

DEPARTMENT OF ECOLOGY
Water Resources Program / Dam Safety Office
PO Box 47600, Olympia, WA 98504-7600

June 4, 2012

To: Project Engineers, Project Managers

From: Marty Walther, Dam Safety Engineer
360-407-6420, martin.walther@ecy.wa.gov

Subject: Supplemental guidance for Construction Inspection Plans

The following information may be helpful to you in preparing the Construction Inspection Plan for your project. Guidance for this document is provided in *Dam Safety Guidelines, Part II, Project Planning and Approval*, Section 4. The Construction Records Summary, to be submitted to Dam Safety following completion of construction, is described in *Part II*, Section 4.8. A copy of Section 4 of *Part II* is attached, along with an example Construction Inspection Plan.

Critical stages of construction. In general, critical stages of construction that Dam Safety is particularly interested in observing or taking part include:

- A pre-construction conference with the contractor(s).
- Foundation conditions prior to constructing the embankment, including key / cutoff trench. Foundation preparation for the embankment.
- Embankment fill and compaction.
- Trench conditions for conduits/pipelines extending through the embankment.
- Installation of outfall conduits/pipelines, including concrete cradles/encasement, filter diaphragms and lead-out drains. (Note: Use low-permeability structural fill for pipe bedding and trench backfill within the dam footprint.)
- Installation of chimney drains, finger drains, filter zone for the key / cutoff trench.
- Installation of outlet control structures / drop inlet structures, including air vents and deflector plates for the outlet pipes.
- Installation of geotextile filter fabric beneath gabions or riprap for open spillways and for spillway outfalls or energy dissipators. (Note: Filter fabric must cover all exposed soil surfaces adjacent to the gabions or riprap, both horizontal and vertical surfaces.)
- Installation of open channel spillways, spillway outfalls, energy dissipators.
- Surface preparation and surface conditions for installation of geomembrane liners. Installation of geomembrane liners.
- Installation of buried erosion cutoff walls or other buried erosion barriers.
- Site preparation, bedding, and underdrains for concrete spillways or other structures.
- Major concrete pours for spillways or other structures.

You should omit any of the above items from your Construction Inspection Plan that do not apply to your project. During our review of your plans and specifications, we may also add other items to the list of critical elements for your project.

Major sections of the plan. In preparing the Construction Inspection Plan, we suggest you use the following target lengths for the following sections (see also *Guidelines Part II*, Section 4.1):

Construction management organization	1 page, chart or table format
Construction activities and planned inspection effort	1 page + matrix
Quality assurance testing program	1 page + matrix
Change order process	½ to 1 page
Technical records handling	½ to 1 page

The discussion of construction management should include the names, affiliations, addresses, phone numbers, and fax numbers for the individuals who will be performing these functions. Be sure to include the owner's construction manager, contractor's superintendent, project engineer, geotechnical engineer, sub-contractors or sub-consultants, Dam Safety engineer(s), and other inspection agencies (city, county, local utility). If a specific individual is not yet assigned, just leave a space for this information to be added later.

In general, a narrative description of the change order process will be adequate. The flow chart of Figure 4 in Section 4.3 of *Guidelines Part II* is shown for illustrative purposes, but it is usually not necessary to include a copy of this flowchart in your Construction Inspection Plan.

Matrix of construction activities. The narrative discussions of construction activities and inspections and quality assurance testing can be very effectively complemented by a two or three-page matrix (page size 11 x 17) summarizing this information. The following column headings are suggested for such a matrix:

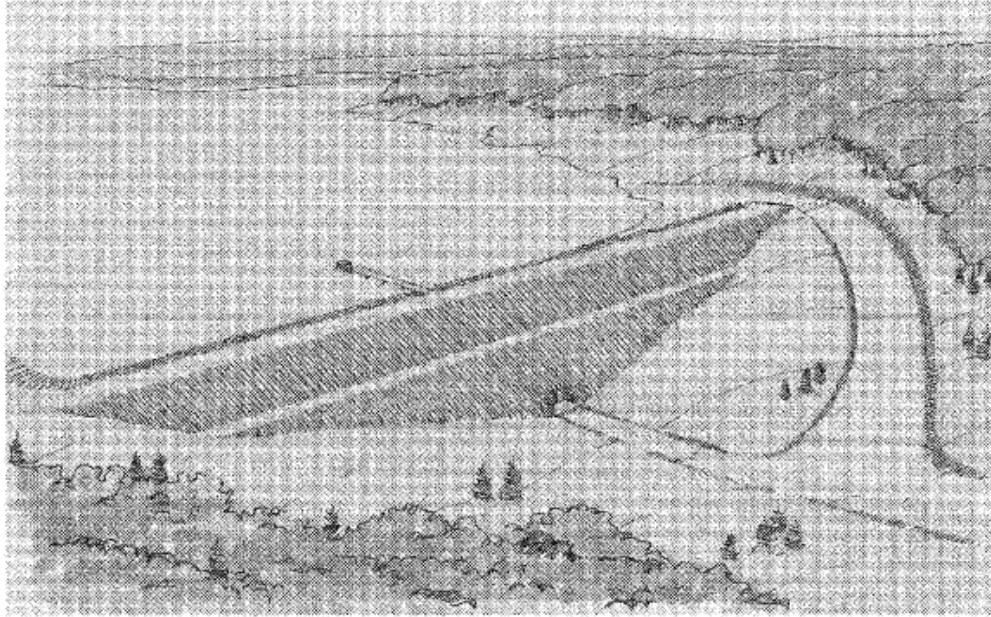
Column 1	Construction phases and specific tasks during each phase (List the phases and corresponding tasks)
Column 2	Critical items, prior notification to Dam Safety Office required (Identify Yes or No)
Column 3	Reference for quality assurance testing (Examples: Standard specifications, ASTM standards, construction manual, geotechnical report)
Column 4	Scope of inspection (Examples: Visual observation, physical measurement, samples collected for testing)
Column 5	Responsibility for inspection (Name those who will perform the inspection(s) for each task identified in column 4)
Column 6	Documentation to be submitted to Dam Safety Office (Examples: Field notes, photos, test results, as-built plans)

