CONSTRUCTION REPORT

GOLDEN EAGLE PARK DAM MODIFICATIONS

CONTRACT NO. FCD 1999C071

FOR:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TOWN OF FOUNTAIN HILLS
FOUNTAIN HILLS UNIFIED SCHOOL DISTRICT
ARIZONA DEPARTMENT OF WATER RESOURCES

MARCH 2001

Stantec

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INTRODUCTION

GENERAL

Deficiency with the Golden Eagle Park Dam (GEP Dam) principal outlet works and related flood hazards to the Fountain Hills High School were originally identified in the Fountain Hills (North) Floodplain Delineation Study. The study identified that the principal outlet works (two 60" reinforced concrete pipes) could not pass the 100-year flood without causing the emergency spillway to operate. Deficiency with the emergency spillway, and the resultant dam safety issue was identified in a dam break study of GEP Dam. The study identified that the emergency spillway could not pass a 0.5 probable maximum flood (PMF) inflow design flood without overtopping the dam. Subsequently, the dam was classified as unsafe, non-emergency by the Arizona Department of Water Resources (ADWR). The design of modifications to the dam was completed by Stantec Consulting, Inc. and is documented in the report entitled Golden Eagle Park Dam, Modification Final Design. Construction plans and specifications were also prepared by Stantec and were approved for construction in May 2000.

PURPOSE

The primary purpose of this project is to construct modifications to the GEP dam and spillway that meet ADWR dam safety requirements. The secondary purpose is to diminish the flood hazard to the Fountain Hills High School located immediately to the south (right abutment) of the dam and emergency spillway, and to the high school athletic field that is located immediately below the emergency spillway.

SCOPE OF REPORT

This construction report presents the documentation of the construction of the dam modifications. The report is to correspond to approved as-built plans and specifications. Supporting material including the plans, specs, supplemental drawings, shop drawings, testing and inspection reports and other material are contained in appendices at the end of the report and are an essential part of the report by reference.

MODIFICATIONS TO THE DAM

GENERAL

Modifications to the dam include the following major items:

- Raising the earth embankment
- Widening the emergency spillway
- Constructing an auxiliary outlet works
- Modifying the principal outlet works

EMBANKMENT RAISE

The earthen embankment of the dam was raised five feet from its present elevation of 1721.5 feet to elevation 1726.5. The existing dam has 1V:2.3H slopes on both the upstream and downstream embankment, and has a 12-foot crest width. The raise consisted of adding new embankment to the upstream slope using a 1V:2H slope and a 12-foot crest width.

Rainfall induced erosion of the downstream slope was also repaired by stripping off the top layer down to a competent surface and re-compaction. The upstream slope was stripped to a depth of approximately 2 feet prior to raising the embankment. All trees and deep-rooted brush were cleared from the slopes prior to construction. A layer of rip-rap was placed at the toe of the upstream embankment in Cloudburst Wash to protect the upstream toe of the dam.

EMERGENCY SPILLWAY

The emergency spillway, constructed in the right abutment of the dam, was enlarged 90 feet by removing the top 8.6 feet of existing dam embankment for a length of 90 feet. The concrete cutoff wall was extended the full 90-foot length of the spillway enlargement. The widened section of the spillway cutoff wall is 2.0 feet lower than the existing spillway cutoff wall. This section of the spillway was backfilled level with the existing spillway with an erodible "fuse plug" fill.

The right end of the embankment where it forms the left side of the emergency spillway is protected by a gabion slope that is tied to the concrete cutoff wall. The right side of the emergency spillway, adjacent to the school grounds, is defined by a concrete floodwall that begins at the sidewalk access to the amphitheater and extends upslope into the existing high ground.

Erosion protection of the emergency spillway immediately downstream of the concrete cutoff wall consists of a one-foot thick gabion mattress anchored to the slope with steel posts.

AUXILIARY OUTLET WORKS

The auxiliary outlet works consists of a concrete box culvert structure installed in the embankment about 110 feet to the south of the existing principal outlet works. The box culvert is 4 feet high by 10 feet wide and 117 feet long and is cast in place. The auxiliary outlet works includes upstream headwalls and a steel trashrack. It discharges to a concrete energy dissipater and into an excavated channel that returns the flow to Ashbrook Wash downstream of the principal outlet works. The excavated channel was lined with 18" rip-rap to prevent scour during operation of the outlet works.

