



Project Application Profile

Project: Naval Weapons Industrial Reserve Plant, McGregor Texas
Contractor: Arrowhead Contracting Inc.
Engineer: CH₂M Hill Constructors, Inc.
Product Used: ProGuard SB, Super Seal 40, Natural 3XD, ROOTS2, Endo-Roots
Date: December 2003 thru July 2004

Naval Weapons Industrial Reserve Plant Area S Landfill Restoration Project

The US Navy had executed a landfill construction contract in the fall of 1999-winter 2000 to close former waste propellant and explosive burning cells and disposal pits. The landfill area encompassed approximately 5-acres, and required nearly 20,000 cubic yards of cover material to complete the landfill closure. Measuring approximately 700 LF from east to west, the landfill grade was gently sloped (2%) to drain to west, and crowned along the center (E/W) transect to drain to the north and south. Upon completion of the cap construction, the contractor was responsible to plant hulled Bermuda and annual winter rye grasses to stabilize the surface soil. For three consecutive growing seasons, grass flourished in the cool wet winter season and quickly disappeared as the hot summer months seared central Texas.

In order to maintain compliance with the State of Texas Storm Water Pollution Prevention Permit requirements, the Navy spent nearly \$25,000 over a three year period to seed, reseed and irrigate the landfill cap using conventional hydro-seeding methods in an attempt to establish and maintain turf. These efforts were unsuccessful.



In January 2004, Arrowhead Contracting Inc. (ACI) was contacted by the Navy to develop a proposal that established a permanent stand of vegetation on the landfill cap. After evaluating the project history, the landfill cap design and the native agronomy, Arrowhead contacted New Waste Concepts (NWC). NWC technical staff has integrated Con Cover products to enhance vegetative regeneration in areas with severe climates, on unique topographical landscapes or on areas that were inaccessible using conventional turf application methods.

NWC representatives introduced Arrowhead to contacts at the University of Oregon sponsored, **Soil and FoodWeb**, Inc. Arrowhead provided the lab seed specifications, seed

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samples and soil samples from random locations at surface and root zone elevations of the cap. FoodWeb conducted bacteria and fungal cultures, and conducted complete nutrient and mineral analysis to determine the chemical and nutrient composition of the soils. Analytical results indicated that the clay soils were abnormally low in oxygen (resulting from compaction of clay cap) and that fungi composition created an unfavorable environment for Hulled Bermuda grass plants, reducing germination and deep root establishment. Additional results identified that nitrogen and phosphorus levels were too low to sustain turf once established. Based on the final lab report, New Waste Concepts and FoodWeb developed a proposal that specified physical land management techniques and the addition of chemical amendments necessary to establish turf:

- Disc till the top 3-inches of soil to aerate the subsurface and soften the root path
- Blend a decayed, finely shredded, wood pulp mulch into the subsurface to facilitate the generation of essential fungi colonies
- Apply a mild bend of fertilizer and a quick germinating annual rye to the area two weeks prior to re-seeding with hulled Bermuda



Since the wet season (December to March) did not facilitate an optimum soil temperature (>70 degrees), the hulled Bermuda would not germinate. NWC hypothesized that since the clay was compacted so tightly, and because the soil temperature was too low, storm water would wash a large percentage of the seed off the cap before it could germinate. Therefore, FoodWeb recommended that Arrowhead pre-germinate the hulled Bermuda seed

by soaking the huls in a 80/20 mixture of water and ROOTS2 (a root stimulator) for five days.

Because of the extreme climate, NWC developed a seeding approach that provided seed both protection and a sufficient nutrient balance during the critical germination and rooting phase. Six-hundred pounds of Bermuda sprigs were nurtured in 25-lb increments until grass seedlings were observed. After five days, the hulled Bermuda sprigs were mixed in a 900-gallon batch with pre-measured volumes of Natural 3XD (liquid) and EndoRoots (granular) fertilizers, ROOTS2 root stimulator, and a 900-gallon batch of ConCover SB and Super Seal 40 hardener.

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The ConCover was sprayed on the landfill cap surface using the CAPS 900, progressive cavity pump applicator. Unlike conventional hydroseeders, the pump mechanism on the CAPS 900 can transfer almost any solid media without damaging the seedlings. The ConCover provided a protective shell to prevent wind and water erosion and the addition of the fertilizer and root stimulator provided a sufficient nutrient supply for germination.

Within days, Bermuda sprigs had evolved into grass plants that were observed penetrating the outer shell of the ConCover, while the sensitive root system was protected below. After three weeks, the annual temperature had risen to levels sufficient to maintain >70 degree soil temperature, stimulating further germination and turf establishment.



With sufficient irrigation, the Bermuda turf fully established within three months. The gradual temperature rise to 90-100 degrees depleted the stand of annual rye grass. Once mowed, the Navy accepted the Bermuda turf. Arrowhead collected soil samples during the 4th month to measure nutrient, bacteria and fungi levels. Results indicated that nitrogen, phosphorous and fungi levels were low. Standard liquid fertilizer amendments and fungi accelerants were sprayed on the landfill prior to site demobilization.

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