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February 9, 2008

U.S. Nuclear Regulatory Commission
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Subject: Draft Decommissioning Plan Completion Report for the Reading Slag Pile Site
License No. SMC-1562
Docket Number 40-9027

Document Control:

Enclosed please find one copy of the Draft Decommissioning Plan Completion Report for the Reading Slag Pile Site, submitted on behalf of Cabot Corporation.

Please contact Mr. Theodore Smith of the NRC or me at 610-435-1151 if you have any questions.

Sincerely,

de maximis, inc.

Geoffrey C. Seibel
Project Manager for Cabot Corporation

cc: Theodore Smith, NRC (3 copies)
Wayne Reiber, Cabot
Steffan Helbig, ST Environmental Professionals
David Harmanas, GeoSystems

Enclosure

NMSS01

NMSS

PAPER

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FOR REVIEW AND COMMENT ONLY

READING SLAG PILE SITE

DECOMMISSIONING PLAN COMPLETION REPORT

SOURCE MATERIAL LICENSE SMC-1562

Prepared by:

ST Environmental Professionals, Inc.
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Austin Masters, Inc

Prepared for:

Cabot Corporation

February 9, 2008

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APPENDICES

> To Be Provided With Final

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CABOT CORPORATION
READING SLAG PILE SITE
DECOMMISSIONING PLAN COMPLETION REPORT
February 11, 2008

1.0 SUMMARY

The Cabot Corporation (Cabot) Reading Slag Pile Site (Site) was decommissioned in accordance with the Decommissioning Plan (Revision 4 & Addendum 1, STEP; August 2006) approved by the U.S. Nuclear Regulatory Commission (NRC) on October 25, 2007 as referenced in the Source Material License SMC-1562, Docket Number 40-9027. Cabot successfully completed decontamination and decommissioning activities on the main processing portion (i.e., the building) of the facility in 1995. On August 18, 1995, the NRC issued an amendment to NRC License SMC-1562 deleting the building and parking lot from Cabot's NRC license. The slag pile portion of the Site that is the subject of this Decommissioning Plan Completion Report is the only remaining area of the Site subject to the NRC License SMC-1562.

The Decommissioning Plan meets NRC Radiological Criteria for License Termination, 10 CFR Part 20 Subpart E and incorporates a rip-rap cover designed and installed in accordance with NRC regulations for Erosion Protection, as provided in NUREG-1623 (Design of Erosion Protection for Long-Term Stabilization (Final), USNRC, Sept 2002). The rip-rap cover is not necessary to meet the NRC's criteria for license termination with unrestricted release. Rather, the rip-rap cover was added to the Decommissioning Plan to provide additional assurance of long-term stability of the slag pile and to eliminate any uncertainty regarding the potential for erosion during the Probable Maximum Flood (PMF) over the 1,000 year period of interest. The rip-rap covers an area of approximately 0.8 acres that is located on a steep-sloping embankment along the Schuylkill River. To meet the requirements of NUREG-1623, the cover was installed by first clearing the slag pile of brush, trees, surface trash and litter, removing subsurface roots, and preparing a relatively uniform subgrade for the placement of the rip-rap. High-durability and uniform database rock was carefully selected for the cover from a local quarry and put in place over the slag pile following NRC-approved rock selection and rock placement procedures. A number of quality assurance/quality control procedures were followed to assure rock selection and placement procedures were met. Test pads were constructed and inspected and approved by the NRC before full-scale construction of the rip-rap cover commenced. The NRC also performed a 90% construction completion inspection of the rip-rap cover.

Construction of the rip-rap cover was completed on January 25, 2008 with all work being performed in accordance with the approved Decommissioning Plan or as otherwise agreed to by NRC. The final status survey was completed on (TBD – To Be Determined), 2008.

This Project Completion Report presents a detailed summary of the work performed to successfully construct the rip-rap cover as set forth in the Decommissioning Plan. This report summarizes the sequencing of the work, rock selection and placement procedures, quality assurance/quality control methods, the results of the NRC inspections and post-construction radiological surveys. Supporting detail, including project records, photographs and testing results are provided in appendices and attachments to this report.

2.0 INTRODUCTION

The Reading Slag Pile Site is located in Reading, Berks County, Pennsylvania. The slag pile is situated on a small portion of a larger industrial property which is bounded by Tulpehocken Street to the north, the Schuylkill River and various Right of Ways (City of Reading River Road, at least two Norfolk Southern Railroad tracks) to the south and Buttonwood Street to the east. The location of the Site is shown on Figure 2-1.

In 1967 and 1968, Kawecki Chemical Company (Kawecki), a predecessor to Cabot, leased a portion of a much larger facility where developmental tantalum ore processing operations were performed. The Kawecki processing operation was designed to increase the percentage of tantalum in Malaysian tin slag by heating a mixture of iron ore, tantalum ore (tin slags) and coke in an electric arc furnace. This operation produced waste slag containing naturally occurring thorium and uranium greater than 0.05% by weight that was deposited on an embankment of a much larger pre-existing slag disposal area and is now subject to NRC Source Material License SMC-1562. The disposal of the slag was performed pursuant to a permit dated March 18, 1968 from the Pennsylvania Department of Health and with written permission from the property owner at that time. The possession, handling and disposal of the slag were authorized under a license issued by the Atomic Energy Commission (AEC), the NRC's predecessor. During the period between April 1967, when processing operations started, and May 1968 when processing operations ceased, approximately 600 tons of waste slag was produced and deposited on the embankment. A small amount of waste slag material is present at the base of the embankment in the City of Reading River Road Right of Way (ROW). Between 1976 and 1977, additional slightly contaminated material from the decontamination of the process building and an associated Baltimore shipyard where the Malaysian tin slag raw material was received were also deposited on the slag pile and a cover of crushed rock and soil placed on top of the pile. Prior to commencement of decommissioning activities, the slag pile was heavily overgrown with trees and shrubs. At no time was either Kawecki Chemical or Cabot Corporation owners of the property or the building.

In 1995, Cabot decommissioned the buildings and surrounding areas of the industrial property. The details of that decommissioning are contained in the Final Decommissioning Project Report for the Main Processing Building and Surrounding Area, Reading PA (NES, 1995). The NRC subsequently modified License SMC-1562 to remove the building and parking lot.

The Decommissioning Plan for the slag pile at the Site was initially submitted to the NRC in 1998; three revised versions of the Decommissioning Plan, Revisions 1, 2, & 3, were subsequently submitted in March 2000, May 2005 and July 2005, respectively. Each revision provided additional detailed information and analysis requested by the NRC. A final Decommissioning Plan (Revision 4) incorporating a rip-rap cover was submitted to the NRC in August 2006. Addendum 1 to the August 2006 Decommissioning Plan providing additional design details of the rip-rap cover was also submitted to the NRC in August 2006. The rip-rap cover is not necessary to meet the NRC's criteria for unrestricted release. Rather, the rip-rap cover was added to the Decommissioning Plan to provide additional assurance of long-term stability of the slag pile and to eliminate any uncertainty regarding the potential for erosion during the probable maximum flood (PMF) during the 1,000 year period of interest. Rock selection and rock placement procedures for the cover were provided to the NRC on July 31, 2007, and August 22, 20070, respectively. The Decommissioning Plan was written to meet the NRC Radiological Criteria for License Termination, 10 CFR Part 20 Subpart E. The rip-rap cover was designed in accordance with NRC guidelines provided in NUREG-1623 (Design of Erosion Protection for Long-Term Stabilization (Final), USNRC, September 2002).

Companies contracted by Cabot to develop and implement the Decommissioning Plan included:

- ST Environmental Professionals, Inc. (STEP) – Project Geologist and Environmental Consultant
- GeoSystems, Inc. – Project/Design Engineer
- Shaw Environment and Infrastructure, Inc. – Primary Contractor
- *de maximis, inc.* – Project/Construction Manager
- AustinMasters - Radiological Control Technician (under direction of Cabot RSO)

3.0 CHRONOLOGICAL SUMMARY OF THE DECOMMISSIONING PLAN IMPLEMENTATION

The implementation of the Decommissioning Plan consisted of multiple and often overlapping phases of work. These phases are discussed in detail in the following sections.

3.1. Coordination with City of Reading and Property Developer

Prior to beginning any Site activities (early August 2007), Cabot met with officials from the City of Reading (City). City officials informed Cabot that the City has an active sanitary sewer line located in the area where the temporary access road to the Site was to be built (see below). After discussion with City officials and their engineering consultant regarding the size and approximate weight of the vehicles that might be traversing the suspected sewer line, the City authorized the access road to be built.

After the access road was built, Cabot met again with City officials and a representative of the developer of the adjacent property to ensure Cabot would have access to the Site and use of adjacent properties during construction activities. Construction of the rip-rap cover required access and use of the adjacent property immediately upslope of the slag pile for material stockpiling, vehicle and equipment parking, and a construction trailer.

3.2. Site Access Road and Erosion Protection

A temporary access road to the lower portion of the Site was built along the City's ROW adjacent to the Norfolk Southern Railroad property. The access road was required to begin site clearing and to construct the rip-rap cover from the bottom of the slope. To provide for erosion protection after clearing and during cover construction, silt fence with wire reinforcement was installed on the down-slope side of the access road, approximately thirteen feet from the center line of the railroad track. The area for the temporary access road was graded, a geo-textile material was placed, and eight to ten inches of R-3 stone was placed on the geo-textile. The location of the access road is shown on Figure 3-1.

Construction of the temporary access road began on August 20, 2007 and was completed on August 24, 2007. Photo 3-1 shows the completed site access road and the silt fence.

At the request of the City, the site access road was not removed following construction completion.

3.3. Site Clearing

To construct the cover, vegetation and surface debris had to be cleared from slag pile area. Since above-grade vegetation would not have been impacted by the slag material and the removal of trees and shrubs did not involve any significant disturbance of the slag material, clearing was performed with concurrence of the NRC, before the Decommissioning Plan was approved. Photos 3-2 and 3-3 show the vegetation at the Site prior to clearing.

The underbrush and smaller trees were removed using a hydraulic axe. The larger trees were then cut as close to grade as possible using chain saws. Using a mechanical log carrier and track hoe (equipped with a thumb), the cut trees and underbrush were removed from the slag pile area and chipped into an onsite tractor-trailer. The chips were then taken to a local wood recycling facility. The stumps were removed only after NRC approved the Decommissioning Plan and prior to the construction of the cover (see below). As discussed in Section 6, periodic radiological monitoring was conducted by the on site radiological control technician during all clearing activities. Photos 3-4 through 3-8 show the Site during and after clearing of the above-grade vegetation.

3.4. Site Maintenance

After clearing the Site and prior to receiving Decommissioning Plan approval from the NRC, surface debris (tires, litter, and dead/fallen trees) were removed and placed in a 30-yard roll-off container for disposal at a municipal waste landfill.

After clearing, but prior to stump removal, Cabot requested and received approval from the NCR to place a minimum of six (6) inches of FS-2 across the slag pile as an interim erosion protection measure. FS-2 rock was placed across the entire slag pile area by placing the material at the top of the slope and pushing it down-slope with a small dozer (see Photos 3-9 and 3-10). Tree stumps were not covered during this phase of work because the Decommission Plan was not approved and the stumps needed to be removed.

3.5. Stump Removal

Removal of the tree stumps from the slag pile area occurred after NRC approval of the Decommissioning Plan in October 2007. The qualified radiological control technician performed radiological surveys of the ground surface surrounding each stump and the stump after it was removed. The technician also performed a visual inspection for slag material on each stump. After each stump was removed, the resulting hole was backfilled with FS-2.

The radiological control technician also surveyed and inspected each 30-yard roll-off prior to being filled with stumps and debris. Once cleared by the radiological control technician, the stumps and debris were placed in the roll-off for off-site disposal at a municipal waste landfill. All survey/inspection results for the stumps and roll-offs were documented in the radiological control technician's daily field book. A total of four (4) roll-off containers of debris and tree stumps were removed from the Site. Removal of the stumps began on October 25, 2007 and was completed on November 2, 2007. Photos 3-11 through 3-14 show examples of the stumps removed from the Site.

3.6. Subgrade Preparation

After stump removal and backfilling with FS-2, between 1 and 6 feet of additional FS-2 material needed to be placed across the slag pile to create a relatively uniform subgrade surface on which to construct the rip-rap cover. The dozer tracked up, down and across (to the extent possible) the slope to compact the subgrade material. The subgrade was completed on November 21, 2007 and is shown in Photos 3-15 through 3-17. The subgrade surface was then surveyed and confirmed that slopes were relatively uniform and were not greater than 1.5H:1V.

3.7. Construction of the Rip-Rap Cover

3.7.1. Rock Type, Source and Selection

The slag pile cover required three types of processed rock, FS-2, FS-3 and R-4 and two types of mechanically broken rock, R-6 and R-7. The FS-2 is the bedding layer for the R-4 rip-rap and the FS-3 is the bedding layer for the R-6 and R-7 rip-rap.

All of the cover material was from the diabase rock source at the Dyer Quarry, located in Birdsboro, PA, approximately 7 miles southeast of the Site. The diabase sill is generally a massive and uniform intrusion into the regional sandstone and siltstone rock (country rock). The diabase sill is hundreds of feet wide and over 1,000 feet thick. The quarry has been processing the diabase sill since approximately 1930. A detailed description of the geology, chemistry and durability of the diabase can be found in Addendum 1 to the Decommissioning Plan (August 2006).

Prior to the approval of the Decommissioning Plan, the NRC and representatives for Cabot made numerous trips to the quarry to gain an understanding of how the quarry selected and processed the diabase rock. These trips involved inspecting various blast face levels in the quarry and talking to the quarry manager about the rock processing and quality control measures. The quarry provided historical physical and chemical testing data to the NRC and Cabot during these visits. The quarry routinely processes and stockpiles the FS-2, FS-3 and R-4 needed for this project. Because of its more limited demand, the quarry had to process some of the R-6 and R-7 particularly for this project.

To help minimize the potential for undesirable rock to be used in the project, Cabot inspected the blast face (when possible) to ensure that each side was a minimum of 200 feet away from the surrounding country rock. The R-6 and R-7 rock was mechanically processed at or near the blast face using a 20,000 pound hammer to break the rock to the appropriate size. Prior to and during cover construction, Cabot's Project Geologist was periodically at the quarry to inspect the selection and processing of the R-6 and R-7 rock. Since the other rock sizes (FS-2, FS-3 and R-4) were routinely processed by the quarry, the NRC and Cabot agreed that daily inspection of these rocks by the Project Geologist was not necessary. However, as discussed in Section 4.0, the Project Geologist did inspect these materials throughout the project. The rock selection procedures are included in Appendix 1. Additional information regarding the rock selection procedures and quality control is provided in Section 4.0 of this report, and in the Decommissioning Plan.

3.7.2. General Rock Placement Procedures

The NRC-approved rock placement procedures are provided in Appendix 2. Detailed information regarding the quality control of rock placement is found in Section 6. The following summarizes the rock placement procedures.

To help ensure proper thickness of each layer, the Contractor set stakes in the field that were marked with the height of the next layer of rock. The Contractor set "string lines" between the stakes across the working face which provided additional control on the placement of rock at the appropriate thickness. During rock placement, the operators and field technicians would periodically check the thickness of the rock against the string lines and also measure the thickness with a survey rod. In addition, the Project Engineer would periodically inspect the rock placement during construction.

Generally, the construction of the rock cover proceeded from the bottom to the top of the embankment. The R-6 and R-7 rocks were placed individually by the operator using a track hoe equipped with a "thumb". After initial placement of the rock, the excavator operator was able to use the gripping ability of the bucket and thumb to adjust and seat ("lock") each rock in place. A spotter on the ground directed the operator of the excavator to achieve optimal placement. Once in place, the equipment operator would "tap" the rock with the track hoe bucket to ensure a solid interlock with the other rock. Manual adjustment was used only when the equipment could not achieve proper placement.

Due to the challenges and safety concerns of equipment working on the steep slope, the R-4 rip-rap was placed by casting the stone both up and down the slope using a long-reach excavator fitted with an extra wide bucket. The rock would then be "tapped" into place using the excavator bucket or driven over using the track hoe, where possible.

