APPENDIX 3.1-A

Pond Construction Specifications, Testing and QA/QC Procedures

Knight Piésold
CONSULTING

Powertech (USA) Inc.
Dewey-Burdock Project
Pond and Land Application
Technical Specifications and QA/QC Plan
Part 1 – Earthworks

July 2010

prepared for:
Powertech (USA) Inc.
5575 DTC Parkway, Suite 140
Telephone: (303) 790-7528
Facsimile: (303) 790-3885

prepared by:

Knight Piésold and Co.
1580 Lincoln Street, Suite 1000
Denver, Colorado 80203-1512 USA
Telephone: (303) 629-8788
Facsimile: (303) 629-8789
E-mail: *denver@knightpiesold.com*

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Knight Piésold
CONSULTING

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Section 1.0 - General

1.1 Introduction

This Specification stipulates materials and construction requirements for earthworks related to the construction of the Ponds and Land Application Systems at Powertech's Dewey-Burdock project.

1.2 Limitations and Disclaimer

This Specification titled Dewey-Burdock Project Pond and Land Application Technical Specifications and QA/QC Plan Part 1 - Earthworks has been prepared by Knight Piésold and Co. (Knight Piésold) for the exclusive use of Powertech (USA) Inc. (Client). No other party is an intended beneficiary of this Specification or the information, opinions, and conclusions contained herein. Any use by any party other than the Client of any of the information, opinions, or conclusions is the sole responsibility of said party. The use of this Specification shall be at the sole risk of the user regardless of any fault or negligence of the Client or Knight Piésold.

The information contained herein have been completed to a level of detail commensurate with the objectives of the assignment and in light of the information made available to Knight Piésold at the time of preparation. This specification and its supporting documentation have been reviewed and/or checked for conformance with industry-accepted norms and applicable government regulations. To the best of the information and belief of Knight Piésold, the information presented in this Specification is accurate to within the limitations specified herein.

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1.3 Contributors and Approvals

This specification was prepared, reviewed, and approved by the undersigned.

Prepared by:

Steven F. Truby, Pr. Eng.
Project Engineer

Approved by:

Paul D. Bergstrom, C.E.P.
Sr. Executive Project Manager

Reviewed by:

Jaye Pickarts, P.E.
Senior Vice President

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Section 2.0 - Scope and General Description of the Work

This Specification stipulates material and construction requirements for the earthworks related to the construction of the Ponds and Land Application Systems at Powertech's Dewey-Burdock project. Should the Contractor wish to deviate from these Specifications, he shall notify the Engineer in writing, providing a description of the deviation. The description shall include data indicating the magnitude of the deviation, justification for the deviation, and any possible short or long-term impacts of the deviation on the project. Deviations to these Specifications shall be subject to the approval of the Engineer and Owner.

2.1 Definition of Terms

"Owner" is defined as an authorized representative of Powertech.

"Engineer" is defined as representative appointed and authorized by the Owner. The Engineer shall be a Registered Professional Engineer, or a designated site representative under the supervision of a Registered Professional Engineer.

"Contractor" is defined as the party that has executed a contract agreement for the specified Work with the Owner.

"Technical Specifications" is defined as this document, prepared by Knight Piésold and Co. and all supplemental addenda.

"Drawings" is defined as the Drawings, in conjunction with these Technical Specifications, prepared by Knight Piésold and Co. for the ponds and land application system at Powertech's Dewey-Burdock Project.

"Work" is defined as the entire completed construction, or the various separately identifiable parts thereof, as shown on the Drawings, and required to be furnished under the Contract Documents.

"Site" is defined as the project area where the work is to be performed.

"Contract Documents" are defined as the Agreement, Addenda, Contractor's Bid (when attached as an Exhibit to the Agreement), Bonds, General Conditions, Special Conditions, Technical Specifications, Drawings and all modifications issued after execution of the Agreement.

"Modifications" are defined as changes made to the Technical Specifications or the Drawings, that are approved by the Owner and Engineer, in writing, after the Technical Specifications and Drawings have been finalized.

All slopes are defined as horizontal to vertical distances.

2.2 General Technical Requirements

The general technical requirements specified herein shall apply to all activities and operations relating to carrying out the Work or as required by the Engineer or Owner for the earthworks associated with the construction of the ponds and land application system at Powertech's Dewey-Burdock Project, South Dakota.

In the event of an inconsistency in the Technical Specifications and Drawings, the Contractor shall refer all questions to the Engineer for final decision. Work that concerns the inconsistency shall not be performed until the contradiction is remedied or explained by the Engineer. In all events, the decision of the Engineer is final.

2.2.1 General Specifications

The contractor will be required to submit to the Engineer or Owner, at a minimum, the following plans and comply with training requirements associated with their project tasks, as may be applicable:

- Occupational Safety and Health Administration (OSHA)
  - Healthy and Safety Plan in accordance with 29 CFR Part 1910 – Occupational Safety and Health Standards
  - Hazardous Communication Plan in accordance with 29 CFR Part 1910.1200 – Toxic and Hazardous Substances
  - Material Safety Data Sheets (MSDS) for all chemicals in accordance with 29 CFR 1910.1200 (g)
- Spill Prevention, Control and Countermeasure (SPCC) Plan in accordance with 40 CFR Part 112.3 – Requirement to prepare and implement a Spill Prevention, Control, and Countermeasure Plan
- Training
  - Mine Safety and Health Administration – 24-hour class plus 8-hour refresher course in accordance with 30 CFR
  - HAZWOPER – 40-hour class plus 8-hour refresher course in accordance with 29 CFR 1910.120

2.3 Scope of Work

The Work to be carried out shall include supplying all supervision, labor, plant and materials required to complete the Work as shown on the Drawings, as described in these Technical Specifications, and as required by the Owner and Engineer.

Section 3.0 - Mobilization and Demobilization

3.1 Scope

The Work covered by this section consists of the Contractor's mobilization to the Site of all the equipment and temporary facilities required for the successful completion of the Work, and shall include, but not necessarily be limited to, the following:

- Establish the Contractor's maintenance facilities, temporary workshops, temporary office accommodation and sanitary facilities.
- Maintain equipment and temporary facilities for the duration of the Work.
- All items required to be moved onto the Site for execution of the Work.
- On completion of the Work, remove all equipment and temporary facilities from the Site, and clean up the Site to the satisfaction of the Owner and the Engineer.

3.2 Mobilization

The Contractor shall mobilize to the Site sufficient labor, materials, and equipment to allow commencement of the Work. The Contractor shall bring on to the Site, as and when necessary, any additional equipment, labor and materials which may be required to complete the remainder of the Work in the time specified in the General Terms and Conditions.

3.3 Contractor's Workshops, Stores, and Offices

The Contractor shall erect, in the area designated by the Owner and Engineer, adequate workshops, offices and other buildings and structures for the completion of the Work as designated in the Contract Documents. Such workshops, offices and etc., shall be maintained in a neat and tidy condition throughout the duration of the Work to the satisfaction of the Engineer and Owner.

3.4 Sanitation

The Contractor shall provide and maintain adequate sanitary facilities for the personnel at the Site, including the Contractor's offices and Engineer's offices, in compliance with local health regulations and to the satisfaction of the Engineer and Owner.

3.5 Construction Roads

All temporary construction roads, which the Contractor may require to complete the Work shall be constructed at the Contractor's expense.

The location of any temporary roads, or portions thereof, on the Site shall be subject to the Owner's and Engineer's approval prior to construction. Any roadways that are not wide enough to accommodate 2-way traffic shall be clearly marked to indicate the direction of travel, or shall be closed to traffic by suitable barriers that have been approved by the Engineer.

Unless otherwise approved by the Owner, all temporary roads shall be reclaimed at the Contractor's expense upon completion of the Work.

3.6 Drainage

Adequate drainage facilities in the form of ditches, culverts or other conduits shall be installed as necessary to protect the Work and to maintain temporary construction or access roads. These temporary drainage facilities shall be constructed to the satisfaction of the Engineer and Owner.

3.7 Demobilization

On completion of the Work, the Contractor shall remove all of the Contractor's equipment, temporary facilities and materials from the Site. The Site shall be left in a clean and tidy state, to the satisfaction of the Engineer and Owner. All waste and refuse shall be disposed of in a legal manner acceptable to the Owner.

Section 4.0 - Earthwork – General

4.1 Survey

The Contractor shall provide all surveying services required for the initial staking of the Work and for staking during construction.

The Contractor shall provide sufficient surveying to control excavation and fill placement, to ensure that the Work is constructed to the lines and grades set forth in the Drawings, and to demonstrate that the work is completed to the required lines and grades.

The Owner will provide survey control for the project, and will provide periodic surveys as required to verify the Contractor's quantities for pay estimates. The Owner will provide the final as-built survey of the project.

The Contractor, in scheduling his Work, shall allow sufficient time in his construction schedule for the completion of such surveys and for the Owner's and Engineer's proper consideration thereof, prior to his authorization to proceed with the Work in the area.

4.2 Clearing, Stripping, Grubbing and Stockpiling

The natural ground surface shall be cleared and stripped and/or grubbed of all organic and objectionable materials by the Contractor to the limits shown on the Drawings or as required by the Owner. The limits of stripping shall generally be 10.0 feet outside of the work activity areas as shown on the Drawings. All usable topsoil, as determined by the Owner, shall be properly stockpiled in locations shown on the Drawings or as designated by the Owner.

Clearing and grubbing shall mean removal of vegetation and roots. Clearing and grubbing may generally be conducted as a single operation together with stripping.

Stripping shall mean the removal of topsoil, which shall be defined as soil of any gradation or degree of plasticity which contains significant quantities of visually identifiable vegetable matter, sod, roots or humus, as determined by the Engineer. In general, this is expected to have an approximate depth of between 0.3 to 1.5 feet. Varying depths will be determined by the Engineer, based on the character and thickness of material encountered.

Prior to stripping, the topsoil shall be moisture conditioned to the satisfaction of the Engineer in order to prevent the loss of fines and maintain dust control. The Contractor shall allow sufficient time after pre-wetting for the moisture to be evenly distributed throughout the soil layer prior to removal. The topsoil may need to be ripped prior to moisture conditioning to allow the moisture to be evenly distributed throughout the topsoil layer. The decision of how often and when to rip the topsoil for purposes of moisture conditioning, will be determined by the Engineer. Additional moisture conditioning may be required on stockpiled materials as determined by the Engineer.

Any stripping beyond the limits shown on the Drawings, or as required by the Owner, shall be subject to the approval of the Owner. Unapproved stripping will be subject to remediation at the sole expense of the Contractor.

Stripping will be carried out using whatever method is deemed necessary, providing it is consistent with producing an acceptable end result as determined by the Owner.

After stripping of the required area, the surface shall be treated as specified on the Drawings or in these Technical Specifications. This activity can involve trimming and shaping the surface, scarifying, moisture

conditioning, and compacting borrow material. Prior to any surface treatment on a stripped area, the Engineer shall be notified to inspect the stripped area and designate the method of treatment.

4.3 Excavation

Excavation shall consist of excavating to the lines and grades shown on the Drawings and hauling materials to designated fill or stockpile areas. Excavation methods, techniques and procedures shall be developed by the Contractor with due consideration of the nature of the materials to be excavated and shall include all precautions that are necessary to preserve, in an undisturbed condition, all areas outside the lines and grades shown on the Drawings or required by the Owner. The work shall be carried out by whatever method is considered most suitable, providing it is consistent with producing an acceptable end result as determined by the Engineer.

No excavation beyond the lines and grades shown on the Drawings, or as required by the Engineer, shall be done without the prior written approval of the Owner. If such additional excavation is done without the prior written approval of the Owner and, in the opinion of the Engineer, requires backfilling in order to satisfactorily complete the Work, such backfilling shall be completed at the Contractor's cost. All such backfilling will be subject to approval by the Engineer.

Pockets of unsuitable materials within the limits of an excavation shall be removed and disposed of as directed by the Owner and Engineer. Unsuitable materials may include, but not be limited to, ash, boulder or gravel zones, soft saturated zones, highly organic zones, drilling mud pits and other deleterious material.

The Contractor shall protect and maintain all excavations until all work is completed and approved.

Any damage resulting from the Contractor's operations during site preparation or excavation, including damage to foundations and excavated surfaces, shall be repaired at the expense of the Contractor, and to the satisfaction of the Engineer.

Waste and topsoil piles shall be leveled, trimmed and shaped as required by the Owner to prevent the occurrence of ponding or concentrations of surface runoff, and to provide a neat appearance. Finished slopes of the topsoil stockpiles shall be graded to 3.0:1 (horizontal:vertical) for interim reclamation. All surface water runoff shall either be directed to surface water diversion structures, or to existing streams downstream of the ponds.