Distribute copies. We expect a copy of the Construction Inspection Plan to be distributed to the various parties involved in construction or construction oversight for the dam after approval of the final plans and specifications, and you receive your Dam Construction Permit. Any information that would help facilitate communication and understanding among the various parties would be appropriate to include within this document.

Summary comments. As noted previously, a copy of Section 4 from *Guidelines Part II* is attached, along with an example Construction Inspection Plan. Our thanks to the engineering firm of Goldsmith and Associates of Bellevue for their permission to use their materials as part of this guidance.

If you have any questions or need more information, please do not hesitate to contact us. Early and open communication helps all of us. Any questions or comments may be directed to:

Marty Walther
Dam Safety Office
Department of Ecology
360-407-6420
martin.walther@ecy.wa.gov



Dam Safety Guidelines

Part II:

Project Planning and Approval of Dam Construction or Modification



July 1992 (Revised February 2008)
Publication #92-55B



Original printed on recycled paper

4. CONSTRUCTION INSPECTION

It is the responsibility of the owner, usually through the project engineer, to provide for adequate engineering control and inspection of the work to ensure that it conforms with the approved plans and specifications. For small projects this generally involves verifying the following:

- The foundations have been adequately prepared and treated.
- Embankment fill has been properly moisture conditioned and compacted.
- The various construction materials conform to the specifications.
- Concrete work conforms to the plans and is accomplished in a satisfactory manner.
- Spillways and appurtenant works are constructed to the specified size and elevation.

Table 6 outlines the normal inspection effort for typical projects. This information may also be used to assist in writing the scope of work for contracting for engineering services. Site specific considerations or project characteristics may warrant a more or less stringent approach than that described.

4.1 CONSTRUCTION INSPECTION PLAN

A detailed plan, incorporating the construction inspection activities shown in Table 6, must be submitted to the department describing how adequate and competent construction will be provided. The Construction Inspection Plan must be reviewed and accepted by the DSO prior to issuance of the Construction Permit. The Construction Inspection Plan must be prepared by a professional engineer and shall include, as a minimum:

- A listing of construction activities related to critical project elements and planned inspection effort including staffing levels, responsibilities, frequency and duration of site visits;
- A description of the quality assurance testing program which describes the type of test, general frequency, acceptable results, handling of deficient materials, and the individual(s) responsible for overseeing the testing;
- A description of construction management organization, lines of communication, and responsibilities;
- A description of the change order process including who is responsible for coordinating the change order review process with the department;
- A description of the technical records handling and the content and frequency of construction progress reports.