3.7.3. *Construction and NRC Inspection of Cover Test Pads*

Prior to initiating full-scale cover construction, test pads for each size of the rip-rap (R-4, R-6, and R-7) were constructed for NRC inspection to establish and confirm acceptable construction methods. Due to site area limitations and to avoid the need to dismantle the test pads after inspection, the test pads were constructed in the upstream portion of the cover area and subsequently incorporated into the rest of the cover. The R-7 test pad was approximately 25' (W) x 25' (L) x 4.5' (H) (minimum thickness for R-7), the R-6 test pad was approximately 20' (W) x 25' (L) x 2' (H) (minimum thickness for R-6) and the R-4 test pad was approximately 10' (W) x 10' (L) x 1' (H) (minimum thickness for R-4).

The NRC inspected the test pads on November 13, 2007 to confirm that they met the requirements of the rock placement procedures. With one exception, the NRC agreed that construction was consistent with the procedures and also agreed that construction of the remainder of the cover could proceed. The NRC noted one area of the test pad where the layer of R-7 rock appeared to be less than the required thickness. It was agreed at this time that the thickness of any area of the cap could be confirmed by dismantling the area in question and confirming the in-place thickness or by providing documentation (i.e. field notes, photos) as evidence of compliance with the design. Verification of proper construction of this area of the test pad and other areas of the cover (during and post-construction) are presented in Section 6.

Photos 3-18 through 3-20 show the completed test pads. Full-scale construction of the rip-rap cover commenced immediately after the NRC inspection and approval to proceed.

3.7.4. Full Rip-Rap Cover Construction

3.7.4.1. Bedding Layer (FS-2 and FS-3) Placement

The Contractor placed field stakes and used string lines across the work area to guide the placement of one foot of FS-3 bedding layer in the R-7 section and eight inches of the FS-3 in the R-6 section. Due to site area limitations and slope constraints, the Contractor chose to construct the R-6 and R-7 sections of the cover in roughly 30 foot by 30 foot areas, moving from west to east. Therefore, instead of placing the bedding material across the entire R-6 and R-7 sections, the bedding layer was also placed in the 30 foot by 30 foot areas. This construction approach also reduced the potential for over-compaction or disturbance of the bedding layer had it been placed initially across the entire R-6 and R-7 area. Placement of the bedding layer in the R-7 and R-6 sections began on October 29, 2007 and was completed on January 9, 2008. Photos 3-21 through 3-24 show placement of the bedding layer.

The design required a minimum of four (4) inches of FS-2 bedding layer beneath the R-4 rip-rap. At the time of the design, it was not expected that FS-2 would be needed to create a relatively uniform subgrade surface. Therefore, at the time of R-4 rip-rap placement, the four-inch bedding layer requirement had already been met by the subgrade work and no additional FS-2 was needed.

3.7.4.2. R-4, R-6 & R-7 Rip-Rap Layer Placement

Construction of the R-6 and R-7 rip-rap cover layers proceeded in the same manner as the bedding layer. Areas approximately 30 feet by 30 feet were completed at a time to minimize compaction and disturbance of the bedding layer. The R-7 rip-rap portion of the cover began on October 30, 2007 with the construction of the test pad area and was completed on January 11, 2008. Construction of the R-6 cover area began on November 10, 2007 and was also completed on January 11, 2008. The R-4 cover began on November 12, 2007 and was completed on January 18, 2008.

Photos 3-25 through 3-32 show construction of the rip-rap layers of the cover.

3.8. Pre-Final NRC Construction Inspection

On January 3, 2008, the NCR conducted an inspection of the cover. At that time, approximately 90% of the cover was complete. With the exception of an area within the R-4 section of the cover, the NRC raised no additional concerns regarding cover construction. The area identified by the NRC was subsequently inspected and corrected by the Contractor, as discussed in Section 6.0.

3.9. Final Radiological Survey

TO BE COMPLETED

4.0 ROCK SELECTION AND QUALITY CONTROL

4.1. Procedure

The durability of the rock used to construct the cover was ensured through utilization of the methods described in the "Rock Selection Procedures, Revision 3" letter to the NRC, dated August 28, 2007. Those procedures include quality control (QC) and quality assurance (QA) measures to minimize the amount of R-6 and R-7 rock with undesirable features that might potentially impact cover performance. As discussed with NRC personnel during development of these procedures, the primary objective was to ensure that there were no local concentrations of undesirable rock in the cover that might affect long-term performance of the cover. The procedures were designed to control and assure rock quality regardless of the specific source location within the quarry at the time of processing. The Project Geologist was responsible for using professional judgment to direct rock selection and perform inspections to achieve the desired rock quality throughout the cover. As presented in Section 5.0, below, the Project Engineer was tasked with the gradation and durability testing of representative rocks samples.

As part of the QC measures, the Project Geologist initially worked closely with the equipment operator at the quarry in selecting large rocks for breaking into the appropriate sizes (R-6 and R-7). In this way, the operator could look for gross features that would make a larger rock undesirable and not process it into the R-6 or R-7 size.

Table 1 provides a summary of the rock selection inspections including dates, locations, type of material and results. That table also provides the dates the equipment operator at the quarry was trained.

4.2. Personnel Involved in Rock Selection

All rock selection procedures and inspections were performed by the Project Geologist from ST Environmental Professionals. As described in the procedures letter, the Project Geologist provided training and instruction to the equipment operator at the quarry on two occasions, August 23, 2007 and September 12, 2007.

4.3. Rock Source Quality and Control

As described in the August 28 letter to the NRC (attached in Table 1) and above, the Dyer Quarry was selected as the source of the material (diabase) for the cover based on extensive historical test results, numerous site inspections, and additional recent testing specifically for this project. The specific location of the material from within the quarry depended on the location of quarry operations when the material was being produced. The August 28, 2007 procedures were developed to account for any of several different potential source locations from within the quarry.

When the Decommissioning Plan was approved, the quarry was operating in the lowest level (Level 1). Level 1 is the furthest distance from the original ground surface (approximately 400 feet) and the furthest distance from the contact with the country rock that surrounds the diabase sill (approximately 300 feet). This location was the most desirable source for the durable rock. As material from Level 1 was quarried, stockpiled, and inspected, the Project Geologist concluded that the rock was all very uniform with almost no pieces of rock exhibiting undesirable features.

4.4. Quarry Blast Face Inspection

Blasting of the R-6 and R-7 material occurred before initiation of cover construction; therefore, the Level 1 quarry face remaining after blasting was inspected. The blast face did not indicate extensive fracturing, weathered zones, or xenoliths. The Project Geologist approved of this source location for the material.

4.5. Selection of R-6 and R-7 Material

The procedures in the "Rock Selection Procedures, Revision 3" incorporated in the approved Decommissioning Plan described two methods of inspecting the R-6 and R-7 material:

1. Method 1 - Inspection of low-height piles at the quarry
2. Method 2 - Inspection of the stockpile face at the quarry as material was being loaded for shipment

The R-7 material was inspected at the quarry in accordance with inspection Method 1. In addition, several inspections occurred during various stages of rock loading at the quarry, stockpiling at the Site, during construction of the cover, and after placement in the cover. Table 1 provides the specific dates and locations of inspections.

The rock selection procedures for the R-6 were modified slightly in response to field conditions and discussions with NRC personnel. Prior to the start of cover construction, some of the R-6 material had been processed and stockpiled at the quarry in a large pile that was 8 to 12 feet high. It was therefore not possible to utilize the low-height pile inspection method on this rock (Method 1, above). Shipping of the R-6 from the quarry to the Site was dictated by project demand and as a result was not regularly scheduled. It was therefore not practical for the Project Geologist to be available to inspect each load as described in Method 2. The Project Geologist modified the procedures for inspection of the R-6 material to assure that design criteria were met or exceeded.

Inspections of the R-6 material were performed by the Project Geologist on the large pile at the quarry and on the stockpiles at the Site during and after completion of shipment. Based on the Project Geologist's professional judgment, these modifications of the selection procedures would result in the same percentage of the R-6 rock being directly observed as would have been using the unmodified procedures. However, to address the remote possibility that some undesirable pieces were hidden from view during all the inspections, additional procedures were implemented for the R-6 (as well as for the R-7 material).

The R-6 stockpile at the Site was inspected several times as the material was being placed on the cover. The Project Geologist identified and marked for rejection any pieces with undesirable features. The R-6 material placed on the cover was also inspected several times by the Project Geologist. These procedures resulted in nearly every piece of R-6 being inspected at least once by the Project Geologist. In addition, the Project Geologist instructed the operator working on the stockpile to reject any marked pieces or pieces with undesirable features, if encountered.

The design thickness of the R-6 material placed on the cover was 24 inches. Inspection Method 1 called for the inspection of piles with a height of 24 inches. Therefore, inspection of the R-6 material as placed on the cover meets the Method 1 criteria. Inspection of the in-place rock provided a higher level of quality assurance because it involved the actual material used in the cover. It also ensured that any undesirable pieces that were present in the exposed surface of the cover, where they might have the greatest impact on long-term cover performance, would be identified and removed.

Ten pieces (out of thousands) of R-6 and R-7 material with potential unexpressed fractures were accepted for use by the Project Geologist. These pieces were either at the upper range of the specified size distribution or the fracture would not reduce the size of the piece by more than 20%. In both situations, expression of the fracture would not impact the overall size distribution or performance of the cover.

4.6. Selection of R-4, FS-3 and FS-2 Material

The R-4, FS-3 and FS-2 material was inspected several times by the Project Geologist. As expected, no concentrations of undesirable rock pieces were identified. The inspections confirmed the long history of quarry test results and pre-construction inspections documenting that the durability of the crushed and sorted products consistently exceeded the minimum design requirements for the cover material. The stockpiles were accepted for use by the Project Geologist.

4.7. Summary

The inspection process of the R-6 and R-7 material resulted in the rejection of less than 20 pieces of rock that had potential unexpressed fractures or a different appearance. Overall, the few undesirable pieces out of thousands would not have impacted cover performance. Nonetheless, these pieces were eliminated to ensure that there could not be a localized concentration of undesirable pieces in the cover. No weathering rinds greater than 1 cm thick or unexpressed calcite veins were identified in any of the inspections, consistent with the numerous inspections done at the quarry prior to project initiation.

No confirmed xenoliths of incorporated country rock were observed. The pieces of material that were rejected for having a different appearance were located in one area of a stockpile and may have represented a xenolith that had been nearly assimilated into the diabase melt.

Based on the actual circumstances at the time of quarrying, the Project Geologist implemented minor modifications to the rock selection procedures and took advantage of several opportunities to provide additional QA/QC procedures. The result was inspection of nearly every piece of R-7 and R-6 material used in the cover and multiple inspections of the R-4 material. These procedures achieved the goal of ensuring that undesirable materials were not incorporated into the cover. Table 1 provides a summary of the inspections and training that were performed on the material incorporated into the cover. Table 1 also contains the testing results and final inspection results that demonstrate the design criteria were met or exceeded. Photos 4-1 through 4-5 were taken during inspections of the stockpiles.

5.0 ROCK PLACEMENT/TESTING AND QUALITY CONTROL

5.1. Subgrade Control

As mentioned in previous sections of this report, a significant amount of FS-2 was placed across the Site (after vegetative clearing and stump removal) to create a relatively uniform surface on which to construct the rip-rap cover. The subgrade topographic control survey is shown on Figure 5-1 The survey confirms field observations that the placement of the subgrade material resulted in slopes no steeper than 1.5 H:1V, and that there were no visible gullies, ditches, or features present which might allow for surface water flow concentrations.

5.2. Trial Section and Test Pads

At the beginning of the project, the Contractor constructed a trial section approximately 10 feet by 10 feet to develop rock handling procedures and to train and communicate the expectations of the design to the equipment operators, field workers and QA/QC personnel. This small trial section was constructed in the rock stockpile area and subsequently dismantled. The trial section was beneficial in providing operators and field personnel in the placement of rock. Photos 5-1 through 5-5 show the trial section.

As discussed in Section 3.6.3. formal test pads of the R-4, R-6 and R-7 were constructed for NRC inspection prior to complete cover construction.

5.3. Cover Layer Thickness Control

Control and verification of cover layer thicknesses was accomplished using four (4) methods, as follows:

- ***Field Stakes and String Lines***

  As mentioned above, the Contractor established field stakes marked with the thickness of each layer to be constructed. String lines were established across the working area using these stakes to serve as a guide to the Contractor in placing the appropriate thickness of material.

- ***Periodic Thickness Measurements During Construction***

  During construction, the thickness of each layer was periodically inspected by the Project Engineer. In addition, the Contractor would also measure the thickness with a survey rod. Photos 5-6 through 5-38 show field measurements being taken during construction.

- ***Elevation Survey***

  To assist in confirming thicknesses and to serve as a guide to conducting field QA/QC (test pits), the top of subgrade, bedding, and rip-rap were surveyed after placement.

- ***Post-Construction Test Pits***
  As discussed below, a number of test pits were completed by the Contractor and Project Engineer to verify the field documentation and survey results and to identify any locations where additional rock might be required.

In summary, extensive care was taken by the Contractor and Project Engineer during construction to ensure that each layer of the cover met the required thickness. Photo documentation and field observations by numerous project personnel support the conclusion that the thicknesses of each layer of the cover meet the design requirement.

5.4. Bedding Layer Thickness Control
Field inspections and a review of all the bedding layer documentation by the Project Engineer confirmed that the bedding layer was placed in accordance with the procedures and design. However, as discussed below, the survey data suggested that there were several areas where the bedding layer thickness was less than required by the design. Also as discussed below, confirmation test pits in these areas showed that the survey thickness was not correct and the bedding layer thickness was in accordance with the design. While not anticipated by the design, it should be recognized that at least one foot of FS-2 was placed below the FS-3 during subgrade preparation, adding to the overall effective bedding thickness beneath the R-7 and R-6.

- The thickness of the FS-3 bedding layer placed below the R-7 as determined by topographic survey is shown in Figure 5-2. Several areas on the figure indicate that the FS-3 is not of adequate thickness, which is not consistent with the documentation and observations during construction. These areas were subsequently evaluated by the Project Engineer and Contractor by direct field investigation (test pits). The locations of the confirmatory test pits are shown in Figure 5-3. In all test pits, the thickness of the FS-3 bedding layer was determined to meet the design criteria. The test pit results are summarized in Table 2 and shown in Photos 5-39 through XXX

- Similarly, the thickness of the FS-3 bedding placed below the R-6 as determined by topographic survey is shown in Figure 5-4. Several areas on the figure indicate that the FS-3 is not of adequate thickness, which is not consistent with the documentation and observations during construction. These areas were subsequently evaluated by the Project Engineer and Contractor by test pits. In all test pits, the thickness of the FS-3 bedding layer was determined to meet the design criteria. The test pit results are summarized in Table 2 and shown in Photos XXX through XXX.

- As previously discussed, a significant layer of FS-2 was placed across the Site to create a relatively uniform subgrade on which to construct the cover. Prior to stump removal and placing the FS-2 subgrade, a topographic survey was completed. During stump removal, the ground surface was slightly changed, but not resurveyed. Therefore, comparing the topographic ground survey to the survey of the top of the subgrade layer does not provide an accurate depiction of the thickness of the FS-2 across the slag pile. Field documentation, such as Photos XXX through XXX, clearly shows a minimum of 6 inches of FS-2 covering the R-4 area (the required thickness). In actuality, some areas of the Site were filled in excess of 6 feet with FS-2 in order to achieve the subgrade requirements. In addition, as discussed below, the thickness of the FS-2 was confirmed during the test pits in the R-4 area of the cover.

5.5. R-4, R-6 & R-7 Rip-Rap Layer Placement Control

As discussed in Section 3.0, the R-6 and R-7 rip-rap was placed using excavators with static "thumbs" to grip and place each rock. After initial placement of the rock, excavators were able to use the gripping ability of the bucket and thumb to adjust and seat each rock in place. A spotter on the ground directed the operator of the excavator to achieve optimal placement. Manual adjustment was only used when the equipment could not achieve proper placement.

The results of the final rip-rap thickness surveys are shown on Figures 5-5 through 5-7. However, as discussed below, the survey data suggested that there were several areas where the rip-rap thickness was less than required by the design. Also as discussed below, confirmation test pits in these areas showed that the survey thickness was not correct and the rip-rap layer thickness was in accordance with the design.

