



**PINES ENGINEERING INC.**

**PROPOSAL FOR  
CINDER LAKE LANDFILL  
RESIDENTIAL DROP-OFF CENTER**

December 6, 2013

**PREPARED FOR**

City of Flagstaff  
Cinder Lake Landfill  
6770 Cinder Lake Landfill Rd  
Flagstaff, AZ 86004

**Submitted By**

Pines Engineering, Inc.  
6483 Oak Tree Ln.  
Flagstaff, AZ 86001



PINES ENGINEERING INC.

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Flagstaff, AZ 86001  
December 6, 2013

Matt Morales  
City of Flagstaff  
6770 E. Landfill Road  
Flagstaff, AZ 86004

Dear Matt Morales:

Pine Engineering, Inc. has completed the Proposal for the City of Flagstaff, Cinder Lake Landfill Residential Drop-Off Center. This proposal is performed in accordance with the request date 12/06/13. The proposal contains the details in consideration to sufficiently complete the design request. Furthermore, attached is a copy of the proposed budget and schedule that PEI will adhere to.

If you have any questions with the report, please do not hesitate to contact Pines Engineering Inc., as it is in our best interest to satisfy your needs.

Sincerely,  
Gerardo Gonzalez  
Frank Parker  
Terrell Dineyazhe  
Jackie Fischer



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## 1.0 PURPOSE

The Pine Engineering Inc. (PEI) Team understands that the City of Flagstaff - Cinder Lake Landfill plans to construct a residential drop-off center (RDC) within the Cinder Lake Landfill, see Fig. 1. The purpose of the residential drop-off center is to eliminate the need to have residents drop off municipal solid waste (MSW) near the potentially dangerous working phase of the landfill. The drop-off center will allow landfill staff to more adequately monitor and categorize tonnage received by residential users.

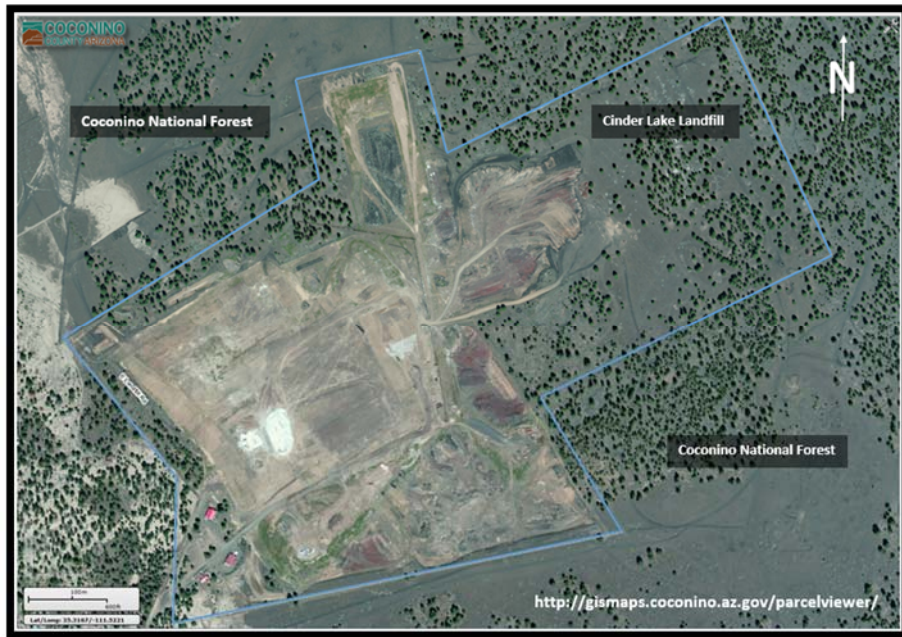


Figure 1 – Map of Site

## 2.0 BACKGROUND INFORMATION

The Cinder Lake landfill provides services to the 68,000 residents of the City of Flagstaff as well as the 135,000 Coconino County residents. The landfill has a life time extending to the year 2054 with a thirty year rehabilitation period after closure.

The general users that utilize the facility are the municipal solid waste collector trucks from the City of Flagstaff, city residents, county residents, contractors, and commercial/industrial businesses. All users must be weighed prior to entering the landfill, excluding residential users. A fee is given per tonnage of landfill waste. Both residential and commercial users enter the landfill through the same access road. Traffic control, therefore, is a crucial design aspect within the landfill in that it changes daily as the landfill airspace is occupied over time. At the current waste drop-off location, a landfill compactor compresses the waste as users dispose of their garbage. With these vehicles present, stray trash has the potential of endangering nearby users and vehicles.

