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Completion Report for Pueblo Canyon Grade-Control Structure and Gage Station E060.1

Los Alamos
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June 2010

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EXECUTIVE SUMMARY

This report was prepared by Kellogg Brown and Root Services, Inc. (KBR), and Post, Buckley, Schuh, and Jernigan, Inc. (PBS&J), for the U.S. Department of Energy (DOE) Los Alamos Site Office and Los Alamos National Laboratory (LANL or the Laboratory) to document and summarize the design, analysis, and construction of the Pueblo Canyon grade-control structure and associated stream gage E060.1. This report addresses engineering and site exploration activities, deviations from the original design, permitting, and construction activities.

The Los Alamos and Pueblo watershed, including the canyons and their tributaries, encompasses several former and current technical areas of the Laboratory. In 2004, the Los Alamos and Pueblo Canyons Investigation Report presented investigations of the nature, extent, transport, and potential risk from chemicals of potential concern in the watershed. Following a notice of disapproval from the New Mexico Environment Department (NMED) in 2005, DOE and the University of California prepared a supplemental investigation report for Los Alamos and Pueblo Canyons. In 2007, NMED issued an approval with direction for this report, with requests that the Laboratory conduct actions to mitigate the transport of polychlorinated biphenyls (PCBs) in stormwater. The February 2008 Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons presented interim actions to mitigate PCB transport. NMED issued an approval with modifications to the interim measure work plan, resulting in a supplemental interim measure work plan. The Pueblo Canyon grade-control structure was presented in the supplemental plan as an additional mitigation measure to reduce contaminant transport within the Los Alamos and Pueblo watershed.

This Pueblo Canyon project consisted of the construction of a grade-control structure that raises the level of the stream bed in an area downstream of headcuts that have degraded an existing wetland. The primary goal of this structure is to induce channel aggradation (sediment deposition) upstream of the structure and stabilize the upstream wetland by preventing further headcut migration. The approximate location of the Pueblo Canyon grade-control structure is north of NM 502, approximately 400 ft downstream of the existing New Mexico Department of Transportation's maintenance facility. The reinstalled and upgraded gage E060.1 is located 320 ft downstream of the structure. In this location the flume and gage can measure the efficiency of the grade-control structure. The downstream location also incorporates the stabilization of two nickpoints located downstream of the grade-control structure.

Construction of the grade-control structure began October 26, 2009, and was completed January 26, 2010. A letter submitted to NMED on February 5, 2010, gave notice of the grade-control structure completion and requested extensions for the dates to complete construction of stream gage E060.1 and submit the completion report. In a letter dated February 16, 2010, NMED approved the requested extension for both stream gage completion and completion report to June 3, 2010. Stream gage E060.1 construction was completed March 11, 2010. Final rip-rap installation was completed May 18, 2010, and the entire site was seeded May 19, 2010.

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Acronyms and Abbreviations

2-D	two-dimensional
3-D	three-dimensional
CMP	corrugated metal pipe
CQC	contractor quality control
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
FFA	flood frequency analysis
KBR	Kellogg Brown and Root Services, Inc.
HDC	hydraulic design chart
HEC-FFA	Hydrologic Engineering Center Flood Frequency Analysis (U.S. Army Corps of Engineers statistical computer program)
HEC-RAS	Hydrologic Engineering Center River Analysis System (U.S. Army Corps of Engineers surface model)
IMWP	interim measure work plan
LANL	Los Alamos National Laboratory
LIDAR	light detection and ranging
NGVD	National Geodetic Vertical Datum
NMED	New Mexico Environment Department
NOAA	National Oceanic and Atmospheric Administration
PBS&J	Post, Buckley, Schuh, and Jernigan, Inc.

PCB	polychlorinated biphenyl
PM	project manager
PVC	polyvinyl chloride
SDIC	Security, Disaster, Infrastructure Construction (USACE multiple-award task-order contract)
SIMWP	supplemental interim measure work plan
SWPPP	stormwater pollution prevention plan
TA	technical area
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

1.0 PROJECT OBJECTIVES

The Los Alamos and Pueblo watershed, including the canyons and their tributaries, encompasses several former and current technical areas of Los Alamos National Laboratory (LANL or the Laboratory). The Los Alamos and Pueblo Canyons Investigation Report (LANL 2004, 087390) presented investigations of the nature, extent, transport, and potential risk from chemicals of potential concern in the watershed. Following a notice of disapproval from the New Mexico Environment Department (NMED) (2005, 088463), the Laboratory prepared a supplemental investigation report for Los Alamos and Pueblo Canyons (LANL 2005, 091818). NMED issued an approval with direction for this report (2007, 098284), with requests that actions be conducted to mitigate the transport of polychlorinated biphenyls (PCBs) in stormwater. The February 2008 Interim Measure Work Plan (IMWP) to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons (LANL 2008, 101714) presented interim actions to mitigate PCB transport. NMED issued an approval with modifications to the IMWP (NMED 2008, 103007), resulting in a supplemental IMWP (SIMWP) (LANL 2008, 105716; NMED 2009, 105014). The Pueblo Canyon grade-control structure is an additional mitigation measure identified in the SIMWP to reduce contaminant transport within the Los Alamos and Pueblo watershed. In order to monitor the effectiveness of the structure for mitigating sediment transport, relocation of stream gage E060 was included as part of the grade-control structure work. Figure 1.0-1 shows sediment transport mitigation sites in Los Alamos and Pueblo Canyons, highlighting the Pueblo Canyon grade-control structure and the relocated stream gage E060.1.

The project consisted of the construction of a grade-control structure and the relocation of stream gage E060 (now named stream gage E060.1) within the Laboratory's Technical Area 74 (TA-74) in the vicinity of Los Alamos, New Mexico. The grade-control structure is located within Pueblo Canyon and is referred to as the Pueblo Canyon grade-control structure. The approximate location of the structure is 360 ft downstream of the previous E060 gaging station location. The new location for stream gage E060.1 is approximately 320 ft downstream of the structure. See Figure 1.0-2 and Appendix A for the location of the structure and relocated stream gage E060.1.

The structure is part of remedial actions taken to reduce the migration of contaminated sediment. A beneficial result of the grade control is the stabilization, expansion, and enhancement of wetland areas upstream of the structure.

The Pueblo Canyon grade-control structure was designed to induce upstream aggradation (sediment deposition) to fill the channel, to establish a new grade that provides stability to the channel headcuts, and to aid in the development of an enhanced wetland environment. The headcut regions were replaced with a broad aggraded wetland surface where floodwaters will spread and further increase sediment deposition. Contaminated materials from areas downstream of the structure were used to provide backfill against the new structure. This material was used to establish an adaptable base level above the preconstruction channel elevation and close to the historic channel level before channel degradation. Aggradation within the channel upstream of the structure will reduce erosion of contaminated stream banks and overbank areas during significant storm events. Flood flows will more frequently spill into the overbank areas and through deposition will bury existing contaminated floodplain deposits. These actions will also contribute to enhanced and sustainable wetlands.

In order to simplify the design, reduce costs, and still provide a stable, safe structure, the structure was designed and constructed to ensure that it did not fall under New Mexico Safe Dams regulations. Under these rules and regulations, a structure is classified as a dam when the structure is more than 10 ft in height (measured from original channel elevation to the top of the low spillway) or is capable of impounding more than 10 acre-ft of water. The Pueblo Canyon grade-control structure does not exceed either of these limitations. The design and final as-built height of structure is 6 ft at the low-flow weir and 7 ft at the overflow weir, as measured from the stream-channel elevation. Maximum impoundment at the low-flow weir is 0.75 acre-ft and at the overflow weir is 1.05 acre-ft.

The objective of locating stream gage E060.1 downstream of the structure is to monitor the efficiency of the structure for mitigating sediment transport.

2.0 DESIGN

2.1 General

2.1.1 Grade-Control Structure

The Pueblo Canyon grade-control structure is composed of gabion baskets with a 30-ft low-flow weir, centered perpendicular to the stream centerline. The low-flow weir was designed to carry storm runoff from a 5-yr storm event. An overflow weir was also incorporated into the structure to handle flow capacities up to the 100-yr storm without overtopping the structure. The total length of the overflow, including the low-flow weir, is 168 ft. The height of the low-flow weir crest was initially designed to be 3 ft below the height of crest of the overflow weir and 4 ft above the stream centerline. The height of the low-flow weir was modified to 1 ft below the height of the overflow weir at the request of NMED to induce greater aggradation upstream of the structure. See Figure 2.1-1 and Appendix A, sheet C-200.

Since the gabion structure would be unsupported, it was designed to provide sufficient mass to prevent slippage and overturning. The design of the structure also provides for the raising of water surface elevations behind the structure during more frequent flood events (5-yr) such that the sediment deposition occurs immediately upstream of the structure and yet minimizes the backwater effects of the less frequent flood events (50- to 100-yr).

The structure design also includes buttress gabions upstream of the weir. The upstream buttress gabions protect the main gabion structure from flow that may contain boulders, trees, and other debris. The top of the grade-control structure was designed to direct flow onto the gabion benches below the top elevation. Downstream buttress gabions also provide energy dissipation of flows. With flows directed to the stilling-basin floor, energy will also be dissipated through the benches.

The upstream face of the structure was wrapped in a geotextile material to minimize the transport of fine sediments during the early stages of operation as well as to reduce the flow of water through the structure. The type of geotextile material was based on gradation analysis of the stream sediment. The material was buried by backfill, using streambed material to stabilize the geotextile and to add impermeability. In addition, a 3-in. concrete cap was applied to the low-flow and overflow crests to protect against potential damage from scouring and debris (Figures 2.1-2 and 2.1-3).

The structure also includes a 220-ft rip-rap armored earthen berm (using New Mexico Department of Transportation wire-enclosed Class A rip-rap) (Figures 2.1-4 and 2.1-5). The elevation of the berm is designed to capture all flow up to the 100-yr flood once sedimentation in the channel is maximized. The berm extends north until it ties back into a common elevation in the canyon (Appendix A).

A perforated and slotted riser pipe was constructed approximately 32 ft upstream of the structure to assist in releasing water stored upstream (Figure 2.1-6). One side consists of removable wood boards placed in slots. The remaining riser pipe is a perforated corrugated metal pipe (CMP) to allow water to enter the pipe. This pipe is connected to an outfall pipe that goes through the gabion structure to the stilling basin. The top wood board is placed at the elevation of the low-flow weir or higher to ensure that maximum water surface elevations are achieved to induce sediment settling. After a storm event, the perforations on the pipe will allow dewatering behind the weir. However, if the rate of dewatering is not sufficient to meet standards or the perforations get plugged by debris, wood boards can be removed as needed to accelerate the dewatering process.

2.1.2 Stream Gage

The new stream gage, E060.1, was originally designed to be located within the grade-control structure. However, during construction, the location was changed to provide more accurate measurements and to better monitor the efficiency of the grade-control structure. The stream gage's concrete supercritical-flow flume design measures flow up to 350 cubic ft per second (cfs) (Figure 2.1-7). The determination of the stream-gage location, approximately 320 ft downstream of the grade-control structure stilling basin, was based on topographic conditions, on-site investigations, and stream geometry. The U. S. Geological Survey (USGS) publication "Techniques of Water Resources Investigations of United States Geological Survey," Chapter A14, Use of Flumes in Measuring Discharge, (Kilpatrick and Schneider 1983, 109514), was used to develop a flume design to accommodate measuring equipment and instrumentation. The final design, the result of the collaboration of design, construction, and environmental professionals, was subjected to a thorough review by Laboratory and U.S. Department of Energy (DOE) personnel. Design details and as-built information are contained in Appendix A.

2.2 Site Selection/Exploration

2.2.1 Grade-Control Structure

The grade-control structure location was chosen to meet the overall project objectives and also provide an efficient and value-engineered structure. During the initial design process, adjustments were made to the structure to reduce the overall length by taking advantage of existing topography.

The general area in which the structure was to be constructed was determined primarily by U.S. Army Corps of Engineers (USACE), DOE, and Laboratory input to meet the principal objectives for the project. During the design process, more detailed topographic information was obtained and a geotechnical exploration was performed. The geotechnical exploration and subsequent report provided information on subsurface soil and bedrock conditions; groundwater conditions; structure support; lateral earth pressures; and earthwork recommendations (see Appendix B for the geotechnical engineering report).

The final site selection was based on a variety of additional factors including hydrologic/hydraulic effectiveness, existing topography, vegetation, on-site investigations, and value engineering. Two factors were considered as the primary focus:

- **Hydraulic Effectiveness**. During the modeling and design process, the positions of the structure longitudinally along the canyon and laterally within the canyon were evaluated. Factors such as turbulence of flow, erosion mitigation, sediment containment, and structural stability were considered. Upstream and downstream channel conditions played a significant role in the design based on the model analysis of the effectiveness of the proposed upstream channel aggradation.
- **Existing Topography**. Significant material excavation and fill were necessary to construct the grade-control structure. Personnel and equipment access during construction and operation were also considered. Once a preliminary structure design was complete, the gabion configuration was fitted into the existing topography of several of the preliminary locations that were identified by field surveys. Each potential site was then evaluated based on the amount of material to be excavated and filled, ease of access, and position in reference to significant contour changes in the canyon.

Once the final location was determined, an additional field visit was performed to ensure no other existing conditions were overlooked.

2.2.2 Stream Gage

Greater accuracy in flow measurements and sediment data were factors that contributed to the choice of a supercritical-flow flume design for the stream gage. The new stream gage measures flow up to 350 cfs. The flume has specific dimensions, is trapezoidal in shape, and requires a 5% channel slope and a straight approach and exit for proper operation. The distance from the structure was also an important consideration. Location of the gage station was driven by

- channel geometry and topographic conditions, so that the approach to and exit from the flume would be fairly straight and that minimal channel disturbance would be required to construct the flume, and
- a distance from the structure that would allow water exiting the structure to calm before entering the flume but would not be too far to prevent accurate sediment disposition measurements.

Appendix A provides as-built drawings of the grade-control structure and stream gage.

2.3 Hydrologic/Hydraulic Modeling

2.3.1 General

The Pueblo Canyon watershed is within the semiarid higher-elevation mountains of New Mexico and contains an ephemeral stream system. The watershed includes areas of variable vegetation density, rock outcrops, and urbanization. Flood-flow frequency estimates for the structure locations were based on statistical analysis based on historical stream-gage information within the project area and the regional USGS regression formulas (USGS 2000, 109515) and the USACE statistical computer program Hydraulic Engineering Center Flood Frequency Analysis (HEC-FFA) (USACE 1992, 109512).

A hydrologic analysis was performed to provide design parameters for the proposed grade-control structure. The initial analysis, performed in August 2009, was based on stream-gage data, topographic information, a site visit, and the geomorphic and climatologic conditions of the project area. This initial analysis was used to develop the conceptual and preliminary construction plans. Additional light detection and ranging (LIDAR) survey data was obtained during the final phases of design. This provided a more detailed and accurate surface model than was previously available. The new LIDAR data and final design dimensions, which included changes to weir elevations and approach conditions, were used to run a second analysis with the HEC River Analysis System (HEC-RAS) model (USACE 2008, 109518) in December 2009. The results of the new model verified that the final design and as-built structure met the original project objectives. Results of the HEC-RAS analysis are included in Appendix C.

2.3.2 Flood Frequency Analysis Results

Table 2.3-1 presents the FFA results for the Pueblo Canyon project site. The fourth column in the table is based upon the USACE statistical computer program HEC-FFA.

The Pueblo Canyon basin is largely undeveloped, which favors the USGS regression (USGS 2000, 109515). Of the two USGS regression equation sets, Small and Rural, the USGS Small regression equations are most appropriate, considering the basin size. The Pueblo Canyon FFA is based on statistical analysis of a very short record base. Since the stream gage is located very near the proposed project location, no adjustments to the results were deemed necessary. Although the FFA results are more conservative, the USGS Small regression results were adopted. To accommodate the uncertainty at the high flows, a safety factor was incorporated by raising the side walls of the structure above the design elevation required to contain the 100-yr flood.

Waltemeyer (2008, 109516) updated the regression equations and with these equations, the 100-yr peak discharge is 2925 cfs, whereas the USGS Small value is 2740 cfs for Pueblo Canyon. Although 2,740 cfs isused for the 100-yr design flow, 2925 cfs was checked in the HEC-RAS models. This discharge resulted in a water surface elevation for the proposed condition that slightly encroached on the freeboard but did not overtop the structure.

2.3.3 Development of the HEC-RAS Hydraulic Models

To determine the hydraulic effects of the proposed structures, HEC-RAS models were developed. The HEC-RAS Version 4.0 models were initially constructed using shape (.shp) files provided by the Laboratory. The 2-dimensional (2-D) data were then converted to 3-D data and geographic information system techniques were used for cross-section development. Existing conditions models were constructed and calibrated to the best extent, and water surface elevations for the 2-, 5-, 10-, 50-, and 100-yr peak-flood discharges were simulated and plotted. All subsequent models used these peak-flood discharges. This initial model was used to develop a base design and plan for the structure. Additional survey data were collected for the site. Based on the new data, new cross sections were prepared and the final, revised, and refined current model was developed.

A proposed conditions model (with grade control), without accumulated sedimentation behind the structure, was constructed, simulated, and plotted. The HEC-RAS in-line weir option was used to model the grade-control structure. Proposed conditions models, with sedimentation, were created to simulate the change in the streambed elevations due to anticipated long-term deposition of sediment upstream of the grade-control structures (described in section 2.4). These three conditions–existing, grade-control structure without sediment deposits, and grade-control structure with sediment deposits–were compared and analyzed. Cross-section layouts, profiles, cross sections, and tabular results for each model condition are included in Appendix C.

2.3.4 Grade-Control Structure Stilling-Basin Design

The stilling-basin length and end-sill height were determined using the USACE Hydraulic Design Chart (HDC) Number 623 (USACE 1959, 109511) based upon the 100-yr flood. HDC 623 develops empirical relationships between the design-critical depth of the approach flow to the height between the weir crest and the top of the end sill in order to size the length of the stilling basin as well as the height of the end sill.

For the empirical relationship of HDC 623 to be successful, the tailwater depth beyond the end sill is recommended to be between 1.25 to 1.67 times that of the approach flow-critical depth. For Pueblo Canyon, the design discharge tailwater would need to be approximately 2½ to 3 ft above the top of the end sill. The HEC-RAS results showed the tailwater conditions were met.

2.3.5 Grade-Control Structure Low-flow Weir Design

A low-flow rectangular weir was sized to induce the design volumes and location of deposition in the upstream area. The width and depth of the weir were estimated using regime equations (Copeland 1994, 109508) and assuming that the 5-yr discharge is a “channel forming” discharge, a common practice for arid to semiarid regions. The regime width and depth dimensions for the 5-yr flood were used as initial guides and adjusted to meet multiple objectives such as accommodating standard gabion sizes and physical site restrictions and minimizing the structure footprint. The weir was laterally placed where the natural thalweg of the stream is located. The height of the weir above the natural ground was determined by examining the design deposition slope (described in section 2.4) and adjusting it vertically to maximize deposition on the overbank sediments, safely pass the 100-yr flood above the weir, and still be a stable structure. The initial height of the low-flow weir was 4 ft above the existing ground. To account for the sediment placed on the upstream side of the structure, and at the request of NMED, the height of the low-flow weir was raised by 2 ft, making the height above the existing ground elevation 6 ft, or 2 ft above the fill elevation behind the structure. The height of the low-flow weir can be varied as described in section 2.5.

2.4 Sediment Deposition Profile Analysis

The profile of the anticipated sedimentation behind the grade-control structure was based upon equilibrium slope analyses (Pemberton and Lara 1984, 109509) and engineering judgment to select an appropriate slope. The equilibrium slope is the theoretical slope that the stream would eventually reach. This slope is projected upstream, starting at the low-flow weir notch elevation, to determine the depths that would cover the contaminated sediments in the floodplain and the potential wetland extents. This deposition profile was used to adjust the cross-section geometry in the HEC-RAS models to determine the water surface elevations for the varied-frequency floods. The deposition profile predicts the water surface profiles for ultimate conditions.

2.5 Adaptive Management Features

2.5.1 Adjustable Weir Crest Height

Predictions of the sediment deposition in the upstream overbank areas can vary because of variations in the stream flow, changes in the sediment characteristics, varying equilibrium slopes, and other factors. To enhance operational flexibility, an additional vertical column of gabions was added to the structure, increasing the thickness of the upper weir foundation. The thicker foundation makes it possible to increase the low-flow weir crest by progressively adding gabions or gabion mattresses up to the crest of the 100-yr overflow. This gives opportunities to accelerate the deposition and to increase or decrease the sediment deposition elevations in the areas upstream of the structure. The initial design crest of the low-flow weir is 1 ft above the existing ground but can go as high as 7 ft. Any additional gabions also increase the structural integrity of the structure.

2.5.2 Adjustable Riser Pipe

When a flow event occurs, the structure causes an impoundment of the water and allows settling of the sediment. After the event has receded and the majority of the suspended sediment has settled, the standing water must be released downstream. A perforated and slotted riser pipe, placed approximately 32 ft upstream of the structure, assists in these functions. The upstream face consists of removable wood boards placed in slots, while the remainder of the riser pipe is perforated CMP. This pipe is connected to an outfall pipe that goes through the gabion structure out to the stilling basin. The height of the riser pipe is the same as the top of the overflow weir to allow for adjustments if the low-flow weir elevation is increased to the height of the overflow weir. Varying the elevation of the top board enables maximum retention of water behind the structure, inducing sediment settlement, or allows for accelerated dewatering.

2.6 Engineering

2.6.1 Grade-Control Structure

Since the gabion grade-control structure is unsupported and acts as a retaining structure, the gabion design required sufficient mass to prevent sliding and overturning. The design of the structure required raising the water surface elevations for the more frequent flood events (5-yr) such that significant sediment deposition will now occur immediately upstream of the structure, minimizing potential backwater effects of the rare flood events (50- to 100-yr) and ensuring the 100-yr flood does not overtop the structure.

The 5-yr flow was used to design a low-flow weir. The 100-yr flow was used to determine the dimensions of the rest of the structure (the overflow weir and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end-sill heights. A 50-yr design was considered, but since the increase in design heights to contain the 100-yr event was small (0.5 feet or less), the design was based upon the 100-yr peak-flood event. This resulted in a minimal increase in cost as well as provided additional structural safety. Structural integrity of the grade-control structures, with and without saturated sediment against the upstream face, was evaluated by a licensed structural engineer.

The structure design included additional gabions upstream of the low-flow weir. The purpose of these gabions is to raise the flow of water approaching the weir for better efficiency; to prevent damage of the main gabion structure and weirs from flow that may contain large rocks, trees, and other debris; and to provide additional structural mass to prevent sliding and overturning. The lower and upper weirs direct flow into buttress gabions downstream. These gabions dissipate flow energy and also provide additional structural mass to prevent sliding and overturning.

The structure design is composed of gabions consisting of 6- to 9-in.-diameter rock enclosed in wire baskets. Whenever possible, standard 3-ft x 3-ft x 6-ft gabions were used. Structure dimensions and embedment elevations were conservatively adjusted to eliminate the need for nonstandard-size gabions. See Appendix A for as-built drawings.

2.6.2 Stream Gage

The supercritical-flow flume is a concrete structure approximately 19 ft wide at the entrance, 15 ft wide at the exit, 15 ft in length, and 4 ft in depth. The width of the channel downstream of the structure posed a few challenges regarding the location of the flume. Several factors were considered in determining the flume location, including minimal disturbance to the downstream channel, overall design and construction costs, providing a straight channel for entrance and exit, and minimal influence on the accuracy of instrument readings. The flume was placed 320 ft downstream of the structure.

Class A rip-rap armoring was added upstream, downstream, and along the edges of the flume to prevent water from undermining the flume, to minimize potential accumulation of additional sediment between the gabion structure and flume, and to protect the stream channel from potential erosion. To maintain flow through the flume and provide accurate measurements, the Class A rip rap on the downstream is a minimum of 4 in. below the bottom of the flume. This elevation difference allows unimpeded flow from the flume.

Class B rip rap, made up of larger rocks, was placed upstream of the Class A rip rap at the flume entrance to stabilize two nickpoints located between the structure and the flume and to provide protection to the channel bank. Since Class B rip rap requires a minimum 18 in. recess into the channel, the Class B rip rap also provides erosion protection for the channel.

Three polyvinyl chloride (PVC) pipes are embedded into the south wall of the flume at varying heights. The PVC pipes daylight into a CMP stilling well. As the water levels in the flume reach the pipe openings, the water is conveyed to the stilling well. Equipment used in measuring water flow and in sample collection is housed in and on top of the CMP. The height of the CMP was designed to keep the equipment above the water surface in the event of a 100-yr flow event. As-built drawings are provided in Appendix A. Equipment for collecting sampling and flow data was also installed at the stream gage E060.1.

2.7 Permitting

The Laboratory's Construction and Engineering group performed an internal review of the design model and the construction documents. To comply with Section 404/401 of the Clean Water Act, applications for Nationwide Permits 43 and 5 were filed with the NMED Surface Water Quality Bureau and the Albuquerque District of the USACE. Section 404 regulates discharges of dredged or filled material in waters of the United States. NMED certified the proposed discharges would not adversely affect water quality standards under Section 401. Local municipal permitting was not required for the proposed improvements.

A joint Notice of Intent (NOI) was submitted to the EPA by DOE and AS Horner (construction subcontractor) for review of the proposed construction activities. Per the NOI, a stormwater pollution prevention plan (SWPPP) was prepared and followed to ensure the use of best management practices and ensure maximum protection of the environment during and after construction. Erosion and sediment control measures were in accordance with NMED Watershed Protection and EPA Guidelines (EPA 2007, 109510) for stormwater pollution prevention. The protocols of the SWPPP conform to Laboratory requirements. This plan was prepared under the direction of a certified professional in erosion and sediment control. Designers coordinated with DOE and Laboratory environmental specialists to provide a SWPPP that was sensitive to the environment and provided maximum protection against the offsite transport of pollutants with particular attention to the protection of adjacent wetlands. The SWPPP will be maintained until final stabilization criteria are met per the NOI. At that time, a notice of termination will be submitted to close out the permitted construction activity.

2.8 Design Improvements/Deviations

The design process was relatively fluid and adaptive to the existing site conditions and Laboratory requirements. The following were the key design changes in the project:

- A riser pipe was designed and installed upstream of the structure to facilitate the sedimentation upstream of the structure while providing a means for discharging retained water though the structure. The riser pipe is adjustable so that it remains functional as sedimentation accumulates behind the structure.
- The riser pipe elevation was increased from the height of the low-flow weir crest to that of the overflow weir crest to allow for greater flexibility should the height of the structure increase.
- The structure was shifted to accommodate the existing topographic conditions and avoid Native American Reservation Lands adjacent to the project site.
- A stabilized construction-access unimproved road was constructed to reduce construction time and minimize site disturbance. This temporary road was restored to a natural state at the end of construction activities through hydro-seeding with a Laboratory-approved seed mix.