TABLE 6. NORMAL CONSTRUCTION INSPECTION ACTIVITIES

DAM SIZE CLASSIFICATION	FREQUENCY OF SITE INSPECTION	QUALITY ASSURANCE TESTING PROGRAM	INSPECTION DOCUMENTATION SUBMITTED TO DSO	INSPECTION REPORT SUBMITTAL FREQUENCY
SMALL Height < 15 Ft.	Intermittent On-Site for Inspection of Critical Elements	<ul style="list-style-type: none"> . Field Memoranda and Inspection Notes . Periodic Compaction Control . Gradations of Representative Samples of Embankment Materials . Photos of Construction of Critical Elements 	<ul style="list-style-type: none"> . Change Order Documentation . Summary of Field Density Test Results . Summary of Gradation Test Results 	<ul style="list-style-type: none"> . As Material is Developed . Provide Abbreviated Construction Summary of Project Containing Representative Photos
INTERMEDIATE Height ≥ 15 Ft. but Height < 50 Ft.	Frequent On-Site Several Times Each Week and Present During Construction of Critical Elements	<ul style="list-style-type: none"> . Field Memoranda and Inspection Notes . Periodic Compaction Control . Gradations of Representative Samples of Embankment Materials . Concrete Cylinders for all Structural Concrete . Photo Record of all Critical Elements and Construction Chronology 	<ul style="list-style-type: none"> . Change Order Documentation . Summary of Field Density Test Results . Summary of Gradation Test Results . Summary of Concrete Test Results 	<ul style="list-style-type: none"> . Provide Initial Material Gradation and Compaction Control Results As Developed to Confirm Compliance with Specifications and Adequacy of Test Procedures . Provide Construction Summary Report at Completion of Project Include Representative Photo Chronology
LARGE Height ≥ 50 Ft.	Continuous Inspector(s) On-Site Throughout Construction Consideration of Increased Inspection Staff During Construction of Critical Elements	<ul style="list-style-type: none"> . Maintain On-Site Complete Set of Daily Inspection Memoranda and All Test Results . Periodic Compaction Control . Gradations of Representative Samples of Embankment Materials . Concrete Cylinders for all Structural Concrete and air entrainment testing . Complete Photo Record Construction Chronology 	<ul style="list-style-type: none"> . Change Order Documentation . Periodic Summaries of Field Density Test Results . Periodic Summaries of Gradation Test Results . Periodic Summaries of Concrete Strength Test Results 	<ul style="list-style-type: none"> . Provide Initial Material Gradation and Compaction Control Results as Developed to Confirm Compliance with Specifications and Adequacy of Test Procedures . Provide Construction Summary Report at Completion of Project Include Representative Photo Chronology

4.2 DAM SAFETY OFFICE ROLE IN CONSTRUCTION INSPECTION

The role of the Dam Safety Office during construction will be to confirm that the project engineer, acting as representative for the owner, is properly implementing the approved Construction Inspection Plan. The DSO will periodically observe the construction work to independently confirm that the conditions assumed in the design stage are valid for actual field conditions, and that construction is proceeding in accordance with the approved plans and specifications. The DSO may require changes to be made to the approved plans and specifications to reasonably secure safety to life and property. Reasons for changes may include:

- To address unanticipated field conditions.
- To correct omissions or errors in the approved plans and specifications.
- To correct situations where the construction work clearly is not being performed satisfactorily, and does not meet the performance intent of the specifications.

Where deemed necessary by the DSO, a stop-work order may be issued to temporarily halt construction until a problem can be resolved.

4.3 CONSTRUCTION CHANGE ORDERS

After construction is in progress, a variety of problems such as unanticipated foundation conditions or shortages of materials may necessitate a change to the plans. Where such changes represent a significant modification of the approved plans or specifications that could have an impact on the structural integrity or safe operation of the impoundment, the change must be submitted to the DSO for a determination if an approval is required. The following flowchart (Figure 4) illustrating the review process, directs the project engineer to notify the DSO of the need for a change order (usually by phone) where a judgment as to the need for an approval would be made. If submittal of a change order is deemed necessary, two complete sets should be forwarded to the DSO for review and approval. The DSO will review the construction change order and provide a response to the project engineer in a timely manner consistent with the complexity and safety concerns of the situation.