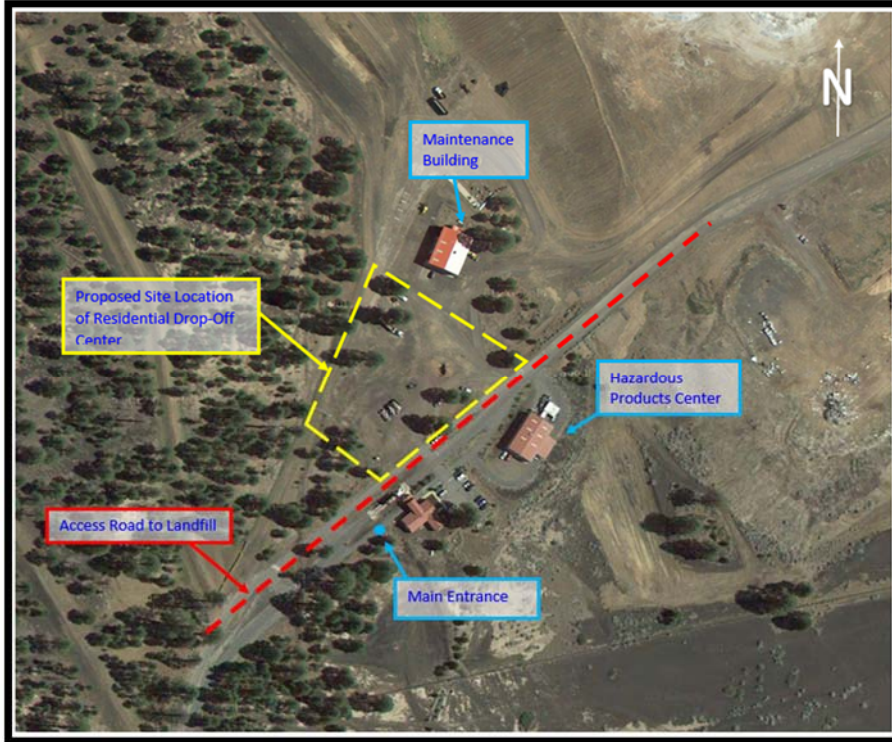


Figure 2 – Proposed location of RDC

The waste drop-off location is currently located at the working face of the landfill, which leaves it exposed to high speed winds. Thus, high profile vehicles and the waste compactors pose a risk to small vehicles because high profile vehicles have the potential to tip over.

Cinder Lake Landfill currently accepts the following type of waste:

- MSW, and industrial waste
- Recycling (Paper, Plastic, etc.)
- Wood waste
- Green waste
- White goods

These items are all located in separated areas. If a resident's waste contains several of these items, they are forced to drive through the various sections to dispose of their waste.

### 3.0 STAKEHOLDERS

PEI will be working with the City of Flagstaff, the primary stakeholder, to complete the desired RDC project. The secondary stakeholder is Coconino County. Since the proposed location of project is located within the bound of City of Flagstaff, all disturbances will be contained within the property. US Forest Service will not be affected, thus, is not a stakeholder. The client and project manager, Matt Morales, will be PEI's primary contact.





## 4.0 EXISTING CONDITIONS

There are several aspects of the existing location that will affect PEI's design of the RDC. These conditions include the hydrology of the land, existing vegetation, and the entrance.

### 4.1 HYDROLOGY

Due to the Shultz fire in 2010, the drainage characteristics have changed in the land surrounding the Cinder Lake landfill. The pathway for the storm water has the potential to affect the RDC because of its flow path. In measures to prevent offsite runoff from entering the landfill property, berms have been placed near the entrance of the landfill. This prevents the contamination of offsite runoff due to contact with the landfill surface. All onsite runoff is conveyed through culverts that connect to a nearby retention basin. These culverts are sized 24in. and 8in. All hydraulic features can be seen in Figure 3 shown below.

