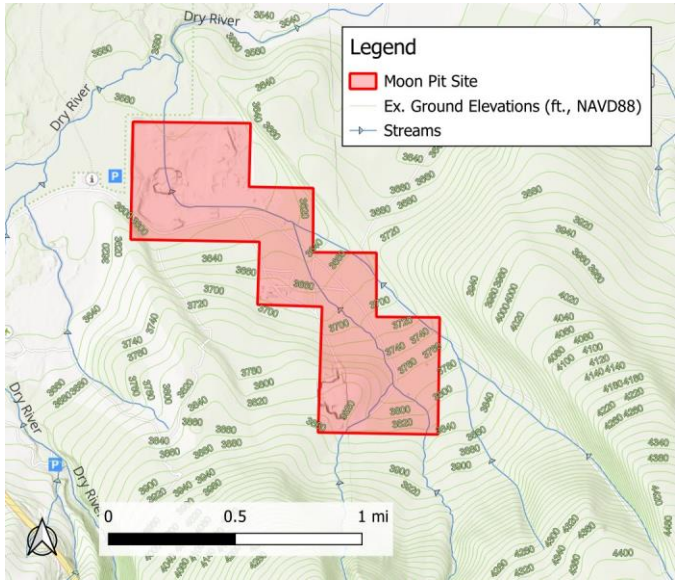


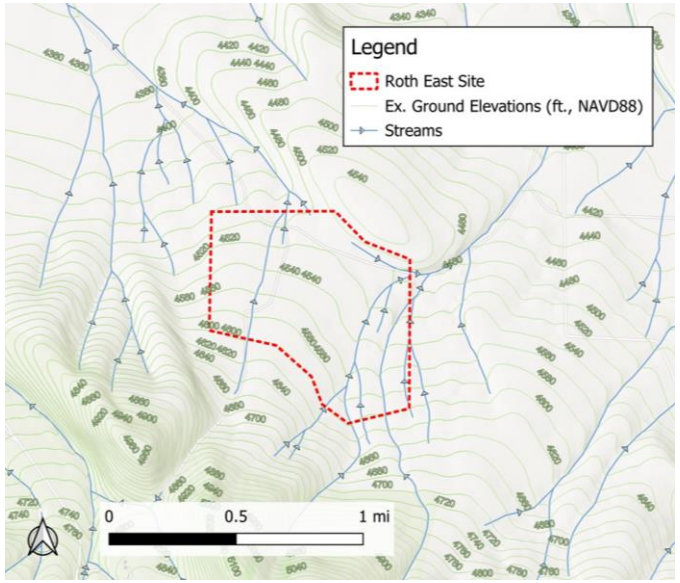
Floodplain Mapping

- Moon Pit site is 800 feet from 100-year floodplain
  - Flood Zone is "approximate" with detailed analysis unavailable
- Roth East site is not near floodplain
- Highway 20 is within the floodplain

Parametrix

FLOOD RISK DESKTOP ASSESSMENT





Moon Pit Site

- Characterized by flat topography near Dry River
- Bisected by mapped stream channel
- Significant upgradient, high slope drainage area

Roth East Site

- Contains mapped stream channels
- Drains a smaller but still high slope drainage area

Conclusion: There are manageable risks of flash flooding at both sites, slightly higher at Moon Pit

Parametrix

GEOLOGY/GROUNDWATER –MOON PIT

- Shallow Depth to Bedrock
- Located within Fault-bounded (pre-Holocene) Valley
- Regional GW about 850 ft bgs
- Onsite Well has Very Good Yield
- Water Quality Analysis also Good - Only 1 parameter (dissolved iron) slightly exceeds reference level
- Low risk of groundwater contamination