- For the R-7 (Figure 5-5), the test pits confirmed that the thickness of the rip-rap layer met the design tolerance and therefore no corrective action was needed by the Contractor.

- As shown in Figure 5-6, several test pits were conducted in the R-6 layer to confirm its thickness. In the _____ area, it was determined that additional R-6 was needed, which was subsequently placed by the Contractor and the appropriate thickness confirmed by the Engineer.

- The post-construction thickness survey for the R-4 is shown as Figure 5-7. The thickness of the R-4 was investigated using the test pits shown on that figure. It was determined by the test pits that additional material was needed, which was subsequently placed by the Contractor and the appropriate thickness confirmed by the Engineer.

5.6. Material QA/QC – Gradation

The quarry supplied bedding and rip-rap that met the design rock gradations. Each type of cover material was tested four times to ensure that it met the proper gradations. The R-6 and R-7 rip-rap was measured by hand in the field by the Engineer during construction of the test pads and during periodic inspections. Four samples of the R-4 and each bedding material were collected and sent to Pennoni Associates, Inc. and GeoSystems Consultants, Inc. for mechanical testing. The gradation test results of the shown on Figures 5-8 through 5-9. The results are in conformance with the placement procedures.

5.7. Material QA/QC – Quality

Four samples of blast face material (R-6, R-7) and four samples of crusher run material (FS-2, FS-3, R-4) were collected throughout the project and sent to Pennoni for Specific Gravity (SSD) ASTM C-127, Absorption ASTM C-127, Soundness (5 cycles) ASTM C-88, and Abrasion (100 revolutions) ASTM C-131.

The rock quality test results and scoring are shown on Tables 3 through 11. The results are in conformance with the specifications. The large specimens of R-6 and R-7 that were collected could not be LA Abrasion tested due to their size. The Schmidt Hammer test was used on these specimens to augment the durability data in the absence of the LA Abrasion results. Table FS-2 from the rock placement procedures (Appendix 2) has been revised to include the Schmidt Hammer scoring criteria and is presented as Table 12 to this report.

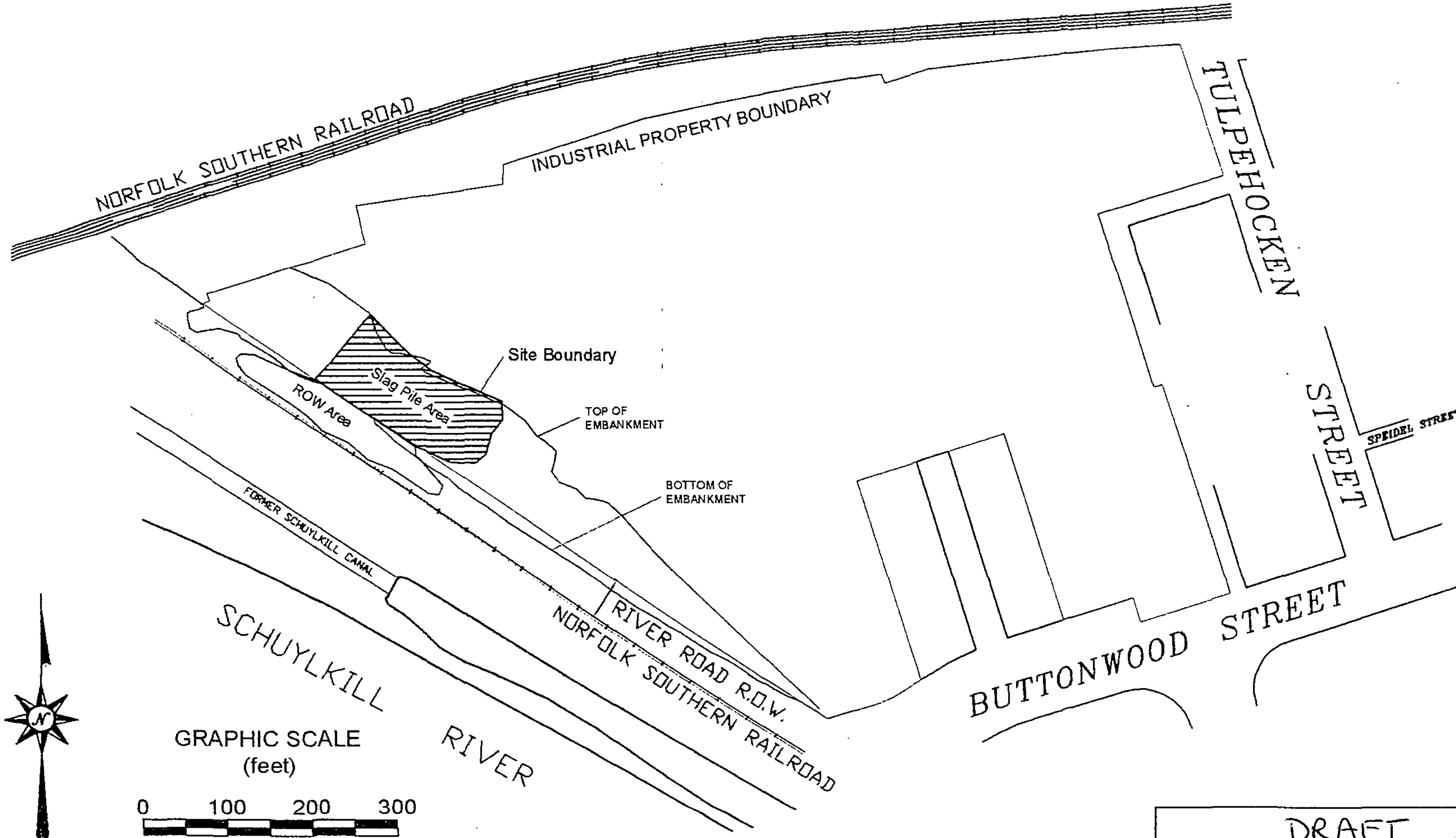
6.0 RADIOLOGICAL MONITORING AND CONTROL

THIS SECTION WILL BE PROVIDED FOLLOWING THE FINAL RADIOLOGICAL SURVEY.

7.0 REFERENCES

THIS SECTION WILL BE PROVIDED LATER

FIGURES



NOTE: The base map (including property boundaries, buildings, rights of way, elevation contours, electric lines, and utility poles) is to scale. It was prepared by a Pennsylvania licensed surveyor. The location of the former Schuylkill Canal and Schuylkill River are approximate and based on the USGS Reading 7 1/2 minute topographic quadrangle.

DRAFT 2-1

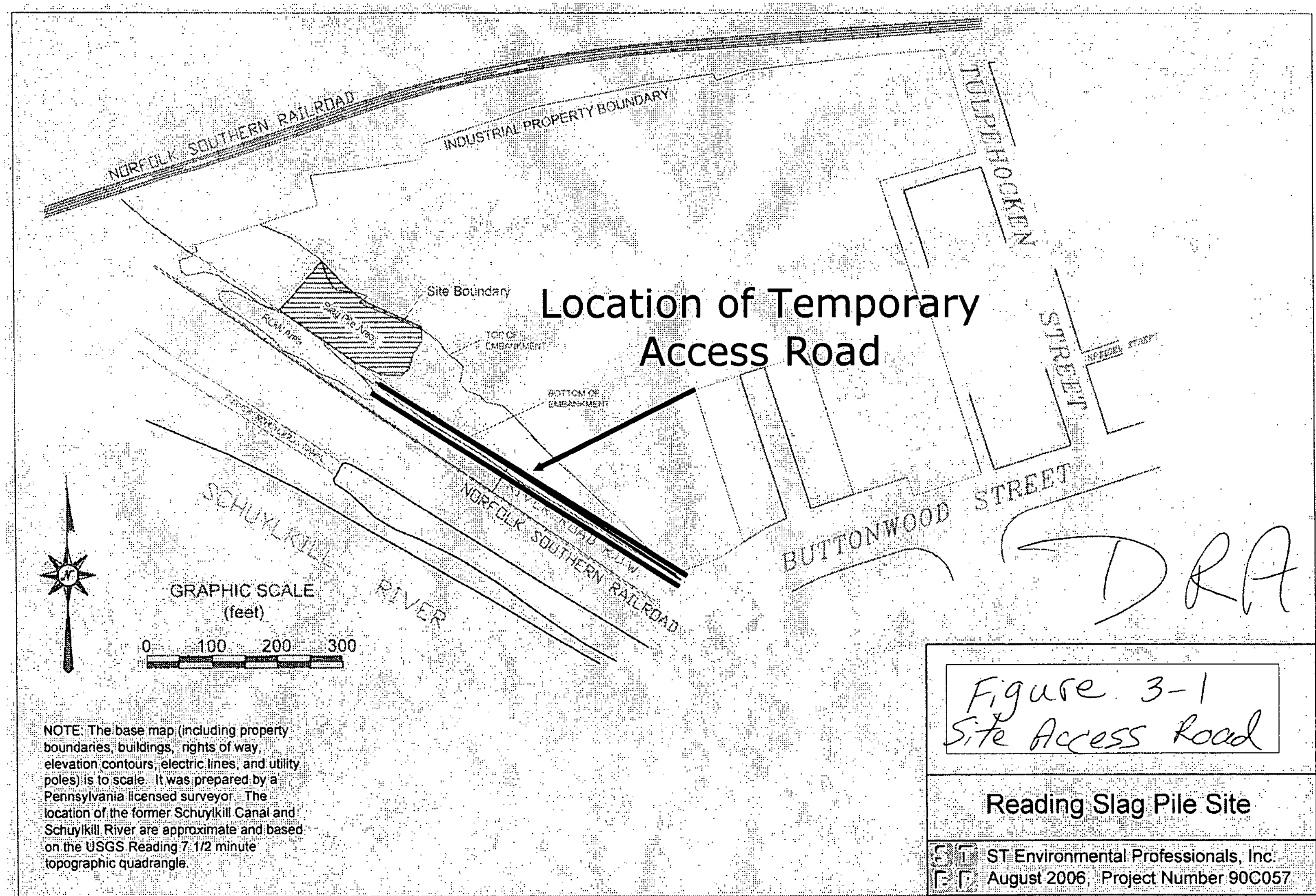
FIGURE ~~12~~

SITE VICINITY MAP

Reading Slag Pile Site

ST Environmental Professionals, Inc.
August 2006, Project Number 90C057

Temporary Access Road



TABLES

TABLE 1

DATE	LOCATION	MATERIALS INSPECTED	COMMENTS/RESULTS
8/23/07	Dyer Quarry	R-7	15 tons on Level 7. Trained operator. No undesirable rocks.
	Dyer Quarry	R-6	1,000 tons from Level 1 stockpile 10+ feet high. Not enough visible for complete inspection. Discussed alternate methods with quarry and contractor.
	Dyer Quarry	R-4	Inspected visible portions of current stockpiles. No undesirable rocks.
9/12/07	Dyer Quarry	R-7	Observed large rocks being broken into R-7 on Level 1. Completed training of operator (Norman).
	Dyer Quarry	Blast Face	Inspected blast face in Level 1 after source material for R-6 and R-7 was removed.
	Dyer Quarry	R-4	Inspected visible portions of current stockpiles. No undesirable rocks.
9/24/07	Dyer Quarry	R-7	Two stockpiles from Level 1. 10'W X 90'L X 5'H and 30'W X 135'L X 5'H. Rejected and marked 10 pieces (5 with unexpressed fractures and 5 with different appearance). Accepted 10 pieces with unexpressed fractures that would reduce size by 20% or less. No weathering rinds greater than 1 cm. No unexpressed calcite veins. All accepted rock was extremely consistent in texture and composition.
10/9/07	Dyer Quarry	R-7	One stockpile from Level 1. 20'W X 90'L X 4'H. Rejected 2 pieces with unexpressed fractures.
	Dyer Quarry	R-6	One stockpile from Level 1. 50'W X 125'L X 4'-12'H. Rejected 2 pieces with different appearance. Because of limited percentage visible, decided to perform additional inspections of R-6 material at the Reading site.
	Dyer Quarry	R-4	Inspected visible portions of current stockpiles. No undesirable rocks.
11/2/07	Reading Site	R-7	Inspected stockpile and material being measured for gradation determination. Rejected 1 piece. Instructed Engineer personnel on features to reject if encountered during measurements.
11/13/07	Reading Site	R-7	Inspected stockpile and placement test section of cover. No undesirable pieces.
		R-6	Inspected stockpile and placement test section of cover. No undesirable pieces.
		R-4	Inspected stockpile and placement test section of cover. No undesirable pieces.
11/20/07	Reading Site	R-7	Inspected stockpile and cover. No undesirable pieces.
		R-6	Inspected stockpile and cover. Rejected 2undesirable pieces (1-concrete and 1-different appearance.
		R-4	Inspected stockpile and cover. No undesirable pieces.
11/29/07	Reading Site	R-7	Inspected stockpile and cover. No undesirable pieces.
		R-6	Inspected stockpile and cover. No undesirable pieces.
		R-4	Inspected stockpile and cover. No undesirable pieces.
12/6/07	Reading Site	R-7	Inspected stockpile and cover. No undesirable pieces.
		R-6	Inspected stockpile and cover. No undesirable pieces.
		R-4	Inspected stockpile and cover. No undesirable pieces.
12/13/07	Reading Site	R-7	Inspected stockpile and cover. No undesirable pieces.
		R-6	Inspected stockpile and cover. Rejected 1 piece of concrete. Instructed operator on undesirable features to reject if encountered.
		R-4	Inspected stockpile and cover. No undesirable pieces.
1/3/08	Reading Site	R-7	Inspected remaining stockpile and cover (90% complete). No undesirable pieces.

		R-6	Inspected remaining stockpile and cover (90% complete). No undesirable pieces.
		R-4	Inspected remaining stockpile and cover (90% complete). No undesirable pieces.
1/30/08	Reading Site	R-7	Inspected completed cover. Two pieces with different appearance. One piece of concrete. All isolated – will not impact performance.
		R-6	Inspected completed cover. One piece with unexpressed fractures. One piece with different appearance. All isolated - will not impact performance
		R-4	Inspected completed cover. No undesirable pieces.