- A 3-in. concrete cap was added to the low-flow and overflow weirs to protect the gabions and reduce long-term maintenance.
- Class B rip rap was added downstream of the structure to ensure that flows exiting the stilling basin would not undermine the downstream side of the stilling-basin gabions.
- Additional Class A rip-rap stabilization was added to the southern slope upstream and downstream of the structure to provide additional erosion protection.
- Additional fill material was deposited upstream of the structure to hasten the creation of the wetland.

Constructability reviews by the construction subcontractor where completed before the initiation of construction. Therefore, no significant modifications occurred during the construction process. As-builts of the improvements detail the minor deviations (Appendix A).

3.0 CONSTRUCTION

3.1 General

Under contract with the USACE, Omaha District, Security, Disaster, Infrastructure Construction (SDIC) multiple-award task-order contract, KBR performed general contractor services, delivering the project using the design-build method. Construction of the Pueblo Canyon grade-control structure and stream gage E060.1 began on October 26, 2009. The grade-control structure was completed on January 26, 2010. Construction of the supercritical-flow flume and installation of the Class A rip rap upstream and downstream of the flume were completed on March 11, 2010. Because of freeze/thaw conditions, installation of Class B rip rap upstream of the flume was postponed until May 3, 2010, and was completed May 18, 2010. The entire site was seeded May 19, 2010. Appendix D presents photo documentation of construction activities.

3.2 Safety and Health

With the guidance and approval of the Omaha District of the USACE, and the Laboratory, the design-build contractor implemented a specific project safety plan to ensure the project met safety and health goals. All work and reports were accomplished in accordance with the USACE Safety and Health Requirements Manual EM 385-1-1 and Laboratory requirements. An activity hazard analysis was conducted for each definable feature of work. Consideration was given to work tasks and steps; hazards, concerns, and potential accidents; controls, preventive measures, and bounding conditions; reference documents; and training and qualification requirements. As a result, there were no loss-time accidents or incidents during the entire project.

3.3 Quality Control

With the guidance and approval of the Omaha District of the USACE, the design-build contractor implemented a contractor quality control (CQC) plan to ensure the project met quality construction goals. The plan was compliant with ISO 9001:2000 international quality standards and met the quality control requirements of the contract. The project quality manager used the quality management system and CQC plan to ensure adherence to USACE, SDIC requirements and standards.

The design-build contractor implemented the CQC as follows:

- Assigned ultimate responsibility for quality to the project manager (PM), who delegated responsibility to each level within the program organization, down to the individual craftsperson and worker. Each level was responsible for application and enforcement of policy within its respective area of authority.
- Provided a quality control supervisor who assisted the PM by administering the program and providing an independent analysis of the quality control program's results.
- Explained to each employee and subcontractor, through an orientation, the program, the individual's role in it, and his or her expected contribution. A primary goal of the quality improvement program was to promote a sense of pride in workmanship. Top management led this program and took a strong, active part in its implementation.
- Delegated to the quality control supervisor the necessary authority, such as stop-work authority, to make quality a viable program. This delegated authority for the quality function ensured that deficiencies were corrected.

4.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Copeland, R.R., September 1994. "Application of Channel Stability Methods – Case Studies," Technical Report HL-94-11, report prepared for the U.S. Army Corps of Engineers, Washington, D.C. (Copeland 1994, 109508)

EPA (U.S. Environmental Protection Agency), September 17, 2007. "Appendix A: SWPPP Template – Unauthorized States," Version 1.1, Washington, D.C. (EPA 2007, 109510)

Kilpatrick, F.A., and V.R. Schneider, 1983. "Techniques of Water-Resources Investigations of the United States Geological Survey, Chapter A14, Use of Flumes in Measuring Discharge," Book 3, Applications of Hydraulics, U.S. Geological Survey, Washington, D.C. (Kilpatrick and Schneider 1983, 109514)

LANL (Los Alamos National Laboratory), April 2004. "Los Alamos and Pueblo Canyons Investigation Report," Los Alamos National Laboratory document LA-UR-04-2714, Los Alamos, New Mexico. (LANL 2004, 087390)

LANL (Los Alamos National Laboratory), December 2005. "Los Alamos and Pueblo Canyons Supplemental Investigation Report," Los Alamos National Laboratory document LA-UR-05-9230, Los Alamos, New Mexico. (LANL 2005, 091818)

LANL (Los Alamos National Laboratory), February 2008. "Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," Los Alamos National Laboratory document LA-UR-08-1071, Los Alamos, New Mexico. (LANL 2008, 101714)

LANL (Los Alamos National Laboratory), October 2008. "Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," Los Alamos National Laboratory document LA-UR-08-6588, Los Alamos, New Mexico. (LANL 2008, 105716)

NMED (New Mexico Environment Department), March 14, 2005. "Notice of Disapproval, Los Alamos and Pueblo Canyons Investigation Report," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and G.P. Nanos (LANL Director) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2005, 088463)

NMED (New Mexico Environment Department), August 30, 2007. "Approval with Direction, Los Alamos and Pueblo Canyons Supplemental Investigation Report," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 098284)

NMED (New Mexico Environment Department), July 18, 2008. "Approval with Modifications, Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 103007)

NMED (New Mexico Environment Department), February 20, 2009. "Approval with Modifications, Supplemental Interim Measure Work Plan (SIWP) to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 105014)

Pemberton, E.L., and J.M. Lara, January 1984. "Computing Degradation and Local Scour," Technical Guideline for Bureau of Reclamation, U.S. Department of the Interior, Denver, Colorado. (Pemberton and Lara 1984, 109509)

USACE (U.S. Army Corps of Engineers), May 1959. "Hydraulic Design Criteria, Artificial Channels – 600," excerpted from the *Corps of Engineers Hydraulic Design Criteria*, Washington, D.C. (USACE 1959, 109511)

USACE (U.S. Army Corps of Engineers), May 1992. "HEC-FFA Flood Frequency Analysis, User's Manual," Computer Program Documentation No. CPD-13, Washington, D.C. (USACE 1992, 109512)

USACE (U.S. Army Corps of Engineers), March 2008. "HEC-RAS River Analysis System, User's Manual," Version 4.0, Computer Program Documentation No. CPD-68, Washington, D.C. (USACE 2008, 109518)

USGS (U.S. Geological Survey), October 2000. "The National Flood-Frequency Program—Methods for Estimating Flood Magnitude and Frequency in Rural Areas in New Mexico, 2000," USGS Fact Sheet 055-00. (USGS 2000, 109515)

Waltemeyer, S.D., 2008. "Analysis of the Magnitude and Frequency of Peak Discharge and Maximum Observed Peak Discharge in New Mexico and Surrounding Areas," report prepared for the U.S. Department of the Interior and the U.S. Geological Survey in cooperation with the New Mexico Department of Transportation, Scientific Investigations Report 2008-5119, Washington, D.C. (Waltemeyer 2008, 109516)

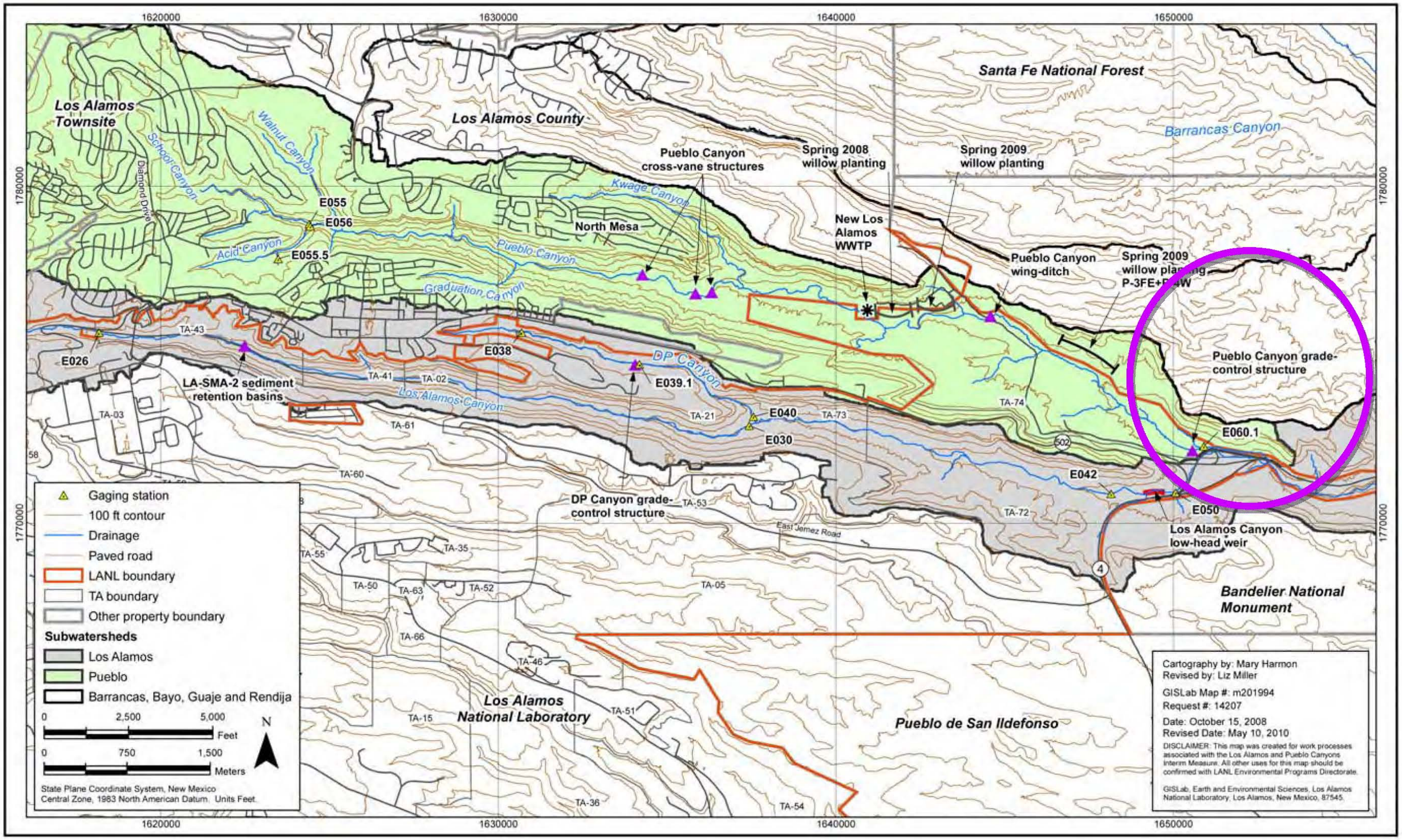


Figure 1.0-1 Sediment transport mitigation sites in Los Alamos and Pueblo Canyons, highlighting the site locations for the Pueblo Canyon grade-control structure and stream gage E060.1

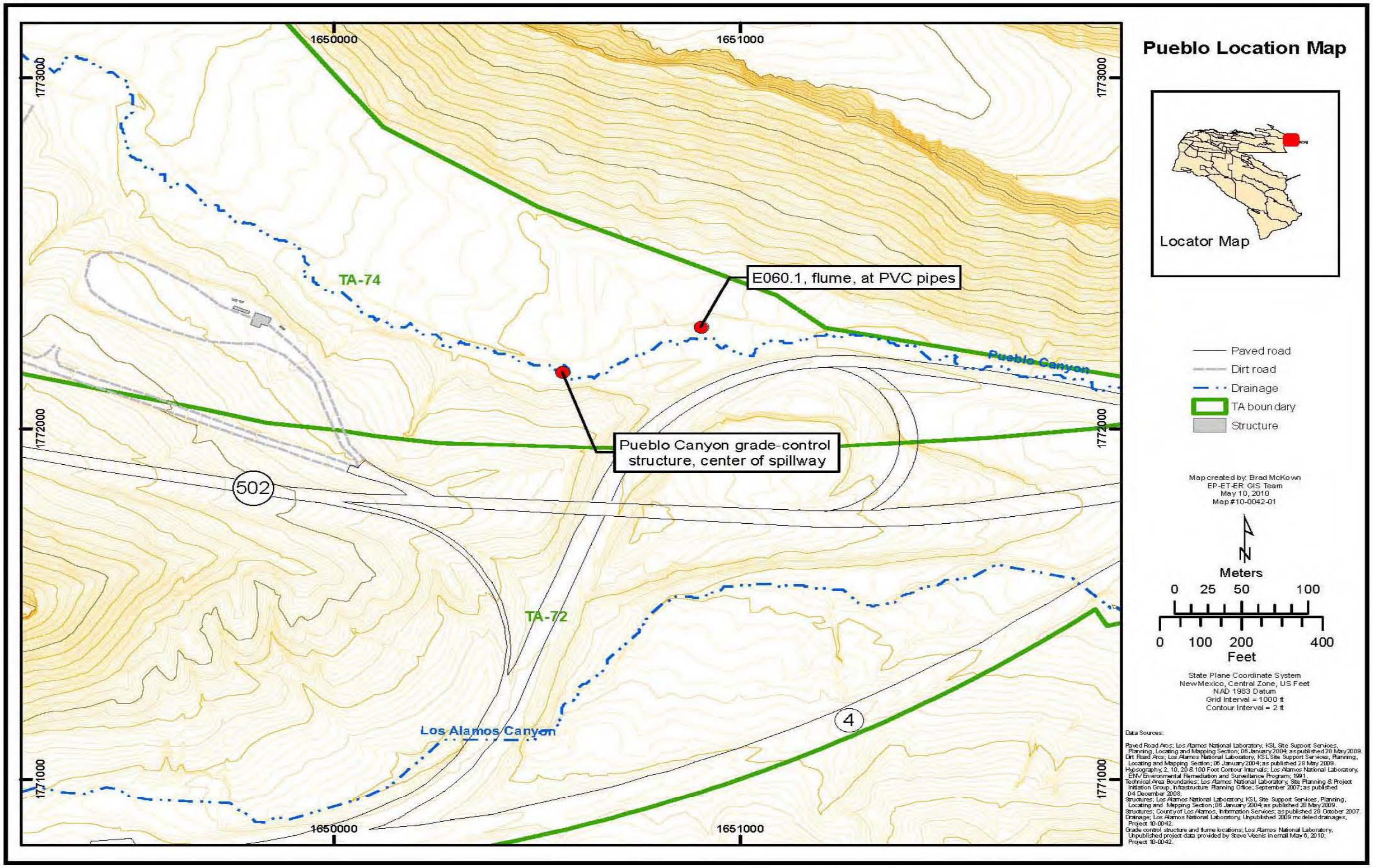


Figure 1.0-2 Pueblo Canyon grade-control structure and stream gage E060.1 site locations

Figure 2.1-1 Pueblo grade-control structure (looking north) showing entire length of weir and 1-ft difference between overflow and low-flow weir crests

Figure 2.1-2 Placement of concrete cap

Figure 2.1-3 Pueblo grade-control structure (looking south). Concrete cap on weir

Figure 2.1-4 Construction of Class A rip-rap armored earthen berm (looking north)

Figure 2.1-5 Class A armored earthen berm upon completion (looking north)

Figure 2.1-6 Riser pipe after extension

Figure 2.1-7 E060.1 stream-gage flume during construction

Table 2.3-1
Pueblo Canyon Flood Frequencies

Percent Chance Exceedance	USGS Small (cfs)[a]	USGS Rural (cfs)[b]	FFA[c] (cfs)
0.2 (500 yr)	4690	6340	5200
1 (100 yr)	2740	3380	3570
2 (50 yr)	2060	2440	2970
10 (10 yr)	932	1,000	1770
20 (5 yr)	593	591	1320
50 (2 yr)	245	225	768

Note: Equations used for determining basin discharges were based on the following references:

[a] Waltemeyer, S.D., 2008. “Analysis of the Magnitude and Frequency of Peak Discharge and Maximum Observed Peak Discharge in New Mexico and Surrounding Areas,” report prepared for the U.S. Department of the Interior and the U.S. Geological Survey in cooperation with the New Mexico Department of Transportation, Scientific Investigations Report 2008-5119, Washington, D.C. (Waltemeyer 2008, 109516).

[b] USGS (U.S. Geological Survey), October 2000. “The National Flood-Frequency Program—Methods for Estimating Flood Magnitude and Frequency in Rural Areas in New Mexico, 2000,” USGS Fact Sheet 055-00. (USGS 2000, 109515).

[c] USACE (U.S. Army Corps of Engineers), May 1992. “HEC-FFA Flood Frequency Analysis, User's Manual,” Computer Program Documentation No. CPD-13, Washington, D.C. (USACE 1992, 109512).

Appendix A

As-Built Drawings

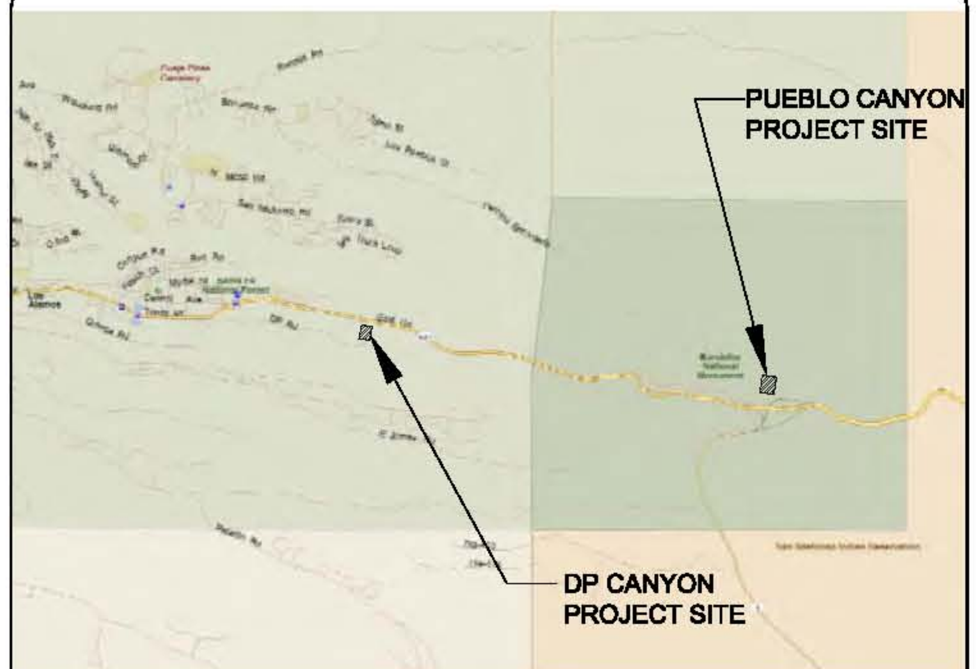
CONSTRUCTION PLANS FOR:

LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURE

FOR PUEBLO CANYON
LOS ALAMOS, NEW MEXICO

INDEX OF DRAWINGS

LOCATION MAP



VICINITY MAP

DRAWINGS REVISED TO INCORPORATE CONTRACTOR AS-BUILT INFORMATION. REVISIONS ARE INDICATED AS REVISION 1 WHERE APPLICABLE.

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05/05/2010	C-000,C-200,C-501	JVC

REVISIONS

LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURE

JOB NO.100005532

DATE: 10/13/2009 SHT. 1 OF 14

GENERAL CONSTRUCTION NOTES

1. ALL ELEVATIONS REFER TO THE NORTH AMERICAN DATUM (1983).

2. LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES AND OTHER FEATURES AFFECTING THIS WORK PRIOR TO CONSTRUCTION.

3. THE CONTRACTOR SHALL CHECK PLANS FOR CONFLICTS AND DISCREPANCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE OWNER'S ENGINEER OF ANY CONFLICT BEFORE PERFORMING ANY WORK IN THE AFFECTED AREA.

4. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION IN AREAS OF BURIED UTILITIES AND SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT MARKING THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION.

5. ANY WELLS DISCOVERED DURING EXCAVATION, EARTHMOVING OR CONSTRUCTION MUST BE REPORTED TO THE APPROPRIATE GOVERNMENTAL AGENCY OFFICE WITHIN 24 HOURS OF DISCOVERY.

6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BECOME FAMILIAR WITH THE PERMIT AND INSPECTION REQUIREMENTS OF THE VARIOUS GOVERNMENTAL AGENCIES. THE CONTRACTOR SHALL SCHEDULE INSPECTIONS ACCORDING TO AGENCY INSTRUCTION.

7. ALL SPECIFICATIONS AND DOCUMENTS REFERRED TO SHALL BE OF LATEST REVISIONS AND/OR LATEST EDITION.

8. ALL WORK PERFORMED SHALL COMPLY WITH THE REGULATIONS AND ORDINANCES OF THE GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE WORK.

9. CONTRACTOR SHALL SUBMIT FOR APPROVAL TO THE OWNER'S ENGINEER SHOP DRAWINGS ON ALL PRECAST AND MANUFACTURED ITEMS PRIOR TO ORDERING MATERIALS. FAILURE TO OBTAIN APPROVAL BEFORE INSTALLATION MAY RESULT IN REMOVAL AND REPLACEMENT AT CONTRACTOR'S EXPENSE.

10. AT LEAST 3 WORKING DAYS PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL NOTIFY THE OWNER AND APPROPRIATE AGENCIES. NOTIFICATION SHALL INCLUDE THE CONTRACTOR'S NAME, STARTING DATE, PROJECTED SCHEDULE, AND OTHER INFORMATION AS REQUIRED. ANY WORK PERFORMED PRIOR TO NOTIFYING THE OWNER OR WITHOUT AGENCY INSPECTOR PRESENT MAY BE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.

11. ALL DISTURBED AREAS WITHIN PUBLIC RIGHT-OF-WAY ARE TO BE RESTORED TO ORIGINAL CONDITION OR BETTER.

12. THE CONTRACTOR IS RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT OF ALL PROPERTY, ABOVE AND BELOW GROUND, AFFECTED BY THIS WORK. ALL PROPERTY SHALL BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN EXISTING CONDITIONS BEFORE CONSTRUCTION COMMENCED UNLESS SPECIFICALLY EXEMPTED BY THE PLANS. ADDITIONAL COSTS ARE INCIDENTAL TO OTHER CONSTRUCTION.

13. ALL DISTURBED AREAS ASSOCIATED WITH CONSTRUCTION, WHICH ARE NOT TO BE SODDED, ARE TO BE SEEDED AND MULCHED TO THE NEW MEXICO DEPARTMENT OF TRANSPORTATION STANDARDS AND MAINTAINED UNTIL A SATISFACTORY STAND OF GRASS ACCEPTABLE TO THE OWNER HAS BEEN OBTAINED. ANY WASHOUTS, REGRADING, RESEEDING, GRASSING, AND OTHER EROSION WORK REQUIRED, WILL BE PERFORMED BY THE CONTRACTOR/SUBCONTRACTOR UNTIL THE SYSTEM IS ACCEPTED FOR MAINTENANCE BY THE OWNER.

15. AS-BUILT DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORDING INFORMATION ON A SET OF THE APPROVED PLANS CONCURRENTLY WITH CONSTRUCTION PROGRESS. WITHIN TWO (2) WEEKS FOLLOWING FINAL INSPECTION THE CONTRACTOR SHALL SUBMIT ONE (1) SET OF AS-BUILT DRAWINGS TO THE ENGINEER. THE FINAL RECORD DRAWINGS SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:

A. DRAWINGS TO BE LEGIBLY MARKED TO RECORD ACTUAL CONSTRUCTION.
B. DRAWINGS SHALL SHOW ACTUAL LOCATION OF ALL UNDERGROUND WORK.
C. DRAWINGS SHALL CLEARLY SHOW ALL FIELD CHANGES OF DIMENSION AND DETAIL INCLUDING CHANGES MADE BY FIELD ORDER OR BY CHANGE ORDER.
D. DRAWINGS SHALL CLEARLY SHOW ALL DETAILS NOT ON ORIGINAL CONTRACT DRAWINGS BUT CONSTRUCTED IN THE FIELD. ALL EQUIPMENT AND PIPING RELOCATION SHALL BE CLEARLY SHOWN.
E. LOCATIONS OF ALL FEATURES SHALL BE SHOWN.
F. DRAWINGS TO BE SIGNED AND SEALED BY A LICENSED SURVEYOR.

16. ALL CONCRETE STRUCTURES SHALL BE MADE OF 3000 PSI CONCRETE PER DOT STANDARD SPECIFICATIONS UNLESS OTHERWISE NOTED ON THE PLANS.

SITE CLEARING PREPARATION NOTES

1. THE CONTRACTOR IS TO PREPARE THE SITE PRIOR TO BEGINNING INFRASTRUCTURE CONSTRUCTION IN ACCORDANCE WITH SOILS TESTING REPORT.

2. CONTRACTOR SHALL CLEAR AND GRUB ONLY THOSE PORTIONS OF THE SITE NECESSARY FOR CONSTRUCTION. DISTURBED AREAS WILL BE SEEDED, MULCHED, OR PLANTED WITH OTHER APPROVED LANDSCAPE MATERIAL IMMEDIATELY FOLLOWING CONSTRUCTION.

3. THE TOP 4" TO 6" OF GROUND REMOVED DURING CLEARING AND GRUBBING SHALL BE STOCKPILED AT A SITE DESIGNATED BY THE OWNER TO BE USED FOR LANDSCAPING PURPOSES, UNLESS OTHERWISE DIRECTED BY THE OWNER.

4. ALL CONSTRUCTION DEBRIS AND OTHER WASTE MATERIAL SHALL BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH APPLICABLE REGULATIONS.

5. CONTRACTOR TO OBTAIN ALL NECESSARY PERMITS AND APPROVALS PRIOR TO BEGINNING WORK.

6. THE LOCATION OF ALL EXISTING UTILITIES SHOWN ON THE PLANS HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR/SUBCONTRACTOR. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ACCURACY PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY. IT SHALL BE THE CONTRACTOR'S/SUBCONTRACTOR'S RESPONSIBILITY TO NOTIFY THE VARIOUS UTILITIES AND TO MAKE THE NECESSARY ARRANGEMENTS FOR ANY RELOCATIONS OF THESE UTILITIES WITH THE OWNER OF THE UTILITY. THE CONTRACTOR/SUBCONTRACTOR SHALL EXERCISE CAUTION WHEN CROSSING ANY UNDERGROUND UTILITY, WHETHER SHOWN ON THE PLANS OR LOCATED BY THE UTILITY COMPANY. ALL UTILITIES WHICH INTERFERE WITH THE PROPOSED CONSTRUCTION SHALL BE RELOCATED BY THE RESPECTIVE UTILITY COMPANIES AND THE CONTRACTOR/SUBCONTRACTOR SHALL COOPERATE WITH THE UTILITY COMPANIES DURING RELOCATION OPERATIONS. ANY DELAY OR INCONVENIENCE CAUSED TO THE CONTRACTOR/SUBCONTRACTOR BY THE VARIOUS UTILITIES SHALL BE INCIDENTAL TO THE CONTRACT AND NO EXTRA COMPENSATION WILL BE ALLOWED.