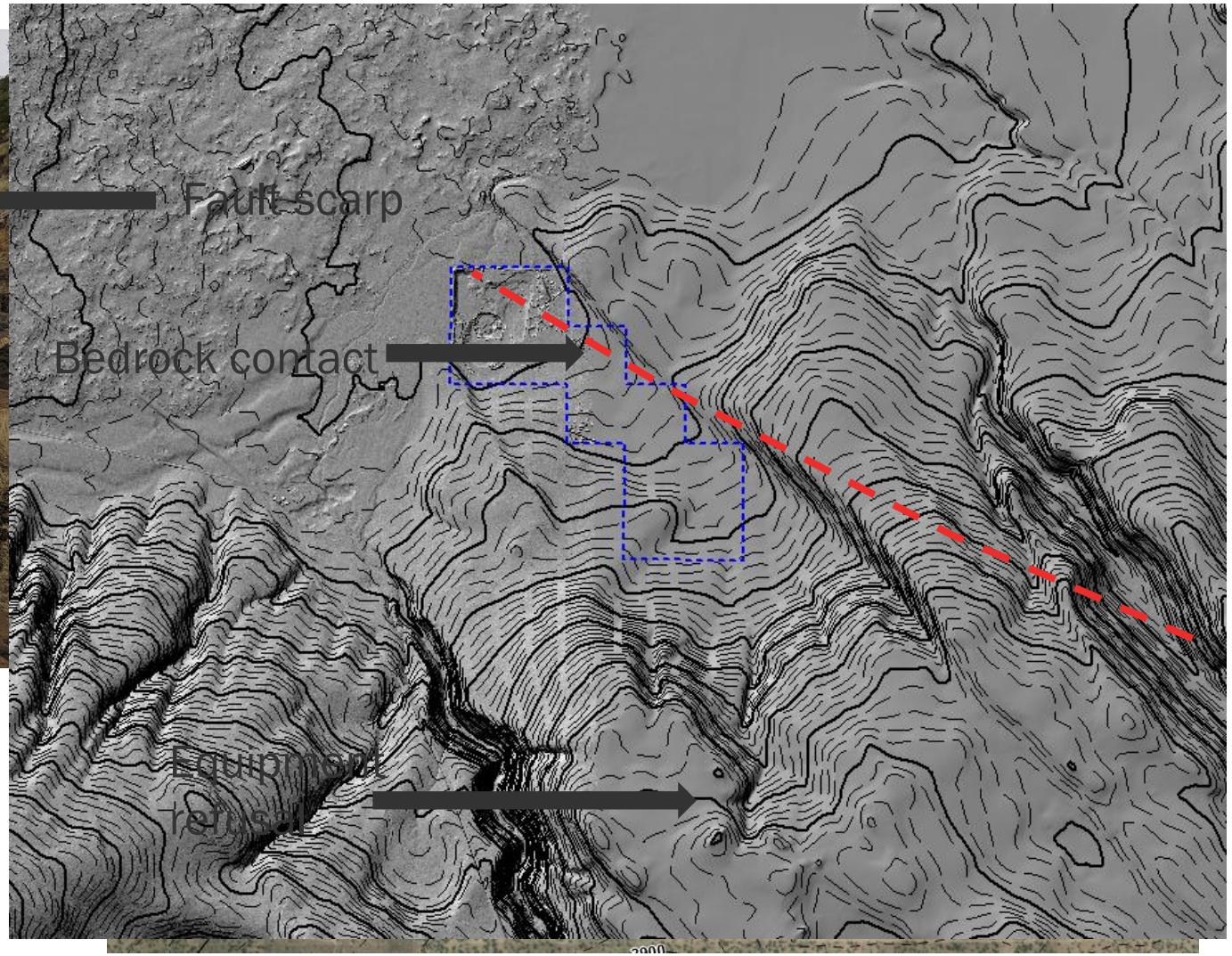
Parametrix

GEOLOGY/GROUNDWATER –ROTH EAST

- 300+ Ft of Alluvial Deposits overlie Bedrock (lots of cover material!)
- Limited Potential for Low Permeability Zones above Bedrock
- Regional GW Expected at 450+ ft
- Uncertainty if a shallower aquifer extends under site
- GW Quality of onsite well (Powell Deep Well 1+ mi SW of site) is Very Good
- Yield of Regional Aquifer is not fully known (Onsite well - 50 gpm)