Installation of the auxiliary outlet works required excavation of the earthen embankment near its maximum section. The excavated embankment was rebuilt to conform to the existing and raised embankment sections. A sand diaphragm around the culvert was constructed for seepage control.

A downstream access barrier on the box culvert was constructed as a wrought iron, breakaway fence. It includes a gate for inspection access to the outlet works.

PRINCIPAL OUTLET WORKS

A utility casing was installed in the 60 inch pipe containing the encased sewer. The pipe was grouted shut at both ends. The other 60 inch pipe was extended upstream through the dam embankment. The downstream energy dissipater was not altered, however an access barrier was installed as a wrought iron, breakaway fence. It includes a gate for inspection access to the outlet works. A concrete inlet headwall was installed to accommodate the upstream embankment raise. The timber trashrack was removed and a steel trashrack incorporated into the new headwall.

OTHER

Other miscellaneous improvements include the following:

- Raising the block wall in front of the gymnasium
- Construction of a masonry retaining wall in the amphitheater
- Construction of chain link fencing
- Excavation to lower the spillway approach
- Excavation to lower and widen the channel along the toe of the dam
- Utility relocations
- Replanting and seeding of disturbed areas

CONSTRUCTION

GENERAL

The project was issued for public bidding on March 24, 2000. The bids were opened on May 4, 2000 at the Flood Control District. Hunter Contracting was the low bidder and was awarded the contract. The Pre-Construction meeting was held on May 30, 2000 and a Notice to Proceed was given for June 5, 2000. A period of 180 calendar days was allowed for completion of the contract. Additionally, a 60 day milestone was placed on construction of the auxiliary outlet works and backfill to the original dam crest elevation. This was due to the probability of monsoon flooding causing damage to the dam during construction.

PROJECT TEAM

Table 1 lists the agencies, companies and personnel responsible for the construction of the modifications to the dam, material supply, inspection, testing, and regulatory approval.

TABLE 1

Name/Affiliation	Responsibility
Tom Renckly - FCDMC	District Project Manager
Shewa Shivaswami - FCDMC	District Resident Engineer/Construction Manager
Art DuBois - FCDMC	District Inspector
Larry Lambert - FCDMC	District Engineer
Chuck Gopperton - Stantec	Engineer of Record
Norm Wetz - AGRA E & E (AMEC)	Geotechnical Engineer
Tony Freiman - AGRA E & E (AMEC)	Geotechnical Engineer
Matt Manthey - AGRA E & E (AMEC)	Soils Technician
Jon Benoist - ADWR	Division of Dam Safety
Gerald Cox - ADWR	Division of Dam Safety
Rich Dobson - Fountain Hills School District	Owner's Representative
Jim Leubner - Town of Fountain Hills	Owner's Representative
Steve Ostwinkle - Hunter Contracting	General Contractor
Tom Leggat - Hunter Contracting	General Contractor
Larry Samples - Hunter Contracting	General Contractor
Bob Bann - Hunter Contracting	General Contractor
Jeff Brown - Hunter Contracting	General Contractor
Bob Carlson - Hunter Contracting	General Contractor
Jim Covey - Hunter Contracting	General Contractor
Chuck Lumer - Lumer Construction	Gabion SubContractor
Don Bain - Maricopa Ready Mix	Concrete Supplier
	Surveyor
Ken Ricker - Ricker Atkinson McBee & Assoc.	Geotechnical Consultant for Contractor

PROJECT COST

The Contractor's bid was for $1,021,346.50 including allowances for partnering, public information and project signs. The Engineer's estimate was $986,727.80. Two change orders were issued to adjust the contract time, quantities and to authorize additional work which included relocation and repair of utilities.

Deleted items of work included cleanup and foundation preparation for rock foundation. Reduced quantities were calculated for pavement removal and replacement and removals of existing improvements. The adjusted final project cost per the change orders was $1,003,047.95. The contract completion date was 12/22/00 for a total contract time of 201 days.

SEQUENCE OF CONSTRUCTION

Mobilization

The Contractor began mobilizing on June 6, 2000 and began clearing, grubbing and miscellaneous removals. The diversion dam was constructed using material stripped from the dam.