4.4 Anchor Trenches

The Contractor shall excavate and backfill all anchor trenches required for the installation of all geosynthetics. Anchor trenches shall be backfilled with the material that was excavated from them, as described in Section 5.3. The excavations shall be to the lines and grades shown on the Drawings, or as directed by the Engineer.

4.5 Fill Placement

The intent of this specification is to use material excavated from the ponds for the construction of embankments and the soil liner, in a manner that satisfies the technical requirements and minimizes construction costs. Material that is excavated from the ponds will be used as fill in various locations, depending on the nature of the material and the discretion of the Engineer.

All material used for fill shall be loaded and hauled to the placement site, dumped, spread and leveled to the specified layer thickness, moisture conditioned, if required, and compacted to form a dense integral fill, per the Technical Specifications, and to the approval of the Owner and the Engineer. Care shall be taken at all times to avoid segregating the material being placed.

Under most conditions, the fill shall be constructed in near horizontal layers with each layer being completed over the full length and breadth of the zone before placement of subsequent layers. Each zone shall be constructed with materials meeting the specified requirements, and shall be free from lenses, pockets and layers of materials, which are substantially different in gradation from the surrounding material in the same zone, as determined by the Engineer. All fill placed shall be free from organic debris, frozen soil, ice, or other unsuitable materials. All over-sized material shall be removed from the fill material either prior to it being placed, or after it is dumped and spread but prior to compaction.

All particles that have dimensions that will interfere with compaction in the specified layer thickness, as determined by the Engineer, shall be removed from the zone in which they were placed, either prior to or during compaction.

Moisture conditioning is the operation required to increase or decrease the moisture content of material to within the specified limits. If moisture conditioning is necessary, it may be carried out by whatever method the Contractor deems is suitable, provided it produces the moisture content specified in these Technical Specifications or designated by the Engineer. The moisture shall be distributed uniformly throughout each layer of material being placed, immediately prior to compaction. Measures shall be adopted as necessary to ensure that the designated moisture content is preserved after compaction, and until the succeeding layer is placed.

Under no circumstances shall fill be placed in water. During construction, the surface of the fill shall be maintained with a crown or cross-slope that will ensure effective drainage to the extent possible. Adequate drainage facilities in the form of ditches or culverts shall be installed to direct surface flow away from the fill zone.

Should the surface of the fill become rutted or uneven subsequent to compaction, it shall be regraded and recompacted before the next layer of fill is placed.

To permit suitable bonding with the subsequent layer, the surface material shall be loosened by scarifying or disk harrowing, as approved by the Engineer, and if necessary, it shall be moisture conditioned before an additional lift is placed.

Fill shall not be placed on frozen soil or when air temperatures drop below 32º F, unless otherwise approved by the Engineer.

All areas with completed surfaces are to be protected from detrimental effects of weather using methods that have been approved by the Engineer. Any areas that are damaged by adverse weather conditions as determined by the Engineer shall be removed and replaced, reconditioned or reshaped, and recompacted to the requirements of the Specifications at the Contractor's expense.

Areas that become unstable due to excessive moisture shall be reworked, brought to the required moisture content, and recompacted to the required density before subsequent fill placement. This includes the repair of any underlying materials damaged as a result of pumping.

4.6 Compaction Equipment

Sufficient compaction equipment, of the types and sizes specified herein, shall be provided as necessary for compaction of the various fill materials. If alternative equipment is to be used, a submittal shall be made to the Engineer for approval of the equipment, and the submittal shall give complete details of such equipment and the methods proposed for its use. The Engineer's approval of the use of alternative equipment will be dependent upon completion of suitable test fills, to the satisfaction of the Engineer, to confirm that the alternative equipment will compact the fill materials to the specified density.

Compaction of each layer of fill shall proceed in a systematic, orderly and continuous manner that has been approved by the Engineer, to ensure that each layer receives the compaction specified.

Compaction equipment shall be routed parallel to the embankment axis or the long axis of the fill zone, and overlap between roll patterns shall be a minimum of 12 inches.

The rolling pattern for compaction of all zone boundaries or construction joints shall be such that the full number of roller passes required in one of the adjacent zones, or on one side of the construction joint, extends completely across the boundary or joint.

Compaction equipment shall be maintained in good working condition at all times to ensure that the amount of compacted effort obtained is a maximum for the equipment.

Before commencing Work with the proposed compaction equipment the Owner and the Engineer shall be provided with a list of each piece of equipment to be used together with the Manufacturer's specification.

4.6.1 Smooth Drum Vibratory Roller

Smooth drum vibratory rollers shall be equipped with a suitable cleaning device to prevent the accumulation of material on the drum during rolling. Each roller shall have a total static weight of not less than 10 ton at the drum when the roller is standing on level ground. The drum shall be not less than 5.0 feet in diameter and 6.5 feet in width. The vibration frequency of the roller drum during operation shall be between 1,100 and 1,500 vibrations per minute, and the centrifugal force developed by the roller, at 1,250 vibrations per minute, shall not be less than 38,250 pounds. The power of the motor driving the vibrator shall be sufficient to maintain the specified frequency and centrifugal force under the most adverse conditions, which may be encountered during the compaction of the fill.

4.6.2 Sheepsfoot Roller

On fine-grained cohesive soils the Contractor will be required to compact the fill with a sheepsfoot roller. The soil liner will require compaction with a sheepsfoot roller, and it is expected that much of the random fill will also consist of fine-grained cohesive soils. Placement of these materials will not be allowed without a sheepsfoot roller working the area of placement prior to the placement of the next lift.

The sheepsfoot roller shall be a self-propelled, fully ballasted standard sheepsfoot design developing 6,000 lbs. in weight per linear foot of width at rest on level ground, or equivalent as approved by the Engineer. The sheepsfoot roller shall be equipped with an hour meter to indicate actual roller operating time.

Following compaction with a sheepsfoot roller, the finish grade surface shall be bladed smooth and the proof-rolled with a smooth drum compactor until the surface is relatively smooth, firm and free from projections.

4.6.3 Special Compactors

Special compactors shall be used to compact materials that, in the opinion of the Engineer, cannot be compacted properly by the specified roller because of location or accessibility.

Special compaction measures shall be adopted such as hand-held vibratory compactors or other methods approved by the Engineer to compact fill in trenches, around structures and in other confined areas that are not accessible to the larger vibratory roller or tamping foot roller. Such compaction shall be to the specified density.

4.7 Compaction and Moisture Content

All material, after placing, spreading and leveling to the appropriate layer thickness shall be uniformly compacted in accordance with the requirements for each type of fill as indicated in the following table:

Table 3.1 - Compaction Requirements

Material	Compaction Specification	Moisture Content
Prepared Subgrade	92% of Maximum Dry Density by ASTM D1557	+/- 3% of Optimum
Random Fill	92% of Maximum Dry Density by ASTM D1557	+/- 3% of Optimum
Soil Liner	92% of Maximum Dry Density by ASTM D1557	0 to +5% of Optimum

Section 5.0 - Earthwork Preparation and Placement

5.1 Subgrade Preparation

After grubbing and stripping, the exposed surface shall be inspected and approved by the Engineer prior to subgrade preparation. Subgrade preparation methods will depend on the location and the materials that will be placed over the subgrade.

5.1.1 Areas to Receive Random Fill

Areas to be covered with random fill shall be scarified to a depth of 0.5 feet, moisture conditioned (if necessary) and recompacted to a minimum of 92 percent of maximum dry density as determined by the modified Proctor test (ASTM D1557).

5.1.2 Prepared Subgrade

The prepared subgrade areas shall be prepared in the same manner as subgrade under random fill as described in Section 5.1.1.

All areas to receive geomembrane shall be prepared to the satisfaction of the Engineer. The exposed surface shall be moistened and proof rolled to ensure that the surface is firm and smooth. Proof rolling should be done using a smooth drum roller or another piece of equipment as approved by the Engineer. Areas to be lined with geosynthetics shall have no sudden, sharp or abrupt changes in grade. The surface shall be prepared such that it is smooth, compacted, and free of protruding rocks, vegetation or any other materials or objects deemed unsuitable by the Engineer. In areas were rocks larger than 3/8 inches are protruding, the rocks shall be removed and replaced with sand or other fine-grained material. Sanding may also be used in other areas to produce a relative smooth surface suitable for installation of High Density Polyethylene (HDPE) liner. Any areas not acceptable to the Engineer shall be repaired to his satisfaction at the expense of the Contractor.

5.2 Fill Placement

The intent of these Specifications is to promote the use of “on-site” materials to construct the facility, and to minimize the importation of offsite materials. It is anticipated that most of the embankment construction material, as well as the soil liner material, will be obtained form the material excavated from the ponds. It may however be necessary to develop borrow areas to source specific kinds of materials. The origin of any material in no way guarantees it’s suitability as fill material. Designation and approval of a stockpile or borrow area does not guarantee that all material from that source is suitable for construction. Unsuitable materials shall be stockpiled in areas designated by the Engineer. The Engineer will conduct testing to establish suitability of all fill materials used on the project.

The Contractor shall not place any fill material in an area until the Engineer has inspected and approved the foundation or in-place lift.

All fill materials shall be placed to the lines and grades shown on the Drawings and in accordance with Section 4.0 of the Technical Specifications.

5.2.1 Random Fill

Random fill shall consist of inorganic soil and rock materials obtained by excavating the ponds or from borrow areas approved by the Engineer. Random fill material may have a wide range of Unified Soil Classifications, and may have significant variation in index and compaction properties. There are no gradation limitations on the random fill, other than the maximum particle size, which shall not exceed 2/3

of the specified lift thickness. However, the contractor shall take necessary care when placing to coarse rock to ensure that boulders do not become nested to the point that large voids can result. Coarse fill shall be placed in such a manner that boulders are surrounded by finer grained material.

Materials with less than 30 percent (by weight) rock materials larger than 3/4 inches and 8 inches maximum rock size shall be conditioned to within 2 percent of optimum moisture content, placed in lifts not exceeding 1.0 feet and compacted to 92 percent of maximum dry density as determined by ASTM D1557 (modified Proctor).

Random fill containing more than 30 percent rock materials larger than 3/4 inches (rock fill) shall be conditioned, placed and compacted using procedures based on the results of a test fill. The type of compaction equipment, number of passes and maximum rock size and loose lift thickness will be approved by the Engineer in writing based on the acceptable test fill performance. The Contractor shall outline his proposed procedures for moisture conditioning and fill placement and submit them to the Engineer for review and approval.

For rock fills, the Contractor shall construct a test fill to verify the adequacy of the compaction equipment for achieving the required density. The test fill may be located so that it is incorporated within the limits of the compacted fill area. The test fill shall be constructed and monitored as per U.S. Army Corps of Engineer's guidelines for test fill construction (USACE EM 1110-2-2301).

The data to be collected during construction of the test fill shall include the following:

- Lift thickness of 1.0, 2.0, and 4.0 feet (three test fills to establish optimum lift thickness).
- Amount of settlement after every 2 passes of compactor, to a maximum of 25 passes.
- Gradation and moisture content of in-place material.
- In-place fill density at completion of the test by nuclear gauge or other methods approved by the Engineer.

A curve showing change in settlement versus number of passes shall be produced from the data. The minimum number of passes to achieve acceptable compaction will be the number required to achieve 80 percent of the total settlement obtained after no fewer than 10 complete passes of the compaction equipment. The lift thickness and minimum number of passes with compaction equipment shall be approved by the Engineer after review of test fill data. A compaction of 92 percent of maximum dry density as determined by ASTM D1557 (modified Proctor) must be achieved.

Random fill is to have a minimum effective angle of friction of 27 degrees. Maximum rock size for rock fills shall be two-thirds of the compacted lift thickness, unless otherwise approved by the Engineer. Oversized materials shall be removed from the fill. No additional payment will be made to remove oversized materials.

5.2.2 Clay Liner

Clay liner shall consist of inorganic fine grained silt and clay or sandy and gravelly silt and clay obtained from the pond excavations, or approved borrow areas. The clay liner shall be placed in lifts not exceeding 6-inches, moisture conditioned to between 0 and +7 percent of optimum and compacted to 92 percent of maximum dry density, as determined by ASTM D1557. The clay liner is to conform to the following specifications:

- Maximum particle size: 3 inches
- Minimum passing No. 200 sieve: 50%
- Minimum plasticity index: 20

- Maximum coefficient of permeability at 92% of Modified Proctor Density (ASTM D1557): $1x10^{-7}$ cm/sec

The Contractor shall provide the equipment and labor necessary to load the soil liner material, haul, place and spread the material within the pond limits, moisture condition and compact it, and prepare the soil liner surface for the placement of the HDPE liner.

Material placed too wet for adequate compaction shall be left to dry or shall be aerated and dried by a means that has been approved by the Engineer until the moisture content is uniform throughout the lift and within the specified limits, or has been approved by the Engineer. Material placed too dry shall be moisture conditioned with water. The lift shall then be mixed until the moisture content is uniform throughout the lift and within the specified limits, or approved by the Engineer. At his discretion, the Engineer may allow the use of material that has a moisture content above the specified limits, provided that the required compaction can be achieved, and that the permeability of the material meets the specified requirements.

