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Tonopah Test Range Closure Sites Revegetation Plan

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TONOPAH TEST RANGE CLOSURE SITES REVEGETATION PLAN

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May 1997

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MASTER

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**TONOPAH TEST RANGE
CLOSURE SITES
REVEGETATION PLAN**

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1.0 INTRODUCTION

This document is a revegetation plan for long-term stabilization (revegetation) of land disturbed by activities associated with the closure of a Bomblet Pit and the Five Points Landfill. Both sites are on the Tonopah Test Range (TTR) located in south-central Nevada (Figure 1). This document contains general reclamation practices and procedures that will be followed during the revegetation of these sites. The revegetation procedures proposed have been developed over several years of research and include the results of reclamation trials at Area 11 and Area 19 on the Nevada Test Site (NTS), and more recently at the Double Tracks (Nellis Air Force Range) reclamation demonstration plots. In addition, the results of reclamation efforts and concurrent research efforts at the Yucca Mountain Project have been considered in the preparation of this revegetation plan.

1.1 Physical Location and Setting

1.1.1 Bomblet Pit

The Bomblet Pit is located on TTR, which is approximately 48.0 km (30.0 mi) southeast of Tonopah, Nevada. The Universal Transverse Mercator (UTM) coordinates for the Bomblet Pit are 524724mE and 4181122mN (Figure 2). Typical access to this site is through the north entrance (main gate) to TTR, south on Main Road for approximately 13.0 km (8.0 mi), east on Bunker Road approximately 4.0 km (2.4 mi), and then approximately 2.0 km (1.2 mi) northwest on a dirt road.

The Bomblet Pit is located on the western edge of Cactus Flat. Existing dirt roads pass through the site. Elevation is 1,640 m (5,380 ft), the aspect is easterly, and the slope is 2-3%. Soils are deep, sandy, and alluvial. Common shrubs found in the area include shadscale saltbush (*Atriplex confertifolia*), budsage (*Artemisia spinescens*), and winterfat (*Krascheninnikovia lanata*). Common grasses include Indian ricegrass (*Achnatherum hymenoides*), bottlebrush squirreltail (*Elymus elymoides*), and galleta (*Pleuraphis jamesii*).

1.1.2 Five Points Landfill

Typical access to the Five Points Landfill is southeast on Lake Road approximately 6.0 km (3.6 mi) from the north entrance (main gate) to TTR, southeast on Mellan Road about 6.0 km (3.6 mi) to the Five Points Intersection, and then 1.9 km (1.1 mi) northeast on Perimeter Road. UTM coordinates are 529402mE and 4184706mN.

The site is located on the eastern side of Cactus Flat (Figure 2). Elevation at the site is 1,650 m (5,412 ft), the aspect is westerly, and the slope is 3-5%. Soils are a deep, sandy alluvial soil with little profile development. Common shrubs occurring at the site include Greene's rabbitbrush (*Chrysothamnus greenei*), shadscale saltbush, winterfat, fourwing saltbush (*Atriplex canescens*), and budsagebrush. Common grasses include Indian ricegrass and bottlebrush squirreltail.

LEGEND

- Primary highway
- - - State boundary
- - - County boundary
- o City

Figure 1. Location of Tonopah Test Range.

Figure 2. Location of the Bomblet Pit and Five Points Landfill Closure Sites on the Tonopah Test Range.

1.2 Project Description

1.2.1 Bomblet Pit

Several years ago, small pits (3 m x 14 m [10 ft x 46 ft]) were created to dispose of various military ordnance. Over the last two years, during closure activities, the pits have been uncovered and the ordnance removed and disposed. Several open pits and piles of excavated soil remain at the site as a result of closure activities. Soils in the immediate area have been compacted due to vehicular traffic and portions appear to have been scraped. A dirt road accesses the site off of

Bunker road from the southeast and borders the eastern side of the disturbance. Another road (possibly a pipeline road) borders the area to the north. The area disturbed is approximately 105 m (344 ft) long and averages 20 m (66 ft) wide; total area is 0.2 ha (0.5 ac).

