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Mill Pond Dam Maintenance Work Plan

Former Georgia-Pacific Wood Products Facility

August 2010

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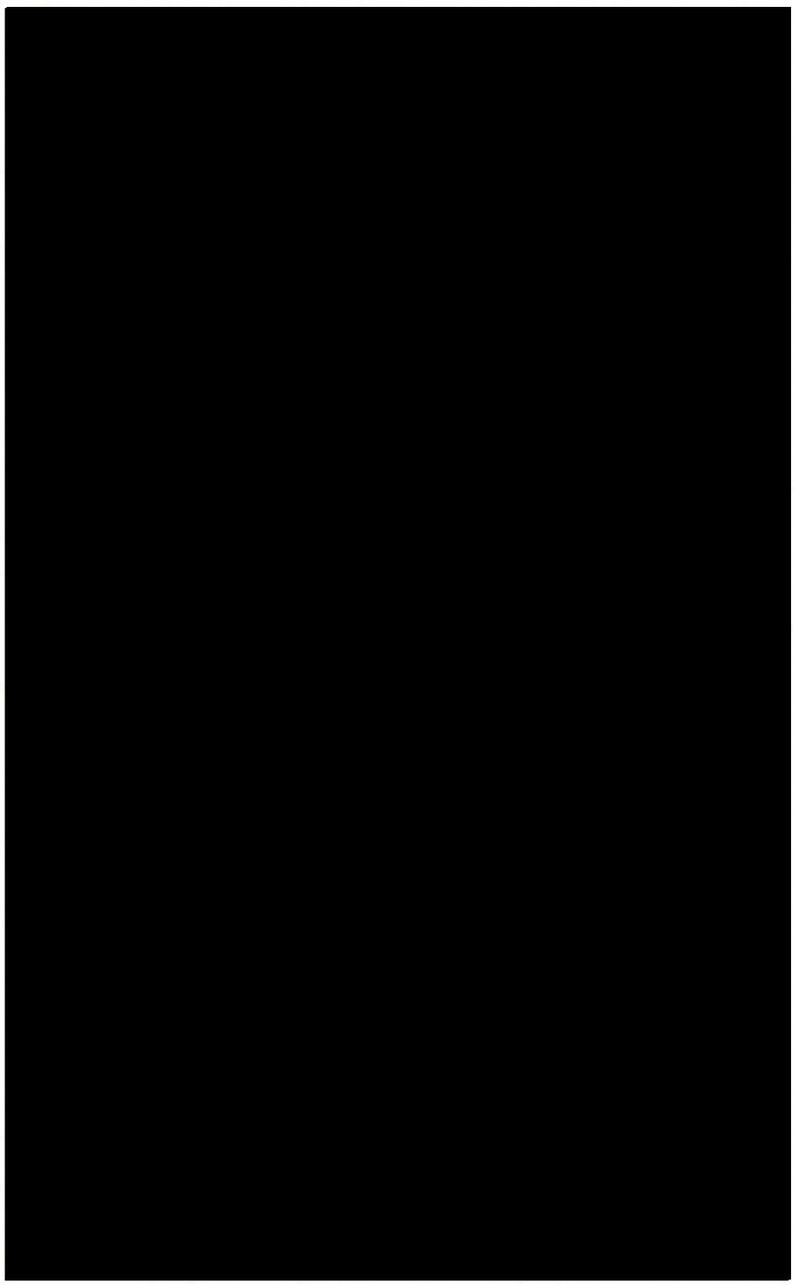

Mill Pond Dam Maintenance Work Plan

Former Georgia-Pacific Wood Products Facility

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Our Ref.:
B0006616.0000

Date:
August 2010

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Acronyms and Abbreviations

AB Mats	Articulating Concrete Block Mats
BMP	Best Management Practice
Caltrans	State of California's Department of Transportation
dam	Mill Pond Dam
DSOD	Division of Safety of Dams
ft	feet/foot
Georgia-Pacific	Georgia-Pacific LLC
HASP	Health and Safety Plan
HTL	high tide line
JLA	Job Loss Analysis
psi	pounds per square inch
NAVD88	National Geodetic Vertical Datum of 1988
SWPPP	Stormwater Pollution Prevention Plan
USACE	United States Army Corps of Engineers
work plan	*Mill Pond Dam Maintenance Work Plan*

1. Introduction

This *Mill Pond Dam Maintenance Work Plan* (work plan) was prepared by ARCADIS on behalf of Georgia-Pacific LLC (Georgia-Pacific) and presents the plan for performing maintenance of the Mill Pond Dam (dam) at the former Georgia-Pacific Wood Products Facility located in Fort Bragg, California (Figure 1). Georgia-Pacific is being directed to perform this maintenance by the Division of Safety of Dams (DSOD) in a letter dated August 11, 2010 (DSOD, 2010). DSOD has requested that maintenance be carried out along the portion of the dam which abuts the beach along Soldier Bay (i.e., along the crib wall and spillway) to address safety issues caused by potential instability of this section of the dam. The scope of the maintenance activity was discussed at an inter-agency meeting held on August 4, 2010.