Moisture conditioning shall be completed using equipment properly equipped with pressure spray bars and valves to give a uniform application of water.

Areas to receive a geomembrane liner are to be prepared as detailed in Section 5.1.2.

5.3 Backfilling of Anchor Trenches

The Contractor shall backfill all anchor trenches following the installation of the geomembrane liners after the Engineer has given his approval. The backfill shall consist of random fill material excavated from the trenches, and which has had all sharp rocks and rocks larger than 3-inches in diameter removed. Where the material excavated from the trenches is not suitable for backfill of the trenches, the Contractor may remove the excavated material to a stockpile that has been designated by the Engineer, and backfill the trenches with suitable material from a source that has been approved by the Engineer.

The moisture content and compaction of the anchor trench backfill shall meet the requirements of random fill material.

No backfill shall be placed in water, and it shall be the Contractor's responsibility to remove any water from the trench prior to placement of backfill material.

Any damage to the geosynthetics caused by the Contractor's excavation or backfill operation shall be repaired at the Contractor's expense, including any costs that may be incurred for retesting the geosynthetic liner.

5.4 Filter Sand

Filter sand shall consist of a medium sand with few fines meeting the size graduation given below:

Table 4.1 – Filter Sand – Particle Size Distribution

Sieve No.	Percent Passing	
	Minimum	Maximum
No. 4	95	100
No. 8	70	100
No. 16	40	90
No. 30	25	75
No. 50	2	25
No. 100	0	4
No. 200	0	2

5.5 Riprap

Riprap will be used for lining a number of the stormwater diversion channels, as shown on the Drawings. Stone used for riprap shall be hard, durable, angular in shape, resistant to weathering and to water action and free of shale and organic material and generally conform to the recommended gradation guidelines. Generally riprap should be well graded with the D_{100} twice the size of the D_{50}, and the D50 twice the size of the D_{20}. The riprap gradations shall be in accordance with the following tables:

Table 4.2 – Riprap Particle Size Distribution – D_{50} = 12"

Particle Size (inch)	Percent Passing	
	Minimum	Maximum
24	100	100
12	30	70
6	10	40

Table 4.3 – Riprap Particle Size Distribution – D_{50} = 9"

Particle Size (inch)	Percent Passing	
	Minimum	Maximum
18	100	100
9	30	70
5	10	40

Table 4.4 – Riprap Particle Size Distribution – D_{50} = 6"

Particle Size (inch)	Percent Passing	
	Minimum	Maximum
18	100	100
9	30	70
5	10	40

Stone for riprap shall be placed on the prepared surface in a manned that will produce a reasonably well-graded mass of stone with the minimum practicable percentage of voids. The entire mass of stone shall be placed so as to be in reasonable conformance with the lines and grades shown on the Drawings or required by the Engineer. The thickness of the riprap layer shall be a minimum of twice the specified D_{50} or the equal of the largest particle, whichever is greater. In no circumstance shall the layer be thinner than as indicated on the drawings. Riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid damaging or displacing the underlying material.

The larger stones shall be well distributed and the material shall be placed and distributed such that there will be no large accumulations of either the large or smaller sizes of stone. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to achieve the specified results.

5.6 Pipe Bedding Material

Pipe bedding material shall consist of natural sand, a mixture of sand with gravel, crushed gravel or stone, or other broken of fragmented material. In addition, the material shall have a plasticity index of 5 or less. The pipe bedding material shall meet the following grading requirements:

Table 4.5 – Pipe Bedding Material – Particle Size Distribution

Sieve No.	Percent Passing	
	Minimum	Maximum
1 inch	100	100
⅜ inch	65	100
No. 4	35	100
No. 200	0	15

Section 6.0 - Quality Control Construction Tolerances

The Contractor shall construct the various zones to the lines and grades shown on the Drawings, or as required by the Engineer, within the following tolerances:

1. All drainage zones shall be constructed such that the dimensions at any location within the zone shall not be less than those shown.
2. Finished grades shall slope uniformly between given spot and contour elevations. All grades shall provide for natural runoff of water without low spots or pockets.
3. Excavations shall not exceed a vertical tolerance of plus or minus 0.1 feet, and a horizontal tolerance of 0.5 feet. Should over-excavation occur resulting in the vertical tolerance of 0.1 feet being exceeded, the excavation is to be backfilled using random fill and compacted to obtain a tolerance of 0.1 feet.
4. Fill and backfill shall be placed within a vertical tolerance of plus or minus 0.1 feet, and a horizontal tolerance of 0.5 feet, unless otherwise approved by the Engineer.

Section 7.0 - Quality Assurance/Quality Control (QA/QC)

The Engineer will be responsible for testing construction materials to assess whether materials and methods comply with the Specifications. All testing performed by the Engineer will be performed in accordance with procedures outlined in the Specifications, and will be conducted on samples collected from the field as well as test performed on the compacted fill. The results of the tests carried out by the Engineer will be final and conclusive in determining compliance with the Technical Specifications.

Each lift of fill will require approval by the Engineer prior to placement of next lift. Sufficient time shall be allowed by the Contractor for the Engineer to carry out the required test work and interpretation of the test results in order to decide upon the acceptability of each lift. Cooperation shall be given by the Contractor, to the Owner and the Engineer, for taking samples or making tests, and such assistance shall be rendered as is necessary to enable sampling and testing to be carried out expeditiously. The making of such tests or the time taken to interpret their results shall not constitute grounds for a claim by the Contractor for additional compensation or extension of time.

Tests carried out by the Engineer will be performed in accordance with the latest principles and methods prescribed by the American Society for Testing and Materials (ASTM) and other such recognized authorities.

The Engineer's staff will consist of a Field Engineer who will be assisted by Laboratory or Field Technicians as required. The Field Engineer will have overall responsibility for the site work and will report directly to the Owner's representative. The Field Engineer will be responsible for all inspection and testing, and interpretation of the results.

7.1 Earthworks Quality Control

Inspection of earthworks will involve testing and on-the-spot examination of all materials being used for construction to establish compliance with the material requirements, moisture conditioning, spreading procedures, layer thicknesses, and compaction requirements.

7.2 Testing Requirements

The ensure that satisfactory quality control is maintained and that the design objectives are achieved, specific testing requirements will be implemented for all materials placed within the Work area. Tests to be carried out will be divided into two categories:

- Control tests
- Record tests

Control tests will be used to verify whether the materials comply with the Specifications prior to placement. During placement and after completion of the Work, record tests will be carried out to assess whether the work and materials meet the requirements of the Specifications.

7.2.1 Control Tests

The following control tests will be performed before material has been compacted:

- Particle size distribution for fill materials, soil liner, filter sand and riprap. Samples for these tests will be obtained from the material source, and also from material that has been placed and spread, but not yet compacted.

- Moisture content of fill materials and the soil liner. Samples for these tests will be obtained from the material source, and also from material that has been placed and spread, but not yet compacted.
- Modified Proctor compaction tests (ASTM D1557) of fill materials and the soil liner. Samples for these tests will be obtained from the material source, and also from material that has been placed and spread, but not yet compacted.
- Atterberg limits of fill materials and the soil liner. Samples for these tests will be obtained from the material source, and also from material that has been placed and spread, but not yet compacted.
- Other tests, where applicable, will be made by the Engineer on samples of fill materials taken from borrow areas and on the fill, at frequencies sufficient to assess whether the fill material is in compliance with the Technical Specifications.

7.2.2 Record Tests

The following record tests will be performed on material that has been placed and compacted:

- Particle size distribution for fill materials, soil liner and filter sand.
- Field density test on fill materials and the soil liner.
- Moisture content of the fill materials and soil liner.
- Laboratory compaction and particle size distribution of materials recovered from select field density test locations.
- In-situ laboratory permeability tests on fill materials and the soil liner.
- Atterberg limit tests on fill materials and the soil liner.
- Other tests on the fill compacted in place, and on samples of the compacted fill for related laboratory testing at such frequency as the Engineer considers necessary to assess whether the compacted fill is in full compliance with the Technical Specifications.

7.3 Testing Frequencies

The Engineer will carry out geotechnical tests to establish compliance of the Work with the Technical Specifications. Standard procedures will be used for all activities and in general these will be adopted by recognized organizations, such as the American Society of Testing and Materials (ASTM). The following tables outline the minimum testing requirements for the project.

Table 6.1 - Test Methods

Test Designation	Type of Test	Test Method (ASTM)
C1, R1	Atterberg Limits	D4318
R2a C2, R2b	Nuclear Method Moisture Content Laboratory Moisture Content	D6938 D2216
C3, R3	Particle Size Distribution	D422[(3)]
C4, R4	Laboratory Compaction	D1557
R5a R5b R5c	Nuclear Method Field Density Sand Cone Field Density Water Replacement Field Density	D6938 D1556 D5030
C6, R6	Laboratory Permeability Test	D5084
C7, R7	Riprap Particle Size Distribution	Pebble Count

Notes:
1. C – Denotes Control Tests
2. R – Denotes Record Tests

3. Hydrometer tests down to the 2-micron size will be carried out as directed by the Engineer but will generally not be required. All samples are to be wash graded over a #200 sieve.

Table 6.2 - Test Frequency - Prepared Subgrade

Test Designation	Type of Test	Frequency (1 per)
R1	Atterberg Limits	2,000 yd^2
C2, R2a, R2b	Moisture Content	1,000 yd^2
C3, R3	Particle Size Distribution	2,000 yd^2
C4, R4	Laboratory Compaction	2,000 yd^2
R5a	Nuclear Density	1,00 yd^2
R5b	Sand Cone Field Density	5,000 yd^2

Table 6.3 - Test Frequency - Random Fill

Test Designation	Type of Test	Frequency (1 per)
R1	Atterberg Limits	5,000 yd^3
C2, R2a, R2b	Moisture Content	2,500 yd^3
C3, R3	Particle Size Distribution	5,000 yd^3
C4, R4	Laboratory Compaction (Modified Proctor)	5,000 yd^3
R5a	Nuclear Density	1,000 yd^3
R5b	Sand Cone Field Density	10,000 yd^3
C6, R6	Laboratory Permeability Test	5,000 yd^3

Table 6.4 - Test Frequency – Soil Liner

Test Designation	Type of Test	Frequency (1 per)
R1	Atterberg Limits	1,000 yd^3
C2, R2a, R2b	Moisture Content	500 yd^3
C3, R3	Particle Size Distribution	1,000 yd^3
C4a, R4a	Laboratory Compaction (Modified Proctor)	1,000 yd^3
R5a	Nuclear Density	1,000 yd^3
R5b	Sand Cone Field Density	2,500 yd^3
C6, R6	Laboratory Permeability Test	1,000 yd^3

Table 6.5 - Test Frequency – Filter Sand

Test Designation	Type of Test	Frequency (1 per)
C3, R3	Particle Size Distribution	250 yd^3

Table 6.5 - Test Frequency – Riprap

Test Designation	Type of Test	Frequency (1 per)
C7, R7	Riprap Particle Size Distribution	1,000 yd^3

7.4 Reporting

The Engineer will prepare daily progress reports throughout the period of construction. The reports will summarize pertinent construction activities, the results of testing completed over that period, and highlight any difficulties that were encountered.

7.5 Test Records

The Engineer will maintain a record of all tests. The tests will be recorded on a form applicable to the test being performed. The location of all tests will be recorded and accurately described. A plan indicating the location of the tests will be maintained.

7.6 Construction Report

On completion of the Work, the Engineer will prepare a construction report that will include a summary of the results from all tests carried out as part of the quality assurance program. It will also include construction record Drawings.

Section 8.0 - As-Built Requirements

To assist in the production of adequate as-built Drawings and documentation, the Contractor will be required to provide one set of 22 inch by 34 inch red-lined Drawings with construction modifications, as well as the electronic formatted version of the Drawings to the Owner.

Section 9.0 - References

ASTM International, 2007, *ASTM D422 - 63 Standard Test Method for Particle-Size Analysis of Soils*, ASTM International.

ASTM International, 2007, *ASTM D1556 - 07 Standard Test Method for Density and unit Weight of Soil in Place by the Sand-Cone Method*, ASTM International.

ASTM International, 2009, *ASTM D1557 - 09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))*, ASTM International.

ASTM International, 2005, *ASTM D2216 - 05 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*, ASTM International.

ASTM International, 2005, *ASTM D4318 - 05 Standard Test Methods for Liquid Limit, Plastic limit, and Plasticity Index of Soils*, ASTM International.

ASTM International, 2009, *ASTM D5030 - 04 Standard Test Method for Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit*, ASTM International.