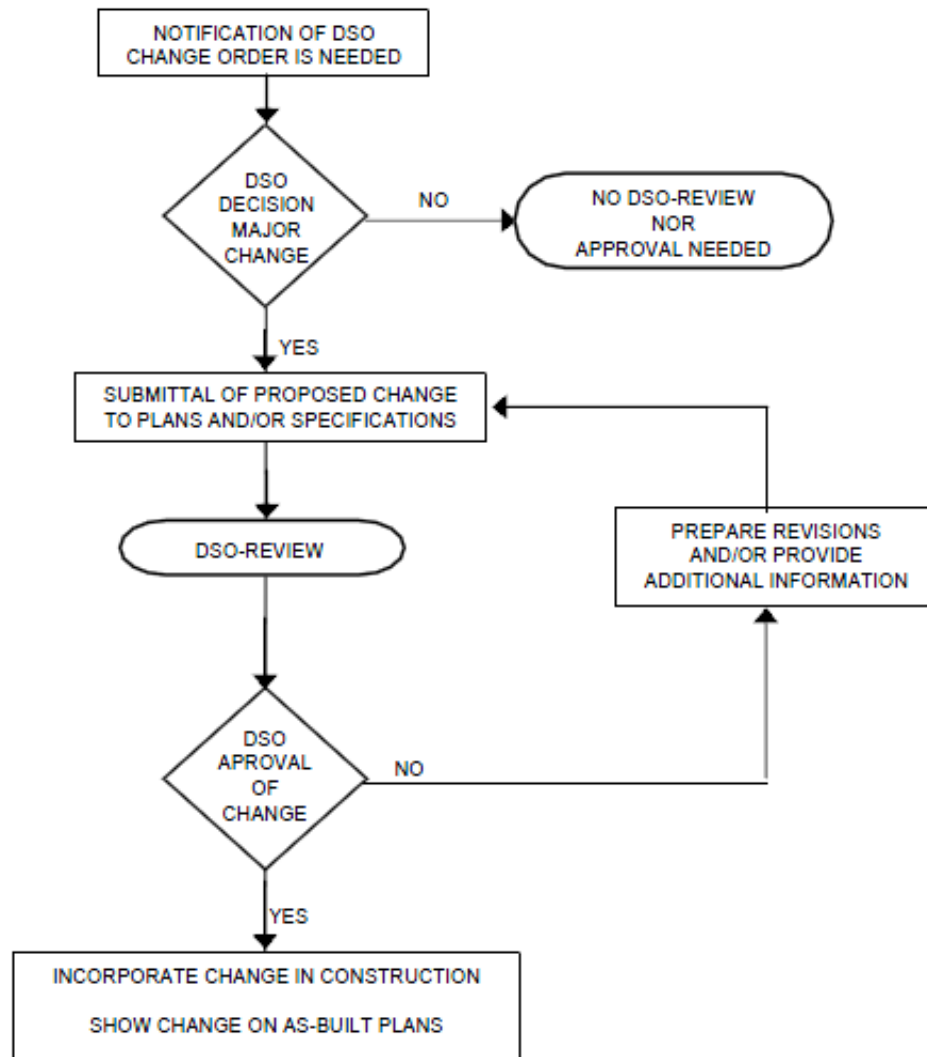


FIGURE 4. FLOWCHART OF REVIEW PROCESS FOR CONSTRUCTION CHANGE ORDERS

4.4 OPERATION AND MAINTENANCE PLAN

An Operation and Maintenance (O&M) Plan must be developed for all dams being constructed or modified, and submitted to the DSO for review and acceptance before project operation can be initiated or resumed. The O&M Plan is a summary and outline of how the project is to be operated, and how monitoring, inspection and maintenance are to be accomplished. A copy of the form to be used in completing an O&M Plan is provided in Appendix B. Owners are responsible for incorporating details of the O&M Plan into an O&M Manual, which is described in Section 5.1.

4.5 EMERGENCY ACTION PLAN

If a failure of the dam could pose a risk to life based on the current level of development in downstream areas, an Emergency Action Plan must be developed and submitted to the DSO for review and acceptance before project operation can be initiated or resumed. Requirements associated with EAPs are described in Section 5.2.

4.6 DECLARATION OF CONSTRUCTION COMPLETION

Within 30 days following substantial completion of construction or modification of a dam, the project engineer shall submit to the DSO a declaration stating that the project was constructed in accordance with the DSO approved plans and specifications and construction change orders. The following declaration form may be used or altered, as appropriate, by the project engineer.

DECLARATION OF DAM CONSTRUCTION COMPLETION	
In accordance with WAC 173-175-230, the undersigned professional engineer states that:	
He/she, or a designated representative under his/her supervision, was present during construction to observe construction activities, and that he/she has reviewed the results of the field testing of materials, and to the best of his/her knowledge, the following dam project,	
_____, was constructed in accordance with the	
(Project Name)	
approved plans, specifications, construction change orders, and construction inspection plan. Based on the forgoing, the project can be put into service.	
_____	_____
(Name)	(Date)
P.E. Seal and Signature	

FIGURE 5. DECLARATION OF CONSTRUCTION COMPLETION

4.7 AUTHORIZATION TO COMMENCE OR RESUME PROJECT OPERATION

Once the project engineer's declaration of acceptable construction completion has been received, the DSO will authorize the owner or the project engineer, as appropriate, to commence controlled reservoir filling, or resume normal project operation, provided that:

- The DSO concurs with the project engineer that the project was constructed in accordance with the approved plans and specifications and construction change orders, and the project is expected to function satisfactorily.
- The proposed O&M Plan, and Emergency Action Plan (if required) are acceptable to the DSO.

If the above conditions are not met, the owner will not be allowed to commence or resume normal operation of the project until all outstanding issues or problems are resolved.

4.8 CONSTRUCTION RECORDS SUMMARY

Within 120 days following completion of construction or modification of a dam, the project engineer must submit a report to the DSO on construction activities. This report should include:

- A summary of results from the field testing of all materials used in construction. The summary shall identify both representative values and the range of test values.
- A discussion of any notable problems, incidents, exceptions, etc. encountered during construction.
- One complete set of drawings depicting the as-built condition of the dam. These drawings shall be submitted in both paper and electronic format.

Dam Safety Construction Inspection Plan

including

General Inspection Guidelines

Project Contact List

Dam Construction / Inspection Activities Table

for the

**Trossachs Division 8
Detention Facility PC-2
(Dam Safety File No. KI 07-1833)**

**Prepared for:
The Trossachs Group**

**Prepared by:
Hugh G. Goldsmith & Associates, Inc.**

September 2000

GENERAL INSPECTION GUIDELINES

Purpose and Scope of Plan

This Construction Inspection Plan is intended as a tool to improve construction quality assurance. It is a source of project information and guidelines for construction inspection to provide for adequate engineering control and inspection of the work to ensure that it conforms with the approved plans and all applicable specifications. It is intended to aid communication among all firms and agencies involved in the design, construction, inspection and future maintenance of the proposed facility: Trossachs Division 8 Detention Facility PC-2.

