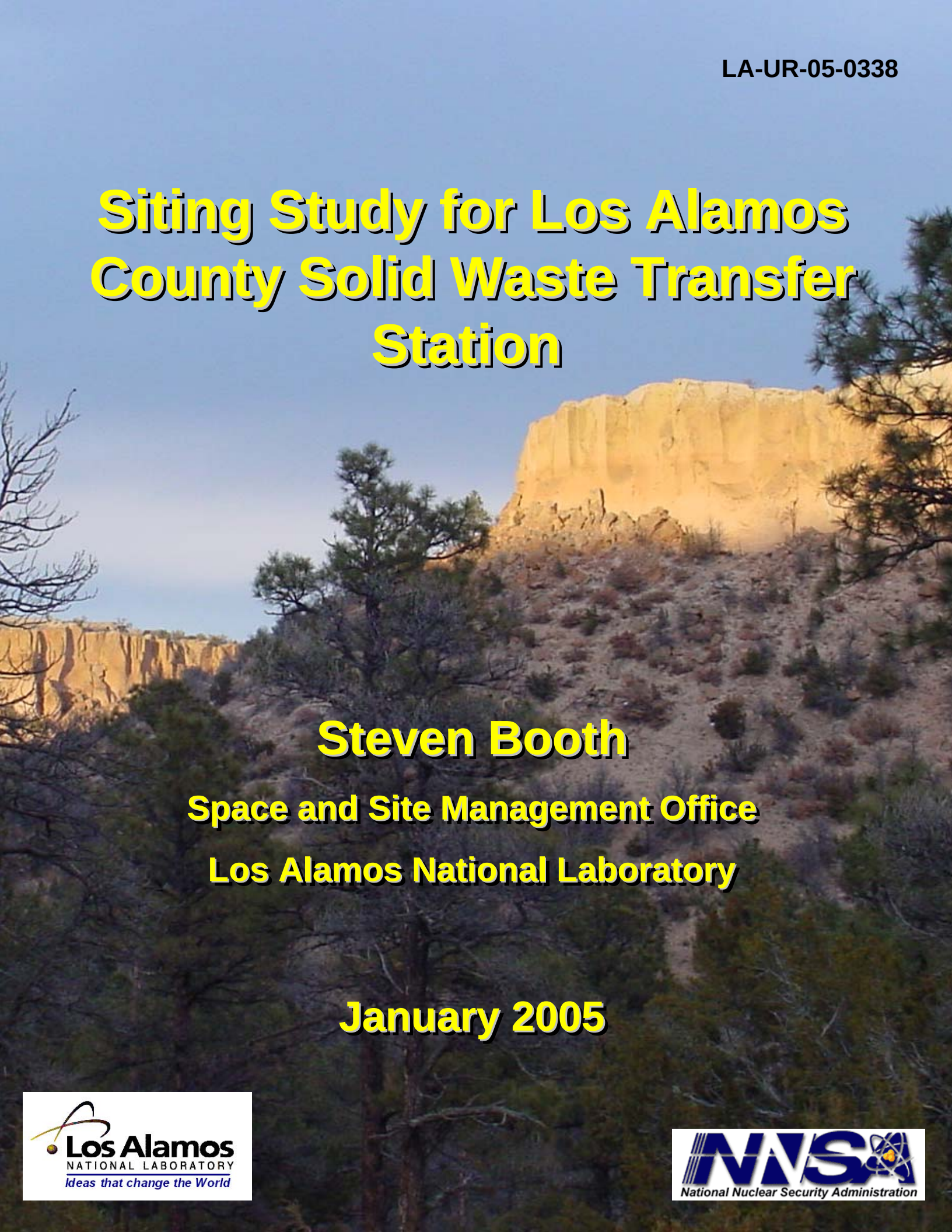
LA-UR-05-0338

Siting Study for Los Alamos County Solid Waste Transfer Station



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January 2005

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Ideas that change the World

National Nuclear Security Administration

Illustration:
Front Cover – Scenic view from Site 1, TA-74.

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Background

The Los Alamos County Landfill must close by December 2006 per NMED directive and an alternative disposal plan for county solid waste is needed. Based on a sanitary landfill site evaluation study conducted by LANL in 2002[1], the TA-61 Borrow Pit site was deemed a possible location to be provided by NNSA to the County for a landfill. Based on this recommendation, the County conducted a feasibility study and found the site to be unsuitable because of high development cost and small size/capacity. This led to the consideration of a solid waste transfer station to sort and ship waste to a landfill outside of the county. This study evaluates six possible locations for such a transfer station (see Figure 1).

The County's vision for the solid waste transfer station is as follows. It will be designed and constructed by the County on 7 to 10 acres of developable land. An administration building plus a structure to house the waste handling and bailing activities will be built. Open land at the site will be used for composting, recycling, mulching, and other tasks. Figure 2 shows a very preliminary layout for the operation at the existing landfill site. Required utilities include Qwest regulated communications, water for dust control and drinking, electricity, and gas or propane. A leach field will be used in lieu of a sewage hook-up. The public would be allowed at the station in the same manner as at the current landfill; it will be open 360 days a year.

[1] Booth, Steven, "Site Screening Study for Los Alamos County Sanitary Landfill," LA-UR-03-1349, February 2003.

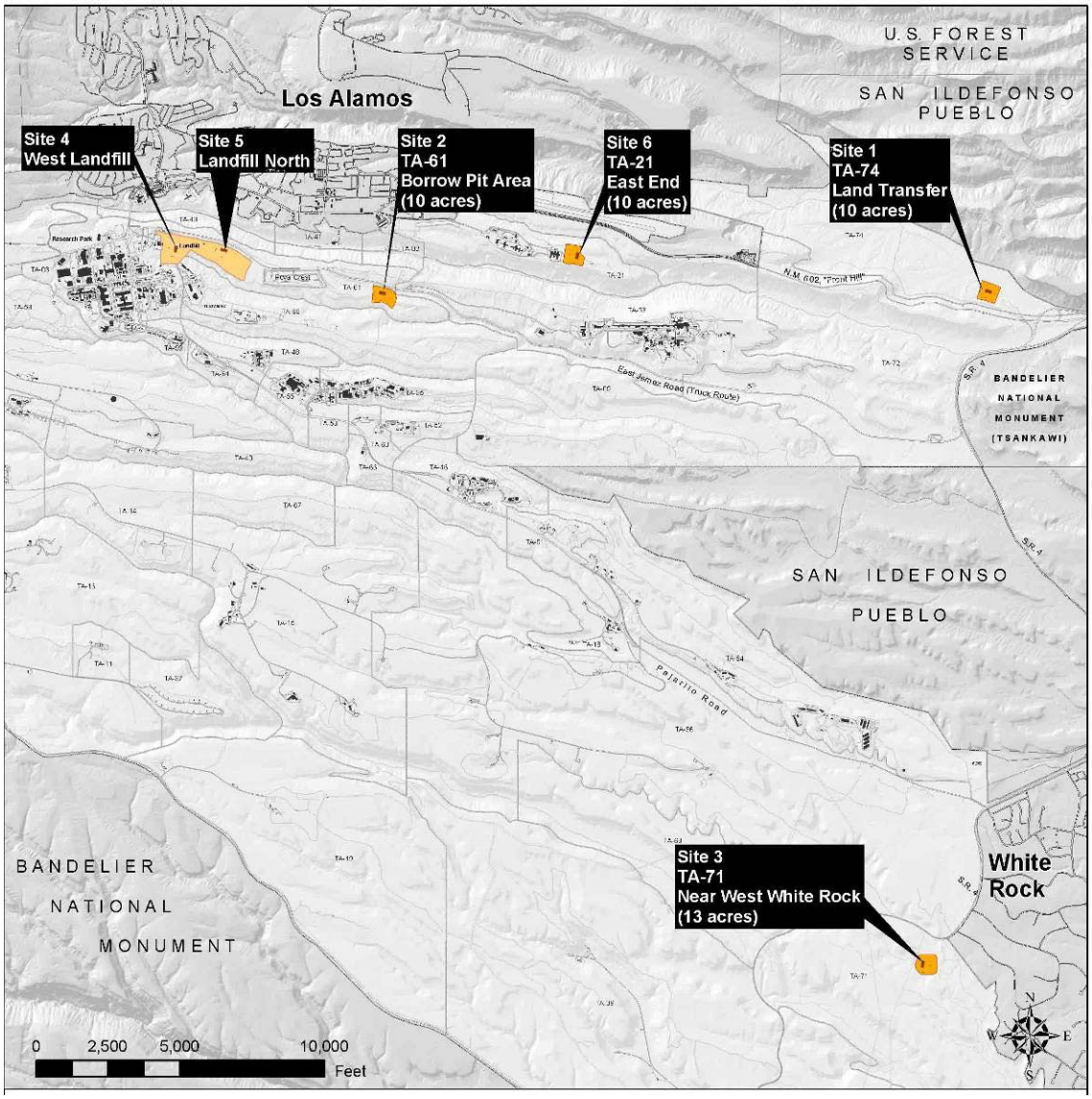

Figure 1: Overview map of six possible solid waste transfer station sites.

Site Descriptions

Six sites were proposed for evaluation. A brief description of each is provided in this section.

Site 1: TA-74, near Department of Transportation

This site at the bottom of the "front hill road" (NM 502) is part of a tract slated for land transfer to Los Alamos County (see Figures 3 and 4). This means there would not be any difficulty for NNSA to make it available for county use. Traffic issues are a concern because of the high-speed nature of the intersection mixing with slow garbage trucks. The site is near important ancestral San Ildefonso cultural sites and will also have environmental justice issues.