7. ALTHOUGH NOT ANTICIPATED, THE LOCATION OF ANY EXISTING UNDERGROUND UTILITY LINES, WELLS OR OTHER BURIED PIPING OR STRUCTURES ASSOCIATED WITH PAST SITE USE WITHIN THE CONSTRUCTION AREA SHOULD BE ESTABLISHED PRIOR TO CONSTRUCTION. PROVISIONS SHOULD THEN BE MADE TO RELOCATE ANY INTERFERING UTILITY LINES WITHIN THE CONSTRUCTION AREA TO APPROPRIATE LOCATIONS. IN THIS REGARD, IT SHOULD BE NOTED THAT IF ABANDONED UNDERGROUND PIPES ARE NOT PROPERLY REMOVED OR PLUGGED, THEY MAY SERVE AS CONDUITS FOR SUBSURFACE EROSION, WHICH SUBSEQUENTLY MAY RESULT IN EXCESSIVE SETTLEMENTS.

8. SITE CLEARING, GRUBBING AND DEMOLITION SHALL INCLUDE THE REMOVAL OF TREES, GROUND BRUSH, ORGANIC SOILS, ROOT MATS, EXISTING STRUCTURES, PAVEMENT, UTILITIES OR OTHER DELETERIOUS MATERIALS ENCOUNTERED. CLEARING AND GRUBBING SHALL BE REVIEWED BY THE OWNER'S REPRESENTATIVE PRIOR TO BEGINNING CONSTRUCTION AT THE SITE. AS A MINIMUM, THE CLEARING OPERATIONS SHALL EXTEND AT LEAST 5 FEET BEYOND THE BUILDING PERIMETERS. ANY EXCAVATIONS OR CAVITIES FORMED BY THE REMOVAL OF ORGANIC MATERIAL, GROUND BRUSH OR STUMPS SHOULD BE FILLED WITH CLEAN, COMPACTED STRUCTURAL FILL.

GRADING AND EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING EXCAVATIONS AGAINST COLLAPSE AND WILL PROVIDE BRACING SHEETING OR SHORING AS NECESSARY. TRENCHES SHALL BE KEPT DRY WHILE PIPE AND APPURTENANCES ARE BEING PLACED. DEWATERING SHALL BE USED AS REQUIRED.

2. CONTRACTOR IS TO PROVIDE EROSION CONTROL BARRIERS (HAY BALES OR SILTATION CURTAIN) TO PREVENT SILTATION OF ADJACENT PROPERTY, STREETS, STORM SEWERS, WATERWAYS, AND EXISTING WETLANDS PER THE CONSTRUCTION DRAWINGS. IN ADDITION, CONTRACTOR SHALL CONSTRUCT A TEMPORARY CONSTRUCTION EXIT (SEE DETAILS) IN AREAS WHERE CONSTRUCTION RELATED TRAFFIC IS TO ENTER AND EXIT THE SITE. IF, IN THE OPINION OF THE OWNER'S REPRESENTATIVE OR GOVERNMENTAL AGENCY THAT EXCESSIVE QUANTITIES OF EARTH ARE TRANSPORTED OFF-SITE EITHER BY NATURAL DRAINAGE OR BY VEHICULAR TRAFFIC, THE CONTRACTOR IS TO REMOVE SAID EARTH TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE AND/OR GOVERNING OFFICIALS. SEE SWPPP NARRATIVE FOR ADDITIONAL INFORMATION.

3. IF WIND EROSION BECOMES SIGNIFICANT DURING CONSTRUCTION, THE CONTRACTOR SHALL STABILIZE THE AFFECTED AREA USING SPRINKLING, IRRIGATION, OR OTHER ACCEPTABLE METHODS.

4. THERE IS TO BE NO DISCHARGE (I.E. PUMPING, SHEET FLOW, SWALE, DITCH, ETC.) INTO EXISTING DITCHES OR CANALS WITHOUT THE USE OF SETTLING PONDS. IF THE CONTRACTOR DESIRES TO DISCHARGE INTO THE EXISTING DITCHES OR CANALS A SETTLING POND PLAN PREPARED BY THE CONTRACTOR MUST BE SUBMITTED TO AND APPROVED BY THE OWNER'S REPRESENTATIVE AND APPROPRIATE GOVERNMENTAL AGENCY PRIOR TO CONSTRUCTION.

GRADING AND EROSION CONTROL NOTES (CONT'D)

5. ANY VEGETATION FROM CLEARING/GRUBBING SHALL BE DISPOSED OF OFF-SITE.

6. SITE CONDITIONS

A. DP CANYON. SURFACE SOILS CONSIST OF SILTY SANDS (SM) TO A DEPTH OF ABOUT 3 TO 4 FEET, VOLCANIC TUFF BEDROCK WAS ENCOUNTERED BELOW THE SILTY SAND AND EXTENDED DOWN TO THE DEPTH OF BORING TERMINATION (APPROXIMATE 15 FEET). TUFF BEDROCK VARIED FROM NON-WELDED TO STRONGLY WELDED.

B. PUEBLO CANYON. SURFACE AND SUBSURFACE SOILS CONSIST OF WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), POORLY GRADED SAND WITH GRAVEL (SP), SILTY SAND (SM), AND SANDY SILT (ML) TO THE FULL DEPTH OF EXPLORATION (SEE SOILS REPORT)

7. IT IS ANTICIPATED THAT SHALLOW EXCAVATIONS IN SOME AREAS FOR THE PROPOSED CONSTRUCTION CAN BE ACCOMPLISHED WITH CONVENTIONAL EARTHMOVING EQUIPMENT. HOWEVER, VERY HARD BEDROCK MATERIALS, AND AUGER REFUSAL MATERIALS WERE ENCOUNTERED AT DEPTHS RANGING BETWEEN 2 AND 3 FEET BELOW EXISTING GROUND SURFACE. BASED UPON THE BORING AND TEST PIT DATA, THIS CONDITION APPEARS TO BE ASSOCIATED WITH THE DP CANYON SITE. DIFFICULT EXCAVATION TECHNIQUES MAY BE REQUIRED IN THIS AREA DEPENDING ON THE FINAL EXCAVATION DEPTHS. CONTRACTOR SHOULD REVIEW THE DATA AND INFORMATION CONTAINED IN THE GEOTECHNICAL REPORT TO DETERMINE THE APPROPRIATE EQUIPMENT REQUIRED TO ADVANCE THE EXCAVATIONS TO CONSTRUCTION DEPTHS.

8. SUBGRADE PREPARATION: EXPOSED AREAS WHICH WILL RECEIVE FILL OF THE INITIAL COURSE OF THE GABION STRUCTURE, ONCE PROPERLY CLEARED, SHOULD BE SCARIFIED TO A MINIMUM DEPTH OF 10 INCHES, CONDITIONED TO NEAR OPTIMUM MOISTURE CONTENT, AND COMPACTED.

9. FILL MATERIALS AND PLACEMENT: GENERALLY, CLEAN ON-SITE SOILS OR APPROVED IMPORTED MATERIALS MAY BE USED AS FILL MATERIAL (IF APPLICABLE) FOR THE SITE. THE FILL MATERIALS SHOULD CONFORM TO THE FOLLOWING:

GRADATION	PERCENT FINER BY WEIGHT ASTM C136)
6"	100
3"	70-100
NO. 4 SIEVE	50-100
NO. 200 SIEVE	35(MAX)
• LIQUID LIMIT	30 (MAX)
• PLASTICITY INDEX	12 (MAX)

FILL LIFTS SHOULD NOT EXCEED 10 INCHES LOOSE THICKNESS. IMPORTED SOILS SHOULD BE COMPACTED WITHIN A MOISTURE RANGE OF OPTIMUM 3 PERCENT ABOVE OPTIMUM IF THE MATERIALS HAVE A PI OF 5 OR MORE. ON-SITE SOILS AND IMPORT SOILS THAT HAVE A PI OF LESS THAN 5 SHOULD BE COMPACTED WITHIN A MOISTURE RANGE OF ±3 PERCENT OF OPTIMUM MOISTURE CONTENT.

10. DISTURBED AREAS, NOT DESIGNATED TO RECEIVE OTHER PERMANENT COVER, SHALL BE SEEDED IN ACCORDANCE WITH SECTION 632.2 OF THE NEW MEXICO DEPARTMENT OF TRANSPORTATION (NMDOT) STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.

11. PROVIDE TEMPORARY TRAFFIC CONTROL DEVICES, AT PUEBLO CANYON, IN ACCORDANCE WITH NMDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES SECTION 702.

12. CONTRACTOR SHALL SUBMIT NPDES NOTICE OF INTENT (N.O.I.) A MINIMUM OF 7 DAYS PRIOR TO BEGINNING WORK.

13. CONTRACTOR SHALL SUBMIT NPDES NOTICE OF TERMINATION (N.O.T.) WITHIN 30 DAYS OF CONSTRUCTION COMPLETION.

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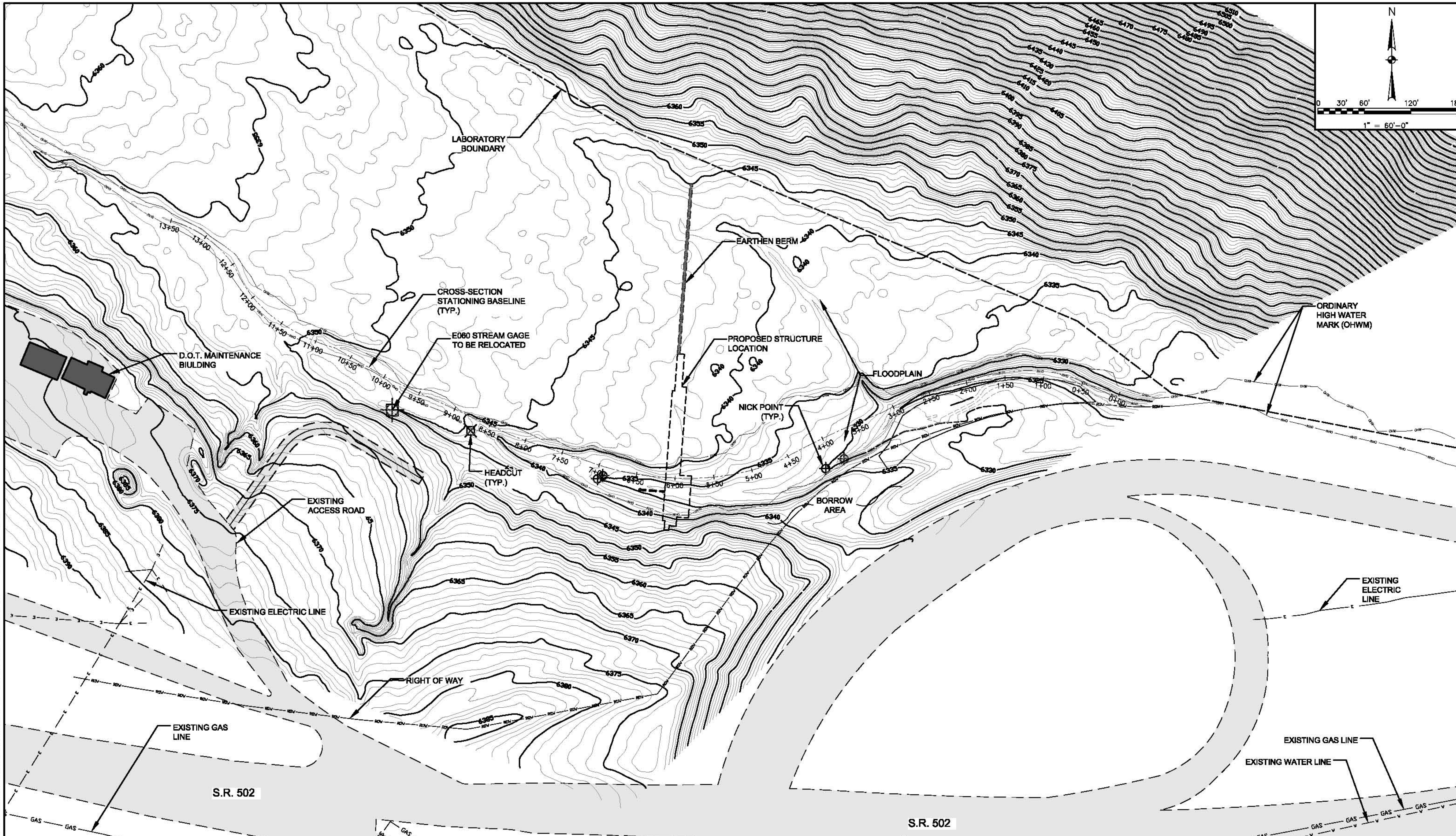
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	GENERAL NOTES

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-001



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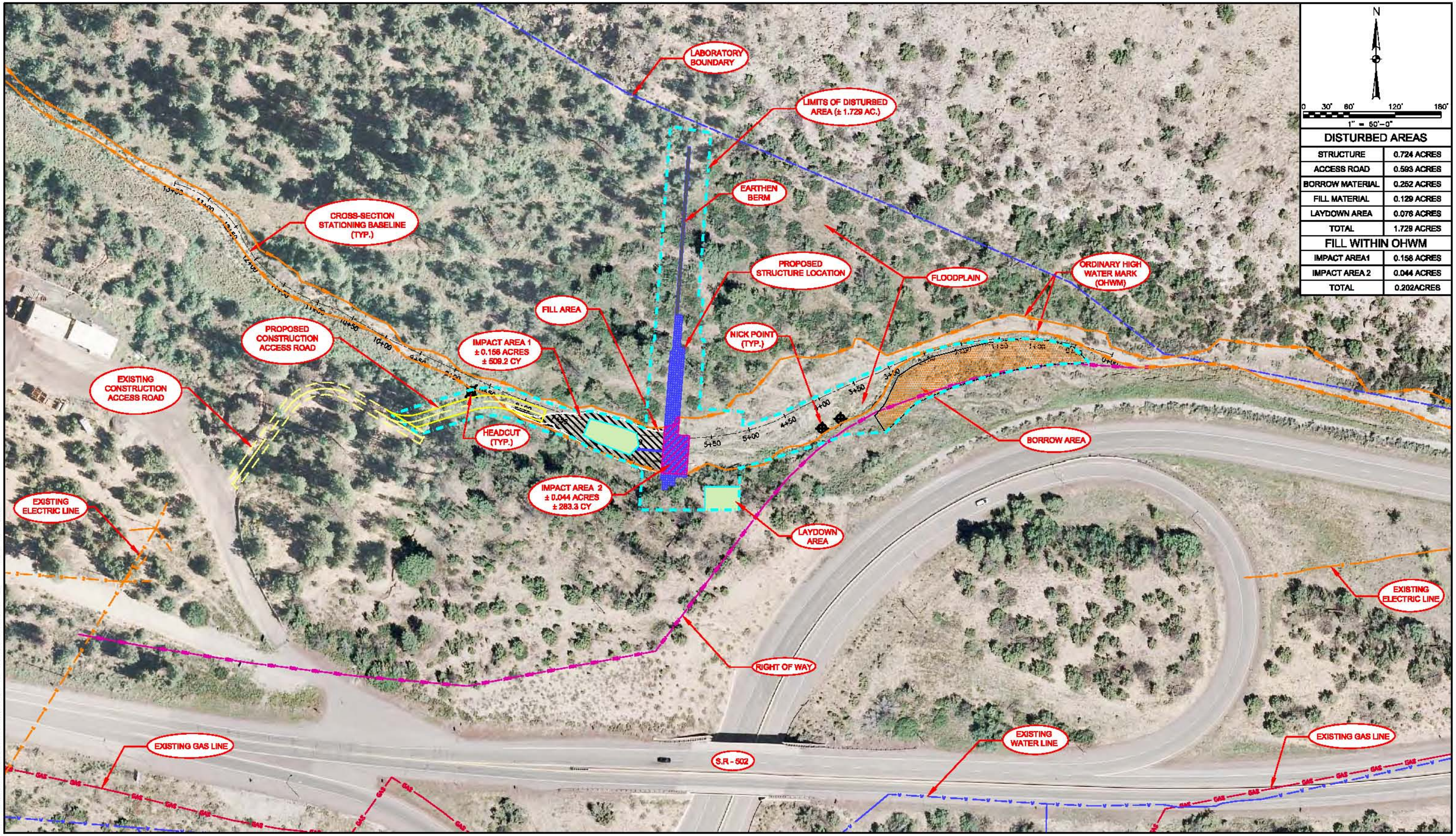
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL	LOS ALAMOS NATIONAL	PUEBLO CANYON
LABORATORY	LABORATORY	EXISTING CONDITIONS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-101



DISTURBED AREAS	
STRUCTURE	0.724 ACRES
ACCESS ROAD	0.593 ACRES
BORROW MATERIAL	0.252 ACRES
FILL MATERIAL	0.129 ACRES
LAYDOWN AREA	0.076 ACRES
TOTAL	1.729 ACRES

FILL WITHIN OHWM	
IMPACT AREA1	0.158 ACRES
IMPACT AREA 2	0.044 ACRES
TOTAL	0.202ACRES

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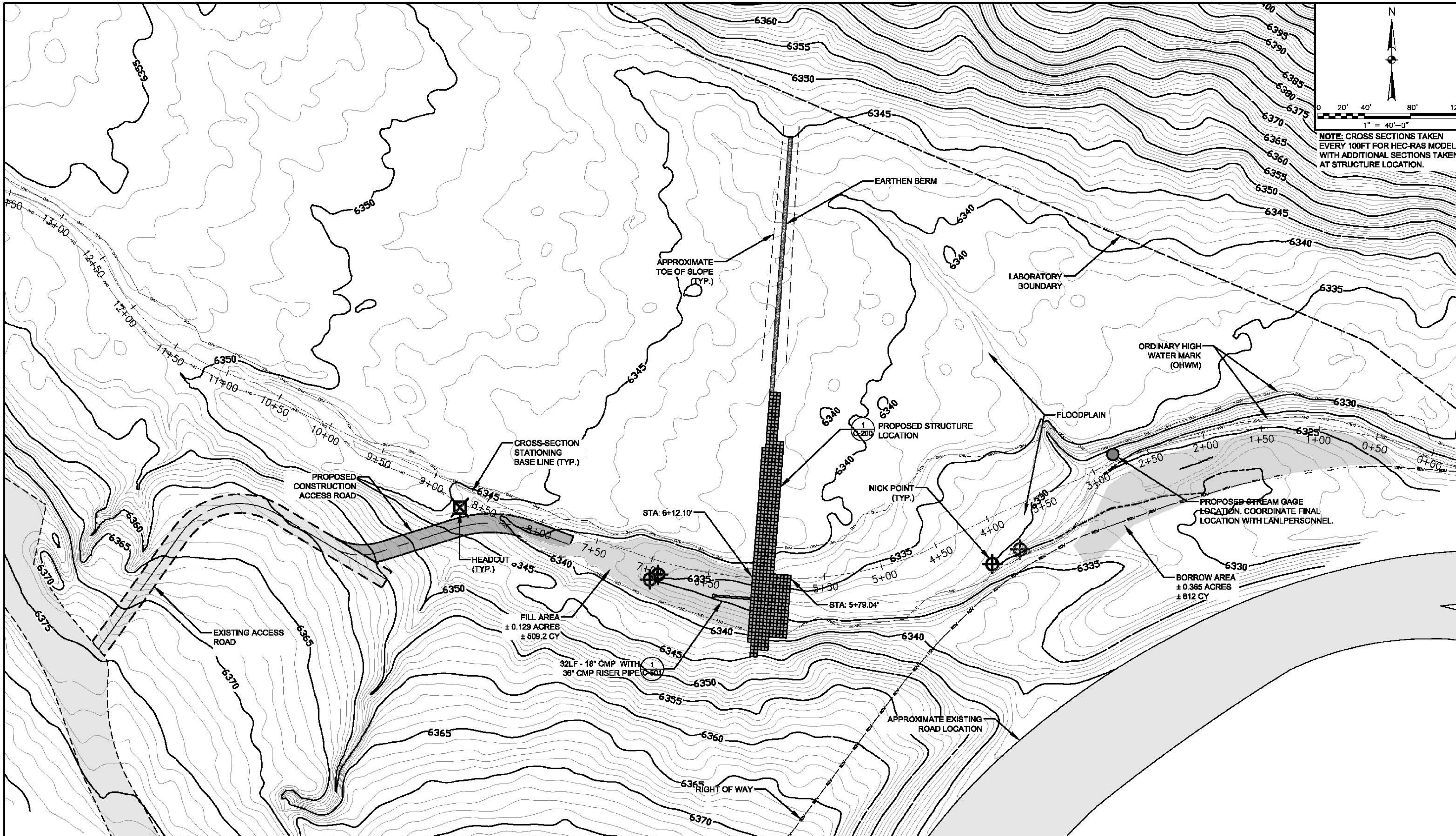
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	PUEBLO CANYON OVERALL SITE PLAN WITH AERIAL

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-102



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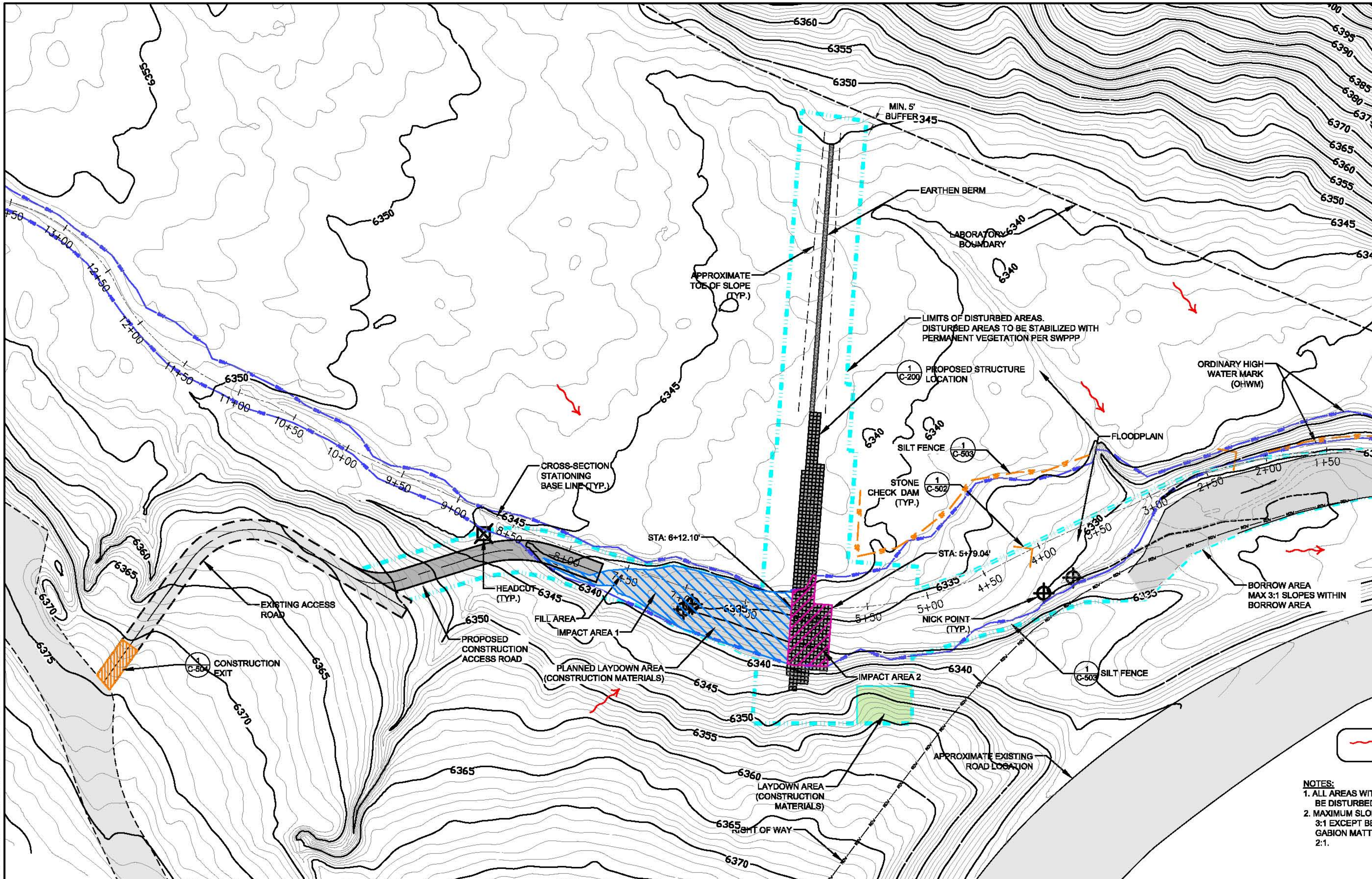
Ph. (941) 378-0272

Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J
5300 West Cypress Street, Suite 200, Tampa, Fl 33607
FBPR Certificate of Authorization No.: 24

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	PUEBLO CANYON ENLARGED SITE PLAN

ORIGINAL DATE: 08/24/09
REVISIONS:

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-103



DISTURBED AREAS	
STRUCTURE	0.724 ACRES
ACCESS ROAD	0.593 ACRES
BORROW MATERIAL	0.252 ACRES
FILL MATERIAL	0.129 ACRES
LAYDOWN AREA	0.076 ACRES
TOTAL	1.729 ACRES

FILL WITHIN OHWM	
IMPACT AREA1	0.158 ACRES
IMPACT AREA 2	0.044 ACRES
TOTAL	0.202ACRES

LEGEND

INDICATES DIRECTION OF SURFACE RUNOFF

NOTES:
1. ALL AREAS WITHIN THE CONSTRUCTION LIMITS WILL BE DISTURBED.
2. MAXIMUM SLOPES, IN DISTURBED AREAS, SHALL BE 3:1 EXCEPT BERMED AREAS BEING STABILIZED WITH GABION MATTRESSES WHERE MAT SLOPE SHALL BE 2:1.