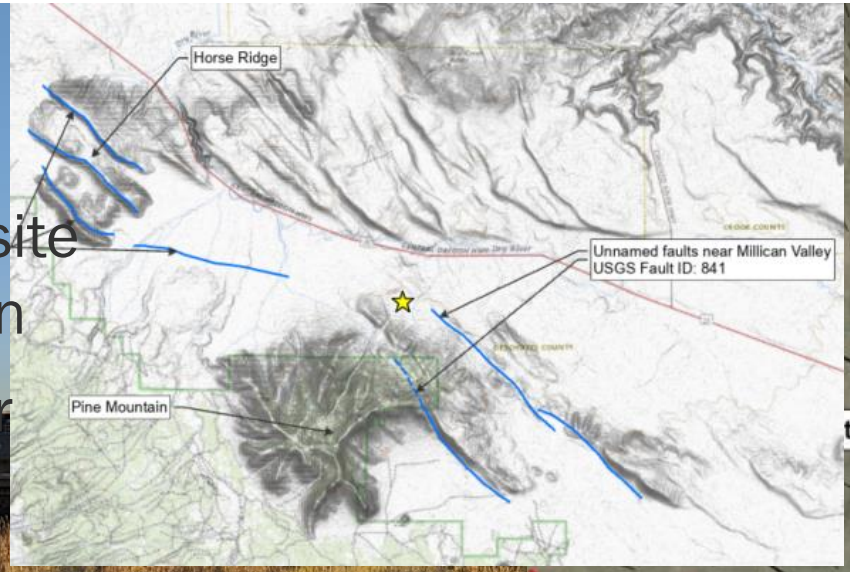
DELVE UNDERGROUND: PRELIMINARY GEOTECHNICAL ENGINEERING – MOON PIT

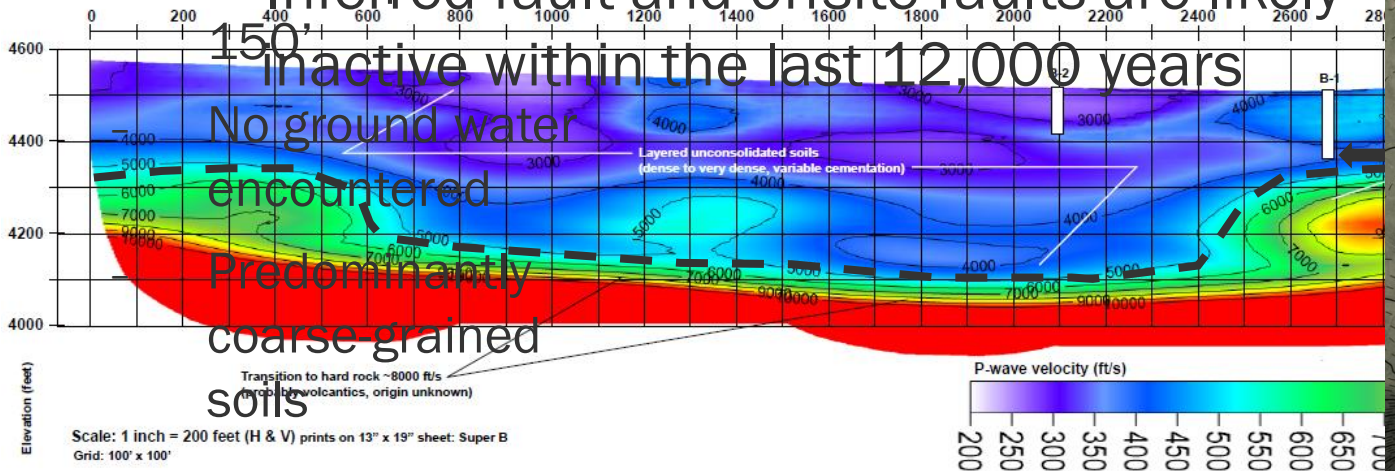
- Shallow bedrock conditions are persistent throughout the site
- 12 test pits excavated
- Blasting will be required
- Shallow bedrock excavations will persist through the site