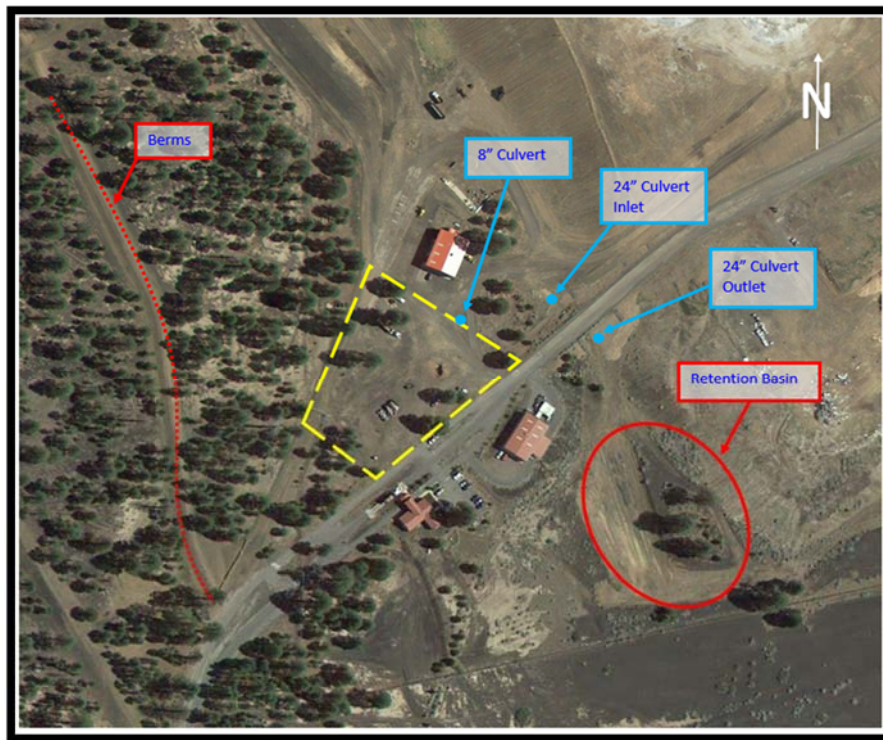


Figure 3. Hydraulic Features

### 4.2 EXISTING VEGETATION

There are approximately 15 existing pine trees located in the general area of the RDC, see Figure 2 and Figure 3. According to County regulations, all trees with a diameter of 16in or greater must not be removed without proper consideration. The project will also require considerations for existing plant units and future accommodations for landscaping.



### 4.3 ENTRANCE

The entrance to the landfill was designed to service the general public, industrial/commercial businesses etc. Typically residents enter the landfill on the south side while commercial customers enter on the north, see Figure 4. The entrance shall remain the same and shall not be affected by the creation of the RDC. All entering vehicles merge into the same access road leading to the working face of the landfill. Traffic control is, therefore, necessitated at this location.



Figure 4- Cinder Lake Landfill Entrance

## 5.0 TECHNICAL TASKS

### 5.1 SITE ANALYSIS

The PEI Team will need to perform a site analysis to identify all factors, seen below, that will control and/or influence the design of the drop-off center that encompasses an area of approximately 2.5 acres.

- Utility locations
- Project survey, mapping
- Hydrologic analysis with the current culverts
- Propose a temporary location for recyclables
- Existing Traffic Control Devices

### 5.2 DESIGN

PEI will prepare a set of plans for each of the following components. These set of plans will include all of the necessary portions of each of the following:

- Grading Design
  - Proposed grade will be designed to mitigate onsite runoff to culverts while maintaining the integrity of surface conditions.
  - Adequate slope will be provided to prevent buildup of ice during the Flagstaff winters.



- Engineered fill will be extracted from the cinder lake landfill borrow pits.
- Drainage Design
  - Site design requires consideration for the 100-year 24-hour event.
  - Culverts will be designed to adequately mitigate calculated onsite runoff without causing excessive pooling.
  - All offsite runoff will be mitigated with upstream flood control structures.
  - Retention basin sizing will be determined by calculated the expected runoff volume.
- Layout Design
  - Available project area will be analyzed to find the most optimal layout of the RDC using the following information:
    - As per client specifications, a total of 6, 40 roll off bins (8' W x 22' L x 8' H ea.)
      - 2 MSW/Industrial Waste
      - 1 Recycling
      - 1 Wood Waste
      - 1 Green Waste
      - 1 Ashes
    - Adequate flow of traffic
  - Engineered safety controls for the site
  - Revised Traffic Control for Future Site
  - Utilities must be considered in the layout designed and will be relocated if necessary.
    - There is currently no known utility conflicts
- Stormwater Controls
  - A control will be installed along the storm water flow path to ensure that no contaminants are carried into the retention basin. Different methods will be analyzed to determine the most effective and economical.
- Retaining Wall Design
  - A gravity block wall and CMU brick will be used as per customer specifications.
  - Soil properties will be provided from geotechnical reports and will be used to determine necessary dimensions required to resist the active pressure of the soil.
  - Retaining wall will be adequately dimensioned such that the existing ground is flush with the top of the 40 roll over bins.