The location of this section of the dam is presented on Figure 2. The section of the dam that will receive this maintenance work is approximately 100 feet (ft) long with the work extending from the toe of the dam face to a height of approximately 20 to 25 ft above the toe.

1.1 Background and Objectives

The dam impounds the 7.3-acre Mill Pond (also known as the Log Pond or Pond 8) and contains a concrete spillway with a discharge elevation of 39 feet National Geodetic Vertical Datum of 1988 (NAVD88), a concrete overflow structure, and a timber crib wall constructed of redwood logs (approximately 80 ft wide and 15 ft tall). The actual internal configuration of the crib wall is unknown. The dam was built in 1885 along and on top of the rock that comprises the edge of the coastal bluff. The upper portion of the dam is made up of native and fill soils; the fill soils evidently were placed to create the dam. The lower portion of the dam consists of the native rock (Franciscan Formation) which is exposed. Several cross-sections of the dam are presented on Figure 3.

As is typical of the coastal bluffs in California, the dam has experienced erosion due to weathering. Specifically, the spillway and overflow structure have experienced erosion at the toe of and underneath these structures. Large pieces of the concrete have broken off of these structures as a result and lay on the beach below. Erosion has also occurred in and around the timber crib wall. In addition, portions of the exposed rock in the dam have undergone erosion, weathering, and spalling creating significant undercutting and crevices in portions of the rock face.

The objectives of the maintenance on the dam are to minimize further erosion, undercutting, and rock spalling. The key components to be used to accomplish this will include:

- filling the crevices and voids in the dam wall and beneath the spillway and overflow structures with shotcrete

- filling the voids within the crib wall with flowable concrete fill
- installing rock netting over the dam wall to prevent rock fall and raveling
- installing articulating block concrete mats (AB Mats) at the base of the wall extending onto the beach to reduce erosion and scour at the toe of the dam
- installing riprap on top of the AB mats and along the toe of the dam face.

These components are shown conceptually on Figures 4 through 8. The precise extent and limits of the components will be determined in the field prior to contractor mobilization by ARCADIS in collaboration with the contractor. The final extents and limits of the components will be submitted to the client for review and approval before implementation.

All heavy equipment used for this maintenance work will be stationed on top of the dam. It is anticipated that no heavy equipment will be required to enter the beach area. Laborers and hand tools/light equipment will be required on the beach to perform portions of the work.

2. Implementation

Prior to implementing any portion of the work, the contractor will submit to ARCADIS and Georgia-Pacific a detailed work plan describing how the work elements will be carried out. The work plan will, at a minimum, consist of a narrative describing how the work will be performed, figures and details depicting the work, technical details of proposed equipment, Job Loss Analyses (JLAs) of the work tasks, and a project schedule.

The contractor will submit to ARCADIS for approval, specifications, and certifications for all materials used in the work. In addition, an addendum to the Construction Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to commencing work.

2.1 Preparation

Georgia-Pacific will obtain necessary permits prior to initiation of proposed activities. Anticipated permits are outlined in Section 2.8.

Water from the spillway currently falls onto the dam face; see Figure 6. It is anticipated that to complete the work, the contractor will need to temporarily divert this water away from the face of the dam. The contractor will propose a method for diverting this water. ARCADIS anticipates that the water will either be temporarily pumped around the spillway or that a temporary extension to the spillway will be constructed so that the water falls further away from the dam face.

Best management practices (BMPs) will be installed to prevent construction material from impacting the waters of Solider Bay. BMPs may include the construction of a temporary berm. Other BMPs may be utilized in addition to or instead of this containment berm. An addendum to the site Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to implementation to present the selected BMPs.

The surfaces of the dam, crib wall, and spillway will be prepared to receive the proposed maintenance components. All rock and concrete surfaces that will be covered with rock netting will be cleaned using a pressure washer to remove loose or deleterious material to expose clean surfaces. In addition, the void space beneath the concrete spillway and overflow will be similarly cleaned to receive the shotcrete fill. Care will be taken to prevent erosion to adjacent soil surfaces due to direct spray or due to runoff from the pressure washer. The work will progress from the top down. Material that is cleaned from the rock face and concrete surfaces will be allowed to fall to the beach below and remain there. Safety measures will be implemented to confirm that all personnel are protected from falling material. The runoff from the pressure washer will be collected to allow any suspended solids to settle before the water is released to Solider Bay. These measures may include constructing a berm on the beach or other containment structure to collect the runoff or switching to a different method for cleaning the dam face, which does not produce runoff

Vegetation, loose soil, loose rock, and any other loose or deleterious material in the vicinity of the crib wall and within the voids of the crib wall will be removed using hand tools. The vegetation and soil removed will not be allowed to fall onto the beach, but will be stockpiled at an approved location and/or properly disposed. After this material has been removed from the crib wall, the surface of the logs which comprise the crib wall will be pressure washed to remove any remaining deleterious material.