ASTM D5030 - 04 Standard Test Method for Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit

ASTM International, 2003, *ASTM D5084 - 03 Standard Test Methods for Measurements of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter*, ASTM International.

ASTM International, 2008, *ASTM D6938 – 08a Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear methods (Shallow Depth)*, ASTM International.

USACE 1110-2-2301, 1994, Engineering and Design – Test Quarries and Test Fills, United States Army Core of Engineers.

Drawings

DEWEY-BURDOCK PROJECT
LAND APPLICATION AND IRRIGATION

JULY 2010

Prepared for
POWERTECH URANIUM CORPORATION
5575 DTC PARRKWAY
GREENWOOD VILLAGE, COLORADO, 80111 USA

Prepared by
Knight Piésold CONSULTING
249 Third Street
Elko, Nevada 89801
1580 Lincoln Street, Suite 1000
Denver, Colorado 80203-1512

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INDEX OF DRAWINGS

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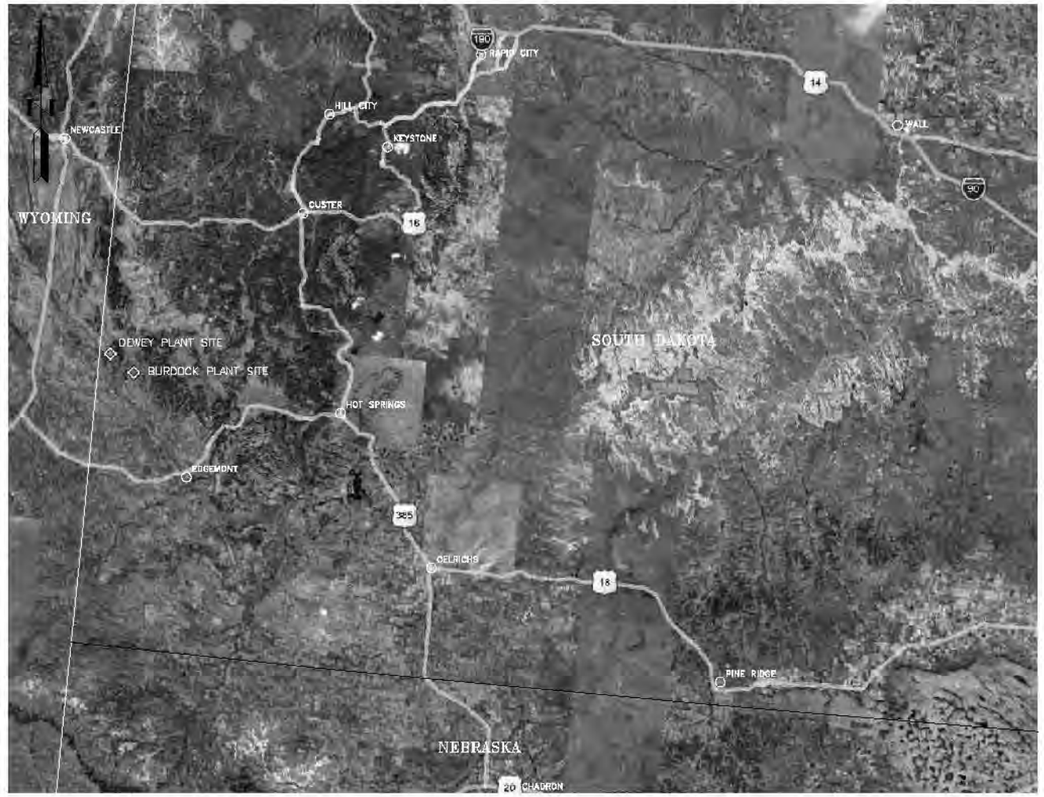

LOCATION MAP

COMMON ABBREVIATIONS		SYMBOLS AND DESCRIPTIONS		SYMBOLS AND DESCRIPTIONS	
℄	CENTER LINE	3:1	3 (HORIZONTAL) TO 1 (VERTICAL) SLOPE	A 100	SECTION CALLOUT WITH LOCATION REFERENCE
DIA	DIAMETER	E 371000	EASTING COORDINATE		
EL	ELEVATION	N 364500	NORTHING COORDINATE		
NTS	NOT TO SCALE	1 100	DETAIL IDENTIFICATION DRAWING REFERENCE NUMBER		DETAIL OR DIMENSION BREAK
REQ'D	REQUIRED				
SCH	SCHEDULE	A 100	PROFILE OR CROSS SECTION IDENTIFICATION DRAWING REFERENCE NUMBER		FENCE LINE
SDR	STANDARD DIMENSION RATIO		DIRECTION OF FLOW	1 2	SLOPE INDICATOR (DETAIL)
TOC	TOP OF CONCRETE		EXISTING GROUND SURFACE OR BOTTOM OF EXCAVATION		
TOS	TOP OF STEEL	6525	EXISTING GROUND SURFACE AND EL. FEET		
(TYP)	TYPICAL		SLOPE INDICATOR		
FT	FEET		TOP OF ROCK OR ROCK SURFACE		
			WATER LEVEL		

REV	DATE	DESCRIPTION	APP'D
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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY–BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION INDEX, GENERAL SITE LOCATION MAP AND SYMBOLS

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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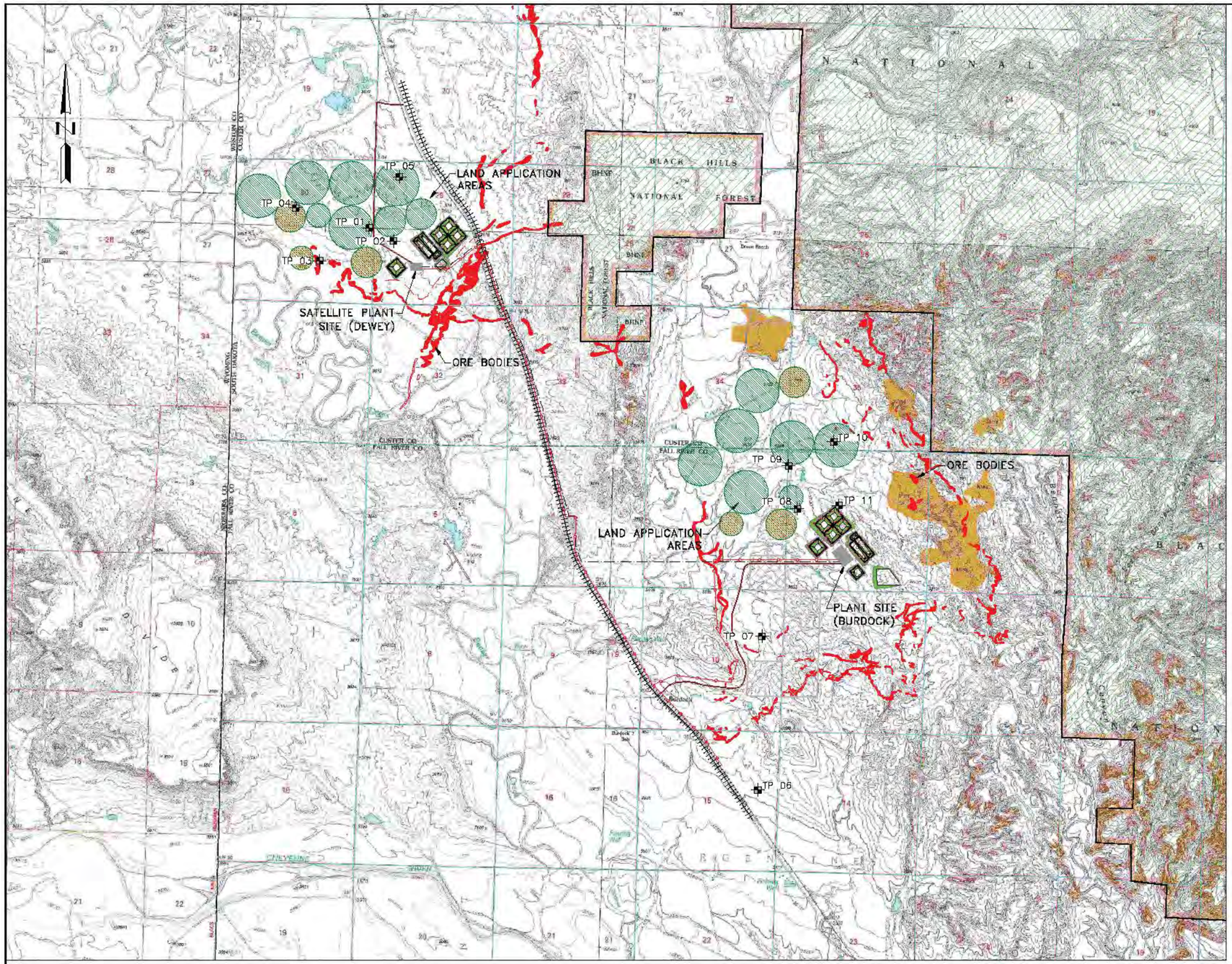

LEGEND:

- REGRADED CONTOURS
- NEW ROADS
- RAILROAD
- POWER LINE
- PIPELINE
- ORE BODIES
- LAND APPLICATION AREAS
- NATIONAL FOREST
- BLM AREAS
- TP 05 — TEST PIT

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PLAN

2000 0 2000 4000 FEET

1" = 2000' AT FULL SIZE (ANSI D)
1" = 4000' AT HALF SIZE (ANSI B)

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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION SITE INVESTIGATION – TEST PIT LOCATIONS

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DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
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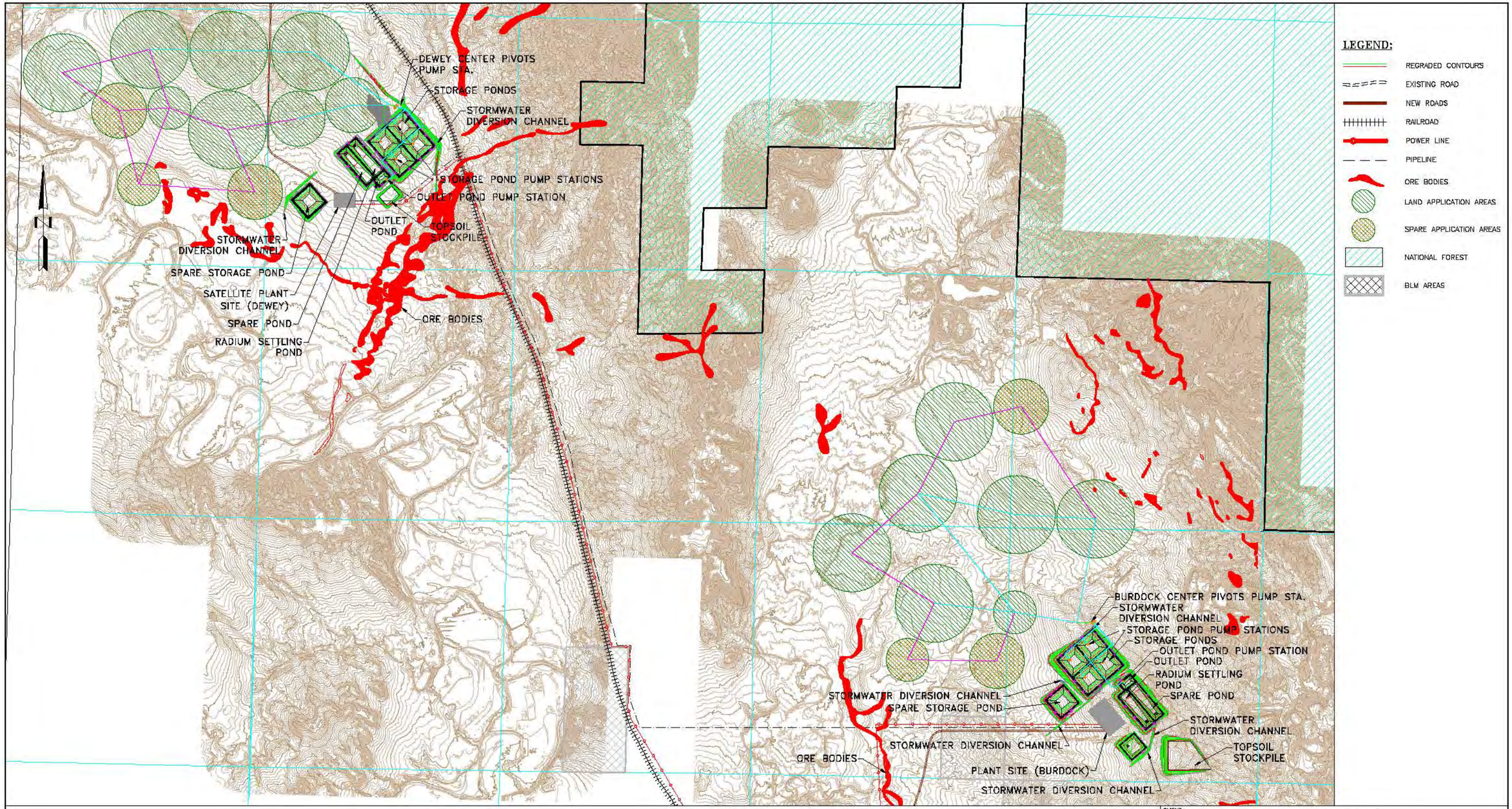