### **5.3 CONSTRUCTION COST**

The City of Flagstaff has provided a maximum budget of \$1,000,000 in construction cost. PEI will gather and maintain the cost of major construction materials through the means of RSMeans Costworks Book. A cost proposal will be presented to the client after design details are complete.





## **6.0 POTENTIAL CHALLENGES**

There are some challenges that PEI may experience in the design process for the Residential Drop-Off Center. The main concerns include the grade, utilities, hydrology, and the safety of the general public.

### **6.1 GRADE**

The desired location for the RDC currently sits below grade. This may incur costs that will limit the design. Along with this, the borrow pit located in the Cinder Lake landfill may not have enough soil to complete the fill needed for the project site. This would create a need for offsite soil to be imported in order to successfully complete the fill.

### **6.2 UTILITIES**

Blue Staking records are on file. These records indicate that electrical wires surround the site area. These must be avoided, and will be considered in the design of the RDC. If avoidance of these utilities is not possible, then a relocation of the utilities may be needed.

### **6.3 HYDROLOGY**

If Cinder Lake landfill experiences an 80 year 24 hour event, it is possible that the berms located offsite could fail. This would cause the offsite runoff to pass through the desired location of the RDC. This must be considered in the design process in order to avoid unsolicited flooding. This offsite runoff would become contaminated by the landfill once coming onsite. Due to the contamination, it would be necessary for the water to be guided into the retention basin which has a limited volume.

The development of the RDC in the desired area could change a pervious surface into an impervious surface depending of the designed surface. The culvert sizes could have to be resized in order to accommodate a greater flow. There are currently two 8” culverts as well as a 24” (see Figure 3) that transfer water into the nearby retention basin.

### **6.4 EXISTING FEATURE ABOVE GROUND**

Located on the desired site of the RDC are approximately 15 pine trees that must be preserved, see Figure 6. This could limit the design of the site. There are also several buildings located near the project site that must be avoided. These buildings are needed for the landfill operations and cannot be relocated.



## 7.0 SCOPE OF SERVICES

PEI offers to provide the following services:

Task	Description
A	<p><b>Topographic Survey</b>            PEI will provide topographic survey of 2.5 acres of proposed location for residential drop-off center. PEI will obtain aerial pictures from Google Maps and set up base sheet for the conceptual design.</p> <ul style="list-style-type: none"> <li>• Elevations and Horizontal Control set to City of Flagstaff datum</li> <li>• Locate known utilities and obstructions.</li> </ul>
B	<p><b>Traffic Report</b>            We will collect data of the existing traffic entering/exiting the landfill which will be used in the analysis. We will review the current user data that Cinder Lake maintains of the vehicles that use the facility. This is to ensure that we design for the average weight and extreme weight for a residential vehicle. This to ensure that design meets the needs of the residents and businesses accessing the Residential Drop-Off Center (RDC). The components that are necessary in the design and layout of the entrance of the are listed below:</p> <ul style="list-style-type: none"> <li>• Maximum weight capacity</li> <li>• Design speed required for RDC</li> <li>• Average Daily Traffic</li> <li>• AM and PM counts</li> <li>• Service percentage of large vehicles (semi-trucks, dump truck, etc.)</li> </ul>
C	<p><b>Design Layout</b>            The layout will be determined in collaboration with the Client, City personnel, and the Client’s design professionals. Design components include the following:</p> <ul style="list-style-type: none"> <li>• Location of Bins: accessibility, no interaction of removal vehicles of bins with residential traffic.</li> <li>• Effective accessibility of vehicles to minimize the drop off time with the drop-off area.</li> <li>• Redesign Road Layout to the drop-off center from the main entrance to mitigate interaction with industrial vehicles that drive up to the industrial area.</li> <li>• Landscaping in accordance with County Regulation</li> </ul>
D	<p><b>Retention Wall</b>            Prepare a design plan for the construction of a gravity block wall in accordance with City Regulations. The following components will be determined:</p> <ul style="list-style-type: none"> <li>• Geotechnical Analysis (Lateral Earth Pressure, Compressive Strength, Bearing Capacity, etc.)</li> </ul>