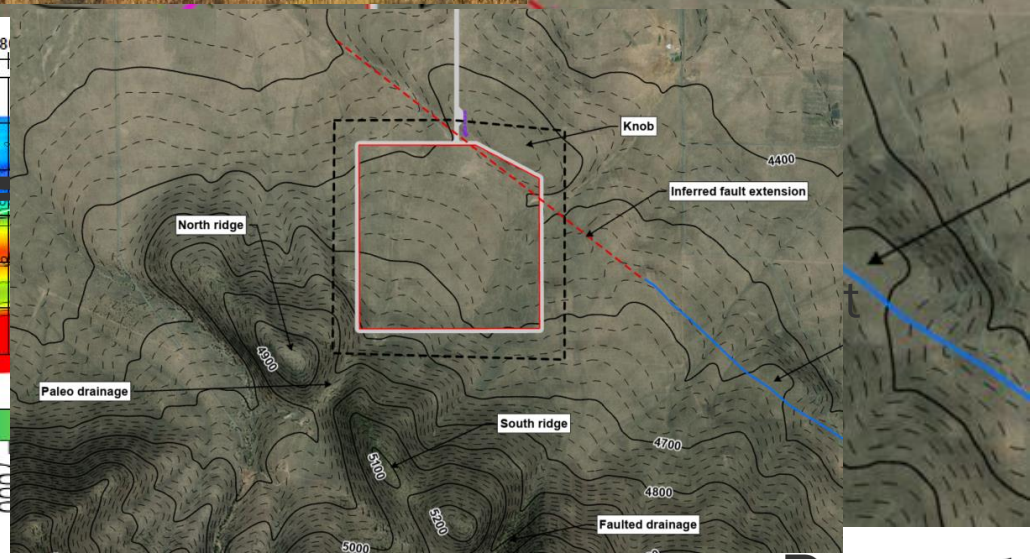
DELVE UNDERGROUND: PRELIMINARY GEOTECHNICAL ENGINEERING –ROTH EAST

- Site is underlain by approximately 400-feet of sediments consisting of an alluvial fan
  - Approximately 400-feet of sediments underlying the site; primarily gravels
- Two geophysical profiles
  - Compressional and shear wave velocity profiles
- Three geotechnical borings
  - Conventional excavation and mass grading equipment is anticipated for development pending further investigation
  - Total depth 100’ – 150’
  - No ground water encountered
  - Predominantly coarse-grained soils





- Inferred fault and offsite faults are likely inactive within the last 12,000 years



DELVE underground

Parametrix

PHASE I ENVIRONMENTAL SITE ASSESSMENT – MOON PIT

- Gravel mining operation began in 1994, prior land use was cattle ranch.
- Asphalt plant operated on the subject property briefly in the 90s during work on Highway 20; some waste asphalt still located on the property.
- Listed on Oregon DEQ Environmental Cleanup Site Information database, for tracking purposes only. No documented releases.
- Boneyard and diesel ASTs (in use) located on the property; some surface staining noted (de minimis).
- Original ranch house dates from the 1980s and could contain hazardous building materials.
- No Recognized Environmental Conditions (as defined by ASTM 1527-21) and no further environmental investigation recommended.

PHASE I ENVIRONMENTAL SITE ASSESSMENT – ROTH EAST

- Only prior land use is as a cattle ranch.
- Lower portion of parcel where landfill would be sited is undeveloped aside from dirt roads.
- Site is not listed in any environmental databases.
- Two fuel ASTs are located on the upper portion of the subject property in proximity to other ranch related infrastructure. No staining or other indications of contamination.
- Existing ranch house dates from the 1990s and is unlikely to contain hazardous building materials.
- No Recognized Environmental Conditions (as defined by ASTM 1527-21) and no further environmental investigation recommended.