Construction Management Organization

A project contact list which outlines the network of firms and agencies involved in this project is attached for reference. The Trossachs Group, as developer, is responsible to provide for adequate engineering control and inspection of the construction work. King County, as future owners of the facility, will eventually be responsible for maintenance and operation of this facility. As the agency responsible for the permitting of the construction work, King County will also serve as the lead inspection agency. The State Department of Ecology (DOE) also serves a regulatory role to oversee design, construction and operation of all dam facilities within the state. They will be a part of the inspection process and any subsequent changes to design.

Under The Trossachs Group, the tri-lateral combination of the construction staff, the project engineer and the geotechnical engineer will work as a team to construct the dam per approved plans and specifications, as well as accommodate plan changes.

The management hierarchy under The Trossachs Group construction staff and Construction Manager, [REDACTED], consists of the general contractor, Universal Land Co., Inc., [REDACTED] - superintendent; the geotechnical engineer, Terra Associates Inc.; and the construction surveyor, Hugh G. Goldsmith & Associates.

Construction Activities and Planned Inspection

Construction activities and planned inspection efforts, arranged by major construction phases and specific tasks, are attached in chart form to identify approximate chronology of the dam construction and summarize the scope of inspection related activities proposed for each specific task.

The first phases include subgrade preparation and structural fill embankment. During these phases of construction, an emphasis on the approved geotechnical recommendations for construction assumes frequent inspections by the geotechnical engineer to assure that the recommendations are fulfilled. During these phases, the required gradation and compaction testing will be conducted by the geotechnical engineer. King County's Land Use Inspection Section (KC LUIS), the lead inspection agency, will also conduct frequent site visits during these phases, particularly during construction of critical project elements. Their inspections typically will consist of visual confirmation and/or hand measurements, as required, for quality control of workmanship per specifications and construction per plans and standards.

Subsequent construction of the overflow drainage systems and outfalls will be inspected primarily by KC LUIS. Typically, the scope of inspection will consist of visual confirmation of workmanship and materials per APWA Standard Specifications and visual and/or hand measurement to verify details of construction as per plan and King County Road Standards. Some of the improvements will also be confirmed by survey of the as-built conditions, as arranged by the owner.

The State Department of Ecology (DOE) will periodically observe construction to confirm that field conditions validate design assumptions; that construction is in accordance with plans and specifications; and that the approved Construction Inspection Plan is being implemented. They may require changes based on observations. In particular, the DOE Dam Safety Office (DSO) has requested prior notification of the following specific tasks, so as to allow arrangements for observation. These areas are also noted on the chart below:

- Foundation conditions prior to constructing the embankment. Foundation preparation for the embankment.
- Embankment fill and compaction.
- Trench conditions for conduits and pipelines extending through or beneath the embankment.
- Installation of pipelines and outfall conduits, including concrete encasement, filter diaphragms and lead-out drains.
- Installation of emergency spillway and energy dissipator.
- Installation of outlet control structure and overflow drop inlet structures.
- Installation of the cutoff trench filter zone, the chimney drains and finger drains.

Quality Assurance and Testing Program

Quality assurance of construction work on Detention Facility PC-2, will be achieved by a combination of inspection, testing and verification of critical project elements. Visual confirmation of workmanship and materials per specifications and visual and/or hand measurements of details per plan and applicable standards will be provided by the Geotechnical Engineer, King County Land Use Inspection Section (KC LUIS) and potentially the State DOE Dam Safety Office. Secondly, gradation and field density testing of the embankment and subsurface drainage media will be conducted according to the geotechnical requirements cited herein. KC LUIS will review the test results and a "Special Inspections Report" required of the geotechnical engineer for this project. Finally, a post-construction survey and as-built (or final corrected) plans and data of several critical project elements will be used to verify the construction per design or equivalent in function.

It should be noted that the DSO requires an initial material gradation and compaction control test with results to confirm compliance with specifications and adequacy of test procedures.

Technical Records

Documentation regarding construction progress, inspection and testing is required by the DSO at several intervals during the construction of the project. Upon completion, a construction records summary must be filed with the State. This summary shall consist of the photographic record, construction progress reports (notes and observations from the geotechnical engineer, KC inspectors, etc.), testing results, change orders and as-built plans and data.