Within the footprint of the articulating concrete block mats (AB mats), all obstructions, such as sharp protruding rocks, drift wood, or other deleterious material with the potential to puncture the fabric of the AB Mats, will be removed and relocated outside of the footprint, but will remain above the high tide line (HTL). A large pile of concrete rubble is currently present along the toe of the dam. This rubble does not need to be removed, but pieces that are protruding significantly will be removed or repositioned to minimize the potential to puncture the fabric of the AB mats.

2.2 Flowable Concrete Fill

The voids within the crib wall will be filled with a flowable concrete fill. The fill will have a minimum 28-day compressive strength of 200 pounds per square inch (psi). The fill will be placed in lifts approximately equal to the height of the individual logs which comprise the crib wall. Each lift will be allowed to cure for a minimum of 24 hours before the next lift is placed. Drainage material such as geocomposite or PVC piping will be placed between lifts and run the full width of the lifts, back to front, to provide a drainage path for seepage behind the fill and to prevent the buildup of excess hydrostatic pressure. This is intended to prevent excessive hydrostatic forces from being exerted on the crib wall. The contractor may use temporary form work, as needed, to keep the fill in place while it is being placed. The contractor will propose a method for preventing the fill from inadvertently spilling and flowing onto the beach. Such measures may include the construction of a temporary berm on the beach. All heavy equipment necessary for the production and placement of the fill will be staged on top of the dam, not on the beach. The contractor will collect two samples of the flowable concrete fill in test cylinders. The samples will be subjected to testing at 7 and 28 days of cure time to determine the compressive strength of the material. Sample collection and testing procedures will follow the guidelines established in American Society for Testing and Materials D4832-10.

2.3 Shotcrete

The voids beneath the concrete spillway and overflow will be filled with shotcrete having a minimum 28-day compressive strength of 4,000 psi. Additionally, significant crevices in the rock face of the dam will be filled with shotcrete to limit further undermining or spalling. The contractor and engineer will jointly determine based on a visual inspection of the dam face, which areas have significant crevices and will be treated with shotcrete. All shotcrete materials and methods will conform to the shotcrete specifications specified in the State of California's Department of Transportation (Caltrans) Standard Specifications (Caltrans, 2006). Wire mesh reinforcing may be placed over the crevices and void faces and attached to the rock or concrete as

proposed by the shotcrete contractor to facilitate the placement of shotcrete. The wire mesh, anchors, and other metal materials used for shotcreting will be coated with a corrosion-resistant material. The final face of the shotcrete will blend in with the surrounding rock to create a continuous surface free of overhangs. Based on preliminary measurements, the volume of shotcrete required is estimated to be approximately 150 to 200 cubic yards.

The contractor will furnish to the engineer a certified statement of training and experience in shotcreting for each of the individuals proposed to be utilized in the position of supervisor, shotcrete nozzle operator, and shotcrete gun operator. The nozzlemen shall be ACI shotcrete certified. Each nozzle operator, working with a qualified gun operator, if used, will pass a qualification test prior to undertaking the shotcrete application in the project work. This test will serve to qualify the shotcrete operator and will be performed prior to beginning work. The test will measure the percent by weight (mass) of rebound. If the rebound is over the allowable percentage, the operator will be disqualified and will be replaced by an operator who can pass this test.

The test will be as follows:

- Test panels consisting of 30-inch by 30-inch pieces of plywood boards will be erected horizontally, vertically, overhead, or any combination of positions depending on the anticipated corresponding shooting positions. The test panels shall contain reinforcement which is representative of the reinforcement which will be used in the work.

- The shotcrete operator will fill the middle 18-inch by 18-inch area of the test panel with shotcrete mortar to a minimum depth of 4 inches.

- Drop cloths will be arranged around and over the test panel to collect the rebound. The quantity of rebound and the applied shotcrete will be determined and the percent rebound will be computed by dividing the weight (mass) of rebound by the combined weight (mass) of rebound plus the weight (mass) of the applied shotcrete. The allowable percentage of rebound depends on the position of the surface and will be 15 percent for a horizontal surface, 30% for a vertical surface, and 50% for an overhead surface.

- The Contractor will furnish the drop cloths, plywood, and all other material necessary for these tests.

- Cores will be taken from each test panel and evaluated for voids according to ACI procedure.

2.4 Rock Netting

After the flowable concrete fill and shotcrete have been installed, a rock net will be attached to the face of the dam to the approximate limits shown on Figures 4 through 8. The final limits of the rock net will be

determined in the field by ARCADIS, but will generally cover all exposed rock on the face of the dam and extend to the toe of the dam. The contractor will propose a suitable material to use as the rock netting. The proposed material must be specifically manufactured for use as rock netting. The rock net will be attached to the rock face using rock anchors. Either mechanical or epoxy-type anchors may be used. The spacing of the anchors will be proposed by the contractor and in accordance with the net manufacturer's recommendations and submitted to ARCADIS for approval. The rock netting, anchors, and other metal materials used for installing the rock netting will be coated with a corrosion resistant material.