PHOTOGRAPHS

PHOTO 3-1   COMPLETED ACCESS ROAD & SILT FENCE

PHOTO 3-2 SOUTHWEST CORNER OF SITE PRIOR TO CLEARING

PHOTO 3-3 SOUTHEAST CORNER OF SITE PRIOR TO CLEARING

PHOTO 3-4 SITE CLEARING

PHOTO 3-5 SITE CLEARING

PHOTO 3-6 SITE CLEARING

PHOTO 3-7 SITE CLEARING

PHOTO 3-8 SITE CLEARING

PHOTO 3-9 SUBGRADE MAINTENANCE

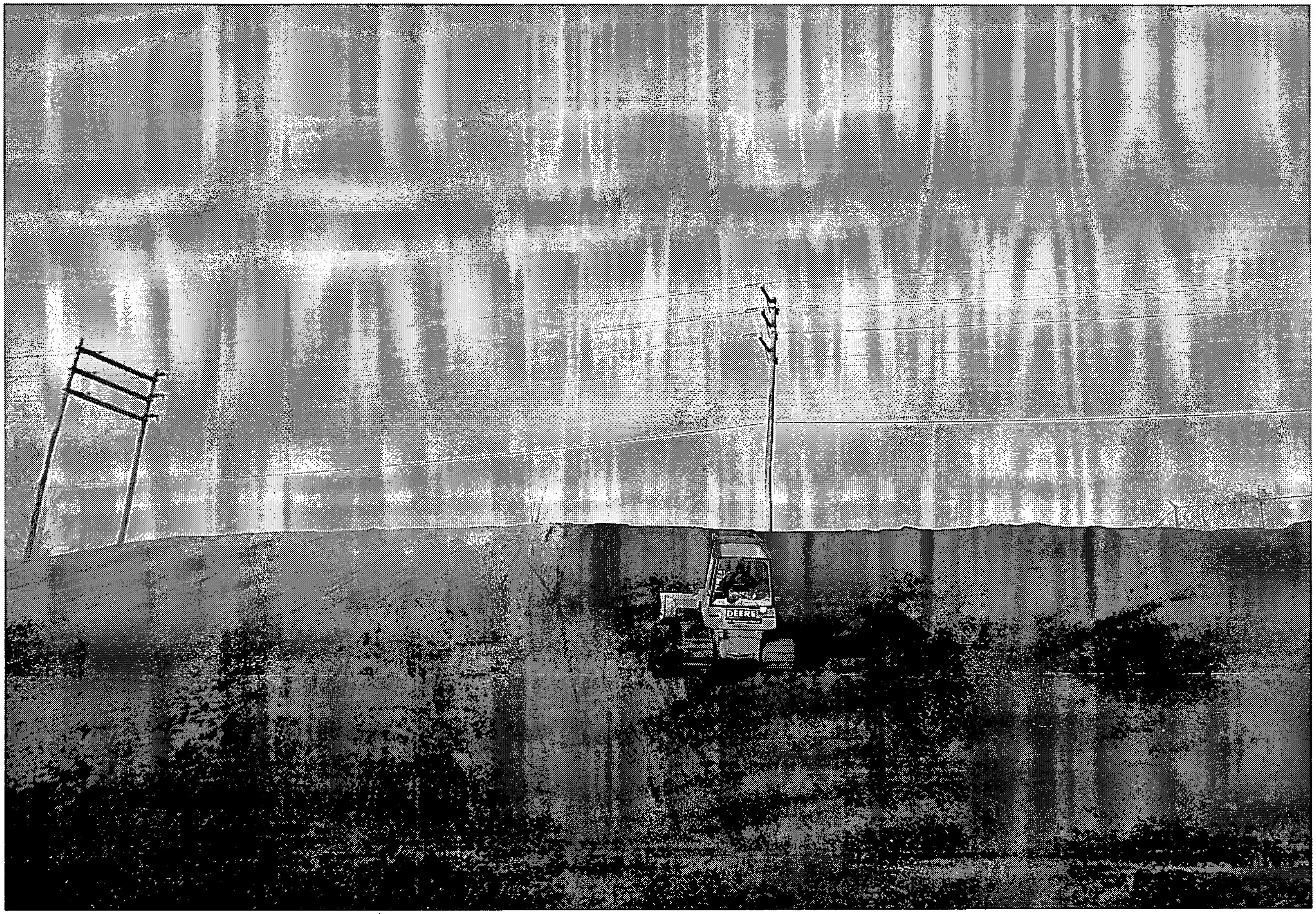


PHOTO 3-10 SUBGRADE MAINTENANCE

PHOTO 3-11 STUMP REMOVAL

PHOTO 3-12 STUMP REMOVAL

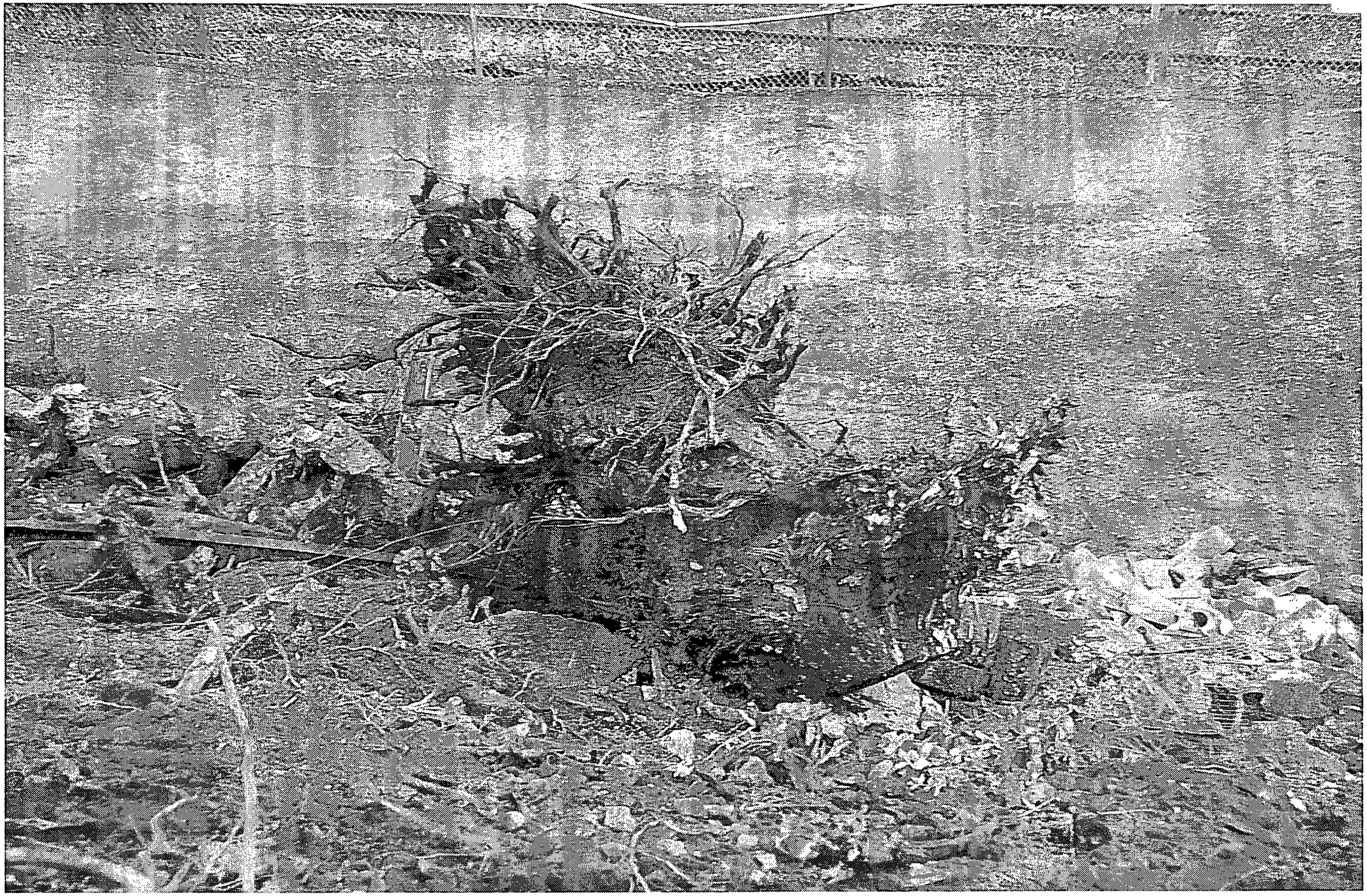


PHOTO 3-13 STUMP REMOVAL