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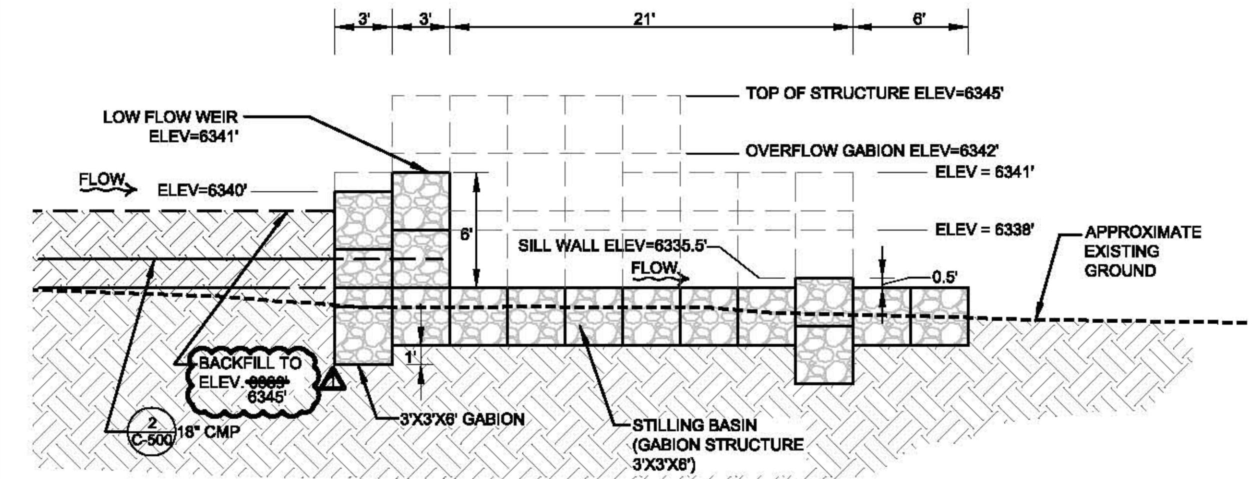
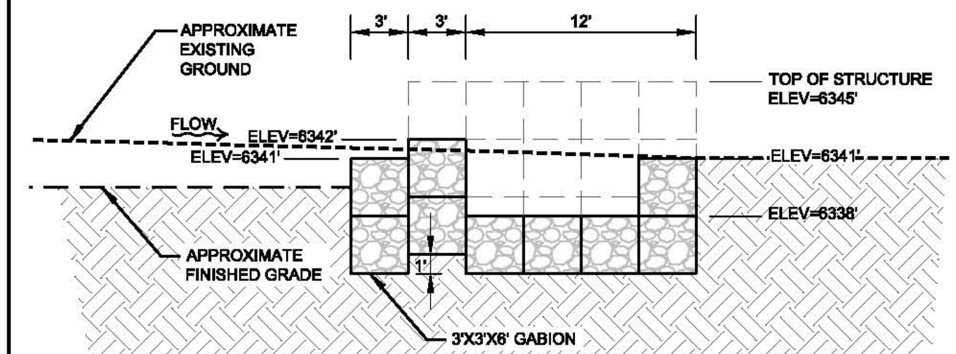
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	EROSION CONTROL PLAN

ORIGINAL DATE: 08/24/09
REVISIONS:

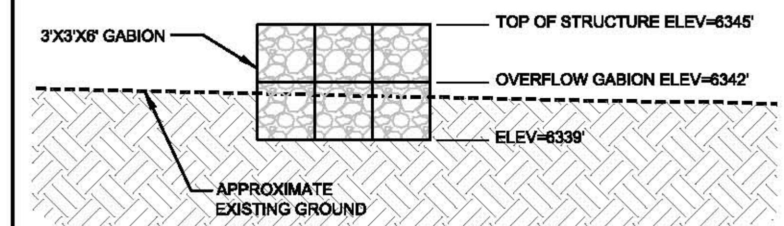
JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C104



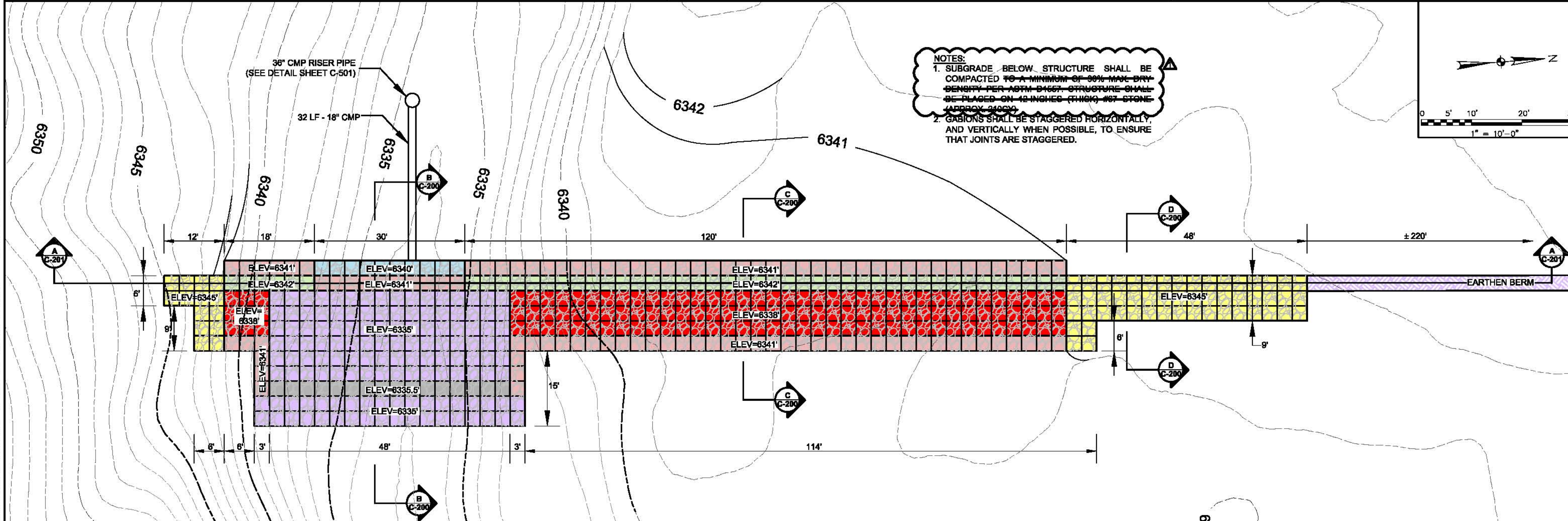
B
C-200 | C-200
SECTION B-B
SCALE: N.T.S.



C
C-200 | C-200
SECTION C-C
SCALE: N.T.S.



D
C-200 | C-200
SECTION D-D
SCALE: N.T.S.



1
C-103 | C-200
PUEBLO CANYON GABION PLAN VIEW
SCALE: 1"=10'

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FBPR Certificate of Authorization No.: 24

KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	PUEBLO CANYON CROSS SECTIONS

ORIGINAL DATE: 08/24/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2
3
4
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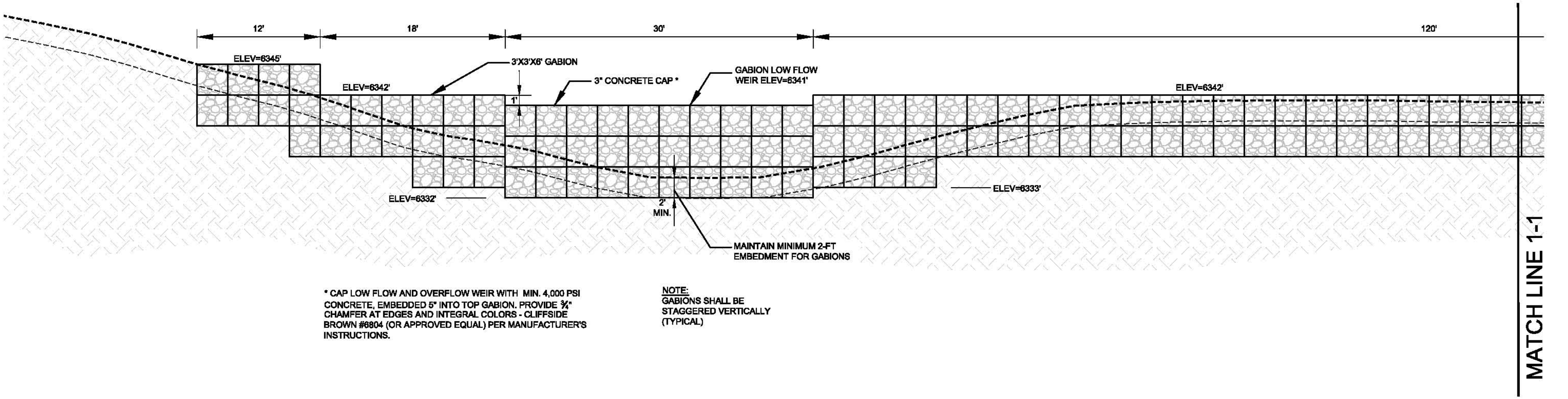
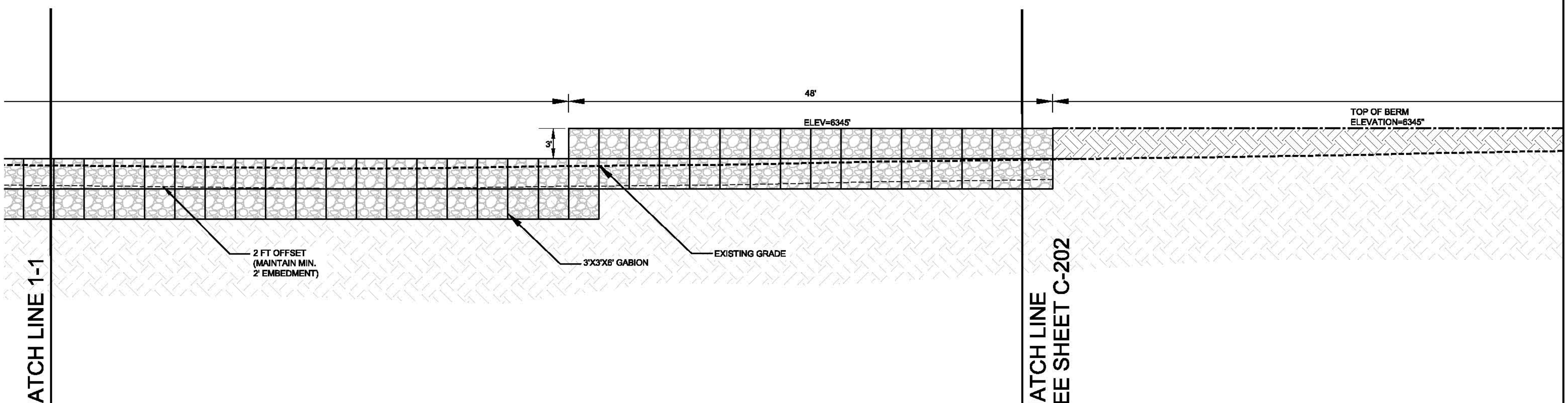
12

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-200

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-200 – C-202 – PUEBLO CANYON CROSS SECTIONS.dwg
May 06, 2010 – 10:27am





A C-200 | C-201 PUEBLO CANYON GABION CROSS SECTION A-A

SCALE: 1"=5'

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-200 – C-202 – PUEBLO CANYON CROSS SECTIONS.dwg May 05, 2010 – 8:45pm

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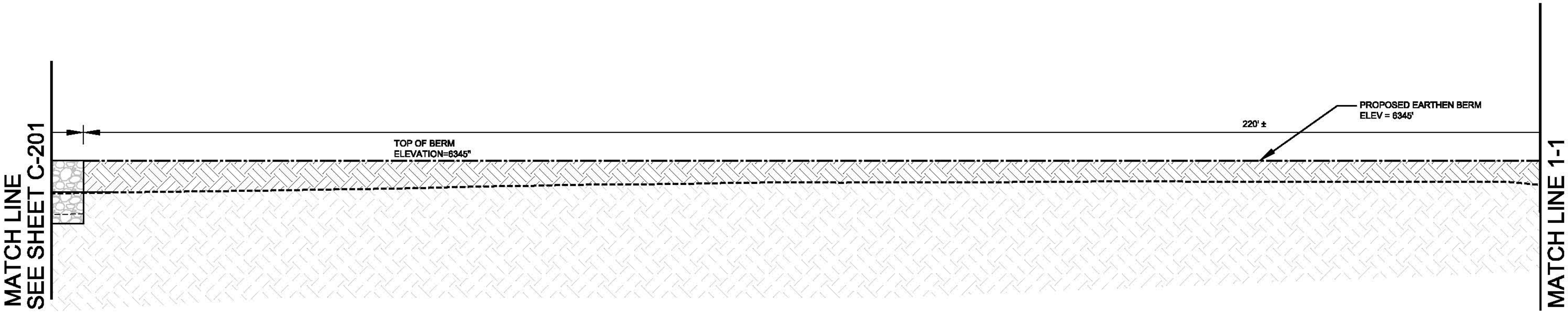
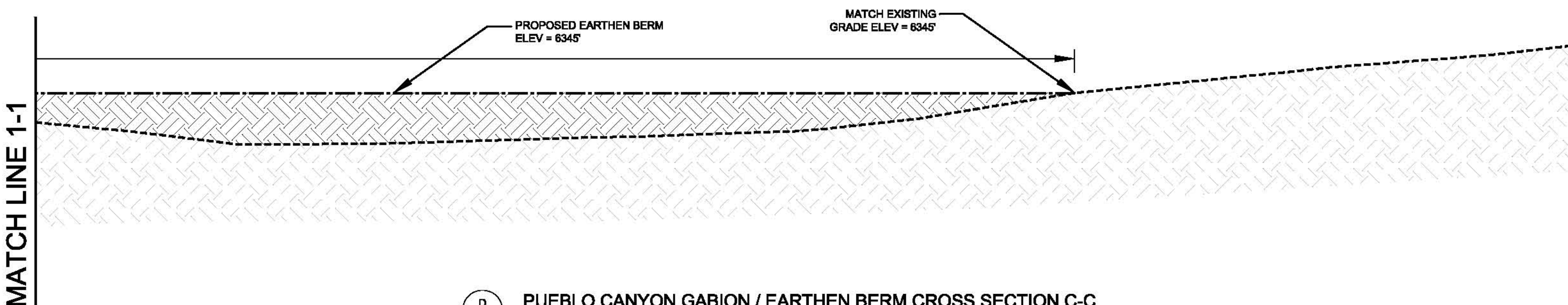
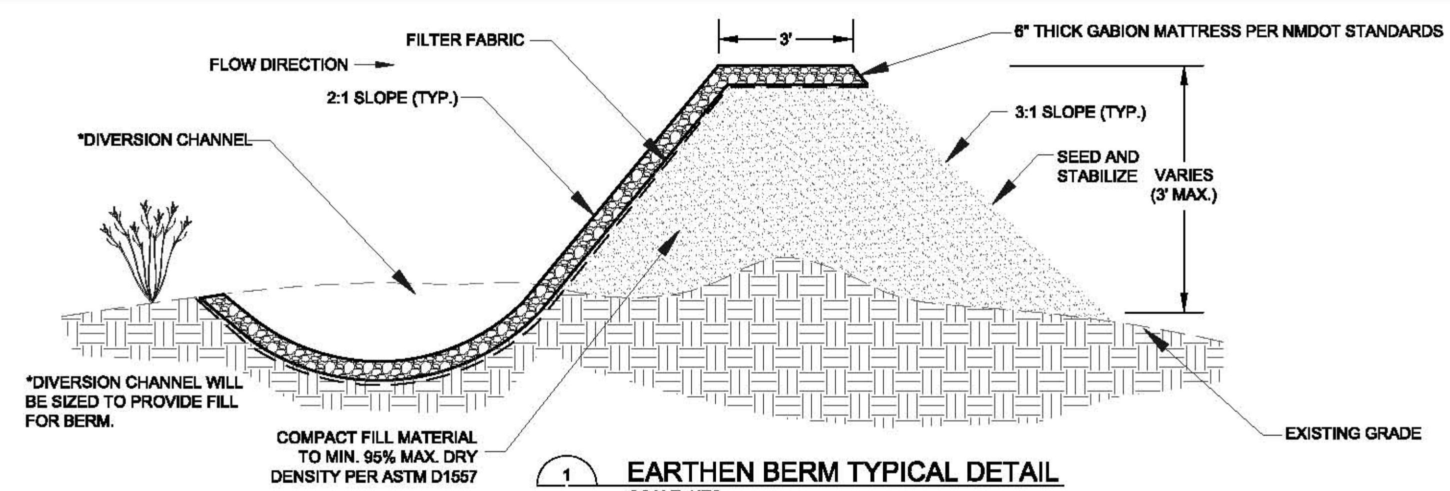




D C-200 C-202 PUEBLO CANYON GABION / EARTHEN BERM CROSS SECTION C-C

SCALE: 1"=5'



1 EARTHEN BERM TYPICAL DETAIL

SCALE: NTS

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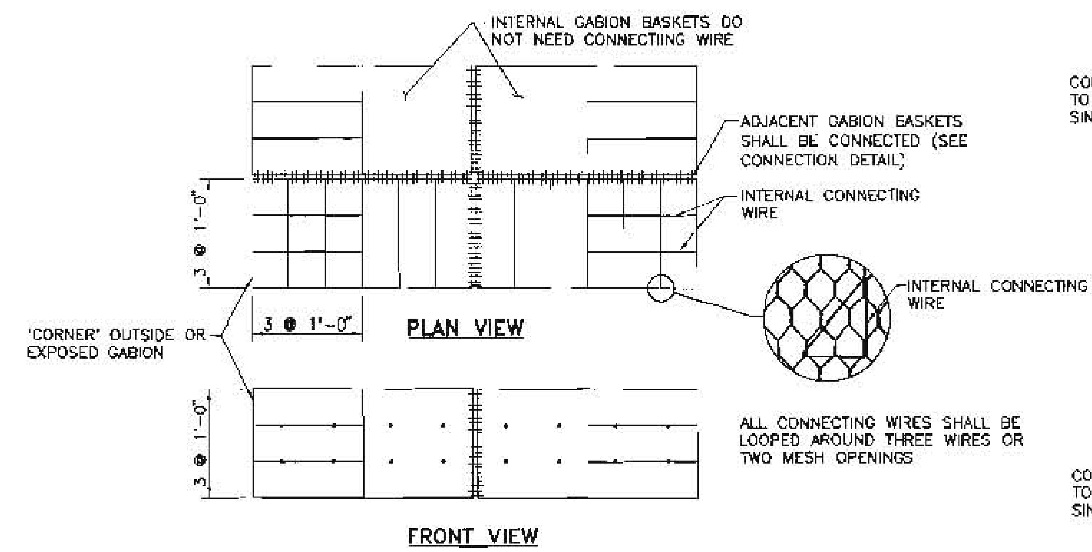
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON CROSS SECTIONS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

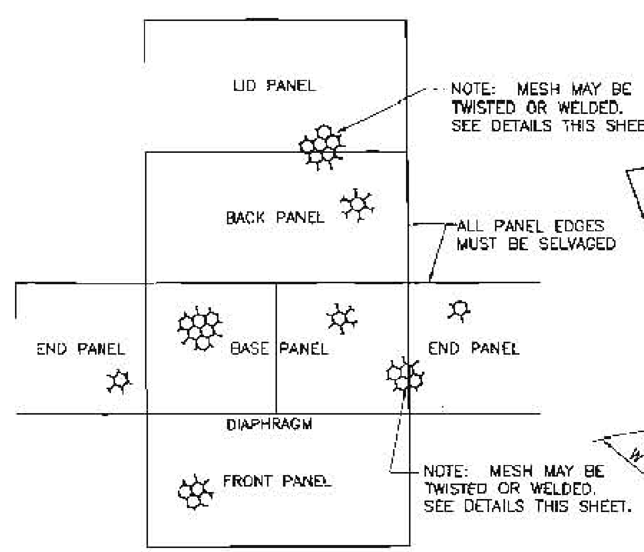
JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-202



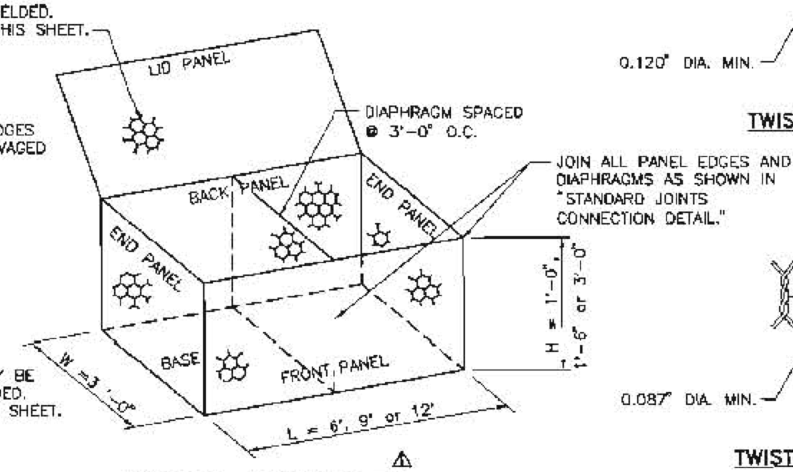
DETAILS OF 9 GAGE INTERNAL CONNECTING WIRES

STANDARD REVETMENT MATTRESS SIZES				
LENGTH	WIDTH	HEIGHT	NUMBER OF CELLS	VOLUME CUBIC YARDS
	FEET			
9'-0"	6'-0"	0'-6"	3	1.00
12'-0"	6'-0"	0'-6"	4	1.33
9'-0"	6'-0"	0'-9"	3	1.50
12'-0"	6'-0"	0'-9"	4	2.00

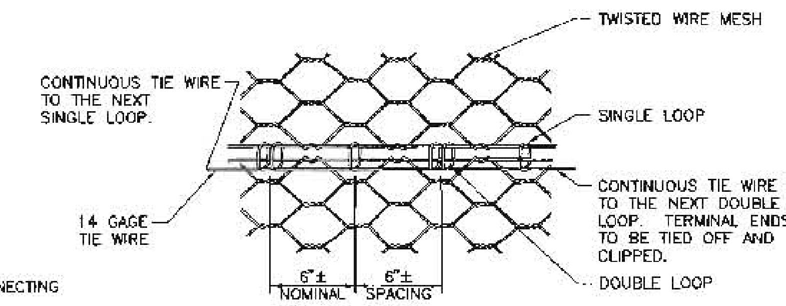
STANDARD GABION SIZES				
LENGTH	WIDTH	HEIGHT	NUMBER OF CELLS	VOLUME CUBIC YARDS
	FEET			
6'-0"	3'-0"	3'-0"	2	2.00
9'-0"	3'-0"	3'-0"	3	3.00
12'-0"	3'-0"	3'-0"	4	4.00
6'-0"	3'-0"	1'-6"	2	1.00
9'-0"	3'-0"	1'-6"	3	1.50
12'-0"	3'-0"	1'-6"	4	2.00
6'-0"	3'-0"	1'-0"	2	0.66
9'-0"	3'-0"	1'-0"	3	1.00
12'-0"	3'-0"	1'-0"	4	1.33



TYPICAL FLAT LAYOUT OF GABION BASKET

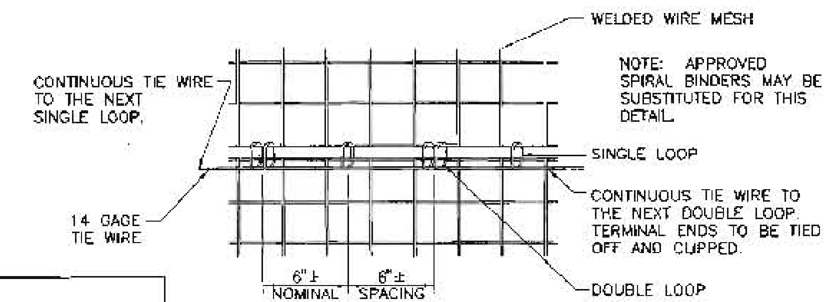


TYPICAL ASSEMBLED GABION BASKET



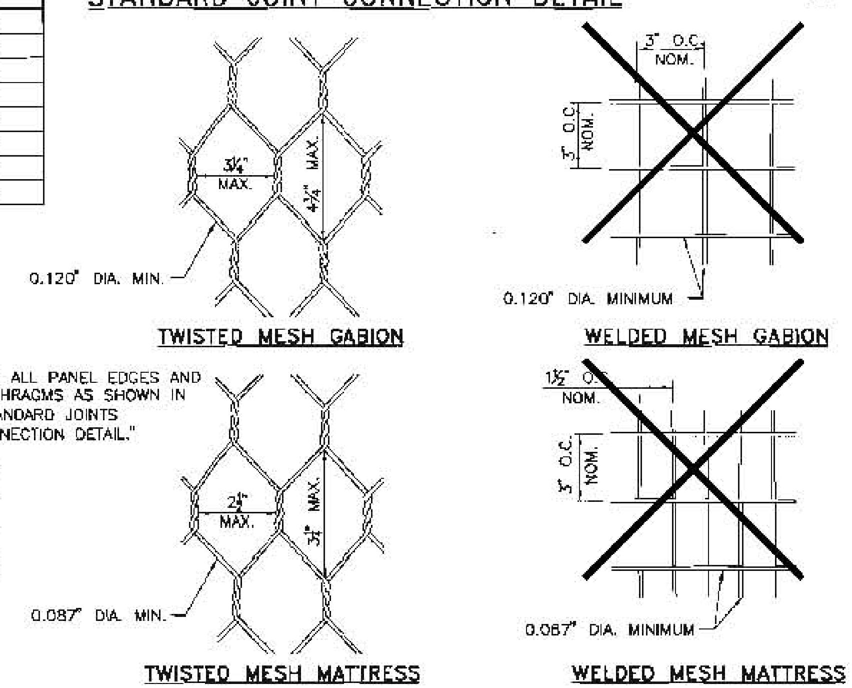
(FOR USE W/ TWISTED MESH)

STANDARD JOINT CONNECTION DETAIL



(FOR USE W/ WELDED WIRE MESH)

STANDARD JOINT CONNECTION DETAIL



TYPICAL ACCEPTABLE MESH STYLES

GENERAL NOTES

1. INTERNAL CONNECTING WIRES ARE TO BE INSTALLED ACROSS WIDTH OF INTERIOR GABIONS AND ACROSS WIDTH AND LENGTH OF END GABIONS.
2. INTERNAL CONNECTING WIRE, LACING WIRE AND GABION MESH SHALL BE GALVANIZED.
3. INTERNAL CONNECTING WIRES ARE REQUIRED ON ALL GABIONS 3'-0" HIGH AND ON ALL GABIONS 1'-6" HIGH WHEN USED TO BUILD VERTICAL STRUCTURES.
4. PREFORMED STIFFENERS (11 GAGE OR 9 GAGE) ARE AN ACCEPTABLE ALTERNATIVE TO INTERNAL CONNECTING WIRES. INSTALL THEM AS RECOMMENDED BY THE MANUFACTURER OR AS DIRECTED BY THE PROJECT MANAGER AT ⅓ POINTS.
5. PLACE ROCK IN THE END GABION CELL FIRST, AND CONTINUE BY FILLING INTERIOR GABION CELLS.
6. FOR GABION DIMENSIONS, REFER TO THE TABLE "STANDARD GABION SIZES."
7. A JOINT CONNECTION MUST BE MADE WHERE ANY PANEL EDGE MEETS ANOTHER PANEL. THIS INCLUDES ADJACENT GABION BASKETS, INDIVIDUAL PANELS WITHIN A BASKET, DIAPHRAGM EDGES ETC. ALL JOINT CONNECTIONS SHALL BE MADE USING STANDARD TIE WIRE.
8. ALTERNATE JOINT CONNECTION PROCEDURES MAY BE USED PROVIDED THAT THE COMPLETED JOINT WILL DEVELOP A TENSILE STRENGTH OF NOT LESS THAN 1400 POUNDS PER FOOT. IF ALTERNATE JOINT CONNECTION PROCEDURES ARE USED THE CONTRACTOR SHALL SUBMIT TO THE PROJECT MANAGER CERTIFIED TEST REPORTS DEMONSTRATING THE ALTERNATE JOINT CONNECTIONS WILL MEET THE MINIMUM TENSILE STRENGTH REQUIREMENTS.