1.2.2 Five Points Landfill

Several years ago, a large open pit was created to dispose of construction materials and military debris. During closure activities the past two years, material from the pit was spread over the area and much of the construction materials and military debris removed. An earthen mound containing metallic materials was created on the area's southern edge, and even though the materials have been removed a small mound still exists. The area where the debris was spread has been lightly compacted. Roads to the south and north border the landfill. The area disturbed is approximately 185 m (607 ft) long and 50 m (164 ft) wide; total area is 0.9 ha (2.3 ac).

2.0 OBJECTIVE

The objective of this document is to provide general procedures for the long-term stabilization of the Bomblet Pit and Five Points Landfill sites. Long-term stabilization is accomplished by establishing a permanent native plant community. The resulting vegetative cover will 1) stabilize the soil and minimize soil erosion and 2) provide habitat for wildlife native to the area.

3.0 REVEGETATION PROCEDURES

3.1 Areas to be Revegetated

3.1.1 Bomblet Pit

Total disturbance area to be revegetated at the Bomblet Pit, including the pits and staging area is approximately 0.2 ha (0.5 ac) (Figure 3). The pipeline corridor and the access road off of Bunker road will remain open and will be revegetated. The pits and denuded area around the pits will be revegetated.

3.1.2 Five Points Landfill

Total disturbance area at the Five Points Landfill is approximately 0.9 ha (2.3 ac) and consists of the landfill proper, which is approximately 40 m x 120 m (131 ft x 394 ft); a staging area (50 m x 60 m [164 ft x 197 ft]) where spoil from the pit was spread out; a small berm (20 m x 55 m [66 ft x 180 ft]) along the southern edge of the staging area; and the access roads on the north and south of the landfill proper (120 m x 3 m [394 ft x 10 ft]) (Figure 4). The entire area will be revegetated.

3.2 Soil Plant Growth Potential

Based on the results of previous soil analyses (Leavitt, 1978), soils at both the Bomblet Pit and Five Points Landfill are suitable for plant growth (USEPA, 1983; USDA, 1978; USDA, 1979). However, soils in this region are generally low in organic matter, especially on disturbed sites where the top few centimeters of soil have been removed. The low percentage of organic matter results in a reduction in nutrients available to plants and the soil water holding capacity is lowered. To improve the poor water holding capacity of the soil, a polyacrylamide gel will be applied. Polyacrylamide gels (cross-linked polymer gels) can absorb 40 to 500 times their weight in water. At NTS, polyacrylamide applications have been successful in increasing the numbers of germinating perennial species over areas not receiving the polyacrylamide application (EG&G/EM 1994; EG&G/EM 1995). Additionally, straw will be incorporated into the soil to increase water holding capacity and add organic matter to the soil. These techniques will enhance the plant growth potential of the soils at the two closure sites.

3.3 Plant Species Selection

Vascular plant species native to each site will be used to revegetate the Bomblet Pit and Five Points Landfill. Plant cover was determined near each site using a point-intercept method. Cover (absolute), defined as the percentage of ground surface area covered by the canopy of a particular species, was recorded for each perennial species along 3 to 5, 100-m (328 ft) long transects. Relative percent cover was calculated for each species by dividing the absolute percent cover for a particular species by the total absolute percent cover for all species. The data revealed that vegetation at each site was different enough to warrant a separate seedmix for each site.

Figure 3. Bomblet Pit Closure Site. Areas to Be Revegetated are Shaded.

Cover data were used to determine the species and proportion of each species to be included in the seedmix used to revegetate each site. Annual plant species were not included because they do not provide constant vegetative cover. Other criteria used to select species for revegetation include 1) previous success in establishing the species by seeding, 2) the ability to collect seed from native species in environments similar to the Bomblet Pit and Five Points Landfill, and 3) the commercial availability of seed from species adapted to the Bomblet Pit and Five Points Landfill environs.

Seed will be purchased from commercial sources, on a pure live seed (PLS) basis and/or collected from areas near the two sites. Requests for seed purchased from commercial sources will carry the stipulation that seed origin be from Mojave and/or Great Basin desert environments. It may be necessary to adjust the seedmixes if seed for a particular species is not available. For example, seed from budsagebrush and Greene's rabbitbrush is infrequently available from commercial sources.