PHOTO 3-14 STUMP REMOVAL

PHOTO 3-15 COMPLETED SUBGRADE

PHOTO 3-16 COMPLETED SUBGRADE

PHOTO 3-17 COMPLETED SUBGRADE

PHOTO 3-18 R-7 TEST PAD

PHOTO 3-19 R-7 TEST PAD

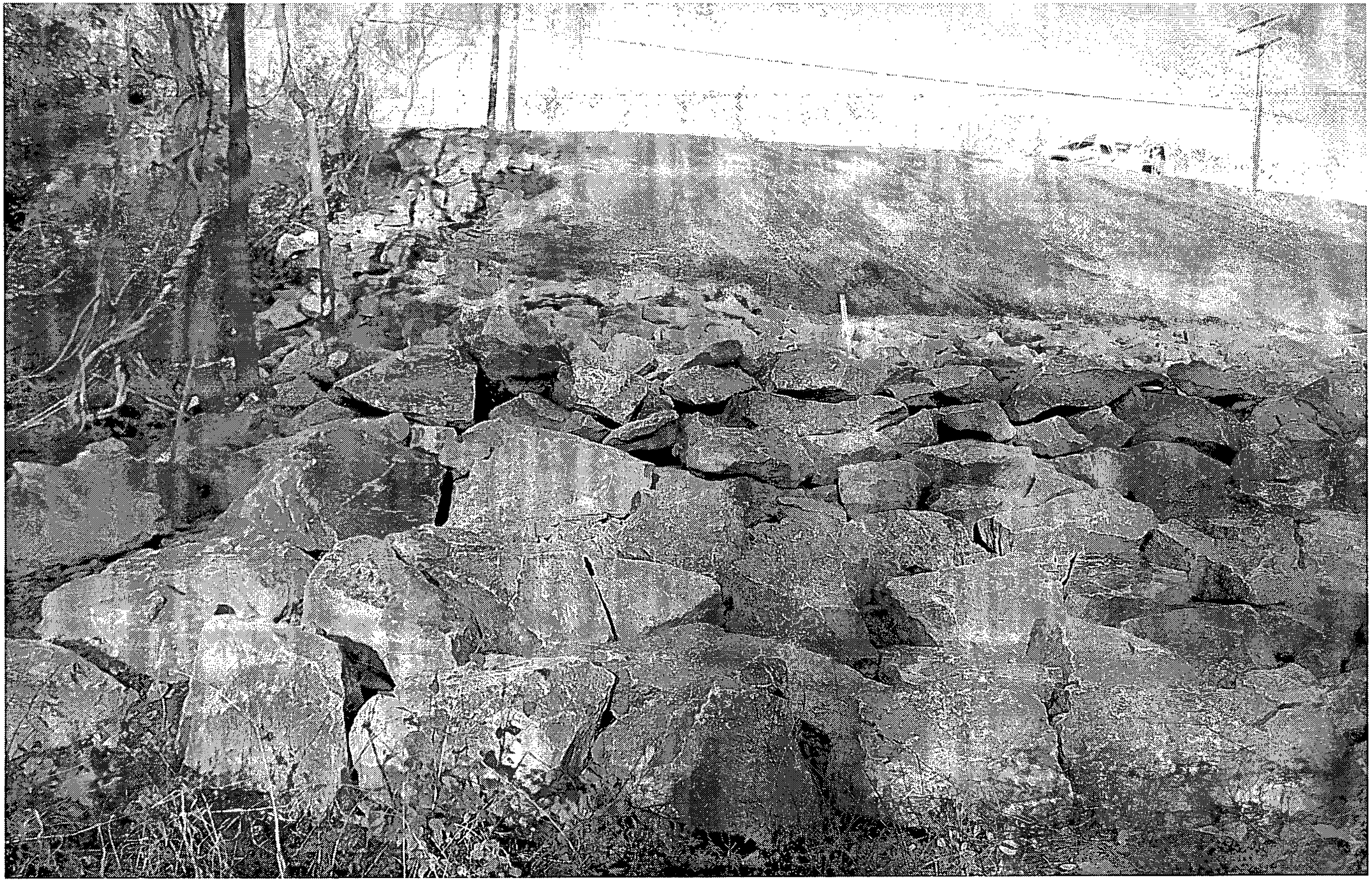


PHOTO 3-20 R-4 & R-6 TEST PADS

PHOTO 3-21 BEDDING LAYER

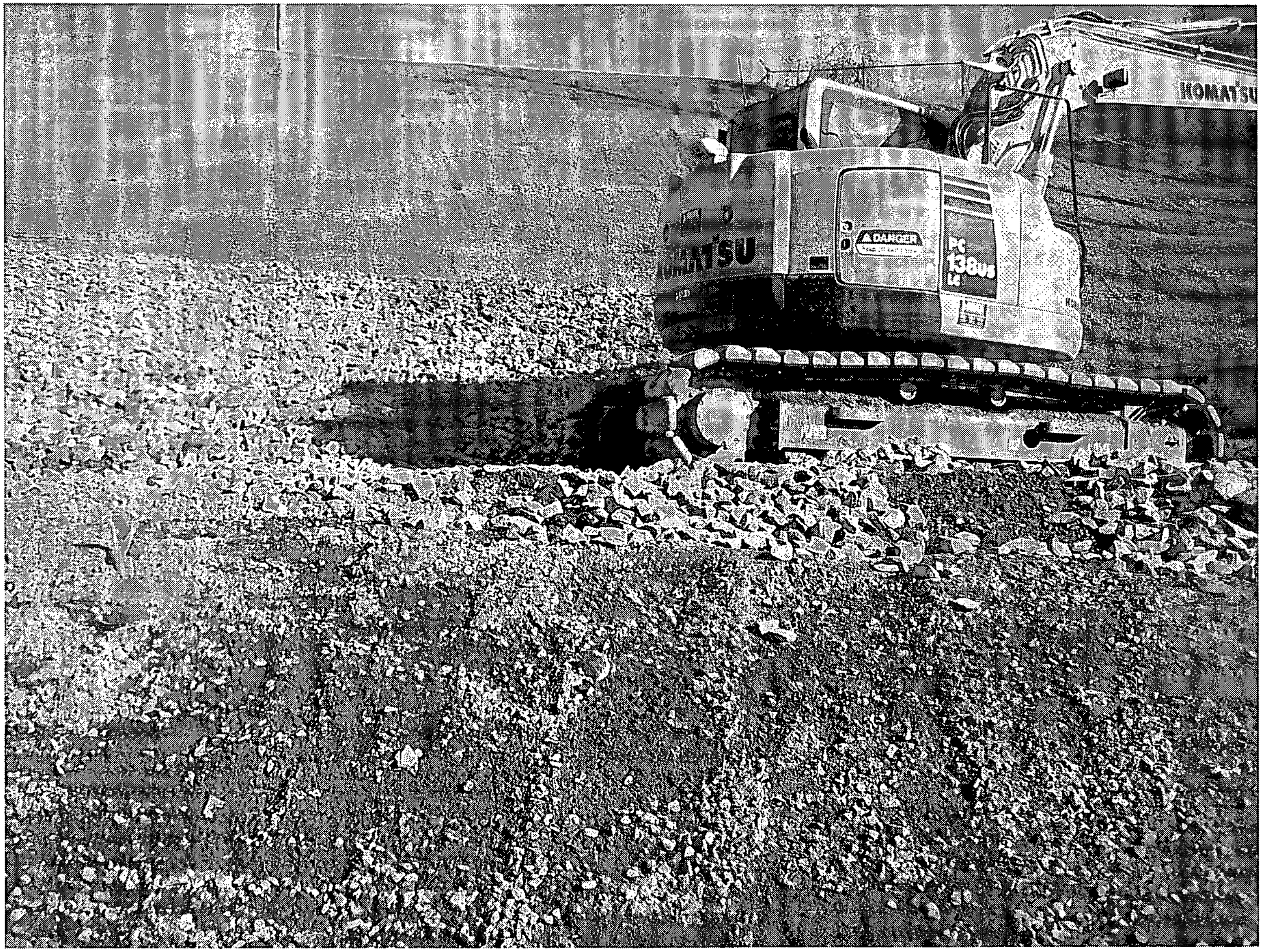


PHOTO 3-22 BEDDING LAYER

PHOTO 3-23 BEDDING LAYER

PHOTO 3-24 BEDDING LAYER

PHOTO 3-25 ARMORING WEST EDGE OF COVER

PHOTO 3-26 ARMORING WEST EDGE OF COVER

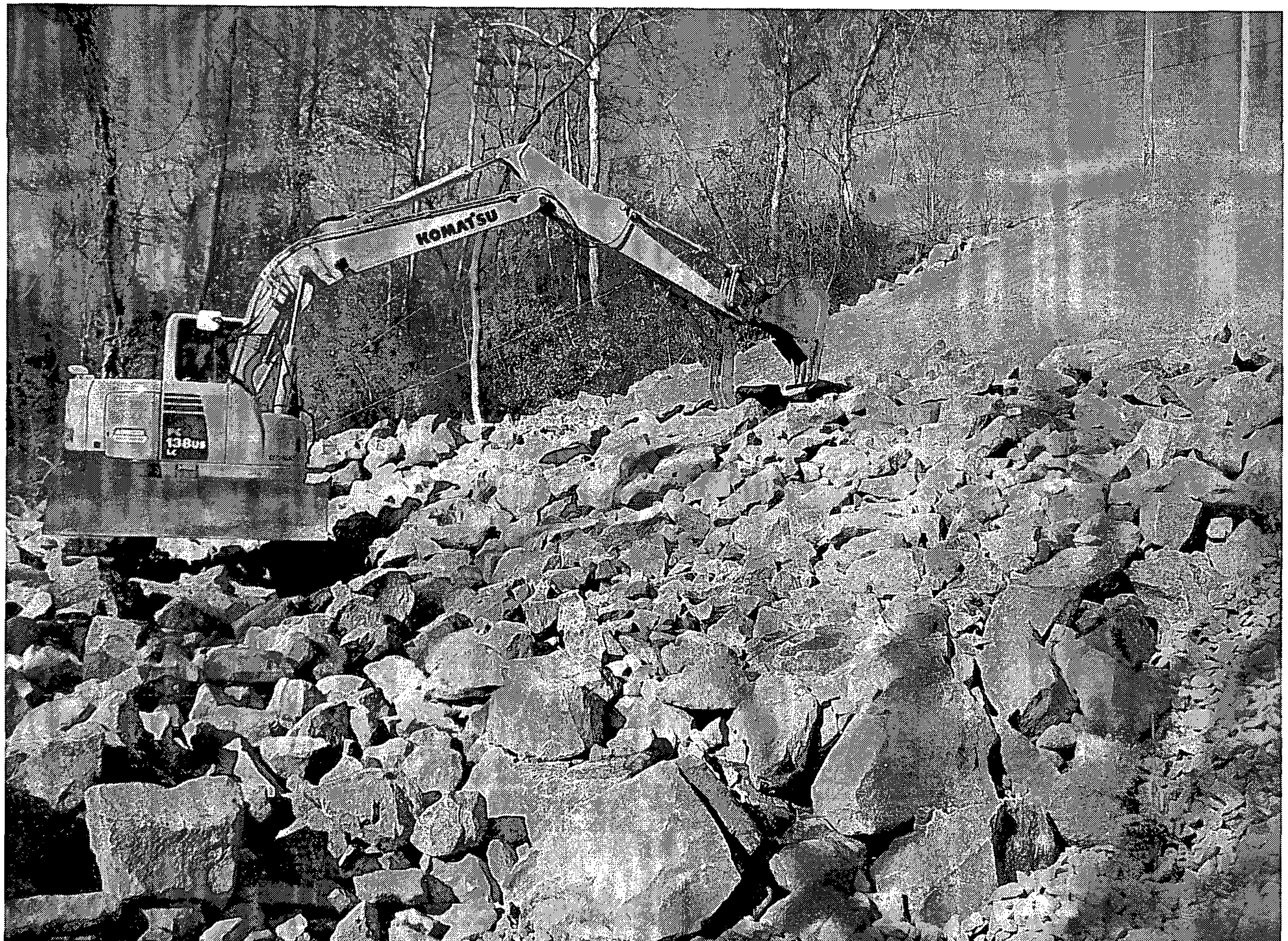