2.5 Articulating Block Mat

An AB mat will be placed at the toe of the dam face and extend onto the beach approximately 10 feet. The mat will extend along the toe of the wall as far as the pile of concrete rubble below the crib wall. Prior to deploying the AB mat, a double layer of 8-ounce non-woven geotextile will be placed in the footprint of the mat to serve as a cushion layer. The AB mat will overlap the rock netting a minimum of 18 inches, as shown in Figure 8. The AB mat will then be filled with concrete grout in accordance with the manufacturer's recommendations. All heavy equipment used for the AB mat installation will be staged on top of the dam, not on the beach. The contractor will implement measures to prevent any spills from entering the bay. These measures may include the construction of a temporary containment berm. The AB mat will be anchored to the rock face using cables and anchor bolts. The anchor system will be proposed by the contractor and designed to accommodate a pull out load of 2,500 pounds per lineal foot along the face of the dam wall. The cable and anchor system will be coated with a corrosion-resistant material.

2.6 Riprap

Riprap will be placed on top of the AB mat and against the dam face as shown on Figure 8. The riprap will consist of an angular rock with a unit weight of approximately 165 pounds per cubic foot. The rock will be durable and resistant to degradation by weathering and abrasion. The gradation of the riprap is presented in Table 2-1, below.

Table 2-1 – Riprap Gradation Requirements

Gradation by Weight	Weight (pounds)
W_{100}	3,200
W_{50}	1,600
W_{30}	940
W_{15}	500

2.7 Surveying and Monitoring

The contractor will perform settlement monitoring along the top of the dam wall. A minimum of six settlement markers will be installed and surveyed daily during implementation of the work. Of the six markers, two will be placed on the crib wall logs at different elevations, one will be placed on the spillway, and one will be placed on the overflow. The results of the survey will be submitted daily to ARCADIS in a daily field report.

The dam will be inspected twice daily by the contractor at the beginning and end of each work shift to check for signs of stress (e.g., cracking, localized failures, seeps). Particular attention will be paid to check for signs of cracking in the concrete structures, tension cracking at the crest of the dam, and movement in the crib wall. Work will immediately be halted if any signs of stress are noticed. A daily field inspection report will be completed and submitted daily to ARCADIS in a daily field report.

The contractor will take digital photographs daily to document the work performed. The first set of photographs will be taken prior to any work occurring to document the initial condition of the dam. The photographs will be submitted to ARCADIS in a daily field report. The daily field report will be submitted electronically.

2.8 Permitting

ARCADIS anticipates that it will be necessary to obtain several permits prior to initiating the work described above. The permits that ARCADIS anticipates Georgia-Pacific will obtain are outlined below.

- United States Army Corps of Engineers (USACE) Clean Water Act Section 404 (Section 404) Permit: As both permanent and temporary impacts will occur below the HTL in Soldier Bay (i.e., the Pacific Ocean) adjacent to the dam, an approved Section 404 permit will be necessary prior to initiating proposed activities. Permanent impacts associated with new dam structures will result in approximately 52 cubic yards (cy) of fill below the HTL across approximately 564 square feet (i.e., 0.01 acres). Temporary impact associated with construction BMPs (e.g., containment berm) will result in approximately an additional 41 cy of fill below the HTL across approximately an additional 146 square feet (i.e., 0.003 acres). ARCADIS anticipates that a Nationwide Permit (NWP) 25 (i.e., Structural Discharges) will be submitted to ACOE to comply with Section 404 requirements.

- Regional Water Quality Control Board Clean Water Act Section 401 (Section 401) Certification: The USACE will not issue the Section 404 Permit until the RWQCB has issued a Section 401 Certification for the proposed activities. NWP 25 has not been pre-certified by the State Water Resources Control Board. Therefore, Georgia-Pacific will apply for a Section 401 Certification specific to the proposed activities.

- Coastal Development Permit (CDP): Since the proposed activities will occur within the Coastal Management Zone it will be necessary to obtain a CDP. The CDP process in Fort Bragg is administered by the City of Fort Bragg. Georgia-Pacific will apply for a CDP to meet the requirements of the Coastal Zone Management Act.

3. Health and Safety

The existing site Health and Safety Plan (HASP) (ARCADIS, 2009) will be followed during the implementation of this work. The HASP will be amended and JLAs added to the HASP prior to implementation of this work to address hazards specific to the work activities described in this work plan, including falling rock hazards, work on vertical rock faces, and work in a surf zone.

4. Schedule

The work is anticipated to take approximately 6 weeks to complete. Upon completion of the work, ARCADIS will prepare a construction report documenting the construction activities and presenting all photographs, surveying data, and settlement monitoring data collected during the work. The report will be submitted within 3 weeks of completing the work. The anticipated schedule is presented in Table 4-1, below.