SERIAL 602-05-2/2 SHEET 2 OF 2 MUST ACCOMPANY THIS SHEET.

NO.	DATE	REV. BY	DESCRIPTION
1	01/16/08	YML	CORRECTED L = 6', 9' or 12'

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

GABION
BASKET DETAILS

APPROVED [signature] DESIGN ENGINEER 3-5-08 DATE

DESIGNED BY TM DRAWN BY SKL CHECKED BY YML

602-05-1/2 SHEET 1 of 2

1 GABION BASKET DETAIL (NMDOT)
C-103 C-303 | C-500 SCALE: NTS

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FBPR Certificate of Authorization No.: 24

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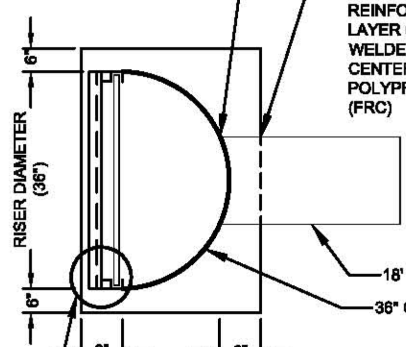
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	GENERAL DETAILS

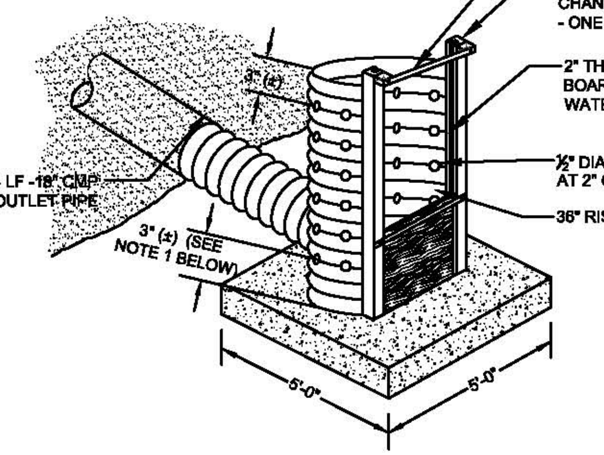
ORIGINAL DATE: 08/24/09
REVISIONS: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED MT
QC MS
SHEET C-500

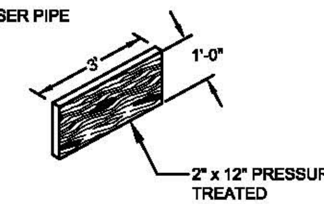
NOTE: ALL APPURTENANCES SHALL BE GALVANIZED, OR PAINTED WITH NOT LESS THAN TWO COATS OF ZINC OXIDE PAINT.



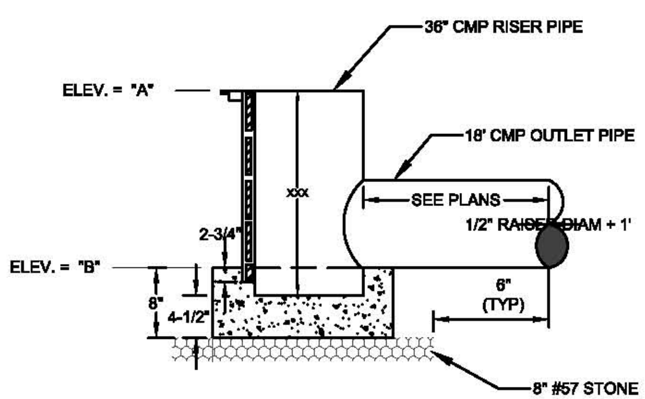
TOP VIEW



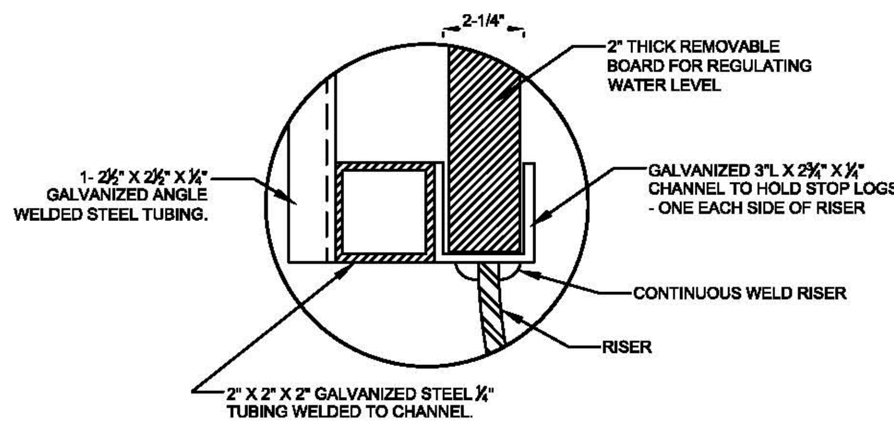
ISOMETRIC VIEW



WOOD RISER



CROSS SECTION OF RISER



DETAIL A

	DP CANYON	PUEBLO CANYON
ELEV "A"	~~7026.0'~~ 7029'	~~6344.0'~~ 6343'
ELEV "B"	7022.5'	6335.5'

NOTES:
1. AT PUEBLO CANYON PERFORATIONS SHALL NOT EXTEND BELOW ELEV. 6339'.
2. CMP SHALL BE FULLY COATED.

1 RISER PIPE DETAILS

C-200 C-400 | C-501 SCALE: NTS

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FBPR Certificate of Authorization No.: 24

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	GENERAL DETAILS

ORIGINAL DATE: 08/24/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2.
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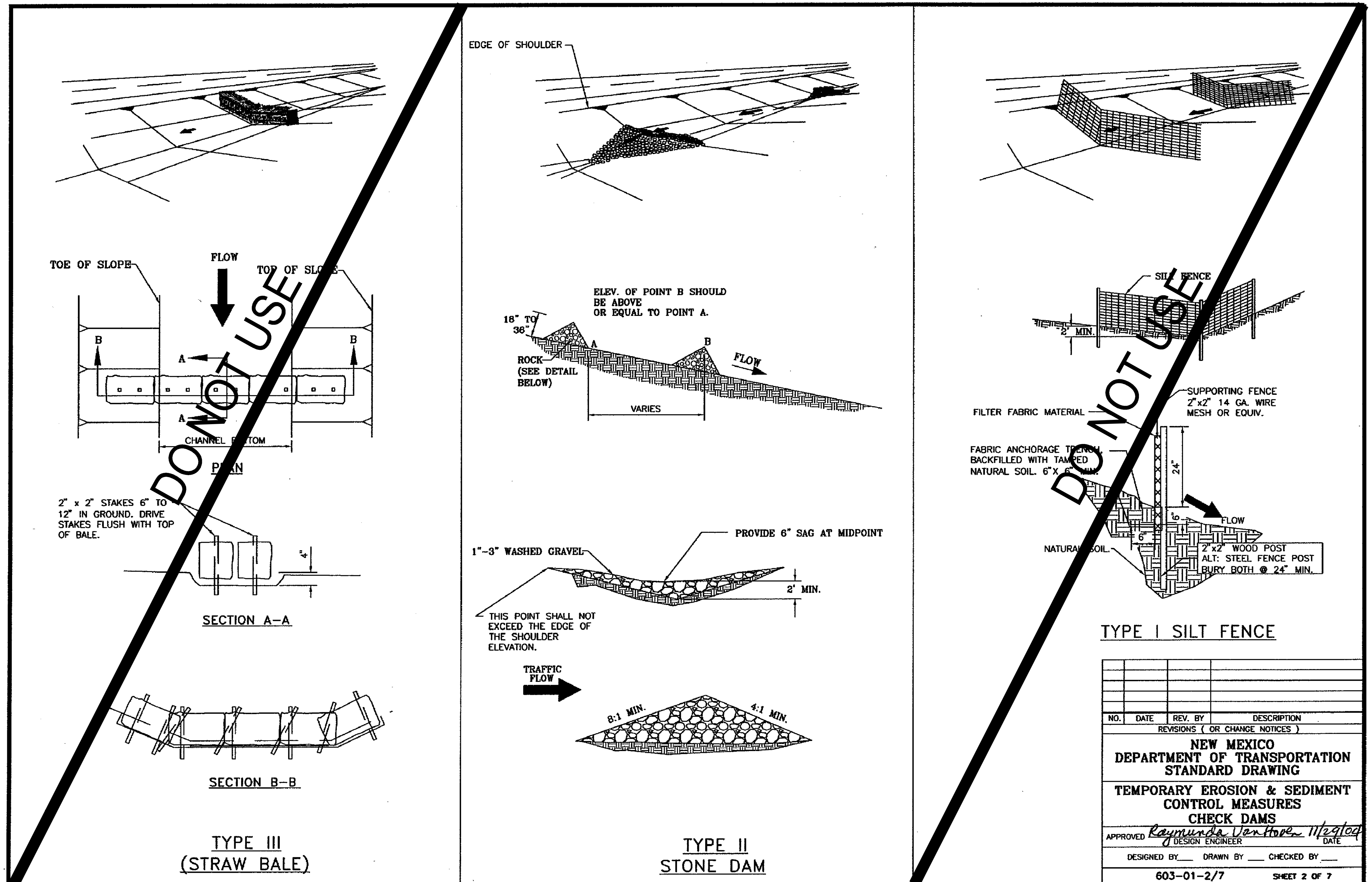
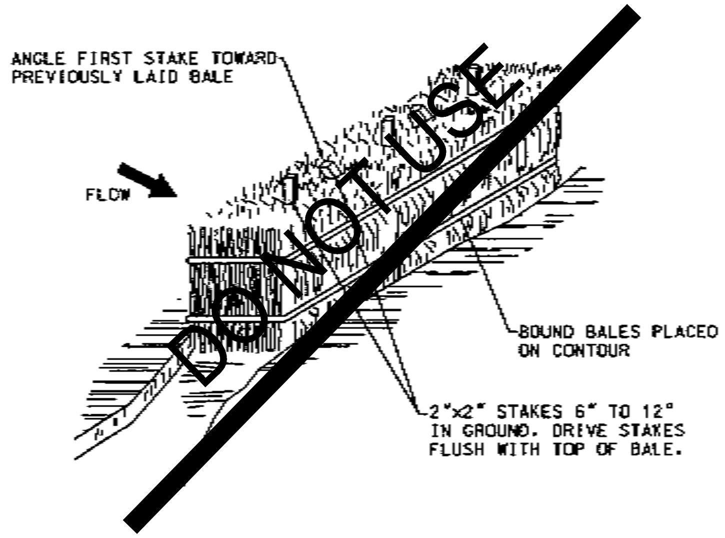
JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-501



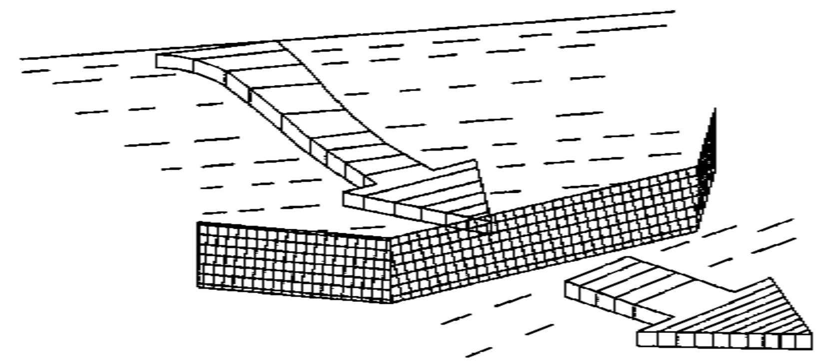
1 CHECK DAM DETAILS (NMDOT)
C-104 C-304 | C-502 SCALE: NTS

PBSJ 101 Arthur Andersen Parkway, Suite 260 Sarasota, Florida 34232 Ph. (941) 378-0272 Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J 5300 West Cypress Street, Suite 200, Tampa, Fl 33607 FBPR Certificate of Authorization No.: 24	KBR	CLIENT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	PROJECT LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	TASK S.W.P.P.P. DETAILS	ORIGINAL DATE: 08/24/09 REVISIONS: 1 2 3 4 5 6 7 8 9 10 11 12
					JOB NO. 100005632 DATE 10/13/2009 DESIGNED DTW PE RMP CHECKED IMT QC MS SHEET C-502

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-502 - C-504 - EROSION CONTROL DETAILS.dwg May 06, 2010 - 9:14am



TYPE II
STRAW BALE OPTION



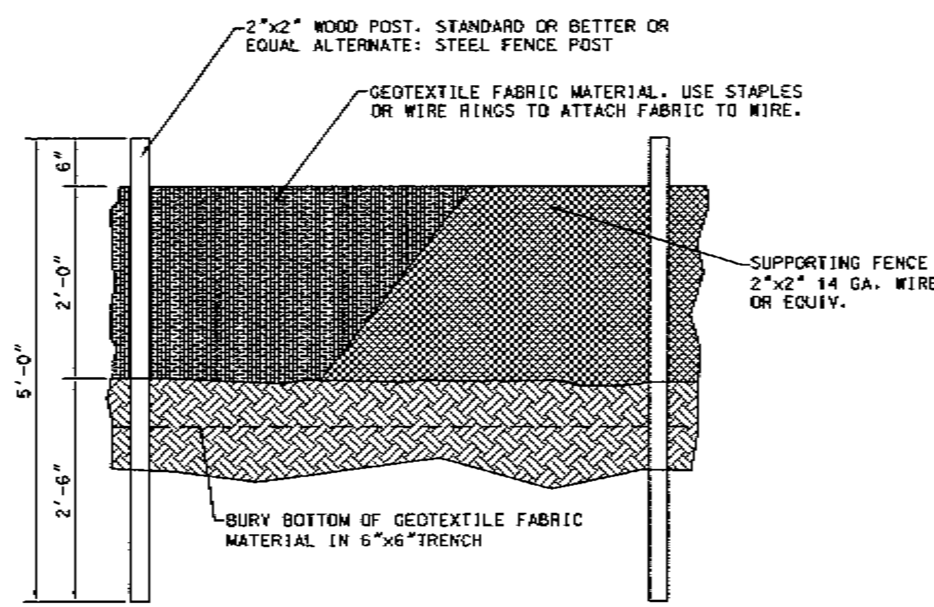
TYPE I
SILT FENCE

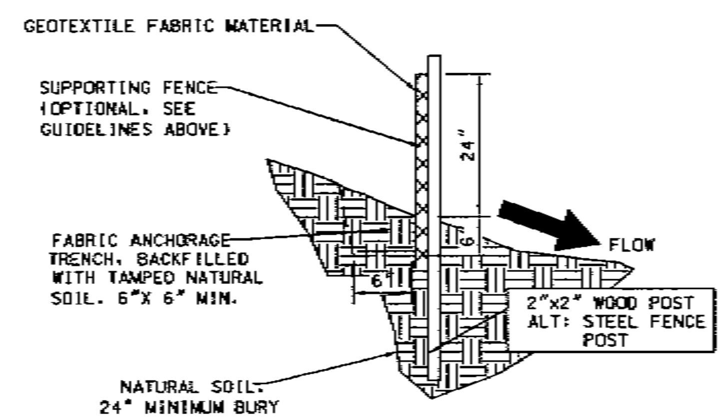
NOTES: SILT FENCE AND CHECK DAM

THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE POST SPACING FOR SILT FENCES TO MINIMIZE MAINTENANCE.

1. POST SPACING SHALL BE 4 FT. MAXIMUM WITHOUT SUPPORTING FENCE. 10 FT. MAXIMUM WITH SUPPORTING FENCE.
2. POSTS FOR 4 FT. MAXIMUM POST SPACING SHALL BE 2 INCH SQUARE NOMINAL SIZE OR HEAVIER WOOD POSTS, OR STANDARD "T" OR "U" SECTION STEEL POSTS WEIGHING NOT LESS THAN 2 LBS. PER. LINEAR FOOT.

   POSTS FOR 10 FT. MAXIMUM POST SPACING SHALL BE 4 INCH SQUARE NOMINAL SIZE OR HEAVIER WOOD POSTS, OR STEEL POSTS AS SPECIFIED ABOVE.
3. SUPPORTING FENCE SHALL BE WIRE MESH (14 GA. MIN., 1 INCH MAX. MESH OPENINGS), SNOW FENCE, PLASTIC FENCE OR APPROVED.
4. SUPPORTING FENCE SHALL BE FASTENED SECURELY TO POSTS WITH STAPLES OR WIRE TIES. GEOTEXTILE FABRIC SHALL BE FASTENED SECURELY TO SUPPORTING FENCE WITH WIRE TIES SPACED AT 2 FT. CENTERS ALONG THE TOP AND MID-SECTION. WHEN A SUPPORTING FENCE IS NOT USED, GEOTEXTILE FABRIC SHALL BE SECURELY FASTENED TO POSTS WITH STAPLES OR WIRE TIES.
5. ~~WHEN SILT FENCE IS USED FOR CHECK DAMS INSTALLED IN DITCHES, A SUPPORTING FENCE SHALL BE PROVIDED, WITH MAXIMUM POST SPACING OF 10 FT.~~
6. ~~STANDARD "T" OR "U" SECTION STEEL POSTS SHALL NOT BE USED WITHIN THE CONSTRUCTION CLEAR ZONE RECOVERY AREA.~~
7. ~~STRAW BALES ARE NOT INTENDED FOR USE ON NEW MEXICO DEPARTMENT OF TRANSPORTATION PROJECTS.~~





1 T.E.S.C.M. SILT FENCE (NMDOT)
C-104 C-304 | C-503 SCALE: NTS

NO.	DATE	REV. BY	DESCRIPTION

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

TEMPORARY EROSION & SEDIMENT CONTROL MEASURES
SILT FENCE

APPROVED Raymunda Von Hoyer 11/29/04
DESIGN ENGINEER DATE

DESIGNED BY___ DRAWN BY___ CHECKED BY___

603-01-3/7

PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, Florida 34232
Ph. (941) 378-0272
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FBPR Certificate of Authorization No.: 24

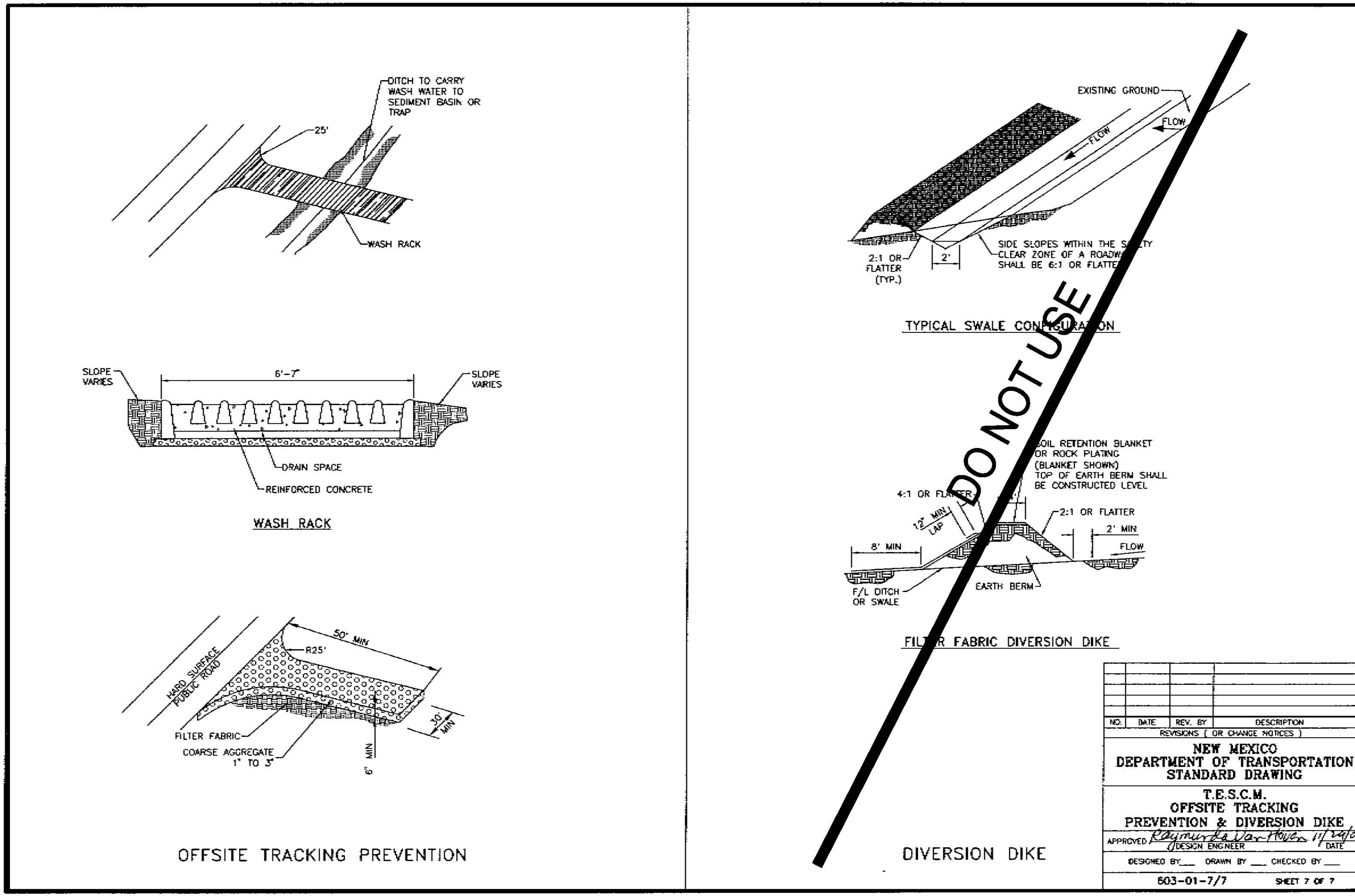
KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	S.W.P.P.P. DETAILS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS: 1 2 3 4 5 6 7 8 9 10 11 12

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-503

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-502 - C-504 - EROSION CONTROL DETAILS.dwg May 06, 2010 - 9:16am



1 C-104 | C-504 T.E.S.C.M. OFFSITE TRACKING PREVENTION (NMDOT)
SCALE: NTS

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JOB NO. 100005632
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CHECKED IMT
QC MS
SHEET C-504

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-502 - C-504 - EROSION CONTROL DETAILS.dwg May 06, 2010 - 9:18am

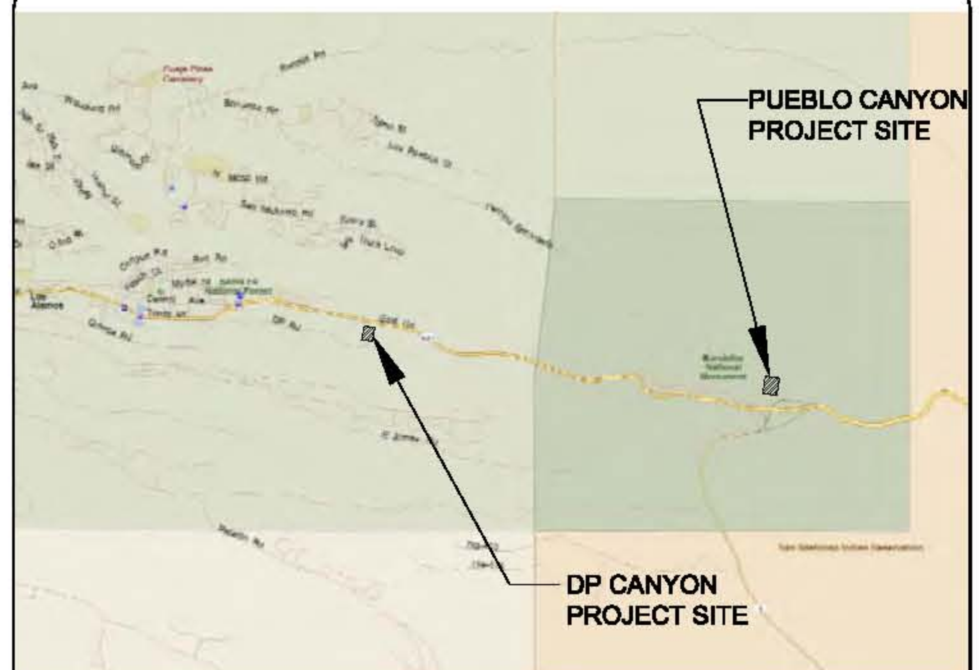
CONSTRUCTION PLANS FOR:

LOS ALAMOS NATIONAL LABORATORY STREAM GAGE

FOR PUEBLO CANYON
LOS ALAMOS, NEW MEXICO

INDEX OF DRAWINGS

LOCATION MAP



VICINITY MAP

DRAWINGS REVISED TO INCORPORATE CONTRACTOR AS-BUILT INFORMATION. REVISIONS ARE INDICATED AS REVISION 1 WHERE APPLICABLE.