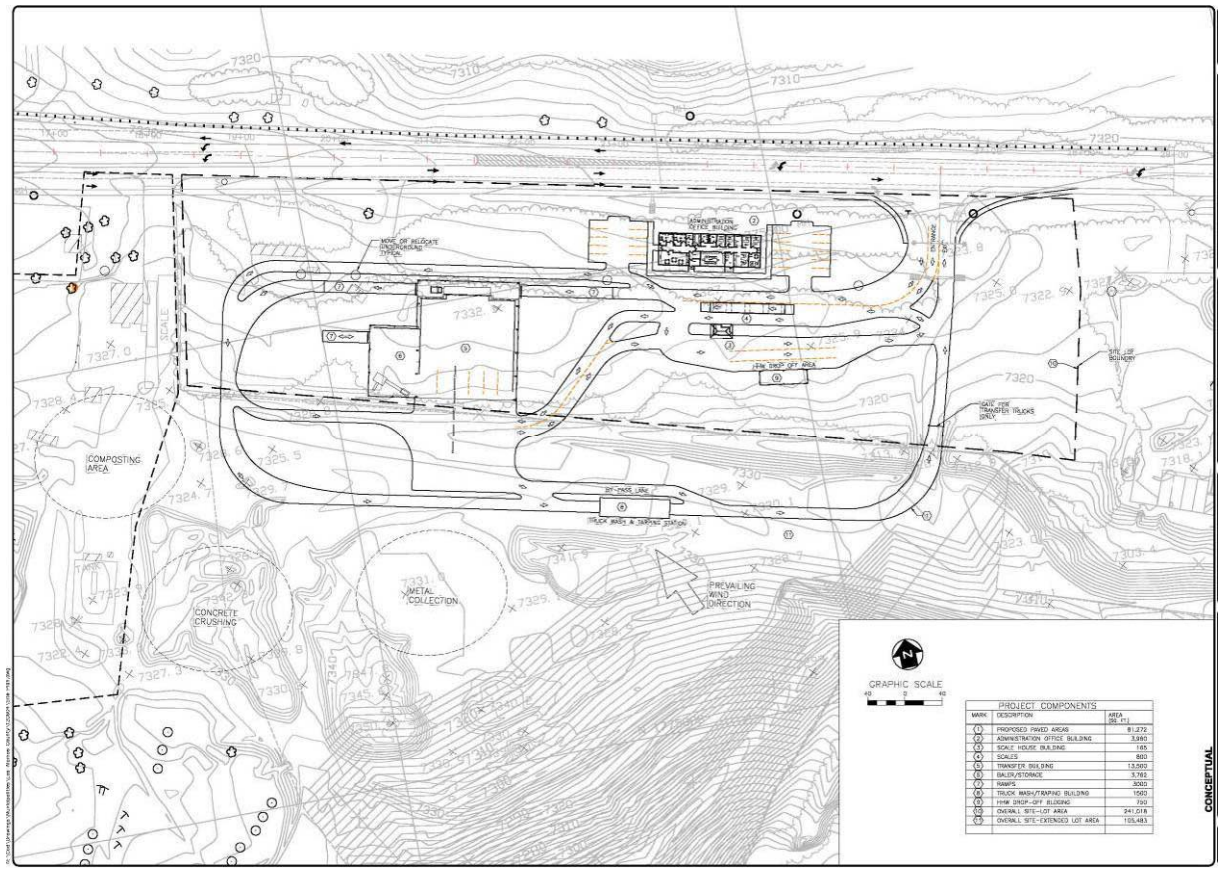

Figure 2: This very preliminary plan demonstrates that the transfer operations and buildings can be placed away from existing burial pits.

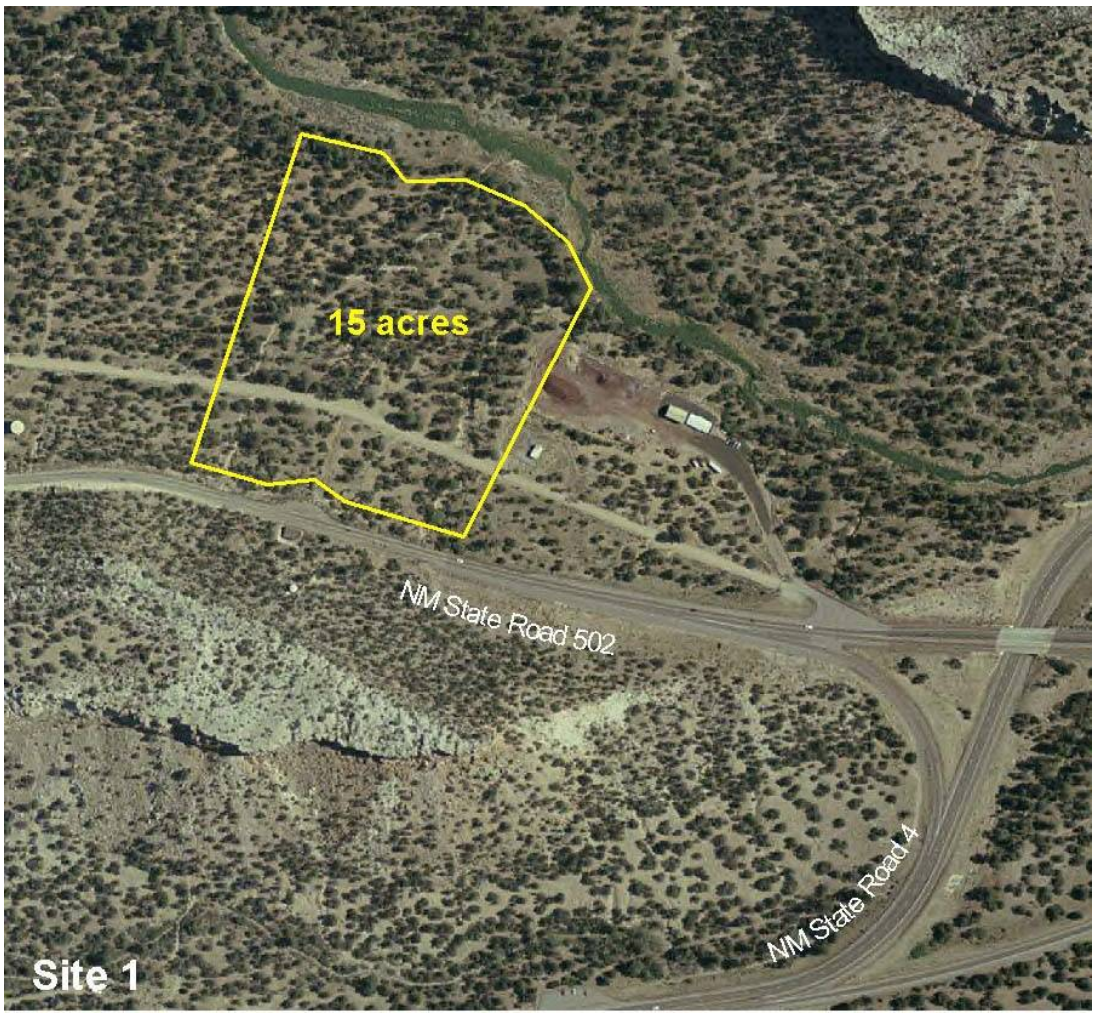

Figure 3: The TA-74, DOT site is located at the bottom of the main hill road (NM 502) near the White Rock "Y."

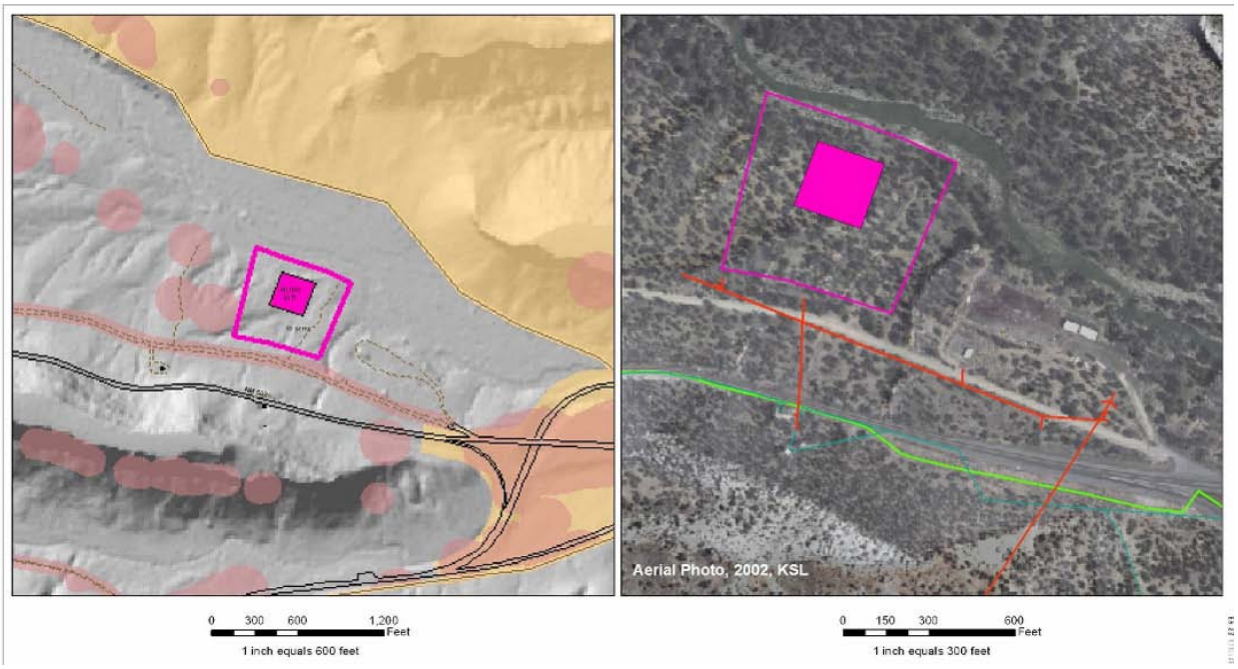

Figure 4: Site 1, TA-74. These two views show cultural sites on the left and utilities on the right. The site outline is ten acres.

Site 2: TA-61 Borrow Pit

The TA-61 Borrow Pit is currently used for LANL soil/rubble storage and as a fill quarry. It is located on the south side of East Jemez Road (Truck Route) near the entrance to LANSCE. See Figures 5 to 7. Its location is about two miles east of the existing county landfill, and is across Sandia Canyon from TA-60, Sigma Mesa. The Borrow Pit is a narrow tract bounded by East Jemez Road to the north and Sandia Canyon to the south. The transfer station would be located to the west of the entrance road so as not to interfere with the existing borrow pit activities.

The Comprehensive Site Plan 2000 (CSP2000) has identified the future land use of this area as Physical/Technical Support. Although currently dump trucks use this site sporadically, significant road improvements would be needed to allow a transfer station.