Table 4-1 – Project Schedule

Task	Week					
	1	2	3	4	5	6
Mobilization						
Preparation						
Concrete Infill						
Shotcrete						
Rock Netting						
AB Mat/Riprap						
Demobilization						

5. References

ARCADIS. 2009. *Health and Safety Plan*. Former Georgia-Pacific Wood Products Facility. 90 West Redwood Avenue, Fort Bragg, California. Prepared for Georgia-Pacific LLC. March.

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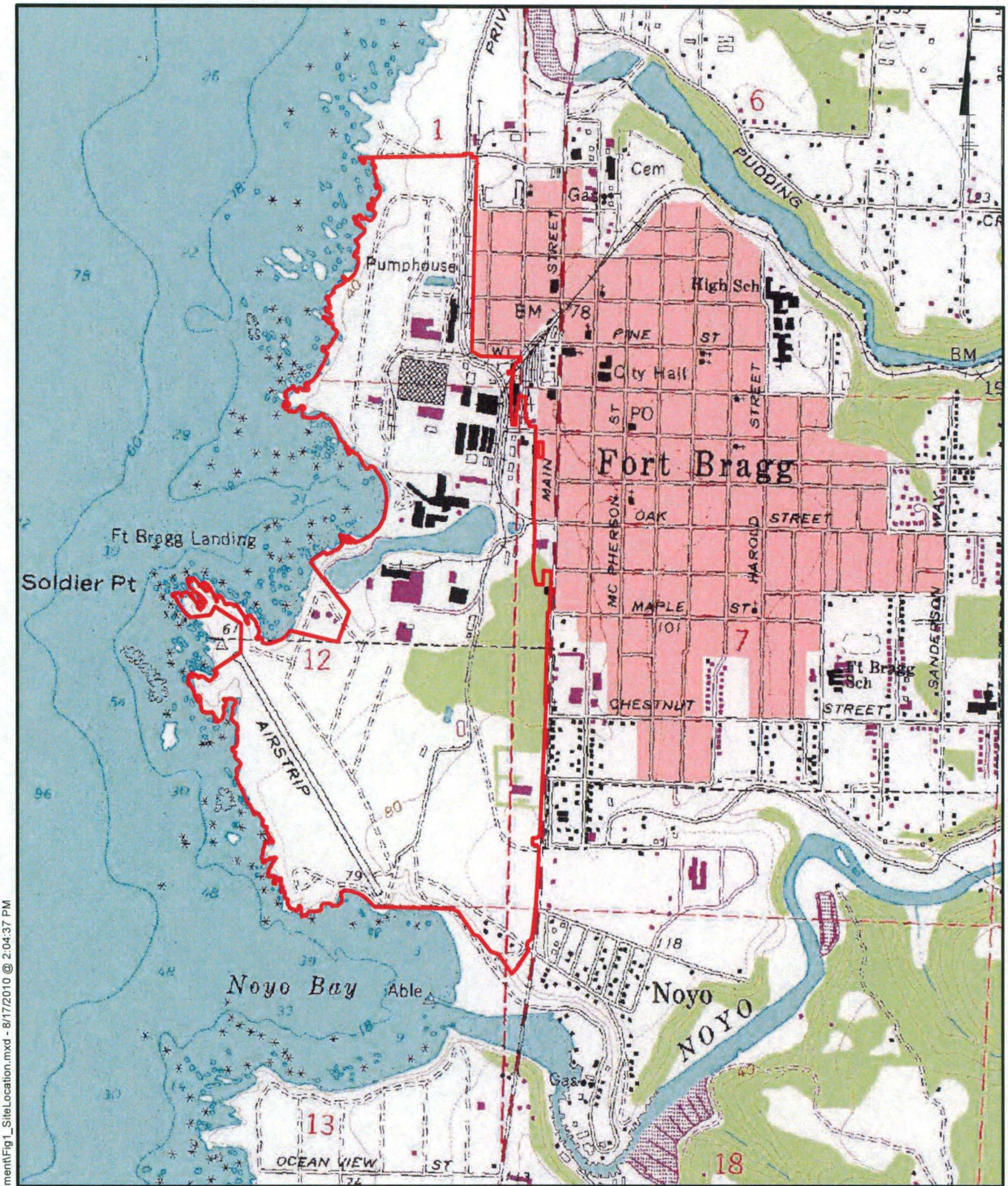
Figures



LEGEND:

SITE BOUNDARY

0 1,440 2,880 Feet

GRAPHIC SCALE

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

MILL POND DAM MAINTENANCE WORK PLAN

SITE LOCATION MAP

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FIGURE 1

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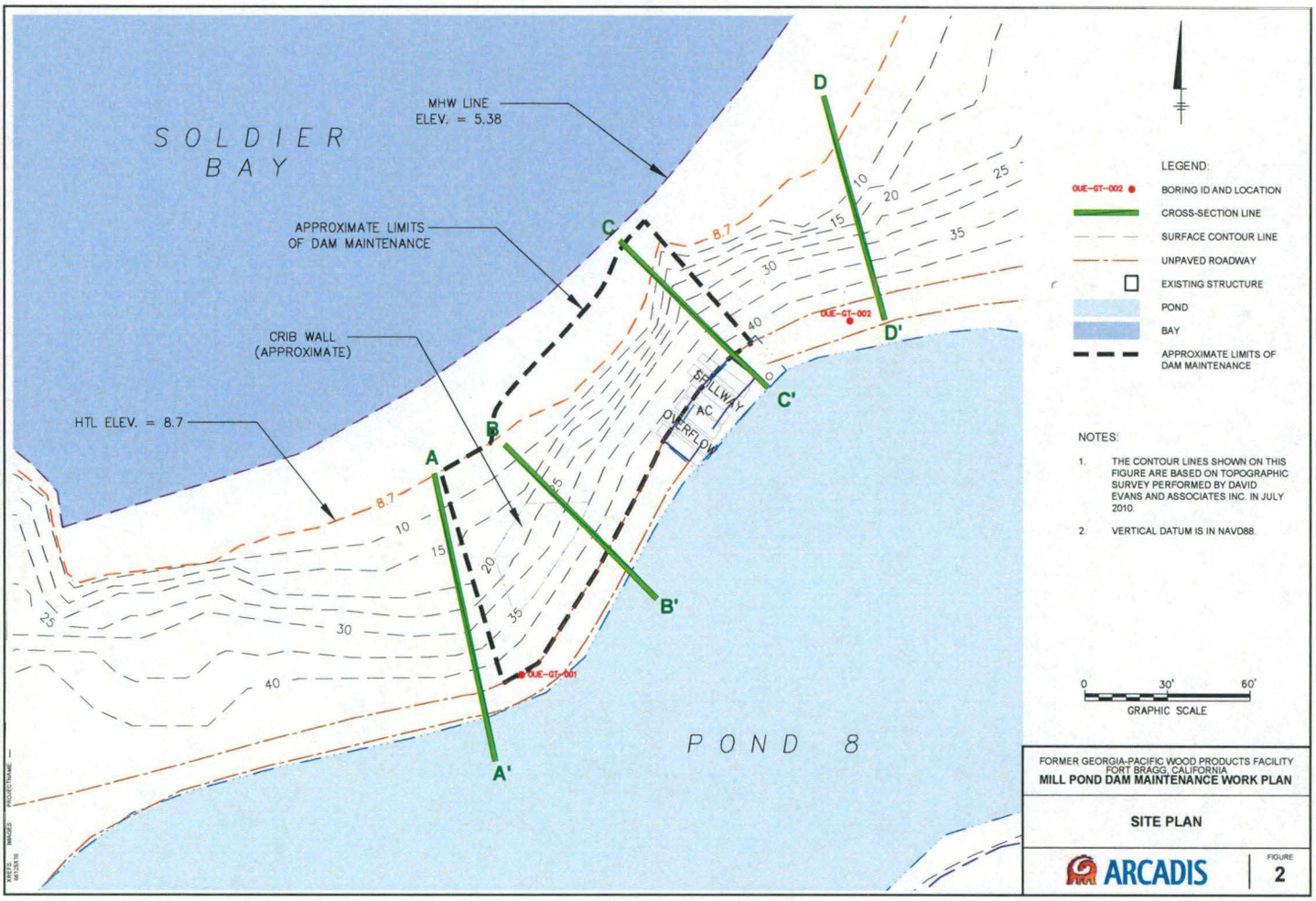

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY
FORT BRAGG, CALIFORNIA

MILL POND DAM MAINTENANCE WORK PLAN

SITE PLAN

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FIGURE 2

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DAM MAINTENANCE CONCEPTUAL FIGURE 1