PREPARED FOR:
LOS ALAMOS NATIONAL LABORATORY
P.O. BOX 1663
LOS ALAMOS, NM 87545

PREPARED BY:
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CONSULTING ENGINEERS
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SARASOTA, FLORIDA 34232
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(941) 371-0297 (FAX)

KBR
GOVERNMENT AND INFRASTRUCTURE
2451 CRYSTAL DRIVE
ARLINGTON, VIRGINIA 22202
(703) 526-7500

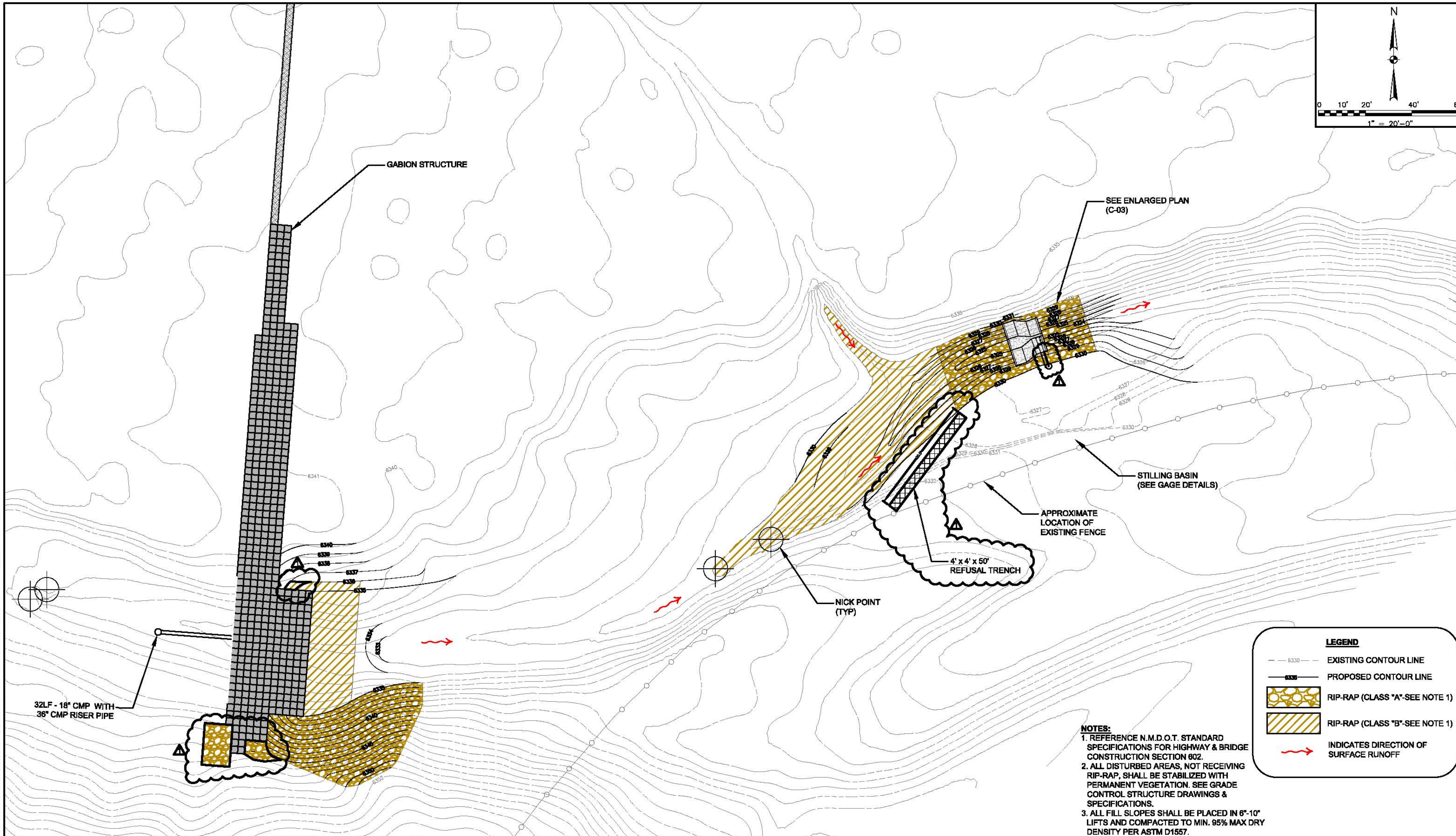
DATE:	SHEETS	BY:
05/05/2010	C-01, C-10 SG-01 TO SG-03	JVC

REVISIONS

LOS ALAMOS NATIONAL LABORATORY STREAM GAGE

JOB NO. 100005632

DATE: 12/22/2009 | SHT. **1** OF **10**



LEGEND

- EXISTING CONTOUR LINE
- PROPOSED CONTOUR LINE
- RIP-RAP (CLASS "A"-SEE NOTE 1)
- RIP-RAP (CLASS "B"-SEE NOTE 1)
- INDICATES DIRECTION OF SURFACE RUNOFF

NOTES:

1. REFERENCE N.M.D.O.T. STANDARD SPECIFICATIONS FOR HIGHWAY & BRIDGE CONSTRUCTION SECTION 602.
2. ALL DISTURBED AREAS, NOT RECEIVING RIP-RAP, SHALL BE STABILIZED WITH PERMANENT VEGETATION. SEE GRADE CONTROL STRUCTURE DRAWINGS & SPECIFICATIONS.
3. ALL FILL SLOPES SHALL BE PLACED IN 6"-10" LIFTS AND COMPACTED TO MIN. 95% MAX DRY DENSITY PER ASTM D1557.

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FBPR Certificate of Authorization No.: 24

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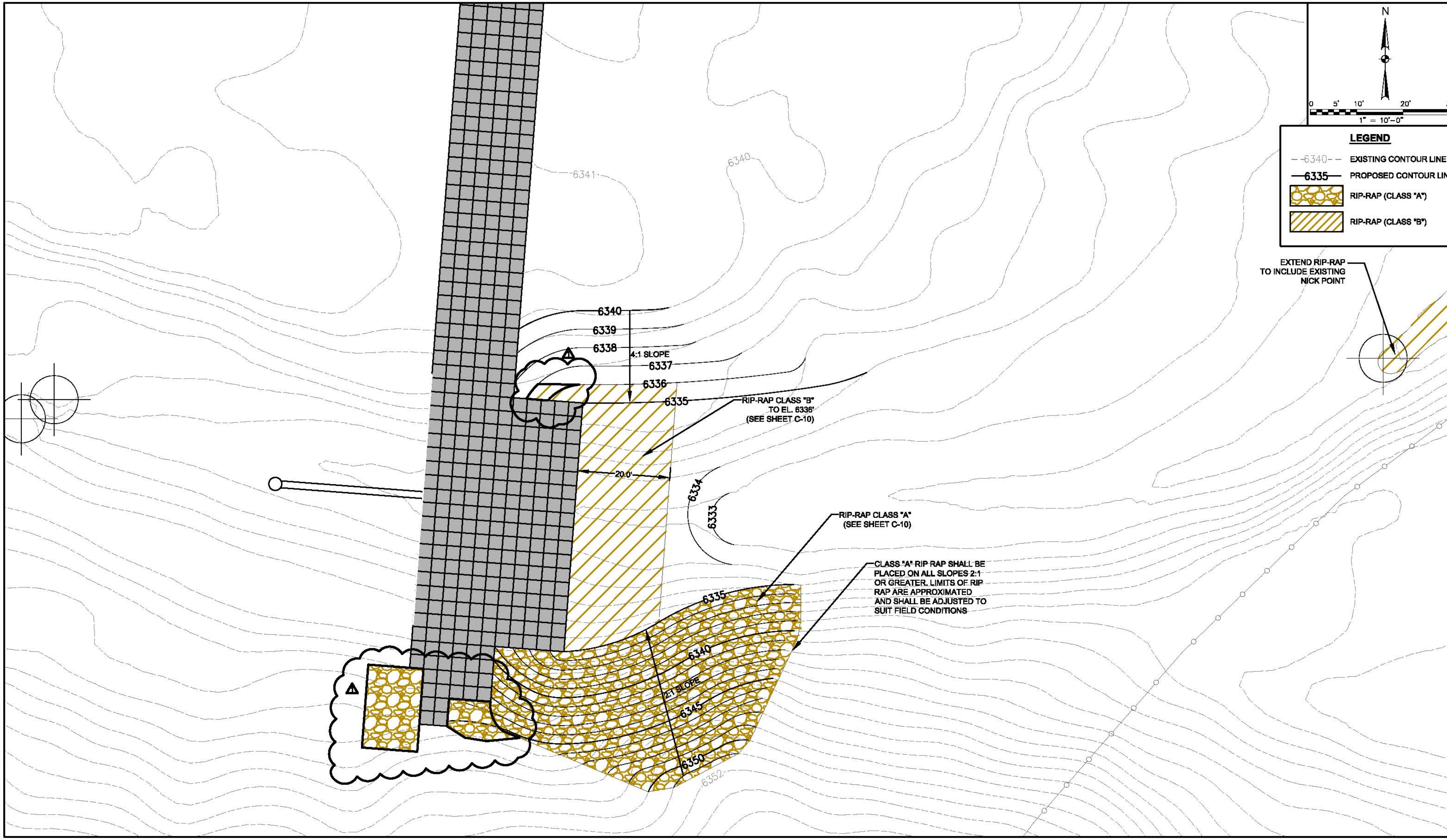
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON STREAM GAGE
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	OVERALL SITE/GRADING PLAN

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 01/05/2010
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-01

User Name: 22190
Drawing Name: \\SARFS01\Common\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-01 - C-04 - Pueblo STREAM GAGE DETAILS.dwg
May 11, 2010 - 2:45pm



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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON STREAM GAGE
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	SITE/GRADING ENLARGED PLAN

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
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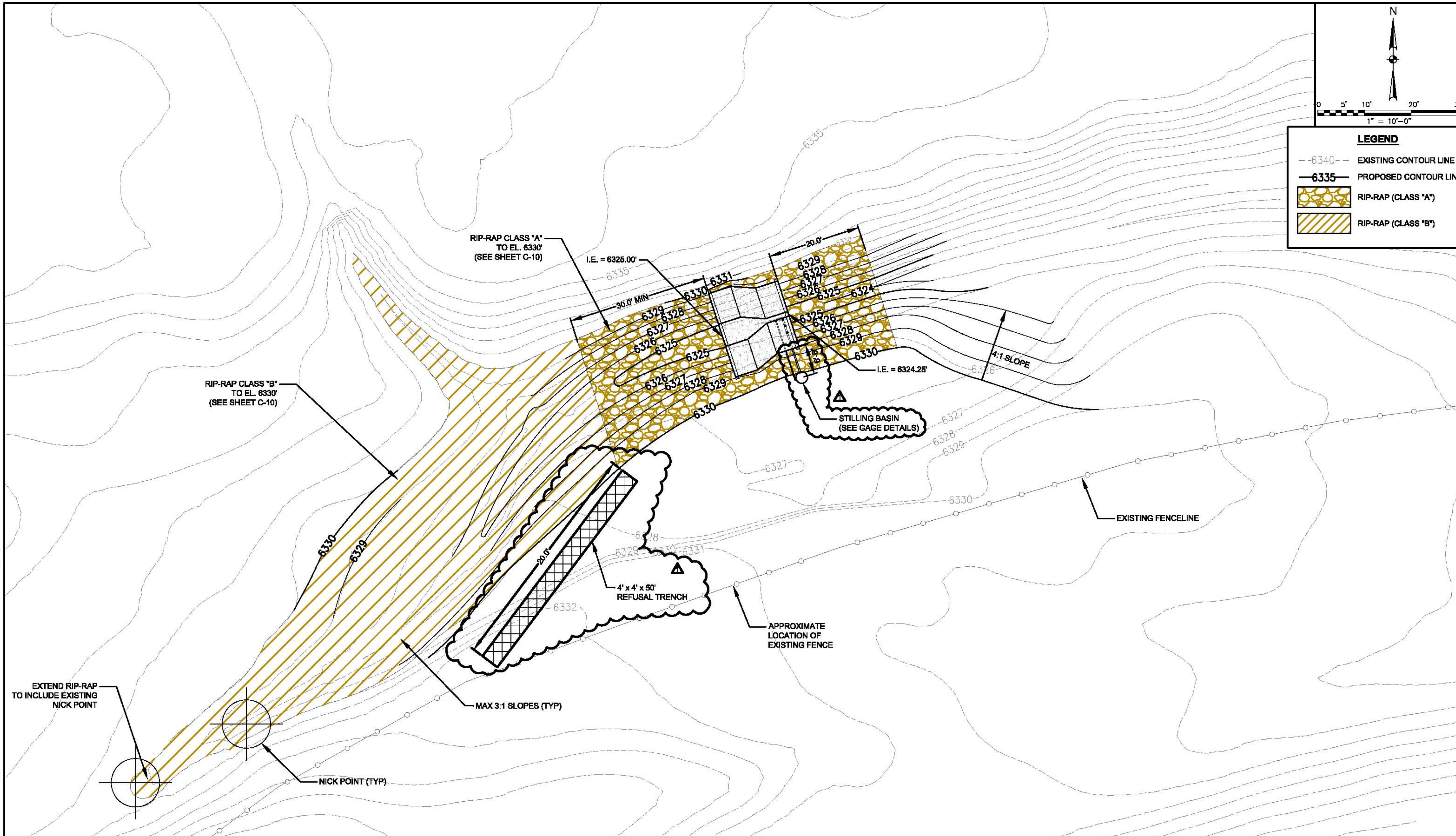
JOB NO. 100005632
DATE 01/05/2010
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-02



PBSJ 101 Arthur Andersen Parkway, Suite 260 Sarasota, Florida 34232 Ph. (941) 378-0272 Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J 5300 West Cypress Street, Suite 200, Tampa, Fl 33607 FBPR Certificate of Authorization No.: 24	KBR	CLIENT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	PROJECT LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	TASK PUEBLO CANYON STREAM GAGE SITE/GRADING ENLARGED PLAN	ORIGINAL DATE: 12/22/09 REVISIONS: 1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	JOB NO. 100005632 DATE 01/05/2010 DESIGNED DTW PE RMP CHECKED IMT QC MS SHEET C-03

User Name: 22190
Drawing Name: \\SARFS01\Common\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-01 - C-04 - Pueblo STREAM GAGE DETAILS.dwg
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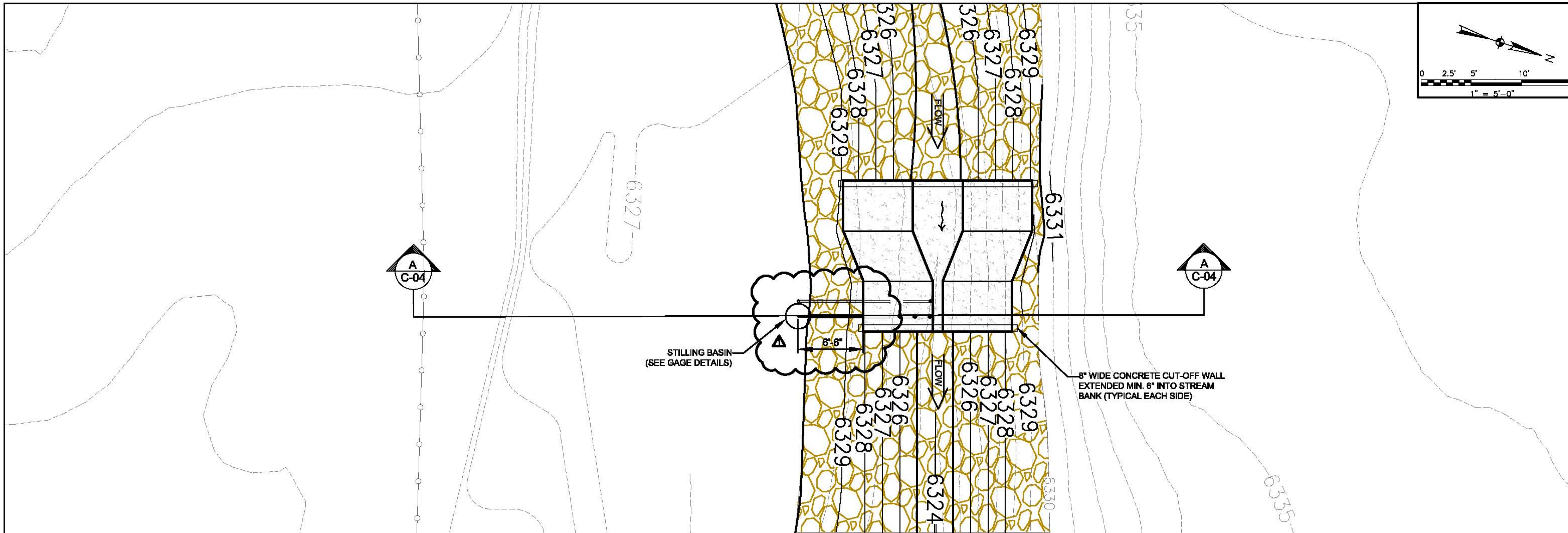

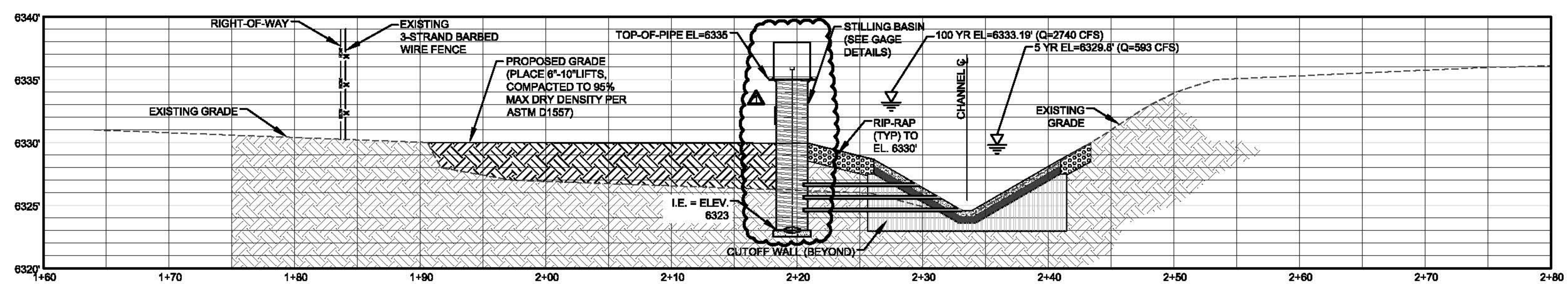

A C-04 | C-04 **CROSS SECTION A-A**
SCALE: 1"=5'

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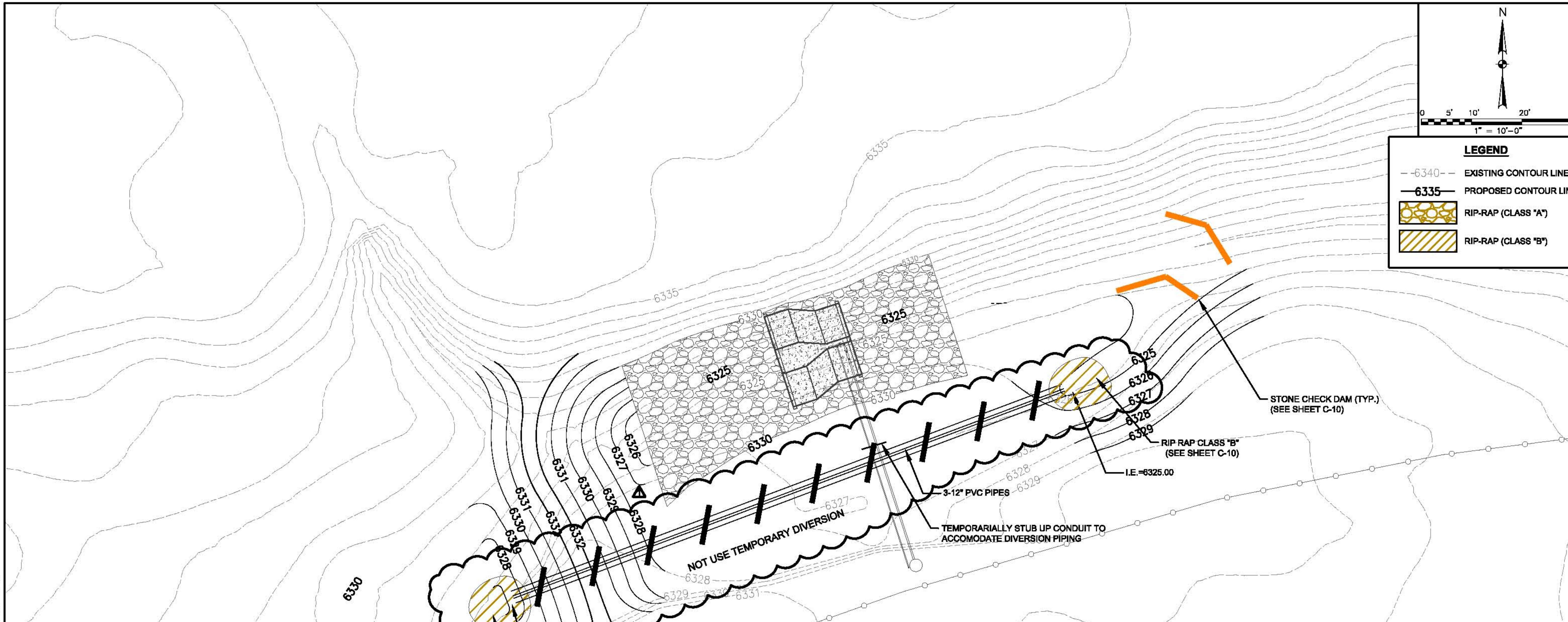
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON STREAM GAGE
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	PLAN AND PROFILE

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010

JOB NO. 100005632
DATE 01/05/2010
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-04



RECOMMENDED CONSTRUCTION SEQUENCE:

1. INSTALL CHECK DAMS AS INDICATED.
2. CONSTRUCT TEMPORARY DIVERSION BERM UPSTREAM OF PROPOSED STREAM GAGE AS SHOWN. BERM WILL HAVE A MAXIMUM 3:1 SIDE SLOPE WITH A TOB WIDTH OF 5'. BERM TO BE PLACED IN MAX. 10" LIFTS AND COMPACTED UTILIZING MECHANICAL HAND TAMPERS.
3. CONSTRUCT STREAM GAGE PER THE DETAILS ON SHEETS SG-01THRU SG-03. INSTALL STILLING BASIN CONDUIT TO WITHIN 5' OF PROPOSED TEMPORARY DIVERSION PIPING AND STUB UP FOR FUTURE CONNECTION. ONCE TEMPORARY DIVERSION PIPE REMOVED, COMPLETE STILLING BASIN CONDUIT INSTALLATION.
4. ONCE CONSTRUCTION OF PROPOSED STREAM GAGE IS COMPLETE, REMOVE TEMPORARY DIVERSION PIPING AND REGRADE PER GRADING PLAN.
5. STABILIZE ALL DISTRUBED AREAS NOT RECEIVING RIP RAP, WITH PERMANENT VEGETATION PER GRADE CONTROL STRUCTURE SEEDING REQUIREMENTS.

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	PUEBLO CANYON STREAM GAGE TEMPORARY DIVERSION AND EROSION CONTROL PLAN

ORIGINAL DATE: 12/22/09
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1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
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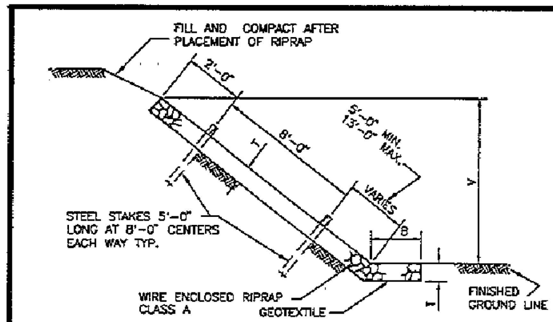
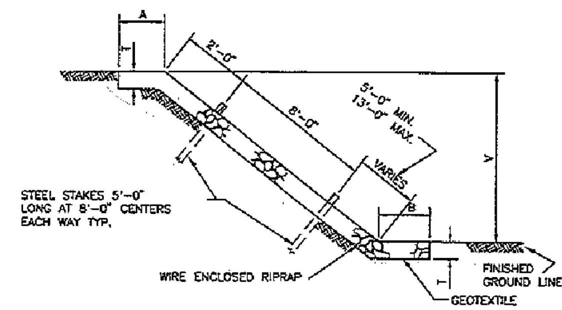
JOB NO. 100005632
DATE 01/05/2010
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-05



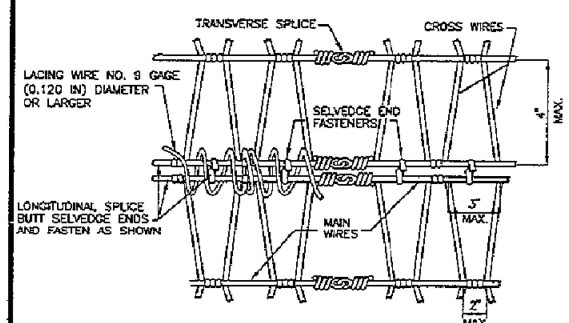
SECTION TYPE 1

QUANTITIES PER LINEAR FOOT	
SLOPE	RIPRAP CU. YARDS
1.5 : 1	$\frac{T}{27}(B + 1.803V + 0.303T)$
1.75 : 1	$\frac{T}{27}(B + 2.016V + 0.266T)$
2 : 1	$\frac{T}{27}(B + 2.236V + 0.236T)$
3 : 1	$\frac{T}{27}(B + 3.162V + 0.162T)$
4 : 1	$\frac{T}{27}(B + 4.123V + 0.123T)$

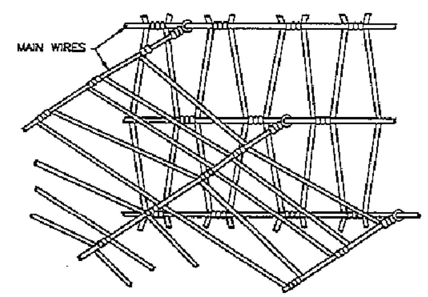


SECTION TYPE 2

QUANTITIES PER LINEAR FOOT	
SLOPE	RIPRAP CU. YARDS
1 : 1	$\frac{T}{27}(A + B + 1.414V)$
1.5 : 1	$\frac{T}{27}(A + B + 1.803V)$
1.75 : 1	$\frac{T}{27}(A + B + 2.016V)$
2 : 1	$\frac{T}{27}(A + B + 2.236V)$
3 : 1	$\frac{T}{27}(A + B + 3.162V)$
4 : 1	$\frac{T}{27}(A + B + 4.123V)$

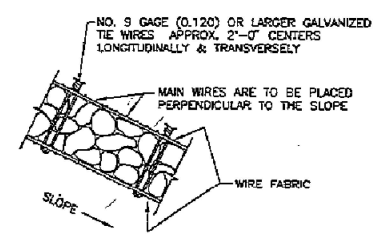


NORMAL INTERSECTION SPLICES



SKEWED INTERSECTION SPLICE

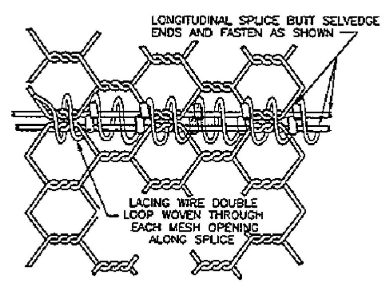
"W" MESH



TYPICAL SECTION

GENERAL NOTES

1. WIRE FABRIC FOR RIP RAP SHALL BE "W" OR HEXAGONAL MESH AND MEET THE REQUIREMENTS LISTED IN SECTION 602 OF THE STANDARD SPECIFICATIONS.
2. STEEL STAKES MAY BE RAILROAD RAILS WEIGHING NOT LESS THAN 30 LBS. PER YARD, 4" NOMINAL DIAMETER STANDARD STRENGTH GALVANIZED STEEL PIPE, OR L4"x4"x3/8" STEEL ANGLES. STEEL STAKES SHALL PROJECT 4" ABOVE TOP OF RIPRAP. STEEL STAKES ARE CONSIDERED INCIDENTAL TO THE COMPLETION OF THE WORK AND NO DIRECT MEASUREMENT OR PAYMENT WILL BE MADE THEREFOR.
3. IF LENGTH OF SLOPE IS 15 FEET OR LESS, ONLY ONE ROW OF STEEL STAKES 2 FEET FROM THE TOP EDGE OF RIPRAP WILL BE REQUIRED UNLESS OTHERWISE NOTED ON PLANS.
4. FOR DIMENSIONS A,B,V,&T SEE BRIDGE OR ROADWAY PLANS.
5. T=12" UNLESS OTHERWISE SHOWN ON PLANS, T= 18" AT BRIDGES.
6. FASTENERS FOR SPLICES AND/OR SELVEDGE END CONNECTORS MAY BE WIRE TIES, INTERLOCKING WIRE CLIPS, HOG RINGS, OR LACING WIRE. ONLY FASTENERS WHICH APPEAR ON THE DEPARTMENT'S "APPROVED PRODUCT LISTING" MAY BE USED.
7. LACING SHALL BE CONTINUOUS AS FAR AS IS PRACTICAL AND SHALL PASS THROUGH EACH MESH OPENING.
8. WHERE SPLICING IS NECESSARY, AN OVERLAP OF LACING OF AT LEAST 1 FOOT SHALL BE PROVIDED.