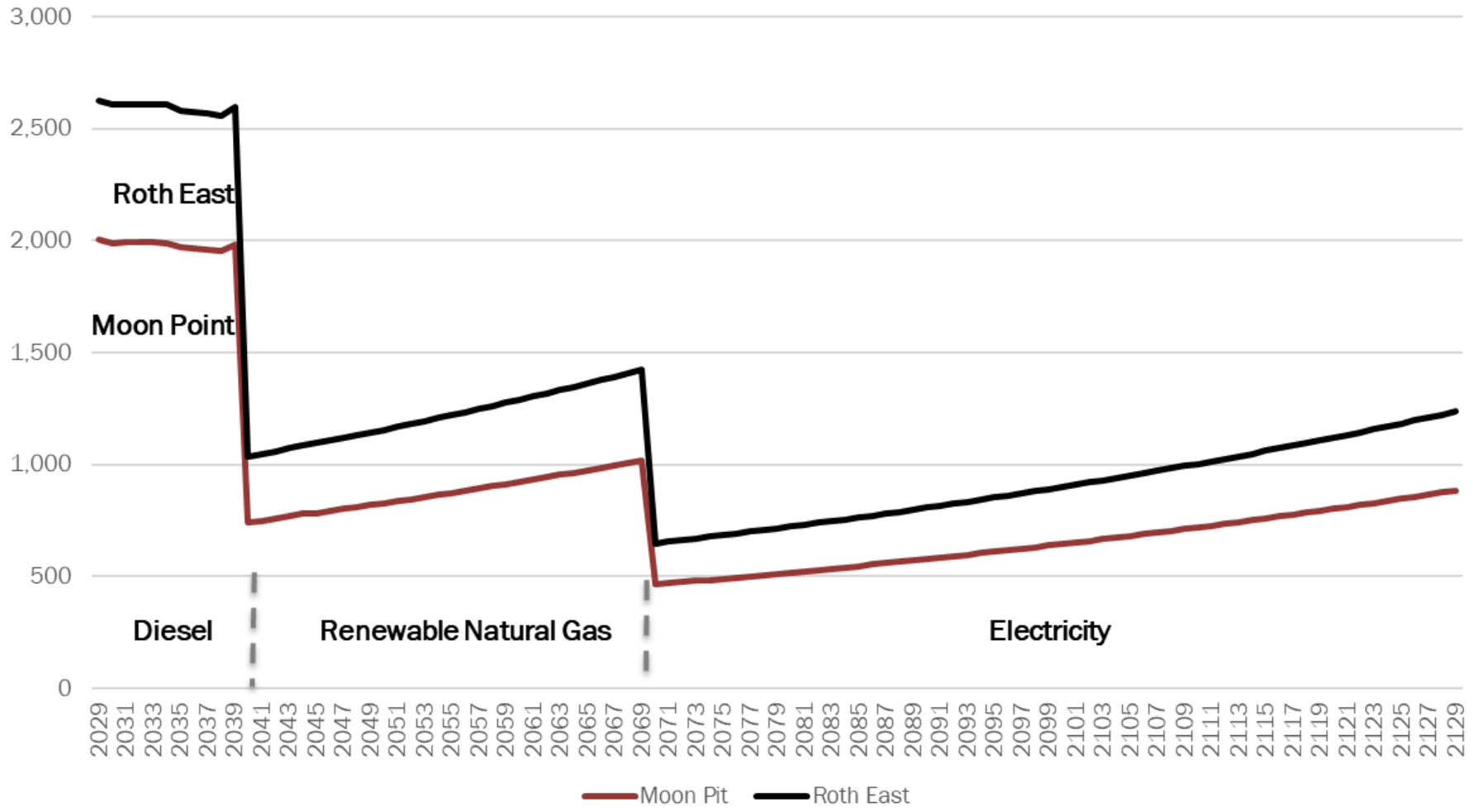
AIR QUALITY AND WEATHER SUMMARY

- Prevailing winds are from SSE and NW (Redmond Airport).
- Average annual precipitation of less than 12 inches (Bend), more than half falls between November and February.
- The vicinity of the subject property has a risk score for lightning susceptibility of 20.7 (relatively low).
- Air quality data from Prineville indicates PM2.5 and ozone peaks of 518 micrograms per cubic meter (9/12/20) and 39 parts per billion (also 9/12/20) respectively (related to the Labor Day fires of 2020).
- No local (within 3 miles) permitted air quality facilities or sensitive receptors identified.
- Because of the local topography, the Roth East site is more exposed and likely more susceptible to high winds causing operations issues.

Parametrix

AIR QUALITY AND WEATHER SUMMARY

Waste Hauling Greenhouse Gas Emissions Profiles by Landfill Location and Energy Source



Parametrix

NATURAL RESOURCE ASSESSMENT

Roth East

309.3 acres intact sage brush steppe

Moon Pit

177.8 acres disturbed juniper woodland

Resources

- No waters or jurisdictional wetland on Roth East or Moon Pit sites
- No ESA-listed species are likely to occur on Roth East or Moon Pit sites
- Golden eagle nest within 2 miles of Moon Pit
  - USFWS Incidental Take Permit
- Wildlife Combining Zone:
  - Both sites are in a wildlife combining zone (County).
  - No mitigation requirements for this designation; to be addressed with land use permitting