Following the clearing operations, the temporary construction fence was erected, the field trailer was brought in and utilities connected. During this time, the Contractor also called for a bluestake of utilities. Bluestaking discovered utility conflicts with water and electrical ducts at the spillway floodwall and near the bleachers.

Auxiliary Outlet Works

Excavation for the box culvert began on June 12th and was completed by June 20th. The material was stockpiled for possible re-use in the backfill and dam embankment. Stockpile locations were near the end of the football field, along the downstream slope and on top of the existing dam embankment. Separate stockpiles were maintained for impervious and pervious materials.

Groundwater was found on the upstream end of the culvert and three small dewatering wells were installed. A flowmeter was installed and the pumps were set to maintain the water level below the subgrade elevation. A log of the amount pumped was kept.

The Contractor requested that the box culvert be cast in place instead of pre-cast, and this change was approved. By June 20th, the revised plans for cast in place construction of the box culvert were forwarded to the field office and given to the Contractor.

Construction of the sand diaphragm under the box and subsequent construction of the forms for the concrete were delayed while waiting for pre-qualification of the filter sand for the diaphragm. Prequalification required testing the hydraulic conductivity, gradation and relative density of the material for compliance with the specifications. Following approval of the material, the sand diaphragm was then placed below the subgrade, concrete forms and steel constructed and the subgrade inspected and approved prior to the first concrete pour on July 7th. The box required 40 foot segments with waterstop control joints. The floor was poured first on the two ends. Problems with concrete delivery, high temperatures and very low slumps in the range of 1-1/2 inches caused problems with pumping of the concrete. The downstream end was not completed quickly enough, and a cold joint formed. This required that the concrete, forms and steel be removed, the subgrade cleaned and prepped and the forms re-built. This work was finished by July 10th and the downstream section of the slab was re-poured. The floor slab was water cured with a burlap covering. Seven days curing time were required between adjacent concrete pours. The walls and deck were formed next and poured in the same sequence as the floor. The outlet structure was constructed and poured in sequence with the walls and deck of the center section. Due to the slipping schedule and the desire to complete the outlet works prior to the onset of the monsoon, it was required that the backfill be placed to elevation 1721.5 (the original embankment elevation) within 70 days after beginning work. Backfill of the box culvert began prior to completion of the inlet structure. The first rain and flow through the outlet works began shortly after completion of the inlet structure and before final backfill was complete. After completion of the outlet works conduit and outlet structure in early August, the outlet channel was excavated to return flows to Ashbrook Wash. The channel was overexcavated, lined with riprap and then backfilled to the finished grade. Backfill of the outlet works continued until late August. The trashrack was installed on the inlet structure in late September. The breakaway fencing was installed on the outlet structure at the end of December.

Emergency Spillway

Excavation and construction of the concrete footing for the masonry retaining wall in the spillway was completed in late June. During removal of the existing walls and excavation, a 2 inch waterline was discovered running near the bottom of the emergency spillway chute. It was relocated near the sidewalk and protected in place during subsequent work on the spillway. Riprap was placed at the toe of the

spillway which protects the sidewalk and the waterline. The masonry wall was completed by late July. Excavation for the spillway lengthening, cutoff wall and gabions was completed by the middle of September. Work on the gabions on the spillway chute began at the end of September and was completed by the beginning of November. Anchor posts were installed by a pneumatic hammer. Due to a Caliche layer under the subgrade, the posts were driven to refusal and then cut off flush with the gabions. Depth to refusal varied and some posts were driven the full length. The average length was 4'. Construction on the gabion protection for the end of the embankment began at the end of November and was completed by the beginning of December. Construction of the new spillway cutoff wall was finished by November 21. The spillway fuseplug material was placed and gravel mulch placed over the top. Due to the non-cohesive nature of the fuseplug material, it was difficult to compact this layer. Moisture control during compaction was critical.