PHOTO 3-27 R-6 PLACEMENT

PHOTO 3-28 R-4 PLACEMENT

PHOTO 3-29 R-4 PLACEMENT

PHOTO 3-30 R-4 PLACEMENT

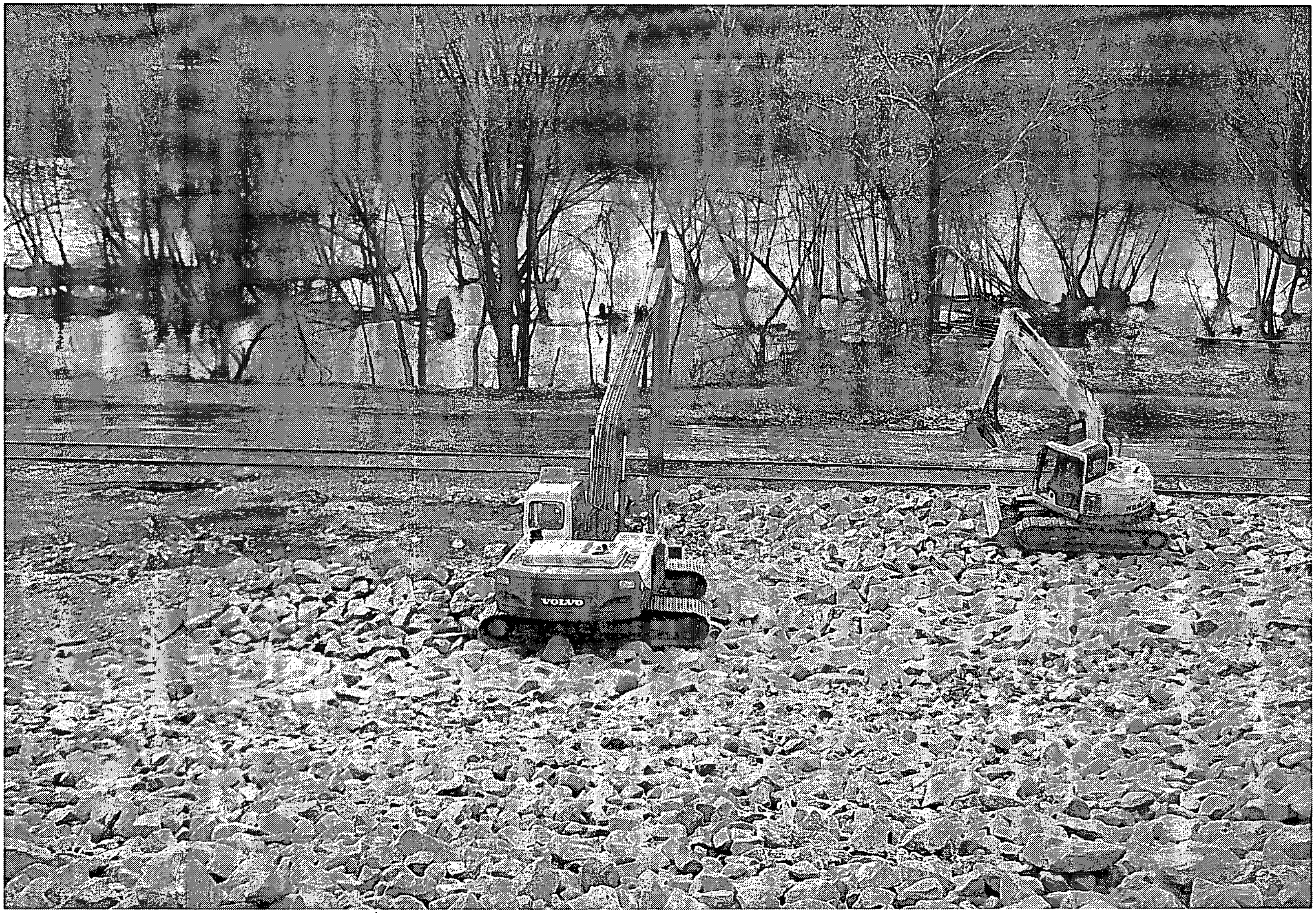


PHOTO3-31 R-7 PLACEMENT

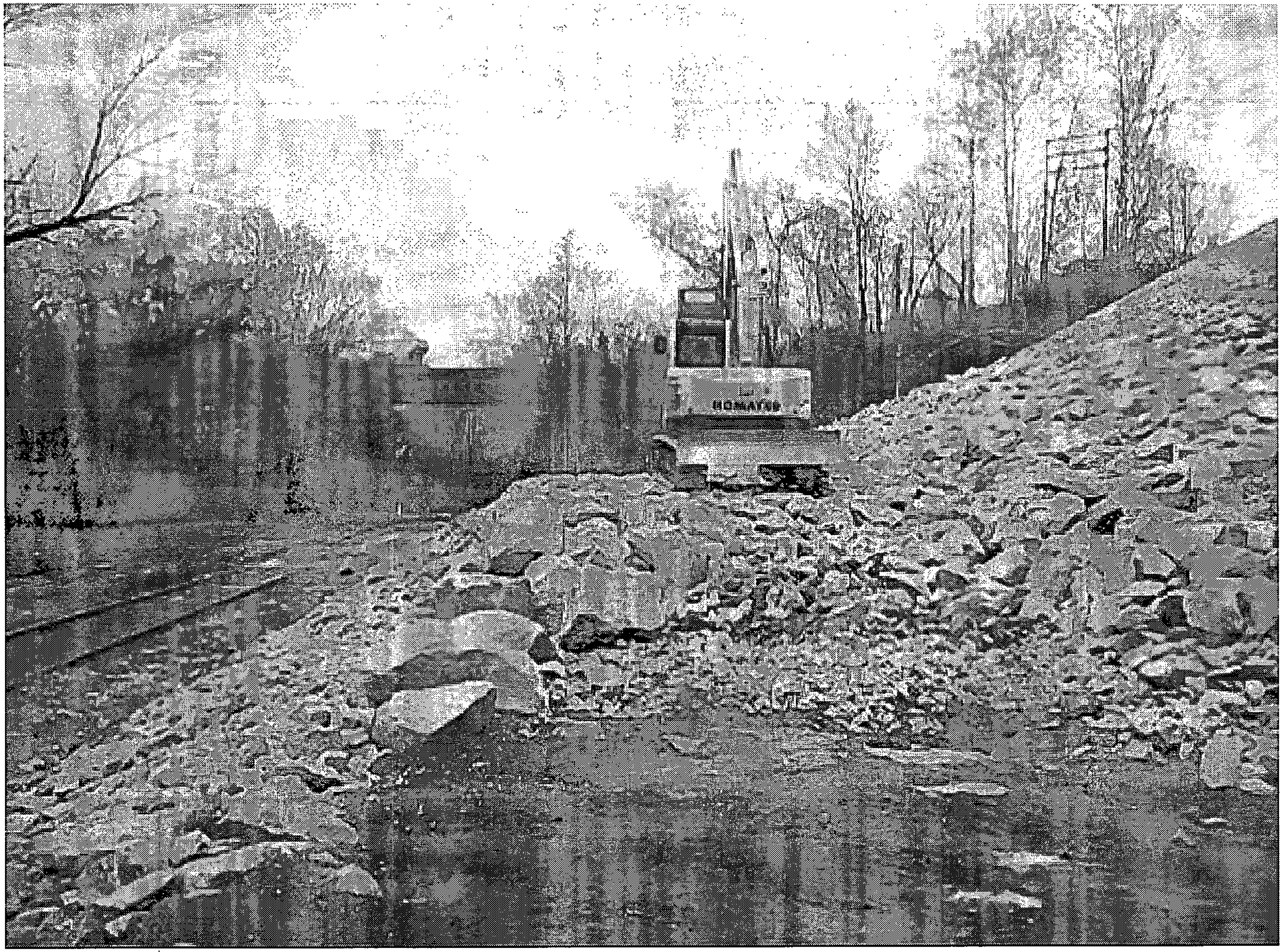


PHOTO 3-32 R-7 PLACEMENT

PHOTO 5-1 TRIAL SECTION

PHOTO 5-2 TIAL SECTION

PHOTO 5-3 TRIAL SECTION

PHOTO 5-4 TRIAL SECTION

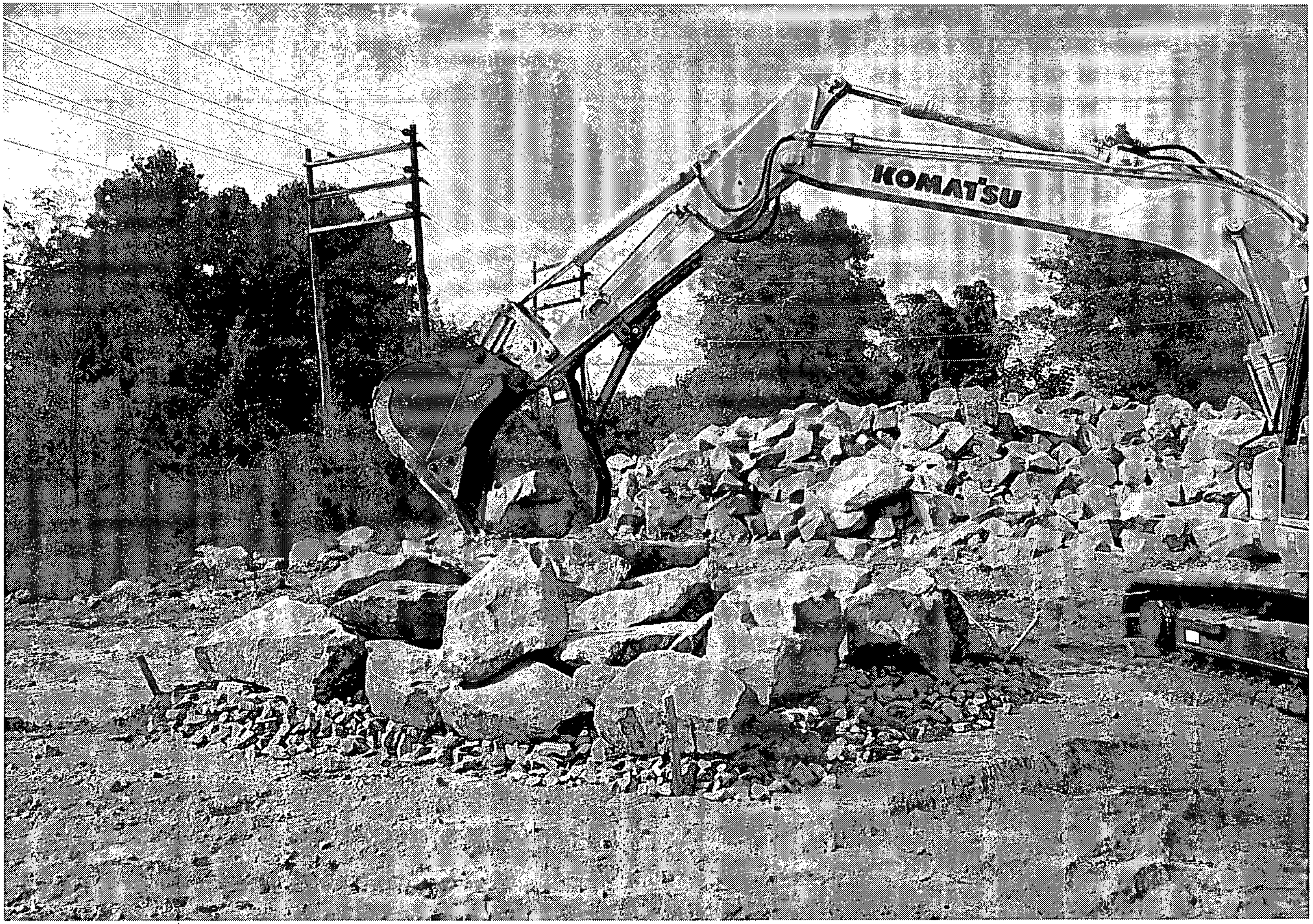


PHOTO 5-5 TRIAL SECTION1

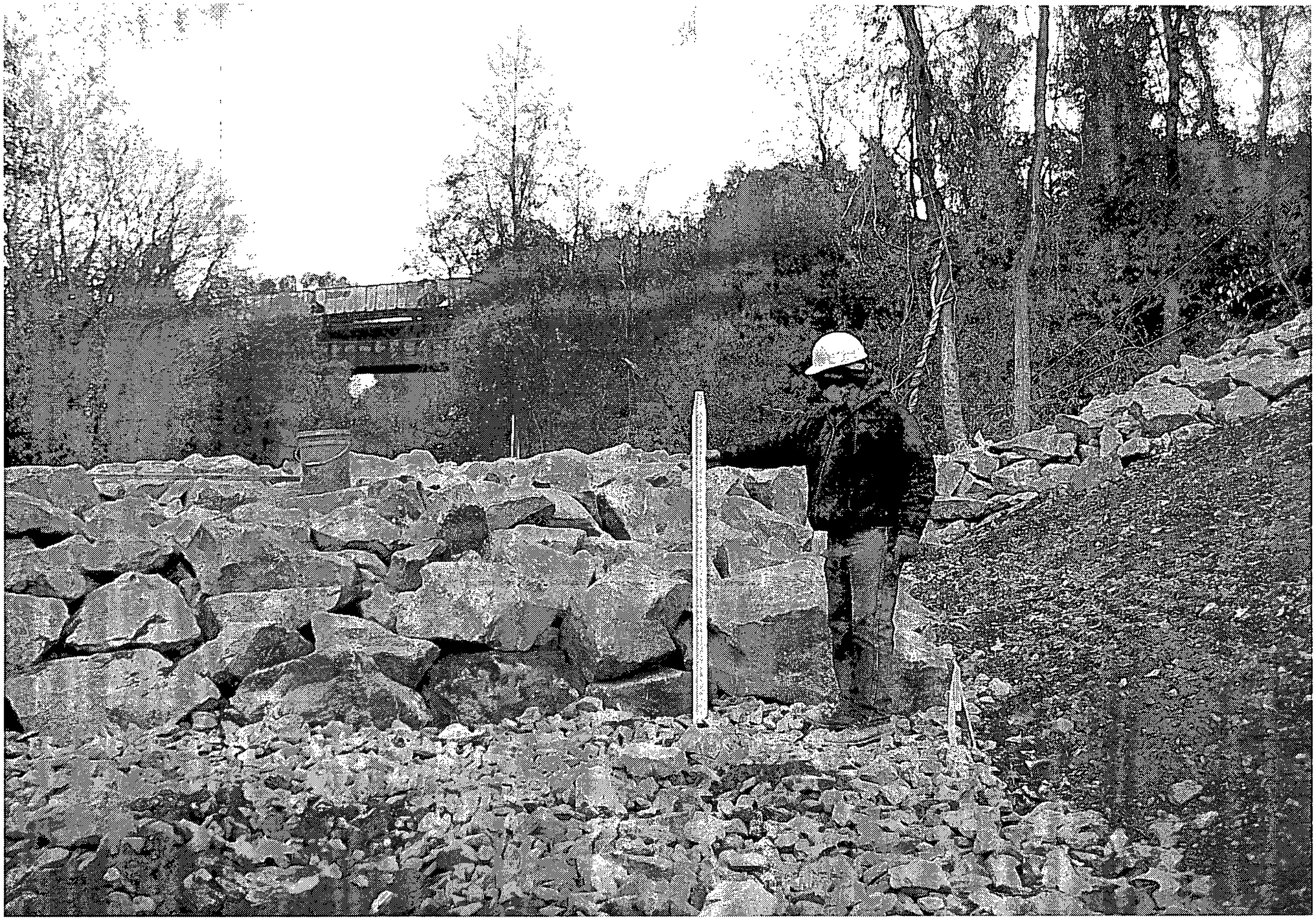


PHOTO 5-6 FIELD QA/QC

PHOTO 5-7 FIELD QA/QC