PLAN

1000 0 1000 2000 FEET

1" = 1000' AT FULL SIZE (ANSI D)
1" = 2000' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION SITE PLAN

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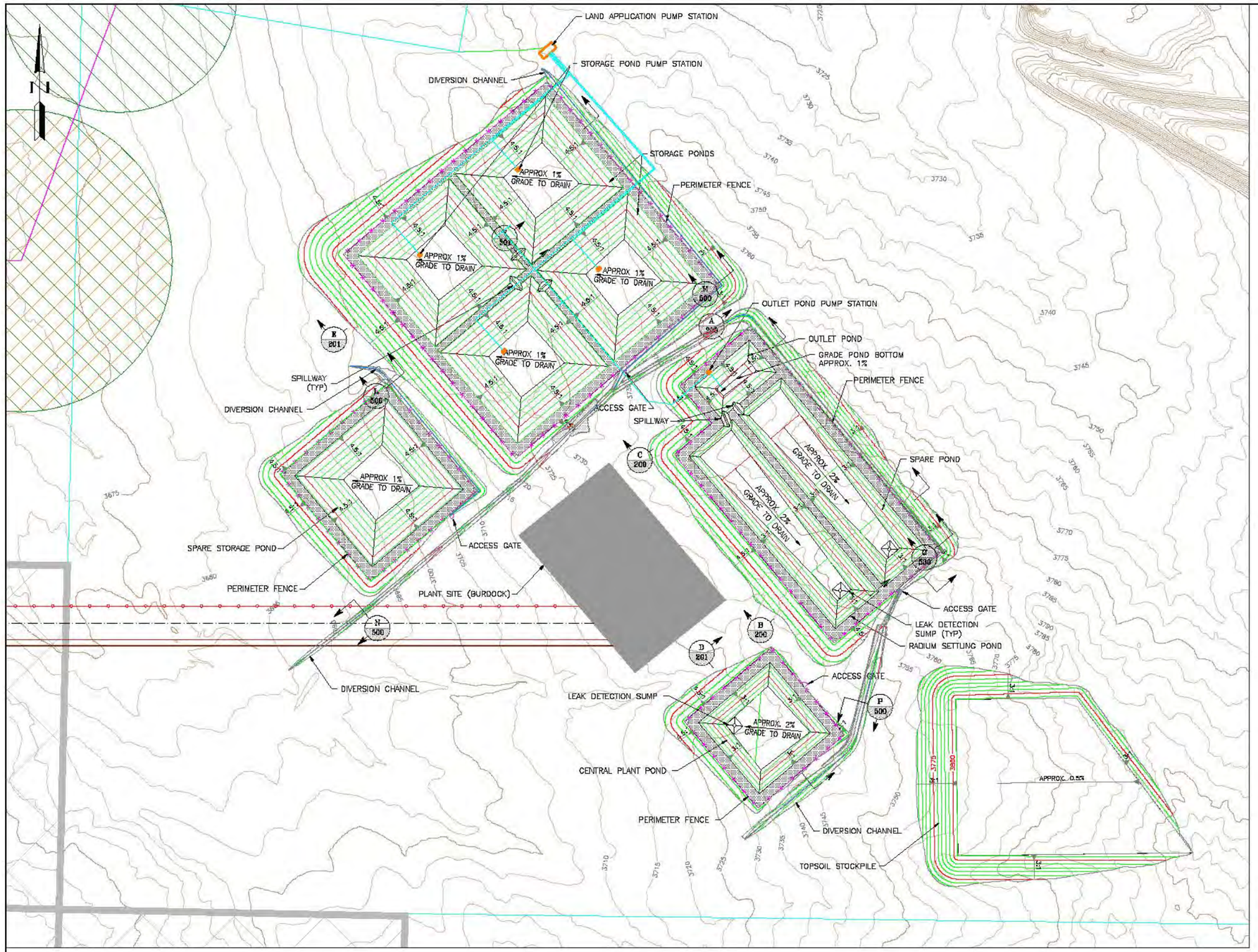

LEGEND:

- EXISTING CONTOURS
- REGRADED CONTOURS
- EMBANKMENT ROAD
- NEW ROADS
- PERIMETER FENCE
- POWER LINE
- PIPELINE
- LAND APPLICATION AREAS
- BLM AREAS

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PLAN – BURDOCK PLANT SITE

200 0 200 400 FEET

1" = 200' AT FULL SIZE (ANSI D)
1" = 400' AT HALF SIZE (ANSI B)

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PROJECT: DEWEY–BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION BURDOCK PLANT SITE PLAN

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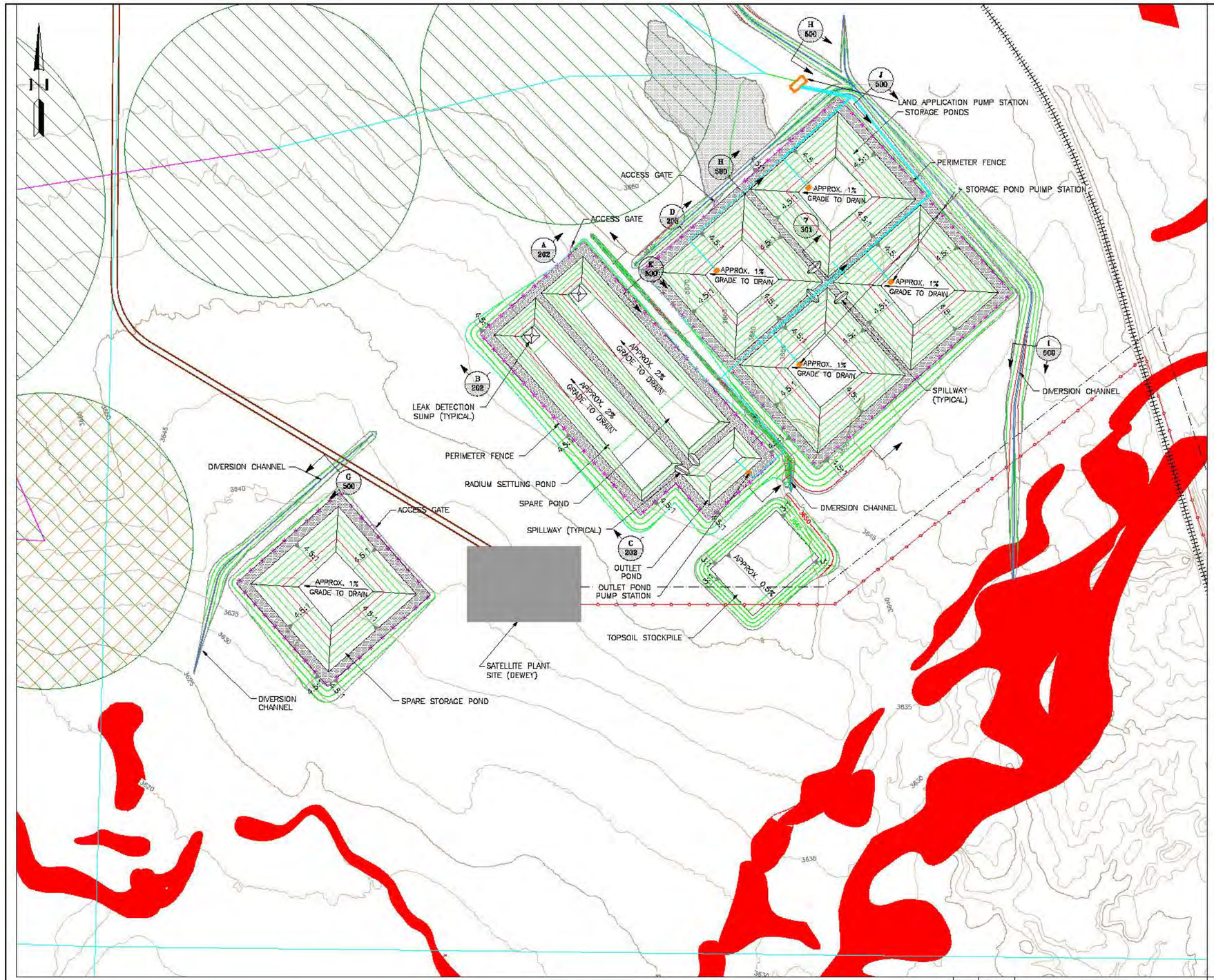

LEGEND:

- EXISTING CONTOURS
- REGRADED CONTOURS
- EMBANKMENT ROAD
- RAILROAD
- PERIMETER FENCE
- PIPELINE
- POWER LINE
- LAND APPLICATION AREAS
- ORE BODIES

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PLAN – DEWEY SATELLITE PLANT SITE

200 0 200 400 FEET

1" = 200' AT FULL SIZE (ANSI D)
1" = 400' AT HALF SIZE (ANSI B)

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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY–BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION
DEWEY PLANT SITE PLAN

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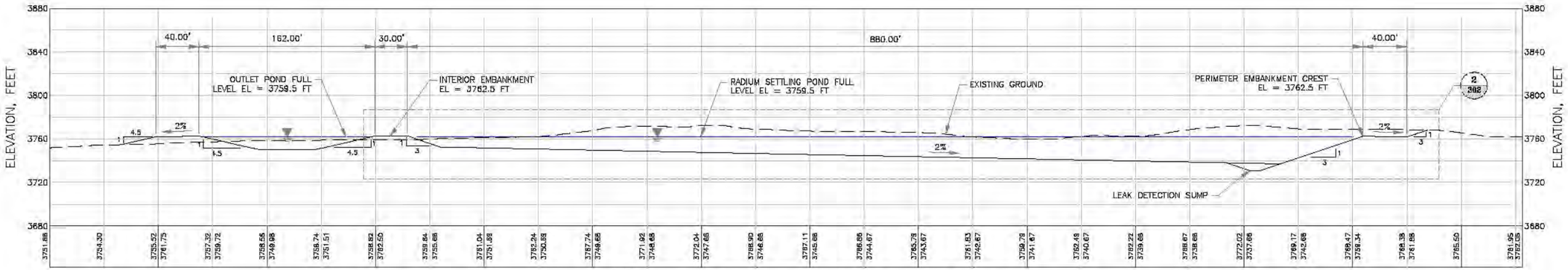
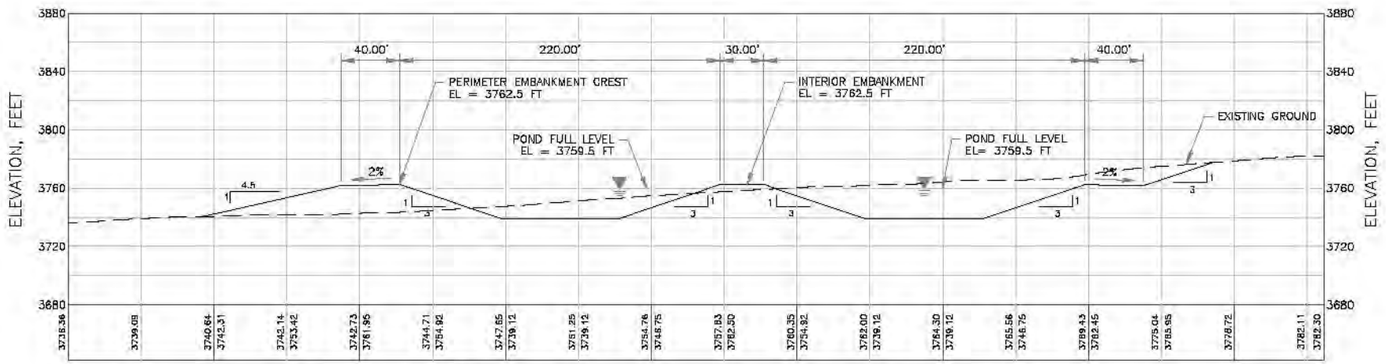
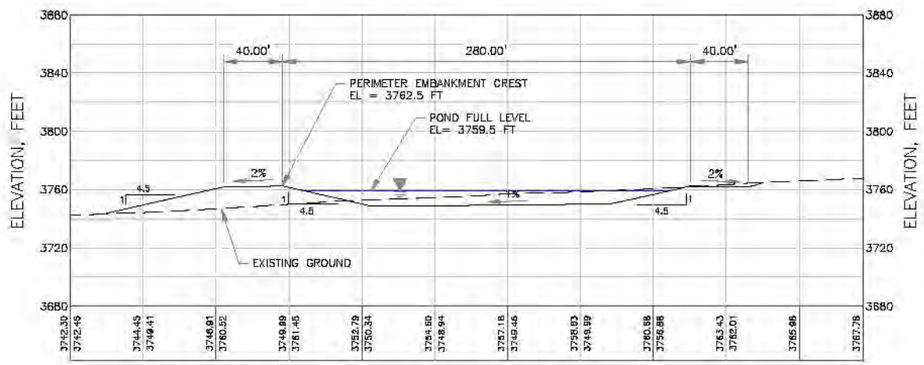