Principal Outlet Works

Work began at the end of July for extension of the 60 inch pipe, installation of the utility conduit and construction of the new headwall. Excavation discovered large riprap which was salvaged and used to protect the sewer manhole and the inlet structure. The Fountain Hills Sanitary District verified that the sewer manholes were waterproof. Class V reinforced concrete pipe with rubber gasketed joints was used to extend the 60 inch outlet conduit. The pipe joints were tested for leakage prior to installation. A 24 inch reinforced concrete pipe was placed on steel rails on the existing sewer encasement. The annular space was then grouted with a 3,000 psi concrete mix. Backfill around the 24 inch and 60 inch pipe extensions at the inlet structure was a 1 sack concrete slurry per MAG Section 728. The inlet structure was completed by the end of August. The trashrack was installed on the inlet structure in late September. Several bars were warped and were removed, straightened and replaced. The breakaway fencing was installed on the outlet structure at the end of December.

Floodwall

Bluestaking and excavation discovered several utility conflicts with the floodwall including:

- SRP electrical power conduits

- School electrical power conduits
- Fountain Hills Sanitary District non-potable waterline

The conduits were both relocated east of the floodwall. The waterline was relocated below the floodwall. Relocation of these utilities was performed in late July.

Construction of the floodwall began in mid August. Excavation for the footing encountered Caliche and large riprap. The existing spillway cutoff wall also extended into the trench and a portion was removed to allow construction of the footing. The walls were formed and poured in 30 foot sections with construction joints. Construction of the walls was completed by the beginning of October.

Dam Embankment

Embankment construction began in mid July and started with placement of fill to the required height of the riprap at the upstream toe of the dam. The toe trench was dug and then riprap placement began. After placement of the riprap, the trench was backfilled and the channel was graded. Work then began on benching and raising the embankment. This work proceeded until the stockpiled material was exhausted. A ramp was constructed up the left abutment of the dam to providing egress for trucks hauling imported material onto the dam. A borrow source was proposed at Shea Blvd. and Palisades Ave. which appeared to be acceptable. After excavation and stockpiling at the borrow source, additional testing revealed that the material did not meet the specifications. The Contractor attempted to blend the stockpiled material, however, it was finally decided to find a new borrow source. A source of fine, silty, impervious material which met the specification was located at Fort McDowell Sand and Gravel. The material is a waste product from the production of concrete sand and aggregate. Hauling of imported impervious fill to top out the dam began on October 27th. Frequent rain began after that day and truck hauls were cancelled due to wet and slick conditions until November 9th. Hauling continued until the 16th with no problems. Due to wet conditions, import was again stopped and the embankment was scarified to allow the material to dry out. Hauling and placing of embankment fill was then resumed on November 22 and was finished. Final trimming of the slopes was finished by the end of November.

Miscellaneous Work

The following miscellaneous work items were also completed as part of the project:

- Block wall in front of gymnasium was lengthened and raised
- Chain link fencing and gates were installed
- steps and sidewalk were installed
- landscaping and irrigation was completed

This work was all completed per plans and specifications, with minor changes and adjustments per the requirements of the Town and the School.

CHANGES IN THE PLANS

The only significant change in the project involved the auxiliary outlet works conduit. The plans called for a pre-cast box culvert to be installed in order to save time. The Contractor proposed to construct the culvert by the cast in place method. This proposal was reviewed by ADWR, FCDMC and Stantec and was approved. Revised drawings and specifications were issued and the delay to the project was minimal. Revisions to the project plans are shown in the revision block on the plan sheet. Field changes are shown on the as-builts. As-built plans are included in the Appendix.

SHOP DRAWINGS

Table 1 lists the shop drawings received and reviewed/approved by Stantec.

TABLE 2

Item	Date
Filter Fabric	6-16-00
Waterstop	6-16-00
Concrete mix design with test data for aggregate, certifications for cement and information sheets for admixtures	6-23-00

Item	Date
Concrete compressive strength test results for proposed concrete mix design	6-26-00
Concrete aggregate sieve analysis, specific gravity, absorption, alkalai, soundness and petrographic analysis test data and certification	7-6-00
Design data for the reinforced concrete pipe	7-6-00
Sieve analysis for 1/4 inch chips (used as the uniform, pervious material above the filter blanket)	7-13-00
Concrete grout mix for encasing 24 inch concrete pipe	7-13-00
Certifications for the gabion anchor posts	7-12-00
Certifications for concrete pipe, hydrostatic test results and certifications for the gaskets	7-13-00
Certifications for the gabions, specs and data for the gabions and hog rings	7-13-00

Submittals are included in the Appendix.