- **Photographic Record:** Construction chronology and, in particular, the construction of all critical project elements must be documented by photographs. Weekly coverage would be adequate if supplemented by more detailed documentation of the critical elements noted by DSO.
- **Construction Progress Reports:** Construction chronology of field notes from various sources: geotechnical engineer, inspectors, etc.
- **Initial Testing Results:** gradation and compaction control testing data sent prior to construction to confirm compliance with specifications and adequacy of test procedures. Testing shall be conducted per geotechnical engineering report recommendations, as summarized above.
- **Subsequent Testing Results:** gradation and compaction control testing data per geotechnical engineering report recommendations, as summarized above.
- **Change Order Processing:** Change orders and related materials processed through the King County Land Use Inspection Section or the State Dam Safety Office, which relate to the dam construction.
- **As-built (or final corrected) plans and data:** revised plan sets and other data from field survey of improvements with approved change orders reflected.

Change Order Process

Change orders (or plan changes) which include the Detention Facility PC-2 Dam may be initiated for several reasons by one of several firms or agencies involved with the project. The changes may be minor field adjustments or significant design changes. As the chief agency inspecting construction, the King County Land Use Inspection Section is also the lead agency for processing and approving change orders. The State Department of Ecology Dam Safety Office shall also be included in the processing of all change orders relating to the dam and their supplemental approval may be required.

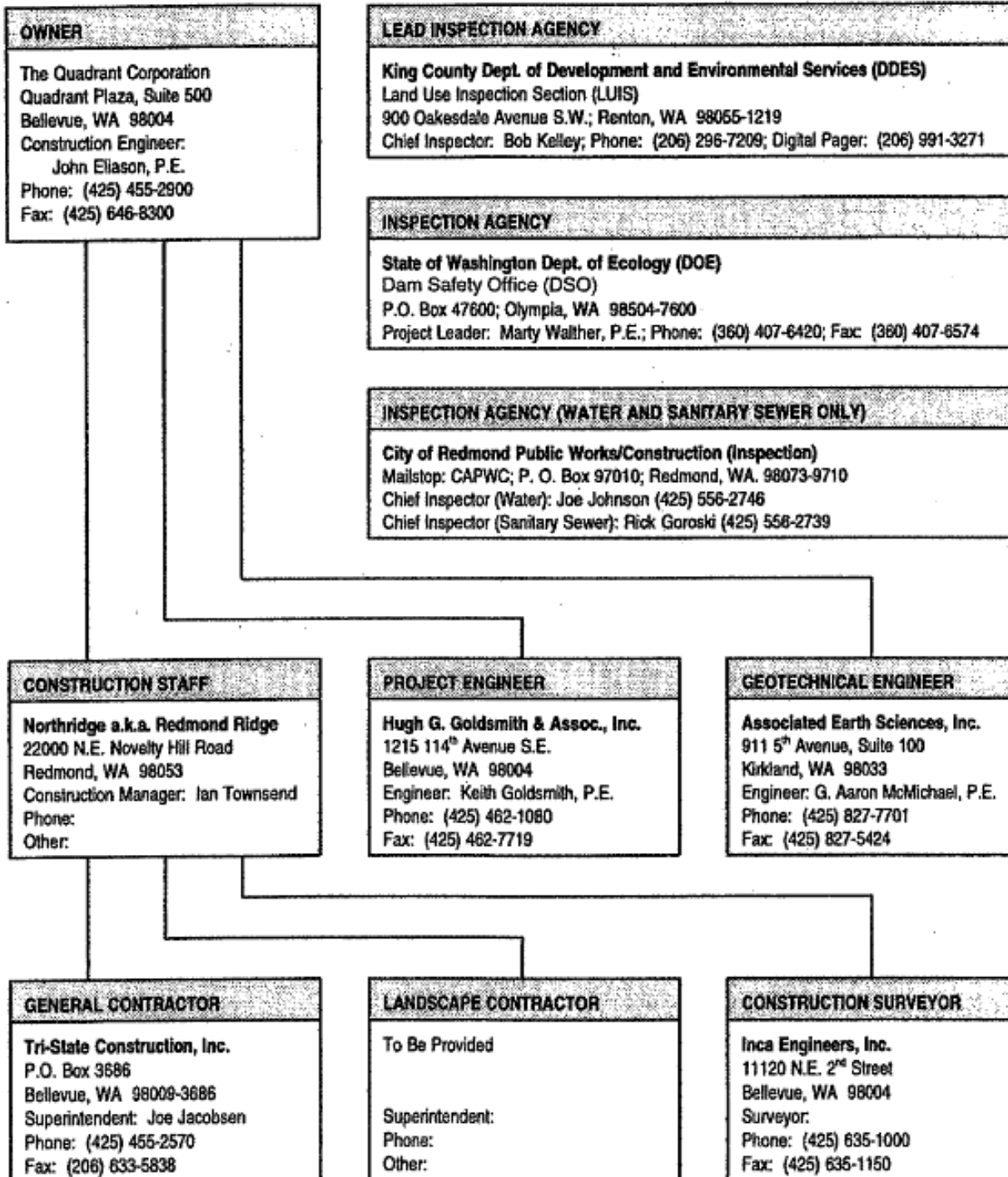
Reasons for change orders include the need to address unanticipated field conditions, to correct omissions or errors in the plans and specifications and for corrections relating to construction performance. For changes which begin internally between the contractor and the owner's Construction Manager, The Trossachs Group uses a system of written field directives to authorize specific field tasks and changes. Items which would vary from the plan are brought to the attention of the King County Inspector and a change is requested. At the discretion of the KC Inspector, a KC Change Order is prepared. Either King County LUIS or the State DSO may recommend or require changes, at their respective discretion, particularly when they discern the need to reasonably secure safety to life or property.