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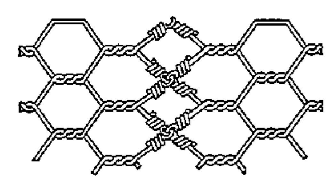
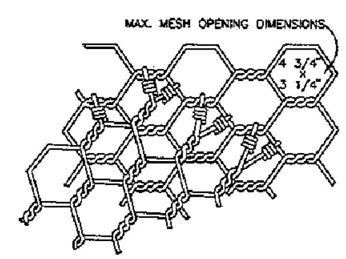


TRANSVERSE SPLICE



SKEWED INTERSECTION SPLICE

HEXAGONAL MESH

NO.	DATE	REV. BY	DESCRIPTION

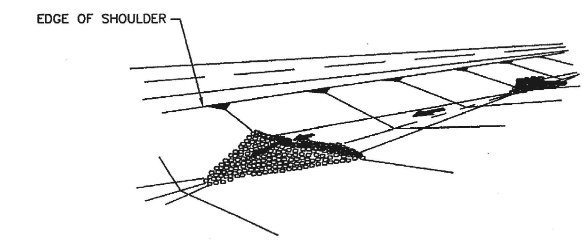
REVISIONS (OR CHANGE NOTICES)

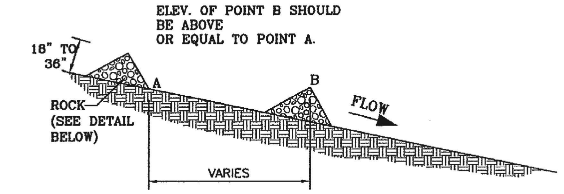
NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

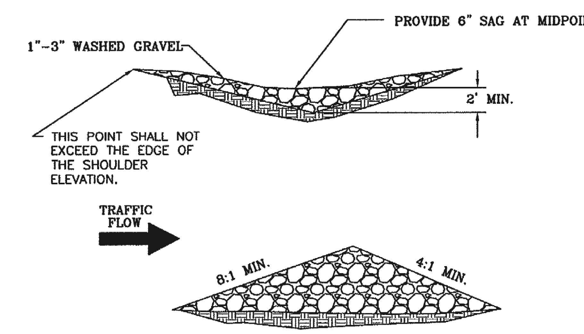
WIRE ENCLOSED RIPRAP
CLASS A

APPROVED ____ DESIGN ENGINEER ____ DATE
DESIGNED BY ___ DRAWN BY ___ CHECKED BY ___
602-01-1/1

A C-10 | C-10 CLASS A RIP RAP DETAIL
SCALE: NTS

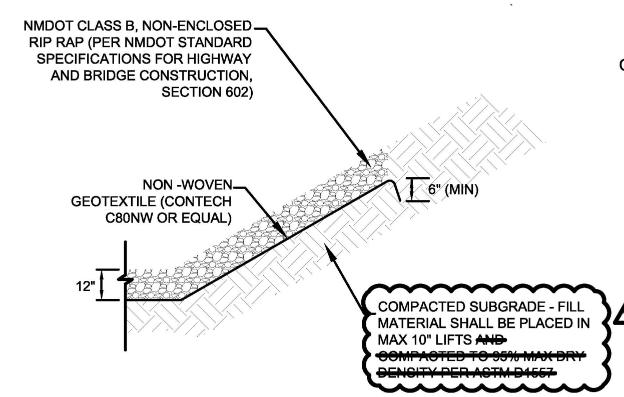






TYPE II
STONE DAM

C C-10 | C-10 CHECK DAM DETAIL (NMDOT)
SCALE: NTS



B C-10 | C-10 CLASS B RIP RAP DETAIL
SCALE: NTS

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\SD-01-03 AND C-10 DETAILS.dwg
May 06, 2010 – 10:02am

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	RIP RAP AND CHECK DAM DETAILS

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2.
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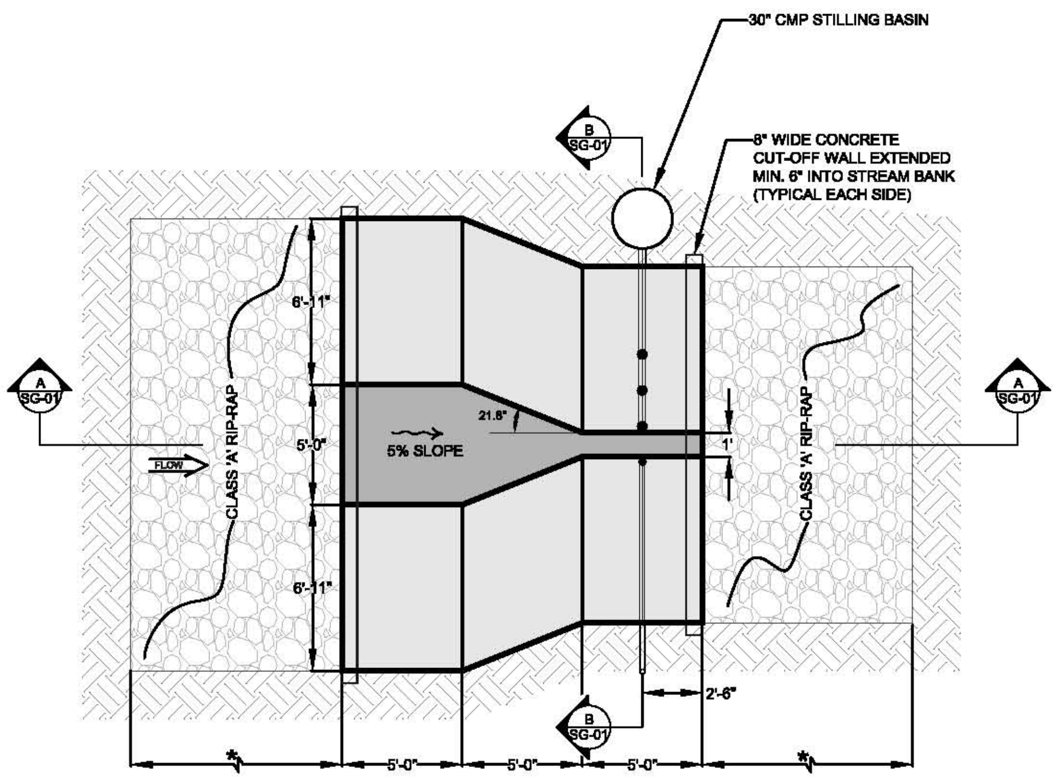
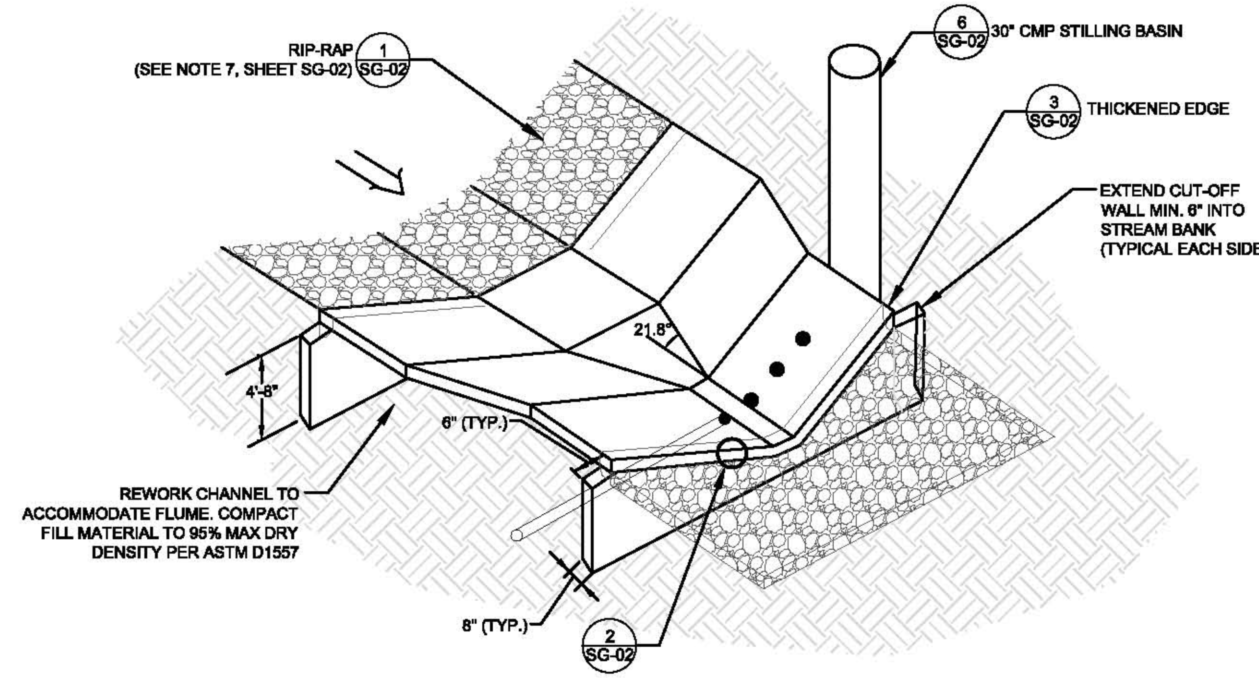
JOB NO. 100005632
DATE 12/22/09
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-10

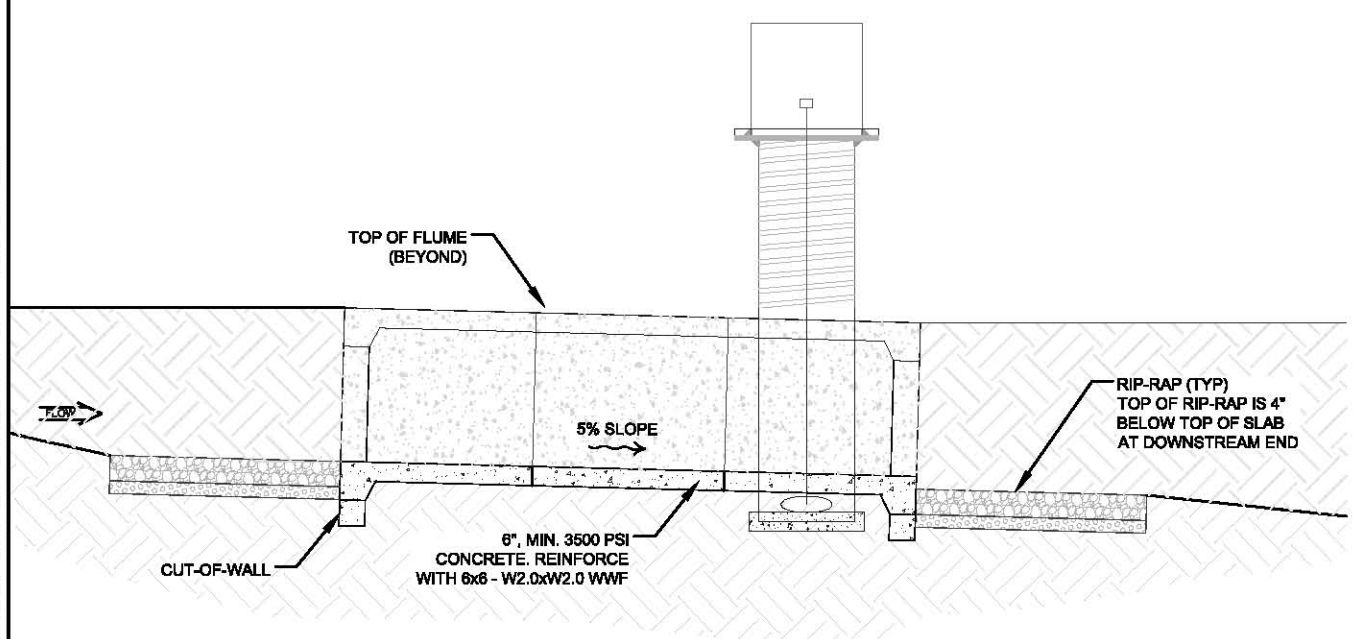


* RIP-RAP DIMENSIONS SHALL BE DETERMINED BASED ON LOCATION AND DESIGN CONDITIONS

1 SG-01 **STREAM GAGE FLUME (PLAN VIEW)**
SCALE: N.T.S.



2 SG-01 **STREAM GAGE FLUME (ISOMETRIC VIEW)**
SCALE: NTS



A SG-01 SG-01 **STREAM GAGE (SECTION THRU ℄)**
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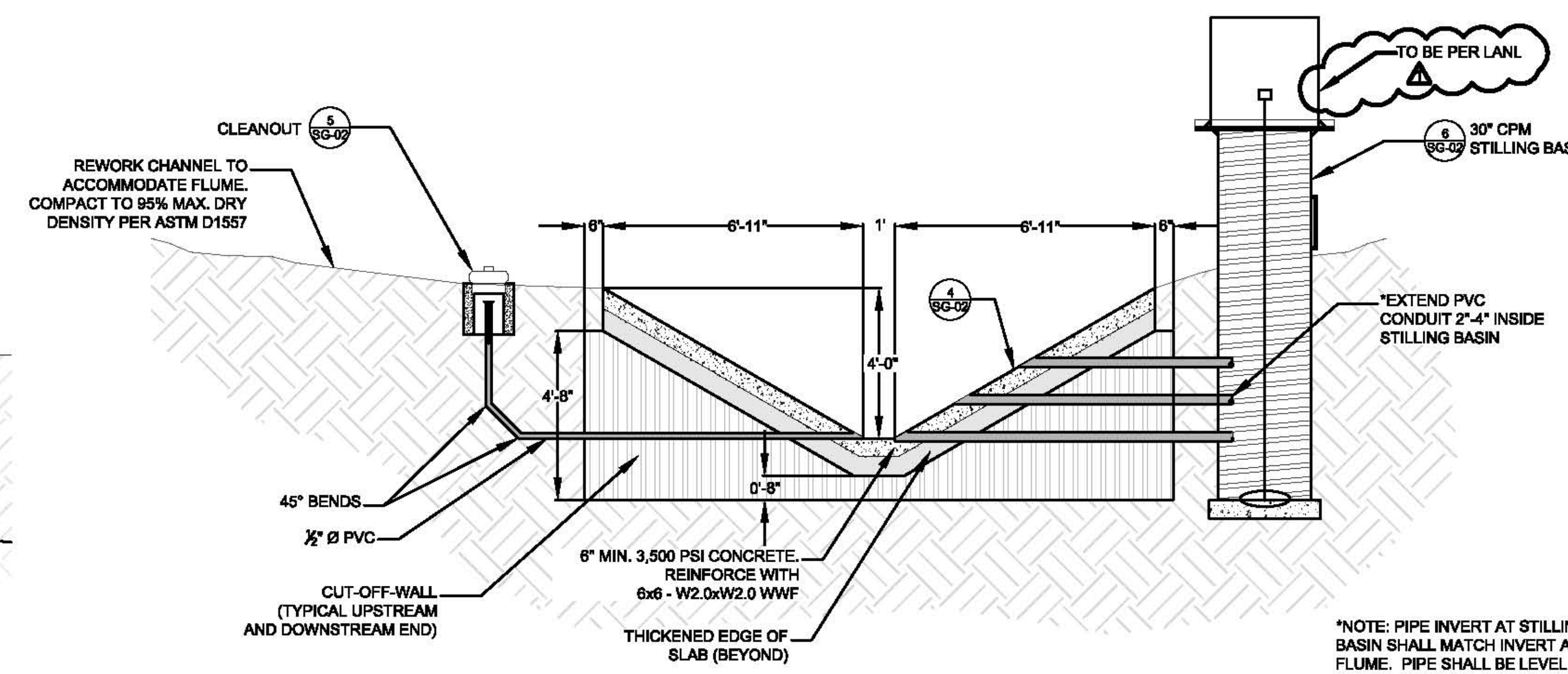

*NOTE: PIPE INVERT AT STILLING BASIN SHALL MATCH INVERT AT FLUME. PIPE SHALL BE LEVEL FOR ENTIRE LENGTH

B SG-01 SG-01 **STREAM GAGE (SECTION B-B)**
SCALE: NTS

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	STANDARD STREAM GAGE DETAILS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	(SHEET 1 OF 3)

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
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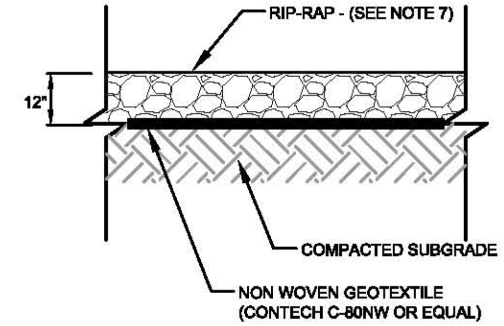
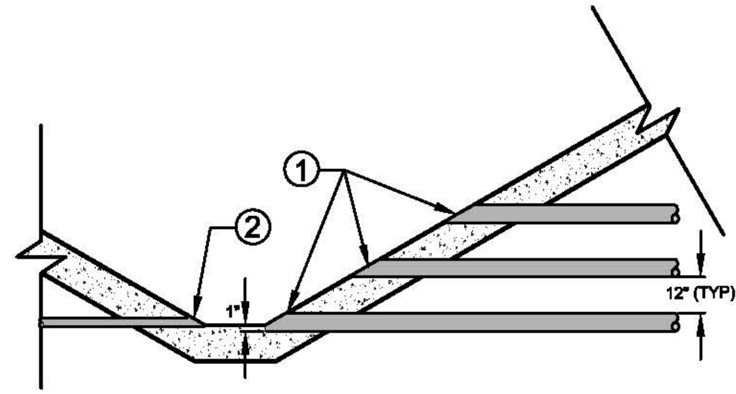
JOB NO. 100005632
DATE 12/22/09
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET SG-01



1 RIP-RAP
SG-01 | SG-02 SCALE: NTS



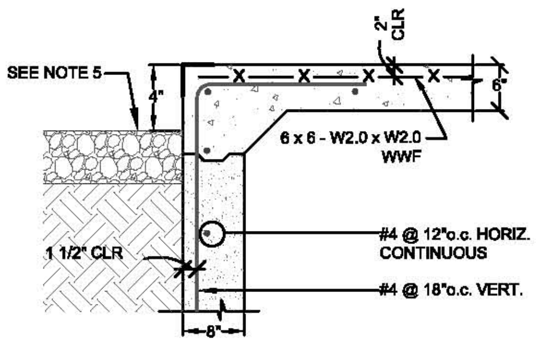
① 3-INCH Ø SCHEDULE 40 PVC. TRIM PIPE FLUSH WITH TOP OF SLAB. LOWER PIPE INVERT SHALL BE I-INCH BELOW FLUME INVERT.

② ½-INCH Ø SCHEDULE 40 PVC. TRIM FLUSH WITH TOP OF SLAB. INVERT APPROX. ½-INCH ABOVE TOP OF SLAB.

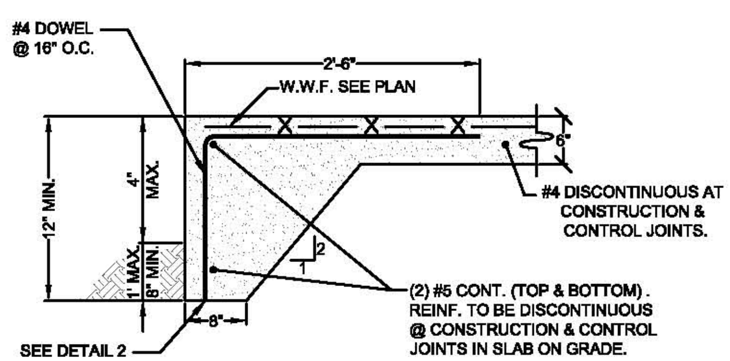
4 SECTION VIEW OF GAS PURGE STAGE MANOMETER CONDUIT & PIPE INTAKE
SG-01 | SG-02 SCALE: NTS

NOTES:

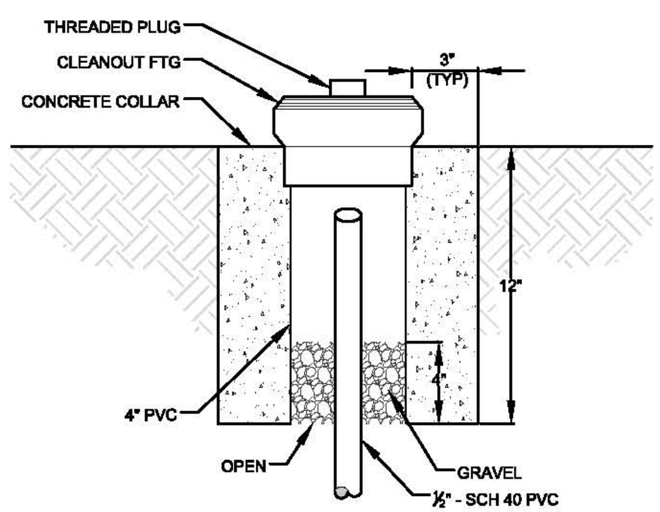
1. THE LENGTH OF STILLING WELL WILL BE DETERMINED DURING THE CONSTRUCTION OF THE STREAM GAGE.
2. METAL ENCLOSURE TO BE INSTALLED AS AN OPTION AT OWNER'S DIRECTION.
3. AS AN OPTION TO THE METAL ENCLOSURE INSTALL 3' x 3' x ¼" (t) METAL COVER PLATE. COVER PLATE SHALL BE PROVIDED WITH TWO HINGES AND A LOCKABLE HASP.
4. EXACT LOCATION OF ACCESS DOOR TO BE DETERMINED IN THE FIELD BY OWNER.
5. RIP-RAP SHALL BE FLUSH WITH TOP OF SLAB AT UPSTREAM END OF FLUME.
6. STILLING BASIN AND PIPE INTAKE SYSTEM MAY BE LOCATED EITHER SIDE OF FLUME. LOCATION TO BE DETERMINED BY OWNER ON A SITE SPECIFIC BASIS.
7. RIP-RAP SHALL BE DURABLE ROCKS OR ROUGH QUARRY STONE WITH NO MORE THAN 60% WEAR PER AASHTO T96. MINIMUM 70 TO 80 PERCENT OF STONE SHALL BE NO LESS THAN 4-INCHES AND NO MORE THAN 8-INCHES IN THE SMALLEST DIMENSION. RIP RAP SHALL BE CLASS A PER NMDOT STD. 602.