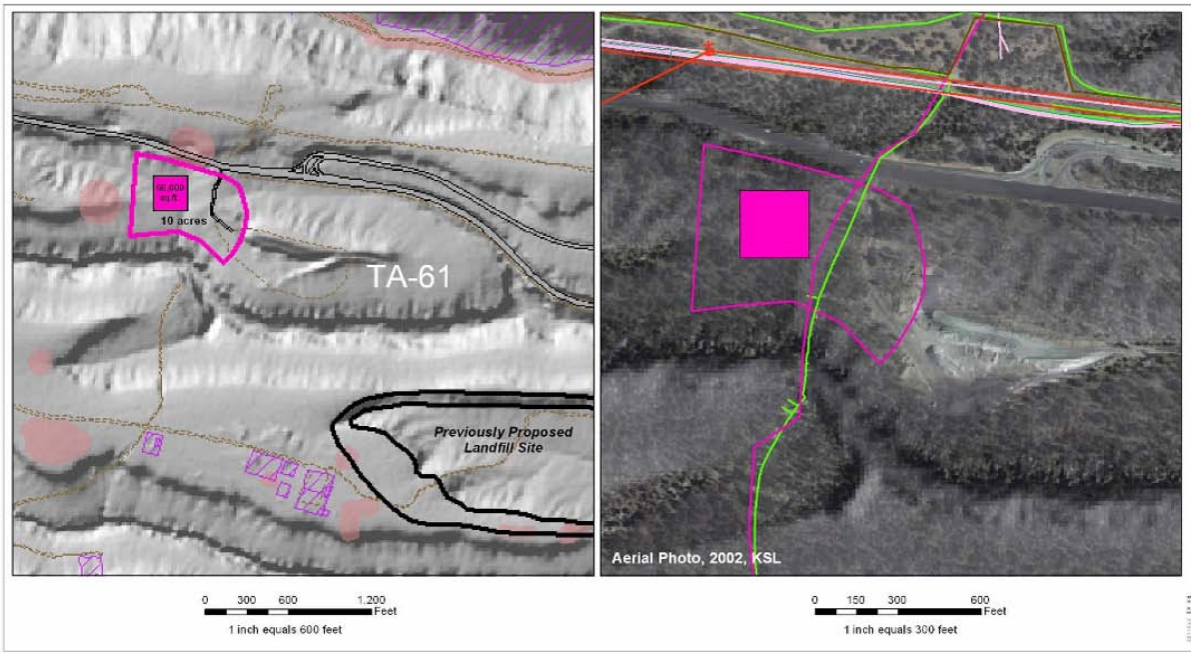

Figure 5: Site 2, TA-61. The proposed transfer site would be to the west of existing LANL borrow pit activities.

Figure 6: View to the west, showing the rise to E. Jemez Rd on the right.

Figure 7: The transfer station will not preclude the continued use of the borrow pit activities.

Site 3: TA-71

A ten acre plot was drawn near NM4 to avoid cultural sites as shown in Figure 8. There is some flexibility in the precise location. This site has excellent road access, but suffers from its proximity to residences in Pajarito Acres. See Figures 9 and 10. The County has utility service nearby that could be tapped as needed. There are no operations of LANL on TA-71. However, the drainage of firing sites from TA-39 and TA-36 run through TA-71. This was a significant issue that eliminated TA-71 from the land transfer process. "Special studies performed adjacent to and within the TA-70 and TA-71 site show occasional instances of sediment and water contaminated with depleted uranium."[2] TA-71 is one of the few large areas available for major new LANL development, and the transfer station would be in a prime area for this.

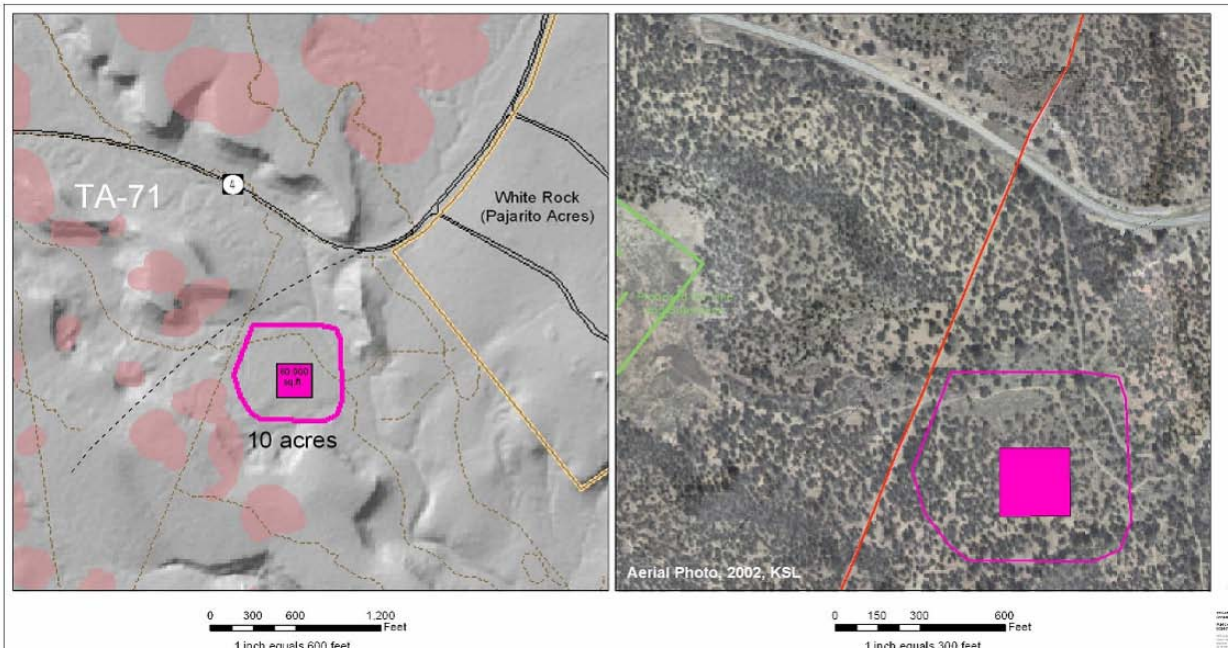

Figure 8: There is significant space available at TA-71. This ten acre plot is located near NM4 to allow easy access to the transfer station.

[2] "Land Transfer Issues for the DX Division and the TA-70 and -71 Sites, DX Division report, January 1998, p. 2.

Figure 9: TA-71 is a flat site that would be easy to develop.

TA-71 currently provides a buffer zone to the hazard zones for DX explosives tests.[3] A note on Hazard Zones:

> "…because the throwing of fragments is a statistical process, the DoD procedure defines the maximum radius as that point beyond which there is a probability of only one lethal fragment for any 25 sq. m. area. Fragments are, on occasion, thrown past the perimeter of the hazard area and fragments have been observed in these areas from past experiments. For this reason, a buffer zone is required outside the hazard area for explosive and material testing firing sites. … The TA-70 site provides the buffer zone for TA-39 and the TA-70 and -71 sites provide the buffer zone for TA-33."[4]

[3] Ibid.
[4] Ibid., p. 22.

Figure 10: This zoomed photo shows the visibility to a Monte Rey South house about 1,000 feet away.

Site 4: Landfill West

This site is located within the existing county landfill with the administration and station buildings on top of buried waste to the south of current entrance. This will require a New Mexico Environmental Improvement Board waiver of transfer station siting criteria; these criteria would normally preclude such a location. For construction of the buildings, this site also will require pilings to bedrock (60 feet in depth) and a methane collection system. Figure 11 shows this site on top of a purple hashed area that indicates past burial pits.

Site 5: Landfill North

The key difference with this location as compared to Landfill West is it will have all transfer station buildings located off burial sites. See Figure 11. The very preliminary schematic shown in Figure 2 is a lay out of solid waste operations, buildings, roads, and the scale that shows how this could be done.

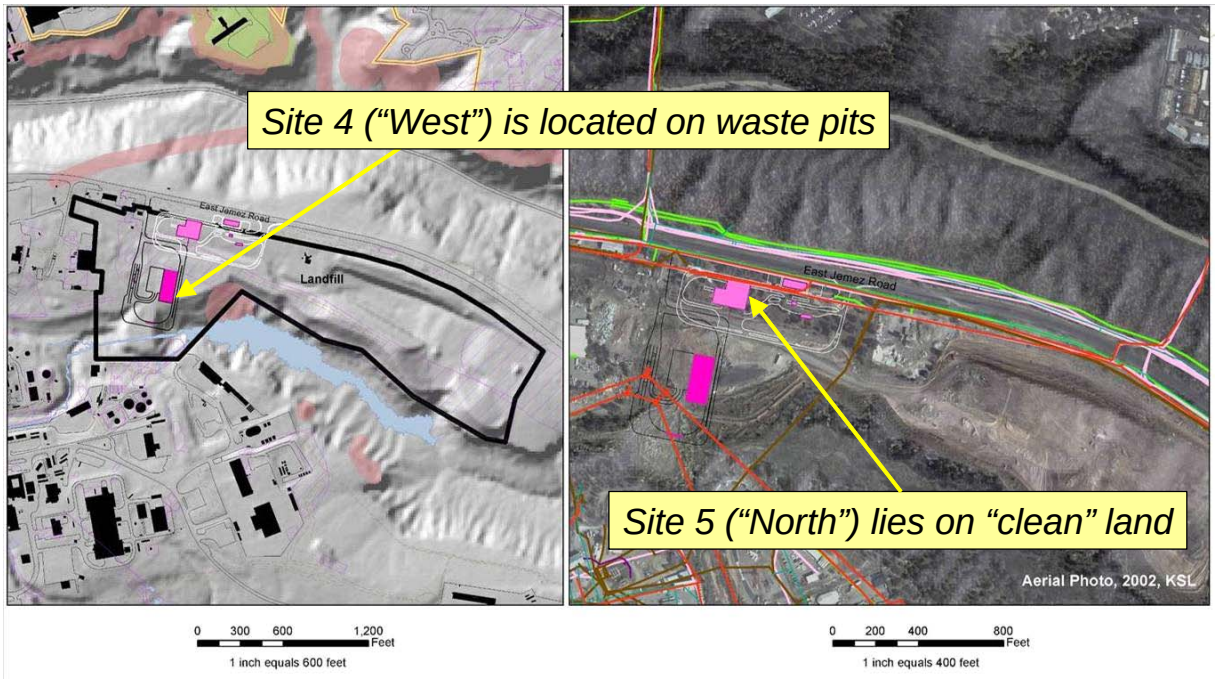

Figure 11: One transfer station plot is located on old burial pits (Site 4, "West") and the other avoids the pits (Site 5, "North").