Parametrix

NATURAL RESOURCE ASSESSMENT

Big Game Category 2 Habitat

- The Big 3: Elk, Mule, and Pronghorn
- Mitigation: Land acquisition for conservation and enhancement
    - Similar costs between sites

Sage-grouse Habitat

Mitigation:

- In-lieu fee, mitigation bank
- Permittee-responsible: Land acquisition or conservation agreement
    - Moon Pit: 10–26 acres
    - Roth East: 221–560 acres

Parametrix

CULTURAL RESOURCES – MOON PIT

Reconnaissance Survey Results

- Surveyed 100 of the approximately 560 project acres.
- Identified 5 archaeological resources – 3 precontact sites and 2 historic isolates.
- All areas not impacted by mining/quarry activities have a moderate to high probability for archaeological resources.
- However, since much of the area is disturbed by mining/quarry activities, the potential for archaeological resources is reduced.

Recommendations

- Conduct formal systematic survey of all areas not directly impacted by mining/quarry activities to identify archaeological resources.
- If a resource will be impacted by the project, the resource's significance must be formally evaluated under Oregon state law. Evaluation will require an Oregon SHPO archaeological permit.

Considerations for Timeline

- SHPO permits take 30 days to process.
- If a resource is determined significant, it must be avoided or mitigated.
- SHPO review and SHPO concurrence take time.

Parametrix

CULTURAL RESOURCES – ROTH EAST

Reconnaissance Survey Results

- Surveyed 128 of the approximately 645 project acres.
- Identified 12 archaeological resources – 6 sites and 6 isolates, majority precontact.
- Entire Roth East parcel has a high probability for archaeological resources.
- Roth East is largely undisturbed, therefore the potential for discovery of intact archaeological resources is great.

Recommendations

- Conduct formal systematic archaeological survey of the entire project area.
- If a resource will be impacted by the project, the resource's significance must be formally evaluated under Oregon state law. Evaluation will require an Oregon SHPO archaeological permit.

Considerations for Timeline

- SHPO permits take 30 days to process.
- If a resource is determined significant, it must be avoided or mitigated.
- SHPO review and SHPO concurrence take time.

Parametrix

COMMUNITY CONSIDERATIONS – MOON PIT

Interested Parties

- Recreation users, including hikers and bikers
- Badlands Wilderness, Bureau of Land Management
- Additional environment, wildlife, and other interests

Concerns & Opportunities

Expressed concerns:

- Traffic and shared access safety
- Disruption to habitat and wildlife

Expressed opportunities:

- Less populated area of County
- Buffered by public lands, potential visual screening from topography
- Comparatively less change from current use, potential for reclamation

Parametrix

COMMUNITY CONSIDERATIONS – ROTH EAST

Interested Parties

- Millican Valley residents
- Pine Mountain Observatory and University of Oregon
- Recreation users, especially paragliders, bikers, hikers, OHV
- Additional environment, wildlife, and other interests

Concerns & Opportunities

Expressed concerns:

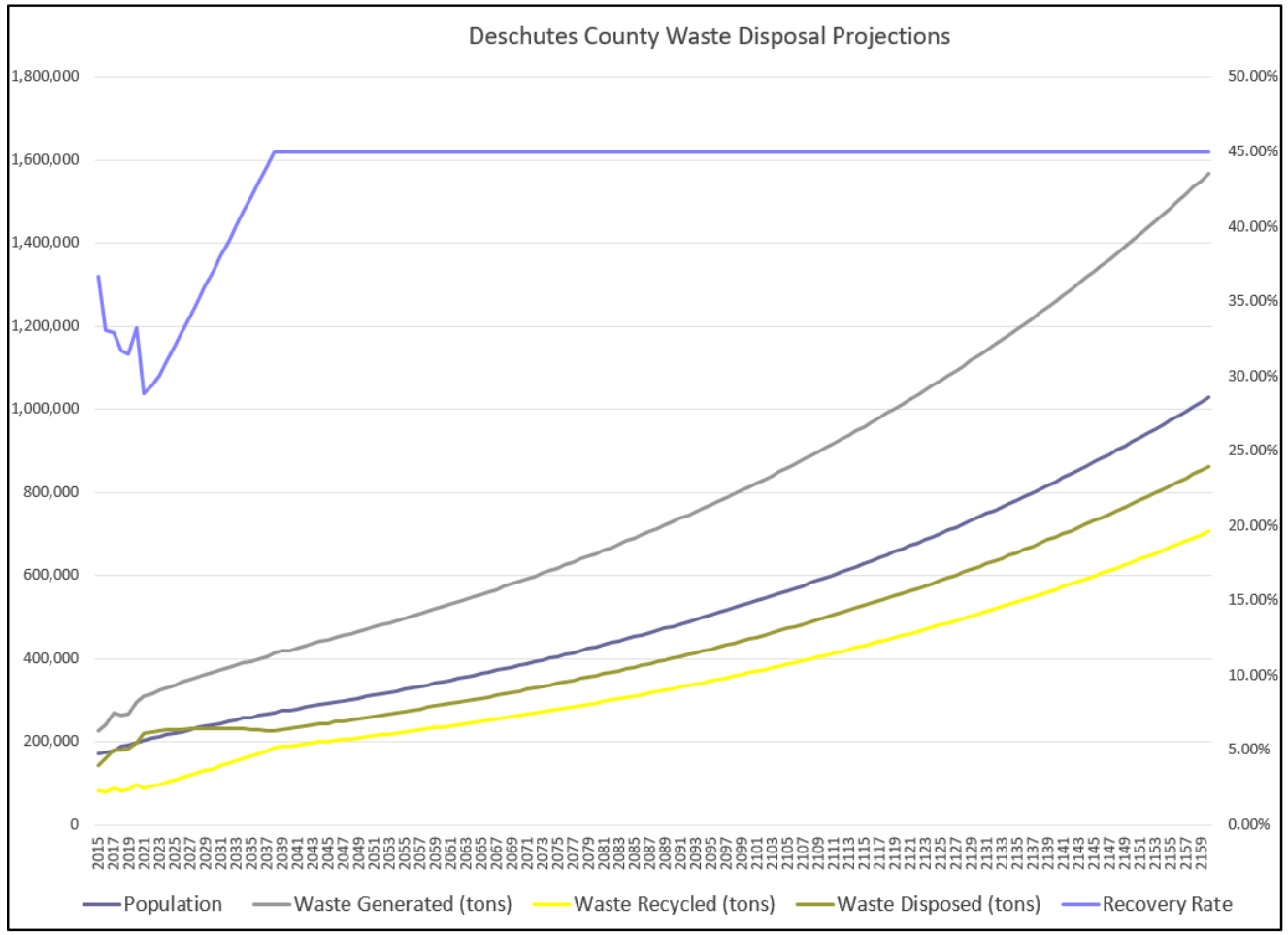
- Dust, litter, odor + wind
- Groundwater contamination
- Potential cultural artifacts/sites
- Disruption to habitat and wildlife

Expressed opportunities:

- Less populated area of County
- Use of adjacent property for mitigation

Parametrix

COST ESTIMATES



Sources:

- Deschutes County Solid Waste Management Plan (2019)
- PSU 2020 Annual Population Report Tables (for 2018-2019 population)
- Coordinated Population Forecast for Deschutes County (2022-2072) by Portland State University Population Research Center
- 2018-2021 Material Recovery and Waste Generation Rates Report
- 2022 Knott Landfill Tonnage Analysis provided by DCSW

Assumptions:

- Continuation of 1.1% Average Annual Growth Rate (AAGR) from 2072
- Recovery Rate will increase from 29% in 2022 at a rate of 1% per year, up to 45% in 2038, and then remain at 45%
- Current (2021) Per capita waste generation of 3,050 lbs/capita will remain steady through planning period

Parametrix

COST ESTIMATES

	MOON PIT	ROTH EAST
INITIAL SITE ACQUISITION COST	$15,370,000-$15,870,000	$5,500,000
INITIAL DEVELOPMENT COST	$50-$64 M (2024-2029)	$36 M (2024-2029)
CELL DEVELOPMENT COST PER ACRE	$705,000-$1,075,000/acre	$393,000/acre
OPERATIONAL COST	$7.6 M/ year	$8.4 M/year
ANNUAL HAUL COST	$2.5 M/year	$3.3 M/year
Avg Cost/Ton (over lifespan)	$43-48/ton	$45/ton