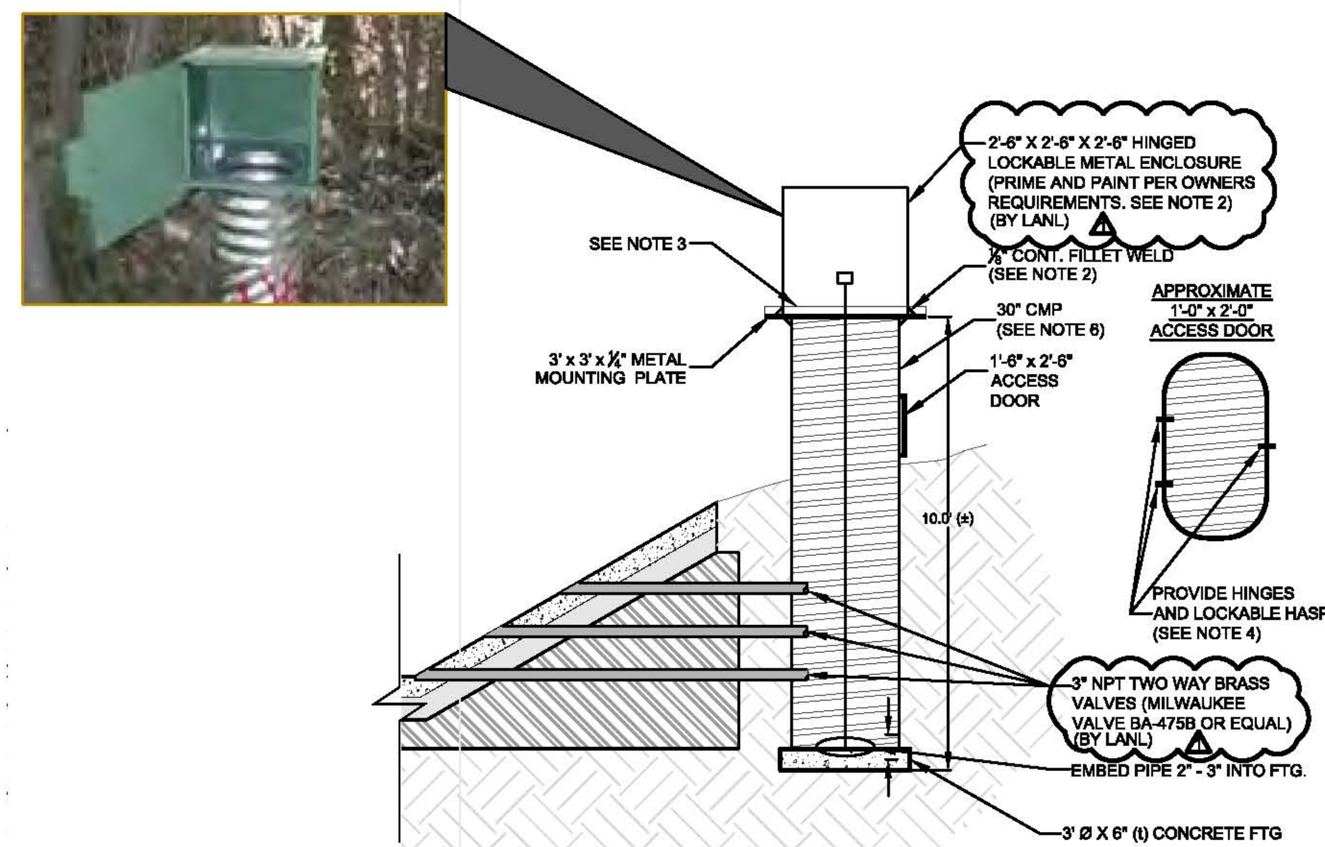
2 REBAR DETAIL
SG-01 | SG-02 SCALE: NTS



3 TYPICAL THICKENED EDGE
SG-01 | SG-02 SCALE: NTS



5 CLEANOUT DETAIL - GAS PURGE - STAGE MANOMETER CONDUIT
SG-01 | SG-02 SCALE: NTS



6 STILLING BASIN DETAIL
SG-01 | SG-02 SCALE: NTS

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	STANDARD STREAM GAGE DETAILS (SHEET 2 OF 3)

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
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JOB NO. 100005632
DATE 12/22/09
DESIGNED DTW
PE RMP
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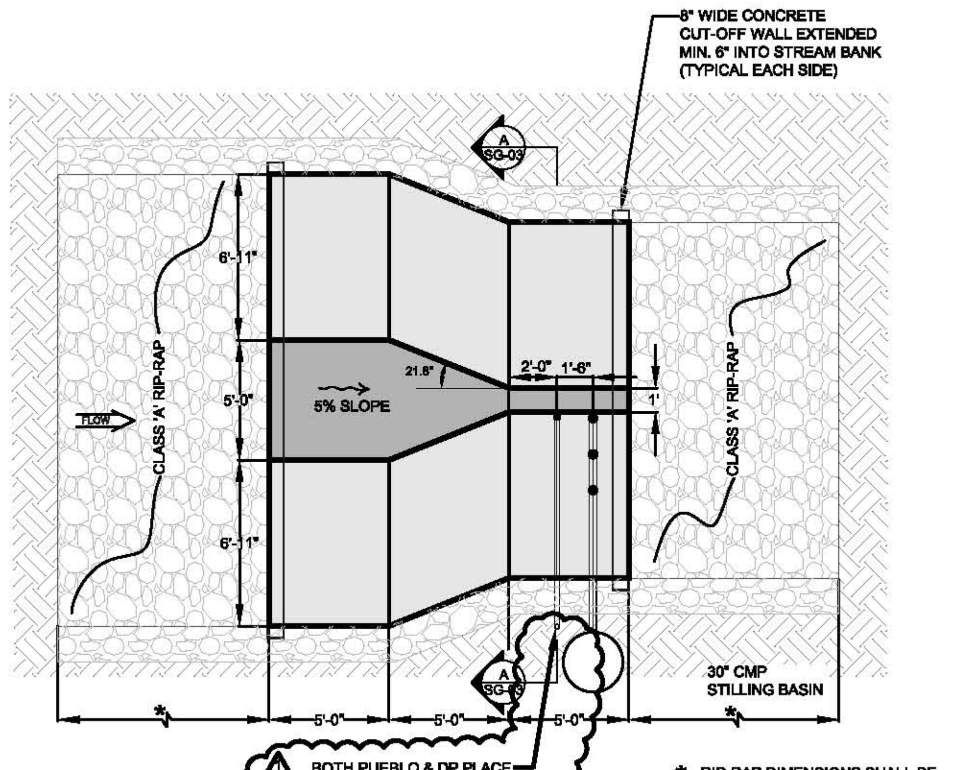
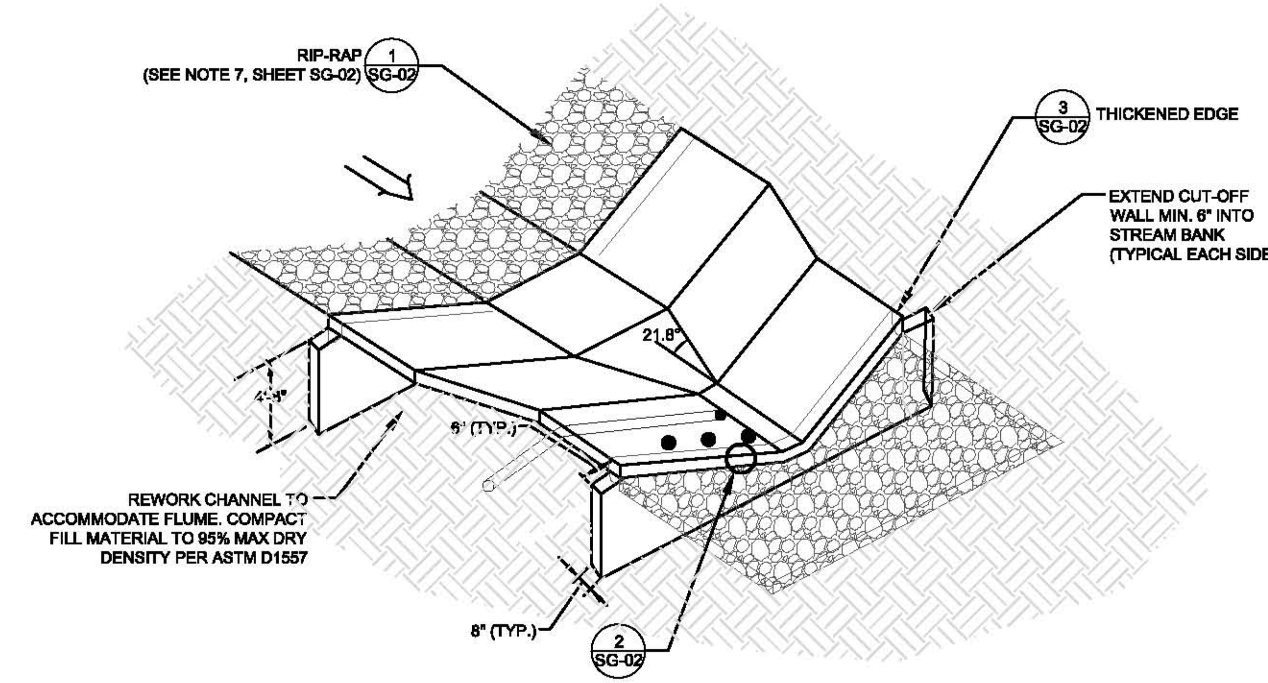
QC MS
SHEET SG-02

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\SG-01-03 AND G-10 DETAILS.dwg
May 06, 2010 - 10:03am

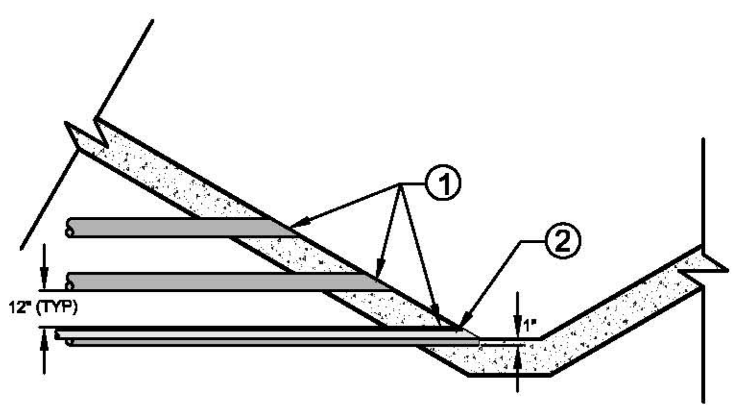


* RIP-RAP DIMENSIONS SHALL BE DETERMINED BASED ON LOCATION AND DESIGN CONDITIONS

1 SG-03 **STREAM GAGE FLUME (PLAN VIEW)**
SCALE: N.T.S.



2 SG-03 **STREAM GAGE FLUME (ISOMETRIC VIEW)**
SCALE: NTS

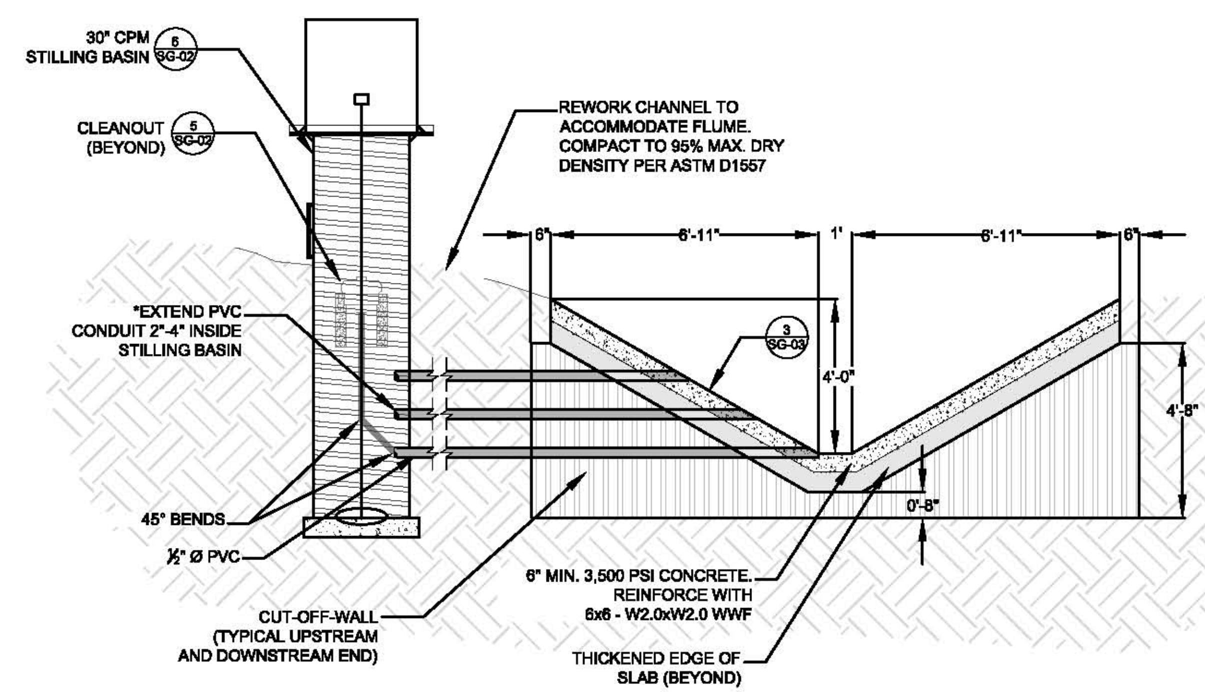


① 3-INCH Ø SCHEDULE 40 PVC. TRIM PIPE FLUSH WITH TOP OF SLAB. LOWER PIPE INVERT SHALL BE I-INCH BELOW FLUME INVERT.

② ½-INCH Ø SCHEDULE 40 PVC. TRIM FLUSH WITH TOP OF SLAB. INVERT APPROX. ½-INCH ABOVE TOP OF SLAB. (SEE PLAN VIEW)

3 SG-03 SG-03 **SECTION VIEW OF GAS PURGE STAGE MANOMETER CONDUIT & PIPE INTAKE**
SCALE: NTS

*NOTE: PIPE INVERT AT STILLING BASIN SHALL MATCH INVERT AT FLUME. PIPE SHALL BE LEVEL FOR ENTIRE LENGTH



A SG-03 SG-03 **STREAM GAGE (SECTION B-B)**
SCALE: NTS

PBSJ 101 Arthur Andersen Parkway, Suite 260 Sarasota, Florida 34232 Ph. (941) 378-0272 Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J 5300 West Cypress Street, Suite 200, Tampa, Fl 33607 FBPR Certificate of Authorization No.: 24	KBR	CLIENT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	PROJECT LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	TASK STANDARD STREAM GAGE DETAILS (OPTION) (SHEET 3 OF 3)	ORIGINAL DATE: 12/22/09 REVISIONS: 1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010 2 3 4 5 6 7 8 9 10 11 12

JOB NO. 100005632
DATE 12/22/09
DESIGNED DTW
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QC MS
SHEET SG-03

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\SG-01-03 AND 0-10 DETAILS.dwg
May 06, 2010 - 1:50pm

Appendix B

Geotechnical Engineering Report
(on CD included with this document)

Appendix C

HEC-RAS Calculations
(on CD included with this document)

Appendix D

Photo Documentation

This appendix contains a series of photographs depicting the work progress on the Pueblo Canyon grade-control structure and associated stream gage E060.1. Photos are representative of the work performed and completed as of the dates noted. Although field work commenced October 26, 2010, photos were not allowed to be taken until November 14, 2009. These photos range from November 14, 2009, through final seeding on May 19, 2010.

November 14, 2009

Photo 1 Downstream of structure, looking east

Photo 2 Temporary access road, looking upgradient at structure location

Photo 3 Silt fence and rock check dam, downgradient of structure

Photo 4 Silt fence and rock check dam

November 14, 2009 (continued)

Photo 5 Assembly area

Photo 6 Assembly area

Photo 7 Gabion baskets

Photo 8 Gabion structure, looking downgradient at stilling-basin subgrade

Photo 9 Stream through temporary access road, diversion channel-right side of photo

Photo 10 Temporary access road

November 14, 2009 (continued)

Photo 11 Gabion stone stockpile

Photo 12 Gabion structure, looking north

Photo 13 Gabion structure subgrade, looking northwest

Photo 14 Gabion structure upstream, looking northeast at overflow weir subgrade and crest

Photo 15 Downstream, looking east

Photo 16 Gabion structure upstream, looking northeast at stilling basin and overflow weir

November 14, 2009 (continued)

Photo 17 Silt fence along channel, looking downstream of borrow area

Photo 18 Looking downstream of structure

Photo 19 Check dam and silt fence

Photo 20 Check dam

November 14, 2009 (continued)

Photo 21 Silt fence

Photo 22 Silt fence, downstream of structure around borrow area

Photo 23 Gabion structure, upstream looking east

November 21, 2009

Photo 1 Temporary access road upgradient of structure

Photo 2 Gabion stone stockpile

Photo 3 Gabion stone stockpile, looking upgradient

Photo 4 Gabion construction, looking north

November 21, 2009 (continued)

Photo 5 Gabion structure upstream, looking east at stilling basin and overflow weir

Photo 6 Structure construction, looking north

Photo 7 Gabion assembly

Photo 8 Structure looking north, gabion assembly

November 21, 2009 (continued)

Photo 9 Geotextile fabric on upstream face of structure

Photo 10 Geotextile fabric on upstream face of structure

Photo 11 Close-up view of gabion baskets

Photo 12 Close-up view of gabion baskets

Photo 13 Overflow basin/gabion bench, looking southwest

Photo 14 Looking upstream towards structure

November 23, 2009

Photo 1 Channel access to structure

Photo 2 Subgrade overflow weir gabion baskets

Photo 3 Overflow weir subgrade gabion baskets

Photo 4 Excavated area for stilling-basin gabion baskets

Photo 5 Stilling-basin gabion baskets, looking northwest

Photo 6 Structure construction, looking north

November 23, 2009 (continued)

Photo 7 Diversion channel downstream of structure

Photo 8 Diversion channel upstream of channel

Photo 9 Structure construction, looking north

November 28, 2009

Photo 1 Area to be excavated for southern portion of structure

Photo 2 Structure looking north, gabion-basket production

Photo 3 Area to be excavated for southern portion of structure

Photo 4 Structure looking northeast, gabion-basket production

Photo 5 Subgrade gabion baskets for gabion bench and stilling basin

Photo 6 Subgrade gabion baskets for gabion bench and stilling basin

November 28, 2009 (continued)

Photo 7 Gabion basket production area

Photo 8 Class A rip-rap stone stockpiles

Photo 9 Excavation of south half of stilling basin

Photo 10 Looking upstream from structure

Photo 11 Area to be excavated for southern portion of structure

December 3, 2009

Photo 1 Gabion structure looking south

Photo 2 Earthen berm construction

Photo 3 Gabion structure, looking south

Photo 4 Gabion structure, looking south from confinement gabion wall

Photo 5 Looking downstream at structure

Photo 6 Structure looking downstream

December 11, 2009

Photo 1 Grading of permanent access road

Photo 2 Grading of permanent access road

Photo 3 Grading of permanent access road

Photo 4 Grading of permanent access road

Photo 5 Grading of permanent access road

Photo 6 Structure, looking north from access road

December 11, 2009 (continued)

Photo 7 Earthen berm, looking north

Photo 8 Structure, looking upstream

Photo 9 Compacted earthen berm

Photo 10 Structure, looking upstream

Photo 11 Looking upstream at structure, gabion baskets in background

December 16, 2009

Photo 1 Structure, looking south from confinement gabions

Photo 2 Forms for concrete cap

Photo 3 Form for concrete cap

Photo 4 Concrete being delivered

December 16, 2009 (continued)

Photo 5 Concrete placement, low-flow and overflow weir

Photo 6 Concrete placement, low-flow and overflow weir

Photo 7 Concrete placement, low-flow and overflow weir

Photo 8 Concrete slump test

December 16, 2009 (continued)

Photo 9 Concrete placement, low-flow and overflow weir

Photo 10 Concrete placement, low-flow and overflow weir

December 17, 2009

Photo 1 Concrete cap finishing

Photo 2 Looking south, concrete cap placement

Photo 3 Placing Class A rip rap along upstream side of earthen berm

December 26, 2009

Photo 1 Concrete weir cap (low-flow and overflow weir)

Photo 2 Concrete weir cap

Photo 3 Class A rip-rap armoring of earthen berm, upstream face of berm

January 3, 2010

Photo 1 Structure, looking south

Photo 2 Looking downstream from structure

Photo 3 Low-flow weir, looking north

Photo 4 Standpipe buried by ice before extension

Photo 5 Earthen berm after rip-rap placement

Photo 6 Earthen berm

January 7, 2010

Photo 1 Structure with concrete cap

Photo 2 Structure, looking north from access road

January 11, 2010

Photo 1 Excavation for installation of Class B rip-rap armoring, downstream side of structure stilling basin

Photo 2 Excavation for installation of Class B rip-rap armoring, downstream side of structure stilling basin

January 14, 2010

Photo 1 Temporary access road looking downstream towards structure

Photo 2 Structure, looking north

Photo 3 South portion of structure, low-flow weir (foreground), overflow weir, confinement wall and gabion bench

Photo 4 Class B rip rap, downstream side of stilling basin

January 14, 2010 (continued)

Photo 5 Structure, looking south

Photo 6 Downgradient side of confinement wall and overflow weir, looking south

Photo 7 Stilling basin, downstream Class B rip rap armoring

Photo 8 Channel access road to flume

January 18, 2010

Photo 1 View from access road, looking northwest

Photo 2 Looking east at north overflow weir

Photo 3 View of structure from access road, looking northwest

Photo 4 Looking upstream of structure

January 18, 2010 (continued)

Photo 5 Downstream side of structure, looking southwest

Photo 6 Downstream side of structure, looking northwest

Photo 7 Overflow weir bench, overflow weir

Photo 8 North overflow weir and confinement gabion wall, looking northwest

January 18, 2010 (continued)

Photo 9 Looking south from confinement wall

Photo 10 Riser pipe before extension

Photo 11 Looking downstream (structure in background)

February 1, 2010

Photo 1 Structure, looking upstream at stilling basin and riser-pipe outlet pipe

Photo 2 Downstream of structure, Class B rip rap for flume entrance

Photo 3 Groundwater intrusion in flume excavation

Photo 4 Excavation for concrete flume

February 1, 2010 (continued)

Photo 5 Form work for flume

Photo 6 Form work for flume

Photo 7 Form work for flume

Photo 8 Excavation for flume

Photo 9 Excavation for flume, groundwater intrusion

Photo 10 Excavation for flume, groundwater intrusion

February 1, 2010 (continued)

Photo 11 Excavation for flume, groundwater intrusion

Photo 12 Looking downgradient at flume

Photo 13 Headwall subgrade compaction

Photo 14 Headwall subgrade compaction

Photo 15 Headwall subgrade compaction

February 2, 2010

Photo 1 Flume headwall form work

Photo 2 Headwall subgrade compaction

Photo 3 Headwall subgrade compaction

Photo 4 Headwall subgrade compaction

Photo 5 Headwall form work

Photo 6 Headwall subgrade compaction

February 2, 2010 (continued)

Photo 7 Headwall subgrade compaction

Photo 8 Headwall subgrade compaction

Photo 9 Headwall form work

Photo 10 Headwall form work

February 5, 2010

Photo 1 Concrete testing for flume headwall concrete placement

Photo 2 Mode of transporting concrete to flume

Photo 3 Slump test

Photo 4 Preparing test cylinder

Photo 5 Concrete testing

Photo 6 Preparing concrete cylinders

February 5, 2010 (continued)

Photo 7 Flume headwall concrete placement

Photo 8 Flume headwall concrete placement

Photo 9 Flume headwall concrete placement

Photo 10 Flume headwall concrete placement

February 9, 2010

Photo 1 Excavation for flume subgrade

Photo 2 Excavation for flume subgrade

Photo 3 Flume headwalls

Photo 4 Flume subgrade compaction

Photo 5 Flume subgrade compaction

Photo 6 Flume subgrade compaction

February 10, 2010

Photo 1 Flume subgrade compaction

Photo 2 Flume subgrade compaction

Photo 3 Flume subgrade compaction

Photo 4 Flume subgrade compaction

Photo 5 Flume subgrade compaction

February 11, 2010

Photo 1 Wire mesh reinforcement for flume

Photo 2 Monitoring temperature of concrete for flume concrete placement

Photo 3 Flume concrete slump test

Photo 4 Flume concrete cylinder samples

Photo 5 Flume concrete cylinder samples for lab testing

Photo 6 Placing concrete flume

February 11, 2010 (continued)

Photo 7 Concrete placement and finishing of flume

Photo 8 Concrete finishing of flume

Photo 9 Concrete finishing of flume

Photo 10 Concrete finishing of flume

February 11, 2010 (continued)

Photo 11 Concrete finishing of flume

Photo 12 Concrete finishing of flume

Photo 13 Concrete finishing of flume

March 4, 2010

Photo 1 Channel access to flume downstream of structure

Photo 2 Flume diversion trench

Photo 3 Placing stilling well for gage

Photo 4 Working on flume rip-rap installation

March 5, 2010

Photo 1 Rip-rap placement

Photo 2 Stream gage stilling-well installation, compaction around well

March 8, 2010

Photo 1 View of south downgradient slope being prepared for Class A rip-rap armoring installation

Photo 2 Structure, looking at south upgradient slope, being prepared for Class A rip-rap armoring installation

Photo 3 Working on Class B rip-rap installation upstream of flume

Photo 4 Installing Class A rip rap for flume

March 8, 2010 (continued)

Photo 5 Installing Class A rip rap

Photo 6 Preparing south downgradient slope for Class A rip-rap armoring

Photo 7 Downstream of structure, looking at gage station rip-rap installation

Photo 8 Final grading, upstream side of structure

Photo 9 Downstream of structure, looking south

March 9, 2010

Photo 1 Gage station/flume rip-rap installation

Photo 2 Preparing south slope, downstream of structure, for rip rap

Photo 3 Placing geotextile for south slope rip rap, downstream of structure

Photo 4 Preparing to place Class A rip-rap armoring on south slope downgradient of structure

Photo 5 Preparing to place Class A rip-rap armoring on south slope downgradient of structure

March 10, 2010

Photo 1 Structure, looking south

Photo 2 Looking upgradient at south downgradient slope Class A rip-rap armoring

Photo 3 Looking downgradient from structure

Photo 4 Class A rip-rap placement, south slope downgradient of structure

March 10, 2010 (continued)

Photo 5 Looking south at south slope armoring

Photo 6 Looking south at south slope armoring

Photo 7 Working on installing Class A rip-rap armoring, south slope downgradient of structure

Photo 8 Working on Class A rip-rap exit from flume

Photo 9 Working on Class A rip-rap entrance to flume

March 11, 2010

Photo 1 Placing Class A rip-rap armoring on south slope downgradient of structure

Photo 2 Placing rip-rap armoring on south slope downgradient of structure

Photo 3 Finalizing grade downstream of flume

Photo 4 Upstream side of low-flow weir

March 12, 2010

Photo 1 Access road

Photo 2 Flume

Photo 3 Class B rip-rap work

Photo 4 Class A rip-rap armoring of south slope on upstream side of structure

March 12, 2010 (continued)

Photo 5 Grading and compacting area south of flume

Photo 6 View looking south at structure from confinement wall

Photo 7 Class B (foreground) and Class A (background) rip-rap approach to flume

March 15, 2010

Photo 1 Slope of flume

Photo 2 Concrete flume

Photo 3 Flume and stilling well

Photo 4 South access road

May 4, 2010

Photo 1 Flume Class B rip-rap installation looking downstream from structure

Photo 2 Flume Class B rip-rap installation looking upstream from flume

Photo 3 Flume Class B rip-rap installation looking downstream from structure

Photo 4 Final grading upstream of structure, riser pipe and willows in foreground

May 4, 2010 (continued)

Photo 5 Final grading upstream and downstream of structure, south slope rip-rap armoring in background

Photo 6 Final grading upstream of structure, newly planted willows on right side of photo

Photo 7 View looking upstream at flume and stilling well (foreground) and structure (background)

Photo 8 View looking downstream at flume from structure, Class B armoring on downstream side of structure in foreground

May 19, 2010

Photo 1 Site hydroseeding complete, looking downstream from the structure

Photo 2 Looking upstream from structure

Photo 3 Looking north from overflow weir

Photo 4 At access, looking east to structure

Photo 5 Looking northeast at upstream side of structure

Photo 6 Hydroseeding