Site 6: TA-21, DP Road

Various tracts of land along DP Road have been or will be transferred to the County. Also, after substantial remediation, other sites may become available for development by LANL or others. There could be space for a transfer station to the east of the Tritium Science and Technology building TA-21-155 (see Figure 12). However, after interviewing Ken Rea (Land Transfer Project Leader)[5] there appears to be a show stopper at this time because of the tritium operations and the buffer zones that include this land area. The following are his comments on Site 6.

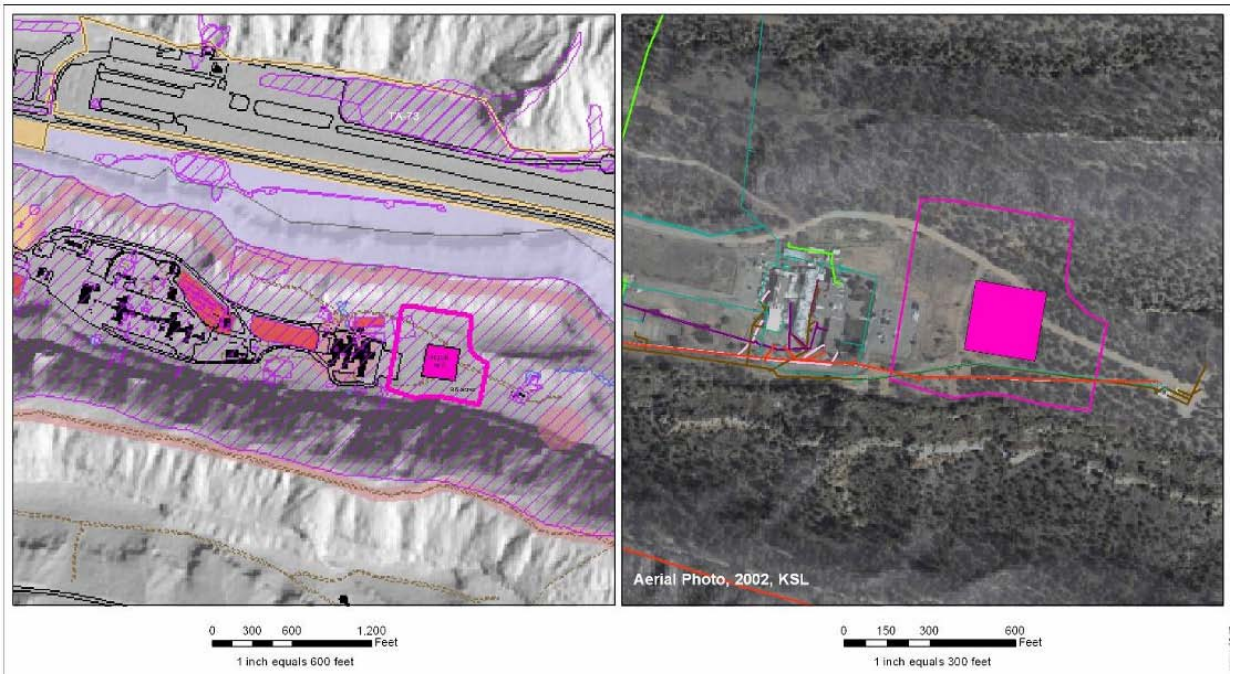

Figure 12: Site 6, DP Road. Ten acres along DP Road were considered for a transfer station.

> Until the tritium facilities are removed, the buffer zones will remain in effect. See Figure 13. Even in stand-down mode, enough tritium remains in the buildings to establish these buffer zones (about 50 grams of tritium inventory remains in the air ducts, pipes, etc.). Further east on the mesa, you run into the buffer zone for the LANSCE facility. I think you have to eliminate this option at this time.

[5] Ken Rae, e-mail communication, January 4, 2005.

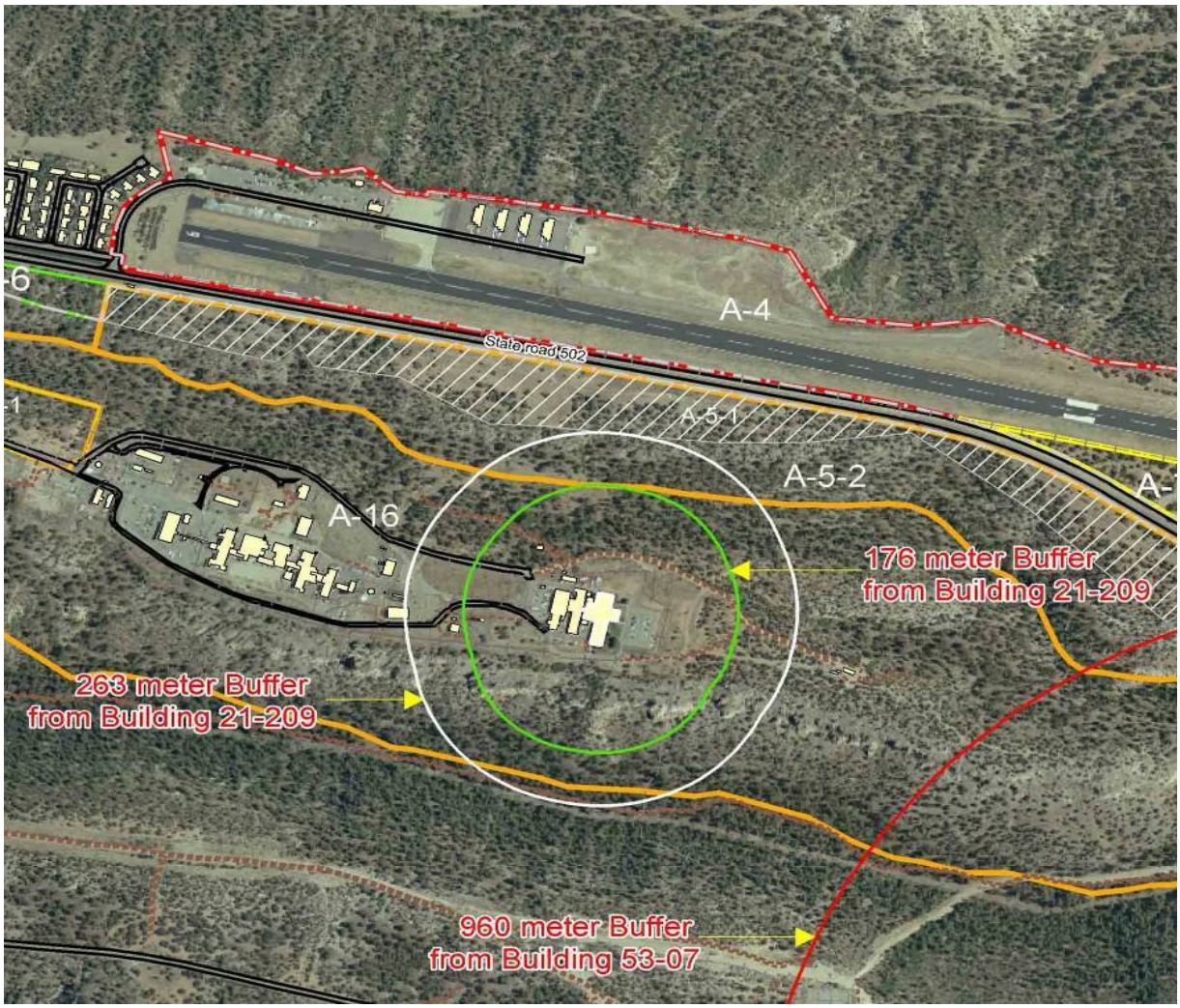

Figure 13: Several areas along DP Road have been or are slated for transfer to the County. The solid waste transfer station site is within the buffer zone for tritium operations at building TA-21-155 as shown. The buffer from building TA-53-07 at LANSCE is shown as a red circle and impacts development for public use further to the east.

However, I think the Site 6 would work, once the tritium facilities are removed, if the following were done.

1. Would need to fence a road from the TA-21 entrance down to the transfer station to keep people on the road, and would need a fence around the transfer station to keep people inside.

2. Would need to have manned access points (one should be sufficient) into TA-21 proper for the personnel that work

there (to keep out the public).

3. Would need to make sure that the ER removal efforts are not hampered by public access to the end of the mesa.

The remaining tritium will not be removed until the buildings can be demolished, and unfortunately nobody has those funds in their budget anywhere. So I think these buildings will remain in safe shut-down for a long time.

Traffic safety will require a new intersection to allow trucks to use Trinity Drive and DP Road. Because NM 502 is unsuitable for heavy trucks, station traffic would have to enter the county via E. Jemez Road and cross over Omega Bridge to Trinity Dr. A bridge connecting 502 with DP Road could be built to avoid the DP/Trinity intersection.

Decision Analysis

The alternative solid waste transfer station sites were evaluated using multi-criteria decision analysis. The team relied on a software package called Criterium Decision Plus[6] to build the model and calculate the results. The Analytical Hierarchy Process (AHP) was used to organize the model. Figure 14 shows the analysis steps used in the evaluation. My discussion below is organized along these steps also. Table 1 lists the team membership and subject matter experts (SMEs) who contributed.

During the first step of the process, "Brainstorming," the team defined the goal of the exercise (*Select Transfer Station Site*) and discussed a multitude of possible evaluation criteria. We were careful to define each criterion to make it independent of the others.

TABLE 1
Roster of Transfer Station Site Screening Team Members

Name	*Affiliation*	*Phone Number*	*E-mail Address*
Steven Booth (lead)	LANL, SSMO	667-0990	sbooth@lanl.gov
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Dan Pava	LANL/RRES-Eco	667-7360	dpava@lanl.gov
Charles Trask (SME)	LANL/NWO-UI	667-7756	Cwtrask3@lanl.gov
Crystal Rodarte (SME)	LANL/NWO-UI	665-7690	crystal@lanl.gov
Charles Trujillo (SME)	LANL/NWO-UI	667-0491	charles@lanl.gov
Kyle Zimmerman (SME)	LA County		
Nancy Talley (SME)	LA County		
Benito Salazar (SME)	LANL/S-1	665-3428	bsalazar@lanl.gov

After narrowing the list of criteria, the team built the hierarchy. In this step the structure of the model is produced as shown in Figure 15. The goal of selecting a transfer station site is on the left side. Next are listed the five top-level criteria that help attain the goal. Each of these criteria has two or three

[6] Infoharvest, Inc., Seattle, WA, www.infoharvest.com.

independent sub-criteria that are used to score the alternative sites. The right side of the hierarchy chart lists the six possible sites. Note that each site alternative is connected through the eleven sub-criteria to the goal. This shows graphically that the alternatives are scored against all of these sub-criteria.