A / 101 BURDOCK RADIUM SETTLING AND OUTLET PONDS SECTION



B / 101 BURDOCK RADIUM SETTLING AND SPARE PONDS SECTION



C / 101 BURDOCK OUTLET POND SECTION

50 0 50 100 FEET
HORIZONTAL SCALE
1" = 50' AT FULL SIZE (ANSI D)
1" = 100' AT HALF SIZE (ANSI B)

50 0 50 100 FEET
VERTICAL SCALE
1" = 50' AT FULL SIZE (ANSI D)
1" = 100' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

REV	DATE	DESCRIPTION	APP'D
A	08/15/09	ISSUED FOR CLIENT REVIEW	ST / RJB

CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICAITON AND IRRIGATION BURDOCK POND SECTIONS SHEET 1 OF 2

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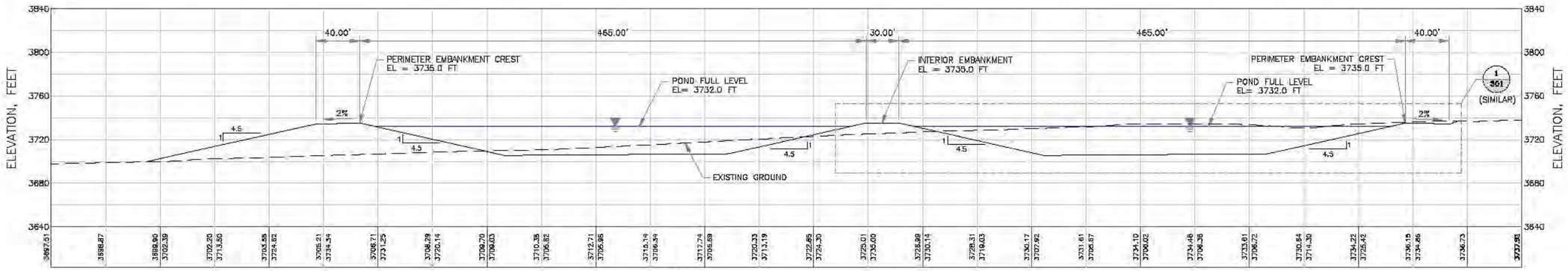
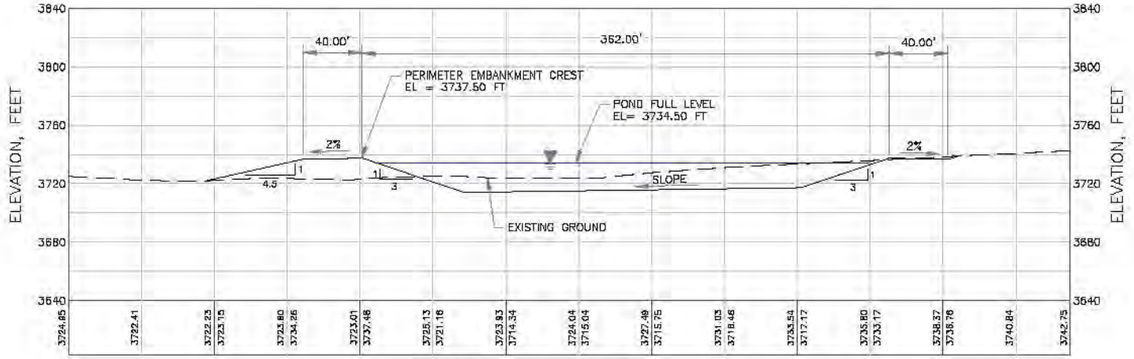
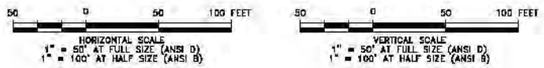


E / 101 BURDOCK STORAGE PONDS
SECTION



D / 101 CENTRAL PLANT POND
SECTION



NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

REV	DATE	DESCRIPTION	APP'D
A	08/15/08	ISSUED FOR CLIENT REVIEW	ST / RJB

CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION
BURDOCK POND SECTIONS
SHEET 2 OF 2

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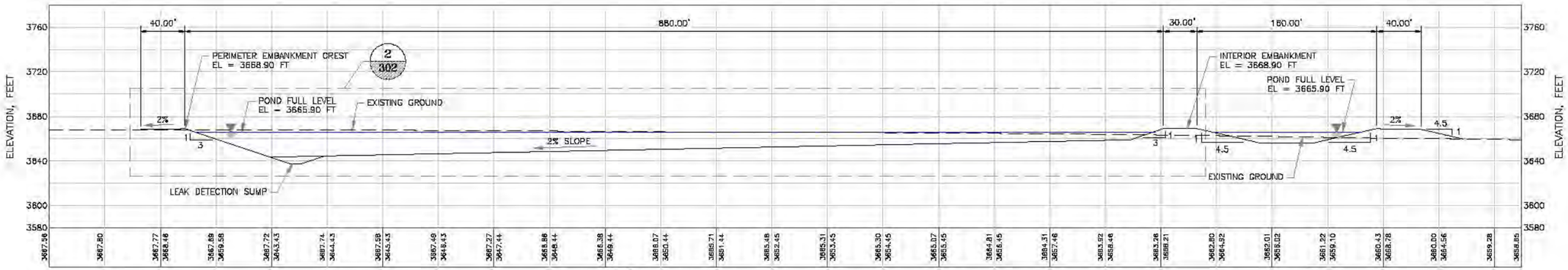
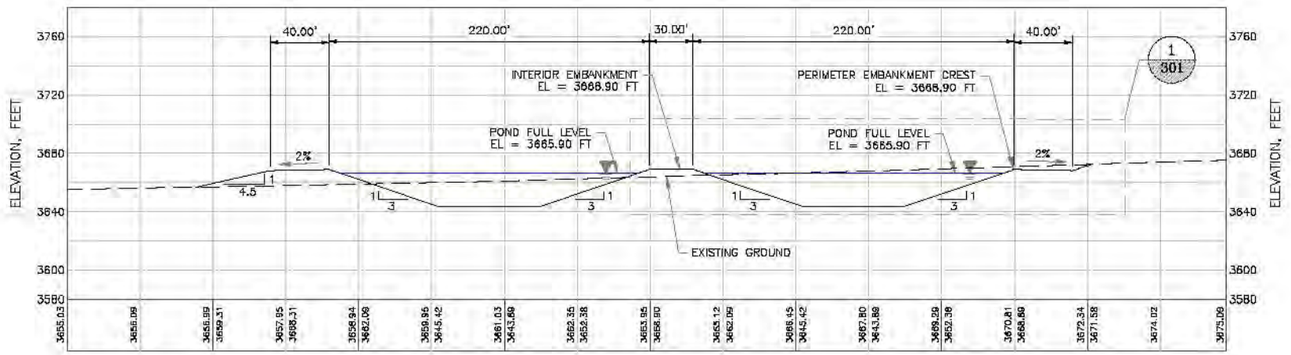
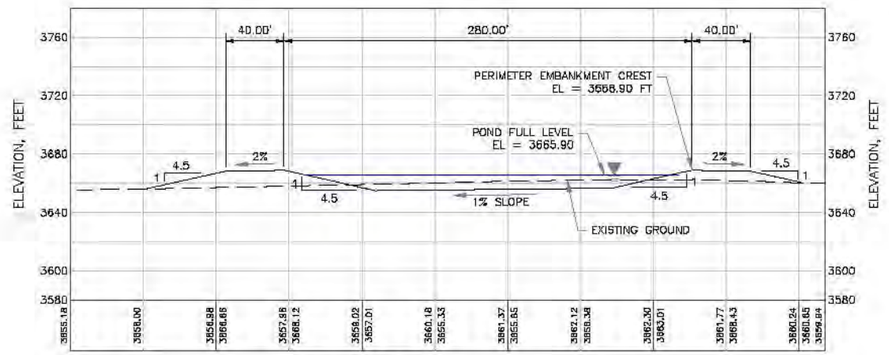


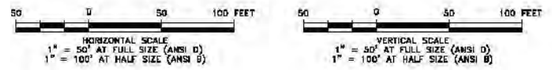
A 102 DEWEY RADIUM SETTLING AND OUTLET PONDS
SECTION



B 102 DEWEY RADIUM SETTLING PONDS
SECTION



C 102 DEWEY OUTLET POND
SECTION



NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

REV	DATE	DESCRIPTION	APP'D
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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION
DEWEY POND SECTIONS
SHEET 1 OF 2

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	RJB	102	279.02	202	A
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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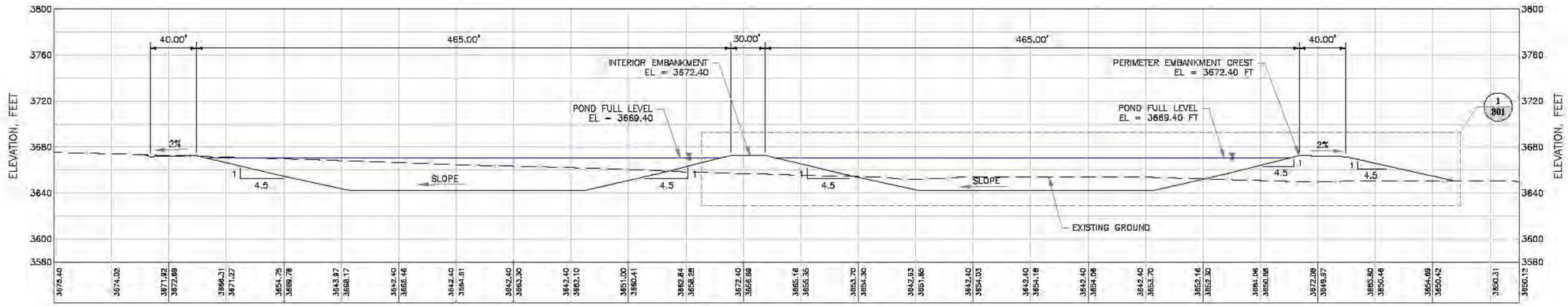

D
102
DEWEY STORAGE PONDS
SECTION

50 0 50 100 FEET
HORIZONTAL SCALE
1" = 50' AT FULL SIZE (ANSI D)
1" = 100' AT HALF SIZE (ANSI B)

50 0 50 100 FEET
VERTICAL SCALE
1" = 50' AT FULL SIZE (ANSI D)
1" = 100' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

REV	DATE	DESCRIPTION	APP'D
A	08/15/08	ISSUED FOR CLIENT REVIEW	ST / RJB

CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY–BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION
DEWEY POND SECTIONS
SHEET 2 OF 2

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	RJB	102	279.02	203	A
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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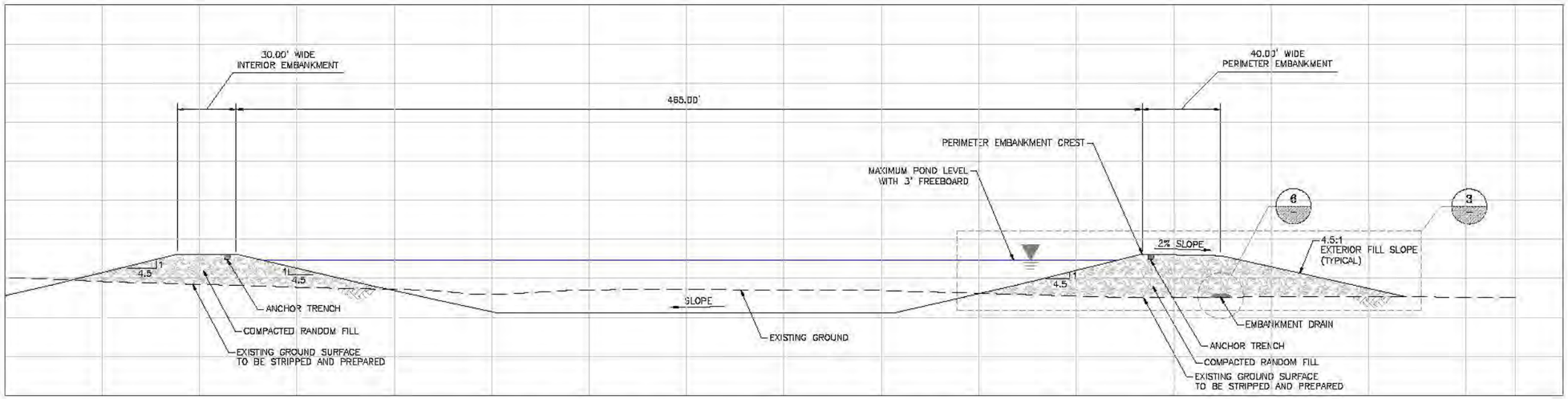
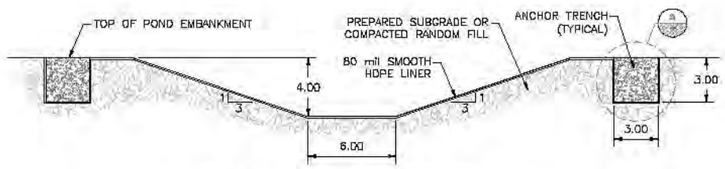