PHOTO 5-8 FIELD QA/QC

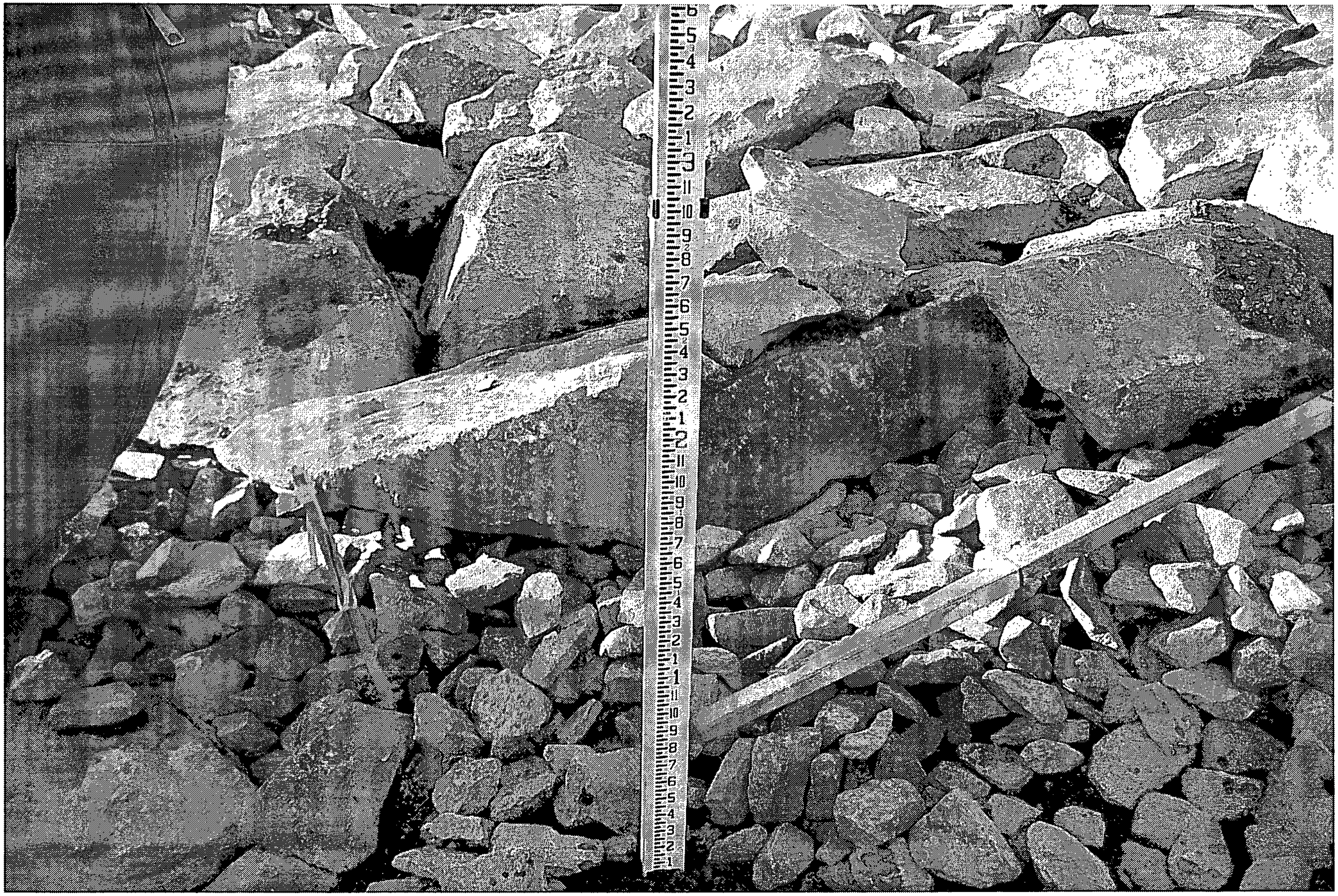


PHOTO 5-9 FIELD QA/QC

PHOTO 5-10 FIELD QA/QC

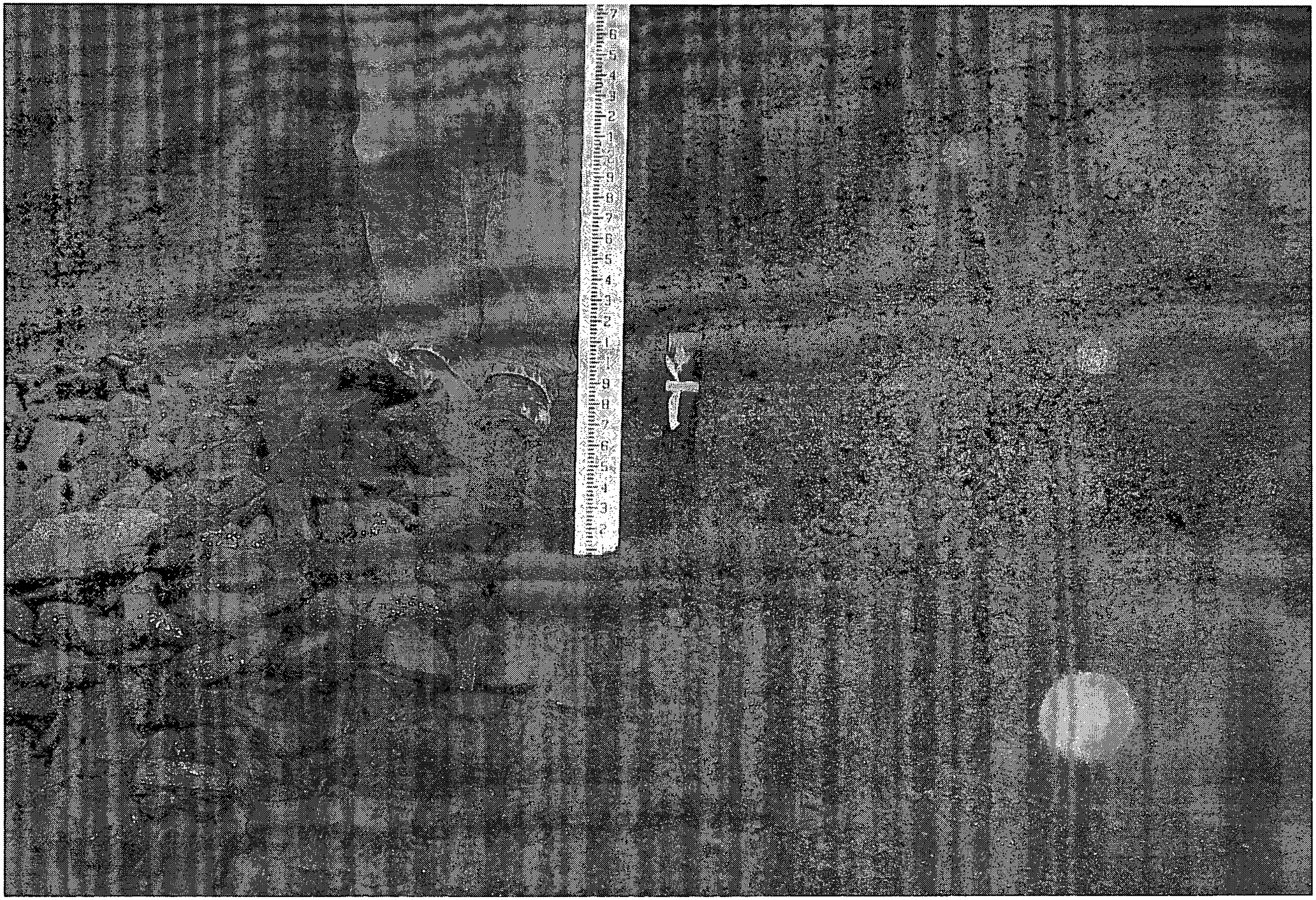


PHOTO 5-11 FIELD QA/QC

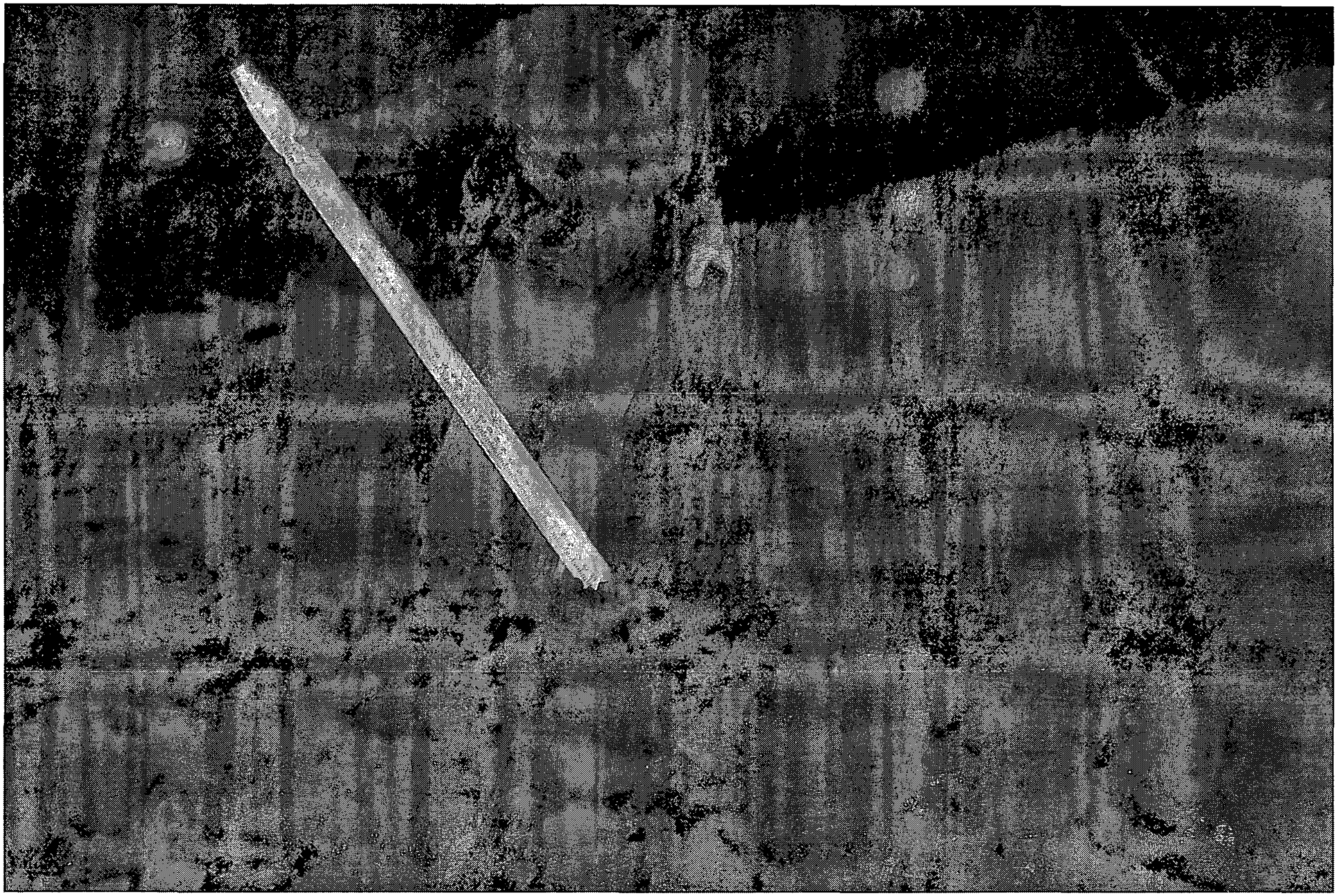


PHOTO 5-12 FIELD QA/QC

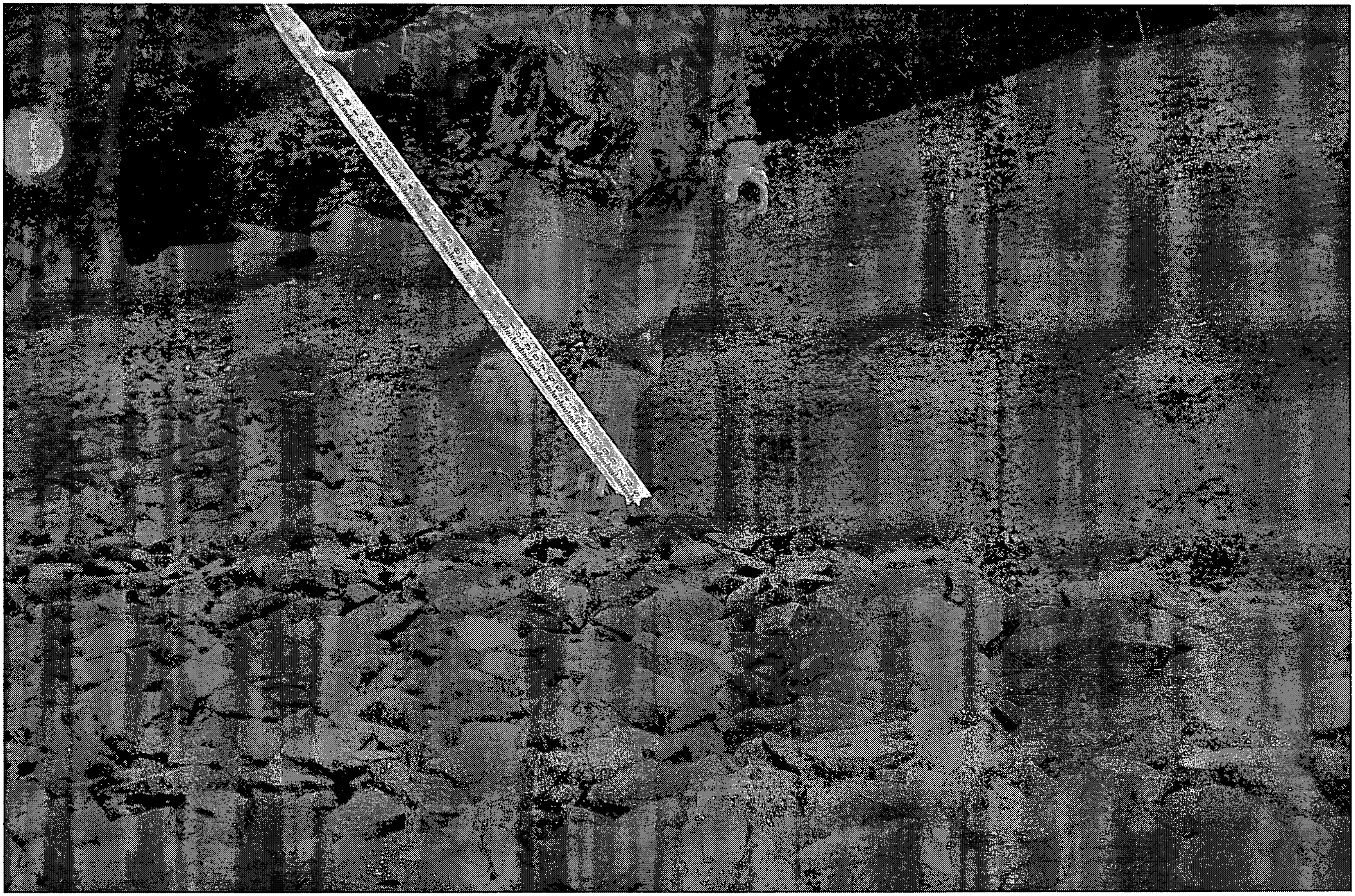


PHOTO 5-13 FIELD QA/QC

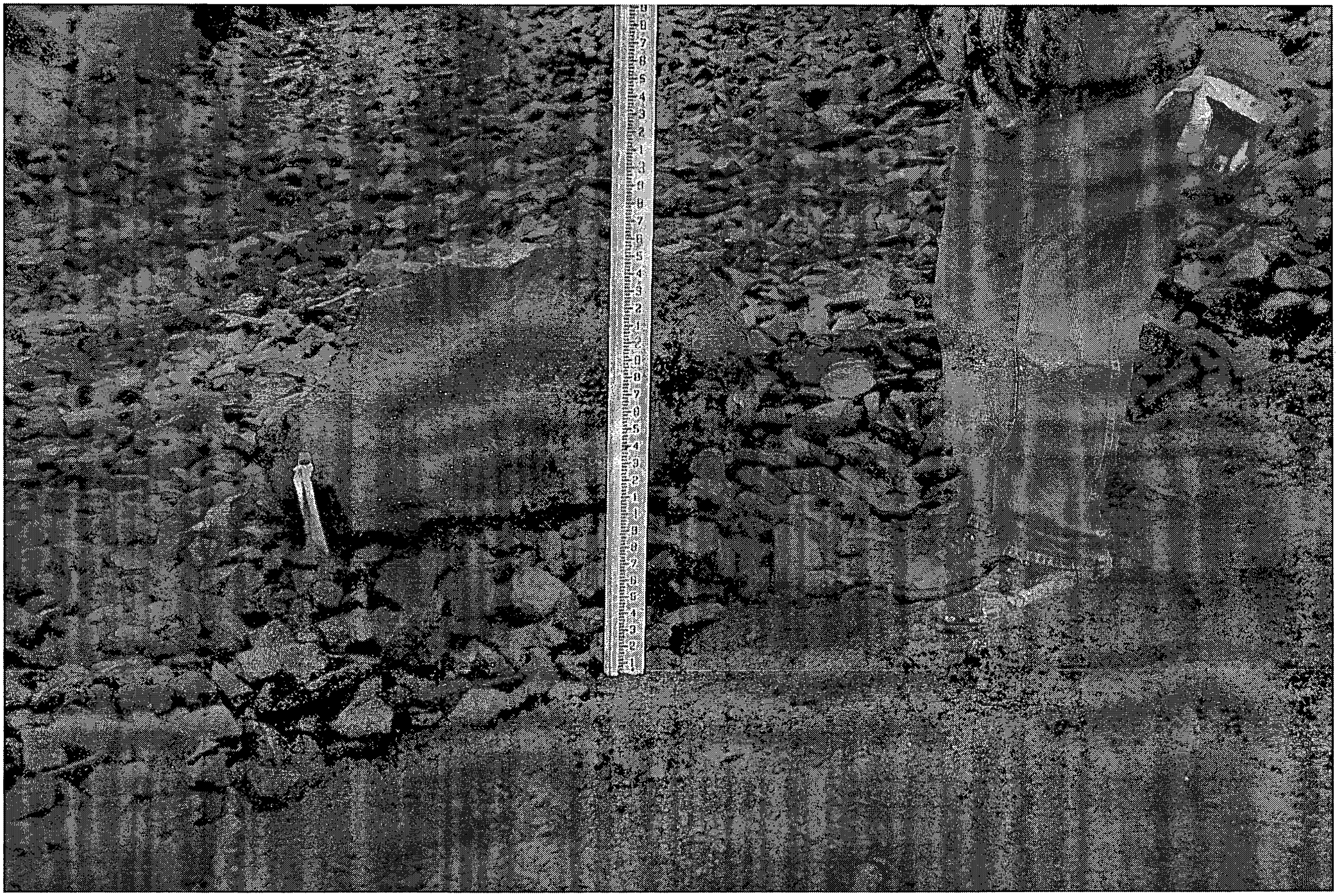
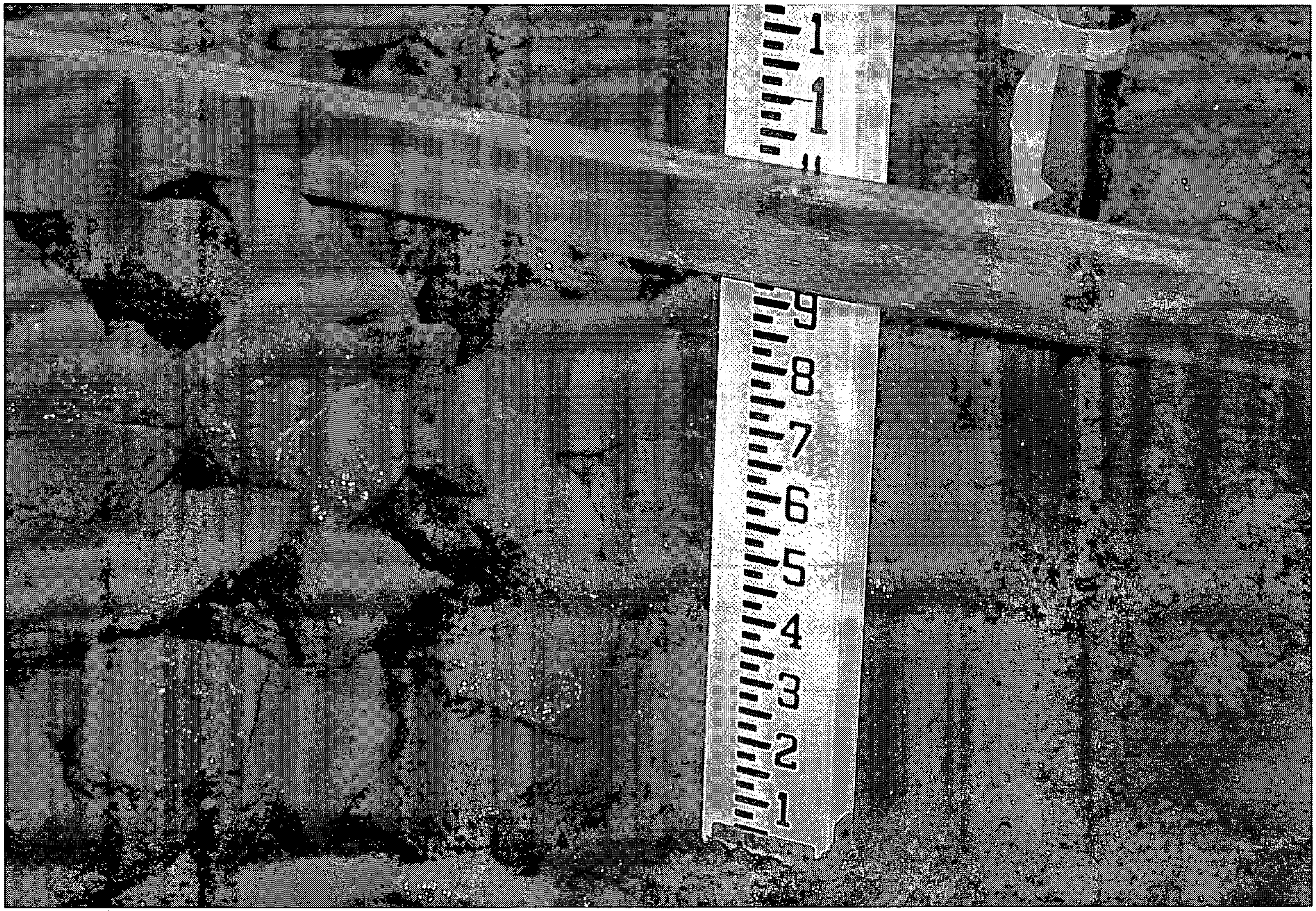


PHOTO 5-14 FIELD QA/QC



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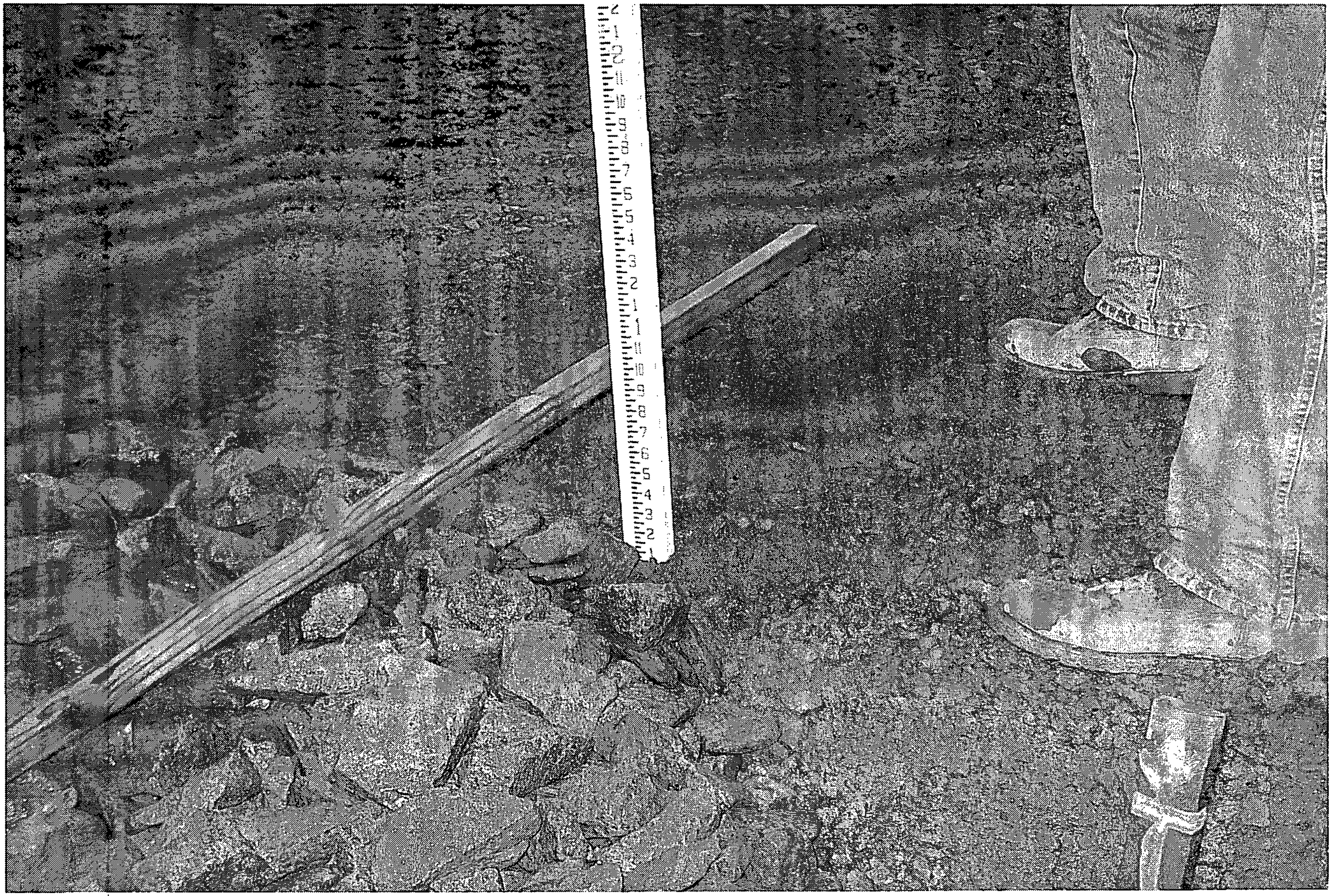