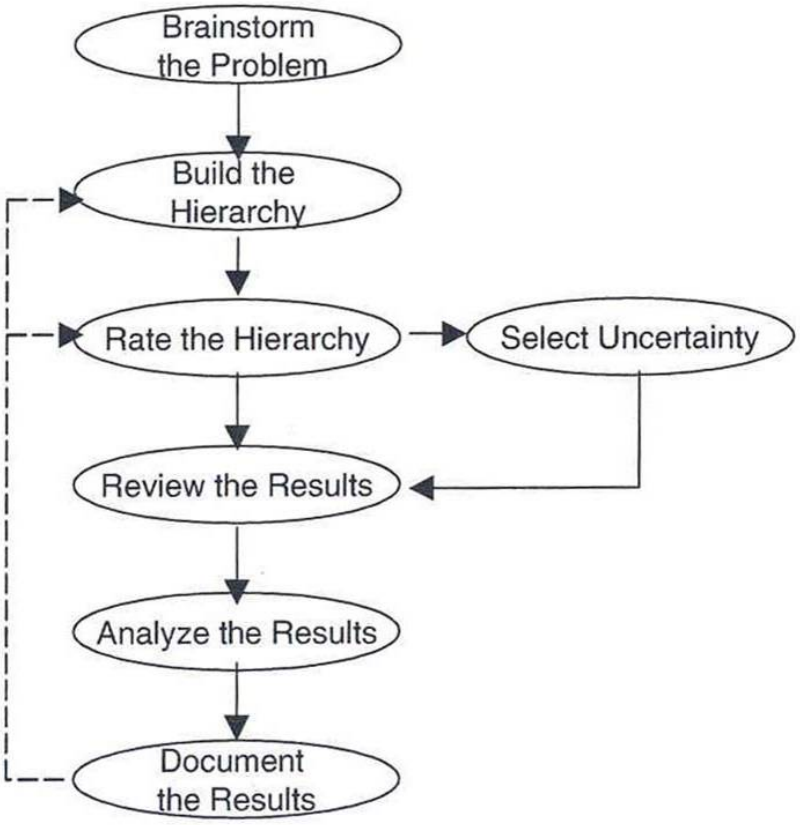

Figure 14: Transfer station site evaluation followed standard decision analysis steps.

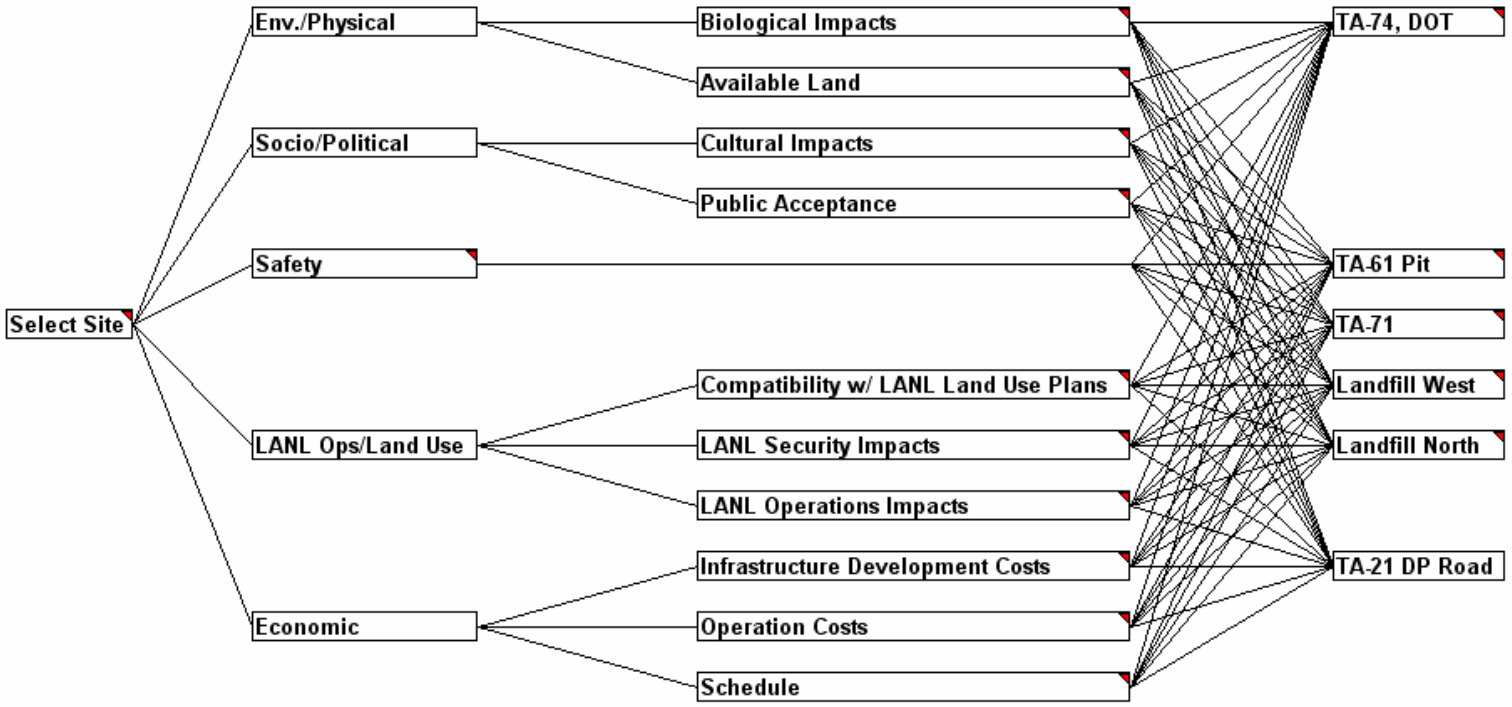

Figure 15: The model's hierarchy shows the goal at the left and the alternatives to achieve that goal on the right, with the evaluation criteria in between.

Definitions

Each component of the model is clearly defined to facilitate accurate scoring of alternatives.

Goal: Select Transfer Station Site

The task is to select one or more sites that can be approved by LANL and NNSA for possible use as a solid waste transfer station to be developed by Los Alamos County.

Environmental/Physical Sub-Criteria

Biological Impacts. Considers plant or animal impacts and known endangered species or their habitat at the site.

Available Land. Considers the size of the site in terms of the required space for the station, yard, and trucks. Total land required for a simple transfer station is seven acres; a high-tech facility will need 10 acres. More space will allow flexible placement of the building on the site and also allow for growth in technology or other LANL or county activities at the site. This criterion captures the issues of seismic, floodplain, topography, etc. Consequently, larger sites will be scored higher than smaller sites.

Socio/Political Sub-Criteria

Cultural Impacts. Considers the presence of historical sites, both ancient and homestead eras. Score is based on conflicting cultural sites within the transfer station boundary, and also the "context" of the area in which the station will be.

Public Acceptance. Considers the presence of nuisance characteristics such as noise/odor, lights, and dust, and available vegetation and topography for shielding. "Open Space" and trails issues are considered here also. Proximity to residential population is an important factor. Potential citizen opposition for other reasons such as NIMBY and environmental justice is captured by this sub-criterion.

Safety Criterion

Considers the increased risk of vehicle accidents caused by large waste trucks and user traffic to and from the station.

The peak number of vehicles that pass the current landfill scale per day is 200 vehicles. Ten county trash and roll-off trucks pass twice per day (20/day), so a total of 220 vehicles per day pass the scale. Of the 200 vehicles, 25% are trucks. The transfer station will be open 7 days/week, 360 days/year. Winter has a little lighter vehicle pressure. There will be four to six transfer trailer trucks daily, Monday through Saturday.

The landfill traffic load is well spread out, with no obvious peak time during the day except for the initial morning exit of garbage trucks at ~7:45am. They turn left from the current landfill into Los Alamos on Mondays, Wednesdays (for non-residential trash pickup), and Thursdays. Two or three trucks turn right to White Rock on Tuesdays and Fridays.

LANL Operations/Land Use Sub-Criteria

Compatibility with LANL Land Use Plans. Considers possible conflicts with LANL land use plans as shown in detailed maps from the CSP2000. The score is higher for land use defined for this type of activity. The focus is only on land use here; security and LANL ops are handled by other sub-criteria.

LANL Security Impacts. Considers potential impacts on LANL's current and future security. The best security posture is when the county operation is located outside of the perimeter of NNSA property. This keeps private trucks and vehicles outside of protected zones. Sites outside of the LANL perimeter score "finest." We recognize that future security needs could further restrict use of interior sites, so these must score lower.

LANL Operations Impacts. Considers the potential impact on on-going and future Lab operations. Divisions that "own" the land in question will be interviewed to understand these issues. Hazard and buffer zones will be defined. Mitigation strategies may be negotiable with impacted divisions.

Economic Sub-Criteria

Infrastructure Development Costs. Considers the cost of installing required infrastructure up to the station buildings, not to construct the buildings. This assumes the building costs will be similar across the sites. If there are special circumstances that increase cost of facility construction, they are included here. (For example, this criterion includes the cost of an interior road from main roadway to reach the facility.) Also included are costs to install utilities, roads, water, natural gas, and telephone communications, as well as storm water issues such as berms. A site more remote from utilities is scored lower. No sewer hook up is needed. Road improvements are the most costly factor and therefore drive the scores.

Operation Costs. Considers the transfer site in terms of operational efficiency and cost. Proximity to waste activities is a factor here as is the distance to the county center and topography (steep grades are tough on big trucks and fuel efficiency). Considers both transfer trailer truck access and county garbage trucks. The scoring is impacted by White Rock vs. Los Alamos population and trash quantities.

Schedule. The transfer station must be operational by December 2006. Accelerating the schedule costs additional funds so this sub-criterion falls under "Economics." Assume we can use same NEPA activities for all site options. If the land is held by NNSA, a special-use permit or other land use mechanism will be needed. Are there activists or stakeholders who could impede the project? Are there other schedule risk factors, e.g., NMED or NNSA regulations? More complex construction scores lower because of the risk of delays from materials or contractor error. A large road project might also delay NEPA deliberations. Expected activist obstruction scores lower.