3.3.1 Bomblet Pit

Vegetation data for the Bomblet Pit were collected near the Roller Coaster Sewage Lagoon site approximately 4 miles south of the Bomblet Pit. Vegetation at the two sites was similar enough so data could be used for both sites. Results of vegetation sampling and the seedmix to be used for revegetating the Bomblet Pit site are shown in Table 1. Fourwing saltbush and desert globemallow (*Sphaeralcea ambigua*) were added to the seedmix because they frequently

Figure 4. Five Points Landfill Closure Site with Areas to Be Revegetated.

occur in the area and have been successful in revegetation efforts in the TTR area.

3.3.2 Five Points Landfill

Vegetation data for the Five Points Landfill were collected from the area adjacent to the site both in and out of the wash. Results of the vegetation sampling and the seedmix to be used for revegetating the Five Points Landfill are shown in Table 2. Budsagebrush, winterfat, bottlebrush squirreltail and desert globemallow were added to the seedmix because these species also occur in the area, although not as frequently as the other species in the seedmix.

3.4 Site Preparation

Site preparation will be completed prior to the October 1 to November 30, 1997 revegetation window. Site preparation will include ripping and disking compacted soils. Ripping will be done using a grader equipped with 16-inch ripper teeth or a chisel-tooth plow, depending on the severity of compaction. Depth of ripping will be below the compacted soil layers, usually between 12 and 16 inches. Disking and/or harrowing may follow ripping or it may be delayed until just before planting. Ripping and disking, if necessary, increase water infiltration and provide a firm seedbed for good soil-to-seed contact (Munshower, 1994).

Table 1. Results of Vegetation Sampling and Proposed Seedmix for the Bomblet Pit Closure Site.

Scientific Name	Common Name	Cover (%)		Approximate No. Seeds/m ²	PLS kg/ha (lbs/ac)
		Absolute	Relative		
<i>Artemisia spinescens</i>	Budsagebrush	7.0	37.5	400*	0.5* (0.4)*
<i>Atriplex canescens</i>	Fourwing Saltbush	0.0***	0.0***	35	2.8 (2.5)
<i>Atriplex confertifolia</i>	Shadscale	4.3	23.2	225	15.7 (14.0)
<i>Krascheninnikovia lanata</i>	Winterfat	0.3	1.8	170	13.4 (12.0)
<i>Erioneuron pulchellum</i>	Fluff Grass	1.0	5.4	**	**
<i>Pleuraphis jamesii</i>	Galleta	5.3	28.6	235	6.7 (6.0)
<i>Achnatherum hymenoides</i>	Indian Ricegrass	0.3	1.8	140	4.5 (4.0)
<i>Elymus elymoides</i>	Bottlebrush Squirreltail	0.3	1.8	135	3.1 (2.8)
<i>Sphaeralcea ambigua</i>	Desert Globemallow	0.0***	0.0***	40	0.3 (0.3)
Totals		18.5	100.0	1380	47.0 (42.0)

* Seed may not be available from commercial sources.

** Seed not available, poor seed viability and difficult to harvest.

*** Present in area but not encountered on study plots.

3.4.1 Bomblet Pit

Site preparation will include backfilling the pits using the excavated soils stockpiled at the site. If there are stockpiled soils available after the pits have been filled, they will be spread over the site to return the site to as near predisturbance contour as possible. Compacted areas will be ripped with a chisel-tooth plow and either disked or harrowed.

3.4.2 Five Points Landfill

The landfill depression will not be refilled with soil. The sides of the depression will be leveled as much as possible and the soil moved to the center of the depression. The staging area where some compaction has occurred and the two access roads bordering the depression will be ripped with a chisel-tooth plow. The berm on the southern edge of the site will be leveled and the soil distributed over the staging area. The entire site will then be disked and/or harrowed. Ripping, disking, harrowing, and all other site preparation work will be done in a manner to return the area to as near predisturbance conditions as possible. Attention will be given to channeling the major drainage that traverses the site into undisturbed lands and not into the depression.