PHOTO 5-16 FIELD QA/QC

PHOTO 5-17 FIELD QA/QC

PHOTO 5-18 FIELD QA/QC

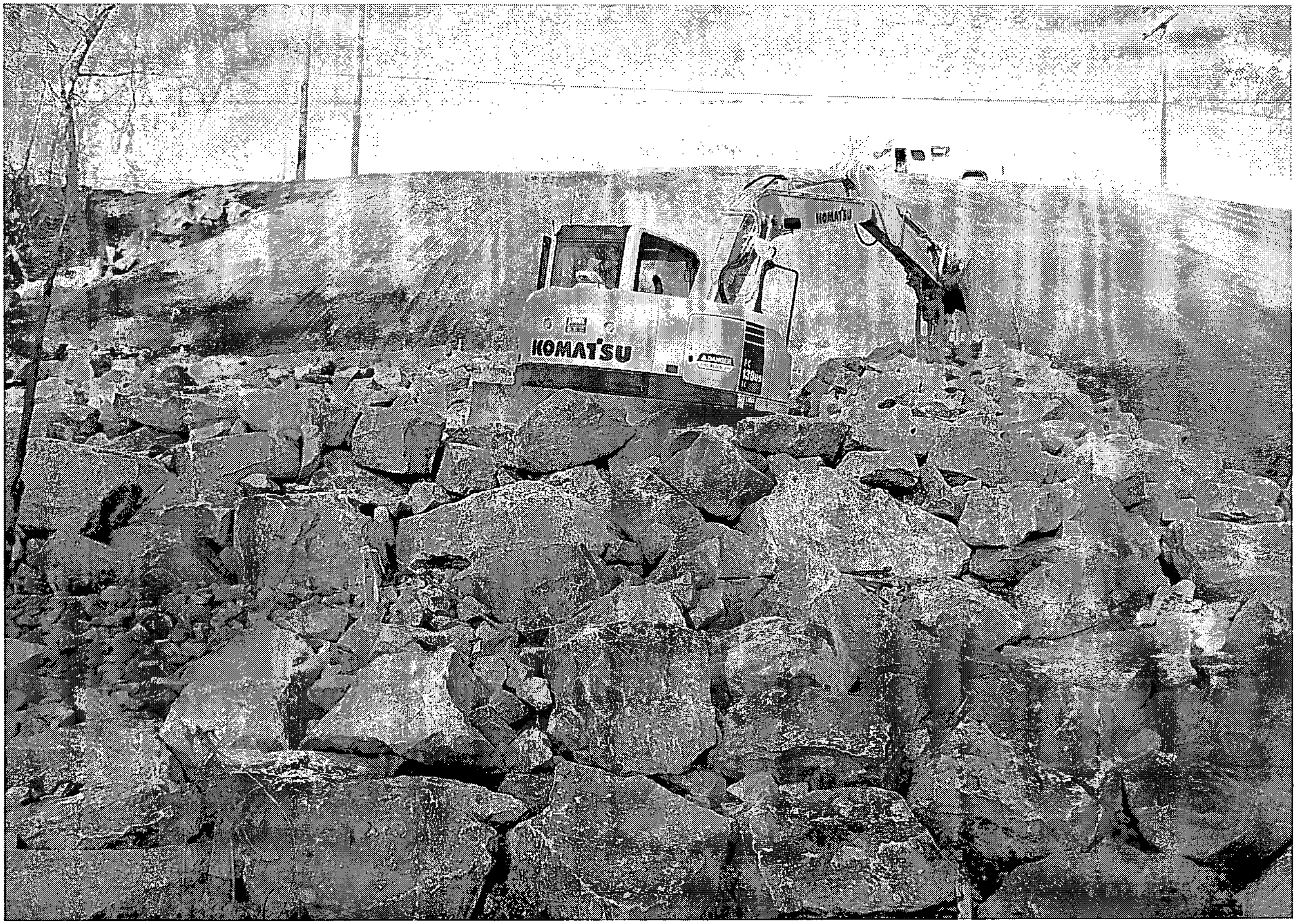

PHOTO 5-19 FIELD QA/QC

PHOTO 5-20 FIELD QA/QC

PHOTO 5-21 FIELD QA/QC

PHOTO 5-22 FIELD QA/QC

PHOTO 5-23 FIELD QA/QC

PHOTO 5-24 FIELD QA/QC

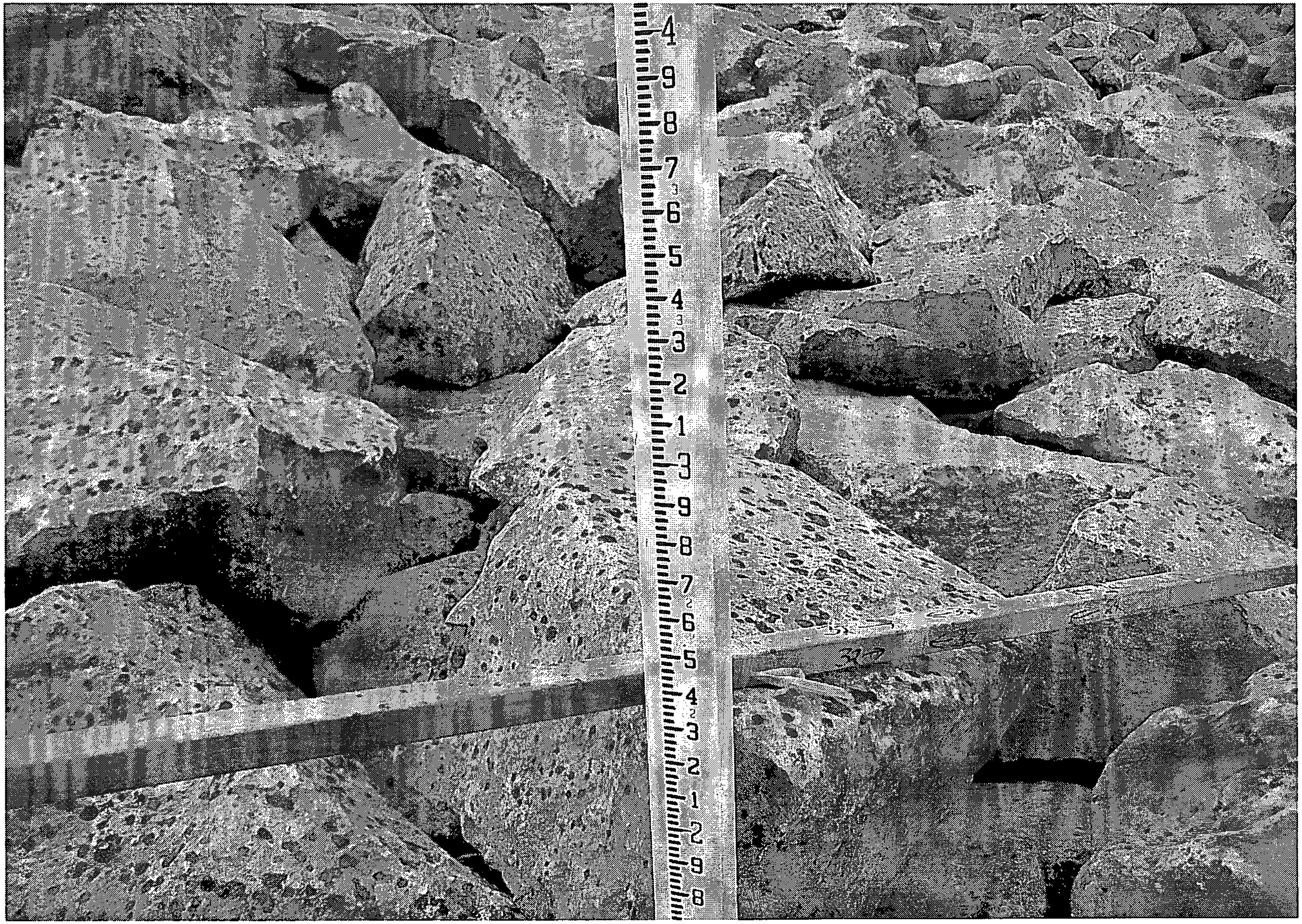

PHOTO 5-25 FIELD QA/QC

PHOTO 5-26 FIELD QA/QC

PHOTO 5-27 FIELD QA/QC

PHOTO 5-28 FIELD QA/QC

PHOTO 5-29 FIELD QA/QC

PHOTO 5-30 FIELD QA/QC

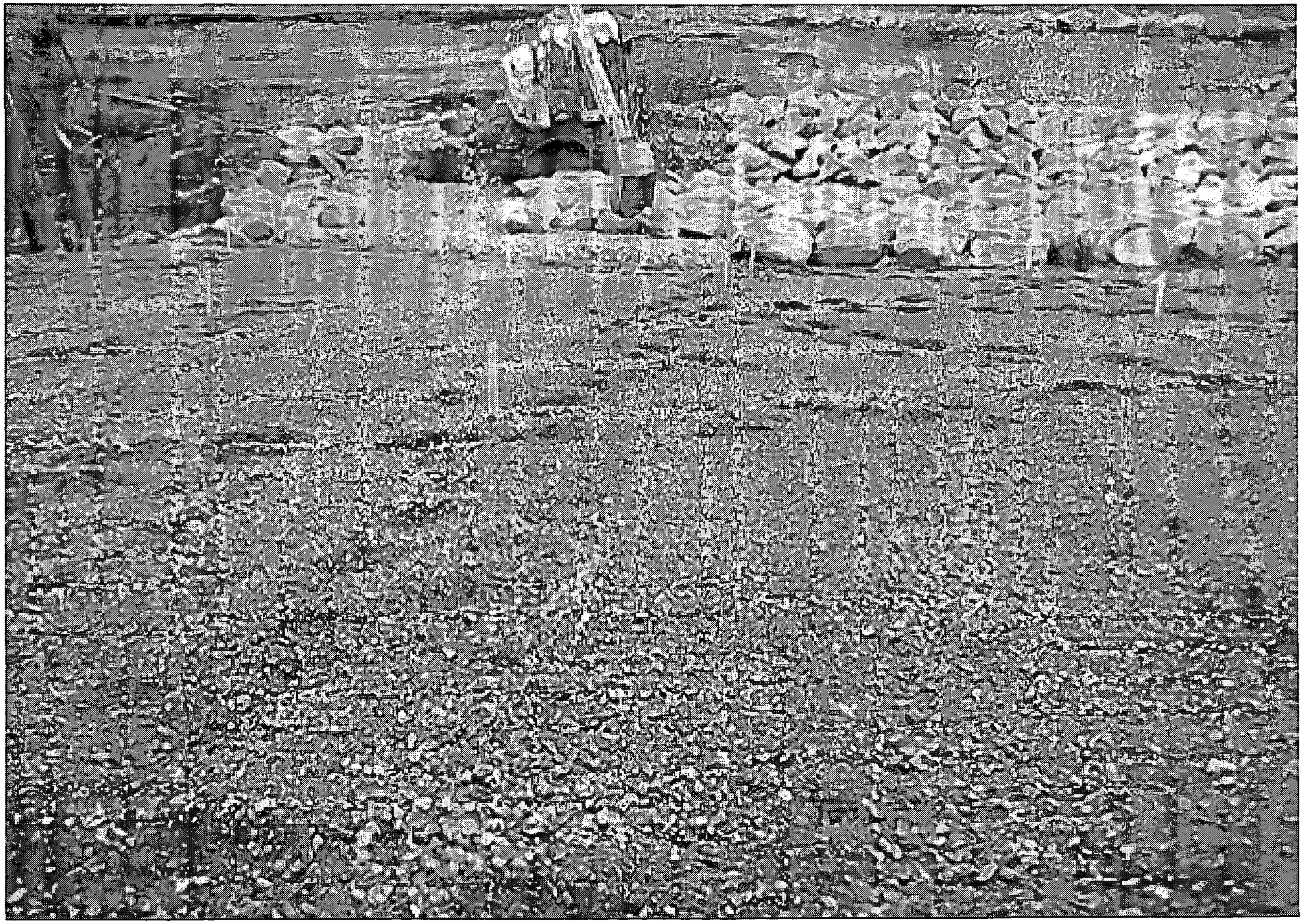

PHOTO 5-31 FIELD QA/QC

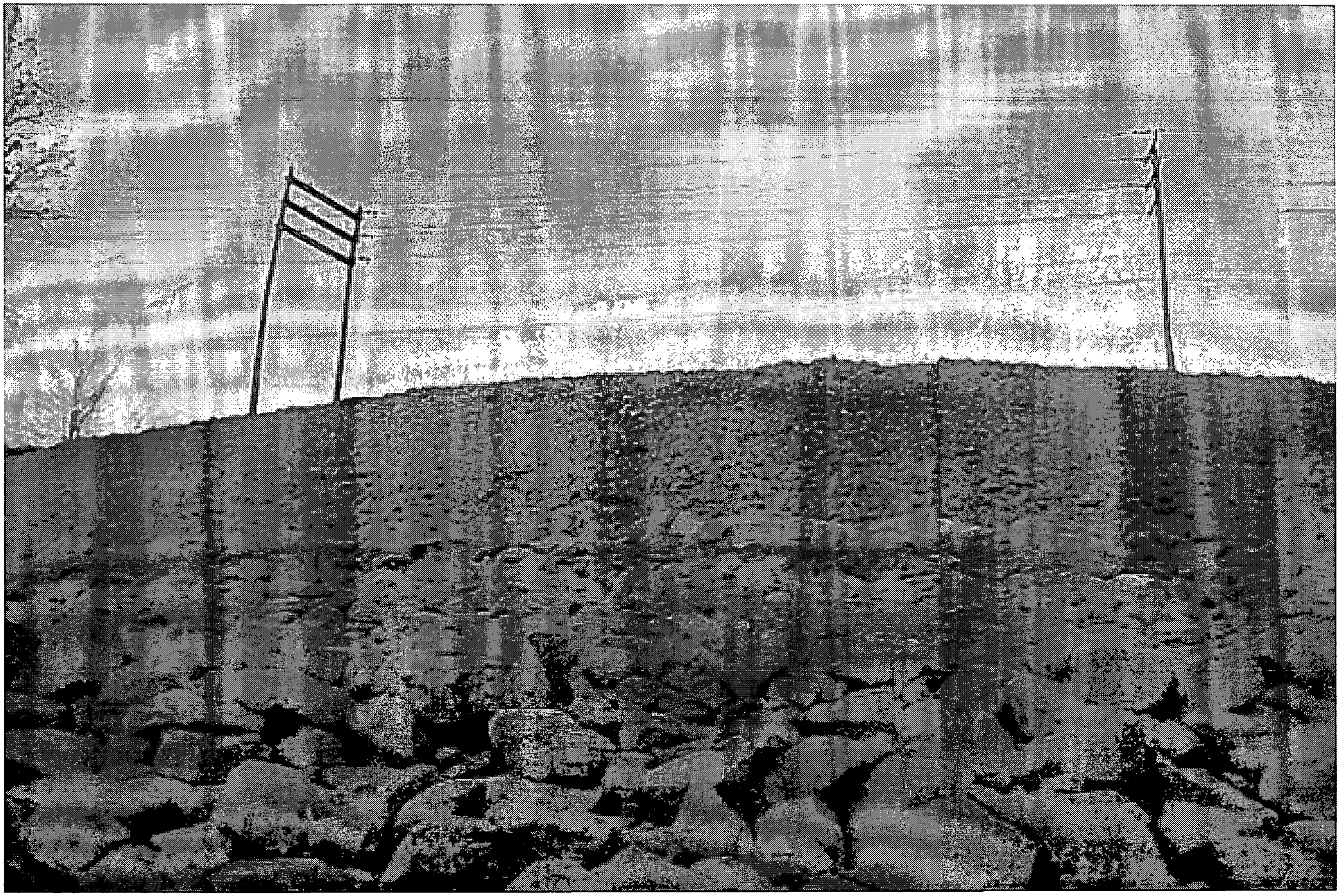

PHOTO 5-32 FIELD QA/QC

PHOTO 5-33 FIELD QA/QC

PHOTO 5-34 FIELD QA/QC

PHOTO 5-35 FIELD QA/QC

PHOTO 5-36 FIELD QA/QC

PHOTO 5-37 FIELD QA/QC

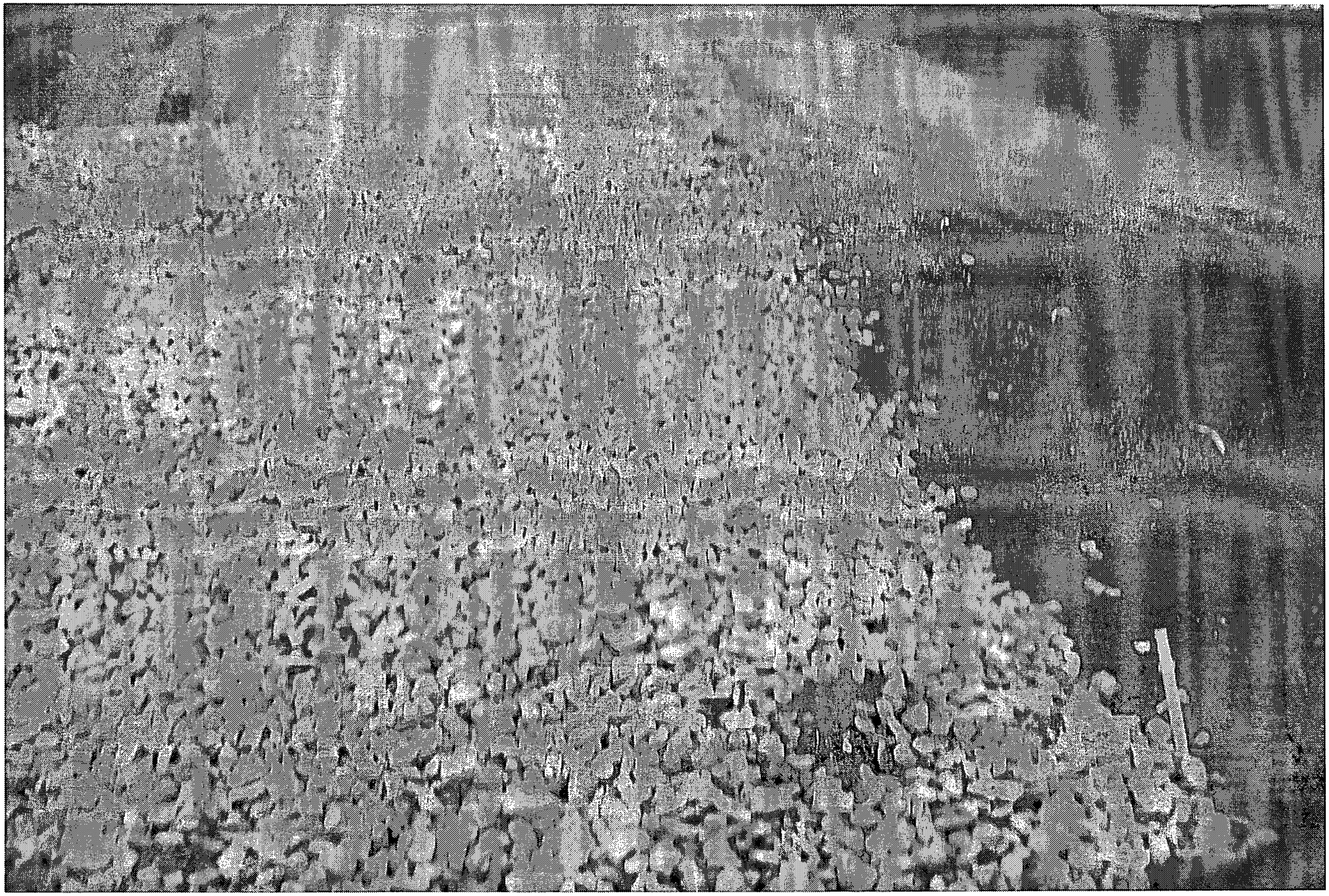

PHOTO 5-38 FIELD QA/QC

APPENDICES

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