	<ul style="list-style-type: none"> <li>• Structural Analysis               <ol style="list-style-type: none"> <li>1. Load distribution on wall</li> <li>2. Type of loads on surface that will be transferred to wall.</li> <li>3. Additional loads applied after construction.</li> </ol> </li> <li>• Wall materials; brick, CMU, concrete</li> <li>• Wall aesthetics to meet landscape guidelines.</li> </ul>
E	<p><b>Hydraulic Analysis:</b> Analyze the current hydrology of surrounding area of the proposed location of project. Analyze how the design will affect the surrounding area, such as runoff from the proposed site. Research alternatives surfaces that will mitigate the run off flow from the site while maintaining the surface structure integrity.</p> <ul style="list-style-type: none"> <li>• Pre-Developed versus Post Developed Hydrology Calculations using HEC-HMS</li> </ul>
F	<p><b>Drainage Analysis:</b> Prepare a drainage analysis of proposed area to allow flow towards CMPs while mitigating the run off flow. Must meet City Low Impact Design (LID) retention and storm water detention measures that will evaluate the effect of additional impervious area per the City’s guidelines. Components required are as follows:</p> <ul style="list-style-type: none"> <li>• Documentation of proposed drainage scheme</li> <li>• Analyze capacity of existing culverts and potentially resizing culverts. We would use Bentley CulvertMaster.</li> <li>• Evaluate water retention basin capacity using Bentley StormCAD.</li> </ul>
G	<p><b>Construction Plan</b> Construction plans shall be prepared in accordance with the City of Flagstaff Design Standards and the limitations provided by Cinder Lake Landfill. These plans include:</p> <ul style="list-style-type: none"> <li>• Engineer’s Design Report: containing quantities of materials used for bidding.</li> <li>• Grading Plan</li> <li>• Drainage Plan</li> <li>• Stormwater Pollution Prevention Plan</li> <li>• Detention Basin Analysis and Drainage Plan</li> <li>• Culvert Plan and Profile Drawings</li> </ul>
H	<p><b>Stormwater Pollution Prevention Plan (SWPPP)</b> Prepare a SWPPP report and associated SWPPP Best Management Practices (BMP) plans for the project to address a single phase of construction per ADEQ requirements. The SWPPP developed under this scope of work will address initial SWPPP best management practices (BMPs) and controls only. Modifications to this SWPPP to address on-site changes are the responsibility of the Contractor. Assumptions: Project is not a Unique or Impaired Water per ADEQ or EPA.</p>



## 8.0 SERVICES NOT INCLUDED

The following services will not be provided:

- Geotechnical investigations
- Archeological Studies
- Landscaping Design
- Environmental Studies
- Flagstaff City Submittals (Including: Plat Submittal, AZPDES Notice of Intent form, Development Review Board Site Plan, and any submittal not specifically addressed in Section 1—Scope of Service)
- Any item not specified in the Scope of Service (Section 1.0)

## 9.0 IMPACTS

The introduction of the Residential Drop-Off Center at Cinder Lake Landfill will present several impacts:

- **Social**: The addition of the RDC will provide a safer means of waste disposal for the users. It will allow individuals to save time, effort, and will allow operators to more efficiently supervise landfill activities.
- **Economical**: The implementation of the RDC will make waste drop-off more accessible, which will generate a larger clientele. This can create an economic growth.



## 10.0 COST OF ENGINEERING SERVICES

Pine Engineering, Inc. professional services described in the Scope of Service Section will be provided for an estimated total cost of \$146,812. Cost breakdown by personnel hours, travel, and overhead is as follows:

Personnel	Person	Hours	Rate, \$/hr.	Cost
	SENG	200	125	\$ 25,000
	ENG	680	110	\$ 74,800
	LAB	10	44	\$ 440
	INT	272	25	\$ 6,800
	AA	20	38	\$ 760
	Total personnel			\$ 107,800
Travel	Local meetings			
	6 mtgs*30mi/mtg	\$0.40/mi		\$ 72
Overhead				\$ 38,952
<b>TOTAL</b>				<b>\$ 146,824</b>

Table 1: Design Cost Estimate

The different team members will alternate roles throughout the project.

## 11.0 APPENDICIES

**\*\*See Attached**