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FIGURE
4

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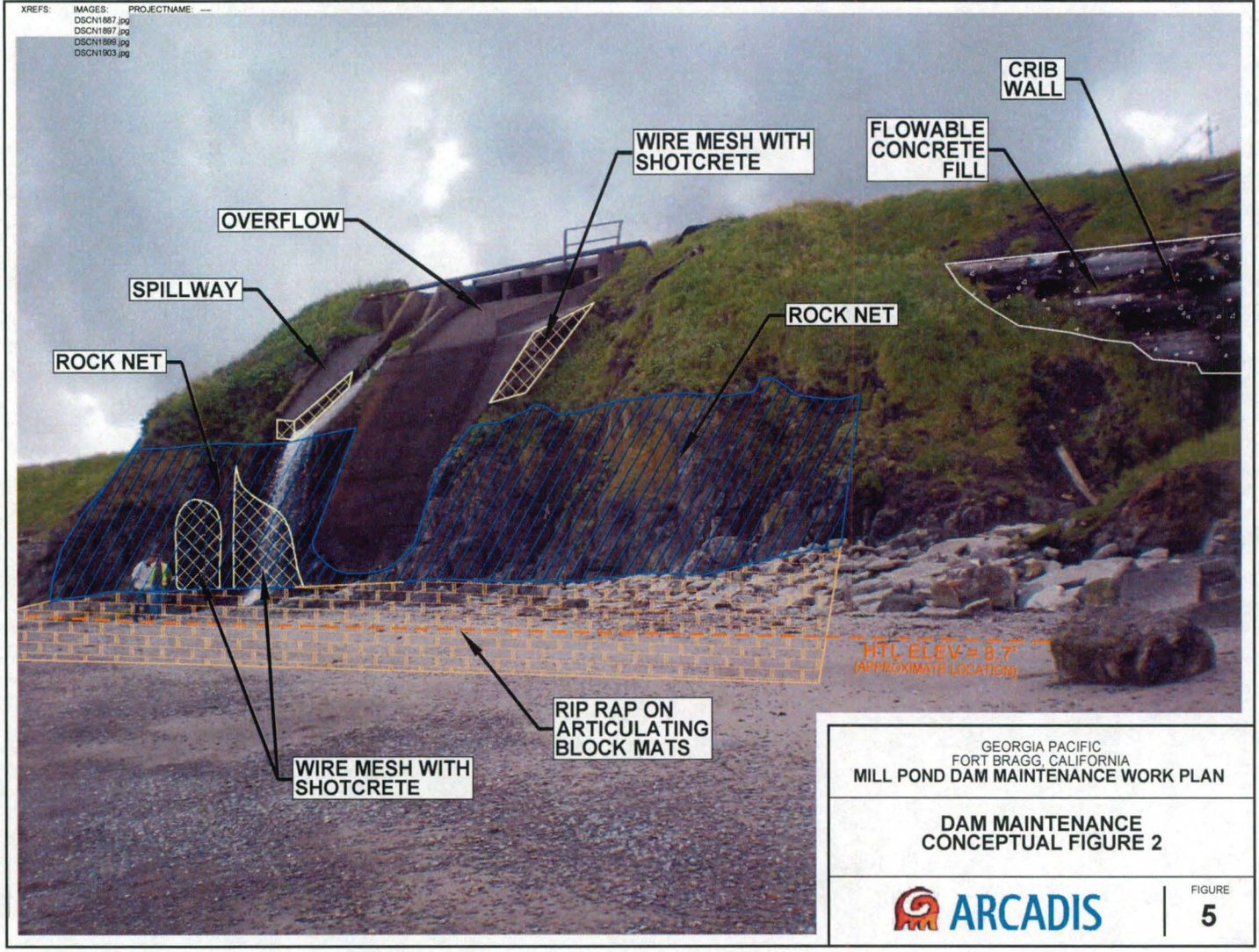

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DAM MAINTENANCE CONCEPTUAL FIGURE 2

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FIGURE
5

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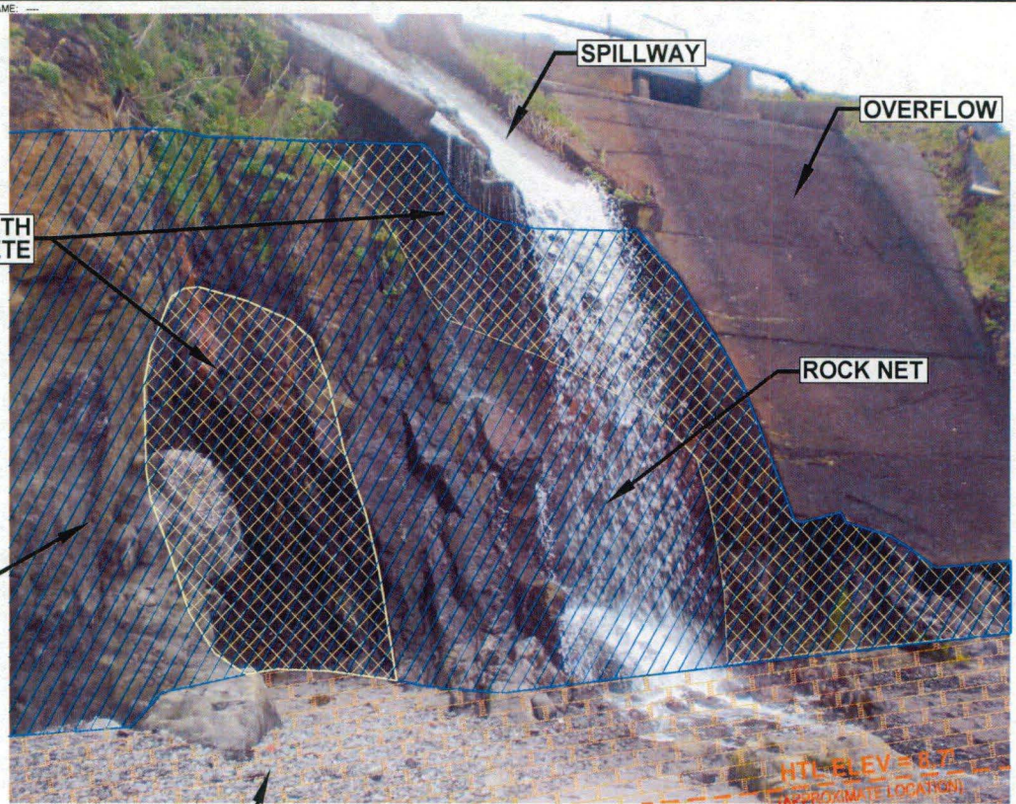