1/201 1/203 STORAGE POND DETAIL
TYPICAL OF SINGLE LINED PONDS

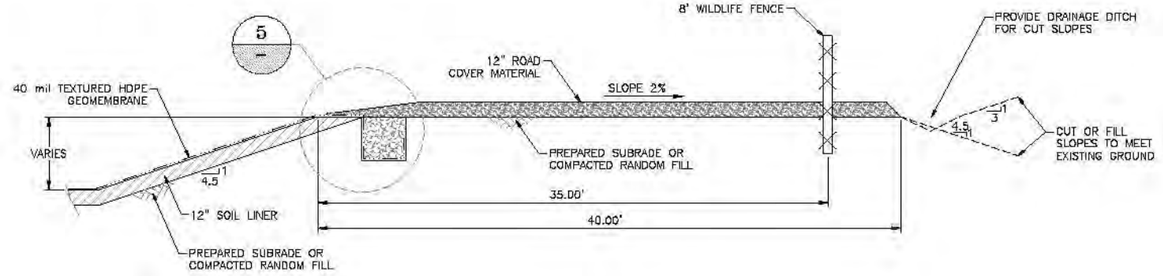
HORIZONTAL SCALE
1" = 30' AT FULL SIZE (ANSI D)
1" = 60' AT HALF SIZE (ANSI B)

VERTICAL SCALE
1" = 30' AT FULL SIZE (ANSI D)
1" = 60' AT HALF SIZE (ANSI B)



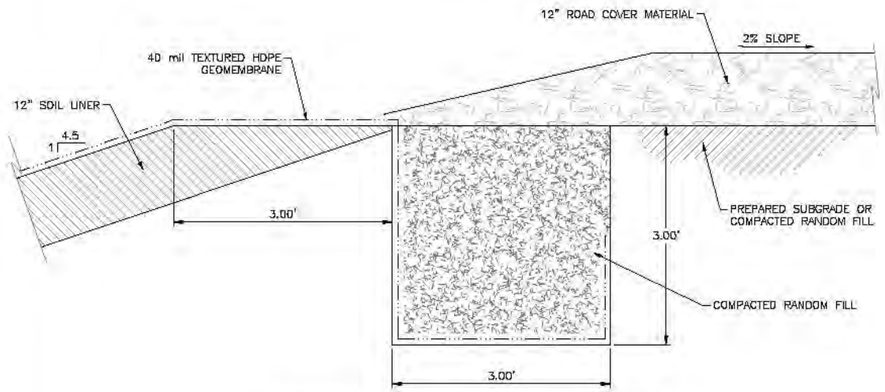
7/101 7/102 SPILLWAY DETAIL

1" = 5' AT FULL SIZE (ANSI D)
1" = 10' AT HALF SIZE (ANSI B)



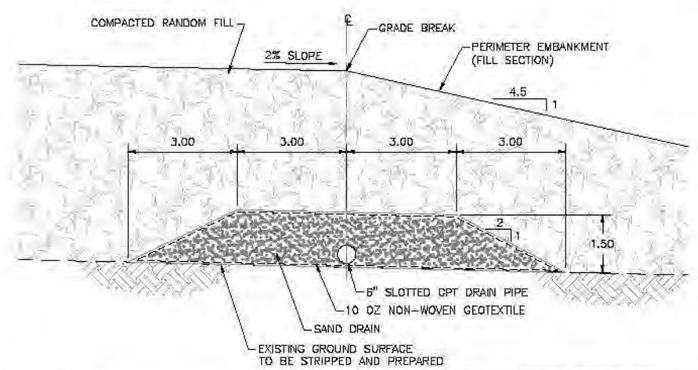
3 POND EMBANKMENT DETAIL
FOR SINGLE LINED PONDS

1" = 5' AT FULL SIZE (ANSI D)
1" = 10' AT HALF SIZE (ANSI B)



5 LINER ANCHOR TRENCH DETAIL
FOR SINGLE LINED PONDS

1" = 1' AT FULL SIZE (ANSI D)
1" = 2' AT FULL SIZE (ANSI B)



6 EMBANKMENT DRAIN DETAIL

2 0 2 4 FEET
1" = 2' AT FULL SIZE (ANSI D)
1" = 4' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
2. EMBANKMENT DRAINS TO BE CONSTRUCTED BENEATH ALL FILL EMBANKMENTS.

REV	DATE	DESCRIPTION	APP'D
A	08/15/08	ISSUED FOR CLIENT REVIEW	ST / RJB / CADD

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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION
TYPICAL POND SECTIONS AND DETAILS
SHEET 1 OF 2

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	RJB	102	279.02	301	A
ACTIVITY CODE	N/A	XREF NUMBER:	N/A		

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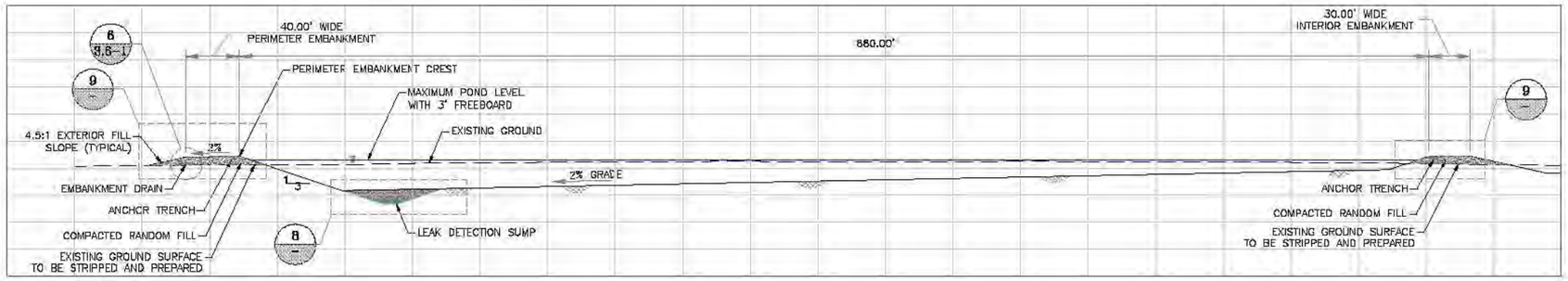
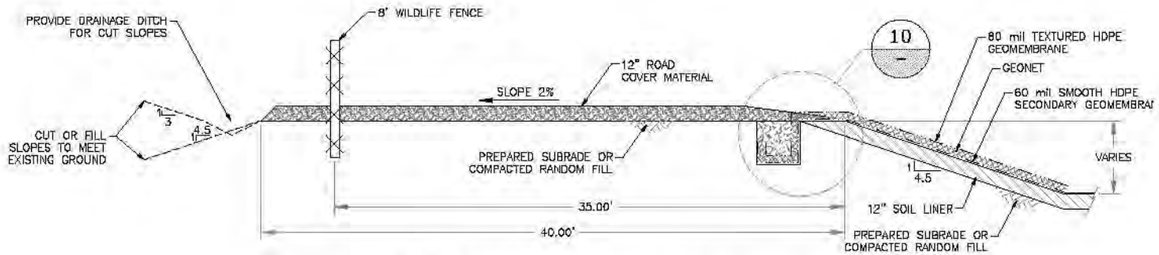


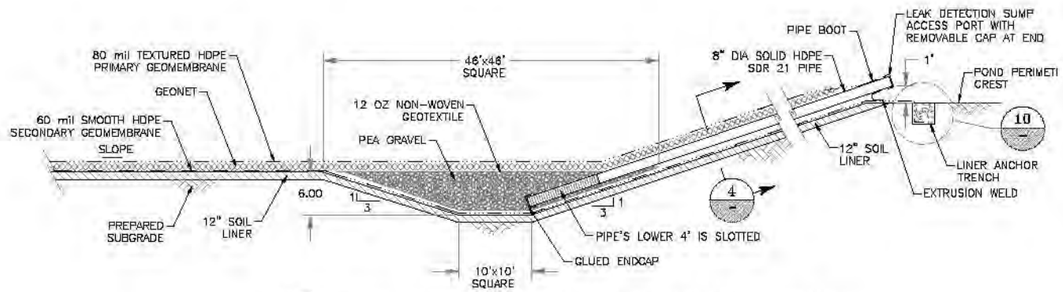
2/200 2/202 RADIUM SETTLING POND DETAIL
TYPICAL OF DOUBLE LINED PONDS

50 0 50 100 FEET
1" = 50' AT FULL SIZE (ANSI D)
1" = 100' AT HALF SIZE (ANSI B)



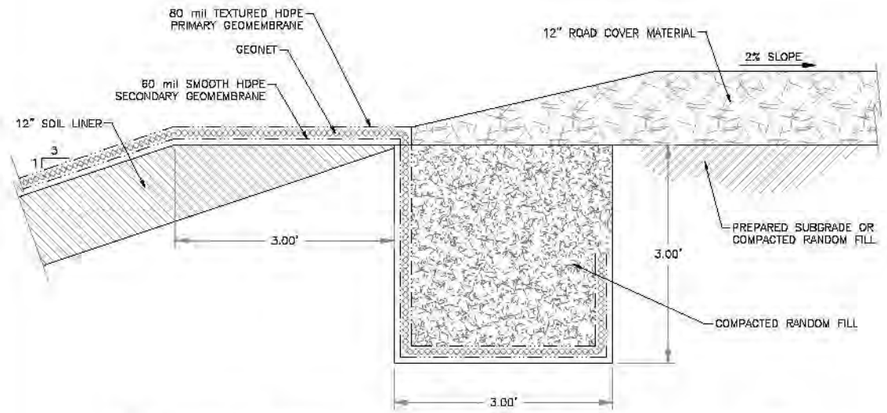
9 POND EMBANKMENT DETAIL
FOR DOUBLE LINED PONDS

5 0 5 10 FEET
1" = 5' AT FULL SIZE (ANSI D)
1" = 10' AT HALF SIZE (ANSI B)



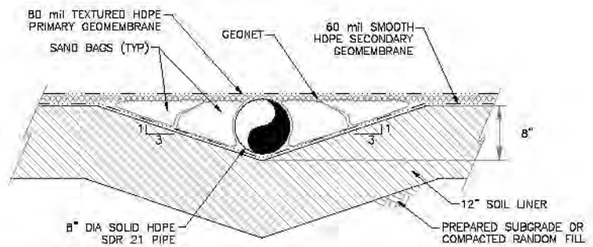
8 LEAK DETECTION SUMP AND ACCESS PORT DETAIL

10 0 10 20 FEET
1" = 10' AT FULL SIZE (ANSI D)
1" = 20' AT HALF SIZE (ANSI B)



10 ANCHOR TRENCH AND LINER DETAIL
FOR DOUBLE LINED PONDS

1 0 1 2 FEET
1" = 1' AT FULL SIZE (ANSI D)
1" = 2' AT HALF SIZE (ANSI B)



4 LEAK DETECTION SUMP ACCESS PORT DETAIL

1 0 1 2 FEET
1" = 1' AT FULL SIZE (ANSI D)
1" = 2' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI–D) AND 1.5" ON A HALF SIZE PLOT (ANSI–B).
2. EMBANKMENT DRAINS TO BE CONSTRUCTED BENEATH ALL FILL EMBANKMENTS.