Rating the Hierarchy

The next step in the decision analysis process is to rate the hierarchy, i.e., apply weights to the criteria based on relative importance and score the alternatives against each sub-criterion. Those products are then summed

over all the sub-criteria to provide a total decision score, thus serving as a measure of how well the alternative fits our decision model.

Weights

The weights of the criteria with respect to the goal were chosen by the Siting Team based on a descriptive scale with points attached: *Critical* (100 points), *Very Important* (75 points*), Important* (50 points), *Unimportant* (25 Points), and *Trivial* (0 points). Safety and LANL Operations/Land Use are considered to be somewhat more important than the other three criteria and so were weighted as "Very Important," the rest as "Important." (See Table 2.)

TABLE 2
Computing Normalized Weights for Five Top Level Criteria

Criterion	***Descriptor***	***User Scale Value (0 to 100)***	***Normalized Scale Value (0 to 1.0) [1]***
Environmental/Physical	Important	50	0.167
Socio/Political	Important	50	0.167
Safety	Very Important	75	0.250
LANL Ops/Land Use	Very Important	75	0.250
Economic	Important	50	0.167

Note 1: This scale adds to 1.0. Computed by dividing the single criterion's weight by the total of all weights, e.g., 50/(50 + 50 + 75 + 75 + 50) = 0.167.

Although ten sub-criteria are all weighted as "Important" with a value of 50 points, the normalized weights can be different as shown in Table 3. This is because the normalization takes account of the number of sub-criteria under each top-level criterion. For example as shown in Table 3, Environmental-Physical has two sub-criteria that are valued with 50 points. Each sub-criterion's normalized weight is calculated as 50/(2x50)= 0.5. In a sense, the influence of Environmental/Physical is divided into two "sub-influences" represented by the sub-criteria. On the other hand, the top-level criterion LANL Operations/Land Use has three sub-criteria. Therefore its influence on the total is split into three components, leading to a weight of 0.333 for each sub-criterion.

The software automatically calculates the accumulated weight for each path in the hierarchy that connects the alternative to the goal. This is done by multiplying the top-level criterion's normalized weight by that of the sub-criterion along the path. For example, Biological Impacts is a sub-criterion of Environmental/Physical. The top-level weight is 0.167 and the sub-criterion weight is 0.5, so the accumulated weight along the path of the hierarchy is 0.167 x 0.5 = 0.083. The total of the eleven accumulated weights is 1.0.

TABLE 3
Weights of Sub-Criteria

Criterion	*Descriptor*	*User Scale Value (0 to 100)*	*Normalized Scale Value (0 to 1.0)*	*Accumulated Value*
Biological Impacts	Important	50	0.5	0.083 [1]
Available Land	Important	50	0.5	0.083
Cultural Impacts	Important	50	0.5	0.083
Public Acceptance	Important	50	0.5	0.083
Compatibility with Land Use Plans	Important	50	0.33	0.083 [2]
Security Impacts	Important	50	0.33	0.083
LANL Operations	Important	50	0.33	0.083
Infrastructure Devel. Costs	Important	50	0.33	0.056 [3]
Operation Costs	Important	50	0.33	0.056
Schedule	Important	50	0.33	0.056

Note 1: The accumulated weight for the two sub-criteria under Env/Physical is 0.5 x 0.167 = 0.083.

Note 2: The accumulated weight for the three sub-criteria under LANL Operations/Land Use is 0.33 x 0.25 = 0.083.

Note 3: The accumulated weight for the three sub-criteria under Economic is 0.33 x 0.167 = 0.056.

Scores

Each sub-criterion was scored with respect to the six alternative sites using a descriptive scale ranging from 100 to zero: *Finest* (100 points), *Excellent* (83.3 points), *Above Average* (66.7 points), *Average* (50 points), *Below Average* (33.3 points), *Poor* (16.7 points), *Unsatisfactory* (0 points). The reasoning behind these scored is described below; the scores are listed in Table 4.

TABLE 4
Scores for the Six Transfer Station Site Alternatives

Sub-Criteria	*Site 1, TA-74*	*Site 2, TA-61 Pit*	*Site 3, TA-71*	*Site 4, Landfill West*	*Site 5, Landfill North*	*Site 6, TA-21*
Biological Impacts	Finest	Below Avg	Finest	Above Avg	Above Avg	Avg
Available Land	Excellent	Avg	Excellent	Unsatis	Avg	Avg
Cultural Impacts	Avg	Excellent	Avg	Finest	Finest	Finest
Public Acceptance	Poor	Excellent	Poor	Finest	Finest	Finest
Safety	Above Avg	Unsatis	Avg	Avg	Avg	Poor
Compatibility with Land Use Plans	Finest	Excellent	Avg	Finest	Finest	Excellent
Security Impacts	Finest	Below Avg	Above Avg	Poor	Poor	Poor
LANL Operations Impacts	Finest	Above Avg	Excellent	Excellent	Excellent	Unsatis
Infrastructure Devel. Costs	Below Avg	Unsatis	Avg	Poor	Above Avg	Poor
Operation Costs	Above Avg	Excellent	Avg	Finest	Finest	Poor
Schedule	Below Avg	Avg	Avg	Unsatis	Finest	Avg

Environmental/Physical Sub-Criteria

Biological Impacts. *Site 1, TA-74/DOT:* no T&E problems, only some possible wetland issues; score is "Finest." *Site 2, TA-61 Borrow Pit:* This site lies inside core and buffer spotted owl habitat; score is "Below Average." *Site 3, TA-71* has no issues with biology: "Finest." *Site 4, Landfill West:* Developed buffer habitat; "Above Average." *Site 5, Landfill North:* scores the same "Above Average." *Site 6, TA-21 DP Road:* This is undeveloped buffer habitat for spotted owl; its score is between TA-61 and landfill, "Average." This score would still apply assuming a bridge were built to access NM 502.

Available Land. The spread of the scores for this sub-criterion is relatively narrow. We use this criterion as a go/no go filter: if there is enough quality land to satisfy the need, then we score it at least "average." We are looking for a show-stopper with this one: Is there adequate land available to satisfy the county's need? Additional land might add some flexibility so it scores a bit higher, up to "Excellent." If less than seven acres: "UNSATISFACTORY." If from 7 and 20 acres score is "AVERAGE;" above 21 acres, "EXCELLENT."

Site 1, TA-74/DOT: Over 100 of developable acres scores "Excellent." There will be an adequate tract available reasonably close to NM 502 access. *Site 2, TA-61 Borrow Pit:* Assuming the transfer station will not shut down the existing borrow pit activities, there are 13-15 acres. Score is "Average." *Site 3, TA-71:* has multiple 10 acres sites; score is "Excellent." *Site 4, Landfill West:* not much hope to get NMED waiver to allow building on pit areas to make this land available. We assume no NMED waiver is possible, so the score is "Unsatisfactory." *Site 5, Landfill North:* The preliminary schematic can place the administration building and the transfer facility on non-pit land; the roads and crushing can be placed on old pit areas. Score is "Average" because we can find just over 7 acres land suitable for building and operations. *Site 6, TA-21/DP ROAD:* The site has 15 acres while still avoiding the head of canyon to the east; score is "Average."

Socio/Political Sub-Criteria

Cultural Impacts. *Site 1, TA-74/DOT:* The station can be placed on land with no archeological sites; the whole area has been surveyed for the land transfer project so there will be no surprises. There are proposed Indian easements nearby. The cultural context of the area is one of Native American importance with major ruins nearby. The "dump" does not fit at all within this context and so it could be very offensive to San Ildefonso. Even though we can avoid actual cultural sites within our station boundary, the context is very bad. Score is "Average." *Site 2, TA-61 Borrow Pit:* There are no cultural issues within the site; two archeological sites are nearby but can be avoided. Score is "Excellent." *Site 3, TA-71* may have some archeological sites nearby. This site has the same cultural context as Site 1, TA-74; "Average."[7] *Site 4, Landfill West:* "Finest." *Site 5, Landfill North:* "Finest." *Site 6, TA-21/DP ROAD:* All the site is developed now, so there are no cultural issues; score is "Finest."

[7] Phil Noll scored this one as "Unsatisfactory" in the Landfill Siting Study for the expectation of a major San Ildefonso complaint. We will capture this issue under Public Acceptability.

Public Acceptance. *Site 1, TA-74/DOT* would be sheltered, but is the "front door of county." Being at the bottom of the canyon, commuters could perhaps see it from the roadway. But no houses can see it and no residences are nearby. It is a popular hiking area so we could get some complaints. Further notes from Dan Pava:

> **"**The vicinity of the transfer station footprint at TA-74 is rich in cultural sites and is close to lands recently transferred to San Ildefonso Pueblo. To the east are three tracts containing clusters of cultural sites that have been identified by NNSA and LANL for special protection within a preservation easement. These are significant cultural sites of interest to both LANL and the Pueblo. Placing a municipal solid waste transfer station in proximity to San Ildefonso land and next to these sites raises issues of environmental justice wherein minority and low-income communities are disproportionately burdened by a use that benefits others. I have discussed this matter with Ecology's Deputy Group Leader John Isaacson who concurs that placing the transfer station in this location could be seen as an affront by the Pueblo, and that consultations would be imperative at an early stage. John and I both agree with the impression that if the transfer station isn't appropriate near Pajarito Acres then the same applies to TA-74; what differs is the perspective and concept of what is meant by "home" and "community" but that the impacts would be similar."

Based on environmental justice issue, Site 1's score is the same as that of TA-71: "Poor."

Site 2, TA-61 Pit: It may be possible to screen the station from E. Jemez using existing trees and topography. It would lie 50 feet or more below the road. The County has had a good initial response from the public to this site for a transfer station or even a landfill. Development would entail cutting trees in the forest and using virgin land; score is "Excellent."

Site 3, TA-71: Lies close to residential population in Pajarito Acres. Predominant west wind blows toward residences. The site can possibly be screened from vision of SR4. But noise,

dust, odor, lights will be an issue for nearby residences. LA County believes that this site is the worst for public acceptance. The previous Landfill Site Study[8] scored this location as "Unsatisfactory" for nuisance, "Poor" for aesthetics, "Poor" for proximity to population, and "Unsatisfactory" for cultural impacts. While the transfer station will have a foot-print one-fifth the size of a fully-developed landfill after several decades of use, the same nuisance operations will be present. Because of close population and nuisance conditions, the score is "Poor."

Site 4, Landfill West: "Finest." *Site 5, Landfill North:* "Finest." *Site 6, TA-21/DP Rd:* Considered by the public as the County's industrial area; "Finest."