NOTE: RIP RAP NOT SHOWN FOR CLARITY

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DAM MAINTENANCE CONCEPTUAL FIGURE 3

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FIGURE
6

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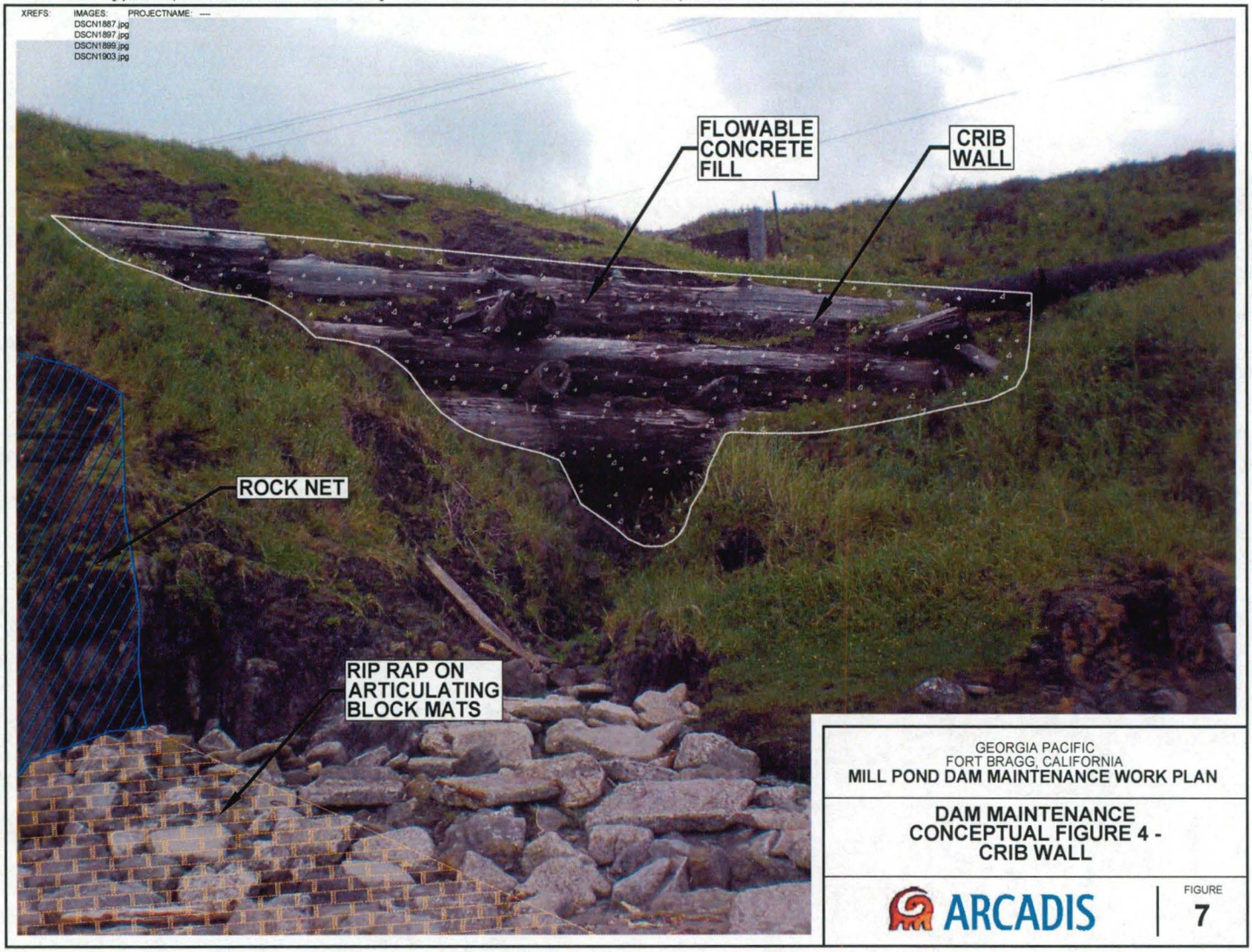

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MILL POND DAM MAINTENANCE WORK PLAN

DAM MAINTENANCE CONCEPTUAL FIGURE 4 - CRIB WALL

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FIGURE
7

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