CONSTRUCTION SURVEY

Construction survey was performed by Ansco, Inc., Ron and Barbara Vogel under subcontract to the Contractor. A copy of the survey field data is included in the Appendix.

DEWATERING

Groundwater was encountered at the upstream end of the culvert and three small dewatering wells were installed. A flowmeter was installed and the pumps were set to maintain the water level below the subgrade elevation. A log of the amount pumped was kept as required by the ADWR dewatering permit. A copy of the permit is included in the specifications. The log is attached in the Appendix.

SURFACE WATER DIVERSION

The surface water diversion plan was intended to handle surface water flow during construction to prevent inundation of the work area and or potentially dangerous conditions at the dam. A low berm was constructed which diverted water around the auxiliary outlet works to the principal outlet works during construction. The berm was kept quite low, however, no overtopping flows occurred during construction of the auxiliary outlet works. A runoff from rainfall combined with a broken 4 inch irrigation line did release quite a bit of water and caused flow through the outlet works, however, the conduit and structures were completed, and the flow caused no damage.

QUALITY ASSURANCE

Guidelines and requirements for quality assurance are presented in the Construction Quality Assurance Plan (CQA Plan) which was submitted to ADWR and approved prior to the construction of the dam. A brief description of the methods and procedures follows.

INSPECTION

Inspection of the construction was the responsibility of the District. The District provided 1 full time person to inspect and administer the project. A second district employee assisted on an as needed basis. The District also contracted with AMEC to provide a full time technician on site. This individual provided testing and additional inspection services to assist the District staff. In addition to these staff and contract employees, additional inspections on a periodic basis were provided by the District, Stantec, AMEC and ADWR. Daily inspection reports are provided

in the Appendix for both the District and AMEC inspectors. In addition to the inspection reports, photos were taken of every aspect of construction. Inspection photos taken by Stantec are provided in the Appendix.

PARTNERING

Partnering was required by the District for this project. An allowance was provided in the contract to compensate the Contractor for the partnering meetings. The first meeting was a half day session facilitated by RH & Associates which was held in conjunction with the pre-construction conference. Monthly meetings were held after that with all stakeholders to discuss and reinforce the goals of partnering. The goals for the partnering were:

- Safety, Zero Accidents
- Safe Continuous Traffic Flow
- Sensitive to the Public
- Quality of Work
- Realistic Schedule
- Communications
- Partnering Attitude
- Having Fun Yet?

All participants in the partnering meetings have agreed that a proactive attitude, reinforced by partnering, helped to make this project a success.

TESTING

Quality Assurance Testing was the responsibility of the District. The District contracted with AMEC to provide a full time technician on site. This individual obtained samples and provided testing as well as additional inspection services to assist the District staff. Required minimum tests and frequencies were specified in the CQA Plan. Additional and revised testing methods and frequencies were specified during construction by the District Construction Manager. In addition to the QA testing, additional QC testing was performed by the Contractor's consultant. Copies of the test reports are provided in the Appendix.

MEETINGS

Weekly meetings were held on-site for the duration of the project. Agenda and minutes were prepared for every meeting. Two week look ahead schedules were prepared by the Contractor and discussed at each meeting. Agency personnel and the Owner's representatives were invited to attend all meetings. Minutes, agendas and schedules are provided in the Appendix.

APPENDICES

The following information is provided in the appendices to this report:

- Appendix A - Specifications
- Appendix B - Other Material
  - ADWR Permit
  - Project Cost and ADWR Permit Fee Calculation
  - Box Culvert Design Changes
  - Construction Survey
  - Dewatering
  - Construction Meetings
  - Partnering Meetings
  - Construction Schedules
  - Other Changes And Requests For Information
  - Submittals
- Appendix C - Testing
  - Impervious Material Tests
  - Contractor Impervious Material Tests
  - Filter Sand Tests
  - Contractor Filter Sand Tests
  - Compaction Tests
  - Concrete Tests
  - Contractor Concrete Tests
  - Concrete Aggregate Tests
  - Miscellaneous Tests
  - Contractor Miscellaneous Tests
- Appendix D - Inspection Reports
  - District Inspection Reports
  - AMEC Inspection Reports
- Appendix E – Photos

As-Built plans are submitted under separate cover.