Safety Criterion[9]

Site 1, TA-74/DOT: If the current poor intersection at the White Rock "Y" remains the site would score "unsatisfactory." A new intersection would be required to prevent incoming and outgoing traffic from crossing lanes. More truck miles by county trucks to this site also could increase risk. Even with a new intersection there would still be the difficulty of the County's high-speed entrance combined with the low speed large trucks. Because of high speed and high traffic level and geometry, with a new intersection the score is "Above Average."

Site 2, TA-61 Borrow Pit: The site has a steep slope, a curve, is narrow and close to canyon, and is a difficult area for truck acceleration. However, trucks are typical for the road. A major improvement in road would be required. Even with lots of money, it could not be made as safe as TA-74. Trucks would be required to cross lanes and enter on a steep slope. The remodel would have to rebuild both sides of E. Jemez (i.e., the TA-53 side as well as TA-61 side) to accommodate traffic from both tech areas. The bad terrain and narrowness of the area makes this infeasible. We can not build a safe, feasible intersection; the score is "Unsatisfactory."

[8] Booth, LA-UR-03-1349, February 2003.
[9] Scores for the safety criterion are based on opinions of subject matter experts during a meeting on 12/21/04: Charlie Trask, Charles Trujillo, Crystal Rodarte, Kyle Zimmerman, and Nancy Talley.

Site 3, TA-71 is close to White Rock and Pajarito Acres residential traffic. It would have a normal intersection, has enough room, good sight lines, and low traffic. There is a curve, so we would need to move intersection to get safe sight lines. Improvement to the Grand Canyon/Pajarito Rd. intersection would be needed as part of the project. One drawback of the site is it requires trucks to go through White Rock on NM 4 where there are numerous commercial and residential intersections. It scores one step below TA-74, "Average."

Sites 4 and 5, Landfill West and North: These have the same scores/situation. The access control station for LANL will be to the west of the current landfill entrance. This already is a high congestion area, especially during rush-hour. Queuing for new transfer station entrance (~850 ft. to the east of the current one) and LANL entrance might cause additional risk and compression of traffic. However, the slow traffic allows the waste trucks in the morning to move into the turning lane and wait to merge safely. This current situation is considered to be quite safe by the County traffic engineers. In terms of the Security Perimeter Project construction there should be no major difficulties or conflicts.[10]

From a pure safety perspective, anything that interrupts the incoming traffic is a problem. The best comparison is with TA-74. There would not be a big increase in traffic on E. Jemez Road if the station were at Site 4 instead of Site 1. There are only three trucks from the landfill to White Rock twice a week. Also, White Rock residents generally don't use the landfill site because they have a transfer station at Overlook Park that is more convenient. In general, commercial dump trucks are from the Los Alamos town-site or LANL rather than from White Rock. We don't know how the queue will be with the new perimeter control access. This site has the same traffic issues as at TA-74 with lanes that must merge, so it should have a similar score to TA-74. But since we won't get as good lane separation as we will at TA-74, we score it one step lower: "Average."

[10] Mark Harris, personal communication, December 21, 2004.

Site 6, TA-21/DP Rd: There are two major safety issues with this site: 1) how to connect to Trinity Road and 2) trash trucks/vehicles that must go through Los Alamos to reach the site.

1) The NM highway department is improving the DP/Trinity intersection soon which we believe will allow truck access. There still will be a long access through TA-21, but it is a relatively straight shot down the mesa without steep grades. It may be hard to avoid the unsafe commercial section of DP Road. This would require significant road improvement or widening and would cause the loss of the casual parking lots along the sides, thereby shifting parking elsewhere. The other option for access would be a bridge between DP Rd and 502, perhaps near the L.A. airport. This might have negative impacts on threatened and endangered species because of canyon disturbance. This option would have similar congestion issues as at the Landfill sites because 502 is at capacity during peak usage times--so the best it could score would be "Average."

2) This site forces all landfill vehicles to drive the full length of downtown Trinity (the town's main commercial street with numerous driveways and intersections, both signaled and non) and across Omega bridge--a poor choice from a safety perspective. Trinity Dr. is very crowded during the peak periods of morning, lunch, and 5:00pm.

Overall, this site scores "Unsatisfactory" with the existing road situation. Assuming an improved Trinity/DP intersection or a bridge to 502, the score is: "Poor."

LANL Operations/Land Use Sub-Criteria

Compatibility with LANL Land Use Plans.

Site 1, TA-74/DOT: This is county land, so there will be no problem with LANL's plans. "Finest." *Site 2, TA-61 Borrow Pit* is planned for "physical/technical support" use. We assume the station will not preclude the current operations and is a physical support use for LANL and well as county, e.g., rubble sorting direct-haul trash disposal, recycling. (But there is LANL's

potential long term plan to get the industrial commercial activities off of East Jemez Road for security reasons.) The transfer station would share a common entrance with LANL's borrow pit entrance. Score: "Excellent."

Site 3, TA-71: The long term plan is for a new tech area somewhere at TA-71. Given the blast/hazard buffer zones "reserve," the transfer station would be right in the prime developable land. This would limit some of LANL's development options. Score: "Average." *Sites 4 and 5, Landfill:* Must score "Finest" because DOE granted a 35 year special use permit just two years ago for the actual use of "transfer station." *Site 6, TA-21/DP:* Land use is listed as "reserve." But in the new TA-21 conceptual master plan this site can be used as an industrial zone. Land use plans are similar to those of TA-74, but we are not transferring the land. No conflicts with future LANL use in the plan. Score: "Excellent."

LANL Security Impacts.
This criterion was scored by security experts as shown in Table 5.[11]

Site 1, TA-74/DOT: Santa Fe county land, set for land transfer, outside of LANL property. Score: "Finest." *Site 2, TA-61 Borrow Pit:* inside of NNSA foot print, "Below Average." *Site 3, TA-71:* A bit close to Pajarito access control area, so not finest. Score is "Above Average." *Sites 4 and 5, Landfill:* worse than TA-61 because closer to TA-3 and might impact perimeter control. Score: "Poor." This site was presented to the Security Integration Board chaired by Scott Gibbs on January 21, 2005; no major security issues were identified. *Site 6, TA-21/DP Rd:* Trucks must drive up E. Jemez, across big bridge, and pass through town. Lab operations are currently on this road. Transfer site would have public driving through lab operational site to get to/from the station. Lots of legacy contamination. Location is within LANL footprint. Score: "Poor."

[11] Benito Salazar, S-1, e-mail January 5, 2005.

TABLE 5
Site Ratings from Security Experts

Site	S-DO	S-PO	S-1	S-5	S-9	PTLA	EM&R	Overall Rating
1. TA-74	Finest	Finest	Finest	Finest	Finest	Finest	Finest	**Finest**
2. TA-61 Borrow Pit	Below Avg	Poor	Poor	Poor	Below Avg		Average	**Below Avg**
3. TA-71	Excellent	Below Avg	Above Avg	Poor	Excellent	Above Avg	Excellent	**Above Avg**
4. and 5. Existing Landfill	Poor	Poor	Poor	Poor	Poor		Below Avg	**Poor**
6. TA-21, DP Road	Poor	Above Avg	Poor	Unsatis	Poor	Poor	Poor	**Poor**

LANL Operations Impacts.
Site 1, TA-74/DOT: NNSA is already planning to give it away. There are no operational problems to LANL: "Finest." *Site 2, TA-61 Borrow Pit:* borrow operations currently going on there. There would be some positive or negative impact of adding a county operation. LANL would gain the use of a new road intersection and could share some operations with the County such as rubble sorting or recycling. There also could possibly be some negative operations impact for TA-55. Score: "Above Average." *Site 3, TA-71:* There is a sled blast zone nearby and drainage of pollutants in the area; for these reasons it was not transferred to County. No current LANL operations are near. Score: "Excellent."

Sites 4 and 5, Landfill: The site is close to LANL's perimeter access gate which might affect efficient operations of moving to and from lab. It is the closest site to TA-3. The fact that DOE signed a special-use permit for the County's transfer station for 35 years means it is only one step below a land transfer. There are no Lab operations nearby that would be negatively affected. Score "Excellent." *Site 6, TA-21 DP Rd:* Score is "Unsatisfactory" because of tritium buffer zone conflict.

Economic Sub-Criteria

Infrastructure Development Cost. Table 6 lists the nominal scores for each type of infrastructure for the six sites. Road construction is the most costly factor for this criterion and so it is used for the overall score for this criterion. Subject matter experts (SMEs) provided the road building cost estimates: Kyle

Zimmerman (LAC), Nancy Talley (LAC), and Charlie Trask (LANL).[12]

TABLE 6
Relative Ranking for Infrastructure Development Cost

Site	Water	Electric	Gas	Communications	Road
1. TA-74	Excellent	Finest	Above Avg	Excellent	Below Avg
2. TA-61	Average	Average	Finest	Poor	Unsatisfactory
3. TA-71	Excellent	Excellent	Excellent	Above Avg	Average
4. Landfill West	Finest	Finest	Finest	Finest	Above Avg
5. Landfill North	Finest	Finest	Finest	Finest	Above Avg
6. TA-21	Finest	Finest	Finest	Poor	Poor

Site 1, TA-74/DOT: This site will require significant road improvements such as an over-pass and merge lanes. The nearby water well (Otowi 1) has 4 – 6 parts per billion of perchlorate contamination so it is suitable for dust control but not as drinking water.[13] Road improvements cost is estimated to be $1M to $5M. Overall score: "Below Average." *Site 2, TA-61 Borrow Pit:* Road improvements will be very expensive and undoable for a reasonable budget, ($20M?). Overall score: "Unsatisfactory."

Site 3, TA-71: Electricity is good since it is close to Pajarito Acres for hook-ups. Utilities alone would be scored "Excellent," but road improvements are estimated at $1M to $2M, including a remodel of the Grand Canyon/Pajarito intersection to improve safety. Overall score: "Average." *Site 4, Landfill West:* Although the road improvements will be the least expensive of the sites, the facility construction cost will be much higher because it will be built on old burial pits. This additional expense causes the overall score to be "Poor." *Site 5,*

[12] Meeting notes from 12/21/04 meeting with traffic experts.
[13] Pat Longmire, LANL, EES-6, personal communication, December 23, 2004.

Landfill North: Road construction cost is the cheapest, less than $1M. Overall score: “Above Average.”