The revegetation strategy is to amend the soil with a polyacrylamide gel, seed the area with seed from native plant species common to the surrounding area, and apply a straw mulch to stabilize the soil. The possibility of the establishment of desirable native plant species without artificially seeding the site is remote. The natural source of seeds is located in the surface

soils. Due to closure activities the surface soils have been disturbed and the seed source either removed or moved to lower levels where germination is impeded. Leaving the disturbed areas to reseed naturally would only promote an influx of undesirable annual species. The abundance of annual species often gives the appearance of restoration success during years of abundant precipitation, but their effectiveness in controlling erosion is short lived and undependable. It may also actually hinder establishment of perennial vegetation and hinder natural restoration processes. The establishment of native shrubs and grasses is a more sound approach but is dependent on the presence of seed in the soil and good growing conditions.

Table 2. Results of Vegetation Sampling and Proposed Seedmix for the Five Points Landfill Closure Site.

Scientific Name	Common Name	Cover (%)		Approximate No. Seeds/m ²	PLS kg/ha (lbs/ac)
		Absolute	Relative		
<i>Artemisia spinescens</i>	Budsagebrush	0.0*	0.0	200**	0.2 (0.2)
<i>Atriplex canescens</i>	Fourwing	3.8	23.8	260	22.4 (20.0)
<i>Krascheninnikovia lanata</i>	Winterfat	0.0*	0.0	115	9.0 (8.0)
<i>Chrysothamnus Greenei</i>	Greene Rabbitbrush	10.4	65.0	385	2.2 (2.0)
<i>Pleuraphis jamesii</i>	Galleta	0.2	1.3	160	4.5 (4.0)
<i>Achnatherum hymenoides</i>	Indian Ricegrass	1.6	10.0	210	6.7 (6.0)
<i>Elymus elymoides</i>	Bottlebrush Squirreltail	0.0*	0.0	65	1.6 (1.4)
<i>Sphaeralcea ambigua</i>	Desert Globemallow	0.0*	0.0	50	0.5 (0.4)
Totals		16.0	100.0	1445	47.0 (42.0)

* Present in area but not encountered on study plots.

** Seed may not be available from commercial sources.

3.5 Revegetation

The reclamation strategy will insure the presence of viable seed by seeding, and maximize the effectiveness of moisture that is received by incorporating the polyacrylamide gel into the soil and applying a straw mulch to the soil surface.

The overall objective of artificially seeding disturbed sites is to accelerate the natural restoration process. The establishment of native grasses and shrubs will provide a permanent means of controlling wind and water erosion. Wildlife should adapt to the newly revegetated area because only species native to the area will be used in revegetation efforts.

3.5.1 Soil Amendments

A polyacrylamide gel will be spread at a rate of 24 kg/ha (20 lbs/ac). The gel will be applied at the time of seeding. The gel is placed in the middle bin of the drill seeder with apertures opened to their maximum. The drag chains on the drill seeder will work the gel crystals into the top 2-5 cm (1-2 in) of soil.

3.5.2 Seeding

Both sites will be seeded during the revegetation window, which is between October 1 and November 30. The preferable month for seeding is November. Seeding at this time ensures that dormancy-breaking requirements for germination of most seeded species are met. Additionally, seed will be in the ground prior to winter precipitation and freezing temperatures.

The seed will be broadcast-seeded at a rate of approximately 47.0 PLS kg/ha (42.0 lbs/ac). Areas will be seeded with a tractor-drawn seed drill having seedboxes that accommodate intermediate and fluffy seeds. The seed tubes will be disconnected from the disk openers, thus allowing the seed to be broadcast over the soil surface. A drag bar with ten 80-cm (30-in) chains attached will be fitted onto the walkboard at the rear of the seeder. The length of the chains will be adjusted so seeds are covered by the chains. The length of the chain that is allowed to drag will be adjusted according to the soil structure. In coarser soils, the chain should drag 20-25 cm (8-10 in) on the ground in order to adequately cover the seed. However, in finer soils, the length of chain should be shortened, so seed is not buried too deep. This process improves soil-seed contact and places the seed near the surface, which is the preferred depth for most seeded species. Seeding will be perpendicular to the slope or at an angle to the slope to avoid gullying or rilling in the event of excessive runoff that may occur from summer thunderstorms.