Assumptions:

- Landfill density – 1400 lbs per cubic yard air space consumed
- Cover to Refuse airspace Ratio – 20%
- Two thirds of cell excavation would occur as a part of daily cover borrow operations at Roth East
- 90% of excavation at Moon Pit would require rock drilling, blasting, and processing at a cost of $12/ton by County, or a discounted cost of $4/ton as a part of aggregate mining

Parametrix

Key Findings Summary

Moon Pit

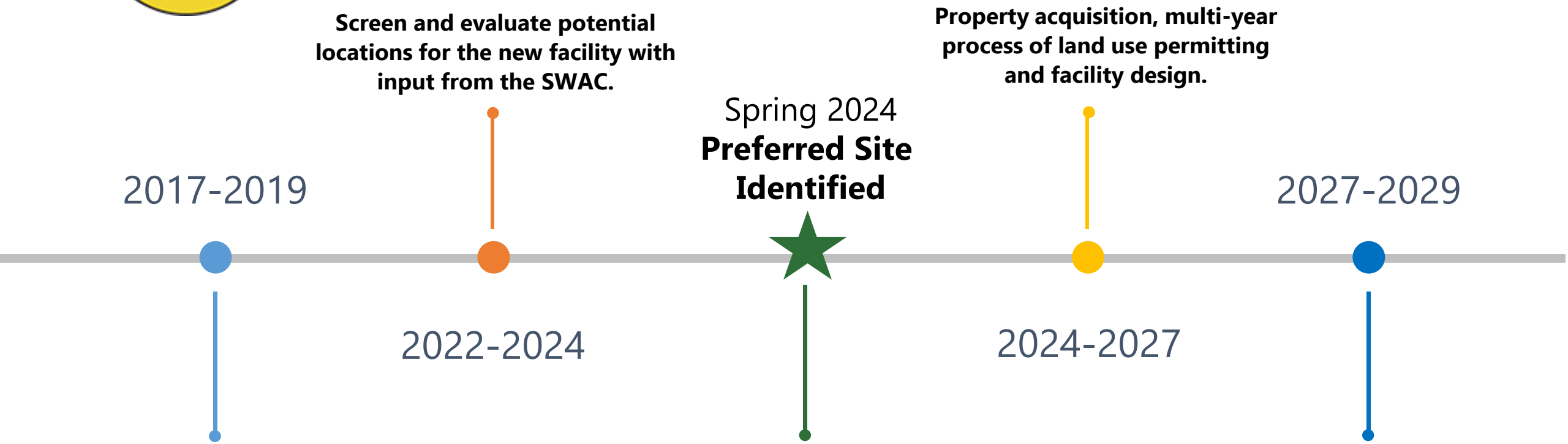
- **Costs:** Higher acquisition and development costs, but lower annual operational costs
- **Infrastructure:** More electrical infrastructure needed, but less water and roadway infrastructure needed.
- **Environmental Impact:** Concerns about cultural resource loss, wildlife, and recreation disruption.
- **Public Concerns:** less concern with visual and residential impacts, but concerns about wildlife and Badlands Wilderness area impacts
- **Risks:** Potential delays and conflicts due to land use approvals and NEPA processes, economic feasibility of aggregate mining to offset rock excavation costs

Roth East

- **Costs:** Lower acquisition and development costs, but higher annual operational costs, largely due to longer haul distance
- **Infrastructure:** More water and road infrastructure needed, but less electrical infrastructure needed
- **Environmental Impact:** Concerns about impacts to cultural resources, groundwater, and wildlife – particularly sage grouse
- **Public Concerns:** more concern with visual and residential impacts, similar concerns about habitat and wildlife
- **Risks:** Potential delays and appeals due to Farm Impacts Test, and higher susceptibility to high winds

SWAC Discussion

Roadmap to opening in 2029



What happens next…

- **Continued briefings/outreach to interested parties**
- **SWAC Meetings:**
  - **March 19, 2024, 9am-noon**: report review and discussion
    - March 12: receive full report
    - March 26: report feedback due
  - **April 16, 2024, 9-11 am**: finalist site recommendation
- **Board of County Commissioners Approval Process:**
  - May and June 2024 (tentative): public hearing(s) prior to BOCC decision

Adjourn