Site 6, TA-21 DP Rd: County believes improving the road is difficult with private buildings and use on both sides. There will be some intersection improvement by the State at Trinity/DP. Perhaps the County could relocate or widen the road with DOE permission. But the County can't spend enough money to get this done in two years of allotted time. If the bridge option were required to avoid these issues, it would be over $5M. Overall score: “Poor.”

Operation Costs.
Site 1, TA-74: This site requires county garbage trucks to go up and down E. Jemez Road to serve the town site which means higher fuel costs. Transfer trailer trucks to and from Albuquerque have the best situation. “Above Average.”

Site 2, TA-61 Borrow Pit: Steep grade makes it hard for the trucks to accelerate in the first 0.5 mile toward town. This is a very good location near mid-point of county. Score is one step below existing landfill sites: “Excellent.” *Site 3, TA-71:* “Average.” *Sites 4 and 5, Landfill East and North:* This location would cause the least disruption in County operations; score is “Finest.”

Site 6, TA-21, DP Rd: This has the maximum driving distance for transfer trailer trucks, including up and down grades on E. Jemez Rd. County drivers don't drive on Trinity at all now, but this site would force trucks to travel through town-site traffic adding stop and go driving, traffic delays, and lowering truck and schedule efficiency. This is the worst site for garbage trucks traveling to and from White Rock. Score: “Poor.”

Schedule.
Site 1, TA-74: Pueblo interests are involved here (see environmental justice notes under the Public Acceptance sub-criterion). The complication of a major road building project and traffic re-routing might slow schedule. This site has sensitive cultural issues and EA/EIS complexities. Land

Transfer schedule might impact transfer station schedule. The combination of activist interest and complex road building leads to a score of “Below Average.”

Site 2, TA-61 Borrow Pit: The most complex road building leads to the biggest schedule risk from construction. We might be able to have a NEPA categorical exclusion for this site (if so, we wouldn't need an EA or EIS). Hard road and easy activist scores: “Average.” *Site 3, TA-71:* Pajarito Acres activists could slow it, but it is a less complex construction project than others. Same score as Site 2 Borrow Pit: “Average.” *Site 4, Landfill West:* Score is “Unsatisfactory” because County doesn’t believe it can get an NMED waiver in the required 24 month period to allow building on the burial pit.

Site 5, Landfill North: County is already doing transfer activities at the site and the planned building location does not require special NMED permission. It already has the special use permit signed by NNSA for 35 year use of the site for solid waste transfer activities. Per Dan Pava, it is possible that a categorical exclusion could be obtained for this site. No pilings needed through existing waste pits for the building construction, thereby minimizing risk. Easy terrain to develop. No activist problems and the simplest road and construction project of all options scores “Finest.”

Site 6, DP Road: Clean up of old LANL contamination pits along the road or special requirements for road construction might slow schedule. This will be a complex road building project because of the private commercial interests along DP Road, plus the bridge construction difficulties. Activist interest should be minimal because this is an industrial area of town, and the EA should have no problem. The combination of hard road construction with easy activist scores the same as the Site 2 Borrow Pit: “Average.”

Results

The weights for the criteria and the scores of the alternatives are combined to create the final results of the decision model. The scores described above and in Table 4 are normalized in a similar fashion to what is done with the

weights. That is, the scores of the six transfer station site alternatives against one sub-criterion are recomputed so that the six scores add to unity. For each sub-criterion this is done by dividing each alternative's score by the sum of the six scores. For example, the (rounded) scores against Biological Impacts are: Site 1 (100), Site 2 (33), Site 3 (100), Site 4 (67), Site 5 (67), and Site 6 (50). The sum of the six scores is 417. Therefore, the normalized score for Sites 1 and 3, 100/417 = 0.24, and that of Sites 4 and 5 is 67/417 = 0.16, and so on. These scores are listed in Table 7.

The decision score is found by computing the weighted sum of the scores of each alternative. The information needed for this calculation is shown in Table 7. The column for each alternative has the normalized scores for each sub-criterion. The sum of an alternative's scores against all the sub-criteria multiplied by their appropriate weights is the total score shown in the bottom row. The chart in Figure 16 shows these results.

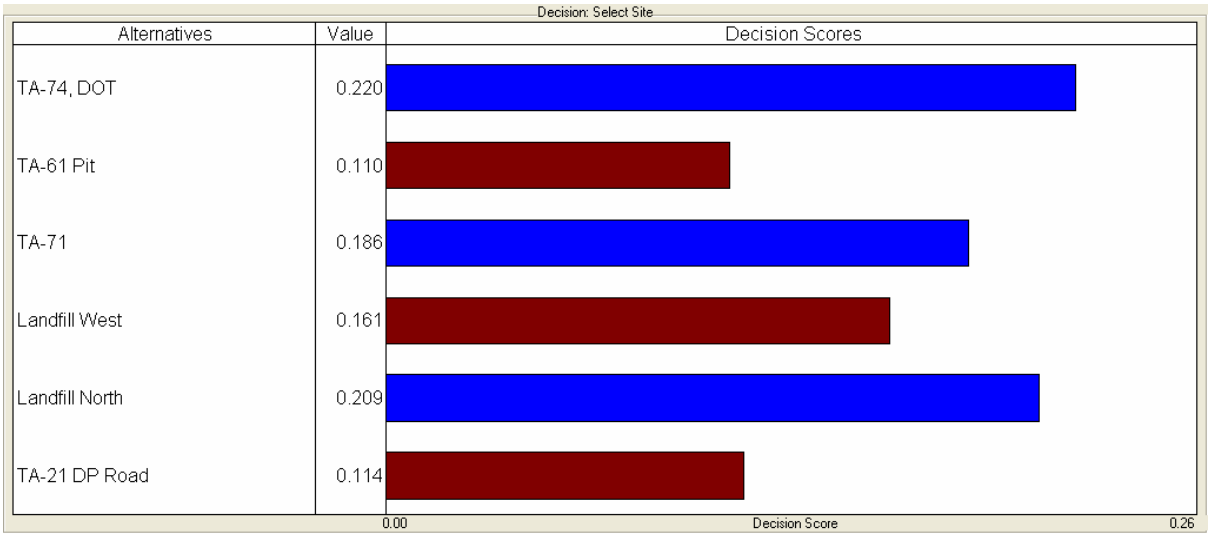

Figure 16: There are three favorable sites for a County solid waste transfer station shown in blue in the decision analysis ranking chart. Red bars signify that the alternative scored "unsatisfactory" on one or more important rating criteria.

TABLE 7
Normalized Scores for the Six Transfer Station Site Alternatives

Sub-Criteria	*Site 1, TA-74*	*Site 2, TA-61 Pit*	*Site 3, TA-71*	*Site 4, Landfill West*	*Site 5, Landfill North*	*Site 6, TA-21*
Biological Impacts	0.24	0.08	0.24	0.16	0.16	0.12
Available Land	0.26	0.16	0.26	0	0.16	0.16
Cultural Impacts	0.10	0.17	0.10	0.21	0.21	0.21
Public Acceptance	0.04	0.20	0.04	0.24	0.24	0.24
Safety	0.29	0	0.21	0.21	0.21	0.07
Compatibility with Land Use Plans	0.19	0.16	0.10	0.19	0.19	0.16
Security Impacts	0.40	0.13	0.27	0.07	0.07	0.07
LANL Operations Impacts	0.24	0.16	0.20	0.20	0.20	0
Infrastructure Devel. Costs	0.18	0	0.27	0.09	0.36	0.09
Operation Costs	0.16	0.20	0.12	0.24	0.24	0.04
Schedule	0.12	0.18	0.18	0	0.35	0.18
RESULTS	**0.22**	**0.11**	**0.19**	**0.16**	**0.21**	**0.11**

Note: Each criterion row adds to 1.0. Normalized scores are computed by dividing the single alternative's score by the total of all alternative scores, e.g. for Site 1 against Biological Impacts, 100/(100 + 33 + 100 + 67 + 67 + 50) = 0.24.

Three of the alternatives have red bars in Figure 16, which signify a violation of one or more rules in the model. Rules are defined to highlight important sub-criteria where a score of *Unsatisfactory* indicates a major problem with that alternative. In this model eight rules are defined, as shown in Table 8. Even though an alternative may score very high against many sub-criteria and have a high total score, a violation of a rule indicates a major potential problem exists in developing a transfer station at that site. In coloring the score bar red in Figure 16, the reader can see the final score but also the fact that a potential "show-stopper" issue exists. Site 2 (TA-61 Borrow Pit) violates the rule "Safety." The traffic safety engineers did not believe adequate road improvements were possible to make the intersection safe for a transfer station. Site 4 (Landfill West) suffers from a lack of Available Land and that the project could not be accomplished within the allotted Schedule. Site 6 (TA-21) violates the rule for LANL Ops because the tritium buffer of a nearby building overlaps the site.

TABLE 8
Rules for Important Sub-Criteria

Rule Name	***Definition***
Available Land	**Available Land** must be better than *Unsatisfactory*.
Cultural Impacts	**Cultural Impacts** must be better than *Unsatisfactory*.
Public Acceptance	**Public Acceptance** must be better than *Unsatisfactory*.
Biological	**Biological Impacts** must be better than *Unsatisfactory*.
Schedule	**Schedule** must be better than *Unsatisfactory*.
Safety	**Safety** must be better than *Unsatisfactory*.
LANL Operations	**LANL Operations** must be better than *Unsatisfactory*.
Security	**LANL Security Impacts** must be better than *Unsatisfactory*.

The three sites that do not violate rules are also ranked as the top three overall. However, it must be pointed out that each of these has a single sub-criterion on which it scored "poor." Site 1 (TA-74) and Site 3 (TA-71) both score "poor" on Public Acceptance because of proximity to San Ildefonso Pueblo and Pajarito Acres, respectively. Getting approval to develop a waste transfer station on one of these sites would require an investment of community outreach resources to partner with important stakeholders. The team believes this would be a difficult if not insurmountable obstacle.

Recommendation

Site 5 (Landfill North) is the recommended site for the solid waste transfer station. It scores “poor” on Security Impacts because of lying with the NNSA footprint relatively close to TA-3, but this is not a show stopper according to S-DO and the Security Integration Board. As the site of the current landfill, Site 5 has qualities making it particularly well-suited to a transfer station: lowest construction and infrastructure cost, ease of NMED and public acceptance, a NNSA-signed special use permit already in place, excellent County operational efficiencies, and a brown-field redevelopment that would not disturb environmentally sensitive land.

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