In this event, the owner's Construction Manager shall be notified and a King County Change Order prepared. For all changes relating to the dam, change orders should be routed by The Trossachs Group to the State DSO.

Minor changes, as deemed by the King County Inspector, do not require KC engineering review and approval, but must be shown on the "Final Corrected Plan" drawings prior to construction approval. The State DSO requires that for changes with "a significant modification of the approved plans or specifications that could have an impact on the structural integrity or safe operation of the impoundment, the change must be submitted to the DSS for a determination if an approval is required." Minor Changes, as deemed by the King County Inspector, proposed for the dam should be routed by The Trossachs Group to the State DSO, although it is assumed that, unless the stated criteria is met, no further determination nor engineering review is required.

Alternatively, the King County Change Order may be a Design Change, for which revised engineering drawings and supporting materials must be submitted for review and approval prior to the field work. For all King County Design Changes relating to the dam, the change order should be routed by The Trossachs Group to the State DSO office. Initially, the DSO makes a determination as to whether an engineering review is required. The State may evaluate changes differently from King County. Any state review of design changes, if required, is independent from King County. A DSO determination to require a review would also require submittal of engineering drawings and supporting materials with proposed changes for approval. Subsequent to required approvals, a design change may be incorporated in construction and must be included on as-built plans.

NORTHRIDGE BOULEVARD N.E. DETENTION DAM PROJECT CONTACT LIST



NORTHBRIDGE BOULEVARD N.E. DETENTION DAM (DAM SAFETY FILE NO. KI 08-1802) CONSTRUCTION/INSPECTION ACTIVITIES FOR CRITICAL PROJECT ELEMENTS

Table 12

MAJOR CONSTRUCTION PHASES / SPECIFIC TASKS OR ITEMS	FROM NOTIFICATION OF DOE REQUIRED FOR POTENTIAL OBSERVATION OF THIS ACTIVITY	REFERENCE FOR QUALITY ASSURANCE AND TESTING PROGRAM	SCOPE OF INSPECTION	RESPONSIBILITY FOR INSPECTION	INSPECTION DOCUMENTATION TO BE SUBMITTED TO DOE**
SUBGRADE PREPARATION					
Clearing, Grubbing, Striping	---	*AESI recommendations, Sections 8.0 & 10.2	Visual confirmation of vegetation and organic soil removal	Geotechnical Engineer, KC LUIS	Relevant field notes and photos
Overexcavation, Keying, Benchling	Yes	*AESI recommendations, Sections 9.1 & 10.2	Visual confirmation of workmanship per specifications; Visual and/or hand measurement of bays & benches	Geotechnical Engineer, KC LUIS	Relevant field notes and photos
Compaction of Subgrade	Yes	*AESI recommendations, Sections 8.0 & 10.2	Visual confirmation of workmanship per specifications and of firm & undraining subgrade	Geotechnical Engineer, KC LUIS	Relevant field notes and photos
Cut-off Trench Overexcavation	Yes	*AESI recommendations, Sections 10.1 & 10.2	Visual confirmation of workmanship per specifications; Visual and/or hand measurement of trench	Geotechnical Engineer, KC LUIS	Relevant field notes and photos
Cut-off Trench Filter Zone, Finger Drains	Yes	*AESI recommendations, 658 letter & Section 10.6; Grain size distribution testing per ASTM D-1557 (1 sample per day)	Visual confirmation of workmanship per specifications; Visual and/or hand measurement of filter zone & drains; Filter drain material testing	Geotechnical Engineer (inspection and testing); KC LUIS	Relevant field notes & photos; provide material gradation results to confirm compliance with specifications (and initial test method adequacy)
STRUCTURAL FILL EMBANKMENT					
Structural Fill Placement	Yes	*AESI recommendations, Sections 9.1, 10.3 & 10.6; Field density testing per ASTM D2922 (1 test per 100 CY; Lab moisture-density testing per ASTM D-1557 (Moist. Proctor) (1 test per 100 field tests)	Visual confirmation of workmanship per specifications; Visual and/or hand measurement of proper slopes; Compaction control testing; Fill soil material testing; Survey confirmation of proper slopes	Geotechnical Engineer (inspection and testing); KC LUIS; Owner-arranged survey and as-builts	Relevant field notes & photos; provide material gradation & compaction control results to confirm compliance with specifications (and initial test method adequacy); as-built plan set and data
Chimney Drain	Yes	*AESI recommendations, 658 letter & Section 10.6; Grain size distribution testing per ASTM D-1557 (1 sample per day)	Visual confirmation of workmanship per specifications; Visual and/or hand measurement of chimney drain; Filter drain material testing	Geotechnical Engineer (inspection and testing); KC LUIS	Relevant field notes & photos; provide material gradation results to confirm compliance with specifications (and initial test method adequacy)
Embarkment Erosion Control	---	*AESI recommendations, Sections 8.0, 9.2, 9.3, & 10.4	Visual confirmation of erosion control practices	Geotechnical Engineer, KC LUIS	Relevant field notes and photos
OVERFLOW DRAINAGE SYSTEMS					
Primary and Secondary Overflow Structures	Yes	1998 APWA Standard Specifications 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of structure details per plan & standards; Survey confirmation of overflow drainage systems as-built	KC LUIS; Owner-arranged survey and as-builts	Relevant field notes & photos; As-built plan set and data
Primary and Secondary Overflow Pipes	Yes	*AESI recommendations, 658 letter & Section 10.6 for pipe bedding material; 1998 APWA Standard Specifications; 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of pipe details per plan & standards; Filter drain material testing; Survey confirmation of overflow drainage systems as-built	KC LUIS; Geotechnical Engineer (testing); Owner-arranged survey and as-builts	Relevant field notes & photos; provide material gradation results to confirm compliance with specifications (and initial test method adequacy); As-built plan set and data
Primary and Secondary Overflow Gabion Outfalls	Yes	1998 APWA Standard Specifications 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of structure details per plan & standards; Survey confirmation of overflow drainage systems as-built	KC LUIS; Owner-arranged survey and as-builts	Relevant field notes & photos; As-built plan set and data