REV	DATE	DESCRIPTION	APP'D
A	09/15/09	ISSUED FOR CLIENT REVIEW	ST RJB

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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY–BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION
TYPICAL SECTIONS AND DETAILS
SHEET 2 OF 2

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	RJB	102	279.02	302	A
ACTIVITY CODE	N/A	SHEET NUMBER	N/A		

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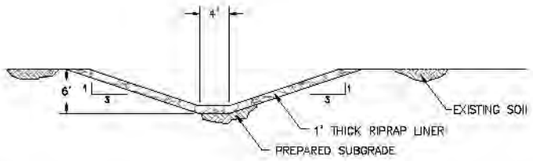
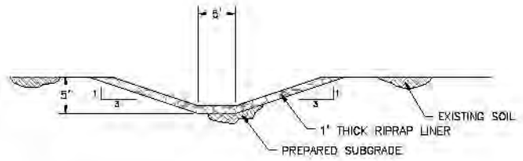


G 102 DEWEY STORMWATER DIVERSION CHANNEL SECTION



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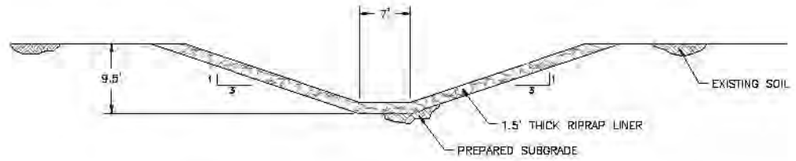

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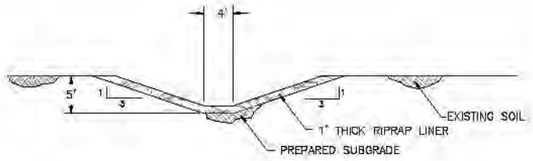

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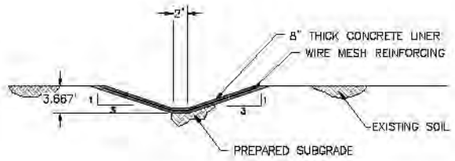

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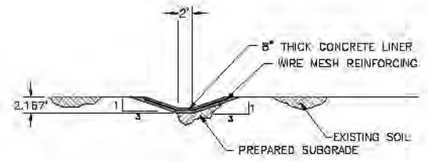
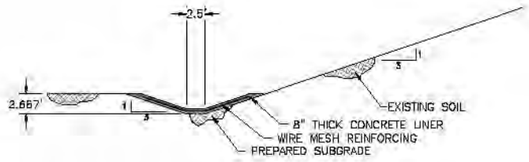
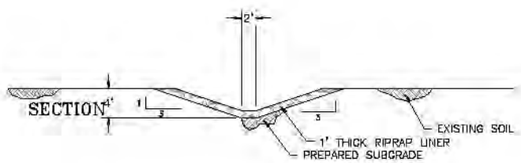


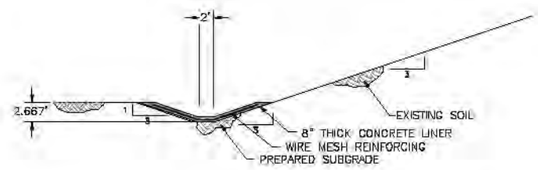
L 101 BURDOCK STORMWATER DIVERSION CHANNEL SECTION



M 101 BURDOCK STORMWATER DIVERSION CHANNEL SECTION



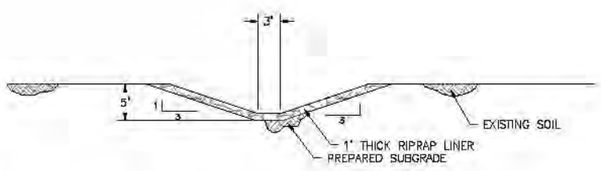
N 101 BURDOCK STORMWATER DIVERSION CHANNEL SECTION



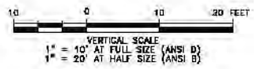
O 101 BURDOCK STORMWATER DIVERSION CHANNEL SECTION

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).



P 101 BURDOCK STORMWATER DIVERSION CHANNEL SECTION



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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY–BURDOCK PROJECT

TITLE: LAND APPLICAITON AND IRRIGATION DIVERSION CHANNEL SECTIONS

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
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ACTIVITY CODE	N/A	WBS NUMBER	N/A		

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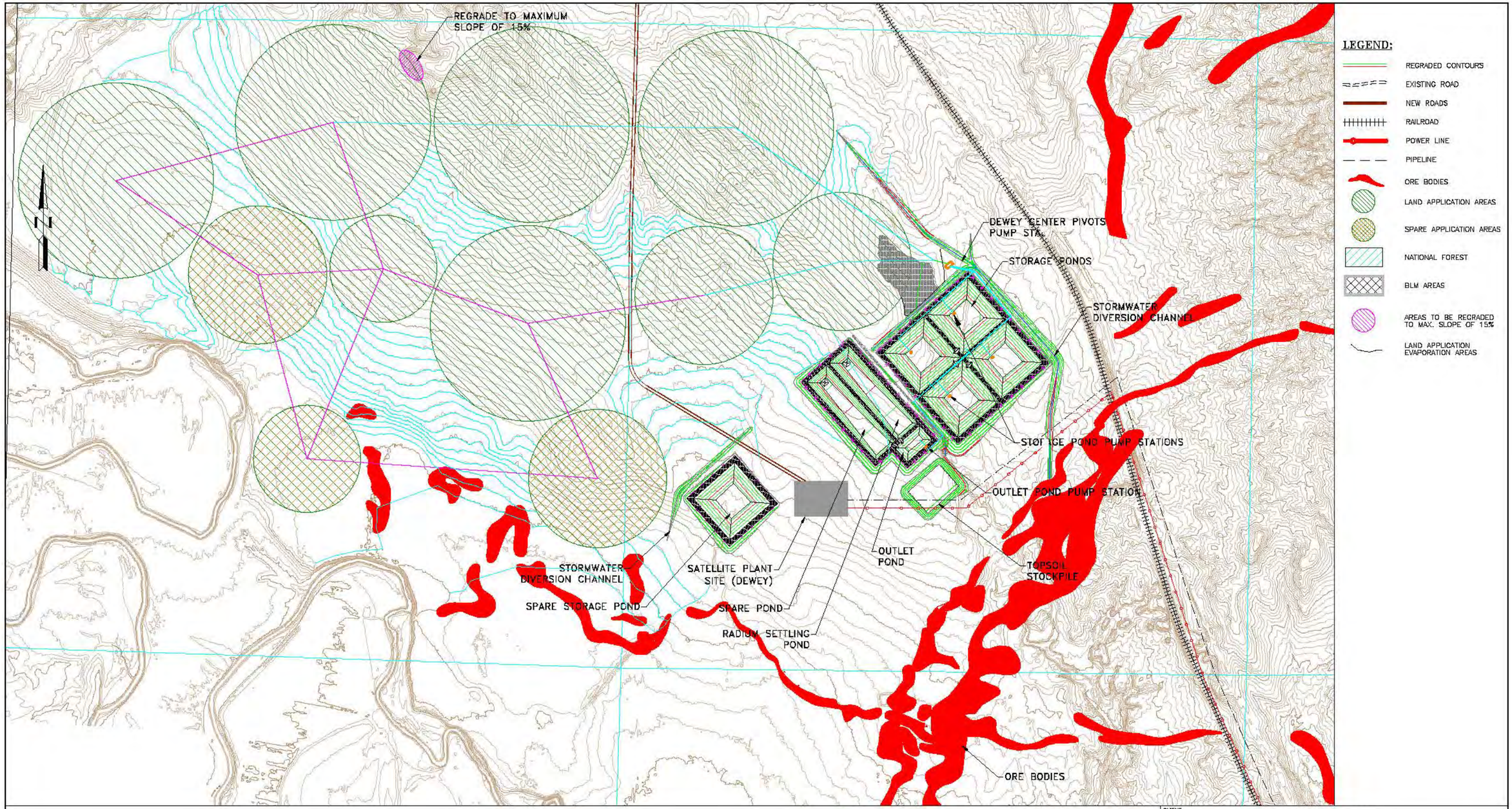

PLAN

400 0 400 800 FEET

1" = 400' AT FULL SIZE (ANSI D)
1" = 800' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

REV	DATE	DESCRIPTION	APP'D
A	10/30/09	ISSUED FOR CLIENT REVIEW	ST
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CLIENT: POWERTECH (USA) Inc.

PROJECT: DEWEY-BURDOCK PROJECT

TITLE: LAND APPLICATION AND IRRIGATION DEWEY EVAPORATION AREAS AND LAND APPLICATION REGRADING

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	RJB	102	279.02	600	A
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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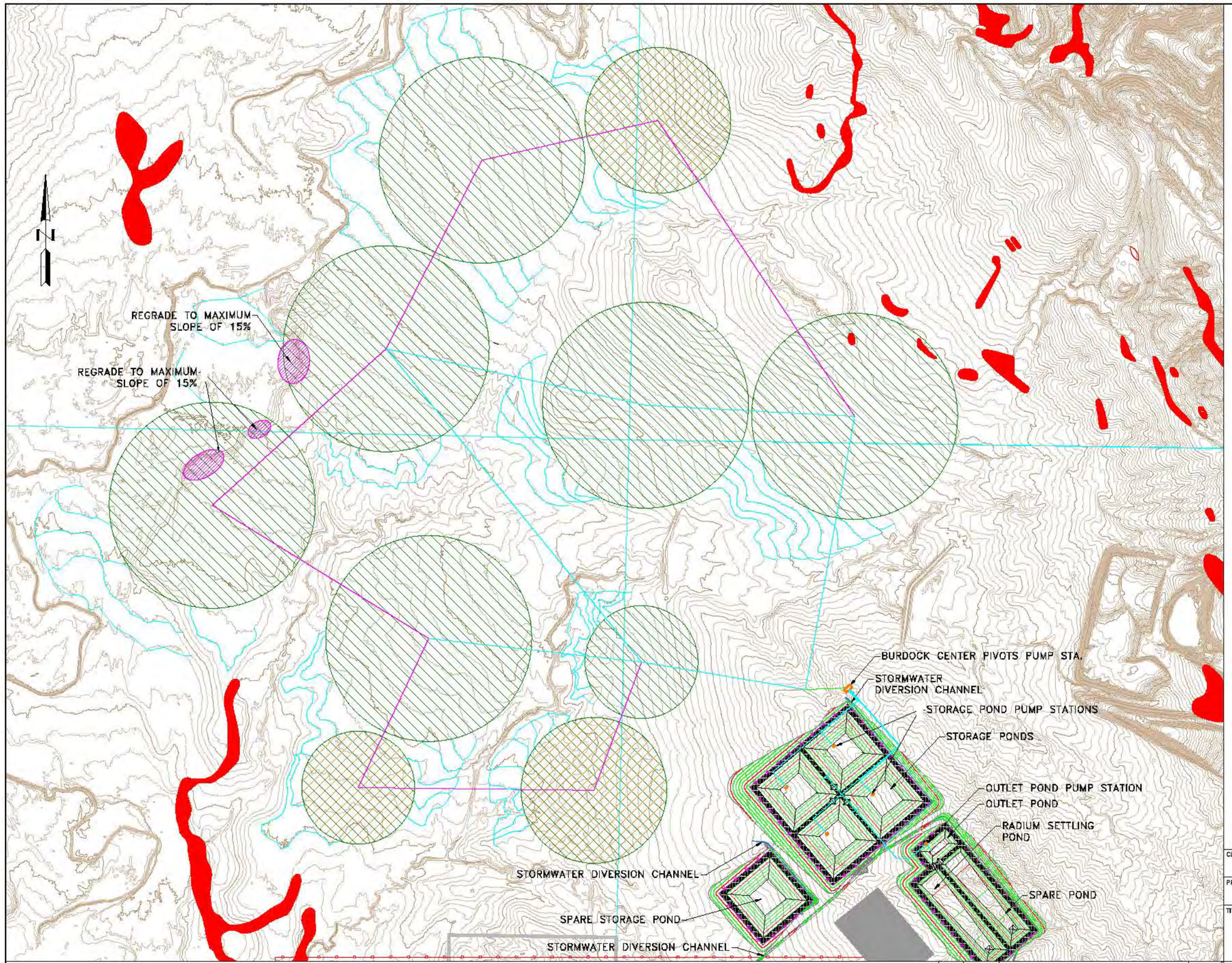

LEGEND:

- REGRADED CONTOURS
- EXISTING ROAD
- NEW ROADS
- RAILROAD
- POWER LINE
- PIPELINE
- ORE BODIES
- LAND APPLICATION AREAS
- SPARE APPLICATION AREAS
- NATIONAL FOREST
- BLM AREAS
- AREAS TO BE REGRADED TO MAX. SLOPE OF 15%
- LAND APPLICATION EVAPORATION AREAS

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PLAN

400 0 400 800 FEET

1" = 400' AT FULL SIZE (ANSI D)
1" = 800' AT HALF SIZE (ANSI B)

REV	DATE	DESCRIPTION	APP'D
A	10/30/09	ISSUED FOR CLIENT REVIEW	ST / ST

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CLIENT	POWERTECH (USA) Inc.
PROJECT	DEWEY-BURDOCK PROJECT
TITLE	LAND APPLICATION AND IRRIGATION BURDOCK EVAPORATION AREAS AND LAND APPLICATION REGRADING

Knight Piésold CONSULTING

DESIGNED BY	ST	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	RJB	102	279.02	601	A
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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