3.5.3 Mulching

Immediately after seeding, the site will be mulched with a grain (wheat or barley) straw. The mulch is secured to the soil surface by crimping, which creates a vertical barrier to both wind and water erosion. The incorporation of the mulch into the soil also increases the percentage of organic matter in the soil, thus creating a more favorable micro-environment for seedling establishment and plant growth.

The straw is applied evenly to the soil surface with a straw blower at a rate of 4,500 kg/ha (4,000 lbs/ac). The exposed soil surface should be less than 5% and the thickness of the straw mulch should be 2.5 cm (1 in), but should not exceed 5.0 cm (2 in). The stem length of the straw should be maximized, preferably 15-25 cm (6-10 in). This is accomplished by adjusting the number of chains attached to the hammermill of the strawblower.

A tractor-drawn, disk-crimper will be used to punch the straw into the soil. Weights are added to the disk-crimper so that disk and straw penetration into the soil is 10-15 cm (4-6 in). The direction of crimping will be perpendicular to the slope of the site.

3.5.4 Fencing

Both sites will be fenced to exclude horses, burros and rabbits. Rabbits and browsing by rabbits were observed on areas revegetated during the fall of 1996 at the Double Tracks cleanup site. To insure the establishment of native plants on the newly revegetated sites at the Bomblet Pit and Five-Points Landfill, they should be fenced and the fence remain in place for a minimum of five years, which should give plants sufficient time to become established and able to withstand the effects of herbivory. To the extent possible the existing fence at the Five Points Landfill should remain in place.

3.5.5 Site Access Requirements

Both sites should have an access with a width of at least 5 m (16 ft). Equipment required at the sites includes a road grader, front-end loader, farm tractor, disk, chisel-tooth plow, harrow, four-wheel drive trucks, seed drill, straw blower, and flat bed truck.

3.5.6 Timing of Reclamation

Long-term stabilization will occur between October 1 and November 30. During this period, conditions are more favorable for meeting germination requirements of the seeded species. Seeding may occur later depending on climatic conditions, but seeding earlier is not recommended.

4.0 REVEGETATION MATERIALS AND EQUIPMENT

4.1 Site Preparation

No materials are required for site preparation. Equipment needed at the Bomblet Pit will be a front-end loader and possibly a scraper to distribute stockpiled soils over the site. A tractor with a chisel-tooth plow and disk will be required to alleviate lightly compacted soils and break up large soil clods. It is estimated that all site preparation work can be completed in 2-3 days. This task will require support from KMI Services at TTR for backfilling the bomblet pits and recontouring the landfill proper at the Five Points Landfill closure site.

4.2 Fencing

Fencing will be completed by Bechtel Nevada personnel prior to seeding. The fence will consist of four strands of barbed wire to exclude horses, and poultry netting will be used along the bottom of the fence to restrict rabbit access. The poultry netting will be four feet high with approximately one foot of it buried below the ground to prevent rabbits from digging under the fence.

4.3 Revegetation

Polyacrylamide gel, native seed, and wheat or barley straw will be required for the revegetation of the two closure sites. Fencing materials required include barbed wire, 2" diameter poultry netting, fence t-posts and stays. The amounts and estimated costs for revegetation materials for the two closure sites are as follows:

Bomblet Pit

<u>Product</u>	<u>Amount Required</u>	<u>Estimated Cost</u>
Gel	4.5 kg (10 lbs)	\$35
Seed	9.1 kg (20 PLS lbs)	\$630
Straw	1 tons	\$100
Fencing Materials		<u>\$475</u>
Total Estimated Costs		\$1,240

Five Points Landfill

<u>Product</u>	<u>Amount Required</u>	<u>Estimated Cost</u>
Gel	20.9 kg (46 lbs)	\$160
Seed	43.9 kg (96.6 PLS lbs)	\$2,900
Straw	4.6 Tons	\$920
Fencing Materials		<u>\$500</u>
Total Estimated Costs		\$4,480

No support from KMI Services will be required during the revegetation of the two closure sites. It is estimated that revegetation will not require more than one week to complete. Equipment operators and laborers will be used to complete the revegetation of the two sites. A tractor, drill

seeder, crimper and straw blower with a flat-bed truck will be required to complete revegetation. All equipment is available and currently located at TTR.

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