* Recommendations provided by Geotechnical Engineer for construction specification (Subsurface Exploration and Geotechnical Engineering Report, Northridge North (Division 1-4) Development), by Associated Earth Sciences, Inc., dated January 1998.
** With the exception of initial material gradation and compaction control results and change order processing, the documentation required shall be submitted with the construction summary report.

NORTHBRIDGE BOULEVARD N.E. DETENTION DAM (DAM SAFETY FILE NO. KI 08-1802) CONSTRUCTION/INSPECTION ACTIVITIES FOR CRITICAL PROJECT ELEMENTS

Table 22

MAJOR CONSTRUCTION PHASES / SPECIFIC TASKS OR ITEMS	FIELD OBSERVATION OF DOE REQUIRED FOR POTENTIAL OBSERVATION OF THIS ACTIVITY	REFERENCE FOR QUALITY ASSURANCE AND TESTING PROGRAM	SCOPE OF INSPECTION	RESPONSIBILITY FOR INSPECTION	INSPECTION DOCUMENTATION TO BE SUBMITTED TO DSO**
UTILITY CORRIDORS WITHIN ROADWAY					
Sanitary Sewer, Water Mains	Yes	1998 APWA Standard Specifications City of Richmond Standard Specifications and Details for Public Works Construction (latest)	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards	City of Richmond; KC LUIS; Consent-arranged survey and as-builts	Relevant field notes & photos; As-built plan set and data
Roadway Storm Sewer Network	---	1998 APWA Standard Specifications 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards	KC LUIS	Relevant field notes & photos
Other: Gas, Electric, Phone, Cable, Etc.	---	1998 APWA Standard Specifications 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards	KC LUIS (French only); Utility firms to inspect respective facilities	Relevant field notes & photos
SURFACE IMPROVEMENTS					
Concrete Curb, Gutter & Sidewalk	---	1998 APWA Standard Specifications; 1993 King County Road Standards; APWA material testing methodology for concrete (all KC request)	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards; Material testing (at KC request)	KC LUIS; Geotechnical Engineer (may be required for testing at KC request)	Relevant field notes & photos
Road Subgrade, Base Course & Asphalt	---	*AASHTO recommendations, Sections 11.1 & 11.4; 1998 APWA Standard Specifications; 1993 King County Road Standards; Subgrade & Base Course compaction testing per ASTM D-1557 (Mod. Proctor); (frequency per APWA); APWA material testing methodology for asphalt (all KC request)	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards; Material testing (at KC request)	KC LUIS; Geotechnical Engineer (may be required for testing at KC request)	Relevant field notes & photos
Landscaping	---	1998 APWA Standard Specifications 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards	KC LUIS; Licensed Landscape Architect required to provide verification / approval letter	Relevant field notes & photos
Stabilization of Roadway Overlap Route	---	1998 APWA Standard Specifications 1993 King County Road Standards	Visual confirmation of workmanship and materials per specifications; Visual and/or hand measurement of construction details per plan and standards	KC LUIS	Relevant field notes & photos

* Recommendations provided by Geotechnical Engineer for construction specification ("Subsurface Exploration and Geotechnical Engineering Report, Northridge North (Division 1-4) Development", by Associated Earth Sciences, Inc., dated January 1998)
 ** With the exception of initial material gradation and compaction control results and change order processing, the documentation required shall be submitted with the construction summary report.